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Introduction

For the convenience of maintenance and management personnel to understand LIFAN X70 Automobile Maintenance Manual, operating principle, technical parameters as well as carry out automobile inspection, fault diagnosis, assembly and disassembly, adjustment and maintenance, and maintenance reference, we had prepared the manual. At the time of preparation, the maintenance manual was intended to be illustrious and easy to understand, and ran through a number of maintenance techniques to reduce the man hours and improve the work efficiency.

Please pay attention to the following when using this manual:

1. When there is any vehicle failure, it is necessary to carry out checking, diagnosis and removal/installation. Before adjusting and maintaining, please read this manual carefully. Carry out operation and maintenance according to the requirements, and pay attention to some contents such as Warning, Caution, Note, and so on.
2. This maintenance manual is suitable for X70 Model. Because the model configurations are different, some devices, facilities or functions introduced in the above may not be appeared in the model.
3. In order to avoid damage to vehicle devices or even cause any safety accident, do not allow any user to refit or install any equipment, especially for electrical appliances, braking system, steering and other systems involving the driving safety.
4 When replacing parts, please purchase and use the genuine fittings provided by Lifan in Lifan special maintenance service stations.
5. Lifan will not be responsible for any safety incident, other direct or indirect loss resulting from the violation of the items specified in Serial No. 3 and 4 as the above.
6. With the progress of technology and development, X70 model series products will also be improve and perfect continuously. Therefore, some of the contents in this maintenance manual may have some discrepancy with the improved products, and Lifan reserves the right to design improvements without prior notices. In this regard, in addition to the revision of the second edition, without notice to the users, Lifan will not be responsible directly or indirectly for the loss caused by the above.

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LiFan Industry(Group) IMP&EXP Co.,Ltd.
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AutoLibrary

AutoLibrary

AutoLibrary

AutoLibrary

1 Overview	Overview	1-1
2 Engine	Engine mechanical system	2-29
	Engine control system (UAES)	2-135
	Engine control system (Delphi)	2-315
	Lubrication System	2-497
	Fuel System	2-519
	Intake system	2-539
	Exhaust system	2-551
	Cooling system	2-561
	Start system	2-601
	Charging system	2-631
	Ignition System	2-651
	Emission control system	2-669
	Power suspension device	2-691
	Engine immobilizer	2-707
3 Transmission	Manual transmission	3-725
	Continuously variable transmission	3-781
	Clutch	3-885
4 Transmission system	Drive Train	4-917
5 Driving system	Front suspension	5-939
	Rear suspension	5-979
	Wheels and tires	5-1001
	Four-wheel alignment	5-1019
6 Steering system	Hydraulic power steering system	6-1035
7 Braking system	Service brake system	7-1075
	Parking system	7-1121
	ABS TCS EBD ESP	7-1137
8 HVAC	Electric air conditioning system	8-1217
9 Safety protection device	Seatbelt	9-1283
	Airbag system	9-1309
10 Body	Fender	10-1365
	Engine cover	10-1371
	Car door	10-1381
	Glass	10-1391
	Door handles, door locks and doors	10-1403
	Filler cap	10-1415
	Shelf curtains	10-1419
11 Interior trims/exterior trims	Dashboard and console	11-1423
	Seat	11-1441
	Interior trim	11-1467
	Exterior trim	11-1493
12 Electrical	Lighting System	12-1509
	Wiper and scrubber	12-1583
	Horn	12-1641
	Instruments and displays	12-1653
	Electric rearview mirror	12-1721
	Audio system	12-1739
	EPS system (keyless entry and one-key start system)	12-1761
	Central locking system	12-1817
	Roof	12-1841
	Power window	12-1855
	Automobile reversing radar	12-1879
	Constant-speed cruise control system	12-1895
	Communication system	12-1911
	Body controller BCM	12-1923
	Defrosting	12-1967
	Cigarette lighter	12-1981
	PMS Tire pressure monitoring system	12-1995

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AutoLibrary

AutoLibrary

AutoLibrary

AutoLibrary

01- Overview

Overview.....1-3
How to use this manual.....1-3
Vehicle parameters 1-6
Logo 1-10
Danger, warning, and caution signs 1-11
Traction and Shipping 1-19
Vehicle Lift and Support 1-20
Regular maintenance.....1-22
Abbreviations 1-25

AutoLibrary

AutoLibrary

AutoLibrary

AutoLibrary

Overview

How to use this manual

Overview

This manual contains procedures for carrying out all necessary maintenance operations. All procedures are divided into five basic operations:

- Remove/install
- Disassemble/assemble
- Replacement
- Check
- Adjust

It omits simple operations that can be accomplished only by viewing the vehicle (removing/installing parts, lifting the vehicle with a jack, cleaning parts, and carrying out visual inspection).

Maintenance procedures

Most maintenance procedures are described firstly with an overview map. These can describe the component name and its combination mode, which describes the visual inspection method. However, written instructions are provided only for the disassembly/assembly procedures that need to be performed systematically.

All maintenance procedure steps are numbered. Main components designed in the step shall come with the corresponding illustration numbers. Some instructions also contain important hints or supplementary information for a particular procedure. The relevant parts of the maintenance shall refer to the hint of information.

Check and adjustment

Carry out inspection and adjustment in steps. The location and contents of the important maintenance procedures are described in detail in this manual.

For the torque conversion in Metric/British system, see Table 1.

Nm	lb-in
1	9
2	18
3	27
4	35
5	44
6	53
7	62
8	71
9	80
10	89

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For the torque conversion in Metric/British system, see Table 2.

Nm	lb-ft	Nm	lb-ft	Nm	lb-ft	Nm	lb-ft
1	1	68	50	135	100	202	149
2	1	69	51	136	100	203	150
3	2	70	52	137	101	204	150
4	3	71	52	138	102	205	151
5	4	72	53	139	103	206	152
6	4	73	54	140	103	207	153
7	5	74	55	141	104	208	153
8	6	75	55	142	105	209	154
9	7	76	56	143	105	210	154
10	7	77	57	144	106	211	156
11	8	78	58	145	107	212	156
12	9	79	58	146	108	213	157
13	10	80	59	147	108	214	158
14	10	81	60	148	109	215	159
15	11	82	83	149	110	216	159
16	12	83	61	150	111	217	160
17	13	84	62	151	111	218	161
18	13	85	63	152	112	219	162
19	14	86	63	153	113	220	162
20	15	87	64	154	114	221	163
21	15	88	65	155	114	222	164
22	16	89	66	156	114	223	164
23	17	90	66	157	116	224	165
24	18	91	67	158	117	225	166
25	18	92	68	159	117	226	167
26	19	93	69	160	118	227	167
27	20	94	69	161	119	228	168
28	21	95	70	162	119	229	169
29	21	96	71	163	120	230	170
30	22	97	72	164	121	231	170
31	23	98	72	165	122	232	171
32	24	99	73	166	122	233	172
33	24	100	74	167	123	234	173

AutoLibrary

AutoLibrary

Nm	lb-ft	Nm	lb-ft	Nm	lb-ft	Nm	lb-ft
34	25	101	74	168	124	235	173
35	26	102	75	169	125	236	174
36	27	103	76	170	125	237	175
37	27	104	77	171	126	238	176
38	28	105	77	172	172	239	176
39	29	106	78	173	128	240	177
40	30	107	79	174	128	241	178
41	30	108	80	175	129	242	179
42	31	109	80	176	130	243	179
43	32	110	81	177	131	244	180
44	32	111	82	178	131	245	181
45	33	112	83	179	132	246	181
46	34	113	83	180	133	247	182
47	35	114	84	181	133	248	183
48	35	115	85	182	134	249	184
49	36	116	86	183	135	250	184
50	37	117	86	184	136	251	185
51	38	118	87	185	136	252	186
52	38	119	88	186	137	253	187
53	39	120	89	187	138	254	187
54	40	121	89	188	139	255	188
55	41	122	90	189	139	256	189
56	41	123	91	190	140	257	190
57	42	124	91	191	141	258	190
58	43	125	92	192	142	259	191
59	44	126	93	193	142	260	192
60	44	127	94	194	143	261	193
61	45	128	94	195	143	262	193
62	46	129	95	196	144	263	194
63	46	130	96	197	145	264	195
64	47	131	97	198	146	265	195
65	48	132	97	199	147	266	196
66	49	133	98	200	148	267	197
67	49	134	99	201	148	268	198

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Vehicle parameters

Engine parameters

Name	Specification
Engine type	Inline four-cylinder, DOHC, chain drive, water cooled, and variable intake timing
EFI system supplier	5MT-DELPH, CVT-UAES
Valve train type	DOHC 16-valve
Valve train drive chain	Chain – gear – cam – tappet – valve
Cylinder diameter × stroke mm	82.5×93
Displacement mL	1988mL
Compression ratio	10:1
Fuel supply device	Electronic fuel multipoint injection
Engine rotation direction (viewed from the output end)	Counterclockwise
Lubrication mode	Pressure & splash
Firing order	1-3-4-2
Cold inlet valve clearance, mm	0.20 ~ 0.25
Cold outlet valve clearance, mm	0.30 ~ 0.35
Spark plug type/clearance	K7RTC /07 ~ 0.8
Thermostat opening/full opening temperature, °C	82±2°C/95±2°C
Combustion chamber type	Roof type
Idle speed, rpm	750±50
High idle speed, rpm	2000±50
Rated power/rated speed kW/rpm	104/6000
Maximum torque/speed corresponding to maximum torque, Nm/rpm	185/4200 ~ 4400
Maximum net power/speed corresponding to maximum net torque, kW/rpm	100/6000
Maximum net torque/speed corresponding to maximum net torque, Nm/rpm	178/4200 ~ 4400
Minimum fuel consumption (total power) g/kw•h	≤ 265
Oil/fuel consumption ratio %	≤ 0.3
Exhaust/intake cam lift, mm	8.8052/9.628
Exhaust temperature in the case of idle, °C	≤ 600
Exhaust back pressure in the rated speed, kPa	≤ 55
Coolant outlet temperature, °C	88 ~ 110
Oil temperature °C	90 ~ 125
Gasoline temperature °C	25±5

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Name	Specification
Ignition timing, °	10-18/800
Piston leakage rate (L/min)	≤ 35.8
Cylinder pressure (kPa/rpm)	≥ 1350/250rpm
Each cylinder pressure difference (kPa/rpm)	≤ 100/250rpm
Overall dimension of engine (without transmission) L × W × H mm	640×641×644
Lubricating oil number	15W/40:(Oil applied for the optimal use temperature of -10 °C ~ 40 °C)
	10W/30:(Oil applied for the optimal use temperature of -20 °C ~ 30 °C)
	5W/30:(Oil applied for the optimal use temperature of -25 °C ~ 30 °C)
	0W/40:(Use oil under the temperature of -35°C and less
Lubricating oil capacity, L	4.0
Emission limit standard	State V

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Transmission parameter (MT)

Transmission model		L5MF25E1 (LD525MFA20)
Transmission type		5MT
Reduction ratio	1 gear	3.889
	2 gear	2.118
	3 gear	1.458
	4 gear	1.091
	5 gear	0.814
	R gear	3.6
	Final drive	4.0625
Gear oil capacity		2±0.1L

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Transmission parameter (CVT)

Name	Specification
Transmission model	019CHD
Transmission form	Continuously variable transmission (CVT)
Layout	Transversal front drive
Starting clutch device	Hydraulic torque converter
Control modes	Electronic hydraulic control
Dimension (L×W×H)	385mm×555mm×505mm
Weight (no cooling lubricating oil contained)	78kg
Central distance	204mm
Maximum permissible input torque	190 Nm
Main reduction ratio	5.141
Pulley speed ratio range	0.427-2.465
Oil type	Idemitsu SP3
Transmission oil level in total	8±0.2L

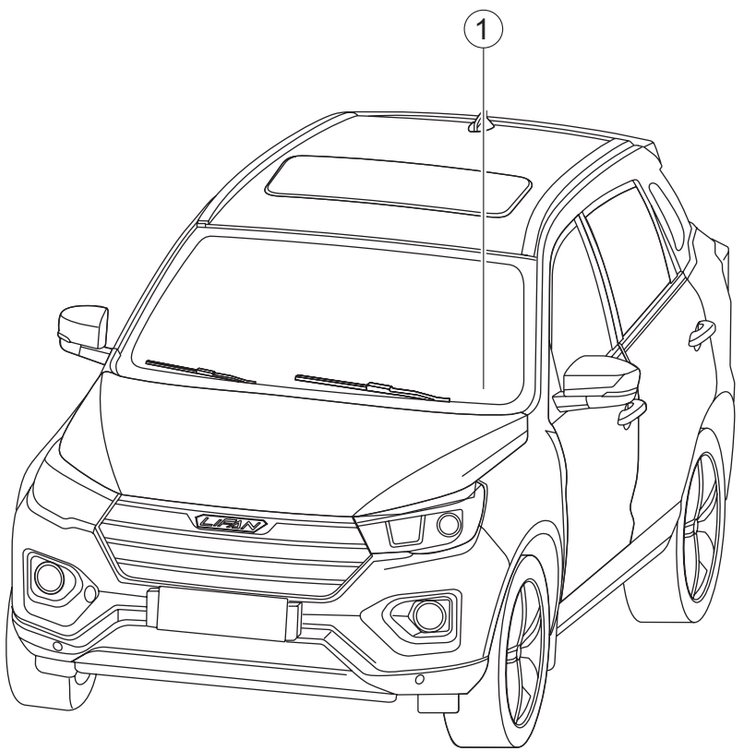
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Logo

Vehicle type and serial number

Vehicle identification code (VIN)



LFX60-SM-01001

No.	Part name
1	Vehicle identification code (VIN)

No.	Part name

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Danger, warning, and caution signs

Information of hints

In this manual, you will find warnings, cautions, notes, specification, hints, upper limit, lower limit and so on.

⚠Warning:
The warning indicates that serious body injury or death will be caused if the hint is ignored.

△Tips:
The hint indicates that vehicles or parts may be damaged if the hint is ignored.

ⓘNote:
The note provides additional information that helps to complete some certain particular procedures.

Diagnosis and procedures in the service manual include general and specific "Warning", "Importance Note", and "Note". Lifan is committed to providing maintenance information, and helping after-sale service technicians and maintenance systems so as to make the vehicle operate normally. But if technicians do not operate according to the recommended method, some procedures may cause danger to technicians. "Warning", "Important Precaution" and "Note" are prepared to prevent the above risks, but not all risks can be foreseen. This kind of information is located in a prominent position in the maintenance manual. These information are prepared to prevent the following cases:

- Cause serious ham to personnel.
- Vehicle damage.
- Unnecessary vehicle maintenance.
- Unnecessary parts replacement.
- Improper maintenance or replacement of vehicle components.

Definition of "Important Precaution"

"Important Precaution" requires special attention to necessary or prohibited measures. If we ignore the "Important Precaution", the following consequences will arise:

- Vehicle damage.
- Unnecessary vehicle maintenance.
- Unnecessary parts replacement.
- The operation or performance of repaired systems and components is abnormal.
- Damage related systems or components.
- Damage to fasteners, basic tools or special tools.
- Leakage of engine coolant, lubricating oil or other main fluids.

Definition of "Caution?

"Caution" statements emphasize the necessity of some certain diagnosis or maintenance process. The "Caution" statement is intended as follows:

- Definite procedures.
- Provide supplementary information for completing a procedure.
- Explain the reasons for operation according to recommended procedures.
- Provide information that helps to complete the program in a more efficient way.
- Provide technicians with previous experience information to complete the procedures easier.

Warning about vehicle lifting

⚠Warning:
When removing a key part from the vehicle and holding the vehicle on a lift, it is required to support the part corresponding to the component to be removed with a jack pad, in order to prevent vehicle damage, serious personal injury and even fatal accident.

Warnings about Handling Components in Anti-lock Braking System (ABS) or Body Stabilizing System (ESP)

⚠Warning:
Some components in ABS or ESP cannot be maintained individually. Attempting to remove or disconnect some certain system components can cause a personal injury or abnormal system operation. Only those components can be removed and installed can be repaired.

Warning about protective devices in collision repair

⚠Warning:
In order to avoid grinding/cutting any type of metal or flake molded parts and prevent any personal injury due to exposure to arc welding or metal plating (Zinc Oxide) toxic smoke, work in good ventilation, and wear a licensing respirator, goggles, ear plugs, protective gloves and protective clothing.

Warnings about co-driver driving

⚠Warning:
When a technician checks and repairs faulty parts, the assistant shall drive the vehicle. Otherwise, it may cause a personal injury.

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Warning about disconnection of storage battery

⚠Warning:
Before repairing any electrical component, start up the switching power supply mode, and put it in the OFF state, and all electrical loads must be OFF unless otherwise stated in the operating procedure. If any servicing tool or equipment is likely to contact an exposed live terminal, the battery negative cable should also be disconnected. The violation of these safety instructions may result in personal injury and/or damage to vehicles and vehicle parts.
When repairing the airbag, disconnect the battery negative for 90 s at least to perform other operations.

Warning about dust from brake

⚠Warning:
Avoid the following operations when the wheel brake parts are maintained:
- Do not grind any brake friction lining.
- Do not polish any brake friction lining with a sand paper.
- Do not clean any wheel brake section with a dry brush or compressed air.
- Provide information that helps to complete the program in a more efficient way.
- Some model or after-sale installation brake sections may contain fibers. This kind of fibers will be mixed in dust. The inhalation of fiber containing dust will seriously damage the body. Please clean up any dust from brake parts with a damp cloth.

Warning about brake fluid

⚠Warning:
The brake fluid is easy to absorb moisture. Do not use any brake fluid that may be contaminated by water in an open container. Improper or contaminated brake fluid may cause system failure, vehicle runaway and personal injury.

Warning about irritant brake fluid

⚠Warning:
The brake fluid is irritating to body skin and eyes. In the event of contact, the following measures shall be taken:
- Eye contact – rinse thoroughly with water.
- Skin contact – wash with soap and water.

Warning about replacement of brake pipe

⚠Warning:
When replacing a brake pipe, please install and fasten it carefully with proper fasteners. Otherwise, it may cause damage to the brake pipe and the brake system so as to cause a personal injury.

Warnings about inhalation of R-134a

⚠Warning:
Avoid any inhalation of air conditioning refrigerant R-134a, lubricant vapor or fog. Contacting with them will irritate eyes, noses and pharynx. Works should be performed in a well-ventilated area.When discharging R-134a from the air conditioning system, use the maintenance equipment that has been certified to meet the requirements of SAEJ2210. In case of accidental system drainage, ventilation must be done to the work area prior to the continued maintenance. More information about health and safety is available from the refrigerant and lubricating oil manufacturers.

Warnings about Clutch Dust

⚠Warning:
When maintaining clutch parts, do not grind or polish the clutch plate with sandpaper. Do not clean parts with dry brush or compressed air because all the above operations will product dust. Use the wet cloth dipped in water (but not soaked). The clutch plate may contain fibers. If dust is produced during the maintenance process, these fibers may be mixed into the air. Inhalation of dust containing fibers can cause severe personal injury.

Collision Sectioning Warning

⚠Warning:
Carry out the sectioning only at the recommended position. Otherwise, the vehicle's structural integrity will be destroyed and personal injury may be incurred during vehicle collision.

Warnings about window crack

⚠Warning:
If a window glass is cracked but still intact, a protective tape shall be crossed to the window glass to avoid further damage to it or cause personal injury.

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Warning about Exhaust System Repair

⚠Warning:
Don't repair the exhaust system when it is very hot, in order to prevent scalding.
Please repair it after it is cooled down.

Warning about Window Regulation Function

⚠Warning:
When the driver operates the switches of electric vehicle door window, the windows without any clamp move very fast and cannot be stopped, which may cause personal injury.

Warning about Eye Protection

⚠Warning:
Wear the approved goggles and gloves to minimize the risk of personal injury while performing this procedure.

Warning about Soundproof Foam Material

⚠Warning:
When use the open flame during the maintenance period of vehicle body, remove foams and sound insulation materials within the range of 152.3 mm (6 in) away from the open flame. When reinstall foams and sound insulation materials, avoid any smoke inhalation. Otherwise, they are harmful to health.

Warning about Fuel Pipes and Vapor Drain Pipe

⚠Warning:
To reduce the risk of fire and injury, please follow the following warnings:

- Replace all fuel pipes scratched, scored or damaged during the installation process. Do not attempt to repair fuel pipes.
- When install new fuel pipes, do not knock the fuel pipe bundle holder directly with a hammer.
- When operate with a welding gun nearby the fuel steam tube, be sure to cover it with a wet towel.
- In addition, for a fuel steam pipe, do not expose the vehicle to the temperature above 115°C (230ºF) for more than 1 h, or at the temperature 90°C (194ºF) and more for a long time.
- Before connecting fuel pipe fittings, be sure to apply a few drops of clean engine oil to male connectors so as to ensure the reconnection is correct and prevent any possible fuel leak. (During the normal operation process, the O-ring in the female connector will expand. If not lubricated, it can not be reconnected properly).

Warning about Fuel Leaks

⚠Warning:
Wrap a piece of cloth around the fuel pressure gauge joint to reduce the risk of fire or personal injury. The cloth can absorb the fuel that leaks when the fuel pressure gauge is connected. After connecting the fuel pressure gauge, place the cloth in an appropriate container.

Warning about Fuel Pipe Connectors

⚠Warning:
When connect fuel pipe fittings, be sure to apply a few drops of clean engine oil to male connectors and reduce the risk of fire and personal injury so as to ensure the reconnection is correct and prevent any possible fuel leak. In normal operations, O-ring in the female connector may be expanded; if it is not lubricated, it can not be reconnected properly.

Warning about Fuel Storage

⚠Warning:
Do not allow fuel to be discharged into an open container. Do not store fuel in an open container. Otherwise, it may fire or explode.

Warning about Fuel Vapor in Vapor Drain Part

⚠Warning:
Do not inhale the air from the vent pipe or hose. The evaporation of fuel vapor in the parts may result in personal injury.

Warning about Gasoline/gasoline Vapor

⚠Warning:
Gasoline or petrol steam is very easy to burn. If there is a fire source, it may cause a fire. Therefore, it is forbidden to discharge fuel into or store fuel in an open container, in order to prevent fire and explosion. In addition, a dry chemical fire extinguisher should be provided near the fuel container.

Warning about Glass and Metal Plate Disposal

⚠Warning:
When any sharp-edged or burred glass or metal plate is disposed of, wear the recognized goggles and gloves to reduce the risk of personal injury.

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Warning about Halogen Bulb

⚠Warning:

Halogen bulbs contain high pressure gas. Improper handle may make the bulb burst into glass fragments. To avoid injuries:

- Before replacing the lamp, turn off the lamp switch, and cool it.
- Keep the lamp switch off until the lamp is replaced.
- When replace the halogen bulb, be sure to wear goggles.
- When take the light bulb, only hold the lamp holder to avoid touching the glass. Prevent the bulb from being stained with dust and moisture.
- Correctly discard old bulbs.
- Stay halogen bulbs away from children.

Warning about Removal of Fuel Injector O-rings

⚠Warning:

- Check the lower (small) O-ring of each oil injector. Do not retain it on the intake manifold to reduce the risk of fire and personal injury.
- If the O-ring is not removed with the oil injector, the service injector with the new O-ring can not be installed properly in the injector holder, and any improper installation will produce oil spills.

Warning about Moving Components and Hot Surfaces

⚠Warning:

When working near the running engine, avoid contacting any of its moving parts and hot surfaces to prevent any personal injury.

Warning about Goggles and Gloves

⚠Warning:

When the exhaust system is removed, be sure to wear goggles and gloves. Otherwise, the rust or sharp edge coming off from a worn part of the exhaust system may cause a severe personal injury.

Warning about Reservoir Tank Removal

⚠Warning:

In order to avoid being scalded, do not remove the reservoir tank cover before the engine is cooled down. If the reservoir tank cover is removed when the engine and radiator are not cooled down, the cooling system will release boiling hot high-pressure liquid and steam.

Warning about Cooling System Repair

⚠Warning:

As long as there is pressure in the cooling system, even if the coolant in the radiator does not boil, the solution temperature will be much higher than the boiling temperature. If the reservoir tank cover is opened when the engine is not cooled down and there is high pressure therein, the engine coolant will boil immediately when the repair is carried out to the cooling system and be possibly ejected onto the body of the operator, thus causing a severe scalding.

Warning about Fuel Pressure Release

⚠Warning:

- The process contains fuel handling. Always pay attention to whether there is any fuel spill, and pay attention to fuel handling precautions. Otherwise, this may cause personal injury.
- When carry out the operation of relevant fuel parts, avoid any form of open fire. High flammable mixture produced during the operation may be ignited. Improper operations can cause personal injury.

Warning about Road Test

⚠Warning:

In the premise of ensuring safety, carry out vehicle road tests, and comply with all traffic laws and regulations. Do not attempt any operation that may endanger vehicle controls. The violation of these safety instructions can result in serious personal injury and damage to the vehicle.

Warning about Goggles and Fuel

⚠Warning:

When disposing of the fuel, be sure to wear goggles to prevent the fuel from splashing into the eyes.

Warnings about airbag system

⚠Warning:

The vehicle is equipped with an airbag system. That not following correct operating procedures will lead to the following:

- Airbag is expanded.
- Injuries to personnel.

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Unnecessary maintenance of airbag system.

⚠Warning:
Observe the following guidelines so as to avoid the above situation:
- See the airbag system component view to determine whether you are performing maintenance operations on airbag system components, around them or on their lines.
- Remove the airbag system if you are carrying out maintenance operations on the airbag system components, around them, or on their lines.

Warning about the temperature of expanded airbag module is very high.

⚠Warning:
After expanding, the metal surface of the airbag system components may be very hot. In order to avoid fire and personal injury, comply with the following regulations:
- Have enough cooling time before touching any metal surface of the airbag system components.
- Do not place any inflatable airbag system component nearby any flammable material.

Warning about Airbag System Clock Spring

⚠Warning:
Improper installation of the clock spring assembly will damage the clock spring's internal spiral coil, and may cause the coil failure to cause the airbag module to not work properly, resulting in personal injury.

Warning about scrapped safety system airbag modules

⚠Warning:
In order to prevent any accident airbag expansion resulting in personal injury, do not dispose any unfolded airbag module as a conventional workshop waste. If the sealed container is damaged during the scrapping process, some of the substances contained in the unexpanded module may cause serious illness or personal injury. Safely discard the unexpanded airbag module by using the expansion program.

Warning about Removal and Storage of Airbag System's Airbag Module

⚠Warning:
When transporting an unexpanded airbag module:
- Do not carry any wire or connector on the airbag module.
- Make sure the airbag opening is not facing you or someone else.
- When storing unexpanded airbag modules, make sure that the airbag opening is not facing the surface of the loaded airbag module. Airbag openings shall not point downward. Do not place any objects on the airbag module. There should be enough space around the airbag for the airbag to unfold unexpectedly. Otherwise, people will be injured.
- Do not immerse undeveloped airbag modules in water or expose them to other liquids.
- Do not deploy unexpanded airbag modules near fire or in high temperature areas to prevent the airbag from being accidentally unfolded and people from being injured.

Warning about Disposal of Airbag System's Collision Sensor

⚠Warning:
Do not hit or shake the airbag system's collision sensor. Before the collision sensor is electrified, ensure that it has been firmly fixed. Failure to comply with the correct procedure may cause the airbag system to explode mistakenly or fail to work when it should work, thus causing personal injury.

Precautions when the baking system is filled with the braking fluid

⚠Warning:
When adding brake fluid into the brake master pump reservoir, only use the brake fluid in the clean and sealed brake fluid container and the brake fluid recommended by Cheetah manufacturer. Failure to use the recommended brake fluid can cause contamination so as to damage rubber seals and/or rubber liners inside of hydraulic brake system components.

Important Precautions for Belt Oil

ⓘNote:
Do not apply any belt oil to on the drive belt. The belt oil will cause the drive belt material to brake. The violation of this precaution can damage the drive belt.

Precautions about brake caliper

ⓘNote:
- When removing the brake caliper, suspend it with a steel wire so as not to damage the brake pipe.
- Pay special attention to the effects on brake fluid on paint and electrical components.

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Note:
Prevent the brake fluid from splashing on paint surface, electrical connectors, wires or cables. The brake fluid will damage the paint surface and cause electrical components to corrode. If the brake fluid is in contact with the paint surface, rinse the contact area with water immediately. If the brake fluid contacts electrical connectors, wires, or cables, wipe the brake fluid with a clean cloth.

Important Precaution for Damage to Fuel Tank Strap

Note:
Do not bend the fuel tank strap. Otherwise, it will be damaged.

Important Precaution for Engine Emission

Note:
The following system modifications will affect the vehicle emission control system, and may cause the fault indicator (MIL) and the “Check Engine” indicator to light up:
- Engine
- Transmission
- Exhaust system
- Fuel system

Important Precaution:

- If the tire replacement does not meet the performance standards of original tire, it will also affect the vehicle’s emission control, which may also cause the fault indicator (MIL) and the indicator “Check Engine” to light up.
- The modification of these systems or the tire with incorrect tire installation performance standard may result in repairs beyond the manufacturer’s warranty, which may prevent the vehicle from passing the required emission test.

Important Precaution for Engine Lift

Note:
No matter for what reason the engine is lifted or jacked, do not make the jack against the oil sump, any metal sheet part, or the lower part of the crankshaft pulley. An incorrect engine jacking method will damage one or more of its parts.

Important Precautions for Engine Mount

Note:
- If the engine mount is broken, it may cause some components of transmission system to be dislocated. The dislocation of transmission system components can result in eventual damage to the transmission components.
- If an engine mount is broken, the stress applied to other engine mounts will increase, which may cause the remaining engine mounts to break.

Important Precautions for Excessive Sealant on Flywheel Bolt

Note:
When the component is assembled, smear an appropriate amount of sealant onto the fasteners. Excessive sealant usage will lead to improper assembly or loose fasteners. Improper assembly will allow it to be loose or come off, thus leading a serious engine damage.

Important Precautions for Exhaust Manifold and Oxygen Sensor

Note:
When the engine temperature is higher than 48°C(120°F), the oxygen sensor will be removed difficultly. Excessive force will damage the threads of exhaust manifold or exhaust pipe.

Important Precaution for Exhaust System Inspection

Note:
When checking or replacing exhaust system components, ensure that there is a sufficient clearance with all the points in the bottom of vehicle body to prevent the floor from overheating or damaging the passenger compartment shock insulators and decorative materials.

Important Precaution for Timing Drive Chain Reaction Torque

Note:
To avoid damage to components, it is necessary to hold the hexagonal parts of the camshaft with a wrench during the disassembly or installation process. If the torque in the timing chain counteraction can not be avoided, it will cause the timing transmission chain to malfunction.

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Important Precaution for Removal of Exterior Logo

Note:
When removing a sign/nameplate, use a plastic flat blade tool to avoid damage to the paint.

Important Precautions for Fastener

Note:
Please use a correct fastener in the correct position. The part number of replacing fastener must be correct. In the maintenance procedure, fasteners that need to be replaced or require using threaded locking glue or sealant are noted specially. Unless otherwise stated, do not use any pint, lubricant or corrosion inhibitor on fasteners or fastener connection surfaces. These coatings may affect the tightening torque and clamping forces of the fasteners and even may damage them. The fasteners must be tightened to the appropriate tightening torque in the correct fastening order, to avoid damage to the parts and system.

Important Precautions for Fuel Pressure

Note:
The fuel pressure shall not exceed the specified value. Otherwise, the fuel pressure regulator or fuel pressure gauge may be damaged.

Important Precautions for Handling Electrostatic Discharge Sensitive Parts

Note:
Electrostatic discharge (ESD) can damage many solid-state electrical components. Components that are susceptible to ESD are not marked necessarily with ESD symbols. Handle all electrical components carefully. Please follow the following safety precautions to avoid damage due to electrostatic discharge:

- Before maintaining any electronic component, touch the metal ground point firstly to release the electrostatic in the vehicle body (especially after sliding on a vehicle seat).
- Do not touch any exposed terminal. Terminals may be connected to circuits that are damaged by ESD susceptibly.
- When maintaining connectors, do not touch tools to exposed terminals.
- Do not remove parts from protective housings unless otherwise required.
- Avoid the following operations unless the diagnostic procedures are required particularly.
- Make parts or connectors cross or ground.
- Connect a test device probe to a part or connector. When using a test probe, connect the ground lead wire firstly. Before opening the protective case of the part, make it ground firstly. Do not place solid parts on a metal table or on the top of display, radio, or other electrical devices.

Special Precautions for Heating Oxygen Sensor and Oxygen Sensor

Note:
Must follow the following principles when repairing the heated oxygen sensor:

- Do not apply contact cleaner or other materials on a sensor or a vehicle harness connector. These materials will enter sensors and result in poor performances.
- Do not damage any sensor lead wire or wire harness, or result in its internal wire exposure, which provides foreign objects access into the sensor channel and lead to performance failures.
- For sensors and vehicle leads, there shall not be any bend or kink. Any larger bend or kink will block air reference channel through lead wires.
- Make sure that the peripheral seal of the harness connector is intact to avoid damage due to water.

Important Precaution for Disconnecting Batteries by Place the Startup Switch in the OFF Position

Note:
Always turn the start switch to the OFF position when connecting or disconnecting battery cable, battery charger or jumper cable. Otherwise, the control module or an electric part will be damaged.

Important Precautions for Not Twisting or Bending in Host Installation

Note:
The inlet and outlet hoses shall not be bent during installation. Do not bend or deform them in order to facilitate their installation. Otherwise, part damage will be incurred.

Note for Damaged Machined Surfaces

Note:
Do not incise, scratch, or damage any sealing surface, which is a machined surface. Its damage can cause leak.

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Special Precautions for Power System Control Module and ESD

Note:
Do not touch any connector pin on the circuit board or any welded part to prevent the vehicle's control module from being damaged by electrostatic discharge.

Important Precaution for Removal of Ring Gear

Note:
Do not pry the ring gear from the differential housing. Prying the ring gear from the differential housing can cause damage to the ring gear and/or the differential case.

Note for Sealant

Note:
Do not let any room-temperature hardened sealant into the thread's blind hole. Otherwise, the fasteners will produce a hydraulic locking effect when applied. The hydraulic locking effect will damage the fasteners and/or other parts, and they cannot give the correct clamping forces. An incorrect clamping force leads to the failure to obtain correct sealing and thus leakage. If the fasteners cannot tighten the part correctly, the part will be loose or detached, thus causing the engine to be seriously damaged.

Important Precaution for Using a Diagnostic Instrument

Note:
Before the vehicle is diagnosed, the following conditions must be met. Otherwise, the control module may be damaged.

- The software version of the diagnostic instrument and terminal version must be up-to-date.
- The vehicle battery must be charged fully, and the battery voltage should be between 11V and 14V.
- Both the diagnostic instrument and the terminal cables must be connected firmly.
- When programming the control module, the battery charger must not be connected to the battery.

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Important Precautions for Testing Probes

Note:

Do not insert a test device probe (such as digital multimeter and so on) into a harness connector or a fuse box terminal. The diameter of test probe will cause most terminals to deform. And the terminals will be contacted poorly after the deformation so as to cause the system to malfunction. Be sure to use special tools and test the terminals from the front. Do not use any paper clip or other substitute to detect the terminals. When testing components with a special tool, make sure that the selected terminal test adapter meets the connector terminal size requirements. Do not visually select the terminal test adapter because some connector terminals may appear larger than the actual terminals in the hole. Using a large terminal to test the adapter will damage the terminals.

Note for Damaged Window Edge

Note:

To avoid damage to the windows due to the impact of exposed edges, the windows must be 1 mm (0.025 in) lower than the sheet metal surface to avoid damage to the windows.

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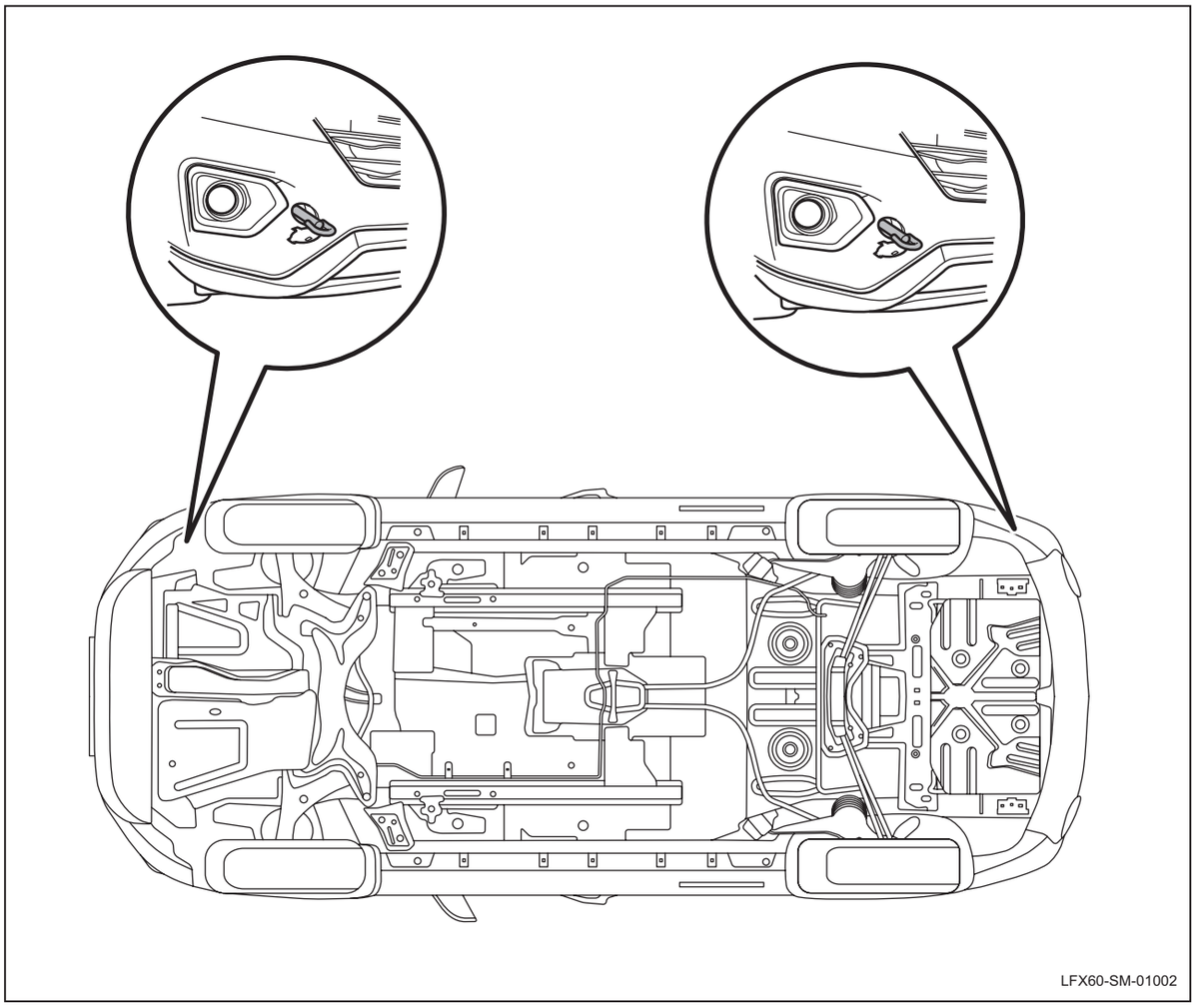
Traction and Shipping

⚠Warning:

When dragging a vehicle, operate the start switch to turn the power mode to the ON state (the steering lock startup warning light is flashing). Only in this way, steering wheel, steering signal lights, speakers and parking lights can be operated normally. The failure to follow this warning may result in injury.

ⓘNote:

Move the towing ring (if equipped) with a right-hand thread. Be sure to tighten fully before starting towing. When need to tow a vehicle necessarily, use the vehicle towing ring. The rope must be fastened securely on the towing ring. In the same way, the other end of the rope shall be tied to another vehicle so that the rope does not wrap around the vehicle body. A vehicle can also be towed by means of a low rack trailer or in a trailer towing mode.



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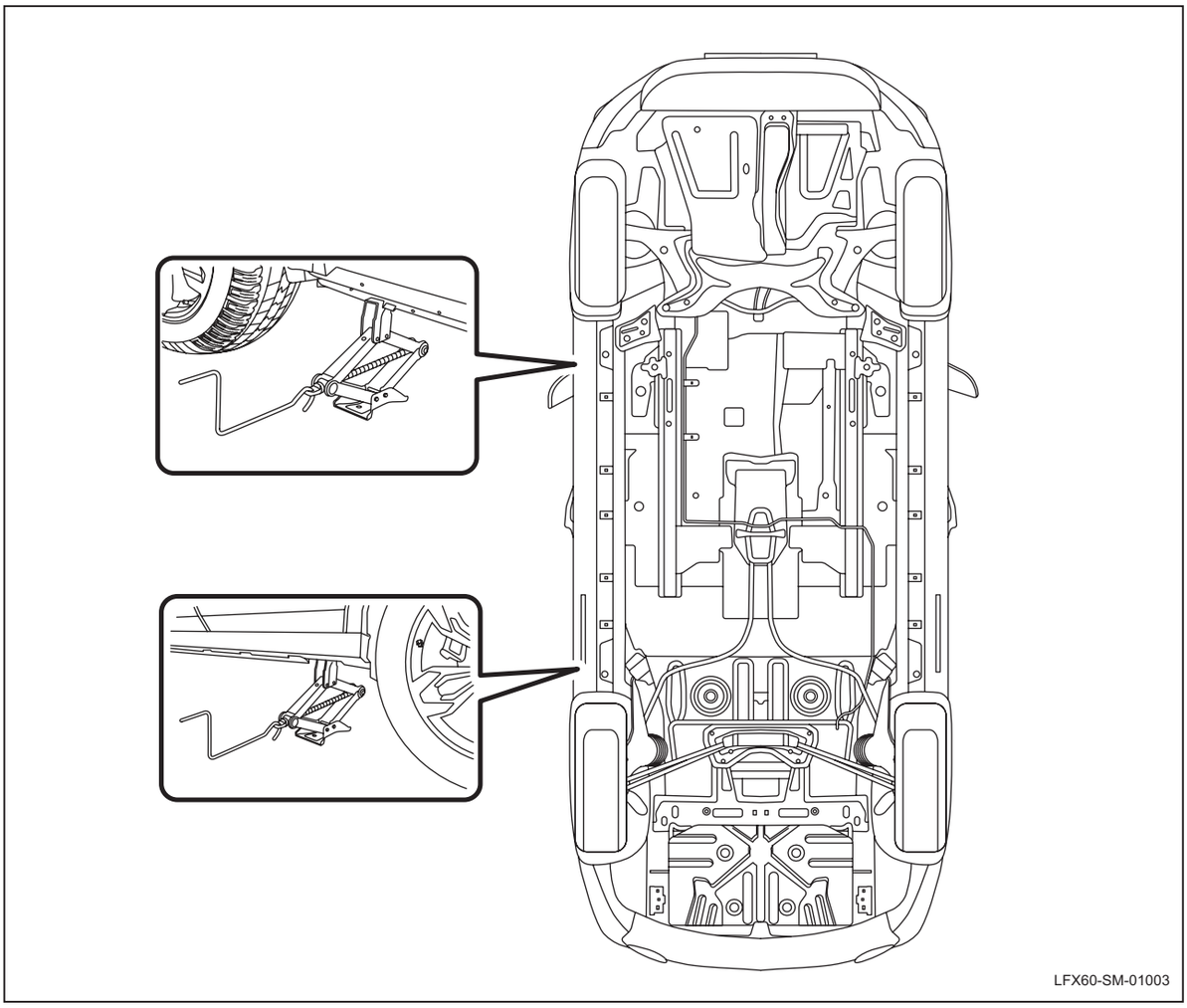
Vehicle Lift and Support

Top lift

⚠Warning:
Place the vehicle at a hard surface. If the vehicle must be lifted on a soft surface, use a load distribution pad under the jack. Apply a wedge pad to the wheel outside diagonally opposite the jacking point. Failure to following this warning may result in personal injury.

ℹNote:
It is very important to use a correct jack to work on a proper support point.

ℹNote:
Refer to the user manual for correct operating instructions when using a jack for vehicles.



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Lift

⚠Warning:
When lift a vehicle with a two-column lift to replace engine, transmission or rear axle, make sure the vehicle is used during the lift process to avoid tilting. Failure to follow these instructions may result in personal injury.

ⓘNote:

- **When lifting a vehicle, the lifting point shall not be on any lower swing arm. Otherwise, it will cause damage to parts.**
- **When lifting a vehicle with two column lifters, the vehicle lift arm adapter must be supported below the lift point.**
- **It is very important to use a correct lift and support positions at all times.**
- **When lift a vehicle with a two-column lift, the vehicle's weight cannot be exceed the maximum limit.**

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Regular maintenance

Maintenance period

Normal vehicle operation

The maintenance procedures described in this manual apply to vehicles that meet the following conditions:

- Deliver passengers and cargo within recommended limits.
- Drive on an ordinary road under the limited legal driving conditions.
- Use the recommended fuel.

Lifan recommends that all recommended maintenance items are implemented at specified intervals and maintenance situations are documented.

According to the vehicle operation environments, the maintenance plan can be divided into two cases such as maintenance plan in general and harsh environments.

Please choose the maintenance plan according to your driving environments.

Harsh conditions include as follows:

- Drive in fog weather or at a seaside.
- Drive in an uneven, muddy or mountain road.
- Drive in a dusty road.
- Drive in cold areas.
- Engine is idle for a long time. Or, carry out a short trip frequently in a cold season.
- Carry out brakes frequently (including emergency braking).
- Use as a tractor.
- Use as a rental vehicle.
- The vehicle usage exceeds 50% in a traffic area with the temperature above 32°C.
- Drive often at a low speed under the frequent start and stop traffic conditions.
- The usage rate is more than 50% when the vehicle speed is higher than 120 km/h in the case that the temperature is higher than 30°C.
- Drive with overloads.

ⓘNote:

Maintenance intervals should be shortened in driving under harsh conditions. Check and repair when there is any abnormal condition. If necessary, transpose the wheel and balance them.

ⓘNote:

Check the engine oil level and the radiator coolant level every week.

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Periodic Maintenance Schedule

Carry out maintenance according to the odometer readings or the number of months, whichever comes first.

When implementing a paid vehicle maintenance periodically, carry out inspection and maintenance according to the following table.

The letters in the table mean as follows:

R = Replace

I = Inspect, adjust, clean, and replace if necessary.

C = Cleaning

Maintenance intervals. Maintenance items.		First warranty	Warranty	Maintenance interval (for the time after the table, things should be done still according to the following time interval)									
	x1000km	3	8	16	24	32	40	48	56	64	72	80	88
	Month	3	9	15	21	27	33	39	45	51	57	63	69
Engine, transmission													
Oil and oil filter		R	R	R	R	R	R	R	R	R	R	R	R
Air cleaner element		I	R	C	R	C	R	C	R	C	R	C	R
Fuel filter		I		R		R		R		R		R	
Spark plug		Replace it once every 2 years or 40,000km											
Throttle body				C		C		C		C		C	
Fuel nozzle				C		C		C		C		C	
Engine coolant		I	Replace it once every 2 years or 40,000km										
		Add some in accordance with specific conditions											
Cooling system piping and fittings		I	I	I	I	I	I	I	I	I	I	I	I
Exhaust tube connector and bracket		I	I	I		I		I		I		I	
Fuel lines and fittings		I	I	I	I	I	I	I	I	I	I	I	I
Drive belt		I	I	I	I	I	I	I	I	I	I	I	I
		Replace it once every 2 years or 50,000km											
Engine timing chain		I	I	I	I	I	I	I	I	I	I	I	I
Manual transmission oil		I	R	Replace it once every 2 years or 40,000km									
Automatic transmission oil		When driving 40,000km replace automatic transmission oil,then don't need replace.											
Chassis and body													
Parking brake function and stroke		I	I	I	I	I	I	I	I	I	I	I	I
Brake fluid/clutch fluid		I	I	I	R	I	I	I	R	I	I	I	R
		Replace it once every 2 years or 40,000km											
Brake tube connector and hose		I	I	I	I	I	I	I	I	I	I	I	I
Steering system		I	I	I	I	I	I	I	I	I	I	I	I
Tire condition and tire pressure		I	I	I	I	I	I	I	I	I	I	I	I

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Maintenance intervals. Maintenance items.		First warranty	Warranty	Maintenance interval (for the time after the table, things should be done still according to the following time interval)									
	x1000km	3	8	16	24	32	40	48	56	64	72	80	88
	Month	3	9	15	21	27	33	39	45	51	57	63	69
Tighten the bolts and nuts on the chassis		I	I	I	I	I	I	I	I	I	I	I	I
Wheel Alignment		Check if there is an abnormal running condition											
Seatbelt		I	I	I	I	I	I	I	I	I	I	I	I
Door lock, hinge and limiter		I	I	I	I	I	I	I	I	I	I	I	I
Parking brake function and stroke		I	I	I	I	I	I	I	I	I	I	I	I
Appliances and air conditioning													
Battery		I	I	I	I	I	I	I	I	I	I	I	I
Lighting and signaling devices		I	I	I	I	I	I	I	I	I	I	I	I
Windshield washing system		I	I	I	I	I	I	I	I	I	I	I	I
Harness plug and ground		I	I	I	I	I	I	I	I	I	I	I	I
Air conditioning filter		I	C	R	C	R	C	R	C	R	C	R	C

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Abbreviations

List of Abbreviation Use Rules

Abbreviations	Description
A	Ampere
dB	Decibel
ft	Foot
g	Gram
gal	Gallon
Hz	Hertz
in	Inch
kg	Kilogram
kHz	Kilohertz
km	Kilometer
km/h	Kilometer/hour
kPa	Kilopascal
kW	Kilowatt
kΩ	Kilo-ohm
lb	Pound
lb-in	Pound – inch
lb-ft	Pound – foot
L	Liter
m	Meter
mA	Milliampere
mg	Milligram
MHz	Megahertz
ml	Milliliter
mm	Millimeter
min	Minute
mpg	Miles per gallon
mph	Miles per hour
mV	Millivolt
MΩ	Megohm
N	Newton
Nm	N.m
No.	No.

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Abbreviations	Description
rpm	Revolutions per minute
V	Volt
W	Watt
ya	Yard

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02- Engine

Mechanical System.....2-31
Technical specifications.....2-31
Precautions 2-36
Preparation.....2-37
Structure and installation location 2-41
General Inspection 2-48
Diagnostic Information and Procedures.....2-49
Removal and Installation.....2-72

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Mechanical System

Technical specifications

General specifications

Name		Specification
Cylinder pressure	Standard cylinder pressure	1.3MPa
	Minimal cylinder pressure	1.1MPa
	Maximum cylinder pressure	1.4MPa
	Maximum cylinder pressure difference	0.1MPa
Oil pressure	Idle speed	60~300kPa
	Calibrated speed	400~570kPa
Minimum diameter of exhaust cam timing sprocket		97.3mm
Minimum diameter of crankshaft timing sprocket		51.6mm
Maximum thickness of timing chain moving track		1.0mm
Cylinder head flatness	Cylinder block junction plane	0.05mm
	Intake side	0.10mm
	Exhaust side	0.10mm
Camshaft radial run-out		0.03mm
Intake and exhaust camshaft maximum lift	Intake camshaft	44.168~44.268
	Exhaust camshaft	43.705~43.805
Camshaft journal	No. 1 exhaust	34.449~34.465mm
	Others	22.949~22.965mm
Axial clearance of the camshaft	Standard axial play	0.085mm
	Maximum axial play	0.12mm
Valve spring	Free length	44.7~45.7mm
	Installation force	153~169Nom (33.88mm)
	Max. working force	335.3~370.7Nom (24.252mm)
Air valve spring verticality	Max. deviation	1.0mm
	Maximum deviation angle	2°
Valve edge thickness	Standard length	1.25 mm for intake, and 1.39 mm for exhaust
	Minimum length	1.05mm

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Name			Specification
Valve length	Intake valve	Standard length	88.65mm
		Minimum length	88.35mm
	Exhaust valve	Standard length	88.69mm
		Minimum length	88.39mm
Valve stem diameter		Intake valve	5.470~5.485mm
		Exhaust valve	5.465~5.480mm
Valve seat contact width		Intake valve seat width	1.0~1.4mm
		Exhaust valve seat width	1.0~1.4mm
Valve guide inside diameter			5.510~5.530mm
Thickness of the top of the mechanical tappet			5.055~6.005
Valve oil clearance	Intake valve	Standard oil clearance	0.025~0.060mm
		Maximum oil clearance	0.08mm
	Exhaust valve	Standard oil clearance	0.030~0.065mm
		Maximum oil clearance	0.1mm
Valve guide mounting hole inside diameter			10.285~10.306mm
Valve guide designated pressing-in amount			8.7~9.1mm
Valve clearance (cold)		Intake valve	0.20~0.25mm
		Exhaust valve	0.30~0.35mm
Piston diameter standard value			82.442~82.458mm
Piston oil clearance		Standard oil clearance	0.042~0.073mm
		Maximum oil clearance	0.073mm
Piston pin mounting hole diameter			20.006~20.015mm
Piston pin top circle diameter			20.004~20.013mm
Connecting rod axial play		Standard axial play	0.16~0.34mm
		Maximum axial play	0.34mm
Connecting rod oil clearance		Standard oil clearance	0.030mm~0.054mm
		Maximum oil clearance	0.08mm
Piston pin oil film gap (piston pin mounting hole)		Standard oil clearance	0.002~0.011mm
		Maximum oil clearance	0.011mm
Connecting rod small end bore			20.012~20.021mm
Piston pin oil film gap (small hole of connecting rod)		Standard oil clearance	0.001~0.017mm
		Maximum oil clearance	0.017mm
Piston ring groove gap		First ring groove	0.035~0.075mm
		Second ring groove	0.035~0.075mm

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Name			Specification
Piston ring notch clearance	Closed gap	First ring	0.20~0.35mm
		Second ring	0.40~0.60mm
		Film ring	0.20~0.70mm
	Maximum opening gap	First ring	10mm
		Second ring	11mm
		Film ring	1~4mm
Maximum twist of connecting rod			0.05mm/100mm
Maximum permissible straightness of connecting rod			0.05mm/100mm
Connecting rod bolt diameter		Nominal diameter	7.30~7.40mm
		Minimum diameter	7.20mm
Crankshaft maximum radial run-out			0.03mm
Crankshaft main journal diameter			47.982~48.000mm
Maximum taper and non-roundness of main crankshaft journal			0.02mm
Crankshaft connecting rod neck diameter			43.984~44.000mm
Crankshaft connecting rod neck taper and non-roundness			0.02mm
Crankshaft oil clearance		Standard oil clearance	0.014~0.032mm
		Maximum oil clearance	0.1mm
Cylinder block main bearing cap fixing bolt diameter		Nominal diameter	8.80~9.00mm
		Minimum diameter	8.70mm
Upper body warpage of cylinder block (maximum warpage)			0.05mm
Cylinder block cylinder hole diameter			82.5~82.015mm

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Torque Specifications

Name	Torque range	
	Metric Nm	British Lb-ft
Oil sump drain bolt	44	32
Engine left suspension mounting bolt	88	65
Engine right suspension mounting bolt	88	65
Engine front suspension mounting bolt	88	65
Engine rear suspension mounting bolt	88	65
Power steering pump fixing bolt	45	33
Air conditioning compressor mounting bolts	25	18
Bolts and nuts for fixing electronic throttle body	11	8
Bolt for fixing intake manifold	30	22
Bolt for fixing outtake manifold	37	27
Bolts for fixing isolation shield on exhaust manifold	18	13
Bolts for fixing timing sprocket on exhaust camshaft	54	40
Bolts for fixing timing sprocket on intake camshaft	60	44
Set bolt of the flexible rail of timing chain	19	14
Timing chain fixed rail mounting bolts	13	10
Front enclosure mounting bolts	23	17
Tensioner hold-down nuts	11	8
Crankshaft pulley fixing bolts	138	102
Pump fixing bolt	11	8
Engine front suspension bracket mounting bolts	52	38
Bolts and nuts for fixing belt tension wheel	Bolt: 69 Nut: 29	Bolt: 51 Nut: 21
Generator fixing bolt	Short bolts: 25. Long bolts: 54.	Short bolts: 18. Long bolts: 40.
Cylinder head cover fixing bolt	11	8
Ignition coil fixing bolt	11	8
Spark plug	40	30
Bolts for fixing camshaft bearing cover	23	17
Other bolts for fixing camshaft bearing cover	13	10
Bolts for fixing cylinder head (fastening it for two times)	First time 49, Second time 90	First time 36,Second time 66
Fuel rail fixing bolt	11	8
Connecting rod cap fixing bolt	50	37
Cylinder drain bolts	23	17

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Name	Torque range	
	Metric Nm	British Lb-ft
Oil filter	28	21
Oil strainer set bolt	25	18
Oil sump fixing bolt	10	7
Bolts for fixing main bearing cover on crankshaft (fastening it for two times)	First time 40, Second time 60	First time 30, Second time 44
Bolts for fixing upper and lower cylinder block	18	13
Bolts for fixing flywheel	88	65
Oil pressure sensor torque	15	11
Bolts for fixing cooling nozzle	33	24

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Precautions

Precautions

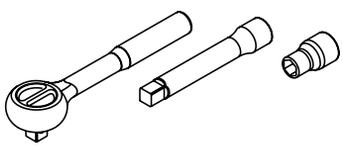
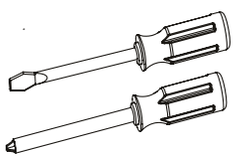
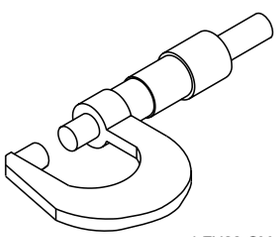
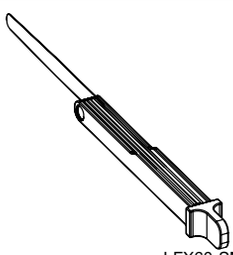
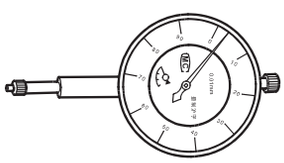
1. Allow the engine to cool down before discharging the engine coolant.
2. When disconnecting the fuel lines, keep away from the source of ignition and kids as much as possible.
3. After removing the oil pipes, seal all the oil pipe joints to prevent the piple plugging or fuel leak.
4. Take special care when removing the engine and do not damage the fitting face and slipping face.
5. When removing the engine, seal the engine openings with the tape or equivalent materials to prevent the foreign matters entering the engine.
6. During the removal, identify and arrange all the disassembled parts to facilitate the troubleshooting and reassembly.
7. Clean and check all the parts thoroughly before the repair or replacement.
8. For the assembly of engine, the basic principles for tightening bolts and nuts are to tighten the middle bolt or nut first and then those on the diagonal position to the same torque in several steps. Follow the designated sequence if any.
9. Replace the new gasket, oil seal and seal ring during the assembly of engine.
10. Apply the sealant uniform and install the bonding components in the specified time after the sealant application.
11. During the assembly of engine, carefully check the engine oil lines and vacuum lines for clogging.
12. When connecting the sensor connectors, ensure to hear a silvery click before stopping the installation.
13. After repairing and assembling the engine, start the engine and increase the engine speed to check the engine coolant, fuel, engine oil and exhaust gas for leak.

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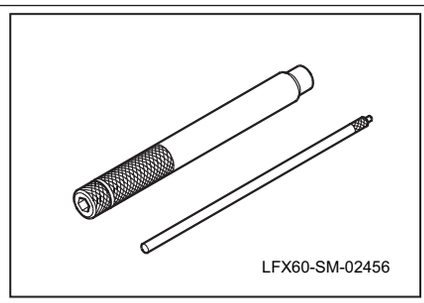
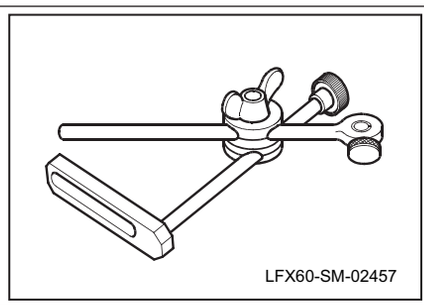
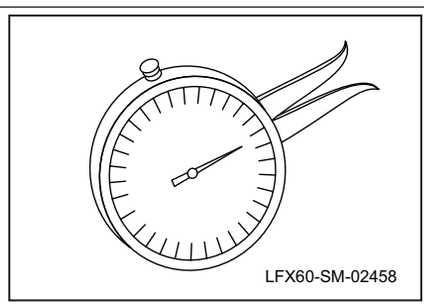
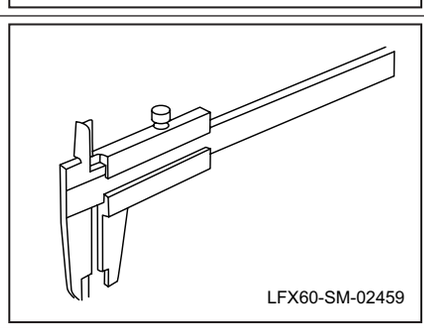
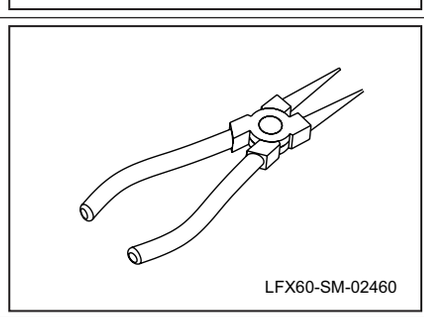
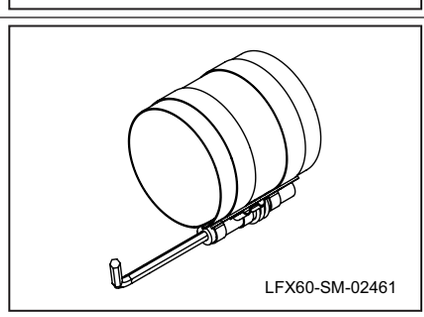
Preparation

Special maintenance tools

No.	Tool name	Tool figure	Remarks
1	Quick wrench, connecting rod and socket	 LFX60-SM-02450	Remove/install the fixing bolts and nut
2	Screwdriver	 LFX60-SM-02452	Remove/install the fixing screw
3	Screw micrometer	 LFX60-SM-02453	Measure the part diameter
4	Thickness gauge	 LFX60-SM-02454	Measure the part clearance
5	Dial indicator	 LFX60-SM-02255	Measurement

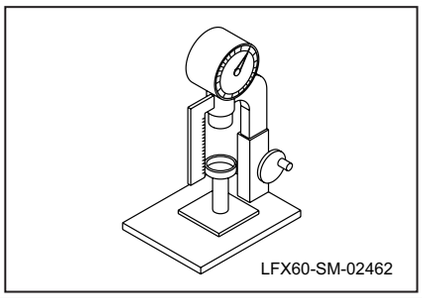
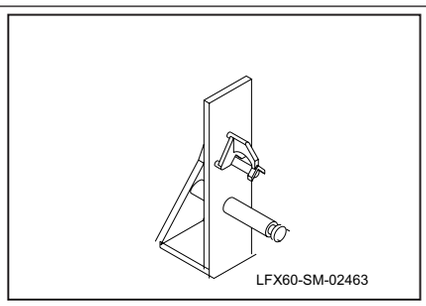
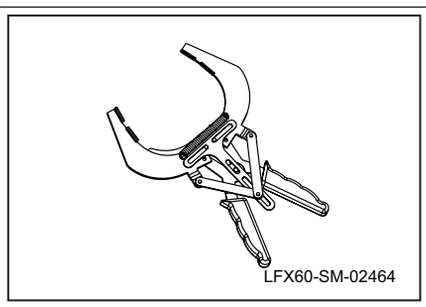
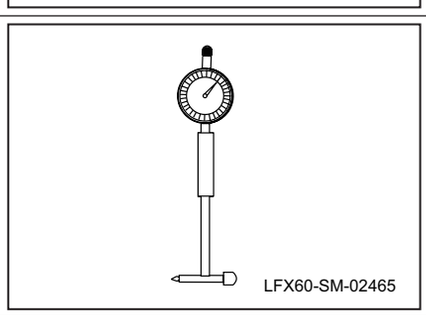
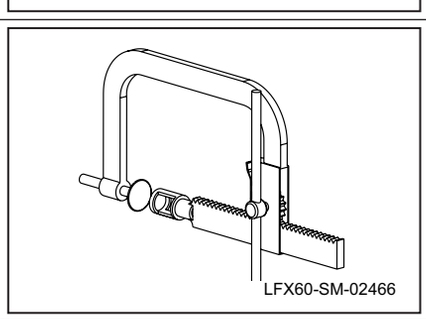
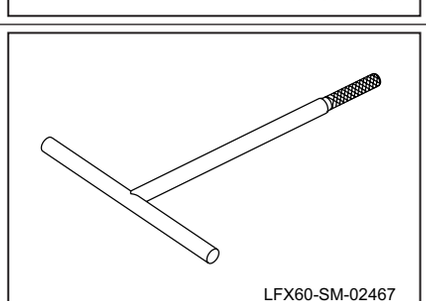
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No.	Tool name	Tool figure	Remarks
6	Measurement gauge adapter	 LFX60-SM-02456	Auxiliary measuring device
7	Dial gauge holder	 LFX60-SM-02457	Auxiliary measuring device
8	Inner diameter dial indicator	 LFX60-SM-02458	Measure the part inner diameter
9	Vernier caliper	 LFX60-SM-02459	Measurement the part length
10	Circlip pliers	 LFX60-SM-02460	Remove/install the circlip
11	Piston ring compressor	 LFX60-SM-02461	Install the piston

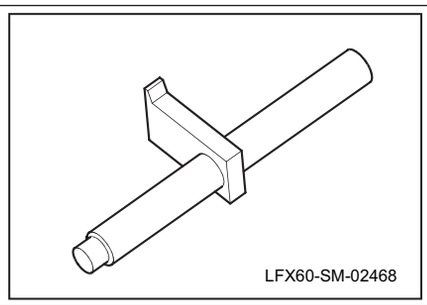
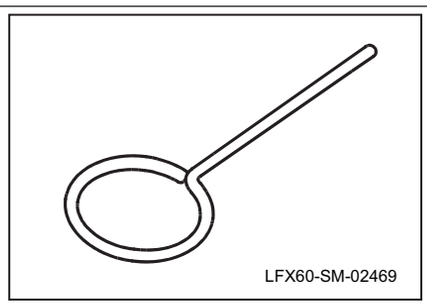
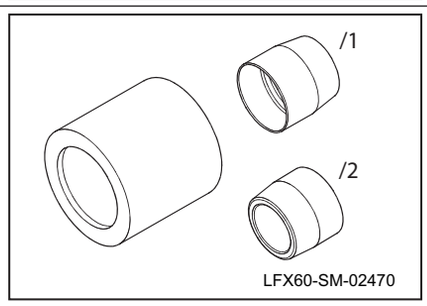
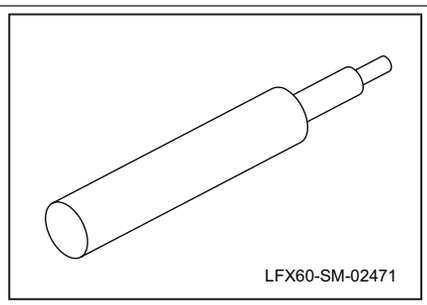
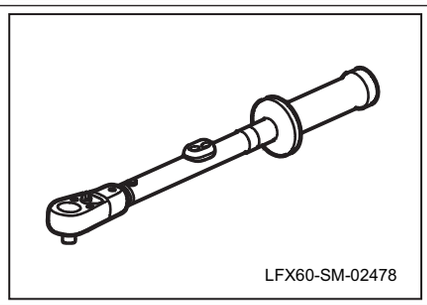
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No.	Tool name	Tool figure	Remarks
12	Spring dynamometer	 LFX60-SM-02462	Measure the spring force
13	Connecting rod collimator	 LFX60-SM-02463	Measure the connecting rod distortion
14	Piston ring expander	 LFX60-SM-02464	Install the piston rings
15	Cylinder diameter measuring gauge	 LFX60-SM-02465	Measure the cylinder diameter
16	Air valve lock piece removal and installation tool	 LFX60-SM-02466	Remove/install the air valve lock piece
17	Reamer	 LFX60-SM-02467	Valve guide

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No.	Tool name	Tool figure	Remarks
18	Retainer	 LFX60-SM-02468	Fix the flywheel
19	Pin	 LFX60-SM-02469	Position the tensioner
20	Combination tool	 LFX60-SM-02470	Install the front crankshaft oil seal
21	Air valve duct removal / installation tool	 LFX60-SM-02471	Remove/install the air valve duct
22	Screwdriver	 LFX60-SM-02478	Tighten bolts and nuts to an appropriate torque

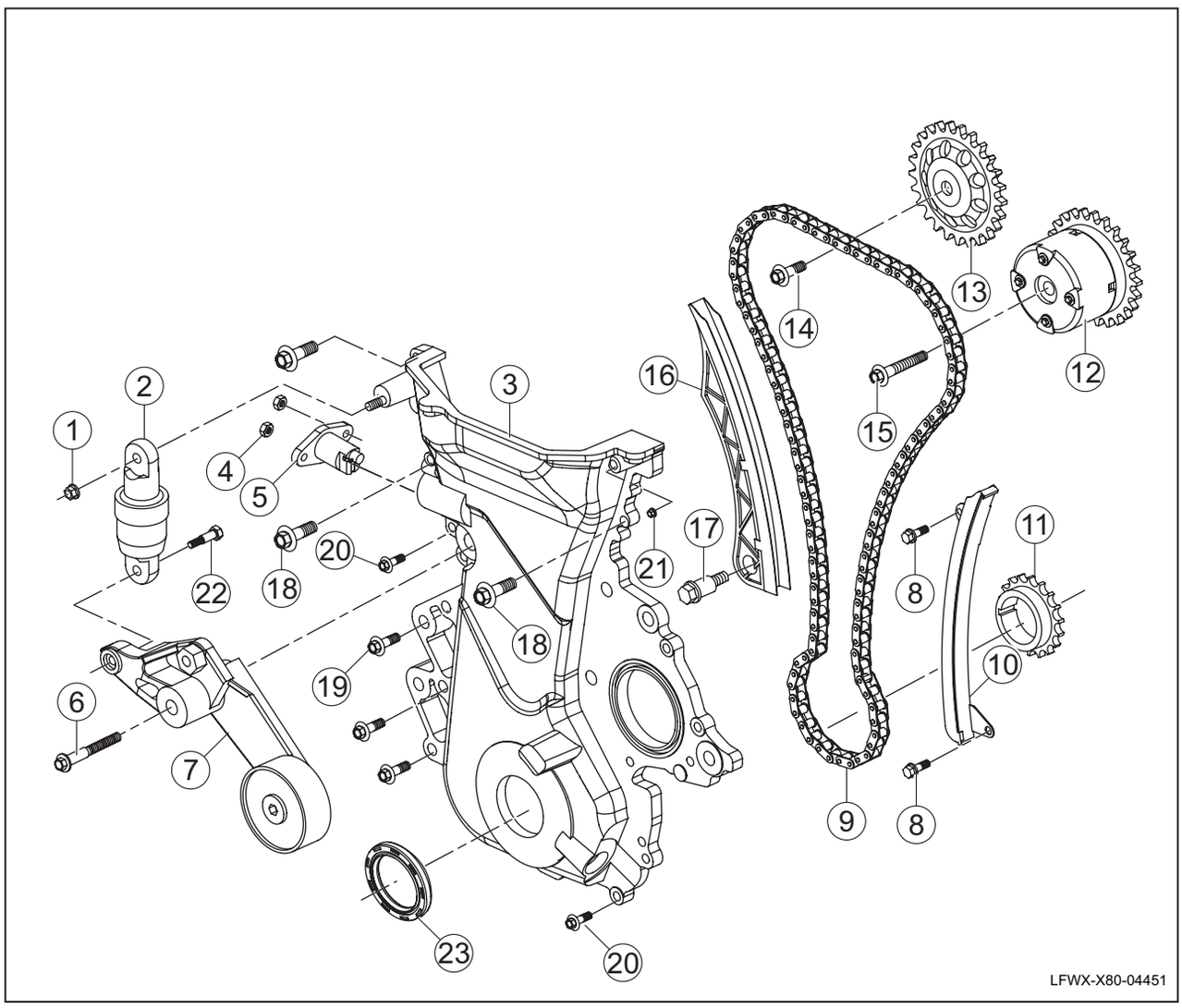
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Structure and installation location

Component Location Plan

Timing sprocket



No.	Part name
1	Hex flange nut
2	Shock absorber
3	Timing cap
4	Hex flange nut
5	Timing chain tensioner
6	Tensioner bolt
7	Tensioner assembly
8	Hexagon head bolt and plain washer assembly
9	Timing chain

No.	Part name
13	Exhaust timing sprocket
14	Exhaust timing sprocket bolt
15	Phaser bolt
16	Timing chain rail components
17	Slide rail positioning bolt
18	Hexagon flange bolt
19	Hexagon flange bolt
20	Hexagon flange bolt
21	Hex flange nut

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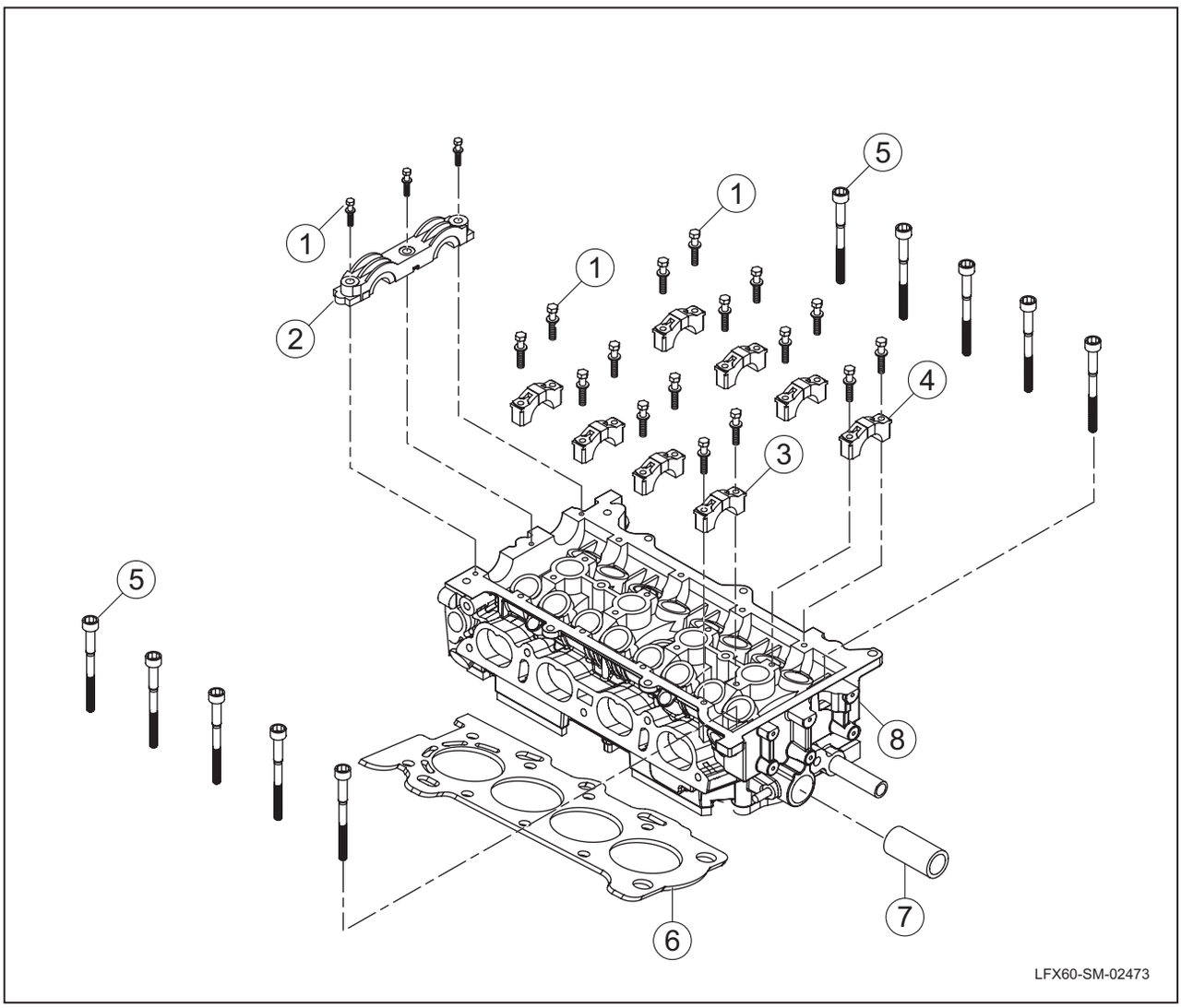
No.	Part name
10	Orbit determination components of timing chain
11	Crankshaft timing sprocket
12	Air intake phaser assembly

No.	Part name
22	Hexagon flange bolt
23	Front crankshaft oil seal

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Cylinder head



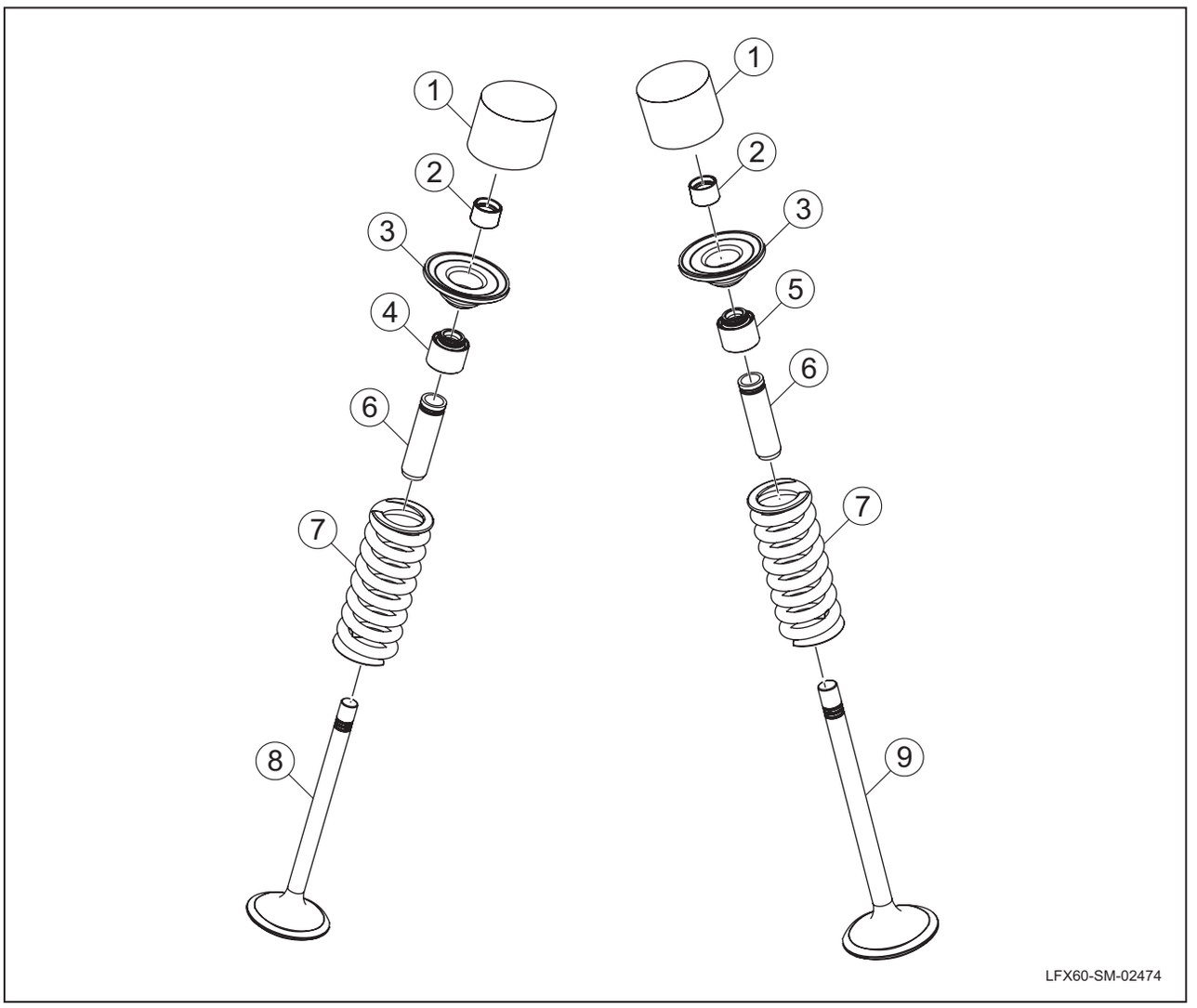
No.	Part name
1	Camshaft cover bolt
2	1st camshaft bearing cap
3	Intake camshaft cap
4	Exhaust camshaft cover

No.	Part name
5	Cylinder head bolt
6	Cylinder head gasket
7	Water outlet pipe
8	Cylinder head assembly

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Valve



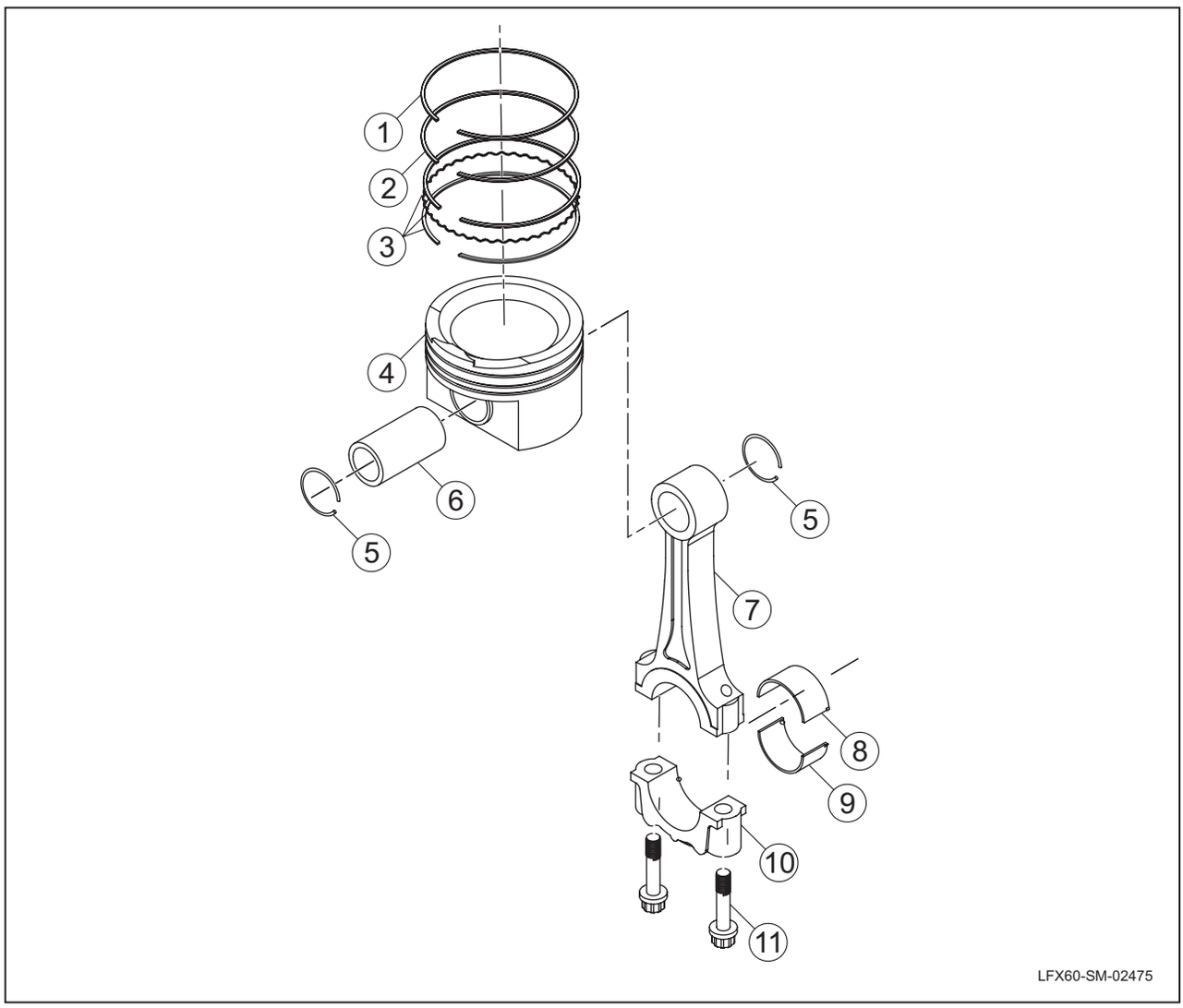
No.	Part name
1	Tappet
2	Valve collet
3	"Seat, spring, valve"
4	Oil seal of exhaust valve
5	Oil seal of Intake valve

No.	Part name
6	Valve guide
7	Valve spring
8	Exhaust valve
9	Intake valve

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Piston and connecting rod



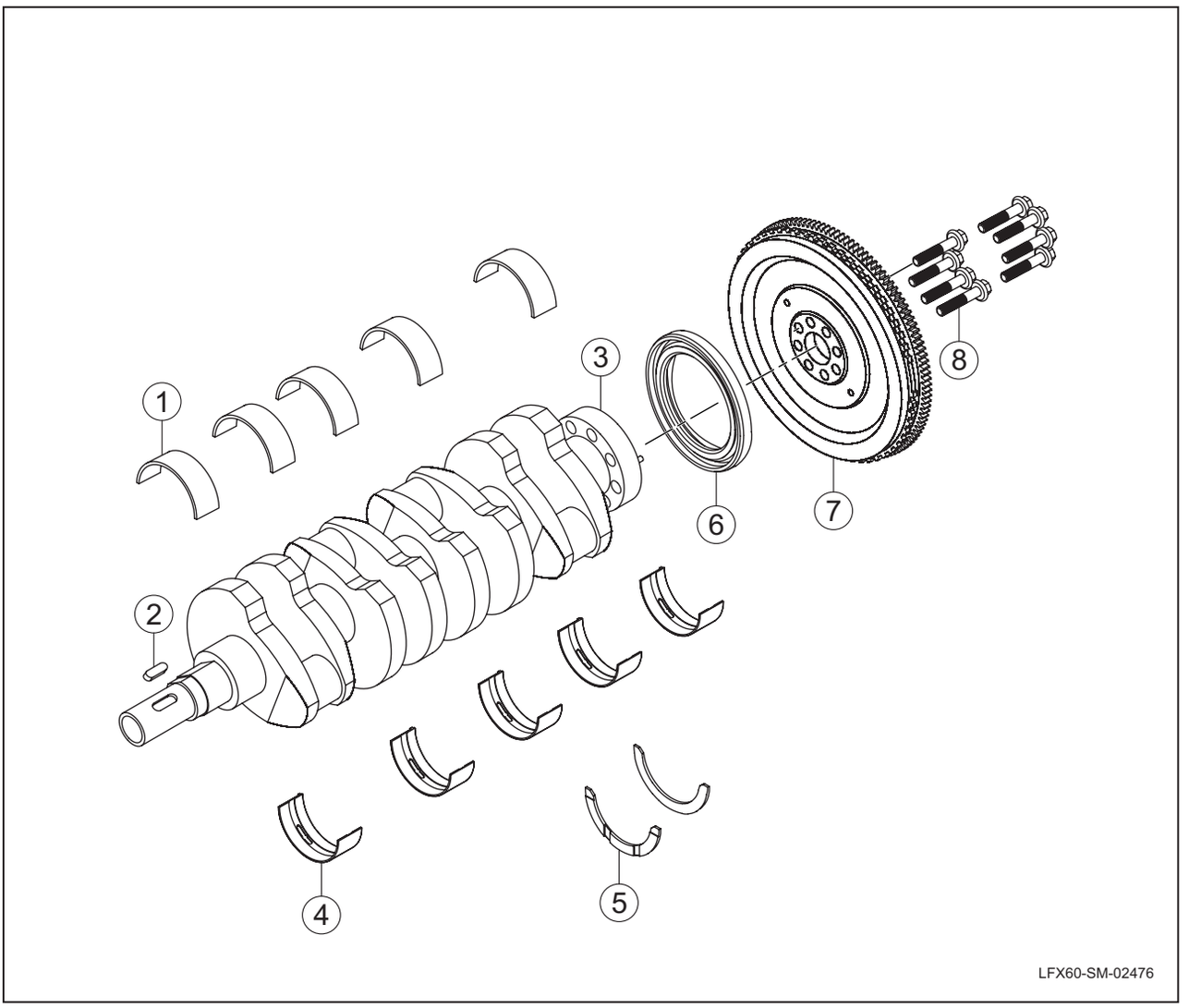
No.	Part name
1	1st piston ring
2	2st piston ring
3	Combination oil ring
4	Piston
5	Snap ring, piston pin
6	Piston pin

No.	Part name
7	Linking rod body
8	Upper connecting rod lining
9	Lower connecting rod lining
10	Connecting rod cap
11	Connecting rod bolt

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Crankshaft and flywheel



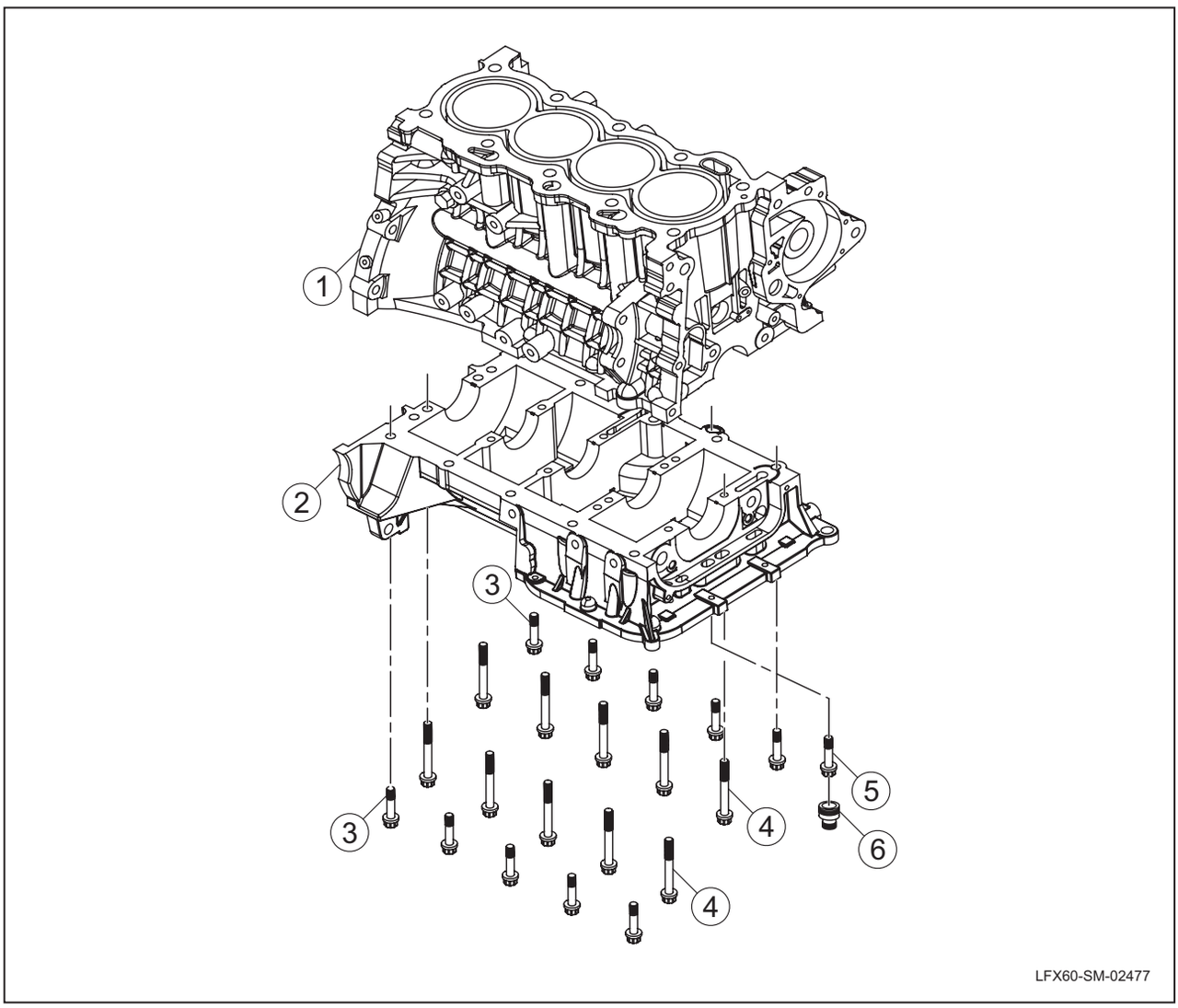
No.	Part name
1	Upper main bearing shell
2	Woodruff key
3	Crankshaft
4	Lower main bearing shell

No.	Part name
5	Upper thrust plate
6	Crankshaft rear oil seal
7	Flywheel assembly
8	Flywheel bolt

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Cylinder block



No.	Part name
1	Upper cylinder body
2	Lower cylinder body
3	Cylinder fixing bolt

No.	Part name
4	Bearing cap fixing bolt
5	Cylinder fixing bolt
6	Oil filter connecting nut

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General Inspection

Check the engine coolant

a. Check whether the engine coolant leaks.

- Add coolant into the radiator assembly.
- Connect the radiator cover detector, adjust the radiator to the standard pressure, and then observe whether the pressure value drops.

Standard pressure of radiator:
94.2~115.8kPa (exhaust)
4.9kPa (intake)
180kPa (sealed)

Note:

- **If the pressure drops, check whether the hose, the radiator assembly and the water pump for leaks.**
- **If there is not any coolant leak outside of the engine, check the heater core, the cylinder block and the cylinder head.**

Check the air filter element

a. Remove the upper cover of air filter.
b. Take off the air filter element.
c. Visually inspect whether there is any dirt or damage on the air filter element. If any, clean or replace it.

Install the driving belt

a. Check whether there is any oil trace on drive belt. If any, clean it.
b. Check whether the drive belt is aged, cracked or worn. If any, replace it.

Check the cylinder pressure

a. Preheat the engine, and then stop it.

Note:

After preheating the engine, turn the transmission shift level in the Neutral position, and enable the parking brake.

b. Disconnect each ignition coil connector.
c. Disconnect each injector connector.
d. Remove each ignition coil retaining bolt, and then remove four ignition coils.
e. Use a sleeve and an extension level to remove all spark plugs.

Note:

- **Do not damage the insulations of the ignition coil.**
- **During the removal, identify the ignition coil of each cylinder to facilitate the subsequent installation.**

f. Install a pressure gauge into a spark mounting hole.
g. Start the engine, and read out the value on the pressure gauge.

Standard cylinder pressure: 1.2MPa
Minimal cylinder pressure: 1.0MPa
Maximum cylinder pressure: 1.3MPa

Note:

Before starting, must check whether the battery is fully charged; otherwise, the battery should be charged or replaced.

h. Test the pressure of other cylinders with the same method, and calculate the maximum pressure difference among cylinders.

Maximum cylinder pressure difference:
0.1MPa

Note:

All tests must be completed within a short period (about 15s) to avoid damage to the starter.

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Diagnostic Information and Procedures

Diagnosis Instructions

Before diagnose the mechanical system failure in an engine, understand and familiarize the operating principle of the mechanical system in the engine, and then begin to diagnose the mechanical system in the engine. This helps to determine the correct troubleshooting procedures in the event of a failure. And most importantly, it helps to determine whether a customer's description belongs to a normal operation.

Any failure diagnosis on mechanical system in engine should be based on the inspection of mechanical system in engine to guide the maintenance staff to take next logical procedures and carry out troubleshooting. Comprehend and correctly use the diagnostic flow chart to shorten the diagnosis time and avoid the misjudgement.

General equipment

Digital multimeter
Diagnostic equipment of vehicle
Oil manometer
Cylinder compression pressure gauge
Sound scope

Visual Inspection

1. Confirm the problem of the customer.
2. Visually check whether there is any obvious mechanical or electrical damage sign.

Visual inspection table

Mechanical
• Coolant leak • Oil leak • Fuel leak • Nut or bolt is loosened or dropped • Part is damaged or worn obviously • Accessory belt is damaged obviously • Tension wheel is damaged obviously • Pulley is damaged obviously

3. If the observed or proposed problem is obvious and its cause is identified, rectify the cause before proceeding with next step.
4. If for the problem, there are no obvious findings, then confirm the fault and refer to the symptom table.

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List of fault symptoms

If the vehicle fails, no trouble code is detected by the engine control module (ECM), and no significant fault location is found after visual inspection and general inspection, it is recommended that troubleshooting should be carried out according to diagnostic ideas and processes of the table below.

Symptom	Possible Cause	Recommended Measures
Accessory belt noise	• Attachment belt	**Refer to: Accessory belt noise diagnosis process**
	• Related fasteners	
	• Crankshaft pulley	
	• Generator	
	• Water pump	
	• Air conditioning compressor	
	• Booster pump	
There is an abnormal noise below the engine	• Deformation of oil pan	**Refer to: Abnormal noise diagnosis process is under the engine**
	• Filter screen is deformed or damaged	
	• The oil pressure is too low	
	• The fitting clearance between the crankshaft and bearing is too big	
	• The axial clearance of the crankshaft is too big	
Engine tempering	• Electric control system fault	**Refer to: Engine tempering diagnosis process**
	• Engine timing	
	• The mixture is too thick	
	• Exhaust valve components	
	• Exhaust system blocked	
	• ECM	
Engine firing **Note:** **❶The fuel in the exhaust system is ignited to produce a severe bust noise.**	• Electric control system fault	**Refer to: Engine blasting diagnosis process**
	• Engine timing	
	• The ignition is too late	
	• The mixture is too thick	
	• Exhaust valve components	
	• Exhaust system leaks	
	• ECM	
Exhaust abnormity (blue smoke)	• Burn oil	**Refer to: Exhaust abnormality (blue smoke) diagnosis process**
Exhaust abnormity (black smoke)	• Fuel and gas mixture is too concentrated	**Refer to:Exhaust abnormality (black smoke) diagnosis process**

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Symptom	Possible Cause	Recommended Measures
Connecting rod and connecting rod bearing noise	• Oil pump pressure is too low • Side clearance at the large end of connecting rod is overrun • Tightening torque of connecting rod bolt • Twist/bend overrun of connecting rod • Crank roundness/taper overrun • Connecting rod bearing overrun	**Refer to: Diagnostic process of noise in connecting rod and connecting rod bearing**
Piston and piston pin noise	• Oil pump pressure is too low	**Refer to: Diagnosis process of piston and piston pin noise**
	• The big end clearance of the connecting rod is beyond the scope	
	• Connecting rod distortion/bend overrun	
	• The piston pin clearance is too big	
	• The clearance between the piston and cylinder wall is too big	
	• The piston ring groove clearance is too big	
Valve train group noise	• Bucket tappet is blocked	**Refer to: Diagnostic procedure of valve train group noise**
	• The oil pump pressure is too low	
	• The cam angle is damaged	
	• The camshaft journal clearance is too big	
	• Camshaft axial clearance is too large	
	• The valve spring is too soft	
	• The valve is stuck	
	• Clearance between valve rod and valve guide pipe is too large	
	• The valve seat is loosened	
Engine can not be started - the crankshaft can not be rotated freely	• Parts in accessory drive system are jammed	**Refer to: Engine non-starting – crankshaft non-rotating diagnosis process**
	• The cylinder is stuck due to the hydraulic reason.	
	• The camshaft is stuck or broken	
	• Components in valve system are stuck or broken	
	• There is a foreign object in the cylinder.	
	• The crankshaft and connecting rod bearing is stuck	
	• The connecting rod is bent or broken	
	• The crankshaft is broken.	

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Accessory belt noise diagnosis process

ℹNote:

- **The accessory belt includes a compressor belt and a pump belt.**
- **Be sure to use a correct accessory belt.**
- **Using a stethoscope will help determine the location where the engine noise is generated.**
- **The flatness (the unevenness of crank pulley and associated accessory pulleys) may cause abnormal wear of accessory belt, abnormal noise, fall-off and others.**
- **Sudden increase of large load may cause the belt to slip and make noise. For example, compressor is started in air conditioning system, and throttle is opened quickly when engine is running, etc.**
- **Excessive load may cause abnormal belt noise, such as excessive filling in air conditioning system.**

Test condition	Details/results/measures
1. Check the attachment belt.	
	A. Check whether the correct accessory belt is installed. B. Check whether the accessory belt appearance is normal. Is it OK after checking? →**Yes** To step 2. →**No** Replace the accessory belt. Refer to: Accessories belt replacement.
2. Check the related fasteners.	
	A. Check whether all fasteners associated with the accessory belt are loose or peel off. B. Check whether they are loose or peel off. →**Yes** Tighten or replace it. →**No** To step 3.
3. Check the tensioner assembly.	
	A. Remove the accessory belt. B. Rotate the tension wheel assembly. The bearing can not appear stuck, loose or others. C. Rotate the tension wheel assembly. The bearing can not appear any abnormal sound. D. The tensioner can not displaced, bent, distorted and cracked. E. There should be abnormal scratches, edges and corners and other abnormalities on the tensioner surface. F. Whether to meet the requirements above? →**No** Clean it. →**Yes** To step 4.

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Test condition	Details/results/measures
4. Check the crankshaft pulley and pulleys of related accessories.	
	A. The pulley can not be displaced, bent, distorted, cracked or loosened. B. There should be abnormal scratches, edges and corners and other abnormalities on the pulley surface. C. There should be no foreign body in pulley groove. Can it meet the above requirements? →**No** Clean the foreign bodies, fasten or replace the part. →**Yes** To step 5.
5. Check water pumps, generators, air conditioning compressor bearings, and steering power pump one by one.	
	A. Check whether pumps, generators, steering power pump, air conditioning compressor can rotate normally. The bearing can not appear stuck, loose or others. B. Turn the bearings, there should be no abnormal noise. Whether to meet the requirements above? →**No** Carry out the part replacement. →**Yes** Confirm that the fault has been ruled out.

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Abnormal noise diagnosis process is under the engine

ℹNote:

- **Remove the accessory belt to eliminate the noise caused by these devices.**
- **Using a stethoscope will help determine the location where the engine noise is generated.**

Test condition	Details/results/measures
1. Check the oil sump.	
	A. Check the oil sump. Whether is the oil pan deformed? **→Yes** Repair or replace it, and then go to Step 2. **→No** To step 2.
2. Check the oil filter screen.	
	A. Check the oil filter screen. Whether the oil filter screen is deformed or damaged? **→Yes** Repair or replace it. **→No** To step 3.
3. Check the oil pressure.	
	A. Check and test the oil pressure. B. Is the oil pressure too low? **→Yes** To step 4. **→No** To step 5.
4. Check the oil pump.	
	A. Remove the oil pump. B. Check the oil pump. Is the oil pump normal? **→ No** Replace the oil pump. **Refer to: oil pump replacement** **→Yes** To step 5.

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Test condition	Details/results/measures
5. Check the shaft tile fitting clearance and the crankshaft axial clearance	
	A. Decompose the main shaft tiles and the connecting rod shaft tiles. B. Check the fitting gap between main engine bearing brush and connecting rod bearing brush as well as whether there is any wear on crankshaft thrust plate. Are the fitting clearances and the crankshaft axial clearance normal? →**No** Maintain the main engine bearing brush, the fitting gap of connecting rod bearing brush, and the axial clearance of crankshaft to a normal value. →**Yes** Confirm that the fault has been ruled out.

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Engine misfire diagnosis procedure

Test condition	Details/results/measures
1. Check the engine DTC.	
	A. Read and see if there is a DTC in the engine control system by using automotive diagnostic equipment. Is there a DTC? →**Yes** **Refer to:Diagnostic trouble code (DTC) list. Perform DTC diagnostic procedure.** →**No** To step 2.
2. Check the vacuum degree of air intake system.	
	A. Check the intake system vacuum and determine whether the intake system leaks. Whether does the intake system leak? →**Yes** Repair it. **Refer to:Air intake leak diagnosis process** →No To step 3.
3. Check the engine timing.	
	A. Intake leakage diagnosis procedure. Is it OK after checking? →**No** Carry out adjusting and repairing. →**Yes** To step 4.
4. Check the fuel pressure.	
	A. Check the fuel pressure. Is the fuel pressure too low? →**Yes** Implement the measures for symptoms. **Refer to: Diagnostic process of low fuel pressure** →**No** To step 5.
5. Check the fuel injector.	
	A. Check the fuel injector. Is the injector jammed? →**Yes** Clean or replace it. →**No** To step 6.

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Test condition	Details/results/measures
6. Test the spark plug.	
	A. Test the spark plug. Is the test normal? →**No** Clean or replace it. →**Yes** To step 7.
7. Check the cylinder pressure.	
	A. Check the cylinder pressure. **Refer to: Cylinder compression pressure check** Is it within the standard scope? →**Yes** To step 8. →**No** Repair it.
8. Check the exhaust system.	
	A. Test the exhaust back pressure, to check whether the exhaust system is clogged. If is it clogged? →**Yes** Implement the exhaust system clogging diagnosis procedure. →**No** To step 9.
9. Check ECM.	
	A. Replace ECM. **Refer to: ECM** ECM confirms that the troubleshooting is successful.

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Engine blasting diagnosis process

Test condition	Details/results/measures
1. Check the engine DTC.	
	A. Read and see if there is a DTC in the engine control system by using automotive diagnostic equipment. Is there a DTC? →**Yes** **Refer to: Diagnostic trouble code (DTC) list. Perform DTC diagnostic procedure.** →No To step 2.
2. Check the engine timing.	
	A. Check the engine timing. Is it OK after checking? →**No** Repair it. →**Yes** To step 3.
3. Check the fuel pressure.	
	A. Check the fuel pressure. Is the fuel pressure too low? →**Yes** Implement the measures for symptoms. **Refer to: Diagnostic process of low engine fuel pressure** →**No** To step 4.
4. Check the fuel injector.	
	A. Check the fuel injector. Is the injector jammed? →**Yes** Clean or replace it. →**No** To step 5.
5. Test the spark plug.	
	A. Test the spark plug. Check whether it is normal? →**No** Clean or replace it. →**Yes** To step 6.

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Test condition	Details/results/measures
6. Check the cylinder pressure.	
	A. Check the cylinder pressure. **Refer to: Cylinder compression pressure check** If is it clogged? →**Yes** To step 7. →**No** Repair it.
7. Check the exhaust system.	
	A. Test the exhaust back pressure, to check whether the exhaust system is clogged. Whether is the exhaust system blocked? →**Yes** Implement the exhaust system clogging diagnosis procedure. →**No** To step 8.
8. Check ECM.	
	A. Replace ECM. **Refer to: ECM** ECM confirms that the troubleshooting is successful.

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Exhaust abnormality (blue smoke) diagnosis process

ℹNote:
- **Use the oil meeting the specifications.**
- **It is accompanied usually with spark plug fouling.**

Test condition	Details/results/measures
1. Check the engine oil level.	
	A. Check the level of engine oil. Whether is the oil level too high? →**Yes** Restore the correct oil level. →**No** To step 2.
2. Check the spark plug.	
	A. Check the spark plug. Whether there is any spark plug fouling? →**Yes** Clean or replace it. →**No** To step 2.
3. Check the oil-gas separator.	
	A. Check the oil-gas separator. Is it OK after checking? →**No** Replace the oil-gas separator. →**Yes** To step 4.
4. Check the piston rings or valve for fault.	
	A. Check the piston rings or valve for fault. **Refer to: Cylinder compression pressure check** **Standard cylinder pressure: 1.2MPa** **Minimal cylinder pressure: 1.0MPa** **Maximum cylinder pressure: 1.3MPa** **Maximum cylinder pressure difference: 0.1MPa** If is it clogged? →**Yes** To step 6. →**No** To step 5.

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Test condition	Details/results/measures
5. Check the piston rings or valve for fault.	
	A. After add a proper amount of oil into the cylinder. The cylinder pressure is increased significantly. Check the piston ring. The cylinder pressure is not increased significantly. Check the valve.
6. Check the carbon deposition in the combustion chamber.	
	A. Check the combustion chamber. If is there some carbons? →**Yes** Clean it. →**No** To step 7.
7. Check the valve seal.	
	A. Check the valve seal. Whether is the valve oil seal leaking? →**Yes** Clean it. →**No** Confirm that the fault has been ruled out.

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Exhaust abnormality (black smoke) diagnosis process

Test condition	Details/results/measures
1. Check the engine DTC.	
	A. Read the engine control system with an automobile diagnostic device to determine whether there is any DTC. Is there a DTC? →**Yes** **Refer to:Diagnostic trouble code (DTC) list. Perform DTC diagnostic procedure.** →**No** To step 2.
2. Check the fuel pressure.	
	A. Check the fuel pressure. Whether is the fuel pressure too high? →**Yes** Check fuel pipelines and fuel pumps. →**No** To step 3.
3. Check the fuel injector.	
	A. Check the fuel injector. Whether is the injector leaking? →**Yes** Clean or replace it. →**No** To step 4.
4. Test the spark plug.	
	A. Test the spark plug. Is the test normal? →**No** Clean or replace it. →**Yes** To step 5.
5. Check the carbon canister solenoid valve.	
	A. Check the carbon canister solenoid valve. Whether is the carbon canister solenoid valve operating normally? →**No** Replace the canister solenoid valve. →**Yes** To step 6.

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Test condition	Details/results/measures
5. Check ECM.	
	A. Replace ECM. **Refer to: ECM** Confirm that the fault has been ruled out.

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Diagnostic process of noise in connecting rod and connecting rod bearing

Note:

- **Remove the accessories belt to remove the noise caused by the accessories device.**
- **Remove the accessories belt. Strictly limit the engine running time. Otherwise, high temperature damage to the engine can be caused.**
- **Using a stethoscope will help determine the location where the engine noise is generated.**
- **The noise can be isolated sometimes by removing an injector harness connector at one time. If the noise volume is reduced or disappears, the noise is related to the cylinder in which it is located.**
- **Excessive connecting rod clearance will cause the engine with a percussion noise at a variety of speeds, and low oil pressure will also be accompanied by this situation.**

Test condition	Details/results/measures
1. Confirm that the fault is not caused by the attachments.	
	A. Remove the attachment belt. **Refer to: Accessories belt replacement.** Does the noise exist? →**No** Noise generated by accessories. Check the accessories. →**Yes** To step 2.
2. Check the oil.	
	A. Check whether the oil status is normal. B. Check whether the oil level is normal. Is it OK after checking? →**Yes** To step 3 →**No** Replace the oil or restore the oil level.
3. Check the oil pump pressure.	
	A. Check the oil pump pressure. Is the oil pump pressure too low? →**Yes** Repair it. →**No** To step 4.
4. Broken cylinder inspection.	
	A. Perform an off-cylinder test by removing the injector harness connector. Confirm which engine cylinder is associated with noise. Is there a cylinder working abnormally? →**Yes** Repair it. →**No** To step 5.

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Test condition	Details/results/measures
5. Check the big end clearance of the connecting rod.	
	A. Check the big end clearance of the connecting rod. If is there a leakage? →**No** Replace the connecting rod. **Refer to: Replacement of the piston, piston ring, and connecting rod assembly.** →**Yes** To step 6.
6. Check the connecting rod bolt tightening torque.	
	A. Check the connecting rod bolt tightening torque. If is there a leakage? →**No** Replace connecting rod bolts, and fasten them according to the standard torque. →**Yes** To step 7.
7. Check the twist/bend of connecting rods.	
	A. Check the twist/bend of connecting rods. If does it meet the requirement? →**No** Replace the connecting rod. **Refer to: Replacement of the piston, piston ring, and connecting rod assembly.** →**Yes** To step 8.
8. Check the crankshaft roundness and taper.	
	A. Check the crankshaft roundness and taper. If is there a leakage? →**No** Repair or replace the crankshaft. →**Yes** To step 9.
9. Check the clearance between the connecting rod and the crankshaft.	
	A. Check the clearance between the connecting rod and the crankshaft. If is there a leakage? →**No** Repair it to meet the specifcation requirements. →**Yes** Confirm that the fault has been ruled out.

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Diagnosis process of piston and piston pin noise

ℹNote:

- **Remove the accessory drive belt to eliminate the noise caused by these accessory devices.**
- **Remove the accessory belt. Strictly limit the engine running time. otherwise, it will lead to a high temperature damage to the engine.**
- **Using a stethoscope will help determine the location where the engine noise is generated.**
- **The percussion noise caused by the excessive gap between piston and cylinder wall can be heard usually when the engine is idling in operation. If the fuel r injector wiring harness plug on the cylinder is removed, the knock sound may be changed obviously.**

Test condition	Details/results/measures
1. Confirm that the noise is not caused by accessories devices.	
	A. Remove the attachment belt. **Reference: Attachment** If is there a noise? **→No** Noise generated by accessories. Check the accessories. **→Yes** To step 2.
2. Check the oil.	
	A. Check whether the oil status is normal. B. Check whether the oil level is normal. Is it OK after checking? **→Yes** To step 3. **→No** Replace the oil or restore the oil level.
3. Check the oil pressure.	
	A. Check the oil pressure. Is the oil pressure too low? **→Yes** Repair it. **Reference: Oil pump** **→No** To step 4.
4. Broken cylinder inspection.	
	A. Use the cylinder disconnection test with removal of the fuel injector wiring harness plug, to confirm the engine cylinder associated with the noise. Is there a cylinder working abnormally? **→Yes** Repair it. **→No** To step 5.

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Test condition	Details/results/measures
5. Check the installation of the connecting rod and the piston.	
	A. Check the installation of the connecting rod and the piston. If is there a leakage? →**No** Reinstall it. **Refer to: Replacement of the piston, piston ring, and connecting rod assembly.** →**Yes** To step 6.
6. Check the connecting rod tortion/bending degree.	
	A. Check the connecting rod torsion/bending degree. If is there a leakage? →**No** Replace the connecting rod. **Refer to: Replacement of the piston, piston ring, and connecting rod assembly.** →**Yes** To step 7.
7. Check the piston pin clearance.	
	A. Check whether the piston pin clearance is within the range specified in the specification. If is there a leakage? →**No** Repair it. **Refer to: Replacement of the piston, piston ring, and connecting rod assembly.** →**Yes** To step 8.
8. Check the piston ring groove clearance.	
	A. Check the piston ring groove clearance. If is there a leakage? →**No** Repair it to meet the requirement. →**Yes** To step 9.
9. Check the clearance between piston and cylinder wall.	
	A. Check the clearance between the piston and the cylinder wall. If is there a leakage? →**No** Repair it to meet the requirement. →**Yes** Confirm that the fault has been ruled out.

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Diagnostic procedure of valve train group noise

ℹNote:

- **Remove the accessories belt to remove the noise caused by the accessories device.**
- **Remove the accessories belt. Strictly limit the engine running time. Otherwise, high temperature damage to the engine can be caused.**
- **Using a stethoscope will help determine the location where the engine noise is generated.**

Test condition	Details/results/measures
1. Confirm that the noise is not caused by accessories devices.	
	A. Remove the attachment belt. **Refer to: Accessories belt replacement.** If is there a noise? **→No** Noise generated by accessories. Check the accessories. **→Yes** To step 2.
2. Check the oil.	
	A. Check whether the oil status is normal. B. Check whether the oil level is normal. Is it OK after checking? **→Yes** To step 3. **→No** Replace the oil or restore the oil level.
3. Check the oil pressure.	
	A. Check the oil pressure. Is the oil pressure too low? **→Yes** Repair it. **Refer to: oil pump replacement** **→No** To step 4.
4. Check the hydraulic rocker component.	
	A. Check the hydraulic rocker assembly. Can they meet the requirements? **→No** Replace and repair it. **Refer to: Replacement of the camshaft and hydraulic rocker arm assembly** **→Yes** To step 5.

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Test condition	Details/results/measures
5. Check the camshaft cam height.	
	A. Check the camshaft cam height. If is there a leakage? →**No** Replace the camshaft **Refer to: Replacement of the camshaft and hydraulic rocker arm assembly** →**Yes** To step 6.
6. Check the camshaft journal clearance	
	A. Check the camshaft journal clearance If is there a leakage? →**No** Repair it. →**Yes** To step 7.
7. Check the camshaft axial clearance.	
	A. Check the camshaft axial clearance. If is there a leakage? →**No** Repair it. →**Yes** To step 8.
8. Check the valve spring.	
	A. Check whether the valve spring can meet the specification requirements. If is there a leakage? →**No** Replace the valve spring. **Refer to: Replace the cylinder head assembly and the valve assembly.** →**Yes** To step 9.
9. Check whether the air valve.	
	A. Check whether the valve is stuck. Whether is the valve stuck? →**Yes** Repair or replace relevant parts. →**No** To step 10.

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Test condition	Details/results/measures
10. Check the clearance between the valve stem and the valve duct.	
	A. Check the clearance between the valve stem and the valve duct. If is there a leakage? →**No** Repair or replace relevant parts. →**Yes** To step 11.
11. Check whether the valve seat is loosened.	
	A. Check whether the valve seat is loosened. Whether is the valve seat loose? →**No** Repair or replace relevant parts. →**Yes** Confirm that the fault has been ruled out.

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Engine non-starting – crankshaft non-rotating diagnosis process

Test condition	Details/results/measures
1. Check the accessory drive system components.	
	A. Remove the accessory belt, and try to rotate the crankshaft with a wrench. **Reference: Attachment** Is the crankshaft rotated freely? → **Yes** Repair or replace the accessory drive system components. →**No** To step 2.
2. Check whether the cylinder is stuck due to the hydraulic pressure.	
	A. Remove all spark plugs and check whether there is water/oil/antifreeze attached on them. If is there a leakage? →**Yes** Check whether there is any crack on cylinder block, cylinder head and cylinder seal gasket to carry out inspection or repair. →**No** To step 3.
3. Check the cylinder head assembly.	
	A. Remove the timing mechanism. B. Check the cylinder head. - The camshaft is stuck or broken - The valve rocker is stuck or broken. - The valve or valve spring is stuck or broken. If are there the above circs? → **Yes** Repair or replace it. → **No** To step 4.
4. Check the cylinder block assembly.	
	A. Check the cylinder block assembly. - The piston is broken. - There is the foreign body in the cylinder - The crankshaft is broken. - The connecting rod is bent or broken If are there the above circs? → **Yes** Repair or replace it. → **No** Confirm that the fault has been ruled out.

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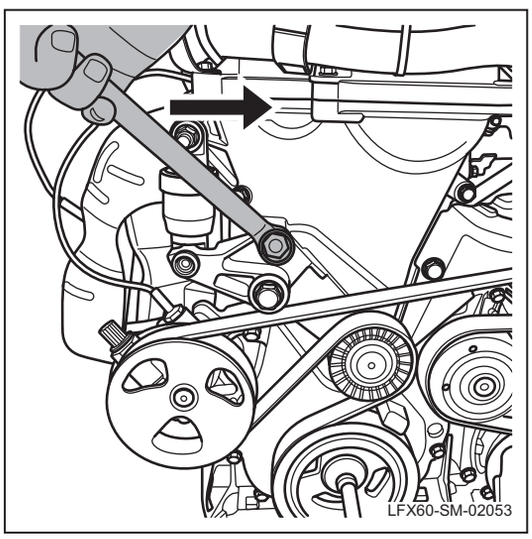
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Removal and Installation

Attachment belt

Removal

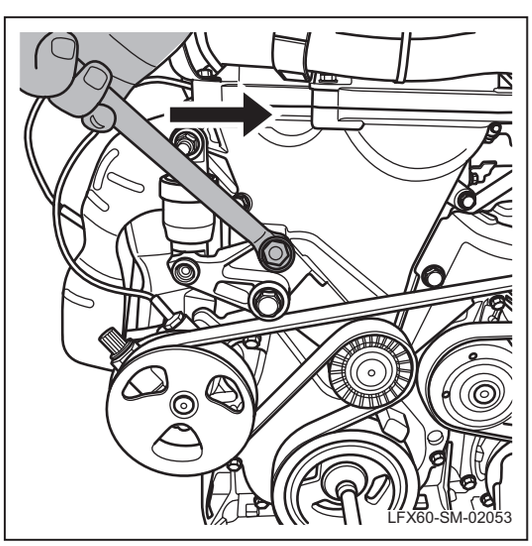
1. Remove the accessory belt.



(a). Turn the tensioning wheel assembly clockwise by using a tool.
(b). Remove the accessory belt.

Installation

1. Install the accessory belt.



(a). Turn the tensioning wheel assembly clockwise by using a tool.
(b). Install the accessory belt.

⚠Warning:

- **When installing the accessory belt, please ensure that it is combined correctly with the pulley groove.**
- **Do not allow the engine oil or the engine coolant to attach on the accessory belt.**
- **Do not excessively twist or bend the accessory belt.**

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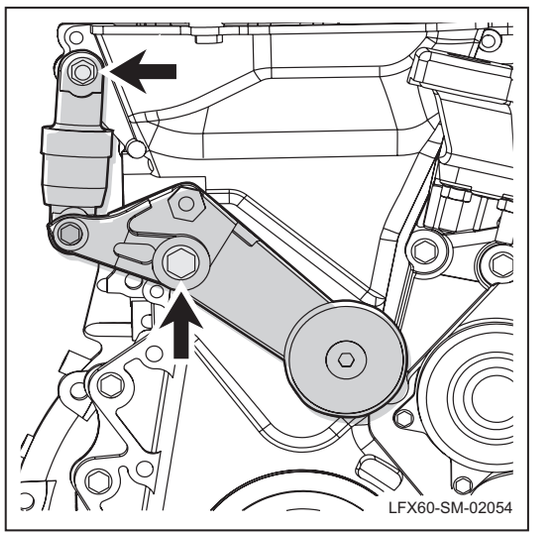
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Tensioner assembly

Removal

1. Remove the tensioner assembly.

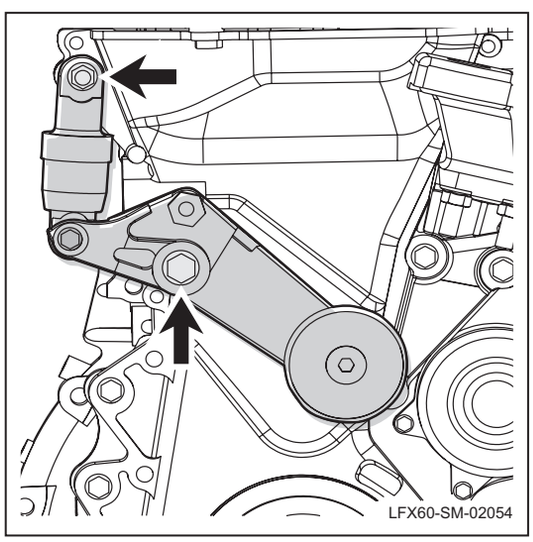
(a). Remove the accessory belt. **Refer to: Accessories belt replacement.**



(b). Remove the tensioning wheel assembly, retaining bolts and nuts as well as take off the tensioning wheel assembly.

Installation

1. Install the tensioner assembly.



(a). Install the tensioning wheel assembly on the engine. Install and tighten retaining bolts and nuts on the tensioning wheel assembly.
Torque: 29 Nm (Nut)
Torque: 69 Nm (bolt)

(b). Install the accessories belt.**Refer to: Accessories belt replacement.**

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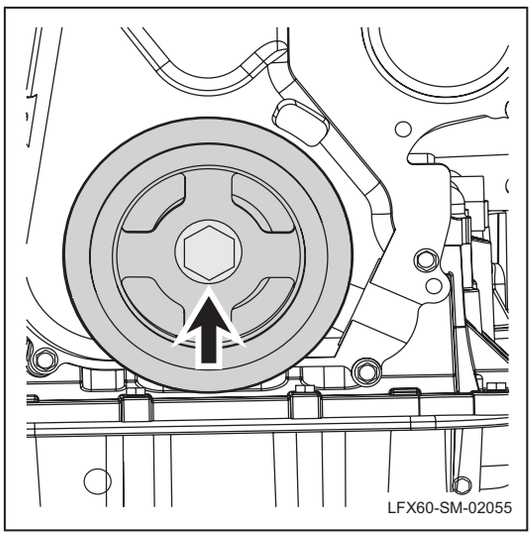
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Crankshaft front oil seal

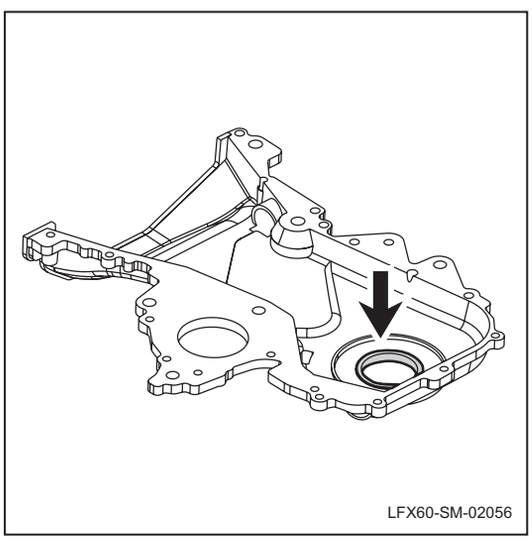
Removal

1. Tensioner bracket

(a). Remove the accessory belt. **Refer to: Accessories belt replacement.**



(b). Remove retaining bolts from the crankshaft pulley, and take off the crankshaft pulley.



(b). Remove the front seal from the crankshaft with a proper tool.

ℹNote:

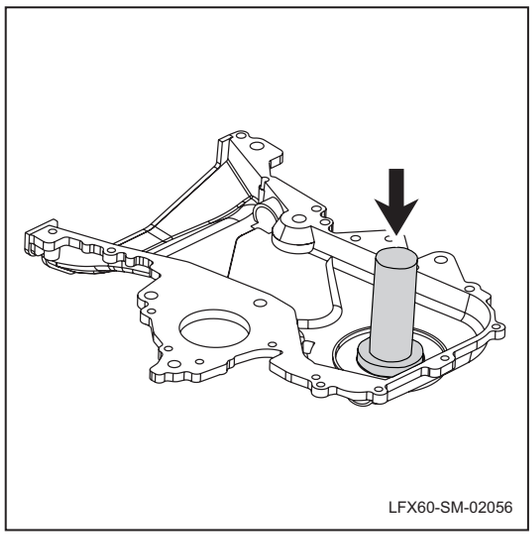
The removed oil seal can not be used again; when installation, please replace the new oil seal.

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Installation

1. Install the front crankshaft oil seal.



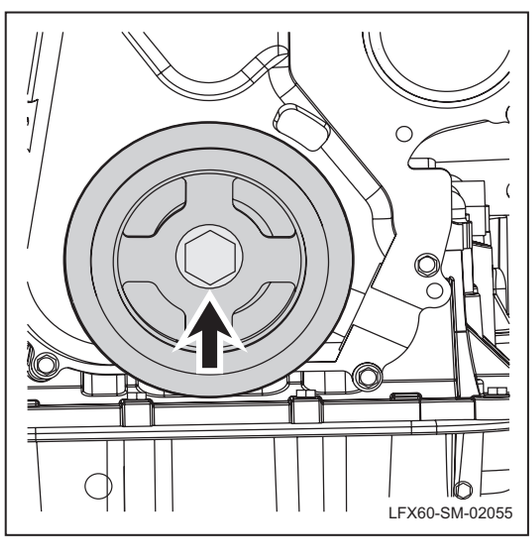
(a). Install the front oil seal with an oil seal tool on the crankshaft.

△ **Tips:**

Before installation, coat a layer of clean oil on the oil seal lip.

Note:

Vertically install the oil seal; do not install it aslant.



(b). Install the crankshaft pulley, install and fasten retaining bolts on the crankshaft pulley.
Torque: 138 Nm

(c). Install the accessories belt，**Refer to: Accessories belt replacement.**

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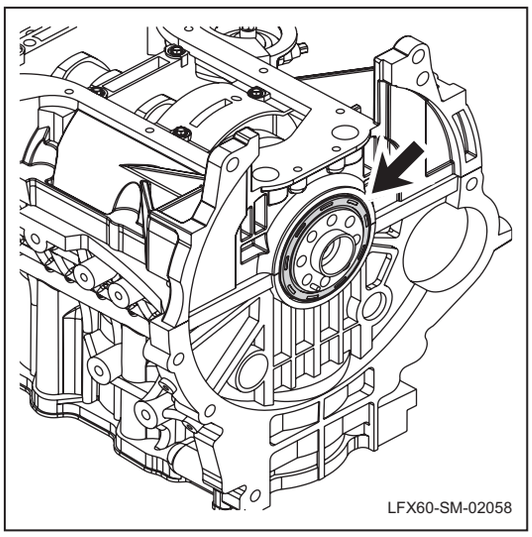
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Crankshaft rear oil seal

Removal

1. Remove the rear crankshaft oil seal.

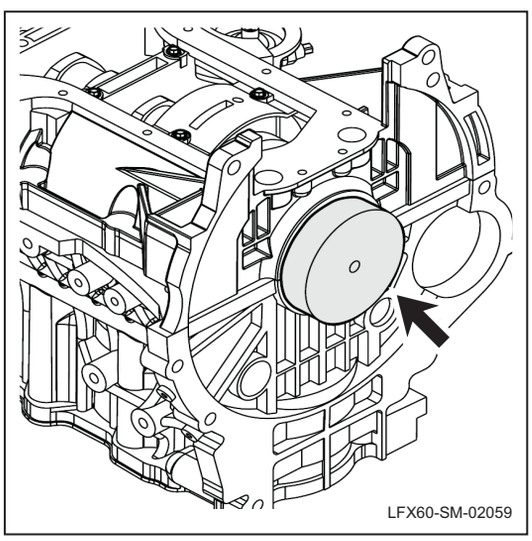
(a). Remove the flywheel. **Refer to: Flywheel replacement.**



(b). Remove the rear oil seal from the crankshaft.

Installation

1. Install the rear crankshaft oil seal.



(a). Use the oil seal tool to install the rear crankshaft oil seal.

(b). Install the flywheel. **Refer to: Flywheel replacement.**

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Replacement of timing chain and sprocket assembly

Removal

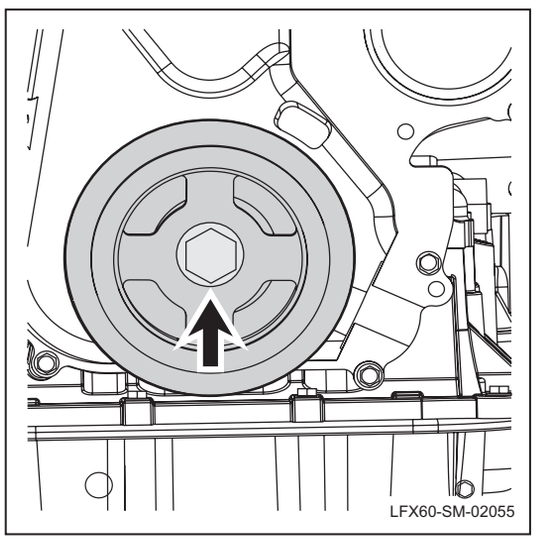
1. Remove the timing chain and sprocket components.

(a). Remove the accessory belt. **Refer to the replacement of accessory belt.**

(b). Remove the camshaft cover. **Refer to: Replacement of the camshaft cover.**

(c). Remove the tensioning wheel assembly. **Refer to the replacement of tensioning wheel assembly.**

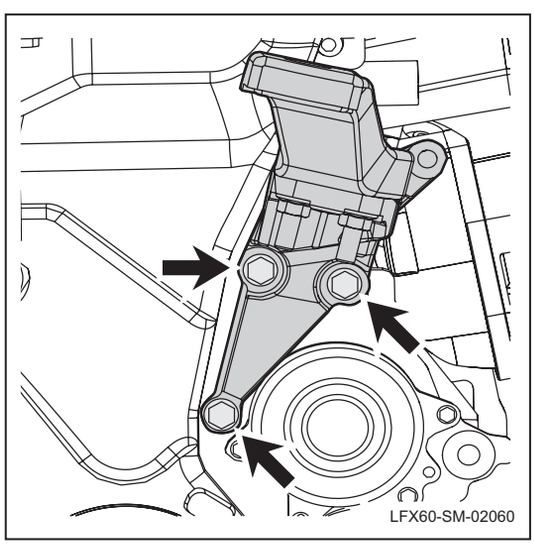
(d). Remove the water pump assembly. **Refer to the replacement of water pump assembly.**



(e). Remove retaining bolts from the crankshaft pulley, and take off the crankshaft pulley.

△**Tips:**

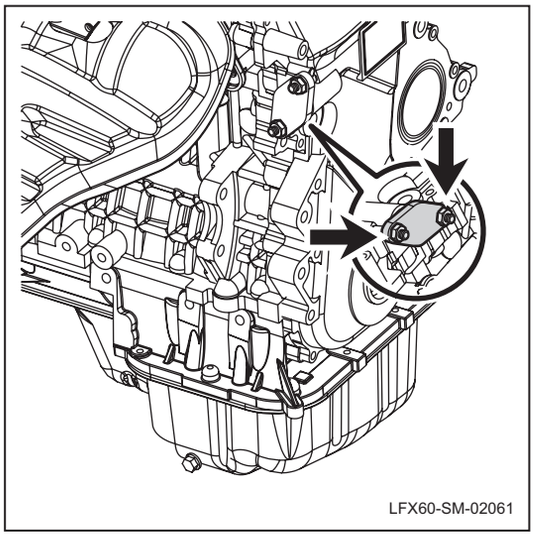
To prevent any rotation when removing the crankshaft pulley, it can be fixed before removal.



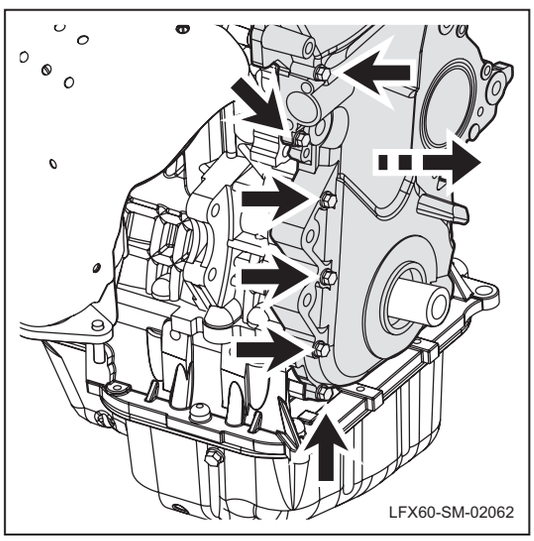
(f). Remove retaining bolts from the right engine mounting bracket.

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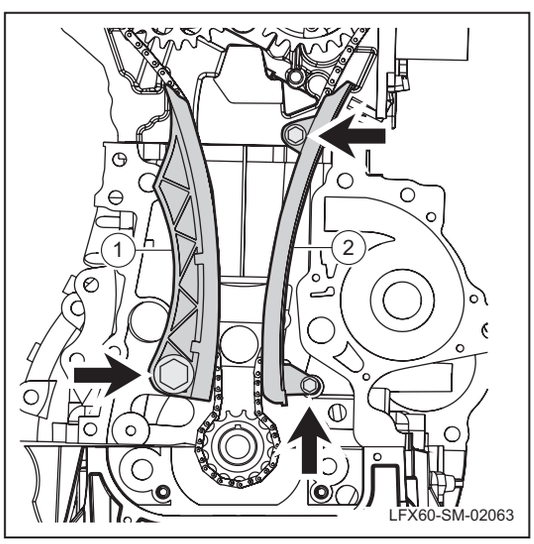
(g). Remove mounting nuts from the timing chain tensioner, and take off the timing chain tensioner.


LFX60-SM-02062

(h). Remove retaining bolts from the timing cover in the order shown in the illustration, and take off the timing cover.

Note:

The timing cover is difficult to remove due to the sealant; it should be tapped with a rubber hammer to remove it.



LFX60-SM-02063

(i). Remove the timing chain rail assembly ① and the orbit determination assembly ② .

Note:

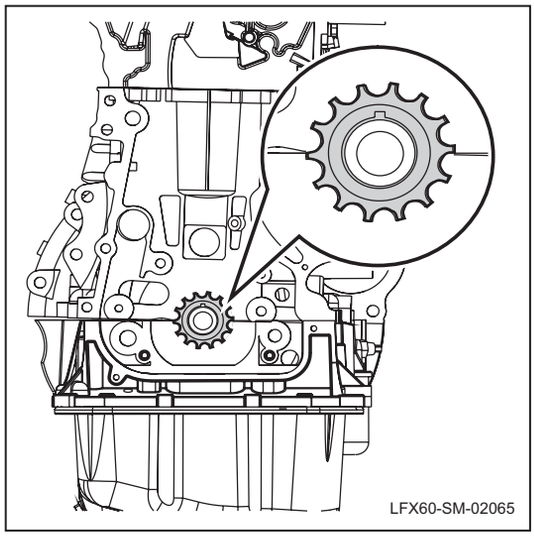
To prevent that the valve tappets or other parts withstand the piston due to the camshaft or crankshaft rotation when removing the timing part, before removal, rotate the crankshaft to allow that the piston is not in TDC or BDC position.

(j). Remove the timing chain.

(k). Take out the timing sprocket.

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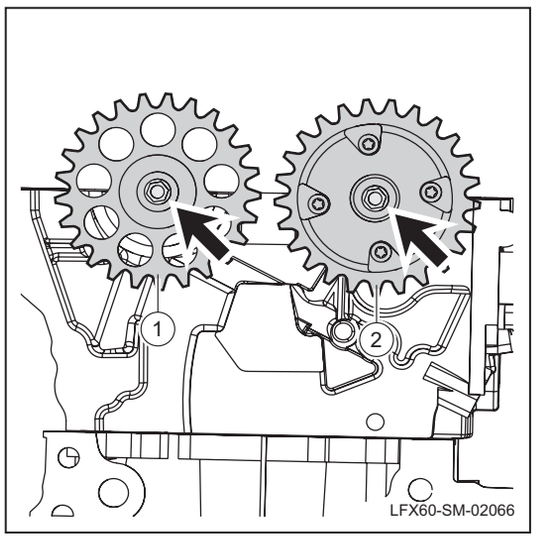


(l). Remove the crankshaft timing sprocket ring.

(m). Remove the crankshaft sprocket and the semicircle key.

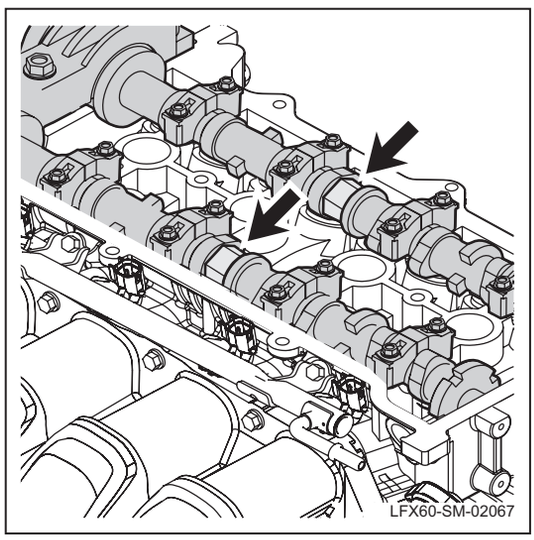
△Tips:

After the semi-circular key is embedded in the pin groove, it is not easy to remove; if it is removed in this step, do not miss it in the installation.



(n). Remove bolts from the exhaust timing sprocket, and take off the exhaust timing sprocket ① .

(o). Remove bolts from the intake phase shifter and take off the intake phase shifter ② .



ⓘNote:

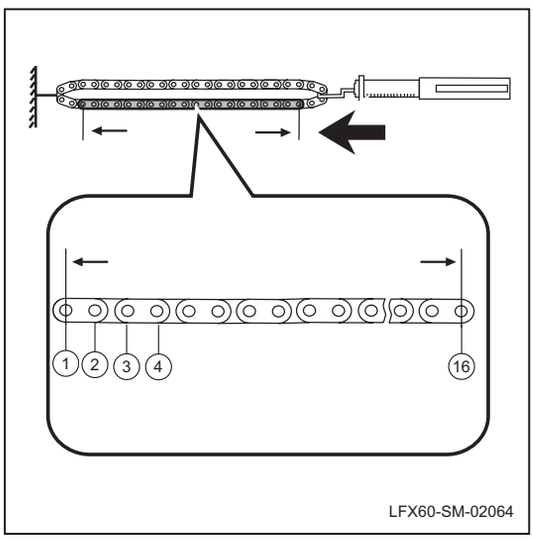
To prevent the camshaft rotation during disassembly, must apply an opposite force on the camshaft with a wrench (apply the force on the position as shown on the left figure).

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Inspection

1. Check the timing chain.



(a). Check the timing chain for damage; if any, replace it.

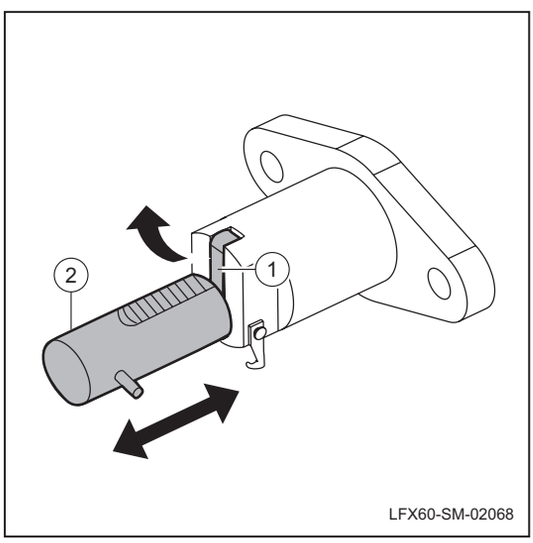
(b). As shown, apply a force of 140N onto the timing chain with a spring pressure gauge and then measure the length of the chain with a vernier caliper. If the maximum elongation of the chain is exceeded, replace the chain.

Maximum elongation of the chain: 13mm

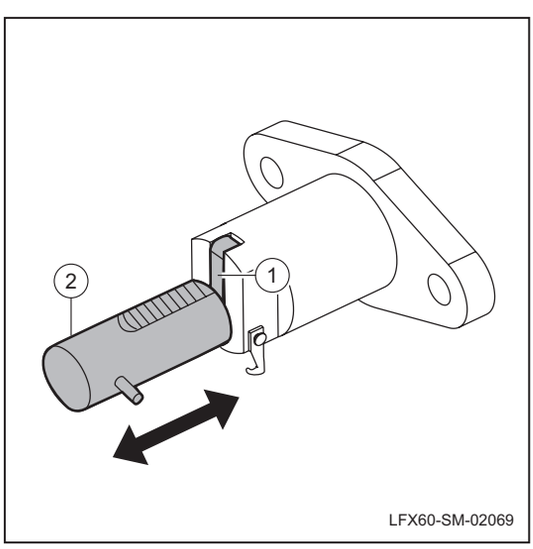
△Tips:

Randomly select 3 or more points for the chain length check with the method as shown in the left figure.

2. Check the timing chain tensioner.



(a). Lift the tensioning shaft lock sheet ① , check whether the tensioning shaft can ② carry out a telescopic movement. If not, replace the tensioner.



(b). Lock the tensioning shaft with a lock sheet ① , check whether the tensioning shaft ② can carry out a telescopic movement. If yes, replace the tensioner.

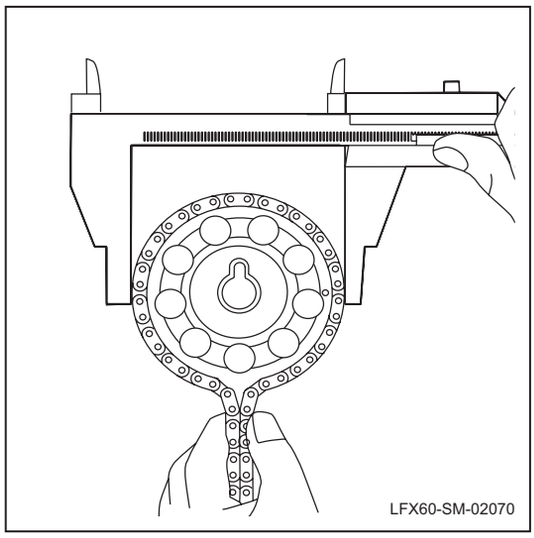
ⓘNote:

At this point, the tensioner shaft can be only retracted inside and can not be stretched outside.

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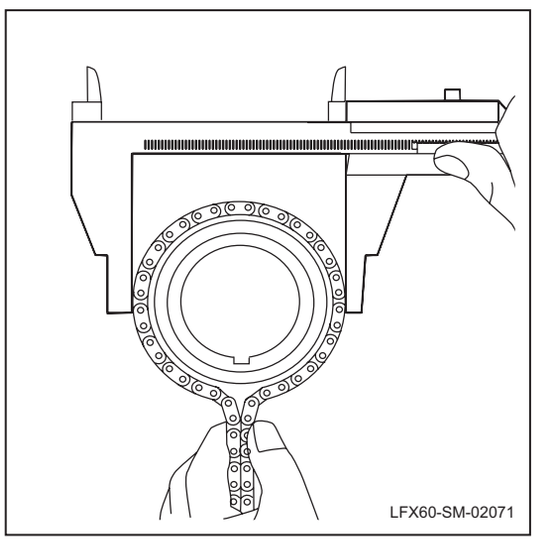
3. Check the exhaust timing sprocket.



(a). Install the chain onto the exhaust timing sprocket.
(b). Use a vernier caliper to measure the exhaust timing sprocket diameter with the timing chain. If it is less than the specified value, replace the exhaust timing sprocket.
Minimum diameter: 97.3mm

Note:
In measurement, the two measuring points of the vernier caliper must be contacted with the chain roller.

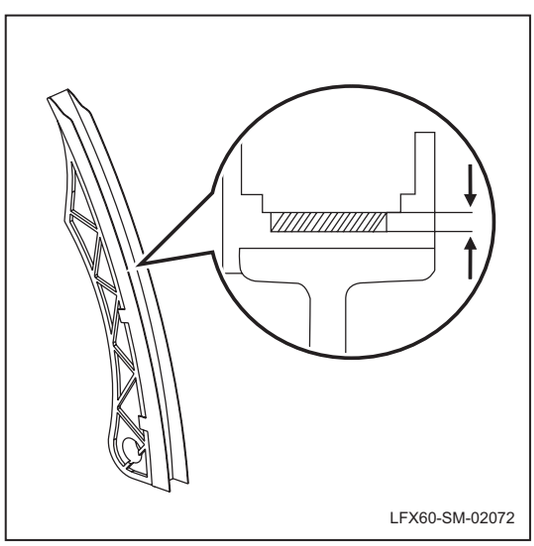
4. Check the crankshaft timing sprocket.



(a). As shown, install the chain onto the crankshaft timing sprocket.
(b). Use a vernier caliper to measure the crankshaft timing sprocket diameter with the timing chain. If it is less than the specified value, replace the crankshaft sprocket.
Minimum diameter: 51.6mm

Note:
In measurement, the two measuring points of the vernier caliper must be contacted with the chain roller.

5. Check the timing chain rail assembly.



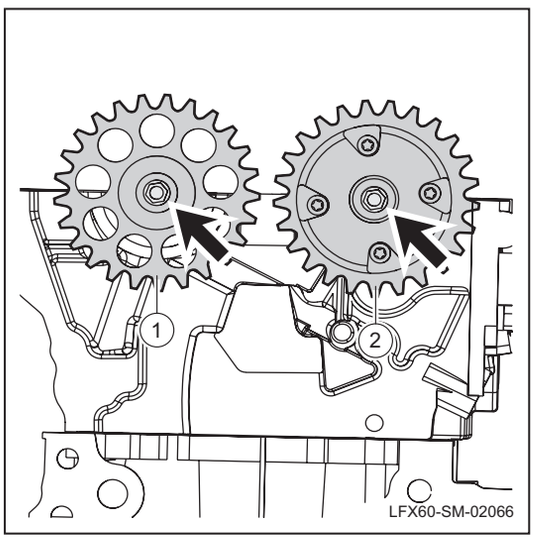
(a). Use a vernier caliper to measure the thickness of the timing chain moving rail. If the rail thickness is greater than the maximum thickness, replace the timing chain drive rail assembly.
Maximum thickness: 1.0 mm.

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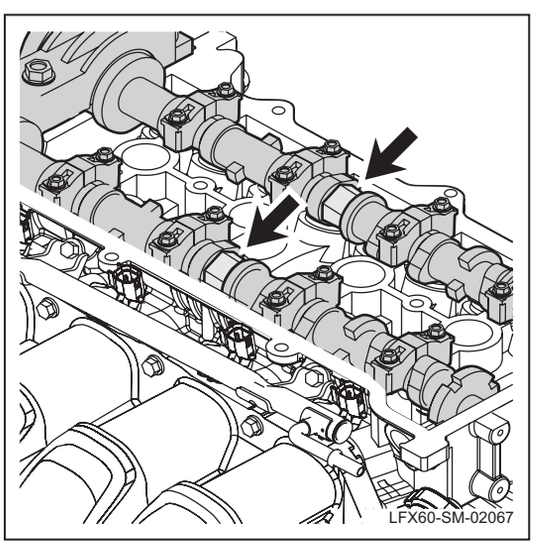
Installation

1. Install the timing chain and sprocket components.

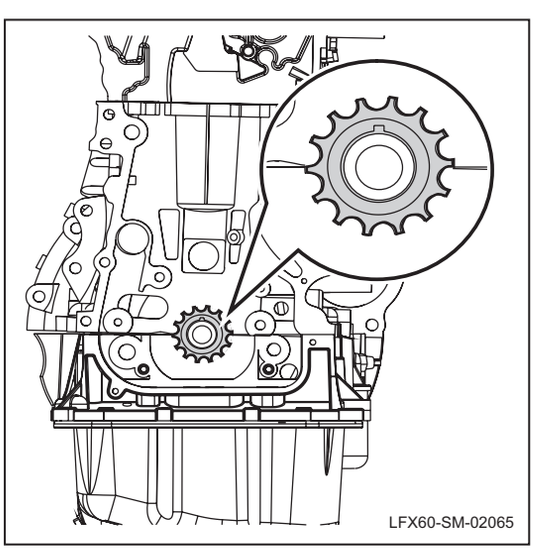


(a). Install the exhaust timing sprocket ① to the mounting position, install mounting bolts, and tighten them.
Torque: 54Nm

(b). Install the intake phase shifter assembly ② to the mounting position, install the phase shifter bolts, and tighten them.
Torque: 60Nm



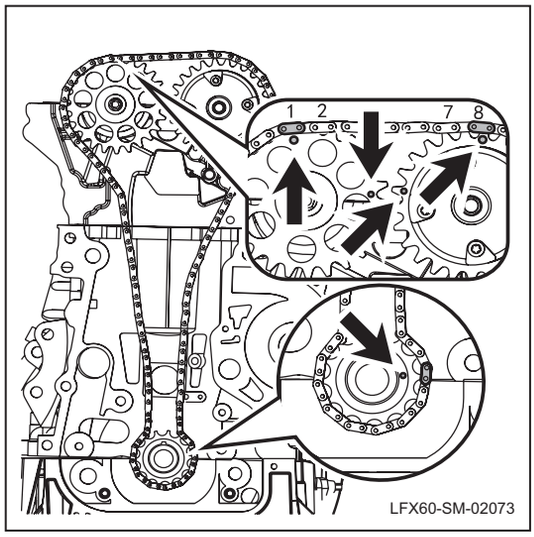
ⓘNote:
To prevent the crankshaft from rotating during the disassembly period, apply an opposite force with a wrench on the camshaft (apply a force on the diagram in the left figure).



(c). Install the crankshaft timing sprocket.

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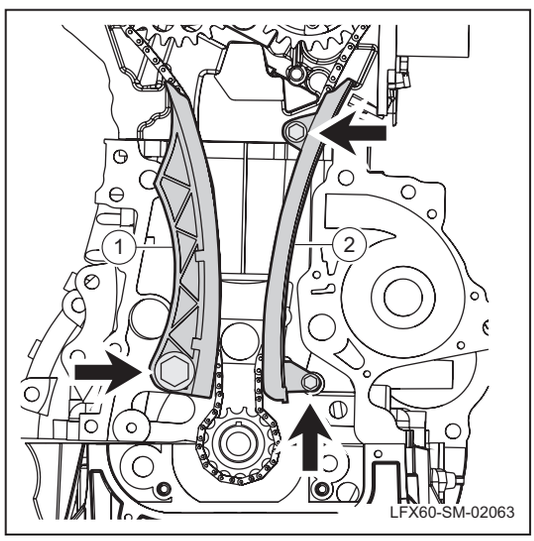
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(d). Install the timing chain.

Note:

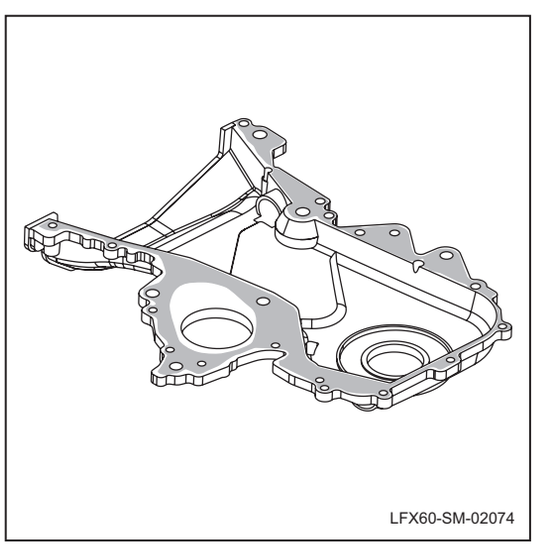
As shown, the markings should be aligned when installing the timing chain.



(e). Install the timing chain rail assembly ① and the orbit determination assembly ② .

Torque: 19 Nm (dynamic rail mounting bolts).

Torque: 13 Nm (orbit determination bolts).



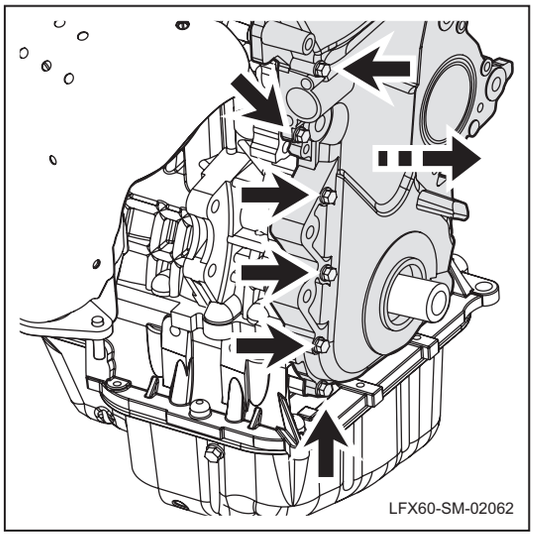
(f). Apply sealant evenly to the mating surface of the timing cover.

Note:

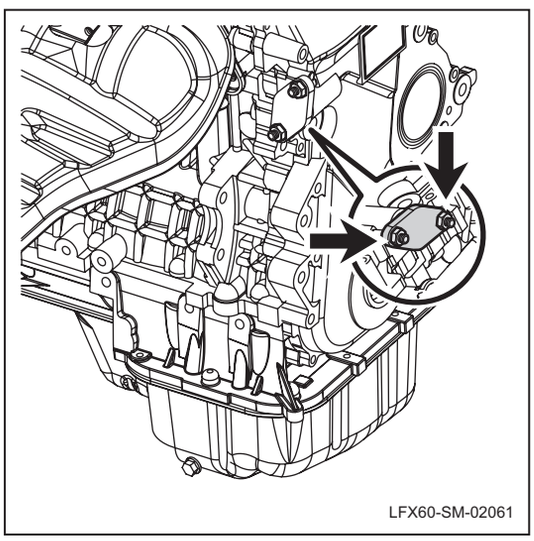
Be sure to clean the old sealant before applying the new one.

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(g). Install the timing cover on the engine, install mounting bolts, and tighten them.
Torque: 23 Nm

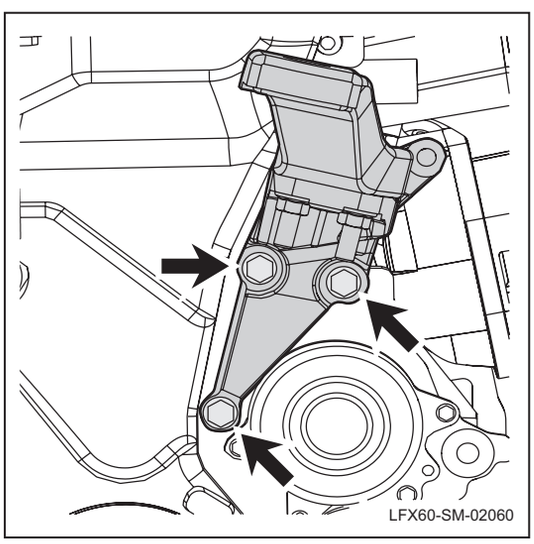


(h). Install the timing chain tensioner to the mounting position, install mounting nuts, and tighten them.
Torque: 11 Nm

△Tips:

Be sure to lock the tensioner plunger with the locking piece before installing the timing chain tensioner. After installing the tensioner fastening bolts, turn the crankshaft counterclockwise to release the locking piece.

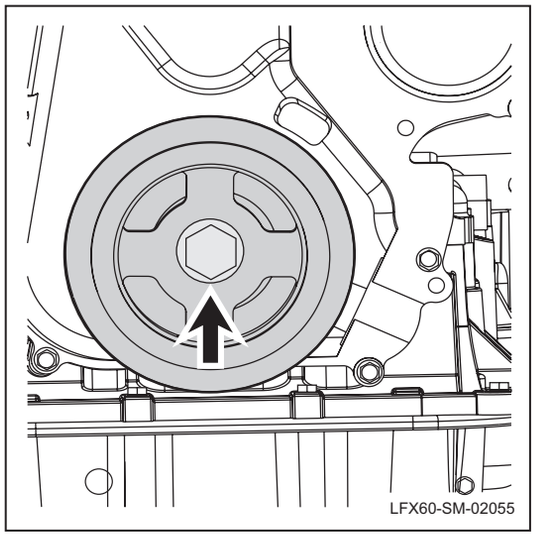
(i). Turn the crankshaft clockwise to check whether the timing chain tensioner is installed properly.



(j). Install the right generator mounting assembly to the installation position, install retaining bolts, and tighten them.
Torque: 75 Nm

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(k). Install the crankshaft pulley onto the mounting position and install and tighten the bolt components.
Torque: 138 Nm
△Tips:
When installing the crankshaft pulley bolt assembly, fasten the flywheel to prevent any crankshaft rotation.

(l). Install the water pump assembly. **Refer to the replacement of water pump assembly.**

(m). Install the tensioning wheel assembly. **Refer to the replacement of tensioning wheel assembly.**

(n). Install the camshaft cover. **Refer to the replacement of camshaft cover.**

(o). Install the accessories belt.**Refer to: Accessories belt replacement.**

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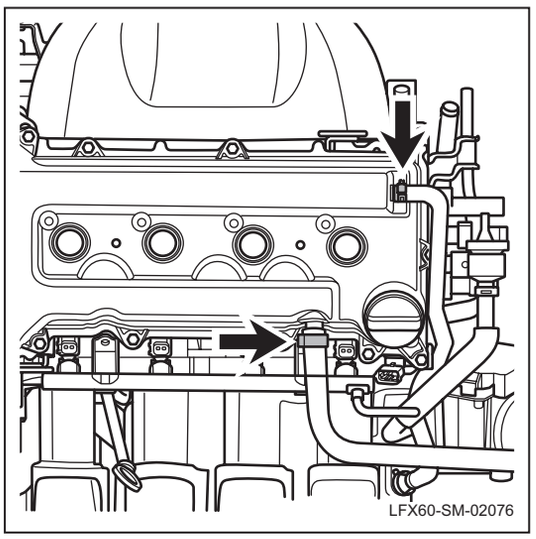
Replacement of cylinder head cover

Removal

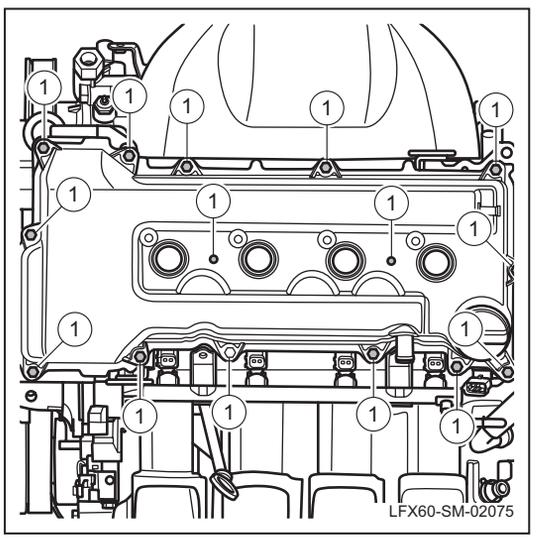
1. Remove the cylinder head cover.

(a). Remove ignition coils. **Refer to the replacement of ignition coils.**

(b). Remove spark plugs. **Refer to the replacement of spark plug.**



(c). Remove clamps, and disengage the upper pipeline from the cylinder head cover.



(d). Remove the cylinder head cover fixing bolts and remove the cylinder head cover.

Note:

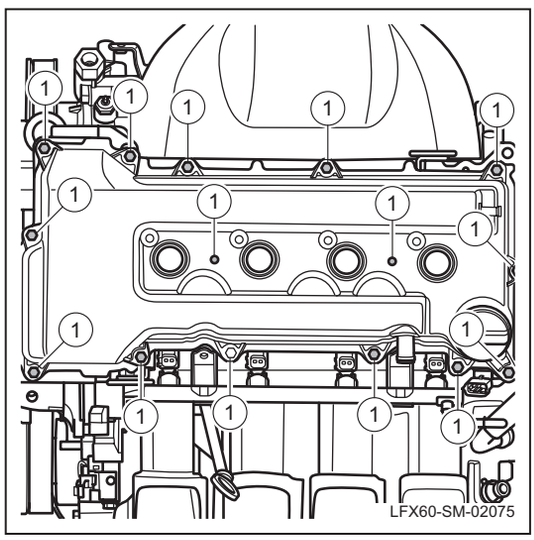
- **The cylinder head cover tightening bolts must be removed evenly.**
- **The cylinder head cover assembly is difficult to remove due to the sealant, and be sure to use a suitable tool to remove it.**

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Installation

1. Install the cylinder head cover assembly.

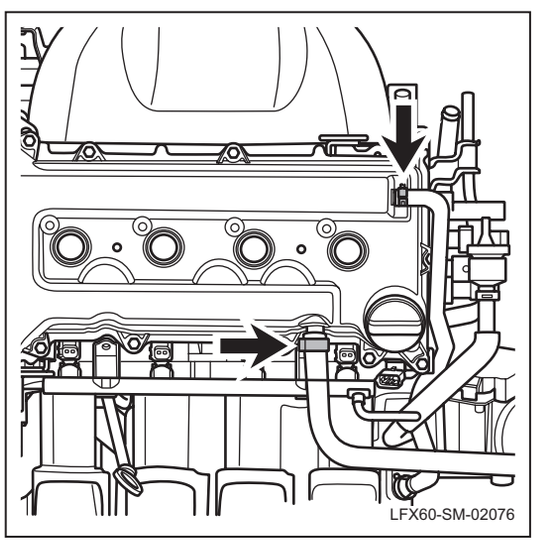


(a). Install the cylinder cover.

Note:

Before installing, apply sealant evenly to the cylinder head cover.

Torque: 11 Nm



(b). Install the upper pipeline of the cylinder head cover.

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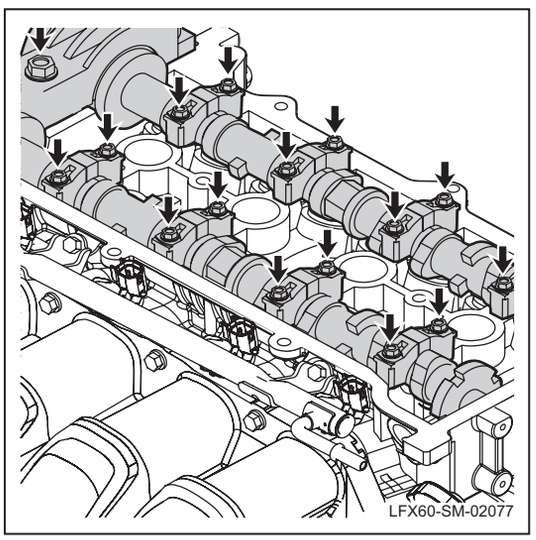
Camshaft replacement.

Removal

1. Remove camshaft

(a). Remove the cylinder head cover. **Refer to the replacement of cylinder head cover.**

(b). Remove the valve cover assembly, **Reference: Timing chain and sprocket assembly removal and replacement.**

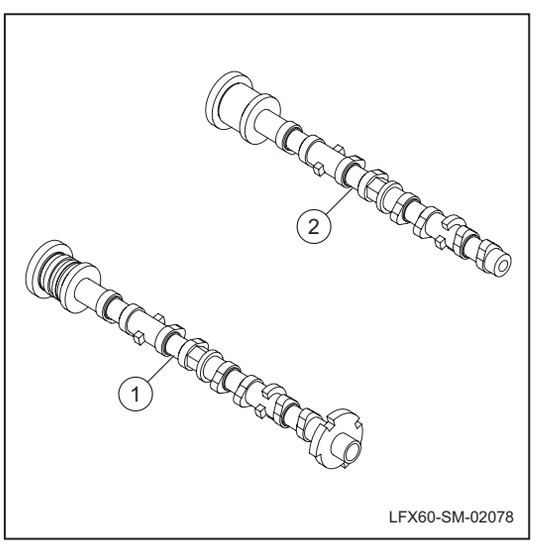


(c). Remove the camshaft cover bolts and remove all camshaft covers.

ℹNote:

- **Remove the camshafts fixing bolts in pairs.**
- **Place the removed camshaft head cover in order. Pay attention to distinguishing the intake and exhaust camshaft covers.**

(d). Take off the intake and exhaust camshafts.



ℹNote:

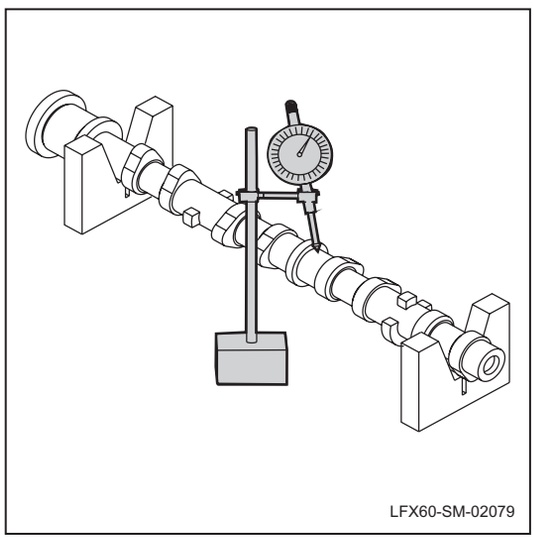
Pay attention to distinguishing intake and exhaust camshafts such as (1) intake camshaft assembly and (2) exhaust camshaft assembly.

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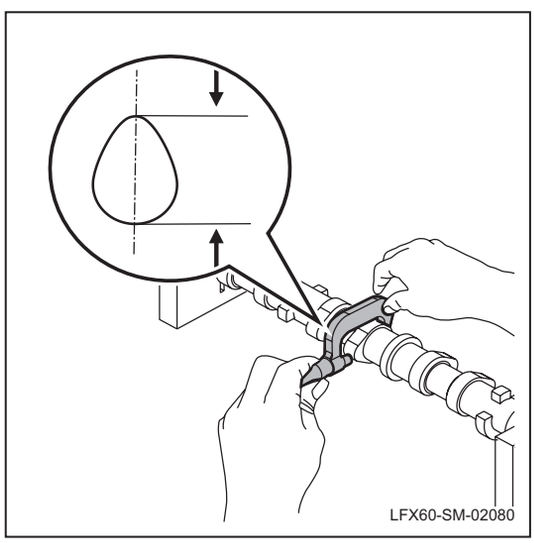
Inspection

1. Check the camshaft rocker runout.



(a). Put the camshaft on a V-shaped block, use a dial indicator to measure the circular rocker runout at the middle shaft journal. If the rocker runout is greater than the maximum value, must replace the camshaft.
Maximum value: 0.03 mm

2. Check the maximum strokes of the inlet and exhaust camshafts.

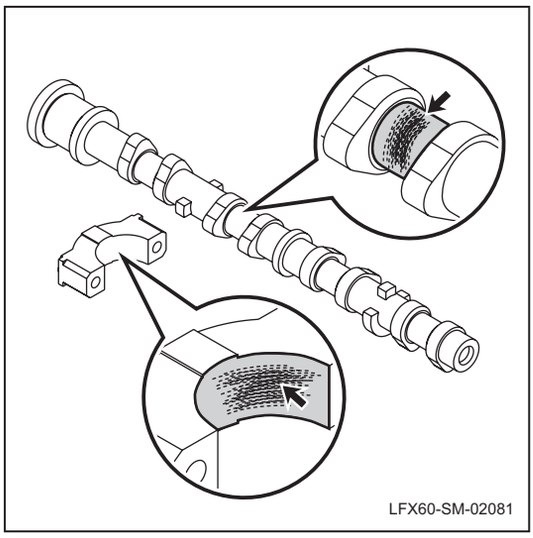


(a). As shown in the figure, measure the maximum lift of intake and exhaust camshafts with a screw-thread micrometer. If the values are beyond the scope, replace them.
Intake: 44.168~44.268
Exhaust: 43.705~43.805

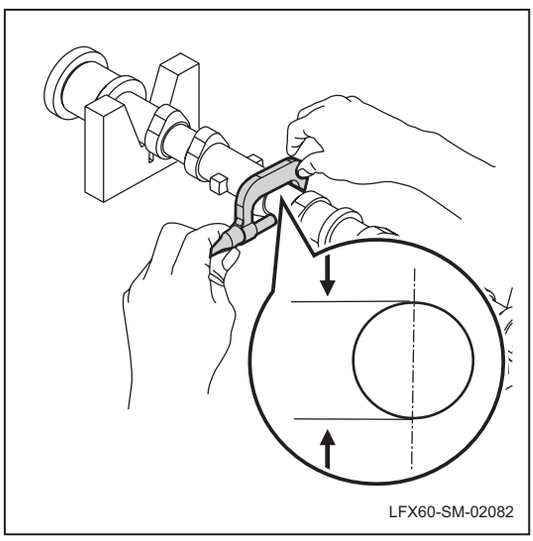
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3. Check the camshaft journal.

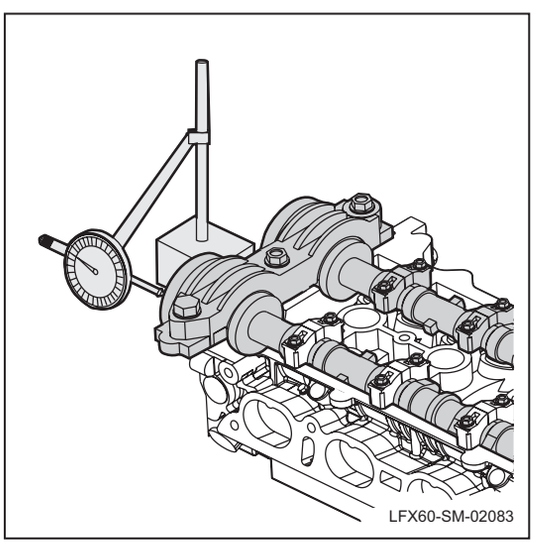


(a). Check the camshaft journal and the bearing cap for rust, abrasion, or other damage; if any, replace it; if necessary, replace the cylinder head assembly.



(b). Measure the camshaft journal with a spiral micrometer; if it can meet the requirement, check the oil film clearance.
No. 1 exhaust: 34.449~34.465 mm
Others: 22.949~22.965mm

4. Check the camshaft axial clearance.



(c). Install the intake and exhaust camshafts onto the cylinder head cover.

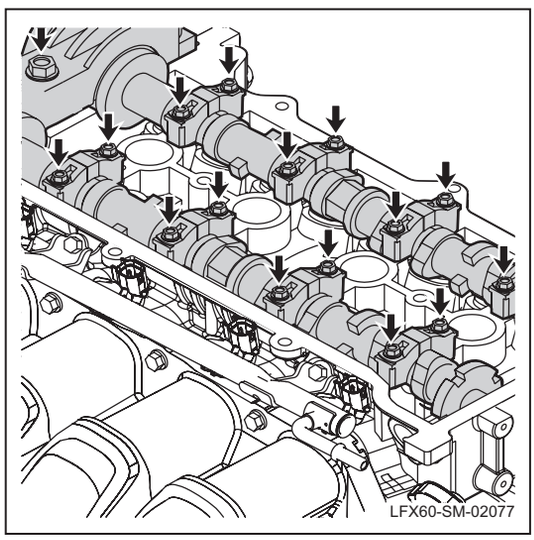
(d). Make the camshaft in a reciprocation motion. Check the axial clearance of the camshaft with a dial indicator. If not meet the requirements, replace the camshaft. If necessary, replace the cylinder head cover.
Standard axial clearance: 0.085 mm
Maximum axial clearance: 0.12 mm

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Installation

1. Install the camshaft.



(a). Install the intake and exhaust camshafts onto the cylinder head.

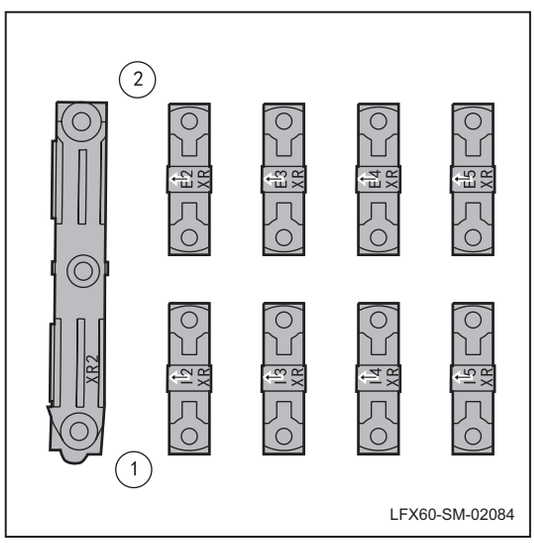
Note:

- **Apply clean oil evenly on each contact surface of the camshaft.**
- **Pay attention to distinguishing intake and exhaust camshafts.**

(b). Install the camshaft cap onto the mounting position, and install and tighten the mounting bolts.

Torque of mounting bolt for No. 1 camshaft cover: 23 Nm.

Other torques: 13 Nm.



(c). Install the intake and exhaust camshaft assembly onto the cylinder head cover.

Note:

- **As shown in the figure, pay attention to distinguishing the bearing cover sequence of intake and exhaust camshaft bearing covers. Do not mix them.**
- **1 is the intake side (identification letter I), 2 is the exhaust side (identification letter E).**
- **Fasten mounting bolts in pairs on the camshaft bearing cover.**
- **After fastening bolts on the camshaft bearing cover, rotate the camshaft flexibly. Do not allow any jamming.**

(d). Install the cylinder head cover. **Refer to the replacement of cylinder head cover.**

(e). Install the timing chain and the sprocket assembly. **Refer to the replacement of the chain and the sprocket assembly.**

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Replace the cylinder head assembly and the valve assembly.

Removal

1. Remove the cylinder head assembly and the valve components.

(a). Remove the intake manifold. **Refer to the replacement of the intake manifold assembly.**

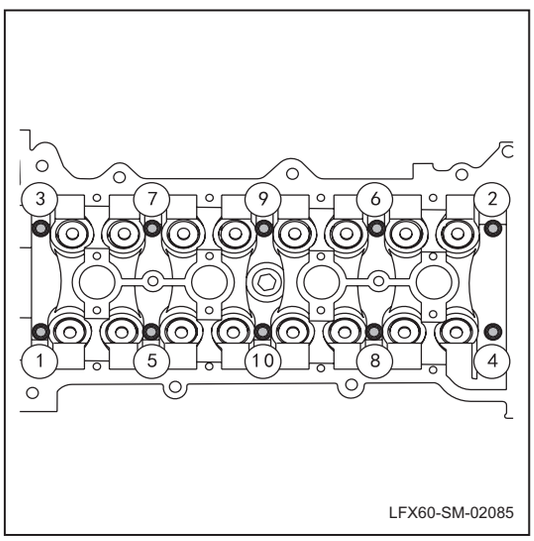
(b). Remove the exhaust manifold. **Refer to the replacement of the exhaust manifold assembly.**

(c). Remove the injector assembly. **Refer to the replacement of injector assembly.**

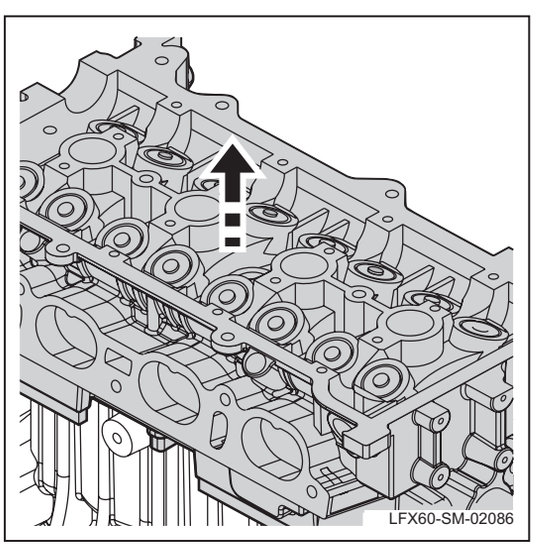
(d). Remove the cylinder head cover. **Refer to the replacement of cylinder head cover.**

(e). Remove the timing chain and the sprocket assembly. **Refer to the replacement of the chain and the sprocket assembly.**

(f). Remove the camshaft. **Refer to the replacement of camshaft.**



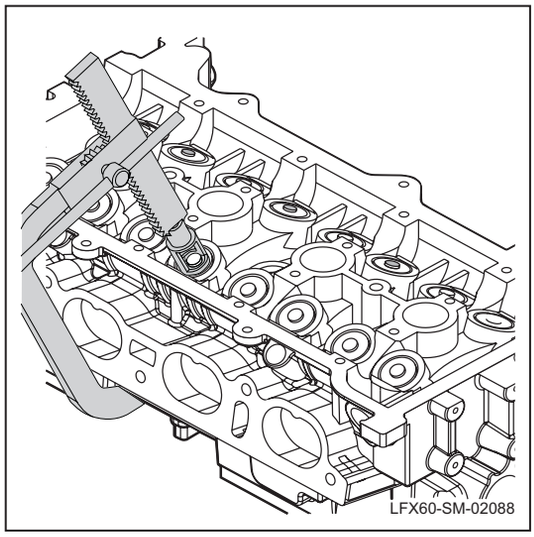
(g). Loosen and remove bolts from the cylinder head in the order shown in the figure.



(h). Remove the cylinder head and the cylinder gasket.

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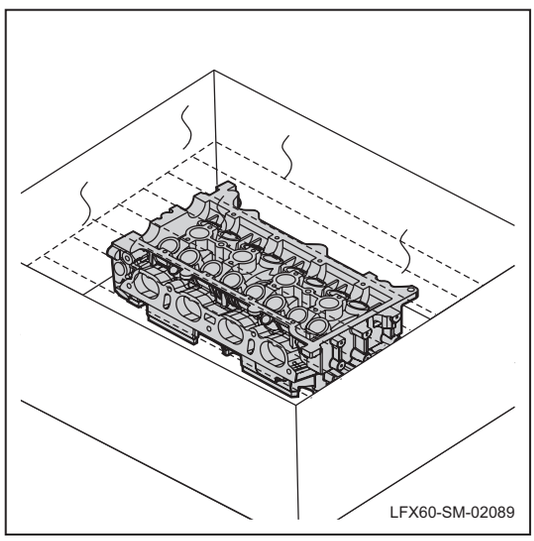

LFX60-SM-02088

(i). Remove all mechanical tappets in turn.

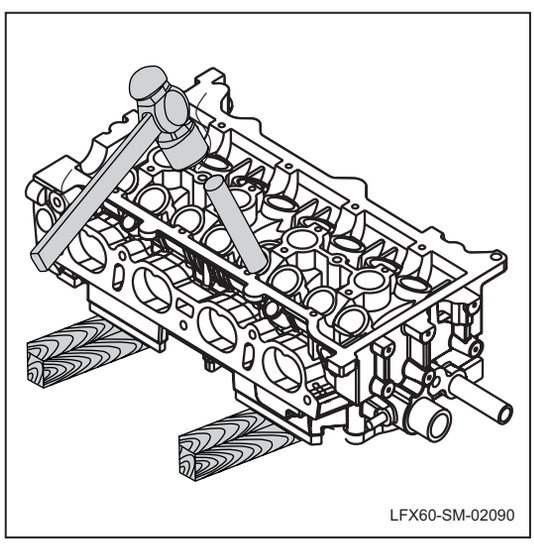
Note:

Remove the mechanical tappets and place them in the installation location order for subsequent installation.

(j). Remove the valve spring with a special tool.


LFX60-SM-02089

(k). Heat the cylinder head to 80~100 °C.


LFX60-SM-02090

(l). Place the cylinder head on a wooden plate, and take off the valve guide pipe from the cylinder head with a special tool.

Note:

- **The removed air valve duct can not be used again.**
- **Because there is an interference fit between the valve duct and the cylinder head, when installing a new duct, must increase the size.**

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Inspection

1. Check the cylinder head.

(a). Clean the sealant and the oil on the cylinder head.

(b). Clean the carbon deposition in the combustion chamber of the cylinder head.

ℹNote:

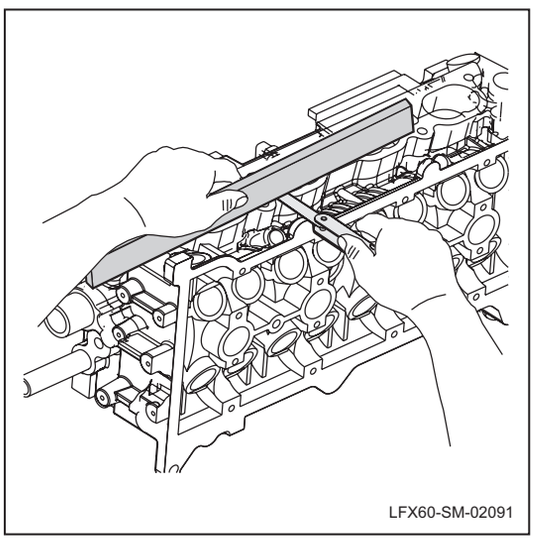
Do not allow scraping carbons with any sharp tool. When removing carbon deposits, pay attention not to scratching or damaging to the metal surface.

(c). Use a high pressure water jet to clean the cylinder head, especially, the water duct and the oil duct.

(d). Use compressed air to dry the cylinder head.

ℹNote:

When using compressed air, it is suggested to wear goggles and protective mask, to avoid any injury from flying debris or dirt.


LFX60-SM-02091

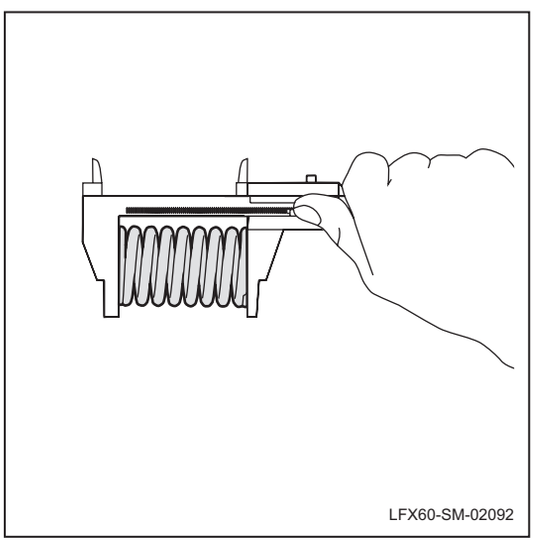
(e). Check the cylinder head bolts for any damage; if necessary, replace them.

(f). Check the cylinder head joint surface and the flatness at the intake and exhaust sides with a ruler and a thickness gauge. If the flatness exceeds the maximum value, replace the cylinder head.

Flatness of cylinder head:0.04 mm

Flatness at intake and exhaust sides: 0.04 mm

2. Check the air valve components.


LFX60-SM-02092

(a). Check whether the valve lock sheet is cracked or damaged. If yes, replace it.

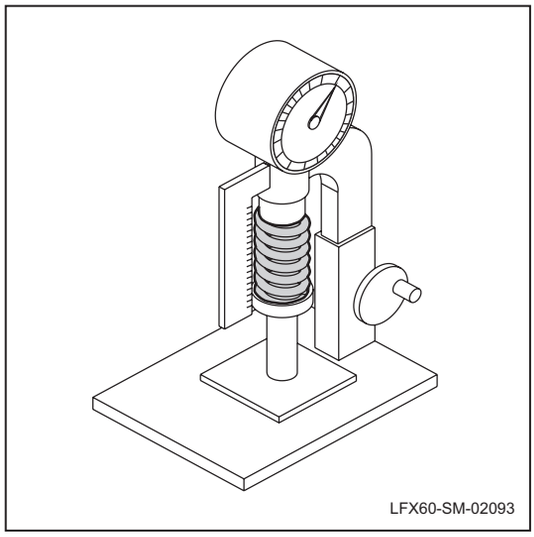
(b). Use a vernier caliper to measure the valve spring length under the free status;, if it is beyond the scope, replace it.

Intake valve spring: 44.7 mm

Exhaust valve spring: 45.7 mm

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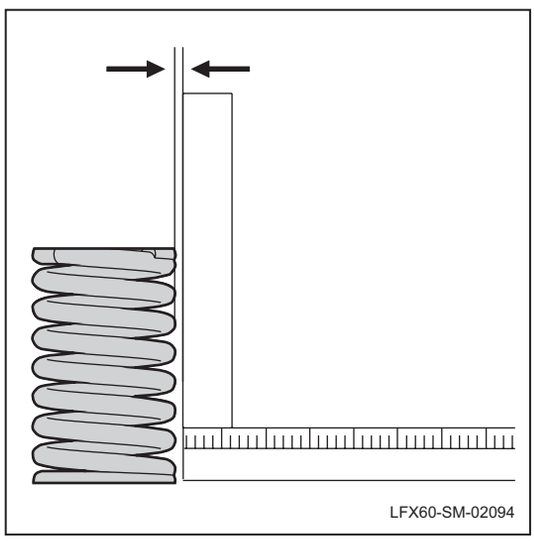
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LFX60-SM-02093

(c). Use a spring dynamometer to measure the spring force under the standard compression length of elasticity; if it can not meet the requirements, replace it.

Installation spring force: 153~169 Nm(33.88mm)

Maximum working force: 335.3~370.7 Nm(24.252mm)

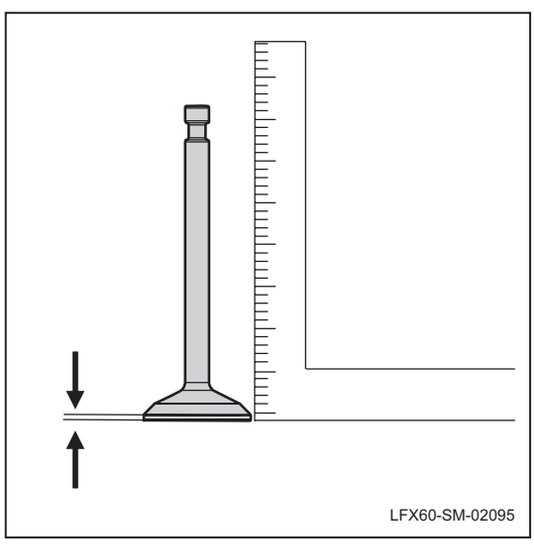

LFX60-SM-02094

(d). Use a ruler and tablet to check the spring verticality based on the clearance between the air valve spring end and the ruler; if it is beyond the specified value, replace it.

Verticality: 1.0 mm (maximum deviation).

Verticality: 2°(The maximum deviation angle)

(e). Remove all carbon deposits from the valve. Check whether there is any wear, ablation or deformation on each valve operating surface and each valve stem. If yes, repair it. If necessary, replace the valve.


LFX60-SM-02095

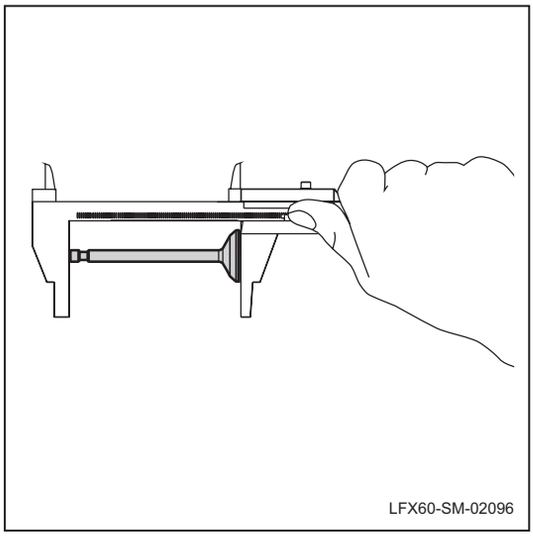
(f). Use a square angle ruler to measure the air valve edge thickness; if the measured value is less than the minimum value, replace the air valve.

Standard thickness: 1.25 mm for intake, and 1.39 mm for exhaust.

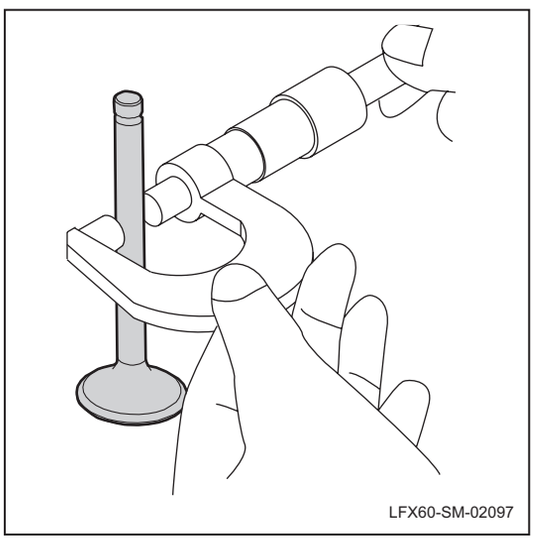
Minimum thickness: 1.05 mm

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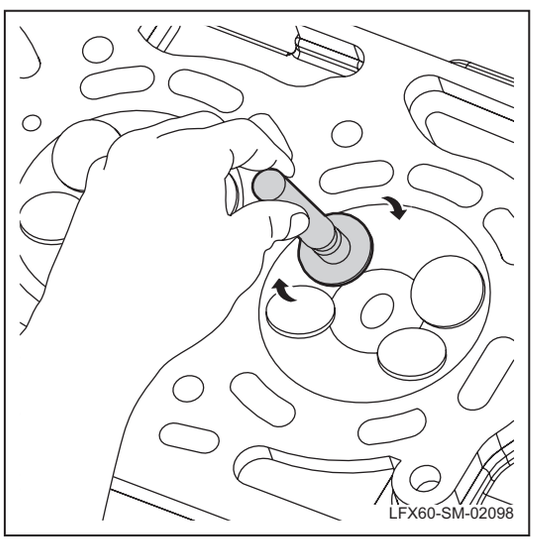
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LFX60-SM-02096

(g). Use a vernier caliper to measure the air valve length, if it can not meet the requirement, replace it.
Standard length:
Intake valve: 88.65mm
Exhaust valve: 88.69mm
Minimum length:
Intake valve: 88.35mm
Exhaust valve: 88.39mm


LFX60-SM-02097

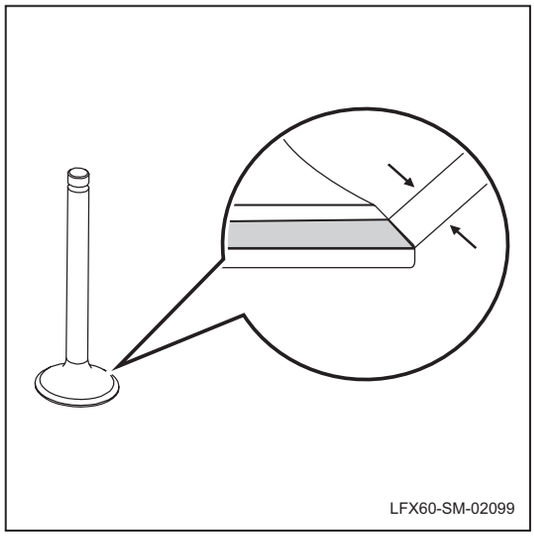
(h). Use a micrometer to measure the air valve stem diameter, if it can not the requirement, replace it.
Intake valve: 5.470mm ~ 5.485mm
Exhaust valve: 5.465mm ~ 5.480mm


LFX60-SM-02098

(i). Check the air valve seat contact width.
❶Note:
Coat a layer of the marking membrane on the air valve seat, and then install the air valve on the cylinder head. Use the air valve grinding tool to rotate the air valve 1/4 turns several times, and then remove the air valve.

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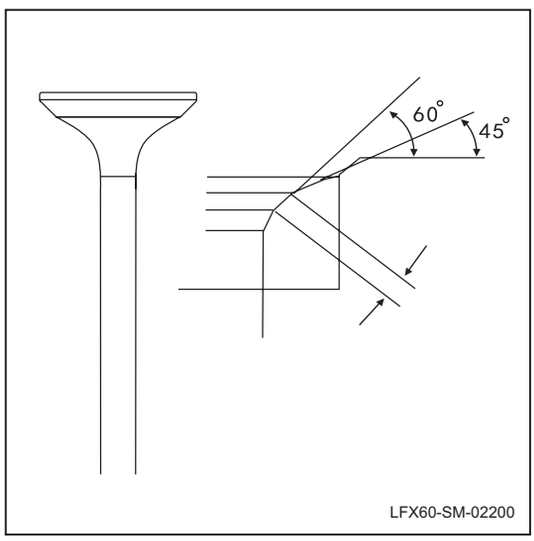
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Note:

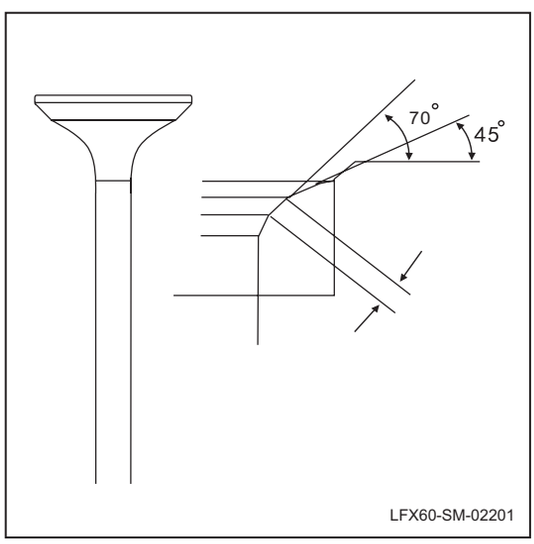
The marking produced on the air valve mating surface must be a continuous closed trace, and its width must be within the prescribed scope. If the marking is uneven, or the mark width is beyond the specified scope, must grind and fine grind and polish the air valve seat.

Width of valve block contact surface: 1.0~1.4 mm



(j). Intake valve block: repair it with a valve block reamer for two times. Must use two reamers to repair it: the first reamer has an angle of 15°, and the second reamer has an angle of 45°. In the second repair, must achieve the required air valve seat width.

Intake valve holder width: 1.0~1.4mm

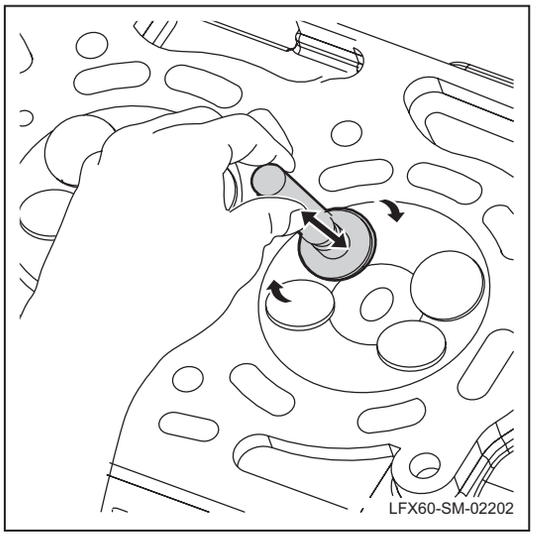


(k). Exhaust valve block: the repair procedures are same as those of intake valve block.

Exhaust valve seat width: 1.0~1.4mm

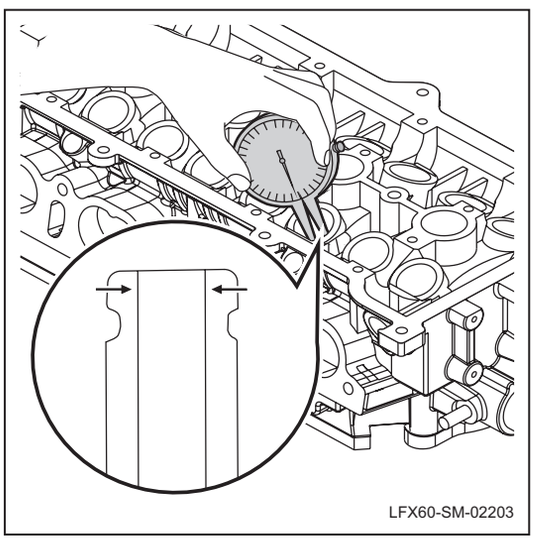
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LFX60-SM-02202

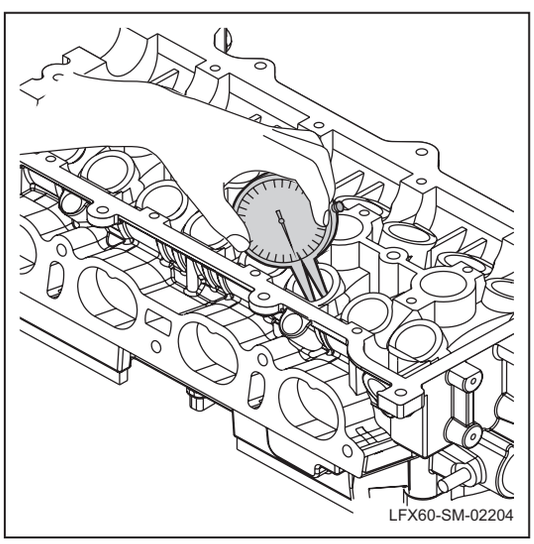
(l). Grind the valve. Firstly, apply the rough grinding paste on the valve block surface to grind the valve with a grinding tool. Then, grind with a fine grinding paste until that the valve is matched perfectly with the valve block.

(m). Clean the valve and the valve block thoroughly after grinding.


LFX60-SM-02203

(n). Measure the inner diameter of valve guide tube with an inner diameter micrometer.
Air valve duct inner diameter: 5.510~5.530mm

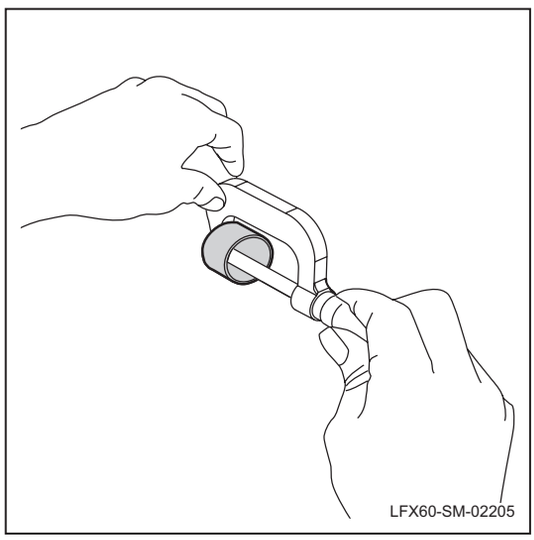
(o). Minus the valve stem diameter from the inner diameter of the valve guide tube to get the oil clearance of valve guide tube. If the oil clearance value is greater than the maximum value, replace the air valve and the air valve duct.
Standard oil clearance:
Intake valve: 0.025~0.060mm
Exhaust valve: 0.030~0.065mm
Maximum oil clearance:
Intake valve: 0.08mm
Exhaust valve: 0.10mm


LFX60-SM-02204

(p). Measure the inner installation diameter of valve guide tube with an inner diameter micrometer.
Inner diameter of installation hole on valve guide tube: 10.285~10.306 mm

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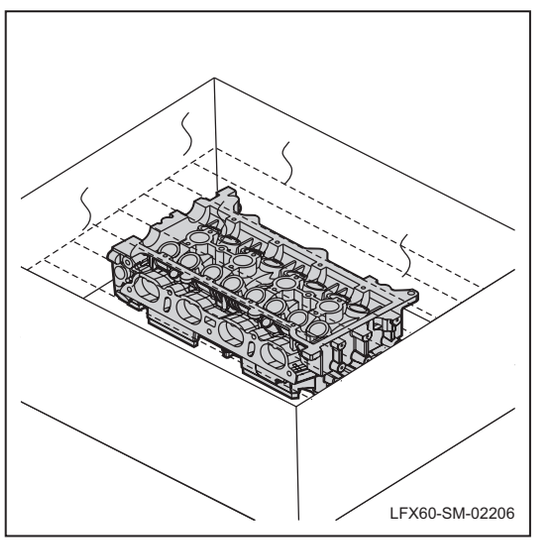


(q). Measure the top thickness of the mechanical tappet. If not meeting the requirements, replace it.

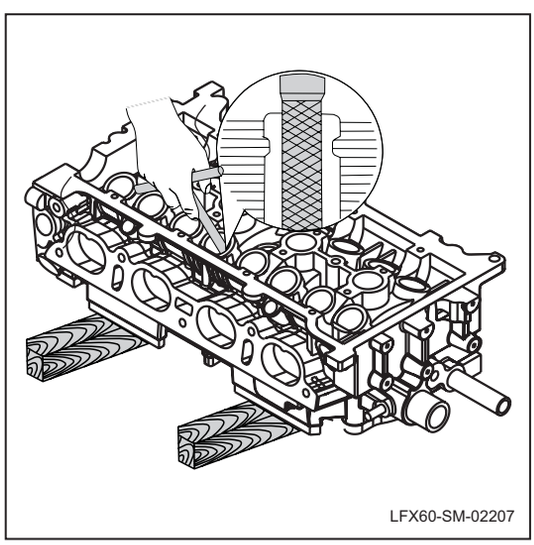
Top thickness of mechanical tappet: 5.055mm~6.005 mm.

Installation

1. Install the cylinder head assembly and the valve components.



(a). Heat the cylinder head to 80 ~ 100°C.



(b). Remove the cylinder head and place it on a wooden board, use the special tool to press the new valve duct to the specified value into the duct hole, until the special tool is contacted with cylinder head.

Specific press amount: 8.7~9.1 mm.

Note:

Hinge the guide hole with a tool (with a 11 mm reamer) to remove the burr.

(c). Use the special tool (5.5 mm reamer), to ream the air valve duct hole to achieve the standard oil clearance.

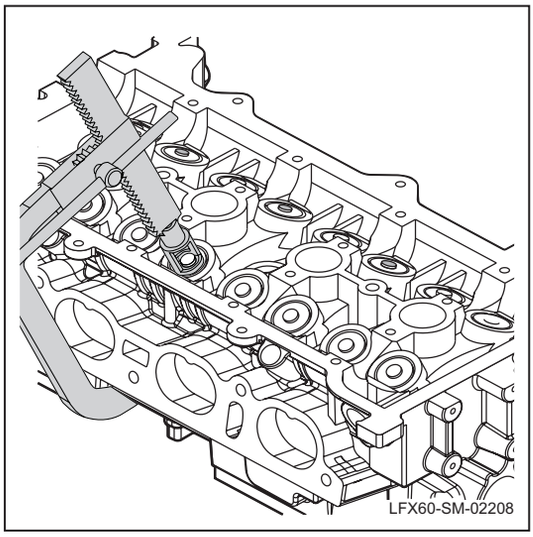
Standard oil clearance:

Intake valve: 0.025~0.060mm

Exhaust valve: 0.030~0.065mm

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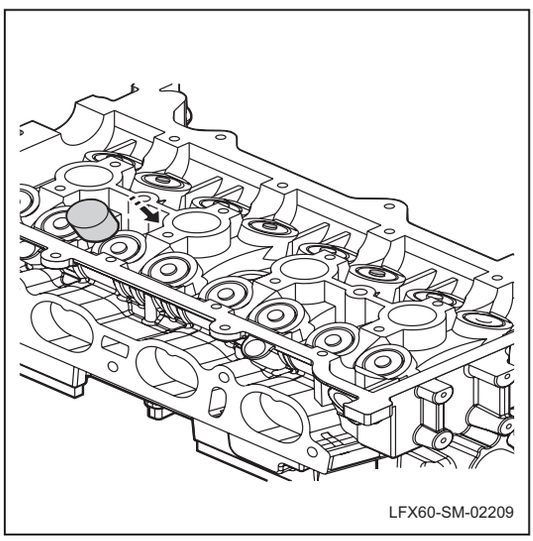
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LFX60-SM-02208

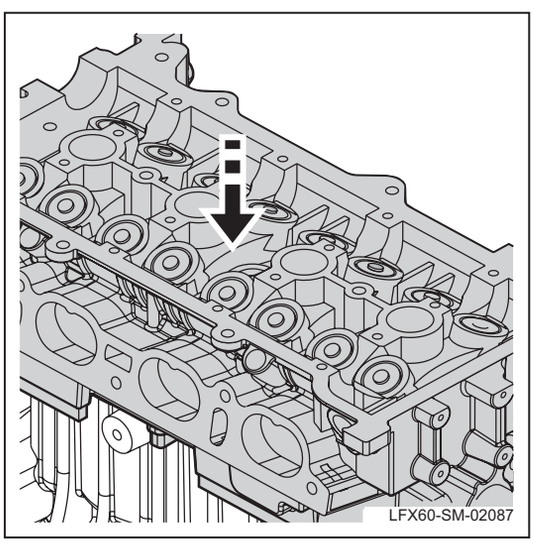
(d). Install valve oil seal, valve, valve spring, valve spring block, and valve lock plate in turn with a special tool.

Note:

- **The removed air valve seal can not be used again; must use the new oil seal during installation.**
- **In installation, it is prohibited to use a hammer or other objects to tap the special tool; when installing the oil seal onto the duct, only manually press the special tool, the tapping on the special tool may cause the air valve seal damage or deformation.**


LFX60-SM-02209

(e). Install mechanical tappets on the cylinder head.


LFX60-SM-02087

(f). Wipe the upper cylinder end clearly with a wiping paper to ensure there is not any oil when installing a cylinder pad.

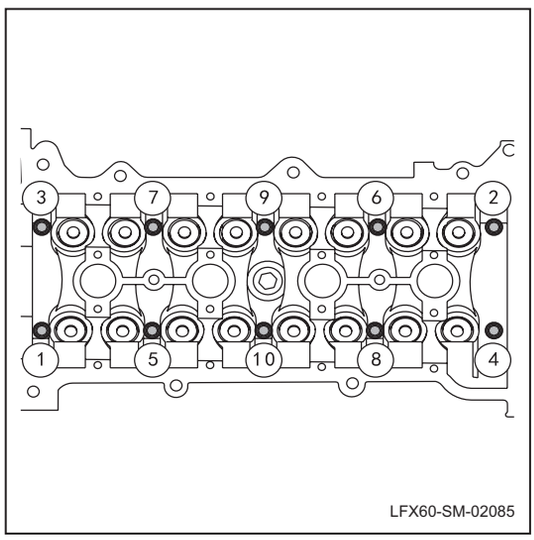
Note:

The marked surface should be upward; the positioning pin hole position should be noticed.

(g). Install the cylinder head onto the cylinder head.

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Note:

- **Apply a proper amount of clean oil to the threads of cylinder head bolt.**
- **In case of tightening the cylinder head bolt, tighten it twice in the shown sequence.**

  The first torque: 49 Nm

  The second torque:90 Nm

(h). Install the camshaft. **Refer to "Replacement of Camshaft".**

(i). Install the timing chain and sprocket assembly. **Refer to "Replacement of Timing Chain or Sprocket Assembly"**.

(j). Install the cylinder head cover. **Refer to "Replacement of Cylinder Head Cover"**.

(k). Install the oil injector assembly. **Refer to "Replacement of Oil Injector Assembly"**.

(l). Install the exhaust manifold. **Refer to "Replacement of Exhaust Manifold Assembly"**.

(m). Install the intake manifold. **Refer to "Replacement of Intake Manifold Assembly"**.

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Piston, piston ring, and connecting rod assembly

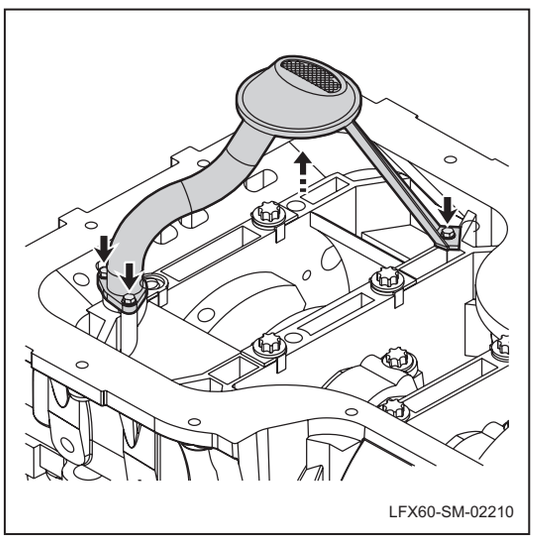
Removal

1. Removal piston, piston ring, and connecting rod assembly

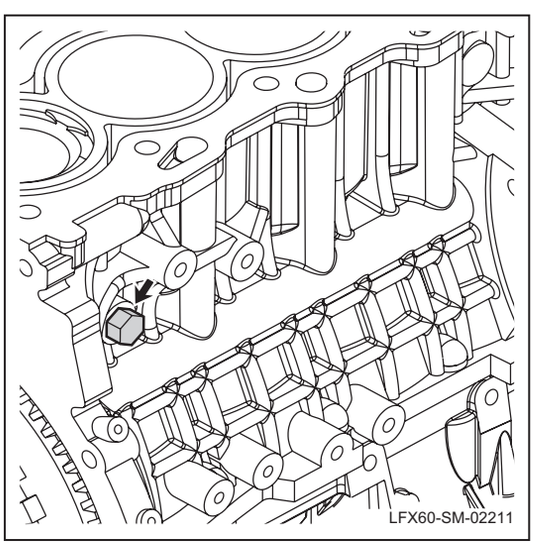
(a). Remove the cylinder cover assembly and valve assembly. **Refer to "Replacement of Cylinder Cover Assembly and Valve Assembly".**

(b). Remove the oil sump. **Refer to "Replacement of Oil Sump".**

(c). Remove the oil pump. **Refer to "Replacement of Oil Pump".**



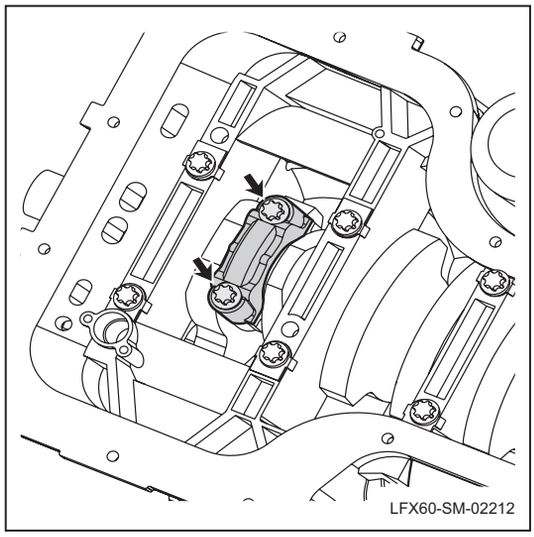
(d). Remove the engine oil suction filter fixing bolts to take out the filter.



(e). Remove the drain bolt and tilt the cylinder to drain the coolant.

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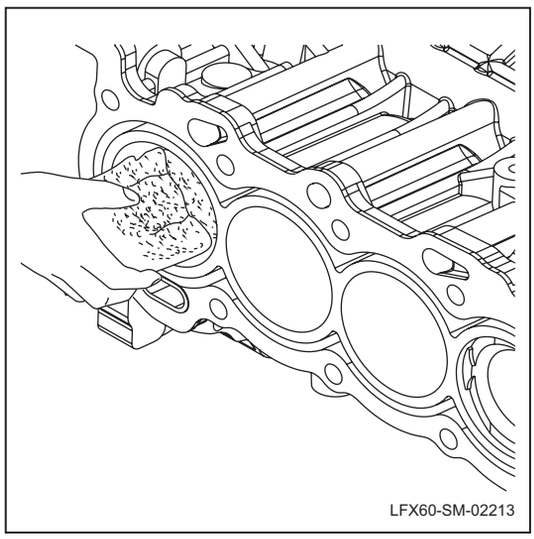
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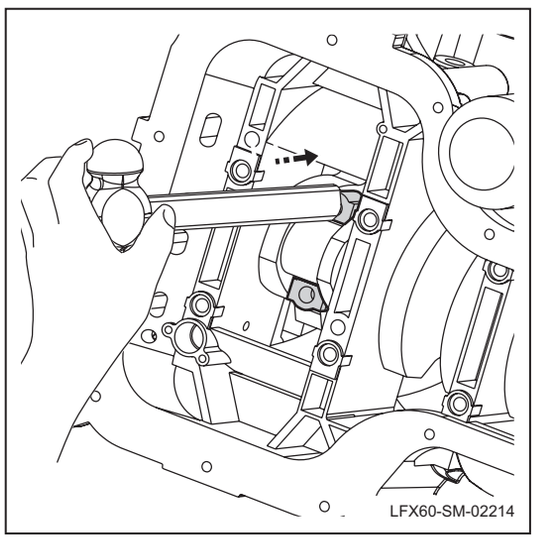
(f). Rotate the crankshaft to bring the piston of cylinder 1 and 4 to the BDC (namely, the connecting rod cap is revealed vertically).

(g). Remove the connecting rod bolt and take out the connecting rod cap and bearing bush.

(h). Remove the other connecting rod caps and bearing bushes in the same way.



(i). Clean up all carbon deposits on top of the cylinder.



(j). Remove the piston assembly.

ℹNote:

Use a wood or rubber object to push out the piston, do not use any metal object, to avoid damage to the connecting rod end surface.

(k). Take out the piston assembly from the other side.

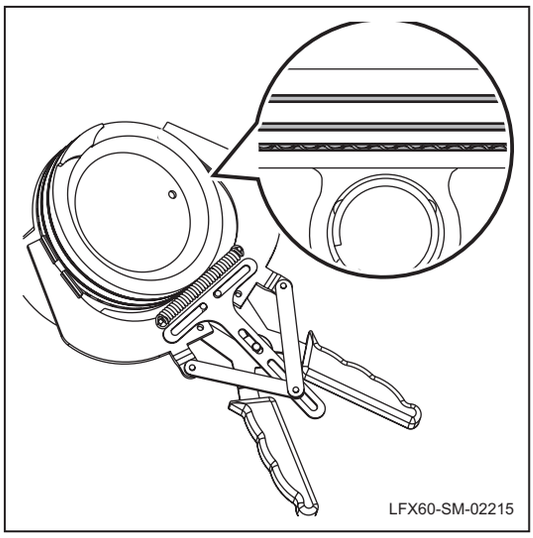
ℹNote:

Place the piston and connecting rod components in the correct order, don't mix them.

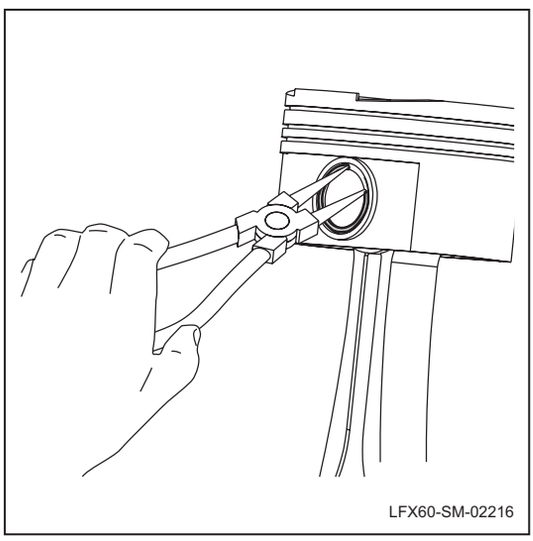
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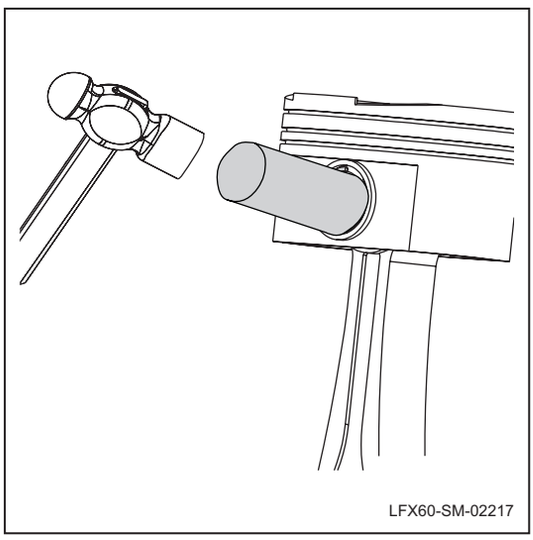
2. Disassemble the piston and connecting rod assembly



(a). Use the piston ring expander to remove the piston ring I, the piston ring II and the combination oil ring.



(b). Remove two piston ring lock rings with ring pliers.



(c). Punch out the piston pin with a punching rod.

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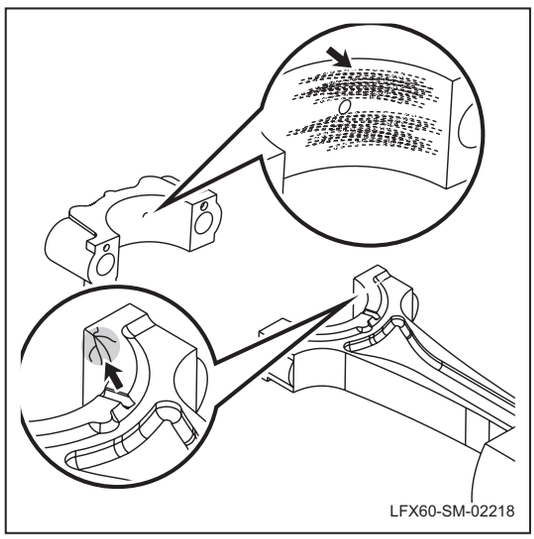
Inspection

1. Visually check the connecting rod assembly.

(a). Check that the connecting rod and the connecting rod cap for marks, cracks, burrs, scratches or wear.

Note:

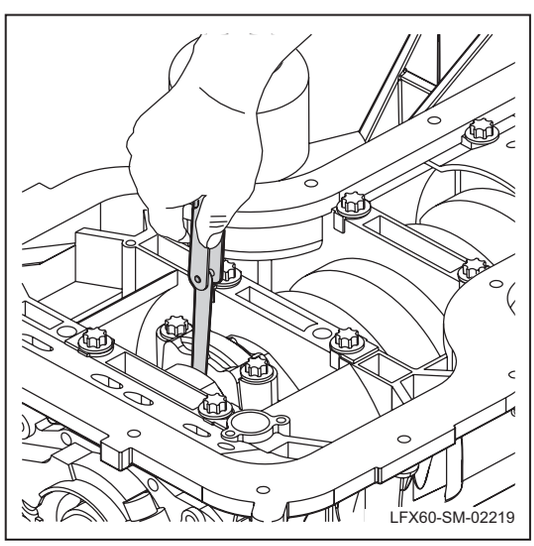
The connecting rod and connecting rod cap must be replaced in pair if either presents noticeable wear.



(b). Check the connecting rod bearing bush and piston pin for flaw, score marks or other damage and replace them if required.

(c). Check the piston skirt, pin hole, top and piston ring groove for damage or abrasion and replace them if required.

2. Check the axial clearance of piston connecting rod.



(d). Adopt a thickness gauge to measure the axial clearance of piston connecting rod. If its axial clearance exceeds its maximum value, replace the connecting rod assembly.

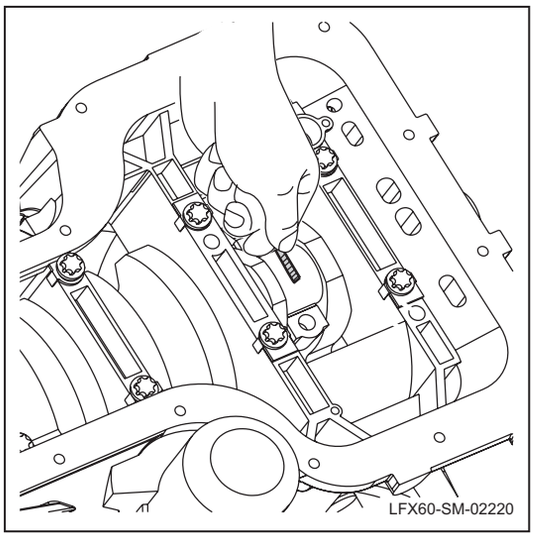
Standard axial clearance: 0.16mm to 0.34mm

Maximum axial clearance: 0.34mm

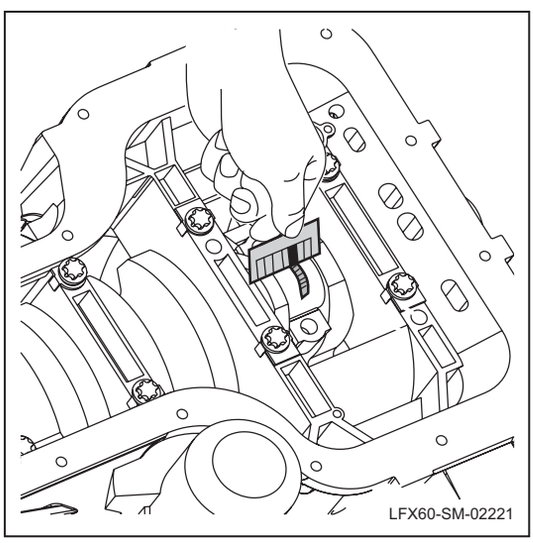
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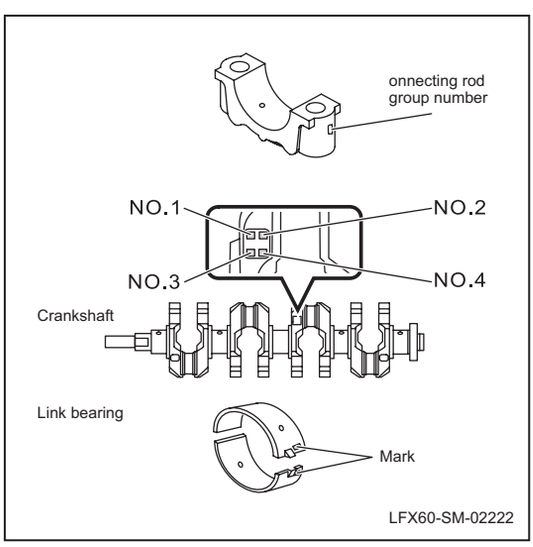
3. Check the oil clearance of connecting rod.



(a). Remove the connecting rod cap fixing bolt and take out the connecting rod cap with bush assembly.
(b). Pass one section of plastic oil clearance gauge through the crankshaft connecting rod journal.
(c). Install the connecting rod cap and tighten the fixing bolt.
Torque: 50 Nm



(d). Remove the connecting rod cap fixing bolt and take out the connecting rod cap with bush assembly.
(e). Measure the oil clearance at the widest part. If the oil clearance exceeds the maximum value, replace the bearing bush. Grind the crankshaft or replace the crankshaft if necessary.
Standard oil clearance: 0.030mm~0.054mm
Maximum oil clearance: 0.08mm
(f). Remove all plastic oil clearance gauges.



Note:
If No. of bearing is unclear or it's required to reassemble the bearing after replacing the crankshaft or connecting rod, please add No. of connecting rod to No. of crankshaft and subtract 1 (calculating method: No. of connecting rod bearing=No. of connecting rod neck+No. of connecting rod hole-1). Ensure the correct selection of the shaft tiles.

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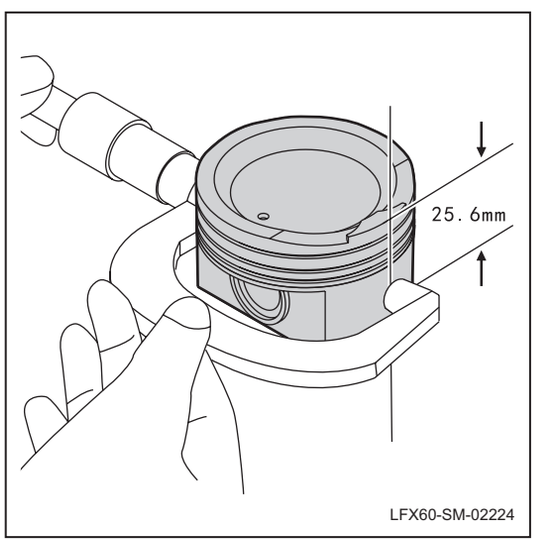
Connecting rod tile selection table

Connecting rod tile number / Connecting rod hole number / Connecting rod journal number	1#	2#	3#
1#	1#	2#	3#
2#	2#	3#	4#
3#	3#	4#	5#

LFX60-SM-02223

(g). For example: connecting rod group “3”(connecting rod neck No.)+crankshaft No.“1”(connecting rod hole No.)-“1”=total No.“3” (i.e. adopt No.“3” bearing)

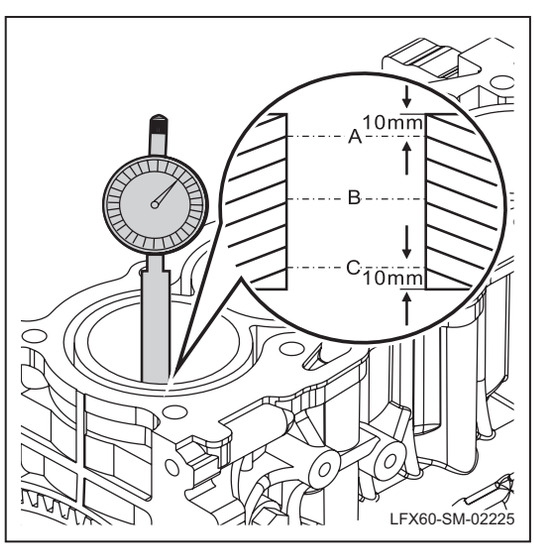
4. Check the piston diameter.



LFX60-SM-02224

(a). On the position with the distance of 25.6 mm from the top of the piston, measure the piston diameter at right angles to the center line of the piston pin with a micrometer.
Standard diameter of piston: 82.442 to 82.458mm

5. Check the oil clearance of piston.



LFX60-SM-02225

(a). Measure the cylinder bore at position A, B and C with the cylinder bore measuring apparatus.
Standard diameter: 79.00-79.13mm.

△Tips:
Test once in the axial direction and thrust direction in each position.

(b). Calculate the difference between the maximum and minimum values of 6 measurement values.
Maximum difference: 0.073mm

ℹNote: If it exceeds the maximum value, replace the cylinder block.

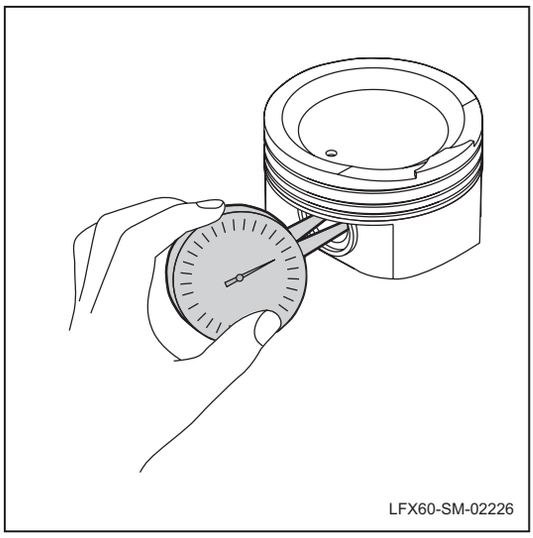
(c). Calculate the piston oil clearance by making the measured inner diameter of cylinder bore subtract the measured diameter of piston.

(d). If its oil clearance is more than its maximum value, replace 4 pistons fully, and bore 4 cylinders again. Replace the cylinder block if necessary.
Standard oil clearance: 0.042~0.073mm

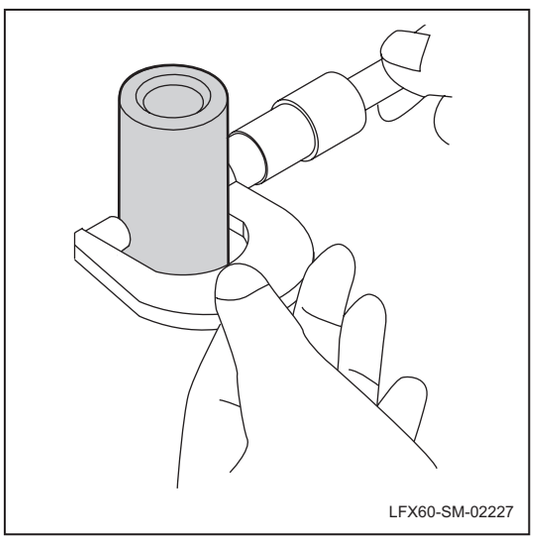
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6. Check the oil clearance of piston pin.

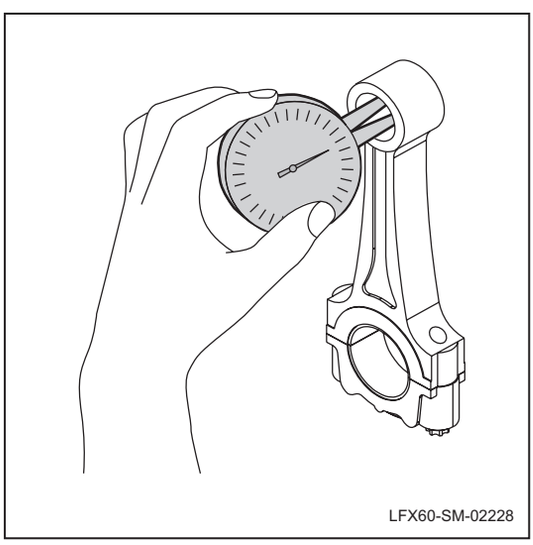

LFX60-SM-02226

(a). Measure the piston mounting hole diameter with the inside micrometer.
Diameter of piston pin mounting hole: 20.006 to 20.015mm


LFX60-SM-02227

(b). Measure the piston pin top circle diameter with the screw thread micrometer.
Outer diameter of piston pin: 20.004 to 20.013mm

(c). The piston pin mounting hole diameter minus the piston pin top circle diameter is the piston pin oil clearance. If the oil clearance exceeds the maximum value, replace the piston pin or replace the piston if necessary.
Standard oil clearance: 0.002~0.011mm
Maximum oil clearance: 0.011mm


LFX60-SM-02228

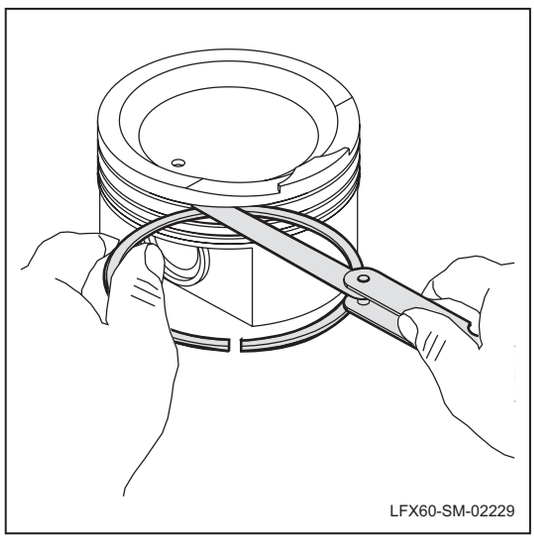
(d). Measure the small end bore with the inside micrometer.
Inner diameter of connecting rod small end hole: 20.012 to 20.021mm

(e). The oil film clearance should be equal to the inner diameter of the small end of connection rod minus the outer diameter of the piston pin; if the oil film clearance is greater than the maximum value, must replace the connecting rod; if necessary, replace the piston and the connecting rod.
Standard oil clearance: 0.001~0.017mm
Maximum oil film gap: 0.017mm.

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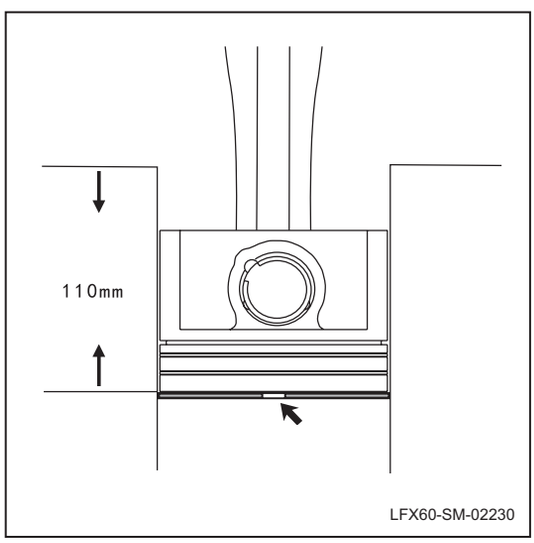
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7. Check the piston ring groove gap.



(a). Adopt a thickness gauge to measure the clearance between the piston ring and ring wall. If the clearance is more than its maximum value, replace the piston.
First ring groove: 0.035~0.075mm
Second ring groove: 0.03~0.075mm

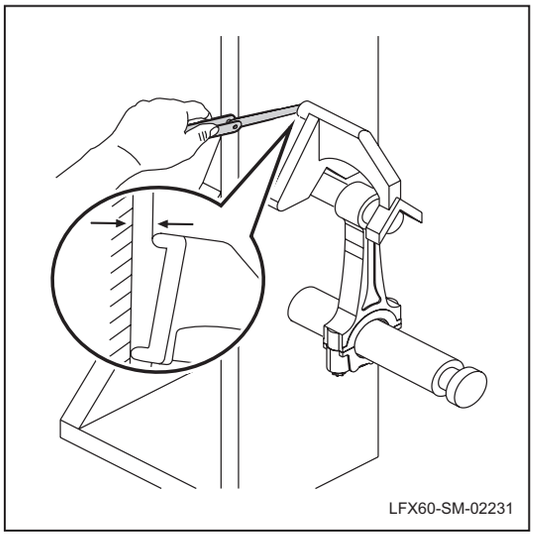
8. Check the end gap of piston ring.



(a). Insert the piston ring in the cylinder hole.
(b). As shown in the figure, push the piston ring in the cylinder hole with the piston and allow the piston ring appreciably to exceed the ring stoke bottom.
(c). Measure the piston ring opening gap with the thickness gauge. Replace the piston ring if the gap exceeds the maximum value. Standard opening gap.
First ring: 0.3~0.45mm
Second ring: 0.40~0.60mm
Film ring: 0.25~0.55mm
Maximum opening gap.
First ring: 1.00mm
Second ring: 1.10mm
Film ring: 1.10mm
ⓘNote:
If the gap still exceeds the maximum value after the piston ring is replaced, bore the 4 cylinders or replace the cylinder block.

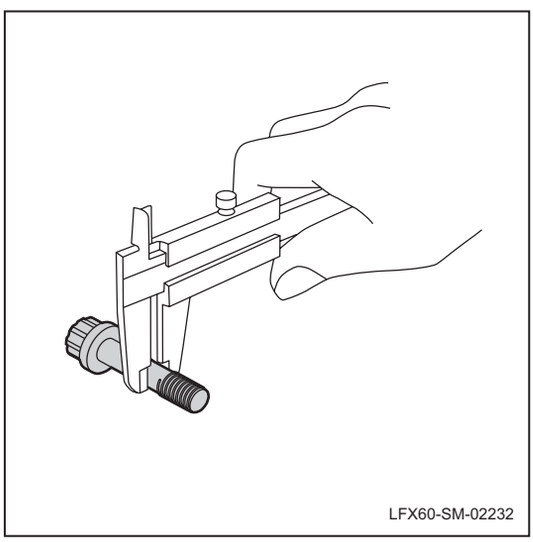
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LFX60-SM-02231

(d). Adopt the collimator and thickness gauge of connecting rod to check its torsion. If its torsion exceeds its maximum value, replace the connecting rod assembly.
Maximum torsion: 0.05mm/100mm

9. Check the diameter of connecting rod bolt.


LFX60-SM-02232

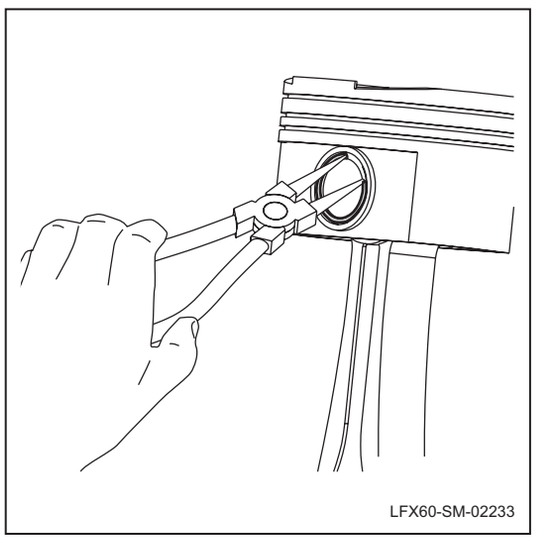
(a). Measure the outer diameter of the connecting rod bolt with a vernier caliper. If the outer diameter is less than the minimum value, replace the connecting rod bolt and nut assembly.
Standard diameter: 7.30 ~ 7.40mm
Minimum diameter: 7.20mm

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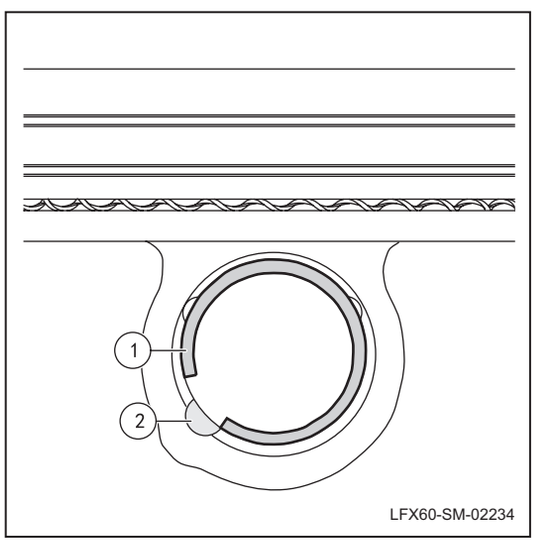
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Installation

1. Installation piston, piston ring, and connecting rod assembly.

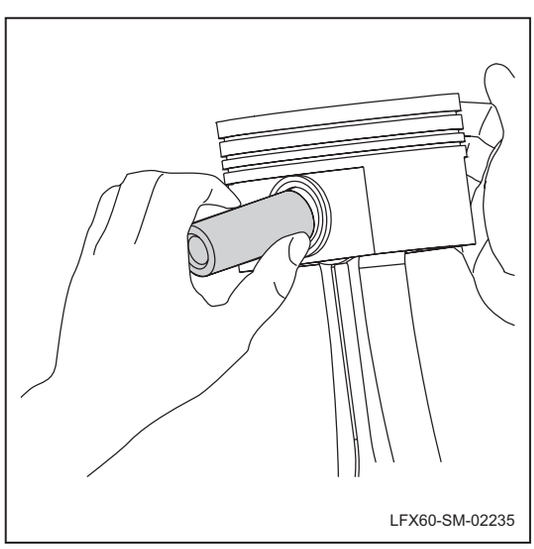

LFX60-SM-02233

(a). Install the piston pin retaining ring at the end of the piston pin hole with a circlip plier.



LFX60-SM-02234

Note:
As shown in the figure, make sure that the end of the piston pin retaining ring 1 is not at the opening of the piston pin hole 2.

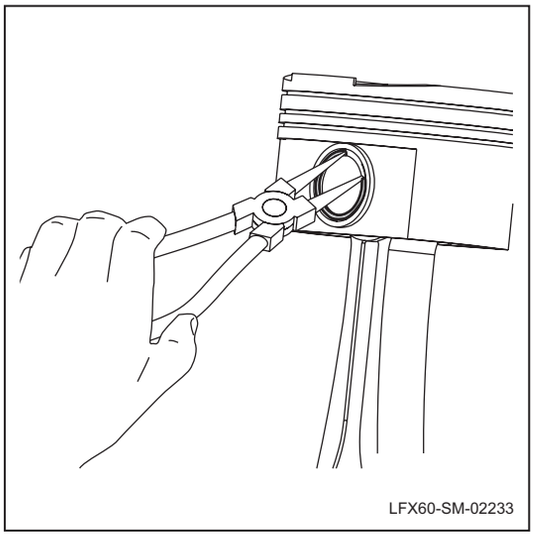

LFX60-SM-02235

(b). Apply the clean engine oil to the piston pin evenly.Align the small end with the piston pin hole and insert the piston pin in the hole.

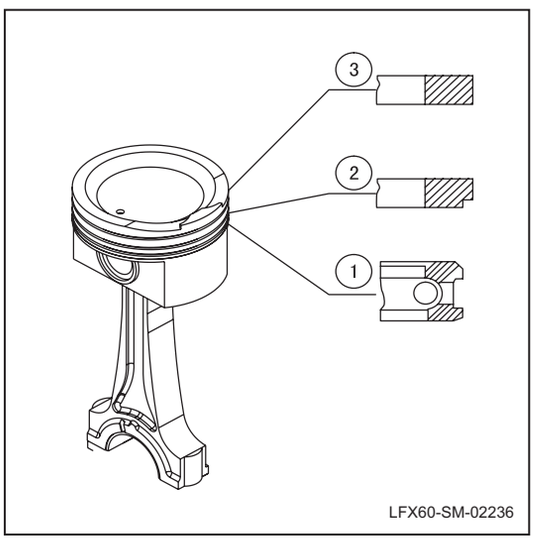
Note:
After the installation, rotate the piston pin and ensure the rotation is flexible. During the installation, ensure to align the forward marks of the piston and connecting rod.

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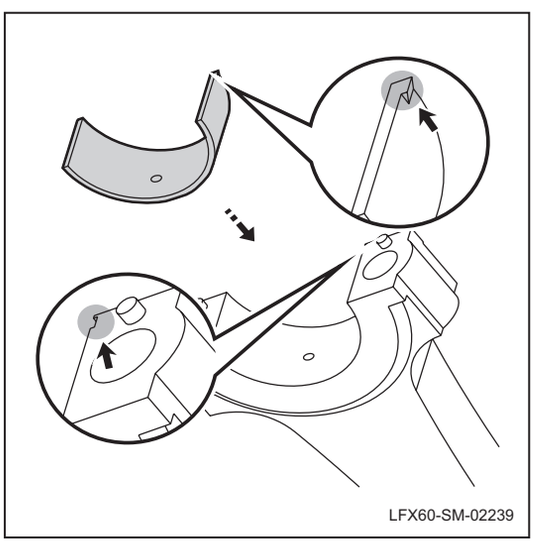
(c). Adopt the circlip pliers to install the circlip on the other end of piston pin.



LFX60-SM-02236

(d). Adopt the piston ring expander to install three piston rings in the shown numerical sequence.
① **Combination oil ring,** ② **2nd piston ring** ③ **1st piston ring**

Note:
- **Install them correctly as per the marks indicated during the removal.**
- **Apply the oil to the surface of piston ring, and check whether the piston ring can turn smoothly inside the groove of piston ring.**

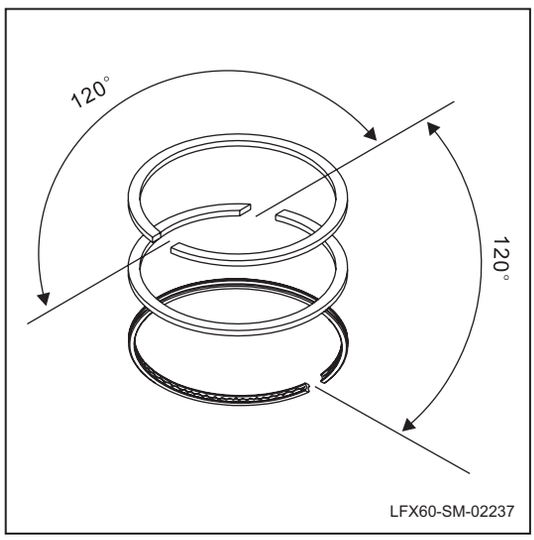

LFX60-SM-02239

(e). Install the upper bearing of piston connecting rod bearing, and apply clean oil inside the upper bearing of connecting rod bearing.

Note:
- **Ensure that the surfaces of connecting rod and connecting rod bearing are clean, and ensure no chippings or damages on them.**
- **Do not lubricate the back of the bearing shell of the connecting rod. Drip clean oil on the inside of the bearing shell of the connecting rod.**

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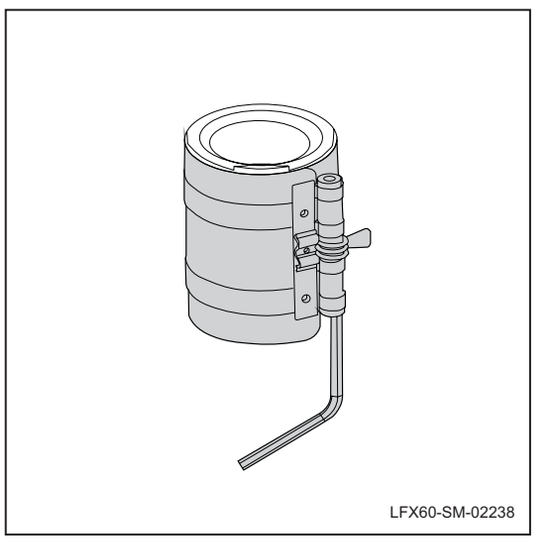
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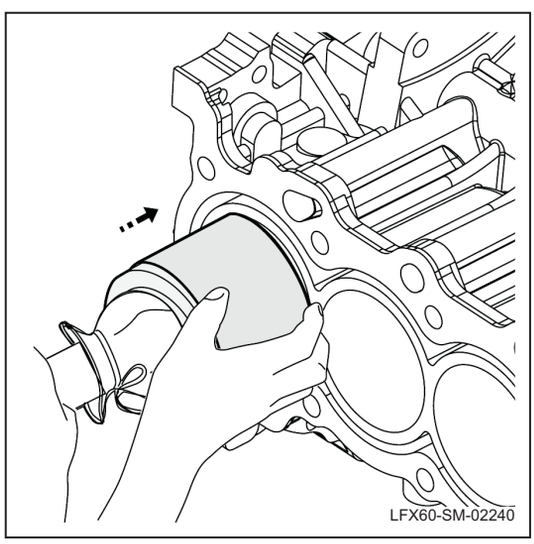
(f). Turn and adjust the opening of piston ring as shown in left figure.

ℹNote:

The piston ring opening should not be aligned with the piston pin or the opening of or other piston ring; otherwise the piston ring cannot be well sealed.



(g). Adopt a piston ring compressor to press the piston ring into its operating position.



(h). Turn the crankshaft, and make the connecting rod neck to be installed at bottom dead center.

(i). Adopt a piston installer and stick to push the piston assembly into each cylinder separately.

△Tips:

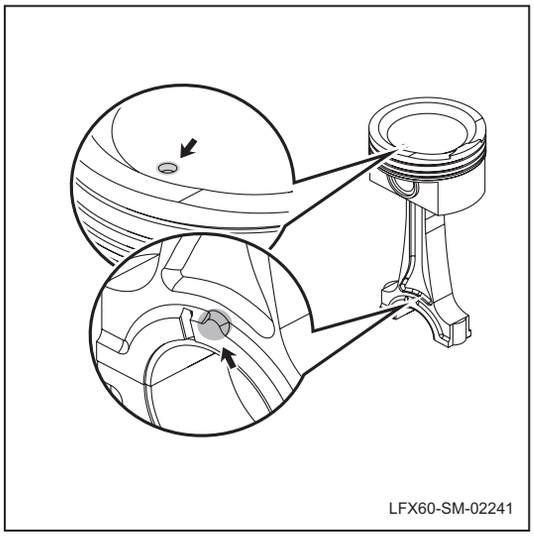
Before installation, apply thin coat of engine oil to the cylinder block wall.

ℹNote:

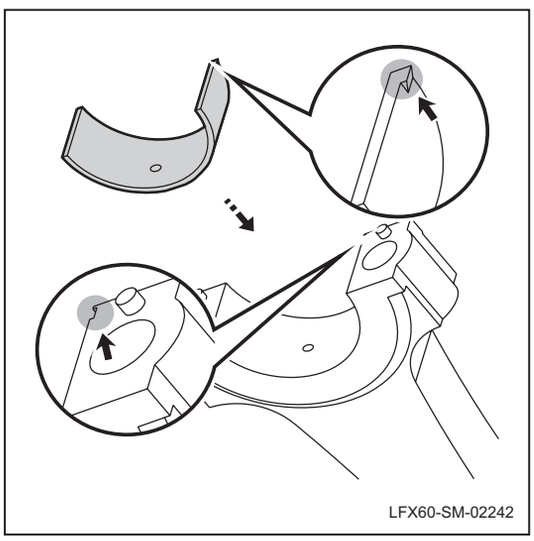
Push the piston assembly with the wood or rubber object and do not use the metal object.

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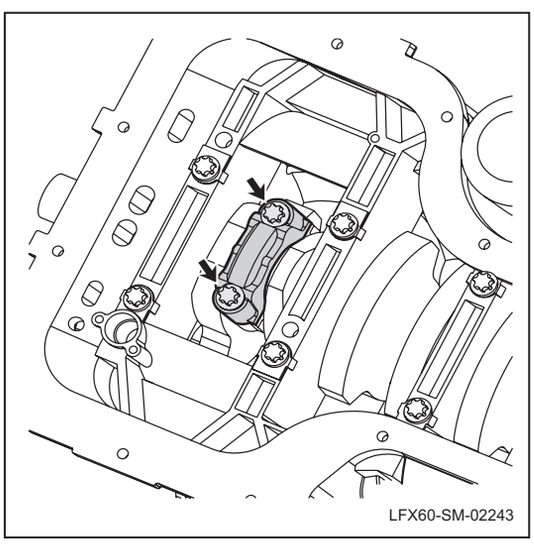

LFX60-SM-02241

Note:
As shown in left figure, make the mark of piston or connecting rod forward (side of crankshaft belt pulley). Be sure to avoid any wrong installation.


LFX60-SM-02242

(j). Install the lower bearing of connecting rod bearing onto the connecting rod cover, and apply clean oil inside the lower bearing of connecting rod bearing.

Note:
- **Ensure that the surface of connecting rod bearing is clean, and ensure no chippings or damages on it.**
- **Do not lubricate the back of the bearing shell of the connecting rod. Drip clean oil on the inside of the bearing shell of the connecting rod.**
- **During the installation, ensure that the locating tongue of bearing is aligned to the locating tongue groove of connecting rod cover.**


LFX60-SM-02243

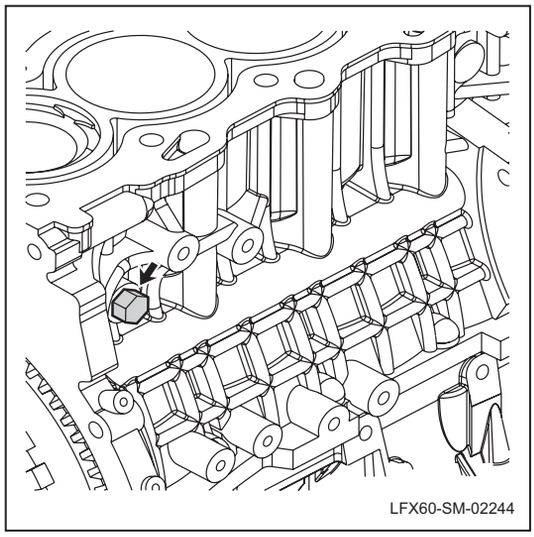
(k). Install the connecting rod cover in its mounting position, attach the connecting rod bolt and tighten it.
Torque: 50 Nm

Note:
Ensure to install the connecting rod cap in position and align the connecting rod cap positioning groove with the connecting rod dowel pin.

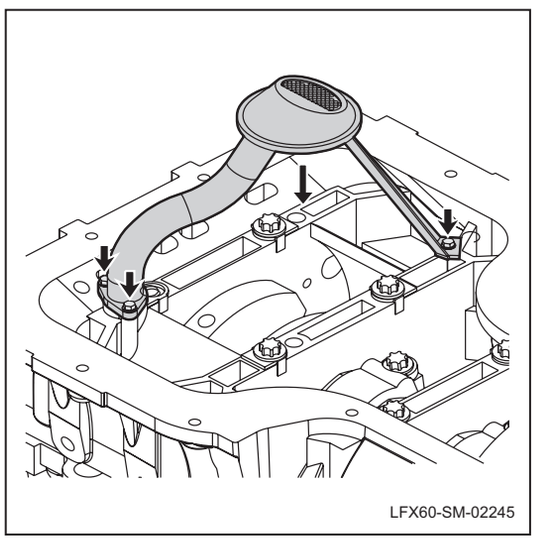
(l). Install other connecting rod covers with the same method.

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(m). Install the drain bolt, and tighten it.
Torque: 23 Nm


LFX60-SM-02245

(n). Install the oil strainer onto the cylinder block, attach and tighten the mounting bolts.
Torque: 25 Nm

(o). Install the oil pump. **Refer to "Replacement of Oil Pump".**

(p). Install the oil sump. **Refer to "Replacement of Oil Sump".**

(q). Install the cylinder head assembly and valve assembly. **Refer to "Replacement of Cylinder Head Assembly and Valve Assembly".**

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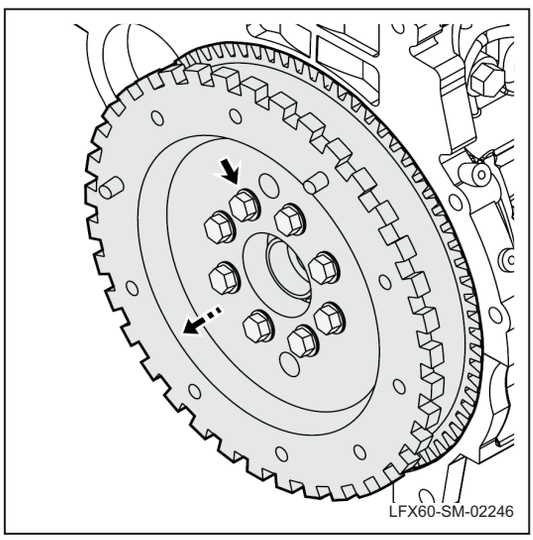
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Replacement of main bearing, crankshaft and cylinder block assembly

Removal

1. Remove main bearing, crankshaft and cylinder block assembly.

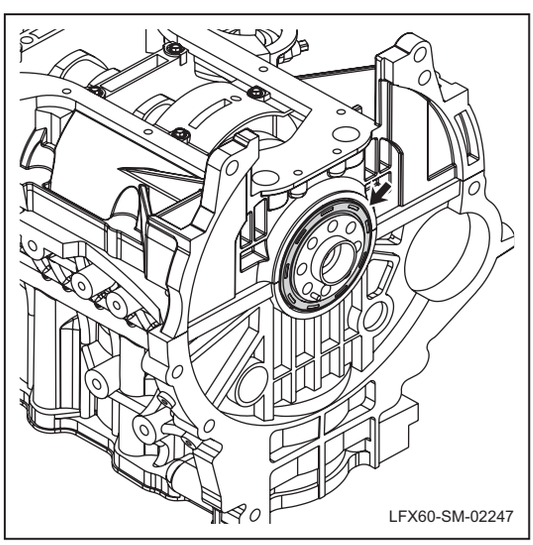
(a). Remove the piston, piston ring and connecting rod assembly. **Refer to:Replacement of the piston, piston ring, and connecting rod assembly**



(b). Remove the flywheel bolt and remove the flywheel assembly.

△**Tips:**

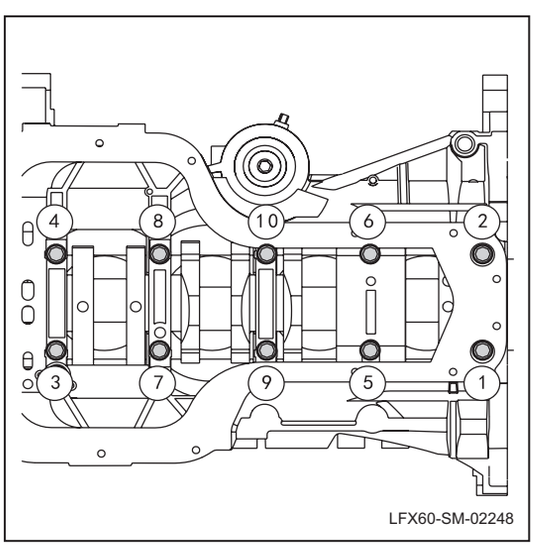
When removing the flywheel assembly, the flywheel should be fixed in advance, to prevent its rotation; or it can be fixed with a rubber or a wooden tool.



(c). Adopt " straight" screwdriver to pry out the crankshaft rear oil seal.

Note:

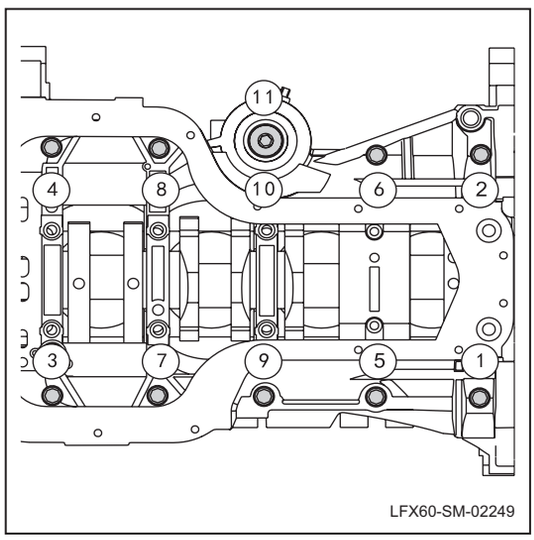
The removed oil seal should not be used again and should be replaced with a new one.



(d). Remove the tightening bolts of main bearing cover of cylinder block in the shown sequence.

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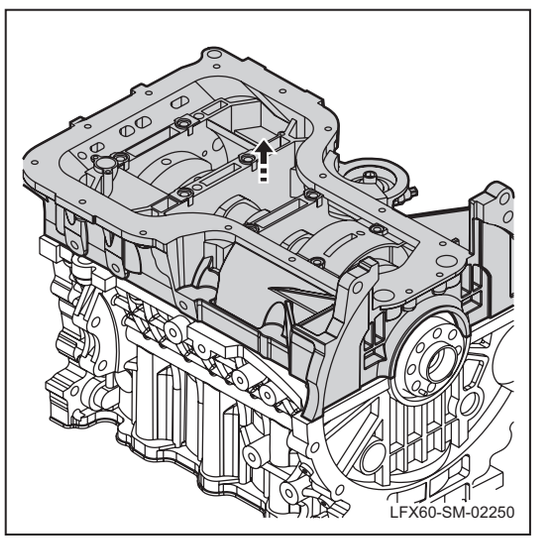
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(e). Remove the upper and lower cylinder block fixing bolts in the order as shown in the figure.

ℹNote:

Do not forget to remove the oil filter coupling nut (as shown in Fig. 11).



(f). Remove the lower cylinder block.

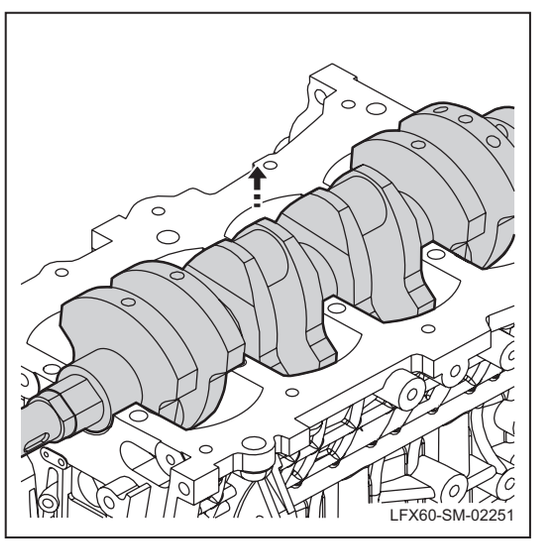
△Tips:

Gently tap the lower cylinder block with a rubber hammer for easy removal.

(g). Remove the lower main shaft tile and the thrust piece.

ℹNote:

Place the lower main shaft tiles in a certain order for subsequent installation.



(h). Remove the crankshaft assembly.

(i). Remove the upper main shaft tile.

ℹNote:

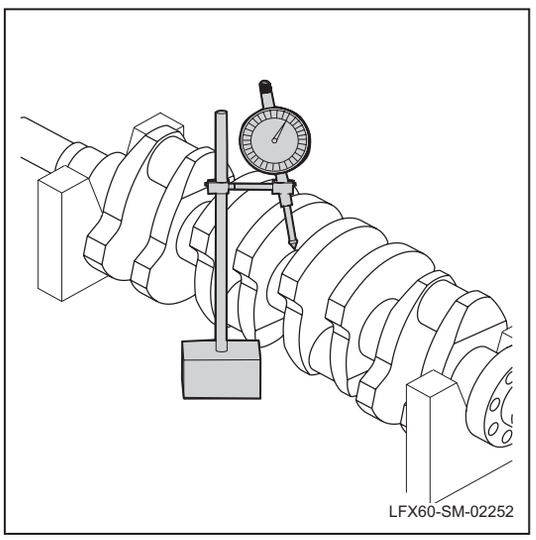
Place the upper main shaft tiles in a certain order for subsequent installation.

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Inspection

1. Check the radial runout of crankshaft.

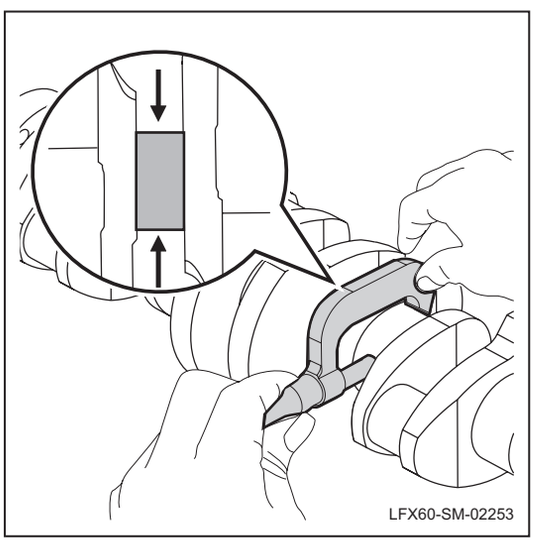


(a). Place the crankshaft on the V-block.

(b). Measure the radial run-out of intermediate journal with the dial indicator. If the radial run-out exceeds the maximum value, replace the crankshaft.

Maximum radial run-out: 0.03mm

2. Check the diameter of crankshaft main neck.



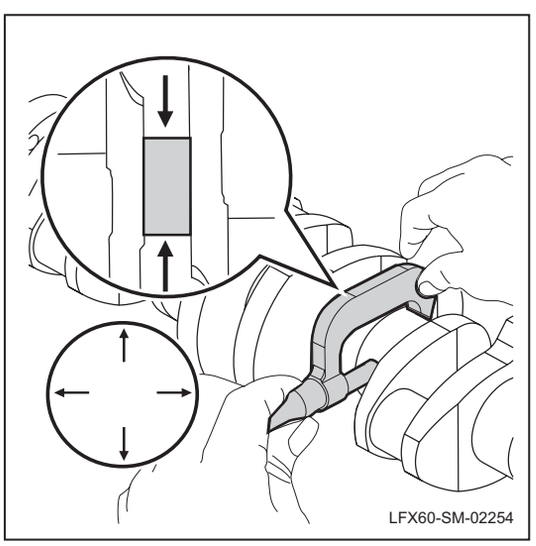
(a). Measure the diameter of every main journal with the screw thread micrometer. If the diameter does not meet the requirement, check the oil clearance and grind the crankshaft or replace the crankshaft if necessary.

Standard diameter: 47.982 ~ 48.000mm.

△**Tips:**

If the diameter does not meet the requirement, check the oil clearance and grind the crankshaft or replace the crankshaft if necessary.

3. Check the maximum conicity and out-of-roundness of crankshaft main neck.



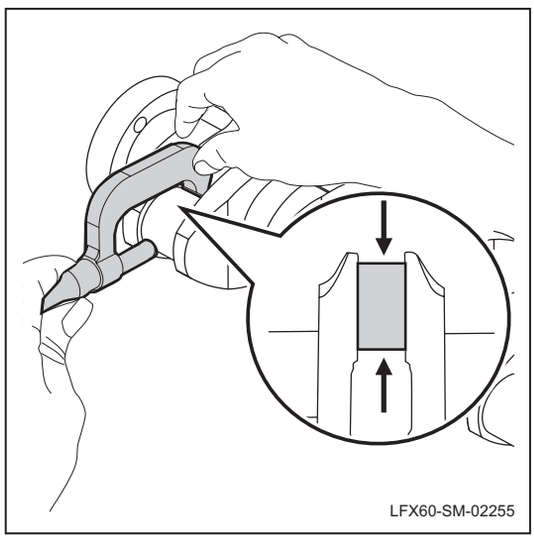
(a). As shown in the figure, check the maximum conicity and out-of-roundness of each main neck. If they exceeds the maximum values, replace the crankshaft.

Maximum taper and out-of-roundness: 0.02mm

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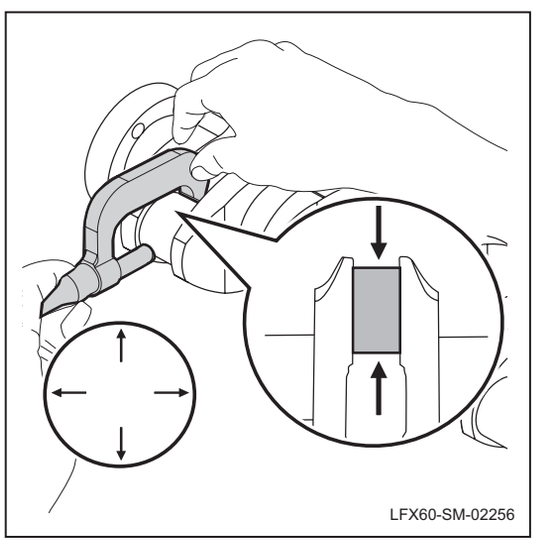
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4. Check the diameter of crankshaft connecting rod neck.



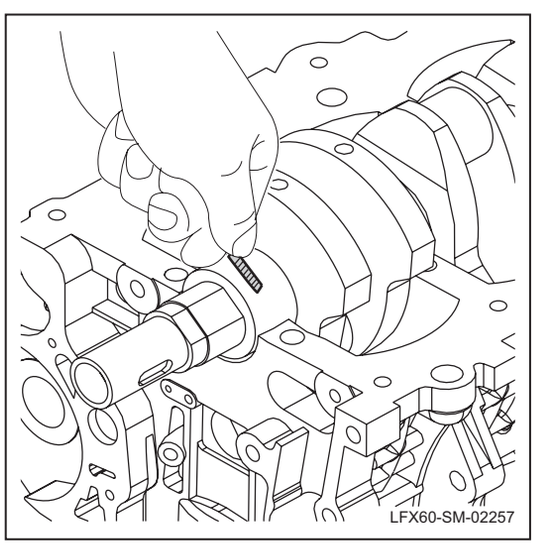
(a). Measure the diameter of every main journal with the screw thread micrometer. If the diameter does not meet the requirement, check the oil clearance and grind the crankshaft or replace the crankshaft if necessary.
Diameter of connecting rod neck: 43.984 to 44.000mm.

5. Check the conicity and out-of-roundness of crankshaft connecting rod neck.



(a). As shown in the figure, check the conicity and out-of-roundness of each crankshaft connecting rod neck. If its conicity and out-of-roundness exceed the maximum values, replace the crankshaft.
Conicity and out-of-roundness of crankshaft connecting rod neck: 0.02mm

6. Check the oil clearance of crankshaft.

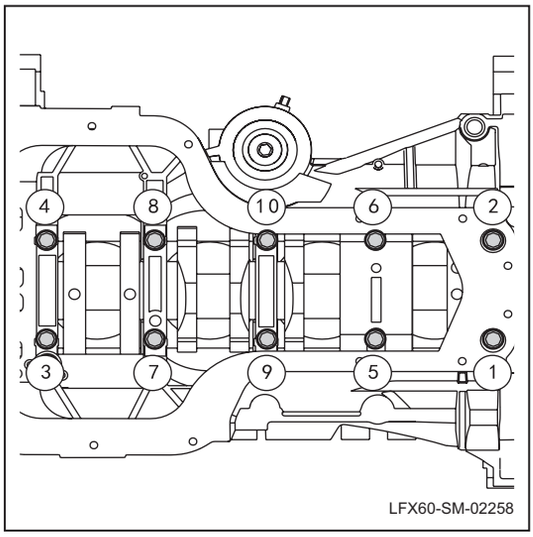


(a). Clean the crankshaft neck all crankshaft bearing bushes.
(b). Install the crankshaft upper bearing bush to the cylinder block and install the crankshaft to the cylinder block.
(c). Pass one section of plastic oil clearance gauge through the crankshaft main journal.

ℹNote:
Do not rotate the crankshaft.

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(d). Install the crankshaft lower bearing bush to the crankcase main bearing cap.

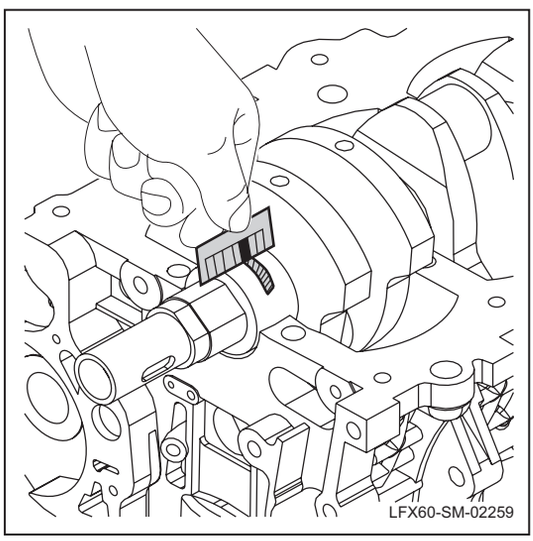
(e). Install the crankcase main bearing cap to the cylinder block and tighten the 10 main bearing cap tightening bolts in the sequence as shown in the figure.

Torque:
First time : 40 N.m
Second time : 60 N.m

△Tips:
Tighten the main bearing cap tightening bolt in two steps.

(f). Remove the 10 main bearing cap tightening bolts in the sequence as shown in the figure and take out the main bearing cap.

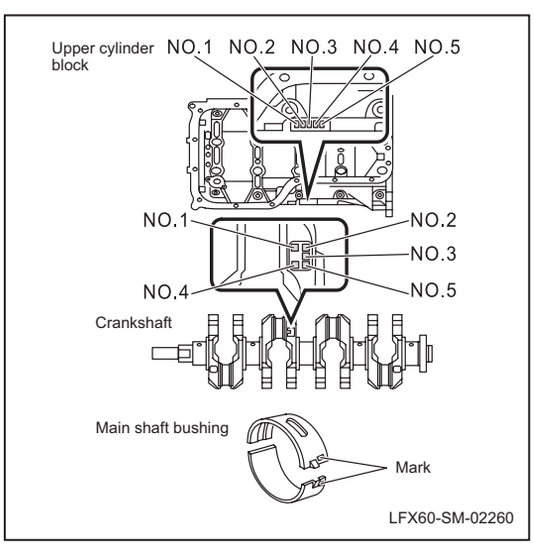
△Tips:
Loosen the tightening bolts in several steps.



(g). Measure the plastic oil clearance gauge at the widest position. If the oil clearance exceeds the maximum value, replace the bearing bush and grind or replace the crankshaft if necessary.

Standard oil clearance: 0.014mm to 0.032mm
Maximum oil film gap: 0.00in.

7. Main shaft bushing



ℹNote:

- **In case of adopting the standard bearing, replace it with the same No. Of bearing.**
- **If No. of bearing can't be determined, please add No. of cylinder block to No. of crankshaft and subtract 1 bearing (calculating method: No. of main bearing=No. of main neck+No. of main shaft hole-1), and then select the bearing with the same No. as its calculated result to ensure the correct selection of bearing. There are 5 standard shaft tile sizes.**

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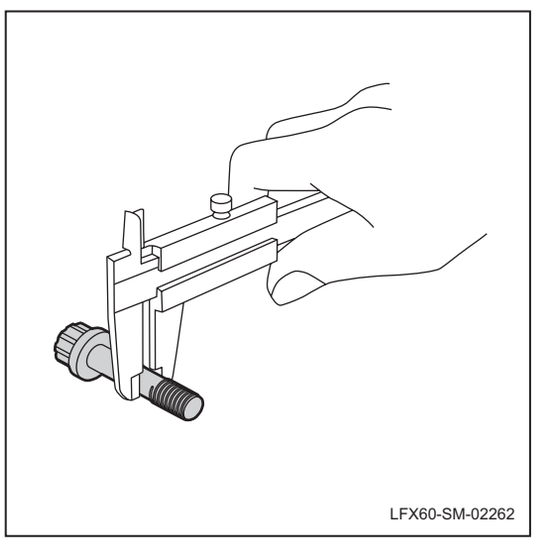
Main shaft bushing selection table

Bearing bush / Main journal / Main shaft hole	1#	2#	3#
1#	1#	2#	3#
2#	2#	3#	4#
3#	3#	4#	5#

LFX60-SM-02261

(a). E.g. No.3 cylinder block “3” (No. of main neck)+crankshaft No. “1” (main shaft hole No.)-“1”=total No. “3”(i.e. adopt No.“3” bearing).

8. Check the fixing bolt of cylinder block main bearing cover.



LFX60-SM-02262

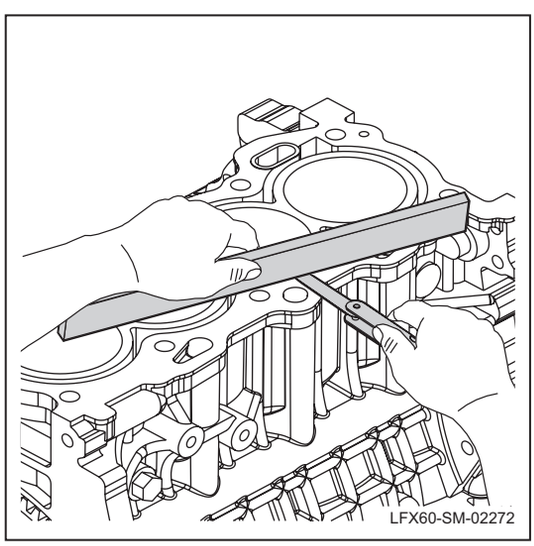
(a). Measure the diameter of the cylinder block main bearing cover fixing bolts with a vernier caliper; If the diameter is less than the minimum value, replace all cylinder block main bearing cover fixing bolts.

Standard diameter: 8.80~9.00mm

Minimum diameter: 8.70mm

9. Check the plane warping of upper top face of cylinder block.

(a). Remove the liner materials of the cylinder block top surface and thoroughly clean the cylinder block with the soft brush and solvent.



LFX60-SM-02272

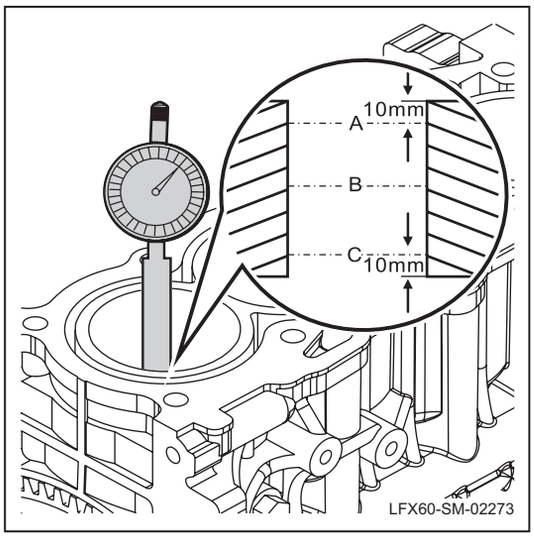
(b). Adopt a ruler and thickness gauge to measure the plane warping of cylinder block top face. If its warping is more than its maximum value, replace the cylinder block.

Maximum warpage: 0.05 mm

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10. Check the diameter of cylinder block upper bore.



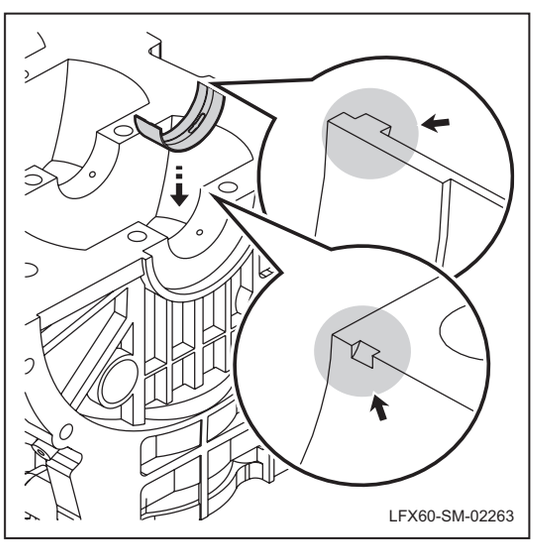
(a). Measure the cylinder bore at position A, B and C with the cylinder bore measuring apparatus.
Standard diameter: 82.5~82.015 mm

△Tips:
Test once in the axial direction and thrust direction in each position.

ℹNote:
If the maximum value is exceeded, replace the upper cylinder block.

Installation

1. Install the main bearing, crankshaft and cylinder block assembly.



(a). Install upper main bearing.

ℹNote:
- **Install it in the order in which it was disassembled.**
- **Make sure that the back of the bearing shell is clean and free from any debris. Do not lubricate the back of the bearing shell by using oil.**
- **Make sure that the positioning tongue of the bearing shell is aligned with the positioning tongue groove on the cylinder block.**

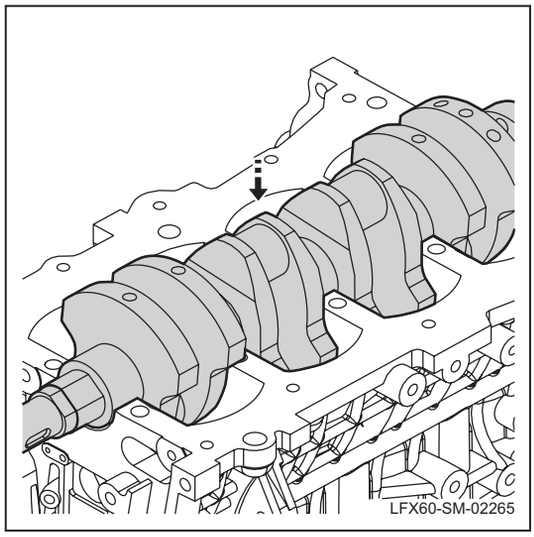


(b). Install the thrust plate.

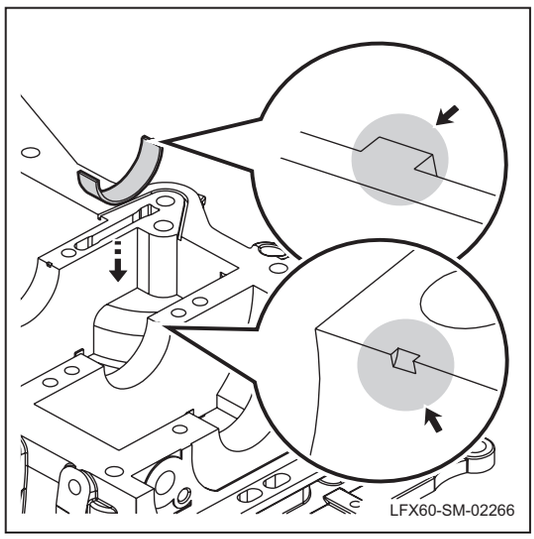
ℹNote:
As shown, place the oil groove on the thrust piece outward, to ensure its proper installation.

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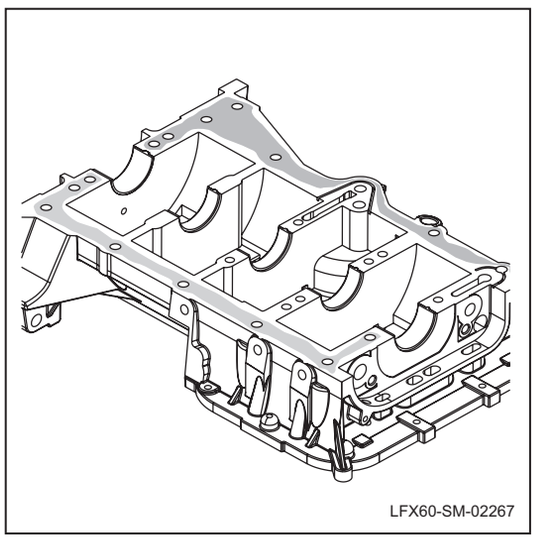
(c). Install the crankshaft assembly.



(d). Install the lower main shaft bushing onto the lower cylinder block.

Note:

- **Install it in the order in which it was disassembled.**
- **Make sure that the back of the bearing shell is clean and free from any debris. Do not lubricate the back of the bearing shell by using oil.**
- **Make sure that the positioning tongue of the bearing shell is aligned with the positioning tongue groove on the cylinder block.**



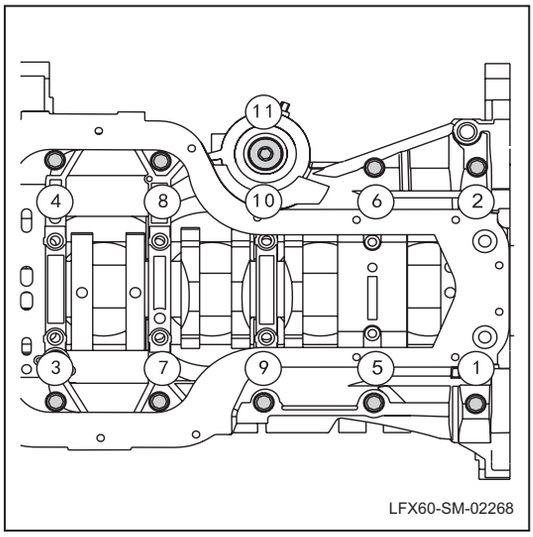
(e). Apply the sealing gum to mounting surface of cylinder lower block evenly.

Note:

- **In case of applying the new sealing gum, be sure to remove the old sealing gum left on the cylinder block in advance.**
- **nstall the lower cylinder block assembly within 3min after applying the gum.**

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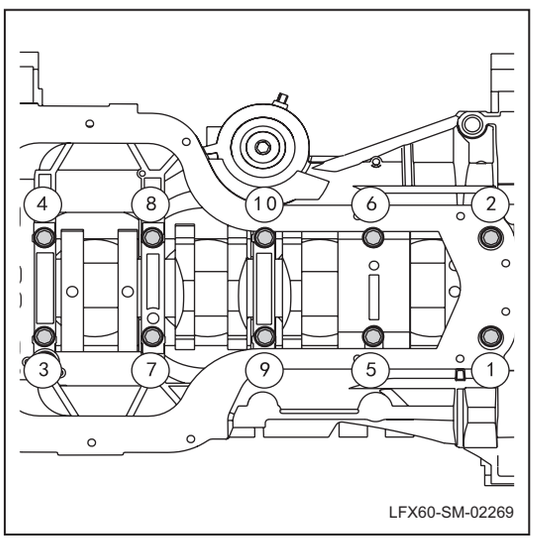
(f). As shown in the figure, tighten the fixing bolts of upper and lower cylinder blocks and oil filter (as shown in Fig. 11).

Torque: 18 Nm

Torque of oil suction strainer fixing bolt: 25 Nm

△Tips:

When installing the fixing bolts, apply an appropriate amount of clean oil evenly onto the threaded portion of the bolts, and tighten them twice.



(g). Install the lower cylinder block, and tighten 10 main bearing fixing bolts orderly as shown in the figure.

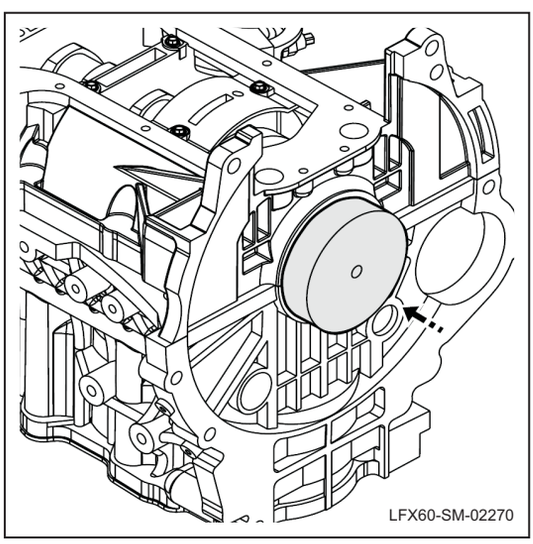
Torque:

First time: 40 N.m

Second time: 60 N.m

△Tips:

Tighten the main bearing cap tightening bolt in two steps.



(h). Install the crankshaft rear oil seal with an oil seal installer.

ℹNote:

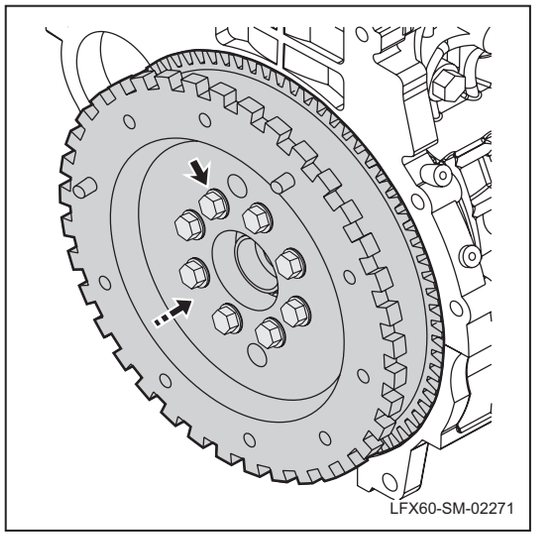
Install the oil seal vertically,and it's prohibited to incline the oil seal.

△Tips:

Before installation, coat a layer of clean oil on the oil seal lip.

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(i). Install the flywheel assembly in its mounting position, attach the flywheel bolt, and tighten it.
Torque: 88 Nm

Note:
When installing the flywheel, ensure that the flywheel is aligned with the positioning pin on the crankshaft.

(j). Install the piston, piston ring and connecting rod assembly. **Refer to:Replacement of the piston, piston ring, and connecting rod assembly**

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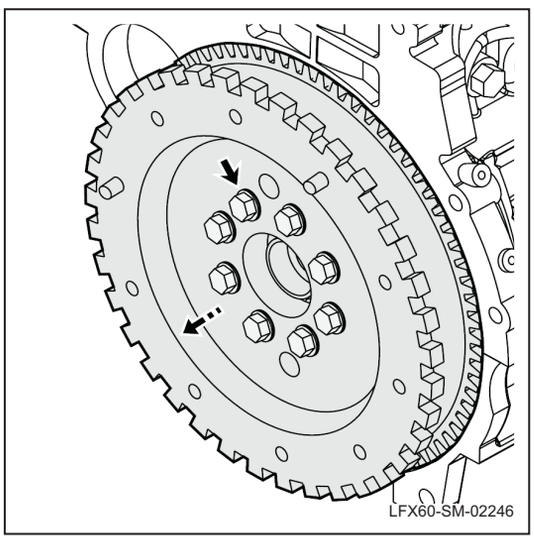
Replacement of flywheel

Removal

1. Removal flywheel

(a) Remove the transmission assembly. **Refer to: Replacement of the transmission assembly.**

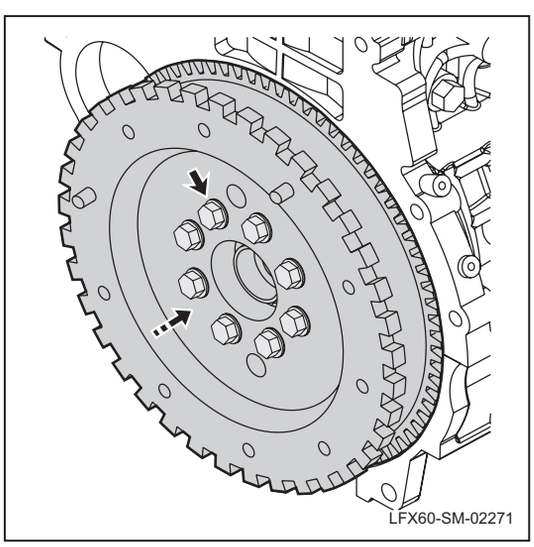
(b). Remove the clutch pressure plate assembly. **Refer to "Replacement of Clutch Pressure Plate Assembly".**



(c). Remove the flywheel bolt, and take down the flywheel assembly.

Installation

1. Installation flywheel



(a). Install the flywheel assembly in its mounting position, attach and tighten the flywheel bolt.
Torque: 88 Nm

ℹNote:
When installing the flywheel, ensure that the flywheel is aligned with the positioning pin on the crankshaft.

(b). Install the clutch pressure plate assembly. **Refer to "Replacement of Clutch Pressure Plate Assembly".**

(c). Install the transmission assembly. **Refer to "Replacement of Transmission Assembly".**

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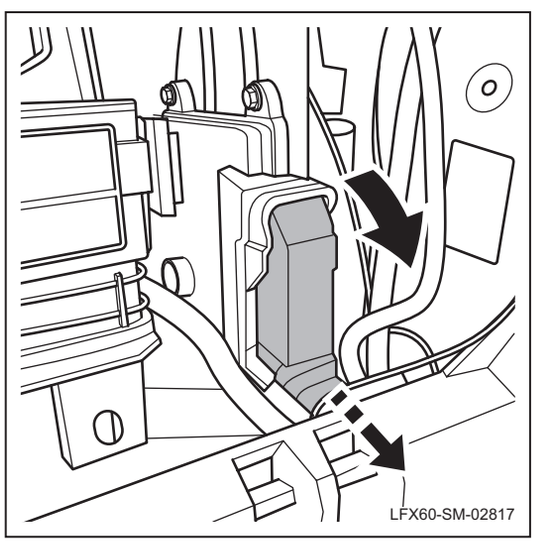
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Replacement of engine assembly

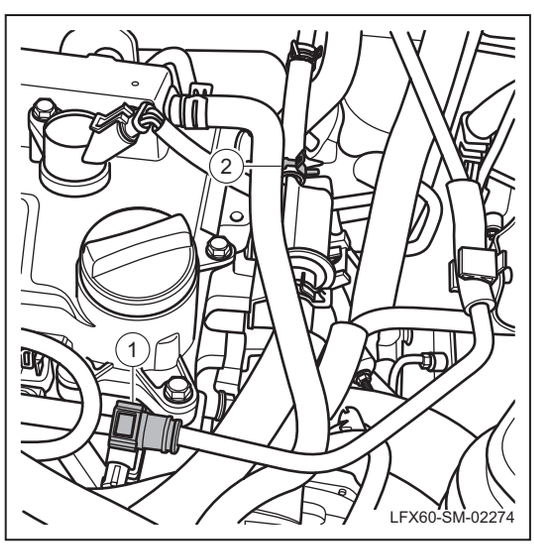
Removal

1. Remove the engine assembly.

(a). Empty the cooling fluid. **Refer to "Emptying and Filling of Cooling Fluid".**
(b). Remove the tire. **Refer to: Tire replacement.**
(c). Remove the drive shaft. **Refer to: Drive shaft replacement.**
(d). Remove front-section exhaust pipe. **Refer to "Replacement of Front-section Exhaust Pipe".**
(e). Remove the engine cover assembly. **Refer to "Replacement of Engine Cover Assembly".**
(f). Remove the cooling fan assembly. **Refer to "Replacement of Cooling Fan Assembly".**
(g). Remove the air filter assembly. **Refer to "Replacement of Air Filter Assembly".**
(h). Remove the glove box. **Refer to "Replacement of Glove Box".**



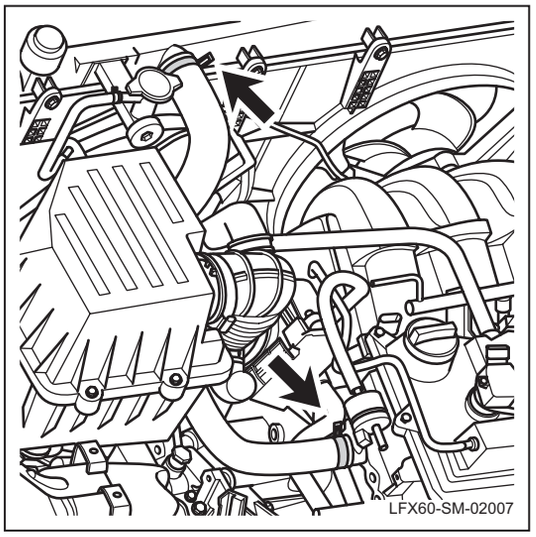
(i). Disconnect the engine control module harness plug.
(j). Pull the engine harness out of front firewall.
(k). Remove front oxygen sensor. **Refer to "Replacement of Front Oxygen Sensor".**



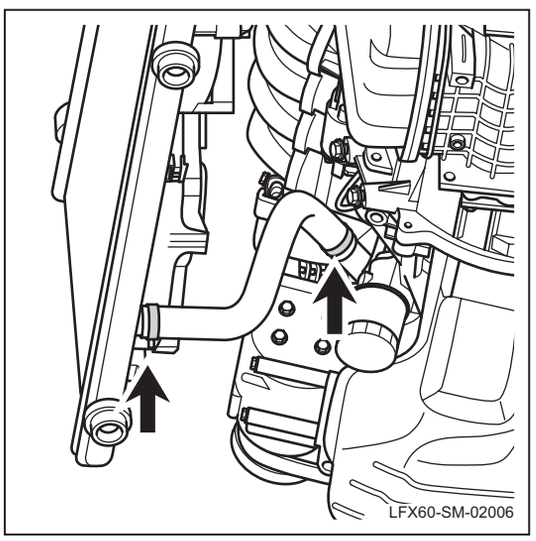
(l). Disconnect #1 inlet pipe of fuel rail.
(m). Disconnect #2 pipe of carnister solenoid valve.

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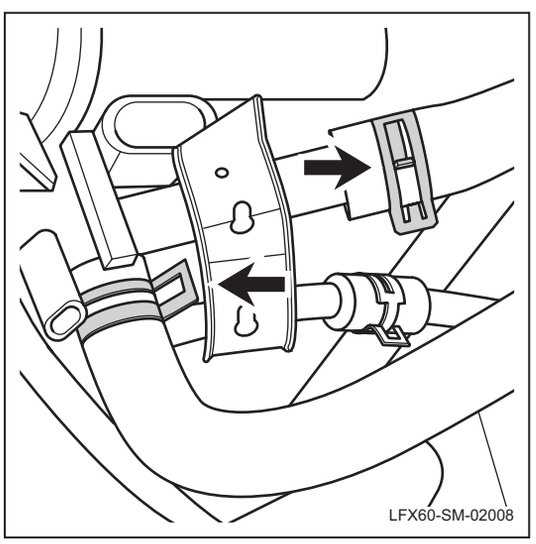
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(n). Remove the circlip to disengage the outlet pipe of engine.



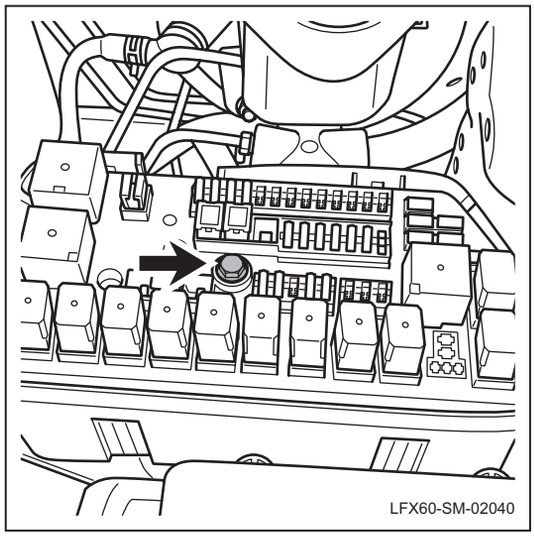
(o). Remove the circlip to disengage the intlet pipe of engine.



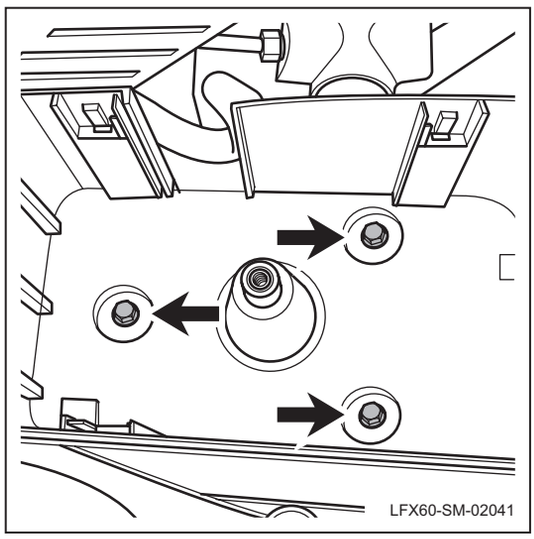
(p). Remove the circlip to disengage the water heater pipe.

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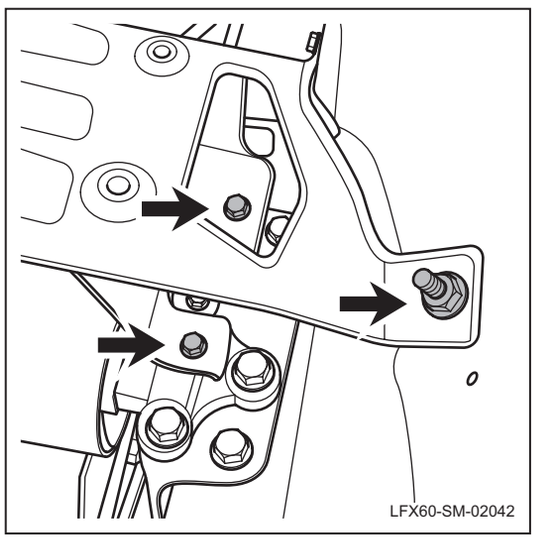
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(q). Remove the fuse box cover of engine compartment.
(r). Remove the fixing bolt of engine compartment fuse assembly.
(s). Disengage the connection of fuse box assembly and fuse box lower casing.



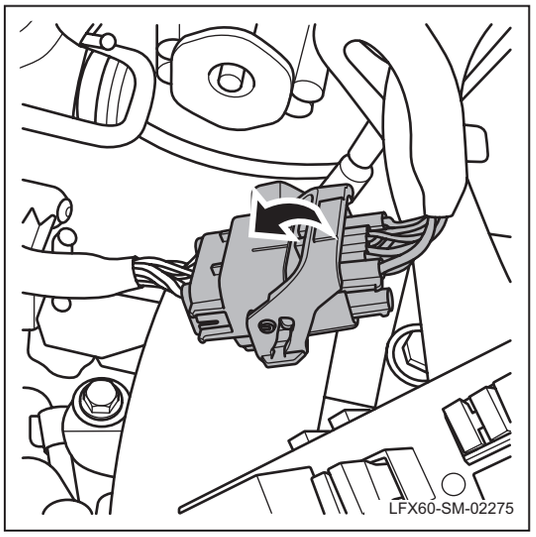
(t). Remove the fixing bolt of engine compartment fuse box lower casing, and take it down.



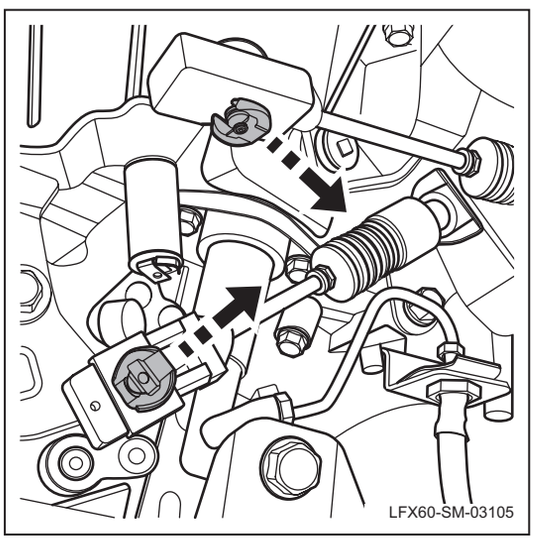
(u). Remove the fixing bolt and nut of engine compartment fuse box bracket, and take them down.

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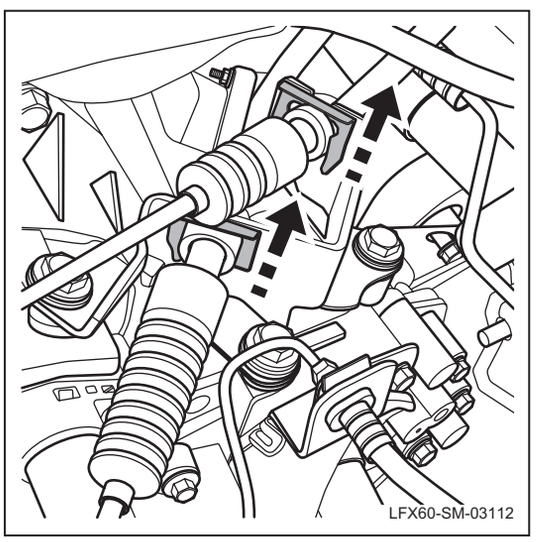
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(v). Disconnect the plug of engine harness.
(w). Remove the vacuum tube of engine.
(x). Remove the earth wire of transmission.
(y). Remove the clutch slave cylinder. **Refer to "Replacement of Clutch Slave Cylinder".**



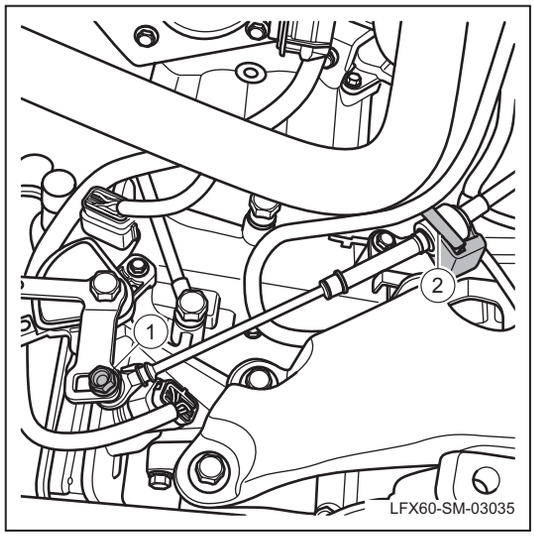
(z). Remove the cable locking plate of shifting mechanism.



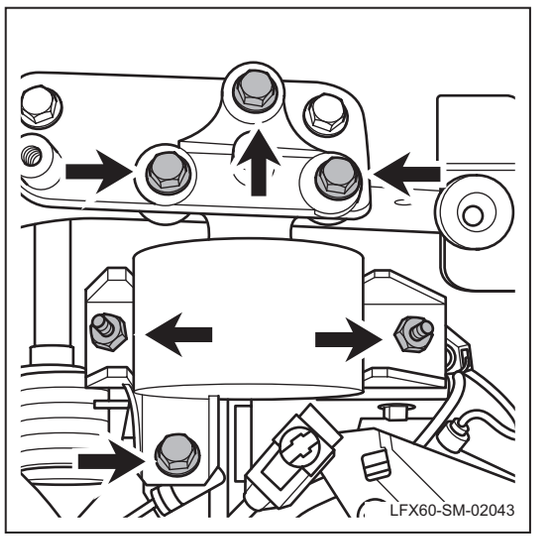
(aa). Disengage the cable of shifting mechanism.

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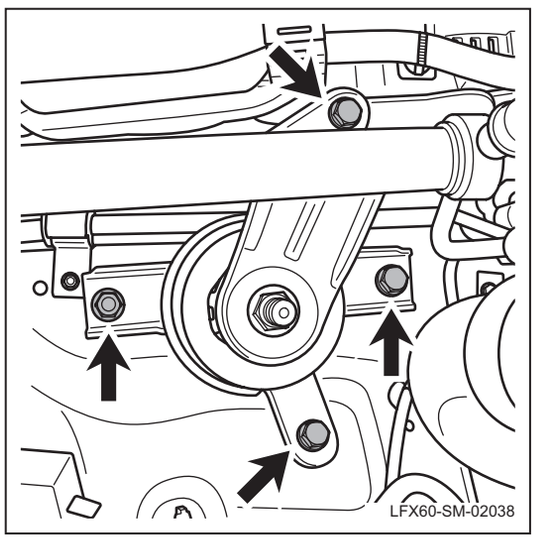
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(ab). Remove #1 fixing nut of shifting mechanism cable (CVT).
(ac). Disengage #2 lock pin of shifting mechanism cable (CVT).



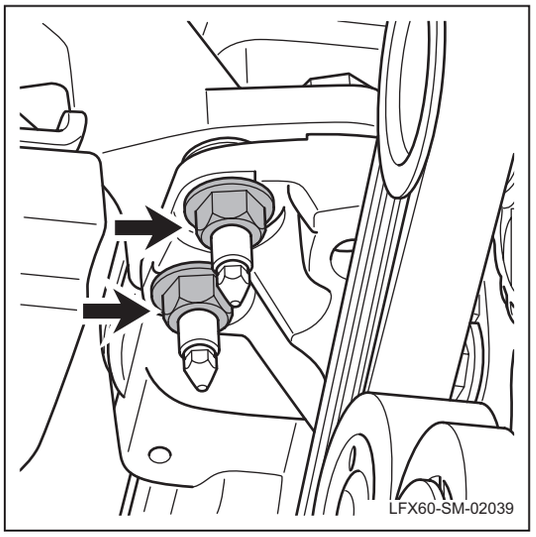
(ad). Install the hanger to hang the engine assembly.
(ae). Remove left suspension fixing bolt.



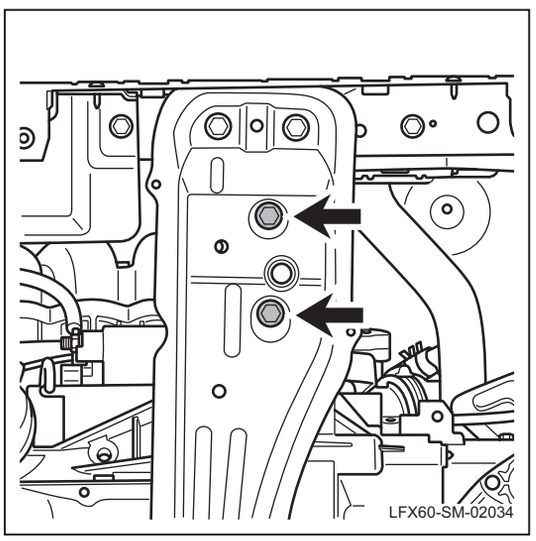
(af). Remove right suspension fixing bolt.

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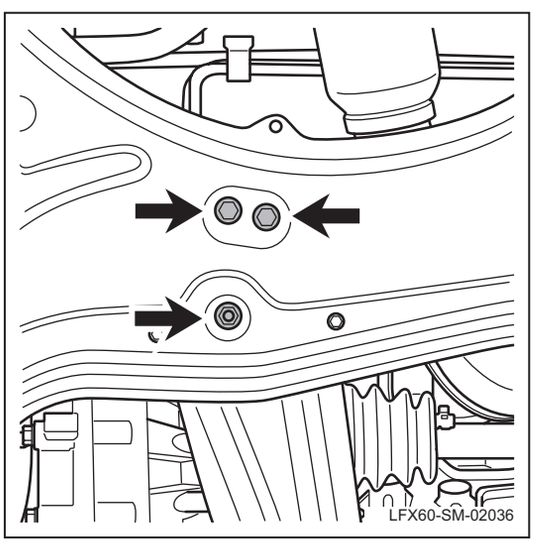
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(ag). Remove right suspension fixing bolt.



(ah). Remove front suspension fixing bolt.



(ai). Remove rear suspension fixing bolt.

(aj). Lift the hanger to remove the engine assembly.

Note:

- **Before lifting the engine, check whether all connectors, grounding wires, tubes, vacuum tubes and water tubes are completely disconnected.**
- **Be sure to observe the parts around the engine to avoid any damage caused by squeezing during the lifting work.**
- **In case of lifting the engine, be sure to stabilize it. Avoid its collision against the vehicle and ensure the safety of personnel around it during its lowering.**

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Installation

1. Install the engine assembly.

(a). The installation sequence is the reverse of the disassembly order.

Note:

- **During the installation of engine, be sure to avoid its collision against the car body or its adjacent parts. Ensure the safety of personnel.**
- **Check whether all the connectors, earth wires, oil pipes, vacuum tubes and water pipes are fully connected.**
- **Check whether all the components of oil pipes, vacuum tubes, A/C pipes and water pipes are fully installed in position.**

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02- Engine

Engine control system (Delphi).....2-317
Precautions.....2-317
Preparation 2-319
Structure and installation location.....2-320
Operating Principle 2-321
Diagnostic Information and Procedures..2-331
Removal and Installation 2-481

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Engine control system (Delphi)

Precautions

Maintenance precautions

1. Irrespective of engine running not, no 12V electrical working device can be disconnected so long as the ignition switch is in ON position. Otherwise, the coil self-inductance of such device will generate the very high instantaneous voltage and damage the ECM and sensor seriously.
2. Do not unplug any sensor conductor plug (connector) with the engine running; otherwise ECM will present the factitious DTC (false DTC) and impair the correct judgment and troubleshooting.
3. If the battery ground wire should be removed, turn the ignition switch to OFF position, shut down each electrical load, remove the negative ground wire and wait for 60s before repairing any electric appliance.
4. The reliability of electronic injection system parts is high. In the case of complete vehicle or engine malfunction, check the related mechanical parts. system connector and harness, ground wire and spark plug wire connector first.
5. Before installation, clear the foreign body on the mounting face with the sealant scraper or steel brush and ensure the sealing face is level and smooth without any oil stain. Do not forget to remove the sealant on the assembly hole, threaded hole and threads.
6. Tighten the fixing bolt to the required torque when installing the sensor and actuator etc.
7. Install and handle the sensors carefully to protect them against damage. Any impact or fall of the sensor will impair the performance greatly.
8. Do not check the system electric signal by piercing the harness with the fine pin.
9. Do not allow the oxygen sensor to contact the water or other fluid when removing or replacing the sensor.
10. Do not allow the fuel pump to run without gasoline for a long time. Besides, the pump should not run with the gasoline bearing air.
11. Most electronic injection parts cannot be repaired. In general, the parts should be replaced if damaged.
12. The system should use anti-interference type spark plug and ignition coil. The non - impedance type spark plug and ignition coil will not only release the interference wave but also generate adverse effect on the ignition coil driver module in ECM.
13. Do not disassemble ECM.
14. Do not check the electronic control system sensors and ECM control unit (including the wiring terminal) by the test lamp.
15. Unless otherwise specified in the test program, do not check the electronic control system resistance with the pointer type universal meter. Instead, check the resistance with the high impedance digital multimeter (above 10MΩ) or the special testing instrument for the electronic control system.
16. For the vehicle equipped with electronic control system, do not check the electrical circuit by the striking through grounding or scratch the wire in any case.
17. Where the jump start is required for the vehicle equipped with electronic control engine, shut down the ignition switch and all electrical loads of the electronic control vehicle before removing and installing the jumper wire.
18. In the case of arc welding on the vehicle equipped with electronic control system, disconnect the ECM electric power supply wire to prevent the high voltage damaging the ECM.
19. When repairing the body near ECM or sensor, take special care to avoid damaging these electronic components.
20. To remove the wire joints of the electronic control system, shut down the ignition switch (OFF) first and remove the battery negative ground wire. Only shut down the ignition switch (OFF) is required if checking the electronic control system only.
21. Remember the electronic control vehicle adopts negative ground power supply system. Do not connect the positive and negative terminal wrong when installing the battery.
22. When installing or removing ECM, the operator should first ground itself. Otherwise, static electricity on the body can damage the ECM circuit.
23. Release the fuel system pressure first before removing any section of the oil line. Keep far from the naked flame when repairing the fuel line system.
24. The loose contact may be caused by the connector terminal rust, outside dirt entering the terminal or the low contact pressure between the connector plug

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and socket. Unplug the connector and insert it again. This may change the connecting condition and restore the normal contact. If when troubleshooting troubleshooters check the harness and connector and there is no abnormal condition, but after the inspection the fault disappears, then the harness or connector may be considered defective.

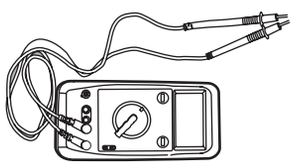
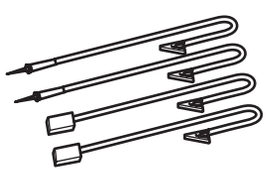
25. Prevent the water splashing onto ECM and circuit when cleaning the engine or repair in a raining day.
26. The electronic control system fault mainly involves in the harness and connector fault such as the harness fracture, connector loose contact, connector terminal unplugged or not inserted in position or the part ground.
27. It is rare that the harness is broken in the middle. The harness is mostly broken where the connector is located. Therefore, you should especially carefully check the wires where the sensor and connector are located.
28. Turn off the ignition switch (to the OFF position) before connecting the V30 diagnostic equipment, and turn on the ignition switch (to the ON position) after connecting.

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Preparation

Special maintenance tools

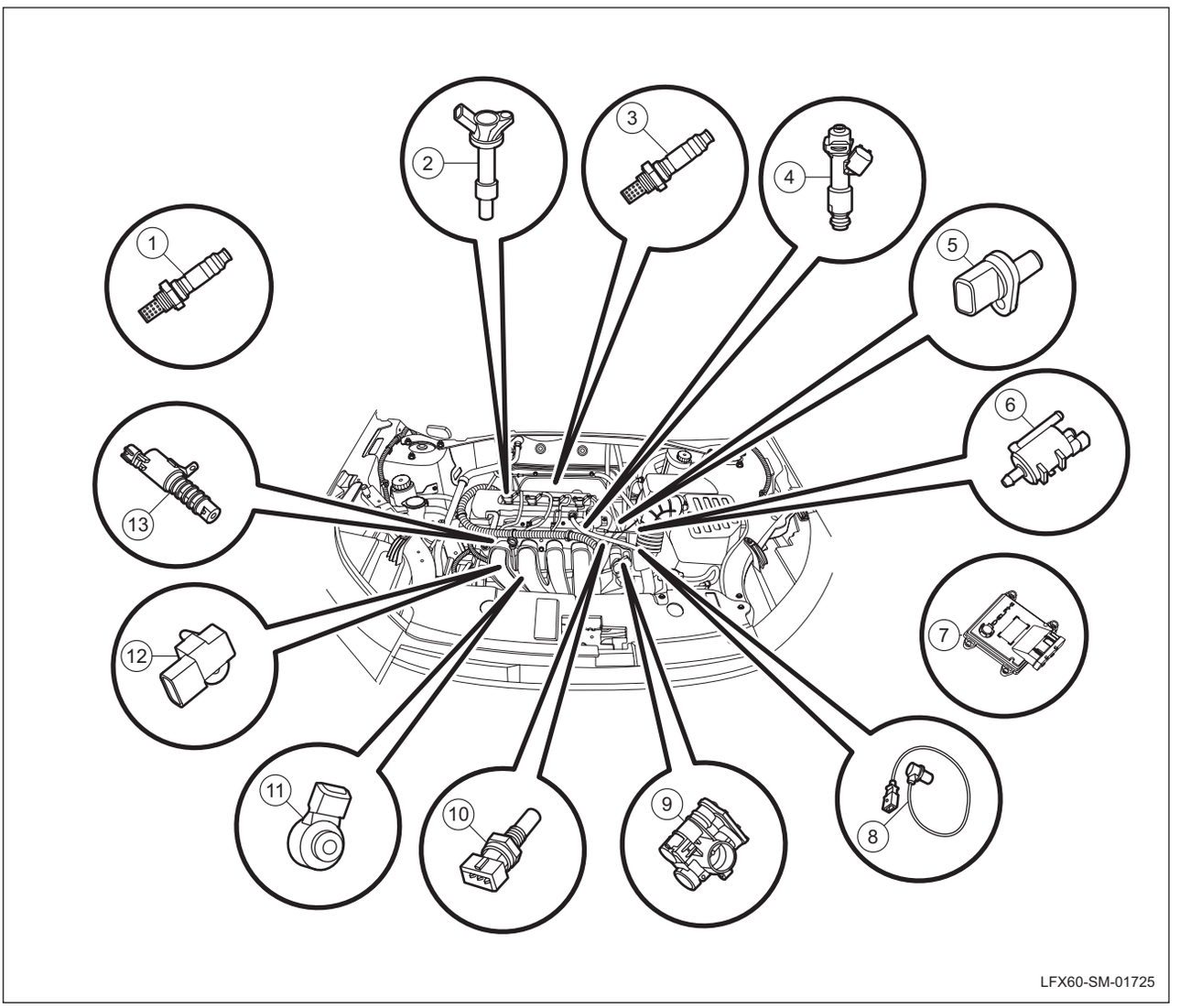
No.	Tool name	Tool figure	Tool code	Remarks
1	Diagnosis equipment	 LFX60-SM-02802	-	Read the EFI system trouble code, data flow etc
2	Digital universal meter	 LFX60-SM-02800	-	Measure the voltage and resistance
3	Circuit group	 LFX60-SM-02801	-	Testing circuit

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Structure and installation location

Component Location Plan



No.	Part name
1	Rear oxygen sensor
2	Ignition coil
3	Front oxygen sensor
4	Fuel injector
5	Camshaft position sensor
6	Canister solenoid valve
7	Electronic Control Unit (ECM)

No.	Part name
8	Crankshaft Position Sensor
9	Electronically controlled throttle valve body
10	Water temperature sensor
11	Knock Sensor
12	Intake temperature/pressure sensor
13	Intake VVT valve

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Operating Principle

System Overview

The engine control system mainly consists of the following parts:

- Various sensors for determining engine status and operating conditions;
- An engine control module for receiving and processing each sensor signal, and controlling various electronic actuators; and
- Electronic actuators that perform different functions.

System function

Start control

In the start-up process, special calculation methods should be used to control charge, fuel injection and ignition timing. At the beginning of the process, the air in the intake manifold is stationary and the internal pressure of the intake manifold is shown as ambient atmospheric pressure. The throttle valve is closed. For the idle adjuster, the one is specified as a fixed parameter depending on the starting temperature. Before the engine is started, as soon as the ignition switch is turned on, the ECM works out the percentage of the total air flow through calculation by collecting the relevant parameters, and then works out the relative number of steps of the step motor by conversion through the relationship between the idle air flow percentage and the position of the step motor. The general trend is that the lower the engine starting temperature, the greater the opening degree of the idle valve. When the calculated value of the idle air flow percentage exceeds 100%, the idle valve will remain fully open. Idle air flow is changed to improve idle speed stability, by the corresponding adjustment of the position of the step motor according to the actual operating conditions of the engine after the start is over. The fuel delivery varies depending on the temperature of the engine to promote the formation of the oil film on the intake manifold and cylinder walls. Thus, the mixture should be enriched before the engine reaches a certain rotational speed. In the starting conditions, the ignition angle is also constantly adjusted. Change with the engine temperature, intake temperature and engine speed.

Idle speed control system

- The electronic-controlled throttle valve is used in the system to achieve high precision idling speed control, so that the actual speed coincides with the target idling speed.
- For electrical load compensation, when there is an electrical load working or cut off, a sudden increase or decrease in the engine load causes a certain range of fluctuations in the engine speed. The electronic-controlled throttle system allows the engine to adjust the intake air volume and/or the ignition advance angle accordingly so that the idling speed is stable in the optimum condition when the load is increased or decreased on the engine.
- Common electrical load compensation includes: A/C compressor compensation, engine cooling fan compensation, blower compensation, battery voltage compensation, power steering compensation, and charcoal canister solenoid valve compensation. Whether the above compensation works depends on the system configuration and functional requirements.

Gaseous thermodynamic model air flow calculation for the engine

ECM calculates the air flow into the cylinder, through the intake air temperature pressure sensor, and makes the air-fuel ratio meet the requirements of each condition, by controlling the fuel supply.

Torque control mode

The system estimates the output torque based on the accelerator pedal position sensor signal and controls the output power of the engine.

Crankshaft position reference and speed measurement

The system determines the crankshaft position and measures the engine speed according to the crankshaft position sensor signal, and precisely controls the engine ignition and fuel injection timing.

Judgment of the working sequence of each cylinder of the engine

The camshaft position sensor cooperates with the gear mounted on the camshaft, and passes the information of the top dead center of one cylinder of the engine to the ECM, whereby the ECM determines the working sequence of the cylinders of the engine.

Fuel control

There are two main modes of fuel control: closed-loop fuel control and open-loop fuel control.

- Closed-loop fuel control provides precise control of the air-fuel ratio of the engine, thus effectively controlling emissions. Closed-loop control has such an advantage that the system has the ability to eliminate the difference caused by the manufacture and wear in use for the system and the related mechanical parts, and improve the overall consistency of the vehicle and cut vehicle emissions.
- Open-loop fuel control is mainly used for working conditions in which it is not suitable to use closed-loop fuel control, such as engine start-up and oxygen sensor failure.

Ignition angle control

- Sequential ignition is used for ignition control. That is, cylinders are subjected to ignition in the order of 1-3-4-2. The

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necessary condition for sequential ignition control is that the engine has determined the cylinder sequence. Otherwise, the matter will work in the packet ignition mode until the cylinder sequence is determined.

- In idling mode, for the ignition angle, closed-loop control will be made to stably control the rotational speed.

Fuel injection system without fuel return

Return-less multi-point sequential injection is used in the system. For each engine cycle, accurate fuel supply is implemented through the main pulse width and trimmed pulse width, with closed-loop control and self-learning function.

Ignition energy control

The system supports sequential ignition; "Magnetization and discharge" logic is used in the system, and the magnetizing time and discharging time of the ignition coil are precisely controlled.

Principle of knock

- The system detects the characteristic vibration present when the knock is generated, through the knock sensor mounted at the appropriate position of the engine, and converts it into an electronic signal which is transmitted to the ECM and processed.
- When the knock sensor detects a knock, the system will calculate the ignition advance angle that needs to be retarded based on the current conditions, knock strength, etc. , and retards the ignition angle to the corresponding ignition angle to avoid or reduce knocking.
- The knock control system can independently control the ignition timing of each cylinder of the engine.

Evaporative emission pollution control

The system controls the cleaning rate of the charcoal canister according to the engine operating conditions.

Variable valve timing (VVT) control

The VVT actuator is used in the variable valve timing control system to change the relative position between the intake side camshaft and the crankshaft. The engine management system calculates the current optimum valve timing based on the engine operating conditions and controls the intake VVT valve actuation so that the flow and direction of the oil pressure entering the VVT actuator changes, eventually driving the camshaft to the desired position.

Overvoltage protection

In the case of voltage high due to the charge system malfunction, the system will enable the guard mode and limit the engine speed to prevent ECM damage.

A/C system pressure, compressor control

When the A/C switch is turned on, the system will receive a signal called A/C request, make preparations according to the current working conditions of the engine, and then turns on the A/C compressor; the system will control the A/C on or off according to the A/C's own protection needs. In order to ensure the power output and protect the engine, the system may disconnect the operation of the air conditioning under certain conditions.

Three-way catalytic converter

The function of the three-way catalytic converter is to convert the harmful gases from the engine after burning into harmless gas to be discharged into the atmosphere. The internal structure of the three-way catalytic converter is a honeycomb pipe design. The honeycomb wall has a coating of noble metal elements such as palladium, rhodium and platinum as the catalytic reaction medium. The three-way catalytic converter is to make the engine power loss from 3% to 5%.

Three-way catalytic converter system overheat protection function

The system predicts the tendency of engine exhaust temperature rise according to the actual working condition of the engine, and reduces the combustion temperature of the engine by controlling the mixture ratio of fuel to air in time, and protects the three-way catalytic converter.

Cooling fan relay control

- The vehicle is provided with the electric double speed engine cooling fan.
- Electric fan control function: ECM determines to turn on each fan or not according to the engine coolant temperature and A/C switching on condition to reduce the engine power consumption.

System self-diagnosis

- Self-diagnosis of system failure is an essential function of the engine control system; when one or several parts of the system are working abnormally, the system will prompt the vehicle user to carry out the necessary inspection and maintenance through the MIL on; in the event of failure, the system can also control the engine work by using the temporary emergency program to ensure that users can go to repair by driving the vehicle.
- When a sensor and actuator are detected to be abnormal, the engine fault check light is on to alert the driver.
- When a sensor and actuator are detected to be abnormal, the trouble code corresponding to the fault condition is output.
- The RAM data associated with the sensors and actuators in the ECM can be read by equipment for diagnosing faults. In addition, under certain conditions, the actuator can be forcedly driven.

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Fundamentals

Start control principle

When the ignition switch is turned “ON”, the fuel pump will run for 2s and then stop.

The engine starts to turn. After the ECM detects two valid 58X signals, the fuel pump starts running.

The fuel pump stops running 0. 6s after the speed signal disappears.

Pilot injection:

Pilot injection is only carried out once during normal start-up (if the fuel is absorbed by carbon deposit, the mixture becomes leaner and it is difficult to start). The conditions for starting the pilot injection are as follows:

- The engine starts to rotate (the ECM detects at least a valid 58-teeth signal);
- The pump relay is engaged.
- The pump running time exceeds the accumulating delay time.
- Start pilot injection has not been carried out.
- Once the above conditions are met, starting pilot injection is carried out simultaneously at all cylinders.

Initial stage of starting:

The intake manifold internal pressure is shown as the environmental atmosphere pressure. The throttle valve is closed. For ECM, the one is specified as a fixed parameter depending on the starting temperature.

During start-up:

The fuel injection amount varies depending on the temperature of the coolant of the engine, and the ignition angle is constantly adjusted and varies with the engine coolant temperature, the intake air temperature, and the engine speed.

End of the start process:

The start process ends when the engine speed exceeds 600r/min.

Fuel injection control principle

ECM controls the injector drive time and fuel injection timing, so that the engine in a variety of conditions can get optimum air-fuel ratio mixture.

In the rail, the fuel pressure regulator keeps the fuel injection pressure stable and the injector injects fuel directly into the airway of each cylinder. In each working cycle of the engine (every two revolutions turned by the crankshaft), fuel injection is carried out once for each cylinder (fuel injection sequence 1-3-4-2), which is called sequential injection.

When the engine is running in cold or high load conditions, in order to maintain good performance, ECM carries out open-loop control to provide a richer mixture; when the engine is in normal working conditions (small and medium load), ECM carries out closed-loop control through signals fed back by the oxygen sensor to get the best air-fuel ratio, so that the three-way catalytic converter achieves the best purification efficiency.

- Injection pulse width control.

Input signal.	ECM	Control output
Correction of air fuel ratio	Calculate injection volume	Fuel injection pulse width
Correct closed-loop feedback		
Intake manifold pressure		
Inflation temperature		
Inflation efficiency		
Charge efficiency compensation of valve timing		
Self-leaning correction		
Correct power voltage		
Exhaust gas recirculation		
Acceleration Enrichment		
Leaning upon deceleration		
Deceleration Fuel Cut Off		
Protective fuel cutoff		
Injector parameters		

Modification of engine mixture

- Under the normal working temperature of the engine, part of the load is under the closed-loop fuel control. At this point, the system will carry out the real time correction on the injection volume through ECM according to the voltage signal feedback from the oxygen sensor to maintain the mixture density near the theoretical air fuel ratio and consequently ensure the three-way catalytic converter can reach the optimum noxious gas conversion efficiency in addition to ensuring the proper fuel economic performance.
- Under the normal working temperature of the engine, the open-loop fuel control is active under the full load running. At this point, to guarantee the optimum power output of the engine, the system will control the injection volume with the rich air fuel ratio and increase the ignition advance angle with the premise of no engine knocking. The system also controls the exhaust temperature through the exhaust temperature mathematic model established during the calibration to protect the engine and three-way catalytic converter.

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- The system determines whether the engine is under full load by the signal supplied by the throttle position sensor. In general, the system will determine the engine is under full load when the throttle opening reaches 80% ~ 90% or higher. When the driver depresses the accelerator pedal, the system will increase the injection volume as appropriate to guarantee the engine power demand upon the acceleration. The additional injection volume is proportional to the throttle opening change rate. During the acceleration, ECM will put off ignition advance angle first as appropriate and then restore gradually to avoid the impact to the power train due to the fast increase of torque during the sharp acceleration.
- When the acceleration condition is near the engine full load, the system will temporarily shut down the A/C system to guarantee the engine power output upon the acceleration. In any case, if the engine speed exceeds the maximum speed set by the system, the fuel supply will be cut off to restrain the speed increase to protect the engine and prevent racing; when the rotary speed falls below the maximum speed restriction, the system will immediately resume the fuel supply.

Ignition control principle

Start

When the engine is started, a fixed ignition advance angle is used to allow the cylinder gas to ignite and provide positive torque.

When the engine speed increases to a certain value, ECM will calculate the ignition advance angle according to the input signal.

Ignition advance angle control

Input signal.	ECM	Control output
Correct coolant temperature	Calculate injection volume	Fuel injection pulse width
Correct intake temperature		
Correct idle speed		
Main ignition angle		
Correct DFCO		
Correct acceleration		
Power thickening correction		
Correct A/C		

Main ignition advance angle

After the engine temperature reaches the normal value, the main ignition angle present when the throttle valve is opened is usually the minimum ignition angle at the best torque point. When the throttle is closed, the ignition angle should be decreased to maintain the idle speed stable.

Ignition advance angle correction

- Acceleration correction: when the vehicle is accelerating, the ECM will detect the knock signal and correct the ignition angle until no knock is detected. Also it can relieve the engine speed fluctuation caused by the transmission system shock.
- Power enriching correction: near the external characteristic point, to obtain the better power and torque, the system will enrich the air fuel ratio to the optimum torque and most lean air fuel ratio.
- Deceleration fuel cut-off correction: when quiting the deceleration fuel cut-off, correct the ignition advance angle to make the transition smooth.
- A/C control correction: shut down A/C upon the engine idling to correct the ignition advance angle and make the engine speed transition smooth.

Acceleration correction

The ignition advance angle acceleration correction is used to reduce the engine speed fluctuation caused by the torsional vibration of the transmission system; it is also possible to eliminate the possibility of knocking during the acceleration process so that the acceleration process is smooth.

Power enriching correction

The dynamic enrichment correction is near the external characteristic point, and in order to obtain better power and torque, the air-fuel ratio will be enriched to the Lean Best Torque (LBT), whereby the ignition angle correction can be performed to obtain the MBT point.

Ignition angle compensation of valve timing control

When the valve timing control mechanism is activated, the engine inlet-exhaust overlap angle changes, which will affect the internal exhaust gas recirculation rate and the cylinder temperature. For different valve timing, the ignition advance angle correction is required to ensure that the actual operating advance angle of ignition is best under the current valve timing.

Deceleration fuel cut-off correction

When exiting deceleration fuel cutoff, the correction of the ignition angle can be made so that the transition is smooth during throttle closure/exit.

A/C control correction

When the engine is driven at idling speed and after the air conditioning is turned off, the ignition advance angle can be corrected, to achieve the smooth transition of the engine speeds.

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Idle speed control principle

Idle speed control

It controls the by-pass air volume of throttle according to the idling condition and engine load variance during idling to maintain the idle speed at the optimal value. ECM drives the idle speed step motor according to the engine coolant temperature and A/C load to make the engine run at the preset target idle speed. In addition, during the engine idling, if A/C switch is turned on or off, the idle speed step motor will adjust the by-pass air volume according to the engine load conditions to avoid instable idle speed.

Calculate target idle speed

Input signal.	ECM	Control output
Basic target idle speed	Calculate target idle speed	Target idle speed
Speed compensation		
Headlamp compensation		
Fan compensation		
A/C compensation		
Deceleration adjustment		

Voltage compensation: When the voltage is less than 12 V, when the system voltage is less than 12V without recovery within 10s, system will control the target idle speed with an increase of 300r/min, in order to increase the generator power generation. In idling mode, when the voltage fluctuates the moment the system is subjected to the impact of external power load, the system will automatically compensate the intake air volume to inhibit the engine speed transition fluctuations.

A/C compensation: with A/C on when parking in idling mode, in order to compensate for the power consumption of the compressor, target idle speed boost is approximately 150r/min.

Headlamp compensation: after the low beam is turned on, in order to compensate for its power consumption, the target idling speed is increased by 50r/min.

Fan compensation: When the coolant temperature increases, and the fan is running, in order to compensate for the power consumption of the fan running, the target idling speed is increased by 50r/min.

Idle speed control parameters

- Idle air volume control.
- Fuel injection control.
- Ignition timing control.

Idle design control timing

- Calibration of idle speed stability.
- Calibration of acceleration condition.
- Calibration of deceleration condition.
- Fuel cut-off upon deceleration.
- Calibration of fuel supply upon transient condition of engine.
- Calibration of uniform speed running.
- Calibration of mechanical and electrical load increase/decrease.

Factor determining the target idle speed

- When the engine water temperature is low, the system gives a higher target idle speed to speed up the warming of the car.
- If the external load (such as the headlamp, A/C, cooling fan and other electrical load) is on, the system will increase the idle speed to compensate the additional load and maintain the idle speed stable.

Knock control principle

Knock sensor introduction

The knock sensor is a vibration acceleration sensor mounted on the engine cylinder block. Generally it is mounted between the cylinders 2 and 3, which is conducive to the knock balance of the engine. Using the vibration frequency signal output from the sensor and by means of ECM internal filtering, ECM further determines whether there is a knock for the engine. When the knock signal is detected, the ECM corrects the ignition angle until no knock occurs.

Knock control start conditions

- The vehicle is equipped with a knock sensor with the knock control function started;
- The engine is running and running time is more than 2s; and
- The engine water temperature is higher than 70°C.
- The engine speed is more than 600r/min.

Knock control mode

- Steady state knock control: When the engine is running normally, the ECM collects and analyzes the sound present during the combustion of the engine, through the knock sensor, and detects knocking after filtration. Once the knock strength exceeds the allowable limit, the system will quickly retard the ignition advance angle of the cylinder subjected to knock. The knock is eliminated in the subsequent combustion cycle. The ignition advance angle will gradually return to normal angle.
- Transient knock control: When there is a rapid acceleration or the engine speed changes rapidly, the knock is easy to occur. After the system predicts the possibility of knocking, it will automatically retard the ignition advance angle to avoid overrun (strong) knocking occurs. After the system detects the knock, according to the different

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engine speed, it quickly retards the ignition advance angle by 3-5°, and makes the control back to normal control in the subsequent 2-3s.

- Adaptive adjustment of the ignition angle: There is a difference between the engines due to manufacturing errors and wear after long term use. After the system and engine are initially used or the ECM is re-powered, the engine may be subjected to knock in work and the system will record it. After a period of running-in, the system will automatically generate an adaptive ignition adjustment correction value (self-learning value). When the engine becomes in the same conditions, the system will automatically adjust the ignition advance angle in an adaptive manner to prevent the occurrence of strong knock. System adaptive learning is such that it is continually updated during engine operation.

Control principle of the charcoal canister solenoid valve

It is used to control the flow of charcoal canister cleaning airflow. The charcoal canister solenoid valve is controlled by the ECM sending the duration and frequency of the electrical pulse (i. e. , the duty ratio) after a comprehensive calculation according to a series of signals including engine load, engine coolant temperature, and speed. Gasoline steam in the charcoal canister will, after being excessively accumulated, lead to leakage of gasoline, causing environmental pollution. Thus, the charcoal canister solenoid valve has the function of opening in the appropriate time so that excess gasoline steam in the charcoal canister enters the inlet pipe, after being fully mixed with the air in the charcoal canister, and is involved in burning.

The charcoal canister solenoid valve further controls the amount and time of fuel steam into the cylinder by controlling the switching time and timing of the passage between the charcoal canister and the inlet pipe, thus minimizing the evaporative emissions from vehicles. At the same time, the impact on engine performance is minimized.

Working condition of the charcoal canister solenoid valve

To reduce the impact of fuel steam into the cylinder on the normal combustion and doing work of the engine, the charcoal canister solenoid valve must meet the following conditions before opening:

- System voltage is less than 18V but greater than 8V;
- The engine water temperature is higher than 0°C;
- The engine intake air temperature is higher than 0°C; and
- There is no related system failure.

Working mode of the charcoal canister solenoid valve

The opening of the charcoal canister solenoid valve is determined by the duty ratio (PWM) signal determined by the ECM according to the engine state. In non-idling mode, the maximum charcoal canister solenoid valve opening is determined by the closed-loop air flow, with a maximum of 100%.

The charcoal canister will not participate in the work in the following cases:

- The engine has run for a period of time after the cold start.
- The engine cooling water temperature is relatively low.
- The engine is idling.
- The engine is under high load.
- The important system sensor has fault.

Electronic-controlled throttle control principle

Forced engine-off mode

When the ECM reports a failure, or the intake system or the throttle valve body has a problem in controlling the intake air volume, the control strategy is to close the fuel, ignition and throttle, so that the engine goes out and no longer output power.

Forced idling power management mode

When the engine idles, the ETC system cannot reliably control the engine power by using the throttle. At this point, ETC cancels the control of the throttle. Its opening returns to the mechanical default state. The engine power is controlled only by switching the injection of a cylinder and retarding the angle of ignition.

Forced idling mode

When the driver's intentions cannot be reliably obtained, for example all pedal signals fail, the engine only works in idling mode to maintain the car environment's cooling, heating, power supply, lighting and other functions. When the accelerator pedal is depressed, the engine does not respond. Therefore, in this mode the car will not be driving.

Restricted power management mode

The ETC system cannot normally control the engine power by using the throttle valve. In this mode, the system determines whether the idle speed or acceleration is present according to the pedal signal. The engine controls the engine power output by closing or opening a cylinder fuel injection and retarding the ignition angle. Therefore, the engine output fluctuations are obvious and prolonged work in this mode will be harmful to the engine and the emission system. The model ensures that the car can barely drive, but it is difficult to control driving in the normal traffic flow or climbing

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steep slopes.

When the reliability of determining the driving intention is reduced or the high power cannot be output, for example when the two pedals have signal input but the difference is too large, the output torque of the engine is limited and the engine's response to the pedal changes is also much slow. The driver will obviously feel that the engine output becomes weak, but normal driving is still possible.

Normal mode

The vehicle can travel exactly as the driver intends.

Variable valve timing control principle

Variable valve timing control mechanism actuating conditions

The variable valve timing control mechanism can act according to the requirements of the engine management system to control the relative position between the camshaft and crankshaft, so as to cause the engine to obtain the best economic, dynamic and emission performance when the following conditions are met:

- The system voltage must not exceed 16V or less than 10. 5V;
- The engine water temperature should not exceed the specified limit of 115°C.
- Engine speed shall not be higher than 7000r/min, nor less than 900r/min; and
- There is no fault associated with the variable valve timing control system.

In the operation of the variable valve timing control system, when the above conditions are met, the appropriate valve timing is determined according to the current operating conditions (speed, and load) of the engine. When the valve timing changes, the engine's charge efficiency and the best ignition angle will change: the charge efficiency compensation is automatically calculated by the formula.

A/C control principle

ECM monitors A/C request inputs and A/C evaporator temperature sensor inputs, and controls A/C compressor clutches via A/C relays. Plug-and-play automatic identification is for the system with respect to A/C.

A/C working conditions

The air conditioning system will be started when the following conditions are met:

- The engine is running and the running period exceeds 7s;
- The air conditioning switch will be turned on;
- All A/C cutoff modes do not work.

A/C cutoff mode

In some cases, in order to ensure the power performance or to protect the engine or to protect the A/C system, the ECM must cut off the A/C compressor or prohibit the A/C system from starting. At the same time in order to prevent the compressor clutch from being switched on and off frequently, once into the A/C cutoff mode, ECM guarantees that only after a certain period of time can the A/C clutch re-engage, by means of delay and the like.

There are some patterns as follows:

- Engine speed being too high, A/C cutoff mode: it protects the A/C.

When the A/C is off, only when the engine speed is less than 5800r/min is it allowed to start the compressor.

When the A/C works, and when the engine speed is greater than 6000r/min, the A/C compressor will be cut off.

- Engine cooling water temperature being too high, A/C cutoff mode: It protects the engine.

When A/C is off, only when the cooling water temperature is less than 105°C is it allowed to start the compressor.

When the A/C works, and when the cooling water temperature is greater than 108°C, the A/C compressor will be cut off.

Fan control logic

The system controls the cooling fan of the engine and A/C. ECM decides whether to turn on the various fans according to the engine coolant temperature and to whether the conditions are in line with A/C ON conditions etc.

Fan working modes and working conditions

- When A/C is off:

When the temperature of the coolant is less than 91°C, the engine fan is off.

When the temperature of the coolant is greater than 94°C, the engine fan runs at low speed.

When the temperature of the coolant is greater than 94°C, the engine fan runs at high speed.

After the coolant temperature falls to below 201. 20 °F, the engine fan will run at low speed again.

After the coolant temperature drops below 89°C, the engine fan is off.

When A/C is on:

When the coolant temperature is below 96°C, the engine fan runs at low speed.

When the coolant temperature is greater than 96°C, the engine fan runs at high speed.

After the coolant temperature falls to below 197. 60 °F, the engine fan will run at low speed again.

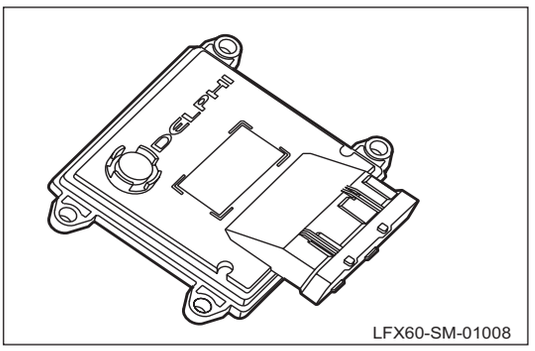
When the A/C is on, regardless of the coolant temperature, when the A/C medium voltage switch is turned on, the engine fan runs at high speed.

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Part description

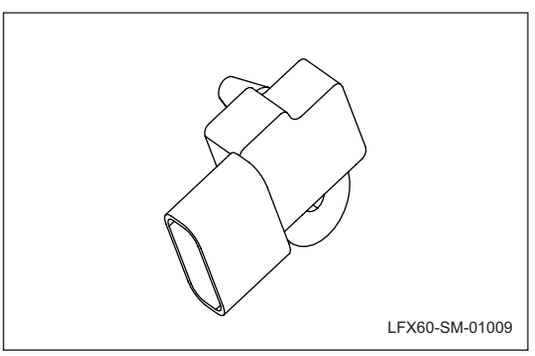
Electronic control unit (ECU)



LFX60-SM-01008

ECU is the core of the engine electronic control system. ECU is an electronically controlled engine control center which is composed of microprocessors as the core, and has a sensor signal input interface and actuator drive circuit. It receives and processes the engine status signals entered by the sensors, and sends control signals to the actuators, so that the engine works according to a predetermined procedure, and so that the engine works in the best condition to ensure good performance in power, fuel economy and emissions.

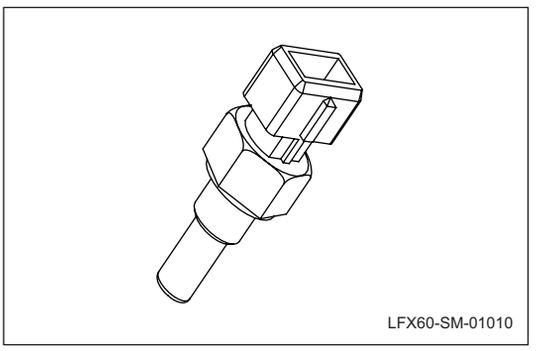
Intake temperature/pressure sensor


LFX60-SM-01009

The intake manifold absolute pressure sensing element consists of a silicon chip. A piece of pressure diaphragm is etched on the silicon chip. The pressure diaphragm is provided with four piezoresistors, and these four piezoresistors act as strain elements for a Wheatstone bridge. The silicon chip is, in addition to the pressure diaphragm, provided with an integrated signal processing circuit. The silicon chip forms a closed reference space with a metal shell, and the absolute pressure of the gas in the reference space is close to zero. This creates a microelectromechanical system. The active surface of the silicon chip is subjected to a pressure close to zero, and its back is subjected to the absolute pressure of the intake manifold to be tested, the matter being introduced through a connection pipe. The thickness of the silicon chip is only a few microns (μm), so that the change in the absolute pressure of the intake manifold will cause the silicon chip to undergo mechanical deformation, so that the four piezoresistors are subsequently deformed and the resistance value changes. After processing is carried out by the signal processing circuit of the silicon chip, a voltage signal linearly related to the pressure is formed.

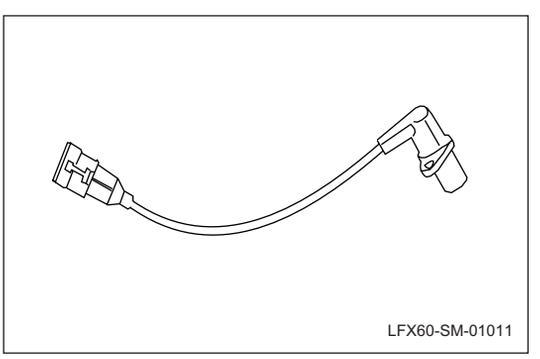
The intake air temperature sensing element is a negative temperature coefficient (NTC) resistance. The resistance varies with the intake air temperature. This sensor delivers a voltage, which indicates the intake air temperature change, to the controller.

Water temperature sensor


LFX60-SM-01010

The water temperature sensor is mounted on the engine body or cylinder head and is in contact with the cooling liquid to detect the temperature of the engine circulating coolant and transmit the test result to the electronic control unit to correct the fuel delivery and the ignition timing. Water temperature sensors are often made of thermistors that are very sensitive to temperature changes. Negative temperature coefficient resistors are often used for thermistors. The lower the water temperature, the greater the resistance of the thermistor. The electronic control unit, according to this signal, increases the fuel delivery to increase the concentration of the combustible mixture.

Crankshaft Position Sensor


LFX60-SM-01011

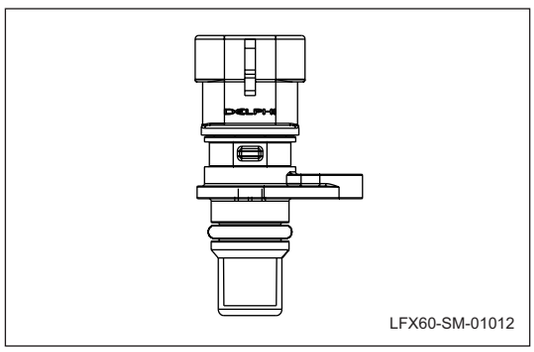
The engine speed and crankshaft position sensor is a magnetoelectric sensor, which is mounted near the crankshaft and works with the 58X ring gear on the crankshaft. When the crankshaft rotates, the crest and tooth space of 58X pass through the sensor at different distances. The sensor senses the change of the magnetoresistance. This alternating magnetoresistance produces an alternating output signal. And the notch position on the 58X ring gear corresponds to the position of the top

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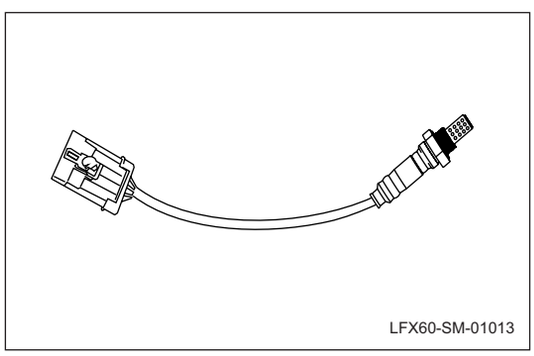
dead center of the engine. At the top dead center of the first cylinder, the sensor is aligned with the falling edge of the 20th tooth of the 58X ring gear. The ECM determines the rotational position and speed of the crankshaft by using this signal.

Camshaft position sensor



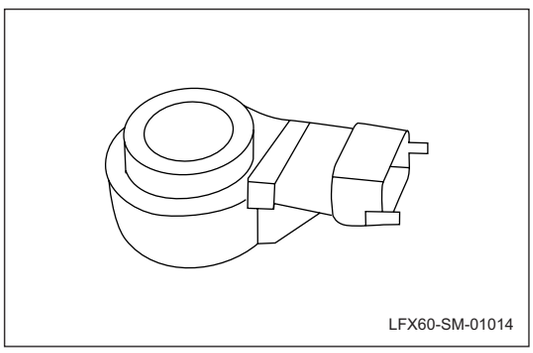
The camshaft position sensor is used to match the pulse disk induction sensor in the absence of a distributor, so as to provide the ECU with crankshaft camshaft position information, that is, to distinguish between the crankshaft compression top dead center and exhaust top dead center. The camshaft position sensor consists of a Hall sensor and a rotor made of steel. The Hall sensor is fixed and the rotor is mounted on the camshaft. The rotor is a cylindrical steel blade in the range of 180°. There is no output signal when the blade covers the Hall sensor; otherwise, there is an output signal. Since the two halves of the camshaft, when combined, correspond to two full circumferences of the crankshaft, whereby the compression top dead center and the exhaust top dead center of the crankshaft can be distinguished.

HO2S



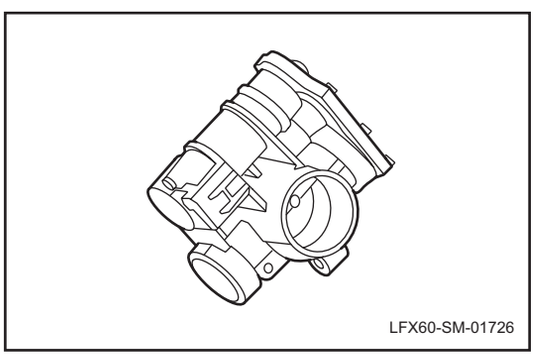
The sensing element of HO2S is a kind of ceramic tube with pores. Its external wall is surrounded by the engine exhaust gas and its internal wall is open to atmosphere. The tube wall contains a kind of solid electrolyte and is internally equipped with an electrical heating tube. The function of HO2S is achieved by converting the difference of the oxygen ion concentrations inside and outside the sensing ceramic tube into voltage signal output. When the temperature of the sensing ceramic tube reaches 350°C, it has the characteristics of a solid electrolyte. Due to the material feature, the oxyanion can freely pass the ceramic tube. Through this characteristic, the differential concentration is converted into electric potential difference and consequently the electrical signal output is generated. If the mixture is rich, the concentration difference between oxygen ions inside and outside the ceramic tube is high, the potential difference is high, a large amount of oxygen ions are moved from the inside to the outside, and the output voltage is high (close to 800mV-1000mV); if the mixture is lean, the concentration difference of oxygen ions inside and outside the ceramic tube is low, the potential difference is low, only a small amount of oxygen ions are moved from the inside to the outside, and the output voltage is low (close to 100mV).

Knock Sensor



The knock sensor is a vibration acceleration sensor mounted on the engine cylinder block. The sensing element of the sensor is a piezoelectric element. The vibration of the engine cylinder block is transmitted to the piezoelectric crystal through the mass block in the sensor. Since the piezoelectric crystal is subjected to the pressure generated by the vibration of the mass block, a voltage is generated at the two pole faces, and the vibration signal is converted into an alternating voltage signal output. Since the frequency of the vibration signal caused by the engine knock is much higher than the frequency of the normal vibration signal of the engine, the ECU can distinguish between the knock and non-knock signals after processing the signal of the knock sensor.

Electronically controlled throttle valve body



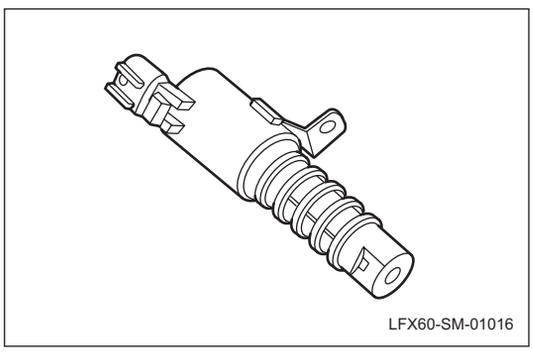
With the size of the throttle opening of the electronic control throttle body assembly, according to the throttle pedal control input

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signal controlled by the driver and the input signals of various other senses, ECM calculates and works out the engine output power required by the vehicle at that time and that state and accordingly control the engine fuel supply (injection), and correct control parameters according to the feedback signal to ensure that the engine works in the best control state. The electronic-controlled throttle valve body is additionally provided with the drive motor, gear drive mechanism and other components as well as the throttle position sensor better in function and reliability.

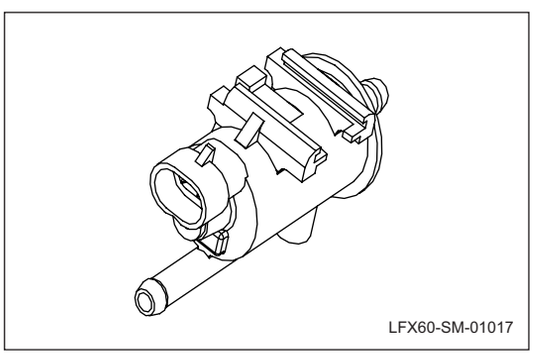
Intake VVT valve



LFX60-SM-01016

The intake VVT solenoid valve is supplied with power from the main relay, and the ECM controls the grounding with a pulse width modulation signal. In this way, the engine oil flow to the camshaft position actuator is controlled. The engine oil pressure makes one of the safety slide valve inside the camshaft position actuator mechanism fixed to the camshaft front act. When the safety slide valve acts, the engine oil is introduced to the camshaft position actuator to make the camshaft rotate.

Canister solenoid valve



LFX60-SM-01017

The inside of the charcoal canister solenoid valve is an electromagnetic valve structure. The digital pulse square wave issued by the ECM controls the opening of the solenoid valve. According to the different engine conditions, charcoal canister solenoid valve opening is not the same. In the case of large engine load and in idling mode, in order to ensure the output power of the engine, the charcoal canister solenoid valve is not put into work.

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Diagnostic Information and Procedures

Diagnosis Instructions

Before you diagnose the fault of the engine control system, familiarize yourself with the working principle of the engine control system before starting the engine control system diagnostics, which helps to determine the correct troubleshooting step in the event of a fault. More importantly, this also helps to determine whether the situation as described by the customer is normal operation.

Any fault diagnosis of the engine control system should be based on the engine control system check as a starting point to guide the maintenance staff to take the next logical step, for troubleshooting. Understanding and using the diagnostic flowchart correctly reduces diagnostic time and avoids misjudgment of components.

General equipment

Digital universal meter
Diagnostic equipment of vehicle

Visual Inspection

1. Confirm the problem of the customer.
2. Visually check whether there is any obvious mechanical or electrical damage sign.

Visual inspection table

Electrical
• Fuse • Harness • Harness connector • Relay • Sensor • Switch • ECM

3. If the observed or proposed problem is obvious and its cause is identified, rectify the cause before proceeding with next step.
4. If for the problem, there are no obvious findings, then confirm the fault and refer to the symptom table.

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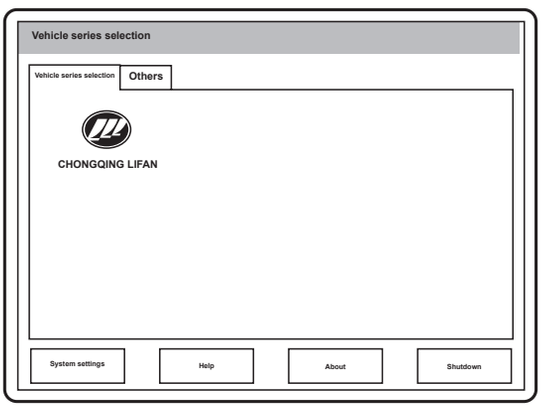
Reading and clear the trouble code

Reading the trouble code

△ Tips:

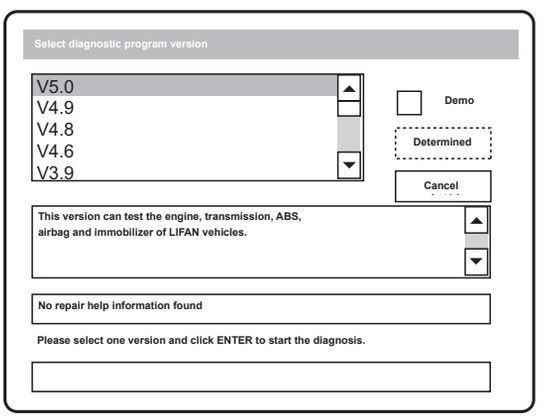
In order to read the engine control system trouble code, you need to use the Lifan provided professional automotive diagnostic equipment. There is a lack of reliability in reading the trouble code by using non-Lifan provided automotive diagnostic equipment. The following automotive diagnostic equipment used to read and clear the trouble code is the Lifan dedicated V30 automotive diagnostic equipment.

(a). Connect the Lifan V30 automotive diagnostic equipment to the diagnostic port.



LFX60-SM-02905

(b). Switch on the diagnostic meter and access to CHONGQING LIFAN Diagnostic System.

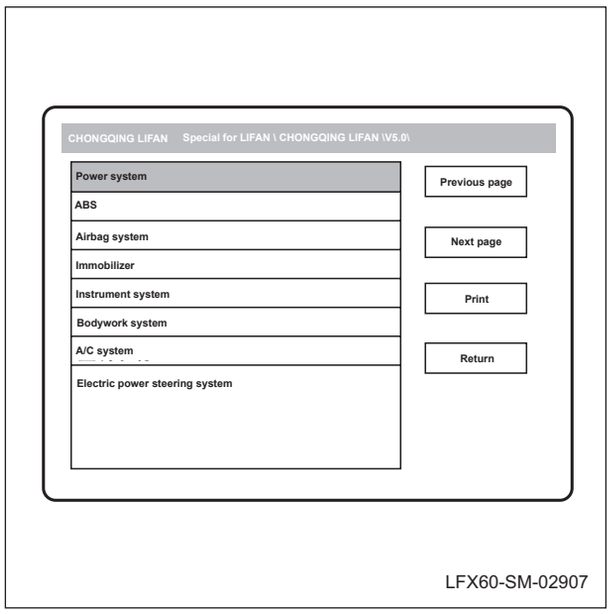


LFX60-SM-02906

(c). Select V5. 0 diagnostic program version and click ENTER.

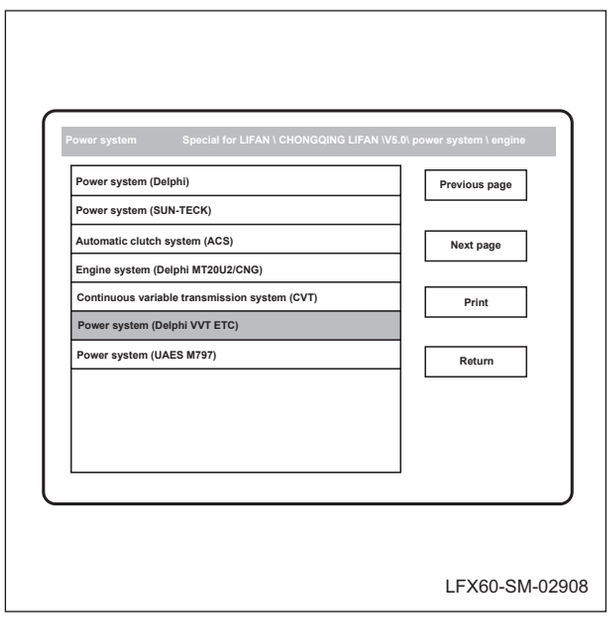
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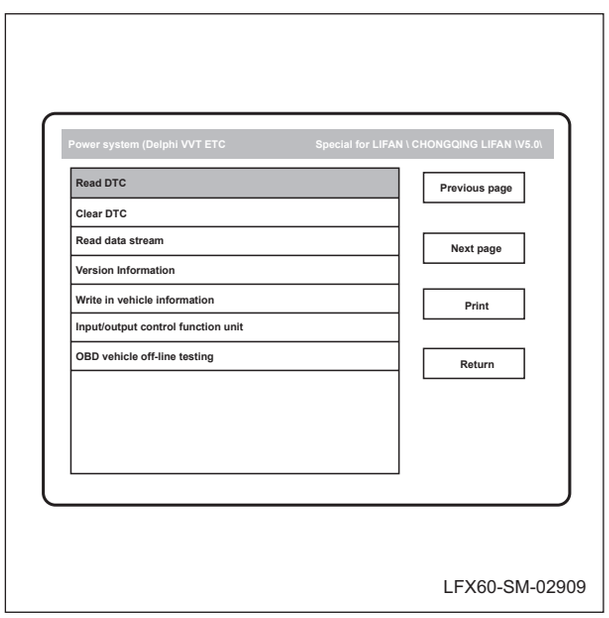
LFX60-SM-02907

(d). Select “power system”.



LFX60-SM-02908

(e). Select “engine system” (Delphi VVTECT).

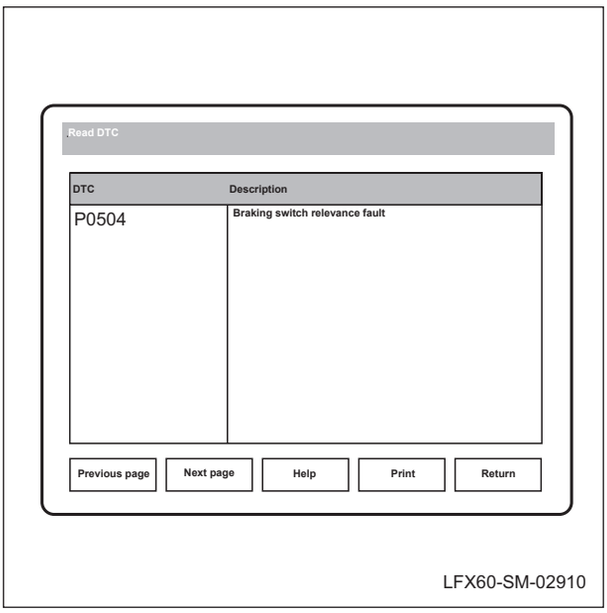


LFX60-SM-02909

(f). Select Enter “Read the trouble code’’.

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LFX60-SM-02910

(g). Read out the engine trouble code information.

Clear the trouble code

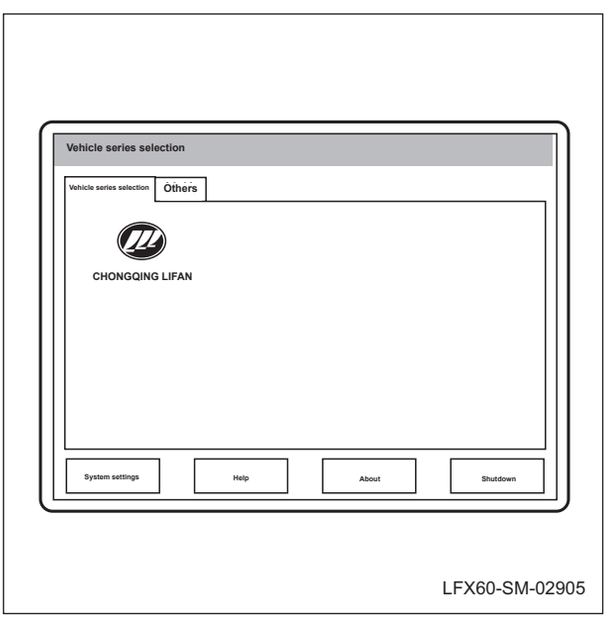
△ Tips:

- **"Clear the trouble code" is to remove the trouble code information from the car computer.**
- **Only after the car fault is removed shall the trouble code be cleared.**
- **After the clear operation is completed, the instrument will automatically read the trouble code once. If a trouble code is also read out, this indicates that there is still a fault.**
- **By using the "Clear the trouble code" function, you can clear part of the trouble code which is in the ECM fault memory, and can be directly removed. Some trouble codes cause the MIL of the OBD system to be lit, and it is necessary to perform several complete start cycles in accordance with the corresponding calibration mode to automatically clear the matter.**

Methods for clearing the trouble code include: instrument clean-up method, and clean-up method of disconnecting the battery negative and disconnecting the control system main fuse.

In order to clear the Lifan X70 model trouble code, it is recommended to use the professional V30 automotive diagnostic equipment for the removal of trouble code.

(a). Connect LIFAN V30 vehicle diagnostic meter to the diagnostic interface.

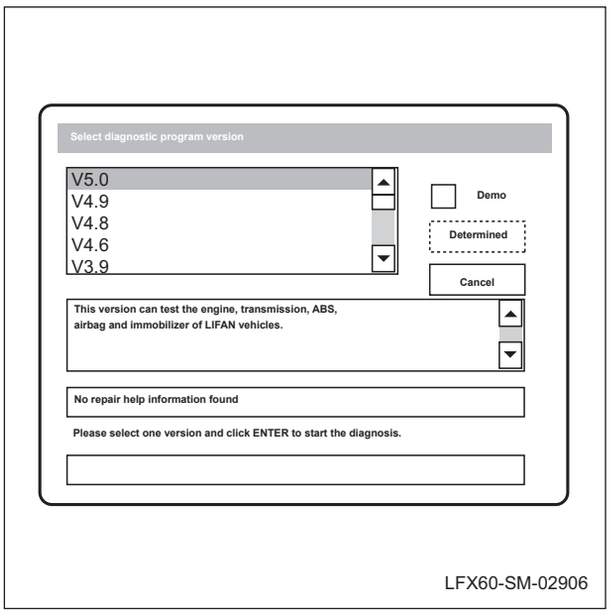


LFX60-SM-02905

(b). Switch on the diagnostic meter and access to CHONGQING LIFAN Diagnostic System.

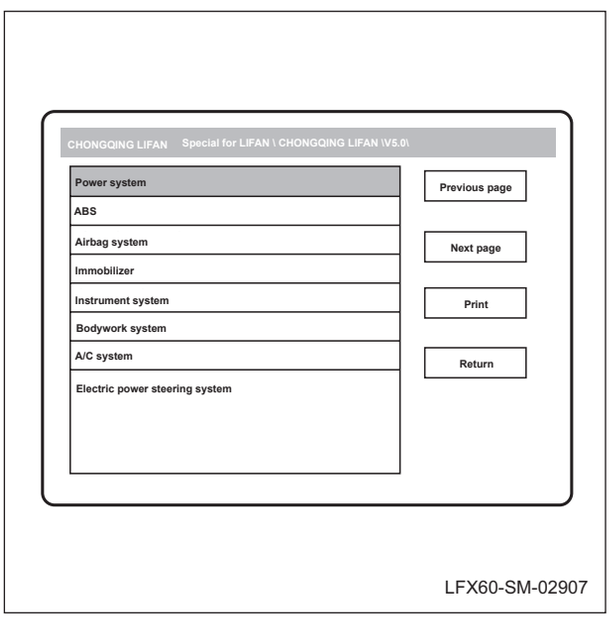
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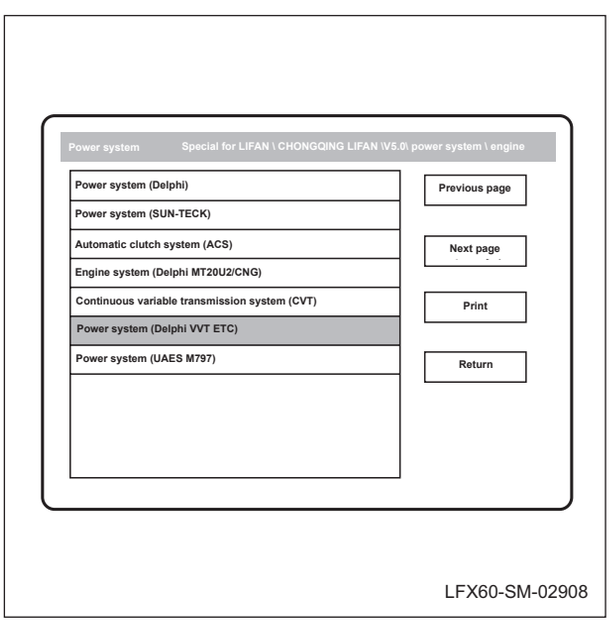
LFX60-SM-02906

(c). Select V5. 0 diagnostic program version and click ENTER.



LFX60-SM-02907

(d). Select “power system”.

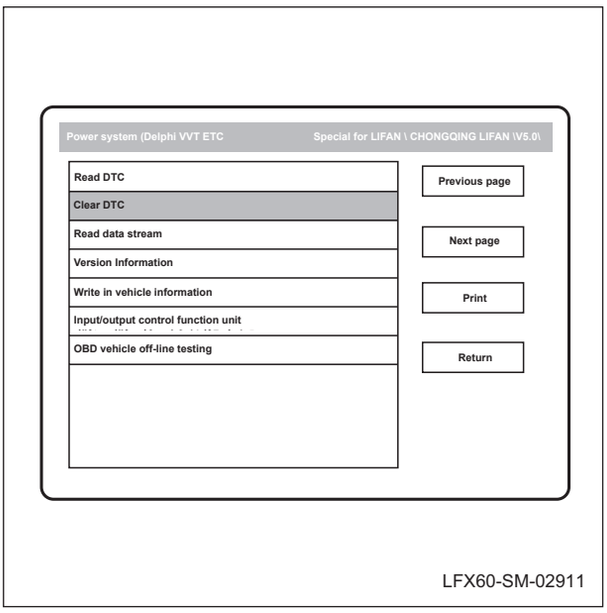


LFX60-SM-02908

(e). Select “engine system” (Delphi VVTECT).

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(f). Click “Clear the trouble code” to clear the trouble code.

Read data flow

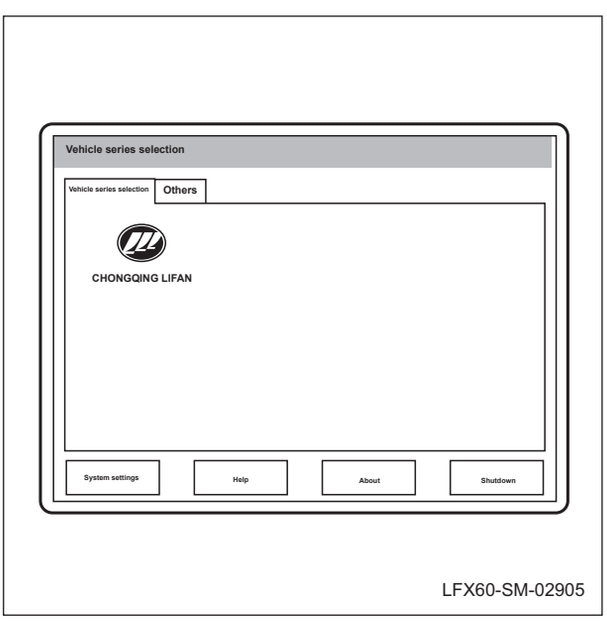
The so called “data flow” means the electric signal sent by the vehicle PC continuously in the form of system working parameters and working state. There are many items in the data flow. The typical data flow of the engine system includes:

- Ignition advance angle
- Throttle opening
- Fuel injection pulse width
- Coolant temperature
- Intake temperature
- Intake manifold pressure
- Atmosphere pressure
- Fuel injection advance angle
- Battery voltage

△ **Tips:**

The data values involving the switches, sensors, actuators, etc. can be checked by reading the data sheet displayed on the automotive diagnostic equipment, without removing any parts. To shorten the diagnosis time, read the data sheet as the first step for troubleshooting.

(a). Connect LIFAN V30 vehicle diagnostic meter to the diagnostic interface.

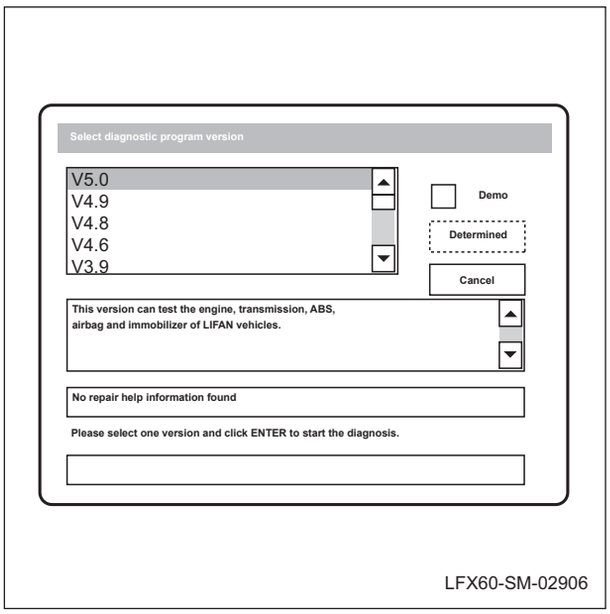


LFX60-SM-02905

(b). Switch on the diagnostic meter and access to CHONGQING LIFAN Diagnostic System.

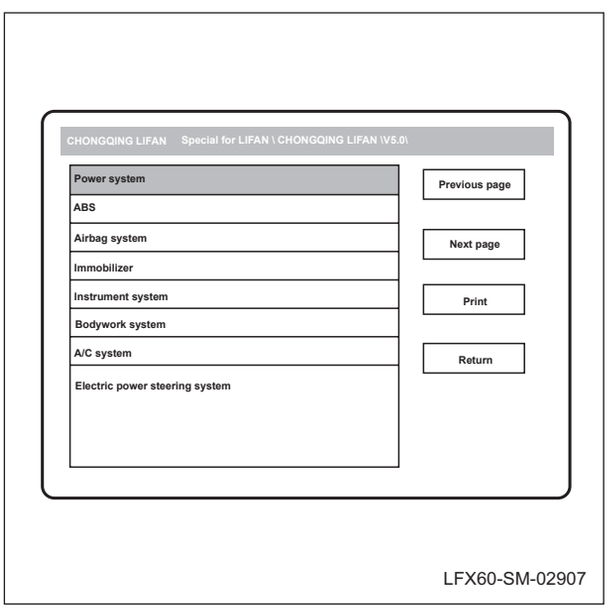
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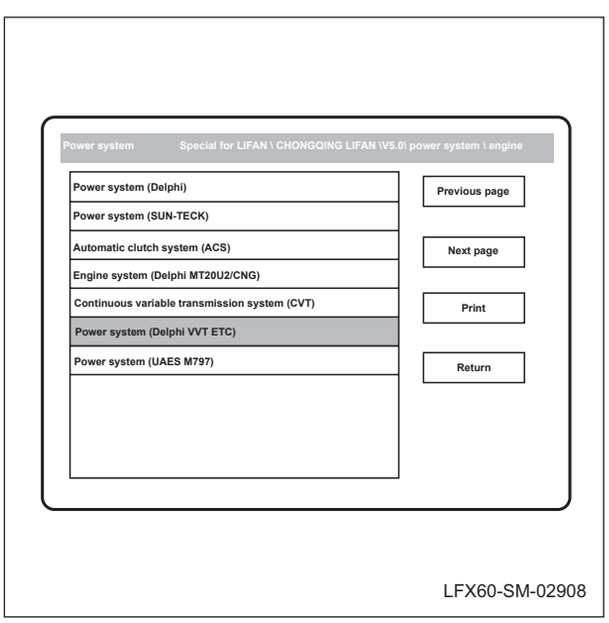
LFX60-SM-02906

(c). Select V5. 0 diagnostic program version and click ENTER.



LFX60-SM-02907

(d). Select “power system”.

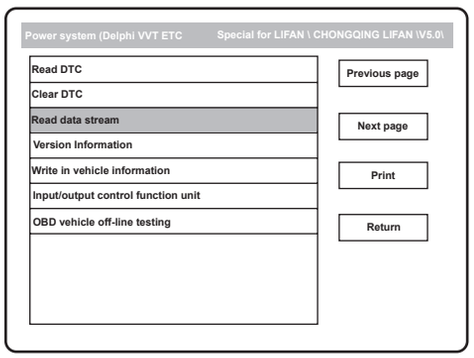


LFX60-SM-02908

(e). Select Enter “Engine System (Delphi VVT ETC)”

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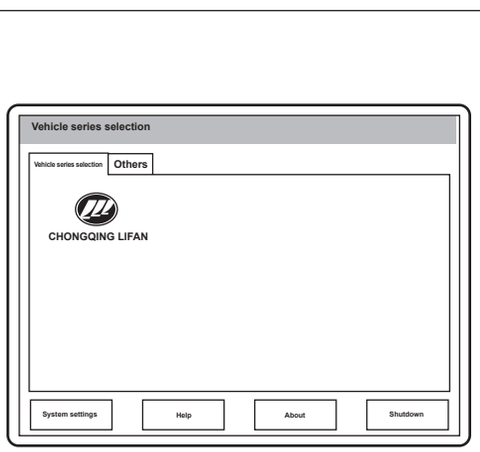
LFX60-SM-02912

(f). Click “Read Data Stream”.

Input and output control functions

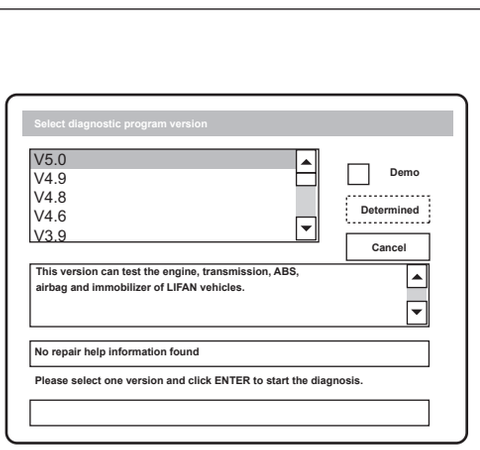
The input and output control function unit is a self-learning process of the component. It is unnecessary to disassemble any parts. It carries out testing and learning of other special operations or the like on components including relays, and actuators.

(a). Connect the Lifan V30 automotive diagnostic equipment to the diagnostic interface, and operate the ignition switch to make the power mode to “ON” state.



LFX60-SM-02905

(b). Switch on the diagnostic meter and access to CHONGQING LIFAN Diagnostic System.

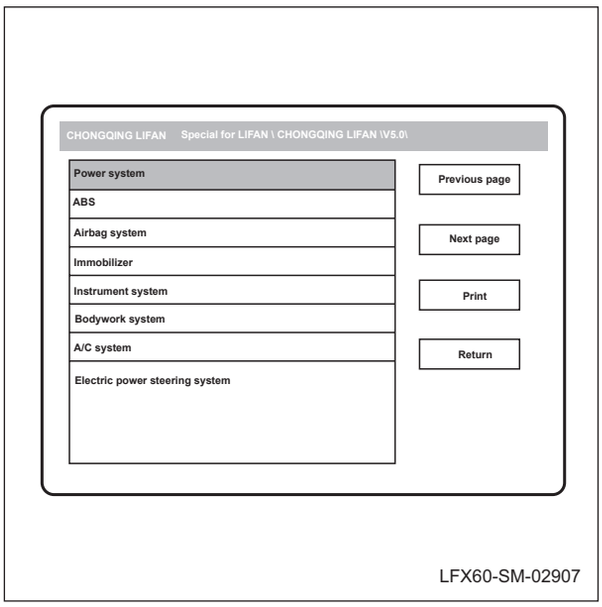


LFX60-SM-02906

(c). Select V5. 0 diagnostic program version and click ENTER.

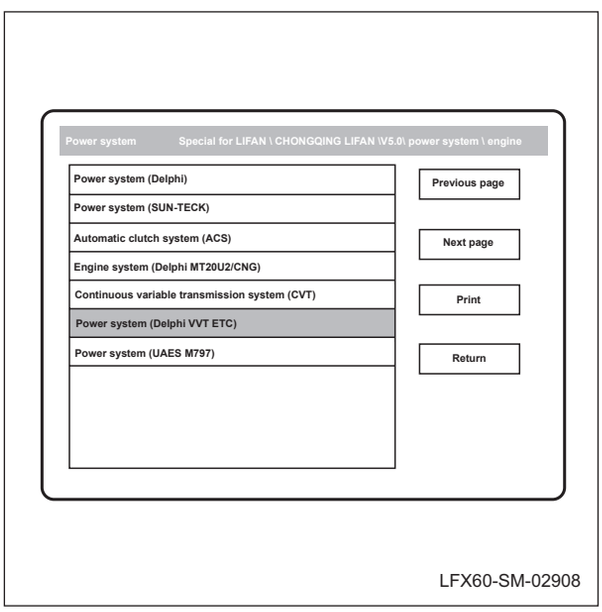
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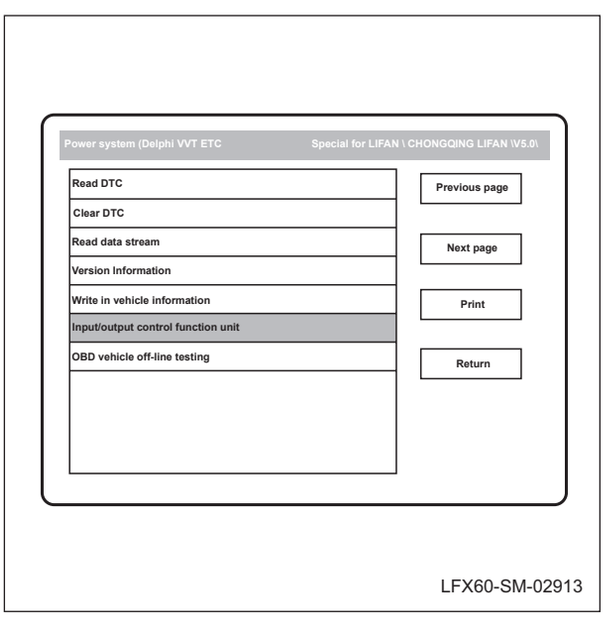
LFX60-SM-02907

(d). Select “power system”.



LFX60-SM-02908

(e). Select Enter “Engine System (Delphi VVT ETC)”



LFX60-SM-02913

(f). Click “I/O Control Function Unit”.

(g). Check and repair the relevant harness or component if there is any abnormality when checking the engine components by using the “I/O control function unit” function.

(h). After the repair is complete, clear the trouble code.

(i). Restart the engine and confirm that the fault has been removed, by using the V30 automotive diagnostic equipment.

(j). Operate the ignition switch to turn the power to OFF state. Disconnect the battery negative connector.

(k). Disconnect the Lifan V30 automotive diagnostic equipment from the diagnostic interface.

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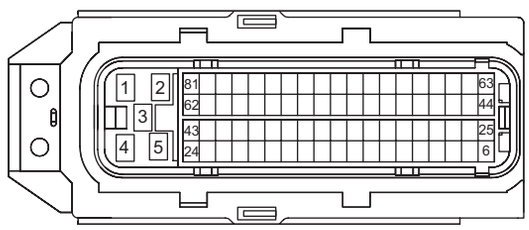
Test content

No.	Name	Test mode	Description
1	Malfunction Indicator Light (MIL)	Open / Close	Test whether the operation of engine MIL is normal
2	Fuel pump	Open / Close	Check whether the pump relay works properly
3	Fan low-speed	Open / Close	Test whether the operation of low speed fan is normal
4	Fan high-speed	Open / Close	Test whether the operation of high speed fan is normal
5	A/C clutch	Open / Close	Test whether the operation of A/C relay is normal
6	Carbon canister purification	0-100%	Check whether the charcoal canister solenoid valve is working properly
7	Ignition advance/retardation	0~255	Start the engine, and enter the value. Turn off the ignition switch to restore the original settings
8	Injector on/off	Open / Close	Start the engine, and it is possible to control the work of the injector
9	Crankshaft position sensor target gear error learning	Open / Close	Start the engine. "ON" is to carry out crankshaft position sensor target gear error learning. "OFF" is to cancel the operation
10	Fuel pump ON cycle	Open / Close	Start the engine and select "ON/OFF" fuel pump ON cycle
11	Fuel unit BLM Learn	Open / Close	Start the engine. 'ON' is to carry out fuel unit BLM Learn. "OFF" is to cancel the operation
12	Fuel unit reset BLM Rest	Open / Close	The engine does not start. Click: run directly
13	Oxygen sensor offline diagnosis	Open / Close	Start the engine. ‘ON’ is for oxygen sensor offline diagnosis. 'OFF' is to cancel the operation
14	Catalyst offline diagnosis	Open / Close	Start the engine. 'ON' is to start the catalyst offline diagnosis. 'OFF' is to cancel the operation

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Control module terminal list



E01a

LFX60-SM-02705

Terminal No.	Wire size/color	Terminal description
E01a-01	0. 75 V/B	Three-cylinder ignition signal
E01a-02	2. 00 B	Grounding
E01a-03	2. 00 B	Grounding
E01a-04	0. 75 P/BI	One-cylinder ignition signal
E01a-05	0. 75 BI/R	Main relay power supply
E01a-06	0. 75 O/B	One cylinder fuel injection signal
E01a-07	0. 75 P/Y	Three cylinder fuel injection signal
E01a-08	0. 75 Y/R	Two cylinder fuel injection signal
E01a-09	0. 50 B/O	Oil pump relay control signal
E01a-10	0. 50 P/G	Compressor control signal
E01a-11	0. 50 P	Crankshaft position sensor signal low
E01a-12	-	-
E01a-13	-	-
E01a-14	-	-
E01a-15	-	-
E01a-16	-	-
E01a-17	0. 50 O/BI	High speed fan control signal
E01a-18	-	-
E01a-19	-	-
E01a-20	0. 75 Br	Electronically controlled throttle valve motor power supply +
E01a-21	0. 75 Y	Electronically controlled throttle valve motor power supply -
E01a-22	-	-

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Terminal No.	Wire size/color	Terminal description
E01a-23	0. 75 G	Rear oxygen sensor heating signal
E01a-24	0. 75 V/W	Front oxygen sensor heating signal
E01a-25	0. 75 G/Y	Four cylinder fuel injection signal
E01a-26	0. 50 R/Bl	Cruise switch signal
E01a-27	0. 50 Gr/G	Electronic control throttle signal
E01a-28	-	-
E01a-29	-	-
E01a-30	0. 50 V	Crankshaft position sensor signal high
E01a-31	-	-
E01a-32	-	-
E01a-33	0. 50 Bl/R	Normally closed signal of the brake switch
E01a-34	0. 50 W/R	Clutch TDC signal
E01a-35	0. 50 G/Br	Reverse gear signal
E01a-36	0. 50 P/B	The knock sensor signal is high
E01a-37	0. 50 B	The knock sensor signal is low
E01a-38	0. 50 Bl/W	PCAN-L
E01a-39	0. 50 Bl/B	PCAN-H
E01a-40	0. 50 V/R	A/C switch signal
E01a-41	0. 50 R/Y	Signal 1
E01a-42	0. 50 Gr	Signal 2
E01a-43	0. 50 Y/W	Intake VVT signal
E01a-44	0. 50 Y	Main relay control signal
E01a-45	-	-
E01a-46	-	-
E01a-47	0. 50 O/Y	The front oxygen sensor signal is high
E01a-48	0. 50 Gr	Rear oxygen sensor: high
E01a-49	0. 50 Y/B	Water temperature sensor signal
E01a-50	-	-
E01a-51	-	-
E01a-52	0. 50 Bl/W	Electronic control throttle signal
E01a-53	-	-
E01a-54	0. 50 P	Intake pressure sensor signal
E01a-55	-	-
E01a-56	0. 50 V/O	NEUTRAL signal

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Terminal No.	Wire size/color	Terminal description
E01a-57	0. 50 V/W	Clutch LDC signal
E01a-58	-	-
E01a-59	-	-
E01a-60	0. 50 BI/W	Power steering switch signal
E01a-61	-	-
E01a-62	0. 75 P/W	Four-cylinder ignition signal
E01a-63	-	-
E01a-64	0. 75 W/G	Canister solenoid valve
E01a-65	0. 50 BI/Y	Low speed fan control signal
E01a-66	0. 50 R/W	Sensor 5V power
E01a-67	0. 50 R	Battery Power
E01a-68	0. 50 B/W	IG power supply
E01a-69	0. 50 W/BI	Normally open signal of the brake switch
E01a-70	0. 50 R/B	Sensor 5V power
E01a-71	0. 50 BI	Intake air temperature pressure sensing signal
E01a-72	-	-
E01a-73	0. 50 V/B	The rear oxygen sensor signal is low
E01a-74	0. 50W	The sensor signal is low
E01a-75	-	-
E01a-76	0. 50 W/B	Cruise switch signal
E01a-77	0. 50 G/W	Air intake camshaft position sensor signal
E01a-78	-	-
E01a-79	0. 50 R/G	A/C switch feedback signal
E01a-80	-	-
E01a-81	0. 75 G	Two-cylinder ignition signal

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DTC list

△ Tips:

When performing a DTC check in the inspection mode, if a DTC is displayed, check the circuit system corresponding to the code listed in the following table.

DTC	Faultdescription	Doubtful part
P0011	Air intake VCP phase response lag	• Valve timing • VVT solenoid valve • Solenoid valve filter element • VVT actuator assembly • ECM
P0012	Intake VCP camshaft phase error high	• Intake VVT valve • Intake VVT valve harness • ECM
P0016	Intake VCP cam gear learning deviation off-limit	• Valve timing • VVT solenoid valve • Solenoid valve filter element • VVT actuator assembly • ECM
P0026	Intake VCP hydraulic control valve clamped	• Valve timing • VVT solenoid valve • Solenoid valve filter element • VVT actuator assembly • ECM
P0031	Front oxygen sensor heater short to low voltage	• Front oxygen sensor • Front oxygen sensor harness • ECM
P0032	Front oxygen sensor heater short to high voltage	• Front oxygen sensor • Front oxygen sensor harness • ECM
P0037	Rear oxygen sensor heater short to low voltage	• Rear oxygen sensor • Rear oxygen sensor harness • ECM
P0038	Rear oxygen sensor heater short to high voltage	• Rear oxygen sensor • Rear oxygen sensor harness • ECM
P0076	Intake VCP hydraulic control valve coil voltage low or open circuit	• VVT solenoid valve • VVT solenoid valve harness • ECM
P0077	Intake VCP hydraulic control valve coil voltage high	• VVT solenoid valve • VVT solenoid valve harness • ECM

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DTC	Faultdescription	Doubtful part
P0105	No intake air pressure sensor signal	• Intake pressure temperature sensor • Intake pressure/temperature sensor harness • ECM
P0106	Intake pressure/throttle position rationality fault	• Intake pressure temperature sensor • Intake pressure temperature sensor harness • ECM
P0107	The intake air temperature sensor circuit has too low voltage or is broken	• Intake pressure temperature sensor • Intake pressure/temperature sensor harness • ECM
P0108	The voltage of the intake air temperature sensor circuit is high	• Intake pressure temperature sensor • Intake pressure/temperature sensor harness • ECM
P0112	The voltage of the intake air temperature sensor circuit is low	• Intake pressure temperature sensor • Intake pressure/temperature sensor harness • ECM
P0113	The intake air temperature sensor circuit has too high voltage or is broken	• Intake pressure temperature sensor • Intake pressure/temperature sensor harness • ECM
P0117	Coolant temperature sensor circuit voltage low	• Coolant temperature sensor. • Coolant temperature sensor harness • ECM
P0118	Coolant temperature sensor circuit voltage high or open circuit	• Coolant temperature sensor. • Coolant temperature sensor harness • ECM
P0122	Electronic throttle position sensor 1# circuit lower voltage	• Throttle position sensor • Throttle position sensor harness • ECM
P0123	Electronic throttle position sensor 1# circuit high voltage	• Throttle position sensor • Throttle position sensor harness • ECM
P0222	Electronic throttle position sensor 2# circuit lower voltage	• Throttle position sensor • Throttle position sensor harness • ECM
P0223	Electronic throttle position sensor 2# circuit high voltage	• Throttle position sensor • Throttle position sensor harness • ECM
P0131	Front oxygen sensor signal short to low voltage	• Front oxygen sensor • Front oxygen sensor harness • ECM

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DTC	Faultdescription	Doubtful part
P0132	Front oxygen sensor short to high voltage	• Front oxygen sensor • Front oxygen sensor harness • ECM
P0133	Too slow front oxygen sensor response	• Front oxygen sensor
P0134	Front oxygen sensor circuit broken	• Front oxygen sensor • Front oxygen sensor harness • ECM
P0137	Rear oxygen sensor heater short to low voltage	• Rear oxygen sensor • Rear oxygen sensor harness • ECM
P0138	Rear oxygen sensor short-circuited to high voltage	• Rear oxygen sensor • Rear oxygen sensor harness • ECM
P0140	Rear oxygen sensor circuit broken	• Rear oxygen sensor • Rear oxygen sensor harness • ECM
P0171	Too dilute fuel in non-idle speed condition	• Injector • Canister solenoid valve • Intake pressure temperature sensor • Throttle position sensor • Front oxygen sensor
P0172	Too concentrated fuel in non-idle speed condition	• Injector • Canister solenoid valve • Intake pressure temperature sensor • Throttle position sensor: front • Oxygen Sensor
P0230	Fuel pump relay fault	• Fuel pump relay • Pump relay harness • ECM
P0261	1# Cylinder nozzle circuit lower voltage fault	• Injector A • Injector harness • ECM
P0262	1# Cylinder nozzle circuit high voltage fault	• Injector A • Injector harness • ECM
P0264	2# Cylinder nozzle circuit lower voltage fault	• Injector B • Injector harness • ECM
P0265	2# Cylinder nozzle circuit high voltage fault	• Injector B • Injector harness • ECM

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DTC	Faultdescription	Doubtful part
P0267	3# Cylinder nozzle circuit lower voltage fault	• Injector C • Injector harness • ECM
P0268	3# Cylinder nozzle circuit high voltage fault	• Injector C • Injector harness • ECM
P0270	4# Cylinder nozzle circuit lower voltage fault	• Injector D • Injector harness • ECM
P0271	4# Cylinder nozzle circuit high voltage fault	• Injector D • Injector harness • ECM
P0300	A single cylinder or multiple cylinders misfire (catalyst damage type misfire) a single cylinder or multiple cylinders misfire (emission damage type misfire)	• Engine harness • Injector • Ignition system • Fuel pressure • Intake pressure temperature sensor • Compression pressure • Valve mechanism timing • Valve lash • Cylinder head • Ventilation valve line • Intake system • Vacuum hose • ECM
P0324	Faulty detonation control system	• Knock sensor • Knock sensor harness • ECM
P0325	Knock control sensor fault	• Knock sensor • Knock sensor harness • ECM
P0335	Crankshaft position sensor circuit no signal	• Crankshaft position sensor • Crankshaft position sensor harness • Sensor signal disc • ECM
P0336	Crankshaft position sensor circuit signal interference	• Crankshaft position sensor • Crankshaft position sensor harness • Sensor signal disc • ECM

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DTC	Faultdescription	Doubtful part
P0340	Intake VCP camshaft position sensor state diagnosis	• Camshaft position sensor • Camshaft position sensor harness • Camshaft signal wheel • ECM
P0341	Intake VCP target wheel diagnosis fault	• Camshaft position sensor • Camshaft position sensor harness • Camshaft signal wheel • ECM
P0351	Ignition coil 1# output fault	• Ignition coils • Ignition coil harness • ECM
P0352	Ignition coil 2lb output fault	• Ignition coils • Ignition coil harness • ECM
P0353	Ignition coil 3lb output fault	• Ignition coils • Ignition coil harness • ECM
P0354	Ignition coil 4lb output fault	• Ignition coils • Ignition coil harness • ECM
P0420	Low catalytic converter efficiency	• Three-way catalytic converter • Front oxygen sensor • Rear oxygen sensor • Exhaust gas leaks
P0458	Canister solenoid valve output short to low voltage or short circuit	• Canister solenoid valve harness • Canister solenoid valve • ECM
P0459	Canister solenoid valve output short to high voltage	• Canister solenoid valve harness • Canister solenoid valve • ECM
P0480	Low speed fan fault	• Low speed fan relay • Low speed fan relay harness • Cooling fan • ECM
P0481	High speed fan fault	• High speed fan relay • High-speed fan relay harness • Cooling fan • ECM
P0502	Vehicle speed sensor no signal	• Speed sensor • Speed sensor harness • ECM

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DTC	Faultdescription	Doubtful part
P0504	Braking switch relevance fault	• Brake switch • Brake switch harness • ECM
P0506	Idle speed low	• ETC throttle valve block assembly • Intake system • Exhaust system • ECM
P0507	Idle speed high	• ETC throttle valve block assembly • Intake system • Exhaust system • ECM
P0551	Power steering switch line voltage range/performance fault	• Power steering switch • Power steering switch harness • ECM
P0562	System voltage low	• Battery • Engine harness • ECM
P0563	System voltage high	• Battery • Engine harness • ECM
P0602	ECM processing fault	• ECM
P0604	RAM error	• ECM
P0606	ECM processing fault	• ECM
P060A	ECM program fault	• ECM
P0633	Non-learning fault of immobiliser	• Ignition key • Ignition key excitation coil • Chip anti-theft module • ECM
P1167	Rather rich during deceleration/fuel cutoff for the front oxygen sensor	• Intake pressure temperature sensor • Throttle position sensor • Front oxygen sensor • Injector • Canister solenoid valve
P1171	Rather lean during acceleration/ enrichment for the rear oxygen sensor	• Intake pressure temperature sensor • Throttle position sensor • Front oxygen sensor • Injector • Canister solenoid valve

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DTC	Faultdescription	Doubtful part
P1336	58-tooth gear error not learned	• Crankshaft gear learning • Crankshaft gear ring gear • Crankshaft position sensor harness • ECM
P1516	Electronic-controlled throttle steady state diagnosis error	• ECM
P2101	Electronic-controlled throttle drive second-order diagnostic error	• ECM
P2119	Throttle restores default position fault	• Electronic-controlled throttle body: dirty • Electronic-controlled throttle body: mechanical failure • ECM
P2122	Electronic throttle pedal position sensor 1# circuit voltage low	• Throttle pedal position sensor • Throttle pedal position sensor harness • ECM
P2123	Electronic throttle pedal position sensor 1# circuit voltage high	• Throttle pedal position sensor • Throttle pedal position sensor harness • ECM
P2127	Electronic throttle pedal position sensor 2# circuit voltage low	• Throttle pedal position sensor • Throttle pedal position sensor harness • ECM
P2128	Electronic throttle pedal position sensor 2# circuit voltage high	• Throttle pedal position sensor • Throttle pedal position sensor harness • ECM
P2135	Electronic throttle pedal position sensor 1# and 2# relevance fault	• Electronic-controlled throttle body • Accelerator pedal position sensor: sensor harness • ECM
P2138	Electronic throttle pedal position sensor 1# and 2# relevance fault	• Accelerator pedal assembly • Electronic accelerator pedal position sensor harness • ECM
P2187	Idling working condition fuel system overlean	• Intake pressure temperature sensor • Throttle position sensor • Front oxygen sensor • Injector • Canister solenoid valve
P2188	Idling working condition fuel system overrich	• Intake pressure temperature sensor • Throttle position sensor • Front oxygen sensor • Injector • Canister solenoid valve

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DTC diagnosis flow index

DTC	Description	Diagnostic process
P0011	Air intake VCP phase response lag	**Refer to:DTC P0011, P0012, P0016, P0026**
P0012	Intake VCP camshaft phase error high	
P0016	Intake VCP cam gear learning deviation off-limit	
P0026	Intake VCP hydraulic control valve clamped	
P0031	Front oxygen sensor heater short to low voltage	**Refer to:DTC P0031, P0032**
P0032	Front oxygen sensor heater short to high voltage	
P0037	Rear oxygen sensor heater short to low voltage	**Refer to:DTC P0037, P0038**
P0038	Rear oxygen sensor heater short to high voltage	
P0076	Intake VCP hydraulic control valve coil voltage low or open circuit	**Refer to:DTC P0076, P0077**
P0077	Intake VCP hydraulic control valve coil voltage high	
P0105	No intake air pressure sensor signal	**Refer to:DTC P0105, P0106, P0107, P0108**
P0106	Intake pressure/throttle position rationality fault	
P0107	The intake air temperature sensor circuit has too low voltage or is broken.	
P0108	The voltage of the intake air temperature sensor circuit is high.	
P0112	The voltage of the intake air temperature sensor circuit is low.	**Refer to:DTC P0112, P0113**
P0113	The intake air temperature sensor circuit has too high voltage or is broken.	
P0117	Coolant temperature sensor circuit voltage low	**Refer to:DTC P0117, P0118**
P0118	Coolant temperature sensor circuit voltage high or open circuit	
P0122	Electronic throttle position sensor 1# circuit lower voltage	**Refer to:DTC P0122, P0123, P0222, P0223**
P0123	Electronic throttle position sensor 1# circuit high voltage	
P0222	Electronic throttle position sensor 2# circuit lower voltage	
P0223	Electronic throttle position sensor 2# circuit high voltage	
P0131	Front oxygen sensor signal short to low voltage	**Refer to:DTC P0131, P0132, P0133, P0134**
P0132	Front oxygen sensor short to high voltage	
P0133	Too slow front oxygen sensor response	
P0134	Front oxygen sensor circuit broken	
P0137	Rear oxygen sensor short-circuited to low voltage	**Refer to:DTC P0137, P0138, P0140**
P0138	Rear oxygen sensor short-circuited to high voltage	
P0140	Rear oxygen sensor circuit broken	

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DTC	Description	Diagnostic process
P0171	Too dilute fuel in non-idle speed condition	**Refer to:DTC P0171, P0172, P2187, P2188**
P0172	Too concentrated fuel in non-idle speed condition	
P2187	Idling working condition fuel system overlean	
P2188	Idling working condition fuel system overrich	
P0230	Fuel pump relay fault	**Refer to:DTC P0230**
P0261	1# Cylinder nozzle circuit lower voltage fault	**Refer to:DTC P0261, P0262, P0264, P0265, P0267, P0268, P0270, P0271**
P0262	1# Cylinder nozzle circuit high voltage fault	
P0264	2# Cylinder nozzle circuit lower voltage fault	
P0265	2# Cylinder nozzle circuit high voltage fault	
P0267	3# Cylinder nozzle circuit lower voltage fault	
P0268	3# Cylinder nozzle circuit high voltage fault	
P0270	4# Cylinder nozzle circuit lower voltage fault	
P0271	4# Cylinder nozzle circuit high voltage fault	
P0300	A single cylinder or multiple cylinders misfire (catalyst damage type misfire) a single cylinder or multiple cylinders misfire (emission damage type misfire)	**Refer to:DTC P0300**
P0324	Faulty detonation control system	**Refer to:DTC P0324, P0325**
P0325	Knock control sensor fault	
P0335	Crankshaft position sensor circuit no signal	**Refer to:DTC P0335, P0336**
P0336	Crankshaft position sensor circuit signal interference	
P0340	Intake VCP camshaft position sensor state diagnosis	**Refer to:DTC P0340, P0341**
P0341	Intake VCP target wheel diagnosis fault	
P0351	Ignition coil 1# output fault	**Refer to:DTC P0351, P0352, P0353, P0354**
P0352	Ignition coil 2lb output fault	
P0353	Ignition coil 3lb output fault	
P0354	Ignition coil 4lb output fault	
P0420	Low catalytic converter efficiency	**Refer to:DTC P0420**
P0458	Canister solenoid valve output short to low voltage or short circuit	**Refer to:DTC P0458, P0459**
P0459	Canister solenoid valve output short to high voltage	
P0480	Low speed fan fault	**Refer to:DTC P0480, P0481**
P0481	High speed fan fault	
P0502	Vehicle speed sensor no signal	**Refer to:DTC P0502**
P0551	Power steering switch line voltage range/performance fault	**Refer to:DTC P0551**

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DTC	Description	Diagnostic process
P0562	System voltage low	**Refer to:TDC P0562, P0563**
P0563	System voltage high	
P0602	ECM processing fault	**Refer to:DTC P0602, P0604, P0606, P060A**
P0604	RAM error	
P0606	ECM processing fault	
P060A	ECM program fault	
P0633	Non-learning fault of immobiliser	**Refer to:DTC P0633**
P1336	58-tooth gear error not learned	**Refer to:DTC P1336**
P2122	Electronic throttle pedal position sensor 1# circuit voltage low	**Refer to:DTC P2122, P2123, P2127, P2128, P2135, P2138**
P2123	Electronic throttle pedal position sensor 1# circuit voltage high	
P2127	Electronic throttle pedal position sensor 2# circuit voltage low	
P2128	Electronic throttle pedal position sensor 2# circuit voltage high	
P2135	Electronic throttle pedal position sensor 1# and 2# relevance fault	
P2138	Electronic throttle pedal position sensor 1# and 2# relevance fault	

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List of fault symptoms

If the vehicle fails, no trouble code is detected by the engine control module (ECM), and no significant fault location is found after visual inspection and general inspection, it is recommended that troubleshooting should be carried out according to diagnostic ideas and processes of the table below. There are many and complex causes to resulting in EFI engine faults, the common suspected fault locations are listed in the following, and the detailed investigation based on this list of fault positions can solve most faults.

Symptom	Possible Cause	Recommended Measures
The automotive diagnostic equipment cannot communicate with ECM	• Power supply (ECM's power supply circuit is poor)	**Refer to:Diagnostic process for the fact that the automotive diagnostic equipment cannot communicate with ECM**
	• Circuit between ECM and automotive diagnostic equipment (broken circuit)	
	• ECM damage	
The crankshaft rotates and the engine cannot start	• Air intake system leak	**Refer to:Diagnostic process for the fact that the crankshaft rotates and the engine cannot start the diagnostic process**
	• Low fuel pressure	
	• The air cleaner is heavily clogged	
	• Coolant temperature sensor damage	
	• Electronic throttle body damage	
	• Injector leakage	
	• Ignition timing incorrect	
	• Circuit from ignition lock to ECM (broken circuit)	
	• Cylinder pressure is too low	
Instable at idling	• Ignition system fault	**Refer to:Diagnostic process for instable idle speed**
	• Air fuel ratio incorrect	
	• Electronic throttle body damage	
	• Ignition timing incorrect	
	• Cylinder compression pressure low	
	• Emission control system fault	
	• ECM damage	
Idle speed high	• Water temperature sensor	**Refer to:Diagnostic process for the fact that the idle speed is too high**
	• Electronic throttle body damage	
	• Air intake system leak	
	• ECM damage	
Slow acceleration reaction and maladjustment	• Air fuel ratio incorrect	**Refer to:Diagnostic process for slow acceleration reaction and maladjustment**
	• Fuel system fault	
	• Cylinder compression pressure low	
	• ECM damage	

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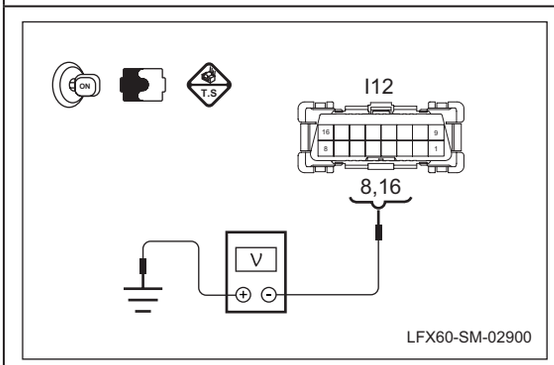
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Symptom	Possible Cause	Recommended Measures
Poor acceleration, poor performance	• Air intake system leak	**Refer to:Diagnostic process for poor acceleration and poor performance**
	• Intake pressure temperature sensor is damaged	
	• Electronic throttle body damage	
	• Air fuel ratio incorrect	
	• Ignition timing	
	• Fuel system fault	
	• Exhaust manifold blockage	
The engine will go out at the start	• Electronic throttle body damage	**Refer to:Diagnostic process for the fact that the engine will go out at the start**
	• The injector is damaged	
	• Ignition system fault	
Difficult cold start	• Coolant temperature sensor damage	**Refer to:Diagnosis procedure about the cold start is difficult**
	• Fuel system fault	
	• Ignition system fault	
	• Electronic-controlled throttle body failure	
The engine will go out when idling cold	• Ignition system fault	**Refer to:Diagnostic process for the fact that the engine will go out when idling cold**
	• Air fuel ratio incorrect	
	• Air intake system failure	
	• Cylinder compression pressure low	
	• Emission control system fault	

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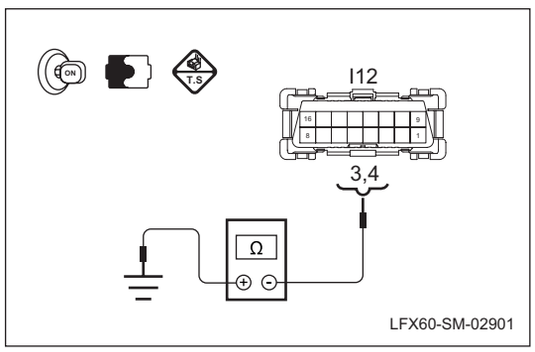
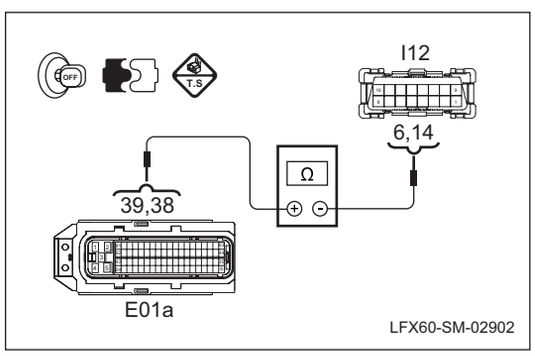
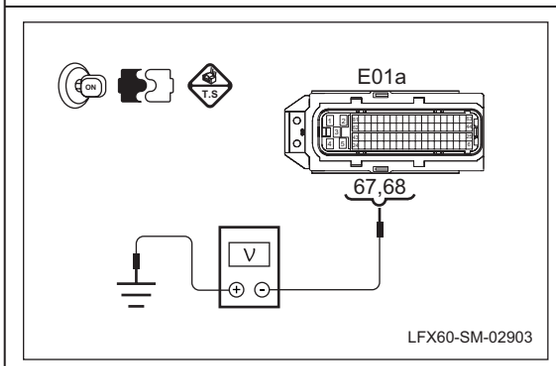
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Diagnostic process for the fact that the automotive diagnostic equipment cannot communicate with ECM

Test condition	Details/results/measures
1. Check the engine data	
	A. Operate the ignition switch to turn the power to OFF and connect the diagnostic meter. B. Operate the ignition switch to turn the power to ON state. Turn on the diagnostic meter - use the latest software version. C. Read the engine data display in the diagnostic meter. Can the diagnostic meter access to the engine system to read the data stream? →**Yes** There is intermittent fault and check the fault. →**No** To step 2.
2. Check the other module data	
	A. Read the airbag and ABS system data. Can the diagnostic meter access to the airbag system or ABS system to read the data stream? →**Yes** To step 5. →**No** To step 3.
3. Check the diagnostic interface power line.	
	A. Operate the ignition switch to turn the power to ON state. B. Measure the voltage between the 8, and 16 of the diagnostic interface I12 and the reliable ground point, with a multimeter. **Standard value:11 ~ 14 V** Is the voltage normal? →**No** Repair the diagnostic interface power line fault and replace the harness if necessary. →**Yes** To step 4.

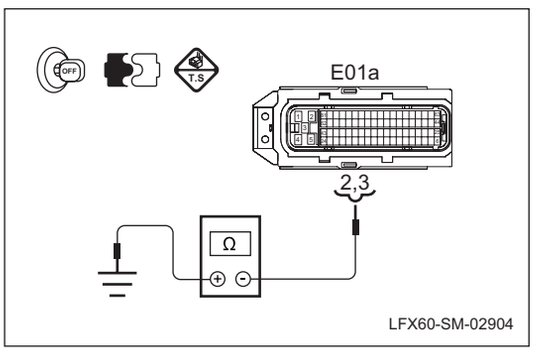
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Test condition	Details/results/measures
4. Check the diagnostic interface ground circuit.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Measure the resistance between the terminal 3 and 4 of the diagnostic interface I12 and fixed ground point with the multimeter. **Standard value:Less than 5Ω** Is the resistance normal? **→Yes** To step 5. **→No** Repair the diagnostic interface ground circuit fault and replace the harness if necessary.
5. Check the ECM communication line.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the ECM harness plug E01a. D. Measure the resistance between the terminal 38, 39 of E01a and the terminal 14 and 6 of diagnostic interface I12 with the multimeter. **Standard value:Less than 5Ω** Is the resistance normal? **→Yes** To step 6. **→No** Repair the communication line fault between the ECM and diagnostic interface and replace the harness if necessary.
6. Check the ECM power.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the ECM harness plug E01a. D. Connect the battery negative terminal. E. Operate the ignition switch to turn the power to ON state. F. Measure the voltage between the terminal 67, 68 of E01a plug and the fixed ground point with the multimeter. **Standard value:11 ~ 14 V** Is the voltage normal? **→Yes** To step 7. **→No** Repair the ECM power line fault and replace the harness if necessary.

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Test condition	Details/results/measures
7. Check the ECM grounding line.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Measure the resistance between the terminal 2, 3 of E01a plug and the fixed ground point with the multimeter. **Standard value:Less than 5Ω** Is the resistance normal? →**Yes** To step 8. →**No** Repair the ECM ground circuit fault and replace the harness if necessary.
8. Check ECM.	
	A. Replace ECM. **Refer to:ECM** Confirm that the fault has been ruled out.

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Diagnostic process for instable idle speed

Test condition	Details/results/measures
1. Check the engine DTC.	
	A. Operate the ignition switch to turn the power to OFF and connect the diagnostic meter. B. Operate the ignition switch to turn the power to OFF, turn on the diagnostic meter - use the latest software version. C. Read the engine DTC. Is there engine DTC? →**Yes** **Refer to: DTC list; execute DTC diagnosis procedures** →**No** To step 2.
2. Visual check and external check.	
	A. Start the engine and observe the engine running condition and dithering degree. B. Observe the swing degree of engine tachometer pointer and the engine speed upon stalling. C. Observe the engine stalls at normal idle speed or when the idle speed conditions are met (for example, the lamp on, gear engagement, A/C on and steering wheel operation). D. Check the engine exterior components for abnormity (such as the vacuum pipe falling, breakage; plug looseness or falling). E. Check the engine for oil leak, water leak, electrical leak or air leak. F. Check whether the exhaust pipe releases chug (indicating the bad combustion of individual cylinder), black smoke or fresh gasoline flavor. Is there any of above abnormal occurrence? →**Yes** Troubleshooting. →**No** To step 3.
3. Check the electronic throttle.	
	A. Check the electron throttle body for oil stain, carbon deposition and check the throttle for seizing. Is it OK after checking? →**No** Clean or replacement electronic throttle. →**Yes** To step 4.

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Test condition	Details/results/measures
4. Test the engine ignition system.	
	A. Operate the ignition switch to turn the power to OFF state. Disconnect the battery negative terminal. B. Remove the engine ignition coil and spark plug. C. Install the spark plug in the ignition coil and ground the spark plug through the engine. D. Execute the ignition coil action with the diagnostic meter to drive the actuator and observe the spark ignition. Is the ignition system test ok? →**Yes** To step 6. →**No** To step 5.
5. Check the ignition system for mechanical fault.	
	A. Check the ignition coil resistance and clean the plug terminal. **Standard value:9840±980Ω** B. Check the spark plug for organic carbon, ceramic insulation cracking, electrical leak, abnormal gap, electrode burning through etc. Is it OK after checking? →**Yes** To step 6. →**No** Replace the fault components.

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Test condition	Details/results/measures
6. Test the injector.	
	A. Operate the ignition switch to turn the power to OFF state and disconnect the injector plug. B. Remove the fuel distribution pipe (with injector). C. Apply the 12V battery voltage to the injector directly. D. Observe whether the injection volume of each injector complies with the standard and the atomizing is uniform. Is the injector test ok? →**Yes** To step 8. →**No** To step 7 △**Tips:** **When testing the injector inject state, if the jet is styloid other than taper or the fuel injection volume of four cylinders' injectors under the same conditions differs a lot (>5ml), replace the injector.** **Note:** **Place the sign indicating "Caution! Flammable" in the working zone when testing the fuel system.** **Ensure to work in the well-ventilated zone and arrange the fire fighting equipment.** **No smoking in the work area and keep the naked flame away.** **Accept the drained fuel in the explosion proof container and handle it correctly.**
7. Clean the injector.	
	A. Clean the injector with the injector rinsing unit. B. Test the injector again. Is the test normal? →**Yes** To step 8. →**No** Replace the injector.
8. Check the fuel supply system.	
	A. Check the fuel line for leak and clogging. B. Check the fuel filter for clogging. C. Check the fuel pressure. Is the above item normal? →**Yes** To step 9. →**No** Replace the damaged components of the fuel supply system.

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Test condition	Details/results/measures
9. Check the engine intake and exhaust system.	
	A. Check the engine intake system for leak. B. Check the intake pipe for falling, cracking, deformation and seal aging. C. Check the PCV system for air leak. D. Check the evaporative emission control system vacuum pipe for air leak. E. Check the three-way catalytic converter for clogging. Are the above items normal? →**Yes** To step 10. →**No** Repair or replace the damaged components.
10. Check the coolant temperature sensor and intake pressure/temperature sensor.	
	A. Check whether the intake pressure/ temperature sensor installation is correct. B. Remove the intake pressure temperature sensor C. Check the sensing hole for clogging. D. Check whether the coolant sensor is dirty. E. Operate the ignition switch to turn the power to ON state and read the engine intake pressure/ temperature sensor and coolant temperature sensor data stream from the diagnostic meter. Is it OK after checking? →**Yes** To step 11. →**No** Repair or replace the damaged components.
11. Check the oxygen sensor.	
	A. Check whether the front and rear oxygen sensors are installed correctly. B. Make the engine idle. Read the oxygen sensor data flow by using the automotive diagnostic equipment. Wait until the water temperature reaches the normal temperature at which the closed-loop control is activated, and then see if the oxygen sensor works properly. Is the oxygen sensor normally active? →**Yes** To step 12. →**No** Replace the oxygen sensor.

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Test condition	Details/results/measures
12. Check the cylinder pressure.	
	A. Test the cylinder compression pressure. **Refer to: Cylinder compression pressure check** **The standard cylinder pressure is 1. 2MPa** **The standard cylinder pressure is 1. 2MPa** **The maximum cylinder pressure is 1. 3MPa** **The maximum cylinder pressure difference is 0. 1MPa** Is it OK after checking? →**Yes** To step 14. →**No** To step 13.
13. Check the engine mechanical parts.	
	A. Disassemble the engine to solve the internal faults, clear the carbon deposition or remove the cylinder head. B. Check the valve and intake manifold for carbon deposition. For example: the excessive gap between the piston ring and cylinder block, cylinder gasket air leak, valve guide looseness, loose valve closure and valve carbon deposition. Is it OK after checking? →**Yes** To step 14. →**No** Repair the engine mechanical fault and replace the damaged components.
14. Check engine timing.	
	A. Check whether the engine timing gear marks are aligned and the timing gears are damaged. Is it OK after checking? →**Yes** To step 15. →**No** Replace the damaged components and regulate the engine timing.
15. Check ECM.	
	A. Replace ECM. **Refer to:ECM** Confirm that the fault has been ruled out.

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Diagnostic process for the fact that the idle speed is too high

Test condition	Details/results/measures
1. Check the engine DTC.	
	A. Operate the ignition switch to turn the power to OFF and connect the diagnostic meter. B. Operate the ignition switch to turn the power to OFF, turn on the diagnostic meter - use the latest software version. C. Read the engine DTC. Is there engine DTC? →**Yes** **Refer to: DTC list; execute DTC diagnosis procedures** →**No** To step 2.
2. Visual check and external check.	
	A. Start the engine and observe the engine operation. B. Check the engine to see if there is idling lift load signal (such as turning on the lights, engaging a gear, turning on A/C, turning the steering wheel, etc.). Is there any of the above? →**Yes** Eliminate load boost signal interference in idling mode. →**No** To step 3.
3. Check the intake system.	
	A. Check the engine intake system for leak. B. Check the intake pipe for higging upon the engine running. C. Check the intake pipe for falling, cracking, deformation and seal aging. Is it OK after checking? →**Yes** To step 4. →**No** Repair the faulty components.
4. Check the relevant service parts.	
	A. Check whether the charcoal canister solenoid valve vacuum hose is connected reliably or damaged. B. Check whether the positive crankcase ventilation vacuum tube is installed reliably or damaged. C. Check whether the brake system vacuum booster pipe is installed reliably or damaged. Is it OK after checking? →**Yes** To step 5. →**No** Repair the faulty components.

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Test condition	Details/results/measures
5. Check the electronic throttle.	
	A. Check the electron throttle body for oil stain, carbon deposition and check the throttle for seizing. Is it OK after checking? →**No** Clean or replacement electronic throttle. →**Yes** To step 6.
6. Check the coolant temperature sensor and intake pressure/temperature sensor.	
	A. Check whether the intake pressure/ temperature sensor installation is correct. B. Remove the intake pressure temperature sensor C. Check the sensing hole for clogging. D. Check whether the coolant sensor is dirty. E. Operate the ignition switch to turn the power to ON state and read the engine intake pressure/ temperature sensor and coolant temperature sensor data stream from the diagnostic meter. Is it OK after checking? →**Yes** To step 7. →**No** Repair or replace the damaged components.
7. Check ECM.	
	A. Replace ECM. **Refer to:ECM** Confirm that the fault has been ruled out.

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Diagnostic process for the fact that the crankshaft rotates and the engine cannot start the diagnostic process

Test condition	Details/results/measures
1. Check the engine DTC.	
	A. Operate the ignition switch to turn the power to OFF and connect the diagnostic meter. B. Operate the ignition switch to turn the power to OFF, turn on the diagnostic meter - use the latest software version. C. Read the engine DTC. Is there engine DTC? →**Yes** **Refer to: DTC list; execute DTC diagnosis procedures** →**No** To step 2.
2. Read the engine data stream.	
	A. Operate the ignition switch so that the power supply mode is “ON” B. Read the data of sensors including the engine intake pressure temperature sensor and water temperature sensor displayed by the automotive diagnostic equipment. Is there any abnormal data? →**Yes** Repair and rectify the abnormal data stream fault. →**No** To step 3.
3. Check the anti-theft system of the engine.	
	A. Operate the ignition switch to turn the power to ON state. B. Check whether the engine enters the anti-theft mode. Is it OK after checking? →**Yes** To step 4. →**No** Check and repair the engine anti-theft system fault.
4. Check the ignition system.	
	A. Perform spark plug ignition test. Is the test normal? →**Yes** To step 5. →**No** Check and repair the ignition system. **Refer to: Diagnostic process for spark plug failure in jump spark**

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Test condition	Details/results/measures
5. Check the fuel system.	
	A. Connect the fuel pressure gauge. B. Measure fuel pressure. **Refer to: Fuel system pressure test** Is the test normal? **→Yes** To step 6. **→No** Check and repair the fuel system. **Refer to: Diagnostic process for fuel pump failure to work**
6. Check the electronic throttle.	
	A. Gently depress the throttle and start the engine. Does the engine start normally? **→No** To step 7. **→Yes** Throttle position learning or electronic-controlled throttle replacement.
7. Check the cylinder pressure.	
	A. Test the cylinder compression pressure. **Refer to: Cylinder compression pressure check** **The standard cylinder pressure is 1. 2MPa** **The standard cylinder pressure is 1. 2MPa** **The maximum cylinder pressure is 1. 3MPa** **The maximum cylinder pressure difference is 0. 1MPa** Is it OK after checking? **→Yes** To step 9. **→No** To step 8.
8. Check the engine mechanical parts.	
	A. Disassemble the engine to solve the internal faults, clear the carbon deposition or remove the cylinder head. B. Check the valve and intake manifold for carbon deposition. For example: the excessive gap between the piston ring and cylinder block, cylinder gasket air leak, valve guide looseness, loose valve closure and valve carbon deposition. Is it OK after checking? **→Yes** To step 9. **→No** Repair the engine mechanical fault and replace the damaged components.

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Test condition	Details/results/measures
9. Check engine timing.	
	A. Check whether the engine timing gear marks are aligned and the timing gears are damaged. Is it OK after checking? →**Yes** To step 10. →**No** Replace the damaged components and regulate the engine timing.
10. Check ECM.	
	A. Replace ECM. **Refer to:ECM** Confirm that the fault has been ruled out.

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Diagnostic process for slow acceleration reaction and maladjustment

Test condition	Details/results/measures
1. Check the engine DTC.	
	A. Operate the ignition switch to turn the power to OFF and connect the diagnostic meter. B. Operate the ignition switch to turn the power to OFF, turn on the diagnostic meter - use the latest software version. C. Read the engine DTC. Is there engine DTC? →**Yes** **Refer to: DTC list; execute DTC diagnosis procedures** →**No** To step 2.
2. Check the intake system.	
	A. Check the intake pipe joints, gaskets, vacuum hose and fuel vapour system for air leak. B. Check the air filter for clogging. Is it OK after checking? →**Yes** To step 3. →**No** Repair the faulty components.
4. Check the idling.	
	A. Check whether the engine idling is normal. Is it OK after checking? →**Yes** To step 5. →**No** Repair the engine idling fault. **Refer to: Unsteady idling** **Refer to: Idling too high**
5. Check the coolant temperature sensor and intake pressure/temperature sensor.	
	A. Check whether the installation of coolant temperature sensor and intake pressure/temperature sensor is normal. B. Operate the ignition switch to turn the power to ON state and read the coolant temperature sensor and intake pressure/ temperature sensor data stream from the diagnostic meter. Is it OK after checking? →**No** Repair the faulty components. →**Yes** To step 6.

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Test condition	Details/results/measures
6. Check the electronic throttle.	
	A. Check the electronic throttle body for seizing. B. Operate the ignition switch to turn the power to ON state and execute the throttle action with the diagnostic meter. C. Check whether the throttle action is normal. Is it OK after checking? →**Yes** To step 7. →**No** Replace the throttle.
7. Check the fuel system.	
	A. Connect the fuel pressure gauge. B. Measure fuel pressure. **Refer to: Fuel system pressure test** Is the test normal? →**Yes** To step 7. →**No** Repair the fuel system abnormal pressure fault.
8. Check the exhaust system.	
	A. Check whether the exhaust system and three-way catalyst are normal. B. Check the exhaust pipe for clogging. Is it OK after checking? →**Yes** To step 9. →**No** Repair the faulty components.
9. Check the cylinder pressure.	
	A. Test the cylinder compression pressure. **Refer to: Cylinder compression pressure check** **The standard cylinder pressure is 1. 2MPa** **The standard cylinder pressure is 1. 2MPa** **The maximum cylinder pressure is 1. 3MPa** **The maximum cylinder pressure difference is 0. 1MPa** Is it OK after checking? →**Yes** To step 11. →**No** To step 10.

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Test condition	Details/results/measures
10. Check the engine mechanical parts.	
	A. Disassemble the engine to solve the internal faults, clear the carbon deposition or remove the cylinder head. B. Check the valve and intake manifold for carbon deposition. For example: the excessive gap between the piston ring and cylinder block, cylinder gasket air leak, valve guide looseness, loose valve closure and valve carbon deposition. Is it OK after checking? →**Yes** To step 11. →**No** Repair the engine mechanical fault and replace the damaged components.
11. Check engine timing.	
	A. Check whether the engine timing gear marks are aligned and the timing gears are damaged. Is it OK after checking? →**Yes** To step 12. →**No** Replace the damaged components and regulate the engine timing.
12. Check ECM.	
	A. Replace ECM. **Refer to:ECM** Confirm that the fault has been ruled out.

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Diagnostic process for poor acceleration and poor performance

Test condition	Details/results/measures
1. Check the engine DTC.	
	A. Operate the ignition switch to turn the power to OFF and connect the diagnostic meter. B. Operate the ignition switch to turn the power to OFF, turn on the diagnostic meter - use the latest software version. C. Read the engine DTC. Is there engine DTC? →Yes Refer to: DTC list; execute DTC diagnosis procedures →No To step 2.
2. Check the intake system.	
	A. Check the intake pipe joints, gaskets, vacuum hose and fuel vapour system for air leak. B. Check the air filter for clogging. Is it OK after checking? →Yes To step 3. →No Repair the faulty components.
3. Check the idling.	
	A. Check whether the engine idling is normal. Is it OK after checking? →Yes To step 4. →No Repair the engine idling fault. Refer to: Unsteady idling Refer to: Idling too high
4. Check the coolant temperature sensor and intake pressure/temperature sensor.	
	A. Check whether the installation of coolant temperature sensor and intake pressure/temperature sensor is normal. B. Operate the ignition switch to turn the power to ON state and read the coolant temperature sensor and intake pressure/ temperature sensor data stream from the diagnostic meter. Is it OK after checking? →No Repair the faulty components. →Yes To step 5.

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Test condition	Details/results/measures
5. Check the electronic throttle.	
	A. Check the electronic throttle body for seizing. B. Operate the ignition switch to turn the power to ON state and execute the throttle action with the diagnostic meter. C. Check whether the throttle action is normal. Is it OK after checking? →**Yes** To step 6. →**No** Replace the throttle.
6. Check the fuel system.	
	A. Connect the fuel pressure gauge. B. Measure fuel pressure. **Refer to: Fuel system pressure test** Is the test normal? →**Yes** To step 7. →**No** Repair the fuel system abnormal pressure fault.
7. Check the exhaust system.	
	A. Check whether the exhaust system and three-way catalyst are normal. B. Check the exhaust pipe for clogging. Is it OK after checking? →**Yes** To step 8. →**No** Repair the faulty components.
8. Check the cylinder pressure.	
	A. Test the cylinder compression pressure. **Refer to: Cylinder compression pressure check** **The standard cylinder pressure is 1. 2MPa** **The standard cylinder pressure is 1. 2MPa** **The maximum cylinder pressure is 1. 3MPa** **The maximum cylinder pressure difference is 0. 1MPa** Is it OK after checking? →**Yes** To step 10. →**No** To step 9.

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Test condition	Details/results/measures
9. Check the engine mechanical parts.	
	A. Disassemble the engine to solve the internal faults, clear the carbon deposition or remove the cylinder head. B. Check the valve and intake manifold for carbon deposition. For example: the excessive gap between the piston ring and cylinder block, cylinder gasket air leak, valve guide looseness, loose valve closure and valve carbon deposition. Is it OK after checking? →**Yes** To step 10. →**No** Repair the engine mechanical fault and replace the damaged components.
10. Check engine timing.	
	A. Check whether the engine timing gear marks are aligned and the timing gears are damaged. Is it OK after checking? →**Yes** To step 11. →**No** Replace the damaged components and regulate the engine timing.
11. Check ECM.	
	A. Replace ECM. **Refer to:ECM** Confirm that the fault has been ruled out.

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Diagnostic process for the fact that the engine will go out when idling cold

Test condition	Details/results/measures
1. Check the engine DTC.	
	A. Operate the ignition switch to turn the power to OFF and connect the diagnostic meter. B. Operate the ignition switch to turn the power to OFF, turn on the diagnostic meter - use the latest software version. C. Read the engine DTC. Is there engine DTC? →**Yes** **Refer to: DTC list; execute DTC diagnosis procedures** →**No** To step 2.
2. Visual check and external check.	
	A. Start the engine and observe the engine running condition and dithering degree. B. Observe the swing degree of engine tachometer pointer and the engine speed upon stalling. C. See if the engine goes out normally when idling or goes out in line with idling (such as turning on the lights, engaging a gear, turning on A/C, turning the steering wheel, etc.). D. Check the engine exterior components for abnormity (such as the vacuum pipe falling, breakage; plug looseness or falling). E. Check the engine for oil leak, water leak, electrical leak or air leak. F. Check whether the exhaust pipe releases chug (indicating the bad combustion of individual cylinder), black smoke or fresh gasoline flavor. Is there any of above abnormal occurrence? →**Yes** Troubleshooting. →**No** To step 3.
3. Check the intake system.	
	A. Check the engine intake system for leak. B. Check the intake pipe for higging upon the engine running. C. Check the intake pipe for falling, cracking, deformation and seal aging. Is it OK after checking? →**Yes** To step 4. →**No** Repair the faulty components.

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Test condition	Details/results/measures
4. Check the electronic throttle.	
	A. Check the electron throttle body for oil stain, carbon deposition and check the throttle for seizing. Is it OK after checking? →**No** Clean or replacement electronic throttle. →**Yes** To step 5.
5. Check the coolant temperature sensor and intake pressure/temperature sensor.	
	A. Check whether the intake pressure/ temperature sensor installation is correct. B. Remove the intake pressure temperature sensor C. Check the sensing hole for clogging. D. Check whether the coolant sensor is dirty. E. Operate the ignition switch to turn the power to ON state and read the engine intake pressure/ temperature sensor and coolant temperature sensor data stream from the diagnostic meter. Is it OK after checking? →**Yes** To step 6. →**No** Repair or replace the damaged components.
6. Check the fuel system.	
	A. Connect the fuel pressure gauge. B. Measure fuel pressure. **Refer to: Fuel system pressure test** Is the test normal? →**Yes** To step 7. →**No** Repair the fuel system abnormal pressure fault.

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Test condition	Details/results/measures
7. Check the cylinder pressure.	
	A. Test the cylinder compression pressure. **Refer to: Cylinder compression pressure check** **The standard cylinder pressure is 1. 2MPa** **The standard cylinder pressure is 1. 2MPa** **The maximum cylinder pressure is 1. 3MPa** **The maximum cylinder pressure difference is 0. 1MPa** Is it OK after checking? →**Yes** To step 9. →**No** To step 8.
8. Check the engine mechanical parts.	
	A. Disassemble the engine to solve the internal faults, clear the carbon deposition or remove the cylinder head. B. Check the valve and intake manifold for carbon deposition. For example: the excessive gap between the piston ring and cylinder block, cylinder gasket air leak, valve guide looseness, loose valve closure and valve carbon deposition. Is it OK after checking? →**Yes** To step 9. →**No** Repair the engine mechanical fault and replace the damaged components.
9. Check engine timing.	
	A. Check whether the engine timing gear marks are aligned and the timing gears are damaged. Is it OK after checking? →**Yes** To step 10. →**No** Replace the damaged components and regulate the engine timing.
10. Check ECM.	
	A. Replace ECM. **Refer to:ECM** Confirm that the fault has been ruled out.

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Diagnostic process for the fact that the engine will go out at the start

Test condition	Details/results/measures
1. Check the engine DTC.	
	A. Operate the ignition switch to turn the power to OFF and connect the diagnostic meter. B. Operate the ignition switch so that the power mode is “ON”, and turn on the automotive diagnostic equipment - using the latest software version. C. Read the engine DTC. Is there engine DTC? →**Yes** **Refer to: DTC list; execute DTC diagnosis procedures** →**No** To step 2.
2. Visual check and external check.	
	A. Start the engine and observe the engine running condition and dithering degree. B. Observe the swing degree of engine tachometer pointer and the engine speed upon stalling. C. Observe the engine stalls at normal idle speed or when the idle speed conditions are met (for example, the lamp on, gear engagement, A/C on and steering wheel operation). D. Check the engine exterior components for abnormity (such as the vacuum pipe falling, breakage; plug looseness or falling). Is there any of above abnormal occurrence? →**Yes** Troubleshooting. →**No** To step 3.
3. Check the electronic throttle.	
	A. Check the electron throttle body for oil stain, carbon deposition and check the throttle for seizing. B. Operate the ignition switch to turn the power to ON state and execute the throttle action with the diagnostic meter. C. Check whether the throttle action is normal. Is it OK after checking? →**No** Clean or replacement electronic throttle. →**Yes** To step 4.

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Test condition	Details/results/measures
4. Test the engine ignition system.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Remove the engine ignition coil, and spark plug. D. Install the spark plug into the ignition coil and ground the spark plug through the engine. E. Using the automotive diagnostic equipment, drive the actuator to perform the ignition coil action and observe the ignition condition of the spark plug. Is the ignition system test ok? →**Yes** To step 6. →**No** To step 5.
5. Check the ignition system for mechanical fault.	
	A. Check the ignition coil resistance and clean the plug terminal. **Standard value:9840±980Ω** B. Check the spark plug for organic carbon, ceramic insulation cracking, electrical leak, abnormal gap, electrode burning through etc. Is it OK after checking? →**Yes** To step 6. →**No** Replace the fault components.

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Test condition	Details/results/measures
6. Test the injector.	
	A. Operate the ignition switch to turn the power to OFF state and disconnect the injector plug. B. Remove the fuel distribution pipe (with injector). C. Apply the 12V battery voltage to the injector directly. D. Observe whether the injection volume of each injector complies with the standard and the atomizing is uniform. Is the injector test ok? →**Yes** To step 8. →**No** To step 7 △ **Tips:** **When testing the injector inject state, if the jet is styloid other than taper or the fuel injection volume of four cylinders' injectors under the same conditions differs a lot (>5ml), replace the injector.** **Note:** **Place the sign indicating "Caution! Flammable" in the working zone when testing the fuel system.** **Ensure to work in the well-ventilated zone and arrange the fire fighting equipment.** **No smoking in the work area and keep the naked flame away.** **Accept the drained fuel in the explosion proof container and handle it correctly.**
7. Clean the injector.	
	A. Clean the injector with the injector rinsing unit. B. Test the injector again. Is the test normal? →**Yes** To step 8. →**No** Replace the injector.
8. Check the fuel supply system.	
	A. Check the fuel line for leak and clogging. B. Check the fuel filter for clogging. C. Check the fuel pressure. **Refer to: Fuel pressure test** Is the above item normal? →**Yes** To step 9. →**No** Replace the damaged components of the fuel supply system.

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Test condition	Details/results/measures
9. Check the engine intake and exhaust system.	
	A. Check the engine intake system for leak. B. Check the intake pipe for falling, cracking, deformation and seal aging. C. Check the PCV system for air leak. D. Check the evaporative emission control system vacuum pipe for air leak. E. Check the three-way catalytic converter for clogging. Are the above items normal? →**Yes** To step 10. →**No** Repair or replace the damaged components.
10. Check the cylinder pressure.	
	A. Test the cylinder compression pressure. **Refer to: Cylinder compression pressure check** **The standard cylinder pressure is 1. 2MPa** **The standard cylinder pressure is 1. 2MPa** **The maximum cylinder pressure is 1. 3MPa** **The maximum cylinder pressure difference is 0. 1MPa** Is it OK after checking? →**Yes** To step 12. →**No** To step 11.
11. Check the engine mechanical parts.	
	A. Disassemble the engine to solve the internal faults, clear the carbon deposition or remove the cylinder head. B. Check the valve and intake manifold for carbon deposition. For example: the excessive gap between the piston ring and cylinder block, cylinder gasket air leak, valve guide looseness, loose valve closure and valve carbon deposition. Is it OK after checking? →**Yes** To step 12. →**No** Repair the engine mechanical fault and replace the damaged components.

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Test condition	Details/results/measures
12. Check engine timing.	
	A. Check whether the engine timing gear marks are aligned and the timing gears are damaged. Is it OK after checking? →**Yes** To step 13. →**No** Replace the damaged components and regulate the engine timing.
13. Check ECM.	
	A. Replace ECM. **Refer to:ECM** Confirm that the fault has been ruled out.

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Diagnosis process for cold start difficulties

Test condition	Details/results/measures
1. Check the engine DTC.	
	A. Operate the ignition switch to turn the power to OFF and connect the diagnostic meter. B. Operate the ignition switch to turn the power to OFF, turn on the diagnostic meter - use the latest software version. C. Read the engine DTC. Is there engine DTC? →**Yes** **Refer to: DTC list; execute DTC diagnosis procedures** →**No** To step 2.
2. Check the water temperature sensor.	
	A. Check whether the water temperature sensor plug is normal. B. Operate the ignition switch so that the power mode is “ON”, and read the water temperature sensor data flow by using the automotive diagnostic equipment. Is it OK after checking? →**Yes** To step 3. →**No** Check and repair the water temperature sensor fault.
3. Check the electronic throttle.	
	A. Check the electron throttle body for oil stain, carbon deposition and check the throttle for seizing. B. Gently step on the throttle. Does the engine start properly? Is it OK after checking? →**No** Clean or replacement electronic throttle. →**Yes** To step 4.

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Test condition	Details/results/measures
4. Test the engine ignition system.	
	A. Operate the ignition switch to turn the power to OFF state. Disconnect the battery negative terminal. B. Remove the engine ignition coil and spark plug. C. Install the spark plug in the ignition coil and ground the spark plug through the engine. D. Execute the ignition coil action with the diagnostic meter to drive the actuator and observe the spark ignition. Is the ignition system test ok? →**Yes** To step 6. →**No** To step 5.
4. Check the ignition system for mechanical fault.	
	A. Check the ignition coil resistance and clean the plug terminal. **Standard value:9840±980Ω** B. Check the spark plug for organic carbon, ceramic insulation cracking, electrical leak, abnormal gap, electrode burning through etc. Is it OK after checking? →**Yes** To step 5. →**No** Replace the fault components.
5. Check the fuel supply system.	
	A. Check the fuel line for leak and clogging. B. Check the fuel filter for clogging. C. Check the fuel pressure. **Refer to: Fuel pressure test** Is the above item normal? →**Yes** To step 6. →**No** Replace the damaged components of the fuel supply system.

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Test condition	Details/results/measures
6. Test the injector.	
	A. Operate the ignition switch to turn the power to OFF state and disconnect the injector plug. B. Remove the fuel distribution pipe (with injector). C. Apply the 12V battery voltage to the injector directly. D. Observe whether the injection volume of each injector complies with the standard and the atomizing is uniform. Is the injector test ok? →**Yes** To step 8. →**No** To step 7. △**Tips:** **When testing the injector inject state, if the jet is styloid other than taper or the fuel injection volume of four cylinders' injectors under the same conditions differs a lot (>5ml), replace the injector.** **Note:** **Place the sign indicating "Caution! Flammable" in the working zone when testing the fuel system.** **Ensure to work in the well-ventilated zone and arrange the fire fighting equipment.** **No smoking in the work area and keep the naked flame away.** **Accept the drained fuel in the explosion proof container and handle it correctly.**
7. Clean the injector.	
	A. Clean the injector with the injector rinsing unit. B. Test the injector again. Is the test normal? →**Yes** To step 8. →**No** Replace the injector.

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Test condition	Details/results/measures
8. Check the cylinder pressure.	
	A. Test the cylinder compression pressure. **Refer to: Cylinder compression pressure check** **The standard cylinder pressure is 1. 2MPa** **The standard cylinder pressure is 1. 2MPa** **The maximum cylinder pressure is 1. 3MPa** **The maximum cylinder pressure difference is 0. 1MPa** Is it OK after checking? →**Yes** To step 9. →**No** To step 10.
9. Check engine timing.	
	A. Check whether the engine timing gear marks are aligned and the timing gears are damaged. Is it OK after checking? →**Yes** To step 10. →**No** Replace the damaged components and regulate the engine timing.
10. Check the engine mechanical parts.	
	A. Disassemble the engine to solve the internal faults, clear the carbon deposition or remove the cylinder head. B. Check the valve and intake manifold for carbon deposition. For example: the excessive gap between the piston ring and cylinder block, cylinder gasket air leak, valve guide looseness, loose valve closure and valve carbon deposition. Is it OK after checking? →**Yes** To step 11. →**No** Repair the engine mechanical fault and replace the damaged components.
11. Check ECM.	
	A. Replace ECM. **Refer to:ECM** Confirm that the fault has been ruled out.

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DTC P0011, P0012, P0016, P0026

DTC description

DTC	Description	Definition
P0011	• Air intake VCP phase response lag	• The intake camshaft position (CMP) actuator is connected to the intake camshaft and is operated by hydraulic pressure to change the angle of the intake camshaft with respect to the crankshaft position (CKP). • The intake VVT solenoid valve is supplied with power from the main relay, and the ECM controls the grounding with a pulse width modulation signal. • The oil pressure causes a safety spool valve fixed in the camshaft position actuator mechanism at the front of the camshaft to act. When the safety slide valve acts, the engine oil is introduced to the camshaft position actuator to make the camshaft rotate. • The intake camshaft position actuator can change the cam operating angle by 50° at the maximum.
P0012	• Air intake VCP camshaft phase error high	
P0016	• Air intake VCP cam gear learning deviation off-limit	
P0026	• Air intake VCP hydraulic control valve clamped	

Possible reasons

DTC	Detection strategy	Set the condition (control strategy)	Define the fault location
P0011	• The intake VCP action is abnormal.	• Air intake VCP phase response lag	• Intake VCP valve • Intake camshaft position (CMP) actuator
P0012		• Air intake VCP camshaft phase error high	
P0016		• Air intake VCP cam gear learning deviation off-limit	
P0026		• Intake VCP cam teeth learning deviation	

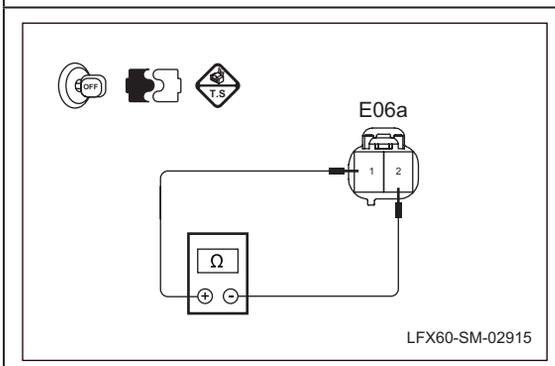
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Diagnostic process

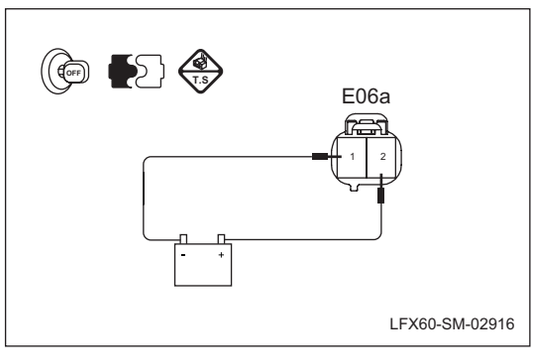
△ Tips:

Before performing this diagnosis procedure, observe the diagnostic meter data list and analyze the data accuracy to help the fast troubleshooting.

Test condition	Details/results/measures
1. Check the DTC.	
	A. Connect the diagnostic meter to the diagnostic interface. B. Operate the ignition switch to turn the power to ON state. C. Turn on the diagnostic meter and select the following menu items: power system/engine system (Delphi VVTECT) to read DTC. D. Is there a trouble code other than P0011, P0012, P0016, and P0026 in the control system? **→Yes** **Refer to: DTC list; determine whether the fault is caused by other DTC** **→No** To step 2.
2. Check the engine oil	
	A. Check whether the engine oil is missing or the state is abnormal. B. Test the engine oil pressure for normality. Is it OK after checking? **→Yes** To step 3. **→No** Replace oil or repair the fault with oil pressure anomaly.
3. Check the air intake VVT valve resistance.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the air intake VVT valve harness plug E06a. D. Measure the resistance between the 1st and 2nd terminals of the intake VVT valve with a multimeter. **Standard value:9. 4 ~ 10. 6 Ω(20 °C)** Is it OK after checking? **→Yes** To step 4. **→No** Replace the air intake VVT valve.

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Test condition	Details/results/measures
4. Test the intake VVT valve action.	
	A. Operate the ignition switch to turn the power to OFF state. B. Remove the intake VVT valve. C. Connect the battery positive terminal to the 1st terminal of the intake VVT valve and the negative terminal to the 2nd terminal of the intake VVT valve. D. Check whether the intake VVT valve core action is normal. Is it OK after checking? →**Yes** To step 5. →**No** Replace the air intake VVT valve.
5. Check the intake camshaft position (CMP) actuator and the engine machinery.	
	A. Check the intake camshaft position (CMP) actuator. B. Check the engine machinery. Is it OK after checking? →**Yes** To step 6. →**No** Check and repair the defective intake camshaft position (CMP) actuator and mechanical parts of the engine.
6. Check ECM.	
	A. Replace ECM. **Refer to:ECM** B. Confirm the DTC with the diagnostic meter. C. Read the sensor data stream. D. Ensure there is no DTC and the data is normal.

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DTC P0076, and P0077

DTC description

DTC	Description	Definition
P0076	• Intake VCP hydraulic control valve coil: low voltage or broken circuit	• The ECM determines whether the control circuit is open, shorted to ground, or shorted to voltage by monitoring the feedback signal. If the ECM detects the fact that the control circuit voltage is within a predetermined range when the control circuit is disconnected by instructions, the diagnostic trouble code is set. • When the hydraulic control valve coil is shorted to the 12V power supply, this is judged as fault. DTC is set to P0076. VVT function cannot be used. The operation of the engine is relatively stable. You can drive the vehicle. • When the hydraulic control valve coil is shorted to ground or disconnected, this is judged as fault. DTC is set to P0077. VVT function cannot be used. The operation of the engine is relatively stable. You can drive the vehicle. When the matter is shorted to ground, since the OCV valve is normally open, the VVT opening is at the maximum, it is likely that the start of the vehicle is difficult and the idling engine goes out.
P0077	• Intake VCP hydraulic control valve coil: high voltage	

Possible reasons

DTC	Detection strategy	Define the fault location
P0076	• Checking the hardware or harness	• Harness or plug intake VCP valve
P0077		

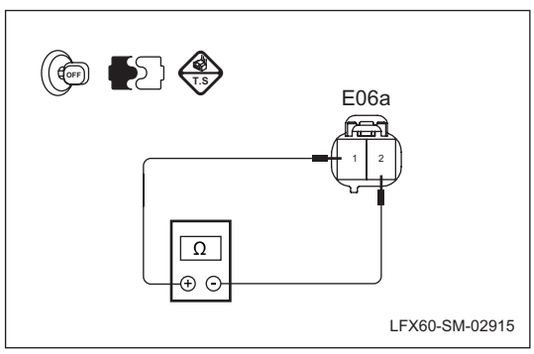
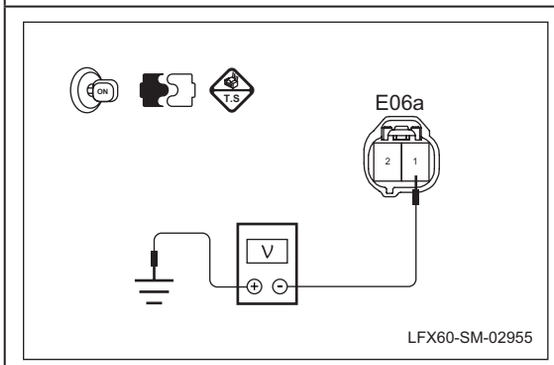
Diagnostic process

△ **Tips:**
Before performing this diagnosis procedure, observe the diagnostic meter data list and analyze the data accuracy to help the fast troubleshooting.

Test condition	Details/results/measures
1. Check the DTC.	
	A. Connect the diagnostic meter to the diagnostic interface. B. Operate the ignition switch to turn the power to ON state. C. Turn on the diagnostic meter and select the following menu items: power system/engine system (Delphi VVTECT) to read DTC. D. Is there a trouble code other than P0076 and P0077 in the control system? →**Yes** **Refer to: DTC list; determine whether the fault is caused by other DTC** →**No** To step 2.

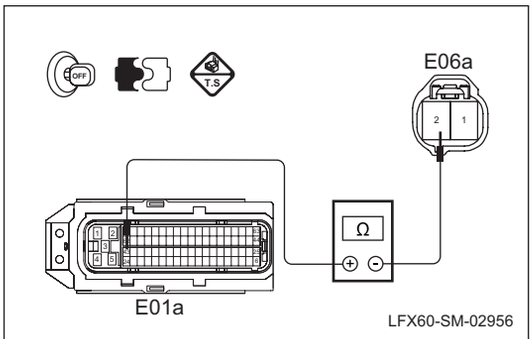
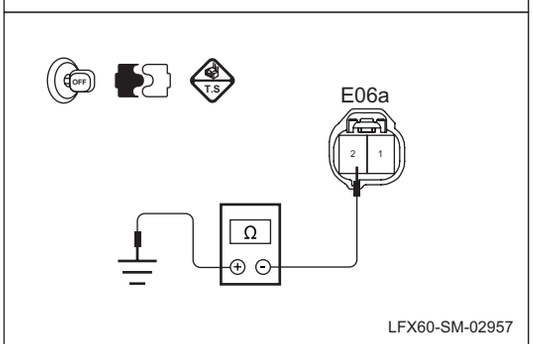
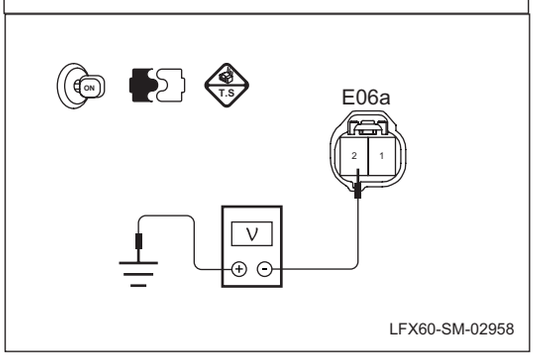
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Test condition	Details/results/measures
2. General Inspection.	
	A. Check the intake VCP hydraulic control valve harness connector for loosening, aging, damage and other abnormalities. Is it OK after checking? →**Yes** To step 3. →**No** Repair the fault parts.
3. Check the air intake VVT valve resistance.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the air intake VVT valve harness plug E06a. D. Measure the resistance between the 1st and 2nd terminals of the intake VVT valve with a multimeter. **Standard value:9. 4 ~ 10. 6 Ω(20 °C)** Is it OK after checking? →**Yes** To step 4. →**No** Replace the air intake VVT valve.
4. Check the VVT valve power supply line.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the VVT valve harness plug E06a. D. Connect the battery negative terminal. E. Operate the ignition switch to turn the power to ON state. F. Measure the voltage between the VVT valve harness connector E06a terminal 1 and the reliable ground point with a multimeter. **Standard value:11 ~ 14 V** Is the voltage normal? →**Yes** To step 5. →**No** Check and repair the VVT valve power supply line fault and replace the wiring harness if necessary.

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Test condition	Details/results/measures
5. Check the VVT valve control circuit.	
 LFX60-SM-02956  LFX60-SM-02957  LFX60-SM-02958	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the VVT valve harness plug E06a. D. Disconnect the ECM harness plug E01a. E. Measure the resistance between the 2nd terminal of the VVT valve harness connector E06a and the 43th terminal of the ECM harness connector E01a with a multimeter. **Standard value:Less than 5Ω** F. Measure the voltage between the VVT valve harness connector E06a terminal 2 and the reliable ground point with a multimeter. **Standard value:10 MΩ or higher** G. Connect the battery negative terminal. H. Operate the ignition switch to turn the power to ON state. I. Measure the voltage between the VVT valve harness connector E06a terminal 2 and the reliable ground point with a multimeter. **Standard value:0V** Is it OK after checking? →**Yes** To step 6. →**No** Check and repair the VVT valve control circuit fault and replace the wiring harness if necessary.
6. Check ECM.	
	A. Replace ECM. **Refer to:ECM** B. Confirm the DTC with the diagnostic meter. C. Read the sensor data stream. D. Ensure there is no DTC and the data is normal.

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DTC P0105, P0106, P0107, P0108

DTC description

DTC	Description	Definition
P0105	• No intake air pressure sensor signal	• The circuit of the sensor consists of the following: 5V reference voltage circuit, low reference voltage circuit, and sensor signal circuit. • The ECM monitors the sensor signal to determine whether the voltage is outside the normal range.
P0106	• Air intake pressure/throttle position reasonableness faulty	
P0107	• Inlet pressure sensor line: low voltage, open circuit	
P0108	• The voltage of the intake air temperature sensor circuit is high.	

Possible reasons

DTC	Detection strategy	Define the fault location
P0105	• Hardware or line check	• Harness or plug • Intake pressure sensor • ECM
P0106		
P0107		
P0108		

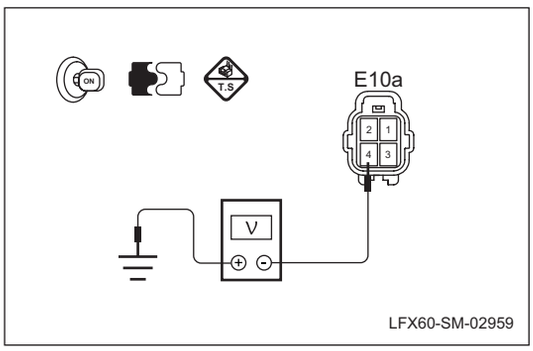
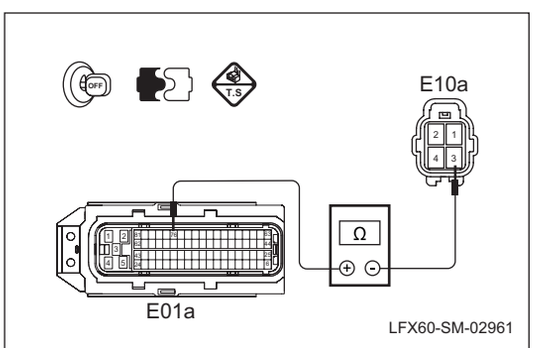
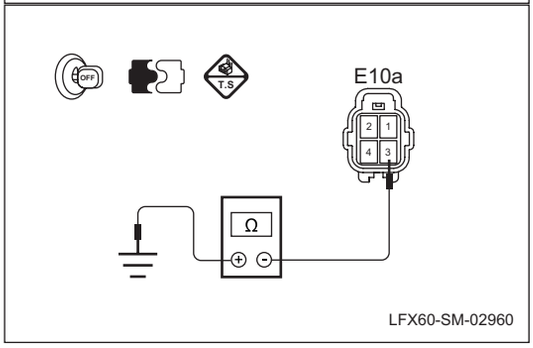
Diagnostic process

△ **Tips:**
Before performing this diagnosis procedure, observe the diagnostic meter data list and analyze the data accuracy to help the fast troubleshooting.

Test condition	Details/results/measures
1. Check the DTC.	
	A. Connect the diagnostic meter to the diagnostic interface. B. Operate the ignition switch to turn the power to ON state. C. Turn on the diagnostic meter and select the following menu items: power system/engine system (Delphi VVTECT) to read DTC. D. Is there a trouble code other than P0105, P0106, P0107, and P0108 in the control system? →**Yes** **Refer to: DTC list; determine whether the fault is caused by other DTC** →**No** To step 2.

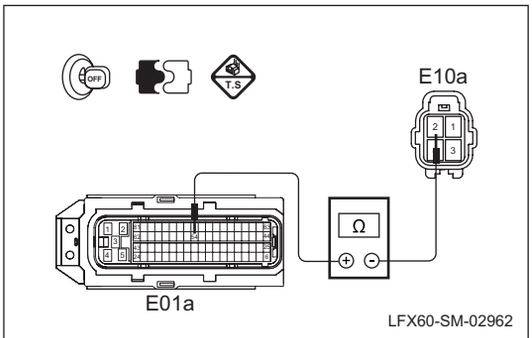
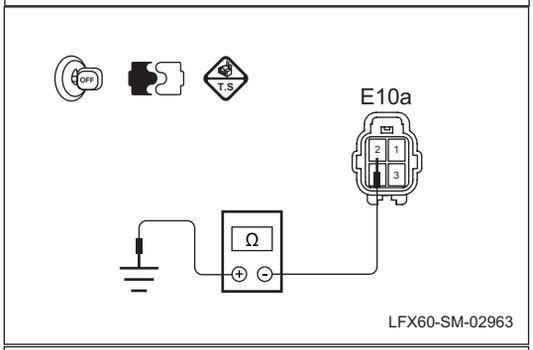
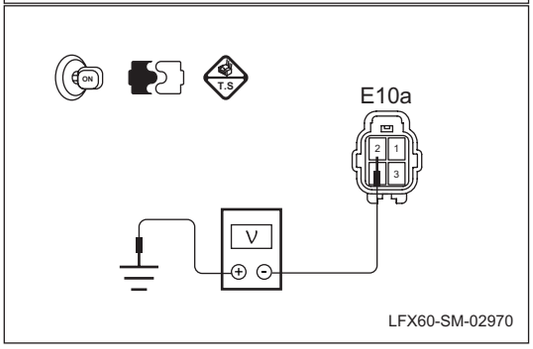
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Test condition	Details/results/measures
2. General Inspection.	
	A. Check the intake pressure sensor harness connector for loosening, aging, damage and other abnormalities. Is it OK after checking? →**Yes** To step 3. →**No** Repair the fault parts.
3. Check the intake pressure sensor power supply line.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the intake pressure sensor harness connector E10a. D. Connect the battery negative terminal. E. Operate the ignition switch to turn the power to ON state. F. Measure the voltage between the intake pressure sensor harness connector E10a terminal 4 and the reliable ground point with a multimeter. **Standard value:4. 5 ~ 5. 5 V** Is the voltage normal? →**Yes** To step 4. →**No** Check and repair the intake pressure sensor power supply line fault and replace the wiring harness if necessary.
4. Check the intake pressure sensor low reference voltage line.	
 	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the intake pressure sensor harness plug E10a. D. Disconnect the ECM harness plug E01a. E. Measure the resistance between the intake pressure sensor harness plug E10a terminal 3 and ECM harness plug E01a terminal 76 with the multimeter. **Standard value:Less than 5Ω** F. Measure the resistance between the intake pressure sensor harness plug E10a terminal 3 and the fixed ground point with the multimeter. **Standard value:10 MΩ or higher** Is it OK after checking? →**Yes** To step 5. →**No** Repair the intake pressure sensor low reference voltage line fault and replace the harness if necessary.

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Test condition	Details/results/measures
5. Check the intake pressure sensor signal line.	
 LFX60-SM-02962  LFX60-SM-02963  LFX60-SM-02970	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the intake pressure sensor harness plug E10a. D. Disconnect the ECM harness plug E01a. E. Measure the resistance between the intake pressure sensor harness plug E10a terminal 2 and ECM harness plug E01a terminal 54 with the multimeter. **Standard value:Less than 5Ω** F. Measure the resistance between the intake pressure sensor harness plug E10a terminal 2 and the fixed ground point with the multimeter. **Standard value:10 MΩ or higher** G. Connect the battery negative terminal. H. Operate the ignition switch to turn the power to ON state. I. Measure the voltage between the intake pressure sensor harness plug E10a terminal 2 and the fixed ground point with the multimeter. **Standard value:0 V** Is it OK after checking? **→Yes** To step 6. **→No** Repair the intake pressure sensor low reference voltage line fault and replace the harness if necessary.
6. Check the intake pressure sensor.	
	A. Connect the diagnostic meter to the diagnostic interface. B. Operate the ignition switch to turn the power to ON state and press the power key of the diagnostic meter. C. Select the following menu items: Power System/Engine System (Delphi VVTETC)/Read Data Flow/Manifold Absolute Pressure. **Standard value:101 kPa** C. Start the engine, run the water temperature to 85°C, read the pressure value. **Standard value:40 ± 10 kPa** Is it OK after checking? **→Yes** To step 7. **→No** Check the intake pressure sensor. **Refer to: Replacement of intake pressure/ temperature sensor**

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Test condition	Details/results/measures
7. Check ECM.	
	A. Replace ECM. **Refer to:ECM** B. Confirm the DTC with the diagnostic meter. C. Read the sensor data stream. D. Ensure there is no DTC and the data is normal.

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DTC P0112, P0113

DTC description

DTC	Description	Definition
P0112	• Intake air temperature sensor line: low voltage	• The function of the intake air temperature sensor is to detect the intake air temperature and convert the intake air temperature signal into an electrical signal to the ECM so that the ECM corrects the fuel injection time and ignition time and so that the engine is at its best working state. • The intake air temperature sensor uses a negative temperature coefficient (NTC) thermistor, whose resistance value decreases with increasing temperature. ECM provides a 5V reference voltage to the 4th terminal of the intake air pressure sensor harness connector E10a via the 66th terminal of the E01a. • When the intake air temperature/pressure sensor is in a cold state, the thermistor value used to measure the temperature is high. When the air temperature rises, the resistance decreases. When the resistance value is relatively high, the ECM will detect a relatively high voltage on the signal circuit. With the decrease of the resistance value, the voltage of the intake air temperature signal circuit detected by the ECM is also low.
P0113	• Intake air temperature sensor line: high voltage or broken circuit	

Possible reasons

DTC	Detection strategy	Define the fault location
P0112	• Hardware or line check	• Harness or plug • Intake pressure temperature sensor • ECM
P0113		

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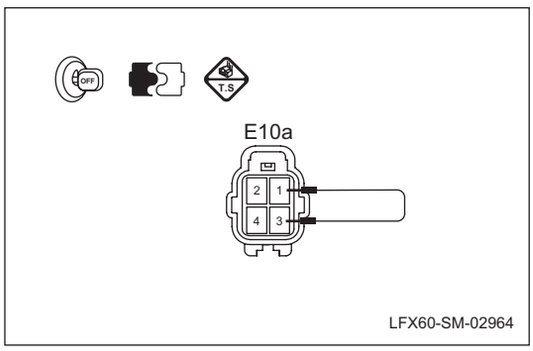
Diagnostic process

△ **Tips:**
Before performing this diagnosis procedure, observe the diagnostic meter data list and analyze the data accuracy to help the fast troubleshooting.

Test condition	Details/results/measures
1. Check the DTC.	
	A. Connect the diagnostic meter to the diagnostic interface. B. Operate the ignition switch to turn the power to ON state. C. Turn on the diagnostic meter and select the following menu items: power system/engine system (Delphi VVTECT) to read DTC. D. Is there a trouble code other than P0112 and P0113 in the control system? →**Yes** **Refer to: DTC list; determine whether the fault is caused by other DTC** →No To step 2.
2. General Inspection.	
	A. Check the intake temperature sensor harness connector for loosening, aging, damage and other abnormalities. Is it OK after checking? →**Yes** To step 3. →**No** Repair the fault parts.
3. Read the intake air temperature data stream.	
	A. Connect the diagnostic meter to the diagnostic interface. B. Operate the ignition switch to turn the power to ON state and press the power key of the diagnostic meter. C. Select the following menu items: Power System/Engine System/Read Data Flow/Air Intake Temperature. **Temperature: the same as the actual intake air temperature** Is it OK after checking? →**Yes** Check the intermittent fault. →**No** If the read value is -40°C, go to Step 4. If the value read out is 130°C or higher, go to step 5.

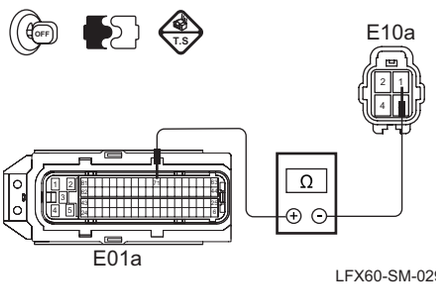
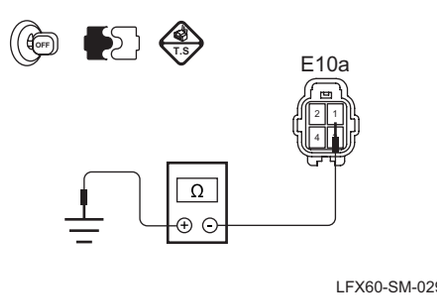
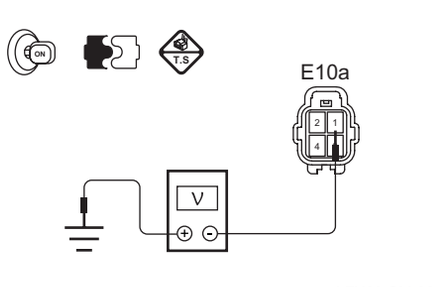
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Test condition	Details/results/measures
4. Check the intake pressure sensor signal line for open circuit.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the intake temperature sensor harness plug E10a. D. Connect the 1st with 3rd terminals of the intake air temperature sensor harness connector E10a with fine wires. E. Connect the battery negative terminal. F. Start the engine. G. Read the intake air temperature on the automotive diagnostic equipment. **Temperature: 266. 00 ° F or higher** Is it OK after checking? **→Yes** Replace the intake temperature sensor. **Refer to: Replacement of intake pressure/ temperature sensor** **→No** To step 6.
5. Check for short circuit.	
	A. Operate the ignition switch to turn the power to OF state. B. Disconnect the battery negative connector. C. Disconnect the intake temperature sensor harness plug E10a. D. Operate the ignition switch to turn the power to ON state. E. Read out the intake air temperature on the diagnostic equipment for faulty vehicles. **Temperature:-40°C or lower** **→Yes** Replace the intake temperature sensor. **Refer to: Replacement of intake pressure/ temperature sensor** **→No** To step 6.

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Test condition	Details/results/measures
6. Check the intake temperature sensor signal line.	
 LFX60-SM-02965  LFX60-SM-02966  LFX60-SM-02971	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the intake temperature sensor harness connector E10a. D. Disconnect the ECM harness plug E01a. E. Measure the resistance between the intake pressure sensor harness plug E10a terminal 1 and ECM harness plug E01a terminal 71 with the multimeter. **Standard value:Less than 5Ω** F. Measure the resistance between the intake pressure sensor harness plug E10a terminal 1 and the fixed ground point with the multimeter. **Standard value:10 MΩ or higher** G. Connect the battery negative terminal. H. Operate the ignition switch to turn the power to ON state. I. Measure the voltage between the intake pressure sensor harness plug E10a terminal 1 and the fixed ground point with the multimeter. **Standard value:0 V** Is it OK after checking? →**Yes** To step 7. →**No** Troubleshoot the intake temperature sensor signal line and replace the harness if necessary.
7. Check ECM.	
	A. Replace ECM. **Refer to:ECM** B. Confirm the DTC with the diagnostic meter. C. Read the sensor data stream. D. Ensure there is no DTC and the data is normal.

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DTC P0117, P0118

DTC description

DTC	Description	Definition
P0117	• Coolant temperature sensor line: low voltage	• The function of the coolant temperature sensor is to convert the engine coolant temperature signal into an electrical signal to the engine ECM so that the ECM corrects the fuel injection time and ignition time and so that the engine is at its best working state. • The coolant temperature sensor uses a negative temperature coefficient (NTC) thermistor, whose resistance value decreases with increasing temperature. • The ECM provides a 5V voltage to the 1st terminal of the ECT sensor harness connector E23a via the 49th terminal of the ECM harness connector E01a, and provides the ECM internal low reference voltage to the 3rd pin of the ECT sensor plug E23a via the 74th terminal of E01a. • The length of the ignition switch being off is always recorded within the ECM. If the set ignition switch off time is reached at the start, the engine control module will compare the difference between the engine coolant temperature and the intake air temperature to determine whether the difference between the two temperatures is in the normal working range.
P0118	• Coolant temperature sensor circuit voltage high or open circuit	

Possible reasons

DTC	Detection strategy	Define the fault location
P0117	• Hardware or line check	• Harness or plug • Coolant temperature sensor. • ECM
P0118		

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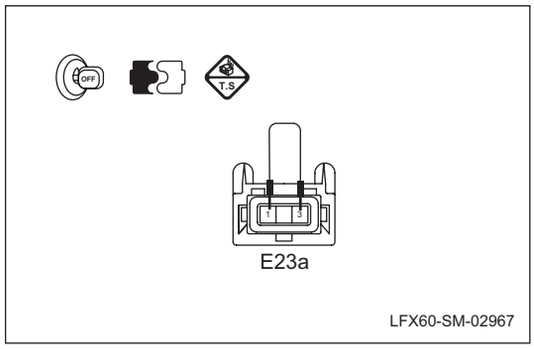
Diagnostic process

△ **Tips:**
Before performing this diagnosis procedure, observe the diagnostic meter data list and analyze the data accuracy to help the fast troubleshooting.

Test condition	Details/results/measures
1. Check the DTC.	
	A. Connect the diagnostic meter to the diagnostic interface. B. Operate the ignition switch to turn the power to ON state. C. Turn on the diagnostic meter and select the following menu items: power system/engine system (Delphi VVTECT) to read DTC. D. Is there a trouble code other than P0017 and P0018 in the control system? →**Yes** **Refer to: DTC list; determine whether the fault is caused by other DTC** →**No** To step 2.
2. General Inspection.	
	A. Check the coolant temperature sensor harness connector for loosening, aging, damage and other abnormalities. Is it OK after checking? →**Yes** To step 3. →**No** Repair the fault parts.
3. Read the coolant temperature data stream.	
	A. Connect the diagnostic meter to the diagnostic interface. B. Operate the ignition switch to turn the power to ON state and press the power key of the diagnostic meter. C. Select the following menu items: Power System/Engine System/Read Data Flow/Coolant Temperature. **Temperature: the same as the actual coolant temperature** Is it OK after checking? →**Yes** Check the intermittent fault. →**No** If the read value is -40°C, go to Step 4. If the value read out is 130°C or higher, go to step 5.

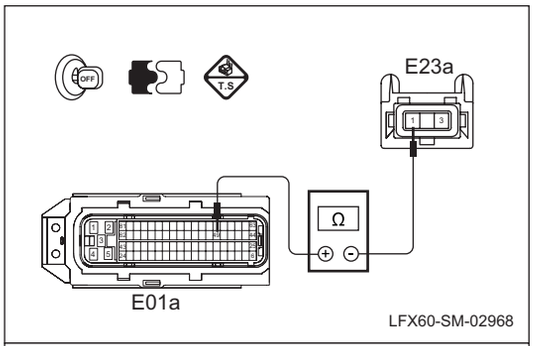
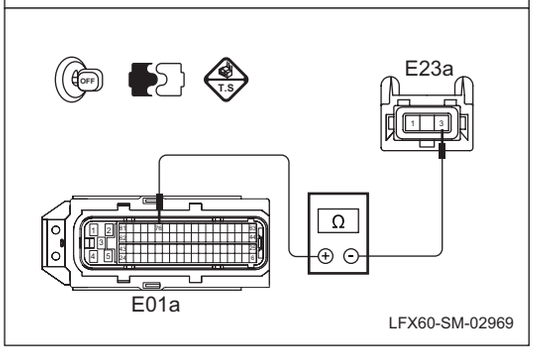
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Test condition	Details/results/measures
4. Check the coolant temperature sensor signal line for open circuit.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the coolant temperature sensor harness plug E23a. D. Connect terminals the 1st with 3rd terminals of the coolant temperature sensor harness connector E23a with fine wires. E. Connect the battery negative terminal. F. Start the engine. G. Read the coolant temperature on the automotive diagnostic equipment. **Temperature: 266. 00°F or higher** Is it OK after checking? **→Yes** Replace the coolant temperature sensor. **Refer to: Replace the coolant temperature sensor.** **→No** To step 5.
5. Check for short circuit.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the coolant temperature sensor harness plug E23a. D. Connect the battery negative terminal. E. Operate the ignition switch to turn the power to ON state. F. Read out the coolant temperature on the diagnostic equipment for faulty vehicles. **Temperature:-40°C or lower** **→Yes** Replace the coolant temperature sensor. **Refer to: Replace the coolant temperature sensor.** **→No** To step 6.

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Test condition	Details/results/measures
6. Check the coolant temperature sensor line.	
 	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the coolant temperature sensor harness plug E23a. D. Disconnect the ECM harness plug E01a. E. Measure the resistance between the 1st terminal of the coolant temperature sensor harness connector E23a and the 49th terminal of the ECM harness connector E01a with a multimeter. **Standard value:Less than 5Ω** F. Measure the resistance between the 3st terminal of the coolant temperature sensor harness connector E23a and the 76th terminal of the ECM harness connector E01a with a multimeter. **Standard value:Less than 5Ω** Is it OK after checking? →**Yes** To step 7. →**No** Check and repair the coolant temperature sensor line fault and replace the wiring harness if necessary.
7. Check ECM.	
	A. Replace ECM. **Refer to:ECM** B. Confirm the DTC with the diagnostic meter. C. Read the sensor data stream. D. Ensure there is no DTC and the data is normal.

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DTC P0122, P0123, P0222, P0223

DTC description

DTC	Description	Definition
P0122	• Electronic throttle position sensor 1# line voltage low	• The function of the throttle position sensor (TPS) is to convert the throttle opening (i. e. , the engine load) into an electrical signal input to the engine ECM to determine the air-fuel ratio. • The actual throttle position will be compared to the throttle position determined according to the engine load. The engine control module (ECM) determines the engine load based on the signal from the intake pressure sensor (MAP). By the farther comparison, the sensor fault can be determined and the corresponding DTC can be set.
P0123	• Electronic throttle position sensor 1# line voltage hight	
P0222	• Electronic throttle position sensor 2lb line voltage low	
P0223	• Electronic throttle position sensor 2lb line voltage hight	

Possible reasons

DTC	Detection strategy	Define the fault location
P0122	• Hardware or line check	• Harness or plug • Electronic-controlled throttle position sensor • ECM
P0123		
P0222		
P0223		

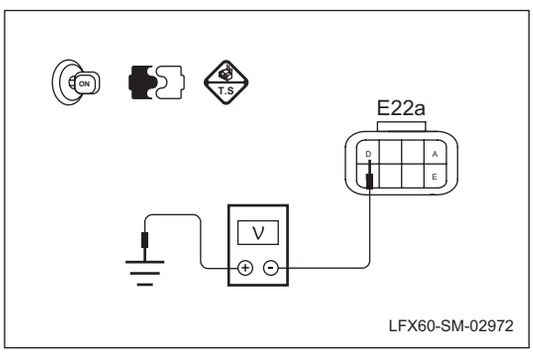
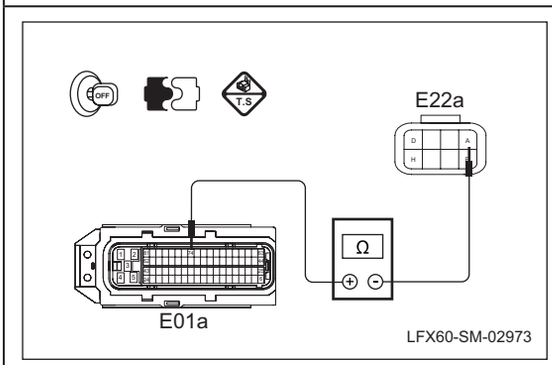
Diagnostic process

△ **Tips:**
Before performing this diagnosis procedure, observe the diagnostic meter data list and analyze the data accuracy to help the fast troubleshooting.

Test condition	Details/results/measures
1. Check the DTC.	
	A. Connect the diagnostic meter to the diagnostic interface. B. Operate the ignition switch to turn the power to ON state. C. Turn on the diagnostic meter and select the following menu items: power system/engine system (Delphi VVTECT) to read DTC. D. Is there a trouble code other than P0122, P0123, P0222, and P0223 in the control system? →**Yes** **Refer to: DTC list; determine whether the fault is caused by other DTC** →**No** To step 2.

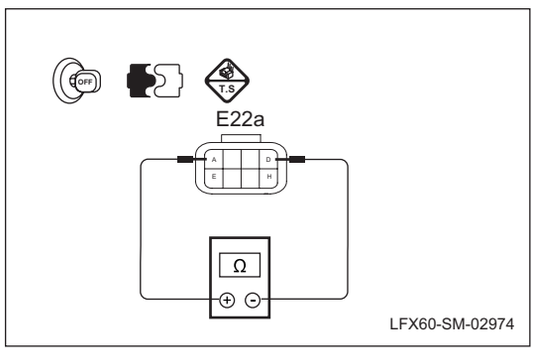
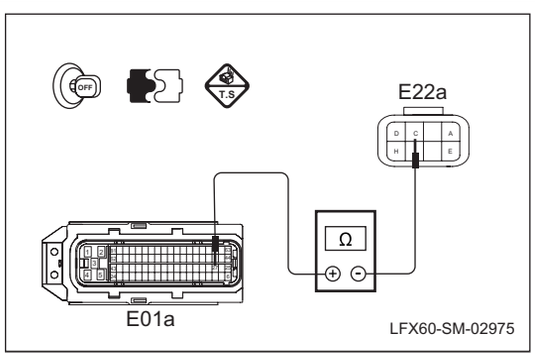
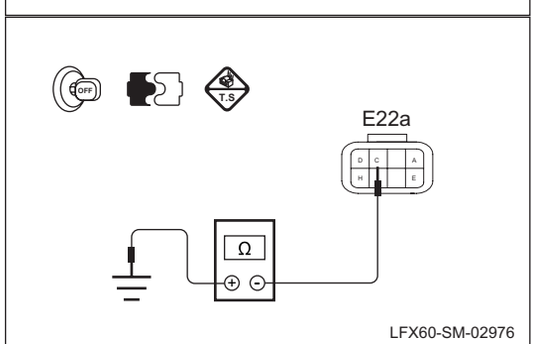
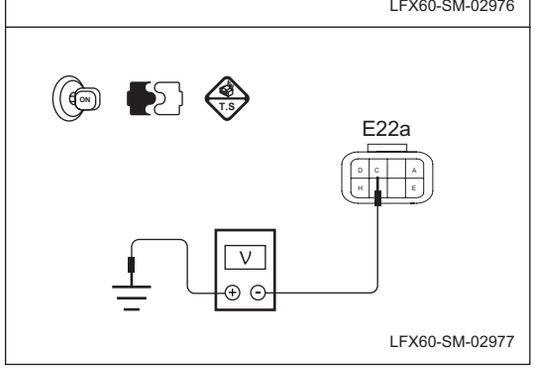
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Test condition	Details/results/measures
2. General Inspection.	
	A. Check the electronic-controlled throttle harness connector for loosening, aging, damage and other abnormalities. Is it OK after checking? →**Yes** To step 3. →**No** Repair the fault parts.
3. Check the electronic-controlled throttle position sensor power supply line.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the electronic throttle harness plug E22a. D. Connect the battery negative terminal. E. Operate the ignition switch to turn the power to ON state. F. Measure the voltage between the electronic-controlled throttle harness connector E22a terminal D and the reliable ground point with a multimeter. **Standard value:4.5 ~ 5.5 V** Is the voltage normal? →**Yes** To step 4. →**No** Check and repair the electronic-controlled throttle sensor power supply line fault and replace the wiring harness if necessary.
4. Check the electronic-controlled throttle position sensor power ground line.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the ECM harness plug E01a. D. Disconnect the electronic-controlled throttle harness connector E22a. E. Measure the resistance between the A terminal of the electronic-controlled throttle harness connector E22a and the 74th terminal of the ECM harness connector E01a with a multimeter. **Standard value:Less than 5Ω** Is the resistance normal? →**Yes** To step 5. →**No** Check and repair the electronic-controlled throttle sensor ground line fault and replace the wiring harness if necessary.

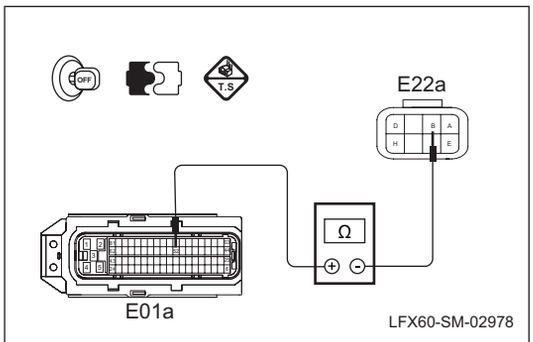
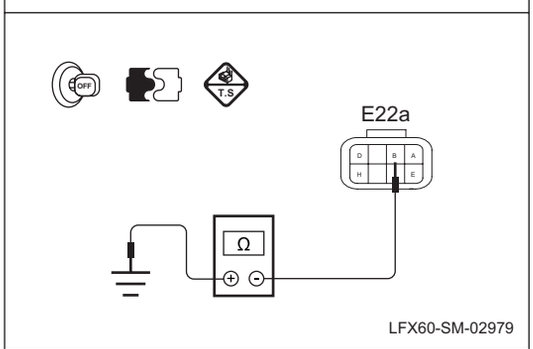
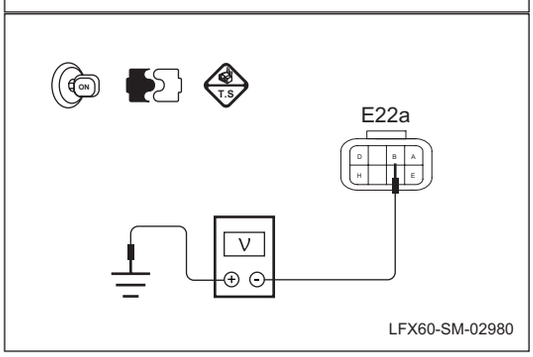
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Test condition	Details/results/measures
5. Check the electronic-controlled throttle position sensor.	
 LFX60-SM-02974	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the electronic throttle harness plug E22a. D. Measure the resistance between the A and D terminals of the electronic-controlled throttle with a multimeter. **Standard value:1.6 ~ 2.4 KΩ** E. Slowly turn the throttle from one end to the other, measure the resistance between the C and A terminals of the connector E22a with a digital multimeter. The resistance changes linearly with the throttle opening. And the resistance between the B and A terminals changes in exactly the opposite way. Is it OK after checking? →**Yes** To step 6. →**No** Change the electronic-controlled throttle. **Refer to: Replacement of the electronic-controlled throttle**
6. Check the electronic throttle position sensor 1# signal line.	
 LFX60-SM-02975  LFX60-SM-02976  LFX60-SM-02977	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the electronic throttle harness plug E22a. D. Disconnect the ECM harness plug E01a. E. Measure the resistance between the C terminal of the electronic-controlled throttle harness connector E22a and the 27th terminal of the ECM harness connector E01a with a multimeter. **Standard value:Less than 5Ω** F. Measure the voltage between the electronic-controlled throttle harness connector E22a terminal C and the reliable ground point with a multimeter. **Standard value:10 MΩ or higher** G. Connect the battery negative terminal. H. Operate the ignition switch to turn the power to ON state. I. Measure the voltage between the electronic-controlled throttle harness connector E22a terminal C and the reliable ground point with a multimeter. **Standard value:0 V** Is it OK after checking? →**Yes** To step 7. →**No** Repair the electronic throttle position sensor 1# signal line fault and replace the harness if necessary.

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Test condition	Details/results/measures
7. Check the electronic throttle position sensor 2lb signal line.	
 LFX60-SM-02978  LFX60-SM-02979  LFX60-SM-02980	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the electronic throttle harness plug E22a. D. Disconnect the ECM harness plug E01a. E. Measure the resistance between the B terminal of the electronic-controlled throttle harness connector E22a and the 52th terminal of the ECM harness connector E01a with a multimeter. **Standard value:Less than 5Ω** F. Measure the voltage between the electronic-controlled throttle harness connector E22a terminal B and the reliable ground point with a multimeter. **Standard value:10 MΩ or higher** G. Connect the battery negative terminal. H. Operate the ignition switch to turn the power to ON state. I. Measure the voltage between the electronic-controlled throttle harness connector E22a terminal B and the reliable ground point with a multimeter. **Standard value:0 V** Is it OK after checking? →**Yes** To step 8. →**No** Repair the electronic throttle position sensor 2lb signal line fault and replace the harness if necessary.
8. Check ECM.	
	A. Replace ECM. **Refer to:ECM** B. Confirm the DTC with the diagnostic meter. C. Read the sensor data stream. D. Ensure there is no DTC and the data is normal.

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DTC P0031, P0032

DTC description

DTC	Description	Definition
P0031	• Front oxygen sensor heater short circuit to low voltage	• The sensor compares the oxygen content of the ambient air with that of the exhaust stream. • Each hot type oxygen sensor is provided with the heating element to heat the sensor inside. • ECM controls the heating control circuit for heated oxygen sensors. Hence, the system can enter into “closed-loop?mode earlier, thus enabling EMS to calculate the air-fuel ratio earlier. • ECM controls the heater to switch on or off through the commands and consequently maintains the oxygen sensor in the specified operating temperature range. ECM determined the temperature by measuring the heater current. The operating voltage of the heating coil of the front oxygen sensor is provided by the main relay controlled by the ECM, that is, when the ignition switch is turned to the ON state, the harness connector E04a terminal 1 has a battery voltage. ECM controls the heater working time through the ECM harness plug E01a terminal 24.
P0032	• Front oxygen sensor heater short circuit to high voltage	

Possible reasons

DTC	Detection strategy	Define the fault location
P0031	• Hardware or line check	• Harness or plug • Fuse • Front oxygen sensor • ECM
P0032		

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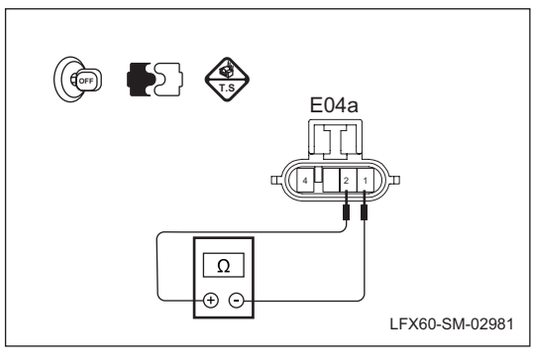
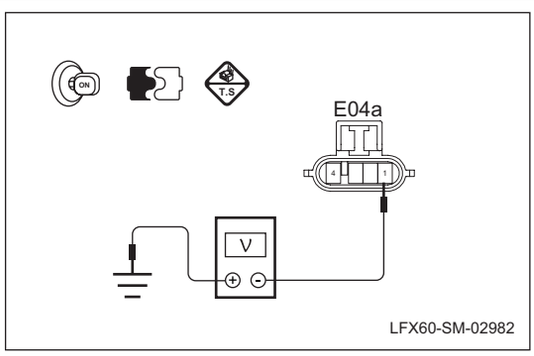
Diagnostic process

△ Tips:
Before performing this diagnosis procedure, observe the diagnostic meter data list and analyze the data accuracy to help the fast troubleshooting.

Test condition	Details/results/measures
1. Check the DTC.	
	A. Connect the diagnostic meter to the diagnostic interface. B. Operate the ignition switch to turn the power to ON state. C. Turn on the diagnostic meter and select the following menu items: power system/engine system (Delphi VVTECT) to read DTC. D. Is there a trouble code other than P0031 and P0032 in the control system? →**Yes** **Refer to: DTC list; determine whether the fault is caused by other DTC** →**No** To step 2.
2. General Inspection.	
	A. Check the front oxygen sensor harness plug for looseness, aging and damage. Is it OK after checking? →**Yes** To step 3. →**No** Repair the fault parts.
3. Check the fuse.	
	A. Check the front oxygen sensor fuse FS13. **Fuse rated capacity: 15 A** Is it OK after checking? →**Yes** To step 4. →**No** Replace the fuse.

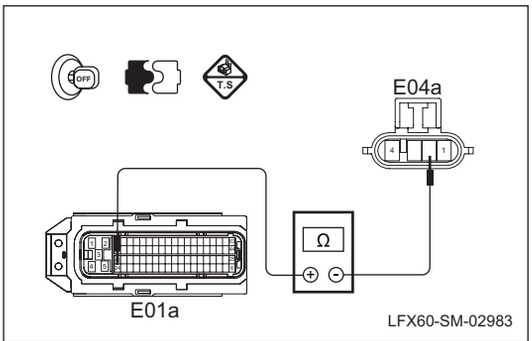
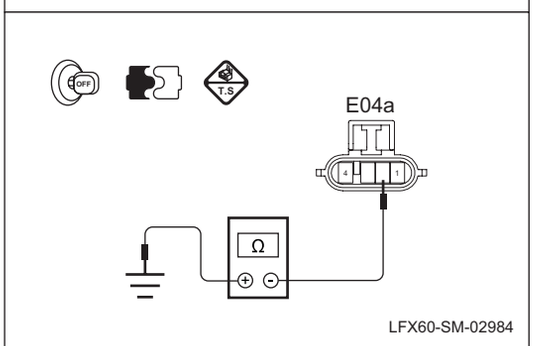
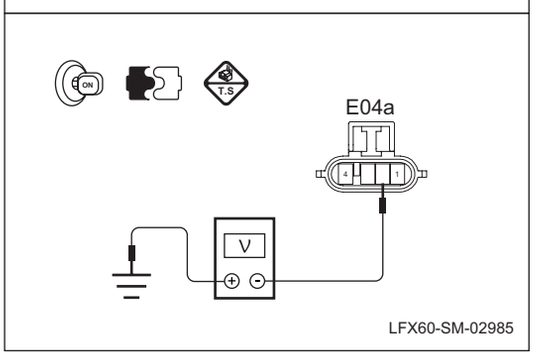
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Test condition	Details/results/measures
4. Check the front oxygen sensor.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the front oxygen sensor harness plug E04a. D. Measure the resistance between the 1st and 2nd terminals of the front oxygen sensor E04a with a multimeter. **Standard value:8.1~11.1 Ω** Is the resistance normal? **→Yes** To step 5. **→No** Replace the front oxygen sensor. **Refer to:Replace the front oxygen sensor.**
5. Check the front oxygen sensor power supply line.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the front oxygen sensor harness plug E04a. D. Connect the battery negative terminal. E. Operate the ignition switch to turn the power to ON state. F. Measure the voltage between the front oxygen sensor E04a terminal 1 and the reliable ground point with a multimeter. **Standard value:11 ~ 14 V** Is it OK after checking? **→Yes** To step 6. **→No** Check and repair the front oxygen sensor power supply line fault and replace the wiring harness if necessary.

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Test condition	Details/results/measures
6. Check the front oxygen sensor control circuit.	
 LFX60-SM-02983  LFX60-SM-02984  LFX60-SM-02985	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the front oxygen sensor harness plug E04a. D. Disconnect the ECM harness plug E01a. E. Measure the resistance between the 2nd terminal of the front oxygen sensor harness connector E04a and the 24th terminal of the ECM harness connector E01a with a multimeter. **Standard value:Less than 5Ω** F. Measure the voltage between the front oxygen sensor harness connector E04a terminal 2 and the reliable ground point with a multimeter. **Standard value:10 MΩ or higher** G. Connect the battery negative terminal. H. Operate the ignition switch to turn the power to ON state. I. Measure the voltage between the front oxygen sensor harness connector E04a terminal 2 and the reliable ground point with a multimeter. **Standard value: 0 V** Is it OK after checking? →**Yes** To step 7. →**No** Check and repair the front oxygen sensor control circuit fault and replace the wiring harness if necessary.
7. Check ECM.	
	A. Replace ECM. **Refer to:ECM** B. Confirm the DTC with the diagnostic meter. C. Read the sensor data stream. D. Ensure there is no DTC and the data is normal.

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DTC P0037, P0038

DTC description

DTC	Description	Definition
P0037	• Rear oxygen sensor heater short circuit to low voltage	• Rear heated oxygen sensor (HO2S) is used to monitor the working status of the three-way catalytic converter. • Each hot type oxygen sensor is provided with the heating element to heat the sensor inside. • The sensor compares the oxygen content of the ambient air with that of the exhaust stream. • ECM controls the heater to switch on or off through the commands and consequently maintains the oxygen sensor in the specified operating temperature range. ECM determined the temperature by measuring the heater current. The operating voltage of the heating coil of the tear oxygen sensor is provided by the main relay controlled by the ECM, that is, when the ignition switch is turned to the ON state, the rear oxygen sensor connector I41 terminal 1 has a battery voltage. ECM controls the heater working time through the ECM harness plug E01a terminal 23.
P0038	• Rear oxygen sensor heater short circuit to high voltage	

Possible reasons

DTC	Detection strategy	Define the fault location
P0037	• Hardware or line check	• Harness or plug • Fuse • Rear oxygen sensor • ECM
P0038		

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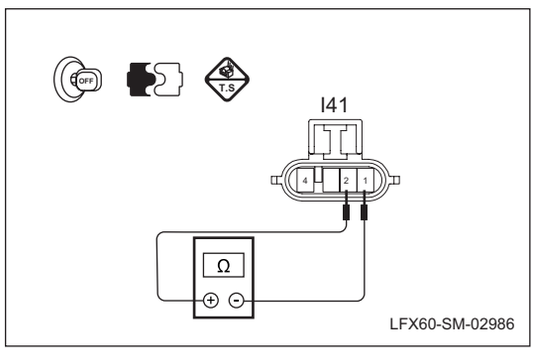
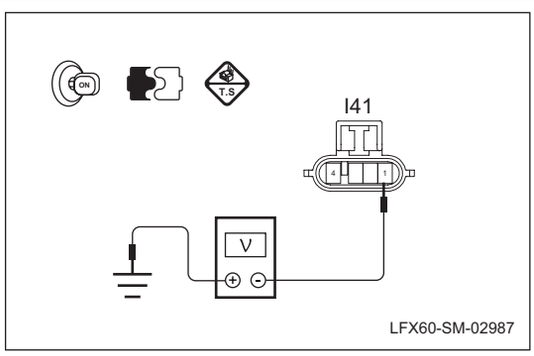
Diagnostic process

△ Tips:
Before performing this diagnosis procedure, observe the diagnostic meter data list and analyze the data accuracy to help the fast troubleshooting.

Test condition	Details/results/measures
1. Check the DTC.	
	A. Connect the diagnostic meter to the diagnostic interface. B. Operate the ignition switch to turn the power to ON state. C. Turn on the diagnostic meter and select the following menu items: power system/engine system (Delphi VVTECT) to read DTC. D. Is there a trouble code other than P0037and P0038 in the control system? →**Yes** **Refer to: DTC list; determine whether the fault is caused by other DTC** →**No** To step 2.
2. General Inspection.	
	A. Check the rear oxygen sensor harness plug for looseness, aging and damage. Is it OK after checking? →**Yes** To step 3. →**No** Repair the fault parts.
3. Check the fuse.	
	A. Check the rear oxygen sensor fuse FS12. **Fuse rated capacity: 15 A** Is it OK after checking? →**Yes** To step 4. →**No** Replace the fuse.

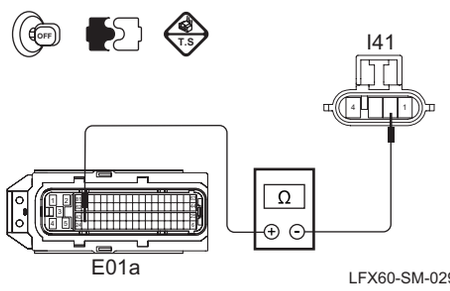
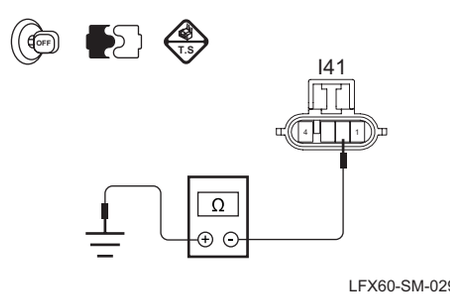
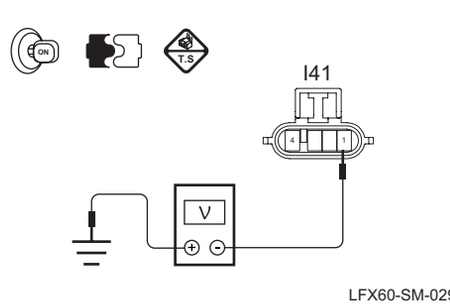
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Test condition	Details/results/measures
4. Check the rear oxygen sensor.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the front oxygen sensor harness plug I41. D. Measure the resistance between the 1st and 2nd terminals of the rear oxygen sensor I41 with a multimeter. **Standard value:8.1~11.1 Ω** Is the resistance normal? **→Yes** To step 5. **→No** Replace the rear oxygen sensor. **Refer to: Replace the rear oxygen sensor.**
5. Check the rear oxygen sensor power supply line.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the rear oxygen sensor harness plug I41. D. Connect the battery negative terminal. E. Operate the ignition switch to turn the power to ON state. F. Measure the voltage between the rear oxygen sensor I41 terminal 1 and the reliable ground point with a multimeter. **Standard value:11 ~ 14 V** Is the voltage normal? **→Yes** To step 6. **→No** Check and repair the rear oxygen sensor power supply line fault and replace the wiring harness if necessary.

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Test condition	Details/results/measures
6. Check the rear oxygen sensor control circuit.	
 LFX60-SM-02988  LFX60-SM-02989  LFX60-SM-02990	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the rear oxygen sensor harness plug I41. D. Disconnect the ECM harness plug E01a. E. Measure the resistance between the 2nd terminal of the rear oxygen sensor harness connector I41 and the 23th terminal of the ECM harness connector E01a with a multimeter. **Standard value:Less than 5Ω** F. Measure the resistance between the 2nd terminal of the oxygen sensor harness connector I41 and the reliable ground point with a multimeter. **Standard value:10 MΩ or higher** G. Connect the battery negative terminal. H. Operate the ignition switch to turn the power to ON state. I. Measure the resistance between the 2nd terminal of the oxygen sensor harness connector I41 and the reliable ground point with a multimeter. **Standard value:0 V** Is it OK after checking? →**Yes** To step 7. →**No** Check and repair the rear oxygen sensor control circuit fault and replace the wiring harness if necessary.
7. Check ECM.	
	A. Replace ECM. **Refer to:ECM** B. Confirm the DTC with the diagnostic meter. C. Read the sensor data stream. D. Ensure there is no DTC and the data is normal.

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DTC P0131, P0132, P0133, P0134

DTC description

DTC	Description	Definition
P0131	• Front oxygen sensor signal short circuit to low voltage	• The operation of the oxygen sensor is achieved by converting the concentration difference between oxygen ions inside and outside the ceramic tube into a voltage signal output. • When the temperature of the sensing ceramic tube reaches 350°C, it has the characteristics of a solid electrolyte. Due to the material feature, the oxyanion can freely pass the ceramic tube. Through this characteristic, the differential concentration is converted into electric potential difference and consequently the electrical signal output is generated. • If the mixture is rich, the concentration difference between oxygen ions inside and outside the ceramic tube is high, the potential difference is high, a large amount of oxygen ions are moved from the inside to the outside, and the output voltage is high (close to 800mV-1000mV). • If the mixture is lean, the concentration difference between oxygen ions inside and outside the ceramic tube is low, the potential difference is low, only a small amount of oxygen ions are moved from the inside to the outside, and the output voltage is low (close to 100mV).
P0132	• Front oxygen sensor signal short circuit to high voltage	
P0133	• The front oxygen sensor responds too slowly	
P0134	• The front oxygen sensor is disconnected	

Possible reasons

DTC	Detection strategy	Define the fault location
P0131	• Hardware or line check	• Harness or plug • Front oxygen sensor • ECM
P0132		
P0133		
P0134		

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Diagnostic process

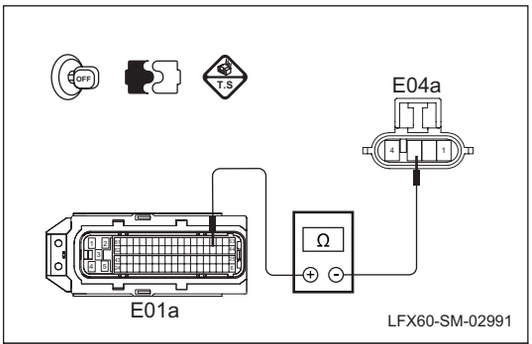
△ Tips:
Before performing this diagnosis procedure, observe the diagnostic meter data list and analyze the data accuracy to help the fast troubleshooting.

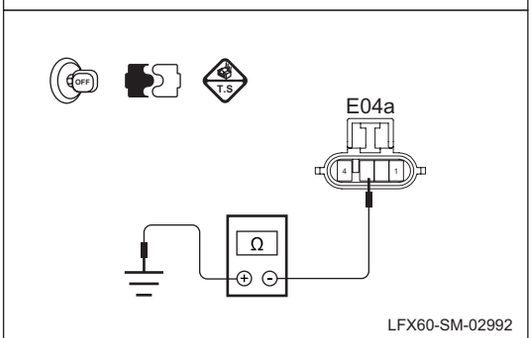
Test condition	Details/results/measures
1. Check the DTC.	
	A. Connect the diagnostic meter to the diagnostic interface. B. Operate the ignition switch to turn the power to ON state. C. Turn on the diagnostic meter and select the following menu items: power system/engine system (Delphi VVTECT) to read DTC. D. Is there a trouble code other than P0131, P0132, P0133, and P0134 in the control system? →**Yes** **Refer to: DTC list; determine whether the fault is caused by other DTC** →**No** To step 2.
2. General Inspection.	
	A. Check the front oxygen sensor harness plug for looseness, aging and damage. Is it OK after checking? →**Yes** To step 3. →**No** Repair the fault parts.

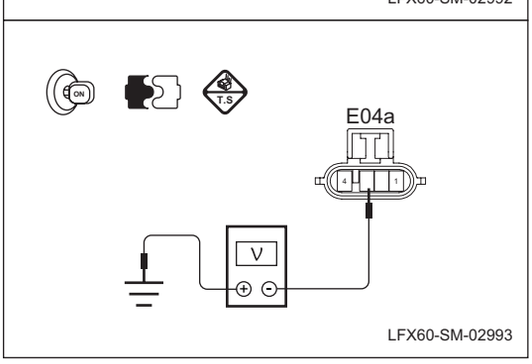
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Test condition	Details/results/measures
3. Check the front oxygen sensor signal line.	



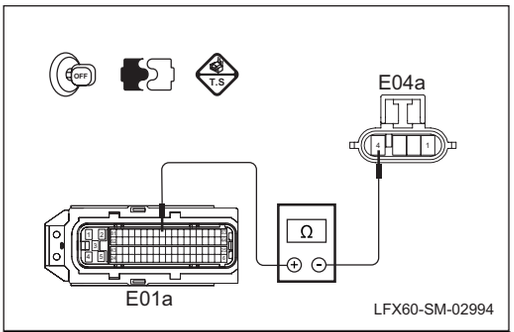
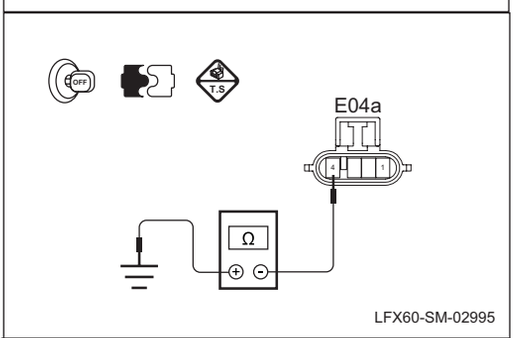
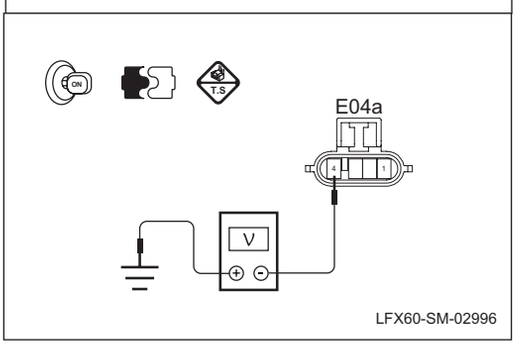




A. Operate the ignition switch to turn the power to OFF state.
B. Disconnect the battery negative connector.
C. Disconnect the front oxygen sensor harness plug E04a.
D. Disconnect the ECM harness plug E01a.
E. Measure the resistance between the front oxygen sensor E04a terminal 3 and ECM harness plug E01a terminal 47 with the multimeter.
Standard value:Less than 5Ω
F. Measure the resistance between the front oxygen sensor E04a terminal 3 and the fixed ground point with the multimeter.
Standard value:10 MΩ or higher
G. Connect the battery negative terminal.
H. Operate the ignition switch to turn the power to ON state.
I. Measure the voltage between the front oxygen sensor E04a terminal 3 and the fixed ground point with the multimeter.
Standard value:0 V
Is it OK after checking?
→**Yes**
To step 4.
→**No**
Troubleshoot the front oxygen sensor single line and replace the harness if necessary.

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Test condition	Details/results/measures
4. Check the front oxygen sensor ground line.	
  	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the front oxygen sensor harness plug E04a. D. Disconnect the ECM harness plug E01a. E. Measure the resistance between the front oxygen sensor E04a terminal 4 and ECM harness plug E01a terminal 73 with the multimeter. **Standard value:Less than 5Ω** F. Measure the resistance between the front oxygen sensor E04a terminal 4 and the fixed ground point with the multimeter. **Standard value:10 MΩ or higher** G. Connect the battery negative terminal. H. Operate the ignition switch to turn the power to ON state. I. Measure the voltage between the front oxygen sensor E04a terminal 4 and the fixed ground point with the multimeter. **Standard value:0 V** Is it OK after checking? →**Yes** To step 5. →**No** Check and repair the front oxygen sensor ground line fault and replace the wiring harness if necessary.
5. Check the front oxygen sensor.	
	A. Connect the fault diagnostic meter to the diagnostic interface. B. Operate the ignition switch to turn the power to ON state and press the power key of the diagnostic meter. C. Select the following menu items: power system/engine system (Delphi VVTETC)/read data stream/read data common ID/B1- S1O2 voltage/common mode. D. Run the engine at 2500rpm for 2min approximately, maintain the oxygen sensor working to reach the temperature more than 752. 00 °F. When the ignition switch is turned on, the voltage should be about 0. 5V; When the engine is started and the rich mixture is supplied (the accelerator pedal is stepped on to the bottom), the signal voltage should be about 0.8V; when the lean mixture is supplied, the signal voltage should be 0.1 V; otherwise, it is indicated that the oxygen sensor fails, and should be replaced. Is it OK after checking? →**Yes** To step 7. →**No** Replace the front oxygen sensor. **Refer to:Replace the front oxygen sensor.**

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Test condition	Details/results/measures
6. Confirm the DTC is stored again.	
	A. Confirm the DTC with the diagnostic meter. B. Read the sensor data stream. C. Ensure there is no DTC and the data is normal.

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DTC P0137, P0138, P0140

DTC description

DTC	Description	Definition
P0137	• Rear oxygen sensor signal short circuit to low voltage	• After the vehicle is started, the control module operates in open-loop mode, i. e. , the signal voltage of the heated oxygen sensor is ignored when calculating the air-fuel ratio. The control module provides a reference voltage of approximately 450 mV to the heated oxygen sensor. • When the engine is running, the heated oxygen sensor is heated and begins to generate a voltage of 0-0. 1V. Once the voltage of the heated oxygen sensor is found to exceed the set voltage, the ECM immediately enters the closed loop mode. • The ECM determines the air-fuel ratio by using a heated oxygen sensor voltage. If the heated oxygen sensor voltage rises above the reference voltage (tends to 1V), it is indicated that the fuel mixture is too rich. If the voltage of the heated oxygen sensor is reduced below the reference voltage (tends to 0 mV), it is indicated that the fuel mixture is too lean.
P0138	• Rear oxygen sensor signal short circuit to high voltage	
P0140	• The rear oxygen sensor is disconnected	

Possible reasons

DTC	Detection strategy	Define the fault location
P0137	• Hardware or line check	• Harness or plug • Rear oxygen sensor • ECM
P0138		
P0140		

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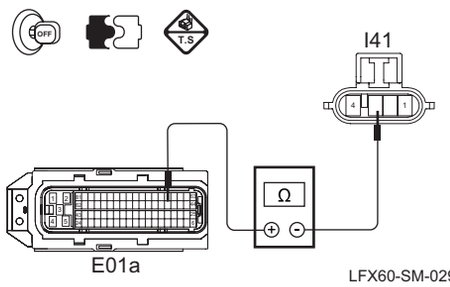
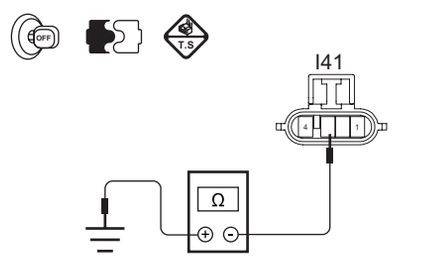
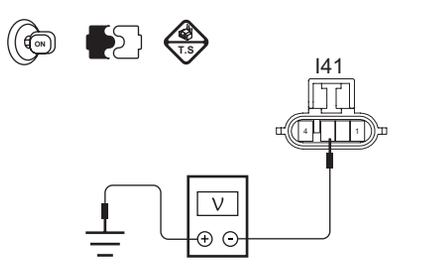
Diagnostic process

△ Tips:
Before performing this diagnosis procedure, observe the diagnostic meter data list and analyze the data accuracy to help the fast troubleshooting.

Test condition	Details/results/measures
1. Check the DTC.	
	A. Connect the diagnostic meter to the diagnostic interface. B. Operate the ignition switch to turn the power to ON state. C. Turn on the diagnostic meter and select the following menu items: power system/engine system (Delphi VVTECT) to read DTC. D. Is there a trouble code other than P0137, P0138 and P0140 in the control system? →**Yes** **Refer to: DTC list; determine whether the fault is caused by other DTC** →**No** To step 2.
2. General Inspection.	
	A. Check the rear oxygen sensor harness plug for looseness, aging and damage. Is it OK after checking? →**Yes** To step 3. →**No** Repair the fault parts.

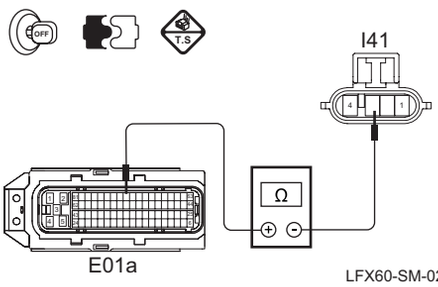
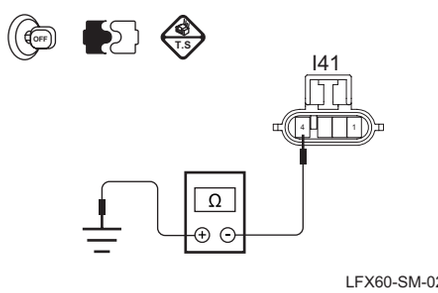
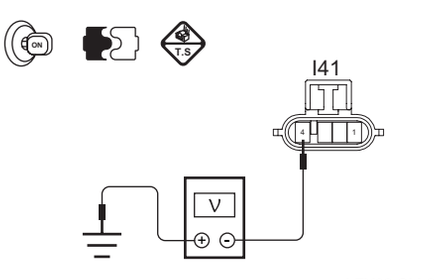
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Test condition	Details/results/measures
3. Check the rear oxygen sensor signal line.	
 LFX60-SM-02997  LFX60-SM-02998  LFX60-SM-02999	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the rear oxygen sensor harness plug I41. D. Disconnect the ECM harness plug E01a. E. Measure the resistance between the rear oxygen sensor I41 terminal 3 and ECM harness plug E01a terminal 48 with the multimeter. **Standard value:Less than 5Ω** F. Measure the resistance between the rear oxygen sensor I41 terminal 3 and the fixed ground point with the multimeter. **Standard value:10 MΩ or higher** G. Connect the battery negative terminal. H. Operate the ignition switch to turn the power to ON state. I. Measure the voltage between the rear oxygen sensor I41 terminal 3 and the fixed ground point with the multimeter. **Standard value:0 V** Is it OK after checking? →**Yes** To step 4. →**No** Repair the rear oxygen sensor signal line fault and replace the harness if necessary.

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Test condition	Details/results/measures
4. Check the rear oxygen sensor ground line.	
 LFX60-SM-02650  LFX60-SM-02651  LFX60-SM-02652	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the rear oxygen sensor harness plug I41. D. Disconnect the ECM harness plug E01a. E. Measure the resistance between the rear oxygen sensor I41 terminal 4 and ECM harness plug E01a terminal 73 with the multimeter. **Standard value:Less than 5Ω** F. Measure the resistance between the rear oxygen sensor I41 terminal 4 and the fixed ground point with the multimeter. **Standard value:10 MΩ or higher** G. Connect the battery negative terminal. H. Operate the ignition switch to turn the power to ON state. I. Measure the resistance between the rear oxygen sensor I41 terminal 4 and the fixed ground point with the multimeter. **Standard value:0 V** Is it OK after checking? **→Yes** To step 5. **→No** Check and repair the rear oxygen sensor ground line fault and replace the wiring harness if necessary.

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Test condition	Details/results/measures
5. Check the rear oxygen sensor.	
	A. Connect the fault diagnostic meter to the diagnostic interface. B. Operate the ignition switch to turn the power to ON state and press the power key of the diagnostic meter. C. Select the following menu items: power system/engine system (Delphi VVTETC)/read data stream/read data common ID/B1- S1O2 voltage/common mode. D. Run the engine at 2500rpm for 2min approximately, maintain the oxygen sensor working to reach the temperature more than 752. 00 °F. When the ignition switch is turned on, the voltage should be about 0. 5V; When the engine is started and the rich mixture is supplied (the accelerator pedal is stepped on to the bottom), the signal voltage should be about 0. 8V; when the lean mixture is supplied, the signal voltage should be 0. 1 V; otherwise, it is indicated that the oxygen sensor fails, and should be replaced. Is it OK after checking? →**Yes** To step 6. →**No** Replace the rear oxygen sensor. **Refer to: Replace the rear oxygen sensor.**
6. Confirm the DTC is stored again.	
	A. Confirm the DTC with the diagnostic meter. B. Read the sensor data stream. C. Ensure there is no DTC and the data is normal.

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DTC P0171, P0172, P0281, P0282

DTC description

DTC	Description	Definition
P0171	• Too lean for the fuel system in idling mode	• ECM controls air/fuel metering systems to provide the best possible combination of power performance, fuel economy and emission control. In the open loop and closed loop, the way to control the oil supply is different. In the open loop, the engine control module determines the supply of fuel based on the sensor signal without the input of the heated oxygen sensor (HO2S). In the closed loop, the engine control module incorporates a heated oxygen sensor input signal to calculate short and long term fuel control values. The ideal fuel control value should be around 0%, and if the heated oxygen sensor indicates that the mixture concentration is on the high side, the fuel control value will be less than 0%. If the heated oxygen sensor indicates that the mixture concentration is on the low side, the fuel control value should be greater than 0%. The short-term fuel control value changes rapidly to respond to the voltage signal of the heated oxygen sensor. Long-term fuel control is a coarse adjustment to keep an air-fuel ratio of 14. 7: 1.
P0172	• Too rich for the fuel system in idling mode	
P0281	• Too lean for the fuel system in non-idling mode	
P0282	• Too rich for the fuel system in non-idling mode	

Possible reasons

DTC	Detection strategy	Define the fault location
P0171	• Hardware or line check	• Harness or plug • Intake pressure temperature sensor • Front oxygen sensor • Electronic-controlled throttle • Canister solenoid valve • Fuel System • Ignition system • ECM
P0172		
P0281		
P0282		

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Diagnostic process

△ Tips:
Before performing this diagnosis procedure, observe the diagnostic meter data list and analyze the data accuracy to help the fast troubleshooting.

Test condition	Details/results/measures
1. Check the DTC.	
	A. Connect the diagnostic meter to the diagnostic interface. B. Operate the ignition switch to turn the power to ON state. C. Turn on the diagnostic meter and select the following menu items: power system/engine system (Delphi VVTECT) to read DTC. D. Is there a trouble code other than P0171,P0172,P0281 and P0282 in the control system? **→Yes** **Refer to: DTC list; determine whether the fault is caused by other DTC** **→No** To step 2.
2. Read the data stream.	
	A. Connect the diagnostic meter to the diagnostic interface. B. Operate the ignition switch to turn the power to ON state. C. Turn on the automotive diagnostic equipment and select the following menu items: Power System/Engine System (Delphi VVT ECT)/Read Data Stream. Is there an engine system abnormal data flow? **→Yes** Repair according to the abnormal data. **→No** To step 3.
3. Check the fuel system.	
	A. Test the fuel pressure. **Refer to: Fuel pressure test** B. Check the injector. Is it OK after checking? **→Yes** To step 4. **→No** Replace the fuel pump or injector.

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Test condition	Details/results/measures
4. Check the evaporative emission system.	
	A. Check the working status of the charcoal canister solenoid valve. Is it OK after checking? →**Yes** To step 5. →**No** Replace the canister solenoid valve. **Refer to: Replacement of canister solenoid valve**
5. Check the front oxygen sensor.	
	A. Replace the front oxygen sensor. **Refer to:Replace the front oxygen sensor.** B. Start the engine. C. Wait until the engine is running in normal condition and then read the data stream “Fuel Correction Data”. Is the data stream normal? →**Yes** Replace the front oxygen sensor. →**No** To step 6.
6. Check ECM.	
	A. Replace ECM. **Refer to:ECM** B. Perform the DTC removal step by using the automotive diagnostic equipment. C. Start the engine. D. Perform the step of reading the sensor data stream. E. Confirm that no DTC exists and the data is normal.

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DTC P0261, P0262, P0264, P0265, P0267, P0268, P0270, P0271

DTC description

DTC	Description	Definition
P0261	• 1# nozzle line voltage low fault	• The operating voltage of the injector is provided by the main relay controlled by the ECM. The battery voltage is supplied to the 1st terminal(s) of all injector plugs via the 87th terminal of the main relay. The ECM controls the injection of cylinder one, cylinder two, cylinder three, and cylinder four injectors respectively through terminals 6, 8, 7, and 25. • The ECM monitors the status of each injector drive circuit. If the ECM detects the fact that the voltage corresponding to the drive circuit command status is incorrect, a diagnostic trouble code for the failure of the injector control circuit will be set.
P0262	• 1# nozzle line voltage hight fault	
P0264	• 2lb nozzle line voltage low fault	
P0265	• 2# nozzle line voltage hight fault	
P0267	• 3lb nozzle line voltage low fault	
P0268	• 3# nozzle line voltage hight fault	
P0270	• 4lb nozzle line voltage low fault	
P0271	• 4# nozzle line voltage hight fault	

Possible reasons

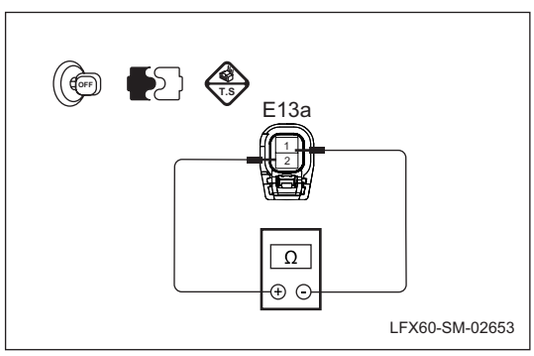
DTC	Detection strategy	Define the fault location
P0261	• Hardware or line check	• Harness or plug • Fuse • Injector • ECM
P0262		
P0264		
P0265		
P0267		
P0268		
P0270		
P0271		

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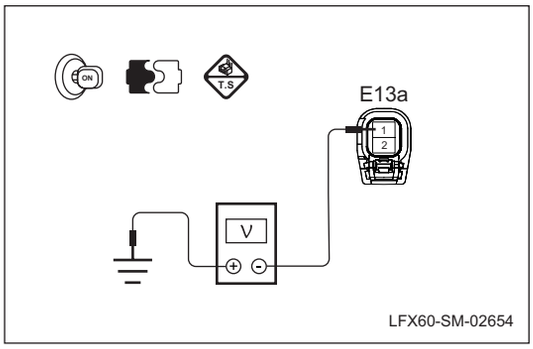
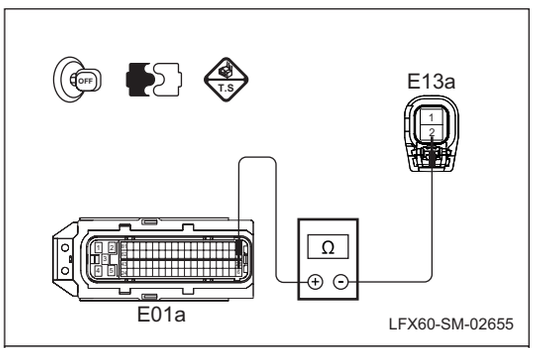
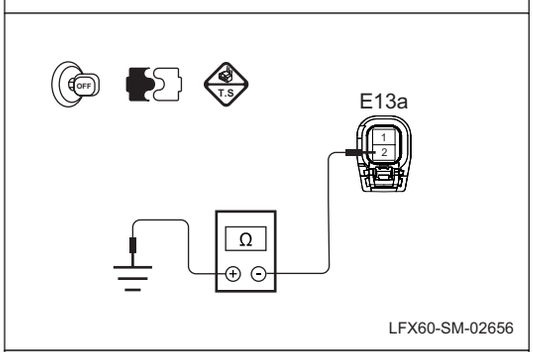
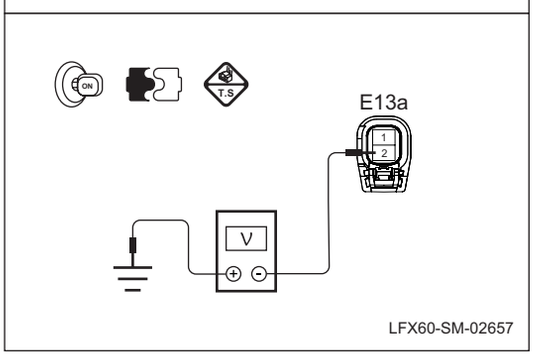
Diagnostic process

△ Tips:
Before performing this diagnosis procedure, observe the diagnostic meter data list and analyze the data accuracy to help the fast troubleshooting.

Test condition	Details/results/measures
1. Check the DTC.	
	A. Connect the diagnostic meter to the diagnostic interface. B. Operate the ignition switch to turn the power to ON state. C. Turn on the diagnostic meter and select the following menu items: power system/engine system (Delphi VVTECT) to read DTC. D. Is there a trouble code other than P0261, P0262, P0264, P0265, P0267, P0268, P0270 and P0271 in the control system? →**Yes** **Refer to: DTC list; determine whether the fault is caused by other DTC** →**No** To step 2.
2. General Inspection.	
	A. Check the fuel injector harness connector for loosening, aging, damage and other abnormalities. Is it OK after checking? →**Yes** To step 3. →**No** Repair the fault parts.
3. Check the injector.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the injector harness plug E13a. D. Measure the resistance between the 1st and 2nd terminals of the fuel injector with a multimeter. **Standard value:12±0. 4Ω** Is the resistance normal? →**Yes** To step 4. →**No** Replace the injector. **Refer to: Replacement of the injector**

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Test condition	Details/results/measures
4. Check the fuel injector power supply line (by taking injector 1 as an example).	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the injector harness plug E13a. D. Measure the voltage between the rear oxygen sensor E13a terminal 1 and the reliable ground point with a multimeter. **Standard value:11 ~ 14 V** Is the voltage normal? →**Yes** To step 5. →**No** Check and repair the fuel injector power supply line fault and replace the wiring harness if necessary.
6. Check the fuel injector control circuit.	
  	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the injector harness plug E13a. D. Disconnect the ECM harness plug E01a. E. Measure the resistance between the 2nd terminal of the fuel injector harness connector E13a and the 6th terminal of the ECM harness connector E01a with a multimeter. **Standard value:Less than 5Ω** F. Measure the voltage between the fuel injector harness connector E13a terminal 2 and the reliable ground point with a multimeter. **Standard value:10 MΩ or higher** G. Connect the battery negative terminal. H. Operate the ignition switch to turn the power to ON state. I. Measure the voltage between the fuel injector harness connector E13a terminal 2 and the reliable ground point with a multimeter. **Standard value:0 V** Is it OK after checking? →**Yes** To step 7. →**No** Check and repair the fuel injector control circuit fault and replace the wiring harness if necessary.

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Test condition	Details/results/measures
7. Check ECM.	
	A. Replace ECM. **Refer to:ECM** B. Confirm the DTC with the diagnostic meter. C. Read the sensor data stream. D. Ensure there is no DTC and the data is normal.

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DTC P0300

DTC description

DTC	Description	Definition
P0300	• Single- or multi-cylinder miss-fire (catalyst damage type miss-fire) • Single- or multi-cylinder miss-fire (Emission damage type miss-fire)	• The ECM determines when the engine suffered from misfiring based on the information of the crankshaft position sensor, and determines which cylinder is suffering from misfiring according to the information of the camshaft position sensor. The DTCP0300 is set if the ECM detects the fact that the miss-fire rate is sufficient to exceed the statutory level. Under certain driving conditions, an excessive miss-fire rate will cause the catalytic converter to overheat and may damage the catalytic converter.

Possible reasons

DTC	Detection strategy	Define the fault location
P0300	• Hardware or line check	• Harness or plug • Intake/exhaust system • Ignition system • Fuel System • Evaporative emission system • Crankcase ventilation system • Engine mechanical system • ECM

Diagnostic process

△ **Tips:**

If the vehicle is sent to the maintenance station without the phenomenon of misfiring, you must re-road-test the vehicle to make the misfiring failure to reproduce. And record the ECM data present when the misfiring is generated, by using the automotive diagnostic equipment, so as to facilitate the analysis of the cause of the malfunction. If the diagnostic trouble code associated with the miss-fire is not stored in the vehicle which has been road-tested for a long time, the fault may be caused by the following reasons:

Test condition	Details/results/measures
1. Check the DTC.	
	A. Connect the diagnostic meter to the diagnostic interface. B. Operate the ignition switch to turn the power to ON state. C. Turn on the diagnostic meter and select the following menu items: power system/engine system (Delphi VVTECT) to read DTC. D. Is there a trouble code other than P0300 in the control system? →**Yes** **Refer to: DTC list; determine whether the fault is caused by other DTC** →**No** To step 2.

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Test condition	Details/results/measures
2. Read the data stream.	
	A. Operate the ignition switch to turn the power to ON state. B. Turn on the automotive diagnostic equipment and select the following menu items: Power System/Engine System (Delphi VVT ECT)/Read Data Stream. Is there an engine system abnormal data flow? →**Yes** Repair according to the abnormal data. →**No** To step 3.
3. Check the ignition system.	
	A. Check the spark plug clearance. **Standard value:0.7 ~ 0.8 mm** B. Check the ignition coil. Is it OK after checking? →**Yes** To step 4. →**No** Replace the spark plug or ignition coil.
4. Check the fuel system.	
	A. Test the fuel pressure. **Refer to: Fuel pressure test** B. Check the injector. Is it OK after checking? →**Yes** To step 5. →**No** Replace the fuel pump or injector.
5. Check the evaporative emission system.	
	A. Check whether the evaporative emission line is leaking. B. Check the working status of the charcoal canister solenoid valve. Is it OK after checking? →**Yes** To step 6. →**No** Replace damaged piping or solenoid valve.

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Test condition	Details/results/measures
6. Check the crankcase ventilation system.	
	A. Check the crankcase ventilation system for leaks. B. Check whether the crankcase ventilation valve is damaged. Is it OK after checking? →**Yes** To step 7. →**No** Replace the crankcase ventilation valve.
7. Check ECM.	
	A. Replace ECM. **Refer to:ECM** B. Confirm the DTC with the diagnostic meter. C. Read the sensor data stream. D. Ensure there is no DTC and the data is normal.

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DTC P0324, P0325

DTC description

DTC	Description	Definition
P0324	• Knock control system failure	• The knock sensor is a vibration acceleration sensor mounted on the engine cylinder block. • The sensing element of the sensor is a piezoelectric element. The vibration of the engine cylinder block is transmitted to the piezoelectric crystal through the mass block in the sensor. Since the piezoelectric crystal is subjected to the pressure generated by the vibration of the mass block, a voltage is generated at the two pole faces, and the vibration signal is converted into an alternating voltage signal output. • Its function is to detect whether there is a knock in the engine, and output a voltage signal to the ECM, so as to determine the engine conditions.
P0325	• Knock sensor failure	

Possible reasons

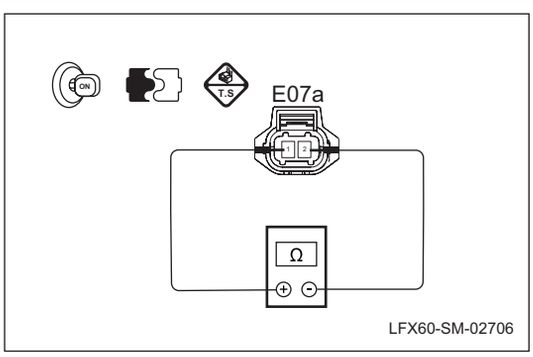
DTC	Detection strategy	Define the fault location
P0324	• Hardware or line check	• Harness or plug • Knock sensor • ECM
P0325		

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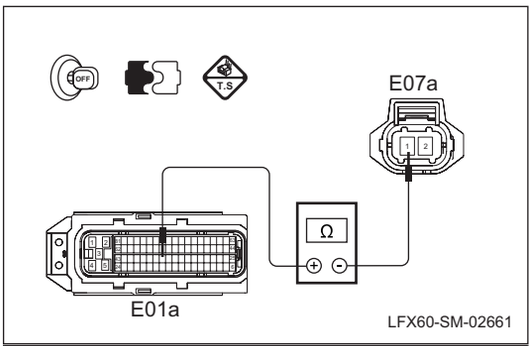
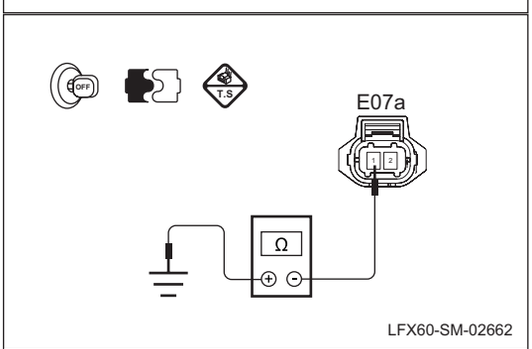
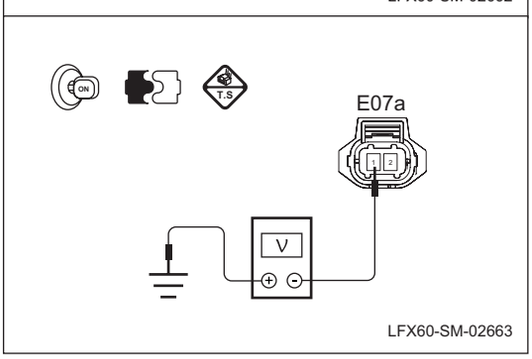
Diagnostic process

△ Tips:
Before performing this diagnosis procedure, observe the diagnostic meter data list and analyze the data accuracy to help the fast troubleshooting.

Test condition	Details/results/measures
1. Check the DTC.	
	A. Connect the diagnostic meter to the diagnostic interface. B. Operate the ignition switch to turn the power to ON state. C. Turn on the diagnostic meter and select the following menu items: power system/engine system (Delphi VVTECT) to read DTC. D. Is there a trouble code other than P0324 and P0325 in the control system? **→Yes** **Refer to: DTC list; determine whether the fault is caused by other DTC.** **→No** To step 2.
2. General Inspection.	
	A. Check whether the knock sensor is installed properly and whether the fasteners are loose. B. Check the knock sensor harness connector for loosening, aging, damage and other abnormalities. Is it OK after checking? **→Yes** To step 3. **→No** Repair the fault parts.
3. Check the knock sensor.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the knock sensor harness plug E07a. D. Measure the resistance between the 1st and 2nd terminals of the knock sensor with a multimeter. **Standard value:10 MΩ or higher** Is the resistance normal? **→Yes** To step 4. **→No** Replace the knock sensor. **Refer to: Replace the knock sensor**

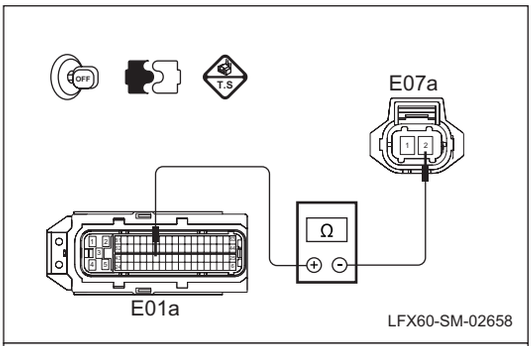
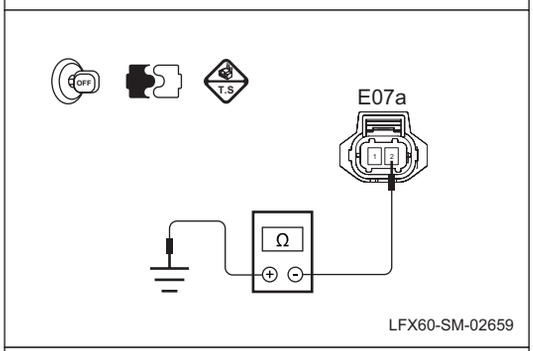
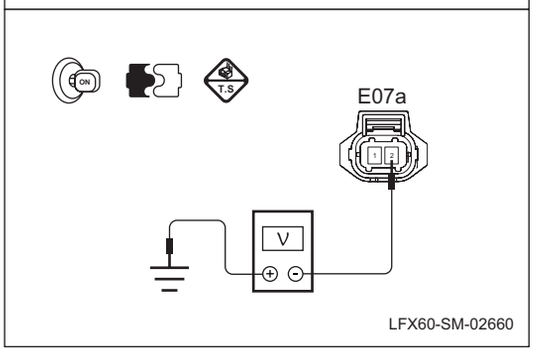
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Test condition	Details/results/measures
4. Check the knock sensor signal high line.	
  	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the knock sensor harness plug E07a. D. Disconnect the ECM harness plug E01a. E. Measure the resistance between the knock sensor harness plug E07a terminal 1 and ECM harness plug E01a terminal 36 with the multimeter. **Standard value:Less than 5Ω** F. Measure the resistance between the knock sensor harness plug E07a terminal 1 and fixed ground point with the multimeter. **Standard value:10 MΩ or higher** G. Connect the battery negative terminal. H. Operate the ignition switch to turn the power to ON state. I. Measure the voltage between the knock sensor harness plug E07a terminal 1 and fixed ground point with the multimeter. **Standard value: 0 V** Is it OK after checking? **→Yes** To step 5. **→No** Check and repair the knock sensor signal high line fault and replace the wiring harness if necessary.

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Test condition	Details/results/measures
5. Check the knock sensor signal low line.	
 LFX60-SM-02658  LFX60-SM-02659  LFX60-SM-02660	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the knock sensor harness plug E07a. D. Disconnect the ECM harness plug E01a. E. Measure the resistance between the knock sensor harness plug E07a terminal 2 and ECM harness plug E01a terminal 37 with the multimeter. **Standard value:Less than 5Ω** F. Measure the resistance between the knock sensor harness plug E07a terminal 2 and fixed ground point with the multimeter. **Standard value:10 MΩ or higher** G. Connect the battery negative terminal. H. Operate the ignition switch to turn the power to ON state. I. Measure the voltage between the knock sensor harness plug E07a terminal 2 and fixed ground point with the multimeter. **Standard value:0 V** Is it OK after checking? →**Yes** To step 6. →**No** Check and repair the knock sensor signal low line fault and replace the wiring harness if necessary.
6. Check ECM.	
	A. Replace ECM. **Refer to:ECM** B. Confirm the DTC with the diagnostic meter. C. Read the sensor data stream. D. Ensure there is no DTC and the data is normal.

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DTC P0335, P0336

DTC description

DTC	Description	Definition
P0335	• The crankshaft position sensor line has no signal	• The crankshaft position sensor is a magnetoelectric sensor, which is mounted near the crankshaft and works with the 58X ring gear on the crankshaft. When the crankshaft rotates, the crest and tooth space of 58X pass through the sensor at different intervals. The sensor senses the change of the magnetoresistance. This alternating magnetoresistance produces an alternating output signal. The ECM determines the rotational position and speed of the crankshaft by using this signal. • The ECM uses the signal from the crankshaft position sensor to determine the specific position of the piston present before the top dead center, and then uses the cylinder judgment signal of the camshaft position sensor to determine which cylinder is at the top dead center and the then working stroke. Therefore, after the ECU determines that a cylinder is in the exhaust stroke and the piston moves to a specific position present before the top dead center, according to the cylinder judgment signal and the crankshaft position signal, the ECU will output the fuel injection control command and drives the injector to perform fuel injection.
P0336	• Crankshaft position sensor line signal interference	

Possible reasons

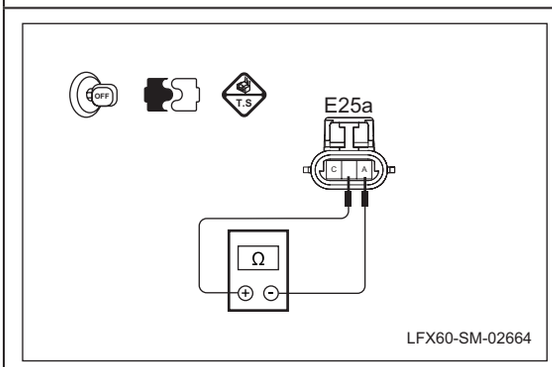
DTC	Detection strategy	Define the fault location
P0335	• Hardware or line check	• Harness or plug • Crankshaft position sensor • ECM
P0336		

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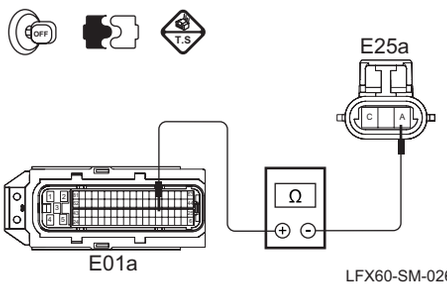
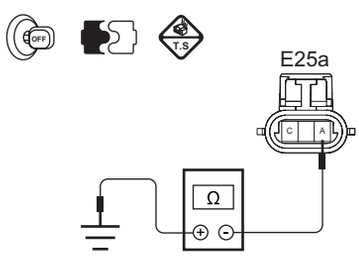
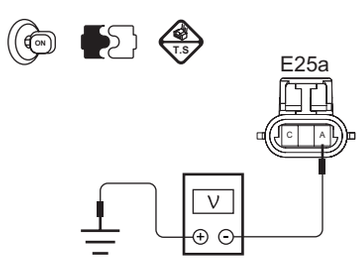
Diagnostic process

△ Tips:
Before performing this diagnosis procedure, observe the diagnostic meter data list and analyze the data accuracy to help the fast troubleshooting.

Test condition	Details/results/measures
1. Check the DTC.	
	A. Connect the diagnostic meter to the diagnostic interface. B. Operate the ignition switch to turn the power to ON state. C. Turn on the diagnostic meter and select the following menu items: power system/engine system (Delphi VVTECT) to read DTC. D. Is there a trouble code other than P0335 and P0336 in the control system? **→Yes** **Refer to: DTC list; determine whether the fault is caused by other DTC** **→No** To step 2.
2. General Inspection.	
	A. Check whether the crankshaft position sensor is installed properly and whether the fasteners are loose. B. Check the crankshaft position sensor harness connector for loosening, aging, damage and other unusual circumstances. Is it OK after checking? **→Yes** To step 3. **→No** Repair the fault parts.
3. Check the crankshaft position sensor.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the crankshaft position sensor harness plug E25a. D. Measure the resistance between the A and B terminals of the crankshaft position sensor with a multimeter. **Standard value:500 Ω± 10%** Is the resistance normal? **→Yes** To step 4. **→No** Replace the crankshaft position sensor. **Refer to: Replace the crankshaft position sensor.**

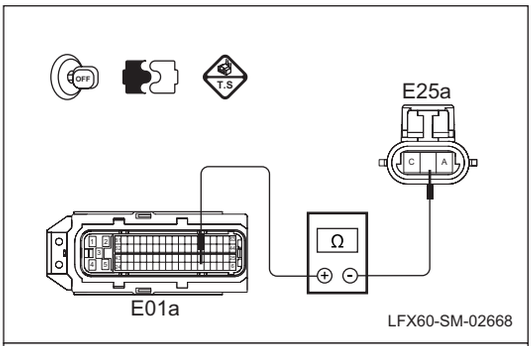
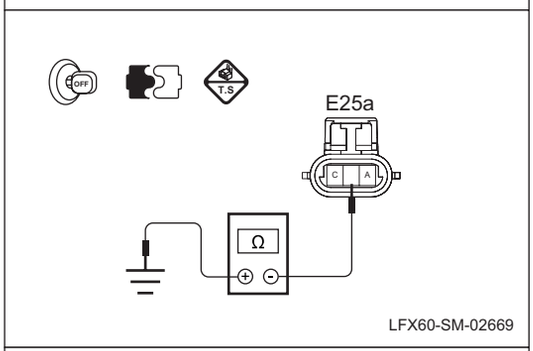
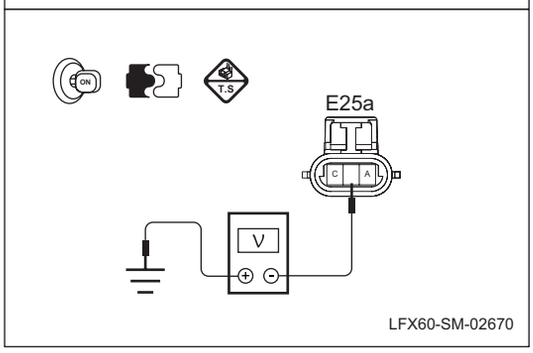
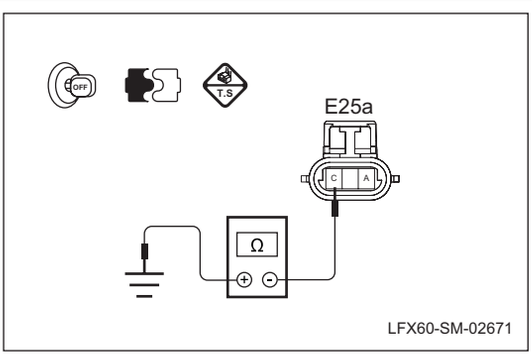
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Test condition	Details/results/measures
4. Check the crankshaft sensor signal high line.	
 LFX60-SM-02665  LFX60-SM-02666  LFX60-SM-02667	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the crankshaft position sensor harness plug E25a. D. Disconnect the ECM harness plug E01a. E. Measure the resistance between the A terminal of the crankshaft position sensor harness connector E25a and the 30th terminal of the ECM harness connector E01a with a multimeter. **Standard value:Less than 5Ω** F. Measure the resistance between the crankshaft position sensor harness connector E25a terminal A and the reliable ground point with a multimeter. **Standard value:10 MΩ or higher** G. Connect the battery negative terminal. H. Operate the ignition switch to turn the power to ON state. I. Measure the resistance between the crankshaft position sensor harness connector E25a terminal A of and the reliable ground point with a multimeter. **Standard value:0 V** Is it OK after checking? → **Yes** To step 5. → **No** Check and repair the crankshaft position sensor signal high line fault and replace the wiring harness if necessary.

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Test condition	Details/results/measures
5. Check the crankshaft sensor signal low line.	
 LFX60-SM-02668  LFX60-SM-02669  LFX60-SM-02670	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the crankshaft position sensor harness plug E25a. D. Disconnect the ECM harness plug E01a. E. Measure the resistance between the B terminal of the crankshaft position sensor harness connector E25a and the 11th terminal of the ECM harness connector E01a with a multimeter. **Standard value: Less than 5Ω** F. Measure the resistance between the crankshaft position sensor harness connector E25a terminal B and the reliable ground point with a multimeter. **Standard value: 10 MΩ or higher** G. Connect the battery negative terminal. H. Operate the ignition switch to turn the power to ON state. I. Measure the resistance between the crankshaft position sensor harness connector E25a terminal B of and the reliable ground point with a multimeter. **Standard value: 0 V** Is it OK after checking? →**Yes** To step 6. →**No** Check and repair the crankshaft position sensor signal low line fault and replace the wiring harness if necessary.
6. Check the crankshaft position sensor ground line.	
 LFX60-SM-02671	A. Operate the ignition switch to turn the power to OFF state. Disconnect the battery negative terminal. B. Disconnect the crankshaft position sensor harness connector E25a. C. Measure the resistance between the crankshaft position sensor harness connector E25a terminal C and the ground point G102a with a multimeter. **Standard value: Less than 5Ω** Is it OK after checking? →**Yes** To step 7. →**No** Check and repair the crankshaft position sensor ground line fault, and replace the wiring harness if necessary.

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Test condition	Details/results/measures
7. Check ECM.	
	A. Replace ECM. **Refer to:ECM** B. Confirm the DTC with the diagnostic meter. C. Read the sensor data stream. D. Ensure there is no DTC and the data is normal.

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DTC P0340, P0341

DTC description

DTC	Description	Definition
P0340	• Air intake VCP camshaft position sensor status diagnostics	• The camshaft phase sensor, also known as the cylinder identification sensor, is used to capture the position signal of the valve timing camshaft and enter it into the ECM to determine the position for the piston being at the compression (or exhaust) stroke top dead center, and finally determine when and to which cylinder the fuel should be injected.
P0341	• Intake VCP target wheel diagnostic failure	

Possible reasons

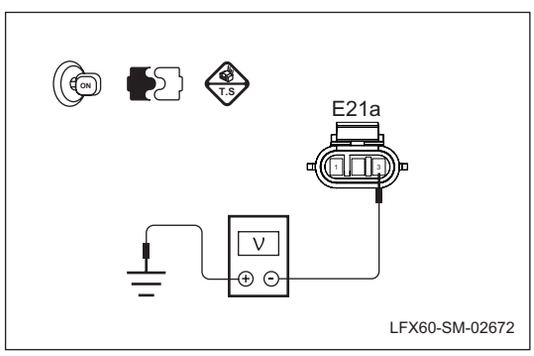
DTC	Detection strategy	Define the fault location
P0340	• Hardware or line check	• Harness or plug • Sensor • ECM
P0341		

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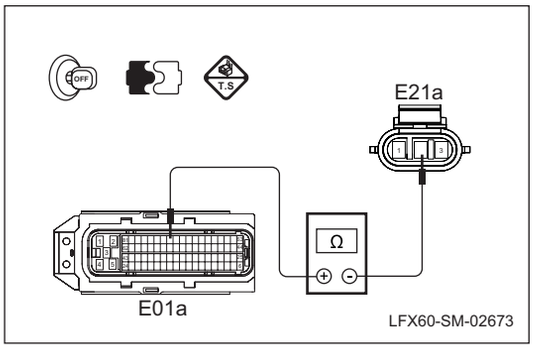
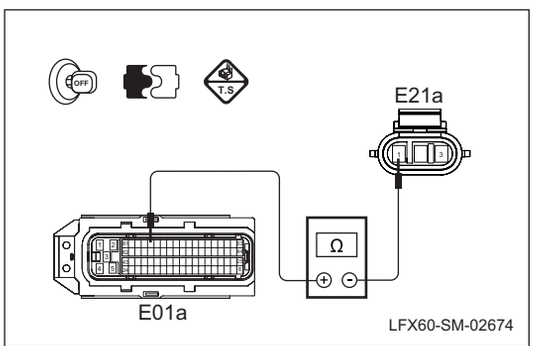
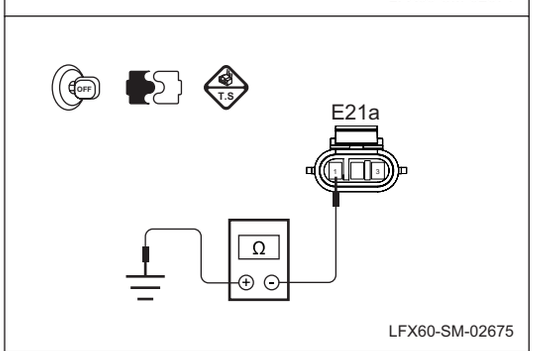
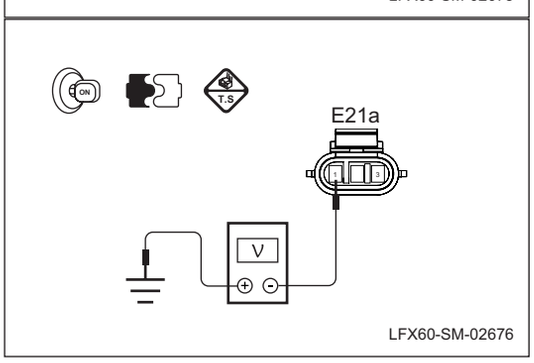
Diagnostic process

△ Tips:
Before performing this diagnosis procedure, observe the diagnostic meter data list and analyze the data accuracy to help the fast troubleshooting.

Test condition	Details/results/measures
1. Check the DTC.	
	A. Connect the diagnostic meter to the diagnostic interface. B. Operate the ignition switch to turn the power to ON state. C. Turn on the diagnostic meter and select the following menu items: power system/engine system (Delphi VVTECT) to read DTC. D. Is there a trouble code other than P0340 and P0341 in the control system? **→Yes** **Refer to: DTC list; determine whether the fault is caused by other DTC** **→No** To step 2.
2. General Inspection.	
	A. Check the intake/exhaust VCP camshaft position sensor harness connectors for loosening, aging, damage and other abnormalities. Is it OK after checking? **→Yes** To step 3. **→No** Repair the fault parts.
3. Check the intake camshaft position sensor power supply line.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the intake camshaft position sensor harness plug E21a. D. Operate the ignition switch to turn the power to ON state. E. Connect the battery negative terminal. F. Measure the voltage between the intake camshaft position sensor harness connector E21a terminal 3 and the reliable ground point with a multimeter. **Standard value:4.5 ~ 5.5 V** Is the voltage normal? **→Yes** To step 4. **→No** Check and repair the intake camshaft position sensor power supply line fault, and replace the wiring harness if necessary.

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Test condition	Details/results/measures
4. Check the intake camshaft position sensor ground line.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the intake camshaft position sensor harness plug E21a. D. Disconnect the ECM harness plug E01a. E. Measure the resistance between the intake camshaft position sensor harness plug E21a terminal 2 and ECM harness plug E01a terminal 74 with the multimeter. **Standard value:Less than 5Ω** Is the resistance normal? **→Yes** To step 5. **→No** Check and repair the intake camshaft position sensor ground line fault, replace the wiring harness if necessary.
5. Check the intake camshaft position sensor signal line.	
  	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the intake camshaft position sensor harness plug E21a. D. Disconnect the ECM harness plug E01a. E. Measure the resistance between the intake camshaft position sensor harness plug E21a terminal 1 and ECM harness plug E01a terminal 77 with the multimeter. **Standard value:Less than 5Ω** F. Measure the resistance between the intake camshaft position sensor harness connector E21a terminal 1 and the reliable ground point with a multimeter. **Standard value:10 MΩ or higher** G. Connect the battery negative terminal. H. Operate the ignition switch to turn the power to ON state. I. Measure the voltage between the intake camshaft position sensor harness connector E21a terminal 1 and the reliable ground point with a multimeter. **Standard value:0 V** Is it OK after checking? **→Yes** To step 6. **→No** Check and repair the camshaft position sensor line fault and replace the wiring harness if necessary.

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Test condition	Details/results/measures
6. Check the intake camshaft position sensor.	
	A. Replace the intake camshaft position sensor. **Refer to:Replacement of the intake camshaft position sensor** Is the system normal? →**Yes** Replace the intake camshaft position sensor. →**No** To step 7.
7. Check ECM.	
	A. Replace ECM. **Refer to:ECM** B. Confirm the DTC with the diagnostic meter. C. Read the sensor data stream. D. Ensure there is no DTC and the data is normal.

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DTC P1336

DTC description

DTC	Description	Definition
P1336	• No learning has being carried out for the P1336 58 teeth gear error	• You must perform adaptive learning of the crankshaft position sensor after replacing the crankshaft position sensor, replacing the ECM, removing and mounting the engine, and other maintenance operations that cause the position of the gear wheel and the crankshaft position sensor to change. Otherwise, fault will be always on. At the same time the ECM will record the trouble code of "no learning has being carried out for the P1336 58 teeth gear error"!

Possible reasons

DTC	Detection strategy	Define the fault location
P1336	• Hardware or line check	• Harness or plug • ECM

Diagnostic process

△ **Tips:**

Before performing this diagnosis procedure, observe the diagnostic meter data list and analyze the data accuracy to help the fast troubleshooting.

Test condition	Details/results/measures
1. Check the DTC.	
	A. Connect the diagnostic meter to the diagnostic interface. B. Operate the ignition switch to turn the power to ON state. C. Turn on the diagnostic meter and select the following menu items: power system/engine system (Delphi VVTECT) to read DTC. D. Is there a trouble code other than P1336 in the control system? →**Yes** **Refer to: DTC list; determine whether the fault is caused by other DTC** →**No** To step 2.

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Test condition	Details/results/measures
2. Crankshaft position sensor target gear teeth learning.	
	A. Connect the fault diagnostic meter to the diagnostic interface. B. Operate the ignition switch to turn the power to ON state. C. Start the engine. **Note: Before performing gear learning, the following conditions must be met:** **It is ensured that the engine coolant temperature is above 60°C;** **The A/C switch is not turned on; and** **The engine has been started for 10s.** D. Press the POWER key of the diagnostic equipment for faulty vehicles. E. Select the following menu items: Power System / Engine System (Delphi VVT ETC) / I/O Control Function Unit / Crankshaft Position Sensor Target Gear Teeth Learning. Is the system normal? →Yes Perform the crankshaft position sensor target gear learning. →No To step 3.
3. Trouble code confirmation.	
	A. Connect the diagnostic meter to the diagnostic interface. B. Operate the ignition switch to turn the power to ON state. C. Perform the “Clear the trouble code” step by using the automotive diagnostic equipment. D. Using the automotive diagnostic equipment, perform the "Read the trouble code" step, and confirm that no DTC exists. If there is, go to the fault diagnosis list.

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DTC P0351, P0352, P0353, P0354

DTC description

DTC	Description	Definition
P0351	• Ignition coil 1# output fault	• The same ECM controls the ignition time, dwell time, and spark progress. The ignition function is accomplished by accompanying the current flowing into the primary coil in the ignition system. This switch is controlled by electronic spark timing signals from pulse code modulation. When the electronic spark timing signal falls below a specific critical voltage level, the primary current is interrupted and the power is transferred from the primary winding to the secondary winding. The electrical energy generated in the secondary winding is directly transmitted to the spark plug.
P0352	• Ignition coil 2lb output fault	
P0353	• Ignition coil 3lb output fault	
P0354	• Ignition coil 4lb output fault	

Possible reasons

DTC	Detection strategy	Define the fault location
P0351	• Hardware or line check	• Harness or plug • Ignition coils • ECM
P0352		
P0353		
P0354		

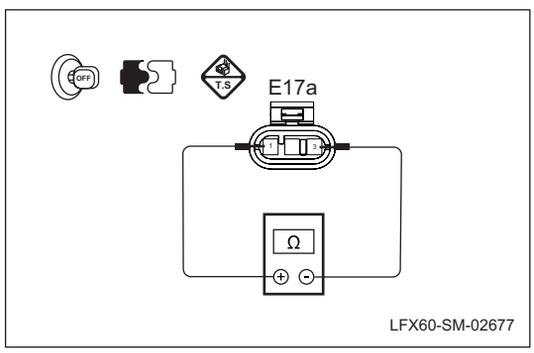
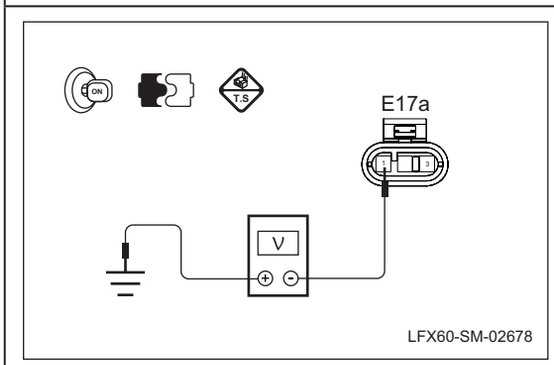
Diagnostic process

△ **Tips:**
Before performing this diagnosis procedure, observe the diagnostic meter data list and analyze the data accuracy to help the fast troubleshooting.

Test condition	Details/results/measures
1. Check the DTC.	
	A. Connect the diagnostic meter to the diagnostic interface. B. Operate the ignition switch to turn the power to ON state. C. Turn on the diagnostic meter and select the following menu items: power system/engine system (Delphi VVTECT) to read DTC. D. Is there a trouble code other than P0351, P0352, P0353 and P0354 in the control system? →**Yes** **Refer to: DTC list; determine whether the fault is caused by other DTC** →**No** To step 2.

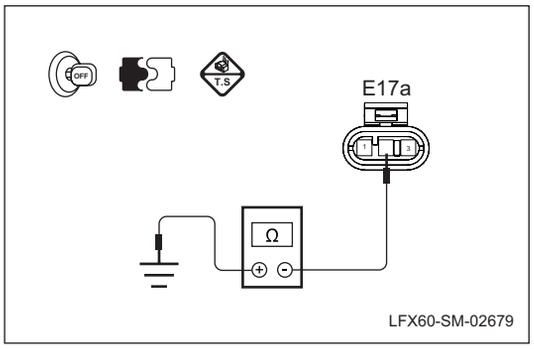
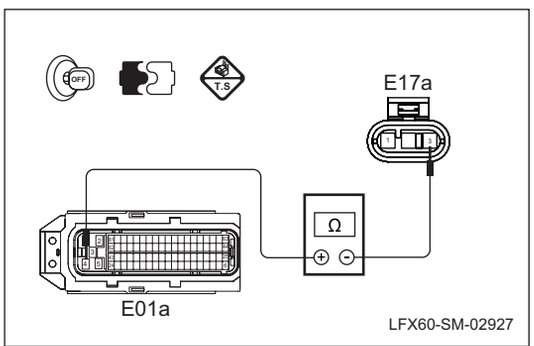
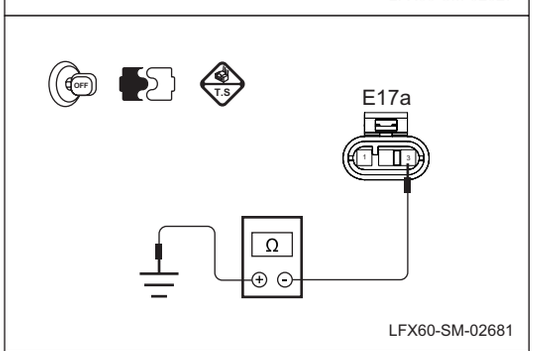
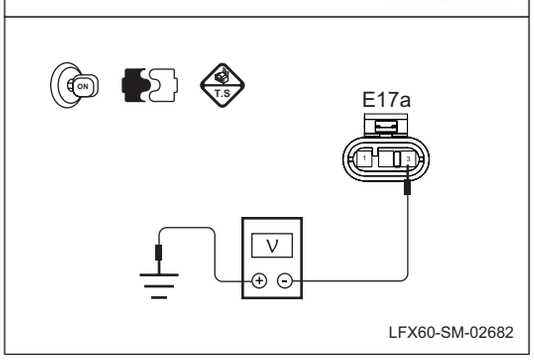
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Test condition	Details/results/measures
2. General Inspection.	
	A. Check the ignition coil harness connector for loosening, aging, damage and other unusual circumstances. Is it OK after checking? →**Yes** To step 3. →**No** Repair the fault parts.
3. Check the ignition coil (by taking the 1# ignition coil as an example).	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the ignition coil harness plug E17a. D. Measure the resistance between the 1st and 3rd terminals of the ignition coil with a multimeter. **Standard value: 0.5±0.05Ω** Is the resistance normal? →**Yes** To step 4. →**No** Replace the ignition coils. **Refer to: Ignition coil replacement**
4. Check the ignition coil power supply line.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the ignition coil harness plug E17a. D. Operate the ignition switch to turn the power to ON state. E. Measure the voltage between the ignition coil harness connector E17a terminal 1 and the reliable ground point with a multimeter. **Standard value: 11 ~ 14 V** Is the voltage normal? →**Yes** To step 5. →**No** Troubleshoot the ignition coil power supply line and replace the harness if necessary.

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Test condition	Details/results/measures
5. Check the ignition coil ground line.	
	A. Operate the ignition switch to turn the power to OFF state. Disconnect the battery negative terminal. B. Disconnect the ignition coil harness connector E17a. C. Measure the resistance between the ignition coil harness connector E17a terminal 2 and the ground point G103a with a multimeter. **Standard value: Less than 5Ω** Is the resistance normal? → **Yes** To step 6. → **No** Repair the ignition coil ground circuit fault and replace the harness if necessary.
6. Check the ignition coil ignition signal line.	
  	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the ignition coil harness plug E17a. D. Disconnect the ECM harness plug E01a. E. Measure the resistance between the 3rd terminal of the ignition coil harness connector E17a and the 4th terminal of the ECM harness connector E01a with a multimeter. **Standard value: Less than 5Ω** F. Measure the resistance between the ignition coil harness connector E17a terminal 3 and the reliable ground point with a multimeter. **Standard value: 10 MΩ or higher** G. Connect the battery negative terminal. H. Operate the ignition switch to turn the power to ON state. I. Measure the voltage between the ignition coil harness connector E17a terminal 3 and the reliable ground point with a multimeter. **Standard value: 0 V** Is it OK after checking? →**Yes** To step 6. →**No** Check and repair the ignition coil ignition signal line fault, and replace the wiring harness if necessary.

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Test condition	Details/results/measures
6. Check ECM.	
	A. Replace ECM. **Refer to: ECM** B. Confirm the DTC with the diagnostic meter. C. Read the sensor data stream. D. Ensure there is no DTC and the data is normal.

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DTC P0420

DTC description

DTC	Description	Definition
P0420	• Catalytic converter is inefficient	• Three-way catalytic converters reduce pollutant emissions by converting hydrocarbons (HC), and carbon monoxide (CO) to carbon dioxide (CO2) and catalytic conversion of nitrogen oxides (NOx). The engine control module monitors the volume of oxygen in storage, that is, in certain idling mode it increases and decreases the fuel while comparing the front and rear catalyst oxygen sensor signals. The ECM compares the signals of the front and rear catalyst oxygen sensors with each other to determine whether the catalyst oxygen storage volume is degraded.

Possible reasons

DTC	Detection strategy	Define the fault location
P0420	• Hardware or line check	• Harness or plug • Catalytic converter • Rear oxygen sensor

Diagnostic process

△ **Tips:**
Before performing this diagnosis procedure, observe the diagnostic meter data list and analyze the data accuracy to help the fast troubleshooting.

Test condition	Details/results/measures
1. Check the DTC.	
	A. Connect the diagnostic meter to the diagnostic interface. B. Operate the ignition switch to turn the power to ON state. C. Turn on the diagnostic meter and select the following menu items: power system/engine system (Delphi VVTECT) to read DTC. D. Is there a trouble code other than P0420 in the control system? →**Yes** **Refer to: DTC list; determine whether the fault is caused by other DTC.** →**No** To step 2.

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Test condition	Details/results/measures
2. General Inspection.	
	A. Check the engine for misfiring, poor fuel quality, too much oil and coolant consumption, too lean/rich mixture and so on. Is it OK after checking? →**Yes** To step 3. →**No** Check the abnormal situation, and eliminate the interference of abnormal circumstances.
3. Check the exhaust system.	
	A. Check the engine exhaust system for leaks, and clogging. B. Check the catalytic converter for deformation. C. Check whether front and rear oxygen sensors are installed correctly. Is it OK after checking? →**Yes** To step 4. →**No** Repair or replace the abnormal components.
4. check the rear oxygen sensor.	
	A. Replace the oxygen sensor. **Refer to: Replace the rear oxygen sensor.** B. Read the engine system rear oxygen sensor data stream with automotive diagnostic equipment. Is the data stream normal? →**Yes** Replace the rear oxygen sensor. →**No** To step 5.
5. Check the catalytic converter.	
	A. Replace the catalytic converter. Confirm that the fault has been ruled out.

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DTC P0458, P0459

DTC description

DTC	Description	Definition
P0458	• Charcoal canister solenoid valve output short circuit to low voltage or short	• The ECM controls the amount of gasoline vapor entering the intake manifold from the charcoal canister through the charcoal canister solenoid valve; the ECM outputs a pulse square wave to it, and the air volume is linearly related to the duty ratio of the control pulse square wave. • The ECM changes the working time and rate for cleaning the charcoal canister according to the engine speed and load conditions.
P0459	• Charcoal canister solenoid valve output short circuit to high voltage	

Possible reasons

DTC	Detection strategy	Define the fault location
P0458	• Hardware or line check	• Harness or plug • Canister solenoid valve • ECM
P0459		

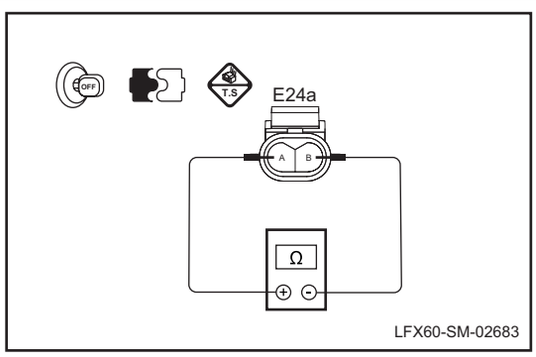
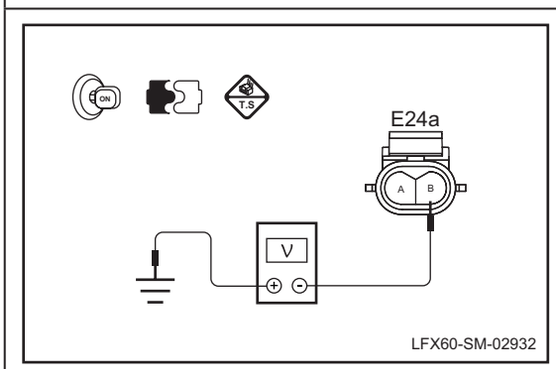
Diagnostic process

△ **Tips:**
Before performing this diagnosis procedure, observe the diagnostic meter data list and analyze the data accuracy to help the fast troubleshooting.

Test condition	Details/results/measures
1. Check the DTC.	
	A. Connect the diagnostic meter to the diagnostic interface. B. Operate the ignition switch to turn the power to ON state. C. Turn on the diagnostic meter and select the following menu items: power system/engine system (Delphi VVTECT) to read DTC. D. Is there a trouble code other than P0458 and P0459 in the control system? →**Yes** **Refer to: DTC list; determine whether the fault is caused by other DTC.** →**No** To step 2.

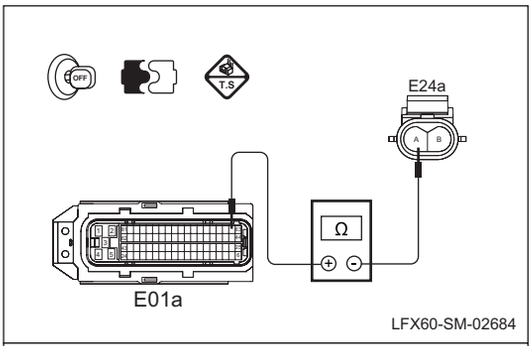
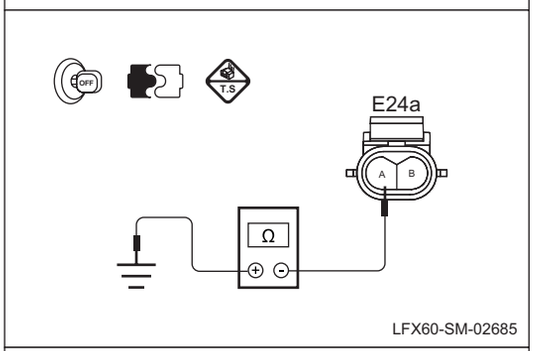
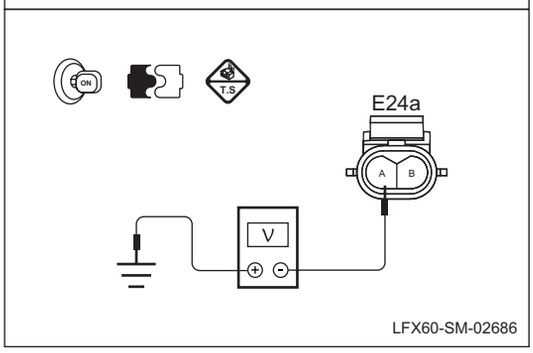
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Test condition	Details/results/measures
2. General Inspection.	
	A. Check the charcoal canister solenoid valve harness connector for loosening, aging, damage and other abnormalities. Is it OK after checking? →**Yes** To step 3. →**No** Repair the fault parts.
3. Check the canister solenoid valve.	
 LFX60-SM-02683	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the canister solenoid valve harness plug E24a. D. Measure the resistance between the canister solenoid valve terminal A and B with the multimeter. **Standard value: 19~22 Ω** Is the resistance normal? →**Yes** To step 4. →**No** Replace the canister solenoid valve. **Refer to: Replacement of canister solenoid valve**
4. Check the canister solenoid valve power supply line.	
 LFX60-SM-02932	A. Operate the ignition switch to turn the power to OFF state. Disconnect the battery negative terminal. B. Disconnect the charcoal canister solenoid valve harness connector E24a. C. Operate the ignition switch to turn the power to ON state. D. Measure the voltage between the charcoal canister solenoid valve harness connector E24a terminal B and the reliable ground point with a multimeter. **Standard value: 0 V** Is the voltage normal? →**Yes** To step 5. →**No** Troubleshoot the canister solenoid valve power supply line. If necessary, replace the harness.

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Test condition	Details/results/measures
5. Check the charcoal canister solenoid valve control circuit.	
 LFX60-SM-02684  LFX60-SM-02685  LFX60-SM-02686	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the canister solenoid valve harness plug E24a. D. Disconnect the ECM harness plug E01a. E. Measure the resistance between the A terminal of the charcoal canister solenoid valve harness connector E24a and the 64th terminal of the ECM harness connector E01a with a multimeter. **Standard value: Less than 5Ω** F. Measure the resistance between the charcoal canister solenoid valve harness connector E24a terminal A and the reliable ground point with a multimeter. **Standard value: 10 MΩ or higher** G. Connect the battery negative terminal. H. Operate the ignition switch to turn the power to ON state. I. Measure the resistance between the charcoal canister solenoid valve harness connector E24a terminal A and the reliable ground point with a multimeter. **Standard value: 0 V** Is it OK after checking? **→Yes** To step 6. **→No** Check the charcoal canister solenoid valve control circuit fault and replace the wiring harness if necessary.
6. Check ECM.	
	A. Replace ECM. **Refer to: ECM** B. Confirm the DTC with the diagnostic meter. C. Read the sensor data stream. D. Ensure there is no DTC and the data is normal.

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DTC P0230

DTC description

DTC	Description	Definition
P0230	• The pump relay is faulty	• The operating voltage of the fuel pump relay is controlled by ECM. The ECM controls the operation of the fuel pump relay via the harness connector E01 terminal 9. The ECM is internally provided with a drive line for controlling the relay coil so that it is grounded. The drive line is equipped with a feedback line to the engine control module. It is determined whether the control circuit is open, shorted to ground or shorted to the power supply, by monitoring the feedback voltage.

Possible reasons

DTC	Detection strategy	Define the fault location
P0230	• Hardware or line check	• Wiring harness or connector • Fuel pump relay • Engine compartment fuse box • ECM

Diagnostic process

Refer to: electric fuel pump out of operation diagnosis flow

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DTC P0480

DTC description

DTC	Description	Definition
P0480	• Low speed fan failure	• The operating voltage of the low-speed cooling fan is controlled by the ECM according to the operating conditions of the engine. The ECM uses the harness connector E01a terminals 65 and 17 to control the K16 #1 fan relay and K14 fan speed control relay work, and control low-speed fan work. The drive line is provided with a feedback line to ECM and determines the open circuit, short circuit to ground or short circuit to power through monitoring the feedback voltage.

Possible reasons

DTC	Detection strategy	Define the fault location
P0480	• Hardware or line check	• Harness or plug • Fan relay • Engine compartment fuse box • Low speed fan • ECM

Diagnostic process

Refer to: Diagnostic process for the fact that the low-speed fan does not turn

Refer to: Diagnostic process for the fact that the low speed fan often turns

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DTC P0481

DTC description

DTC	Description	Definition
P0481	• High speed fan failure	• The operating voltage of the high-speed cooling fan is controlled by the ECM according to the operating conditions of the engine. The ECM uses the harness connector E01a terminals 17 to control the K15 #2 fan relay and K14 fan speed control relay work, and control high -speed fan work. The drive line is provided with a feedback line to ECM and determines the open circuit, short circuit to ground or short circuit to power through monitoring the feedback voltage.

Possible reasons

DTC	Detection strategy	Define the fault location
P0481	• Hardware or line check	• Harness or plug • Fan relay • Engine compartment fuse box • High speed fan • ECM

Diagnostic process

Refer to: Diagnostic process for the fact that the high-speed fan does not turn

Refer to: Diagnostic process for the fact that the high speed fan often turns

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DTC P0551

DTC description

DTC	Description	Definition
P0551	• Power steering switch line voltage range/performance fault	• The ECM provides a reference voltage for the power steering switch to detect the operating status of the power steering switch.

Possible reasons

DTC	Detection strategy	Define the fault location
P0551	• Hardware or line check	• Harness or plug • Power steering switch • ECM

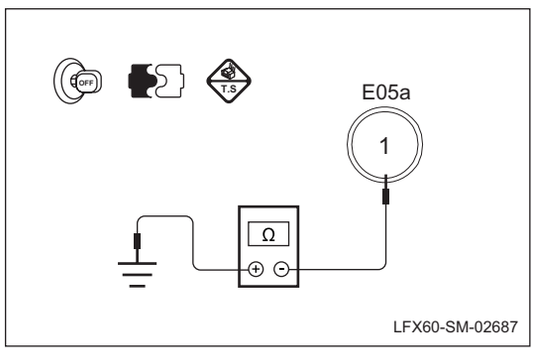
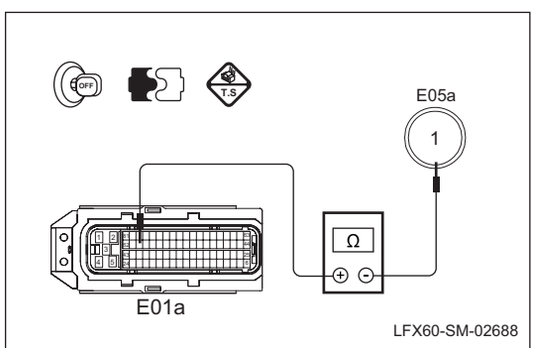
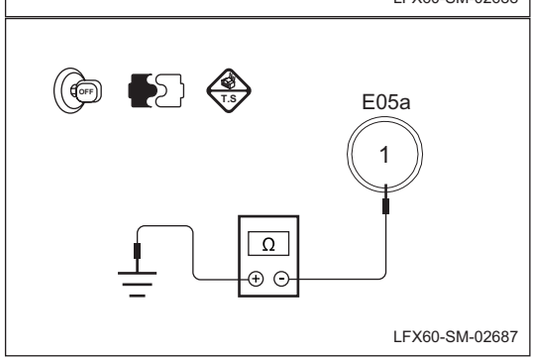
Diagnostic process

△ **Tips:**
Before performing this diagnosis procedure, observe the diagnostic meter data list and analyze the data accuracy to help the fast troubleshooting.

Test condition	Details/results/measures
1. Check the DTC.	
	A. Connect the diagnostic meter to the diagnostic interface. B. Operate the ignition switch to turn the power to ON state. C. Turn on the diagnostic meter and select the following menu items: power system/engine system (Delphi VVTECT) to read DTC. D. Is there a trouble code other than P0551 in the control system? →**Yes** **Refer to: DTC list; determine whether the fault is caused by other DTC** →**No** To step 2.
2. General Inspection.	
	A. Check the ECM, and power steering switch harness connectors for loosening, aging, damage and other abnormalities. Is it OK after checking? →**Yes** To step 2. →**No** Repair the fault parts.

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Test condition	Details/results/measures
3. Check the power steering switch.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the power steering switch harness connector E05a. D. Measure the resistance between the power steering switch terminal and the reliable ground point with a multimeter. **Standard value: 10 MΩ or higher** Is the resistance normal? **→Yes** To step 4. **→No** Replace the power steering switch. **Refer to: Replacement of the power steering switch**
4. Check the power steering switch signal line.	
 	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the power steering switch harness connector E05a. D. Disconnect the ECM harness plug E01a. E. Measure the resistance between the 1st terminal of the power steering switch harness connector E05a and the 60th terminal of the ECM harness connector E01a with a multimeter. **Standard value: Less than 5Ω** F. Measure the resistance between the power steering switch harness connector E05a terminal 1 and the reliable ground point with a multimeter. **Standard value: 10 MΩ or higher** Is the voltage normal? **→Yes** To step 5. **→No** Check and repair the power steering switch signal line fault, and replace the wiring harness if necessary.
5. Check ECM.	
	A. Replace ECM. **Refer to: ECM** B. Confirm the DTC with the diagnostic meter. C. Read the sensor data stream. D. Ensure there is no DTC and the data is normal.

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DTC P0502

DTC description

DTC	Description	Definition
P0502	• The vehicle speed sensor has no signal	• The ECM fails to receive the vehicle speed sensor signal via CAN bus communication.

Possible reasons

DTC	Detection strategy	Define the fault location
P0502	• Hardware or line check	• Harness or plug • Vehicle speed sensor • ECM

Diagnostic process

△ **Tips:**
Before performing this diagnosis procedure, observe the diagnostic meter data list and analyze the data accuracy to help the fast troubleshooting.

Test condition	Details/results/measures
1. General Inspection.	
	A. Check the ECM, ABS, and vehicle speed sensor harness connectors for loosening, aging, damage and other abnormalities. Is it OK after checking? →**Yes** To step 2. →**No** Repair or replace the damaged components.
2. Check the DTC.	
	A. Connect the diagnostic meter to the diagnostic interface. B. Operate the ignition switch to turn the power to ON state. C. Turn on the automotive diagnostic equipment, and enter the ABS control module. Is there a vehicle speed sensor failure? →**Yes** Go to the ABS DTC diagnostic process. →**No** To step 3.

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Test condition	Details/results/measures
3. Check ECM.	
	A. Check ECM. **Refer to: ECM** B. Confirm the DTC with the diagnostic meter. C. Read the sensor data stream. D. Ensure there is no DTC and the data is normal.

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DTC P0562, P0563

DTC description

DTC	Description	Definition
P0562	• Low system voltage	• The engine control module power supply consists of the following lines: the battery constant power provides ECM with a constant power supply and an IG1 power supply via ECM harness connector E01a terminals 20 and 35 through fuses FS18 and FS22.
P0563	• High system voltage	

Possible reasons

DTC	Detection strategy	Define the fault location
P0562	• Hardware or line check	• Harness or plug • Battery • Charging system • ECM
P0563		

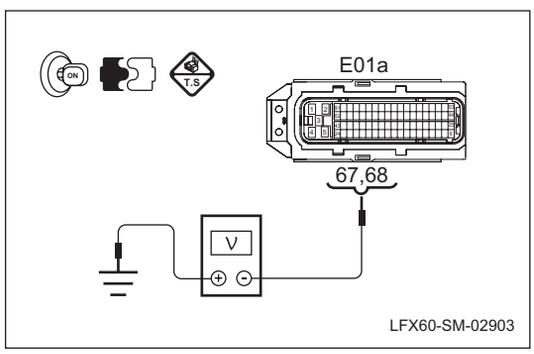
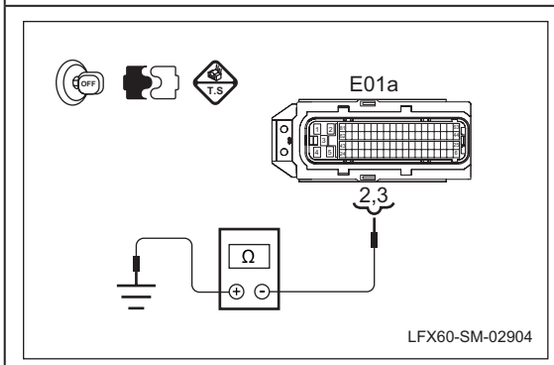
Diagnostic process

△ **Tips:**
Before performing this diagnosis procedure, observe the diagnostic meter data list and analyze the data accuracy to help the fast troubleshooting.

Test condition	Details/results/measures
1. General Inspection.	
	A. Check the ECM, charging system, and battery harness connectors for loosening, aging, damage and other abnormalities. Is it OK after checking? →**Yes** To step 2. →**No** Repair the fault parts.
2. Check the DTC.	
	A. Connect the diagnostic meter to the diagnostic interface. B. Operate the ignition switch to turn the power to ON state. C. Turn on the automotive diagnostic equipment and enter the other control modules. Is there a system voltage fault? →**Yes** To step 3. →**No** To step 4.

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Test condition	Details/results/measures
3. Check the battery voltage.	
	A. Operate the ignition switch to turn the power to OFF state. B. Measure the voltage of the battery with a multimeter. **Standard value: 11 ~ 14 V** Is the voltage normal? →**Yes** To step 4. →**No** Replace the battery or overhaul the charging system.
4. Check the ECM power.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the ECM harness plug E01a. D. Connect the battery negative terminal. E. Operate the ignition switch to turn the power to ON state. F. Measure the voltage between the terminal 67, 68 of E01a plug and the fixed ground point with the multimeter. **Standard value: 11 ~ 14 V** Is the voltage normal? →**Yes** To step 5. →**No** Repair the ECM power line fault and replace the harness if necessary.
5. Check the ECM grounding line.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Measure the resistance between the terminal 2, 3 of E01a plug and the fixed ground point with the multimeter. **Standard value: Less than 5Ω** Is the resistance normal? →**Yes** To step 6. →**No** Repair the ECM ground circuit fault and replace the harness if necessary.

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Test condition	Details/results/measures
6. Check ECM.	
	A. Replace ECM. **Refer to: ECM** B. Confirm the DTC with the diagnostic meter. C. Read the sensor data stream. D. Ensure there is no DTC and the data is normal.

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DTC P0602, P0604, P0606, P060A

DTC description

DTC	Description	Definition
P0602	• ECM processor fault	• ECM internal program processing error
P0604	• RAM error	
P0606	• ECM processor fault	
P060A	• ECM programming error	

Possible reasons

DTC	Detection strategy	Define the fault location
P0602	• Hardware or line check	• Harness or plug • ECM
P0604		
P0606		
P060A		

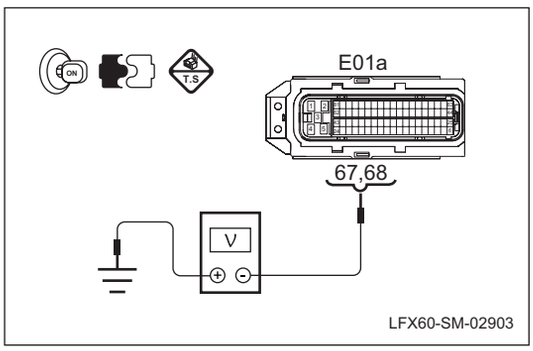
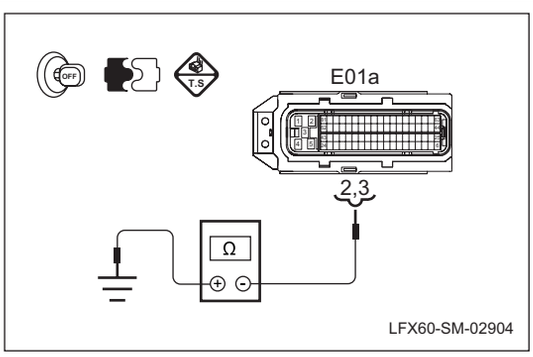
Diagnostic process

△ **Tips:**
Before performing this diagnosis procedure, observe the diagnostic meter data list and analyze the data accuracy to help the fast troubleshooting.

Test condition	Details/results/measures
1. Check the DTC.	
	A. Connect the diagnostic meter to the diagnostic interface. B. Operate the ignition switch to turn the power to ON state. C. Turn on the diagnostic meter and select the following menu items: power system/engine system (Delphi VVTECT) to read DTC. D. Is there a trouble code other than P0602, P0604, P0606 and P060A in the control system? →**Yes** **Refer to: DTC list; determine whether the fault is caused by other DTC** →**No** To step 2.

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Test condition	Details/results/measures
2. General Inspection.	
	A. Check the ECM harness connector for loosening, aging, damage and other unusual circumstances. Is it OK after checking? →**Yes** To step 3. →**No** Repair the fault parts.
3. Check the ECM power.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the ECM harness plug E01a. D. Connect the battery negative terminal. E. Operate the ignition switch to turn the power to ON state. F. Measure the voltage between the terminal 67, 68 of E01a plug and the fixed ground point with the multimeter. **Standard value: 11 ~ 14 V** Is the voltage normal? →**Yes** To step 4. →**No** Repair the ECM power line fault and replace the harness if necessary.
4. Check the ECM grounding line.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Measure the resistance between the terminal 2, 3 of E01a plug and the fixed ground point with the multimeter. **Standard value: Less than 5Ω** Is the resistance normal? →**Yes** To step 5. →**No** Repair the ECM ground circuit fault and replace the harness if necessary.
5. Check ECM.	
	A. Replace ECM. **Refer to: ECM** B. Confirm the DTC with the diagnostic meter. C. Read the sensor data stream. D. Ensure there is no DTC and the data is normal.

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DTC P0633

DTC description

DTC	Description	Definition
P0633	• Anti-theft device failure to learn	• Signals provided for ECM fortification via the CAN network when the car is in the anti-theft state. • Signals provided for ECM defenselessness via the CAN network when the car is in the non-anti-theft state. Every time you switch on the ignition, you need to verify the legitimacy of the key and, in the case of failure of the key certification, change the anti-theft status to the fortified state and do not respond to the ECM request to prevent the car from starting.

Possible reasons

DTC	Detection strategy	Define the fault location
P0633	• Hardware or line check	• Harness or plug • Ignition key • Immobilizer identification coil • BCM • ECM

Diagnostic process

Refer to: ECM always detects the fault that the anti-theft is not lifted

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DTC P2122, P2123, P2127, P2128, P2135, P2138

DTC description

DTC	Description	Definition
P2122	• Electronic throttle pedal position sensor 1# line voltage low	• The electronic accelerator pedal position sensor is a sliding potentiometer. When the accelerator pedal is depressed, the sensor feeds back the voltage signal to the ECM. • The ECM adjusts the opening of the throttle by driving the motor to rotate by controlling the output voltage signal. The sensor signal voltage changes in the range of 0-5V, and it changes in proportion to the throttle opening.
P2123	• Electronic throttle pedal position sensor 1# line voltage high	
P2127	• Electronic throttle pedal position sensor 2lb line voltage low	
P2128	• Electronic throttle pedal position sensor 2lb line voltage high	
P2135	• Electronic accelerator pedal position sensor 1# / 2# line-related fault	
P2138	• Electronic accelerator pedal position sensor 1# / 2# associated fault	

Possible reasons

DTC	Detection strategy	Define the fault location
P2122	• Hardware or line check	• Harness or plug • Electronic accelerator pedal position sensor • ECM
P2123		
P2127		
P2128		
P2135		
P2138		

Diagnostic process

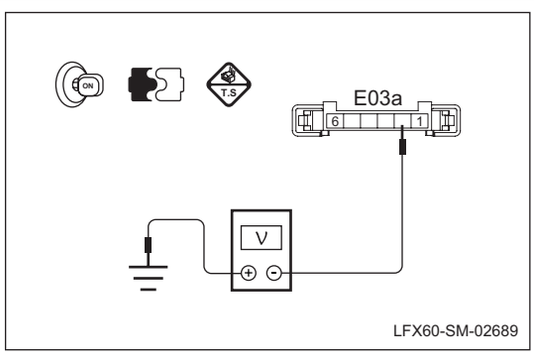
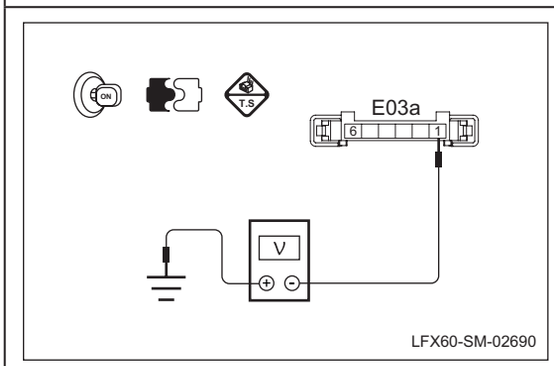
△ **Tips:**

Before performing this diagnosis procedure, observe the diagnostic meter data list and analyze the data accuracy to help the fast troubleshooting.

Test condition	Details/results/measures
1. Check the DTC.	
	A. Connect the diagnostic meter to the diagnostic interface. B. Operate the ignition switch to turn the power to ON state. C. Turn on the diagnostic meter and select the following menu items: power system/engine system (Delphi VVTECT) to read DTC. D. Is there a trouble code other than P2122, P2123, P2127, P2128, P2135 and P2138 in the control system? →**Yes** **Refer to: Diagnostic trouble code (DTC) list to determine whether the fault is due to other trouble codes.** →**No** To step 2.

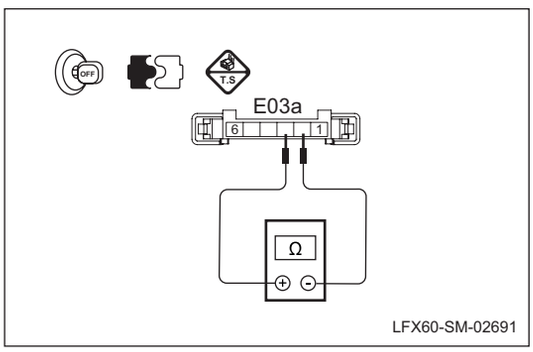
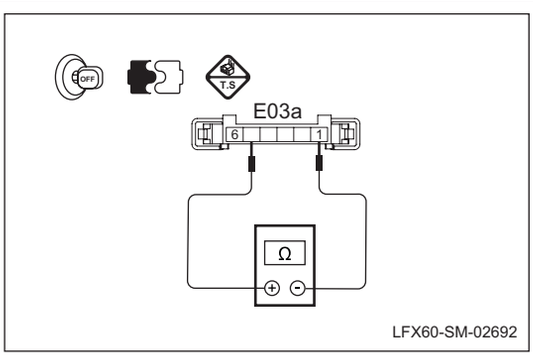
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Test condition	Details/results/measures
2. General Inspection.	
	A. Check the electronic-controlled throttle harness connector for loosening, aging, damage and other abnormalities. Is it OK after checking? →**Yes** To step 3. →**No** Repair the fault parts.
3. Check the electronic throttle position sensor 1 power line.	
 LFX60-SM-02689	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the electronic throttle position sensor harness plug E03a. D. Connect the battery negative terminal. E. Operate the ignition switch to turn the power to ON state. F. Measure the voltage between the electronic-controlled throttle position sensor harness connector E03a terminal 2 and the reliable ground point with a multimeter. **Standard value: 4.5 ~ 5.5 V** Is the voltage normal? →**Yes** To step 4. →**No** Repair the electronic throttle position sensor 1 power line fault and replace the harness if necessary.
4. Check the electronic throttle position sensor 2 power line.	
 LFX60-SM-02690	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the electronic throttle position sensor harness plug E03a. D. Connect the battery negative terminal. E. Operate the ignition switch to turn the power to ON state. F. Measure the voltage between the electronic-controlled throttle position sensor harness connector E03a terminal 1 and the reliable ground point with a multimeter. **Standard value: 4.5 ~ 5.5 V** Is the voltage normal? →**Yes** To step 4. →**No** Repair the electronic throttle position sensor 2 power line fault and replace the harness if necessary.

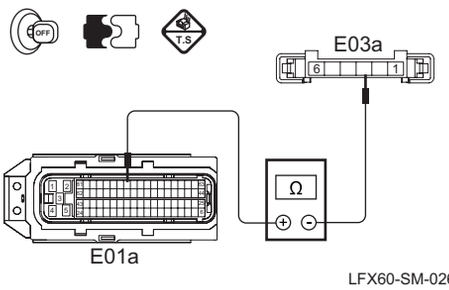
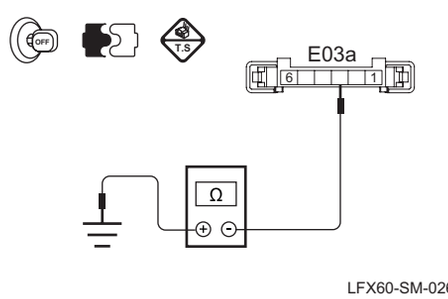
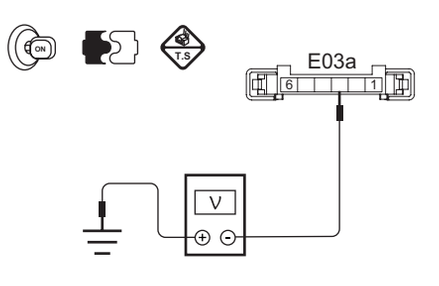
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Test condition	Details/results/measures
5. Check the electronic throttle position sensor 1.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the electronic throttle position sensor harness plug E03a. D. Measure whether the electronic throttle position sensor 1 terminal 2 and terminal 3 are conducted with the multimeter. Is it OK after checking? →**Yes** To step 6. →**No** Replace the electronic throttle pedal. **Refer to: replacement of electronic throttle pedal**
6. Check the electronic throttle position sensor 2.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the electronic throttle position sensor harness plug E03a. D. Measure whether the electronic throttle position sensor 2 terminal 1 and terminal 5 are conducted with the multimeter. Is it OK after checking? →**Yes** To step 7. →**No** Replace the electronic throttle pedal. **Refer to: replacement of electronic throttle pedal**

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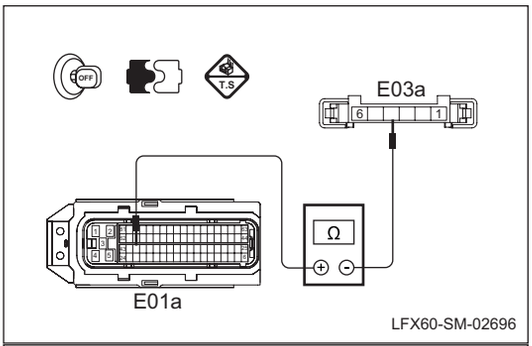
AutoLibrary

Test condition	Details/results/measures
7. Check the electronic throttle position sensor 1 ground line.	
 LFX60-SM-02693  LFX60-SM-02695  LFX60-SM-02694	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the electronic throttle position sensor harness plug E03a. D. Disconnect the ECM harness plug E01a. E. Measure the resistance between the electronic throttle position sensor harness plug E03a terminal 3 and ECM harness plug E01a terminal 74 with the multimeter. **Standard value: Less than 5Ω** F. Measure the resistance between the electronic throttle position sensor harness plug E03a terminal 3 and the fixed ground point with the multimeter. **Standard value: 10 MΩ or higher** G. Connect the battery negative terminal. H. Operate the ignition switch to turn the power to ON state. I. Measure the voltage between the electronic throttle position sensor harness plug E03a terminal 3 and the fixed ground point with the multimeter. **Standard value: 0 V** Is it OK after checking? →**Yes** To step 8. →**No** Repair the electronic throttle position sensor 1 ground line fault and replace the harness if necessary.

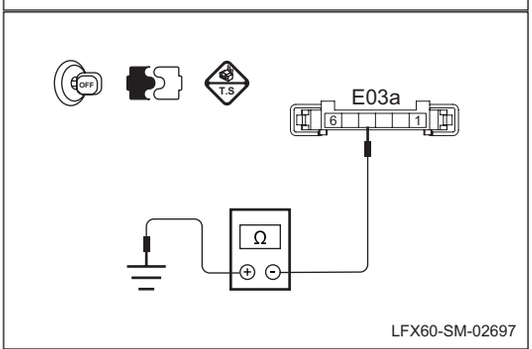
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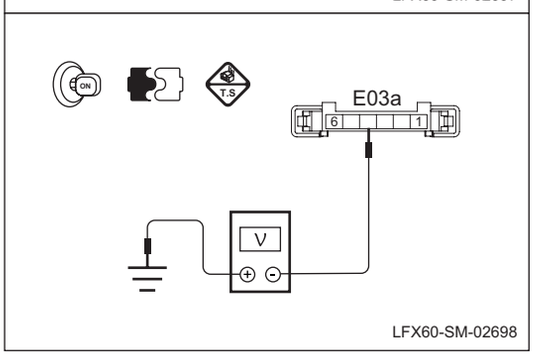
Test condition	Details/results/measures
8. Check the electronic throttle position sensor 1 signal line.	



LFX60-SM-02696



LFX60-SM-02697

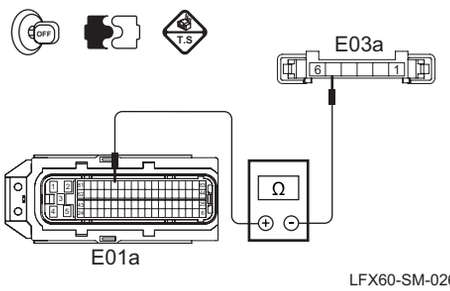
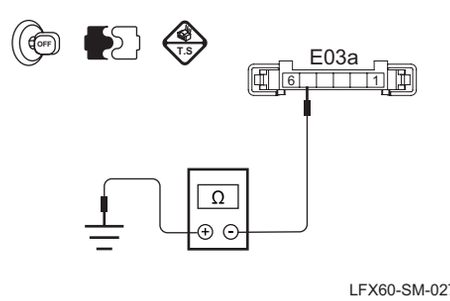
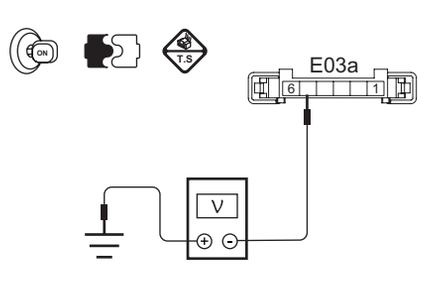


LFX60-SM-02698

A. Operate the ignition switch to turn the power to OFF state.
B. Disconnect the battery negative connector.
C. Disconnect the electronic throttle position sensor harness plug E03a.
D. Disconnect the ECM harness plug E01a.
E. Measure the resistance between the electronic throttle position sensor harness plug E03a terminal 4 and ECM harness plug E01a terminal 41 with the multimeter.
Standard value: Less than 5Ω
F. Measure the resistance between the electronic-controlled throttle position sensor harness connector E03a terminal 4 and the reliable ground point with a multimeter.
Standard value: 10 MΩ or higher
G. Connect the battery negative terminal.
H. Operate the ignition switch to turn the power to ON state.
I. Measure the voltage between the electronic-controlled throttle position sensor harness connector E03a terminal 4 and the reliable ground point with a multimeter.
Standard value: 0 V
Is it OK after checking?
→**Yes**
To step 9.
→**No**
Repair the electronic throttle position sensor 1 signal line fault and replace the harness if necessary.

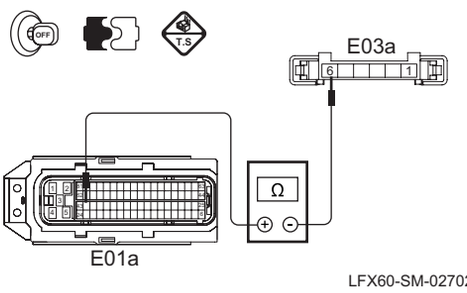
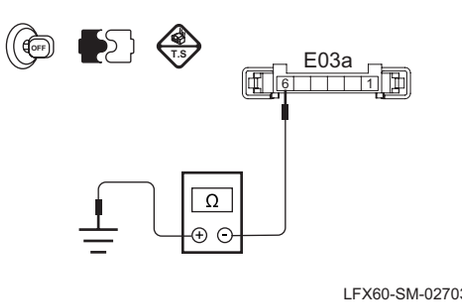
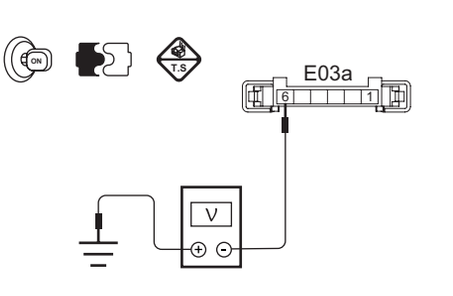
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Test condition	Details/results/measures
9. Check the electronic throttle position sensor 2 ground line.	
 LFX60-SM-02699  LFX60-SM-02700  LFX60-SM-02701	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the electronic throttle position sensor harness plug E03a. D. Disconnect the ECM harness plug E01a. E. Measure the resistance between the electronic throttle position sensor harness plug E03a terminal 5 and ECM harness plug E01a terminal 76 with the multimeter. **Standard value: Less than 5Ω** F. Measure the resistance between the electronic throttle position sensor harness plug E03a terminal 5 and the fixed ground point with the multimeter. **Standard value: 10 MΩ or higher** G. Connect the battery negative terminal. H. Operate the ignition switch to turn the power to ON state. I. Measure the voltage between the electronic throttle position sensor harness plug E03a terminal 5 and the fixed ground point with the multimeter. **Standard value: 0 V** Is it OK after checking? →**Yes** To step 10. →**No** Repair the electronic throttle position sensor 2 ground line fault and replace the harness if necessary.

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Test condition	Details/results/measures
10. Check the electronic throttle position sensor 2 signal line.	
 LFX60-SM-02702  LFX60-SM-02703  LFX60-SM-02704	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the electronic throttle position sensor harness plug E03a. D. Disconnect the ECM harness plug E01a. E. Measure the resistance between the electronic throttle position sensor harness plug E03a terminal 6 and ECM harness plug E01a terminal 42 with the multimeter. **Standard value: Less than 5Ω** F. Measure the resistance between the electronic throttle position sensor harness plug E03a terminal 6 and the fixed ground point with the multimeter. **Standard value: 10 MΩ or higher** G. Connect the battery negative terminal. H. Operate the ignition switch to turn the power to ON state. I. Measure the voltage between the electronic throttle position sensor harness plug E03a terminal 6 and the fixed ground point with the multimeter. **Standard value: 0 V** Is it OK after checking? →**Yes** To step 11. →**No** Repair the electronic throttle position sensor 2 signal line fault and replace the harness if necessary.
11. Check ECM.	
	A. Replace ECM. **Refer to: ECM** B. Confirm the DTC with the diagnostic meter. C. Read the sensor data stream. D. Ensure there is no DTC and the data is normal.

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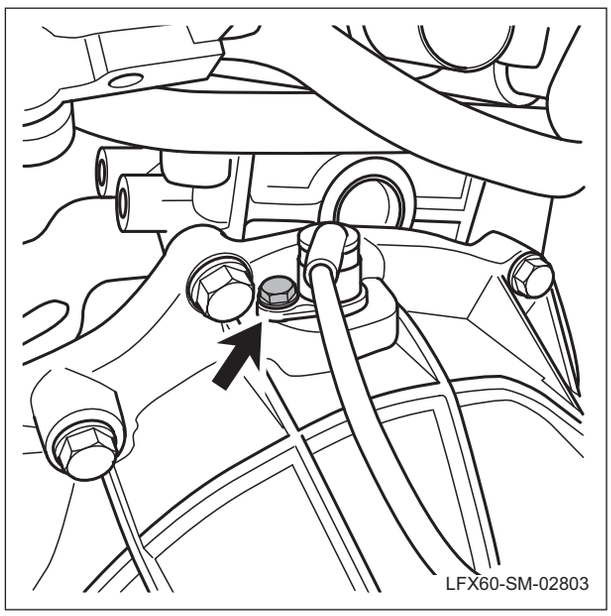
Removal and Installation

Replacement of the crankshaft position sensor

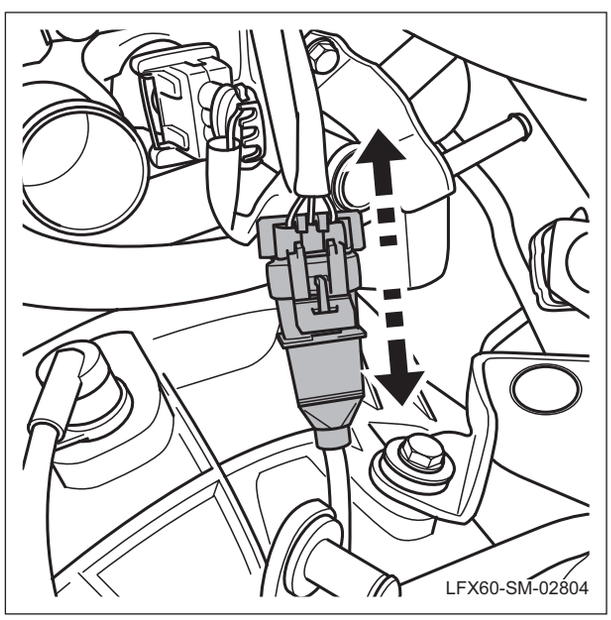
Removal

1. Remove the crankshaft position sensor.

(a). Disconnect the battery negative connector.



(b). Disconnect the crankshaft position sensor harness plug.



(c). Remove the crankshaft position sensor fixing bolt.

(d). Take down the crankshaft position sensor.

ⓘ Note:

Screen the sensor notch to prevent the foreign body falling in the engine and causing damage.

Installation

1. Install the crankshaft position sensor.

(a). The installation sequence is the reverse of the disassembly order.

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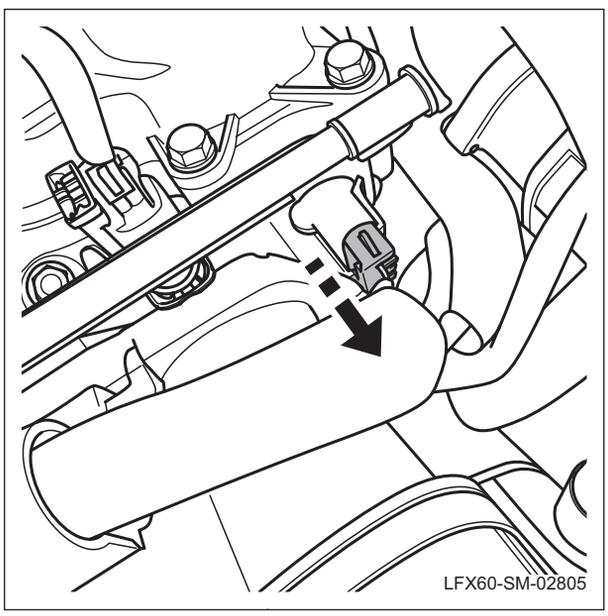
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Camshaft position sensor

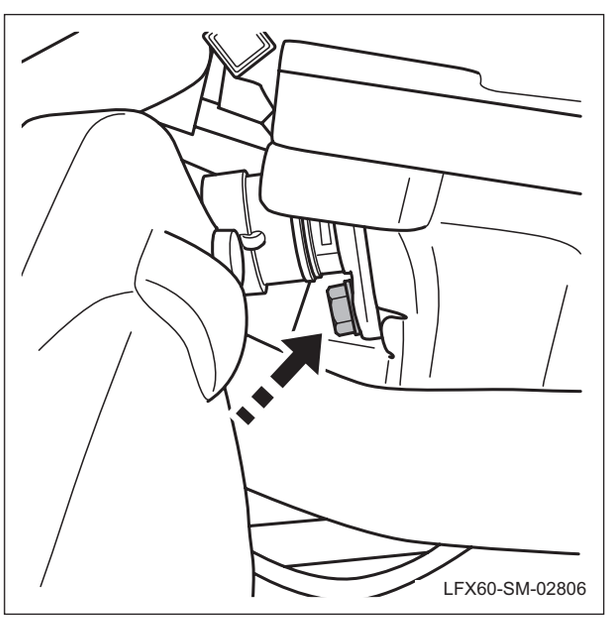
Removal

1. Remove the camshaft position sensor.

(a). Disconnect the battery negative connector.



(b). Disconnect the camshaft position sensor harness plug.



(c). Remove the camshaft position sensor fixing bolt.

(d). Take down the camshaft position sensor.

ⓘ Note:

Screen the sensor notch to prevent the foreign body falling in the engine and causing damage.

After the removal, clean the installation face and ensure there is no oil stain.

Installation

1. Install the camshaft position sensor.

(a). The installation sequence is the reverse of the disassembly order.

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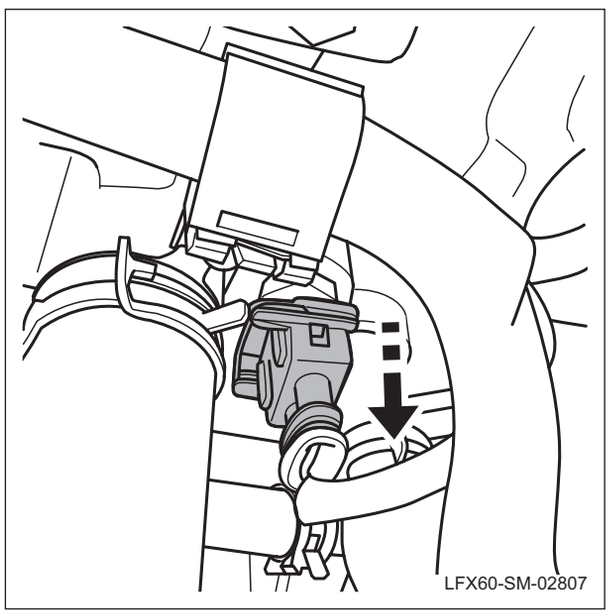
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Water temperature sensor

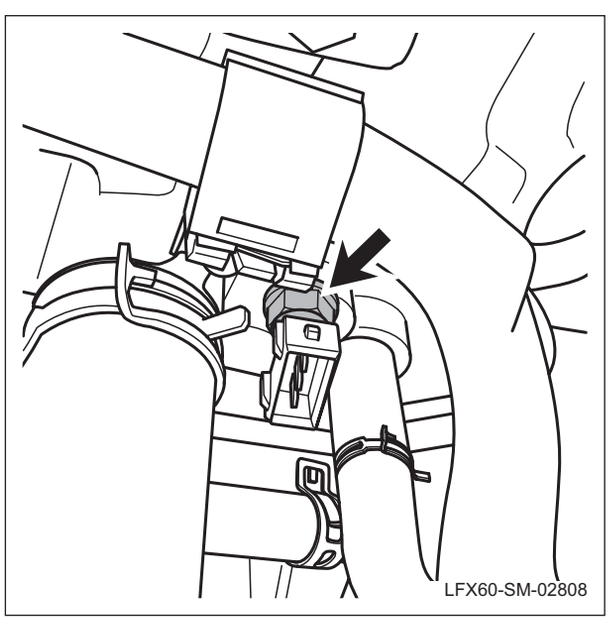
Removal

1. Remove the water temperature sensor.

(a). Disconnect the battery negative connector.



(b). Disconnect the water temperature sensor harness connector.



(c). Remove the water temperature sensor.

Note:

Screen the sensor notch to prevent the foreign body falling in the engine and causing damage.

Installation

1. Install the water temperature sensor.

(a). The installation sequence is the reverse of the disassembly order.

AutoLibrary

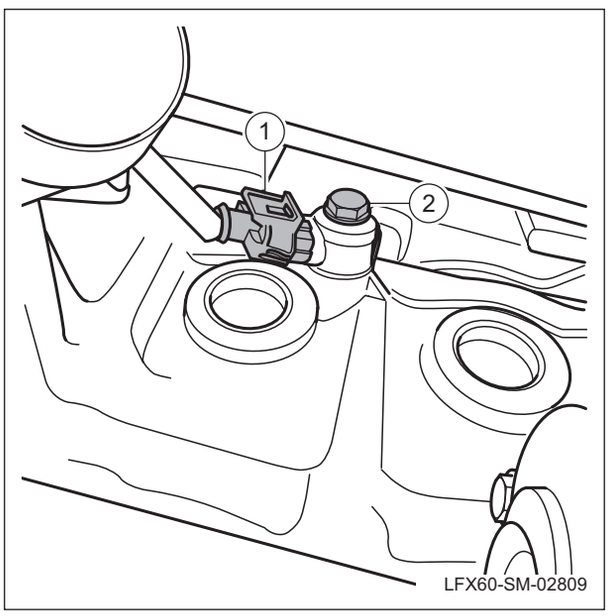
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Knock Sensor

Removal

1. Remove the knock sensor.

(a). Disconnect the battery negative connector.



(b). Disconnect the knock sensor harness plug 1.
(c). Remove the knock sensor fixing bolt 2.
(d). Take down the knock sensor.

Installation

1. Install the knock sensor.

(a). The installation sequence is the reverse of the disassembly order.

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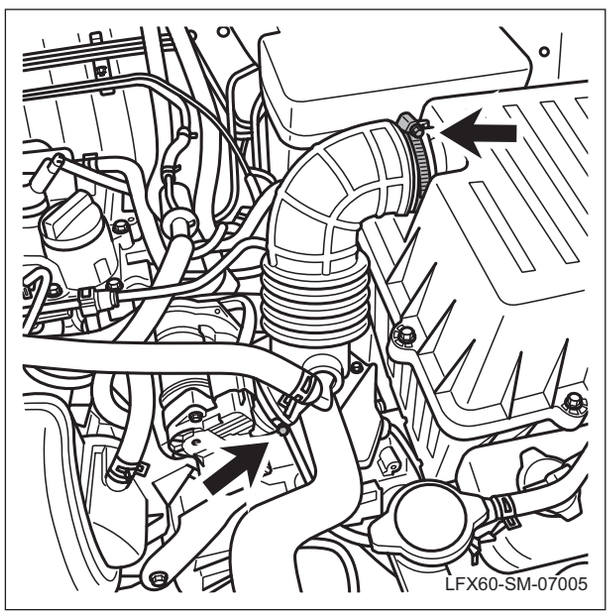
Replacement of electronic throttle body assembly

Removal

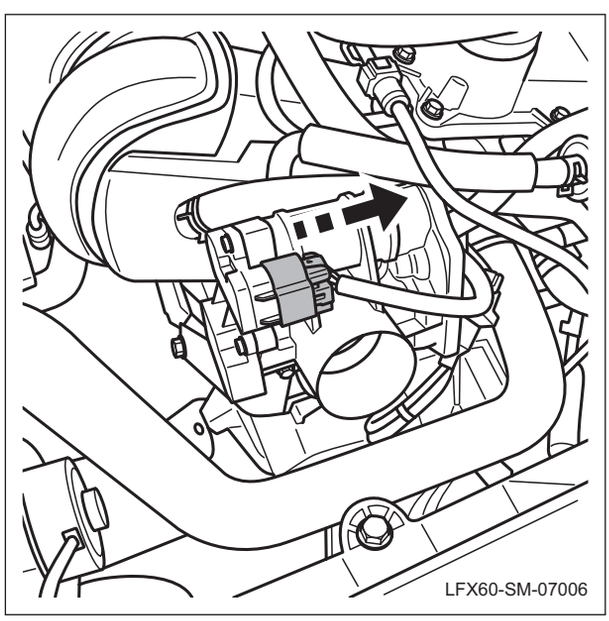
1. Remove the electronic throttle body assembly.

(a). Open the engine cover.

(b). Disconnect the battery negative connector.



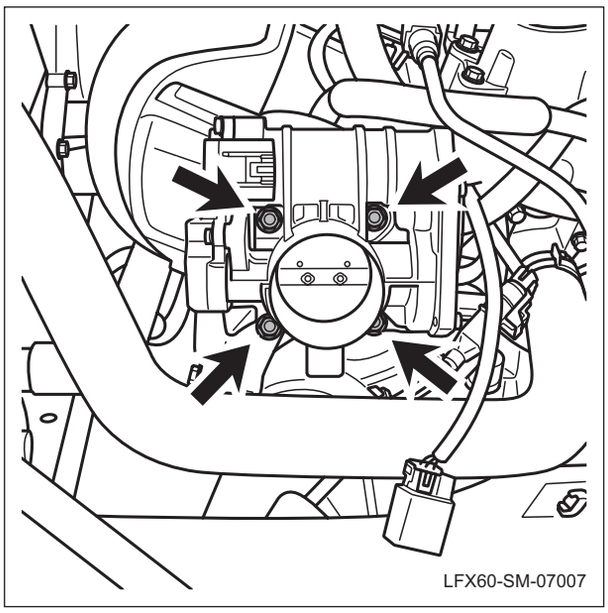
(c). Disconnect the air intake duct fixing clamp.



(d). Disconnect the electronic throttle body assembly harness plug.

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LFX60-SM-07007

(e). Remove the electronic-controlled throttle body fixing bolts and nuts.
(f). Loosen the electronic-controlled throttle bracket fixing bolts.
(g). Take down the electronic throttle body assembly.

Installation

1. Install the electronic throttle body assembly.
(a). The installation sequence is the reverse of the disassembly order.

Inspection

a. When not powered on, the valve plate should be at the mechanical LDC position. When being turned by hand, the valve plate should rotate smoothly. If the valve plate seizing occurs, it means the inside parts may be damaged.
b. Replace the electronic throttle body assembly if necessary.

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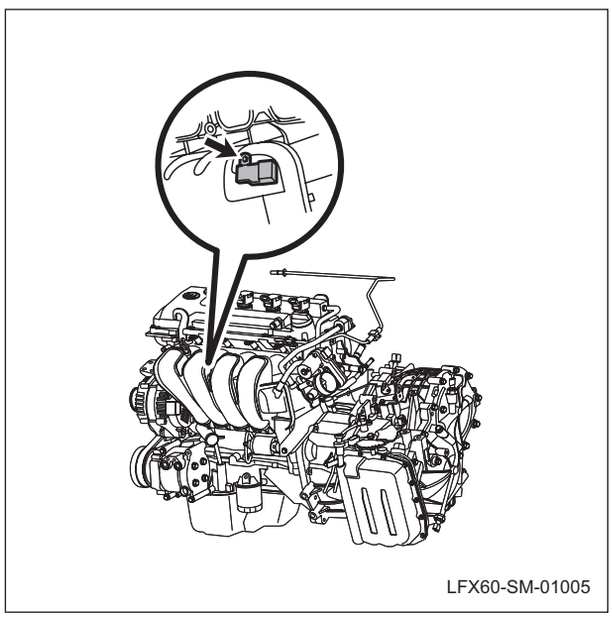
Replacement of intake pressure / temperature sensor

Removal

1. Remove the intake pressure temperature sensor

(a). Disconnect the battery negative connector.

(b). Remove the intake manifold. **Refer to the replacement of intake manifold.**



(c). Disconnect the intake pressure/ temperature sensor harness plug.

(d). Remove the intake pressure/ temperature sensor fixing bolt.

(e). Take out the intake pressure/ temperature sensor.

Installation

1. Install the intake pressure temperature sensor

(a). The installation sequence is the reverse of the disassembly order.

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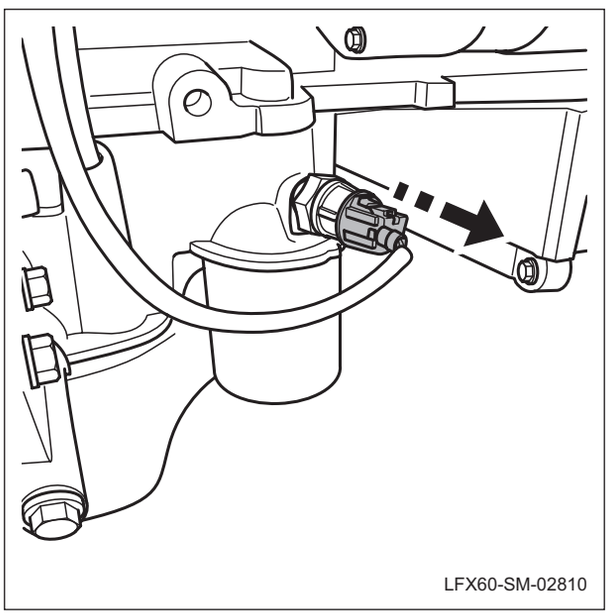
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Replacement of oil pressure sensor

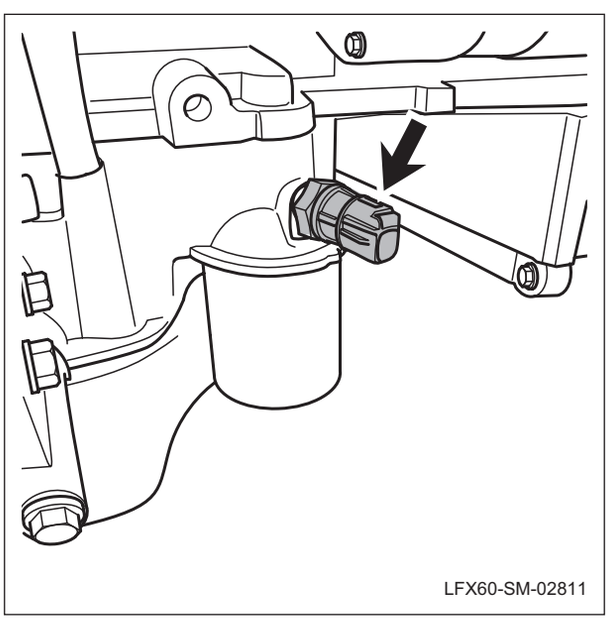
Removal

1. Remove the oil pressure sensor.

(a). Disconnect the battery negative connector.



(b). Disconnect the oil pressure sensor harness plug.



(c). Remove the oil pressure sensor.

Installation

1. Install the oil pressure sensor.

(a). The installation sequence is the reverse of the disassembly order.

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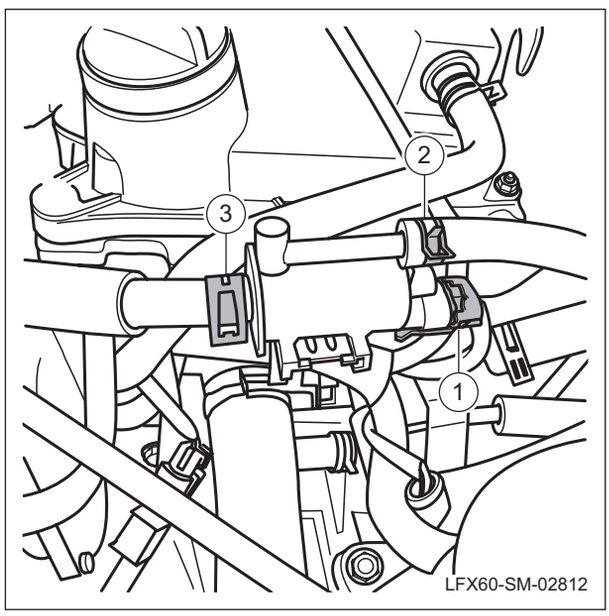
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Replacement of canister control valve

Removal

1. Remove the canister control valve.

(a). Disconnect the battery negative connector.



(b). Disconnect the canister control valve harness plug 1.

(c). Disassemble the fuel evaporation hose clamp 2 and disconnect it from the fuel evaporation hose.

(d). Disassemble clamp 3 fixed with fuel vent hose and disconnect the hose connected to the charcoal canister solenoid valve.

(e). Take down the canister control valve.

Installation

1. Install the canister control valve.

(a). The installation sequence is the reverse of the disassembly order.

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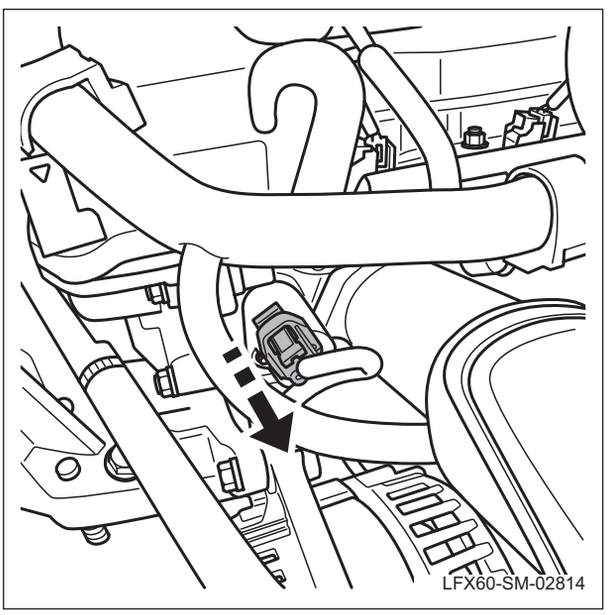
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Replacement of air intake VVT valve

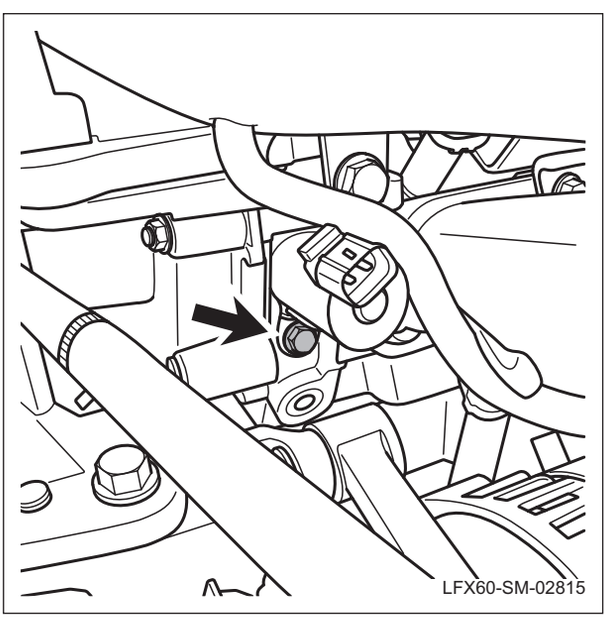
Removal

1. Remove the air intake VVT valve.

(a). Disconnect the battery negative connector.



(b). Disconnect the air intake VVT valve harness plug.



(c). Remove the air intake VVT valve fixing bolt and take down the VVT valve.

Installation

1. Install the air intake VVT valve.

(a). The installation sequence is the reverse of the disassembly order.

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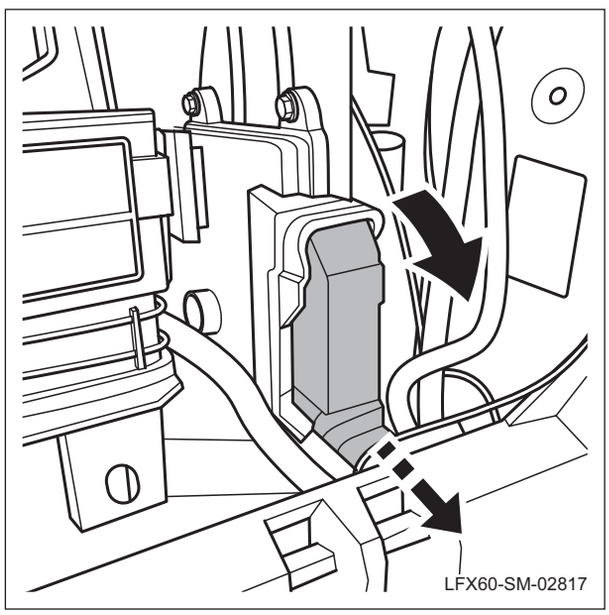
ECU

Removal

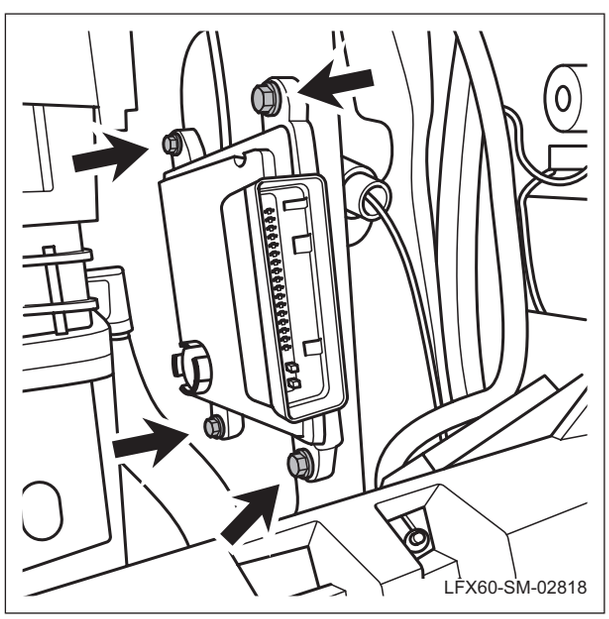
1. Remove the electronic control unit (ECU).

(a). Disconnect the battery negative connector.

(b). Remove the glove box. **See: Replacement of dashboard assembly.**



(c). Disconnect the electronic control unit (ECU) harness plug.



(d). Remove the four fixing bolts of the ECU.

(e). Take down the electronic control unit (ECU).

ⓘ Note:

After the removal, protect ECU against water and do not soak it in water. Handle ECU gently while removing it.

Installation

1. Install the electronic control unit (ECU).

(a). The installation sequence is the reverse of the disassembly order.

ⓘ Note:

Pay attention to static electricity protection during installation.

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02- Engine

Engine control system (UMC) 2-137

Precautions 2-137

Preparation.....2-138

Structure and installation location 2-139

Operating Principle.....2-140

Diagnostic Information and Procedures.....2-145

Removal and installation 2-303

AutoLibrary

AutoLibrary

AutoLibrary

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Engine control system (UMC)

Precautions

General repair instructions

1. It's only allowed to check the electronic injection system with a digital multimeter.
2. Please use the authentic parts for repair, otherwise the normal operation of electronic injection system can't be ensured.
3. Unleaded gasoline can be only applied during the repair.
4. Perform the repair work as per the specified repair and diagnosis procedures.
5. It's prohibited to disassemble the parts of electronic injection system during the repair.
6. During the repair, take the electronic elements (electronic control unit and sensor, etc) carefully, and ensure that they can't fall to ground.
7. Build the environmental awareness, and handle the waste produced during the repair effectively.

Maintenance precautions

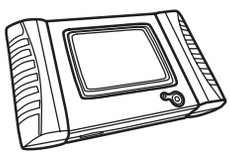
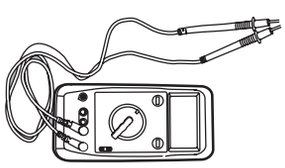
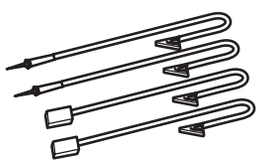
1. Don't remove any part or connector of electronic injection system randomly from its mounting position, so as to avoid any unexpected damage or prevent the water or oil dirt, etc from entering into the connector, otherwise the normal operation of electronic injection system will be influenced.
2. In case of disconnecting or connecting the connector, be sure to place the ignition switch in its OFF position, otherwise the electric elements will be damaged.
3. During the simulation of fault at hot state and other repair possible to cause temperature rise, the temperature of electronic control unit shall not exceed 80°C.
4. The fuel supply pressure of electronic injection system is higher (400kPa or so), so all the fuel pipes are high pressure resistant fuel pipes. Therefore, during the maintenance process, the fuel pipe should not be removed Therefore, don't remove the fuel pipes easily during the repair. When it's required to repair the fuel system, relieve the pressure of fuel system before removing the fuel pipe as per the method below: remove the fuel pump relay, start the engine to make it idling until the engine stops automatically.
5. In case of removing the electric fuel pump from the fuel tank, don't power on the fuel pump, so as to avoid any fire accident caused by electric spark.
6. Don't make any running test of fuel pump at dry state or in water, otherwise its service life will be shortened. Additionally, don't connect the positive or negative pole of fuel inversely.
7. During the check of ignition system, carry out a spark-over test only if necessary, and its test time should be the shortest one. Don't open the throttle valve, otherwise a lot of unburned gasoline will enter into the exhaust pipe, thus the three-way catalyst will be damaged.
8. Any manual adjustment isn't required because its idling adjustment is fully finished by electronic injection system. The valve limit screw of throttle valve body has been adjusted by the producer during the shipment, and its initial position shall not be randomly changed.
9. During the connection of battery, don't connect its positive or negative pole wrongly, otherwise the electronic elements will be damaged.
10. In case of running the engine or turning on the ignition switch, don't remove the battery cable.
11. Before welding on the car, be sure to remove positive or negative cable and electronic control unit of battery.
12. Don't test electric input or output signals of parts by piercing the conductor skin.
13. Attentions for starting after disconnecting constant power supply (battery power supply): turn on the ignition switch for at least 30 seconds, and then turn off the ignition switch during the starting; start the car after waiting for 30 seconds. In order to ensure that the electronic injection system can finish the self-learning test of throttle valve, the starting faults of car (starting failure or unstable idling) or faults of electronic injection system will occur if this test can't be finished by the electronic injection system.

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Preparation

General maintenance tools

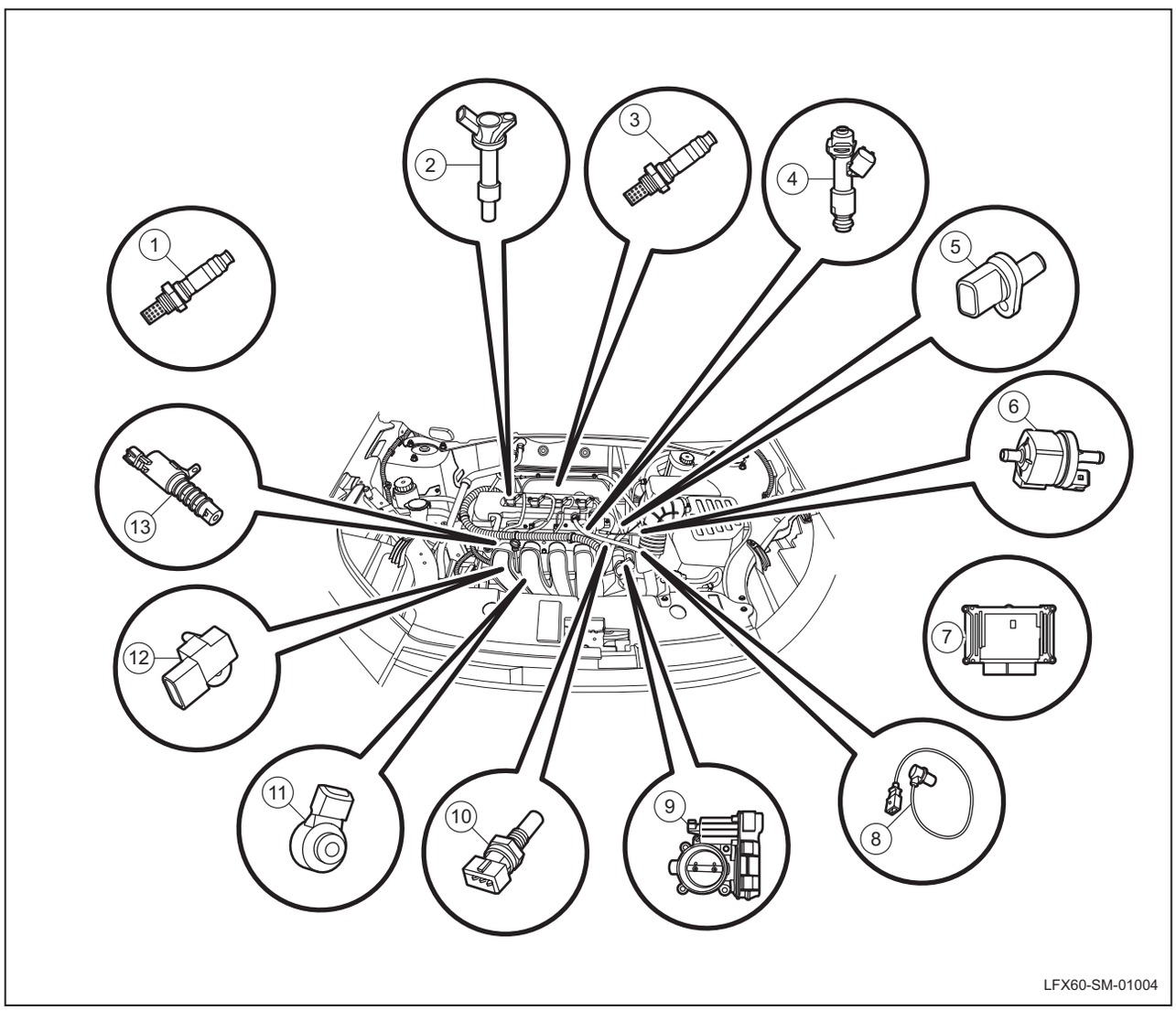
No.	Tool name	Tool figure	Tool code	Remarks
1	Diagnosis equipment	 LFX60-SM-02802	-	Read the EFI system trouble code, data flow etc
2	Digital universal meter	 LFX60-SM-02800	-	Measure the voltage and resistance
3	Circuit group	 LFX60-SM-02801	-	Testing circuit

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Structure and installation location

Component Location Plan



No.	Part Name
1	Rear oxygen sensor
2	Ignition coil
3	Front oxygen sensor
4	Fuel injector
5	Camshaft position sensor
6	Canister solenoid valve
7	Electronic Control Unit (ECM)

No.	Part Name
8	Crankshaft Position Sensor
9	Electronically controlled throttle valve body
10	Water temperature sensor
11	Knock Sensor
12	Intake air temperature and pressure sensor
13	Intake VVT valve

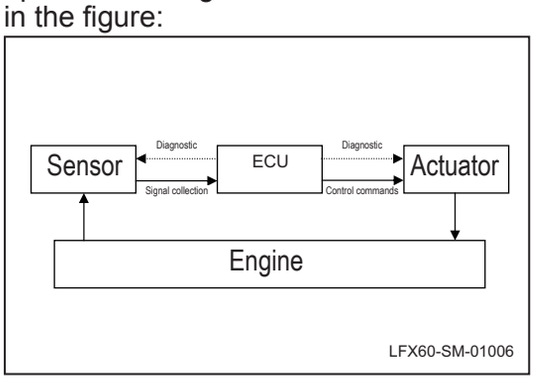
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Operating Principle

System overview

The engine management system is usually composed of sensor, electronic control unit (ECU) and actuator, which can control the air suction volume, fuel injection amount and ignition advance angle produced during the operation of engine. Its basic structure is shown in the figure:



In the electronic control system of engine, the sensor is used to measure all kinds of physical signals(temperature and pressure, etc) and convert them into their corresponding electric signals as an input part; ECU is used to receive the input signal of sensor, calculate and process it as per the set program, produce its corresponding control signal, and output it to the power drive circuit, which performs different actions by driving each actuator, so as to make the engine running as per the set control strategies; the fault diagnosis system of ECU monitors each part or control functions of the system. Once any fault is detected and confirmed, its fault code will be stored, and the function of “Limp Home” is invoked. Upon detecting the elimination of fault, its normal value will return to service.

Basic components of engine electronic control system:

- Electronic control unit (ECU)
- Intake pressure and temperature sensor
- Water temperature sensor
- Throttle body assembly
- Phase position (camshaft position) sensor
- Rotating speed (crankshaft position) sensor
- Knock Sensor
- HO2S
- Electronic Accelerator Pedal
- Fuel injector
- Electric fuel pump
- Fuel distribution pipe
- Canister control valve
- Ignition coil

Input signals of ECU main sensor in engine electronic control system include:

- Intake pressure signal
- Electronic accelerator pedal signal
- Intake temperature signal
- Throttle valve turning angle signal
- Water temperature signal
- Engine speed signal
- Phase position signal
- Knock sensor signal
- Oxygen sensor signal
- Vehicle speed signal
- A/C pressure signal

The required actuator control signals are produced after processing the above information entering into ECU, and these signals are amplified in the output drive circuit and transmitted to their respective actuators. These control signals include:

- Opening of electronic throttle valve
- Injection timing and injection duration
- Fuel pump relay
- Opening of carnister control valve
- Dell angle and ignition advance angle of ignition coil
- Air conditioning compressor relay
- Cooling fan relay

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Introduction of system functions

Start control

- In the start-up process, special calculation methods should be used to control charge, fuel injection and ignition timing. At the beginning of the process, the air in the intake manifold is stationary and the internal pressure of the intake manifold is shown as ambient atmospheric pressure.
- In the similar process, special “Injection Timing” is appointed as an initial injection pulse.
- The fuel delivery varies depending on the temperature of the engine to promote the formation of the oil film on the intake manifold and cylinder walls. Thus, the mixture should be enriched before the engine reaches a certain rotational speed.
- Once the engine starts, the system will start a cranking enrichment immediately, until its cranking enrichment is fully canceled at the end of starting process (600…700min-1).
- In the starting conditions, the ignition angle is also constantly adjusted. Change with the engine temperature, intake temperature and engine speed.

Warming up and three-way catalyst heating control

- After the engine starts at low temperature, the air filling capacity of cylinder, fuel injection and electronic ignition shall be adjusted to compensate higher torque of engine; this process lasts until its temperature is increased up to the appropriate threshold value.
- At this stage, the most important is quick heating of three-way catalyst, because the quick transition to operation of three-way catalyst can reduce the exhaust emission greatly. At this state, adopt the exhaust for “three-way catalyst heating” by postponing the ignition advance angle properly.

Acceleration/deceleration and motoring fuel cut-off control

- Some of fuel injected to intake manifold can’t enter into the air cylinder in time to participate in combustion. On the contrary, it forms a layer of oil film on the intake manifold wall. The fuel volume stored in the oil film will quickly increase along with the load increase and the fuel injection duration.
- When the opening of throttle valve is increased, some of injected fuel will be absorbed by this fuel film. Therefore, it is necessary to inject the corresponding supplement fuel to compensate and prevent the gas mixture becoming lean during the engine acceleration. Once its load coefficient is reduced, the additional fuel contained in fuel film on inlet manifold wall will be again released, and its corresponding injection duration must be reduced during the deceleration.
- Reversed towing or traction means the negative power value provided by the flywheel of engine. At this case, the frictions and pumping loss of engine can be used to decelerate the car. With the engine in motoring or towing working condition, the fuel injection is cut off to reduce the fuel consumption and exhaust gas emission and in particular to protect the three-way catalyst.
- The fuel injection system will resume the fuel supply once the rotary speed falls to the specific fuel supply rotary speed above the idle speed.Actually there is a speed reversion range in ECU program, which is different as per the dynamic changes of engine temperature and speed, etc, and prevents the speed from dropping to the specified minimum threshold value via calculation.
- Once the injection system recovers the fuel supply, the system will start the initial injection pulse to refill the fuel, and rebuild the fuel film on the wall of inlet manifold. After the fuel injection is recovered, the torque-based control system will make the torque of engine slowly and stably increased (smooth transition).

Idle speed control system

- At idling speed, the engine doesn’t give the torque to flywheel. In order to ensure the stable running of engine at the minimum idle speed, the closed loop idling control system must maintain the balance of produced torque and engine “power consumption”. At idling speed, it’s required to produce a certain power for meeting all the load requirements. They include the internal frictions from engine crankshaft, valve mechanism and auxiliary parts, e.g. water pump.
- The torque-based control policies of this system are used to determine the output torque of engine required for maintaining the idling speed at any operating condition via the closed loop idling control. This output torque is increased with the reduction of engine speed and reduced with the increase of engine speed. The system responds new “interference factors” with higher torques, e.g. starting/stopping of A/C compressor or automatic transmission shift. At lower temperature of engine, it’s also required to increase the torque for compensating more

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internal friction loss and/or maintaining higher idling speed. The sum of all these output torques is transmitted to the torque coordinator, which processes and calculates it to get the corresponding charge density, mixed gas components and ignition timing.

λ closed-loop control

- The exhaust after-treatment of three-way catalyst is an effective method to reduce the concentration of harmful substances in exhaust. Three-way catalyst can reduce the concentrations of hydrocarbon (HC), carbon monoxide (CO) and nitrogen oxide (NOx) by 98% or more, and convert them into water (H2O), carbon dioxide (CO2) and nitrogen (N2). However, only if the excess air coefficient of engine is equal to 1, such high efficiency can be reached in adjacent narrow space, and the purpose of closed loop control is to ensure the concentration of mixed gas within this range.
- λ closed loop control system can function only if it's equipped with an oxygen sensor. The oxygen sensor monitors the oxygen content of exhaust on the side of three-way catalyst, the diluted mixed gas (λ>1) produces ca. 100mV sensor voltage, and the dense mixed gas (λ>1) produces ca. 900mV sensor voltage. When λ is 1, a jumping will occur to the voltage of sensor. λ closed loop control responds the input signal (the mixed gas is too diluted when λ is 1, and it's too dense when λ is less than 1) to alter the control variable, and produces a correction factor as a multiplier to correct the injection duration.

Evaporative emissions control

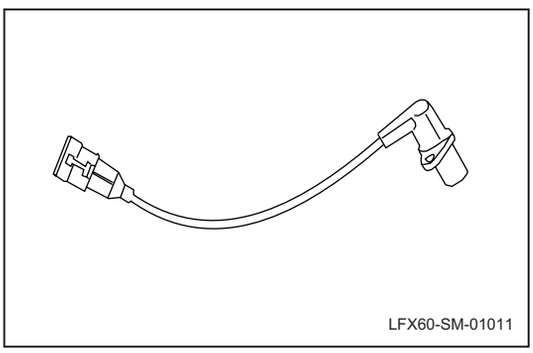
The fuel in the fuel tank is heated to form fuel vapor due to the transmission of outer radiation heat and fuel return heat. Due to the limitations of vapor emission regulations, it's not allowed to emit the vapor containing a lot of HC ingredient into air. In the system, the fuel vapor is collected into the active canister through a guide pipe, and enters into the engine via flushing to participate in combustion at proper time. The flow of flushing air can be realized by ECU control of canister control valve. This control can work only during the operation of closed loop control system.

Principle of knock

- The system detects the characteristic vibrations produced by knock sensor installed in proper position of engine, and converts these vibrations into electronic signals for transmission to ECU and processing. ECU will detect whether any knock occurs in each combustion cycle of each cylinder as per special processing algorithm. The knock closed-loop control will be triggered once the knock is detected. After the knock risk is eliminated, the ignition of influenced cylinder will be gradually advanced to the preset ignition advance angle.
- The threshold values of knock control have good adaptability for different conditions and marks of fuel.

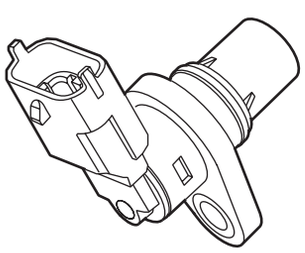
Part description

Crankshaft Position Sensor



The crankshaft position sensor is a passive speed sensor, whose operating principles are the adoption of magnetoelectric effect. When the crankshaft rotates, it will rotate with the sensor signal wheel together, the teeth of sensor signal wheel will cut the magnetic lines of sensor to cause the alternation of magnetic field at sensed points inside the speed sensor coil, that is to say, the magnetic flux through the coil will be increased when the teeth of signal wheel align to the crankshaft position sensor; the magnetic flux will be reduced when the slot of signal wheel aligns to the crankshaft position sensor. The changes of this flux will cause the changes of output signal voltage. The changes of magnetic field will also cause the changes of magnetic flux in the coil, thus the voltage output will be produced.

Camshaft position sensor



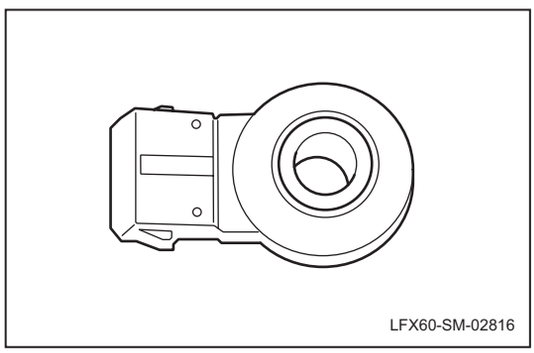
The camshaft position sensor fits the crankshaft position sensor to provide the crankshaft phase position data for ECU, i.e. distinguishing compression top dead center and exhaust

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top dead center of #1 cylinder. The phase position (camshaft position) sensor contains a permanent magnet and a hall chip. The rotation of signal wheel causes the alternation of magnetic intensity at the sensed points of sensor. When the gear is in front of sensor, its magnetic intensity will be increased. When its slot is in front of sensor, its magnetic intensity will be reduced. The changes of its magnetic intensity shall be identified by Hall elements. Based on this principle, the signals of mechanical gears and teeth are converted into electric signal output by the sensor.

Knock Sensor

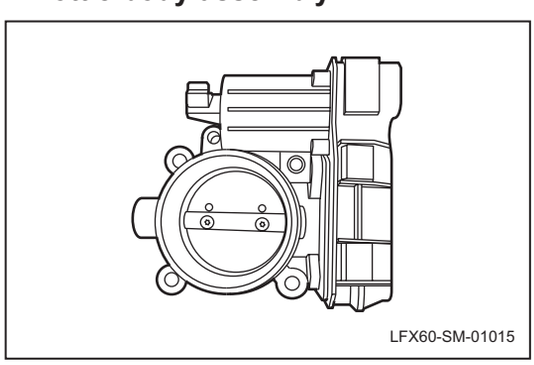

LFX60-SM-02816

The knock sensor is a sensor to monitor the knock signals, and installed on the engine cylinder block.

Its sensitive element is a piezoelectric ceramics. In operation, the vibration of the engine cylinder block is transferred to the piezoelectric ceramics via the mass block in the sensor. The piezoelectric ceramics can produce a voltage between both electrode surfaces due to the pressure produced by mass block vibrations, and convert the vibration signal into a voltage signal output.

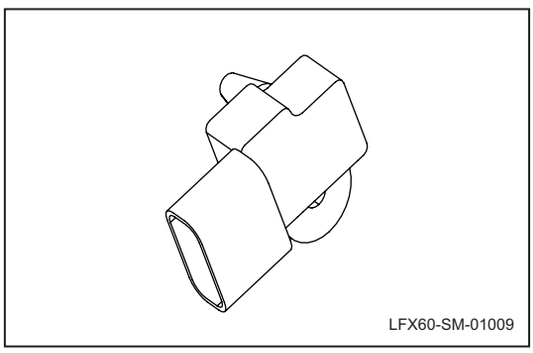
The frequency of vibration signals caused by engine knocking is a lot higher than normal frequency and acceleration speed of engine vibration signals, so its knock and non-knock signals can be distinguished by ECU after processing the signals of knock sensor.

Throttle body assembly


LFX60-SM-01015

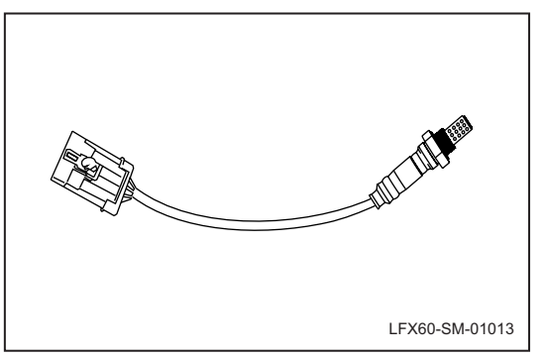
The throttle valve body assembly is mainly used to adjust the area of inlet channel, thus its air inflow can be controlled and different air inflow demands of engine at different conditions can be met, and it can respond the position signal of throttle valve plate to its control unit for precise control at the same time.

Intake air temperature and pressure sensor


LFX60-SM-01009

The inlet pressure/temperature sensor consists of inlet manifold absolute pressure sensor and inlet temperature sensor, and it's installed on the inlet manifold.

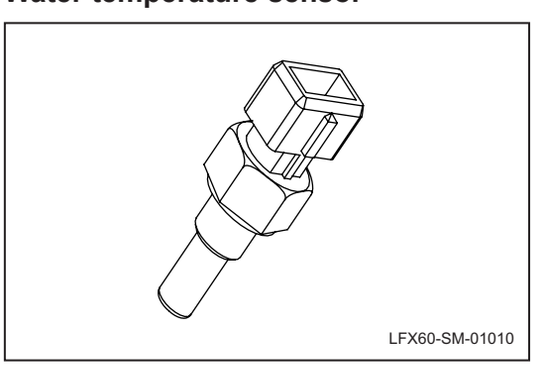
HO2S


LFX60-SM-01013

The oxygen sensor is installed on the exhaust pipe, determines the oxygen content of exhaust, and determines whether the gasoline and air are fully burnt, so as to ensure the maximum conversion efficiency of three-way catalyst to HC, CO and NOx of exhaust.

The operation of oxygen sensor is realized by converting the oxygen concentration difference inside and outside the sensor elements into a voltage signal.

Water temperature sensor


LFX60-SM-01010

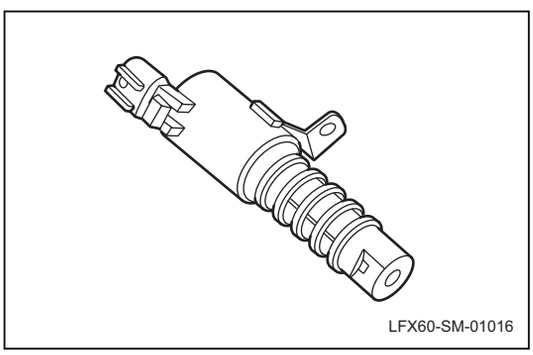
The water temperature sensor is mounted on the engine body or cylinder head and is in contact with the cooling liquid to detect the

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temperature of the engine circulating coolant and transmit the test result to the electronic control unit to correct the fuel delivery and the ignition timing. Water temperature sensors are often made of thermistors that are very sensitive to temperature changes. Negative temperature coefficient resistors are often used for thermistors. The lower the water temperature, the greater the resistance of the thermistor. The electronic control unit, according to this signal, increases the fuel delivery to increase the concentration of the combustible mixture.

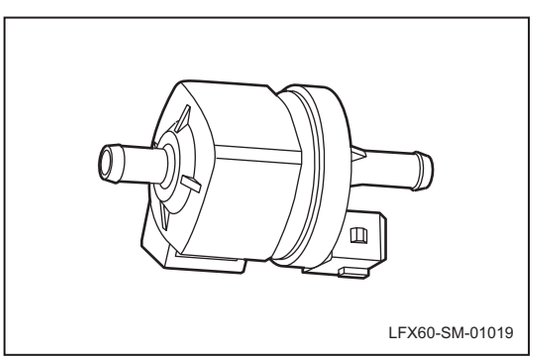
Intake VVT valve



LFX60-SM-01016

The intake VVT solenoid valve is supplied with power from the main relay, and the ECM controls the grounding with a pulse width modulation signal. In this way, the engine oil flow to the camshaft position actuator is controlled. The engine oil pressure makes one of the safety slide valve inside the camshaft position actuator mechanism fixed to the camshaft front act. When the safety slide valve acts, the engine oil is introduced to the camshaft position actuator to make the camshaft rotate.

Canister solenoid valve



LFX60-SM-01019

The charcoal canister control valve consists of an electromagnetic coil, an armature, a valve, etc. The flow of air flowing through the canister control valve is related to the duty ratio of the electrical pulse output to the canister control valve on the one hand, and the pressure difference between the inlet and the outlet of the canister control valve on the other hand. When there is no electric pulse, the canister control valve is closed.

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Diagnostic Information and Procedures

Diagnosis Instructions

Before you diagnose the fault of the engine control system, familiarize yourself with the working principle of the engine control system before starting the engine control system diagnostics, which helps to determine the correct troubleshooting step in the event of a fault. More importantly, this also helps to determine whether the situation as described by the customer is normal operation.

Any fault diagnosis of the engine control system should be based on the engine control system check as a starting point to guide the maintenance staff to take the next logical step, for troubleshooting. Understanding and using the diagnostic flowchart correctly reduces diagnostic time and avoids misjudgment of components.

General equipment

Digital multimeter
Diagnostic equipment of vehicle

Visual Inspection

1. Confirm the problem of the customer.
2. Visually check whether there is any obvious mechanical or electrical damage sign.

Visual inspection table

Electrical
• Fuse • Wire harness • Wiring harness plug • Relay • Sensor • Actuating elements • Engine control module (ECM)

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Troubleshooting process for intermittent failure

Note:

- **Clear DTC.**
- **Carry out a simulation test.**
- **Check and shake the harness, plugs and terminals.**

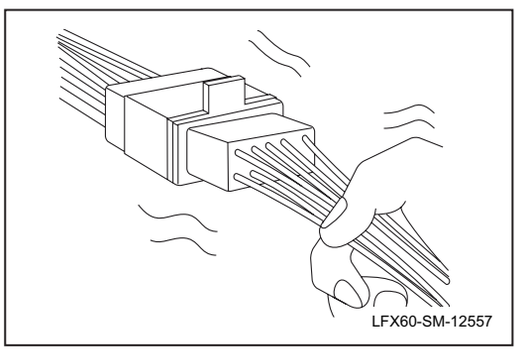
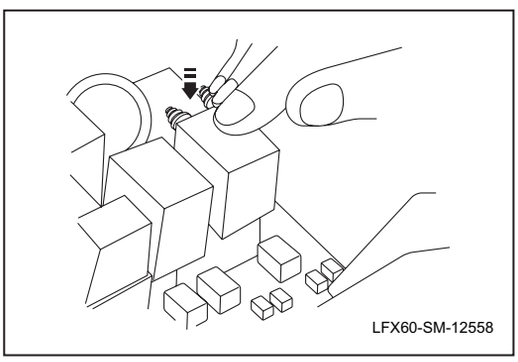
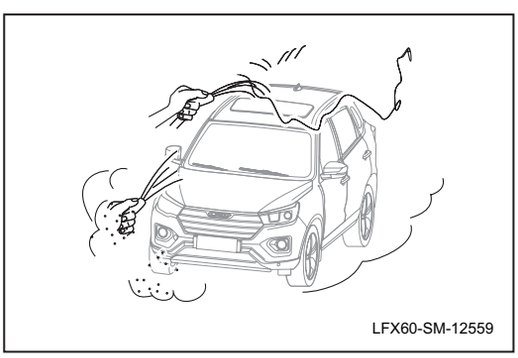
If DTC examination cannot confirm the fault and the fault occurs occasionally during the use, In this case, confirm all the circuits and parts that may cause the fault. In many cases, to follow the diagnosis procedure given in the table as follows can effectively and rapidly locate the faulty part Especially the poor contacts of harness plugs, etc.

Definition: the fault does not occur currently but the historical fault diagnosis records show that the fault ever occurred. Or the customer reports this fault while the fault does not relate to the DTC and the fault symptom cannot be reproduced currently.

Test condition	Details/results/measures
1. Vibration method	
	A. If any fault occurs or this fault becomes more serious, or the engine vibrates while driving on a uneven road, please carry out the following steps. B. Several reasons may cause the electric faults of car or engine vibrations. Check the following items: • The plug is not fully in position. • The harness has no sufficient gap. • The harness is laid over the support or moving parts. • The laid harness is too near to high-temperature parts. • Is it OK after checking? C. Incorrect wiring, improper clamping or loosened harness will make the wires squeezed between the parts. D. The focus of inspections is on the plug junctions, vibration parts and passed positions of harness, e.g. the harness through the firewall and car body plate.
2. Method of checking the switch plug or harness.	
	A. Connect the diagnostic equipment to the diagnostic interface. B. Operate the start switch to make the power mode to the N? State (do not start the engine). **Note** **If the engine is started, perform the following steps during its operation in idling mode.** C. Access the data flow of the switch you are checking. D. Turn on the switch manually. E. While monitoring the data stream, gently shake each plug or harness horizontally and horizontally. If the data flow is not stable, check whether the connection is bad.

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Test condition	Details/results/measures
3. Method of checking the sensor plug or harness.	
 LFX60-SM-12557	A. Connect the diagnostic equipment to the diagnostic interface. B. Operate the start switch to make the power mode to the N? State (do not start the engine). **Note** If the engine is started, perform the following steps during its operation in idling mode. C. Access the data flow of the switch you are checking. D. While monitoring the data stream, gently shake each plug or harness horizontally and horizontally. If the data flow is not stable, check whether the connection is bad.
4. Method of checking the actuator or relay.	
 LFX60-SM-12558	A. Connect the diagnostic equipment to the diagnostic interface. B. Operate the start switch to make the power mode to the N? State (do not start the engine). **Note** **If the engine is started, perform the following steps during its operation in idling mode.** C. Prepare the output status control function well for the actuator or relay you are checking. D. After the output status control function is activated, use a finger to vibrate the actuator or relay 3s. If you hear an unstable “click” sound, check for any improper connection or improper installation of the actuator and/or relay. **Note** **A strongly vibrating relay may cause the relay to be disconnected.**
5. Sprinkling method	
 LFX60-SM-12559	If the fault occurs only when the humidity is high or it rains or snows, then carry out the following procedure. The temperature and humidity are changed indirectly by water spray on the front of the radiator. If the vehicle is likely to leak, this may damage the control module.In case of checking whether the water leakage occurs to a car, be sure to take the special preventive measures. A. In case of checking the sensor or switch, connect the diagnostic unit to diagnostic interface. B. Operate the start switch to make the power mode to the N? State (do not start the engine). **Note** **If the engine is started, perform the following steps during its operation in idling mode.** C. If you want to check the sensor or switch, access the sensor or switch data stream. D. If you want to check the switch, manually turn it on. E. Spray water on the car, or drive the car through the car wash. F. If the data flow is unstable or malfunctioning, repair or replace parts if necessary.

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List of fault symptoms

If any fault occurs to the car, and engine control unit ECM fails to detect any fault code, and no obvious faulted positions can't be found out after visual check or general inspection, it's recommended to remedy the faults as per the diagnostic idea and process described in the table below.

Symptom	Possible point of failure	Recommended Measures
The engine cannot be started at the normal starting speed	• Crankshaft position sensor • Fuel injector • Ignition coils • ECM • Engine mechanical • Immobilizer	**Refer to: the diagnosis process for failure to start the engine at the normal starting speed.**
Difficult cold start	• Water temperature sensor • Spark plugs • Fuel injector • Injector • Throttle body • Engine mechanical • Engine control module circuit	**Refer to: Diagnosis procedure for engine being hard to clod start.**
Hot start is difficult	• Water temperature sensor • Ignition coils • Fuel injector • Injector • Engine control module circuit	**Refer to: Diagnosis procedure for engine being hard to hot start.**
The start is normal while idling is unsteady at any time	• Intake system • Spark plugs • Throttle body • Ignition timing • Engine mechanical • Engine control module circuit	**Refer to: Diagnostic process for unstable idling at any time under the normal starting conditions**
The start is normal while engine idling is unsteady or stalls under partial load	• Air conditioner system • Throttle body • Injector	**Refer to: Diagnosis procedure about idle instability or shutdown under conditions of normal starting and partial load**
The start is normal while idle speed is too high	• Water temperature sensor • Throttle body • Vacuum tube • Ignition timing • Control module circuit	**Refer to: Diagnosis procedure for excessive idle speed in case of normal start.**
• The speed of engine can't increase or it stops during the acceleration. • Difficult acceleration • Slow acceleration response • Forceless acceleration, poor performance	• Intake system • Intake pressure sensor • hrottle body • Injector • Spark plugs • Ignition timing • Fuel • Exhaust blocking • Control module circuit	**Refer to: Diagnosis procedure for acceleration fault.**

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Symptom	Possible point of failure	Recommended Measures
Engine running unstably	• Oxygen Sensor • Injector • Spark plugs • Ignition timing • Fuel pressure • Loosening of fixing bolts or damages of engine suspension • ECM lines	**Refer to: Diagnosis procedure for engine running unstably.**
Tendency to stall during starting	• Crankshaft position sensor • Injector • Spark plugs • Ignition timing • Fuel pressure • A/C system pressure, compressor • Control module circuit	**Refer to: Diagnosis procedure for tendency to stall during starting.**
Vehicle jitter during running	• Intake pressure sensor • Incorrect operation of A/C system • Unstable signals or no signals from camshaft position sensor • Air leakage on the intake system parts • Unstable signals from crankshaft position sensor • Vacuum leakage • Poor fuel quality • Intermittent fault of main relay and fuel pump relay • Faults of throttle valve • Overheated engine • The spark plug has fault • Ignition timing • Exhaust system limitations • Insufficient fuel pressure • Mechanical fault of fuel pump • Injector • Unstable signals of accelerator pedal sensor	**Refer to: Diagnosis procedure for vehicle jitter during running.**

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Symptom	Possible point of failure	Recommended Measures
Stall during neutral-position running	• Vacuum leakage • Air intake system leaks • Improper control of air/fuel mixture ratio • Faults of accelerator pedal sensor or its related wires • Faults of inlet pressure sensor or its related wires • Incorrect operation of A/C electromagnetic clutch • Injector • Spark plugs • Ignition timing • Fuel • Exhaust blocking	**Refer to: Diagnosis procedure for stall during neutral-position running**

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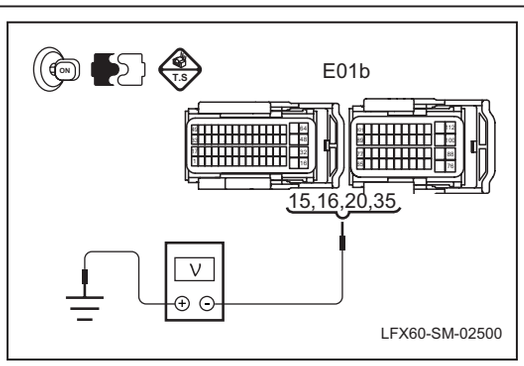
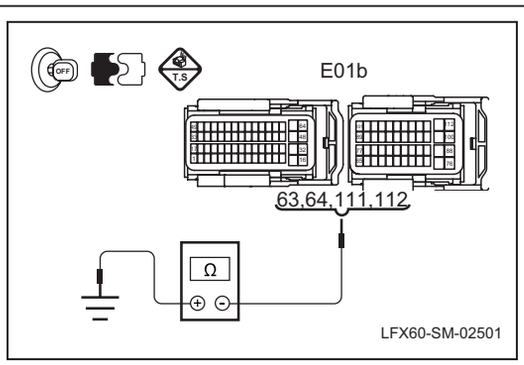
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Diagnostic process for starting failure of engine at normal starting speed

Test condition	Details/results/measures
1. Check the trouble code.	
	A. Use the fault diagnosis instrument to detect the engine DTC. Is there a DTC? →**Yes** **Refer to:DTC TROUBLESHOOTING TABLE.** →**No** To step 2**.**
2. Check the ignition system.	
	A. Perform ignition spark test. **Refer to: Ignition spark test** Is the spark plug ignition spark test normal? →**Yes** To step 3**.** →**No** Check the ignition system. **Refer to: Diagnostic process for spark plug failure in jump spark**
3. Check the fuel pressure.	
	A. Connect the fuel pressure gauge. B. Measure fuel pressure. **Refer to: Fuel system pressure test** Is fuel pressure normal? →**Yes** To step 4**.** →**No** Check the fuel system. **Refer to: Diagnostic process for fuel pump failure to work**
4. Check the engine compression pressure.	
	A. Check the engine compression pressure. **Refer to: Cylinder compression pressure check** Is the cylinder compressing pressure normal? →**Yes** To step 5**.** →**No** Check the mechanical system of the engine.

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Test condition	Details/results/measures
5. Check the anti-theft system of the engine.	
	A. Check the anti-theft system of engine. Is the anti-theft system of engine activated? →**Yes** Repair the anti-theft system to stop the activation of anti-theft system. →**No** To step 6**.**
6. Check the moisture in the fuel.	
	A. Remove the joint of fuel filter pipe. **Refer to: Replacement of the oil filter** Discharge the fuel from the fuel filter. Check the moisture inside the fuel. Is fuel check normal? →**Yes** To step 7**.** →**No** Remove the mixed water from the fuel. Add a clear, high-standard fuel.
7. Check the ECM power supply line.	
	A. Operate the start switch to set the power mode to the “on” state. B. Measure the voltage between terminals 15, 16, 20, 35 of the ECM harness connector E01b and the reliable ground point, respectively, with a multimeter. **Standard value: 11 ~ 14V** Is the voltage normal? →**Yes** To step 10. →**No** Troubleshoot the ECM power supply line and replace the harness if necessary.
8. Check the ECM grounding line.	
	A. Operate the start switch to set the power mode to the “OFF” state. B. Disconnect the battery negative connector. C. Disconnect the ECM harness connector E01b. D. Measure the resistance between the terminals 63, 64, 111, 112 of the ECM harness connector E01b and the reliable ground point with a multimeter. **Standard value: Less than 5** Is it OK after checking? →**Yes** To step 11. →**No** Troubleshoot the ECM grounding line and replace the harness if necessary.

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Test condition	Details/results/measures
9. Check ECM.	
	A. Replace ECM. **Refer to: Replacement of the engine control module** Confirm that the fault has been ruled out.

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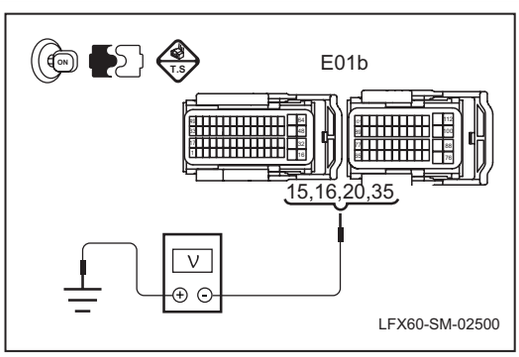
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Diagnosis procedure for engine being hard to clod start

Test condition	Details/results/measures
1. Check the trouble code.	
	A. Connect the diagnostic equipment. B. Operate the start switch to make the power mode to the N? State. Diagnose the engine system. Is there a trouble code? →**Yes** Diagnose the fault codes. **Refer to: DTC TROUBLESHOOTING TABLE** →**No** To step 2**.**
2. Check the throttle.	
	A. Step the accelerator lightly to start the engine. Is the engine easy to start? →**Yes** Clean the throttle valve. →**No** To step 3**.**
3. Check the ignition system.	
	A. Perform ignition spark test. **Refer to: Ignition spark test** Is the spark plug ignition spark test normal? →**Yes** To step 4**.** →**No** Check the ignition system. **Refer to: Diagnostic process for spark plug failure in jump spark**
4. Check the fuel pressure.	
	A. Connect the fuel pressure gauge. B. Measure fuel pressure. **Refer to: Fuel system pressure test** Is fuel pressure normal? →**Yes** To step 5**.** →**No** Check for abnormal fuel pressure.

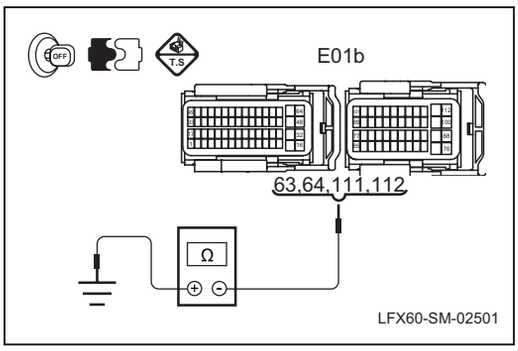
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Test condition	Details/results/measures
5. Check the water temperature sensor.	
	A. Disconnect the harness plug E23b of water temperature sensor. B. Connect 2500Ω resistance with the plug of water temperature sensor harness in series to substitute the water temperature sensor. C. The engine starts at cold state. Is the engine easy to start? **→Yes** Replace the water temperature sensor. **Refer to: Replacement of the water temperature sensor** **→No** To step 6**.**
6. Check the engine compression pressure.	
	A. Check the engine compression pressure. **Refer to: Cylinder compression pressure check** Is the cylinder compressing pressure normal? **→Yes** To step 7**.** **→No** Check the mechanical system of the engine.
7. Check the injector.	
	A. Remove the injector. B. Check the injector for leaks or clogging with an injector-specific cleaning analyzer. Is the injector normal? **→Yes** To step 8**.** **→No** Replace the injector. **Refer to: Replacement of the injector**
8. Check the ECM power supply line.	
	A. Operate the start switch to set the power mode to the “on” state. B. Measure the voltage between terminals 15, 16, 20, 35 of the ECM harness connector E01b and the reliable ground point, respectively, with a multimeter. **Standard value: 11 ~ 14V** Is the voltage normal? **→Yes** To step 9**.** **→No** Check and repair the faults of ECM power circuit.

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Test condition	Details/results/measures
9. Check the ECM grounding line.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the ECM harness connector E01b. D. Measure the resistance between the terminals 63, 64, 111, 112 of the ECM harness connector E01b and the reliable ground point with a multimeter. **Standard value: Less than 5** Is the resistance normal? →**Yes** To step 10. →**No** Check and remove the faults of ECM grounding circuit.
10. Check ECM.	
	A. Replace ECM. **Refer to: Replacement of the engine control module (ECM)** Confirm that the fault has been ruled out.

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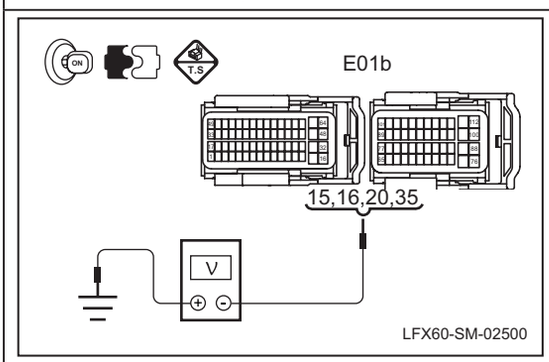
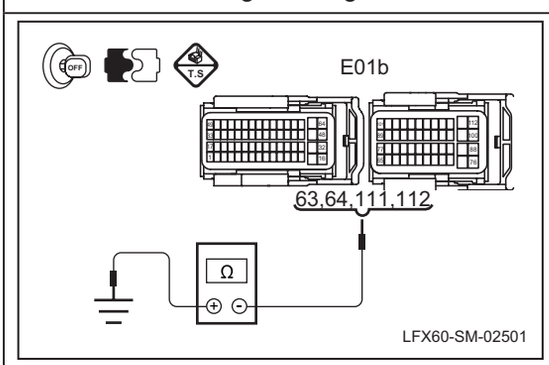
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Diagnosis procedure for engine being hard to hot start

Test condition	Details/results/measures
1. Check the trouble code.	
	A. Connect the diagnostic equipment. B. Operate the start switch to make the power mode to the N? State. Diagnose the engine system. Is there a trouble code? →**Yes** Make a diagnosis of the trouble code. **Refer to: DTC TROUBLESHOOTING TABLE** →**No** To step 2**.**
2. Check the ignition system.	
	A. Perform ignition spark test. **Refer to: Ignition spark test** Is the spark plug ignition spark test normal? →**Yes** To step 3**.** →**No** Check the ignition system. **Refer to: Diagnostic process for spark plug failure in jump spark**
3. Check the fuel pressure.	
	A. Connect the fuel pressure gauge. B. Measure fuel pressure. **Refer to: Fuel system pressure test** Is fuel pressure normal? →**Yes** To step 4**.** →**No** Check for abnormal fuel pressure.

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Test condition	Details/results/measures
4. Check the water temperature sensor.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the water temperature sensor harness connector E23b. D. Connect 2500Ω resistance with the plug of water temperature sensor harness in series to substitute the water temperature sensor. E. The engine starts at cold state. Is the engine easy to start? **→Yes** Replace the water temperature sensor. **Refer to: Replacement of the water temperature sensor** **→No** To step 5**.**
5. Check the ECM power supply line.	
	A. Operate the start switch to set the power mode to the "on" state. B. Measure the voltage between terminals 15, 16, 20, 35 of the ECM harness connector E01b and the reliable ground point, respectively, with a multimeter. **Standard value: 11 ~ 14V** Is the voltage normal? **→Yes** To step 10**.** **→No** Troubleshoot the ECM power supply line and replace the harness if necessary.
6. Check the ECM grounding line.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the ECM harness connector E01b. D. Measure the resistance between the terminals 63, 64, 111, 112 of the ECM harness connector E01b and the reliable ground point with a multimeter. **Standard value: Less than 5** Is the resistance normal? **→Yes** To step 11**.** **→No** Troubleshoot the ECM grounding line and replace the harness if necessary.
7. Check ECM.	
	A. Replace ECM. **Refer to: Replacement of the engine control module (ECM)** Confirm that the fault has been ruled out.

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Diagnostic process for unstable idling at any time under the normal starting conditions

Test condition	Details/results/measures
1. Check the trouble code.	
	A. Connect the diagnostic equipment. B. Operate the start switch to make the power mode to the N? State. Diagnose the engine system. Is there a trouble code? →**Yes** Make a diagnosis of the trouble code. **Refer to: DTC TROUBLESHOOTING TABLE** →**No** To step 2**.**
2. Check the intake system.	
	A. Check whether the intake system is blocked. B. Check whether the intake system is leaking. **Refer to: Air intake leak diagnosis process** Is the intake system normal? →**Yes** To step 3**.** →**No** Remove the faults of inlet system.
3. Check the throttle.	
	A. Operate the start switch to set the power mode to the “OFF” state. B. Check whether the throttle valve is blocked or its carbon deposit exist. Is the throttle normal? →**Yes** To step 4**.** →**No** Clean the throttle or replace the throttle. **Refer to: Replacement of the throttle body assembly**

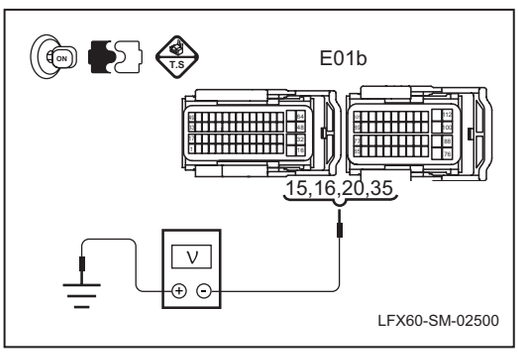
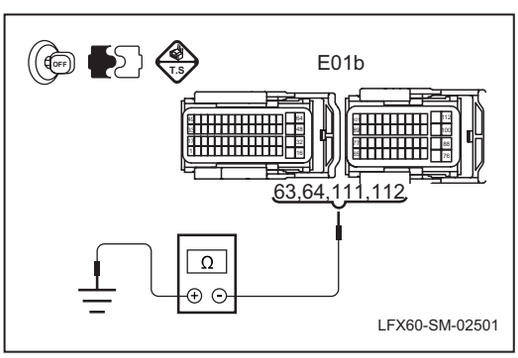
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Test condition	Details/results/measures
4. Check the spark plug.	
	A. Remove the spark plug. B. Check the spark plugs of each cylinder to see if the model and clearance are in compliance with the specifications. **Refer to: Spark plug test** Is the spark plug ignition spark test normal? →**Yes** To step 5. →**No** Replace the spark plug **Refer to: Spark plug replacement**
5. Check the injector.	
	A. Remove the injector. B. Check the injector for leaks or clogging with an injector-specific cleaning analyzer. Is the injector normal? →**Yes** To step 6. →**No** Replace the injector. **Refer to: Replacement of the injector**
6. Check the fuel.	
	A. Remove the fuel filter plug. **Refer to: Replacement of the oil filter** B. Drain the fuel out of fuel filter, and check the moisture in fuel. Is fuel check normal? →**Yes** To step 7. →**No** Remove the mixed water from the fuel. Add a clear, high-standard fuel.
7. Check the engine compression pressure.	
	A. Check the engine compression pressure. **Refer to: Cylinder compression pressure check** Is the cylinder compressing pressure normal? →**Yes** To step 8. →**No** Check the mechanical system of the engine.

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Test condition	Details/results/measures
8. Check the ignition timing.	
	A. Check the ignition timing. **Refer to: Checking the timing** Is the ignition timing normal? →**Yes** To step 9. →**No** Adjust the ignition timing.
9. Check the ECM power supply line.	
	A. Operate the start switch to set the power mode to the “on” state. B. Measure the voltage between terminals 15, 16, 20, 35 of the ECM harness connector E01b and the reliable ground point, respectively, with a multimeter. **Standard value: 11 ~ 14V** Is the voltage normal? →**Yes** To step 10. →**No** Troubleshoot the ECM power supply line and replace the harness if necessary.
10. Check the ECM grounding line.	
	A. Operate the start switch to set the power mode to the “OFF” state. B. Disconnect the battery negative connector. C. Disconnect the ECM harness connector E01b. D. Measure the resistance between the terminals 63, 64, 111, 112 of the ECM harness connector E01b and the reliable ground point with a multimeter. **Standard value: Less than 5** Is the resistance normal? →**Yes** To step 11. →**No** Troubleshoot the ECM grounding line and replace the harness if necessary.
11. Check ECM.	
	A. Replace ECM. **Refer to: Replacement of the engine control module (ECM)** Confirm that the fault has been ruled out.

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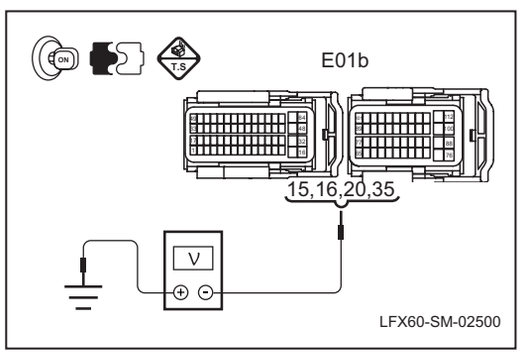
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Diagnostic process for normal starting but unstable idling or stopping (e.g. starting A/C)

Test condition	Details/results/measures
1. Check the trouble code.	
	A. Connect the diagnostic equipment. B. Operate the start switch to make the power mode to the N? State. Diagnose the engine system. Is there a trouble code? →**Yes** **Refer to: DTC TROUBLESHOOTING TABLE** →**No** To step 2**.**
2. Check the throttle.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Check the throttle valve for seizure or carbon deposits. Is the throttle valve normal? →**Yes** To step 3**.** →**No** Clean the throttle or replace the throttle. **Refer to: Replacement of the throttle body assembly**
3. Check whether the output power of engine increases in case of starting A/C.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Connect the diagnostic equipment. C. Start the engine, and enter into the data flow menu of engine to select the ignition advance angle, injection pulse width and inlet pressure sensor parameters. D. Turn on A/C, and observe the changes of data flow parameters. Are the parameters of data flow changed? →**Yes** To step 4**.** →**No** Check A/C system.

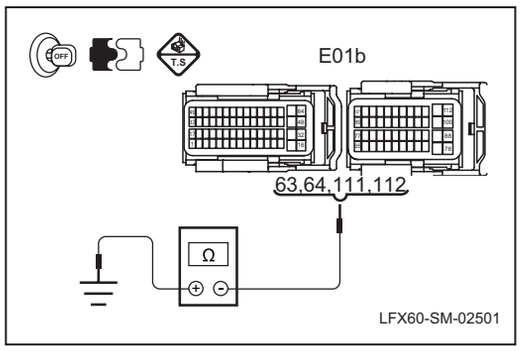
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Test condition	Details/results/measures
4. Check the starting signals of engine module A/C.	
	A. Operate the start switch to set the power mode to the “OFF” state. B. Disconnect the battery negative connector. C. Remove A/C compressor relay. D. Connect the battery negative terminal. E. Operate the start switch to set the power mode to the “on” state. F. Adopt a multimeter to measure #2 terminal of A/C compressor relay K12, and measure the level signal of harness terminal in case of starting A/C. G. Is the voltage of #2 terminal of K12 A/C compressor relay 0V in case of stopping A/C? **→Yes** To step 5**.** **→No** Remove the abnormal open voltage of A/C compressor relay.
5. Check the injector.	
	A. Remove the injector. B. Check the injector for leaks or clogging with an injector-specific cleaning analyzer. Is the injector normal? **→Yes** To step 6**.** **→No** Replace the injector. **Refer to: Replacement of the injector**
6. Check the ECM power supply line.	
	A. Operate the start switch to set the power mode to the “on” state. B. Measure the voltage between terminals 15, 16, 20, 35 of the ECM harness connector E01b and the reliable ground point, respectively, with a multimeter. **Standard value: 11 ~ 14V** Is the voltage normal? **→Yes** To step 7**.** **→No** Troubleshoot the ECM power supply line and replace the harness if necessary.

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Test condition	Details/results/measures
7. Check the ECM grounding line.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the ECM harness connector E01b. D. Measure the resistance between the terminals 63, 64, 111, 112 of the ECM harness connector E01b and the reliable ground point with a multimeter. **Standard value: Less than 5** Is the resistance normal? →**Yes** To step 8. →**No** Troubleshoot the ECM grounding line and replace the harness if necessary.
8. Check ECM.	
	A. Replace ECM. **Refer to: Replacement of the engine control module (ECM)** Confirm that the fault has been ruled out.

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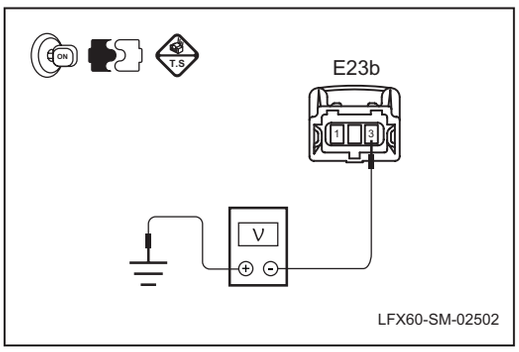
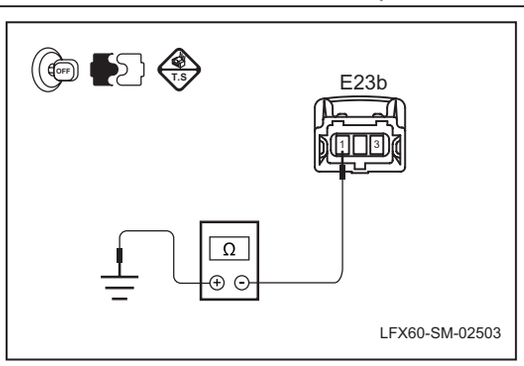
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Diagnosis procedure for excessive idle speed in case of normal start.

Test condition	Details/results/measures
1. Check the trouble code.	
	A. Connect the diagnostic equipment. B. Operate the start switch to make the power mode to the N? State. Diagnose the engine system. Is there a trouble code? →**Yes** Make a diagnosis of the trouble code. **Refer to: DTC TROUBLESHOOTING TABLE** →**No** To step 2**.**
2. Check whether the accelerator pedal is seized or too tight.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Check whether the accelerator pedal is seized or too tight. Is the accelerator pedal seized or too tight? →**Yes** Replace the accelerator pedal. **Refer to "Replacement of Accelerator Pedal Assembly".** →**No** To step 3**.**
3. Check the vacuum pipe.	
	A. Check the air inlet system for leakage. **Refer to: Air intake leak diagnosis process** Is the air inlet system leaked? →**Yes** Overhaul the intake system. →**No** To step 4**.**
4. Check the water temperature sensor.	
	A. Start the engine, and read the data of water temperature sensor. Are the data of water temperature sensor normal? →**Yes** To step 7**.** →**No** To step 5**.**

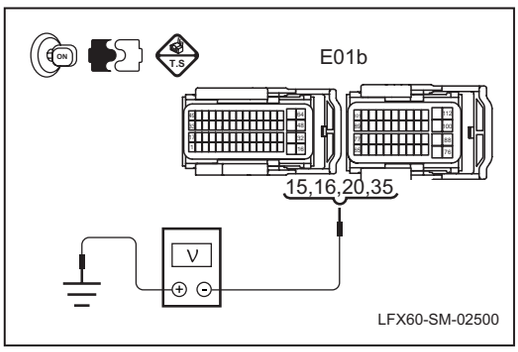
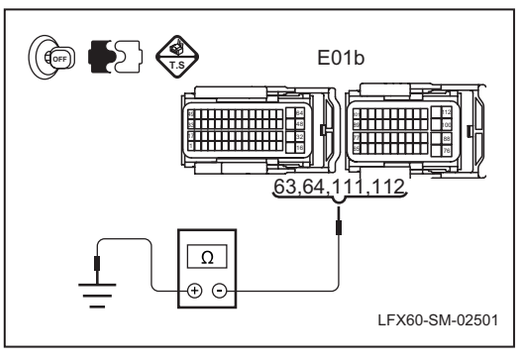
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Test condition	Details/results/measures
5. Check the signal circuit of water temperature sensor.	
	A. Operate the start switch to set the power mode to the “OFF” state. B. Disconnect the battery negative connector. C. Disconnect the water temperature sensor harness connector E23b. D. Connect the battery negative terminal. E. Operate the start switch to set the power mode to the “on” state. F. Adopt a multimeter to measure the voltage of #3 terminal of water temperature sensor harness plug E23b to reliable ground. **Standard value: 4.7 ~ 5.5V** Is the voltage normal? →**Yes** To step 6**.** →**No** Check and remove the faults of water temperature sensor signal circuit, and replace the harness if necessary.
6. Check the circuit of water temperature sensor to ground.	
	A. Operate the start switch to set the power mode to the “OFF” state. B. Disconnect the battery negative connector. C.Disconnect the water temperature sensor harness connector E23b. D. Adopt a multimeter to measure the resistance of #1 terminal of water temperature sensor harness plug E23b to reliable ground. **Standard value: Less than 5** Is the resistance normal? →**Yes** To step 7**.** →**No** Troubleshoot the water temperature sensor grounding line. If necessary, replace the harness.
7. Check the ignition timing.	
	A. Check the ignition timing. **Refer to: Checking the timing** Is the ignition timing normal? →**Yes** To step 8**.** →**No** Adjust the ignition timing.

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Test condition	Details/results/measures
8. Check the ECM power supply line.	
	A. Operate the start switch to set the power mode to the “on” state. B. Measure the voltage between terminals 15, 16, 20, 35 of the ECM harness connector E01b and the reliable ground point, respectively, with a multimeter. **Standard value: 11 ~ 14V** Is the voltage normal? **→Yes** To step 9. **→No** Troubleshoot the ECM power supply line and replace the harness if necessary.
9. Check the ECM grounding line.	
	A. Operate the start switch to set the power mode to the “OFF” state. B. Disconnect the battery negative connector. C. Disconnect the ECM harness connector E01b. D. Measure the resistance between the terminals 63, 64, 111, 112 of the ECM harness connector E01b and the reliable ground point with a multimeter. **Standard value: Less than 5** Is the resistance normal? **→Yes** To step 10. **→No** Troubleshoot the ECM grounding line and replace the harness if necessary.
10. Check ECM.	
	A. Replace ECM. **Refer to: Replacement of the engine control module (ECM)** Confirm that the fault has been ruled out.

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Diagnosis procedure for acceleration fault

Test condition	Details/results/measures
1. Check the trouble code.	
	A. Connect the diagnostic equipment. B. Operate the start switch to make the power mode to the N? State. Diagnose the engine system. Is there a trouble code? →**Yes** Make a diagnosis of the trouble code. **Refer to: DTC TROUBLESHOOTING TABLE** →**No** To step 2**.**
2. Check the intake system.	
	A. Check whether the intake system is blocked. B. Check whether the intake system is leaking. **Refer to: Air intake leak diagnosis process** Is the intake system normal? →**Yes** To step 3**.** →**No** Overhaul the intake system.
3. Check the throttle.	
	A. Operate the start switch to set the power mode to the “OFF” state. B. Check the throttle valve for seizure. C. Check the throttle valve for carbon deposits. Is the throttle normal? →**Yes** To step 4**.** →**No** Clean the throttle or replace the throttle.

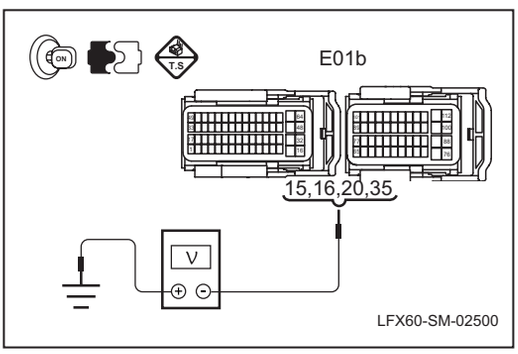
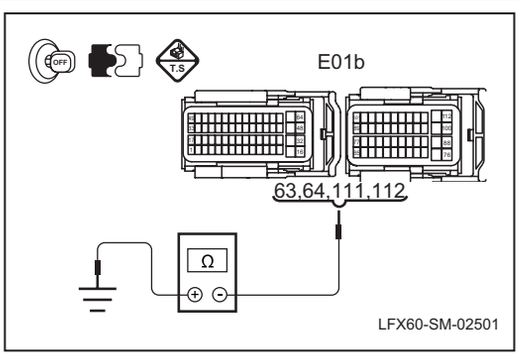
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Test condition	Details/results/measures
4. Check the spark plug.	
	A. Remove the spark plug. B. Check the spark plugs of each cylinder to see if the model and clearance are in compliance with the specifications. **Refer to: Spark plug test** Is the spark plug ignition spark test normal? **→Yes** To step 5. **→No** Replace the spark plug **Refer to: Spark plug replacement**
5. Check the injector.	
	A. Remove the injector. B. Check the injector for leaks or clogging with an injector-specific cleaning analyzer. Is the injector normal? **→Yes** To step 6. **→No** Replace the injector. **Refer to: Replacement of the injector**
6. Check the fuel.	
	A. Remove the fuel filter plug. **Refer to: Replacement of the oil filter** B. Discharge the fuel from the fuel filter. Check the moisture inside the fuel. Is fuel check normal? **→Yes** Remove the mixed water from the fuel. Add a clear, high-standard fuel. **→No** To step 7.
7. Check the intake pressure sensor, and throttle position sensor.	
	A. Operate the start switch to set the power mode to the “OFF” state. B. Connect the diagnostic equipment. C. Start the engine. View the intake pressure sensor and throttle position sensor data flow. Is the intake pressure sensor and throttle position sensor data flow normal? **→Yes** To step 8. **→No** Replace the intake pressure sensor and throttle position sensor or service the sensor line.

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Test condition	Details/results/measures
8. Check the ignition timing.	
	A. Check the ignition timing. **Refer to: Checking the timing** Is the ignition timing normal? →**Yes** To step 9. →**No** Adjust the ignition timing.
9. Check the exhaust back pressure.	
	A. Check the exhaust back pressure. Is the exhaust back pressure normal? →**Yes** To step 10. →**No** Overhaul the exhaust system.
10. Check the ECM power supply line.	
	A. Operate the start switch to set the power mode to the “on” state. B. Measure the voltage between terminals 15, 16, 20, 35 of the ECM harness connector E01b and the reliable ground point, respectively, with a multimeter. **Standard value: 11 ~ 14V** Is the voltage normal? →**Yes** To step 11. →**No** Troubleshoot the ECM power supply line and replace the harness if necessary.
11. Check the ECM grounding line.	
	A. Operate the start switch to set the power mode to the “OFF” state. B. Disconnect the battery negative connector. C. Disconnect the ECM harness connector E01b. D. Measure the resistance between the terminals 63, 64, 111, 112 of the ECM harness connector E01b and the reliable ground point with a multimeter. **Standard value: Less than 5** Is the resistance normal? →**Yes** To step 12. →**No** Troubleshoot the ECM grounding line and replace the harness if necessary.

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Test condition	Details/results/measures
12. Check ECM.	
	A. Replace ECM. **Refer to: Replacement of the engine control module** Confirm that the fault has been ruled out.

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Diagnosis procedure for engine running unstably

Test condition	Details/results/measures
1. Check the trouble code.	
	A. Connect the diagnostic equipment. B. Operate the start switch to make the power mode to the N? State. Diagnose the engine system. Is there a trouble code? →**Yes** Make a diagnosis of the trouble code. **Refer to: DTC TROUBLESHOOTING TABLE** →**No** To step 2**.**
2. Check the intake system.	
	A. Check whether the intake system is blocked. B. Check whether the intake system is leaking. **Refer to: Air intake leak diagnosis process** Is the intake system normal? →**Yes** To step 3**.** →**No** Overhaul the intake system.
3. Check the oxygen sensor.	
	A. Connect the diagnostic equipment. B. Start the starting switch to turn the power mode to “ON”, and adopt a diagnostic unit to enter into the engine data flow and read “Voltages of Front or Rear Oxygen Sensor”. Is the data stream normal? →**Yes** To step 4**.** →**No** Replace front or rear oxygen sensor. **Refer to: Replacement of the front oxygen sensor** **Refer to: Replacement of the rear oxygen sensor**

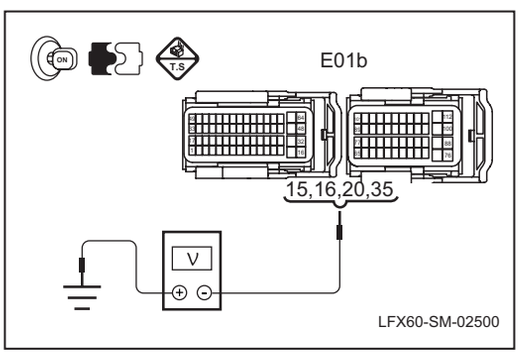
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Test condition	Details/results/measures
4. Check the spark plug.	
	A. Remove the spark plug. B. Check the spark plugs of each cylinder to see if the model and clearance are in compliance with the specifications. **Refer to: Spark plug test** Is the spark plug ignition spark test normal? →**Yes** To step 5. →**No** Replace the spark plug **Refer to: Spark plug replacement**
5. Check the injector.	
	A. Remove the injector. B. Check the injector for leaks or clogging with an injector-specific cleaning analyzer. Is the injector normal? →**Yes** To step 6. →**No** Replace the injector. **Refer to: Replacement of the injector**
6. Check the fuel pressure.	
	A. Connect the fuel pressure gauge. B. Measure fuel pressure. **Refer to: Fuel system pressure test** Is fuel pressure normal? →**Yes** To step 7. →**No** Check the fuel system. **Refer to:Diagnostic process for fuel pump failure to work**

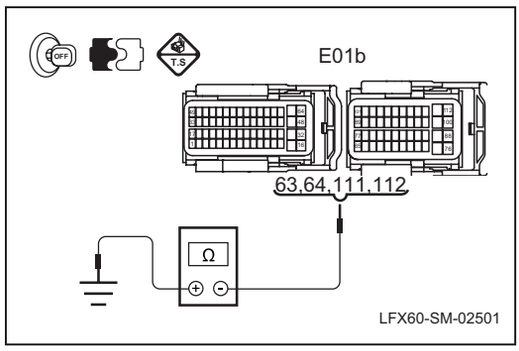
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Test condition	Details/results/measures
7. Check the intake pressure sensor, and throttle position sensor.	
	A. Operate the start switch to set the power mode to the “OFF” state. B. Connect the diagnostic equipment. C. Start the engine. View the intake pressure sensor and throttle position sensor data flow. Is the intake pressure sensor and throttle position sensor data flow normal? →**Yes** To step 8. →**No** Replace the intake pressure sensor and throttle position sensor or service the sensor line.
8. Check the ignition timing.	
	A. Check the ignition timing. **Refer to: Checking the timing** Is the ignition timing normal? →**Yes** To step 9. →**No** Adjust the ignition timing.
9. Check the engine suspension.	
	A. Check the fasteners of engine suspension for loosening. B. Check the engine suspension for damages. C. Are the support parts of engine cracked or damaged, its bolts loosened or missed? →**Yes** Repair the fault parts. →**No** To step 10.
10. Check the ECM power supply line.	
	A. Operate the start switch to set the power mode to the “on” state. B. Measure the voltage between terminals 15, 16, 20, 35 of the ECM harness connector E01b and the reliable ground point, respectively, with a multimeter. **Standard value: 11 ~ 14V** Is the voltage normal? →**Yes** To step 11. →**No** Troubleshoot the ECM power supply line and replace the harness if necessary.

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Test condition	Details/results/measures
11. Check the ECM grounding line.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the ECM harness connector E01b. D. Measure the resistance between the terminals 63, 64, 111, 112 of the ECM harness connector E01b and the reliable ground point with a multimeter. **Standard value: Less than 5** Is the resistance normal? →**Yes** To step 12. →**No** Troubleshoot the ECM grounding line and replace the harness if necessary.
12. Check ECM.	
	A. Replace ECM. **Refer to: Replacement of the engine control module (ECM)** Confirm that the fault has been ruled out.

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Diagnosis procedure for tendency to stall during starting

Test condition	Details/results/measures
1. Check the trouble code.	
	A. Connect the diagnostic equipment. B. Operate the start switch to make the power mode to the N? State. Diagnose the engine system. Is there a trouble code? →**Yes** Make a diagnosis of the trouble code. **Refer to: DTC TROUBLESHOOTING TABLE** →**No** To step 2**.**
2. Check the intake system.	
	A. Check whether the intake system is blocked. B. Check whether the intake system is leaking. **Refer to: Air intake leak diagnosis process** Is the intake system normal? →**Yes** To step 3**.** →**No** Overhaul the intake system.
3. Check the crankshaft position sensor.	
	A. Operate the start switch to set the power mode to the “OFF” state. B. Disconnect the battery negative connector. C. Disconnect the crankshaft position sensor harness connector E25b. D. Adopt a multimeter to measure the resistance between #1 and #2 terminals of crankshaft position sensor. **Standard value: 731~989Ω** Is the resistance normal? →**Yes** To step 4**.** →**No** Replace the crankshaft position sensor. **Refer to: Replacement of the crankshaft position sensor**

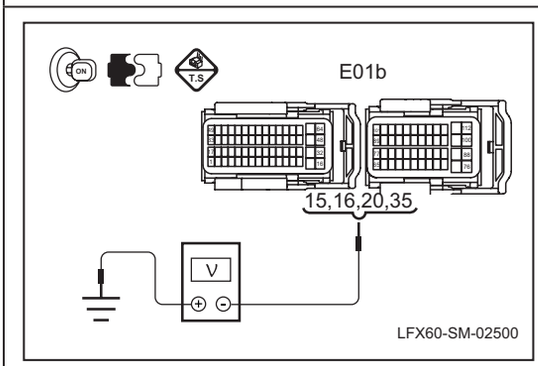
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Test condition	Details/results/measures
4. Check the crankshaft position signal circuit.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the crankshaft position sensor harness connector E25b. D. Disconnect the ECM harness connector E01b. E. Connect the battery negative terminal. F. Adopt a multimeter to measure the resistance between #1 terminal of crankshaft position sensor harness plug E25b and #96 terminal of ECM harness plug E01b. G. Adopt a multimeter to measure the resistance between #2 terminal of crankshaft position sensor harness plug E25b and #97 terminal of ECM harness plug E01b. **Standard value: Less than 5** Is the resistance normal? →**Yes** To step 5. →**No** Remove the faults of crankshaft position sensor signal circuit, and replace the harness if necessary.
5. Check the spark plug.	
	A. Remove the spark plug. B. Check the spark plugs of each cylinder to see if the model and clearance are in compliance with the specifications. **Refer to: Spark plug test** Is the spark plug ignition spark test normal? →**Yes** To step 6. →**No** Replace the spark plug **Refer to: Spark plug replacement**
6. Check the injector.	
	A. Remove the injector. B. Check the injector for leaks or clogging with an injector-specific cleaning analyzer. Is the injector normal? →**Yes** To step 7. →**No** Replace the injector. **Refer to: Replacement of the injector**

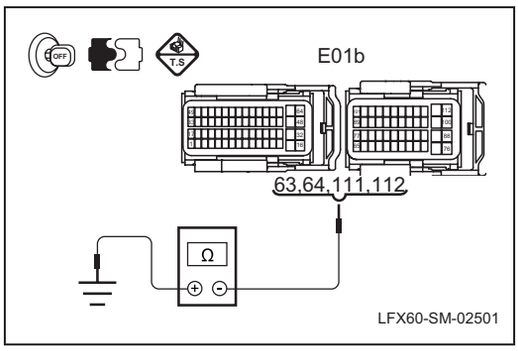
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Test condition	Details/results/measures
7. Check the fuel pressure.	
	A. Connect the fuel pressure gauge. B. Measure fuel pressure. **Refer to: Fuel system pressure test** Is fuel pressure normal? →**Yes** To step 8. →**No** Check the fuel system. **Refer to: Diagnostic process for fuel pump failure to work**
8. Check the intake pressure sensor, and throttle position sensor.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Connect the diagnostic equipment. C. Start the engine. View the intake pressure sensor and throttle position sensor data flow. Is the intake pressure sensor and throttle position sensor data flow normal? →**Yes** To step 9. →**No** Replace the intake pressure sensor and throttle position sensor or service the sensor line.
9. Check the ignition timing.	
	A. Check the ignition timing. **Refer to: Checking the timing** Is the ignition timing normal? →**Yes** To step 10. →**No** Adjust the ignition timing.
10. Check the ECM power supply line.	
	A. Operate the start switch to set the power mode to the "on" state. B. Measure the voltage between terminals 15, 16, 20, 35 of the ECM harness connector E01b and the reliable ground point, respectively, with a multimeter. **Standard value: 11 ~ 14V** Is the voltage normal? →**Yes** To step 11 →**No** Troubleshoot the ECM power supply line and replace the harness if necessary.

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Test condition	Details/results/measures
11. Check the ECM grounding line.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the ECM harness connector E01b. D. Measure the resistance between the terminals 63, 64, 111, 112 of the ECM harness connector E01b and the reliable ground point with a multimeter. **Standard value: Less than 5** Is the resistance normal? →**Yes** To step 12. →**No** Troubleshoot the ECM grounding line and replace the harness if necessary.
12. Check ECM.	
	A. Replace ECM. **Refer to: Replacement of the engine control module (ECM)** Confirm that the fault has been ruled out.

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Diagnosis procedure for vehicle jitter during running

Test condition	Details/results/measures
1. General inspection.	
	A. Check the following items: • Vacuum tube connection • Air filter cartridge • Air leakage of inlet system • Correct seals of the intake manifold and its components • Ignition line • Appropriate fuel quality (e.g. appropriate octane value, sundries, mixture in winter/summer) • Electrical connection • Stable operation of the throttle B. Operate the start switch to make the power mode to the N? State. Diagnose the engine system. Is it OK after checking? **→Yes** To step 2. **→No** Repair the fault parts.
2. Check the trouble code.	
	A. Connect the diagnostic equipment. B. Operate the start switch to make the power mode to the N? State. Diagnose the engine system. Is there a trouble code? **→Yes** Make a diagnosis of the trouble code. **Refer to: DTC TROUBLESHOOTING TABLE** **→No** To step 3.
3. Check the data flows.	
	A. Connect the diagnostic equipment. B. Start the engine, and check the following data flows of engine with a diagnostic unit: • Engine speed • Actual intake manifold pressure • 1# throttle potentiometer voltage • 2# throttle potentiometer voltage Are the changes of data flows normal within the specified range? **→Yes** To step 4. **→No** Remove the corresponding faults of data flows.

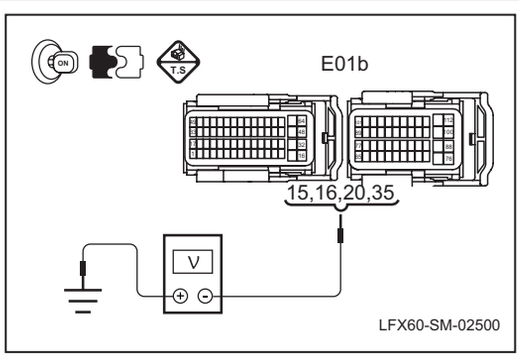
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Test condition	Details/results/measures
4. Check the spark plug.	
	A. Remove the spark plug. B. Check the spark plugs of each cylinder to see if the model and clearance are in compliance with the specifications. **Refer to: Spark plug test** Is the spark plug ignition spark test normal? →**Yes** To step 5**.** →**No** Replace the spark plug **Refer to: Spark plug replacement**
5. Check the injector.	
	A. Remove the injector. B. Check the injector for leaks or clogging with an injector-specific cleaning analyzer. Is the injector normal? →**Yes** To step 6**.** →**No** Replace the injector. **Refer to: Replacement of the injector**
6. Check the fuel pressure.	
	A. Connect the fuel pressure gauge. B. Measure fuel pressure. **Refer to: Fuel system pressure test** Is fuel pressure normal? →**Yes** To step 7**.** →**No** Check the fuel system. **Refer to: Diagnostic process for fuel pump failure to work**
7. Check the ignition timing.	
	A. Check the ignition timing. **Refer to: Checking the timing** Is the ignition timing normal? →**Yes** To step 8**.** →**No** Adjust the ignition timing.

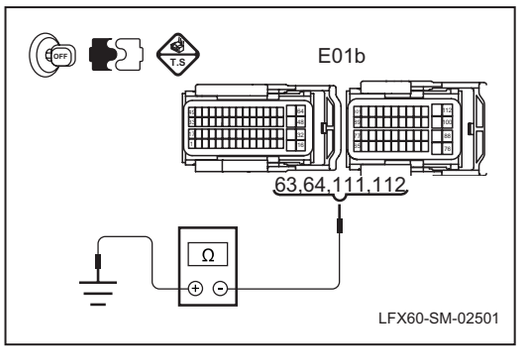
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Test condition	Details/results/measures
8. Check the fuel evaporative emission system (EVAP).	
	A. Check the fuel evaporative emission system. **Refer to: Check of canister** Is the fuel evaporative emission system normal? **→Yes** To step 9**.** **→No** Repair the fuel evaporative emission system.
9. Check the exhaust recirculation system.	
	A. Check the exhaust recirculation system. Is the exhaust recirculation system normal? **→Yes** To step 10**.** **→No** Repair the exhaust recirculation system.
10. Check the exhaust back pressure.	
	A. Check the exhaust back pressure. Is the exhaust back pressure normal? **→Yes** To step 12**.** **→No** Overhaul the exhaust system.
12. Check the ECM power supply line.	
	A. Operate the start switch to set the power mode to the “on” state. B. Measure the voltage between terminals 15, 16, 20, 35 of the ECM harness connector E01b and the reliable ground point, respectively, with a multimeter. **Standard value: 11 ~ 14V** Is the voltage normal? **→Yes** To step 13**.** **→No** Troubleshoot the ECM power supply line and replace the harness if necessary.

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Test condition	Details/results/measures
13. Check the ECM grounding line.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the ECM harness connector E01b. D. Measure the resistance between the terminals 63, 64, 111, 112 of the ECM harness connector E01b and the reliable ground point with a multimeter. **Standard value: Less than 5** Is the resistance normal? →**Yes** To step 14. →**No** Troubleshoot the ECM grounding line and replace the harness if necessary.
14. Check ECM.	
	A. Replace ECM. **Refer to: Replacement of the engine control module (ECM)** Confirm that the fault has been ruled out.

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Sliding flameout diagnosis procedure

Test condition	Details/results/measures
1. General inspection.	
	A. Ensure correct layout and no damages of vacuum pipe. B. Ensure no leakage of inlet system. Is it OK after checking? →**Yes** To step 2**.** →**No** Repair the fault parts**.**
2. Check the idling of engine.	
	A. Check the engine idling. Is the engine idling unstable? →**Yes** Diagnose its unstable idling. **Refer to: Diagnostic Process for Normal Starting but Unstable Idling or Stopping at Some Load** →**No** To step 3**.**
3. Check A/C compressor.	
	A. Activate the starting switch to make the power mode OFF. B. Disconnect CA40 harness plug of A/C compressor electromagnetic clutch. C. Check whether the test of A/C system is normal. D. Recover CA40 harness plug of electromagnetic clutch. Is it normal to disconnect the electromagnetic clutch system? →**Yes** Remove the disconnection failure of compressor electromagnetic clutch. →**No** To step 4.
4. Check the trouble code.	
	A. Connect the diagnostic equipment. B. Operate the start switch to make the power mode to the N? State. Diagnose the engine system. Is there a trouble code? →**Yes** Perform the fault diagnosis. **Refer to: DTC TROUBLESHOOTING TABLE** →**No** To step 5**.**

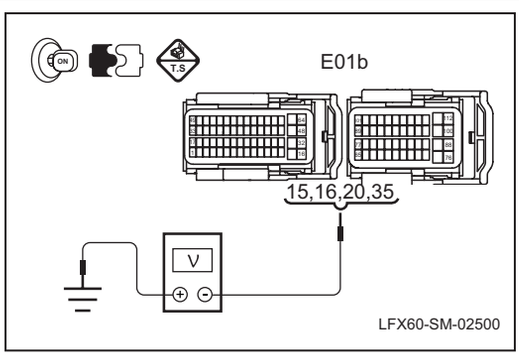
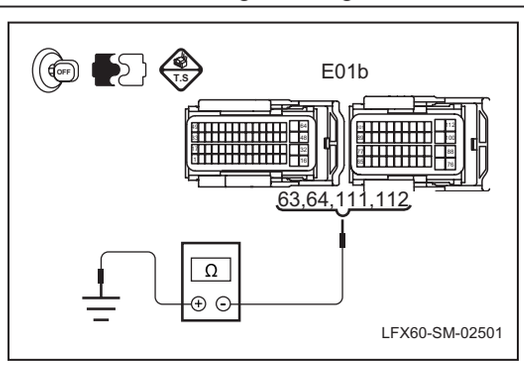
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Test condition	Details/results/measures
5. Check the spark plug.	
	A. Remove the spark plug. B. Check the spark plugs of each cylinder to see if the model and clearance are in compliance with the specifications. **Refer to: Spark plug test** Is the spark plug ignition spark test normal? **→Yes** To step 6. **→No** Replace the spark plug **Refer to: Spark plug replacement**
6. Check the injector.	
	A. Remove the injector. B. Check the injector for leaks or clogging with an injector-specific cleaning analyzer. Is the injector normal? **→Yes** To step 7. **→No** Replace the injector. **Refer to: Replacement of the injector**
7. Check the fuel.	
	A. Remove the fuel filter plug. **Refer to: Replacement of the oil filter** B. Discharge the fuel from the fuel filter. Check the moisture inside the fuel. Is fuel check normal? **→Yes** Replace the fuel. **→No** To step 8.
8. Check the intake pressure sensor, and throttle position sensor.	
	A. Operate the start switch to set the power mode to the “OFF” state. B. Connect the diagnostic equipment. C. Start the engine. View the intake pressure sensor and throttle position sensor data flow. Is the intake pressure sensor and throttle position sensor data flow normal? **→Yes** To step 9. **→No** Replace the intake pressure sensor and throttle position sensor or service the sensor line.

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Test condition	Details/results/measures
9. Check the ignition timing.	
	A. Check the ignition timing. **Refer to: Checking the timing** Is the ignition timing normal? **→Yes** To step 10. **→No** Adjust the ignition timing.
10. Check the exhaust back pressure.	
	A. Check the exhaust back pressure. Is the exhaust back pressure normal? **→Yes** To step 11. **→No** Overhaul the exhaust system.
11. Check the ECM power supply line.	
	A. Operate the start switch to set the power mode to the “on” state. B. Measure the voltage between terminals 15, 16, 20, 35 of the ECM harness connector E01b and the reliable ground point, respectively, with a multimeter. **Standard value: 11 ~ 14V** Is the voltage normal? **→Yes** To step 12. **→No** Troubleshoot the ECM power supply line and replace the harness if necessary.
12. Check the ECM grounding line.	
	A. Operate the start switch to set the power mode to the “OFF” state. B. Disconnect the battery negative connector. C. Disconnect the ECM harness connector E01b. D. Measure the resistance between the terminals 63, 64, 111, 112 of the ECM harness connector E01b and the reliable ground point with a multimeter. **Standard value: Less than 5** Is the resistance normal? **→Yes** To step 13. **→No** Troubleshoot the ECM grounding line and replace the harness if necessary.

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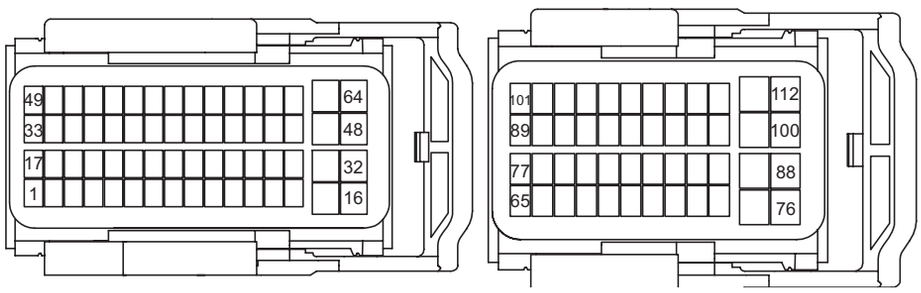
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Test condition	Details/results/measures
13. Check ECM.	
	A. Replace ECM. **Refer to: Replacement of the engine control module (ECM)** Confirm that the fault has been ruled out.

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Control module terminal list



E01b

LFX60- SM -02627

Pin number	Wire size/color	Function
1	0.50 R/W	PCAN-H
2	-	-
3	-	-
4	-	-
5	0.50 Y	Main relay control signal
6	-	-
7	0.50 Bl/W	Accelerator pedal position sensor signal ground 1
8	-	-
9	0.50 O/G	Cruise switch signal
10	-	-
11	-	-
12	-	-
13	-	-
14	-	-
15	1.50 Bl/R	Main relay power supply
16	1.50 Bl/R	Main relay power supply
17	0.50 B/W	PCAN-L
18	-	-
19	-	-
20	0.50 R	Storage battery power supply
21	0.50 P	Rear oxygen sensor signal signal high

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Pin number	Wire size/color	Function
22	-	-
23	0.50 Gr/W	Normally open signal of the brake switch
24	0.50 G	A/C switch signal
25	0.50 Gr/R	Normally closed signal of the brake switch
26	-	-
27	-	-
28	0.50 Gr/V	A/C switch feedback signal
29	0.50 Bl/G	Steering power switch
30	0.50 G/R	Throttle pedal position sensor signal 2
31	0.85 V/W	High speed fan control signal
32	-	-
33	-	-
34	-	-
35	0.50 B/W	IG power supply
36	0.50 R/W	Accelerator pedal position sensor 5V power supply
37	0.50 O/Bl	Accelerator pedal position sensor 5V power supply
38	-	-
39	-	-
40	-	-
41	0.50 Gr/Y	Oil pump relay control signal
42	-	-
43	0.50 V/B	The rear oxygen sensor signal is low
44	-	-
45	0.50 R/Y	Throttle pedal position sensor signal 1
46	-	-
47	0.75 B/W	Pilot switch signal ground
48	0.75 G/O	Rear oxygen sensor heating signal
49	-	-
50	-	-
51	-	-
52	-	-
53	-	-
54	-	-
55	-	-

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Pin number	Wire size/color	Function
56	0.50 Gr/O	Low speed fan control signal
57	-	-
58	0.50 B/O	Compressor control signal
59	0.50 W/B	Throttle pedal position sensor signal 1
60	-	-
61	-	-
62	-	-
63	1.50 B	Grounding
64	1.50 B	Grounding
65	-	-
66	-	-
67	0.50 Y/R	Two cylinder fuel injection signal
68	0.50 O/B	One cylinder fuel injection signal
69	-	-
70	-	-
71	0.50 Y/W	Inlet VVT valve signal
72	0.50 P/Y	Three cylinder fuel injection signal
73	0.50 V/W	-
74	0.50 G/Y	Four cylinder fuel injection signal
75	0.75 P	Electronically controlled throttle valve motor power supply +
76	1.50 Br	Four-cylinder ignition signal
77	0.50 W/P	Electronically controlled throttle valve signal 1
78	0.50 Bl/G	Electronically controlled throttle valve signal 2
79	-	-
80	0.50 V/B	The front oxygen sensor’s signal is low
81	-	-
82	-	-
83	-	-
84	-	-
85	0.50 G/R	Sensor signal ground
86	0.50 V	-
87	0.75 R/GW	Electronically controlled throttle valve motor power supply -
88	1.50 P/G	Two-cylinder ignition signal
89	0.50 Bl/O	The knock sensor signal is high

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Pin number	Wire size/color	Function
90	0.50 Bl/B	The knock sensor signal is low
91	0.50 P/B	Intake pressure sensor signal
92	-	-
93	0.50 R/Bl	Air intake camshaft position sensor signal
94	0.50 W/G	Canister solenoid valve signal
95	0.50 G/W	Inlet camshaft position sensor signal ground
96	0.50 Bl	Crankshaft position sensor signal high
97	0.50 G	Crankshaft position sensor signal low
98	0.50 Y/G	Inlet camshaft position sensor 5V power supply
99	1.50 G/W	Three-cylinder ignition signal
100	1.50 G/R	One-cylinder ignition signal
101	0.50 Y/B	Water temperature sensor signal
102	0.50 Bl	Intake pressure sensor signal
103	-	-
104	0.50 O/Y	The front oxygen sensor signal is high
105	-	-
106	-	-
107	0.50 R/B	Electric control throttle valve 5V power supply
108	-	-
109	0.50 Y/Bl	Inlet temperature &pressure sensor 5V power supply
110	1.50 B	Grounding
111	1.50 B	Grounding

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DTC troubleshooting table

DTC	Trouble code information	Diagnostic process
P000A	Intake VVT slow response	**Refer to: P000A, P0010, P0012, P0016, P2088, P2089**
P0010	VVT intake control valve circuit fault	
P0012	Intake VVT not in default position when starting	
P0016	Improper relative installation position of camshaft and crankshaft	
P2088	VVT intake control valve circuit voltage low	
P2089	VVT intake control valve circuit voltage high	
P0030	Fault of upstream oxygen sensor heating control circuit	**Refer to: P0030, P0031, P0032, P0053**
P0031	Overlow voltage of upstream oxygen sensor heating control circuit	
P0032	Overhigh voltage of upstream oxygen sensor heating control circuit	
P0053	Upstream oxygen sensor heating circuit internal resistance unreasonable	
P0036	Fault of downstream oxygen sensor heating control circuit	**Refer to: P0036, P0037, P0038, P0054**
P0037	Overlow voltage of downstream oxygen sensor heating control circuit	
P0038	Overhigh voltage of downstream oxygen sensor heating control circuit	
P0054	Downstream oxygen sensor heating circuit internal resistance unreasonable	
P0105	Intake pressure sensor signal no fluctuation	**Refer to: P0105, P0106, P0107, P0108**
P0106	Intake pressure sensor unreasonable	
P0107	Intake pressure sensor signal circuit voltage low	
P0108	Intake pressure sensor signal circuit voltage high	
P0112	Intake temperature sensor signal circuit voltage low	**Refer to: P0112, P0113**
P0113	Intake temperature sensor signal circuit voltage high	
P0117	Engine coolant temperature sensor circuit voltage low	**Refer to: P0117, P0118**
P0118	Engine coolant temperature sensor circuit voltage high	
P0121	Electronic throttle position sensor 1 signal unreasonable	**Refer to: P0121, P0122, P0123**
P0122	Electronic throttle position sensor 1 signal circuit voltage low	
P0123	Electronic throttle position sensor 1 signal circuit voltage high	
P0130	Upstream oxygen sensor signal unreasonable	**Refer to: P0130, P0131, P0132, P0133, P0134, P2195, P2196**
P0131	Upstream oxygen sensor signal circuit voltage low	
P0132	Upstream oxygen sensor signal circuit voltage high	
P0133	Response delay of upstream oxygen sensor to dense and diluted mixed gas	
P0134	Faults of upstream oxygen sensor circuit signal circuit	
P2195	Response delay of upstream oxygen sensor to diluted mixed gas	
P2196	Response delay of upstream oxygen sensor to dense mixed gas	

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DTC	Trouble code information	Diagnostic process
P0136	Downstream oxygen sensor signal unreasonable	**Refer to: P0136, P0137, P0138, P0140, P2270, P2271**
P0137	Downstream oxygen sensor signal circuit voltage low	
P0138	Downstream oxygen sensor signal circuit voltage high	
P0140	Faults of downstream oxygen sensor circuit signal circuit	
P2270	Response delay of downstream oxygen sensor to diluted mixed gas	
P2271	Response delay of downstream oxygen sensor to dense mixed gas	
P0201	Cylinder 1 injector control circuit faults	**Refer to: P0201, P0261, P0262**
P0261	Cylinder 1 injector control circuit voltage low	
P0262	Cylinder 1 injector control circuit voltage high	
P0202	Cylinder 2 injector control circuit faults	**Refer to: P0202, P0264, P0265**
P0264	Cylinder 2 injector control circuit voltage low	
P0265	Cylinder 2 injector control circuit voltage high	
P0203	Cylinder 3 injector control circuit faults	**Refer to: P0203, P0267, P0268**
P0267	Cylinder 3 injector control circuit voltage low	
P0268	Cylinder 3 injector control circuit voltage high	
P0204	Cylinder 4 injector control circuit faults	**Refer to: P0204, P0270, P0271**
P0270	Cylinder 4 injector control circuit voltage low	
P0271	Cylinder 4 injector control circuit voltage high	
P0219	Engine speed exceeding maximum speed limit	**Refer to: P0219**
P0221	Electronic throttle position sensor 2 signal unreasonable	**Refer to: P0221, P0222, P0223**
P0222	Electronic throttle position sensor 2 signal circuit voltage low	
P0223	Electronic throttle position sensor 2 signal circuit voltage high	
P0300	Multi-cylinder misfire	**Refer to: P0300, P0301, P0302, P0303, P0304**
P0301	Cylinder 1 misfire	
P0302	Cylinder 2 misfire	
P0303	Cylinder 3 misfire	
P0304	Cylinder 4 misfire	
P0322	Non-speed (crankshaft position) sensor pulse signal	**Refer to: P0322**
P0327	Overhigh voltage of knock sensor circuit	**Refer to: P0327, P0328**
P0328	Overlow voltage of knock sensor circuit	
P0341	Poor contact of phase position (camshaft position) sensor	**Refer to: P0341**
P0420	Aged oxygen storing capacity of three-way catalyst (emission overlimit)	**Refer to: P0420**

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DTC	Trouble code information	Diagnostic process
P0444	Faults of canister control valve circuit	**Refer to: P0444, P0458, P0459**
P0458	Overlow voltage of canister control valve circuit	
P0459	Canister control valve control circuit voltage high	
P0480	Signal faults of cooling fan relay control circuit (low speed)	**Refer to: P0480, P0691, P0692**
P0691	Overlow voltage of cooling fan relay control circuit (low speed)	
P0692	Cooling fan relay control circuit voltage high (low speed)	
P0481	Faults of cooling fan relay control circuit (high speed)	**Refer to: P0481, P0693, P0694**
P0693	Cooling fan relay control circuit voltage low (low speed)	
P0694	Cooling fan relay control circuit voltage high (low speed)	
P0506	Idle speed control speed below target	**Refer to: P0506, P0507**
P0507	Idle speed control speed above target	
P0560	System battery voltage signal unreasonable	**Refer to: P0560, P0562, P0563**
P0562	System battery voltage low	
P0563	System battery voltage high	
P0571	Fault or non-synchronous relevance of brake switch signal circuit	**Refer to: P0571**
P0604	ECU RAM fault	**Refer to: P0604, P0605, P0606**
P0605	ECU ROM fault	
P0606	Faults of electronic throttle safety monitoring function	
P2106	Electronic throttle drive stage fault	
P0627	Faults of fuel pump relay circuit	**Refer to: P0627, P0628, P0629**
P0628	Overlow voltage of fuel pump relay control circuit	
P0629	Fuel pump relay control circuit voltage high	
P0645	Faults of A/C compressor relay circuit	**Refer to: P0645, P0646, P0647**
P0646	A/C compressor relay control circuit voltage low	
P0647	Overhigh voltage of A/C compressor relay	
P0688	Main relay output voltage unreasonable	**Refer to: P0688**
P1336	Lectronic throttle safety monitoring torque restriction	**Refer to: P1336, P1545, P1559,**
P1545	Electronic throttle actual position deviation from target exceeding limit	
P1559	Electronic throttle self-learning process fault	
P1565	Self-learning fault of electronic throttle lower limit position initialization	**P1564, P1565, P1568, P1579**
P1568	Overhigh return resistance of electronic throttle valve	
P1579	Electronic throttle not meeting self-learning condition	

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DTC	Trouble code information	Diagnostic process
P1610	ECM fails to finish anti-theft matching or error of eeprom status	**Refer to: P1610, P1626, P1631, P1632**
P1626	Anti-theft certification commission error or response failure of anti-theft alarm	
P1631	Secret key error	
P1632	checksum error in anti-theft certification	
P2122	Electronic throttle pedal position sensor 1 signal voltage lower	**Refer to: P2122, P2123, P2138**
P2123	Electronic throttle pedal position sensor 1 signal voltage high	
P2138	Electronic throttle pedal position sensor signal unreasonable	
P2127	Electronic throttle pedal position sensor 2 signal voltage lower	**Refer to: P2127, P2128, P2138**
P2128	Electronic throttle pedal position sensor 2 signal voltage high	
P2138	Electronic throttle pedal position sensor signal unreasonable	
P2177	Air fuel ratio closed-loop control self-learning value exceeding upper limit	**Refer to: P2177, P2178**
P2178	Air fuel ratio closed-loop control self-learning value exceeding lower limit	
U0001	Faults of CAN high-speed transmission lines	**Refer to: U0001, U0121, U0140**
U0121	Commission missing between ECM and ABS control module	
U0140	Commission missing or abnormal signals between ECM and BCM	

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DTC P000A, P0010, P0012, P0016, P2088, P2089

DTC description

DTC	Description	Definition
P000A	Slow response speed to inlet VVT movement	• Engine control module controls the operation of inlet VCP hydraulic control valve, drives VVT sprocket via oil, and changes its timing phase as per the running conditions. When the control circuit of inlet VCP hydraulic control valve is abnormal, engine control module will set this fault code. #1 terminal of inlet VCP hydraulic control valve harness plug E06b is the power supply of control valve. #2 terminal of E06b is the drive signal of control valve.
P0010	Open circuit of inlet VVT control solenoid valve	
P0012	Inlet VVT is not in default locking position while starting	
P2088	Overlow voltage of inlet VVT control solenoid valve circuit	
P2089	Overhigh voltage of inlet VVT control solenoid valve circuit	

Possible reasons

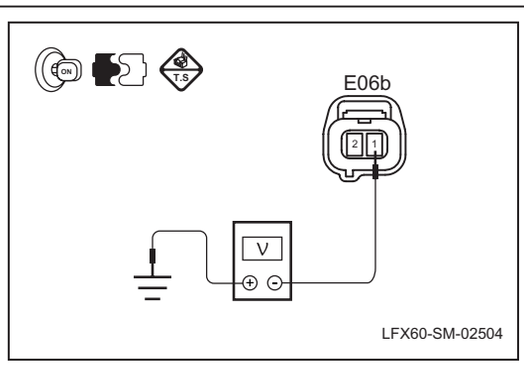
DTC	Detection strategy	Set the condition (control strategy)	Define the fault location
P000A	• Check of hardware and circuits	• Incorrect signal relevance	• Phaser • Inlet VVT control solenoid valve • Inlet VVT control solenoid valve circuit • ECM
P0010			
P0012			
P2088			
P2089			

Diagnostic process

Test condition	Details/results/measures
1. General inspection.	
	A. Check the inlet VVT control solenoid valve harness plug and engine control module for damages, poor contact, aging or loosening, etc. Is it OK after checking? →Yes **To step 2.** →**No** Repair the fault parts.

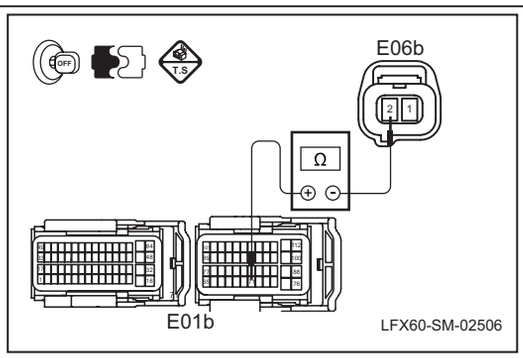
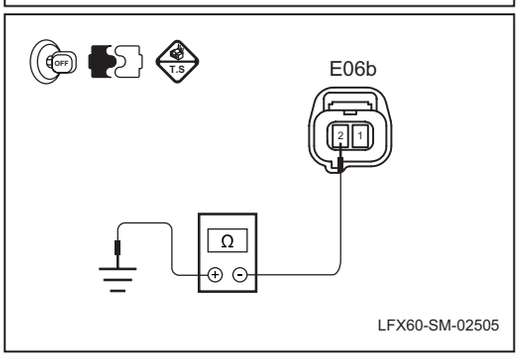
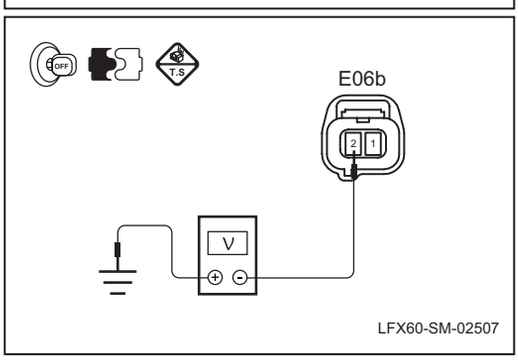
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Test condition	Details/results/measures
2. Check the oil.	
	A. Check the oil for chippings or serious pollution, etc. B. Check the oil pressure. **Refer to: Check the oil pressure.** Is the oil pressure normal? →**Yes** Step 3. →**No** Repair the fault parts.
3. Timing check	
	A. Check the accuracy of timing. B. Check the timing chain, timing sprocket or timing chain tensioner for damages or wears. Is it OK after checking? →**Yes** Step 4. →**No** Repair the fault parts.
4. Replace the timing phase modulator.	
	A. Replace the timing phase modulator. Is the troubleshooting successful? →**Yes** Replace the timing phase modulator. →**No** Step 5.
5. Check the power circuit of inlet VVT control solenoid valve.	
	A. Operate the start switch to set the power mode to the “OFF” state. B. Disconnect the battery negative connector. C. Disconnect the intake VVT control solenoid valve harness connector E06b. D. Connect the battery negative terminal. E. Operate the start switch to set the power mode to the “on” state. F. Adopt a multimeter to measure the voltage of #1 terminal of inlet VVT control solenoid valve harness plug E06b to reliable ground. **Standard value: 11 ~ 14V** Is the voltage normal? →**Yes** To step 6. →**No** Check and remove the faults of inlet VVT control solenoid valve power circuit, and replace the harness if necessary.

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Test condition	Details/results/measures
6. Check the control circuit of inlet VVT control solenoid valve.	
  	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the intake VVT control solenoid valve harness connector E06b. D. Disconnect the ECM harness connector E01b. E. Adopt a multimeter to measure the resistance between #1 terminal of inlet VVT control solenoid valve harness plug E06b and #71 terminal of ECM harness plug E01b. **Standard value: Less than 5** F. Adopt a multimeter to measure the resistance of #2 terminal of inlet VVT control solenoid valve harness plug E06b to reliable ground. **Standard value: 10MΩ or higher** G. Connect the battery negative terminal. H. Adopt a multimeter to measure the voltage of #2 terminal of inlet VVT control solenoid valve harness plug E06b to reliable ground. **Standard value: 0V** Is it OK after checking? →**Yes** To step 7. →**No** Check and remove the faults of inlet VVT control solenoid valve control circuit, and replace the harness if necessary.
7. Check the inlet VVT control solenoid valve.	
	A. Replace the inlet VVT control solenoid valve. Is the troubleshooting successful? →**Yes** Replace the inlet VVT control solenoid valve. **Refer to: Replacement of inlet VVT valve** →No **To step 8.**
8. Check ECM.	
	A. Replace ECM. **Refer to: Replacement of the engine control module (ECM)** Confirm that the fault has been ruled out.

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DTC P0030, P0031, P0032, P0053

DTC description

DTC	Description	Definition
P0030	• Fault of upstream oxygen sensor heating control circuit	• The heated oxygen sensor must reach the operating temperature to provide accurate voltage signals. The heating element inside the heated oxygen sensor makes the sensor reach the operating temperature quickly. Main relay provides the operating voltage for upstream sensor via A terminal of upstream oxygen sensor harness plug E04a. The engine control module provides grounding for B terminal of upstream oxygen sensor harness plug E04a.
P0031	• Overlow voltage of upstream oxygen sensor heating control circuit	
P0032	• Overhigh voltage of upstream oxygen sensor heating control circuit	
P0053	• Upstream oxygen sensor heating circuit internal resistance unreasonable	

Possible reasons

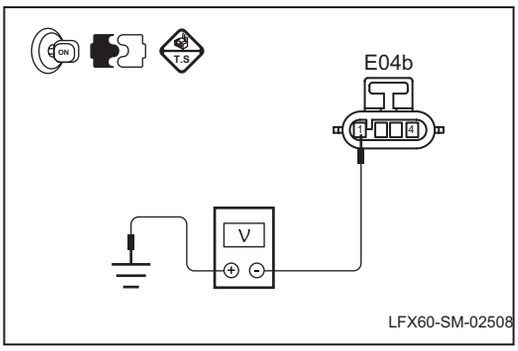
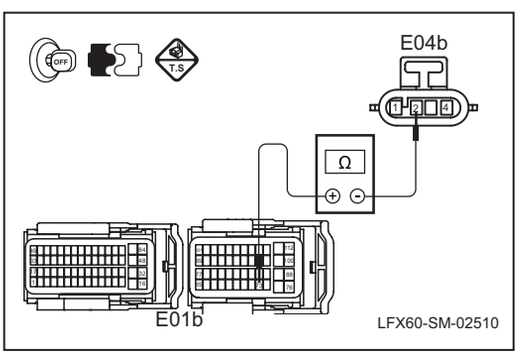
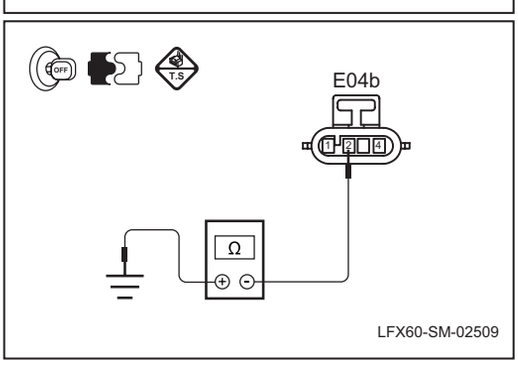
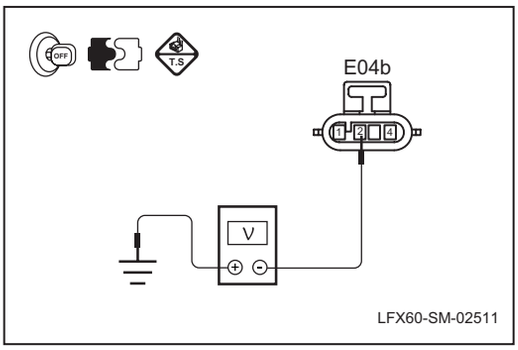
DTC	Detection strategy	Set the condition (control strategy)	Define the fault location
P0030	• Hardware or line check	• The fact that the corresponding heated oxygen sensor heater control circuit voltage is not within the specified range is observed by the engine control module	• Front oxygen sensor • Front oxygen sensor line • ECM
P0031			
P0032			
P0053			

Diagnostic process

Test condition	Details/results/measures
1. General inspection.	
	A. Check the front oxygen sensor and the engine control module harness connect for damage, poor contact, aging, loosening and other similar signs. Is it OK after checking? →**Yes** To step 2. →**No** Examine and repair the fault location.
2. Clear the trouble code.	
	A. Connect the equipment for diagnosing faults to the diagnostic interface. B. Operate the start switch to set the power mode to the “on” state. C. Clear the trouble code by using diagnostic equipment. Does the trouble code reappear? →**Yes** To step 3. →**No** Finish.

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Test condition	Details/results/measures
3. Check the power circuit of front oxygen sensor heater.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the front oxygen sensor harness connector E04b. D. Connect the battery negative terminal. E. Operate the start switch to set the power mode to the "on" state. F. Adopt a multimeter to measure the voltage of #1 terminal of front oxygen sensor harness plug E04b to reliable ground. **Standard value: 11 ~ 14V** Is the voltage normal? **→Yes** Step 4. **→No** Check and remove the faults of front oxygen sensor heater power circuit, and replace the harness if necessary.
4. Check the control circuit of front oxygen sensor heater.	
  	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the front oxygen sensor harness connector E04b. D. Disconnect the ECM harness connector E01b. E. Adopt a multimeter to measure the resistance between #2 terminal of front oxygen sensor harness plug E04b and #73 terminal of ECM harness plug E01b. **Standard value: Less than 5** F. Adopt a multimeter to measure the resistance of #2 terminal of front oxygen sensor harness plug E04b to reliable ground. **Standard value: 10MΩ or higher** G. Connect the battery negative terminal. H. Adopt a multimeter to measure the resistance of #2 terminal of front oxygen sensor harness plug E04b to reliable ground. **Standard value: 0V** Is it OK after checking? **→Yes** To step 5. **→No** Check and remove the faults of front oxygen sensor heater power circuit, and replace the harness if necessary.

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Test condition	Details/results/measures
5. Check the front oxygen sensor.	
	A. Measure the resistance between the front oxygen sensor terminals 4 and 3 with a multimeter at room temperature. **Standard value: 7Ω~11Ω** Is it OK after checking? →**Yes** Step 6 →**No** Replace the front oxygen sensor. **Refer to: Replace the front oxygen sensor.**
6. Check ECM.	
	A. Replace ECM. **Refer to: Replacement of the engine control module (ECM)** Confirm that the fault has been ruled out.

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DTC P0036, P0037, P0038, P0054

DTC description

DTC	Description	Definition
P0036	• Fault of downstream oxygen sensor heating control circuit	• The heated oxygen sensor must reach the operating temperature to provide accurate voltage signals. The heating element inside the heated oxygen sensor makes the sensor reach the operating temperature quickly. • Main relay provides the operating voltage for downstream sensor via 1 terminal of downstream oxygen sensor harness plug I41. The engine control module provides grounding for 2 terminal of downstream oxygen sensor harness plug E04a.
P0037	• Overlow voltage of downstream oxygen sensor heating control circuit	
P0038	• Overhigh voltage of downstream oxygen sensor heating control circuit	
P0054	• Downstream oxygen sensor heating circuit internal resistance unreasonable	

Possible reasons

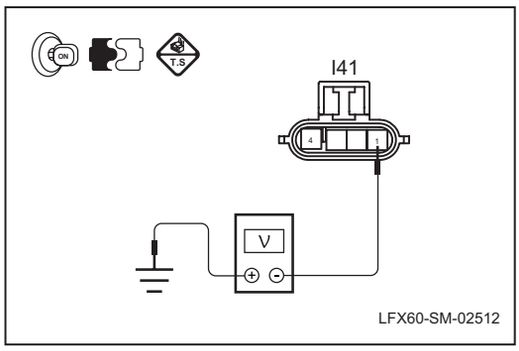
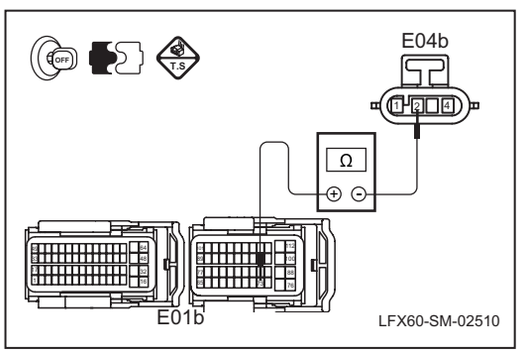
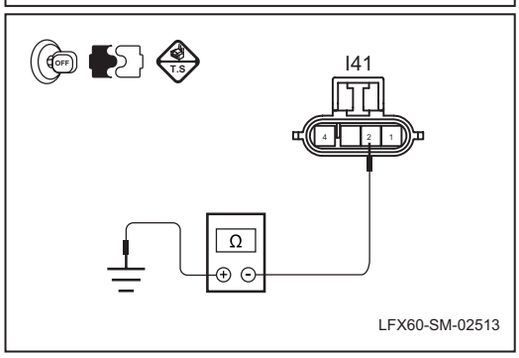
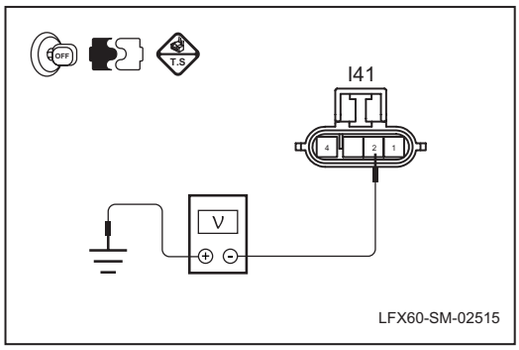
DTC	Detection strategy	Set the condition (control strategy)	Define the fault location
P0036	• Hardware or line check	• The fact that the corresponding heated oxygen sensor heater control circuit voltage is not within the specified range is observed by the engine control module	• Rear oxygen sensor • Rear oxygen sensor line • ECM
P0037			
P0038			
P0054			

Diagnostic process

Test condition	Details/results/measures
1. General inspection.	
	A. Check rear oxygen sensor harness plug for damages, poor contact, aging or loosening, etc. Is it OK after checking? →**Yes** To step 2. →**No** Examine and repair the fault location.
2. Clear the trouble code.	
	A. Connect the equipment for diagnosing faults to the diagnostic interface. B. Operate the start switch to set the power mode to the “on” state. C. Clear the trouble code by using diagnostic equipment. Does the trouble code reappear? →**Yes** To step 3. →**No** Finish.

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Test condition	Details/results/measures
3. Check the power circuit of rear oxygen sensor heater.	
	A. Operate the start switch to set the power mode to the “OFF” state. B. Disconnect the battery negative connector. C. Disconnect the rear oxygen sensor harness connectorI41. D. Connect the battery negative terminal. E. Operate the start switch to set the power mode to the “on” state. F. Adopt a multimeter to measure the voltage of #1 terminal of rear oxygen sensor harness plug I41 to reliable ground. **Standard value: 11 ~ 14V** Is the voltage normal? →**Yes** Step 4. →**No** Check and remove the faults of rear oxygen sensor heater power circuit, and replace the harness if necessary.
4. Check the control circuit of rear oxygen sensor heater.	
  	A. Operate the start switch to set the power mode to the “OFF” state. B. Disconnect the battery negative connector. C. Disconnect the rear oxygen sensor harness connectorI41. D. Disconnect the ECM harness connector E01b. E. Adopt a multimeter to measure the resistance between #2 terminal of rear oxygen sensor harness plug I41 and #48 terminal of ECM harness plug E01b. **Standard value: Less than 5** F. Measure the resistance between the 2nd terminal of the oxygen sensor harness connector I41 and the reliable ground point with a multimeter. **Standard value: 10MΩ or higher** G. Connect the battery negative terminal. H. Adopt a multimeter to measure the resistance of #2 terminal of rear oxygen sensor harness plug I41 to reliable ground. **Standard value: 0V** Is it OK after checking? →**Yes** To step 5. →**No** Check and remove the faults of rear oxygen sensor heater power circuit, and replace the harness if necessary.

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Test condition	Details/results/measures
5. Check the front oxygen sensor.	
	A. Measure the resistance between the rear oxygen sensor terminals 1 and 3 with a multimeter at room temperature. **Standard value: 7Ω~11Ω** Is it OK after checking? →**Yes** Step 6 →**No** Replace the rear oxygen sensor. **Refer to: Replacement of the rear oxygen sensor**
6. Check ECM.	
	A. Replace ECM. **Refer to: Replacement of the engine control module (ECM)** Confirm that the fault has been ruled out.

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DTC P0105, P0106, P0107, P0108

DTC description

DTC	Description	Definition
P0105	• No changes of inlet pressure sensor signals	• The engine control module provides a 5V reference voltage to the intake pressure sensor and provides the ground to the low level reference voltage circuit.According to the changes of inlet pressure, the inlet manifold pressure sensor provide voltage signals for engine control module via its signal circuit. #3 terminal of inlet pressure/ temperature sensor harness plug E10b is 5V power supply of inlet pressure/temperature sensor, its #1 terminal is the ground of inlet pressure/ temperature sensor, and its #4 terminal is the inlet pressure signal of inlet pressure sensor.
P0106	• Inappropriate measurement signals of inlet pressure sensor	
P0107	• Overlow voltage of inlet manifold pressure sensor circuit	
P0108	• Overhigh voltage of inlet manifold pressure sensor circuit	

Possible reasons

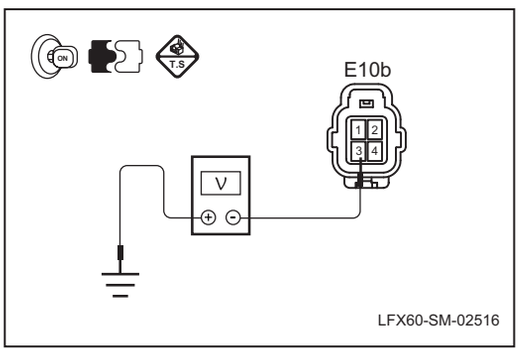
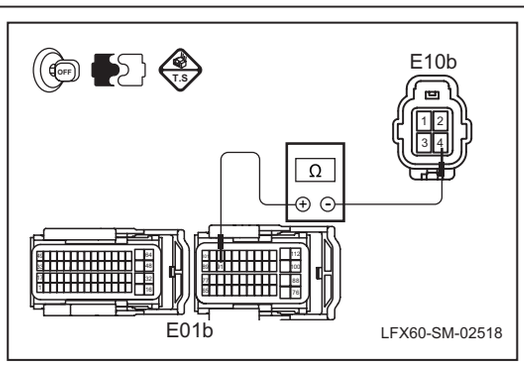
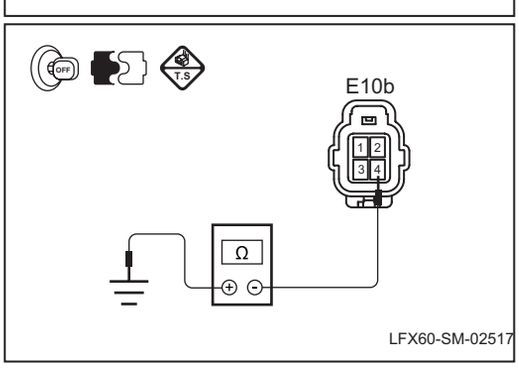
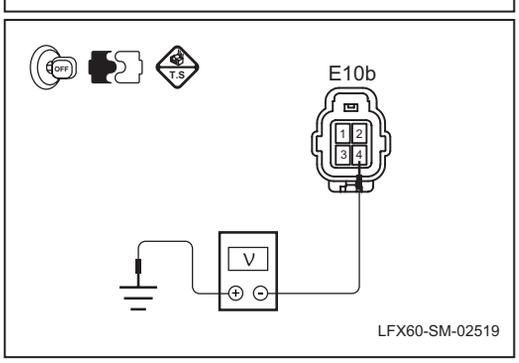
DTC	Detection strategy	Set the condition (control strategy)	Define the fault location
P0105	• Hardware or line check	• The engine control module monitors that its corresponding inlet pressure voltage and signal are not within the specified range.	• Fuel guide rail assembly • Intake pressure temperature sensor line • ECM
P0106			
P0107			
P0108			

Diagnostic process

Test condition	Details/results/measures
1. General inspection.	
	A.Check the intake pressure temperature sensor and engine control module harness connectors for damage, poor contact, aging, loosening and other similar signs. Is it OK after checking? →**Yes** To step 2. →**No** Examine and repair the fault location.
2. Clear the trouble code.	
	A.Connect the equipment for diagnosing faults to the diagnostic interface. B.Operate the start switch to set the power mode to the “on” state. C.Clear the trouble code by using diagnostic equipment. Does the trouble code reappear? →**Yes** To step 3. →**No** Finish.

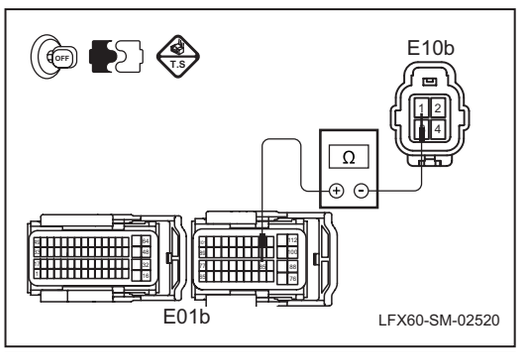
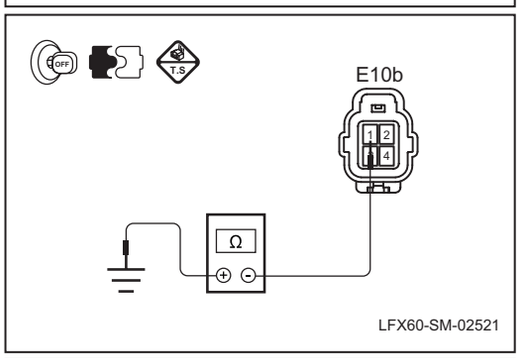
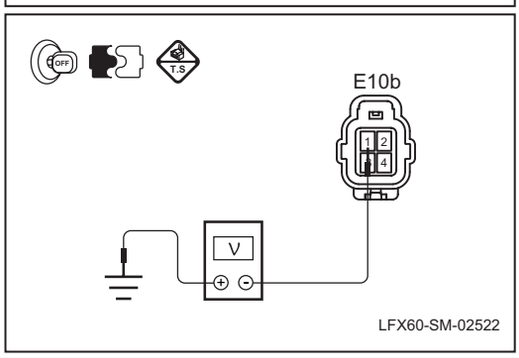
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Test condition	Details/results/measures
3. Check the sensor power supply line for intake pressure.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the intake pressure temperature sensor harness connector E10b. D. Connect the battery negative terminal. E. Operate the start switch to set the power mode to the "on" state. F. Measure the voltage between the 3rd terminal of the intake pressure temperature sensor harness connector E10b and the reliable ground point with the multimeter. Is the voltage normal? **Standard value: 4.5 ~ 5.5 V** **→Yes** Step 4. **→No** Overhaul the intake pressure sensor power supply line and replace the harness if necessary.
4. Check the signal circuit of inlet pressure sensor.	
  	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the intake pressure temperature sensor harness connector E10b. D. Disconnect the ECM harness connector E01b. E. Measure the resistance between the 4th terminal of the intake pressure temperature sensor harness connector E10b and the 91th terminal of the ECM harness connector E01b with a multimeter. **Standard value: Less than 5** F. Measure the resistance between the 4th terminal of the intake pressure temperature sensor harness connector E10b and the reliable ground point with a multimeter. **Standard value: 10MΩ or higher** G. Connect the battery negative terminal. H. Measure the voltage between the 4th terminal of the intake pressure temperature sensor harness connector E10b and the reliable ground point with a multimeter. **Standard value: 0V** Is it OK after checking? **→Yes** To step 5. **→No** Check and remove the faults of inlet pressure sensor signal circuit, and replace the harness if necessary.

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Test condition	Details/results/measures
5. Check the ground circuit of inlet pressure sensor.	
  	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the intake pressure temperature sensor harness connector E10b. D. Disconnect the ECM harness connector E01b. E. Measure the resistance between the 1th terminal of the intake pressure temperature sensor harness connector E10b and the 85th terminal of the ECM harness connector E01b with a multimeter. **Standard value: Less than 5** F. Measure the resistance between the 4th terminal of the intake pressure temperature sensor harness connector E10b and the reliable ground point with a multimeter. **Standard value: 10MΩ or higher** G. Connect the battery negative terminal. H. Measure the voltage between the 4th terminal of the intake pressure temperature sensor harness connector E10b and the reliable ground point with a multimeter. **Standard value: 0V** Is it OK after checking? **→Yes** To step 6. **→No** Check and remove the faults of inlet pressure sensor ground circuit, and replace the harness if necessary.
6. Check the intake pressure temperature sensor.	
	A. Plug the inlet pressure/temperature sensor harness plug. B. Plug the engine control module harness plug. C. Connect the fault diagnostic unit to the diagnostic interface D. Activate the starting switch to make its power mode "ON". E. Adopt a diagnostic unit to read the data flows. **Standard value: ~101 kPa** Is it OK after checking? **→Yes** To step 7. **→No** Finish.
7. Check ECM.	
	A. Replace ECM. **Refer to: Replacement of the engine control module (ECM)** Confirm that the fault has been ruled out.

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DTC P0112, P0113

DTC description

DTC	Description	Definition
P0112	• Overlow signal voltage of inlet manifold temperature sensor	• The engine control module provides a 5V reference voltage to the intake pressure sensor and provides the ground to the low level reference voltage circuit.Inlet temperature sensor is a negative temperature coefficient resistance. #3 terminal of inlet pressure/ temperature sensor harness plug E10b is 5V power supply of inlet pressure/temperature sensor, its #1 terminal is the ground of of inlet pressure/temperature sensor, and its #2 terminal is the inlet temperature signal of inlet temperature sensor.
P0113	• Overhigh signal voltage of inlet manifold temperature sensor	

Possible reasons

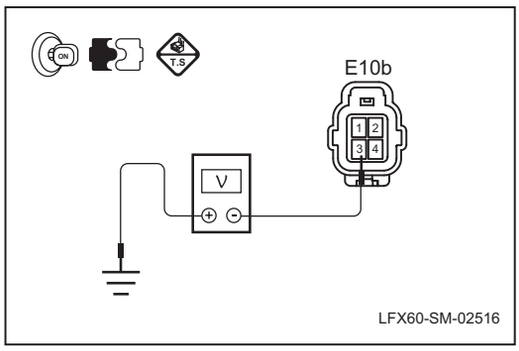
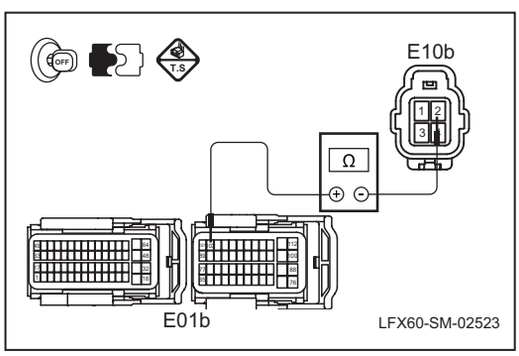
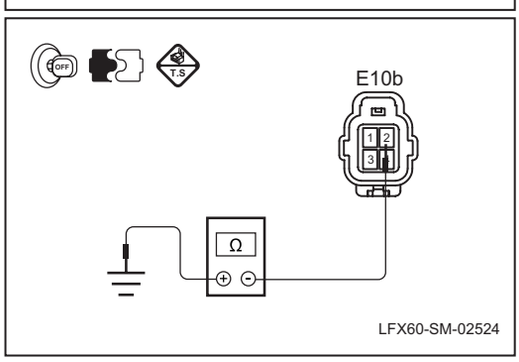
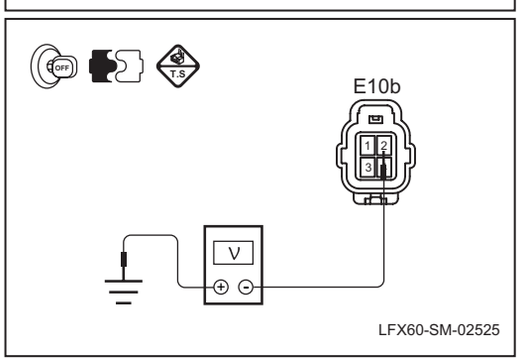
DTC	Detection strategy	Set the condition (control strategy)	Define the fault location
P0112	• Hardware or line check	• The engine control module monitors that its corresponding temperature voltage and signal are not within the specified range.	• Fuel guide rail assembly • Intake pressure temperature sensor line • ECM
P0113			

Diagnostic process

Test condition	Details/results/measures
1. General inspection.	
	A. Check the intake pressure temperature sensor and engine control module harness connectors for damage, poor contact, aging, loosening and other similar signs. Is it OK after checking? →**Yes** To step 2. →**No** Examine and repair the fault location.
2. Clear the trouble code.	
	A. Connect the equipment for diagnosing faults to the diagnostic interface. B. Operate the start switch to set the power mode to the “on” state. C. Clear the trouble code by using diagnostic equipment. Does the trouble code reappear? →**Yes** To step 3. →**No** Finish.

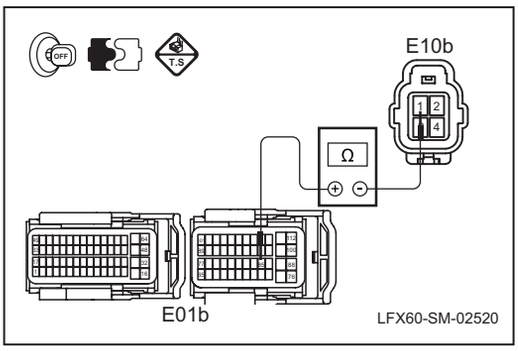
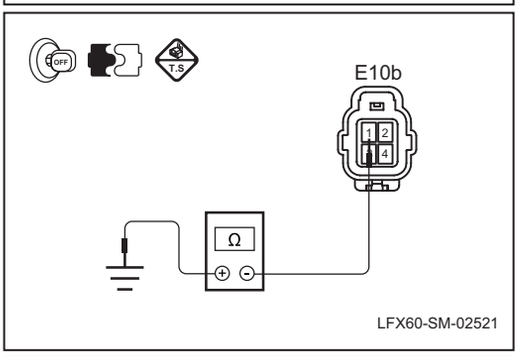
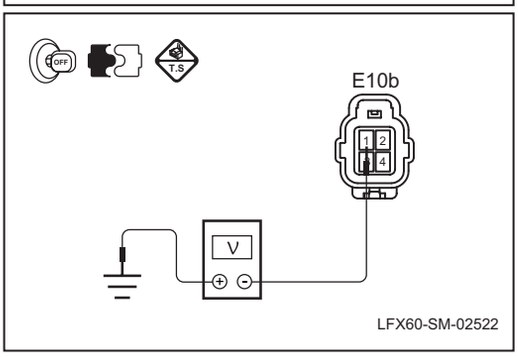
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Test condition	Details/results/measures
3. Check the sensor power supply line for intake pressure.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the intake pressure temperature sensor harness connector E10b. D. Connect the battery negative terminal. E. Operate the start switch to set the power mode to the "on" state. F. Measure the voltage between the 3rd terminal of the intake pressure temperature sensor harness connector E10b and the reliable ground point with the multimeter. Is the voltage normal? **Standard value: 4.5 ~ 5.5 V** **→Yes** Step 4. **→No** Overhaul the intake pressure sensor power supply line and replace the harness if necessary.
4. Check the signal circuit of inlet temperature sensor.	
  	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the intake pressure temperature sensor harness connector E10b. E. Disconnect the ECM harness connector E01b. F. Measure the resistance between the 2th terminal of the intake pressure temperature sensor harness connector E10b and the 102th terminal of the ECM harness connector E01b with a multimeter. **Standard value: Less than 5** F. Measure the resistance between the 2th terminal of the intake pressure temperature sensor harness connector E10b and the reliable ground point with a multimeter. **Standard value: 10MΩ or higher** G. Connect the battery negative terminal. H. Measure the resistance between the 2th terminal of the intake pressure temperature sensor harness connector E10b and the reliable ground point with a multimeter. **Standard value: 0V** Is it OK after checking? **→Yes** To step 5. **→No** Troubleshoot the intake temperature sensor signal line and replace the harness if necessary.

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Test condition	Details/results/measures
5. Check the ground circuit of inlet temperature sensor.	
  	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the intake pressure temperature sensor harness connector E10b. D. Disconnect the ECM harness connector E01b. E. Connect the battery negative terminal. F. Adopt a multimeter to measure the resistance between #1 terminal of inlet pressure/temperature sensor harness plug E10b and #85 terminal of ECM harness plug E01b. **Standard value: Less than 5** G. Adopt a multimeter to measure the resistance of #1 terminal of inlet pressure/temperature sensor harness plug E10b to reliable ground. **Standard value: 10MΩ or higher** H. Connect the battery negative terminal. I. Adopt a multimeter to measure the voltage of #1 terminal of inlet pressure/temperature sensor harness plug E10b to reliable ground. **Standard value: 0V** Is it OK after checking? **→Yes** To step 6. **→No** Check and remove the faults of inlet temperature sensor ground circuit, and replace the harness if necessary.
6. Check the intake pressure temperature sensor.	
	A. Adopt a multimeter to measure the resistance between #2 and #1 terminals of inlet pressure/temperature sensor. **Standard value: Its rated resistance is 2.5kΩ±5% at 20°C.** Is it OK after checking? **→Yes** To step 7. **→No** Replace the inlet pressure/temperature sensor.
7. Check ECM.	
	A. Replace ECM. **Refer to: Replacement of the engine control module (ECM)** Confirm that the fault has been ruled out.

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DTC P0117, P0118

DTC description

DTC	Description	Definition
P0117	• Overlow signal voltage of water temperature sensor	• Water temperature sensor is a variable resistor used to measure the temperature of engine cooling fluid. #3 terminal of water temperature sensor harness plug E23b is the signal of sensor, and #1 terminal of sensor harness plug E23b is the ground of sensor.
P0118	• Overhigh signal voltage of water temperature sensor	

Possible reasons

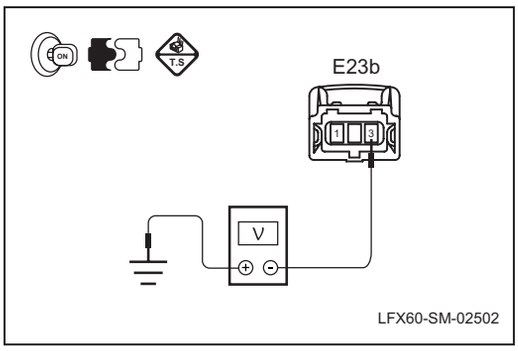
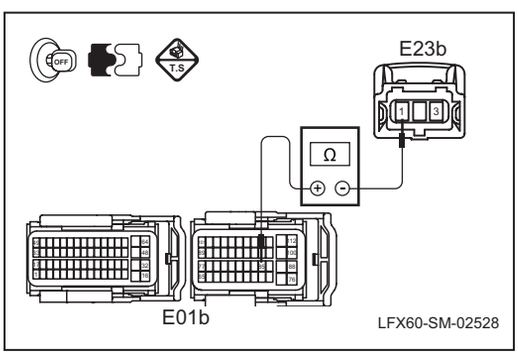
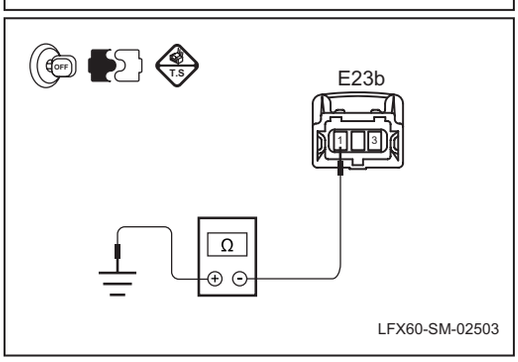
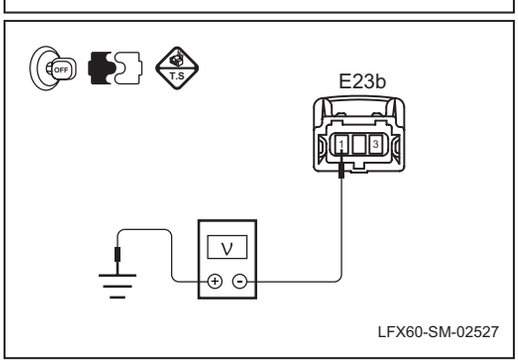
DTC	Detection strategy	Set the condition (control strategy)	Define the fault location
P0117	• Hardware or line check	• Engine control module monitors that water temperature is over its lower limit or below its upper limit.	• Fuel guide rail assembly • Intake pressure temperature sensor line • ECM
P0118			

Diagnostic process

Test condition	Details/results/measures
1. General inspection.	
	A. Check the harness plugs of water temperature sensor and engine control module for damages, poor contact, aging or loosening, etc. Is it OK after checking? →**Yes** To step 2. →**No** Examine and repair the fault location.
2. Clear the trouble code.	
	A. Connect the equipment for diagnosing faults to the diagnostic interface. B. Operate the start switch to set the power mode to the “on” state. C. Clear the trouble code by using diagnostic equipment. Does the trouble code reappear? →**Yes** To step 3. →**No** Finish.

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Test condition	Details/results/measures
3. Check the power circuit of water temperature sensor.	
	A .Operate the start switch to set the power mode to the “OFF” state. B. Disconnect the battery negative connector. C. Disconnect the water temperature sensor harness connector E23b. D. Connect the battery negative terminal. E. Operate the start switch to set the power mode to the “on” state. Adopt a multimeter to measure the voltage of #3 terminal of water temperature sensor harness plug E23b to reliable ground. **Standard value: 4.5 ~ 5.5 V** Is the voltage normal? →**Yes** Step 4. →**No** Check and remove the faults of water temperature sensor power circuit, and replace the harness if necessary.
4. Check the ground circuit of water temperature sensor.	
  	A. Operate the start switch to set the power mode to the “OFF” state. B. Disconnect the battery negative connector. C. Disconnect water temperature sensor harness plug E32b. D. Disconnect the ECM harness connector E01b. E. Adopt a multimeter to measure the resistance between #1 terminal of water temperature sensor harness plug E23b and #85 terminal of ECM harness plug E01b. **Standard value: Less than 5** F. Adopt a multimeter to measure the resistance of #1 terminal of water temperature sensor harness plug E23b to reliable ground. **Standard value: 10MΩ or higher** Connect the battery negative terminal. Adopt a multimeter to measure the resistance of #1 terminal of water temperature sensor harness plug E23b to reliable ground. **Standard value: 0V** Is it OK after checking? →**Yes** To step 5. →**No** Troubleshoot the water temperature sensor grounding line. If necessary, replace the harness.

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Test condition	Details/results/measures
5. Check the water temperature sensor.	
	A. Adopt a multimeter to measure the resistance between #2 and #1 terminals of water temperature sensor. **Standard value: (XXX) Ω** Is the resistance normal? →**Yes** To step 6. →**No** Replace the water temperature sensor. **Refer to: Replacement of the water temperature sensor**
6. Check ECM.	
	A. Replace ECM. **Refer to: Replacement of the engine control module (ECM)** Confirm that the fault has been ruled out.

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DTC P0121, P0122, P0123

DTC description

DTC	Description	Definition
P0121	• The electronic throttle position sensor 1 signal is unreasonable	• The engine control module monitors the throttle position sensor 1# and the sensor 2# signal to determine the position of the throttle. When the throttle position sensor signal line is abnormal, the engine control module sets this fault. The electronic-controlled throttle harness connector E22b terminal 3 is the throttle position sensor 5V power supply; terminal 6, throttle position sensor 1# signal; terminal 2, throttle position sensor ground.
P0122	• The throttle position sensor 1 signal circuit voltage exceeds the low limit	
P0123	• The electronic-controlled throttle position sensor 1 signal circuit voltage is too high	

Possible reasons

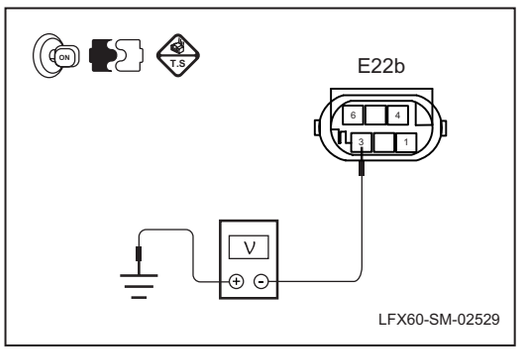
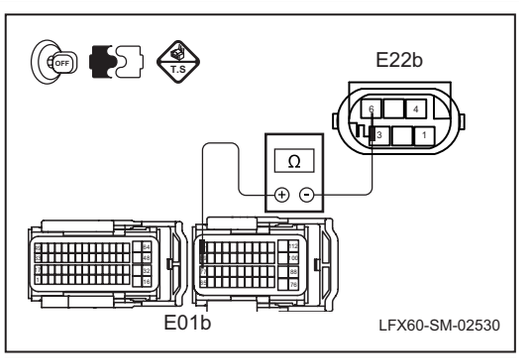
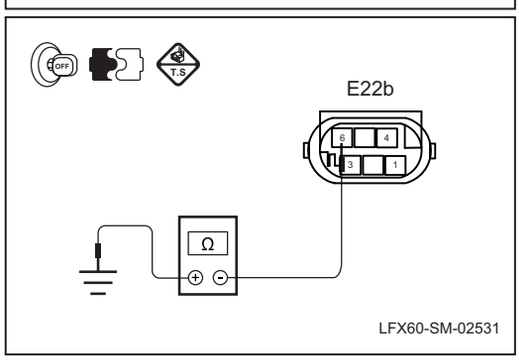
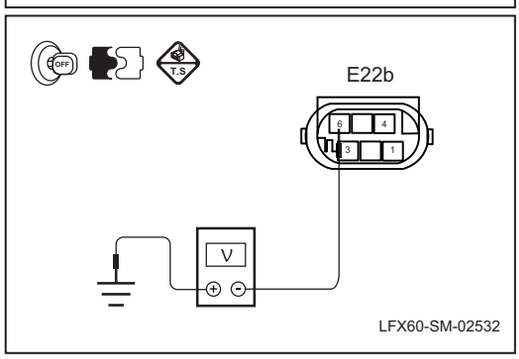
DTC	Detection strategy	Set the condition (control strategy)	Define the fault location
P0121	• Hardware or line check	• The fact that the electronically controlled throttle valve signal line is not within a reasonable range is detected by the engine control module	• Electronically controlled throttle valve • Electronically controlled throttle valve line • ECM
P0122			
P0123			

Diagnostic process

Test condition	Details/results/measures
1. General inspection.	
	A. Check the electronically controlled throttle valve and engine control module harness connectors for damage, poor contact, aging, loosening and other similar signs. Is it OK after checking? →**Yes** To step 2. →**No** Examine and repair the fault location.
2. Clear the trouble code.	
	A. Connect the equipment for diagnosing faults to the diagnostic interface. B. Operate the start switch to set the power mode to the “on” state. C. Clear the trouble code by using diagnostic equipment. Does the trouble code reappear? →**Yes** To step 3. →**No** Finish.

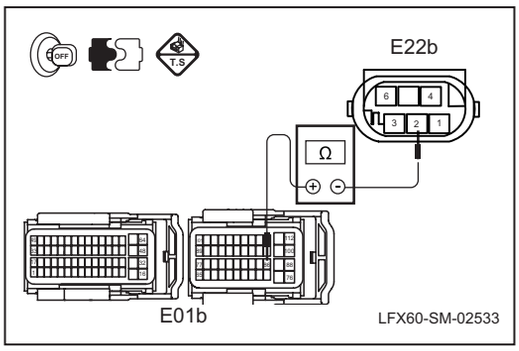
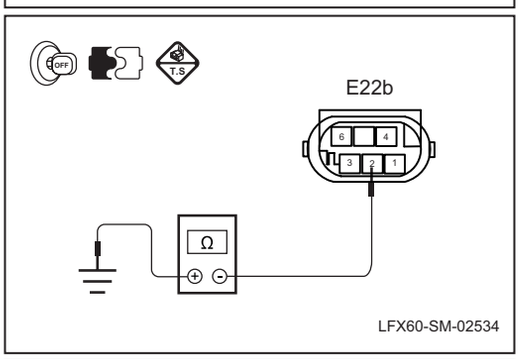
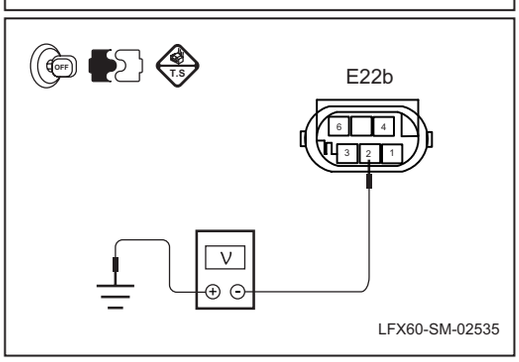
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Test condition	Details/results/measures
3. Check the throttle valve position sensor power supply line.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the electronically controlled throttle valve harness connector E22b. D. Connect the battery negative terminal. E. Operate the start switch to set the power mode to the "on" state. F.Measure the voltage between the electronically controlled throttle valve harness connector E22b terminal 3 and the reliable ground point with a multimeter. **Standard value: 4.5 ~ 5.5 V** Is the voltage normal? **→Yes** Step 4. **→No** Troubleshoot the throttle position sensor power supply line and replace the harness if necessary.
4. Check the throttle position sensor 1 signal line.	
  	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the electronically controlled throttle valve harness connector E22b. D. Disconnect the ECM harness connector E01b. E. Measure the resistance between the 6th terminal of the electronically controlled throttle valve harness connector E22a and the 77th terminal of the ECM harness connector E01a with a multimeter. **Standard value: Less than 5** F. Measure the voltage between the electronically controlled throttle valve harness connector E22b terminal 6 and the reliable ground point with a multimeter. **Standard value: 10MΩ or higher** G. Connect the battery negative terminal. H. Measure the voltage between the electronically controlled throttle valve harness connector E22b terminal 6 and the reliable ground point with a multimeter. **Standard value: 0V** Is it OK after checking? **→Yes** To step 5. **→No** Troubleshoot the throttle valve position sensor power supply line and replace the harness if necessary.

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Test condition	Details/results/measures
5. Check the throttle position sensor 1 ground line.	
  	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the electronically controlled throttle valve harness connector E22b. D. Disconnect the ECM harness connector E01b. E. Measure the resistance between the 2th terminal of the electronically controlled throttle valve harness connector E22a and the 86th terminal of the ECM harness connector E01b with a multimeter. **Standard value: Less than 5** Measure the voltage between the electronically controlled throttle valve harness connector E22b terminal 2 and the reliable ground point with a multimeter. **Standard value: 10MΩ or higher** F. Connect the battery negative terminal. G. Measure the voltage between the electronically controlled throttle valve harness connector E22b terminal 2 and the reliable ground point with a multimeter. **Standard value: 0V** Is it OK after checking? →**Yes** To step 6. →**No** Troubleshoot the electronically controlled throttle valve sensor ground line and replace the harness if necessary.
6. Check the throttle valve.	
	A. Replace the electronically controlled throttle valve. **Refer to: Replacement of electronically controlled throttle valve** Is it OK after checking? →**Yes** Replace the electronically controlled throttle valve. →**No** Step 7.
7. Check ECM.	
	A. Replace ECM. **Refer to: Replacement of the engine control module (ECM)** Confirm that the fault has been ruled out.

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DTC P0130, P0131, P0132, P0133, P0134, P2195, P2196

DTC description

DTC	Description	Definition
P0130	• Inappropriate signals of upstream oxygen sensor	• Engine control module provides a ca.450mV reference voltage for front oxygen sensor. Front oxygen sensor heats and produces a 0 to 1V voltage signal while the engine is running. This voltage fluctuates above or below its reference voltage. The engine control module will enter into closed loop mode upon finding out that the voltage of front oxygen sensor exceeds its set threshold value, and the engine control module can determine its air-fuel ratio as per the voltage of front oxygen sensor. C terminal of front oxygen sensor harness plug EN10 is the signal of front oxygen sensor, and its D terminal is the ground of front oxygen sensor.
P0131	• Overlow voltage of upstream oxygen sensor signal circuit	
P0132	• Upstream oxygen sensor signal circuit voltage high	
P0133	• Aging of upstream oxygen sensor	
P0134	• Signal fault of upstream oxygen sensor circuit	
P2195	• Aging of upstream oxygen sensor (diluted)	
P2196	• Upstream oxygen sensor aging (dense)	

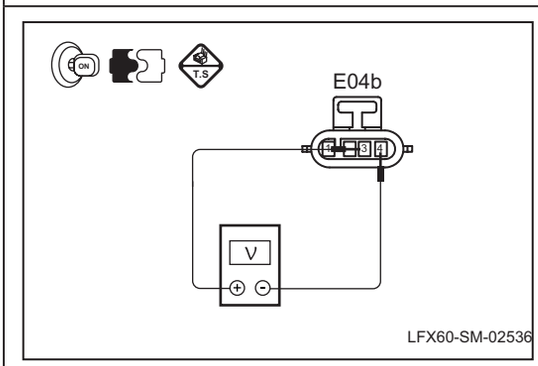
Possible reasons

DTC	Detection strategy	Set the condition (control strategy)	Define the fault location
P0130	• Checking the hardware or harness	• Engine control module detects that the signal voltage of front oxygen sensor is not within the appropriate range.	• Front oxygen sensor • Front oxygen sensor line • ECM
P0131			
P0132			
P0133			
P0134			
P2195			
P2196			

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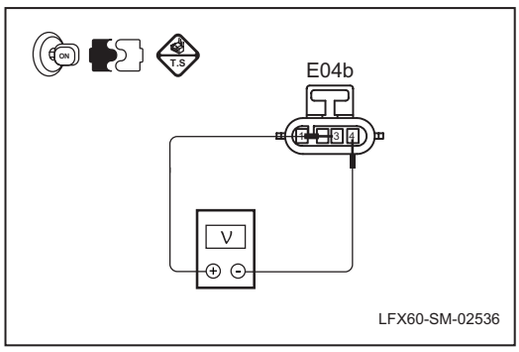
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Diagnostic process

Test condition	Details/results/measures
1. General inspection.	
	A. Check the front oxygen sensor and the engine control module harness connect for damage, poor contact, aging, loosening and other similar signs. Is it OK after checking? →**Yes** To step 2. →**No** Examine and repair the fault location.
2. Clear the trouble code.	
	A. Connect the equipment for diagnosing faults to the diagnostic interface. B. Operate the start switch to set the power mode to the “on” state. C. Clear the trouble code by using diagnostic equipment. Does the trouble code reappear? →**Yes** To step 3. →**No** Finish.
3. Check the heating circuit of front oxygen sensor.	
	A. Check the heating circuit of front oxygen sensor. **Refer to: P0030, P0031, P0032, P0053 troubleshooting** Is it OK after checking? →**Yes** Step 4. →**No** Check and repair the heating circuit of front oxygen sensor.
4. Check the voltage between the signal lines of the front oxygen sensor.	
	A. Operate the start switch to set the power mode to the “on” state. B. Adopt a multimeter to measure the voltage between #3 and #4 terminals of front oxygen sensor harness plug E04b. **Standard value: ~450mV** Is the voltage normal? →**Yes** To step 5. →**No** Troubleshoot the front oxygen sensor single line and replace the harness if necessary.

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Test condition	Details/results/measures
5. Check the voltage between the signal lines of the front oxygen sensor.	
	A. Start the engine. B. Run until the temperature is the normal temperature, in idling mode. C. Adopt a multimeter to measure the voltage fluctuation between #3 and #4 terminals of front oxygen sensor harness plug E04b. **Standard value: 0 ~ 1V** Is the voltage normal? **→Yes** To step 6. **→No** Replace the front oxygen sensor.
6. Check the front oxygen sensor.	
	A. Measure the resistance between the front oxygen sensor terminals 3 and 4 with a multimeter at room temperature. **Standard value: 10MΩ or higher** Is the resistance normal? **→Yes** Step 7 **→No** Replace the front oxygen sensor.
7. Check ECM.	
	A. Replace ECM. **Refer to: Replacement of the engine control module (ECM)** Confirm that the fault has been ruled out.

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DTC P0136, P0137, P0138, P0140, P2270 or P2271

DTC description

DTC	Description	Definition
P0136	• Rear oxygen sensor deceleration fuel cut-off response slow	• Engine control module provides a ca.450mV reference voltage for rear oxygen sensor. Rear oxygen sensor heats and produces a 0 to 1V voltage signal while the engine is running. This voltage fluctuates above or below its reference voltage. The engine control module will enter into closed loop mode upon finding out that the voltage of rear oxygen sensor exceeds its set threshold value, and the engine control module can determine its air-fuel ratio as per the voltage of rear oxygen sensor. 3 terminal of rear oxygen sensor harness plug I41 is the signal of rear oxygen sensor, and its 4 terminal is the ground of rear oxygen sensor.
P0137	• Downstream oxygen sensor signal circuit voltage low	
P0138	• Downstream oxygen sensor signal circuit voltage high	
P0140	• Downstream oxygen sensor circuit signal fault	
P2270	• Aging of downstream oxygen sensor (diluted)	
P2271	• Downstream oxygen sensor aging	

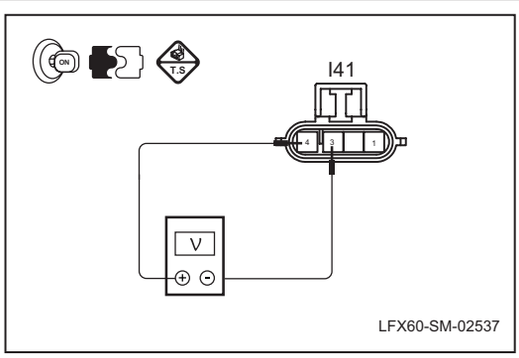
Possible reasons

DTC	Detection strategy	Set the condition (control strategy)	Define the fault location
P0136	• Checking the hardware or harness	• Engine control module detects that the signal voltage of rear oxygen sensor is not within the appropriate range.	• Front oxygen sensor • Front oxygen sensor line • ECM
P0137			
P0138			
P0140			
P2270			
P227			

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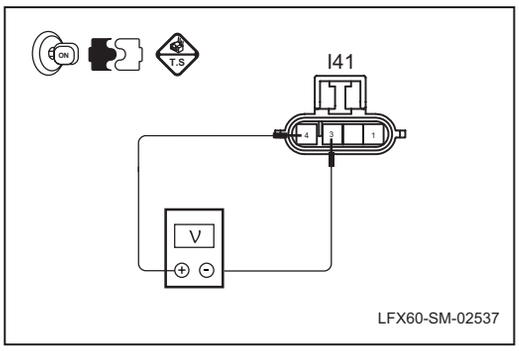
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Diagnostic process

Test condition	Details/results/measures
1. General inspection.	
	A. Check the rear oxygen sensor and the engine control module harness connect for damage, poor contact, aging, loosening and other similar signs. Is it OK after checking? →**Yes** To step 2. →**No** Examine and repair the fault location.
2. Clear the trouble code.	
	A. Connect the equipment for diagnosing faults to the diagnostic interface. B. Operate the start switch to set the power mode to the “on” state. C. Clear the trouble code by using diagnostic equipment. Does the trouble code reappear? →**Yes** To step 3. →**No** Finish.
3. Check the heating circuit of rear oxygen sensor.	
	A. Check the heating circuit of rear oxygen sensor.. **Refer to: P0036, P0037, P0038, P0054 troubleshooting** Is it OK after checking? →**Yes** Step 4. →**No** Check and repair the heating circuit of rear oxygen sensor.
4. Check the voltage between the signal lines of the rear oxygen sensor.	
	A. Operate the start switch to set the power mode to the “on” state. B. Adopt a multimeter to measure the voltage between #3 and #4 terminals of rear oxygen sensor harness plug I41. **Standard value: ~450mV** Is it OK after checking? →**Yes** To step 5. →**No** Troubleshoot the rear oxygen sensor single line and replace the harness if necessary.

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Test condition	Details/results/measures
5. Check the voltage between the signal lines of the rear oxygen sensor.	
	A. Start the engine. Run until the temperature is the normal temperature, in idling mode. Adopt a multimeter to measure the voltage fluctuation between #3 and #4 terminals of rear oxygen sensor harness plug I41. **Standard value: 0 ~ 1V** Is it OK after checking? **→Yes** To step 6. **→No** Replace the rear oxygen sensor.
6. Check the front oxygen sensor.	
	A. Measure the resistance between the rear oxygen sensor terminals 3 and 4 with a multimeter at room temperature. **Standard value: 10MΩ or higher** Is the resistance normal? **→Yes** Step 7. **→No** Replace the rear oxygen sensor.
7. Check ECM.	
	A. Replace ECM. **Refer to: Replacement of the engine control module (ECM)** Confirm that the fault has been ruled out.

AutoLibrary

AutoLibrary

DTC P0201, P0261, P0262

DTC description

DTC	Description	Definition
P0201	• Signal fault of #1 cylinder fuel injector	• The engine control module controls the main relay to supply power to the injector. The engine control module is directly connected to the injector to provide a grounding signal to drive the injector to operate. The engine control module monitors the status of each injector drive line. If the fact that the voltage corresponding to the drive line command status is incorrect is detected, the trouble code of the relevant injector control circuit fault will be set.#1 terminal of #1 cylinder fuel injector harness plug E13b is the power supply of fuel injector, and its #2 terminal is a drive signal.
P0261	• #1 cylinder fuel injector control circuit short to ground	
P0262	• #1 cylinder fuel injector control circuit short to power supply	

Possible reasons

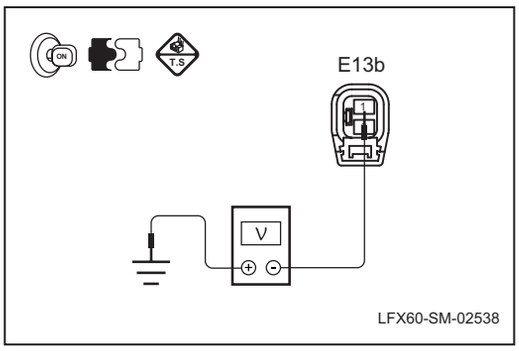
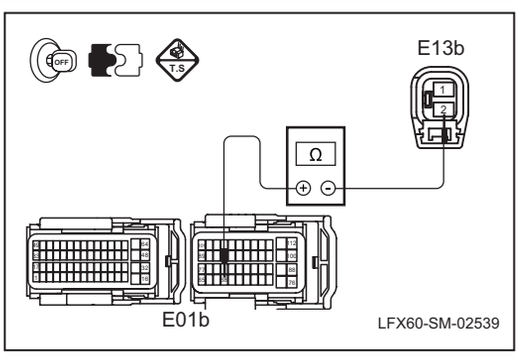
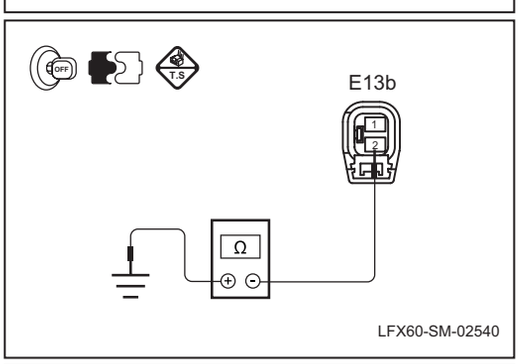
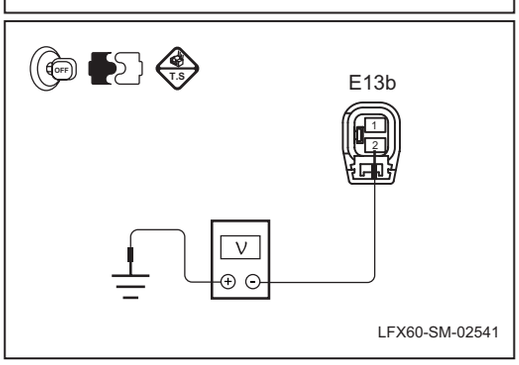
DTC	Detection strategy	Set the condition (control strategy)	Define the fault location
P0201	• Checking the hardware or harness	• The fact that the voltage corresponding to the injector drive line command status is incorrect is detected by the engine control module.	• Injector • Injector line • ECM
P0261			
P0262			

Diagnostic process

Test condition	Details/results/measures
1. General inspection.	
	A. Check the harness plugs of #1 cylinder fuel injector and engine control module for damages, poor contact, aging or loosening, etc. Is it OK after checking? →**Yes** To step 2. →**No** Examine and repair the fault location.
2. Clear the trouble code.	
	A.Connect the equipment for diagnosing faults to the diagnostic interface. B.Operate the start switch to set the power mode to the “on” state. C.Clear the trouble code by using diagnostic equipment. Does the trouble code reappear? →**Yes** To step 3. →**No** Finish.

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Test condition	Details/results/measures
3. Check the power circuit of #1 cylinder fuel injector.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect #1 cylinder fuel injector plug E13b. D. Connect the battery negative terminal. E. Operate the start switch to set the power mode to the "on" state. F. Adopt a multimeter to measure the voltage of #1 terminal of #1 cylinder fuel injector harness plug E13b to reliable ground. **Standard value: 11 ~ 14V** Is the voltage normal? →**Yes** Step 4. →**No** Check and remove the faults of #1 cylinder fuel injector power circuit, and replace the harness if necessary.
4. Check the drive signal circuit of #1 cylinder fuel injector.	
  	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect #1 cylinder fuel injector harness plug E13b. D. Disconnect the engine control module connector E01b. E. Adopt a multimeter to measure the resistance between #2 terminal of #1 cylinder fuel injector harness plug E13b and #68 terminal of E01b. **Standard value: Less than 5** F. Adopt a multimeter to measure the resistance of #1 terminal of #2 cylinder fuel injector harness plug E13b to reliable ground. **Standard value: 10MΩ or higher** G. Connect the battery negative terminal. H. Adopt a multimeter to measure the voltage of #1 terminal of #2 cylinder fuel injector harness plug E13b to reliable ground. **Standard value: 0V** Is it OK after checking? →**Yes** To step 5. →**No** Check and remove the faults of #1 cylinder fuel injector drive signal circuit, and replace the harness if necessary.

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Test condition	Details/results/measures
5. Check #1 cylinder fuel injector.	
	A. Adopt a multimeter to measure the resistance between #1 and #2 terminals of #1 cylinder fuel injector. **Standard value: Injector resistance 12 at 20°C** Is the voltage normal? →Yes Step 6. →No Replace #1 cylinder fuel injector. **Refer to: Replacement of the injector**
6. Check ECM.	
	A. Replace ECM. **Refer to: Replacement of the engine control module (ECM)** Confirm that the fault has been ruled out.

AutoLibrary

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DTC P0202, P0264, P0265

DTC description

DTC	Description	Definition
P0202	• Signal fault of #2 cylinder fuel injector	• The engine control module controls the main relay to supply power to the injector. The engine control module is directly connected to the injector to provide a grounding signal to drive the injector to operate. The engine control module monitors the status of each injector drive line. If the fact that the voltage corresponding to the drive line command status is incorrect is detected, the trouble code of the relevant injector control circuit fault will be set. #2 terminal of #1 cylinder fuel injector harness plug E14b is the power supply of fuel injector, and its #2 terminal is a drive signal.
P0264	• Cylinder 2 injector control circuit short to ground	
P0265	• Cylinder 2 injector control circuit short to power	

Possible reasons

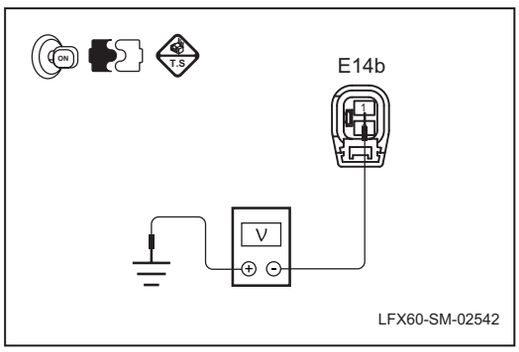
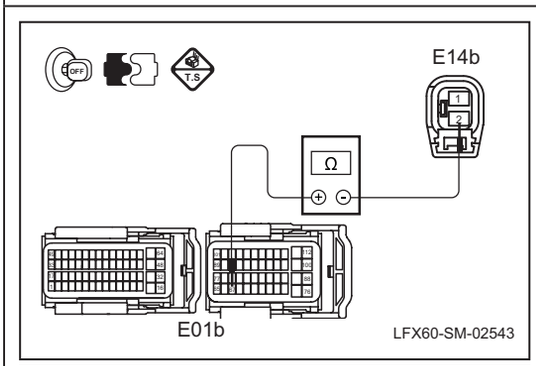
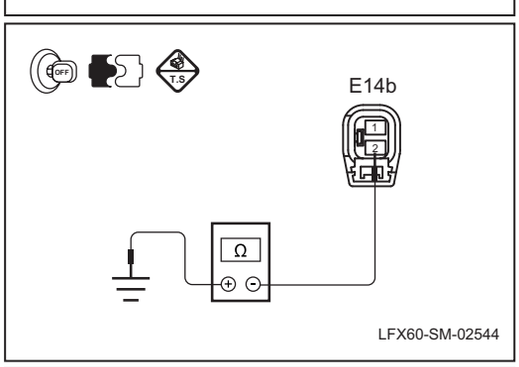
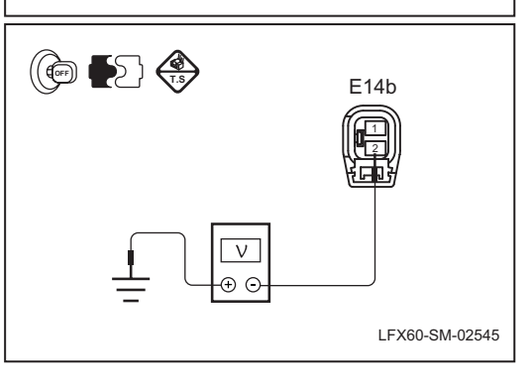
DTC	Detection strategy	Set the condition (control strategy)	Define the fault location
P0202	• Checking the hardware or harness	• The fact that the voltage corresponding to the injector drive line command status is incorrect is detected by the engine control module.	• Injector • Injector line • ECM
P0264			
P0265			

Diagnostic process

Test condition	Details/results/measures
1. General inspection.	
	A. Check the harness plugs of #2 cylinder fuel injector and engine control module for damages, poor contact, aging or loosening, etc. Is it OK after checking? →**Yes** To step 2. →**No** Examine and repair the fault location.
2. Clear the trouble code.	
	A.Connect the equipment for diagnosing faults to the diagnostic interface. B.Operate the start switch to set the power mode to the “on” state. C.Clear the trouble code by using diagnostic equipment. Does the trouble code reappear? →**Yes** To step 3. →**No** Finish.

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Test condition	Details/results/measures
3. Check the power circuit of #2 cylinder fuel injector.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect #2 cylinder fuel injector plug E14b. D. Connect the battery negative terminal. E. Operate the start switch to set the power mode to the "on" state. F. Adopt a multimeter to measure the voltage of #2 terminal of #1 cylinder fuel injector harness plug E14b to reliable ground. **Standard value: 11 ~ 14V** Is the voltage normal? **→Yes** Step 4. **→No** Check and remove the faults of #2 cylinder fuel injector power circuit, and replace the harness if necessary.
4. Check the drive signal circuit of #2 cylinder fuel injector.	
  	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect #2 cylinder fuel injector harness plug E14b. D. Disconnect the engine control module connector E01b. E. Adopt a multimeter to measure the resistance between #2 terminal of #2 cylinder fuel injector harness plug E14b and #67 terminal of E01b. **Standard value: Less than 5** F. Adopt a multimeter to measure the resistance of #2 terminal of #2 cylinder fuel injector harness plug E14b to reliable ground. **Standard value: 10MΩ or higher** G. Connect the battery negative terminal. H. Adopt a multimeter to measure the voltage of #2 terminal of #2 cylinder fuel injector harness plug E14b to reliable ground. **Standard value: 0V** Is it OK after checking? **→Yes** To step 5. **→No** Check and remove the faults of #2 cylinder fuel injector drive signal circuit, and replace the harness if necessary.

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Test condition	Details/results/measures
5. Check #2 cylinder fuel injector.	
	A. Adopt a multimeter to measure the resistance between #1 and #2 terminals of #2 cylinder fuel injector. **Standard value: Injector resistance 12 at 20°C** Is the voltage normal? →**Yes** Step 6. →**No** Replace #2 cylinder fuel injector.
6. Check ECM.	
	A. Replace ECM. **Refer to: Replacement of the engine control module (ECM)** Confirm that the fault has been ruled out.

AutoLibrary

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DTC P0203, P0267, P0268

DTC description

DTC	Description	Definition
P0203	• Signal fault of #3 cylinder fuel injector	• The engine control module controls the main relay to supply power to the injector. The engine control module is directly connected to the injector to provide a grounding signal to drive the injector to operate. The engine control module monitors the status of each injector drive line. If the fact that the voltage corresponding to the drive line command status is incorrect is detected, the trouble code of the relevant injector control circuit fault will be set. #3 terminal of #1 cylinder fuel injector harness plug E15b is the power supply of fuel injector, and its #2 terminal is a drive signal.
P0267	• Cylinder 3 injector control circuit short to ground	
P0268	• Cylinder 3 injector control circuit short to power	

Possible reasons

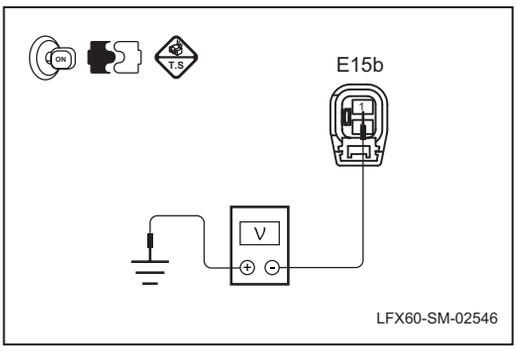
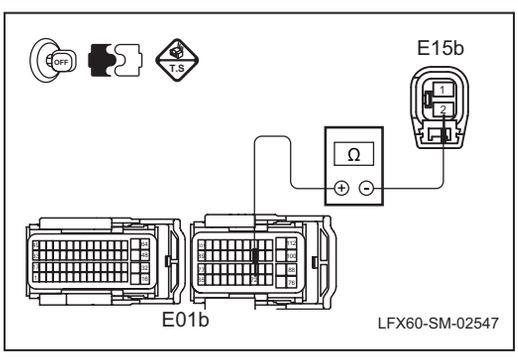
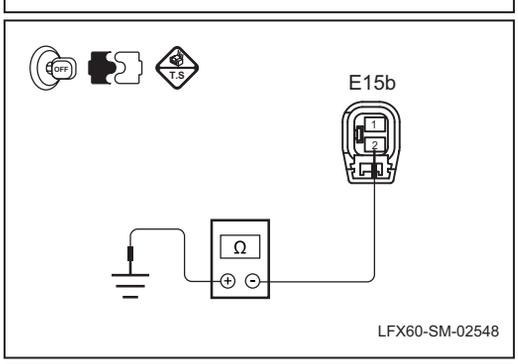
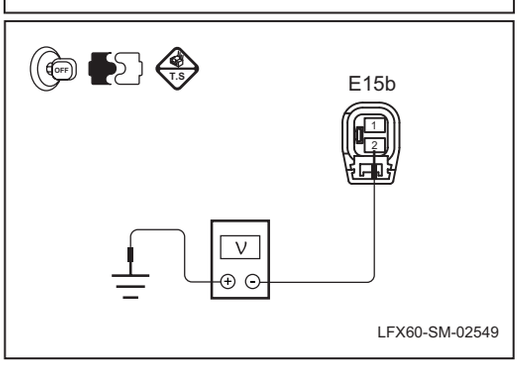
DTC	Detection strategy	Set the condition (control strategy)	Define the fault location
P0203	• Checking the hardware or harness	• The fact that the voltage corresponding to the injector drive line command status is incorrect is detected by the engine control module.	• Injector • Injector line • ECM
P0267			
P0268			

Diagnostic process

Test condition	Details/results/measures
1. General inspection.	
	A.Check the harness plugs of #3 cylinder fuel injector and engine control module for damages, poor contact, aging or loosening, etc. Is it OK after checking? →**Yes** To step 2. →**No** Examine and repair the fault location.
2. Clear the trouble code.	
	A.Connect the equipment for diagnosing faults to the diagnostic interface. B.Operate the start switch to set the power mode to the “on” state. C.Clear the trouble code by using diagnostic equipment. Does the trouble code reappear? →**Yes** To step 3. →**No** Finish.

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Test condition	Details/results/measures
3. Check the power circuit of #3 cylinder fuel injector.	
	A. Operate the start switch to set the power mode to the “OFF” state. B. Disconnect the battery negative connector. C. Disconnect #3 cylinder fuel injector plug E15b. D. Connect the battery negative terminal. E. Operate the start switch to set the power mode to the “on” state. F. Adopt a multimeter to measure the voltage of #3 terminal of #1 cylinder fuel injector harness plug E15b to reliable ground. **Standard value: 11 ~ 14V** Is the voltage normal? →**Yes** Step 4. →**No** Check and remove the faults of #3 cylinder fuel injector power circuit, and replace the harness if necessary.
4. Check the drive signal circuit of #3 cylinder fuel injector.	
  	A. Operate the start switch to set the power mode to the “OFF” state. B. Disconnect the battery negative connector. C. Disconnect #3 cylinder fuel injector plug E15b. D. Disconnect the engine control module connector E01b. E. Adopt a multimeter to measure the resistance between #3 terminal of #2 cylinder fuel injector harness plug E15b and #72 terminal of E01b. **Standard value: Less than 5** F. Adopt a multimeter to measure the resistance of #3 terminal of #2 cylinder fuel injector harness plug E15b to reliable ground. **Standard value: 10MΩ or higher** G. Connect the battery negative terminal. H. Adopt a multimeter to measure the voltage of #3 terminal of #2 cylinder fuel injector harness plug E15b to reliable ground. **Standard value: 0V** Is it OK after checking? →**Yes** To step 5. →**No** Check and remove the faults of #3 cylinder fuel injector drive signal circuit, and replace the harness if necessary.

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Test condition	Details/results/measures
5. Check #3 cylinder fuel injector.	
	A. Adopt a multimeter to measure the resistance between #1 and #2 terminals of #3 cylinder fuel injector. **Standard value: Injector resistance 12 at 20°C** Is the resistance normal? →**Yes** Step 6. →**No** Replace #3 cylinder fuel injector.
6. Check ECM.	
	A. Replace ECM. **Refer to: Replacement of the engine control module (ECM)** Confirm that the fault has been ruled out.

AutoLibrary

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DTC P0204, P0270, P0271

DTC description

DTC	Description	Definition
P0204	• Signal fault of #4 cylinder fuel injector	• The engine control module controls the main relay to supply power to the injector. The engine control module is directly connected to the injector to provide a grounding signal to drive the injector to operate. The engine control module monitors the status of each injector drive line. If the fact that the voltage corresponding to the drive line command status is incorrect is detected, the trouble code of the relevant injector control circuit fault will be set. #4 terminal of #1 cylinder fuel injector harness plug E15b is the power supply of fuel injector, and its #2 terminal is a drive signal.
P0270	• Cylinder 4 injector control circuit short to ground	
P0271	• Cylinder 2 injector control circuit short to power	

Possible reasons

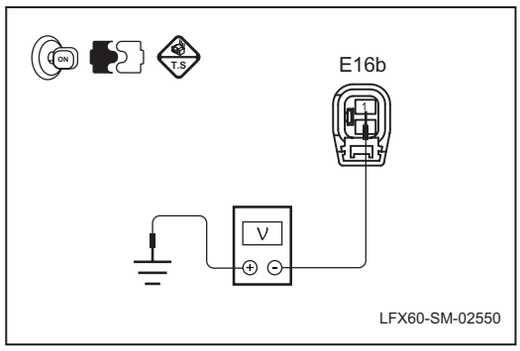
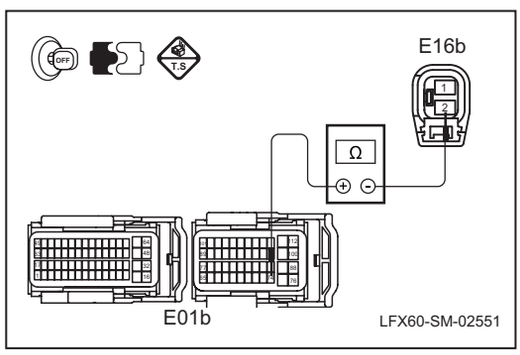
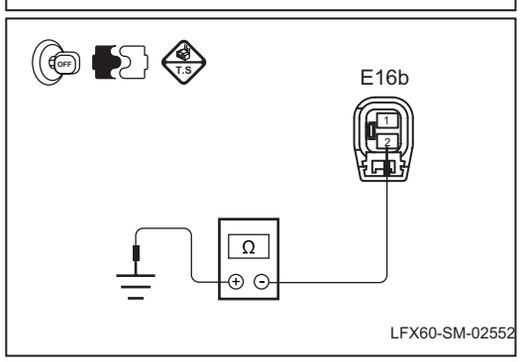
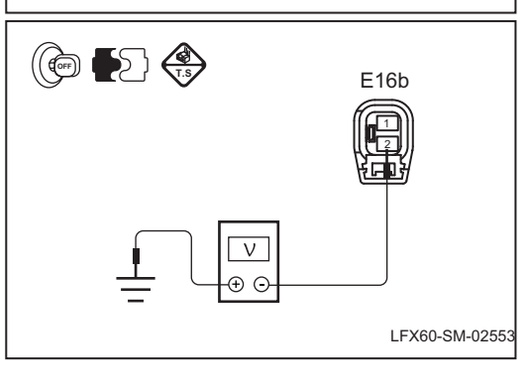
DTC	Detection strategy	Set the condition (control strategy)	Define the fault location
P0204	• Checking the hardware or harness	• The fact that the voltage corresponding to the injector drive line command status is incorrect is detected by the engine control module.	• Injector • Injector line • ECM
P0270			
P0271			

Diagnostic process

Test condition	Details/results/measures
1. General inspection.	
	A.Check the harness plugs of #4 cylinder fuel injector and engine control module for damages, poor contact, aging or loosening, etc. Is it OK after checking? →**Yes** To step 2. →**No** Examine and repair the fault location.
2. Clear the trouble code.	
	A.Connect the equipment for diagnosing faults to the diagnostic interface. B.Operate the start switch to set the power mode to the “on” state. C.Clear the trouble code by using diagnostic equipment. Does the trouble code reappear? →**Yes** To step 3. →**No** Finish.

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Test condition	Details/results/measures
3. Check the power circuit of #4 cylinder fuel injector.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect #4 cylinder fuel injector plug E16b. D. Connect the battery negative terminal. E. Operate the start switch to set the power mode to the "on" state. F. Adopt a multimeter to measure the voltage of #4 terminal of #1 cylinder fuel injector harness plug E16b to reliable ground. **Standard value: 11 ~ 14V** Is the voltage normal? **→Yes** Step 4. **→No** Check and remove the faults of #4 cylinder fuel injector power circuit, and replace the harness if necessary.
4. Check the drive signal circuit of #4 cylinder fuel injector.	
  	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect #4 cylinder fuel injector plug E16b. D. Disconnect the engine control module connector E01b. E. Adopt a multimeter to measure the resistance between #4 terminal of #2 cylinder fuel injector harness plug E01b and #74 terminal of E01b. **Standard value: Less than 5** F. Adopt a multimeter to measure the resistance of #4 terminal of #2 cylinder fuel injector harness plug E16b to reliable ground. **Standard value: 10MΩ or higher** G. Connect the battery negative terminal. H. Adopt a multimeter to measure the voltage of #4 terminal of #2 cylinder fuel injector harness plug E15b to reliable ground. **Standard value: 0V** Is it OK after checking? **→Yes** To step 5. **→No** Check and remove the faults of #4 cylinder fuel injector drive signal circuit, and replace the harness if necessary.

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Test condition	Details/results/measures
5. Check #4 cylinder fuel injector.	
	A. Adopt a multimeter to measure the resistance between #1 and #2 terminals of #4 cylinder fuel injector. **Standard value: Injector resistance 12 at 20°C** Is the voltage normal? →**Yes** Step 6. →**No** Replace #4 cylinder fuel injector.
6. Check ECM.	
	A. Replace ECM. **Refer to: Replacement of the engine control module (ECM)** Confirm that the fault has been ruled out.

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DTC P0219

DTC description

DTC	Description	Definition
P0219	• The speed of engine exceeds its maximum speed limit.	• The engine control module detects the speed of engine via its crankshaft position sensor. When the speed of engine is over its upper limit, this fault code is set. When the electronic accelerator pedal or throttle valve is seized in higher opening position, the speed of engine will exceed its upper limit.

Possible reasons

DTC	Detection strategy	Set the condition (control strategy)	Define the fault location
P0219	• Checking the hardware or harness	• Engine control module detects that its speed signal exceeds its upper limit.	• Electronic accelerator pedal or its circuit • Electronic throttle valve or its circuit • Crankshaft position sensor or its circuit • ECM

Diagnostic process

Test condition	Details/results/measures
1. General inspection.	
	A. Check the electronic accelerator pedal, electronic throttle valve, crankshaft position sensor and engine control module harness plugs for damages, poor contact, aging or loosening, etc. Is it OK after checking? →**Yes** To step 2. →**No** Examine and repair the fault location.
2. Clear the trouble code.	
	A. Connect the equipment for diagnosing faults to the diagnostic interface. B. Operate the start switch to set the power mode to the “on” state. C. Clear the trouble code by using diagnostic equipment. Does the trouble code reappear? →**Yes** To step 3. →**No** Finish.

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Test condition	Details/results/measures
3. Check the faults of electronic accelerator pedal.	
	A. Check the faults of electronic accelerator pedal. **Refer to: DTC TROUBLESHOOTING TABLE** Is it OK after checking? →**Yes** Step 4. →**No** Troubleshoot the electronic accelerator pedal.
4. Check the electronically controlled throttle valve for faults.	
	A. Check the electronically controlled throttle valve for faults. **Refer to: "P0121, P0122, P0123", "P0221, P0222, P0223"** Fault diagnosis Is it OK after checking? →**Yes** Step 5. →**No** Troubleshoot the electronic accelerator pedal.
5. Check the faults of crankshaft position sensor.	
	A. Check the faults of crankshaft position sensor. **Refer to: "P0322" troubleshooting** Is it OK after checking? →**Yes** Step 6. →**No** Remove the faults of crankshaft position sensor.
6. Check ECM.	
	A. Replace ECM. **Refer to: Replacement of the engine control module (ECM)** Confirm that the fault has been ruled out.

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DTC P0221, P0222, P0223

DTC description

DTC	Description	Definition
P0221	• The electronic throttle position sensor 2 signal is unreasonable	• The engine control module monitors the throttle position sensor 1# and the sensor 2# signal to determine the position of the throttle. When the throttle position sensor signal line is abnormal, the engine control module sets this fault. The electronic-controlled throttle harness connector E22b terminal 3 is the throttle position sensor 5V power supply; terminal 5, throttle position sensor 2Ib signal; terminal 2, throttle position sensor ground.
P0222	• The throttle position sensor 2 signal circuit voltage exceeds the low limit	
P0223	• The electronic-controlled throttle position sensor 2 signal circuit voltage is too high	

Possible reasons

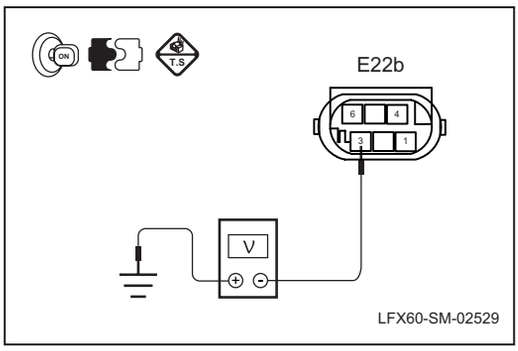
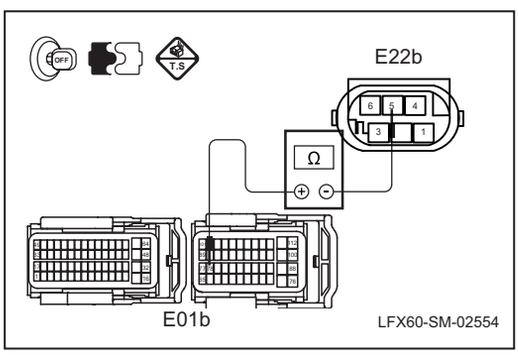
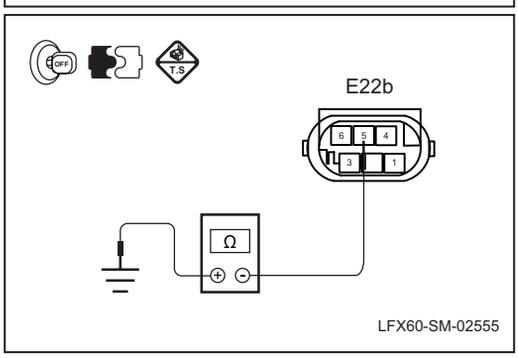
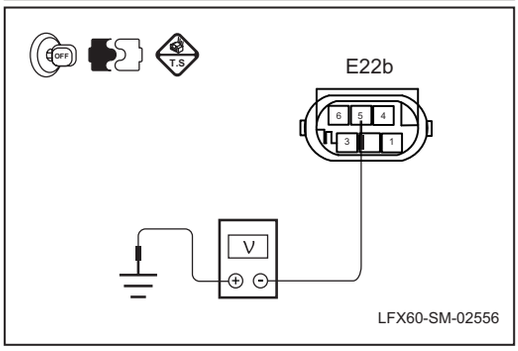
DTC	Detection strategy	Set the condition (control strategy)	Define the fault location
P0221	• Hardware or line check	• The fact that the electronically controlled throttle valve signal line is not within a reasonable range is detected by the engine control module	• Electronically controlled throttle valve • Electronically controlled throttle valve line • ECM
P0222			
P0223			

Diagnostic process

Test condition	Details/results/measures
1. General inspection.	
	A. Check the electronically controlled throttle valve and engine control module harness connectors for damage, poor contact, aging, loosening and other similar signs. Is it OK after checking? →**Yes** To step 2. →**No** Examine and repair the fault location.
2. Clear the trouble code.	
	A. Connect the equipment for diagnosing faults to the diagnostic interface. B. Operate the start switch to set the power mode to the “on” state. C. Clear the trouble code by using diagnostic equipment. Does the trouble code reappear? →**Yes** To step 3. →**No** Finish.

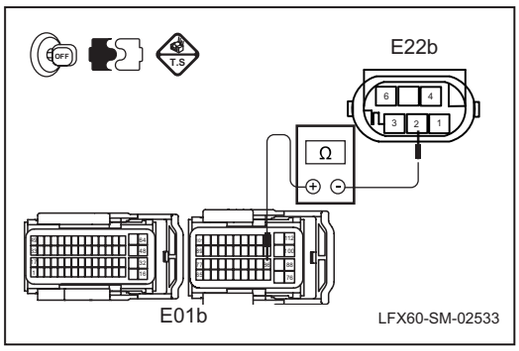
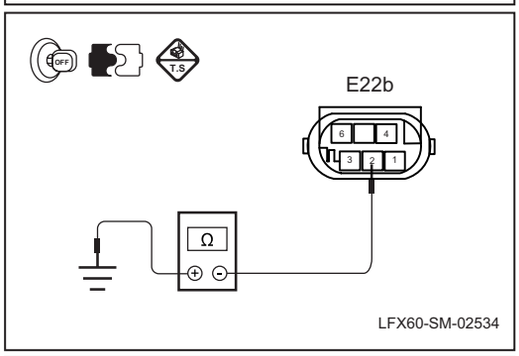
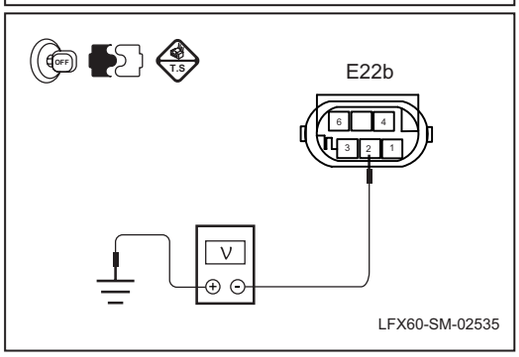
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Test condition	Details/results/measures
3. Check the throttle valve position sensor power supply line.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the electronically controlled throttle valve harness connector E22b. D. Connect the battery negative terminal. E. Operate the start switch to set the power mode to the "on" state. F. Measure the voltage between the electronically controlled throttle valve harness connector E22b terminal 3 and the reliable ground point with a multimeter. **Standard value: 4.5 ~ 5.5 V** Is the voltage normal? →**Yes** Step 4. →**No** Troubleshoot the throttle position sensor power supply line and replace the harness if necessary.
4. Check the throttle position sensor 2 signal line.	
  	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the electronically controlled throttle valve harness connector E22b. D. Disconnect the ECM harness connector E01b. E. Measure the resistance between the 5th terminal of the electronically controlled throttle valve harness connector E22a and the 78th terminal of the ECM harness connector E01b with a multimeter. **Standard value: Less than 5** F. Measure the voltage between the electronically controlled throttle valve harness connector E22b terminal 5 and the reliable ground point with a multimeter. **Standard value: 10MΩ or higher** G. Connect the battery negative terminal. H. Measure the voltage between the electronically controlled throttle valve harness connector E22b terminal 5 and the reliable ground point with a multimeter. **Standard value: 0V** Is it OK after checking? →**Yes** To step 5. →**No** Troubleshoot the throttle valve position sensor 2 power supply line and replace the harness if necessary.

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Test condition	Details/results/measures
5. Check the throttle position sensor 1 ground line.	
 LFX60-SM-02533  LFX60-SM-02534  LFX60-SM-02535	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the electronically controlled throttle valve harness connector E22b. D. Disconnect the ECM harness connector E01b. E. Measure the resistance between the 2th terminal of the electronically controlled throttle valve harness connector E22a and the 86th terminal of the ECM harness connector E01b with a multimeter. **Standard value: Less than 5** F. Measure the voltage between the electronically controlled throttle valve harness connector E22b terminal 2 and the reliable ground point with a multimeter. **Standard value: 10MΩ or higher** G. Connect the battery negative terminal. H. Measure the voltage between the electronically controlled throttle valve harness connector E22b terminal 2 and the reliable ground point with a multimeter. **Standard value: 0V** Is it OK after checking? **→Yes** To step 6. **→No** Troubleshoot the electronically controlled throttle valve sensor ground line and replace the harness if necessary.
6. Check the throttle valve.	
	A. Replace the electronically controlled throttle valve. **Refer to: Replacement of electronically controlled throttle valve** Is it OK after checking? **→Yes** Replace the electronically controlled throttle valve. **→No** Step 7.
7. Check ECM.	
	A. Replace ECM. **Refer to: Replacement of the engine control module (ECM)** Confirm that the fault has been ruled out.

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DTC P0300, P0301, P0302, P0303 or P0304

DTC description

DTC	Description
P0300	• Multi-cylinder misfire
P0301	• Cylinder 1 misfire
P0302	• Cylinder 2 misfire
P0303	• Cylinder 3 misfire
P0304	• Cylinder 4 misfire

Possible reasons

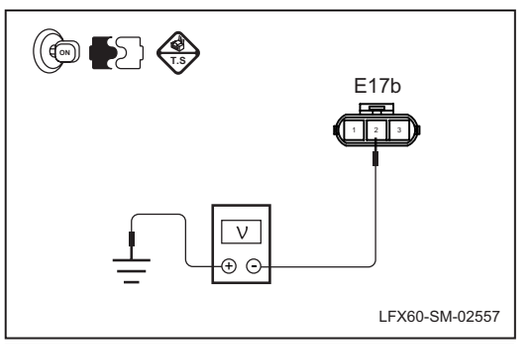
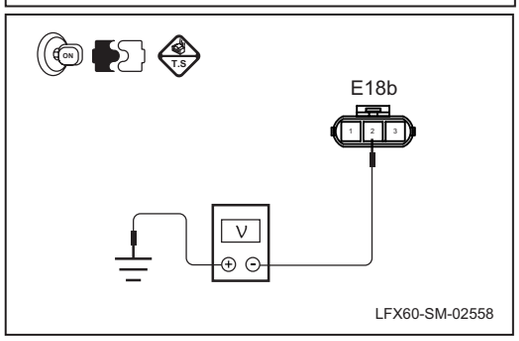
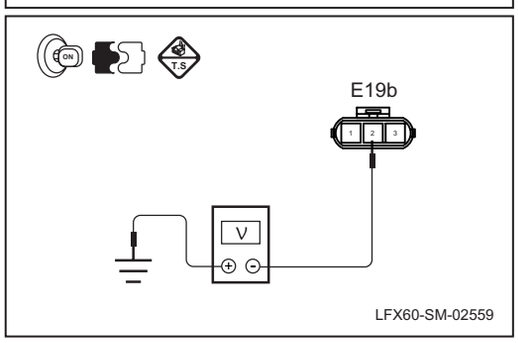
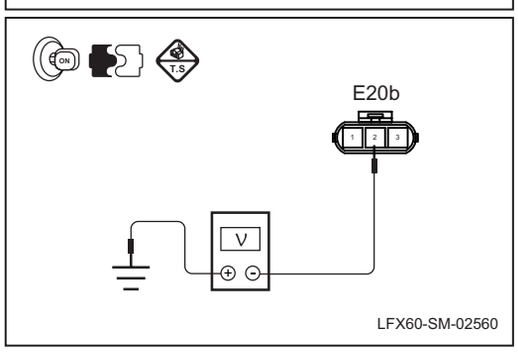
DTC	Detection strategy	Set the condition (control strategy)	Define the fault location
P0300	• Hardware or line check	• Misfire rate of damaged catalyst • Misfire rate for causing deteriorated emission • Incredible error	• Ignition coils • Ignition coil circuit • Spark plugs • ECM
P0301			
P0302			
P0303			
P0304			

Diagnostic process

Test condition	Details/results/measures
1. General inspection.	
	A. Check the ignition coil and engine control module harness plugs for damages, poor contact, aging or loosening, etc. B. Check the spark plug for damages. Is it OK after checking? →**Yes** To step 2. →**No** Examine and repair the fault location.
2. Check the fault codes.	
	A. Connect the equipment for diagnosing faults to the diagnostic interface. B. Operate the start switch to set the power mode to the “on” state. C. Adopt a diagnostic unit to check whether any fault code of fuel injector exists. Is it OK after checking? →**Yes** **Refer to: Diagnosis of relevant fuel injector faults** →**No** To step 3.

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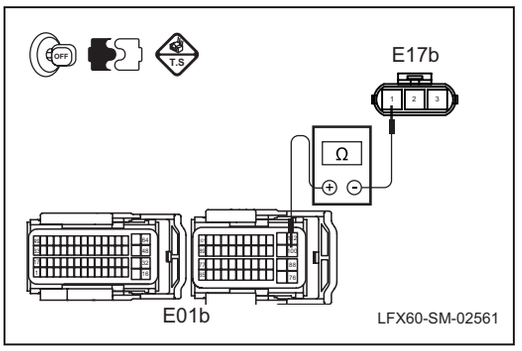
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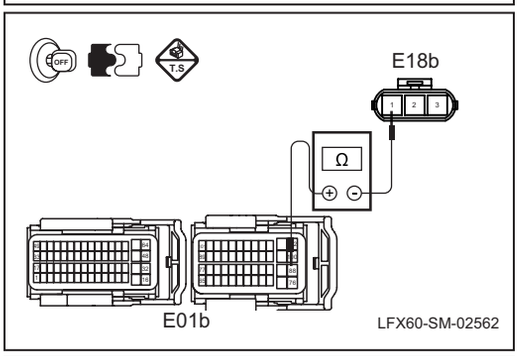
Test condition	Details/results/measures
3. Clear the trouble code.	
	A. Connect the equipment for diagnosing faults to the diagnostic interface. B. Operate the start switch to set the power mode to the “on” state. C. Clear the trouble code by using diagnostic equipment. Does the trouble code reappear? →**Yes** To step 4. →**No** Finish.
4. Check the ignition coil power supply line.	
   	A. Operate the start switch to set the power mode to the “OFF” state. B. Disconnect the battery negative connector. C. Disconnect the ignition coil 1 harness connector E17b. D. Disconnect the ignition coil 2 harness connector E18b. E. Disconnect the ignition coil 3 harness connector E19b. F. Disconnect the ignition coil 4 harness connector E20b. G. Connect the battery negative terminal. H. Operate the start switch to set the power mode to the “on” state. I. Measure the voltage between the ignition coil harness connector E17a terminal 2 and the reliable ground point with a multimeter. J. Measure the voltage between the ignition coil harness connector E18b terminal 2 and the reliable ground point with a multimeter. K. Measure the voltage between the ignition coil harness connector E19b terminal 2 and the reliable ground point with a multimeter. L. Measure the voltage between the ignition coil harness connector E20b terminal 1 and the reliable ground point with a multimeter. **Standard value: 10 ~ 14V** Is the voltage normal? →**Yes** Step 5. →**No** Troubleshoot the ignition coil power supply line and replace the harness if necessary.

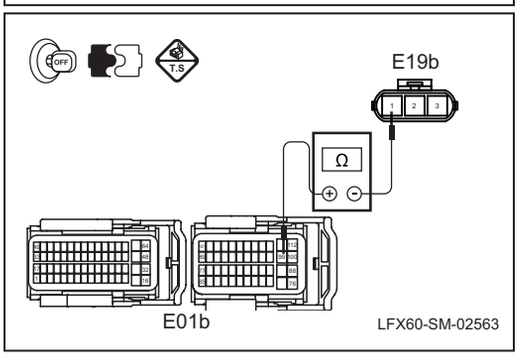
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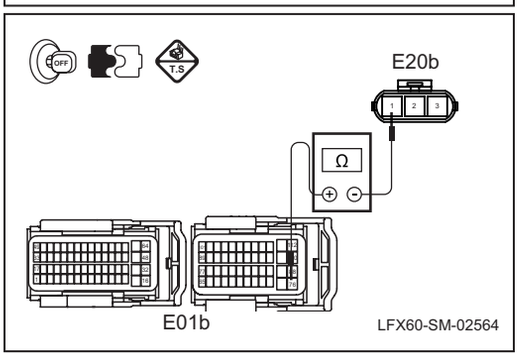
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Test condition	Details/results/measures
5. Check whether the control circuit of ignition coil is open.	









A. Operate the start switch to set the power mode to the "OFF" state.
B. Disconnect the battery negative connector.
C. Disconnect the ignition coil 1 harness connector E17b.
D. Disconnect the ignition coil 2 harness connector E18b.
E. Disconnect the ignition coil 3 harness connector E19b.
F. Disconnect the ignition coil 4 harness connector E20b.
G. Disconnect the ECM harness connector E01b.
H. Adopt a multimeter to measure the resistance between #1 terminal of ignition coil harness plug E17b and #100 terminal of ECM harness plug E01b.
I. Adopt a multimeter to measure the resistance between #1 terminal of ignition coil harness plug E18b and #88 terminal of ECM harness plug E01b.
J. Adopt a multimeter to measure the resistance between #1 terminal of ignition coil harness plug E19b and #99 terminal of ECM harness plug E01b.
K. Adopt a multimeter to measure the resistance between #1 terminal of ignition coil harness plug E20b and #76 terminal of ECM harness plug E01b.

Standard value: Less than 5

Is the resistance normal?

→**Yes**

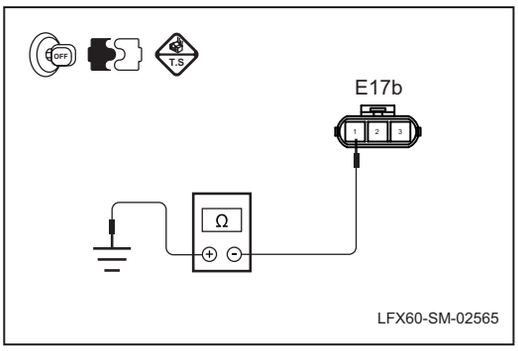
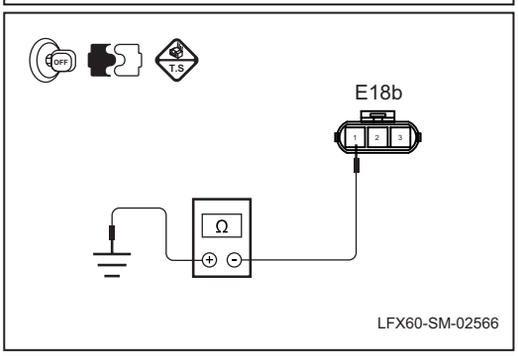
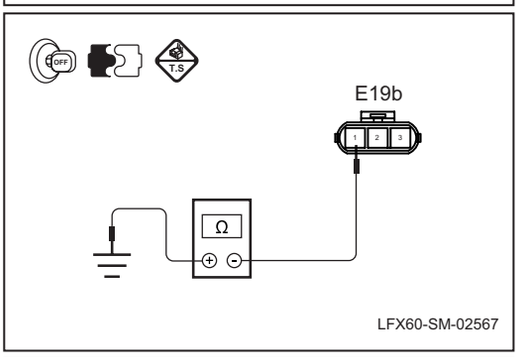
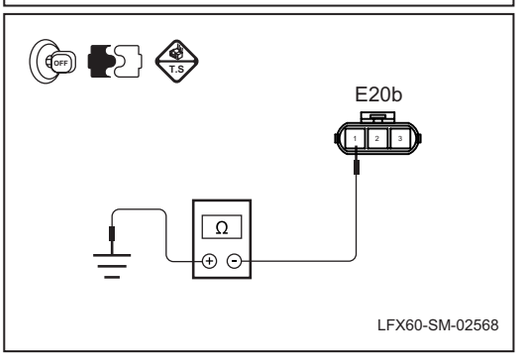
To step 6.

→**No**

Check and remove the open circuit fault of ignition coil control circuit, and replace the harness if necessary.

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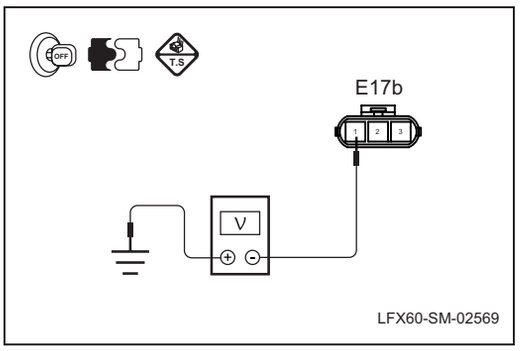
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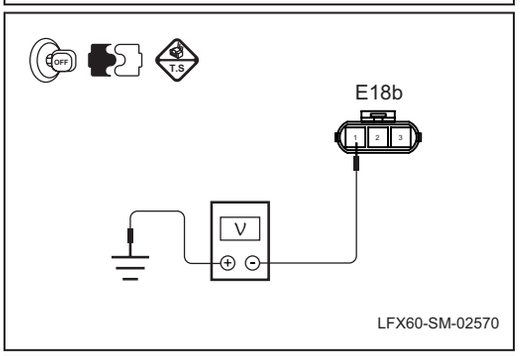
Test condition	Details/results/measures
6. Check whether the ignition coil control circuit is short to ground.	
   	A. Operate the start switch to set the power mode to the “OFF” state. B. Disconnect the battery negative connector. C. Disconnect the ignition coil 1 harness connector E17b. D. Disconnect the ignition coil 2 harness connector E18b. E. Disconnect the ignition coil 3 harness connector E19b. F. Disconnect the ignition coil 4 harness connector E20b. G. Disconnect the ECM harness connector E01b. H. Adopt a multimeter to measure the resistance of #1 terminal of ignition coil harness plug E17b to reliable ground. I. Adopt a multimeter to measure the resistance of #1 terminal of ignition coil harness plug E18b to reliable ground. J. Adopt a multimeter to measure the resistance of #1 terminal of ignition coil harness plug E19b to reliable ground. K. Adopt a multimeter to measure the resistance of #1 terminal of ignition coil harness plug E20b to reliable ground. **Standard value: 10MΩ or higher** Is the resistance normal? →**Yes** To step 7. →**No** Check the ignition coil power supply line for the short-to-ground fault and repair it. Replace the harness if necessary.

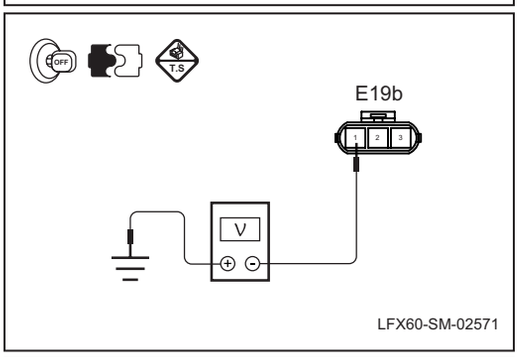
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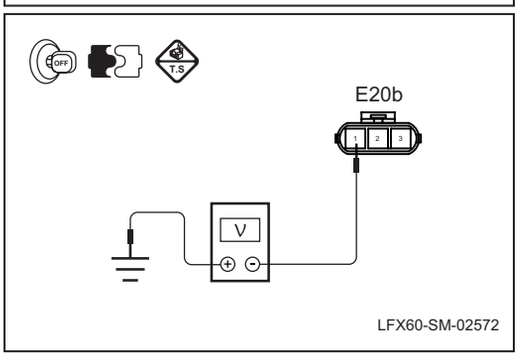
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Test condition	Details/results/measures
7. Check whether the control circuit of ignition coil is short to power supply.	









A. Operate the start switch to set the power mode to the "OFF" state.
B. Disconnect the battery negative connector.
C. Disconnect the ignition coil 1 harness connector E17b.
D. Disconnect the ignition coil 2 harness connector E18b.
E. Disconnect the ignition coil 3 harness connector E19b.
F. Disconnect the ignition coil 4 harness connector E20b.
G. Disconnect the ECM harness connector E01b.
H. Connect the battery negative terminal.
I. Measure the voltage between the ignition coil harness connector E17a terminal 1 and the reliable ground point with a multimeter.
J. Measure the voltage between the ignition coil harness connector E18b terminal 1 and the reliable ground point with a multimeter.
K. Measure the voltage between the ignition coil harness connector E19b terminal 1 and the reliable ground point with a multimeter.
L. Measure the voltage between the ignition coil harness connector E20b terminal 1 and the reliable ground point with a multimeter.

Standard value: 0V

Is the voltage normal?

→**Yes**

To step 8.

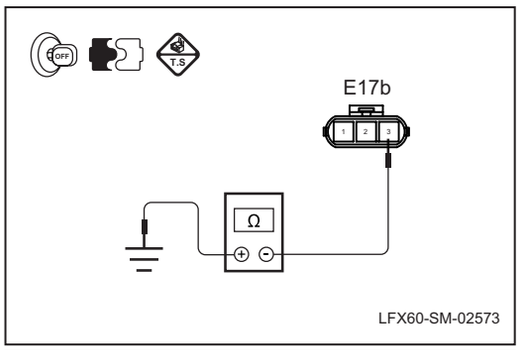
→**No**

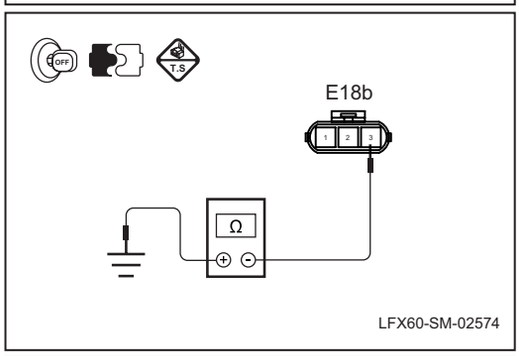
Check and remove the short circuit fault of ignition coil control circuit to power supply, and replace the harness if necessary.

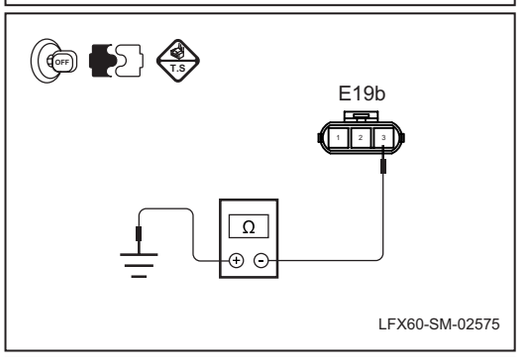
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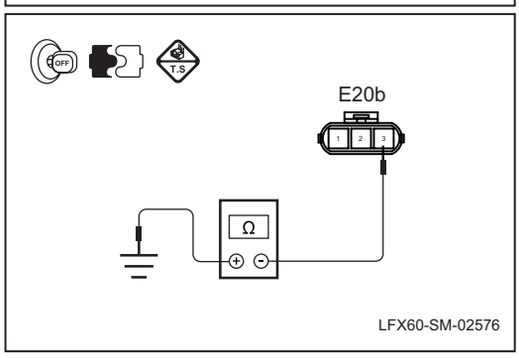
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Test condition	Details/results/measures
8. Check the ignition coil ground line.	









A. Operate the start switch to set the power mode to the "OFF" state.
B. Disconnect the battery negative connector.
C. Disconnect the ignition coil 1 harness connector E17b.
D. Disconnect the ignition coil 2 harness connector E18b.
E. Disconnect the ignition coil 3 harness connector E19b.
F. Disconnect the ignition coil 4 harness connector E20b.
G. Adopt a multimeter to measure the resistance of #3 terminal of ignition coil harness plug E17b to reliable ground.
H. Adopt a multimeter to measure the resistance of #3 terminal of ignition coil harness plug E18b to reliable ground.
I. Adopt a multimeter to measure the resistance of #3 terminal of ignition coil harness plug E19b to reliable ground.
J. Adopt a multimeter to measure the resistance of #3 terminal of ignition coil harness plug E20b to reliable ground.

Standard value: Less than 5

Is the voltage normal?

→**Yes**

To step 9.

→**No**

Check the ignition coil power supply line for the short-to-ground fault and repair it. Replace the harness if necessary.

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Test condition	Details/results/measures
9. Check the ignition coil.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the harness plug of ignition coil. D. Measure the initial coil resistance and secondary coil resistance of ignition coil. **Standard value: Initial coil resistance: 530mΩX (1±12%)** **Standard value: Secondary coil resistance: 9.3kΩX(1±12%)** Is it OK after checking? →**Yes** Step 10. →**No** Replace Ignition coils. **Refer to: Ignition coil replacement**
10. Check ECM.	
	A. Replace ECM. **Refer to: Replacement of the engine control module (ECM)** Confirm that the fault has been ruled out.

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DTC P0322

DTC description

DTC	Description
P0322	• Signal faults of speed sensor

Possible reasons

DTC	Detection strategy	Set the condition (control strategy)	Define the fault location
P0322	• Checking the hardware or harness	• The number of detected signal faults of speed sensor is more than 5.	• Crankshaft position sensor • Crankshaft position sensor circuit • ECM

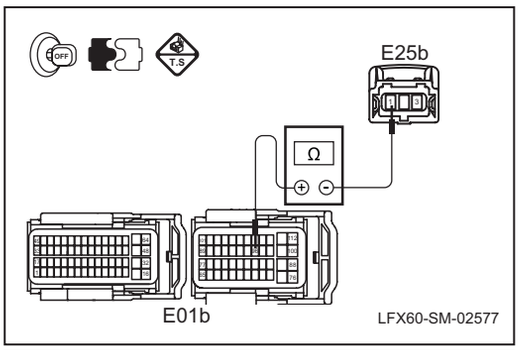
Diagnostic process

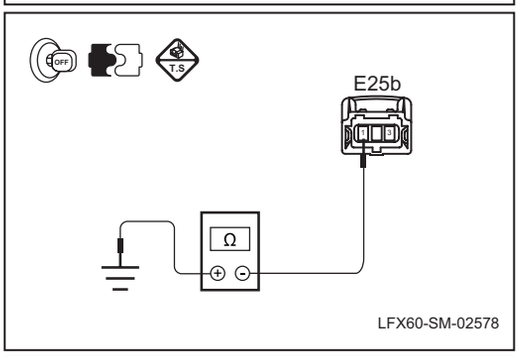
Test condition	Details/results/measures
1. General inspection.	
	A. Check the crankshaft position sensor and engine control module harness plugs for damages, poor contact, aging or loosening, etc. B. Check whether the crankshaft position sensor is wrong installed or its disc is damaged. Is it OK after checking? →**Yes** To step 2. →**No** Examine and repair the fault location.
2. Clear the trouble code.	
	A. Connect the equipment for diagnosing faults to the diagnostic interface. B. Operate the start switch to set the power mode to the “on” state. C. Clear the trouble code by using diagnostic equipment. Does the trouble code reappear? →**Yes** To step 3. →**No** Finish.

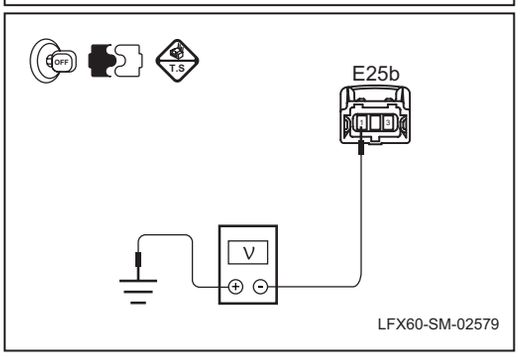
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Test condition	Details/results/measures
3. Check the signal+circuit of crankshaft position sensor.	



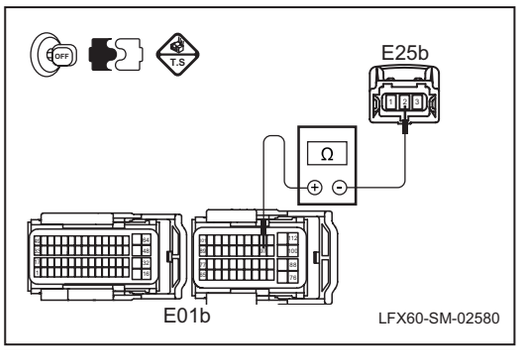
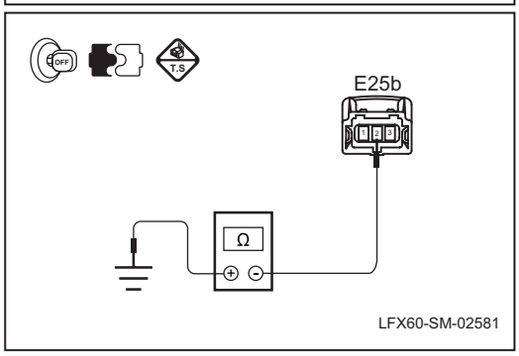
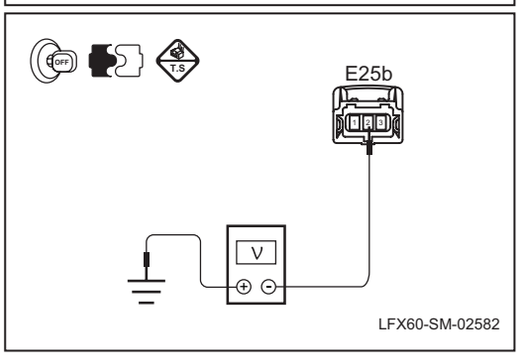




A. Operate the start switch to set the power mode to the “OFF” state.
B. Disconnect the battery negative connector.
C. Disconnect the crankshaft position sensor harness connector E25b.
D. Disconnect the ECM harness connector E01b.
E. Measure the resistance between the 1st terminal of the crankshaft position sensor harness connector E25b and the 96th terminal of the ECM harness connector E01b with a multimeter.
Standard value: Less than 5
F. Measure the resistance between the 1st terminal of the crankshaft position sensor harness connector E25b and the reliable ground point with a multimeter.
Standard value: 10MΩ or higher
G. Connect the battery negative terminal.
H. Measure the voltage between the 1st terminal of the crankshaft position sensor harness connector E25b and the reliable ground point with a multimeter.
Standard value: 0V
Is it OK after checking?
→**Yes**
Step 4.
→**No**
Check and remove signal+circuit fault of crankshaft position sensor, and replace its harness if necessary.

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Test condition	Details/results/measures
4. Check the signal-circuit of crankshaft position sensor.	
  	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the crankshaft position sensor harness connector E25b. D. Disconnect the ECM harness connector E01b. E. Measure the resistance between the 2st terminal of the crankshaft position sensor harness connector E25b and the 97th terminal of the ECM harness connector E01b with a multimeter. **Standard value: Less than 5** F. Measure the resistance between the 2st terminal of the crankshaft position sensor harness connector E25b and the reliable ground point with a multimeter. **Standard value: 10MΩ or higher** G. Connect the battery negative terminal. H. Measure the voltage between the 2st terminal of the crankshaft position sensor harness connector E25b and the reliable ground point with a multimeter. **Standard value: 0V** Is it OK after checking? →**Yes** Step 4. →**No** Check and remove signal-circuit fault of crankshaft position sensor, and replace its harness if necessary.
5. Check the crankshaft position sensor.	
	A. Adopt a multimeter to measure the resistance between #1 and #2 terminals of crankshaft position sensor. **Standard value: 731 to 989Ω at room temperature of 20 °C** Is the resistance normal? →**Yes** Step 6. →**No** Replace the crankshaft position sensor.
6. Check ECM.	
	A. Replace ECM. **Refer to: Replacement of the engine control module (ECM)** Confirm that the fault has been ruled out.

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DTC P0327, P0328

DTC description

DTC	Description
P0327	• Overlow voltage of knock sensor circuit
P0328	• Overhigh voltage of knock sensor circuit

Possible reasons

DTC	Detection strategy	Set the condition (control strategy)	Define the fault location
P0327	• Checking the hardware or harness	• Low detected value of signal range	• Knock sensor • Knock sensor circuit • ECM
P0328		• High detected value of signal range	

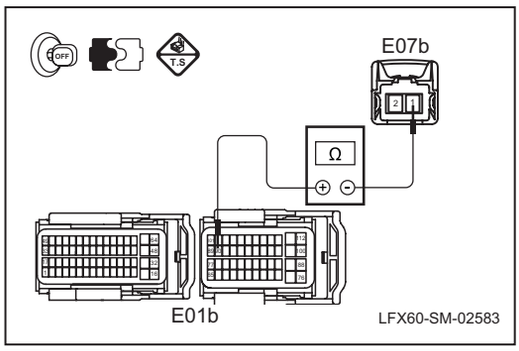
Diagnostic process

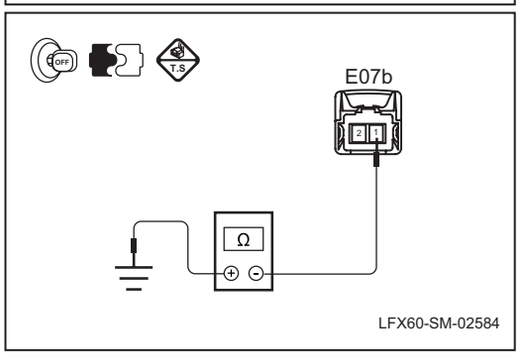
Test condition	Details/results/measures
1. General inspection.	
	A. Check the knock sensor and engine control module harness plugs for damages, poor contact, aging and loosening, etc. Is it OK after checking? →**Yes** To step 2. →**No** Examine and repair the fault location.
2. Clear the trouble code.	
	A. Connect the equipment for diagnosing faults to the diagnostic interface. B. Operate the start switch to set the power mode to the “on” state. C. Clear the trouble code by using diagnostic equipment. Does the trouble code reappear? →**Yes** To step 3. →**No** Finish.

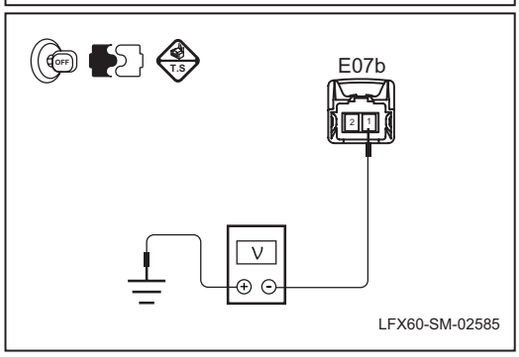
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Test condition	Details/results/measures
3. Check signal+circuit of knock sensor.	



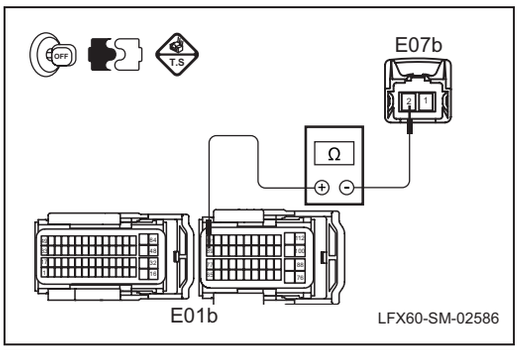
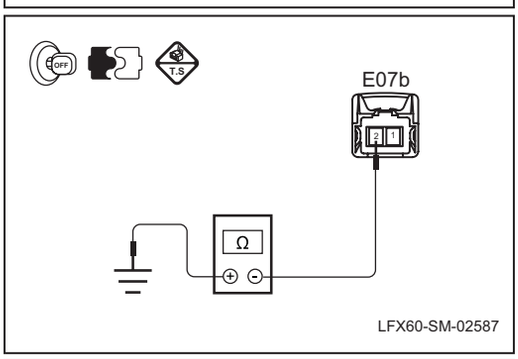
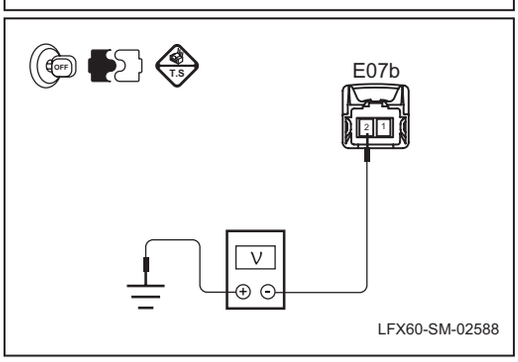




A. Operate the start switch to set the power mode to the "OFF" state.
B. Disconnect the battery negative connector.
C. Disconnect knock sensor harness plug E07b.
D. Disconnect the ECM harness connector E01b.
E. Measure the resistance between the 1st terminal of the knock sensor harness connector E07b and the 90th terminal of the ECM harness connector E01b with a multimeter.
Standard value: Less than 5
F. Measure the resistance between the 1st terminal of the knock sensor harness connector E07b and the reliable ground point with a multimeter.
Standard value: 10MΩ or higher
G. Connect the battery negative terminal.
H. Measure the voltage between the 1st terminal of the knock sensor harness connector E07b and the reliable ground point with a multimeter.
Standard value: 0V
Is it OK after checking?
→**Yes**
Step 4.
→**No**
Check and remove signal+circuit fault of knock sensor, and replace its harness if necessary.

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Test condition	Details/results/measures
4. Check signal-circuit of knock sensor.	
  	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect crankshaft position sensor harness plug E07b. D. Disconnect the ECM harness connector E01b. E. Measure the resistance between the 2st terminal of the knock sensor harness connector E07b and the 89th terminal of the ECM harness connector E01b with a multimeter. **Standard value: Less than 5** F. Measure the resistance between the 2st terminal of the knock sensor harness connector E07b and the reliable ground point with a multimeter. **Standard value: 10MΩ or higher** G. Connect the battery negative terminal. H. Measure the voltage between the 2st terminal of the knock sensor harness connector E07b and the reliable ground point with a multimeter. **Standard value: 0V** Is it OK after checking? →**Yes** Step 4. →**No** Check and remove signal-circuit fault of knock sensor, and replace its harness if necessary.
5. Check the knock sensor.	
	A. Adopt a multimeter to measure the resistance between #1 and #2 terminals of knock sensor. **Standard value: > 1 MΩ** Is it OK after checking? →**Yes** Step 6. →**No** Replace the knock sensor. **Refer to: Replacement of the knock sensor**
6. Check ECM.	
	A. Replace ECM. **Refer to: Replacement of the engine control module (ECM)** Confirm that the fault has been ruled out.

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DTC P0341

DTC description

DTC	Description
P0341	• Inappropriate signal of phase sensor

Possible reasons

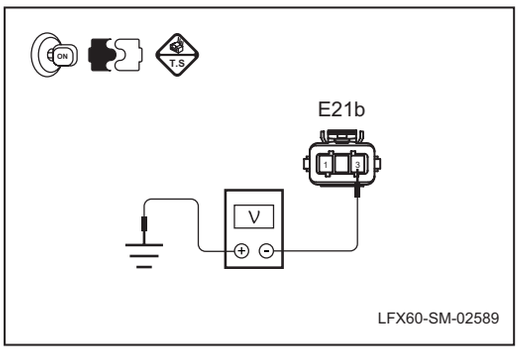
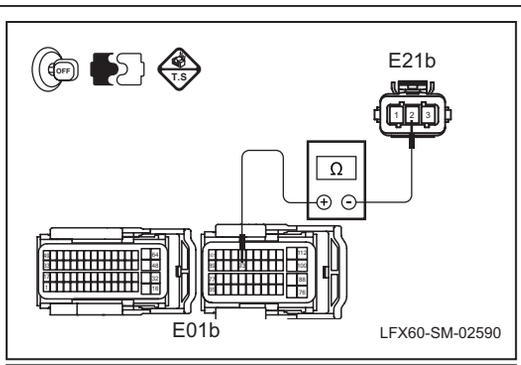
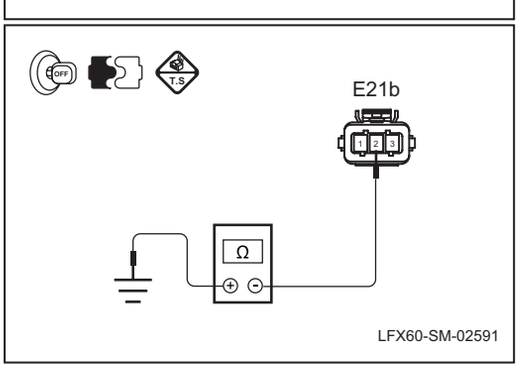
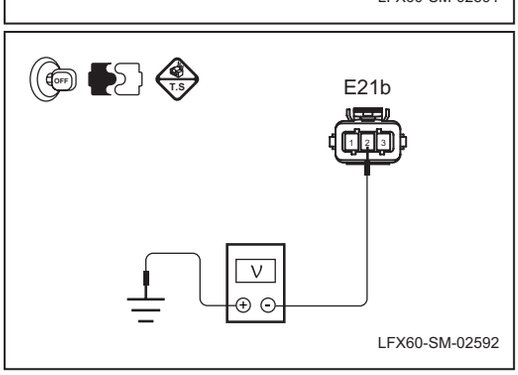
DTC	Detection strategy	Set the condition (control strategy)	Define the fault location
P0341	• Hardware or line check	• The number of detected signal faults of phase sensor is more than 5.	• Camshaft position sensor • Camshaft position sensor circuit • ECM

Diagnostic process

Test condition	Details/results/measures
1. General inspection.	
	Check the camshaft position sensor and engine control module harness plugs for damages, poor contact, aging or loosening, etc. Check whether the camshaft position sensor is wrongly installed. Check whether its disc is chipped. Is it OK after checking? →**Yes** To step 2. →**No** Examine and repair the fault location.
2. Clear the trouble code.	
	A. Connect the equipment for diagnosing faults to the diagnostic interface. B. Operate the start switch to set the power mode to the “on” state. C. Clear the trouble code by using diagnostic equipment. Does the trouble code reappear? →**Yes** To step 3. →**No** Finish.

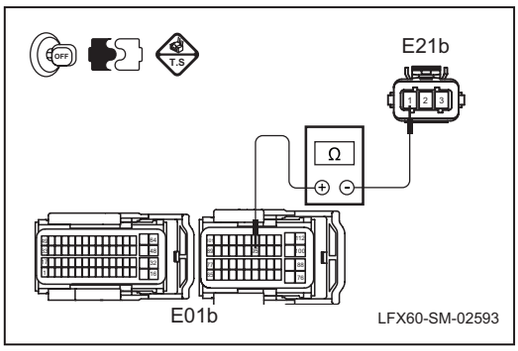
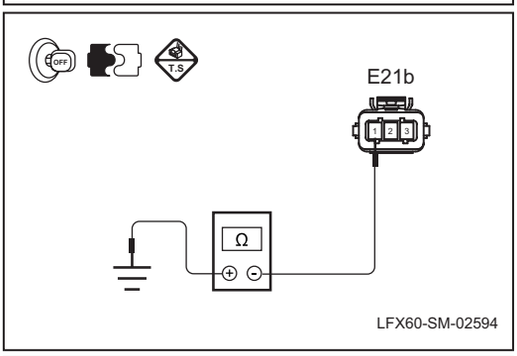
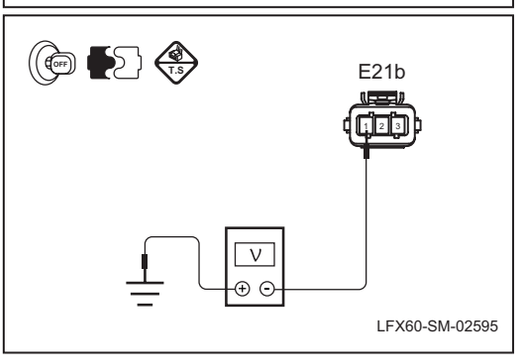
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Test condition	Details/results/measures
3. Check the power circuit of camshaft position sensor.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the camshaft position sensor harness connector E21b. D. Connect the battery negative terminal. E. Operate the start switch to set the power mode to the "on" state. F. Adopt a multimeter to measure the voltage of #3 terminal of camshaft position sensor harness plug E21b to reliable ground. **Standard value: 4.5 ~ 5.5 V** Is the voltage normal? →**Yes** Step 4. →**No** Check and remove the faults of camshaft position sensor power circuit, and replace its harness if necessary.
4. Check the signal circuit of camshaft position sensor.	
  	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the camshaft position sensor harness connector E21b. D. Disconnect the ECM harness connector E01b. E. Measure the resistance between the 2nd terminal of the camshaft position sensor harness connector E21b and the 93th terminal of the ECM harness connector E01b with a multimeter. **Standard value: Less than 5** F. Measure the resistance between the 2th terminal of the camshaft position sensor harness connector E21b and the reliable ground point with a multimeter. **Standard value: 10MΩ or higher** G. Connect the battery negative terminal. H. Measure the voltage between the 2nd terminal of the camshaft position sensor harness connector E21b and the reliable ground point with a multimeter. **Standard value: 0V** Is it OK after checking? →**Yes** To step 5. →**No** Check and remove the faults of camshaft position sensor signal circuit, and replace its harness if necessary.

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Test condition	Details/results/measures
5. Check the ground circuit of camshaft position sensor.	
  	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the camshaft position sensor harness connector E21b. D. Disconnect the ECM harness connector E01b. E. Measure the resistance between the 1nd terminal of the camshaft position sensor harness connector E21b and the 95th terminal of the ECM harness connector E01b with a multimeter. **Standard value: Less than 5** F. Measure the resistance between the 1th terminal of the camshaft position sensor harness connector E21b and the reliable ground point with a multimeter. **Standard value: 10MΩ or higher** G. Connect the battery negative terminal. H. Measure the voltage between the 1th terminal of the camshaft position sensor harness connector E21b and the reliable ground point with a multimeter. **Standard value: 0V** Is it OK after checking? **→Yes** To step 6. **→No** Check and remove the faults of camshaft position sensor ground circuit, and replace its harness if necessary.
6. Check the camshaft position sensor.	
	A. Replace the camshaft position sensor. **Refer to: Replacement of camshaft position sensor** Is it OK after checking? **→Yes** To step 7. **→No** Finish.
7. Check ECM.	
	A. Replace ECM. **Refer to: Replacement of the engine control module (ECM)** Confirm that the fault has been ruled out.

AutoLibrary

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DTC P0420

DTC description

DTC	Description
P0420	• Three-way catalyst oxygen reservoir capacity aging (emission exceeding limit)

Possible reasons

DTC	Detection strategy	Set the condition (control strategy)	Define the fault location
P0420	• Checking the hardware or harness	• Exhaustion over its maximum limit	• Three-way catalytic converter • Oxygen sensor or circuit • Exhaust system

Diagnostic process

Test condition	Details/results/measures
1. General inspection.	
	A. Check the oxygen sensor and engine control module harness plugs for damages, poor contact, aging or loosening, etc. B. Check the exhaust system for blockage or leakage. Is it OK after checking? →**Yes** To step 2. →**No** Examine and repair the fault location.
2. Clear the trouble code.	
	A. Connect the equipment for diagnosing faults to the diagnostic interface. B. Operate the start switch to set the power mode to the “on” state. C. Clear the trouble code by using diagnostic equipment. Does the trouble code reappear? →**Yes** To step 3. →**No** Finish.
3. Check the faults of oxygen sensor.	
	A. Adopt a diagnostic unit to read the parameters of oxygen sensor. Is it OK after checking? →**Yes** **Step 4.** →No Remove the faults of oxygen sensor. **Refer to: P0030, P0031, P0032, P0036, P0037, P0038**

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Test condition	Details/results/measures
4. Check three-way catalyst.	
	A. Replace three-way catalyst. **Refer to: Replacement of three-way catalyst** Confirm that the fault has been ruled out.

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DTC P0444, P0458, P0459

DTC description

DTC	Description
P0444	• Faults of canister control valve circuit
P0458	• Overlow voltage of canister control valve circuit
P0459	• Overhigh voltage of canister control valve circuit

Possible reasons

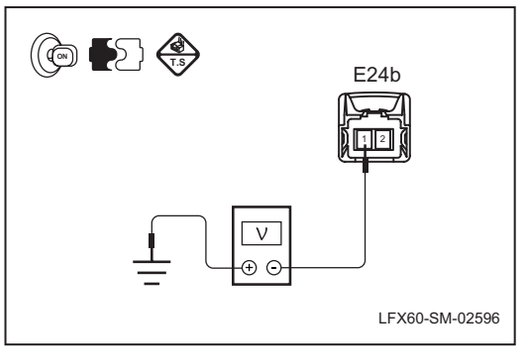
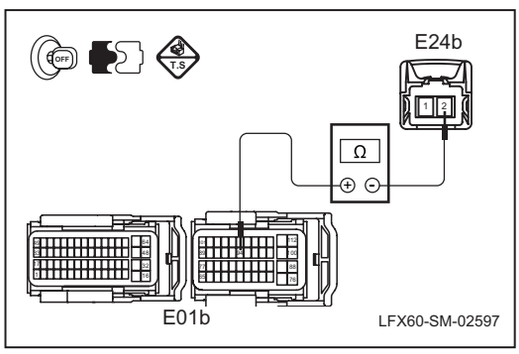
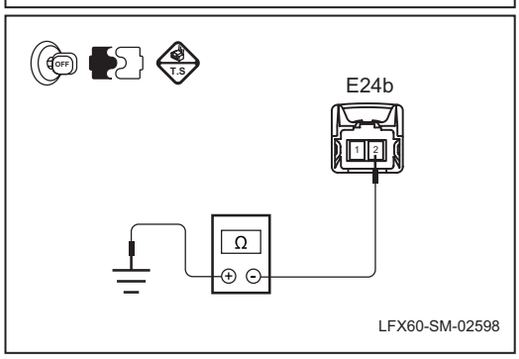
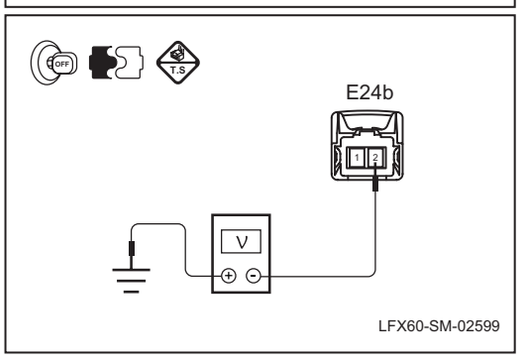
DTC	Detection strategy	Define the fault location
P0444	• Checking the hardware or harness	• Canister solenoid valve • Canister solenoid valve circuit • ECM
P0458		
P0459		

Diagnostic process

Test condition	Details/results/measures
1. General inspection.	
	A. Check the canister solenoid valve and engine control module harness plugs for damages, poor contact, aging and loosening, etc. Is it OK after checking? →**Yes** To step 2. →**No** Examine and repair the fault location.
2. Clear the trouble code.	
	A. Connect the equipment for diagnosing faults to the diagnostic interface. B. Operate the start switch to set the power mode to the “on” state. C. Clear the trouble code by using diagnostic equipment. Does the trouble code reappear? →**Yes** To step 3. →**No** Finish.

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Test condition	Details/results/measures
3. Check the canister solenoid valve power supply line.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect canister solenoid valve plug E24b. D. Connect the battery negative terminal. E. Operate the start switch to set the power mode to the "on" state. F. Adopt a multimeter to measure the voltage of #1 terminal of canister solenoid valve harness plug E24b to reliable ground. **Standard value: 11 ~ 14V** Is the voltage normal? →**Yes** Step 4. →**No** Troubleshoot the canister solenoid valve power supply line. If necessary, replace the harness.
4. Check the drive signal circuit of canister solenoid valve.	
  	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect canister solenoid valve harness plug E24b. D. Disconnect the engine control module connector E01b. E. Adopt a multimeter to measure the resistance between #2 terminal of canister solenoid valve harness plug E24b and #94 terminal of E01b. **Standard value: Less than 5** F. Adopt a multimeter to measure the resistance of #2 terminal of canister solenoid valve harness plug E24b to reliable ground. **Standard value: 10MΩ or higher** G. Connect the battery negative terminal. H. Adopt a multimeter to measure the resistance of #2 terminal of canister solenoid valve harness plug E24b to reliable ground. **Standard value: 0V** Is it OK after checking? →**Yes** To step 5. →**No** Check and remove the faults of canister solenoid valve drive signal circuit, and replace its harness if necessary.

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Test condition	Details/results/measures
5. Canister solenoid valve.	
	A. Adopt a multimeter to measure the resistance between #1 and #2 terminals of canister solenoid valve at normal temperature. **Standard value: 26±4Ω** Is it OK after checking? →**Yes** Step 6. →**No** Replace the canister solenoid valve. **Refer to: Replace the canister solenoid valve.**
6. Check ECM.	
	A. Replace ECM. **Refer to: Replacement of the engine control module (ECM)** Confirm that the fault has been ruled out.

AutoLibrary

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DTC P0480, P0691, P0692

DTC description

DTC	Description
P0480	• Signal faults of cooling fan relay control circuit (at low speed)
P0691	• Overlow voltage of cooling fan relay control circuit (low speed)
P0692	• Cooling fan relay control circuit voltage high (low speed)

Possible reasons

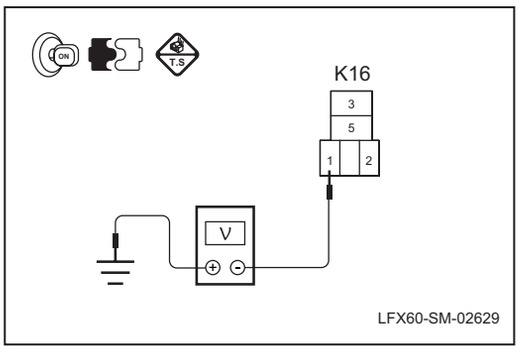
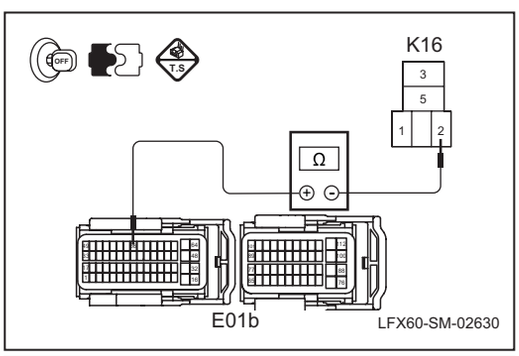
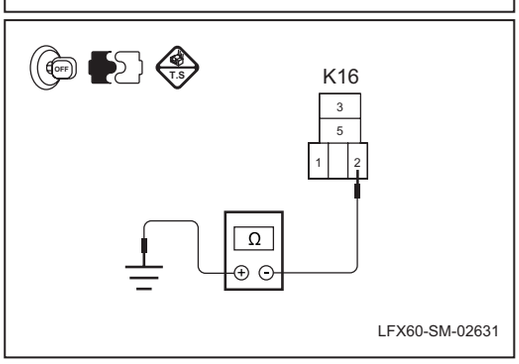
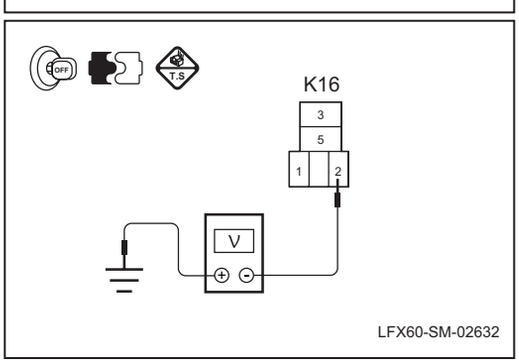
DTC	Detection strategy	Define the fault location
P0480	• Checking the hardware or harness	• Cooling fan relay • Cooling fan relay line • ECM
P0692		
P0693		

Diagnostic process

Test condition	Details/results/measures
1. General inspection.	
	A. Check #1 fan relay K16 and engine control module harness plugs for damages, poor contact, aging or loosening, etc. Is it OK after checking? →**Yes** To step 2. →**No** Examine and repair the fault location.
2. Clear the trouble code.	
	A. Connect the equipment for diagnosing faults to the diagnostic interface. B. Operate the start switch to set the power mode to the “on” state. C. Clear the trouble code by using diagnostic equipment. Does the trouble code reappear? →**Yes** To step 3. →**No** Finish.

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Test condition	Details/results/measures
3. Check the 1st fan relay power supply line.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Remove the 1st fan relay K16. D. Connect the battery negative terminal. E. Operate the start switch to set the power mode to the "on" state. F. Measure the voltage between the 1st terminal of the 1st fan relay harness terminal and the reliable ground terminal with a multimeter. **Standard value: 11 ~ 14V** Is the voltage normal? →**Yes** Step 4. →**No** Troubleshoot the 1st fan relay power supply line and replace the harness if necessary.
4. Check the 1st fan relay drive signal line.	
  	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Remove the 1st fan relay K16. D. Disconnect the engine control module connector E01b. E. Adopt a multimeter to measure the resistance between #2 terminal of #1 fan relay K16 and #56 terminal of E01b. **Standard value: Less than 5** F. Adopt a multimeter to measure the resistance of #2 terminal of #1 fan relay K16 to reliable ground. **Standard value: 10MΩ or higher** G. Connect the battery negative terminal. H. Adopt a multimeter to measure the voltage of #2 terminal of #1 fan relay K16 to reliable ground. **Standard value: 0V** Is it OK after checking? →**Yes** To step 5. →**No** Troubleshoot the 1st fan relay drive line and replace the harness if necessary.

AutoLibrary

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Test condition	Details/results/measures
5. Check the 1st fan relay.	
	A. Apply 12V voltage to #1 and #2 terminals of #1 fan relay K16, and adopt a multimeter to measure the resistance between its #3 and #5 terminals. **Standard value: Less than1** Is it OK after checking? →**Yes** Step 6. →**No** Replace the 1st fan relay.
6. Check ECM.	
	A. Replace ECM. **Refer to: Replacement of the engine control module (ECM)** Confirm that the fault has been ruled out.

AutoLibrary

AutoLibrary

DTC P0481, P0693 & P0694

DTC description

DTC	Description
P0481	• Faults of cooling fan relay control circuit (high speed)
P0693	• Cooling fan relay control circuit voltage low (high speed)
P0694	• Cooling fan relay control circuit voltage high (high speed)

Possible reasons

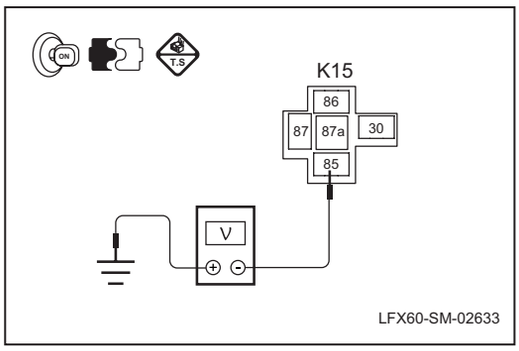
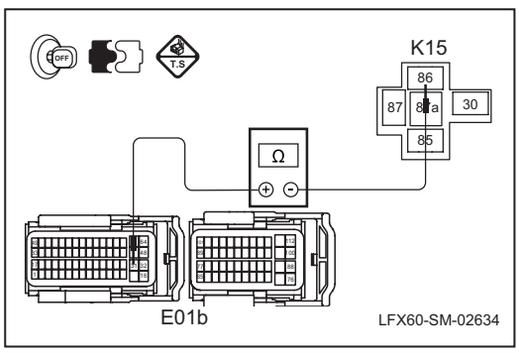
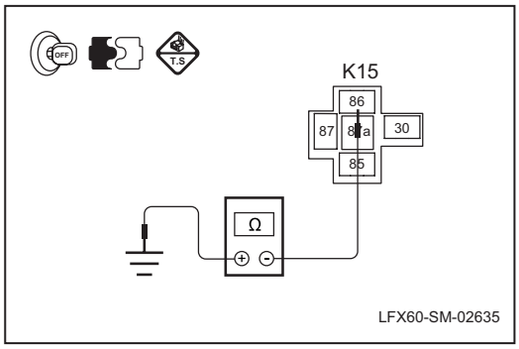
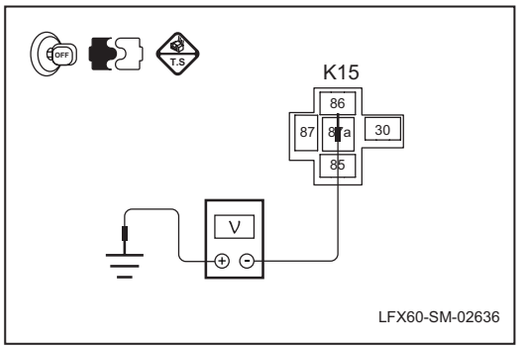
DTC	Detection strategy	Define the fault location
P0481	• Checking the hardware or harness	• Cooling fan relay • Cooling fan relay line • ECM
P0693		
P0694		

Diagnostic process

Test condition	Details/results/measures
1. General inspection.	
	A. Check #2 fan relay K15 and engine control module harness plugs for damages, poor contact, aging or loosening, etc. Is it OK after checking? →**Yes** To step 2. →**No** Examine and repair the fault location.
2. Clear the trouble code.	
	A. Connect the equipment for diagnosing faults to the diagnostic interface. B. Operate the start switch to set the power mode to the “on” state. C. Clear the trouble code by using diagnostic equipment. D. Does the trouble code reappear? →**Yes** To step 3. →**No** Finish.

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Test condition	Details/results/measures
3. Check the 2st fan relay power supply line.	
	A. Operate the start switch to set the power mode to the “OFF” state. B. Disconnect the battery negative connector. C. Remove the 2st fan relay K15. D. Connect the battery negative terminal. E. Operate the start switch to set the power mode to the “on” state. F. Measure the voltage between the 2st terminal of the 85st fan relay harness terminal and the reliable ground terminal with a multimeter. **Standard value: 11 ~ 14V** Is the voltage normal? **→Yes** Step 4. **→No** Troubleshoot the 2st fan relay power supply line and replace the harness if necessary.
4. Check the 2st fan relay drive signal line.	
  	A. Operate the start switch to set the power mode to the “OFF” state. B. Disconnect the battery negative connector. C. Remove the 2st fan relay K15. D. Disconnect the engine control module connector E01b. E. Adopt a multimeter to measure the resistance between #2 terminal of #31fan relay K15 and #86 terminal of E01b. **Standard value: Less than 5** F. Adopt a multimeter to measure the resistance of #2 terminal of #86 fan relay K15 to reliable ground. **Standard value: 10MΩ or higher** G. Connect the battery negative terminal. H. Adopt a multimeter to measure the voltage of #2 terminal of #86 fan relay K15 to reliable ground. **Standard value: 0V** Is it OK after checking? **→Yes** To step 5. **→No** Troubleshoot the 2st fan relay drive line and replace the harness if necessary.

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Test condition	Details/results/measures
5. Check the 2st fan relay.	
	A. Apply 12V voltage to #86 and #85 terminals of #2 fan relay K16, and adopt a multimeter to measure the resistance between its #30 and #587 terminals. **Standard value: Less than1** Is the resistance normal? →**Yes** Step 6. →**No** Replace the 2st fan relay.
6. Check ECM.	
	A. Replace ECM. **Refer to: Replacement of the engine control module (ECM)** Confirm that the fault has been ruled out.

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DTC P0506, P0507

DTC description

DTC	Description
P0506	• Idling control speed lower its target idling speed
P0507	• Idling control speed above its target idling speed

Possible reasons

DTC	Detection strategy	Set the condition (control strategy)	Define the fault location
P0506	• Idling actuator seized in smaller opening position	• Difference between static target idling speed and actual speed>100 U/min	• Electronic-controlled throttle body • Generator • Injector • ECM
P0507			

Diagnostic process

Test condition	Details/results/measures
1. General inspection.	
	A. Check the electronic throttle valve, fuel injector and engine control module harness plugs for damages, poor contact, aging or loosening, etc. B. Check whether the throttle valve keeps sticking and check whether the intake and exhaust, and the injector are blocked. Is it OK after checking? →**Yes** To step 2. →**No** Examine and repair the fault location.
2. Clear the trouble code.	
	Connect the equipment for diagnosing faults to the diagnostic interface. Operate the start switch to set the power mode to the “on” state. Clear the trouble code by using diagnostic equipment. Does the trouble code reappear? →**Yes** To step 3. →**No** Finish.

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Test condition	Details/results/measures
3. Check the generator for voltage faults.	
	A. Start the engine so that it rotates at 2000 rpm. B. Check whether the generator output voltage is within the range. Is it OK after checking? →**Yes** Step 4. →**No** Troubleshoot the generator.
4. Check the electronically controlled throttle valve for faults.	
	A. Check the electronically controlled throttle valve for faults. **Refer to: "P0121, P0122, P0123, P0221, P0222, P0223"** Is it OK after checking? →**Yes** Step 5. →**No** Remove the faults of electronic throttle valve.
5. Check the faults of fuel injector.	
	A. Check the faults of fuel injector. **Refer to: "P0201, P0261, P0262""P0202, P0264, P0265""P0203, P0267, P0268""P0204, P0270, P0271"** Is it OK after checking? →**Yes** Step 6. →**No** Remove the faults of fuel injector.
6. Check ECM.	
	A. Replace ECM. **Refer to: Replacement of the engine control module (ECM)** Confirm that the fault has been ruled out.

AutoLibrary

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DTC P0560, P0562, P0563

DTC description

DTC	Description
P0560	• Inappropriate voltage signal of system battery
P0562	• Overlow voltage of system battery
P0563	• Overhigh voltage of system battery

Possible reasons

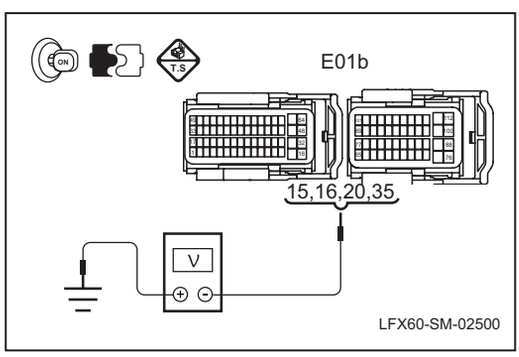
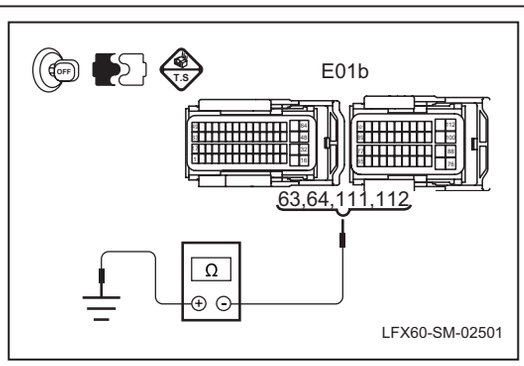
DTC	Detection strategy	Set the condition (control strategy)	Define the fault location
P0560	• Appropriateness check	• The battery voltage is less than 2.5V	• Charging system • ECM
P0562	• Below lower limit	• The battery voltage is less than 10.02V	
P0563	• Over upper limit	• Battery voltage over 17.02 V	

Diagnostic process

Test condition	Details/results/measures
1. General inspection.	
	A. Check the charging circuit and engine control module harness plugs for damages, poor contact, aging or loosening, etc. B. Check whether the throttle valve keeps sticking and check whether the intake and exhaust, and the injector are blocked. Is it OK after checking? →**Yes** To step 2. →**No** Examine and repair the fault location.
2. Clear the trouble code.	
	A. Connect the equipment for diagnosing faults to the diagnostic interface. B. Operate the start switch to set the power mode to the “on” state. C. Clear the trouble code by using diagnostic equipment. Does the trouble code reappear? →**Yes** To step 3. →**No** Finish.

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Test condition	Details/results/measures
3. Check the generator for voltage faults.	
	A. Start the engine so that it rotates at 2000 rpm. B. Check whether the generator output voltage is within the range. Is the voltage normal? →**Yes** Step 4. →**No** Troubleshoot the generator.
4. Check the battery voltage.	
	A. Measure the battery voltage with a multimeter. **Standard value: 11 ~ 14V** Is the voltage normal? →**Yes** Step 5. →**No** Replace the battery.
5. Check the ECM power supply line.	
	A. Operate the start switch to set the power mode to the “on” state. B. Measure the voltage between terminals 15, 16, 20, 35 of the ECM harness connector E01b and the reliable ground point, respectively, with a multimeter. **Standard value: 11 ~ 14V** Is the voltage normal? →**Yes** To step 6. →**No** Troubleshoot the ECM power supply line and replace the harness if necessary.
6. Check the ECM grounding line.	
	A. Operate the start switch to set the power mode to the “OFF” state. B. Disconnect the battery negative connector. C. Disconnect the ECM harness connector E01b. D. Measure the resistance between the terminals 63, 64, 111, 112 of the ECM harness connector E01b and the reliable ground point with a multimeter. **Standard value: Less than 5** Is the resistance normal? →**Yes** To step 7. →**No** Troubleshoot the ECM grounding line and replace the harness if necessary.

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Test condition	Details/results/measures
7. Check ECM.	
	A. Replace ECM. **Refer to: Replacement of the engine control module (ECM)** Confirm that the fault has been ruled out.

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DTC P0571

DTC description

DTC	Description
P0571	• Inappropriate brake signal

Possible reasons

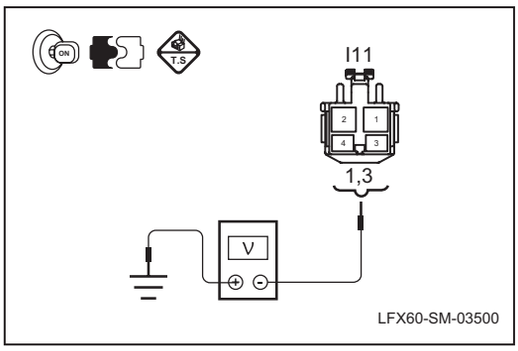
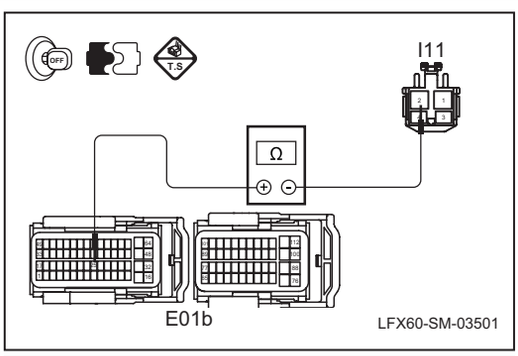
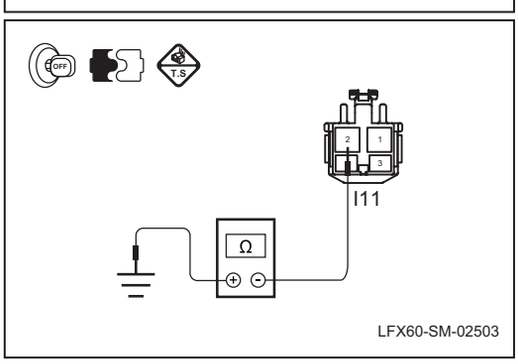
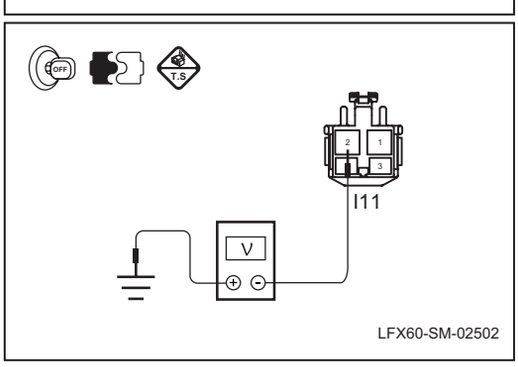
DTC	Detection strategy	Set the condition (control strategy)	Define the fault location
P0571	• Checking the hardware or harness	• The ratio of battery voltage and brake lamp switch signal pin response voltage is less than 1.133 or over 0.469.	• Brake switch • Brake switch line • ECM

Diagnostic process

Test condition	Details/results/measures
1. General inspection.	
	A. Check the brake switch plug and engine control module for damages, poor contact, aging or loosening, etc. Is it OK after checking? →**Yes** To step 2. →**No** Examine and repair the fault location.
2. Clear the trouble code.	
	A. Connect the equipment for diagnosing faults to the diagnostic interface. B. Operate the start switch to set the power mode to the “on” state. C. Clear the trouble code by using diagnostic equipment. Does the trouble code reappear? →**Yes** To step 3. →**No** Finish.

AutoLibrary

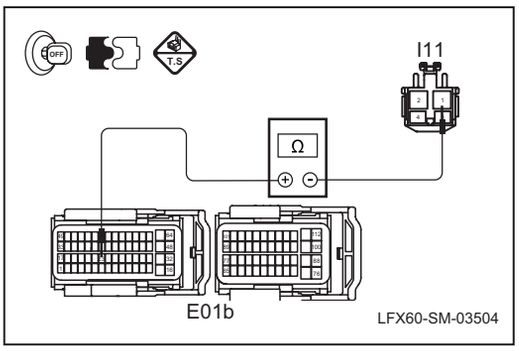
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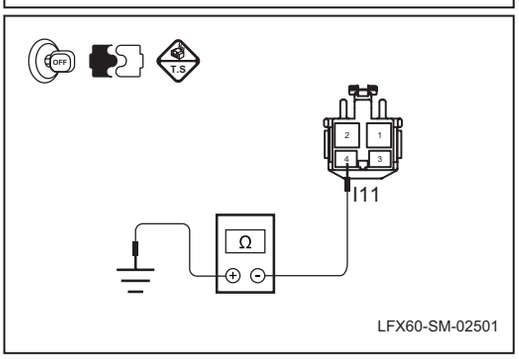
Test condition	Details/results/measures
3. Check the power circuit of brake switch.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect brake switch plug I11. D. Connect the battery negative terminal. E. Operate the start switch to set the power mode to the "on" state. F. Adopt a multimeter to measure the voltage of #1 or #3 terminal of brake switch harness plug to reliable ground. **Standard value: 11 ~ 14V** Is the voltage normal? →**Yes** Step 4. →**No** Check and remove the faults of brake switch power circuit, and replace its harness if necessary.
4. Check the brake switch power supply line output signal 1 circuit.	
  	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect brake switch plug I11. D. Disconnect the engine control module connector E01b. E. Measure the resistance between the 2nd terminal of the brake switch harness connector I11 and the 25th terminal of the engine control module connector E01b with a multimeter. **Standard value: Less than 5** F. Measure the resistance between the 2nd terminal of the brake switch power supply line harness connector I11 and the ground with a multimeter. **Standard value: 10MΩ or higher** G. Connect the battery negative terminal. H. Measure the resistance between the 2nd terminal of the brake switch power supply line harness connector I11 and the ground with a multimeter. **Standard value: 0V** Is it OK after checking? →**Yes** To step 5. →**No** Provide a breakdown service for the brake switch output signal 1 failure. If necessary, replace the harness.

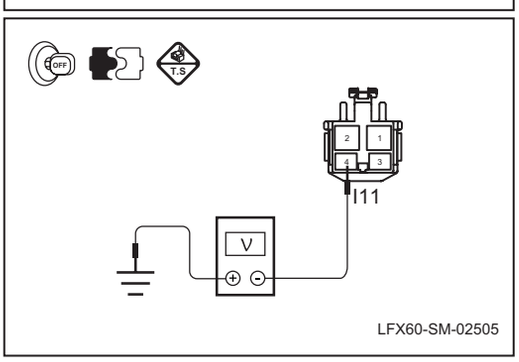
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Test condition	Details/results/measures
5. Check the brake switch power supply line output signal 2 circuit.	







A. Operate the start switch to set the power mode to the "OFF" state.
B. Disconnect the battery negative connector.
C. Disconnect brake switch power circuit plug I11.
D. Disconnect the engine control module connector E01b.
E. Measure the resistance between the 4nd terminal of the brake switch harness connector I11 and the 23th terminal of the engine control module connector E01b with a multimeter.
Standard value: Less than 5
F. Measure the resistance between the 4nd terminal of the brake switch power supply line harness connector I11 and the ground with a multimeter.
Standard value: 10MΩ or higher
G. Connect the battery negative terminal.
H. Measure the resistance between the 4nd terminal of the brake switch power supply line harness connector I11 and the ground with a multimeter.
Standard value: 0V
Is it OK after checking?
→**Yes**
To step 6.
→**No**
Provide a breakdown service for the brake switch output signal 2 failure. If necessary, replace the harness.

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Test condition	Details/results/measures
6. Check the brake switch.	
	A. Step down the brake pedal, and adopt a multimeter to measure the resistance between #1 and #3 terminals of brake switch power circuit. **Standard value: 10MΩ or higher** B. Step down the brake pedal, and adopt a multimeter to measure the resistance between #2 and #4 terminals of brake switch power circuit. **Standard value: Less than1** C. Release the brake pedal, and adopt a multimeter to measure the resistance between #1 and #3 terminals of brake switch power circuit. **Standard value: Less than1** D. Release the brake pedal, and adopt a multimeter to measure the resistance between #2 and #4 terminals of brake switch power circuit. **Standard value: 10MΩ or higher** Is the resistance normal? **→Yes** Step 7. **→No** Replace the brake switch.
7. Check ECM.	
	A.Replace ECM. **Refer to: Replacement of the engine control module (ECM)** Confirm that the fault has been ruled out.

AutoLibrary

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DTC P0604, P0605 & P0606

DTC description

DTC	Description
P0604	• RAM faults of electronic control unit
P0605	• ROM faults of electronic control unit
P0606	• Faults of electronic throttle valve safety monitoring function
P2106	• Drive stage faults of electronic throttle valve

Possible reasons

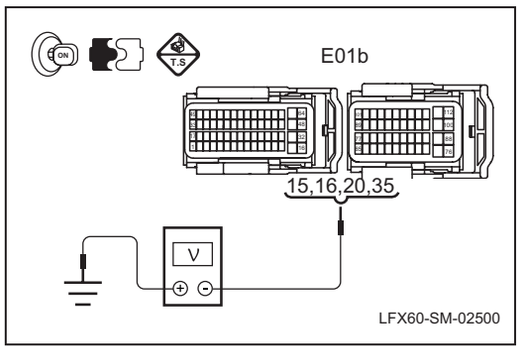
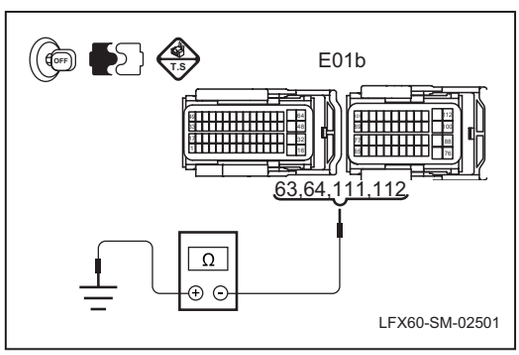
DTC	Detection strategy	Define the fault location
P0604	• Checking the hardware or harness	• ECM • ECM lines
P0605		
P0606		
P2106		

Diagnostic process

Test condition	Details/results/measures
1. General inspection.	
	A. Check the harness plugs of engine control module for damages, poor contact, aging or loosening, etc. B. Check whether the battery voltage is too low. Is it OK after checking? →**Yes** To step 2. →**No** Examine and repair the fault location.
2. Clear the trouble code.	
	A. Connect the equipment for diagnosing faults to the diagnostic interface. B. Operate the start switch to set the power mode to the “on” state. C. Clear the trouble code by using diagnostic equipment. Does the trouble code reappear? →**Yes** To step 3. →**No** Finish.

AutoLibrary

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Test condition	Details/results/measures
3. Check the ECM power supply line.	
	A. Operate the start switch to set the power mode to the “on” state. B. Measure the voltage between terminals 15, 16, 20, 35 of the ECM harness connector E01b and the reliable ground point, respectively, with a multimeter. **Standard value: 11 ~ 14V** Is the voltage normal? **→Yes** To step 4. **→No** Troubleshoot the ECM power supply line and replace the harness if necessary.
4. Check the ECM grounding line.	
	A. Operate the start switch to set the power mode to the “OFF” state. B. Disconnect the battery negative connector. C. Disconnect the ECM harness connector E01b. D. Measure the resistance between the terminals 63, 64, 111, 112 of the ECM harness connector E01b and the reliable ground point with a multimeter. **Standard value: Less than 5** Is the resistance normal? **→Yes** To step 5. **→No** Troubleshoot the ECM grounding line and replace the harness if necessary.
5. Check ECM.	
	A. Replace ECM. **Refer to: Replacement of the engine control module (ECM)** Confirm that the fault has been ruled out.

AutoLibrary

AutoLibrary

DTC P0627, P0628, P0629

DTC description

DTC	Description
P0627	• Faults of fuel pump relay circuit
P0628	• Overlow voltage of fuel pump relay control circuit
P0629	• Overhigh voltage of fuel pump relay control circuit

Possible reasons

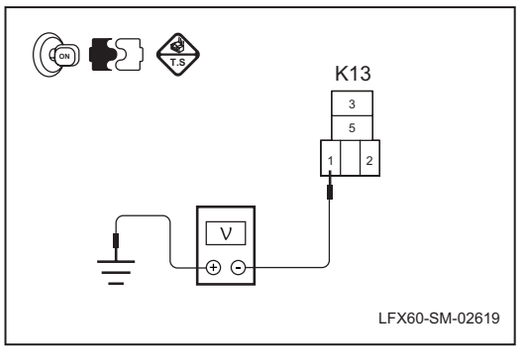
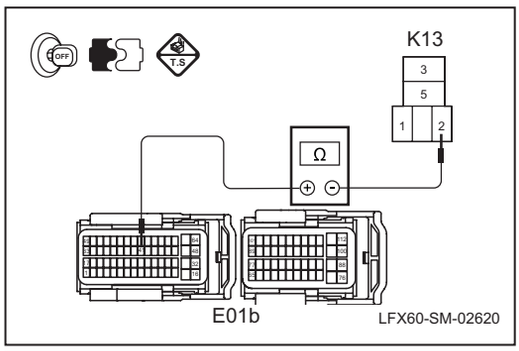
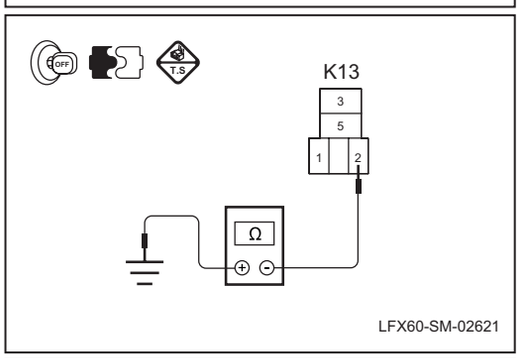
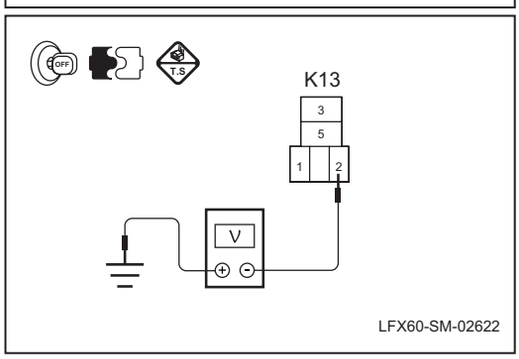
DTC	Detection strategy	Define the fault location
P0627	• Checking the hardware or harness	• Fuel pump relay • Fuel pump relay circuit • ECM
P0628		
P0629		

Diagnostic process

Test condition	Details/results/measures
1. General inspection.	
	A. Check the fuel pump relay and engine control module harness plugs for damages, poor contact, aging or loosening, etc. Is it OK after checking? →**Yes** To step 2. →**No** Examine and repair the fault location.
2. Clear the trouble code.	
	A. Connect the equipment for diagnosing faults to the diagnostic interface. B. Operate the start switch to set the power mode to the “on” state. C. Clear the trouble code by using diagnostic equipment. Does the trouble code reappear? →**Yes** To step 3. →**No** Finish.

AutoLibrary

AutoLibrary

Test condition	Details/results/measures
3. Check the power circuit of fuel pump relay.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Remove the pump relay K13. D. Connect the battery negative terminal. E. Operate the start switch to set the power mode to the "on" state. F. Adopt a multimeter to measure the voltage of #1 terminal of fuel pump relay harness to reliable ground. **Standard value: 11 ~ 14V** Is the voltage normal? **→Yes** Step 4. **→No** Check and remove the faults of fuel pump relay power circuit, and replace its harness if necessary.
4. Check the pump relay drive signal line.	
  	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Remove the pump relay K13. D. Disconnect the engine control module connector E01b. E. Adopt a multimeter to measure the resistance between #2 terminal of fuel pump relay K13 and #41 terminal of E01b. **Standard value: Less than 5** F .Adopt a multimeter to measure the resistance of #2 terminal of fuel pump relay K13 to reliable ground. **Standard value: 10MΩ or higher** G. Connect the battery negative terminal. H. Adopt a multimeter to measure the voltage of #2 terminal of fuel pump relay K13 to reliable ground. **Standard value: 0V** Is it OK after checking? **→Yes** To step 5. **→No** Check and remove the faults of fuel pump relay drive signal circuit, and replace its harness if necessary.

AutoLibrary

AutoLibrary

Test condition	Details/results/measures
5. Check the fuel pump relay.	
	A. Apply 12V voltage to #1 and #2 terminals of fuel pump relay K13, and adopt a multimeter to measure the resistance between its #3 and #5 terminals. **Standard value: Less than1** Is the resistance normal? →**Yes** Step 6. →**No** Replace the fuel pump relay.
6. Check ECM.	
	A. Replace ECM. **Refer to: Replacement of the engine control module (ECM)** Confirm that the fault has been ruled out.

AutoLibrary

AutoLibrary

DTC P0645, P0646, P0647

DTC description

DTC	Description
P0645	• Faults of A/C compressor relay circuit
P0646	• Overlow voltage of A/C compressor relay control circuit
P0647	• Overhigh voltage of A/C compressor relay

Possible reasons

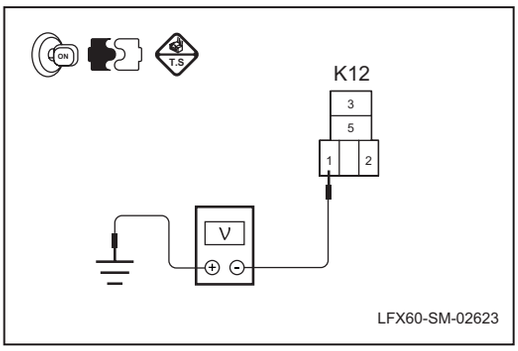
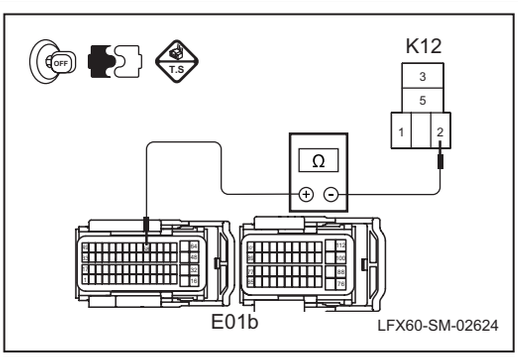
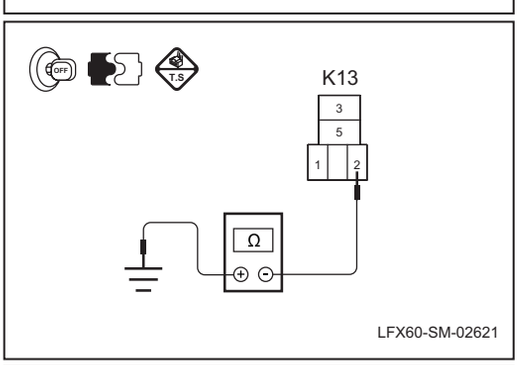
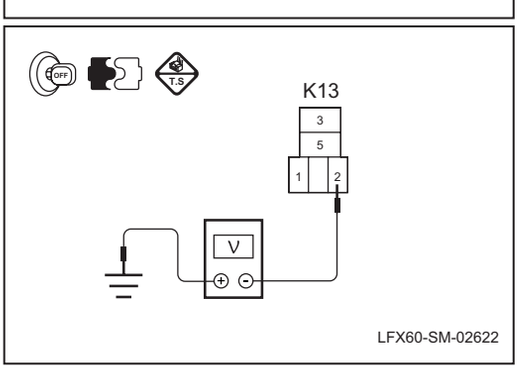
DTC	Detection strategy	Define the fault location
P0645	• Checking the hardware or harness	• Air conditioner compressor relay • A/C compressor rely circuit • ECM
P0646		
P0647		

Diagnostic process

Test condition	Details/results/measures
1. General inspection.	
	A. Check A/C compressor relay and engine control module harness plugs for damages, poor contact, aging or loosening, etc. Is it OK after checking? →**Yes** To step 2. →**No** Examine and repair the fault location.
2. Clear the trouble code.	
	A. Connect the equipment for diagnosing faults to the diagnostic interface. B. Operate the start switch to set the power mode to the “on” state. C. Clear the trouble code by using diagnostic equipment. Does the trouble code reappear? →**Yes** To step 3. →**No** Finish.

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Test condition	Details/results/measures
3. Check the air conditioning compressor relay power supply line.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Remove the air conditioning compressor relay K12. D. Connect the battery negative terminal. E. Operate the start switch to set the power mode to the "on" state. F. Adopt a multimeter to measure the voltage of #1 terminal of A/C compressor relay harness to reliable ground. **Standard value: 11 ~ 14V** Is the voltage normal? →**Yes** Step 4. →**No** Check and remove the faults of A/C compressor relay power circuit, and replace its harness if necessary.
4. Check the dive signal circuit of A/C compressor relay.	
  	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Remove the air conditioning compressor relay K12. D. Disconnect the engine control module connector E01b. E. Adopt a multimeter to measure the resistance between #2 terminal of A/C compressor relay K12 and #58 terminal of E01b. **Standard value: Less than 5** F. Adopt a multimeter to measure the resistance of #2 terminal of A/C compressor relay K12 to reliable ground. **Standard value: 10MΩ or higher** G. Connect the battery negative terminal. H. Adopt a multimeter to measure the voltage of #2 terminal of A/C compressor relay K12 to reliable ground. **Standard value: 0V** Is it OK after checking? →**Yes** To step 5. →**No** Check and remove the faults of A/C compressor relay drive signal circuit, and replace its harness if necessary.

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Test condition	Details/results/measures
5. Check the air conditioning compressor relay.	
	A. Apply 12V voltage to #1 and #2 terminals of A/C compressor relay K12, and adopt a multimeter to measure the resistance between its #3 and #5 terminals. **Standard value: Less than1** Is the resistance normal? →**Yes** Step 6. →**No** Replace the air conditioner compressor relay.
6. Check ECM.	
	A. Replace ECM. **Refer to: Replacement of the engine control module (ECM)** Confirm that the fault has been ruled out.

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DTC P0688

DTC description

DTC	Description
P0688	• Inappropriate output voltage of main relay

Possible reasons

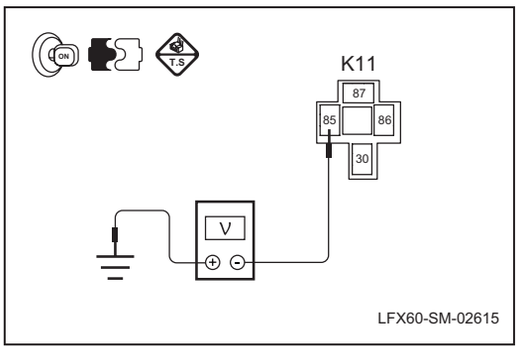
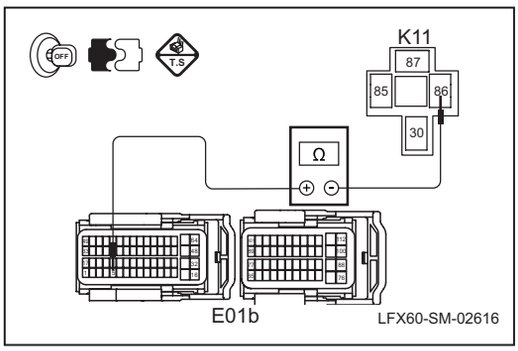
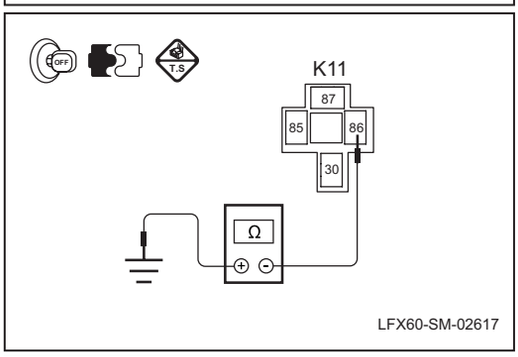
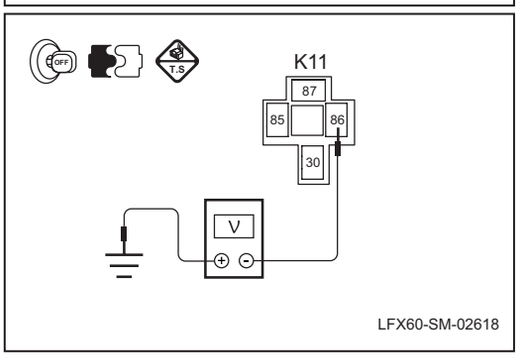
DTC	Detection strategy	Define the fault location
P0688	• Checking the hardware or harness	• Main relay • Main relay circuit • ECM

Diagnostic process

Test condition	Details/results/measures
1. General inspection.	
	A. Check the main compressor relay and engine control module harness connectors for damage, poor contact, aging, loosening and other similar signs. B. Check whether the battery voltage is too low. Is it OK after checking? →**Yes** To step 2. →**No** Examine and repair the fault location.
2. Clear the trouble code.	
	A. Connect the equipment for diagnosing faults to the diagnostic interface. B. Operate the start switch to set the power mode to the “on” state. C. Clear the trouble code by using diagnostic equipment. Does the trouble code reappear? →**Yes** To step 3. →**No** Finish.

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Test condition	Details/results/measures
3. Check the power circuit of main relay.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Remove the main relay K11. D. Connect the battery negative terminal. E. Operate the start switch to set the power mode to the "on" state. F. Adopt a multimeter to measure the voltage of #85 terminal of main relay harness to reliable ground. **Standard value: 11 ~ 14V** Is the voltage normal? →**Yes** Step 4. →**No** Check and remove the faults of main relay power circuit, and replace its harness if necessary.
4. Check the drive signal circuit of main relay.	
  	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Remove the main relay K11. D. Disconnect the engine control module connector E01b. E. Adopt a multimeter to measure the resistance between #86 terminal of main relay K11 and #5 terminal of E01b. **Standard value: Less than 5** F. Adopt a multimeter to measure the resistance of #86 terminal of main relay K11 to reliable ground. **Standard value: 10MΩ or higher** G. Connect the battery negative terminal. H. Adopt a multimeter to measure the voltage of #86 terminal of main relay K11 to reliable ground. **Standard value: 0V** Is it OK after checking? →**Yes** To step 5. →**No** Check and remove the faults of main relay drive signal circuit, and replace its harness if necessary.

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Test condition	Details/results/measures
5. Check main relay.	
	A. Apply 12V voltage to #85 and #86 terminals of A/C compressor relay K12, and adopt a multimeter to measure the resistance between its #30 and #87 terminals. **Standard value: Less than1** Is the resistance normal? →**Yes** Step 6. →**No** Replace main relay.
6. Check ECM.	
	A. Replace ECM. **Refer to: Replacement of the engine control module (ECM)** Confirm that the fault has been ruled out.

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DTC P1336, P1545, P1559, P1564, P1565, P1568, P1579

DTC description

DTC	Description
P1336	• Limitation of electronic throttle valve safety monitoring torque
P1545	• Over-limit tolerance between actual position and target position of electronic throttle valve
P1559	• Faults of electronic throttle valve self-learning process
P1564	• Failure of system voltage of meeting the self-learning conditions of electronic throttle valve.
P1565	• Initialized self-learning faults of electronic throttle valve lower limit position
P1568	• Overhigh return resistance of electronic throttle valve
P1579	• Failure of meeting the self-learning conditions of electronic throttle valve

Possible reasons

DTC	Detection strategy	Define the fault location
P1336	• Checking the hardware or harness	• Electronic-controlled throttle • Self learning of electronic throttle valve
P1545		
P1559		
P1564		
P1565		
P1568		
P1579		

Diagnostic process

Test condition	Details/results/measures
1. General inspection.	
	A. Check the main compressor relay and engine control module harness connectors for damage, poor contact, aging, loosening and other similar signs. B. Check whether the battery voltage is too low. C. Check whether the throttle valve is seized. Is it OK after checking? →**Yes** To step 2. →**No** Examine and repair the fault location.

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Test condition	Details/results/measures
2. Clear the trouble code.	
	A. Connect the equipment for diagnosing faults to the diagnostic interface. B. Operate the start switch to set the power mode to the “on” state. C. Clear the trouble code by using diagnostic equipment. Does the trouble code reappear? →**Yes** To step 3. →**No** Finish.
3. Check the faults of throttle valve circuit.	
	A. Check the faults of throttle valve circuit. **Refer to: “P0121, P0122, P0123, P0221, P0222, P0223”** **Fault diagnosis** Is it OK after checking? →**Yes** To step 4. →**No** Check and remove the faults of throttle valve circuit, and replace its harness if necessary.
4. Check the self-learning conditions of throttle valve.	
	A. Engine air inlet temperature **Standard value: >5°C** B. Engine water temperature **Standard value: 5°C~100.5°C** C. Engine speed **Standard value: ≤ 250rpm** D. Car speed **Standard value: =0** E. Battery voltage **Standard value: >10V** F. Opening of electronic accelerator pedal **Standard value: <14.9%** Are its self-learning conditions normal? →**Yes** To step 5. →**No** Ensure that all self-learning conditions are met.
5. Throttle valve self-learning	
	A. Perform the self-learning of throttle valve. Confirm that the fault has been ruled out.

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DTC P1610, P1626, P1631, P1632

DTC description

DTC	Description	Definition
P1610	• Anti-theft matching failure of ECM or eeprom status error	• While the ignition switch is ON, the engine control module (ECM) and body control module (BCM) communicate and certify the information with each other via CAN high-speed bus. After passing the certification, BCM allows the operation of starting motor. In case of turning off the key for starting, ECM controls the ignition and fuel injection, and the engine starts. If BCM can't receive the certification information from ECM, the starting motor can't work, and the engine will fail to start.
P1626	• Anti-theft certification communication error or response failure of anti-theft alarm	
P1631	• Failure of anti-theft certification	
P1632	• checksum error during anti-theft certification	

Possible reasons

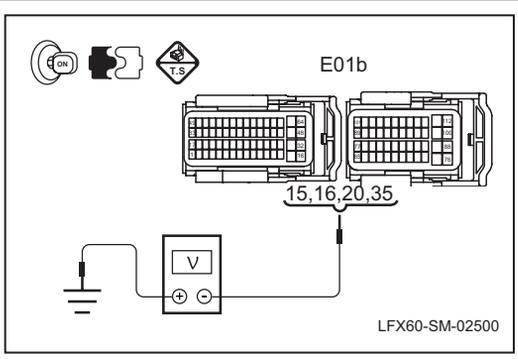
DTC	Detection strategy	Define the fault location
P1610	• Checking the hardware or harness	• Harness or circuit faults • BCM • ECM
P1626		
P1631		
P1632		

Diagnostic process

Test condition	Details/results/measures
1. General inspection.	
	A. Check the body control module and engine control module harness plugs for damages, poor contact, aging or loosening, etc. B. Check whether the voltage of battery or remote-control key is too low. Is it OK after checking? →**Yes** To step 2. →**No** Examine and repair the fault location.

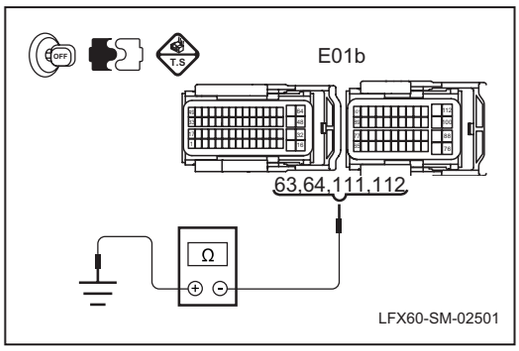
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Test condition	Details/results/measures
2. Read the trouble code.	
	A. Connect the equipment for diagnosing faults to the diagnostic interface. B. Operate the start switch to set the power mode to the “on” state. C. Read the trouble code by using diagnostic equipment. D. Check the body control module for relevant faults. Do their fault codes exist? →**Yes** Remove the relevant faults of body control module. →**No** To step 3.
3. Clear the trouble code.	
	A. Connect the equipment for diagnosing faults to the diagnostic interface. B. Operate the start switch to set the power mode to the “on” state. C. Clear the trouble code by using diagnostic equipment. Does the trouble code reappear? →**Yes** To step 4. →**No** Finish.
4. Check the communications between the body control module and engine control module.	
	A. Check CAN communications between the body control module and engine control module. **Refer to: “U140” troubleshooting** Is it OK after checking? →**Yes** To step 5. →**No** Remove its relevant faults.
5. Check the ECM power supply line.	
	A. Operate the start switch to set the power mode to the “on” state. B. Measure the voltage between terminals 15, 16, 20, 35 of the ECM harness connector E01b and the reliable ground point, respectively, with a multimeter. **Standard value: 11 ~ 14V** Is the voltage normal? →**Yes** To step 6. →**No** Troubleshoot the ECM power supply line and replace the harness if necessary.

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Test condition	Details/results/measures
6. Check the ECM grounding line.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the ECM harness connector E01b. D. Measure the resistance between the terminals 63, 64, 111, 112 of the ECM harness connector E01b and the reliable ground point with a multimeter. **Standard value: Less than 5** Is the resistance normal? →**Yes** To step 7. →**No** Troubleshoot the ECM grounding line and replace the harness if necessary.
7. Replace ECM.	
	A. Replace ECM. **Refer to: Replacement of engine control module** B. Set or program the anti-theft system. Is the system normal? →**Yes** Finish. →**No** To step 8.
8. Replace the body control module.	
	A. Replace the body control module. **Refer to: Replacement of body control module** B. Set or program the anti-theft system. Ensure that the system faults have been removed.

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DTC P2122, P2123, P2138

DTC description

DTC	Description
P2122	• Electronic accelerator pedal position sensor 1 signal voltage is too low
P2123	• Electronic accelerator pedal position sensor 1 signal voltage is too high
P2138	• The electronic accelerator pedal position sensor signal is unreasonable

Possible reasons

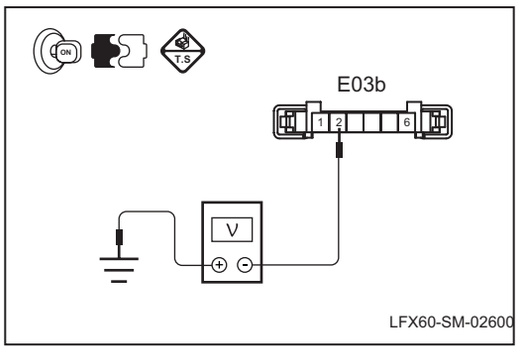
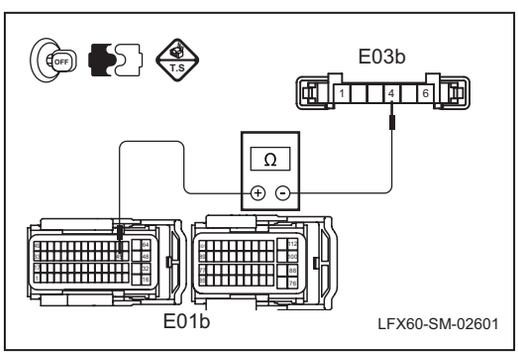
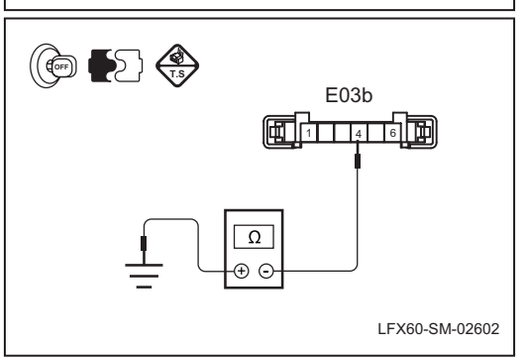
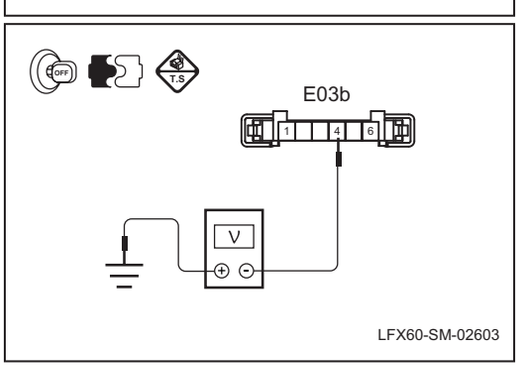
DTC	Detection strategy	Set the condition (control strategy)	Define the fault location
P2122	• Hardware or line check	• The fact that the electronically controlled throttle valve signal line is not within a reasonable range is detected by the engine control module	• Throttle pedal position sensor • Accelerator pedal position sensor line • ECM
P2123			
P2138			

Diagnostic process

Test condition	Details/results/measures
1. General inspection.	
	A. Check the throttle pedal position sensor and engine control module harness plug for breakage, loose contact, aging or looseness. Is it OK after checking? →**Yes** To step 2. →**No** Examine and repair the fault location.
2. Clear the trouble code.	
	A. Connect the equipment for diagnosing faults to the diagnostic interface. B. Operate the start switch to set the power mode to the “on” state. C. Clear the trouble code by using diagnostic equipment. Does the trouble code reappear? →**Yes** To step 3. →**No** Finish.

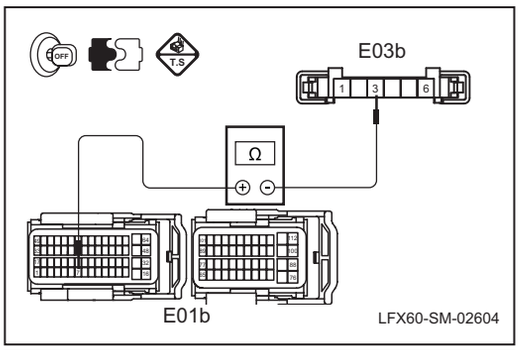
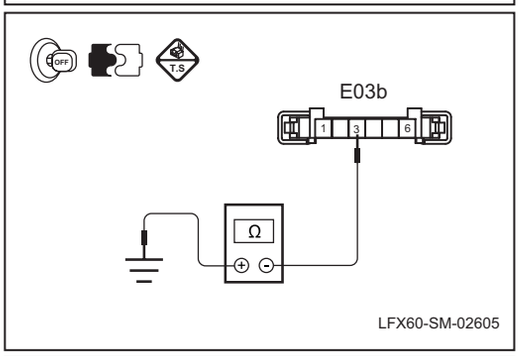
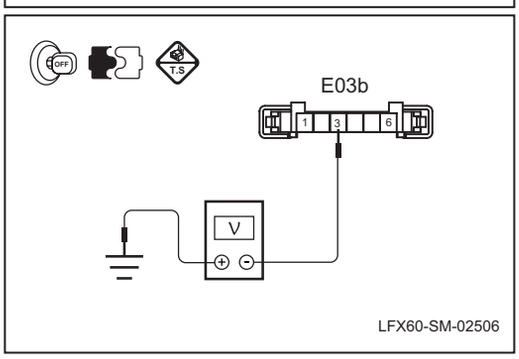
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Test condition	Details/results/measures
3. Check the throttle pedal position sensor 1 power line.	
	A. Operate the start switch to set the power mode to the “OFF” state. B. Disconnect the battery negative connector. C. Disconnect the throttle pedal position sensor harness plug E03b. D. Connect the battery negative terminal. E. Operate the start switch to set the power mode to the “on” state. F. Measure the voltage between the throttle pedal position sensor harness plug E03b terminal 2 and fixed ground point with the multimeter. **Standard value: 4.5 ~ 5.5 V** Is the voltage normal? →**Yes** Step 4. →**No** Repair the throttle pedal position sensor 1 power line fault and replace the harness if necessary.
4. Check the throttle pedal position sensor 1 signal line.	
  	A. Operate the start switch to set the power mode to the “OFF” state. B. Disconnect the battery negative connector. C. Disconnect the throttle pedal position sensor harness plug E03b. D. Disconnect the ECM harness connector E01b. E. Measure the resistance between the throttle pedal position sensor harness plug E03b terminal 4 and ECM harness plug E01b terminal 45 with the multimeter. **Standard value: Less than 5** F. Measure the resistance between the throttle pedal position sensor harness plug E03b terminal 4 and fixed ground point with the multimeter. **Standard value: 10MΩ or higher** G. Connect the battery negative terminal. H. Measure the voltage between the throttle pedal position sensor harness plug E03b terminal 4 and fixed ground point with the multimeter. **Standard value: 0V** Is it OK after checking? →**Yes** To step 5. →**No** Repair the throttle pedal position sensor 1 signal line fault and replace the harness if necessary.

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Test condition	Details/results/measures
5. Check the throttle pedal position sensor 1 ground circuit.	
 LFX60-SM-02604  LFX60-SM-02605  LFX60-SM-02506	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the throttle pedal position sensor harness plug E03b. D. Disconnect the ECM harness connector E01b. E. Measure the resistance between the throttle pedal position sensor harness plug E03b terminal 3 and ECM harness plug E01b terminal 7 with the multimeter. **Standard value: Less than 5** F. Measure the resistance between the throttle pedal position sensor harness plug E03b terminal 3 and fixed ground point with the multimeter. **Standard value: 10MΩ or higher** G. Connect the battery negative terminal. H. Measure the voltage between the throttle pedal position sensor harness plug E03b terminal 3 and fixed ground point with the multimeter. **Standard value: 0V** Is it OK after checking? →**Yes** To step 6. →**No** Repair the throttle pedal position sensor 1 ground circuit fault and replace the harness if necessary.
6. Check the throttle pedal position sensor.	
	A. Replace the throttle pedal position sensor. **Refer to: Replacement of accelerator pedal position sensor** Is it OK after checking? →**Yes** Replace the throttle pedal position sensor. →**No** Step 7.
7. Check ECM.	
	A. Replace ECM. **Refer to: Replacement of the engine control module (ECM)** Confirm that the fault has been ruled out.

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DTC P2127, P2128 & P2138

DTC description

DTC	Description
P2127	• Electronic accelerator pedal position sensor 2 signal voltage is too low
P2128	• Electronic accelerator pedal position sensor 2 signal voltage is too high
P2138	• The electronic accelerator pedal position sensor signal is unreasonable

Possible reasons

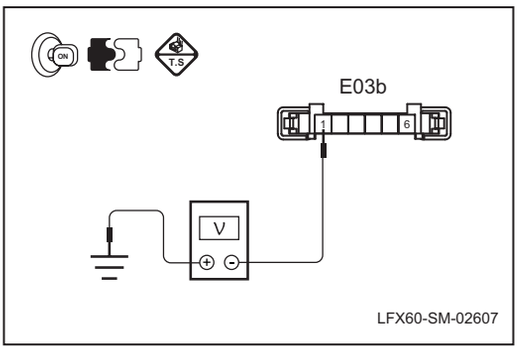
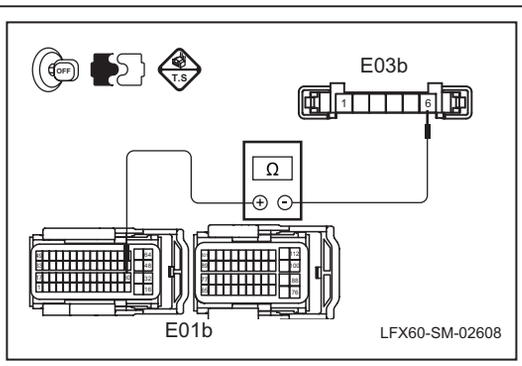
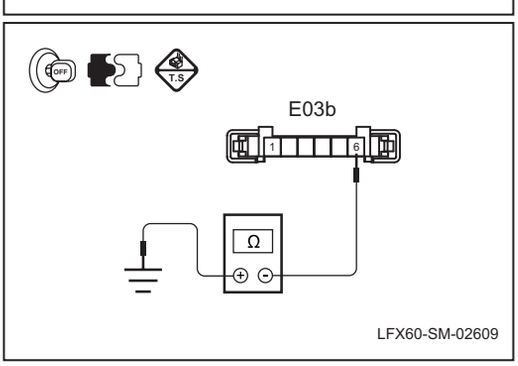
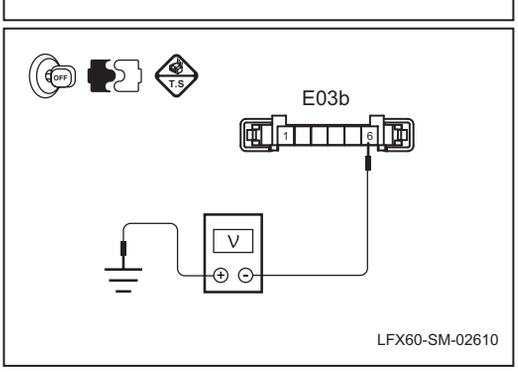
DTC	Detection strategy	Set the condition (control strategy)	Define the fault location
P2127	• Hardware or line check	• The fact that the electronically controlled throttle valve signal line is not within a reasonable range is detected by the engine control module	• Throttle pedal position sensor • Accelerator pedal position sensor line • ECM
P2128			
P2138			

Diagnostic process

Test condition	Details/results/measures
1. General inspection.	
	A. Check the throttle pedal position sensor and engine control module harness plug for breakage, loose contact, aging or looseness. B. Is it OK after checking? →**Yes** To step 2. →**No** Examine and repair the fault location.
2. Clear the trouble code.	
	A. Connect the equipment for diagnosing faults to the diagnostic interface. B. Operate the start switch to set the power mode to the “on” state. Clear the trouble code by using diagnostic equipment. Does the trouble code reappear? →**Yes** To step 3. →**No** Finish.

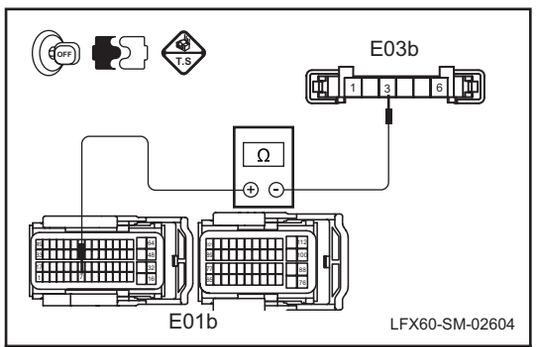
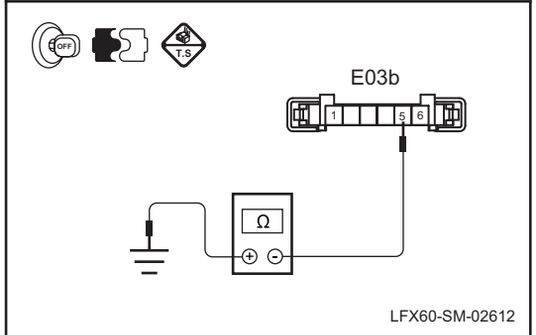
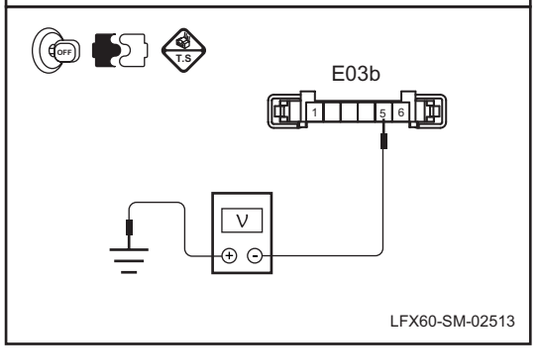
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Test condition	Details/results/measures
3. Check the throttle pedal position sensor 2 power line.	
	A. Operate the start switch to set the power mode to the “OFF” state. B. Disconnect the battery negative connector. C. Disconnect the throttle pedal position sensor harness plug E03b. D. Connect the battery negative terminal. E. Operate the start switch to set the power mode to the “on” state. F. Measure the voltage between the throttle pedal position sensor harness plug E03b terminal 1 and fixed ground point with the multimeter. **Standard value: 4.5 ~ 5.5 V** Is the voltage normal? →**Yes** Step 4. →**No** Repair the throttle pedal position sensor 2 power line fault and replace the harness if necessary.
4. Check the throttle pedal position sensor 2 signal line.	
  	A. Operate the start switch to set the power mode to the “OFF” state. B. Disconnect the battery negative connector. C. Disconnect the throttle pedal position sensor harness plug E03b. D. Disconnect the ECM harness connector E01b. E. Measure the resistance between the throttle pedal position sensor harness plug E03b terminal 6 and ECM harness plug E01b terminal 30 with the multimeter. **Standard value: Less than 5** F. Measure the resistance between the throttle pedal position sensor harness plug E03b terminal 6 and fixed ground point with the multimeter. **Standard value: 10MΩ or higher** G. Connect the battery negative terminal. H. Measure the voltage between terminals 6 of the ECM harness connector E01b and the reliable ground point, respectively, with a multimeter. **Standard value: 0V** Is it OK after checking? →**Yes** To step 5. →**No** Repair the throttle pedal position sensor 2 signal line fault and replace the harness if necessary.

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Test condition	Details/results/measures
5. Check the throttle pedal position sensor 2 ground circuit.	
  	A. Operate the start switch to turn the power to OFF state B. Disconnect the battery negative connector. C. Disconnect the throttle pedal position sensor harness plug E03b. D. Disconnect the ECM harness connector E01b. E. Measure the resistance between the throttle pedal position sensor harness plug E03b terminal 5 and ECM harness plug E01b terminal 59 with the multimeter. Standard value:Less than 5Ω F. Measure the resistance between the throttle pedal position sensor harness plug E03b terminal 5 and fixed ground point with the multimeter. Standard value:10 MΩ or higher G. Connect the battery negative terminal. H. Measure the voltage between the throttle pedal position sensor harness plug E03b terminal 5 and fixed ground point with the multimeter. **Standard value:0V** Is it OK after checking? →Yes To step 6. →No Repair the throttle pedal position sensor 2 ground circuit fault and replace the harness if necessary.
6. Check the throttle pedal position sensor.	
	A. Replace the throttle pedal position sensor. Refer to: Is the replacement of the accelerator pedal position sensor checked properly? →Yes Replace the throttle pedal position sensor. →No Step 7.
7. Check ECM.	
	A. Replace ECM. **Refer to: Replacement of the engine control module(ECM)** Confirm that the fault has been ruled out.

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DTC P2177, P2178, P2187, P2188

DTC description

DTC	Description
P2177	• Too lean mixture (medium load area) as diagnosed with the fuel supply system
P2178	• Too rich mixture (medium load area) as diagnosed with the fuel supply system
P2187	• Too lean mixture (low load area) as diagnosed with the fuel supply system
P2188	• Too rich mixture (low load area) as diagnosed with the fuel supply system

Possible reasons

DTC	Detection strategy	Set the condition (control strategy)	Define the fault location
P2177	• Checking the hardware or harness	• The fuel correction exceeds the upper limit and the threshold exceeds 1. 23	• Front oxygen sensor • Front oxygen sensor line • Rear oxygen sensor • Rear oxygen sensor line
P2178		• Fuel correction exceeds lower limit and the threshold is less than 0. 77	
P2187		• The fuel correction exceeds the upper limit and the threshold exceeds 10	
P2188		• Fuel correction exceeds lower limit and the threshold is less than -10	

Diagnostic process

Test condition	Details/results/measures
1. General Inspection.	
	A. Check front/rear oxygen sensor and engine control module harness connectors for signs of damage, poor contact, aging, working loose, etc. Is it OK after checking? →Yes To step 2. →No Examine and repair the fault location.
2. Clear the trouble code.	
	A. Connect the equipment for diagnosing faults to the diagnostic interface. B. Operate the start switch to turn the power to ON state C. Clear the trouble code by using diagnostic equipment. Does the trouble code reappear? →Yes To step 3. →No Finish.

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Test condition	Details/results/measures
3. Look for the front oxygen sensor signal fault.	
	A. Look for the front oxygen sensor signal fault. **Refer to: DTC TROUBLESHOOTING TABLE** Is it OK after checking? →Yes To step 4. →No Repair the front oxygen sensor signal fault.
4. Look for the rear oxygen sensor signal fault.	
	A. Look for the rear oxygen sensor signal fault. **Refer to: DTC TROUBLESHOOTING TABLE** Confirm that the fault has been ruled out.

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DTC U0001, U0121, U0140

DTC description

DTC	Description
U0001	• CAN high speed transmission line fault
U0121	• ECU-ABS control module communication is lost
U0140	• The communication between ECU and BCM is lost or signal is abnormal

Possible reasons

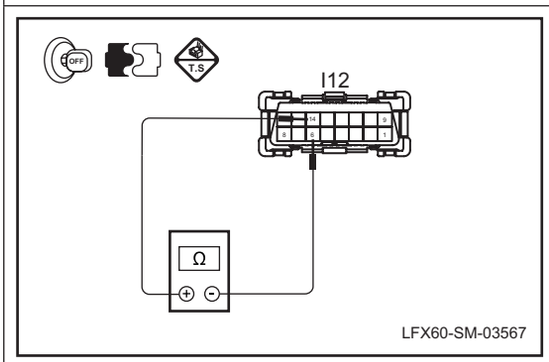
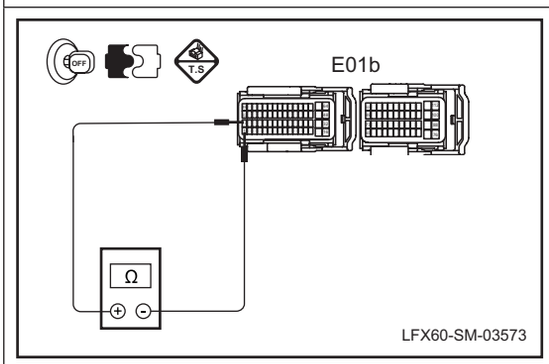
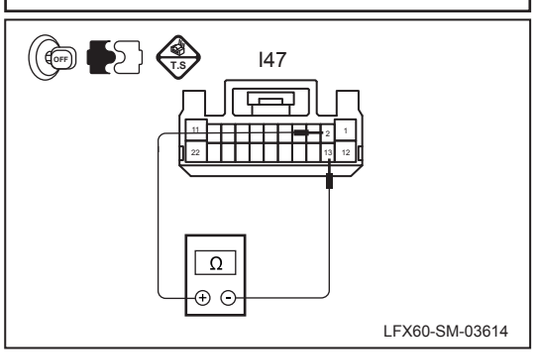
DTC	Detection strategy	Define the fault location
U0001	• Checking the hardware or harness	• CAN communication fault • Module fault
U0121		
U0140		

Diagnostic process

Test condition	Details/results/measures
1. General Inspection.	
	A. Check the engine control module, body control module, and ABS control module plugs for signs of damage, poor contact, aging, working loose, etc. Is it OK after checking? →Yes To step 2. →No Examine and repair the fault location.
2. Read the trouble code.	
	A. Connect the equipment for diagnosing faults to the diagnostic interface. B. Operate the start switch to turn the power to ON state C. Read the trouble code by using diagnostic equipment. Is there any other DTC? →Yes Eliminate other DTCs first. **Refer to: List of relevant DTCs** →No To step 3.

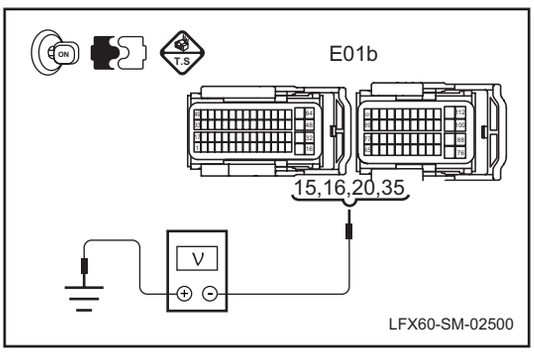
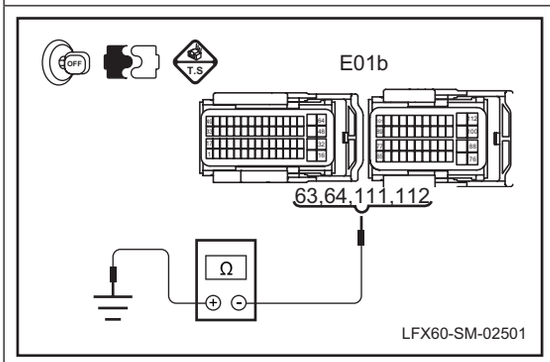
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Test condition	Details/results/measures
3. Clear the trouble code.	
	A. Connect the equipment for diagnosing faults to the diagnostic interface. B. Operate the start switch to turn the power to ON state C. Clear the trouble code by using diagnostic equipment. Does the trouble code reappear? →Yes To step 4. →No Finish.
4. Check CAN bus terminal resistance.	
	A. Operate the start switch to turn the power to OFF state B. Measure the resistance between the 6th and 14th terminals of the OBD diagnostic interface I12 with a multimeter. **Standard value:60±5Ω** →Yes Step 5. →No Examine and repair the fault location.
5. Check the CAN line of each control module.	
 	A. Operate the start switch to turn the power to OFF state B. Disconnect the battery negative cable. C. Disconnect the engine control module harness connector E01b. D. Measure the resistance between the 1st and 17th terminals of the engine control module harness connector E01b with a multimeter. **Standard value:120±5Ω** E. Plug the engine control module connector E01b. F. Disconnect the BCM plug I47. G. Measure the resistance between the 2nd and 13th terminals of the BCM harness connector I47 with a multimeter. **Standard value:120±5Ω** H. Plug the BCM plug I47. I. Disconnect the ABS control module plug U10. J. Measure the resistance between the ABS control module harness plug U10 terminal 14 and terminal 26 with the multimeter. **Standard value:60±5Ω** Is it OK after checking? →Yes Step 6. →No Examine and repair the fault location.

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Test condition	Details/results/measures
6. Check the ECM power supply line.	
	A. Operate the start switch to turn the power to ON state B. Measure the voltage between terminals 15, 16, 20, 35 of the ECM harness connector E01b and the reliable ground point, respectively, with a multimeter. **Standard value:11 ~ 14V** Is the voltage normal? →Yes To step 7. →No Troubleshoot the ECM power supply line and replace the harness if necessary.
7. Check the ECM grounding line.	
	A. Operate the start switch to turn the power to OFF state B. Disconnect the battery negative connector. C. Disconnect the ECM harness connector E01b. D. Measure the resistance between the terminals 63, 64, 111, 112 of the ECM harness connector E01b and the reliable ground point with a multimeter. **Standard value:Less than 5Ω** Is the resistance normal? →Yes To step 8. →No Troubleshoot the ECM grounding line and replace the harness if necessary.
8. Check ECM.	
	A. Replace ECM. **Refer to: Replacement of the engine control module(ECM)** Is the system normal? →Yes Replace ECM. →No Step 9.
9. Check the ABS control module or body control module.	
	A. Replace the ABS control module or body control module. **Refer to:Replacement of body control module or replacement of ABS** Confirm that the fault has been ruled out.

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Removal and installation

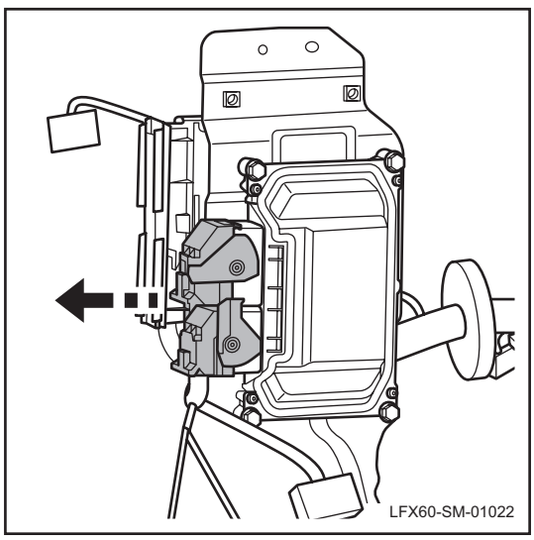
Electronic control unit (ECU)

Removal

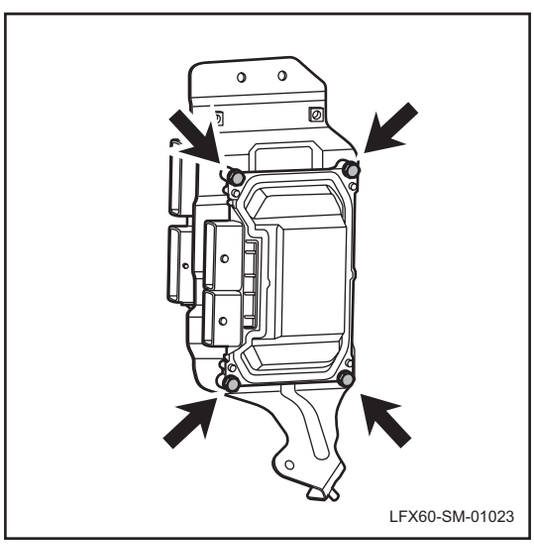
1. Remove the electronic control unit (ECU).

(a). Disconnect the battery negative connector.

(b). Remove the glove box. See: Replacement of dashboard assembly.



(c). Disconnect the electronic control unit (ECU) harness plug.



(d). Remove the four ECU fixing bolts.

(e). Take down the electronic control unit (ECU).

ⓘ Note:

After the removal, protect ECU against water and do not soak it in water. Handle ECU gently while removing it.

Installation

1. Install the electronic control unit (ECU).

(a). The installation sequence is the reverse of the disassembly order.

ⓘ Note:

Pay attention to static electricity protection during installation.

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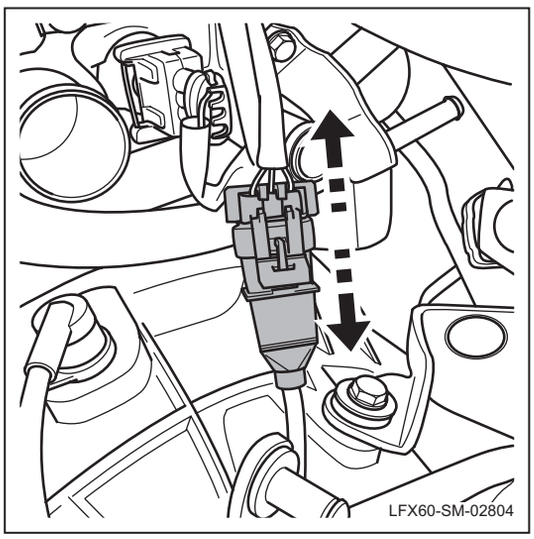
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Replacement of the crankshaft position sensor

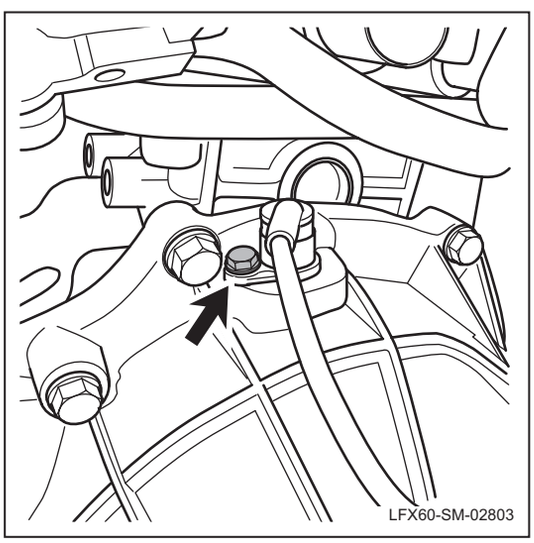
Removal

1. Remove the crankshaft position sensor.

(a). Disconnect the battery negative connector.



(b). Disconnect the crankshaft position sensor harness plug.



(c). Remove the crankshaft position sensor fixing bolt.

(d). Take down the crankshaft position sensor.

Note:

Screen the sensor notch to prevent the foreign body falling in the engine and causing damage.

Installation

1. Install the crankshaft position sensor.

(a). The installation sequence is the reverse of the disassembly order.

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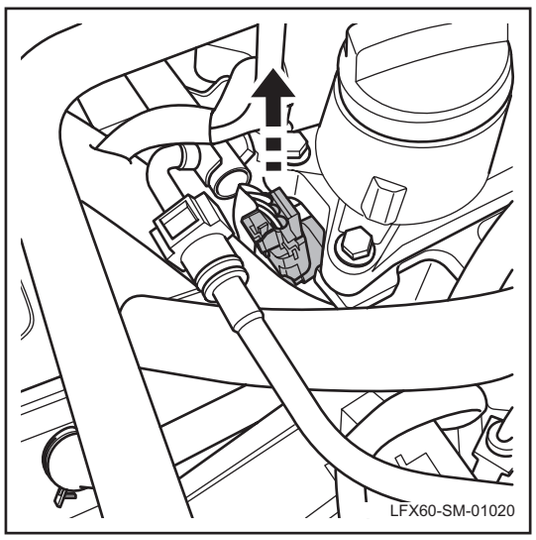
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Camshaft position sensor

Removal

1. Remove the camshaft position sensor.

(a). Disconnect the battery negative connector.



(b). Disconnect the camshaft position sensor harness plug.

(c). Remove the camshaft position sensor fixing bolt.

(d). Take down the camshaft position sensor.

Note:

Screen the sensor notch to prevent the foreign body falling in the engine and causing damage.

After the removal, clean the installation face and ensure there is no oil stain.

Installation

1. Install the camshaft position sensor.

(a). The installation sequence is the reverse of the disassembly order.

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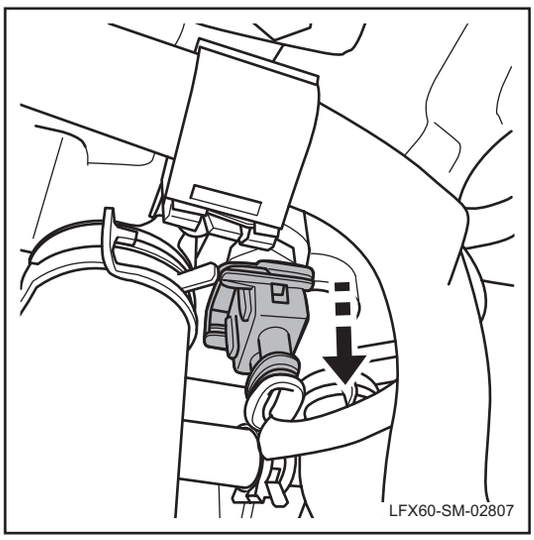
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Water temperature sensor

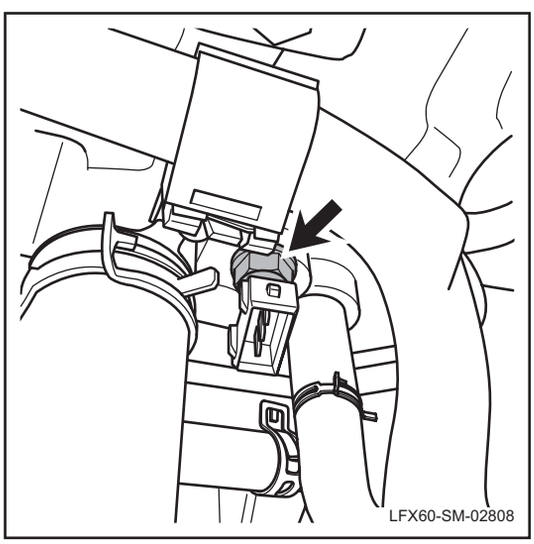
Removal

1. Remove the water temperature sensor.

(a). Disconnect the battery negative connector.



(b). Disconnect the water temperature sensor harness connector.



(c). Remove the water temperature sensor.

Note:

Screen the sensor notch to prevent the foreign body falling in the engine and causing damage.

Installation

1. Install the water temperature sensor.

(a). The installation sequence is the reverse of the disassembly order.

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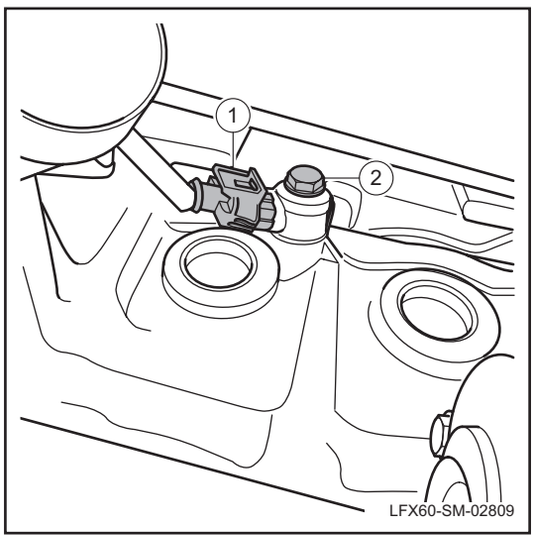
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Knock Sensor

Removal

1. Remove the knock sensor.

(a). Disconnect the battery negative connector.



(b). Disconnect the knock sensor harness plug 1.
(c). Remove the knock sensor fixing bolt 2.
(d). Take down the knock sensor.

Installation

1. Install the knock sensor.

(a). The installation sequence is the reverse of the disassembly order.

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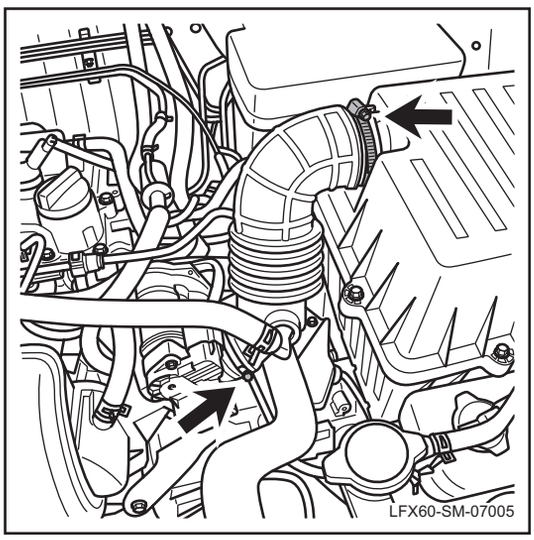
Replacement of electronic throttle body assembly

Removal

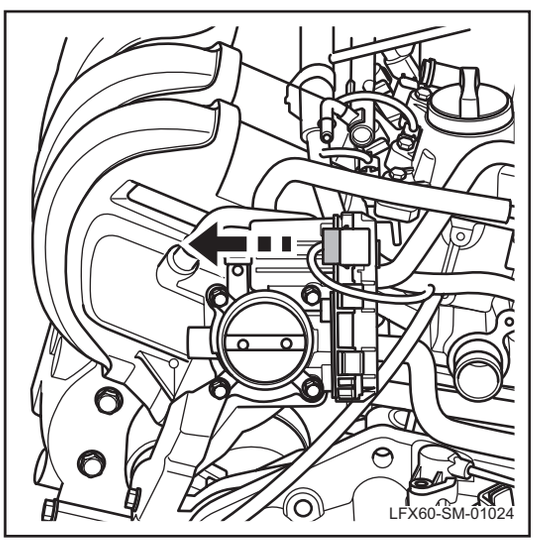
1. Remove the electronic throttle body assembly.

(a). Open the engine compartment door.

(b). Disconnect the battery negative connector.



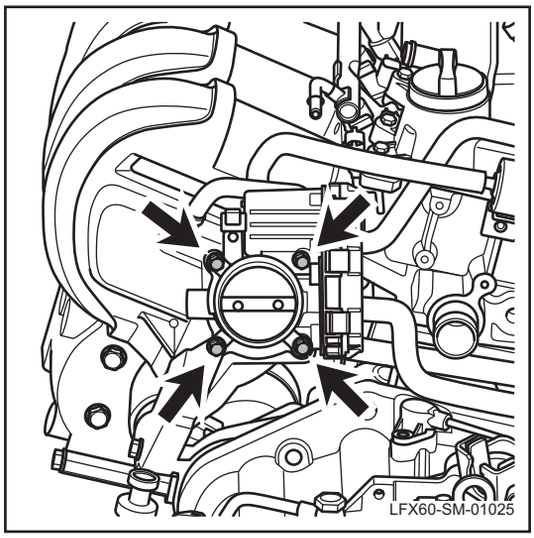
(c). Disconnect the air intake duct fixing clamp.



(d). Disconnect the electronic throttle body assembly harness plug.

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(e). Remove the electronic-controlled throttle body fixing bolts.

(f). Loosen the electronic-controlled throttle bracket lower-side fixing bolts.

(g). Take down the electronic throttle body assembly.

Installation

1. Install the electronic throttle body assembly.

(a). The installation sequence is the reverse of the disassembly order.

Inspection

a. When not powered on, the valve plate should be at the mechanical LDC position. When being turned by hand, the valve plate should rotate smoothly. If the valve plate seizing occurs, it means the inside parts may be damaged.

b. Replace the electronic throttle body assembly if necessary.

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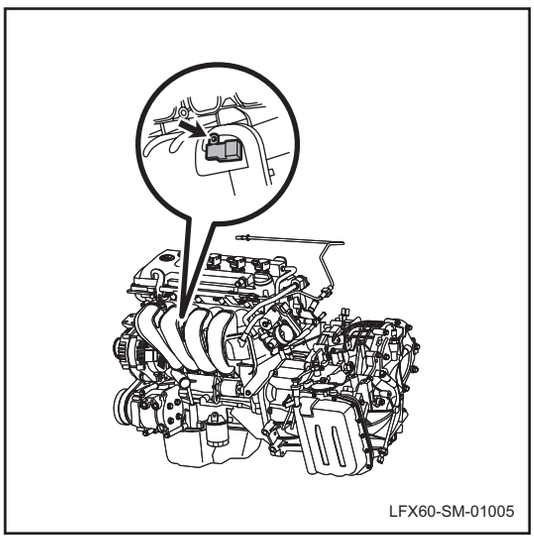
Replacement of intake pressure/temperature sensor

Removal

1. Remove the intake pressure temperature sensor

(a). Disconnect the battery negative connector.

(b). Remove the intake manifold. Refer to the replacement of intake manifold.



(c). Disconnect the intake pressure/ temperature sensor harness plug.

(d). Remove the intake pressure/ temperature sensor fixing bolt.

(e). Take out the intake pressure/ temperature sensor.

Installation

1. Install the intake pressure temperature sensor

(a). The installation sequence is the reverse of the disassembly order.

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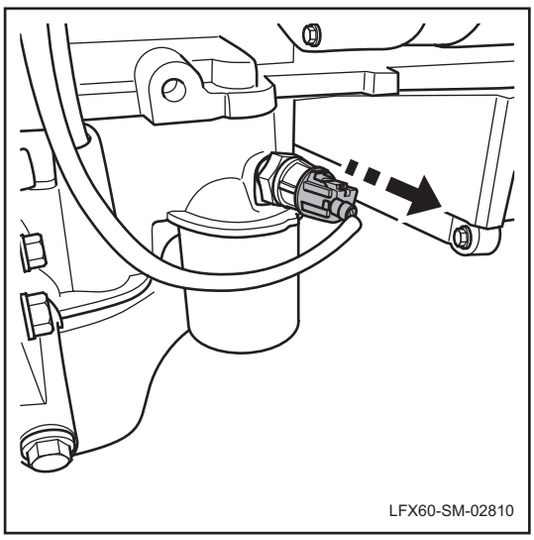
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Replacement of oil pressure sensor

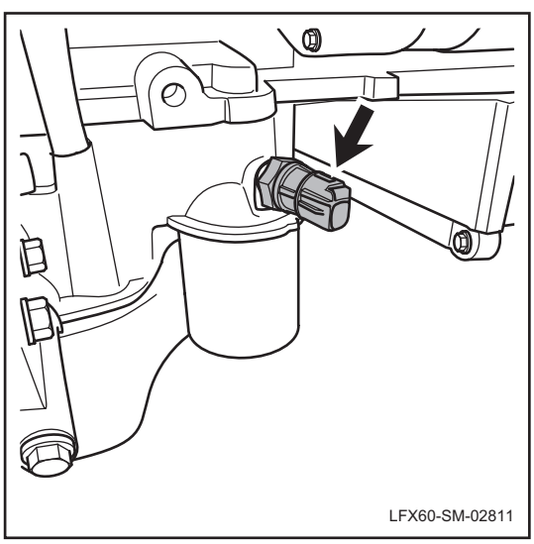
Removal

1. Remove the oil pressure sensor.

(a). Disconnect the battery negative connector.



(b). Disconnect the oil pressure sensor harness plug.



(c). Remove the oil pressure sensor.

Installation

1. Install the oil pressure sensor.

(a). The installation sequence is the reverse of the disassembly order.

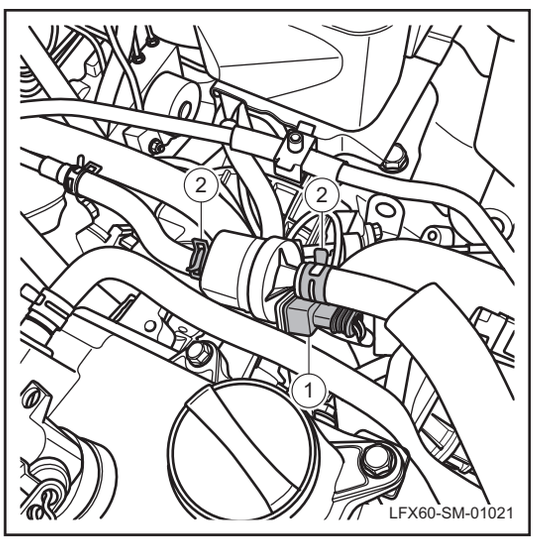
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Replacement of canister control valve

Removal

1. Remove the canister control valve.



(a). Disconnect the battery negative connector.

(b). Disconnect the canister control valve harness plug 1.

(c). Remove the charcoal canister solenoid valve connection hose clamp 2.

(d). Disengage the charcoal tank solenoid valve connection hose.

(e). Take down the canister control valve.

Installation

1. Install the canister control valve.

(a). The installation sequence is the reverse of the disassembly order.

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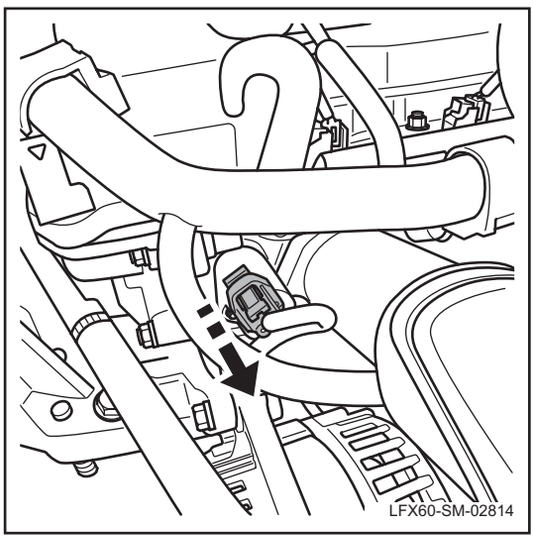
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Replacement of air intake VVT valve

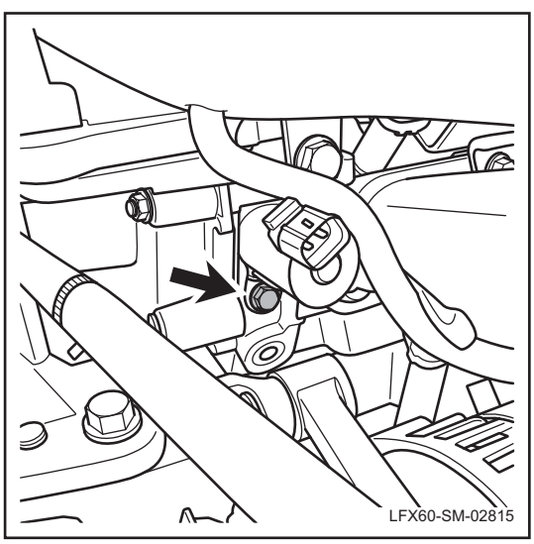
Removal

1. Remove the air intake VVT valve.

(a). Disconnect the battery negative connector.



(b). Disconnect the air intake VVT valve harness plug.



(c). Remove the air intake VVT valve fixing bolt and take down the VVT valve.

Installation

1. Install the air intake VVT valve.

(a). The installation sequence is the reverse of the disassembly order.

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02- Engine

Lubrication System 2-495
Technical specifications 2-495
Precautions.....2-497
Preparation 2-498
Structure and installation location.....2-499
Electrical Schematic Diagram.....2-500
General Inspection.....2-501
Operating Principle 2-503
Diagnostic Information and Procedures..2-504
Removal and Installation 2-510

AutoLibrary

AutoLibrary

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Lubrication System

Technical specifications

General specifications

Engine oil grade		5W-30-SF or better
Oil filling		4L
Oil pressure	Idle speed	60~300kpa
	Calibrated speed	400~570kpa
Clearance for the oil pump driving rotor/driven rotor top:	Minimum clearance value	0. 06mm
	Maximum clearance value	0. 17mm
Clearance for the rotor (driving/driven) / oil pump housing top		0. 025-0. 062mm
Clearance between the driven rotor and oil pump housing		0. 08~0. 16mm

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Torque Specifications

Name	Torque range	
	Metric (Nm)	British (lb-ft)
Oil sump drain bolt	44	32
Oil filter	27	20
Oil sump fixing bolt	10	7
Oil pump mounting bolt	11	8
Oil pump cover fixing screw	11	8
Oil pump relief valve plug	11	8
Oil pressure sensor	15	11
Set bolt of the flexible rail of timing chain	19	14
Timing chain fixed rail mounting bolts	13	10
Front enclosure mounting bolts	23	17
Tensioner hold-down nuts	11	8
Crankshaft pulley fixing bolts	138	102
Oil level stick guide fixing bolt	11	8
Engine front suspension bracket mounting bolts	52	38
Set bolt of the belt tension pulley	69	51
Tensioning pulley fixing nut	29	21
Generator fixing bolt (long bolt)	54	40
Generator fixing bolt (short bolt)	25	18
Cylinder head cover fixing bolt	11	8
Water pump assembly fixing bolt	11	8
Ignition coil fixing bolt	11	8

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Precautions

Precautions

1. During the work of Lubrication system, be sure to start the work after the engine is cooled.
2. During the work, don't splash the oil on drive belt.
3. Collect the old engine oil and always maintain the service site clean.
4. Note the following several points for the use of sealant:

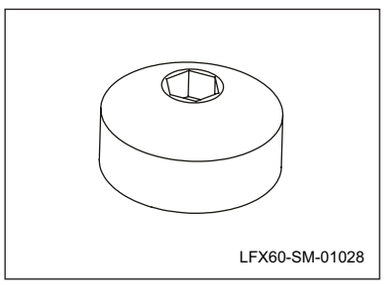
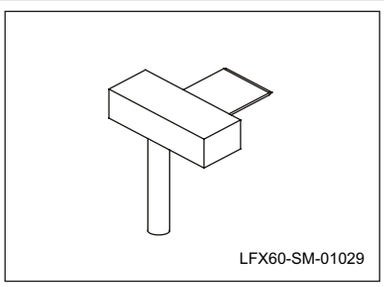
- **Use a scraper to thoroughly remove the residual sealant on the mounting surfaces (including the grooves of the applied surface of sealant, fixed bolts and bolt mounting holes) of oil pan and cylinder block.**
- **When using sealant, wipe the applied surface of sealant and remove the water or other foreign matters.**
- **Remove the foreign matters from sealant immediately, if any.**

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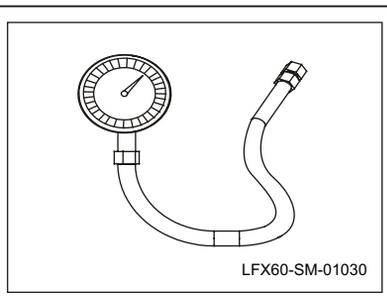
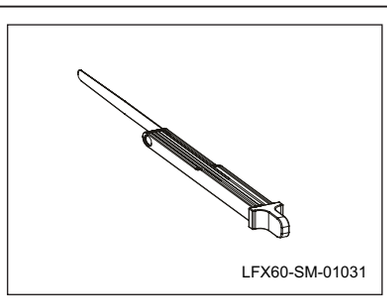
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Preparation

Special maintenance tools

No.	Tool name	Tool figure	Tool code	Remarks
1	Oil filter puller	 LFX60-SM-01028	-	Remove and install the oil filter
2	Oil sump remover	 LFX60-SM-01029	-	Install the front crankshaft oil seal.

General maintenance tools

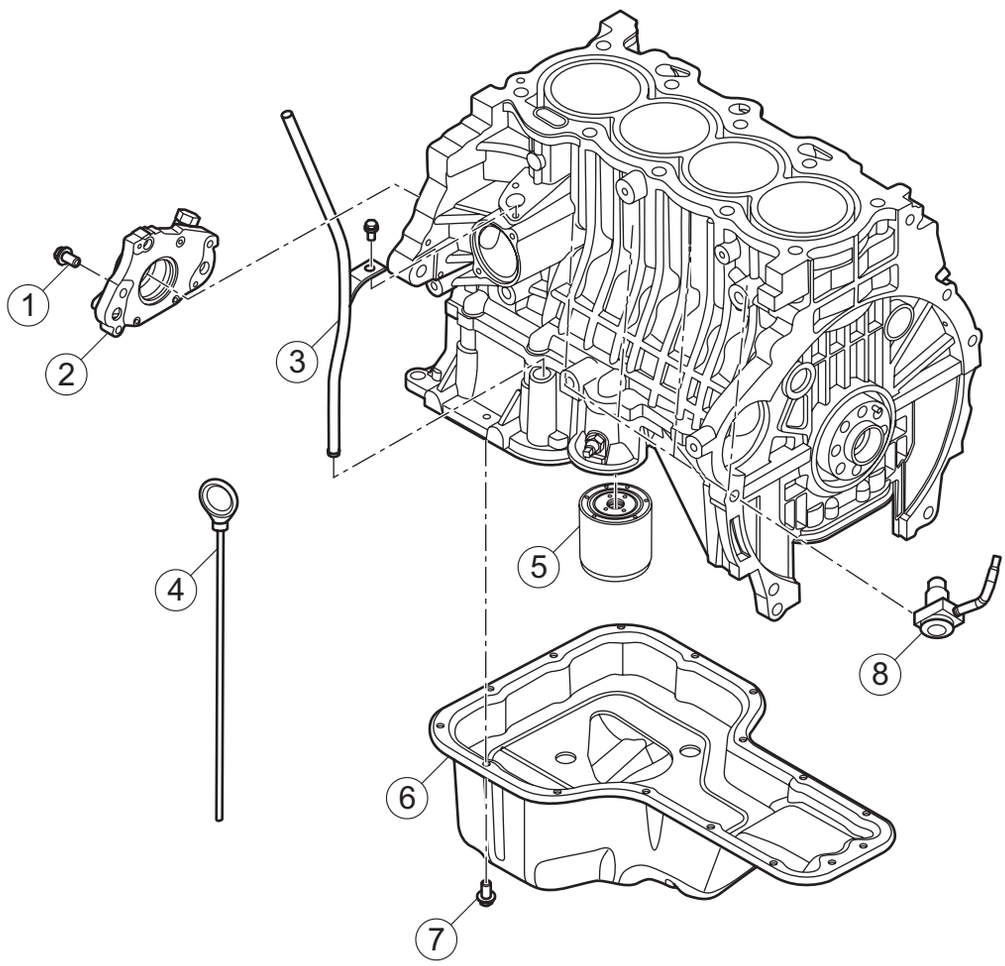
No.	Tool name	Tool figure	Tool code	Remarks
1	Oil manometer	 LFX60-SM-01030	-	To test engine oil pressure
2	Thickness gauge	 LFX60-SM-01031	-	Measure the part clearance

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Structure and installation location

Component Location Plan



LFX60-SM-01027

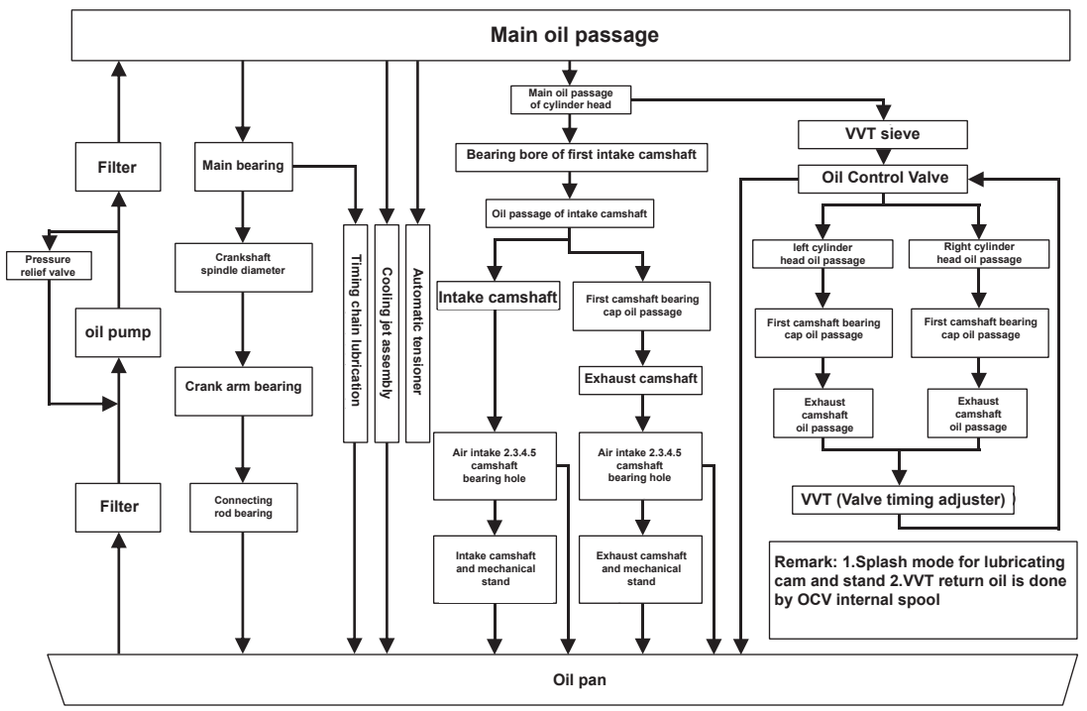
No.	Part Name
1	Bolt
2	Oil pump
3	O-il guage duct
4	Oil dipstick

No.	Part Name
5	Oil filter
6	Oil Pan
7	Bolt
8	Cooling jet assembly

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Electrical Schematic Diagram



LFX60-SM-01026

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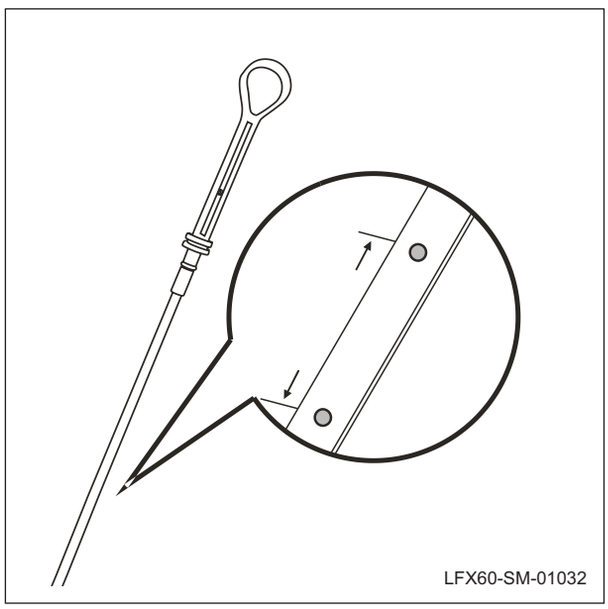
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General Inspection

Engine oil, filter, oil pressure

Inspection

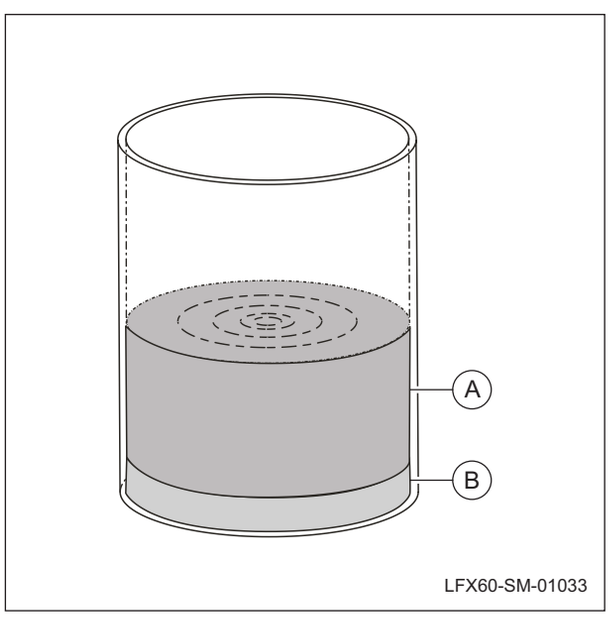
1. Check the engine oil



LFX60-SM-01032

(a). Check whether the engine oil level is between the upper and the lower level limits.

Note:
After the oil level is stable, remove the dipstick, wipe the oil on it with a clean cloth, insert it into its tube, and remove it for oil level check.



LFX60-SM-01033

(b). Drain a little volume of oil into a container and check the oil quality.

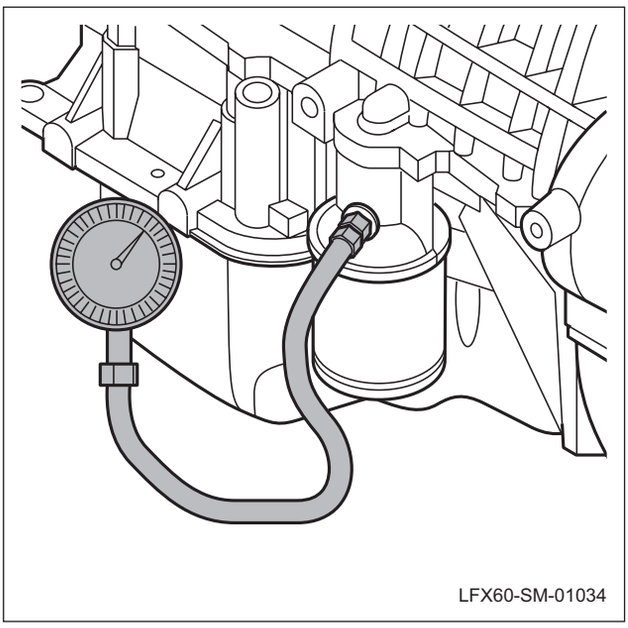
Note:
Check if the engine oil deteriorates, changes in color or mixes with water (A.engine oil, B: water). If yes, repleace it.

(c). Check the engine oil for poor quality, water entering, fading or thinning. If the oil quality is deteriorated, replace it.

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2. Check of oil pressure



(a). Disconnect the connector of oil pressure sensor.

(b). Dismount the oil pressure sensor and install oil pressure gauge.

(c). Warm the engine and observe the oil pressure gauge.

Oil pressure at idling:60~300kPa

Oil pressure at rated speed:400~570kPa

ℹNote:

If the pressure is not within the rated range, check the oil pump.

(d). Remove the pressure gauge, install the oil pressure sensor and connect the sensor connector.Remove the pressure gauge

Torque: 15Nm

ℹNote:

When installing the oil pressure sensor, coat the sensor threads with glue.It is prohibited to start the engine right after installing the oil pressure sensor.Wait a while before starting the engine.

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Operating Principle

System Overview

The lubrication system mainly consists of the oil pump, oil strainer, oil filter, oil filter bracket, oil sump, oil pressure switch, etc.When the engine works, it continuously transmits sufficient clean oil with proper temperature to the friction surfaces of all the transimission parts.The oil forms films between the friction surfaces to realize liquid friction so as to reduce the friction resistance, decrease the power consumption and reduce the wearing of parts.In this way, thhe engine can work more reliable and durable.Use the oil pressure switch to monitor the oil pressure at real time to avoid the engine from serious damage.

Oil pump

The oil pump is independently installed on the timing chain shell and the driving gear is installed on the crankshaft.Because the oil pump gear and the oil pump driving gear on the crankshaft engage together, the oil pump starts to work when the crankshaft rotates.

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Diagnostic Information and Procedures

Diagnosis Instructions

Before trouble-shooting, first understand and get familiar with the working principle of lubrication system.This is helpful to determine the correct procedures of trouble-shooting when the trouble occurs.More important, it is also helpful to determine if the status described by the client is normal operation.

Any trouble-shooting for the lubrication system shall start from the inspection for the lubrication system, then guide the maintenance personnel to take next logic procedure to perform trouble-shooting.Comprehend and correctly use the diagnostic flow chart to shorten the diagnosis time and avoid the misjudgement.

General equipment

Digital multimeter
Diagnostic equipment of vehicle
Jumper wire
Oil pressure testor

Visual Inspection

1. Confirm the customer’s question.
2. Visually check for obvious signs of mechanical or electrical damage.

Visual inspection table

Mechanical
• Engine oil • Oil pressure switch • Oil filter • Oil pump • Strainer

3. If the observed or raised problem is the evident and the cause has been found, ensure to fix this fault before proceeding with the next step.
4. If for the problem, there are no obvious findings, then confirm the fault and refer to the symptom table.

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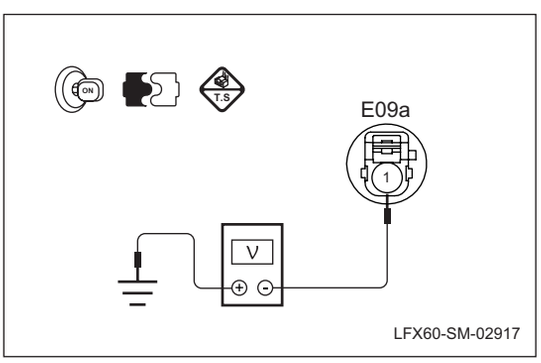
List of fault symptoms

Symptom	Possible Cause	Recommended Measures
Oil abnormal consumption	• Oil seal or other parts leak	• Check and replace the leaking part.
	• Ventilation system of crank case in trouble	• Check and replace the damaged part on the ventilation system of crank case.
	• Combustion chamber abnormal consumption	• Engine mechanical fault
Oil pressure warning lamp fails	• Oil pressure alarm	**Refer to:Trouble-shooting procedure for oil pressure warning lamp failing**
	• Oil pressure alarming circuit	
	• Instrument cluster	
Oil pressure warning lamp normally on	• Oil pressure low	**Refer to:Trouble-shooting procedure for oil pressure warning lamp normally on**
	• Oil pressure alarm	
	• Oil pressure alarming circuit	
	• Instrument cluster	

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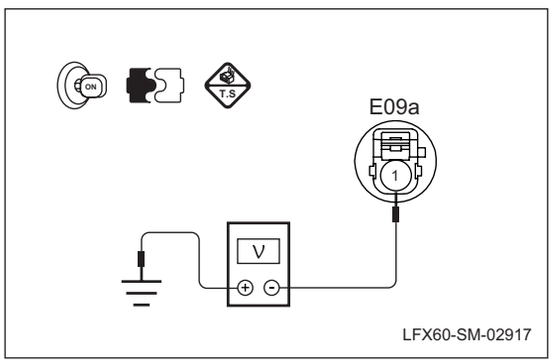
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Trouble-shooting procedure for oil pressure warning lamp failing

Test condition	Details/results/measures
1. Check the oil pressure alarm.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the oil pressure alarm plug E09a. D. Connect the battery negative terminal. E. Operate the ignition switch to turn the power to ON state. F. Ground No.1 terminal of oil pressure switch connector E09a to the reliable grounding with a jumper wire. Is the oil pressure warning lamp on? →**Yes** Replace the oil pressure alarm. →**No** To step 2.
2. Check the input voltage of oil pressure beeper.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the oil pressure alarm plug E09a. D. Connect the battery negative terminal. E.Operate the ignition switch to turn the power to ON state. F. Measure the voltage beween No.1 terminal of oil pressure beeper E09a and the reliable grounding with a multimeter **Standard value:11 ~ 14V** Is the voltage normal? →**Yes** To step 3. →**No** To step 4.

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Test condition	Details/results/measures
3. Check the power supply circuit of oil pressure beeper.	
 LFX60-SM-02917	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the oil pressure alarm plug E09a. D. Disconnect the instrument cluster harness plug I29. E. Measure the resistance beween No.1 terminal of oil pressure beeper plug E09a and No.15 terminal of the combination instrument harness connector I29 with a multimeter **Standard value:Less than 5Ω** Is the resistance normal? →**Yes** To step 4. →**No** Check if the power supply circuit of oil pressure beeper is in trouble.Replace the harness if necessary.
4. Check the instrument cluster.	
	A. Replace the instrument cluster. **Refer to:Replacement of instrument cluster assembly** Confirm the fault is eliminated

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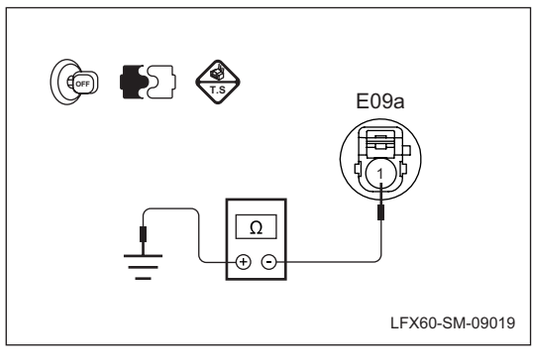
Trouble-shooting procedure for oil pressure warning lamp normally on

ℹNote:
Before trouble-shooting, make sure the oil level, viscosity and quality are normal, if necessary, replace or add the oil.

Test condition	Details/results/measures
1. Check the oil pressure.	
	A. Check the engine oil. B. heck the oil pressure. Is it OK after checking? →**Yes** To step 5 →**No** To step 2.
2. Check the oil strainer.	
	A. Check if the sieve of oil strainer gets deformed or blocked. Is it OK after checking? →**Yes** To step 3. →**No** Replace the oil strainer.
3. Check the oil pump.	
	A. Check the oil pump. Is it OK after checking? →**Yes** To step 4, →**No** Replace the oil pump. **Refer to:Oil pump**
4. Check the fit clearance of bearing shell	
	A. Decompose main bearing shell and connecting rod shell. B. Check the fit clearance between the main bearing shell and connecting rod shell. Is it OK after checking? →**Yes** To step 5, →**No** Repair the fit clearance of bearing shell to normal.

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Test condition	Details/results/measures
5.Check the circuit of oil pressure beeper.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the oil pressure alarm plug E09a. D. Measure the resistance beween No.1 terminal of oil pressure beeper plug E09a and the reliable grounding with a multimeter **Standard value:10 MΩ or higher** Is the resistance normal? →**Yes** To step 6. →**No** Check the oil pressure beeper circuit.If necessary, replace the harness.
6. Check the oil pressure alarm.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the oil pressure alarm plug E09a. D. Replace the oil pressure beeper. Is the troubleshooting successful? →**Yes** Replace the oil pressure alarm. →**No** To step 7.
7. Check the instrument cluster.	
	A. Replace the instrument cluster. **Refer to:Replacement of instrument cluster assembly** Confirm the fault is eliminated

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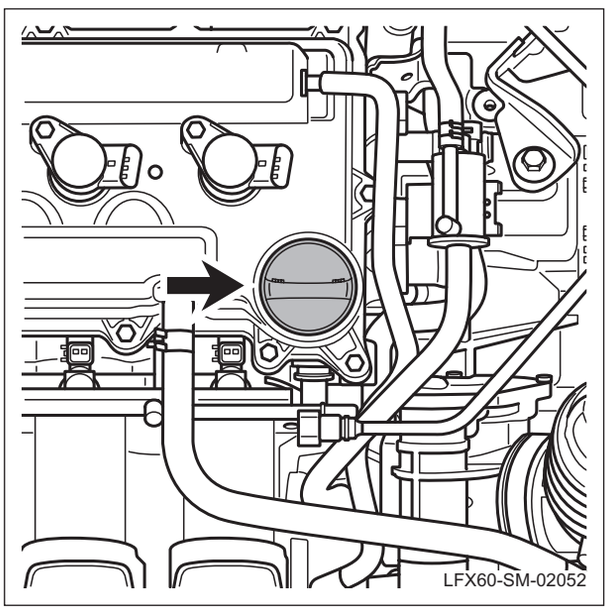
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Removal and Installation

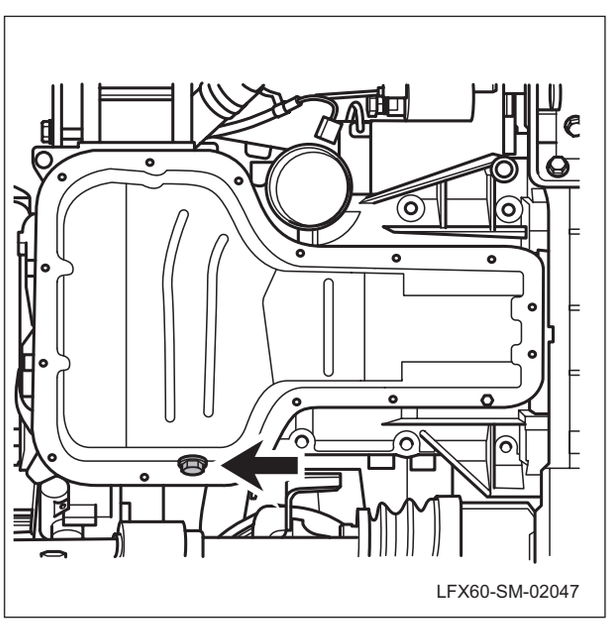
Removal and Installation

Removal

1. Discharge



(a). Undo the cover of oil filler port.



(b). Lift the vehicle
(c). Place oil collector under discharge bolt of oil sump.
(d). Dismantle discharge bolt to discharge engine oil.

2. Filling

(a). Install the oil drain bolt of oil sump.

ℹNote:

If necessary, replace the oil drain bolt and gasket ring.

(b). Lower the vehicle.
(c). Fill in the engine with oil of the type and amount specified in the table.

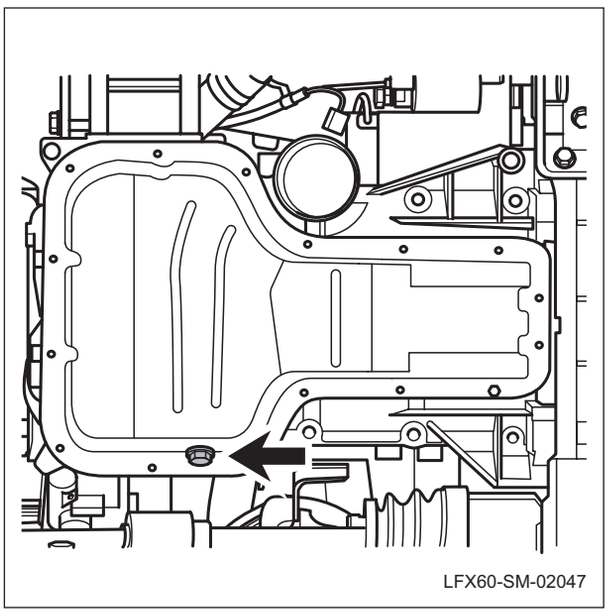
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Oil filter

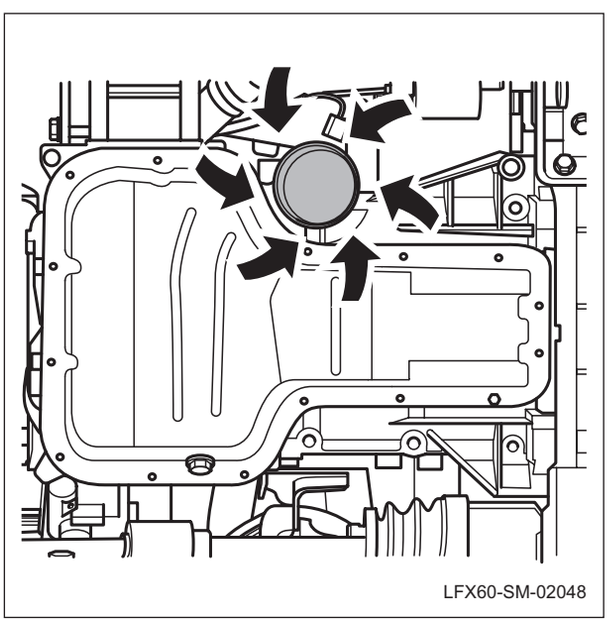
Removal

1. Dismount the oil filter.



LFX60-SM-02047

(a). Lift the vehicle
(b). Remove the oil drain plug to drain the oil from the engine.



LFX60-SM-02048

(c). Use the remover of oil filter to dismount the oil filter.

Note:

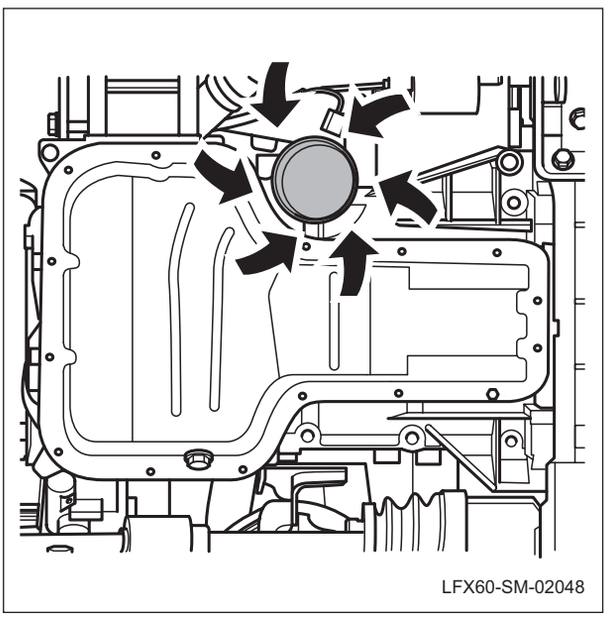
- **After the engine is cooled, perform the operation.**
- **During operation, prepare a piece of rag to clean up spilled or splashed engine oil.**
- **Do not splash the engine oil onto the drive belt.**
- **Thoroughly clean the oil splashed on the engine or body.**
- **If necessary, replace the oil drain bolt and gasket ring.**

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Installation

1. Install the oil filter.



LFX60-SM-02048

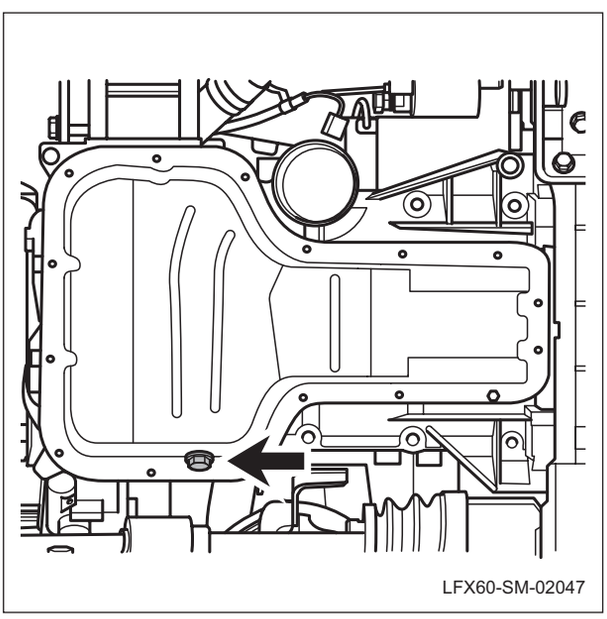
(a). Use the remover of oil filter to install the oil filter.

Note:

Use the genuine oil filter.

Before installing the oil filter, coat the sealer of oil filter with lubricant.

When installing the oil filter, first put it on the base manually until the O-ring completely seats on the base, then use the filter remover to tighten it.



LFX60-SM-02047

(b). Install the oil drain screw plug.
(c). Fill in proper oil.
(d). Start the engine and confirm there is no leakage.

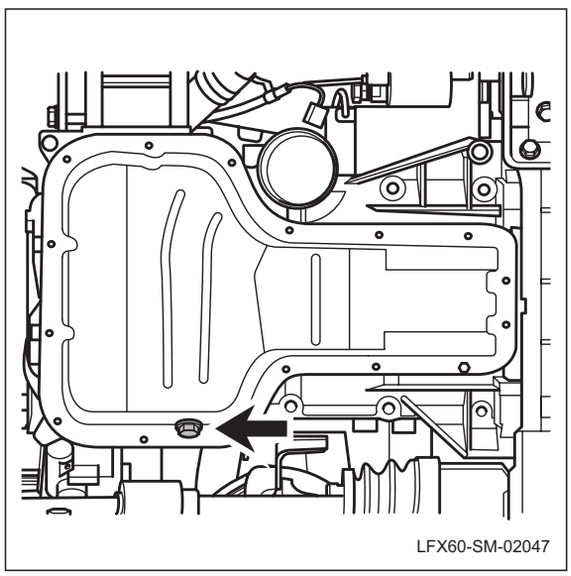
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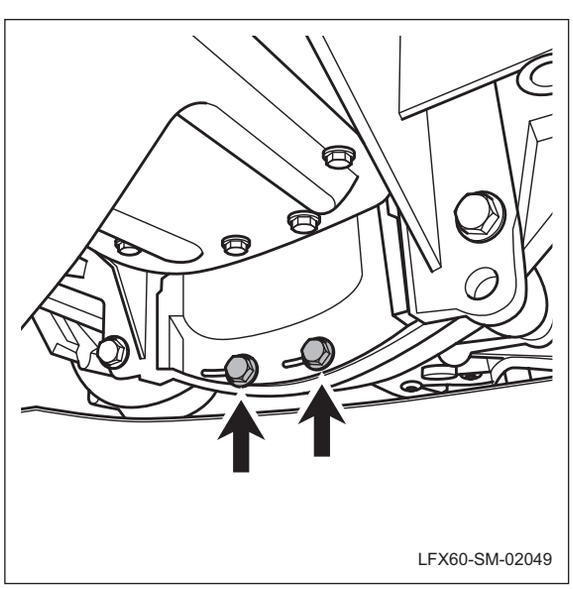
Replacement of oil sump assembly

Removal

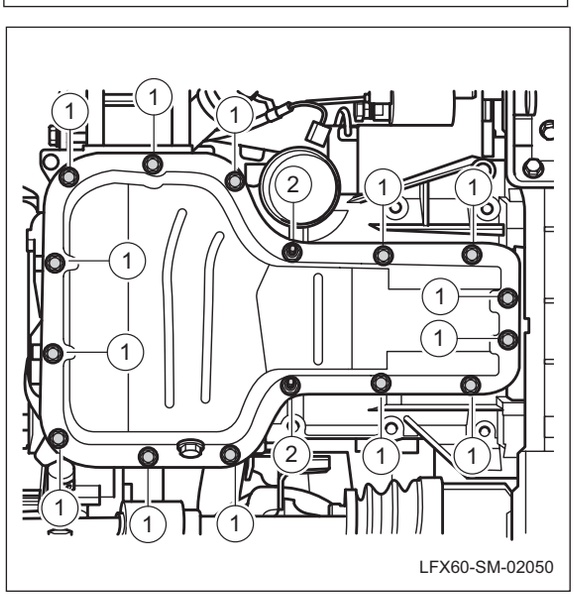
1. Dismount the oil sump assembly.


LFX60-SM-02047

(a). Lift the vehicle
(b). Remove the oil drain plug to drain the oil from the engine.


LFX60-SM-02049

(c). Dismount the tap bolts of flywheel baffle and detach them.



LFX60-SM-02050

(d). Dismount the tap bolt 1 and grip nut 2 of oil sump assembly.
(e). Detach the oil sump assembly.

Note:

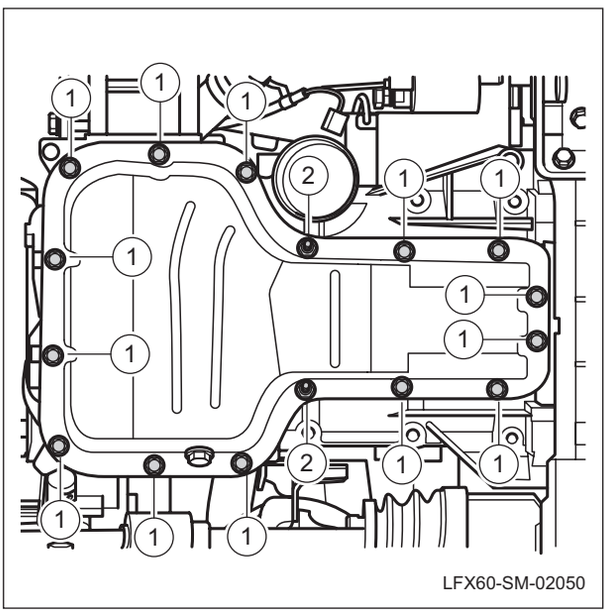
There an opening between the oil pan and crankcase, from which the oil pan can be separated from the crankcase.

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Installation

1. Install the oil sump assembly.



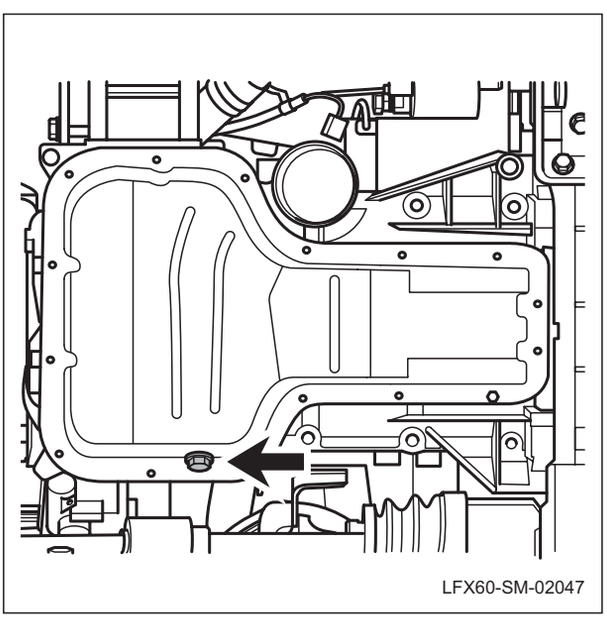
LFX60-SM-02050

(a). Install the oil sump by alternately tightening the tap bolts

Note:

Coat the sealant on the interface between the cylinder and oil sump before installing the oil sump.Make sure to install it before the sealant gets hard.

Torque: 10Nm


LFX60-SM-02047

(b). Install the oil drain screw plug.
(c). Lower the vehicle.
(d). Fill in the lubricant for the engine according to the standard.
(e). Check each joint and there should not be any leakage.

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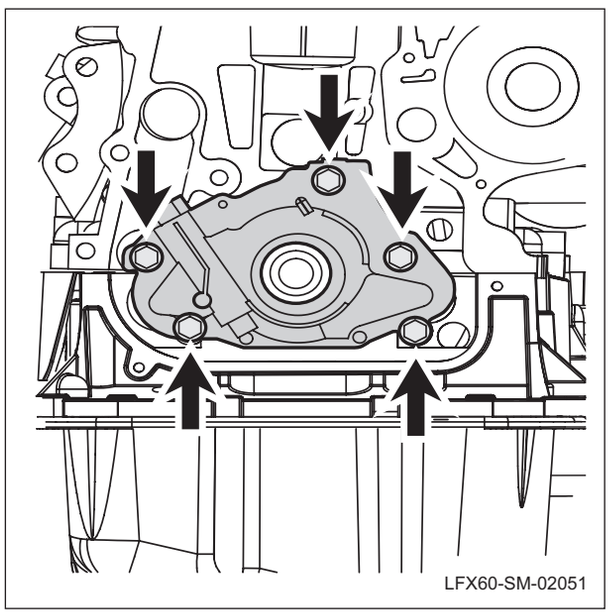
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Oil pump

Removal

1. Dismout the oil pump.

(a). Disconnect the battery negative terminal.



(b). Remove the camshaft cover. **Refer to: Replacement of the camshaft cover.**

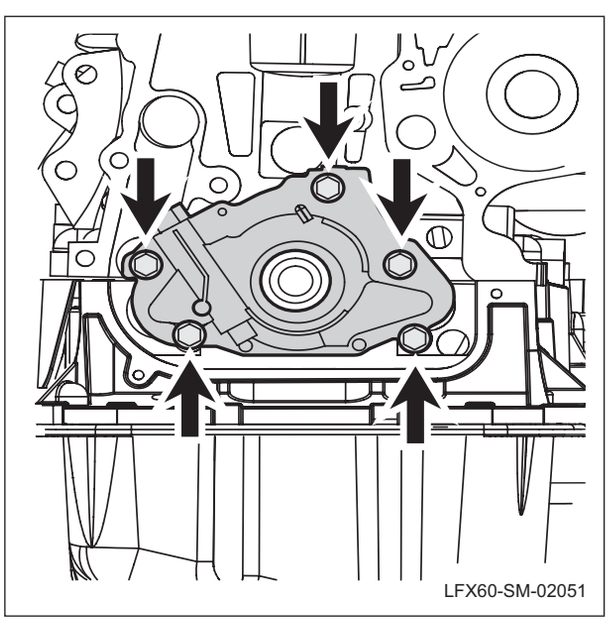
(c). Dismount the oil sump.**Refer to:Replacement of oil pan.**

(d). Remove the timing chain and sprocket components. **Refer to: Replacement of timing chain and sprocket assembly.**

(e). Dismount the tap bots of oil pump and detach the pump.

Installation

1. Install the oil pump.



(a). Install the oil pump and pad to the position.Put on the bolts and tighten them.

Torque: 11Nm

(b). Install the subassembly of timing chain and sprocket.**Refer to: Replacement of timing chain and sprocket assembly.**

(c). Install the oil sump.**Refer to:Replacement of oil pan.**

(d). Install the camshaft cover.**Reference: Replacement of camshaft cover.**

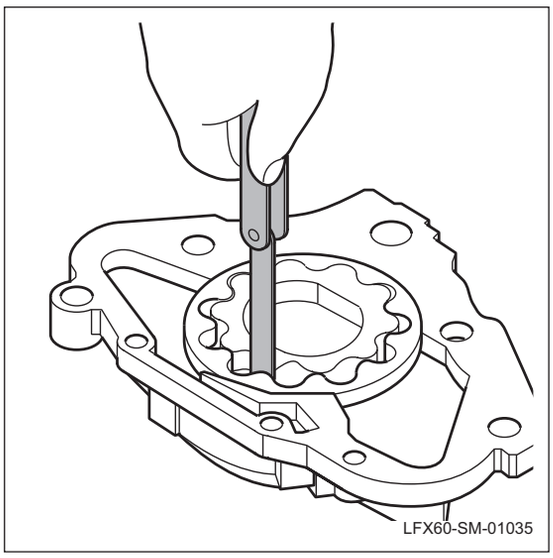
(e). Connect the battery negative terminal.

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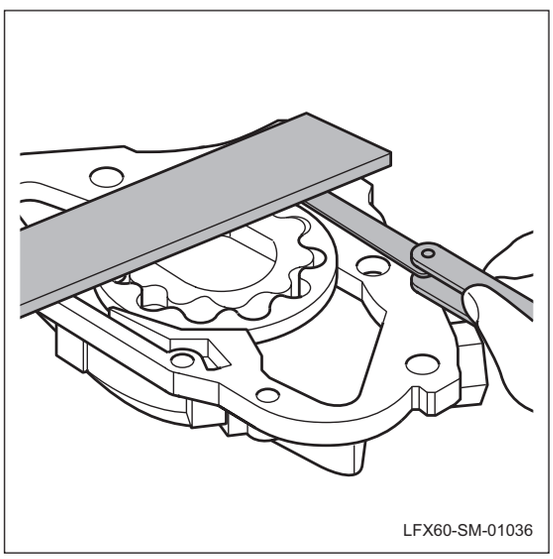
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Inspection

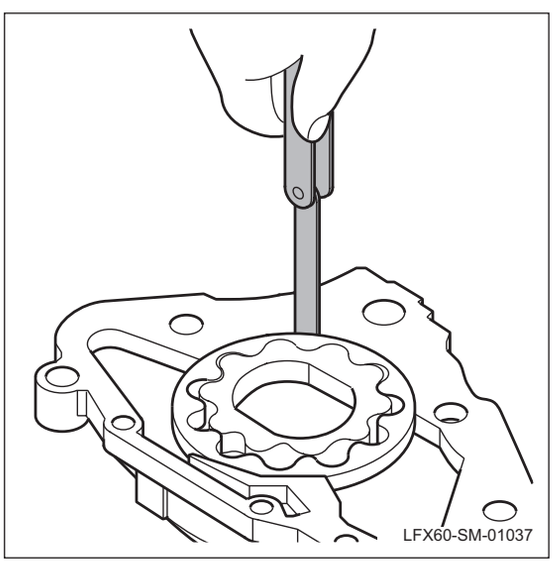
1. Check the subassembly of oil pump.



(a). Use a thickness gauge to measure the top clearance between the drive and driven rotators as shown in the diagram.If it is more than the maximum value, replace the oil pump.
Minimal gap: 0.06mm
Maximum gap: 0.17mm



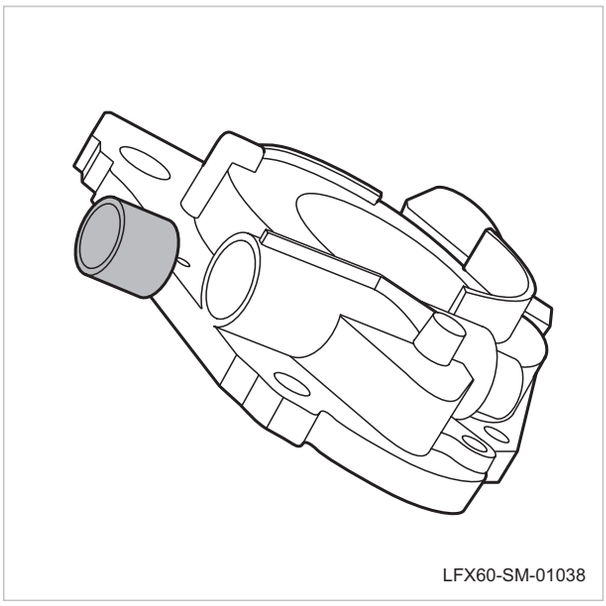
(b). Use a thickness gauge to measure the top clearance between the 2 rotators and the housing of oil pump as shown in the diagram.If it is more than the maximum value, replace the oil pump.
Standard gap: 0.025 ~ 0.062mm



(c). Use a thickness gauge to measure the top clearance between the driven rotator and the housing of oil pump as shown in the diagram.If it is more than the maximum value, replace the oil pump.
Standard gap: 0.08 ~ 0.01in

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LFX60-SM-01038

(d). Coat a layer of clean oil on the pressure relieve valve of oil pump.Check and confirm if the oil valve can slide into the valve hole by its own weight.If not, replace the oil pump.

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02 -Engine

Fuel System 2-521
Mechanical systems 2-521
Precautions..... 2-522
Preparation 2-523
Structure and installation location..... 2-524
Functional diagram 2-525
General Inspection..... 2-526
Diagnostic Information and Procedures...2-528
Removal and Installation 2-534

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Fuel System

Mechanical systems

General specifications

Capacity of fuel tank	(55±3)L
Model of fuel	92#
Normal pressure of fuel	(400±10)KPa
Resistance of oil level sensor (the highest value)	(30±2)Ω
Resistance of oil level sensor (the lowest value)	(300±3)Ω

Torque Specifications

Name	Torque range	
	Metric(Nm)	British (lb-ft)
Tap bolt for fuel tank	23	17
Tap bolt for carbon tube stand	23	17
Fuel filter support fixing bolt	9	7
Fuel tank cap	60	44

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Precautions

Precautions

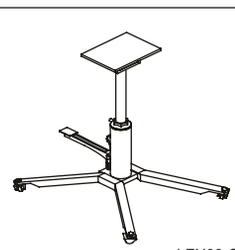
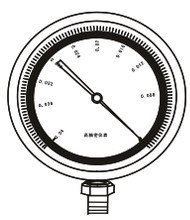
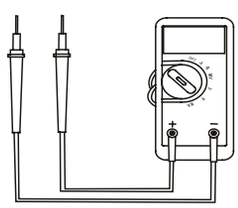
1. No matter whether the gasoline engine is running or not, do not connect any part (such as any cable of battery, injector, electrical fuel pump, ignition system wire, electrical control unit (ECU) circuit, air-condition circuit, etc.) in the system during the ignition switch is on.
2. No smoking and keep away from open fire during the operation of fuel system. Keep ventilated and make the corresponding fire extinguishers available on the maintenance site.
3. After the engine stops, a higher residual pressure still keeps in the fuel system. During the removal of any element of fuel system, be sure to release the pressure of fuel system first, so as to prevent the fuel from spraying out of the system, and avoid any personal injury or fire accident.
4. Before disconnecting any fuel pipe, it's required to clean the pipe and remove the dust or dirt near to it.
5. After disconnecting the fuel pipe, it's required to seal the pipe joint to avoid the entry of foreign substance into it.
6. During the maintenance, replace all the cracked, scratched or damaged nylon fuel pipes, and don't attempt to repair each section of nylon fuel pipe.
7. Carry out the emptying work before installing the fuel system.
8. During the installation of any new fuel pipe, don't hit any fuel pipe bundle clamp directly with a hammer, otherwise it may damage the nylon pipe, resulting in fuel leakage.
9. When connecting the fuel pipeline, make sure put a few drops of clean oil on the oil pipe joint to ensure the oil pipes connected correctly and prevent leakage (In correct operation, the O-ring in the socket will expand.If not lubricating it, it is not possible to install it correctly).
10. Prevent any rubber or leather tool or part from contacting the gasoline.
11. In order to avoid unexpected fire accident or explosion, don't pour the fuel into the opened container.

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Preparation

General maintenance tools

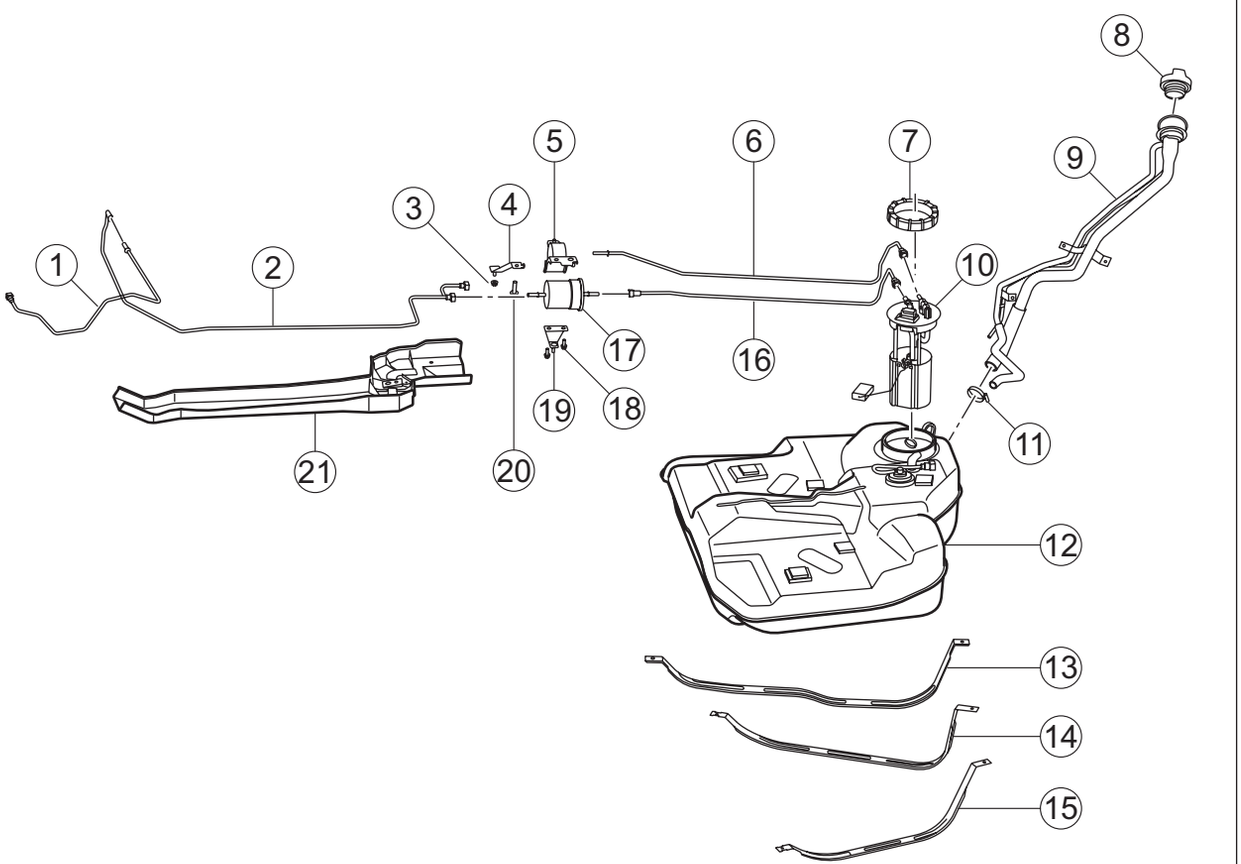
No.	Tool name	Tool figure	Tool code	Remarks
1	Bracket	 LFX60-SM-01039	-	Lift up the parts.
2	Oil pressure gauge	 LFX60-SM-01040	-	Measure the pressure of fuel in the fuel system.
3	Digital universal meter	 LFX60-SM-01041	-	Measure the current, voltage and resistance

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Structure and installation location

Component Location Plan



LFX60-SM-01042

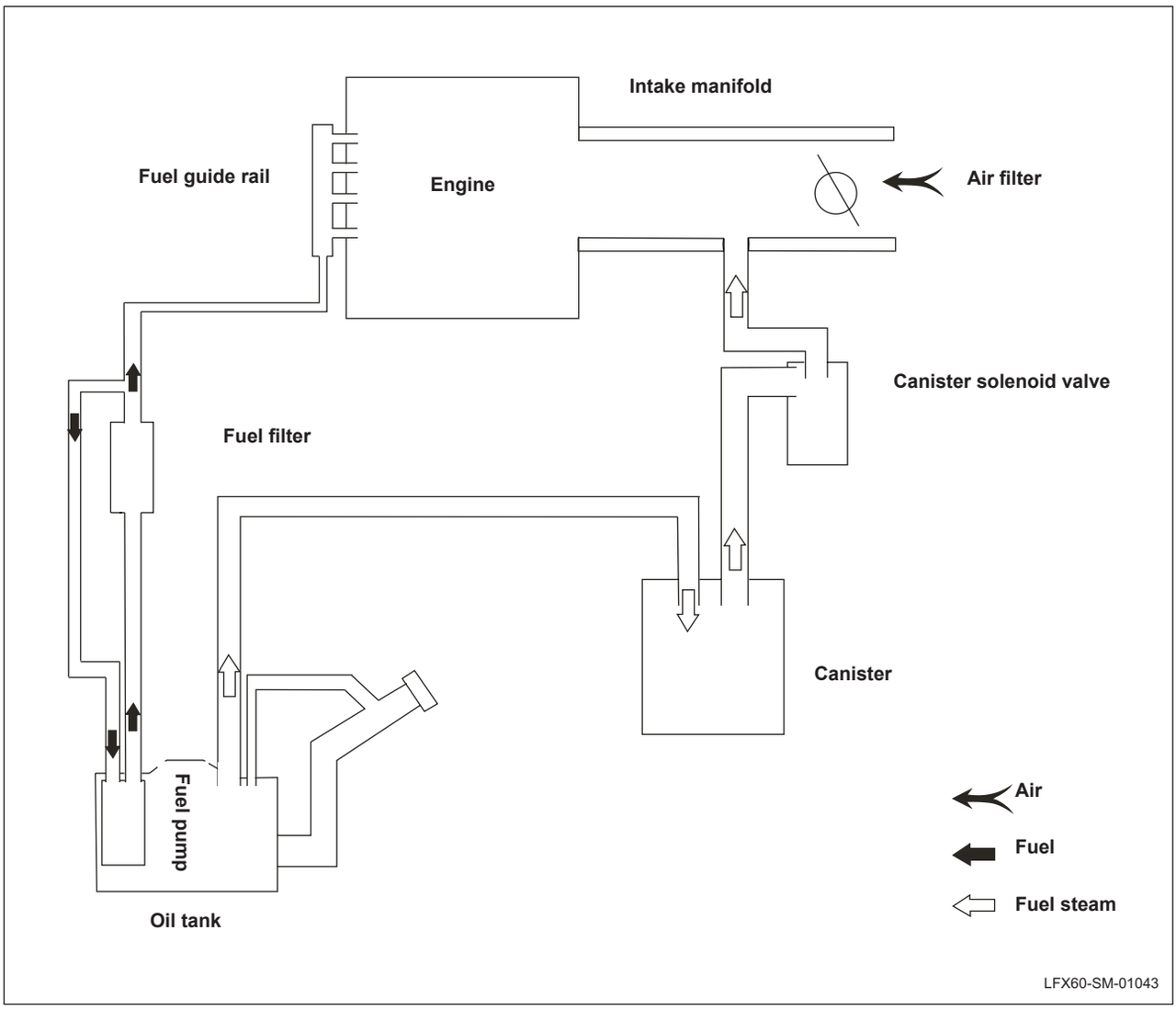
No.	Part Name
1	Engine sucker
2	Fuel pipe assembly
3	Stand grip nut
4	Filter support
5	Filter support
6	Filter outlet tube assembly
7	Fuel pump upper cover
8	Filler cap
9	Fuel filling pipe assembly
10	Fuel pump assembly
11	Clamp

No.	Part Name
12	Fuel tank assembly
13	Fuel tank bracket assembly
14	Fuel tank bracket assembly
15	Fuel tank bracket assembly
16	Fuel tank output pipe assembly
17	Fuel filter assembly
18	Bolt
19	Filter bracket
20	Bolt
21	Backplate of fuel braking line

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Functional diagram



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General Inspection

⚠Warning:

Gasoline or its boil-off gas is highly combustible.In order to avoid fire or explosion, keep far away from fire.The operator is forbidden to use a cell phone when performing this procedure.The discharged gasoline should not be stored in an open vessel. Prepare a dry chemical extinguisher nearby before executing this procedure.

Inspection of fuel pump assembly

1. Check if the fuel pump gasket ring is broken.If yes, replace it.
2. Unplug the harness plug and check if the pins of fuel pump plug are bent or corroded.If yes, replace the fuel pump assembly.

Inspection of fuel filter

1. Check if the fuel filter bolts are loose.If yes, reinstall them.
2. Check if the exterior housing of fuel filter is broken or there is leakage.If yes, replace the fuel filter.
3. Check if there is leakage at the joint of fuel filter pipeline.If yes, clean up the fuel filter and pipeline joint, then reinstall them.If there is still leakage, replace the fuel filter and connecting pipeline.

Inspection of filler cap and oil filing pipe

1. Undo the filler cap and check if there is obvious stain on the accessories of oiling port.Check if the gasket of oiling port is broken.If yes, replace the oil filing pipe and filler cap.
2. Check if the exterior housing of filler cap and string are broken.If yes, replace the filler cap.

Inspection of fuel tank

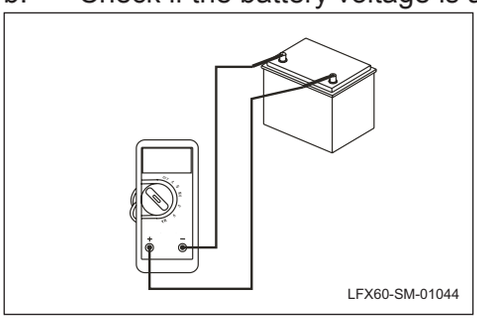
1. Check if the fuel tank bolts and nuts are loose.If yes, tighten them according to the regulation.
2. Check if there is leakage in the fuel tank.If yes, replace the fuel tank assembly.

Fuel supply pipeline and connecting parts

1. Check if the joint of fuel supply pipeline is corrected assembled.If not, reassemble it.
2. Check if the fuel supply pipeline and connecting parts are broken.If yes, replace the broken parts.

Test of fuel system pressure

a. Release the fuel system pressure.
b. Check if the battery voltage is around 12V.



ℹNote:

High or low voltage has direct influence on the supply pressure of fuel pump.

c. Disconnect the fuel track sucker.

ℹNote:

• After the pressure in the fuel system is released, there may be a little of fuel in the pipe; therefore, when the fuel pipe is disconnected, its connector should be wrapped with a cloth, to prevent fuel leakage.

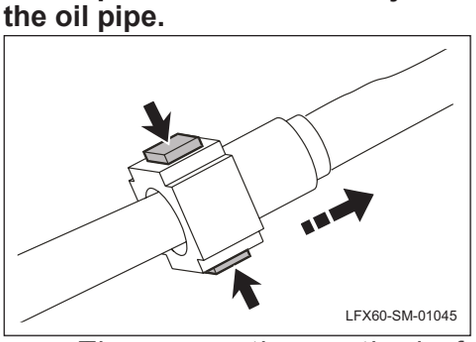
• Do not bend or twist the resin duct.

• If the fuel sprays, clean up the sprayed fuel to aovid the rubber or leather tools or parts from contacting gasoline.

d. Connect the special oil pressure gauge to the fuel system.

ℹNote:

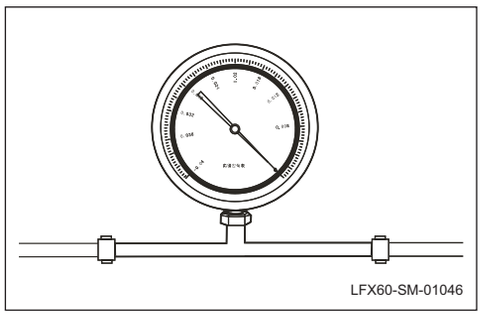
As shown in the diagram, press down the raised part at the resin duct joint and pull out the oil pipe.



e. The connecting method of special oil pressure gauge is shown in the diagram (sketch)

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f. Start the engine and maintain it at idling.

ℹNote:

Before starting the engine, accumulate the pressure.Switch on the ignition switch to fill up the fuel pipeline before starting the engine.

g. Read the value on the pressure gauge.If it does not meet the requirement, replace the fuel pump.

Fuel pressure: XXX

h. Switch off the ignition switch.

i. Release the fuel pressure.

j. Remove the special oil pressure gauge, recover the fuel pipeline.

ℹNote:

• When hearing a sharp click, it means the resin oil duct joint is in place.

• Pull out the oil duct joints at the two ends of oil pressure gauge and take the gauge out.

k. Start the engine after the fuel pressure is accumulated.

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Diagnostic Information and Procedures

Diagnosis Instructions

Before trouble-shooting, first understand and get familiar with the working principle of fuel system. This is helpful to determine the correct procedures of trouble-shooting when the trouble occurs. More important, it is also helpful to determine if the status described by the client is normal operation.

Any trouble-shooting for the fuel system shall start from the inspection for the fuel system, then guide the maintenance personnel to take next logic procedure to perform trouble-shooting.

Comprehend and correctly use the diagnostic flow chart to shorten the diagnosis time and avoid the misjudgement.

General equipment

Digital multimeter
Diagnostic equipment of vehicle
Fuel pressure gauge

Visual Inspection

1. Confirm the customer's question.
2. Visually check for obvious signs of mechanical or electrical damage.

Visual inspection table

Mechanical	Electrical
• Fuel filter not installed correctly • Fuel filter broken • Oil filling pipe of fuel tank broken • Filler cap of fuel tank broken • Fuel feed pipe broken • Fuel tank broken	• Electrical fuel pump fuse • harness connector • Electrical fuel pump relay • Electrical fuel pump circuit • Electric fuel pump

3. If the observed or raised problem is the evident and the cause has been found, ensure to fix this fault before proceeding with the next step.
4. If for the problem, there are no obvious findings, then confirm the fault and refer to the symptom table.

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List of fault symptoms

If the vehicle fails, no trouble code is detected by the engine control module (ECM), and no significant fault location is found after visual inspection and general inspection, it is recommended that troubleshooting should be carried out according to diagnostic ideas and processes of the table below.

Symptom	Possible Cause	Recommended Measures
Fuel pressure low	• Fuel line leak	• Repair or replace the fuel line
	• Electrical fuel pump trouble	• Replace electrical fuel pump. **Reference: electrical fuel pump**
Fuel system pressure high	• Fuel pipe blocked	• Repair fuel pipe
Heavy fuel smell	• Fuel line leak	• Repair or replace the fuel line
	• Filler cap seal abnormal	• Replace filler cap
	• Fuel filter joint leaking	• Replace fuel filter or pipe
	• Fuel steam pipe leaking	• Repair or replace fuel steam pipe
	• Carbon tank of fuel tank broken	• Replace the canister
	• Electromagnetic valve of carbon tank broken	• Replace the canister solenoid valve
	• Engine working abnormal and combustion not compeletely	• Check engine working condition
Fuel gauge indicator abnormal	• Harness or plug	**Refer to: Trouble-shooting for fuel gauge indicator abnormal**
	• Fuel tank	
	• Fuel level sensor	
	• Instrument cluster	
Failure of electrical fuel pump	• Fuel pump fuse	**Refer to: electric fuel pump out of operation diagnosis flow**
	• Harness or plug	
	• Fuel pump relay	
	• Fuel pump circuit	
	• Electric fuel pump	
	• ECM	

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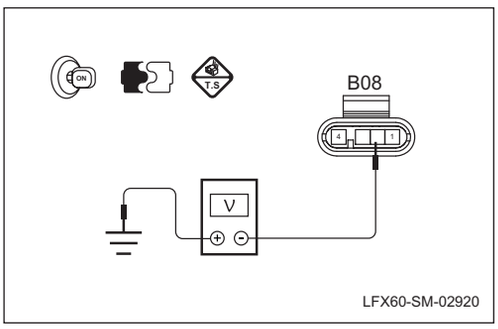
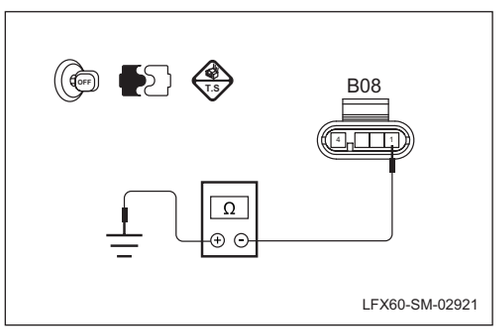
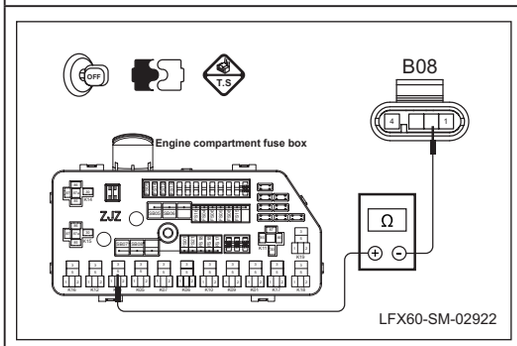
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Trouble-shooting for electrical fuel pump not working

Test condition	Details/results/measures
1. Check the engine DTC.	
	A. Operate the ignition switch to turn the power to OFF and connect the diagnostic meter. B. Operate the ignition switch to turn the power to ON state. C. Turn on the diagnostic meter and check the engine system. If it is related to the fuel control? →**Yes** **Refer to:Diagnostic trouble code (DTC) list.** **Perform DTC diagnostic procedure.** →**No** To step 2.
2. Check the electrical fuel pump fuse.	
	A. Operate the ignition switch to turn the power to OFF state. B. Check the electrical fuel pump fuse FS17in the forecabin electrical box. **Fuse rated capacity: 15A** Is it OK after checking? →**Yes** To step 3.0. →**No** Replace the fuse of electrical fuel pump.
3. Check the electrical fuel pump relay.	
	A. Operate the ignition switch to turn the power to OFF state. B. Dismount the relay K13 of electrical fuel pump in the broken vehicle and install it on a normal vehicle. If the vehicle operates normally. →**Yes** To step 4. →**No** The electrical fuel pump relay is in trouble.Replace it.

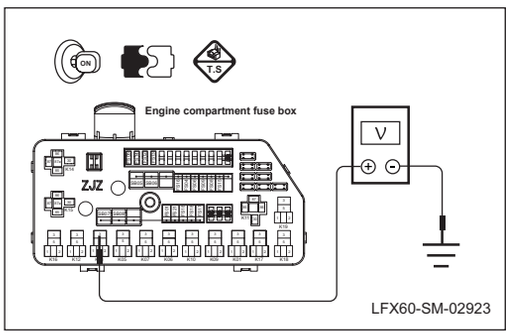
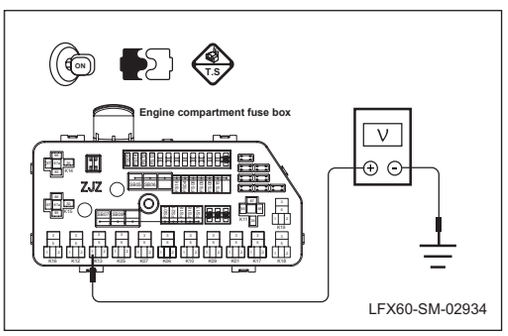
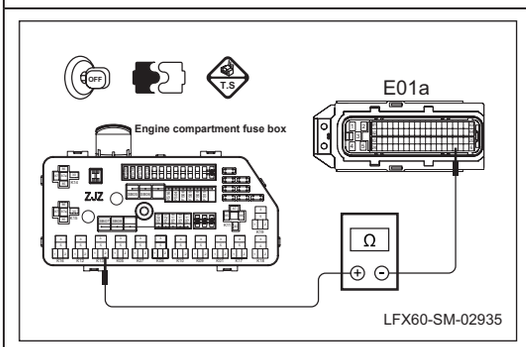
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Test condition	Details/results/measures
4. Perform the active test for the electrical fuel pump.	
	A. Operate the ignition switch to turn the power to OFF and connect the diagnostic meter. B. Disconnect the plug B08 of electrical fuel pump. C. Operate the ignition switch to turn the power to ON state. D. Switch on the automobile diagnosis equipment, select the input and output function control and perform the electrical fuel pump to start circulation. E. Measure the voltage between No.2 terminal of electrical fuel pump plug B08 and the reliable grounding with a multimeter. **Standard value:11 ~ 14V** Is the voltage normal? →**Yes** To step 5. →**No** To step 6.
5. Check the grounding circuit of electrical fuel pump.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Measure the resistance between No.1 terminal of electrical fuel pump plug B08 and the reliable grounding with a multimeter. **Standard value:Less than 5Ω** Is the resistance normal? →**Yes** Replace the electrical fuel pump. **Refer to:Replacement of electric fuel pump** →**No** Check if the grounding circuit of electrical fuel pump is in trouble.Replace the harness if necessary.
6. Check the power supply circuit of electrical fuel pump.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Remove the electric fuel pump relay K13. D. Disconnect the plug B08 of electrical fuel pump. E. Measure the resistance between No.2 terminal of electrical fuel pump plug B08 and No.5 terminal of electrical fuel pump relay K13 in the forecabin electrical box with a multimeter. **Standard value:Less than 5Ω** Is the resistance normal? →**Yes** To step 7. →**No** Check if there is any problem in the circuit between the electrical fuel pump and forecabin relay.Replace the harness if necessary.

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Test condition	Details/results/measures
7. Check the power supply of electrical fuel pump relay K13.	
	A. Operate the ignition switch to turn the power to OFF state. B. Remove the electric fuel pump relay K13. C. Measure the voltage between No.3 terminal of electrical fuel pump relay K13 in the forecabin electrical box and the reliable grounding with a multimeter. **Standard value:11 ~ 14V** Is the voltage normal? **→Yes** To step 8. **→No** Check if there is any problem in the power supply circuit of electrical fuel pump relay K13.Replace the harness if necessary.
8. Check the control power supply of electrical fuel pump relay.	
	A. Operate the ignition switch to turn the power to OFF state. B. Remove the electric fuel pump relay K13. C. Operate the ignition switch to turn the power to ON state. D. Measure the voltage between No.1 terminal of electrical fuel pump relay K13 in the forecabin electrical box and the reliable grounding with a multimeter. **Standard value:11 ~ 14V** Is the voltage normal? **→Yes** To step 9. **→No** Check if there is any problem in the control power supply of electrical fuel pump relay.If yes, replace the harness.
9. Check the control circuit of electrical fuel pump relay.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Remove the electric fuel pump relay K13. D. Disconnect the ECM harness connector E01b. E. Measure the resistance between No.2 terminal of electrical fuel pump relay K13 in the forecabin electrical box and No.9 terminal of ECM harness with a multimeter. **Standard value:Less than 5Ω** Is the resistance normal? **→Yes** To step 10. **→No** Check if there is any problem in the control power supply of electrical fuel pump relay.If yes, replace the harness.

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Test condition	Details/results/measures
10. Check ECM.	
	A. Replace ECM. **Refer to:REPLACEMENT OF ECM** Confirm the fault is eliminated

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Removal and Installation

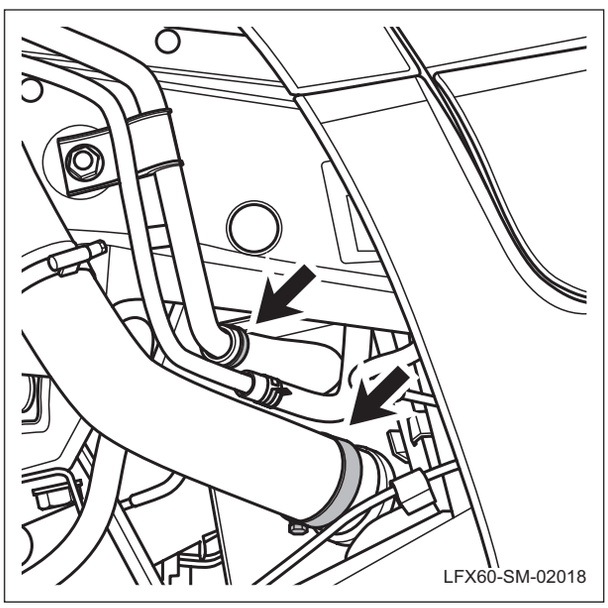
Replacement of fuel tank assembly

Removal

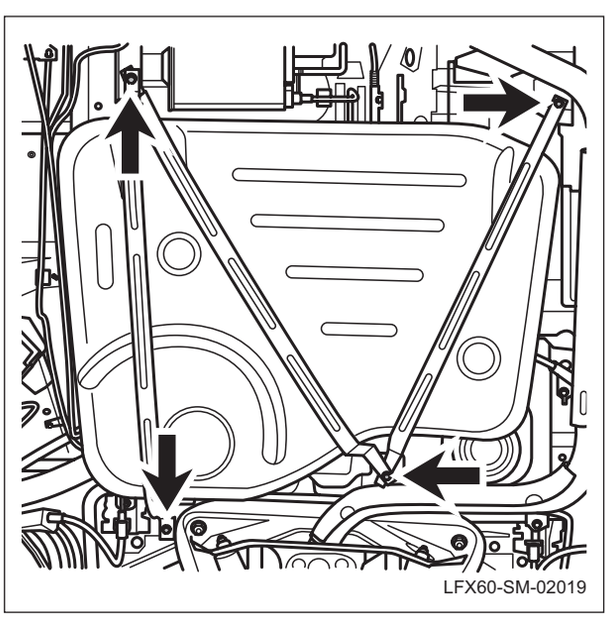
1. Dismount the fuel tank assembly.

(a). Lift the vehicle.

(b). Dismount the bar clasp of fuel filler pipe and breather pipe.



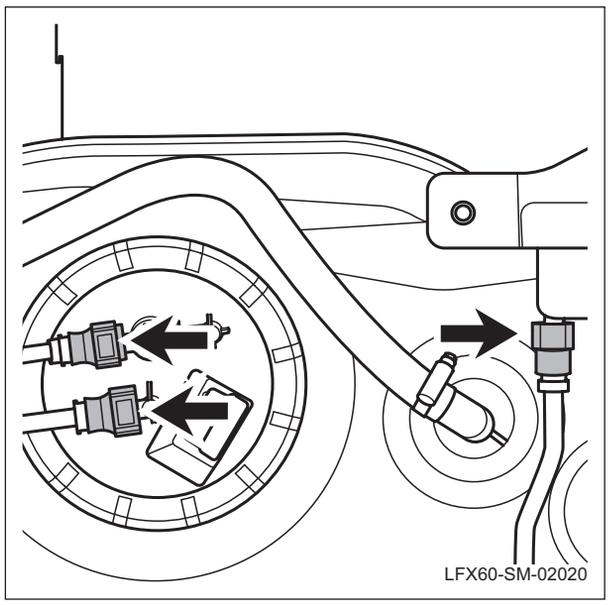
(c). Lift the plane jack to support the fuel tank.



(d). Dismount the tap bolts of fuel tank assembly.

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(e). Slowly lower the jack partially.
(f). Disconnect the harness plug of fuel pump.
(g) Disconnect the pipe of fuel tank.
(h). Detach the fuel tank assembly.

Installation

1. Install the fuel tank assembly.

(a). The installation sequence is the reverse of the disassembly order.

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Replacement of fuel filter.

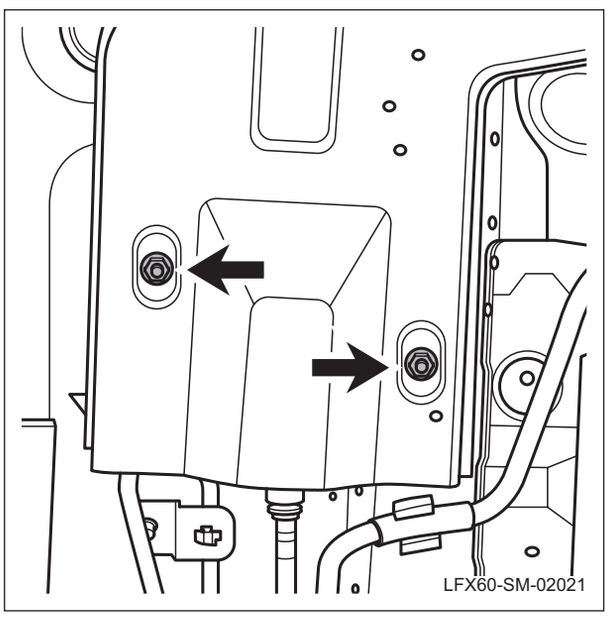
Removal

1. Remove the fuel filter.

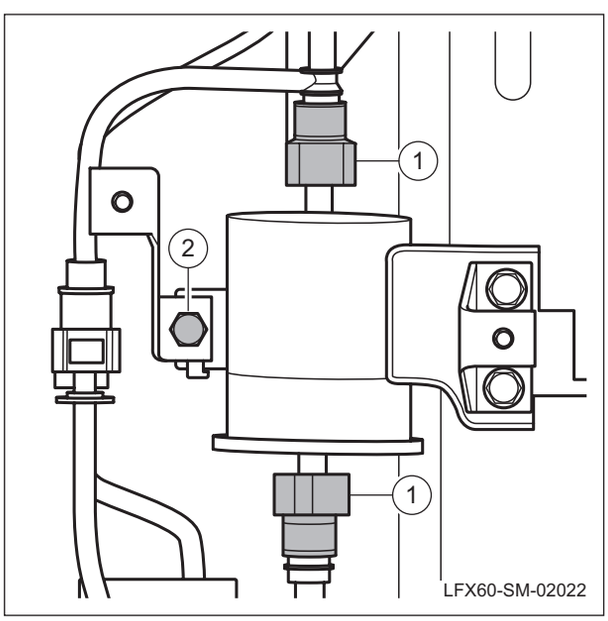
❶Note:

Release the pressure of fuel system before operation.

(a). Lift the vehicle.



(b). Dismount the grip nuts of lower backplate of fuel filter.



(c). Disconnect the input and output pipe 1 of fuel filter.

(d). Dismount the tap bolt 2 of fuel filter and detach the filter.

Installation

1. Installation the fuel filter.

(a). The installation sequence is the reverse of the disassembly order.

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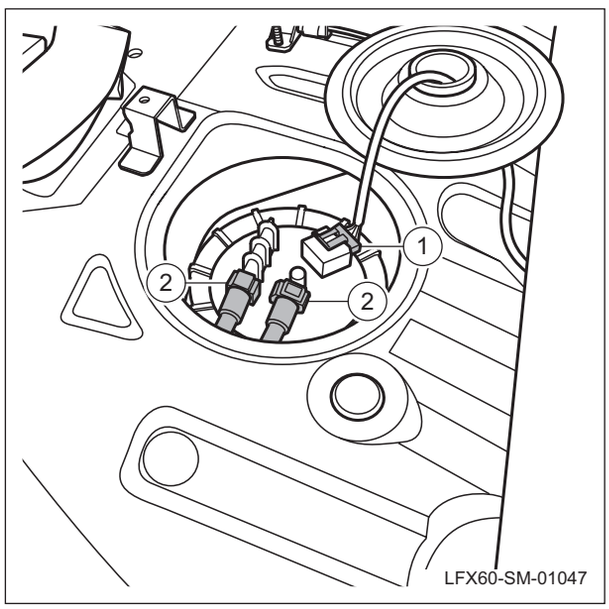
Replacement of electrical fuel pump

Removal

1. Dismout the electrical fuel pump.

(a). Dismount C column decorative sheet.**Reference:replacement of C column decorative sheet.**

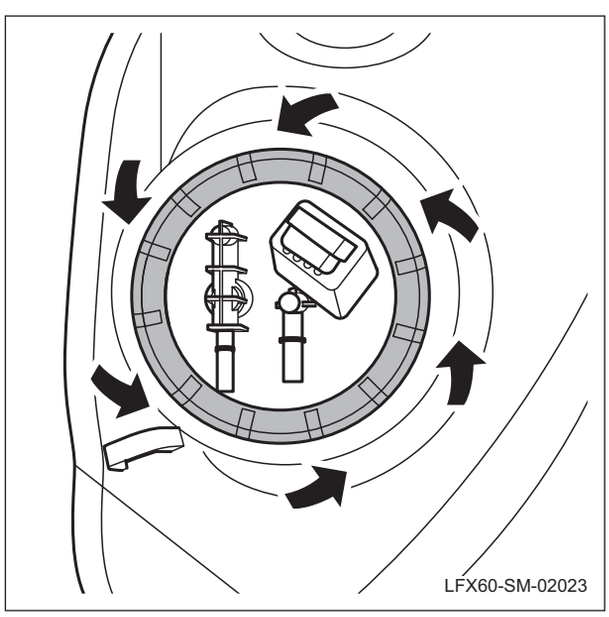
(b). Open the cushions of rear row seats and carpet.



(c). Open the upper cover of electrical fuel pump.

(d). Disconnect the harness plug 1 of electrical fuel pump.

(e). Detach the oil pipe 2 of electrical fuel pump.



(f). Dismount the clamping ring of electrical fuel pump.

(g). Lift the electrical fuel pump up and take it out.

Installation

1. Install the electrical fuel pump.

(a). The installation sequence is the reverse of the disassembly order.

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02 -Engine

Intake system 2-541
Structure and installation location 2-541
Functional diagram 2-543
Operating Principle 2-544
Diagnostic Information and Procedures .. 2-545
Removal and Installation 2-548

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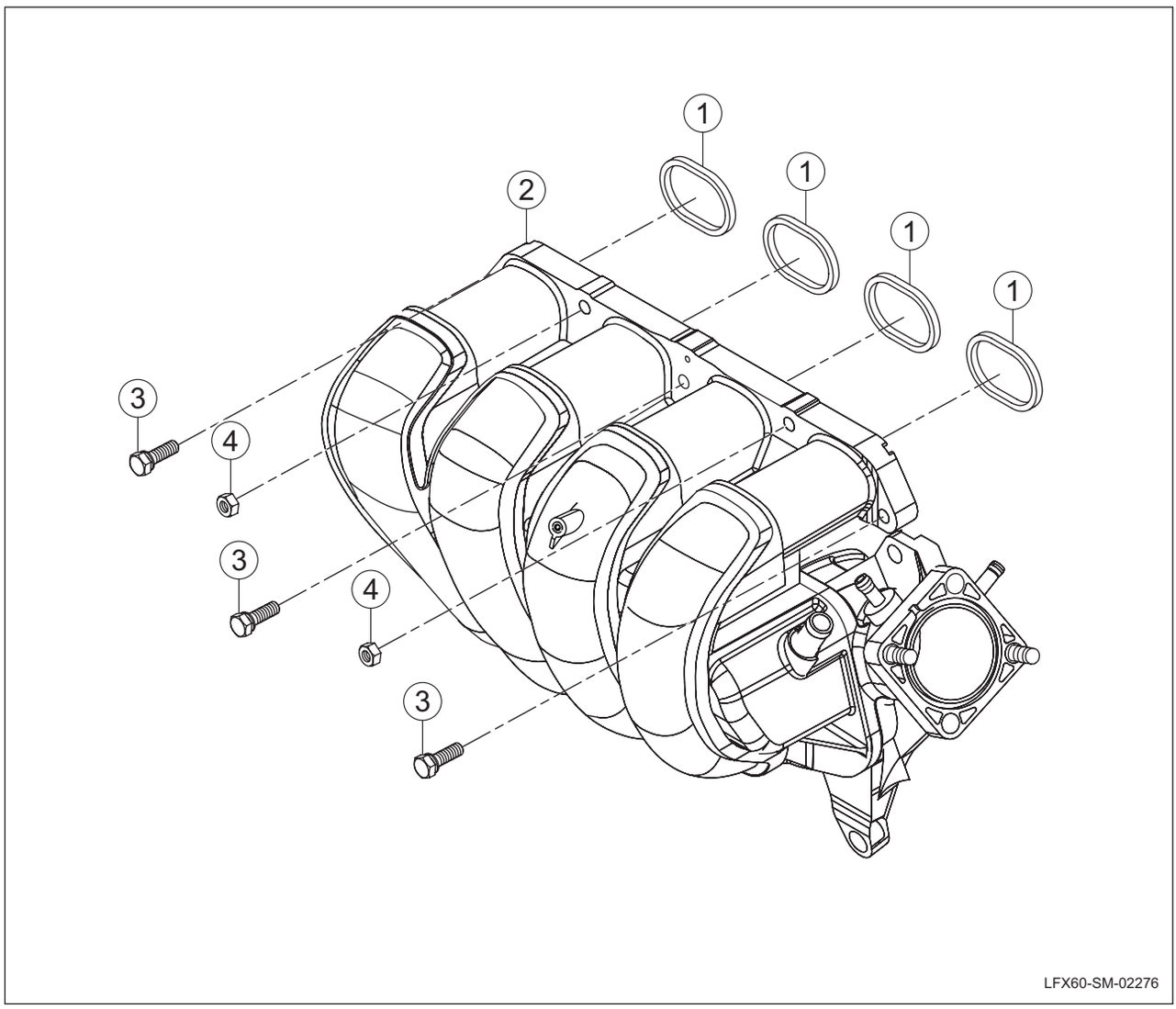
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Intake system

Structure and installation location

Component Location Plan



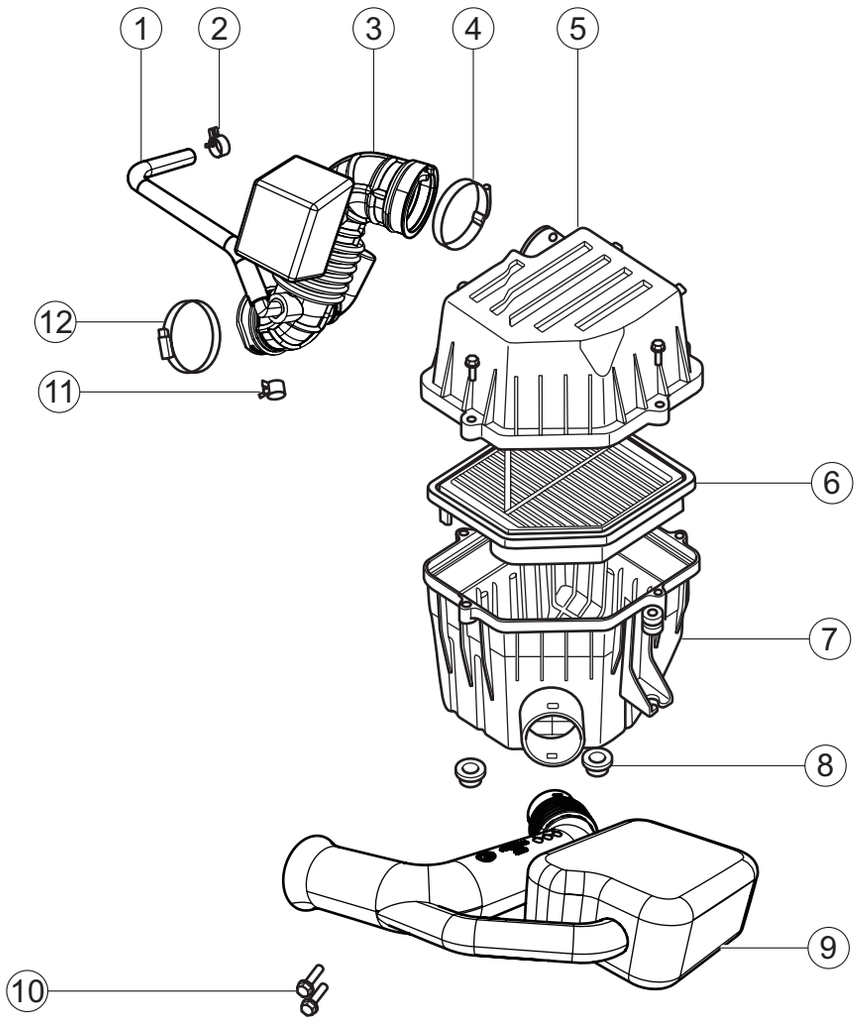
LFX60-SM-02276

No.	Part Name
1	Rubber sealing ring
2	Intake manifold assembly

No.	Part Name
3	Hexagon head bolt and plain washer assembly
4	Hex flange nut

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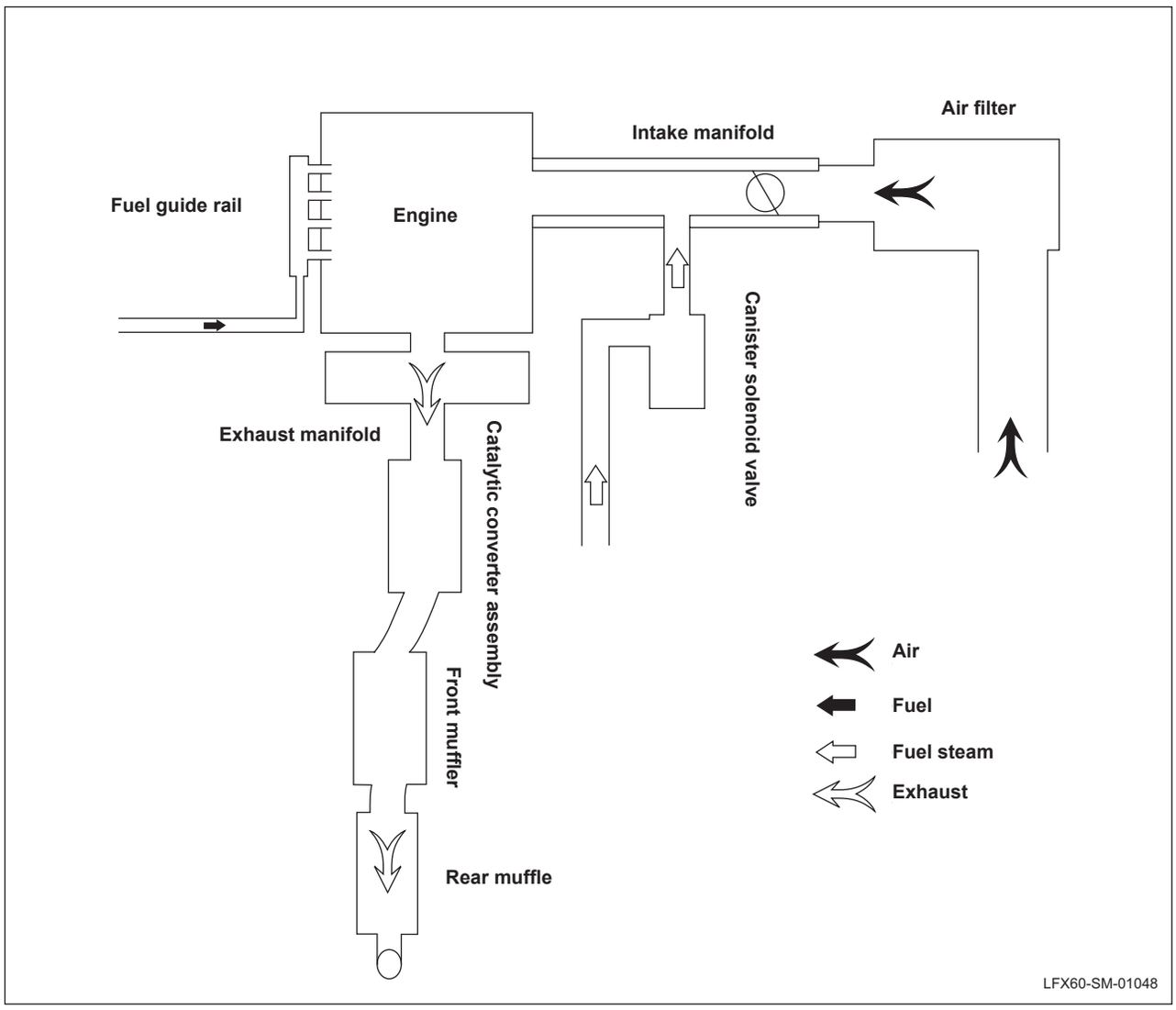
No.	Part Name
1	Crankcase ventilation tube
2	Elastic tape hoop
3	intake hose
4	B type worm drive clip
5	Air filter upper housing
6	Air filter cartridge

No.	Part Name
7	air filter lower housing
8	air filter cushion
9	Drain tube
10	Hexagon head bolt and plain washer assembly
11	Elastic tape hoop
12	B type worm drive clip

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Functional diagram



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Operating Principle

System Overview

The ambient air enters into the air filter and gets into the cylinder through the intake-tube, throttle body and intake manifold after passing the filter element.The crankcase vent-pipe is connected to the intake-tube.The exhaust gas in the crankcase enters into the cylinder through the vent-pipe along with the fresh air.

Part instructions

Air filter

The sub-assembly of air filter consists of:

- assembly of air filter upper housing
- assembly of air filter lower housing
- Assembly of filter element

Dry air enters into the lower housing of air filter and goes through the air filter element.The air after filtering flows out from the air filter upper housing and enters into the cylinder through the throttle body

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Diagnostic Information and Procedures

Diagnosis Instructions

Before trouble-shooting, first understand and get familiar with the working principle of induction system.This is helpful to determine the correct procedures of trouble-shooting when the trouble occurs.More important, it is also helpful to determine if the status described by the client is normal operation.

Any trouble-shooting for the induction system shall start from the inspection for the induction system, then guide the maintenance personnel to take next logic procedure to perform trouble-shooting.Comprehend and correctly use the diagnostic flow chart to shorten the diagnosis time and avoid the misjudgement.

General equipment

Vacuum gauge

Visual Inspection

1. Confirm the customer's question.
2. Visually check for obvious signs of mechanical or electrical damage.

Visual inspection table

Mechanical
• Fixing part of admission passage • Subassembly of air filter • Electronic-controlled throttle body • Intake manifold • Fuel steam intake-tube • Canister solenoid valve

3. If the observed or raised problem is the evident and the cause has been found, ensure to fix this fault before proceeding with the next step.
4. If for the problem, there are no obvious findings, then confirm the fault and refer to the symptom table.

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List of fault symptoms

If the vehicle fails, no trouble code is detected by the engine control module (ECM), and no significant fault location is found after visual inspection and general inspection, it is recommended that troubleshooting should be carried out according to diagnostic ideas and processes of the table below.

Symptom	Possible Cause	Recommended Measures
Intake leaking	• Part connection	**Refer to:Trouble-shooting for intake leakage**
	• Air filter	
	• Intake manifold	
	• Electronic-controlled throttle body	
	• crankcase vent-pipe	
	• Steam ischarge pipe of fuel tank	
Intake blocked	• Air filter cartridge	• Check the air filter and replace it if necessary.
	• Foreign object in the intake tube.	• Check if there is any foreign object in the air filter and intake tube.If yes, eliminate it.

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Trouble-shooting for intake leakage

Test condition	Details/results/measures
1. Check if there is a leaking sound.	
	A. Start the engine. B. Listen carefully if there is a leaking sound If there is a “sizzle” leaking sound? →**Yes** Check the leaking position and repair the leaking part. →**No** To step 2.
2. Check all the pipelines connecting to the intake manifold.	
	A. Check if the vent-pipe of crankcase and steam discharge pipe of fuel tank get aged or are not sealed properly. If all the pipelines are normal? →**Yes** To step 3. →**No** Repair relevant pipelines.
3. Check the vacuum degree of air intake system.	
	A. Perform the inspection procedure for the intake system vacuum degree. If the vacuum degree is normal? →**Yes** Confirm the system is normal. →**No** To step 4.
4. Check the intake manifold or electrical throttle body.	
	A. Check the tightness of intake manifold or electrical throttle body. If the intake manifold or throttle body leaks? →**Yes** Repair the seal of intake manifold or electrical throttle. →**No** Check the admission gear of engine. **Refer to:Timing gear (mechanical system, dismounting and installation)**

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Removal and Installation

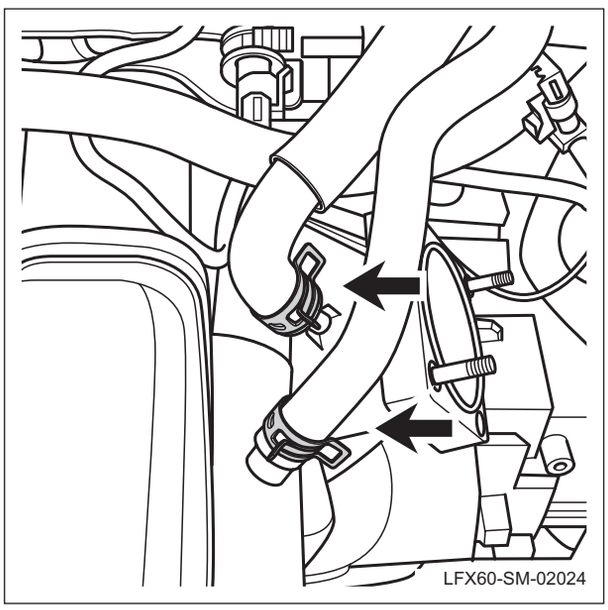
Replacement of intake manifold assembly

Removal

1. Dismount the intake manifold assembly.

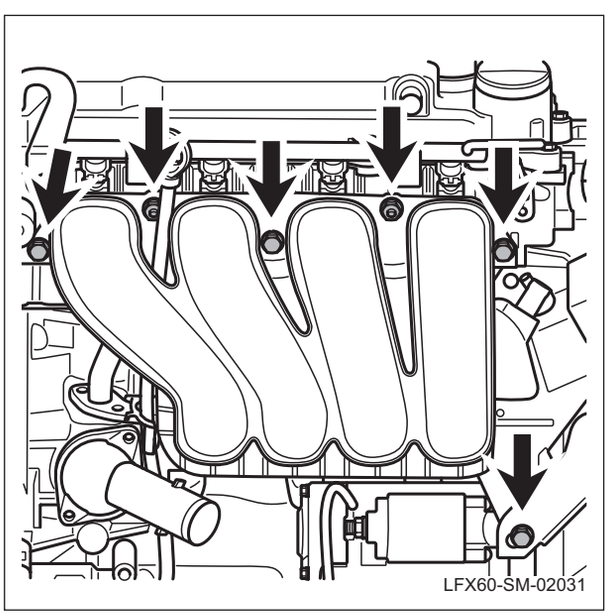
(a). Remove the air filter assembly. **Refer to the replacement of air filter assembly.**

(b). Dismount the throttle body assembly.**Reference: replacement of throttle body assembly.**



(c). Disconnect the upper passage of intake manifold.

(d). Pull out the oil scale.



(e). Dismount the tap bolt and nut of intake manifold.

(f). Detach the intake manifold assembly.

Installation

1. Install the intake manifold assembly.

(a). The installation sequence is the reverse of the disassembly order.

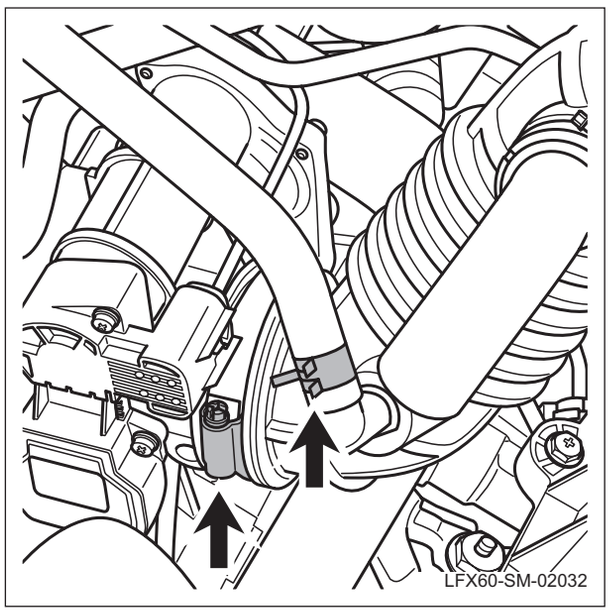
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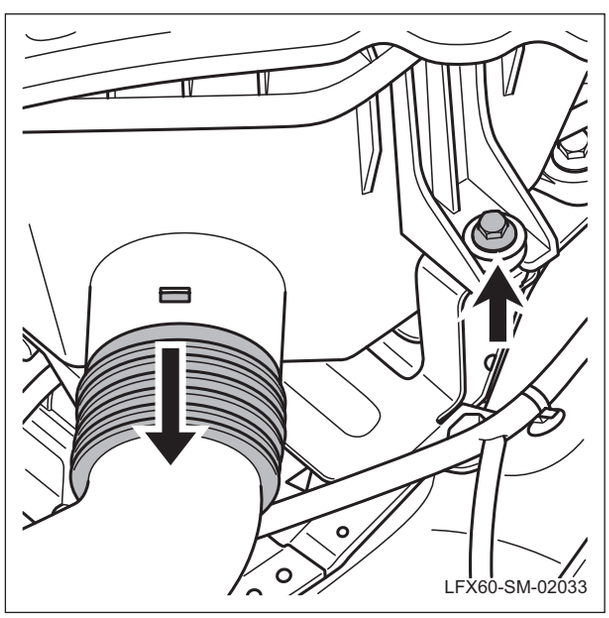
Replacement of air filter assembly

Removal

1. Dismount the air filter assembly



(a). Dismount the bar clasp to detach the connection between the throttle and throttle intake pipe.
(b). Disconnect the upper passage of throttle intake pipe.



(c). Dismount the tap bolt of air filter assembly.
(d). Disconnect the air filter intake pipe.
(e). Detach the air filter assembly.

Installation

1. Installation the air filter assembly

(a). The installation sequence is the reverse of the disassembly order.

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02 -Engine

Exhaust system 2-553
Precautions.....2-553
Structure and installation location.....2-554
Functional diagram 2-555
Diagnostic Information and Procedures..2-556
Removal and Installation 2-559

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Exhaust system

Precautions

Precautions

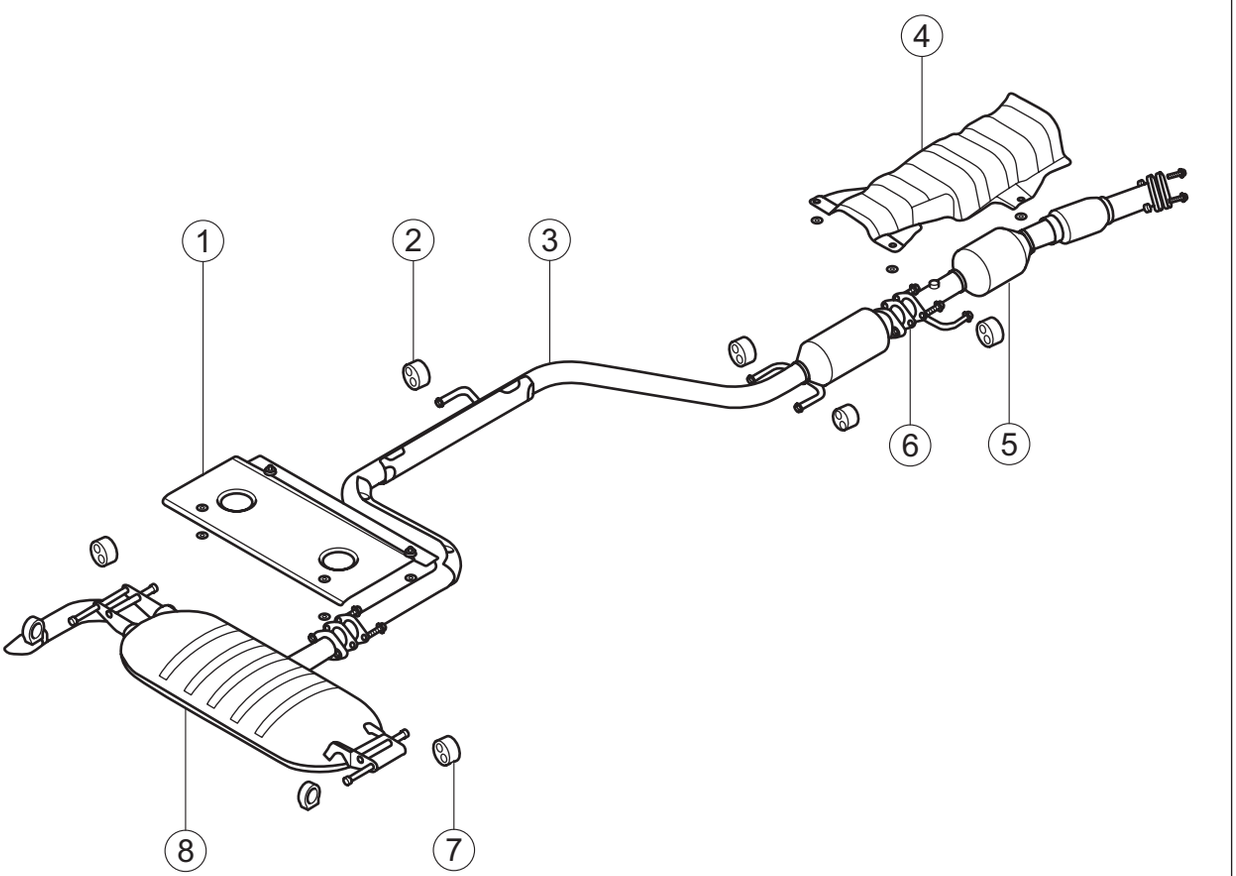
1. The temperature of exhaust pipe is high during the operation of engine. During the work of exhaust system, stop the engine, and restart it after the engine and exhaust system is cooled down.

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Structure and installation location

Component Location Plan



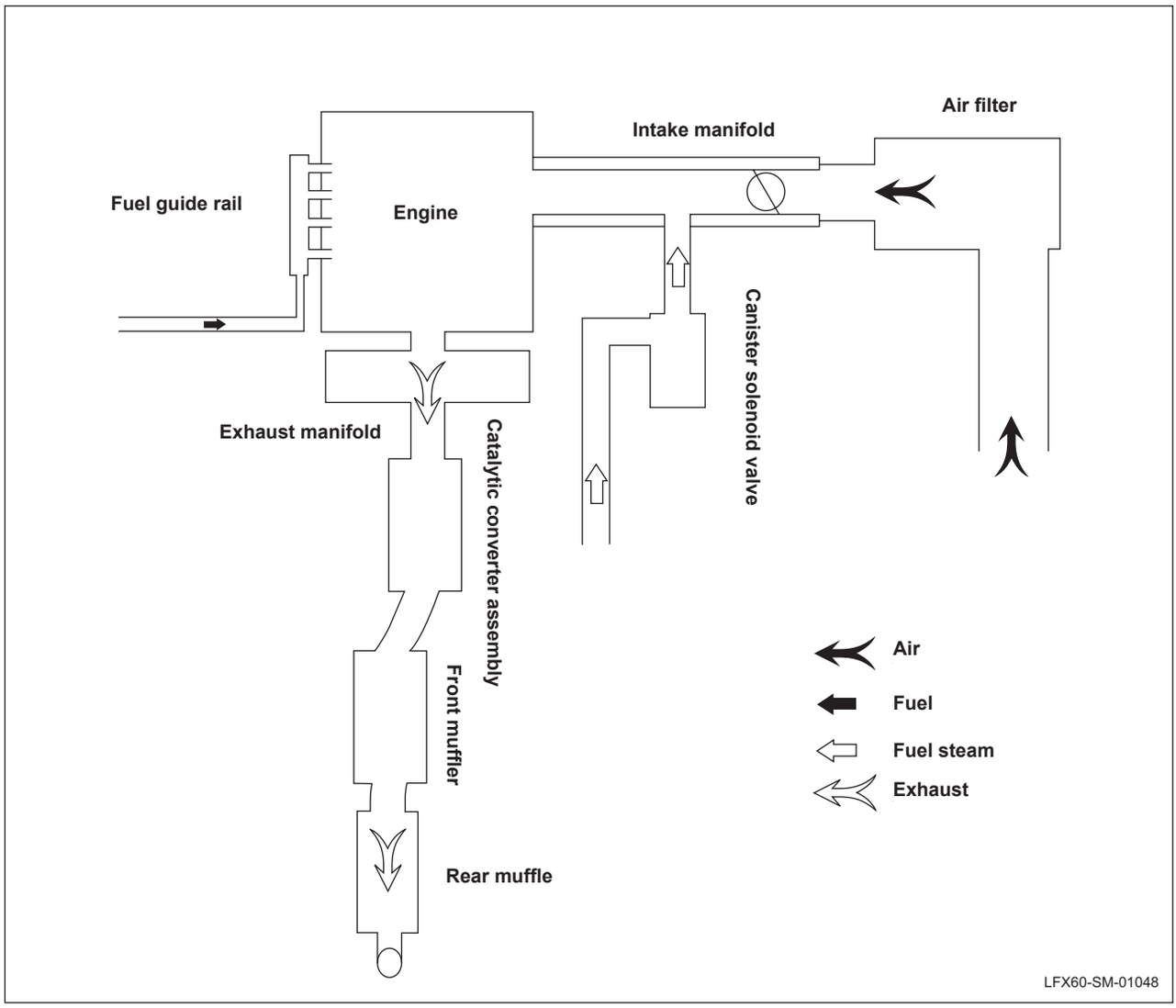
No.	Part Name
1	Thermal baffle
2	Rubber suspension block
3	Front muffler assembly
4	Heat shield III

No.	Part Name
5	rear catalyst assembly
6	exhaust gasket
7	rubber suspension block II
8	Rear muffler assembly

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Functional diagram



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Diagnostic Information and Procedures

Diagnosis Instructions

Before trouble-shooting, first understand and get familiar with the working principle of exhaust system.This is helpful to determine the correct procedures of trouble-shooting when the trouble occurs.More important, it is also helpful to determine if the status described by the client is normal operation.

Any trouble-shooting for the exhaust system shall start from the inspection for the exhaust system, then guide the maintenance personnel to take next logic procedure to perform trouble-shooting. Comprehend and correctly use the diagnostic flow chart to shorten the diagnosis time and avoid the misjudgement.

General equipment

Exhaust back pressure gauge

Visual Inspection

1. Confirm the customer's question.
2. Visually check for obvious signs of mechanical or electrical damage.

Visual inspection table

Mechanical
• vent-pipe lifting lug • vent-pipe fastener • exhaust manifold • Muffler

3. If the observed or raised problem is the evident and the cause has been found, ensure to fix this fault before proceeding with the next step.
4. If for the problem, there are no obvious findings, then confirm the fault and refer to the symptom table.

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List of fault symptoms

If the vehicle fails, no trouble code is detected by the engine control module (ECM), and no significant fault location is found after visual inspection and general inspection, it is recommended that troubleshooting should be carried out according to diagnostic ideas and processes of the table below.

Symptom	Possible Cause	Recommended Measures
Exhaust leaking	• Exhaust system parts in wrong places or installation mistake	• Position and tighten the exhasut system parts to the required Torque
	• Seal components or cushion leaking • Exhaust manifold and cylinder head • Assembly of exhaust manifold and catalyst • Assembly of catalyst and assembly of front muffle	• Replace the leaking seal components of l exhaust system.
	• Exhaust manifold cracking or disconnected	• Replace the exhaust manifold.
	• Welding joints of exhaust system parts leaking	• Replace the leaking parts.
Exhaust blocked	• Exhaust pipe • Catalytic converter • Muffler	**Refer to:Trouble-shooting for blocked exhuast**

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Trouble-shooting for blocked exhaust

Test condition	Details/results/measures
1. General check.	
	A. Check if there is any foreign object at the mouth of exhaust pipe. B. Check if the exhaust pipe is bent or deformed obviously. Is it OK after checking? →**Yes** To step 2. →**No** Replace the foreign object or replace the parts.
2. Check the exhaust back pressure.	
	A. Check the back pressure of exhaust system. Is the test normal? →**Yes** Exhaust system normal →**No** To step 3.
3. Check the catalytic converter.	
	A. Dismount the catalytic converter. B. Check if the catalyst gets blocked. Is it OK after checking? →**Yes** To step 4. →**No** Replace the assembly of catalytic converter.
4. Check the muffle	
	A. Dismount the muffle. B. Check if the muffle gets blocked inside. Is it OK after checking? →**Yes** Check the connections of all the parts in the exhaust system and test if the system works properly. →**No** Replace the muffle.

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Removal and Installation

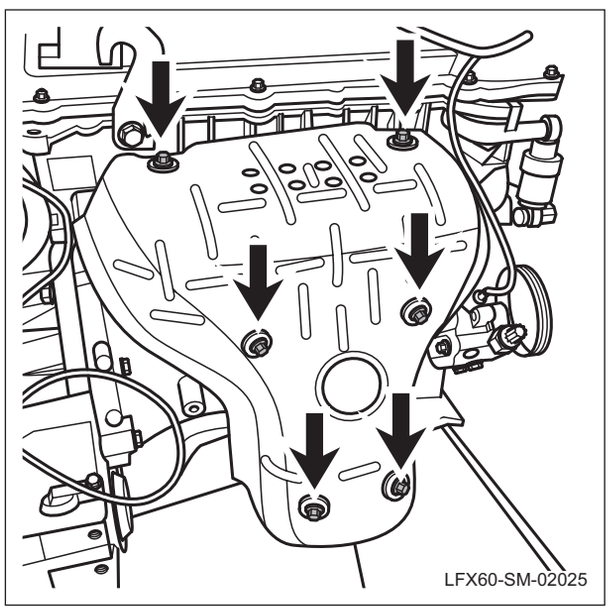
Replacement of exhaust manifold

Removal

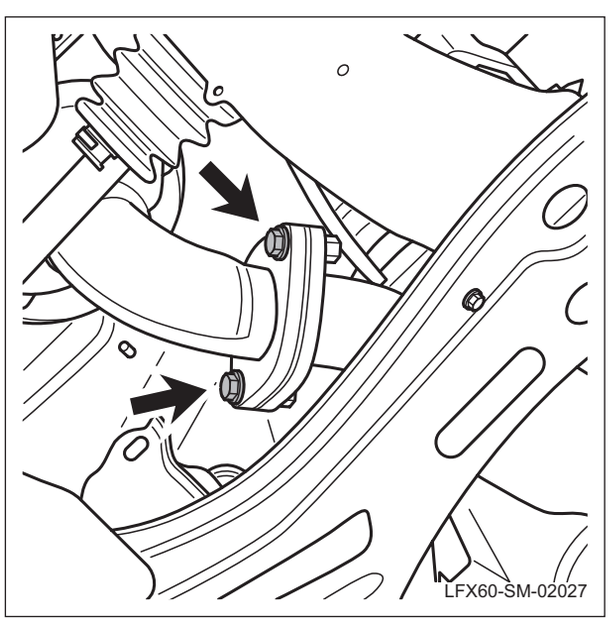
1. Dismount the exhaust manifold.

(a). Disconnect the battery negative terminal.

(b). Dismount the front oxgen sensor.**Reference: replacement of front oxgen sensor.**



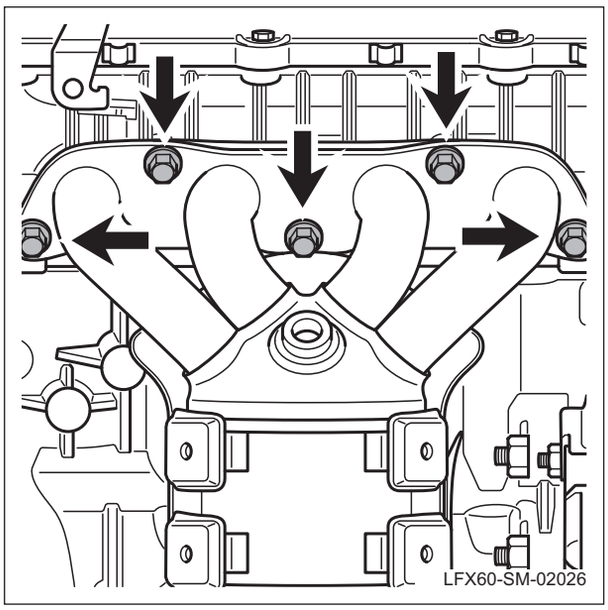
(c). Dismount the tap bolt of heat shield of exhaust manifold and detach the shield.



(d). Dismount the bolt connecting the front exhaust pipe and exhaust manifold.

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(e). Dismount the tap bolt of exhaust manifold.
(f). Dismount the tap bolt for fixing the stand 1 under the exhaust manifold.
(g). Detach the exhaust manifold.

Installation

1. Install the assembly of exhaust manifold.

(a). The installation sequence is the reverse of the disassembly order.

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02 -Engine

Cooling system.....2-563
Mechanical systems 2-563
Precautions.....2-564
Structure and installation location.....2-565
General Inspection.....2-568
Functional diagram 2-569
Operating Principle 2-570
Diagnostic Information and Procedures ..2-571
Removal and Installation 2-587

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Cooling system

Mechanical systems

Components

Name	Specification
Type of thermostat	Pellet type thermostat
Initial temperature of thermostat	82±2 ˚C
Thermostat full open temperature	95±2 ˚C
Water pump type	Mechanical type
Water pump vane number	6

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Precautions

Precautions

1. During the work of cooling system, be sure to start the work after the engine is cooled.
2. During the work, don't splash the cooling fluid on drive belt.
3. During the removal of heat radiator, be sure to avoid any scratch or damage of heat exchanger core.
4. During the reinstallation of cooling system, please ensure the frm firm connection of each hose and proper installation of hose clamps.

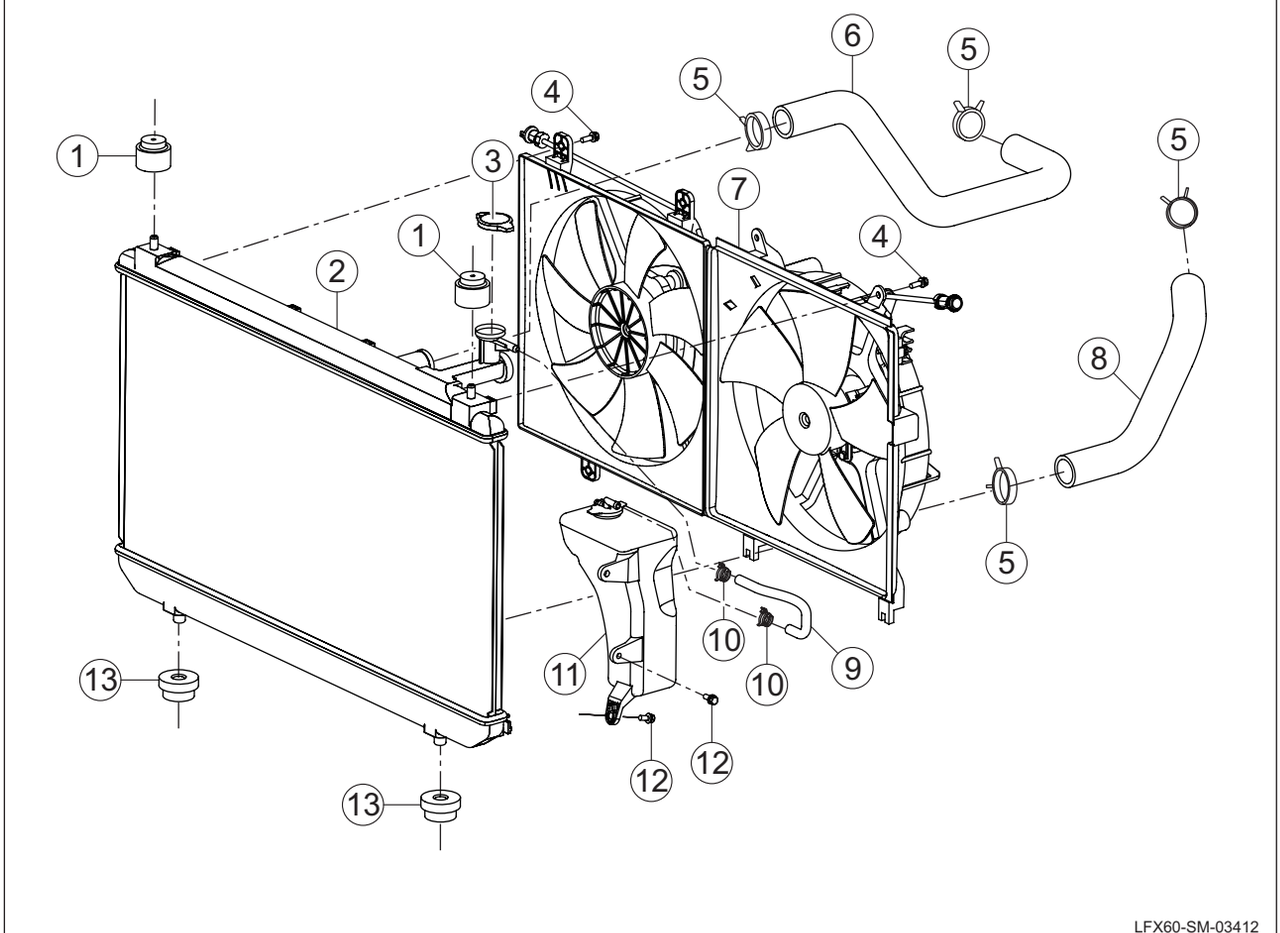
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Structure and installation location

Component Location Plan

Cooling system (MT)



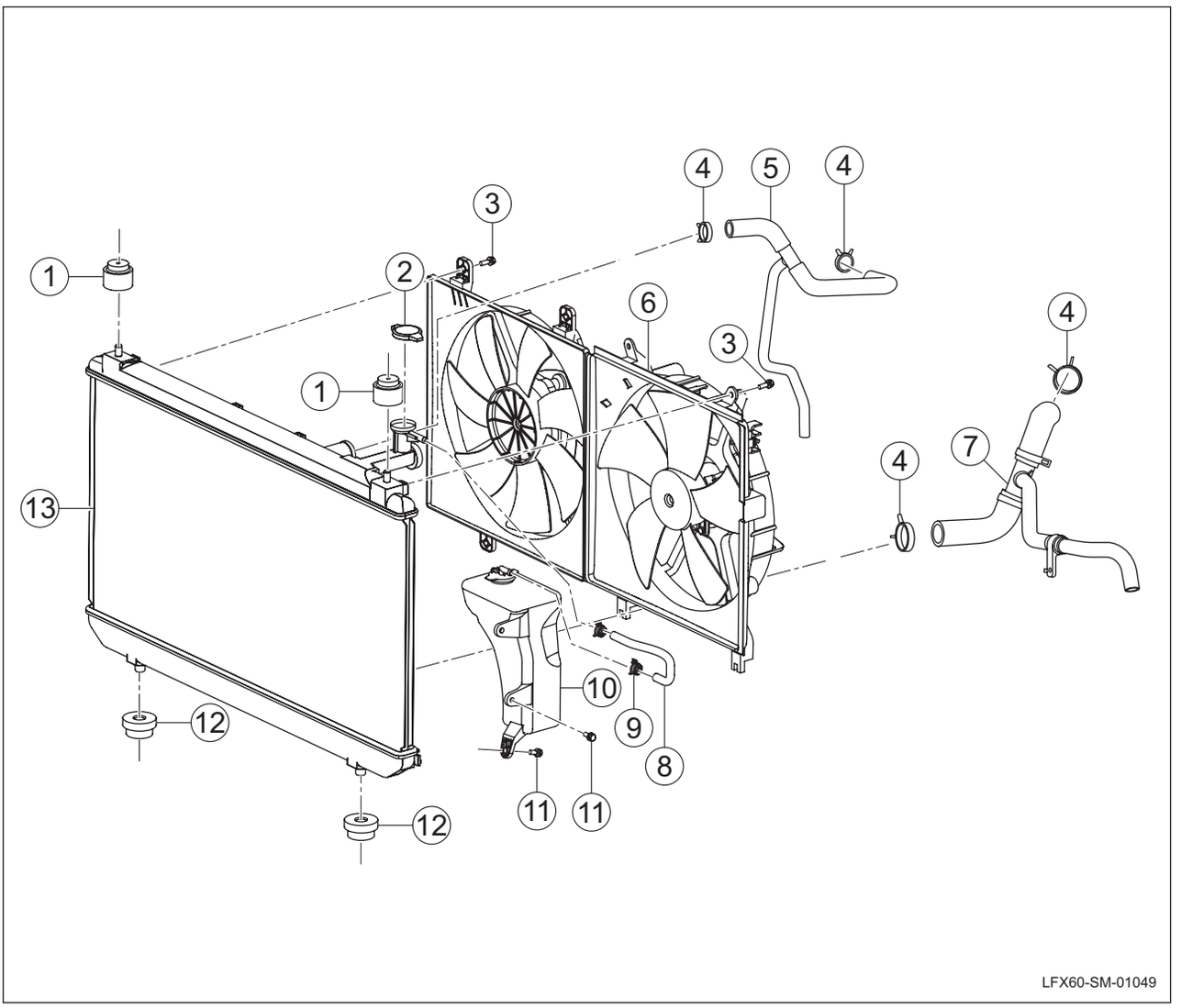
No.	Part Name
1	Install the bushing to the radiator
2	Radiator assembly
3	Water filler cap
4	Hexagon head bolt and taper elastic washer assembly
5	Steel strip elastic clamp
6	Radiator water inlet pipe
7	Electronic fan with cowl assembly

No.	Part Name
8	Radiator water outlet pipe
9	Expansion tank and radiator connection pipe
10	Steel strip elastic clamp
11	Expansion water tank assembly
12	hexagon flange bolt
13	Radiator lower suspension

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Cooling system(CVT)



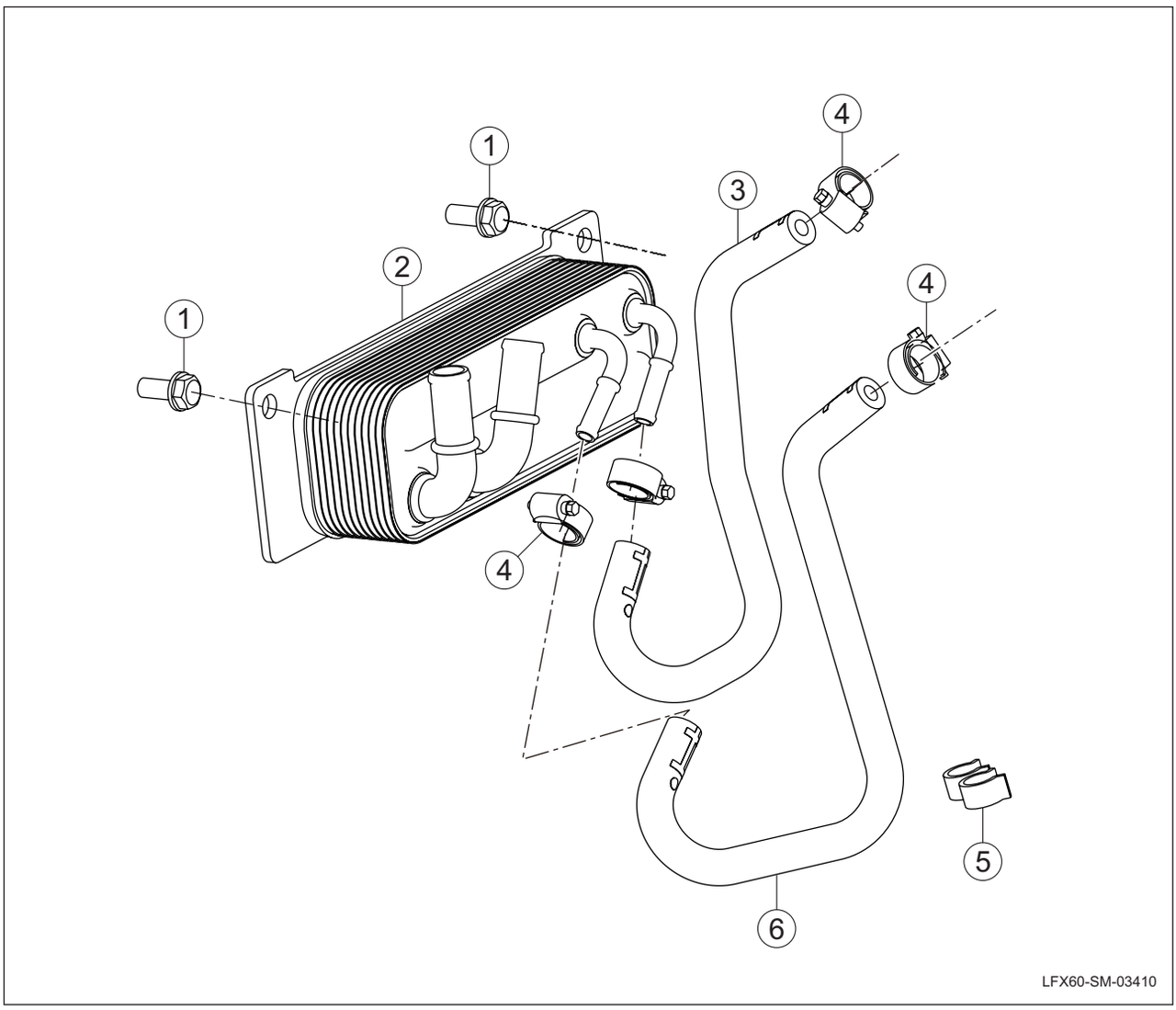
No.	Part Name
1	Install the bushing to the radiator
2	Water filler cap
3	Hexagon head bolt and taper elastic washer assembly
4	Steel strip elastic clamp
5	Radiator water inlet pipe
6	Electronic fan with cowl assembly
7	Radiator water outlet pipe

No.	Part Name
8	Expansion tank and radiator connection pipe
9	Steel strip elastic clamp
10	Expansion kettle assembly
11	Hexagon flange bolt
12	Radiator lower suspension
13	Radiator assembly

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Transmission oil cooler (CVT)



No.	Part Name
1	Hexagon head bolt and taper elastic washer assembly
2	Oil cooler assembly
3	Oil cooler flowline

No.	Part Name
4	Worm bar clasp
5	Oil cooler pipeline clamp
6	Oil cooler inlet tube

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General Inspection

General Inspection

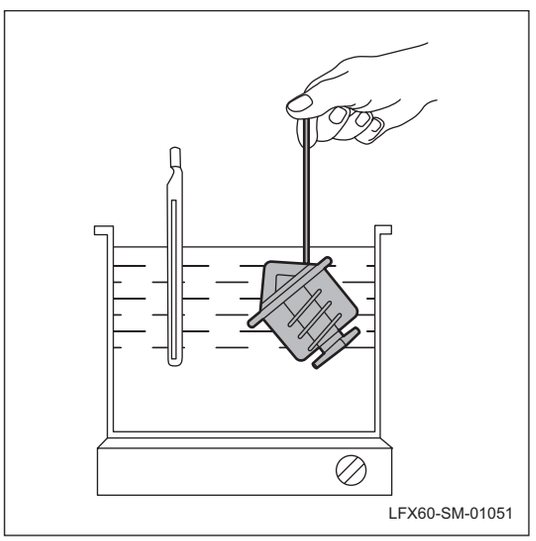
Thermostat test

1. Check if the discharge valve of thermostat is clean. If this valve is blocked, it will cause much heat for engine.
2. Check if there is something unusual in the valve seat. There shall be no unusual object inside; otherwise, the valve cannot be mounted tightly.
3. Check if the sealing pieces of thermostat are broken, deformed or damaged.
4. Check the wax bead by following the steps below under constant temperature:

- **Remove the thermostat.**

Refer to:Replacement of thermostat.

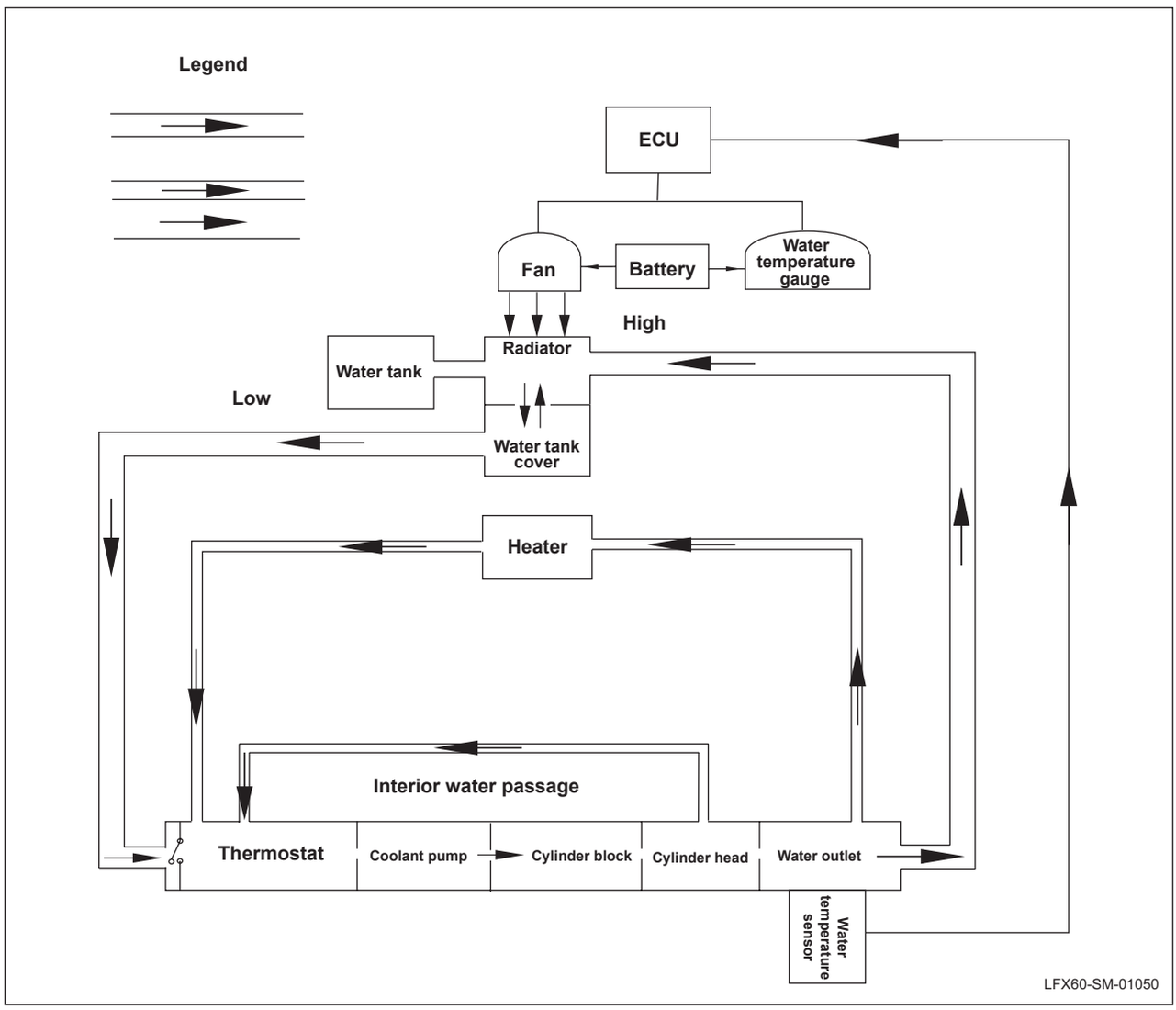
- **Immerse the thermostat under water that can be heated.**
- **Put thermometer in water.**
- **Heat water and observe the state of thermostat. Check if valve opening temperature is the same as specified temperature:**
  - Initial temperature of thermostat 82 ˚C
  - full open temperature of thermostat 95 ˚C
- **If the valve opening temperature is obviously lower/higher than specified temperature, change it with new thermostat. Use of thermostat outside specified temperature will result in overheat or over-cooling.**



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Functional diagram



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Operating Principle

System Overview

The cooling system consists of the radiator, expansion water tank, hose, water pump, electrical fan and thermostat. The radiator is of piping type. When the engine is cold: the normal working temperature of engine is about 95 ℃ .Within this range, the parts in the engine are optimal in cooperation.If the engine cannot reach the desired temperature, wearing will increase.Because if the temperature is low, the mixed gas cannot burn completely in the combustion chamber.It will cause serious carbon deposition.Therefore, if the engine works at a low temperature, it requires its working temperature gets to the normal working temperature soonest in a short time and the heat created by the engine shall be minized in exchanging with external ambient. At this moment, the cooling liquid inside control chamber of thermostat is circulating only inside engine body, thus bringing heat generated around cylinder wall to other parts of engine to increase the temperature quickly. The water pump will circulate cooling liquid inside the cylinder and cooling liquid will circulate inside water sleeve, throttle assembly and cylinder cover, which is called “minor circulation”.

When the temperature reaches to 82 ℃ , the engine coolant is extracted to the water jacket of engine, intake manifold, cylinder head and radiator.This status is called as “general circulation”.

Part instructions

Coolant

When the engine reaches the normal working temperature: along with the operation of engine, the engine coolant inside rises rapidly in temperature.When it reaches the general circulation system of thermostat, it is the standard system.The coolant in the radiator expands because of heat and overflows to the expansion water tank.When the system cools down, the coolant returns to the radiator.

ℹNote:

Alcohol or methanol coolant or water only cannot be used for the cooling system. Otherwise, the cooling system will be in trouble.

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Diagnostic Information and Procedures

Diagnosis Instructions

Before trouble-shooting, first understand and get familiar with the working principle of cooling system.This is helpful to determine the correct procedures of trouble-shooting when the trouble occurs.More important, it is also helpful to determine if the status described by the client is normal operation.

Any trouble-shooting for the cooling system shall start from the inspection for the induction cooling system, then guide the maintenance personnel to take next logic procedure to perform trouble-shooting.Comprehend and correctly use the diagnostic flow chart to shorten the diagnosis time and avoid the misjudgement.

General equipment

Digital multimeter
Diagnostic equipment of vehicle

Visual Inspection

1. Confirm the customer's question.
2. Visually check for obvious signs of mechanical or electrical damage.

Visual inspection table

Mechanical	Electrical
• Coolant leaking • Cooling water hose • Gasket or seal • Coolant filler cap and seal • Expansion tank • Thermostat • Water pump • Driving belt • Oil cooler	• Fuse • Harness or plug • Engine compartment fuse box • Cooling fan relay • Water temperature sensor • Fan • ECM

3. If the observed or raised problem is the evident and the cause has been found, ensure to fix this fault before proceeding with the next step.
4. If for the problem, there are no obvious findings, then confirm the fault and refer to the symptom table.

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List of fault symptoms

If the vehicle fails, no trouble code is detected by the engine control module (ECM), and no significant fault location is found after visual inspection and general inspection, it is recommended that troubleshooting should be carried out according to diagnostic ideas and processes of the table below.

Symptom	Possible Cause	Recommended Measures
Coolant leaking	• Cooling pipeline aged or connected wrong.	• Replace the aged hose or reconnect the pipeline.
	• Coolant filler cap or seal abnormal	• Replace the coolant filler cap.
	• Thermostat or seal components broken	• Replace the thermostat or seal components **Refer to:Replacement of thermostat**
	• Expansion tank assembly leaking	• Replace the expansion tank. **Refer to:Replacement of expansion tank assembly**
	• Radiator assembly leaking	• Replace the radiator assembly **Refer to:Replacement of the radiator assembly**
	• Heating water tank leaking	• Replace the heating water tank **Refer to:Replacement of heating water tank assembly**
	• Water pump and seal components	• Replace the water pump or seal components. **Refer to:Replacement of water pump assembly**
	• Engine cylinder cushion leaking	• Check the engine cylinder cushion, head and body. **Refer to:Engine machinery**
	• Transmission oil cooler.	• Replace the transmission oil cooler. **Refer to:Replacement of oil cooler assembly**
The engine coolant cannot reach the normal temperature (the instrument indicates the coolant temperature is low)	• Water temperature sensor in trouble	• Replace the water temperature sensor. **Refer to:Replacement of the water temperature sensor**
	• The thermostat has a fault	• Check the thermostat (replace the thermostat if necessary) **Refer to:Replacement of thermostat**
	• Electrical fan working abnormal (running all the time)	**Refer to:Diagnosis flow for electronic fan always running at low speed** **Refer to:Diagnosis flow for electronic fan always running at high speed**
	• Electrical fan working abnormal (not running all the time)	
	• Combination instrument.in trouble	• Check the combination instrument. **Refer to:Replacement of instrument cluster assembly**

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Symptom	Possible Cause	Recommended Measures
Engine overheated (coolant boiling)	• Cooling system pressure abnormal	• Release the air in the cooling system.
	• Coolant filler cap or seal broken	• Check if the coolant filler cap is abnormal in tightening or the seal components are broken (if necessary, replace the coolant filler cap).
	• Cooling liquid contamination	• Replace the coolant. **Reference: Discharging and filling procedure for engine coolant.**
	• Radiator blocked	• Check if the radiator gets blocked inside or there is any foreign object on the radiating surface (if necessary, repair or replace the radiator assembly).
	• The thermostat has a fault	• Replace the thermostat. **Reference: thermostat replacement.**
	• Water pump in trouble	• Check if the water pump leaks or the blades are broken (if necessary, replace the water pump assembly). **Refer to:Replacement of water pump assembly**
	• Accessory drive belt in trouble	• Check if the accessory drive belt slips or works abnormally (replace it if necessary). **Refer to:Accessories belt replacement**
	• Electrical fan in trouble	• Check if the electrical fan is broken (if necessary replace it) • Check if the electrical fan works properly. **Reference: trouble-shooting for electrical fan not running.**
	• Engine mechanical fault	• Check the engine cylinder cap, cushion and body. **Refer to:Engine machinery**
Electrical fan not running at the low speed.	• Fuse	**Refer to: Trouble-shooting for electrical fan not running at the low speed**
	• Relay	
	• Line	
	• Engine compartment fuse box	
	• Electronic fan	
	• ECM	
Electrical fan not running at the high speed.	• Fuse	**Refer to: Trouble-shooting for electrical fan not running at the high speed**
	• Relay	
	• Line	
	• Engine compartment fuse box	
	• Electronic fan	
	• ECM	

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Symptom	Possible Cause	Recommended Measures
Diagnosis flow for electronic fan always running at low speed	• Relay	**Refer to:Diagnosis flow for electronic fan always running at low speed**
	• Engine compartment fuse box	
	• Line	
	• ECM	
Diagnosis flow for electronic fan always running at high speed	• Relay	**Refer to:Diagnosis flow for electronic fan always running at high speed**
	• Engine compartment fuse box	
	• Line	
	• ECM	

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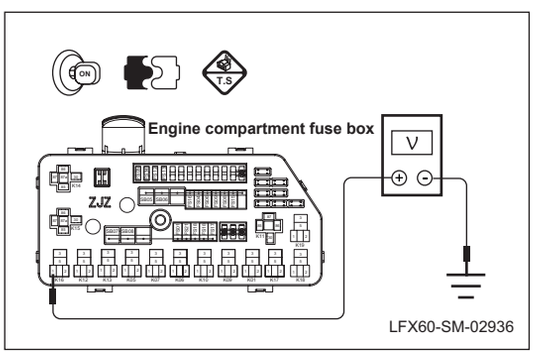
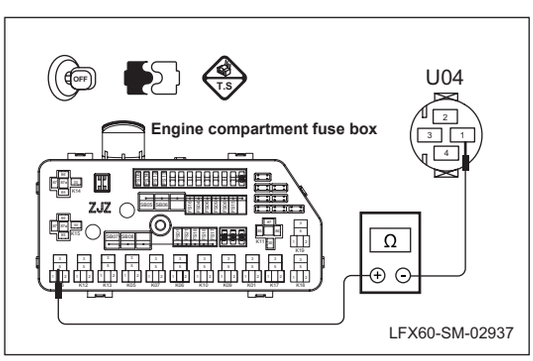
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Trouble-shooting for electrical fan not running at the low speed

Test condition	Details/results/measures
1. Check the engine DTC.	
	A. Operate the ignition switch to turn the power to OFF and connect the diagnostic meter. B. Operate the ignition switch to turn the power to ON state. C. Turn on the diagnostic meter and check the engine system. Is there DTC related to electronic fan control? →**Yes** **Refer to:Diagnostic trouble code (DTC) list. Perform DTC diagnostic procedure.** →**No** To step 2.
2. Perform the low speed drive of electrical fan.	
	A. Operate the ignition switch to turn the power to ON state. B. Switch on the automobile diagnosis equipment. C. Perform the low speed drive of electrical fan. If the electrical fan works properly at the low speed? →**Yes** Check the coolant temperature sensor. →**No** To step 3.
3. Replace the low speed fuse of electrical fan.	
	A. Operate the ignition switch to turn the power to OFF state. B. Check the low speed fuse SB06 of electrical fan in the forecabin electrical box. **Fuse rated capacity: 30A** Is it OK after checking? →**Yes** To step 4. →**No** Replace the low speed fuse of electrical fan.
4. Check the K161 fan relay.	
	A. Operate the ignition switch to turn the power to OFF state. B. Exchange K161 fan relay with that of the same model vehicle. Is the electronic fan low speed running normal? →**Yes** Replace K161 electrical fan relay. →**No** To step 5.

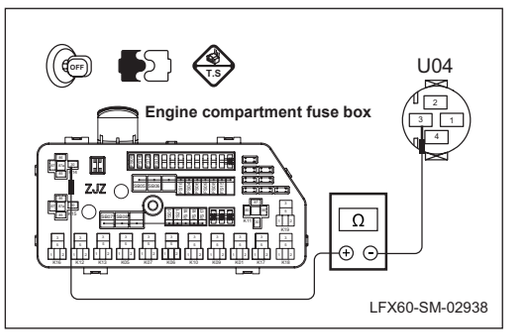
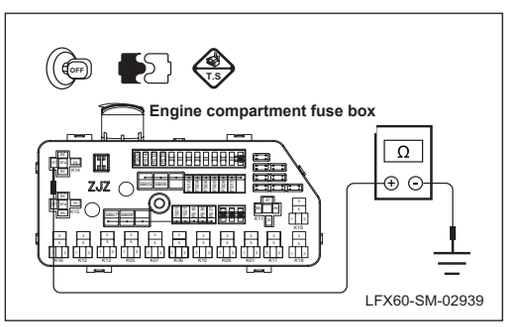
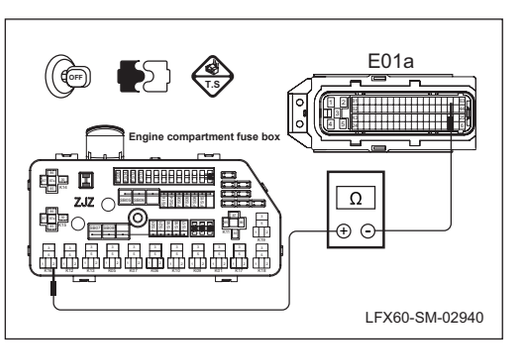
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Test condition	Details/results/measures
5. Check the K14 fan speed regulation relay.	
	A. Operate the ignition switch to turn the power to OFF state. B. Exchange K14 fan speed regulation relay with that of the same model vehicle. Is the electronic fan low speed running normal? →**Yes** Replace the K14 fan speed regulation relay. →**No** To step 6.
6. Check the power supply circuit of K161 fan relay.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Remove the engine compartment fuse box K161 fan relay. D. Connect the battery negative terminal. E. Operate the ignition switch to turn the power to ON state. F. Measure the voltage between No.1 and 3 terminals of K161 fan relay in the forecabin electrical box and the reliable grounding with a multimeter **Standard value:11 ~ 14V** Is the voltage normal? →**Yes** To step 7. →**No** Check the power supply circuit of K161 fan relay and replace the harness if necessary.
7. Check the power supply input circuit of low speed fan.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Dismount K161 fan relay in the forecabin electrical box D. Disconnect the electronic fan harness plug U04. E. Measure the resistance between No.5 terminal of K161 fan relay in the forecabin electrical box and No.1 terminal of electrical fan harness plug U04 with a multimeter **Standard value:Less than 5Ω** Is the resistance normal? →**Yes** To step 8. →**No** Repair the low speed fan power input line fault and replace the harness if necessary.

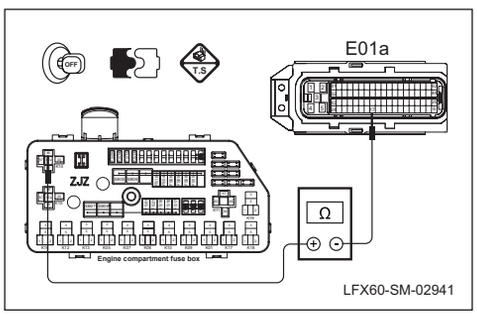
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Test condition	Details/results/measures
8. Check the power supply output circuit of low speed fan.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Remove the engine compartment fuse box K14 fan speed regulation relay. D. Disconnect the electronic fan harness plug U04. E. Measure the resistance between No.30 terminal of K14 fan relay in the forecabin electrical box and No.3 terminal of electrical fan harness plug U04 with a multimeter **Standard value:Less than 5Ω** Is the resistance normal? **→Yes** To step 9. **→No** Repair the low speed fan power output line fault and replace the harness if necessary.
9. Check the grounding circuit of low speed fan.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Remove the engine compartment fuse box K14 fan speed regulation relay. D. Measure the resistance between No.87 terminal of K14fan relay in the forecabin electrical box and the reliable grounding with a multimeter **Standard value:Less than 5Ω** Is the resistance normal? **→Yes** To step 10. **→No** Check the grounding circuit of low speed fan and replace the harness if necessary.
10. Check the control circuit of low speed fan.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the ECM harness connector E01b. D. Dismount the K161 fan relay in the forecabin electrical box. E. Measure the resistance between No.2 terminal of K161 fan relay in the forecabin electrical box and No.65 terminal of ECM harness plug E01awith a multimeter **Standard value:Less than 5Ω** Is the resistance normal? **→Yes** To step 11. **→No** Repair the low speed fan control line fault and replace the harness if necessary.

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Test condition	Details/results/measures
11. Check the control circuit of high speed fan.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the ECM harness connector E01b. D. Remove the engine compartment fuse box K14 fan speed regulation relay. E. Measure the resistance between No.86 terminal of K14 fan relay in the forecabin electrical box and No.17 terminal of ECM harness plug E01awith a multimeter **Standard value:Less than 5Ω** Is the resistance normal? **→Yes** To step 12. **→No** Repair the high speed fan control line fault and replace the harness if necessary.
12. Check the low speed electrical fan.	
	A. Replace the low speed electrical fan. **Refer to:Replacement of electronic fan with guard ring assembly** Is the system normal? **→Yes** Replace the low speed electrical fan. **→No** To step 13.
13. Check ECM.	
	A. Replace ECM. **Refer to:REPLACEMENT OF ECM** Confirm the fault is eliminated

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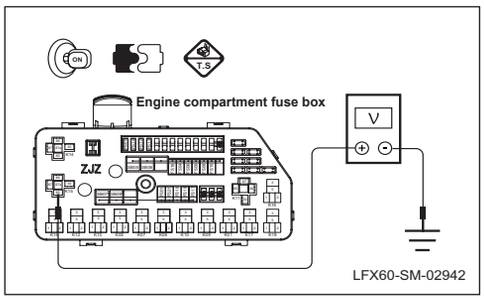
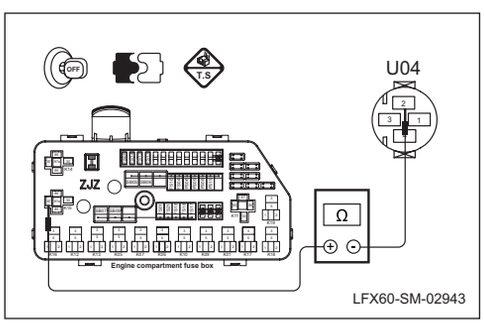
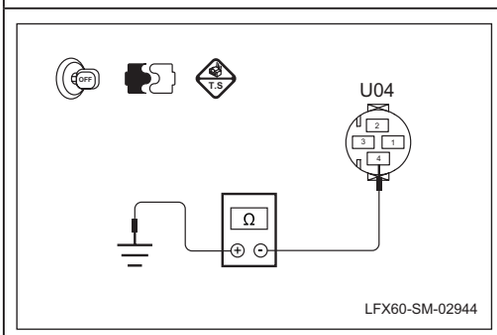
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Trouble-shooting for electrical fan not running at the high speed

Test condition	Details/results/measures
1. Check the engine DTC.	
	A. Operate the ignition switch to turn the power to OFF and connect the diagnostic meter. B. Operate the ignition switch to turn the power to ON state. C. Turn on the diagnostic meter and check the engine system. Is there DTC related to electronic fan control? →**Yes** **Refer to:Diagnostic trouble code (DTC) list. Perform DTC diagnostic procedure.** →**No** To step 2.
2. Perform the test of electrical fan running at the high speed.	
	A. Operate the ignition switch to turn the power to ON state. B. Switch on the automobile diagnosis equipment and enter into the input and output function control C. Perform the test of electrical fan running at the high speed. If the electrical fan works properly at the high speed? →**Yes** Check the coolant temperature sensor. →**No** To step 3.
3. Check the high speed fuse of electrical fan.	
	A. Operate the ignition switch to turn the power to OFF state. B. Check the low speed fuse SB05 of electrical fan in the forecabin electrical box. **Fuse rated capacity: 30 A** Is it OK after checking? →**Yes** To step 4. →**No** Replace the high speed fuse of electrical fan.
4. Check the relay of K152 fan.	
	A. Operate the ignition switch to turn the power to OFF state. B. Exchange the relay of K152 fan with the same model of vehicle. If the electrical fan works properly at the high speed? →**Yes** Replace the relay of K152 fan. →**No** To step 5.

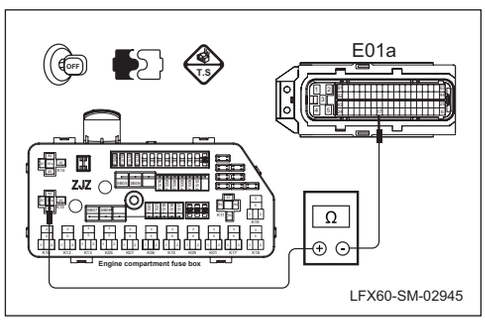
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Test condition	Details/results/measures
5. Check the K125 fan relay power supply line.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Remove the engine compartment fuse box K152 fan relay. D. Connect the battery negative terminal. E. Operate the ignition switch to turn the power to ON state. F. Measure the voltage between No.30 and 85 terminals of K152 fan relay in the forecabin electrical box and the reliable grounding with a multimeter **Standard value:11 ~ 14V** Is the voltage normal? →**Yes** To step 6. →**No** Check the power supply circuit of K152 fan relay and replace the harness if necessary.
6. Check the power supply input circuit of high speed fan.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Remove the engine compartment fuse box K152 fan relay. D. Disconnect the electronic fan harness plug U04. E. Measure the resistance between No.87 terminal of K152 fan relay in the forecabin electrical box and No.2 termianl of harness plug U04 of electrical fan with a multimeter. **Standard value:Less than 5Ω** Is the resistance normal? →**Yes** To step 7. →**No** Repair the low speed fan power input line fault and replace the harness if necessary.
7. Check the power supply input circuit of high speed fan.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the electronic fan harness plug U04. D. Measure the resistance between No.4 terminal of harness plug U04 of electrical fan and the grounding with a multimeter. **Standard value:Less than 5Ω** Is the resistance normal? →**Yes** To step 8. →**No** Repair the high speed fan power input line fault and replace the harness if necessary.

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Test condition	Details/results/measures
8. Check the relay control circuit of K152 fan.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the ECM harness connector E01b. D. Dismount the relay of K152 fan in the forecabin electrical box. E. Measure the resistance between No.86 terminal of K152 fan relay in the forecabin electrical box and No.17termianl of ECM harness plug E01awith a multimeter. **Standard value:Less than 5Ω** Is the resistance normal? →**Yes** To step 9. →**No** Repair the low speed fan control line fault and replace the harness if necessary.
9. Check the high speed electrical fan.	
	A. Replace the high speed electrical fan. **Refer to:Replacement of electronic fan with guard ring assembly** Is the system normal? →**Yes** Replace the high speed electrical fan. →**No** To step 10.
10. Check ECM.	
	A. Replace ECM. **Refer to:REPLACEMENT OF ECM** Confirm the fault is eliminated

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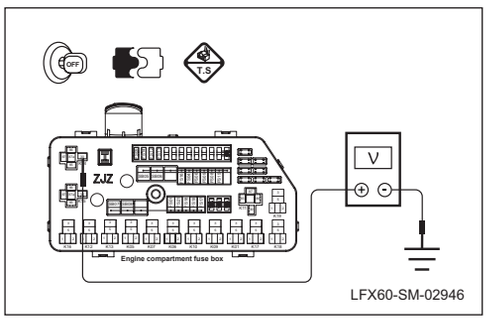
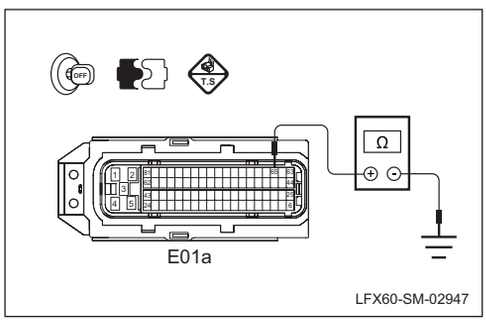
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Diagnosis flow for electronic fan always running at low speed

Test condition	Details/results/measures
1. Check the engine DTC.	
	A. Operate the ignition switch to turn the power to OFF and connect the diagnostic meter. B. Operate the ignition switch to turn the power to ON state. C. Turn on the diagnostic meter and check the engine system. Is there DTC related to electronic fan control? →**Yes** **Refer to:Diagnostic trouble code (DTC) list. Perform DTC diagnostic procedure.** →**No** To step 2.
2. Read the engine coolant temperature data stream.	
	A. Operate the ignition switch to turn the power to ON state. B. Turn on the diagnostic meter and read the read data stream. C. Read the engine coolant temperature data stream. Is the coolant temperature high? →**Yes** Repair the high coolant temperature fault. →**No** To step 3.
3. Check the K161 fan relay.	
	A. Operate the ignition switch to turn the power to OFF state. B. Exchange the relay of K161 fan with the same model of vehicle. If the electrical fan stops working at the low speed? →**Yes** Replace the electronic K161 fan relay. →**No** To step 4.
4. Check the K14 fan speed regulation relay.	
	A. Operate the ignition switch to turn the power to OFF state. B. Exchange K14 fan speed regulation relay with that of the same model vehicle. If the electrical fan stops working at the low speed? →**Yes** Replace the K14 fan speed regulation relay. →**No** To step 5.

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Test condition	Details/results/measures
6. Check the low speed input circuit of electrical fan	
 LFX60-SM-02946	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Remove the engine compartment fuse box K161 fan relay. D. Remove the engine compartment fuse box K14 fan speed regulation relay. E. Connect the battery negative terminal. F. Operate the ignition switch to turn the power to ON state. G. Measure the voltage between No.30 terminal of governing speed relay of K14fan and the reliable grounding with a multimeter. **Standard value:0 V** Is the voltage normal? →**Yes** To step 7. →**No** Check the low speed input circuit of electrical fan and replace the harness if necessary.
7. Check the low speed control circuit of electrical fan.	
 LFX60-SM-02947	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Remove the engine compartment fuse box K161 fan relay. D. Disconnect the ECM harness connector E01b. E. Measure the resistance between No.65 terminal of ECM harness plug E01aand the reliable grounding with a multimeter. **Standard value:10 MΩ or higher** Is the resistance normal? →**Yes** To step 8. →**No** Check the low speed control circuit of electrical fan and replace the harness if necessary.
8. Check ECM.	
	A. Replace ECM. **Refer to:REPLACEMENT OF ECM** Confirm the fault is eliminated

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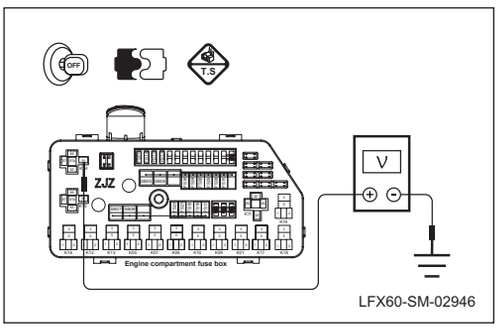
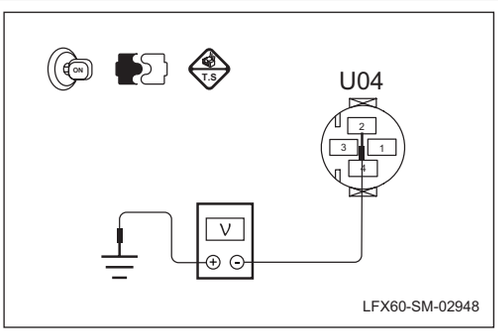
AutoLibrary

Diagnosis flow for electronic fan always running at high speed

Test condition	Details/results/measures
1. Check the engine DTC.	
	A. Operate the ignition switch to turn the power to OFF and connect the diagnostic meter. B. Operate the ignition switch to turn the power to ON state. C. Turn on the diagnostic meter and check the engine system. Is there DTC related to electronic fan control? →**Yes** **Refer to:Diagnostic trouble code (DTC) list. Perform DTC diagnostic procedure.** →**No** To step 2.
2. Read the engine coolant temperature data stream.	
	A. Operate the ignition switch to turn the power to ON state. B. Turn on the diagnostic meter and read the read data stream. C. Read the engine coolant temperature data stream. Is the coolant temperature high? →**Yes** Repair the high coolant temperature fault. →**No** To step 3.
3. Check the K161 fan relay.	
	A. Operate the ignition switch to turn the power to OFF state. B. Exchange K161 fan relay with that of the same model vehicle. Is the electronic fan high speed running stopped? →**Yes** Replace the electronic K161 fan relay. →**No** To step 4.
4. Check the K161 fan relay.	
	A. Operate the ignition switch to turn the power to OFF state. B. Exchange the relay of K152 fan with the same model of vehicle. Is the electronic fan high speed running stopped? →**Yes** Replace the electronic K152 fan relay. →**No** To step 5.

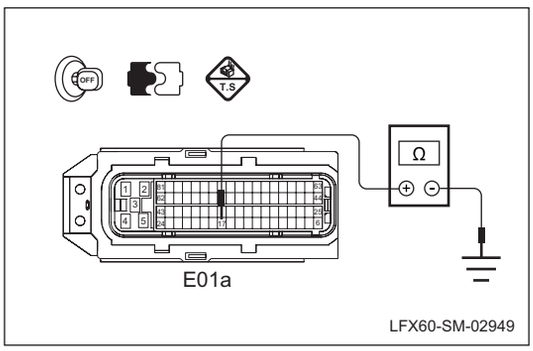
AutoLibrary

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Test condition	Details/results/measures
5. Check the circuit of speed governing relay of K14fan.	
 LFX60-SM-02946	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Dismount the speed governing relay of K14fan D. Connect the battery negative terminal. E. Operate the ignition switch to turn the power to ON state. F. Measure the voltage between No.30 terminal of speed governing relay of K14fan in the forecabin electrical box and the reliable grounding with a multimeter. **Standard value:0V** Is the voltage normal? →**Yes** To step 6. →**No** Check the circuit of governing relay of K14fan and replace the harness if necessary.
6. Check the high speed input circuit of electrical fan	
 LFX60-SM-02948	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the electronic fan harness plug U04. D. Remove the engine compartment fuse box K14 fan speed regulation relay. E. Remove the engine compartment fuse box K152 fan relay. F. Connect the battery negative terminal. G. Operate the ignition switch to turn the power to ON state. H. Measure the voltage between No.2 terminal of harness plug U04 of electrical fan and the reliable grounding with a multimeter. **Standard value:0V** Is the voltage normal? →**Yes** To step 7. →**No** Check the high speed control circuit of electrical fan and replace the harness if necessary.

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Test condition	Details/results/measures
7. Check the high speed control circuit of electrical fan.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Remove the engine compartment fuse box K152 fan relay. D. Remove the engine compartment fuse box K14 fan speed regulation relay. E. Disconnect the E01aplug of ECM harness. F. Measure the resistance between No.17 terminal of ECM harness plug E01aand the reliable grounding with a multimeter. **Standard value:10 MΩ or higher** Is the resistance normal? →**Yes** To step 8. →**No** Check the high speed control circuit of electrical fan and replace the harness if necessary.
8. Check ECM.	
	A. Replace ECM. **Refer to:REPLACEMENT OF ECM** Confirm the fault is eliminated

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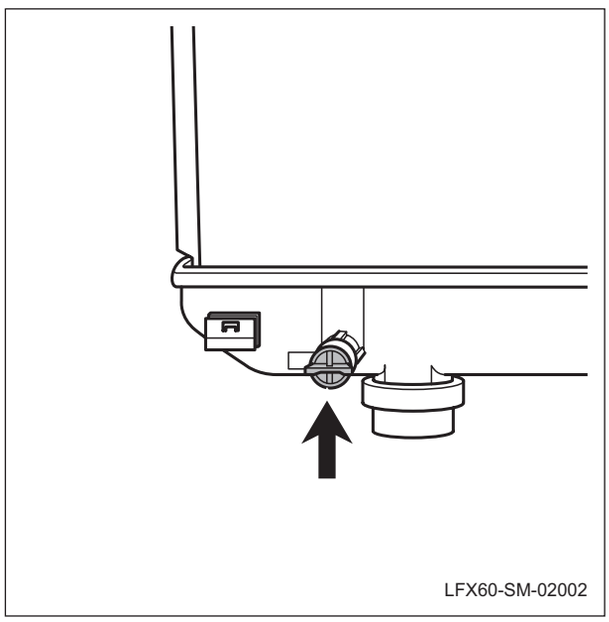
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Removal and Installation

Procedure for discharging and filling the engine coolant

Emission

1. Discharge the engine coolant.



(a). Open the cover of expansion tank.

ℹNote:

- **Any hot steam or hot coolant may cause injuries.**
- **When the engine is under the operating temperature, the cooling system will be under overpressure condition.**
- **Cover the coolant expansion tank cap with the rag and carefully open the cap to release the excessive pressure.**
- **The heating steam may escape when the expansion tank cap opens. Must wear protective glasses and protective clothing, to avoid burns and other injuries.**

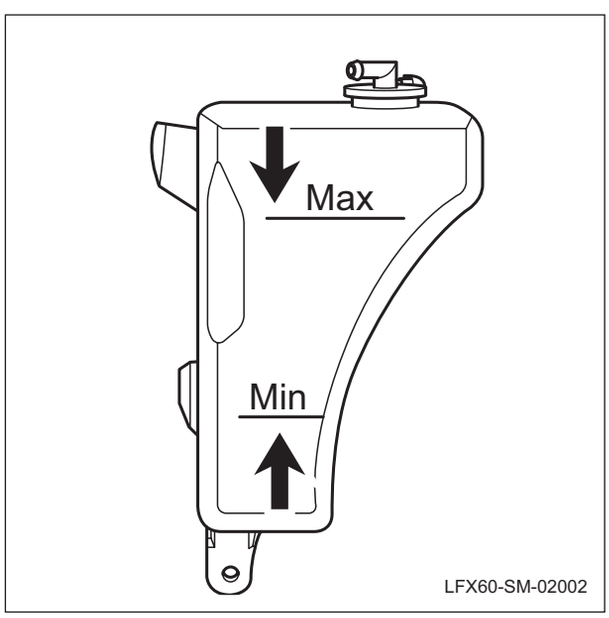
(b). Lift the vehicle.

(c). Dismount the release bolt of radiator to discharge the coolant completely.

(d). Install the release bolt of radiator

Filling

1. Fill the engine coolant.



(a). Fill the engine coolant to the standard scale.

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Replacement of the assembly of radiator overflow pipe and expansion tank

Removal

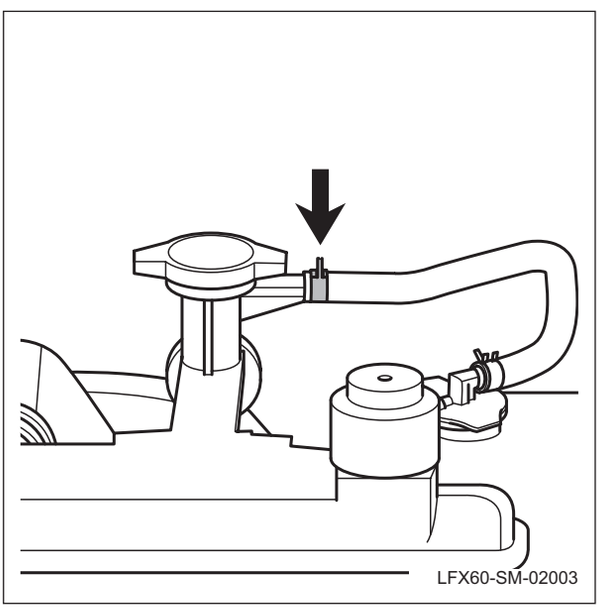
1. Dismount the assembly of radiator overflow pipe and expansion tank

ℹNote:

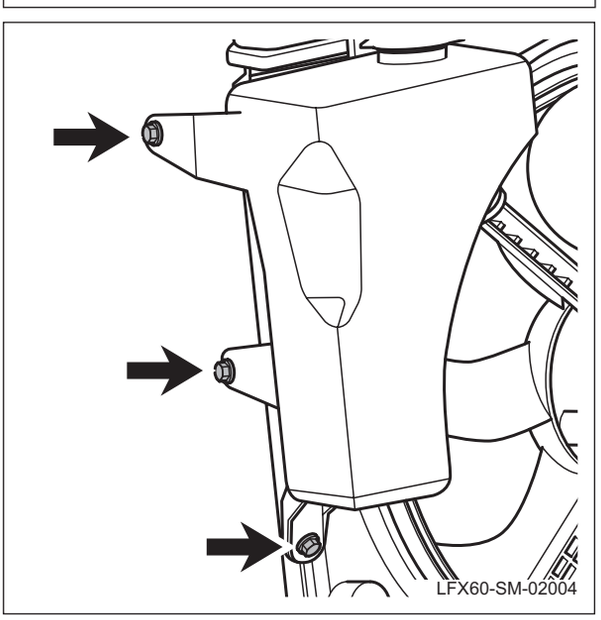
- **Any hot steam or hot coolant may cause injuries.**
- **When the engine is under the operating temperature, the cooling system will be under overpressure condition.**
- **Cover the coolant expansion tank cap with the rag and carefully open the cap to release the excessive pressure.**
- **The heating steam may escape when the expansion tank cap opens. Must wear protective glasses and protective clothing, to avoid burns and other injuries.**

(a). Empty the coolant. **Refer to engine coolant draining and filling procedures.**

(b). Remove the air filter assembly. **Refer to the replacement of air filter assembly.**



(a). Dismount the bar clasp of radiator overflow pipe and detach the pipe.



(b). ismount the tap bolts of expansion tank.

(c). Detach the assembly of radiator overflow pipe and expansion tank

Installation

1. Install the assembly of radiator overflow pipe and expansion tank.

(a) The installation sequence is the reverse of the disassembly order.

(b). Fill the coolant,**Refer to engine coolant draining and filling procedures.**

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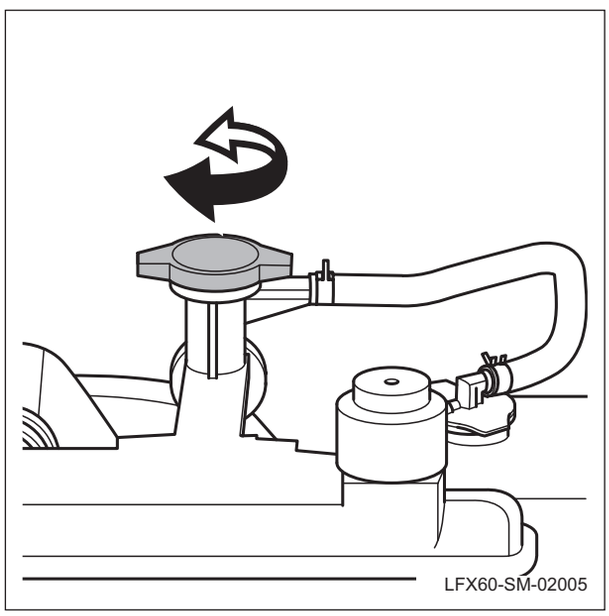
Replacement of radiator filler cover.

Removal

1. Dismount the radiator filler cover.

❶Note:

- **Any hot steam or hot coolant may cause injuries.**
- **When the engine is under the operating temperature, the cooling system will be under overpressure condition.**
- **Cover the coolant expansion tank cap with the rag and carefully open the cap to release the excessive pressure.**
- **The heating steam may escape when the expansion tank cap opens. Must wear protective glasses and protective clothing, to avoid burns and other injuries.**



(a). Dismount the radiator filler cover.

Installation

1.I nstall the radiator filler cover.

(a). The installation sequence is the reverse of the disassembly order.

AutoLibrary

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Replacement of radiator delivery hose

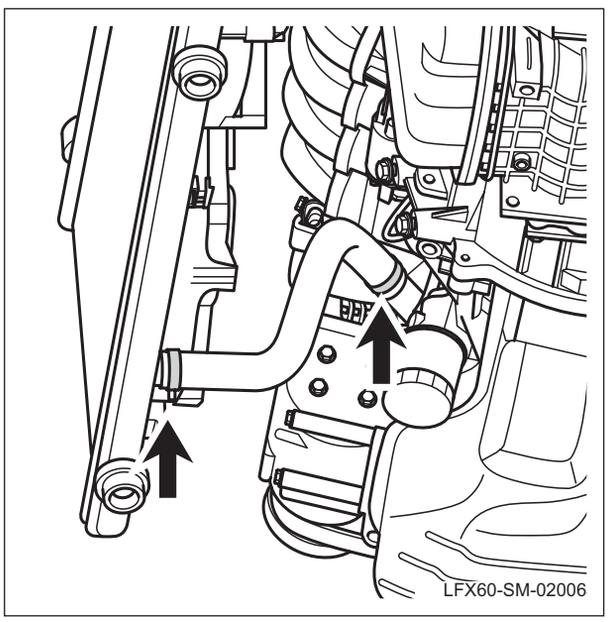
Removal

1. Dismount the radiator delivery hose.

ℹNote:

- **Any hot steam or hot coolant may cause injuries.**
- **When the engine is under the operating temperature, the cooling system will be under overpressure condition.**
- **Cover the coolant expansion tank cap with the rag and carefully open the cap to release the excessive pressure.**
- **The heating steam may escape when the expansion tank cap opens. Must wear protective glasses and protective clothing, to avoid burns and other injuries.**

(a). Empty the coolant. **Refer to engine coolant draining and filling procedures.**



(b). Dismount the bar clasp of radiator delivery hose.

(c). Detach the radiator delivery hose.

Installation

1. Install the radiator delivery hose.

(a) The installation sequence is the reverse of the disassembly order.

(b). Fill the coolant,**Refer to engine coolant draining and filling procedures.**

AutoLibrary

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Replacement of radiator water supply hose.

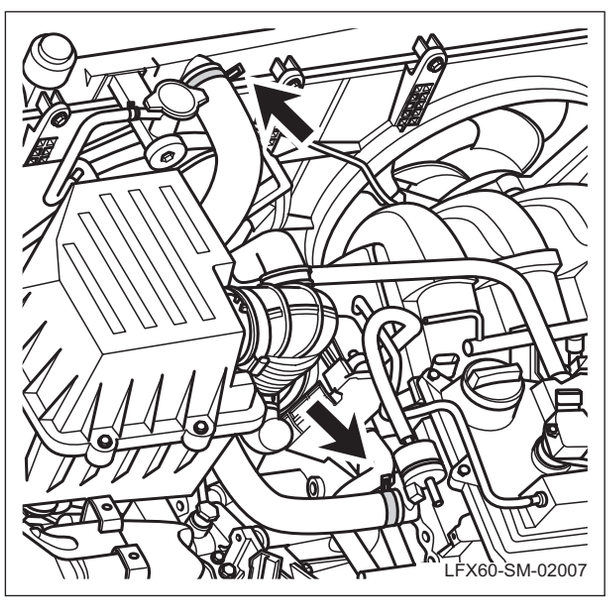
Removal

1. radiator water supply hose.

❶Note:

- **Any hot steam or hot coolant may cause injuries.**
- **When the engine is under the operating temperature, the cooling system will be under overpressure condition.**
- **Cover the coolant expansion tank cap with the rag and carefully open the cap to release the excessive pressure.**
- **The heating steam may escape when the expansion tank cap opens. Must wear protective glasses and protective clothing, to avoid burns and other injuries.**

(a). Empty the coolant. **Refer to engine coolant draining and filling procedures.**



(b). Dismount the bar clasp of radiator water supply hose.
(c). Detach the radiator water supply hose.

Installation

1. Installation water supply hose.

(a). The installation sequence is the reverse of the disassembly order.
(b). Fill the coolant,**Refer to engine coolant draining and filling procedures.**

AutoLibrary

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Replacement of warm braw hose

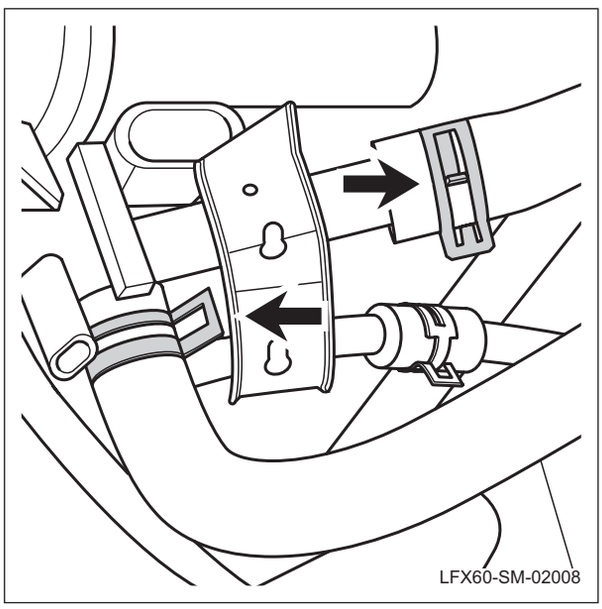
Removal

1. Dismount the warm braw hose.

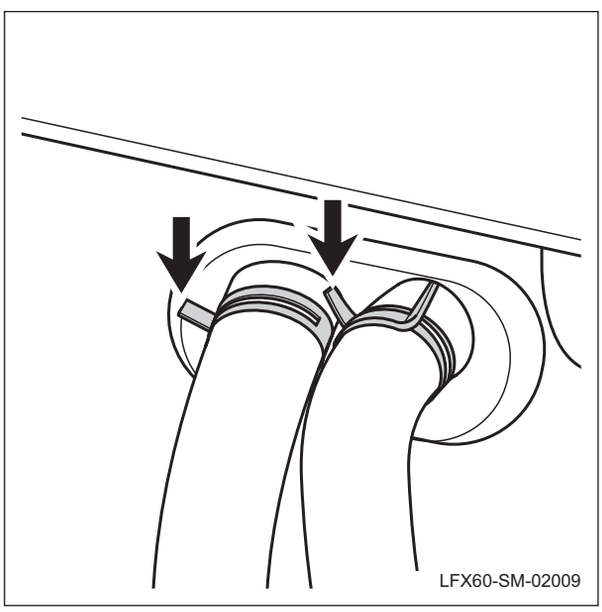
❶Note:

- **Any hot steam or hot coolant may cause injuries.**
- **When the engine is under the operating temperature, the cooling system will be under overpressure condition.**
- **Cover the coolant expansion tank cap with the rag and carefully open the cap to release the excessive pressure.**
- **The heating steam may escape when the expansion tank cap opens. Must wear protective glasses and protective clothing, to avoid burns and other injuries.**

(a). Empty the coolant. **Refer to engine coolant draining and filling procedures.**



(b). Dismount the bar clasp of warm braw hose.



(c). Dismount the bar clasp of warm braw hose.

(d). Detach the warm braw hose

Installation

1. Install the warm braw hose.

(a). The installation sequence is the reverse of the disassembly order.

(b). Fill the coolant,**Refer to engine coolant draining and filling procedures.**

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Replacement of thermostat

Removal

1. Remove thermostat.

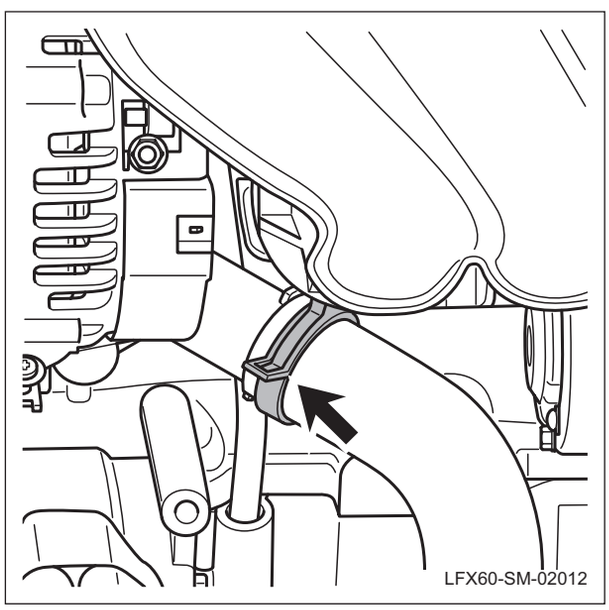
❶Note:

- **Any hot steam or hot coolant may cause injuries.**
- **When the engine is under the operating temperature, the cooling system will be under overpressure condition.**
- **Cover the coolant expansion tank cap with the rag and carefully open the cap to release the excessive pressure.**
- **The heating steam may escape when the expansion tank cap opens. Must wear protective glasses and protective clothing, to avoid burns and other injuries**

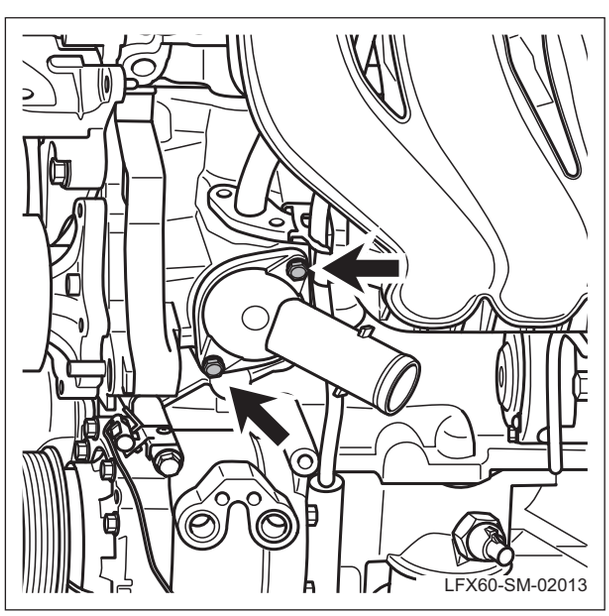
(a). Empty the coolant. **Refer to engine coolant draining and filling procedures.**

(b). Remove the accessory belt. **Refer to replacement of accessory belt.**

(c). Dismount the engine.**Reference: Replacement of engine**



(d). Dismount the bar clasp of radiator delivery hose and detach the hose.



(e). Dismount the tap bolts of thermostat housing.

(f). Detach the thermostat.

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Installation

1. Installation thermostat.

(a). The installation sequence is the reverse of the disassembly order.

(b). Fill the coolant,**Refer to engine coolant draining and filling procedures.**

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Replacement of the assembly of electrical fan with air shield

Removal

1. Dismount the assembly of electrical fan with air shield.

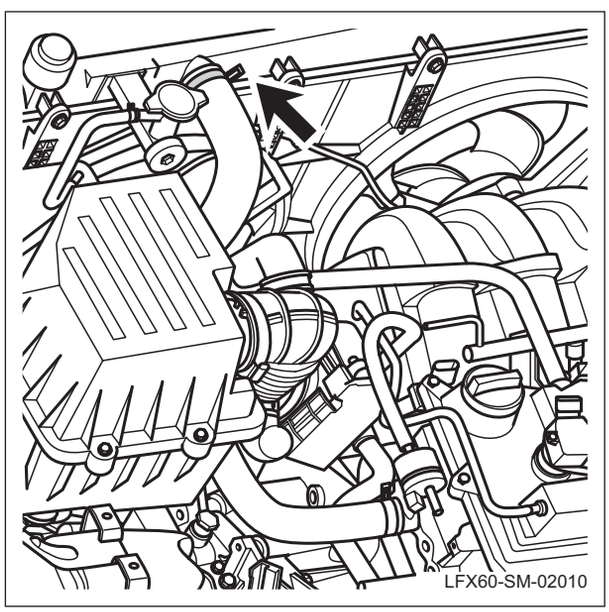
❶Note:

- **Any hot steam or hot coolant may cause injuries.**
- **When the engine is under the operating temperature, the cooling system will be under overpressure condition.**
- **Cover the coolant expansion tank cap with the rag and carefully open the cap to release the excessive pressure.**
- **The heating steam may escape when the expansion tank cap opens. Must wear protective glasses and protective clothing, to avoid burns and other injuries**

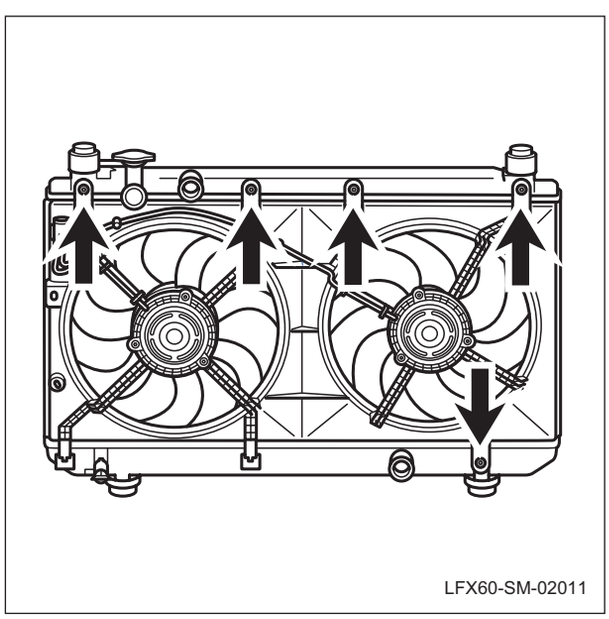
(a). Empty the coolant. **Refer to engine coolant draining and filling procedures.**

(b). Disconnect the battery negative terminal .

(c). Disconnect the harness plug of electrical fan.


LFX60-SM-02010

(d). Dismount the bar clasp of radiator water supply hose and detach the hose.


LFX60-SM-02011

(e). Dismount the tap bolts of the assembly of electrical fan with air shield.

(f). Detach the assembly of electrical fan with air shield.

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Installation

1. Install the assembly of electrical fan with air shield.

(a). The installation sequence is the reverse of the disassembly order.

(b). Fill the coolant,**Refer to engine coolant draining and filling procedures.**

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Replacement of radiator assembly

Removal

1. Remove the radiator assembly.

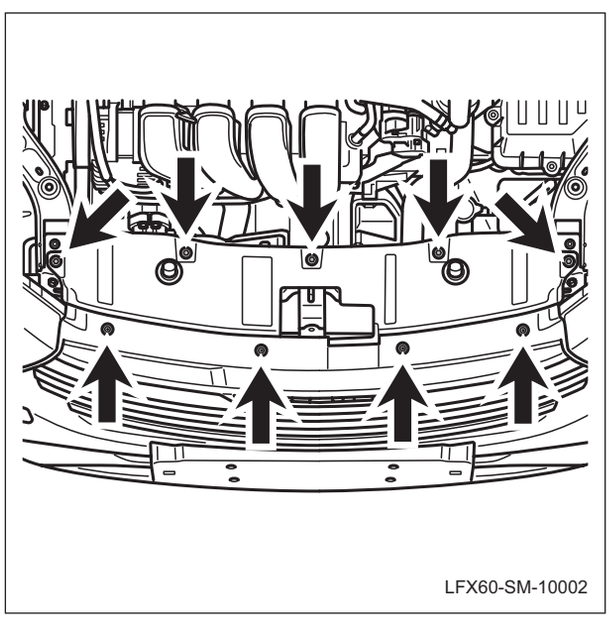
ℹNote:

- **Any hot steam or hot coolant may cause injuries.**
- **When the engine is under the operating temperature, the cooling system will be under overpressure condition.**
- **Cover the coolant expansion tank cap with the rag and carefully open the cap to release the excessive pressure.**
- **The heating steam may escape when the expansion tank cap opens. Must wear protective glasses and protective clothing, to avoid burns and other injuries.**

(a). Disconnect the battery negative connector.

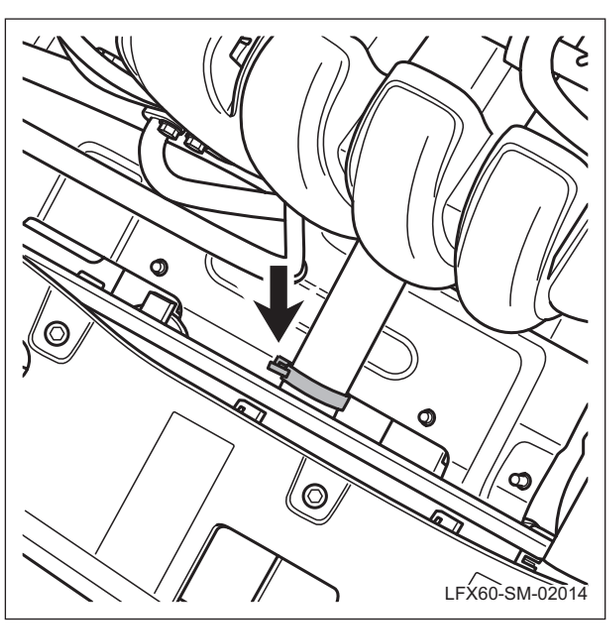
(b). Empty the coolant. Refer to engine coolant draining and filling procedures.

(c). Remove the radiator's air escape tube and expansion tank assembly. Reference: Replacement of the radiator's air escape tube and expansion tank assembly.



LFX60-SM-10002

(d). Remove the fixing bolts and screws of the decorative plate on the front bumper, and take the decorative plate.

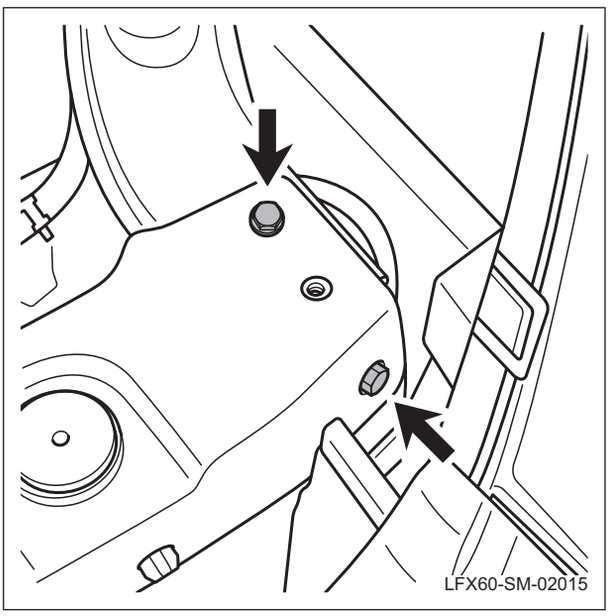


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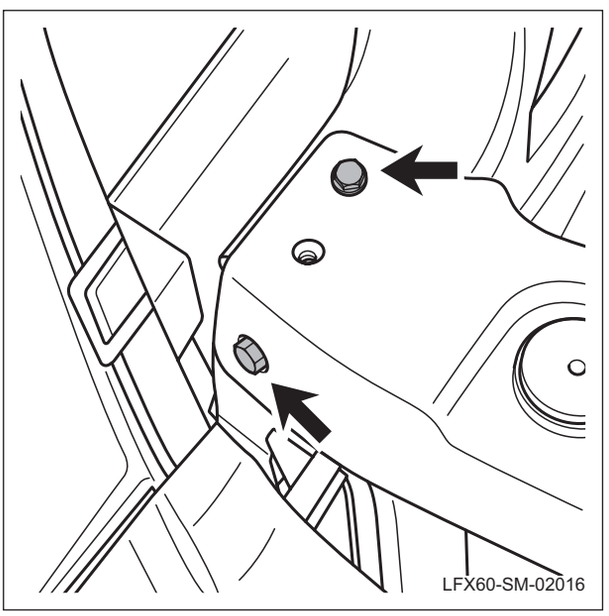
(e). Remove the clamps from the outlet hose on radiator, and take the outlet hose.

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(f). Remove the beam fixing bolts on the radiator.



(g). Remove the beam fixing bolts on the radiator.
(h). Disconnect the radiator from the bushing on the radiator.
(i). Remove the electronic fan belt guard assembly. **Reference: the replacement of electronic fan belt guard assembly.**
(j). Remove the radiator assembly.

Installation

1. Install the radiator assembly.

(a). The installation sequence is the reverse of the disassembly order.

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Replacement of pump assembly

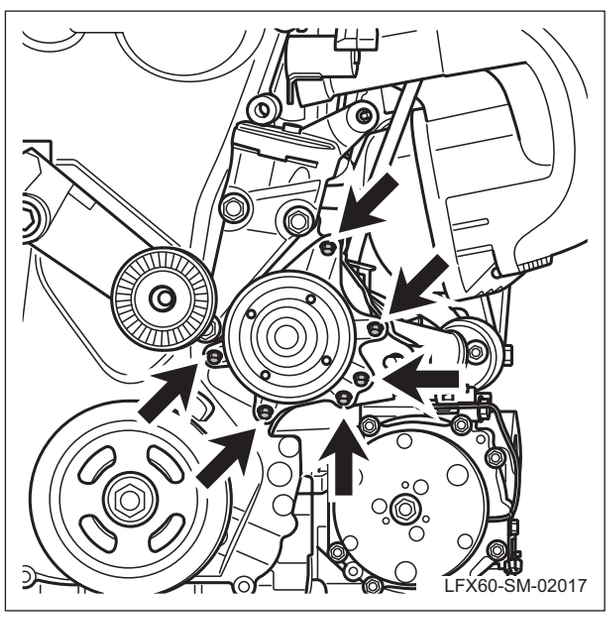
Removal

1. Dismantle water pump assembly.

Note:

- **Hot steam and hot coolant may cause burns.**
- **When the engine is under the operating temperature, the cooling system will be under overpressure condition.**
- **Cover the coolant expansion tank cap with the rag and carefully open the cap to release the excessive pressure.**
- **The heating steam may escape when the expansion tank cap opens.Must wear protective glasses and protective clothing, to avoid burns and other injuries.**

(a). Empty the coolant. Refer to engine coolant draining and filling procedures.
(b). Remove the accessory belt. Refer to replacement of accessory belt.



(c). Remove the pump fixing bolts.
(d). Remove the pump.

Installation

1. Install the pump assembly.

(a). The installation sequence is the reverse of the disassembly order.

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02-Engine

Start system 2-603
Technical specifications.....2-603
Precautions 2-604
Preparation.....2-605
Structure and installation location 2-606
General Inspection 2-607
Operating Principle.....2-612
Diagnostic Information and Procedures.....2-613
Removal and Installation.....2-630

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Start system

Technical specifications

General specifications

Name	Specification
Commutator ring gear runout	
Commutator diameter	
Starter brush length	

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Precautions

Precautions

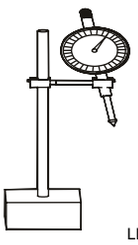
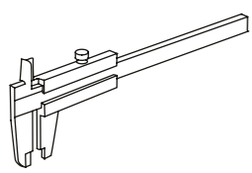
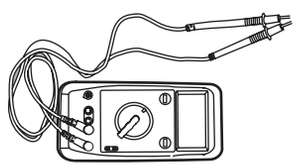
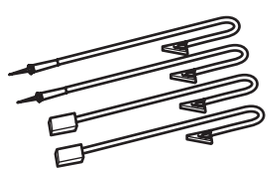
1. No matter the engine is running or not, when the ignition switch is turned on, do not enable any components in the system such as any cable of the battery, fuel injector, fuel pump, ignition system wire, electronic control unit (ECU) wire, etc.
2. When the engine is difficult to start, the starting time once cannot be too long (generally not greater than 5s), and the other start should be made 15s later. It will not only allow the battery electrolyte to penetrate into the inner layers of the electrode plates, so that the battery potential can be restored to facilitate the engine start, but also it can avoid that the starter is damaged due to overheating after long-time continuous operation.
3. Be careful not to damage the insulating parts when disassembling the starter.
4. Do not use the starter to drive the car, so as to avoid damage to the starter due to excessive load.
5. Release the ignition switch in time after the engine starts, and let the ignition switch automatically return to the ignition gear, so as to avoid the wear when starting the electric motor and one-way clutch after the starter idles at high speed for a long time.
6. Do not turn the ignition switch to the starting gear when the engine is running, so as to avoid the fact that the driving gear of starter collides with the flywheel gear ring of engine.
7. The performance testing time of the starter in maintenance shall not exceed 5s to avoid damage to the starter.

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Preparation

General and special tools

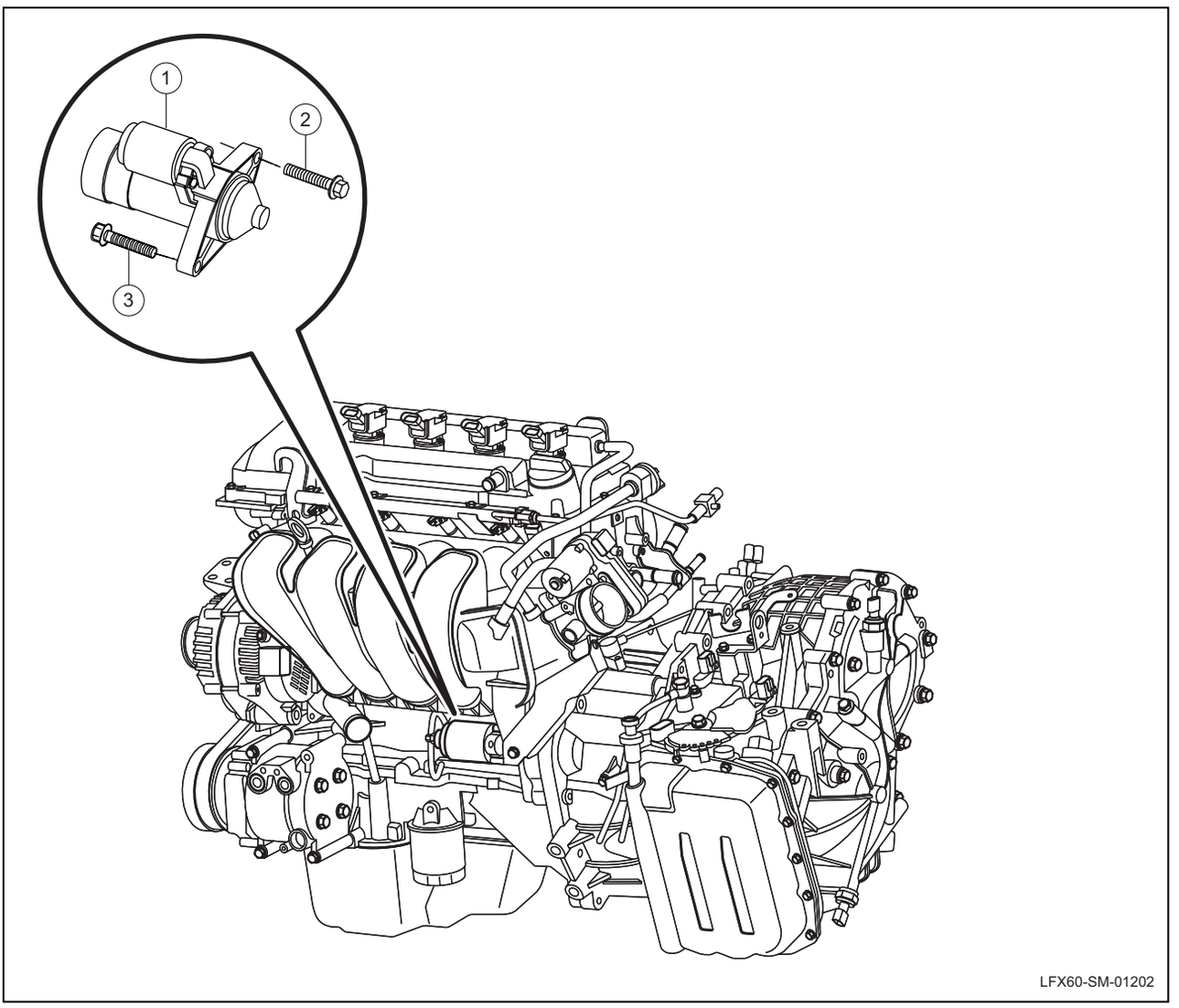
No.	Tool name	Tool figure	Tool code	Remarks
1	Dial gauge	 LFX60-SM-01201	-	Measure the starting commutator gear ring runout
2	Calipers	 LFX60-SM-01200	-	Measure the diameter and length
3	Digital universal meter	 LFX60-SM-02800	-	Measure the voltage and resistance
4	Conductor assembly	 LFX60-SM-02801	-	Testing circuit

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Structure and installation location

Component Location Plan



No.	Part Name
1	Starter assembly
2	Starter mounting bolt

No.	Part Name
3	Starter mounting bolt

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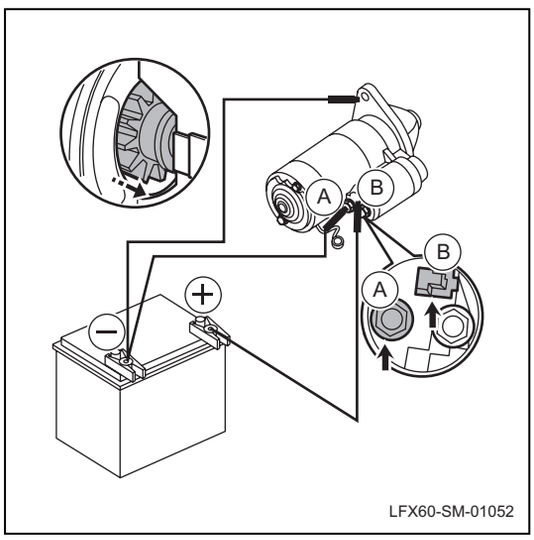
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General Inspection

Starter detection

Testing

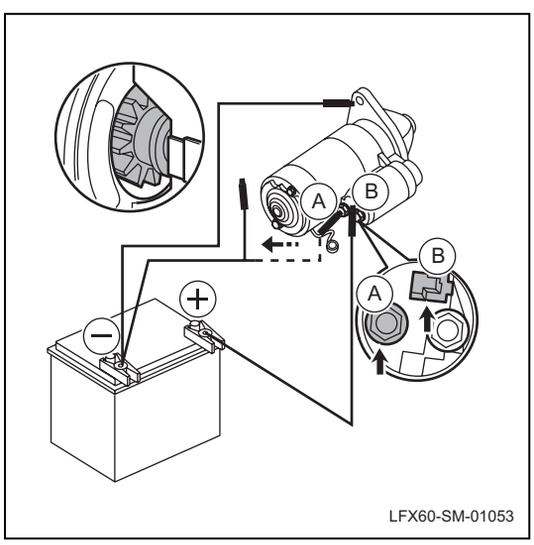
1. Check the starter assembly.



Note:

- **To prevent the starter from running, disconnect the field coil lead from terminal A.**
- **Complete the following tests within 3 to 5 s.**

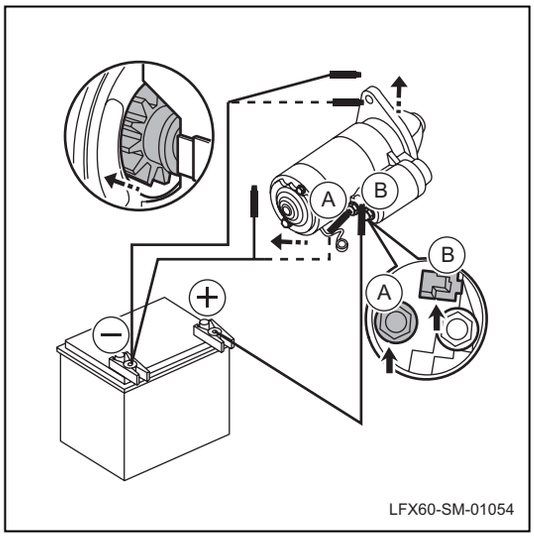
(a). As shown, connect the battery to the two terminals A and B of the starter, and check if the clutch pinion is moving outward. If the clutch pinion does not run or move outward, replace the electromagnetic starter switch assembly.



(b). As shown, disconnect the terminal A lead and check that the clutch pinion can remain in place (no inward movement).

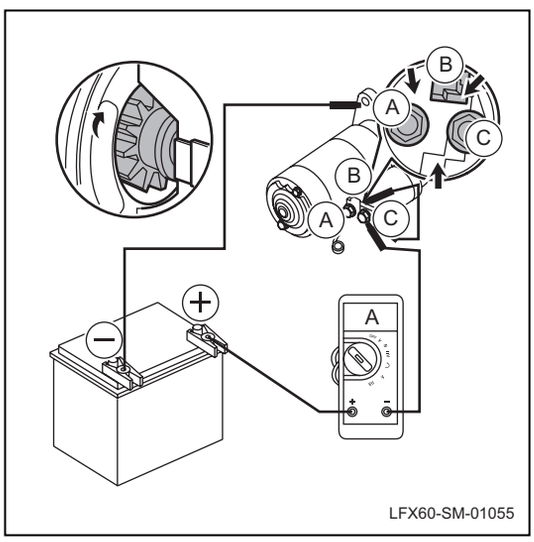
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LFX60-SM-01054

(c). As shown, disconnect the terminal A lead and D lead, and check if the clutch pinion can return (inward movement).



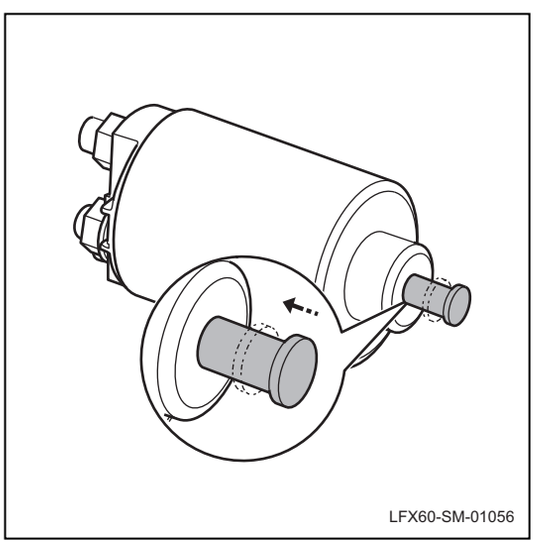
LFX60-SM-01055

(d). As shown, perform no load test on the starter, and observe and record the current value (using the multimeter's current mode).

Note:

- **Use a vise to hold the starter caught by the aluminum plate or the cloth.**
- **When the battery voltage is below 11.5V, the current value should be <90A; replace the starter if the current value does not meet the requirements.**

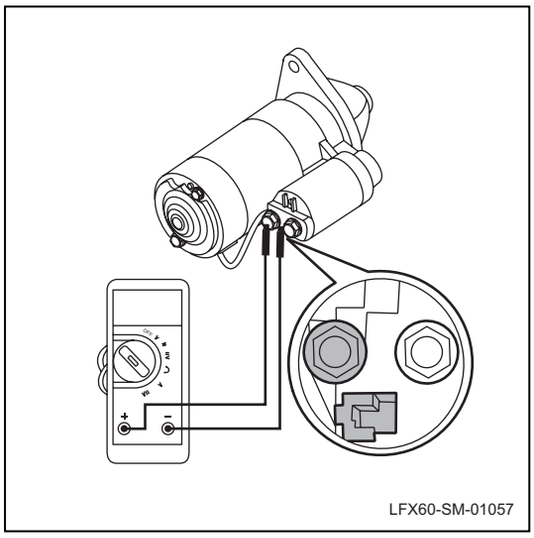
2. Check the starter magnetic switch.


LFX60-SM-01056

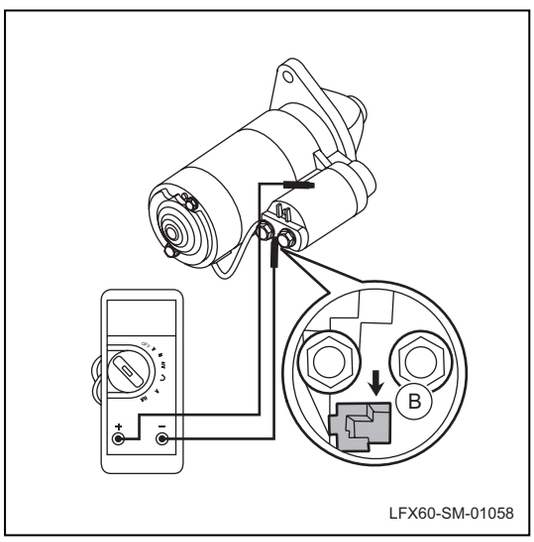
(a). As shown, push the core in, and check if the core can quickly return; if not, replace the magnetic switch assembly.

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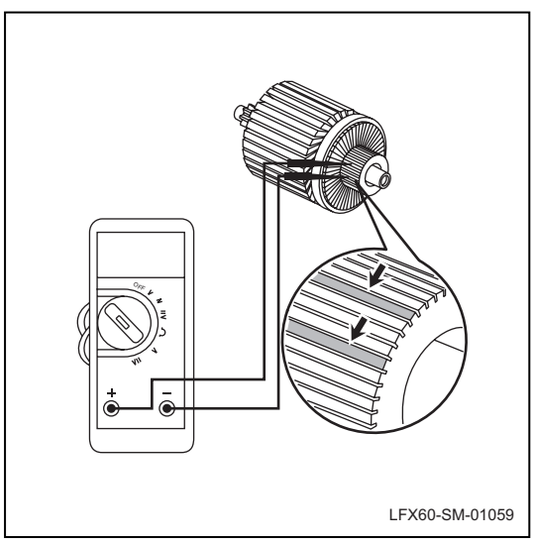


(b). As shown, use the multimeter's ohm mode to measure the resistance between terminals A and B; replace the magnetic switch if it does not meet the requirements.
Resistance: <1Ω



(c). As shown, use the multimeter's ohm mode to measure the resistance between terminal B and housing; replace the magnetic switch if it does not meet the requirements.
Resistance:<2Ω

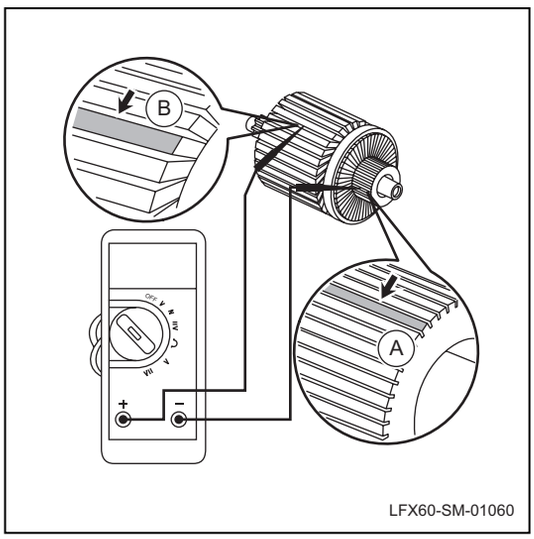
3. Check the armature coil.



(a). As shown, use the multimeter's ohm mode to check if any two commutation bars are conductive; if not, replace the armature winding.

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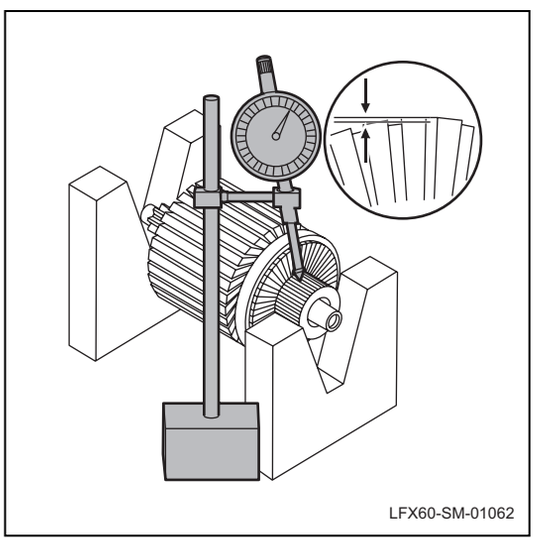
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LFX60-SM-01060

(b). Test the commutator in the Ohm gear of multimeter, as shown in the figure to check if the commutator (as shown in Figure A) and armature core (as shown in Figure B) are conductive; if conductive, replace the armature winding.

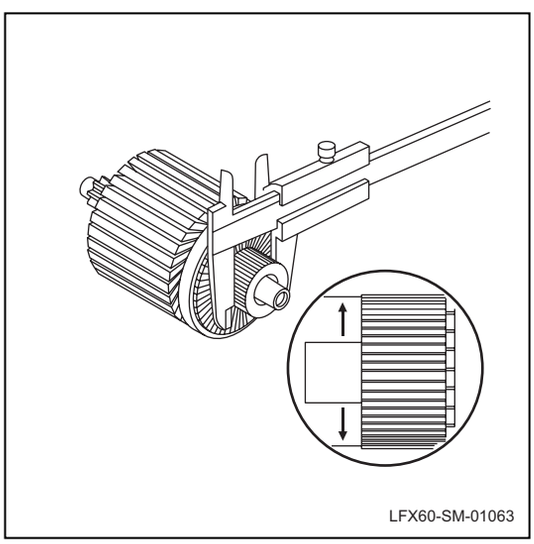
4. Check the commutator.


LFX60-SM-01062

(a). Check the surface of the commutator for contamination and burns; if yes, polish with a sandpaper.

(b). Put the commutator on the V-shaped block, and check the commutator gear ring with a dial indicator; if the difference is greater than the maximum value, repair it or replace it if necessary.

Maximum gear ring difference: 0.05mm


LFX60-SM-01063

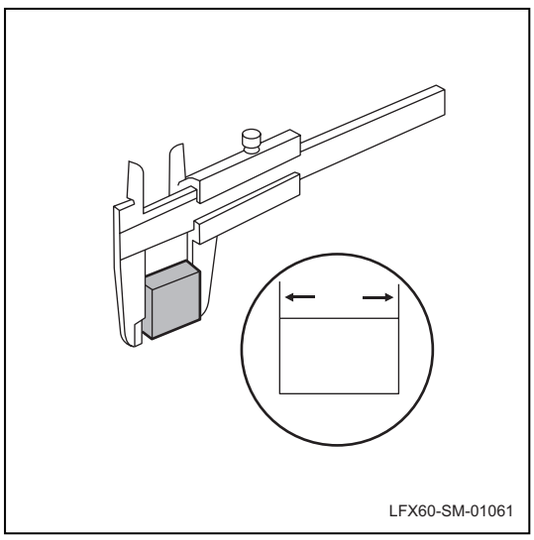
(c). Use the vernier caliper to measure the diameter of the commutator, and replace the armature if the diameter is less than the minimum.

Standard Diameter:30mm
Minimum diameter:29mm

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5. Check the starter brush.



(a). Use the vernier caliper to check the length of the brush. If the length is less than the minimum, replace the brush. Replace the brush carrier and the starter yoke assembly, if necessary.
Standard Diameter:15.5mm
Minimum diameter:10mm

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Operating Principle

System Overview

The start-up system consists of a battery, a start-up switch, a starter and related lines, all of which are connected by wires. When the start signal is received, and the power supply is supplied to the starter's electromagnetic switch; the electromagnetic switch coil generates a magnetic field to drive the plunger and gear transmission rod, then the pinion gets engaged with the engine's flywheel gear ring; finally, the electromagnetic switch is closed, and the engine starts. After the engine is started, the pinion will overrun the clutch protection armature, to avoid that the flywheel drives the pinion driving armature, until the switch is disconnected, and then the return spring will make the pinion to return its original position.

Starter

The starter consists of stator assembly, armature assembly, overdrive clutch assembly, electromagnetic switch assembly, front shell, rear shell, brush carrier and transmission rod.

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Diagnostic Information and Procedures

Diagnosis Instructions

Before starting to diagnose a fault in the startup system, familiarize yourself with the operating principle of the startup system, and then start the system diagnostics, which helps to determine the correct troubleshooting steps in the event of a failure. More importantly, this also helps to determine whether the customer's situation belongs to normal operation.

Any troubleshooting of the start-up system should begin with the start-up system check, so as to instruct the service personnel to take the next logical step to troubleshoot. Comprehend and correctly use the diagnostic flow chart to shorten the diagnosis time and avoid the misjudgement.

General equipment

Digital universal meter
Diagnostic equipment of vehicle

Visual Inspection

1. Confirm the customer's question.
2. Visually check for obvious signs of mechanical or electrical damage.

Visual inspection table

Mechanical	Electrical
• One-touch start switch • Lgnition switch • Starter • Flyweight disk	• Fuse • Harness or plug • Battery • Engine compartment fuse box • PEPS

3. Check the system lines easy to see or can be seen.
4. If the observed or proposed problem is obvious and its cause is identified, rectify the cause before proceeding with next step.
5. If for the problem, there are no obvious findings, then confirm the fault and refer to the symptom table.

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List of fault symptoms

Symptom	Possible point of failure	Recommended Measures
The starter can not be operated	• Fuse	**Refer to: Diagnostic process for starter failing to work**
	• Battery	
	• Harness or plug	
	• Engine compartment fuse box	
	• Dashboard fuse box	
	• Ignition switch/one-touch start switch	
	• Starter	
	• PEPSECU	
The starter can not stop running	• Starter relay	**Refer to:Diagnostic process for starter failing to stop running**
	• Harness or plug	
	• Engine compartment fuse box	
	• Ignition switch/one-touch start switch	
	• PEPSECU	
The starter is working but the engine is not working	• Starter	• Repair or replace the starter **Refer to: Replacement of starter**
	• Flywheel	• Repair or replace the flywheel **Refer to: Replacement of flywheel**
The starter is running slowly	• Battery voltage low	• Charge or replace the battery. **Reference: Replacement of the battery**
	• Engine accessories	• Repair the booster pump and other accessories; replace, if necessary.
	• Starter	• Repair or replace the starter **Refer to: Replacement of starter**
Abnormal start-up noise	• Starter fasteners get loose	• Reinstall the starter fasteners
	• Flywheel fasteners get loose	• Reinstall the flywheel fasteners
	• Starter	• Repair or replace the starter **Refer to: Replacement of starter**
	• Flywheel	• Repair or replace the flywheel **Refer to: Replacement of flywheel**

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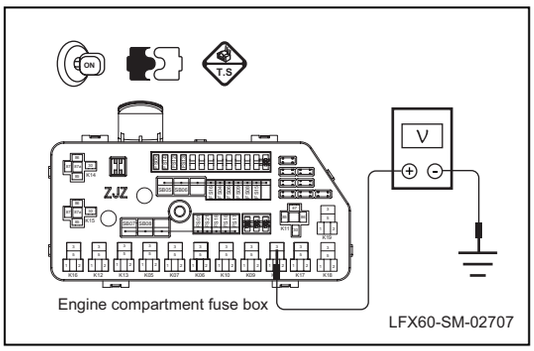
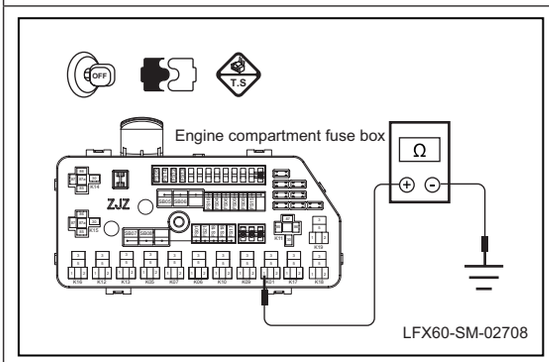
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Diagnostic process for starter failing to work

Test condition	Details/results/measures
1. General inspection.	
	A. Check whether the battery positive and negative harness connection is loose. B. Check the starter positive terminal harness and harness plug for looseness. Is it OK after checking? →**Yes** To step 2. →**No** Repair the fault position.
2. Check the battery voltage.	
	A. Measure the battery voltage with a multimeter. **Standard value:11 ~ 14V** Is the voltage normal? →**Yes** To step 3. →**No** Charge or replace the battery. **Refer to: Replacement of battery**
3. Check the fuse.	
	A. Check the fuse starting relay fuse FS01 and starting switch fuse SB03. **Fuse rated capacity: FS01 (15A), SB03 (30A)** Is it OK after checking? →**Yes** To step 4. →**No** Replace the fuse.
4 Check the K01 starter relay.	
	A. Operate the ignition switch to turn the power to OFF state. B. Remove the engine compartment fuse box K01 starter relay. C. Replace the K01 starter relay and check whether the starting operation is normal. Is the starter running normal? →**Yes** Replace the K01 starter relay. →**No** To step 5.

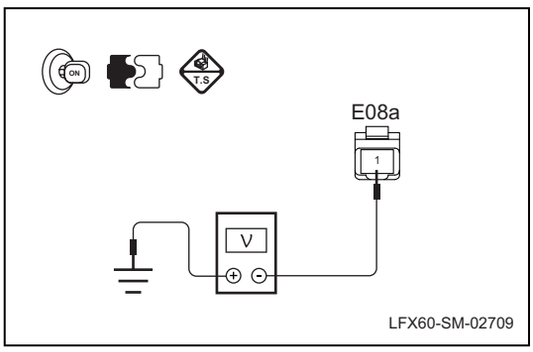
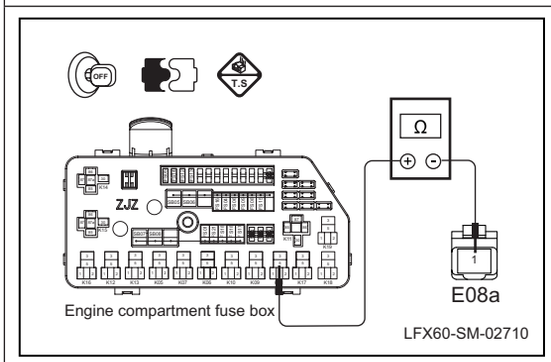
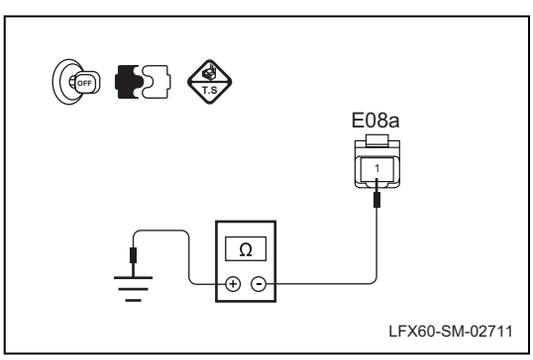
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Test condition	Details/results/measures
5. Check the K01 starter relay power line.	
	A. Operate the ignition switch to turn the power to OFF state. B. Remove the engine compartment fuse box K01 starter relay. C. Measure the voltage between the engine compartment fuse box K01 starter relay terminal 3 and the fixed ground point with the multimeter. **Standard value:11 ~ 14V** Is the voltage normal? →**Yes** To step 6. →**No** Check the K01 starting relay power line; if necessary, replace the electrical box of engine compartment.
6. Check the K01 starter relay ground line.	
	A. Operate the ignition switch to turn the power to OFF state. B. Remove the engine compartment fuse box K01 starter relay. C. Measure the resistance between the engine compartment fuse box K01 starter relay terminal 1 and the fixed ground point with the multimeter. **Standard value:Less than 5Ω** Is the resistance normal? →**Yes** To step 6. →**No** Repair the K01 starter relay ground line fault and replace the harness if necessary.
7. Check the starter power line.	
	A. Check whether the start power line is loose. B. Measure the voltage between the starter power line and fixed ground point with the multimeter. **Standard value:11 ~ 14V** Is the voltage normal? →**Yes** To step 8. →**No** Repair the starter power line fault and replace the harness if necessary.

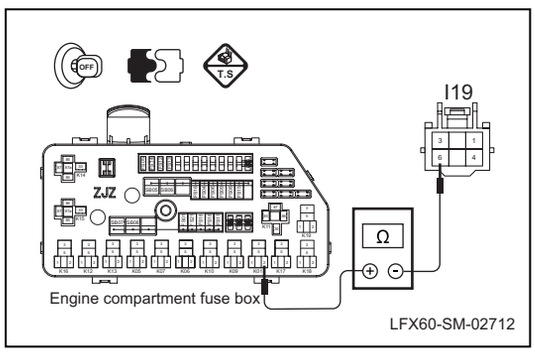
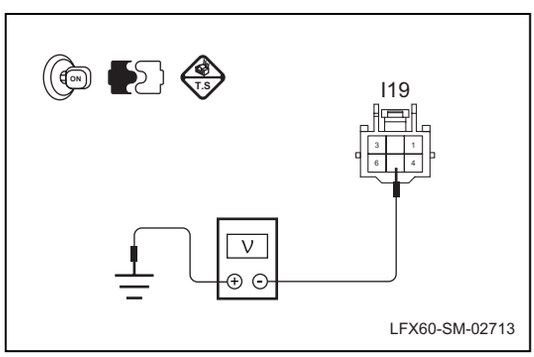
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Test condition	Details/results/measures
8. Check the starter relay input voltage.	
 LFX60-SM-02709	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the starter harness plug E08a. D. Connect the battery negative terminal. E. Start the engine, and use a multimeter to measure the voltage between terminal 1 of the starter harness plug E08a and the reliable ground point. **Standard value:11 ~ 14V** Is the voltage normal? →**Yes** To step 9. →**No** To step 10.
9. Check the starter.	
	A. Replace the starter. **Refer to: Replacement of starter** Confirm that the fault has been ruled out.
10. Check the starter relay input voltage line.	
 LFX60-SM-02710  LFX60-SM-02711	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Remove the engine compartment fuse box K01 starter relay. D. Disconnect the starter harness plug E08a. E. Measure the resistance between the engine compartment fuse box K01 starter relay terminal 5 and the starter harness plug E08a terminal 1 with the multimeter. **Standard value:Less than 5Ω** F. Measure the resistance between the starter harness plug E08a terminal 1 and the fixed ground point with the multimeter. **Standard value:10MΩ or higher** Is the resistance normal? →**Yes** To step 11. →**No** Repair the starter relay input voltage line fault and replace the harness if necessary.

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Test condition	Details/results/measures
11. Check the K01 starter relay control line.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Remove the engine compartment fuse box K01 starter relay. D. Disconnect the harness plug I19 of the ignition switch. E. Use a multimeter to measure the resistance between the terminal 2 of K01 starting relay in the engine compartment electrical box / terminal 4 of ignition switch harness plug I19 and the reliable ground point. **Standard value:Less than 5Ω** Is the resistance normal? →**Yes** To step 12. →**No** Repair the K01 starter relay control line fault and replace the harness if necessary.
12. Check the power supply for ignition switch.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the ignition switch harness plug I19. D. Connect the battery negative terminal. E. Operate the ignition switch to turn the power to ON state. F. Measure the voltage between the ignition switch harness plug I19 terminal 5 and fixed ground point with the multimeter. **Standard value:11 ~ 14 V** Is the voltage normal? →**Yes** To step 13. →**No** Repair the ignition switch start power line fault and replace the dashboard fuse box if necessary.
13. Check the ignition switch.	
	A. Replace the ignition switch. **Refer to: Replacement of ignition switch** Confirm that the fault has been ruled out.

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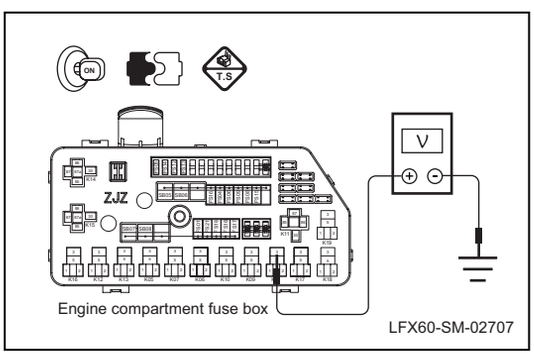
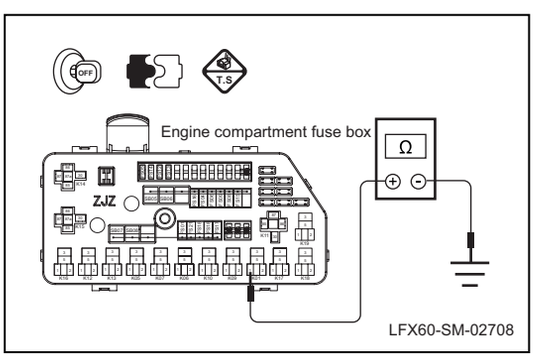
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Diagnostic process for starter failing to run (one-button start)

Test condition	Details/results/measures
1. Check the PEPS system DTC.	
	A. Operate the ignition switch to turn the power to OFF and connect the diagnostic meter. B. Operate the ignition switch to turn the power to ON, turn on the diagnostic meter - use the latest software version. C. Read PEPS DTC. Is there PEPS DTC? →**Yes** **Refer to: Diagnostic trouble code (DTC) list. Perform DTC diagnostic procedure.** →**No** To step 2.
2. General inspection.	
	A. Check whether the battery positive and negative harness connection is loose. B. Check the starter positive terminal harness and harness plug for looseness. Is it OK after checking? →**Yes** To step 3. →**No** Repair the fault position.
3. Check the battery voltage.	
	A. Measure the battery voltage with a multimeter. **Standard value:11 ~ 14V** Is the voltage normal? →**Yes** To step 4. →**No** Charge or replace the battery. **Refer to: Replacement of battery**
4. Check the fuse.	
	A. Check the fuse FS01 of K01 starter relay. **Fuse rated capacity: 15A** Is it OK after checking? →**Yes** To step 5. →**No** Replace the fuse.

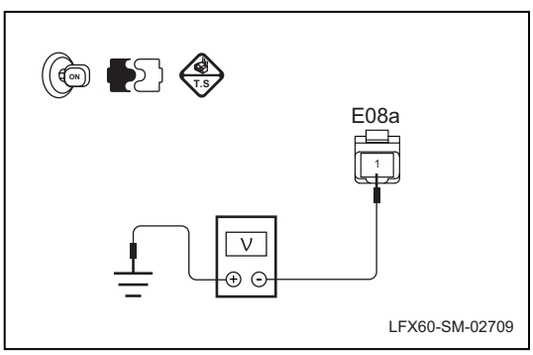
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Test condition	Details/results/measures
5. Check the K01 starter relay.	
	A. Operate the ignition switch to turn the power to OFF state. B. Remove the engine compartment fuse box K01 starter relay. C. Replace the K01 starter relay and check whether the starting operation is normal. Is the starter running normal? →**Yes** Replace the K01 starter relay. →**No** To step 6.
6. Check the K01 starter relay power line.	
	A. Operate the ignition switch to turn the power to OFF state. B. Remove the engine compartment fuse box K01 starter relay. C. Measure the voltage between the engine compartment fuse box K01 starter relay terminal 3 and the fixed ground point with the multimeter. **Standard value:11 ~ 14V** Is the voltage normal? →**Yes** To step 7. →**No** Check the K01 starting relay power line; if necessary, replace the electrical box of engine compartment.
7. Check the K01 starter relay ground line.	
	A. Operate the ignition switch to turn the power to OFF state. B. Remove the engine compartment fuse box K01 starter relay. C. Measure the resistance between the engine compartment fuse box K01 starter relay terminal 1 and the fixed ground point with the multimeter. **Standard value:Less than 5Ω** Is the resistance normal? →**Yes** To step 8. →**No** Repair the K01 starter relay ground line fault and replace the harness if necessary.

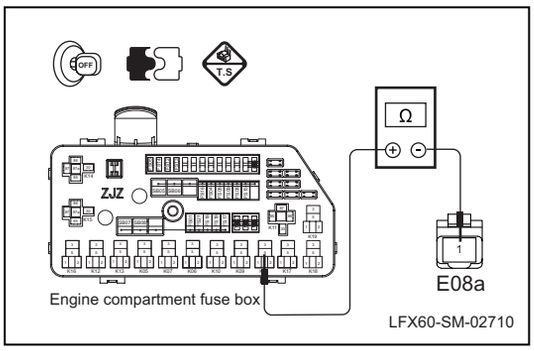
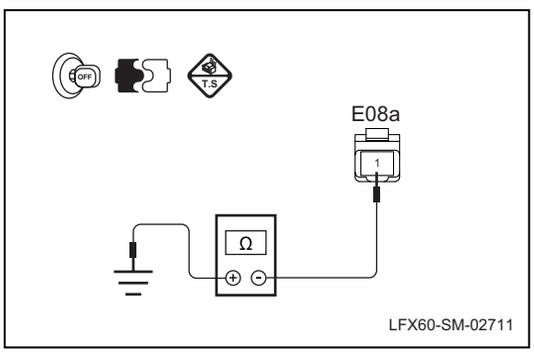
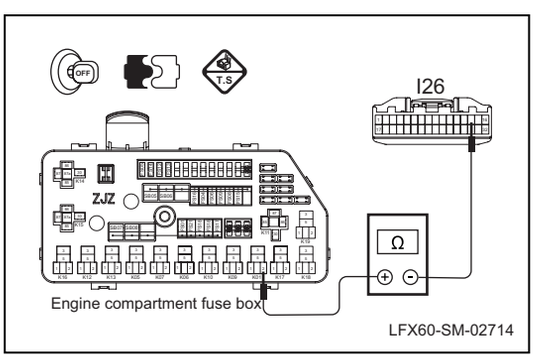
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Test condition	Details/results/measures
8. Check the starter power line.	
	A. Check whether the start power line is loose. B. Measure the voltage between the starter power line and fixed ground point with the multimeter. **Standard value:11 ~ 14V** Is the voltage normal? →**Yes** To step 9. →**No** Repair the starter power line fault and replace the harness if necessary.
9. Check the starter relay input voltage.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the starter harness plug E08a. D. Start the engine, and use a multimeter to measure the voltage between terminal 1 of the starter harness plug E08a and the reliable ground point. **Standard value:11 ~ 14V** Is the voltage normal? →**Yes** To step 10. →**No** To step 11.
10. Check the starter.	
	A. Replace the starter. **Refer to: Replace the starter.** Confirm that the fault has been ruled out.

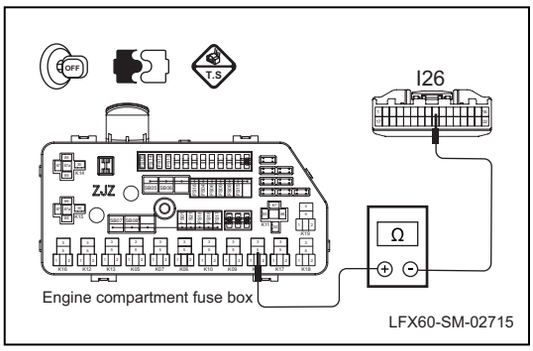
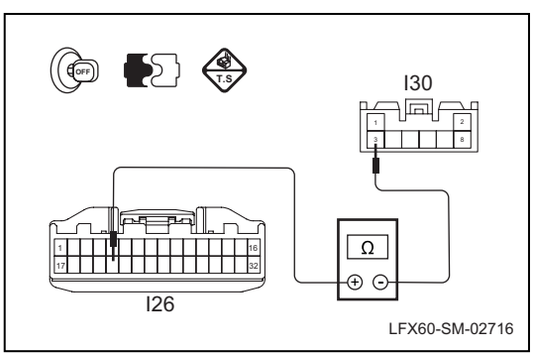
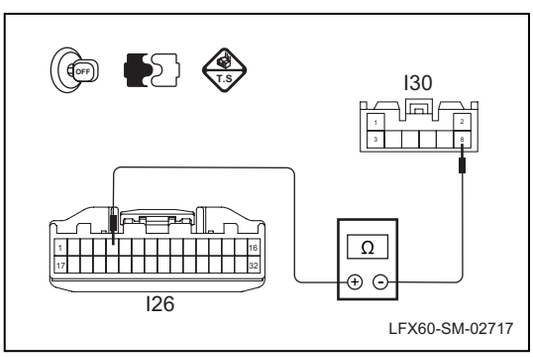
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Test condition	Details/results/measures
11. Check the starter relay input voltage line.	
 	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Remove the engine compartment fuse box K01 starter relay. D. Disconnect the starter harness plug E08a. E. Measure the resistance between the engine compartment fuse box K01 starter relay terminal 5 and the starter harness plug E08a terminal 1 with the multimeter. **Standard value:Less than 5Ω** F. Measure the resistance between the starter harness plug E08a terminal 1 and the fixed ground point with the multimeter. **Standard value:10MΩ or higher** Is the resistance normal? **→Yes** To step 12. **→No** Repair the starter relay input voltage line fault and replace the harness if necessary.
12. Check the K01 starter relay control line.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Remove the engine compartment fuse box K01 starter relay. D. Disconnect the PEPS ECU harness plug I26. E. Use a multimeter to measure the resistance between the terminal 2 of K01 starting relay in the engine compartment electrical box / terminal 14 of PEPSECU harness plug I26 and the reliable ground point. **Standard value:Less than 5Ω** Is the resistance normal? **→Yes** To step 13. **→No** Repair the K01 starter relay control line fault and replace the harness if necessary.

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Test condition	Details/results/measures
13. Check the start signal feedback line.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Remove the engine compartment fuse box K01 starter relay. D. Disconnect the PEPS ECU harness plug I26. E. Use a multimeter to measure the resistance between the terminal 5 of K01 starting relay in the engine compartment electrical box / terminal 9 of PEPSECU harness plug I26 and the reliable ground point. **Standard value:Less than 5Ω** Is the resistance normal? →**Yes** To step 14. →**No** Repair the K01 starter relay control line fault and replace the harness if necessary.
14. Check the signal line of one-button start switch.	
 	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the harness plug of one-button start switch. D. Disconnect the PEPS ECU harness plug I26. E. Use a multimeter to measure the resistance between the terminal 3 of harness plug I30 of one-button start switch and the terminal 21 of PEPSECU harness plug I26. **Standard value:Less than 5Ω** F. Use a multimeter to measure the resistance between the terminal 8 of harness plug I30 of one-button start switch and the terminal 5 of PEPSECU harness plug I26. **Standard value:Less than 5Ω** Is the resistance normal? →**Yes** To step 15. →**No** Repair the ignition switch start power line fault and replace the dashboard fuse box if necessary.
15. Check the one-touch start switch.	
	A. Replace the one-touch start switch. **Refer to: Replacement of one-touch start switch** Is the troubleshooting successful? →**Yes** Replace the one-touch start switch. →**No** To step 16.

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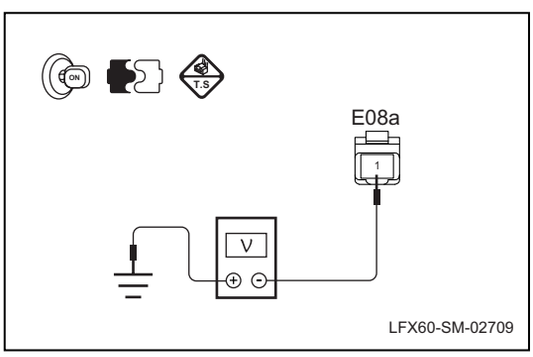
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Test condition	Details/results/measures
16. Check the PEPS ECU.	
	A. Replace the PEPS ECU. **Refer to: Replacement of PEPS ECU** Confirm that the fault has been ruled out.

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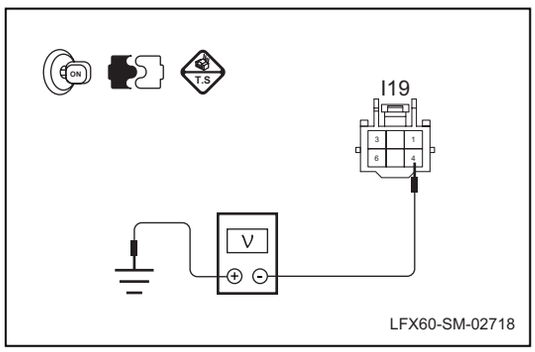
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Diagnostic process for starter failing to stop running

Test condition	Details/results/measures
1. Check the K01 starter relay.	
	A. Remove the engine compartment fuse box K01 starter relay. B. Operate the ignition switch to turn the power to ON state. Is the starter running stopped? →**Yes** To step 4. →**No** To step 2.
2. Check the starter relay line.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the starter harness plug E08a. D. Connect the battery negative terminal. E. Operate the ignition switch to turn the power to ON state. F. Measure the voltage between the starter harness plug E08a terminal 1 and the fixed ground point with the multimeter. **Standard value:0V** Is the voltage normal? →**Yes** To step 3. →**No** Repair the starter relay line fault and replace the harness if necessary.
3. Check the starter.	
	A. Replace the starter. **Refer to: Replacement of starter** Confirm that the fault has been ruled out.
4. Replace the K01 starter relay.	
	A. Operate the ignition switch to turn the power to OFF state. B. Replace the engine compartment fuse box K01 starter relay. Is the troubleshooting successful? →**Yes** Replace the K01 starter relay. →**No** To step 5.

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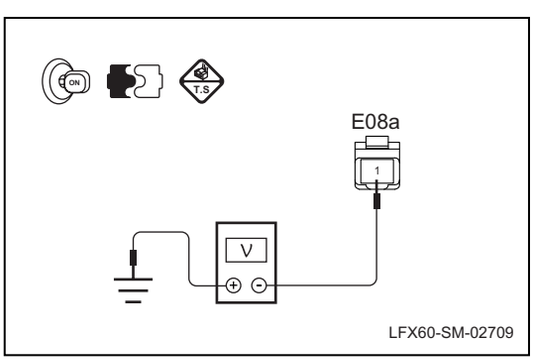
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Test condition	Details/results/measures
5. Check the K01 starter relay control line.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the ignition switch harness plug I19. D. Connect the battery negative terminal. E. Operate the ignition switch to turn the power to ON state. F. Measure the voltage between the ignition switch harness plug I19 terminal 4 and fixed ground point with the multimeter. **Standard value:0V** Is the voltage normal? →**Yes** To step 6. →**No** Check the K01 starting relay control line; if necessary, replace the electrical box of engine compartment.
6. Check the ignition switch.	
	A. Replace the ignition switch. **Refer to: Replacement of ignition switch** Confirm that the fault has been ruled out.

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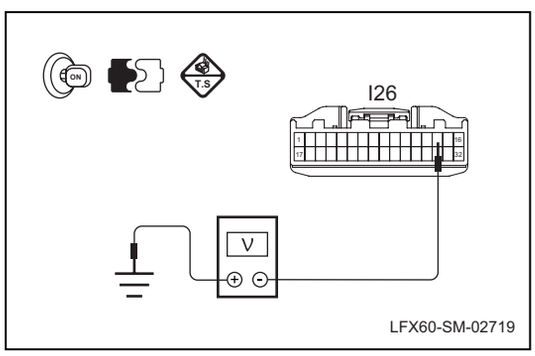
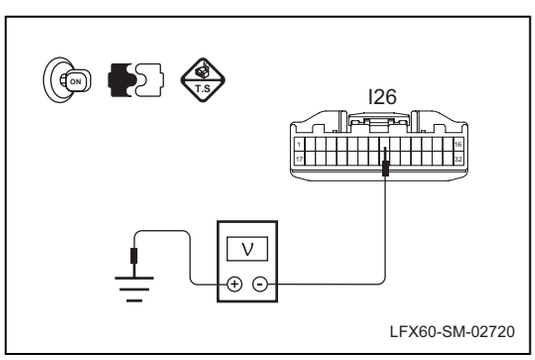
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Diagnostic process for starter failing to stop running (one-button start)

Test condition	Details/results/measures
1. Check the PEPS system DTC.	
	A. Switch off the ignition switch; switch on the ignition switch to connect the automobile diagnosis device. B. Operate the ignition switch to turn the power to ON, turn on the diagnostic meter - use the latest software version. C. Read PEPS DTC. Is there PEPS DTC? →**Yes** **Refer to: Diagnostic trouble code (DTC) list. Perform DTC diagnostic procedure.** →**No** To step 2.
2. Check the K01 starter relay.	
	A. Remove the engine compartment fuse box K01 starter relay. B. Operate the ignition switch to turn the power to ON state. Is the starter running stopped? →**Yes** To step 5. →**No** To step 3.
3. Check the starter relay line.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the starter harness plug E08a. D. Connect the battery negative terminal. E. Operate the ignition switch to turn the power to ON state. F. Measure the voltage between the starter harness plug E08a terminal 1 and the fixed ground point with the multimeter. **Standard value:0V** Is the voltage normal? →**Yes** To step 4. →**No** Repair the starter relay line fault and replace the harness if necessary.
4. Check the starter.	
	A. Replace the starter. **Refer to: Replacement of starter** Confirm that the fault has been ruled out.

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Test condition	Details/results/measures
5. Replace the K01 starter relay.	
	A. Operate the ignition switch to turn the power to OFF state. B. Replace the engine compartment fuse box K01 starter relay. Is the troubleshooting successful? →**Yes** Replace the K01 starter relay. →**No** To step 6.
6. Check the K01 starter relay control line.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the PEPSECU harness plug 126. D. Connect the battery negative terminal. E. Operate the ignition switch to turn the power to ON state. F. Use a multimeter to measure the voltage between terminal 14 of PEPSECU harness plug 126 and the reliable ground point. **Standard value:0V** Is the voltage normal? →**Yes** To step 7. →**No** Check the K01 starting relay control line; if necessary, replace the electrical box of engine compartment.
7. Check the start signal feedback line.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the PEPSECU harness plug 126. D. Connect the battery negative terminal. E. Operate the ignition switch to turn the power to ON state. F. Use a multimeter to measure the voltage between terminal 9 of PEPSECU harness plug 126 and the reliable ground point. **Standard value:0V** Is the voltage normal? →**Yes** To step 8. →**No** Check the start signal feedback line for fault; and replace, if necessary.

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Test condition	Details/results/measures
8. Check the one-touch start switch.	
	A. Replace the one-touch start switch. Is the troubleshooting successful? →**Yes** Replace the one-touch start switch. →**No** To step 9.
9. Check the PEPS ECU.	
	A. Replace the PEPS ECU. **Refer to: Replacement of PEPS ECU** Confirm that the fault has been ruled out.

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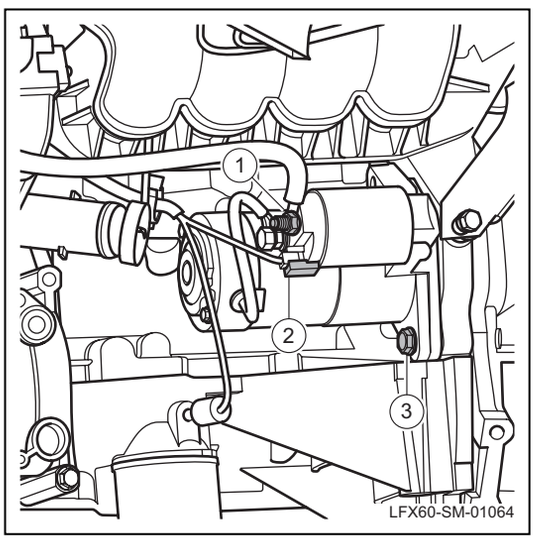
Removal and Installation

Replacement of starter

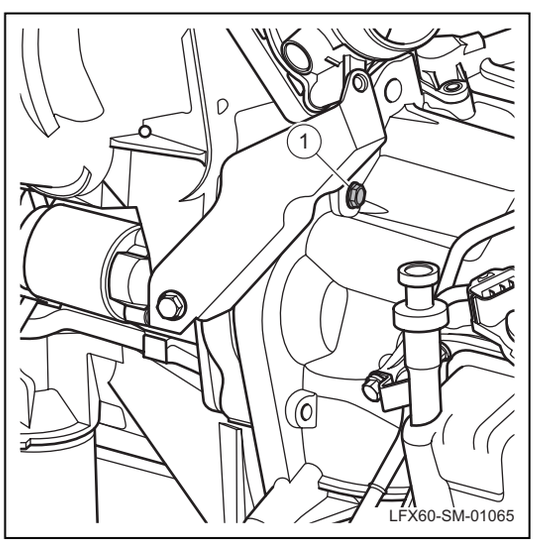
Removal

1. Disassemble the starter.

(a). Disconnect the battery negative terminal.



(b). Remove the starter's power supply fixing bolt 1.
(c). Disconnect the starter harness plug 2.
(d). Remove the starter fixing bolt 3.



(e). Remove the upper fixing bolts on the starter and take the starter assembly.

Installation

1. Install the starter.

(a). The installation sequence is the reverse of the disassembly order.

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02- Engine

Charging system.....2-633
Technical specifications.....2-633
Precautions 2-634
Preparation.....2-635
General Inspection 2-636
Operating Principle.....2-637
Structure and installation location 2-638
Diagnostic Information and Procedures.....2-639
Removal and Installation.....2-648

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Charging system

Technical specifications

General specifications

Name	Specification
Generator speed	1200 rpm
The starter is running slowly	13.5V±0.25V
Generator voltage specification	90A

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Precautions

Precautions

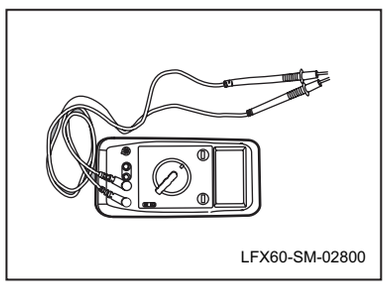
1. Do not disconnect the battery connector when the engine is running.
2. When checking the charging system, you first need to check if the connectors and harness connectors are solid and reliable.
3. When disassembling the generator, do not damage the insulation paste outside the coil.

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Preparation

Special general-purpose tools

No.	Tool name	Tool figure	Tool code	Remarks
1	Multimeter	 LFX60-SM-02800	-	Measure the current, voltage, or resistance

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General Inspection

General Inspection

Inspection of battery

1. Battery appearance inspection:

The battery surface should have no traces of leakage, the shell should have no cracks or damage, the electrodes are not corroded, and electrodes are wired reliable.

2. Check with a discharge detector

Press the corresponding contacts onto the corresponding positive and negative electrodes of the battery. When the discharge detector's pointer is in the green range and keeps for about 2s, the battery capacity is sufficient to meet high-current start requirements; when the discharge detector's pointer is in the red range without other abnormalities, the battery capacity is insufficient and must be charged.

3. Use headlamps as load and check with a voltmeter

Connect the voltmeter to the battery according to the method of measuring the battery voltage, and read the battery voltage; turn on the headlamps, and if the battery keeps at over 10V without voltage drop, the battery can be used to start the vehicle after being charged. If battery voltage decreases quickly after turning on headlamp, charge the battery to restore its function. For the battery that is not used for long time, charge it with longer time and for more times to fully activate it.

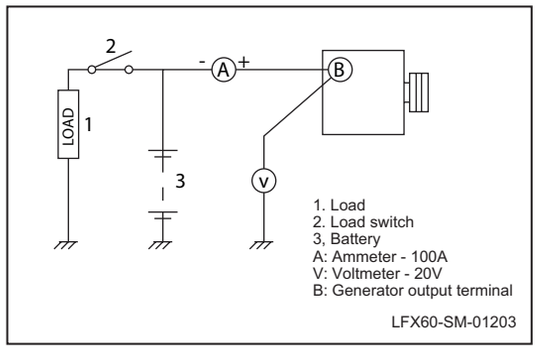
ℹNote:

For the charging/discharging or freshly charged battery, it is inappropriate to use discharging tester to check it, because it will produce large amount of oxy-hydrogen gas during charging process. By using discharging tester or resistance fuse to perform checking, it will produce sparkle to explode the gas to cause physical injury and property loss.

Power generation test of generator

1. Connect test equipment

Select appropriate scale and connect voltmeter between connecting column of alternator B and ground. Connect ammeter between B connecting column of alternator and positive column of battery.



2. No-load test

Start the engine to increase its rotational speed from idle speed to 2,000 rpm / min, and read the number in the instrument.

ℹNote:

- **Consider that voltage can be different depending on different temperature of voltage regulator. Do not perform this test on discharged battery. Fully charge the battery before the test.**
- **When the engine is running, do not dismantle connecting column of battery, or it will damage electronic parts.**

Standard current: 10A (max.)

Standard voltage: under 25℃ , 14.2 ~ 14.8 V

3. Load test

Keep engine running at the speed of 2,000 rpm, and connect front headlamp and heating motor. If the measured current is less than 20 A, repair or replace.

Battery parasitic current test

If the battery continuously lacks of power, the following test procedure should be performed to check if the battery produces parasitic current.

1. Disconnect negative wire of battery.
2. Connect positive pen of multi-meter to the negative wire of battery and connect negative pen to the negative pole of battery.
3. Ensure that all electrical units of tested vehicle are shut off. The door, engine cover and trunk cover are well closed.
4. Select mA scale of multi-meter.
5. Measure parasitic current after vehicle module is in dormancy.

ℹNote:

Module in dormancy can vary depending on different equipment level.

Standard value of parasitic current: less than 30 mA

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Operating Principle

System Overview

Self discharging of battery

Theoretically speaking, self discharging battery is unavoidable. Self discharging of maintenance-free battery is far less than ordinary battery, but it still has automatic discharging to some degree. Even it is placed with open circuit for long time, the battery will be consumed obviously. Self discharging of battery is mainly affected by the following factors:

1. The higher the temperature is, the ratio of self discharging will be. Generally, for every increase in temperature by 10 ℃ , the ratio of self discharging will increase by about 2.7 fold. Therefore, self discharging of vehicle battery will vary greatly in summer and winter.
2. The condition of storage site will have great impact. High humidity and dust will increase self discharging of battery.

Battery capacity loss after loading

After being loaded on vehicle, battery will lose capacity in the following ways:

1. Electricity lost in debugging process.
2. Some electrical appliances on the car can always consume power, such as the security alarm system.
3. Electric leakage of components caused by poor insulation performance.
4. Power loss caused by static current or power leaking due to connected negative wire.

ℹNote:

The standing time of battery is dependent on many factors. Generally, fully charged batter can still start the vehicle 6 months after disconnecting negative wire.

Charging system

One feature of alternator is that it has a solid regulator inside. All the parts of regulator are installed in a closed box. The regulator together with electric brush assembly are mounted on sliding ring and frame. Set voltage of alternator cannot be regulated.

As rotor bearing of alternator has enough lubricating grease, there is no need to lubricate it regularly. Two electric brushes will enable current to flow to excitation coil through two sliding rings. Under normal circumstances, there is no need to maintain electric brushes for long time.

Stator winding is mounted inside laminated core, which is alternator frame component. The rectifier connected to stator winding is composed by 6 LEDs which transform AC voltage on stator to DC voltage on alternator output column. Center diode is used to transform central point voltage into DC and increase alternator output.

The capacitor mounted on regulator assembly will provide voltage protection for diode and control interference of radio wave.

Part instructions

Battery

If the battery is tested to be good, but it always has under-voltage or failure to start overnight. Consider the following causes for failure:

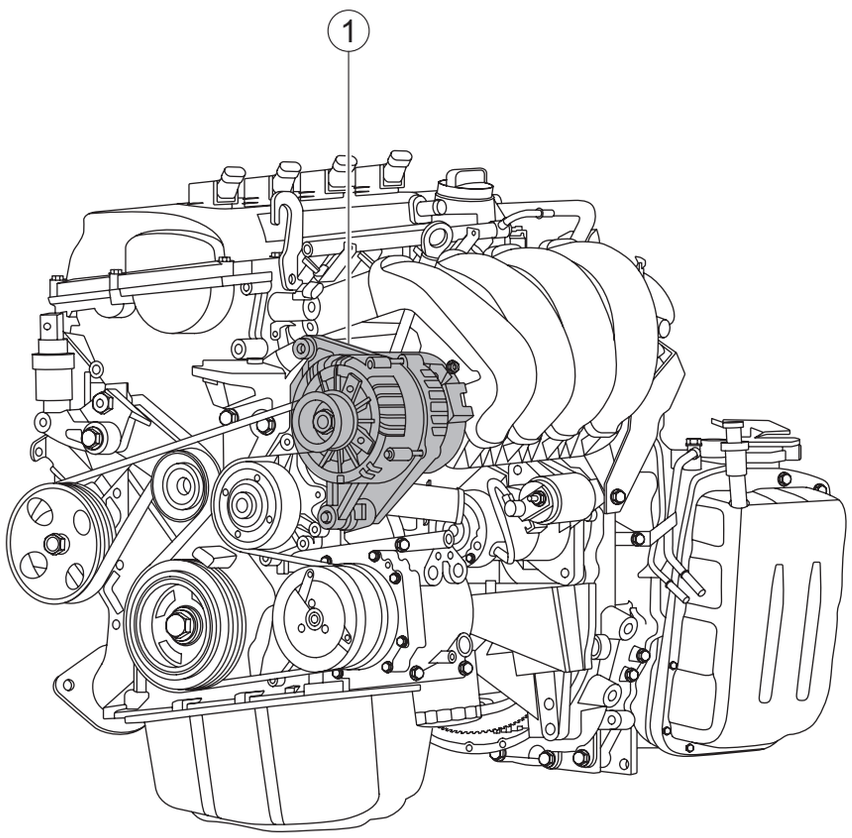
1. There is electric unit that is not switched off for the whole night.
2. The vehicle is running at low speed and stops at intervals.
3. The vehicle electrical load exceeds alternator output, especially when the vehicle is installed with after-sales additions.
4. There is some problem in charging system, such as electrical short circuit, sliding alternator belt, failed alternator or voltage regulator.
5. The battery is not properly used, such as failure to keep clean and tight battery terminal or loosened battery fixing plate.
6. Mechanical failure in electrical system, such as wire short circuit or clamping.

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Structure and installation location

Component Location Plan



LFX60-SM-02801

No.	Part Name
1	Generator

No.	Part Name

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Diagnostic Information and Procedures

Diagnosis Instructions

Before starting to diagnose a fault in the charging system, familiarize yourself with the operating principle of the charging system, and then start the system diagnostics, which helps to determine the correct troubleshooting steps in the event of a failure. More importantly, this also helps to determine whether the customer's situation belongs to normal operation.

Any troubleshooting of the charging system should begin with the charging system check, so as to instruct the service personnel to take the next logical step to troubleshoot. Comprehend and correctly use the diagnostic flow chart to shorten the diagnosis time and avoid the misjudgement.

General equipment

Digital universal meter
Diagnostic equipment of vehicle

Visual Inspection

1. Confirm the problem of the customer.
2. Visually check whether there is any obvious mechanical or electrical damage sign.

Visual inspection table

Mechanical	Electrical
• Alternator • Driving belt	• Fuse • Harness or plug • Battery • Positive and negative terminals on battery • Charging system warning light

3. If the observed or proposed problem is obvious and its cause is identified, rectify the cause before proceeding with next step.
4. If for the problem, there are no obvious findings, then confirm the fault and refer to the symptom table.

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List of fault symptoms

If the vehicle fails, no trouble code is detected by the engine control module (ECM), and no significant fault location is found after visual inspection and general inspection, it is recommended that troubleshooting should be carried out according to diagnostic ideas and processes of the table below.

Symptom	Possible point of failure	Recommended Measures
Alternator noises	• Accessory driving belt • Bearing • Stator and rotor	**Refer to: Diagnosis process for generator noise**
The battery is charged insufficiently	• Accessory driving belt • Alternator governor • Alternator	**Refer to: Diagnosis process for battery undercharge**
Battery is overly charged	• Alternator governor • Alternator	**Refer to: Diagnosis process for battery overcharge**
Charging indicator is always on.	• Drive belt wear • Damage of drive belt tightener of accessories • Alternator • Charge indicator line fault • Instrument cluster	**Refer to: Diagnosis process for charging indicator which is normally on**
Charging indicator is off.	• Panel charging indicator • Line fault • Poor contact between brush and slip ring • Voltage regulator	**Refer to: Diagnosis process for charging indicator which is not on**

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Diagnosis process of alternator noises

Note:

Generator noise may be from electrical or mechanical noise. Electrical noise (whine) usually changes with the changes in electrical load applied to the generator, which is the normal operating feature of all generators. You should know this during the maintenance or diagnosis, or it will cause unnecessary complaints from the customers. For the alternator diagnosed with mechanical noises, check if the parts around alternator are loosened or mutually interfered. In some cases, gentle noises inside cabin will be heard in passenger cabin. In this case, you cannot resolve the problem by replacing alternator. You will misjudge it in this case.

Test condition	Details/results/measures
1. Check the drive belt of accessories	
	A. Check if accessory drive belt is lacking teeth. B. Check tensioning force of accessory drive belt. Is accessory drive belt working properly. →**Yes** To step 2. →**No** Repair accessory drive belt.
2. Check the engine noise	
	A. Dismantle accessory drive belt. B. Start the engine to run. Does the noise still exist? →**Yes** Check the engine itself for noise. →**No** To step 3.
3. Check the noise from compressor and water pump.	
	A. Dismantle accessory drive belt. B. Turn the compressor and water pump pulley by hand. Is there noise? →**Yes** Repair and eliminate the abnormal noise from compressor or water pump. →**No** To step 4.
4. Check the noise from power steering pump and belt tensioner pulley of accessories.	
	A. Dismantle accessory drive belt. B. Check the power steering pump and belt tensioner pulley of accessories. Is there noise? →**Yes** Repair and eliminate the abnormal noise from power steering pump and belt tensioner pulley of accessories. →**No** To step 5.

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Test condition	Details/results/measures
5. Check alternator.	
	A. Replace the alternator. **Refer to: Replacement of alternator** Confirm that the fault has been ruled out.

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Diagnosis process of inadequate charging of battery

Test condition	Details/results/measures
1. Check the generator charging voltage.	
	A. Start the alternator to increase alternator rotational speed from idle speed to 2,000 rpm. B. Measure the battery voltage with the multimeter. Check if the voltage is no less than 14.2 V. →**Yes** To step 2. →**No** To step 3.
2. Check parasitic current of battery.	
	A. Perform the process to check battery parasitic current. Is it OK after checking? →**Yes** To step 3. →**No** Repair failed wiring or electric unit.
3. Check alternator.	
	A. Perform alternator test process. Is it OK after testing? →**Yes** Charge the battery or replace the battery. **Refer to: Replacement of battery** →**No** Check the generator or replace the generator. **Refer to: Replacement of alternator**

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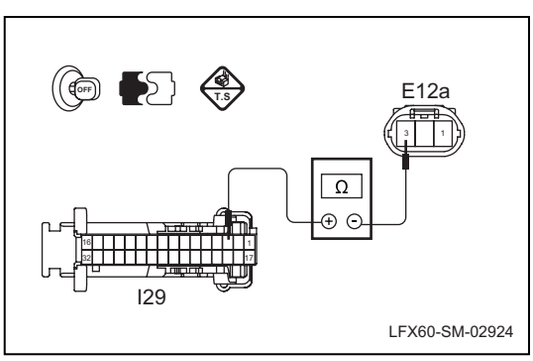
Diagnosis of over-charging of battery

Test condition	Details/results/measures
1. Check the generator charging voltage.	
	A. Start the engine to increase alternator rotational speed from idle speed to 2,000 rpm. B. Measure the battery voltage with the multimeter. Is the voltage higher than 14.8V? →**Yes** To step 2. →**No** System normal.
2. Check alternator regulator.	
	A. Replace alternator regulator. Is alternator charging voltage is OK? →**Yes** System normal. →**No** Check the alternator separately.

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Diagnosis process of charging indicator that is always on

Test condition	Details/results/measures
1. Check the engine DTC.	
	A. Read the instrument cluster system for DTC with the diagnostic meter. Is there a DTC? →**Yes** **Refer to: Diagnostic trouble code (DTC) list. Perform DTC diagnostic procedure.** →**No** To step 2.
2. Check the generator charging voltage.	
	A. Start the alternator to increase alternator rotational speed from idle speed to 2,000 rpm. B. Measure the alternator output voltage with the multimeter. Is the output voltage 12.8 ~ 14.8V? →**Yes** To step 3. →**No** To step 5.
3. Check the generator's charging indicator signal line.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the instrument cluster harness plug I29. D. Disconnect the harness plug E12a of generator regulator. E. Use a multimeter to measure the resistance between the terminal 3 of integrated instrument harness plug I29 and the terminal 3 of harness plug E12a of generator regulator. **Standard value:Less than 5Ω** Is the resistance normal? →**Yes** To step 4. →**No** Check the generator's charging indicator signal line.
4. Check the instrument cluster.	
	A. Operate the ignition switch to turn the power to OFF state. B. Replace the integrated instrument. **Refer to: Replacement of instrument cluster**

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Test condition	Details/results/measures
5. Check the generator charging voltage.	
	A. Check if the accessory drive belt is slipping or too loose. Is it OK after checking? →**Yes** To step 6. →**No** Adjust or replace accessory drive belt and/or belt tensioner.
6. Check alternator regulator.	
	A. Replace alternator regulator. **Refer to: Replacement of alternator** Is the charging indicator normal? →**Yes** Replace the generator regulator. →**No** To step 7.
7. Check alternator.	
	A. Replace the alternator. **Refer to: Replacement of alternator** Confirm that the fault has been ruled out.

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Diagnosis process of charging indicator that is not on

Test condition	Details/results/measures
1. Check the engine DTC.	
	A. Read the instrument cluster system for DTC with the diagnostic meter. Is there a DTC? →**Yes** **Refer to: Diagnostic trouble code (DTC) list.** →**No** To step 2.
2. Check the generator charging voltage.	
	A. Start the alternator to increase alternator rotational speed from idle speed to 2,000 rpm. B. Measure the alternator output voltage with the multimeter. Is the output voltage 12.8 ~ 14.8V? →**Yes** System normal. →**No** To step 3.
3. Check the instrument cluster.	
	A. Replace the instrument cluster. **Refer to: Replacement of instrument cluster** Make sure the problem has been solved.

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Removal and Installation

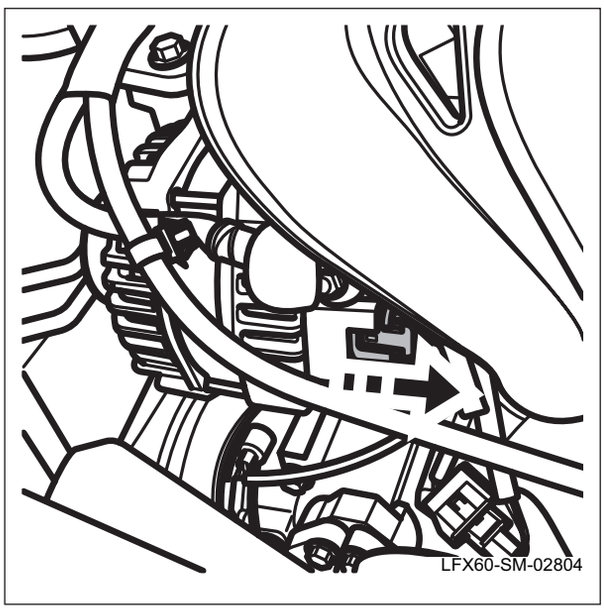
Replacement of generator

Removal

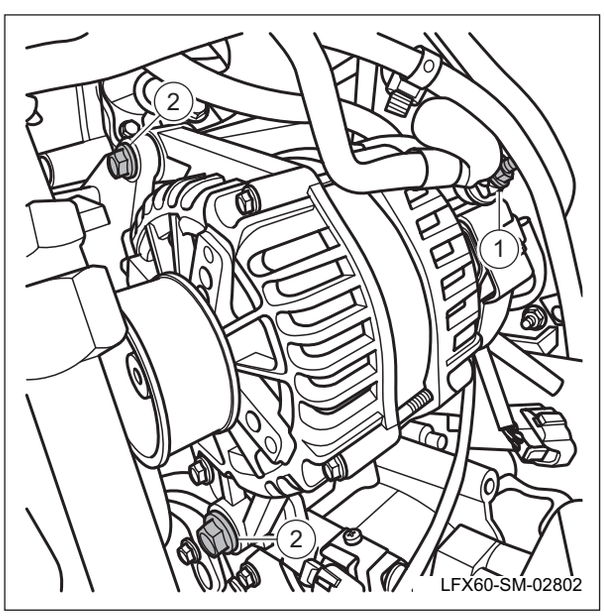
1. Dismantle the alternator.

(a). Disconnect the battery negative terminal.

(b). Remove the accessory belt. **Refer to replacement of accessory belt.**



(c). Disconnect the generator harness plug.



(d). Remove the harness connector nut 1 from the generator regulator.

(e). Remove the generator bolt 2.

(f). Remove the generator assembly.

Installation

1. Installation alternator.

(a). The installation sequence is the reverse of the disassembly order.

ℹNote:

Please install the accessory drive belt to the pulley in place.

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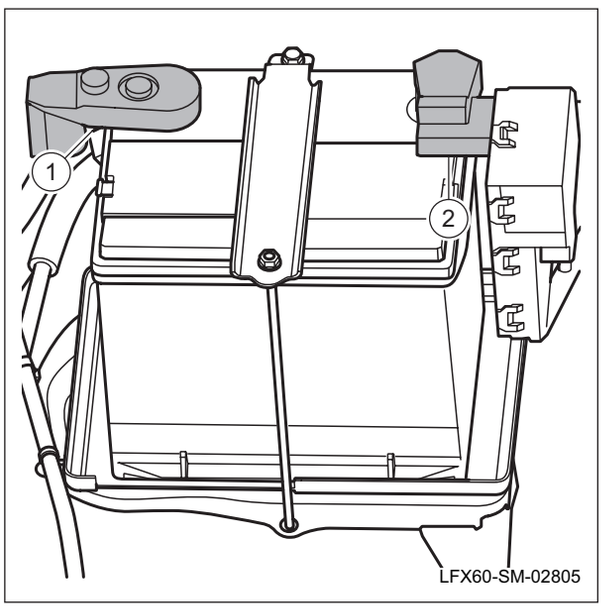
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Replacement of battery

Removal

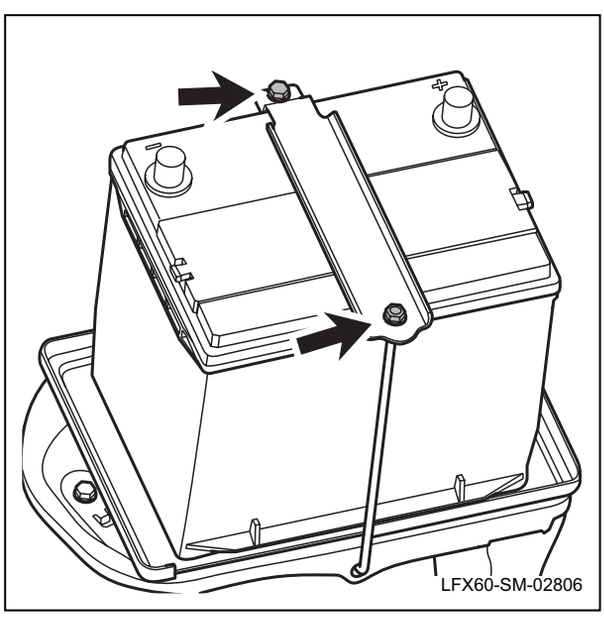
1. Dismantle the battery.

(a). Remove the front ventilation cover. **Reference: Replacement of front ventilation cover.**



(b). Disconnect the negative terminal 1 from the battery.

(c). Disconnect the positive terminal 2 from the battery.



(d). Remove the battery holder fixing bolts.

(e). Remove the battery

Installation

1. Installation the battery.

(a). The installation sequence is the reverse of the disassembly order.

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02- Engine

Ignition System.....2-653
Technical specifications 2-653
Precautions.....2-654
Preparation 2-655
Structure and installation location.....2-656
General Inspection.....2-657
Operating Principle 2-658
Diagnostic Information and Procedures..2-659
Removal and Installation 2-666

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Ignition System

Technical specifications

Components

Name	Specification
Standard clearance between spark plug electrodes	About 0.7~0.9mm

Torque Specifications

Name	Torque range	
	Metric(Nm)	British(lb-ft)
Ignition coil fixing bolt	11	8
Spark plug	30	22

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Precautions

Precautions

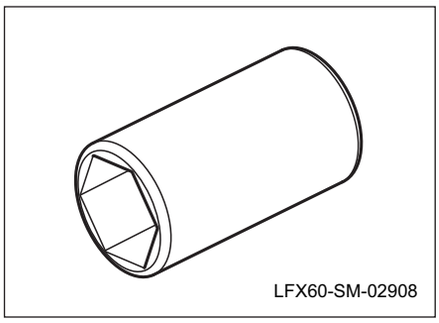
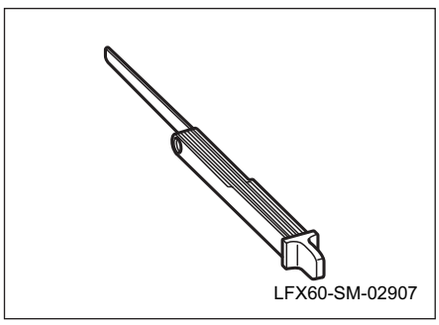
1. Do not damage the spark plug thread when removing the spark plug.
2. Do not drop or knock the spark plug electrode.
3. Do not exceed 2s for spark plug firing test.

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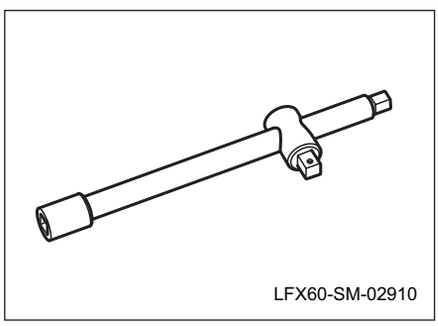
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Preparation

Special maintenance tools

No.	Tool name	Tool figure	Tool code	Remarks
1	Sleeve	 LFX60-SM-02908	-	Remove the spark plug
2	Thickness gauge	 LFX60-SM-02907	-	Measure the spark plug clearance

General maintenance tools

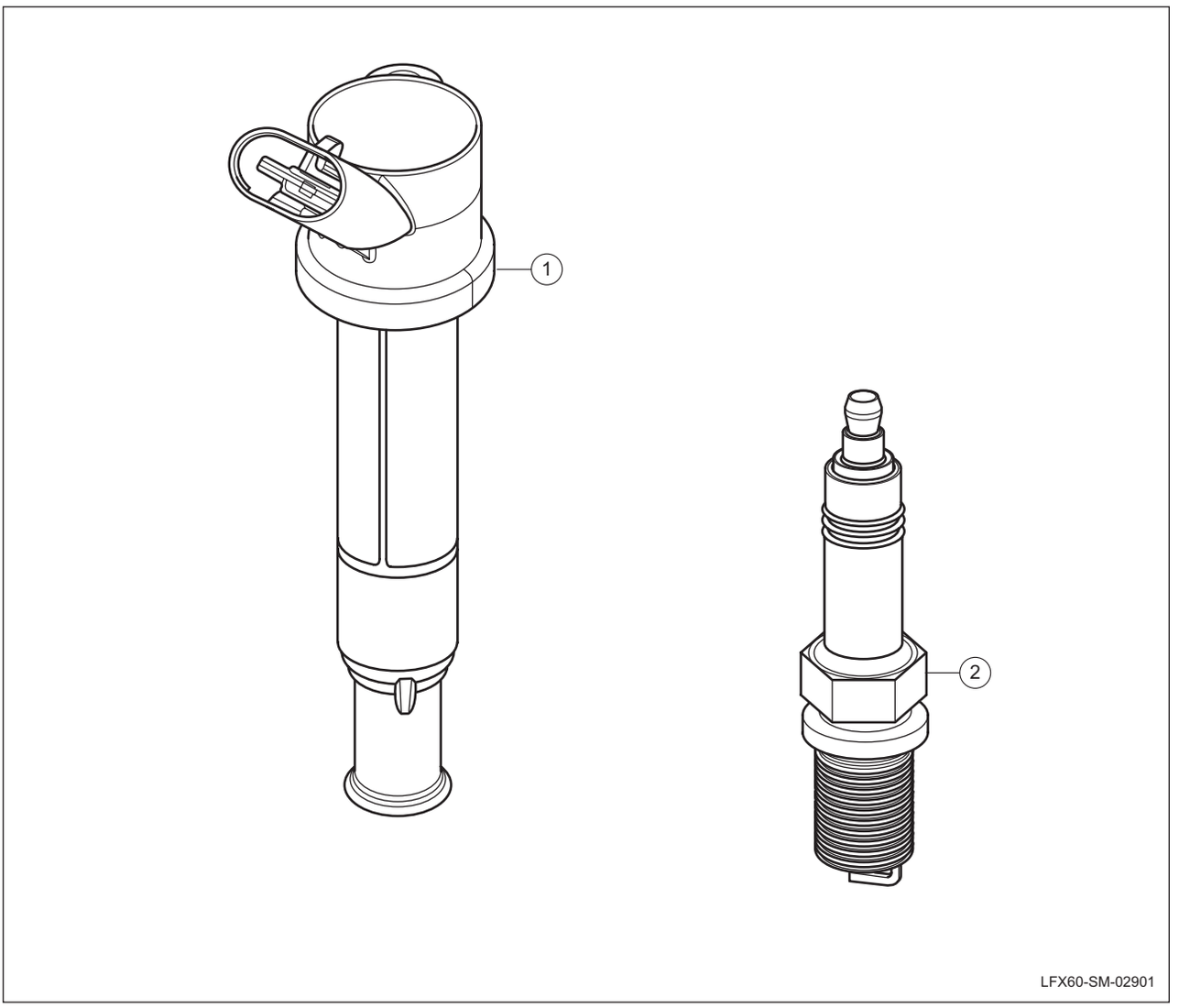
No.	Tool name	Tool figure	Tool code	Remarks
1	Extension bar	 LFX60-SM-02910	-	Remove the spark plug

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Structure and installation location

Part exploded view



No.	Part Name
1	Ignition coil

No.	Part Name
2	Spark plug

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General Inspection

Ignition spark test

⚠Warning:

- **Testing flashover directly with ignition coil may cause personal injury and module damage.Do not use ignition coil directly for ignition spark test.**
- **The engine temperature is very high under operation, any burn should be avoided when working on the engine just shut down.**

1. Push the shift lever to "N", and apply the parking brake reliably.
2. Turn the ignition switch to "LOCK" and disconnect the injector plug.

⚠Warning:

The connection of the fuel injector may cause a fire.

3. Disconnect the ignition coil assembly, and remove the spark plug.
4. Connect the ignition coil assembly with the spark plug, and ground the spark plug at the reliable engine grounding point.
5. Start the engine and observe the spark plug status.
6. After the engine stops, turn the ignition switch to "LOCK".
7. Install spark plug and ignition coil.
8. Connection the fuel injector plug.

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Operating Principle

System Overview

The engine adopts the non-distributor direct ignition system. The system is mainly composed of ECU, ignition coil, spark plug, crankshaft position sensor, camshaft position sensor and knock sensor.

With no distributor ignition system, ECU can control the optimal ignition timing based on various engine load conditions, to ensure that the engine output power, acceleration, economy and exhaust emissions are reach the ideal status, and the voltage on the ignition system will not be decreased with the increase of the speed. Since there is no mechanical component, there is no mechanical error.

Ignition coil can not be repaired and must be replaced as a whole.

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Diagnostic Information and Procedures

Diagnosis Instructions

Before starting to diagnose a fault in the ignition system, familiarize yourself with the operating principle of the ignition system, and then start the system diagnostics, which helps to determine the correct troubleshooting steps in the event of a failure. More importantly, this also helps to determine whether the customer's situation

Any troubleshooting of the ignition system should begin with the ignition system check, so as to instruct the service personnel to take the next logical step to troubleshoot. Comprehend and correctly use the diagnostic flow chart to shorten the diagnosis time and avoid the misjudgement.

General equipment

Digital universal meter
Thickness gauge
Ignition timing gun
Diagnostic equipment of vehicle

Visual Inspection

1. Confirm the problem of the customer.
2. Visually check whether there is any obvious mechanical or electrical damage sign.

Visual inspection table

Electrical
• Fuse • Harness or plug • Spark plug • Ignition coils • ECM

3. If the observed or proposed problem is obvious and its cause is identified, rectify the cause before proceeding with next step.
4. If for the problem, there are no obvious findings, then confirm the fault and refer to the symptom table.

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List of fault symptoms

If the vehicle fails, no trouble code is detected by the engine control module (ECM), and no significant fault location is found after visual inspection and general inspection, it is recommended that troubleshooting should be carried out according to diagnostic ideas and processes of the table below.

Symptom	Possible point of failure	Recommended Measures
The engine is shaken	• Spark plugs	• Spark plug test
	• Ignition coils	• Check the ignition coil (replace, if necessary)
	• Engine suspension device	• Check the engine and transmission suspension (replace, if necessary)
The spark plug is not fired	• Fuse	**Refer to: Diagnostic process for spark plug failure in jump spark**
	• Ignition control line	
	• Spark plugs	
	• Ignition coils	
	• Crankshaft position sensor	
	• ECM	**Refer to:Diagnosis process for engine power shortage**
Insufficient engine power	• Ignition coils	
	• Spark plugs	
	• ECM	

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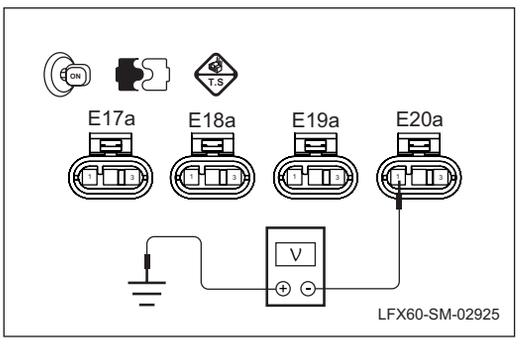
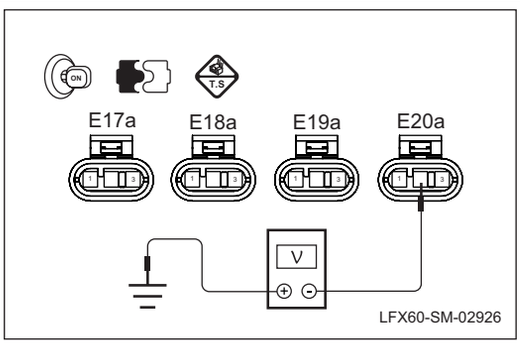
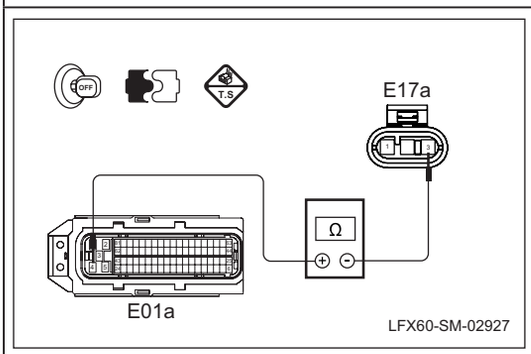
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Diagnostic process for spark plug failure in jump spark

Test condition	Details/results/measures
1. Check the engine DTC.	
	A. Operate the ignition switch to turn the power to OFF and connect the diagnostic meter. B. Operate the ignition switch to turn the power to ON state. C. Turn on the diagnostic meter and check the engine system. Is there DTC related to the ignition control? →**Yes** **Refer to: Diagnostic trouble code (DTC) list. Perform DTC diagnostic procedure.** →**No** To step 2.
2. Check the fuse.	
	A. Operate the ignition switch to turn the power to OFF state. B. Check fuses FS15 and FS14 in the electrical box of engine compartment. **Fuse rated capacity: 25A(FS15), 15A(FS14)** Is it OK after checking? →**Yes** To step 3. →**No** Replace the fuse.
3. Check the spark plug.	
	A. Remove the spark plug. B. Spark plug test. **Refer to: Spark plug test** Is the spark plug normal? →**Yes** To step 4. →**No** Replace the spark plug. **Refer to: Spark plug replacement**
4. Check the ignition coil.	
	A. Execute ignition coil test program. Is the ignition coil normal? →**Yes** To step 5. →**No** Replace the ignition coil. **Refer to: Ignition coil replacement**

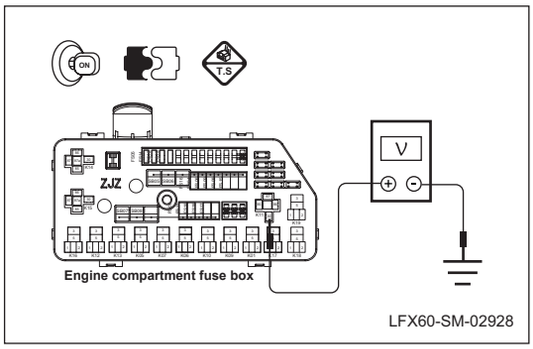
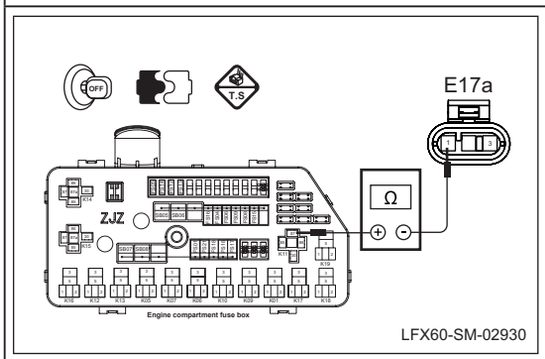
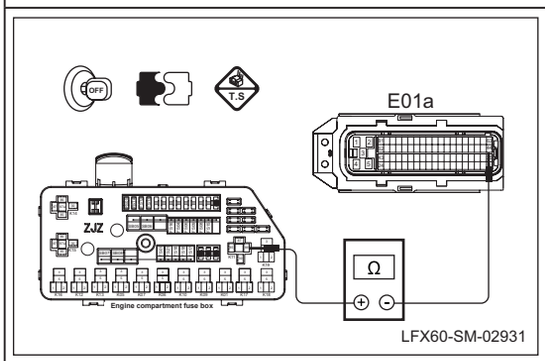
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Test condition	Details/results/measures
5. Check the ignition coil input voltage.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the ignition coil harness plug E17a, E18a, E19a, E20a. D. Connect the battery negative terminal. E. Operate the ignition switch to turn the power to ON state. F. Use a multimeter to measure the voltage between the terminal 1 of E17a/E18a/E19a/E20a and the reliable ground point. **Standard value:11 ~ 14V** Is the voltage normal? →**Yes** To step 6. →**No** To step 8.
6. Check the ignition coil ground line.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the ignition coil harness plug E17a, E18a, E19a, E20a. D. Use a multimeter to measure the resistance between the terminal 2 of E17a/E18a/E19a/E20a and the ground point. **Standard value: Less than 5Ω** Is the resistance normal? →**Yes** To step 7. →**No** Repair the ignition coil ground circuit fault and replace the harness if necessary.
7. Check the ignition drive signal line.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the ignition coil harness plug E17a, E18a, E19a, E20a. D. Disconnect the EMC harness plug E01a. E. Use a multimeter to measure the resistance between the terminal 3 of E17a/E18a/E19a/E20a and the points 4, 81, 1 and 62 of ECM harness plug E01a, respectively. **Standard value: Less than 5Ω** Is the resistance normal? →**Yes** To step 8. →**No** Check the ignition drive signal line for fault; and replace, if necessary.

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Test condition	Details/results/measures
8. Check the power circuit of K11 main relay.	
 LFX60-SM-02928	A. Operate the ignition switch to turn the power to OFF state. B. Remove the K11 main relay in the engine compartment electrical box. C. Use a multimeter to measure the voltage between the terminals 30 and 85 of K11 main relay in the engine compartment electrical box and the reliable ground point. **Standard value:11 ~ 14V** Is the voltage normal? →**Yes** To step 9. →**No** Repair the K11 main relay power line; if necessary, replace the harness.
9. Check the ignition coil input voltage line.	
 LFX60-SM-02930	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Remove the engine compartment fuse box K11 main relay. D. Disconnect the ignition coil harness plugs E17a, E18a, E19a, and E20a. E. Use a multimeter to measure the resistance between the terminal 87 of the main relay k11 in the engine compartment electrical box and terminal 1 of ignition coil harness plugs E17a, E18a, E19a, and E20a. **Standard value: Less than 5Ω** Is the resistance normal? →**Yes** To step 10. →**No** Check the ignition coil input voltage line for fault; and replace the harness, if necessary.
10. Check the control circuit of K11 main relay.	
 LFX60-SM-02931	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Remove the engine compartment fuse box K11 main relay. D. Disconnect the EMC harness plug E01a. E. Use a multimeter to measure the resistance between the terminal 86 of k11 main relay in the engine compartment electrical box and the terminal 44 of ECM harness plug E01a. **Standard value: Less than 5Ω** Is the resistance normal? →**Yes** To step 11. →**No** Repair the control power line of K11 main relay; if necessary, replace the harness.

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Test condition	Details/results/measures
11. Check ECM.	
	A. Replace ECM. **Refer to: Replacement of ECM** Confirm the fault is eliminated

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Diagnosis procedure about lack of engine power

Note:

Make sure the engine cylinder pressure is normal, the ignition timing mark is error free, the engine has no mechanical system failure, and the other systems of the engine are all normal.

Test condition	Details/results/measures
1. Check the engine DTC.	
	A. Operate the ignition switch to turn the power to OFF and connect the diagnostic meter. B. Operate the ignition switch to turn the power to ON state. C. Turn on the diagnostic meter and check the engine system. Is there DTC related to the ignition control? →**Yes** **Refer to: Diagnostic trouble code (DTC) list. Perform DTC diagnostic procedure.** →**No** To step 2.
2. Check the spark plug	
	A. Perform the spark plug test procedure. Is the spark plug normal? →**Yes** To step 3. →**No** Replace the spark plug.
3. Check the ignition coil	
	A. Execute ignition coil test program. Is the ignition coil normal? →**Yes** To step 4. →**No** Replace the ignition coil. **Refer to: Ignition coil replacement**
4. Check ECM.	
	A. Replace ECM. **Refer to: REPLACE THE ECM** Confirm that the fault has been ruled out.

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Removal and Installation

Replacement of ignition switch components

Removal

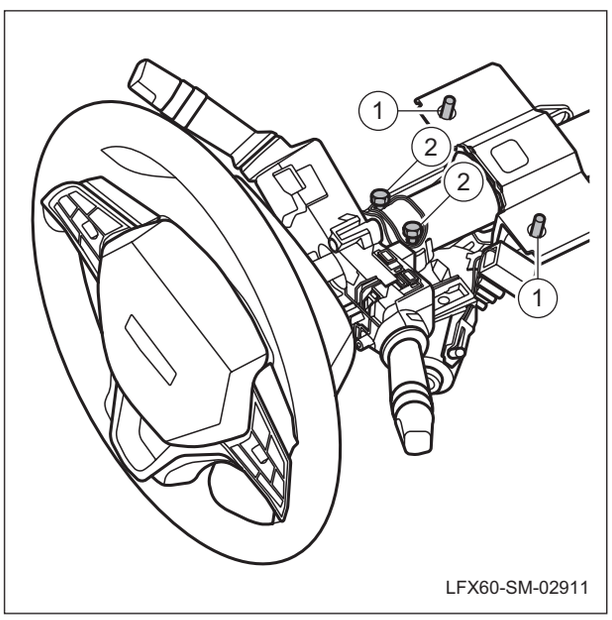
1. Remove the ignition switch components

(a). Disconnect the battery negative connector.

(b). Remove the dashboard lower left panel assembly. **Refer to the replacement of dashboard assembly.**

(c). Adjust the steering column regulating mechanism and then adjust the steering column to the proper position.

(d). Remove the steering column hood. **Refer to the replacement of steering column hood.**



(e). Disconnect the ignition switch, the anti-theft recognition coil and the harness plug of key insertion reminder switch.

(f). Remove the steering column fixing bolt1.

(g). Remove the ignition switch fixing bolt 2.

(h). Remove the ignition switch components.

Installation

1. Install the ignition switch components.

(a) The installation sequence is the reverse of the disassembly order.

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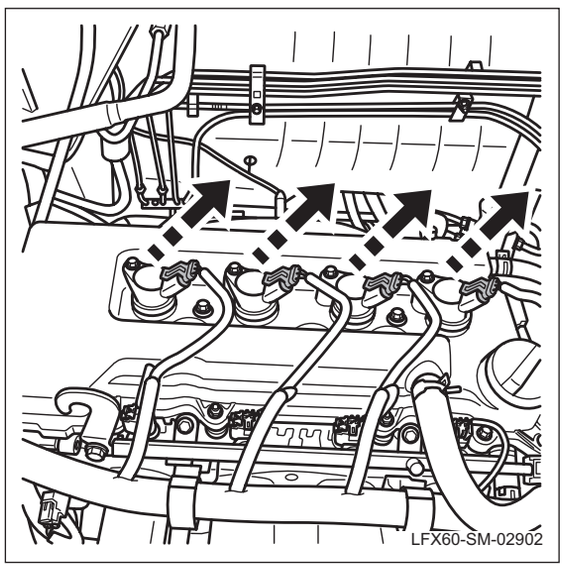
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Replacement of ignition coil

Removal

1. Remove the ignition coil.

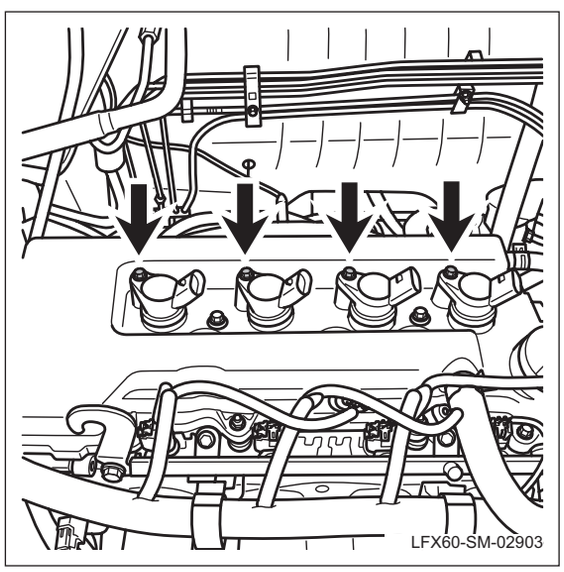
(a). Disconnect the battery negative connector.



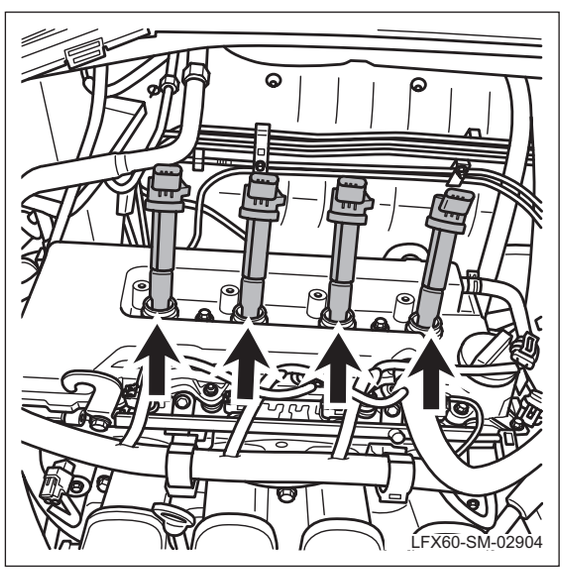
(b). Disconnect the ignition coil harness plugs.

❶Note:

When the engine is operated or started, do not contact or pull out the ignition coil assembly. The wire on the ignition device (ignition coil assembly and measurement gauge wire) can be connected or disconnected only when the ignition switch is turned off. To drive the engine using the starter motor without starting the engine (e.g. in a compression pressure test), just unplug the ignition coil connector and the injector plug. After operation, query the fault memory and delete the fault record. The engine can be cleaned only when the ignition switch is turned off. Only when the ignition switch is turned off, the batteries can be connected or disconnected; otherwise it may damage ECU.



(c). Remove the ignition coil fixing bolts.



(d). Remove the ignition coil.

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Installation

1. Install the ignition coil.

(a). The installation sequence is the reverse of the disassembly order.

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02- Engine

Emission control system 2-671
Technical specifications 2-671
Preparation 2-673
Structure and installation location 2-674
General Inspection.....2-675
Operating Principle 2-676
Diagnostic Information and Procedures..2-677
Removal and Installation 2-682

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Emission control system

Technical specifications

Torque Specifications

Name	Torque range	
	Metric(Nm)	British(lb-ft)
Front oxygen sensor	40	30
Rear oxygen sensor	40	30

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Precautions

Precautions

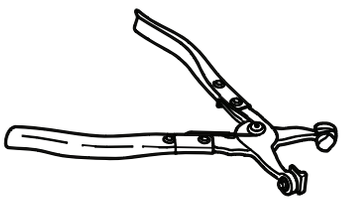
1. Be careful not to get burnt when the engine is very hot.
2. Do not remove the oxygen sensor when the engine is very hot, as this can damage the screw socket.

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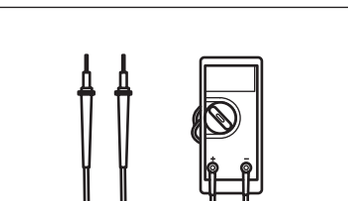
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Preparation

Special maintenance tools

No.	Tool name	Tool figure	Tool code	Remarks
1	Pipe wrench	 LFX60-SM-02109	-	Remove the water pipe clamps

General maintenance tools

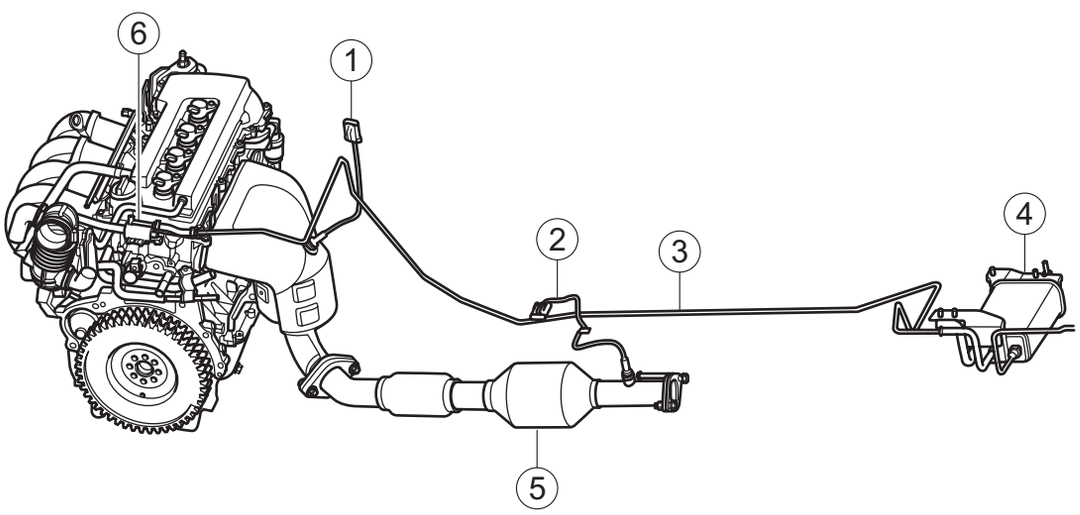
No.	Tool name	Tool figure	Tool code	Remarks
1	Digital universal meter	 LFX60-SM-12128	-	Measure the voltage and resistance

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Structure and installation location

Component Location Plan



LFX60-SM-02108

No.	Part Name
1	Front oxygen sensor
2	Rear oxygen sensor
3	Desorption tube II

No.	Part Name
4	Canister Assembly
5	Rear catalyst assembly
6	Canister solenoid valve

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General Inspection

General Inspection

Inspection of the positive crankcase ventilation valve

If the engine is idling unstably, check if the positive crankcase ventilation valve is blocked, and if the vent hole filter and air filter element are too dirty or blocked. Execute the following procedures:

1. Remove the positive crankcase ventilation valve from the valve chamber cover.
2. Start the engine and run it idling.
3. Put your finger at the valve end, check the vacuum. If the valve is not vacuum, check the following items: hose is blocked.
4. Manifold port is blocked.
5. Crankcase ventilation valve is blocked.

The positive crankcase ventilation valve or hose blockage may lead to the following problems:

- Engine idling instable.
- Engine stall or idling slowly.
- Engine oil leakage.
- Oil enters the air filter.
- Oil dirt in the engine.
- Engine crankcase pressure is too high.

The positive crankcase ventilation valve or hose leakage may lead to the following problems:

- Engine idling instable.
- Engine stall.
- engine is idling too fast.
- Engine oil leakage.

Inspection of carbon canister solenoid valve

Execute the following procedures:

1. Remove the vacuum hose from the solenoid valve.
2. Start the engine and run it idling.
3. Put the finger on the far end of the vacuum hose to check the tube for vacuum feeling. If not, check if there are such problems:
   Vacuum hose is blocked.
   Vacuum hose is ruptured.
4. Blow air from the solenoid valve inlet, and the solenoid valve passage should not be circulating; if there is leak, replace the solenoid valve.
5. Then drive the solenoid valve with the automobile diagnosis device, and blow air from the solenoid valve inlet again, and the solenoid valve passage should be circulating; if it is not circulating, repair and eliminate the solenoid valve problem.

Carbon canister inspection

1. Check the filter on the carbon canister vent pipe; if there is clogging, rupture, deformation, etc., replace the filter.
2. Carbon canister appearance inspection: no rupture, deformation; if necessary, replace it.
3. Remove the carbon canister, and shake with hands; if there has abnormal sound, replace the canister.
4. Check the connection hose on the canister, and replace it if it's blocked or damaged.
5. Use the appropriate air source, to blow in one port on the carbon canister, there should be air outflow at the other two ports; otherwise, replace the carbon canister.

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Operating Principle

System Overview

Emission control system is mainly composed of an exhaust emission control system, PVC (Positive Crankcase Ventilation) emission system, EVAP control system and fuel evaporation system.

Crankcase forced ventilation system

At the end of the effective engine combustion process, a certain mixture that not be burned under high pressure is leaked into the crankcase from the piston rings, which is called as “Channeling Gas”. The channeling gas contains nitrogen oxides, carbon monoxide and hydrocarbons. If the channeling gas is not exhausted, it can dilute the oil in the crankcase, and degrade the oil, resulting in premature wear of the engine parts. The channeling gas may escape into the atmosphere from the crankcase, resulting in the pollution. In order to avoid pollutant emissions and oil deterioration, positive crankcase ventilation system is used to get the crankcase blow-by back to the intake system, then the blow-by enters the combustion chamber from the intake manifold via PRV valve. Crankcase blow-by is mainly controlled by positive crankcase ventilation valve. Positive crankcase ventilation valve meters the volume of blow-by according to manifold vacuum signals. Positive crankcase ventilation valve allows some vacuum pressure to pass through the orifice inside the valve to reach a low pressure state in the crankcase. The blow-by air in the crankcase is then sucked into the intake system and burned during normal combustion. The volume of blow-by entering the intake manifold is precisely controlled to maintain the idling stability. The car must use a correct and properly calibrated positive crankcase ventilation valve. The relationship between blow-by flow and vacuum degree of engine manifold is shown in the following table:

Vacuum degree of manifold	Open degree of positive crankcase ventilation valve	Blow-by flow
Low	Wide	Much
High	Narrow	Little

Fuel evaporative emission (EVAP) control system

Fuel evaporation (EVAP) control system is to minimize the role of the fuel vapor into the atmosphere to reduce the vehicle emissions of hydrocarbons (HC). The system mainly includes:

- Activated carbon tank with evaporative emission (EVAP) control. It is used to temporarily store the fuel vapour, until the fuel vapour can be sent from EVAP controlled activated carbon tank into the engine for combustion.
- Fuel tank steam purification control system. The inhaled fresh air is sent into the inlet hole on the throttle body through the canister solenoid valve, where the purification is performed in the activated carbon tank.
- Fuel tank steam control system. When fuel vapour pressure in the fuel tank is above the set value of EVAP two-way valve, EVAP two-way valve will opened, to allow the fuel vapour to flow into EVAP controlled activated carbon tank.

Canister solenoid valve

The charcoal canister control valve consists of an electromagnetic coil, an armature, a valve, etc. The flow of air flowing through the canister control valve is related to the duty ratio of the electrical pulse output to the canister control valve on the one hand, and the pressure difference between the inlet and the outlet of the canister control valve on the other hand. When there is no electric pulse, the canister control valve is closed.

Evaporative emission carbon canister

The evaporative emission carbon canister is an emission control device containing activated carbon particles. The evaporative emission carbon canister is used to adsorb and store fuel vapor from fuel tank. The fuel vapor is always stored in carbon canister, when certain conditions are meet, the engine control module will power on the canister sewage solenoid valve, to allow the fuel vapor to enter into the engine cylinder for consumption.

The following conditions can lead to poor idle, loss of idle and poor control performance:

- The carbon canister solenoid valve does not action.
- The carbon canister is damaged.
- The hose is disconnected broken, or not connected with the proper pipeline.

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Diagnostic Information and Procedures

Diagnosis Instructions

Before starting to diagnose a fault in the emission control system, familiarize yourself with the operating principle of the emission control system, and then start the system diagnostics, which helps to determine the correct troubleshooting steps in the event of a failure. More importantly, this also helps to determine whether the customer's situation belongs to normal operation.

Any troubleshooting of the emission control system should begin with the emission control system check, so as to instruct the service personnel to take the next logical step to troubleshoot. Comprehend and correctly use the diagnostic flow chart to shorten the diagnosis time and avoid the misjudgement.

General equipment

Digital universal meter
Thickness gauge
Ignition timing gun
Diagnostic equipment of vehicle

Visual Inspection

1. Confirm the problem of the customer.
2. Visually check whether there is any obvious mechanical or electrical damage sign.

Visual inspection table

Electrical	Electrical
• Fuel vapor line • Vacuum tube • Carbon canister • Crankcase ventilation valve • Canister solenoid valve	• Fuse • Harness or plug • Canister solenoid valve • Front oxygen sensor • Rear oxygen sensor • ECM

3. If the observed or proposed problem is obvious and its cause is identified, rectify the cause before proceeding with next step.
4. If for the problem, there are no obvious findings, then confirm the fault and refer to the symptom table.

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List of fault symptoms

If the vehicle fails, no trouble code is detected by the engine control module (ECM), and no significant fault location is found after visual inspection and general inspection, it is recommended that troubleshooting should be carried out according to diagnostic ideas and processes of the table below.

Symptom	Possible point of failure	Recommended Measures
The evaporative emission system is leaked	• Discharge pipe is ruptured	• Replace the discharge pipe
	• Carbon canister rupture	• Replace the canister
The evaporative emission system is clogged	• Vent line is blocked	• Clean and/or replace the vent line
	• Carbon canister line is blocked	• Clean the carbon canister pipe • Replace the canister
	• Carbon canister solenoid valve is blocked	• Replace the canister solenoid valve **Refer to: Replacement of canister solenoid valve**
The pressure in the crankcase is too high	• Oil-gas separator or hose is blocked or damaged	• Check if the components of oil-gas separator system are blocked (clean or install new components if necessary)
	• Engine components are worn or damaged	• Check the engine mechanical system
Out-of-service of Canister Solenoid Valve	• Harness or plug	**Refer to:Diagnostic process for carbon canister solenoid valve failing to work**
	• Canister solenoid valve	
	• ECM	

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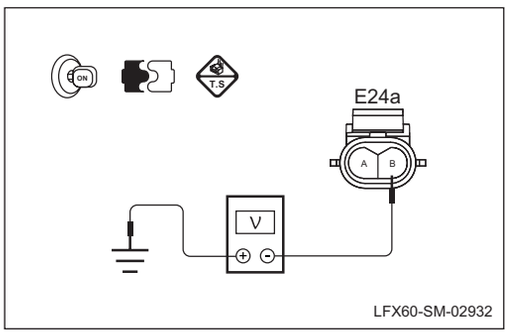
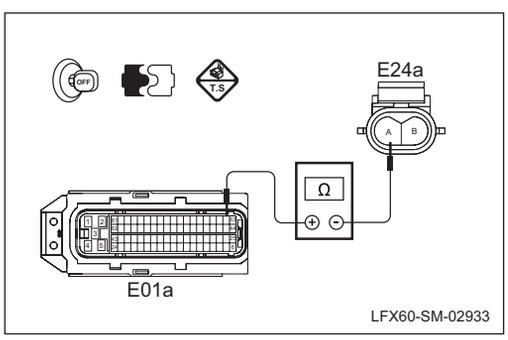
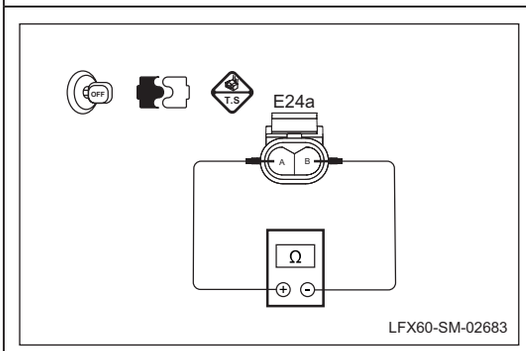
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Diagnostic process for carbon canister solenoid valve failing to work

Test condition	Details/results/measures
1. Check the engine DTC.	
	A. Operate the ignition switch to turn the power to OFF and connect the diagnostic meter. B. Operate the ignition switch to turn the power to ON state. C. Turn on the diagnostic meter and check the engine system. Is there emission control fault code? →**Yes** **Refer to: Diagnostic trouble code (DTC) list. Perform DTC diagnostic procedure.** →**No** To step 2.
2. Execute the active testing of carbon canister solenoid valve.	
	A. Operate the ignition switch to turn the power to OFF and connect the diagnostic meter. B. Operate the ignition switch to turn the power to ON state. C. Open the diagnostic device, select the I/O function, and execute the carbon canister cleaning function. Does the carbon canister solenoid valve work properly? →**Yes** Intermittent failure. →**No** To step 3.
3. Check the fuse.	
	A. Operate the ignition switch to turn the power to OFF state. B. Check fuse FS14 in the electrical box of engine compartment. **Fuse rated capacity: 15A** Is it OK after checking? →**Yes** To step 4. →**No** Replace the fuse.

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Test condition	Details/results/measures
4. Check the canister solenoid valve power supply line.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the canister solenoid valve harness plug E24a. D. Operate the ignition switch to turn the power to ON state. E. Connect the battery negative terminal. F. Use a multimeter to measure the voltage between terminal B of harness plug E24a of carbon canister solenoid valve and the reliable ground point. **Standard value:11 ~ 14V** Is the voltage normal? →**Yes** To step 5. →**No** Troubleshoot the canister solenoid valve power supply line. If necessary, replace the harness.
5. Check the carbon canister solenoid valve signal line.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the canister solenoid valve harness plug E24a. D. Disconnect the EMC harness plug E01a. E. Use a multimeter to measure the resistance between terminal A of harness plug E24a of carbon canister solenoid valve and terminal 64 of ECM harness plug E01a. **Standard value:Less than 5Ω** Is the resistance normal? →**Yes** To step 6. →**No** Check the carbon canister solenoid valve signal line for fault; and replace the harness, if necessary.
6. Check the canister solenoid valve.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the canister solenoid valve harness plug E24a. D. Measure the resistance between the canister solenoid valve terminal A and B with the multimeter. **Standard value:19~22Ω** Is the resistance normal? →**Yes** To step 7. →**No** Replace the canister solenoid valve. **Refer to: Replacement of canister solenoid valve**

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Test condition	Details/results/measures
7. Check ECM.	
	A. Replace ECM. **Refer to: Replacement of ECM** Confirm that the fault has been ruled out.

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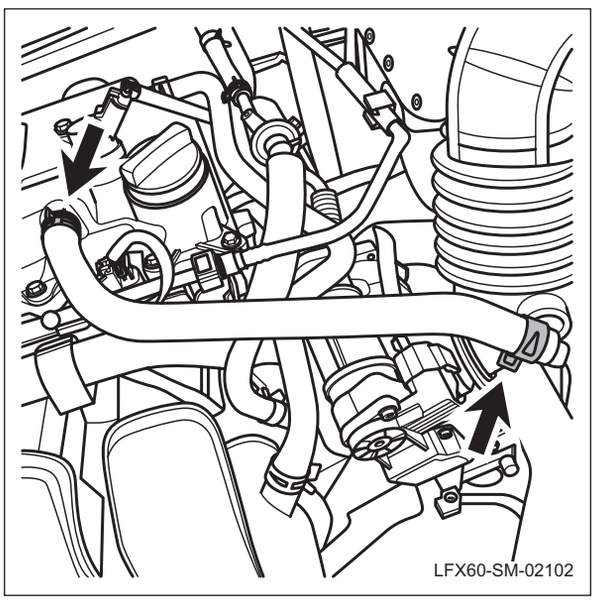
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Removal and Installation

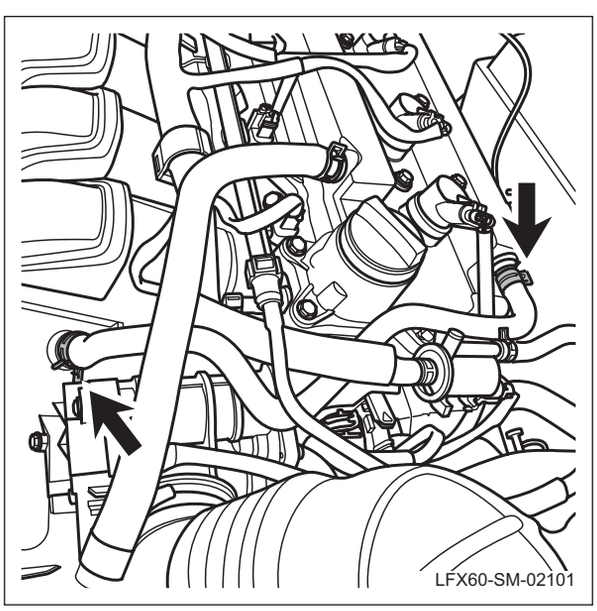
Replacement of crankcase vent pipe

Removal

1. Remove the crankcase vent pipe



(a). Remove the clamp from crankcase vent pipe 1, disconnect the connection, and remove the crankshaft vent pipe.



(b). Remove the clamp from crankcase vent pipe 2, disconnect the connection, and remove the crankshaft vent pipe.

Installation

1. Install the crankcase vent tube.

(a) The installation sequence is the reverse of the disassembly order.

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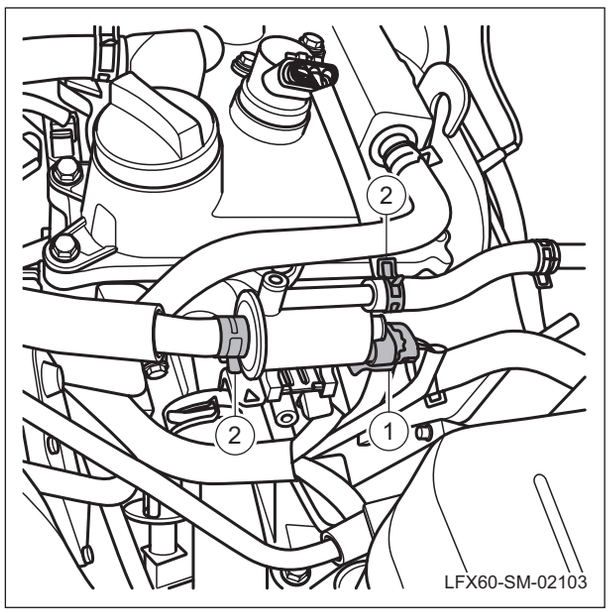
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Replacement of carbon canister solenoid valve

Removal

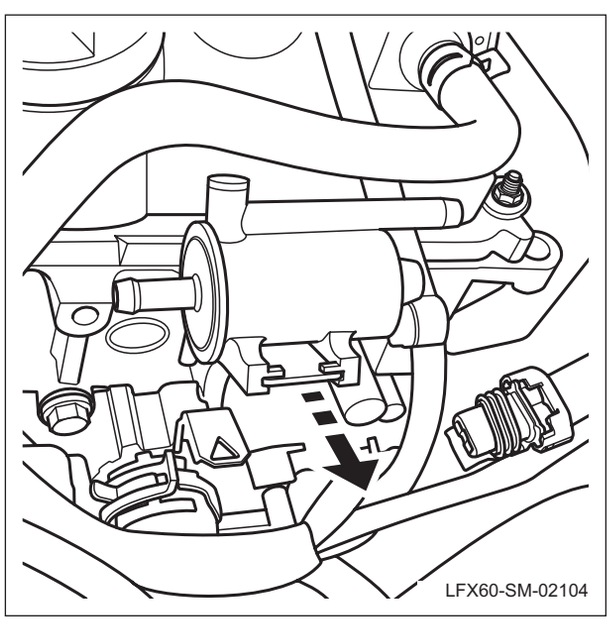
1. Disconnect the canister solenoid valve.

(a). Disconnect the battery negative connector.



(b). Disconnect the carbon canister solenoid valve harness plug 1.

(c). Remove the carbon canister solenoid valve hose clamp 2 and disconnect the hose.



(d). Remove the carbon canister solenoid valve.

Installation

1. Installation the canister solenoid valve.

(a). The installation sequence is the reverse of the disassembly order.

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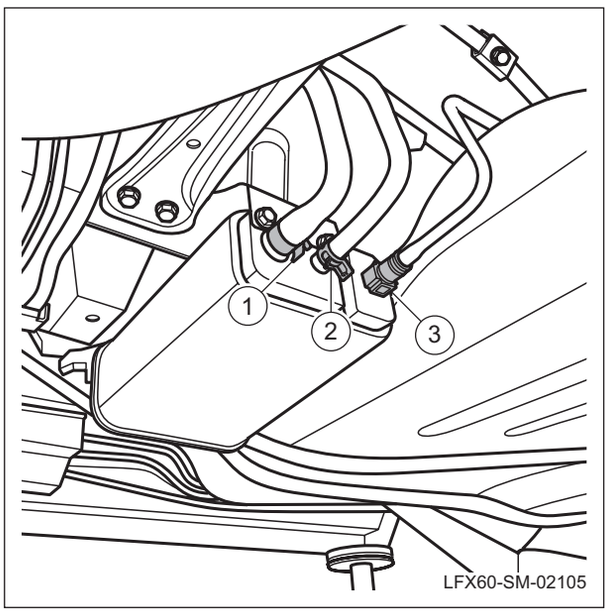
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Replacement of carbon canister

Removal

1. Remove the carbon canister.

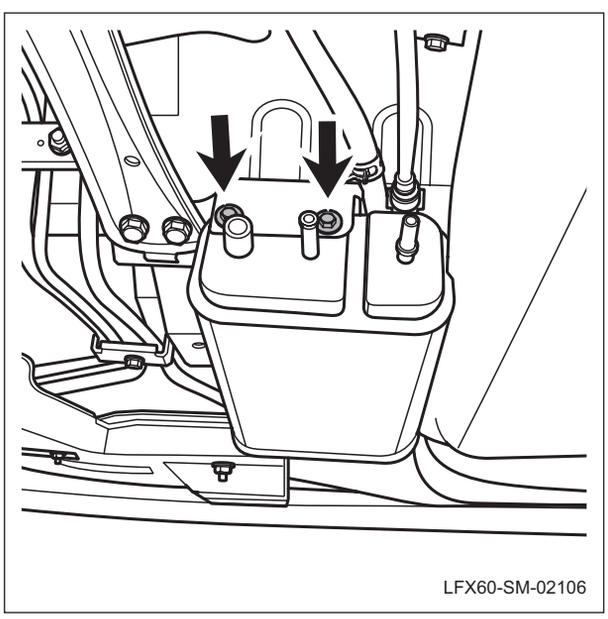
(a). Lift the vehicle. **Refer to the vehicle lift and support.**



(b). Remove the carbon canister desorption tube.

(c). Remove the carbon canister adsorption tube 2.

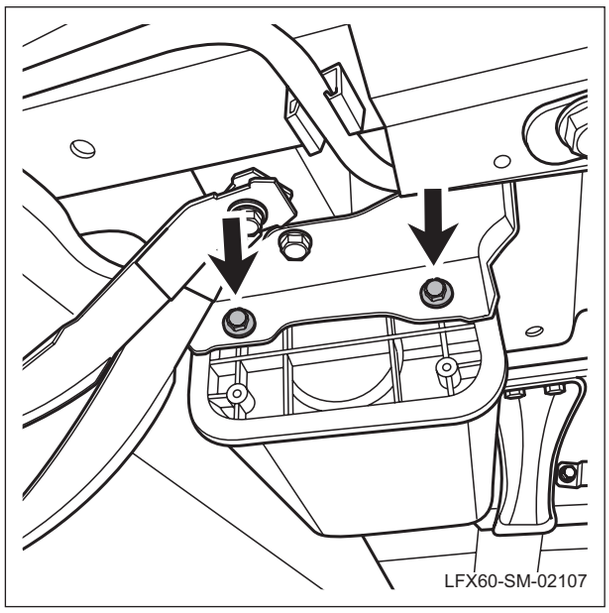
(d). Remove the carbon canister ventilation tube 3.



(e). Remove the front fixing bolts from the carbon canister.

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(f). Remove the rear fixing bolts from the carbon canister.
(g). Remove the canister assembly.

Installation

1. Installation of carbon canister.

(a). The installation sequence is the reverse of the disassembly order.

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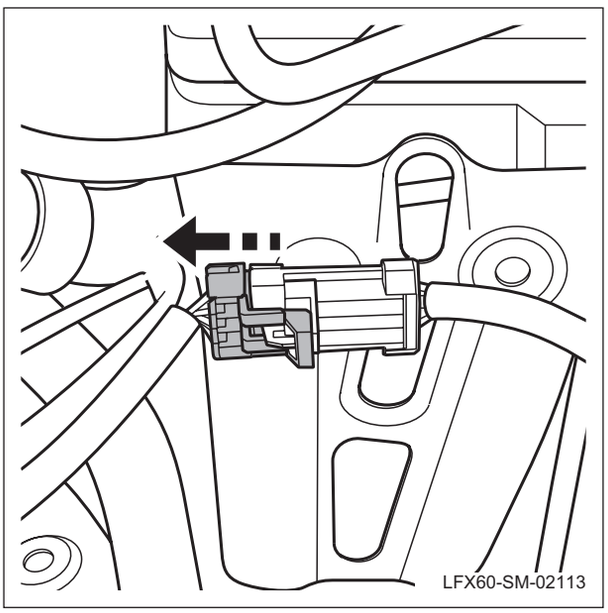
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Replacement of Front HO2S

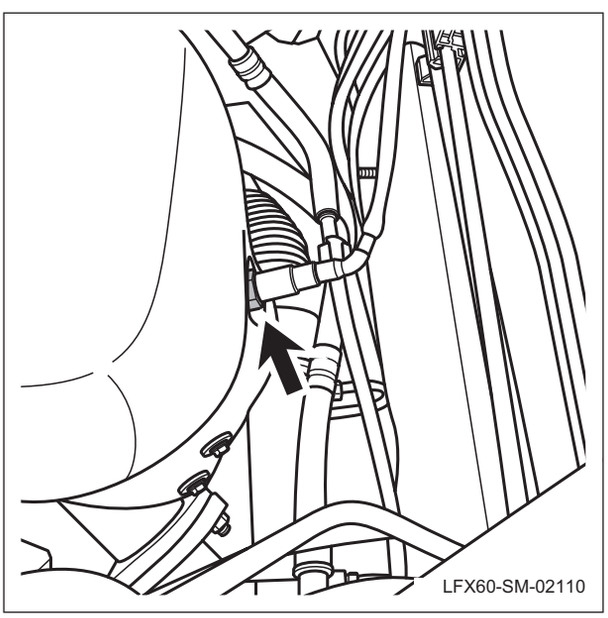
Removal

1. Remove the front oxygen sensor.

(a). Disconnect the battery negative connector.



(b). Disconnect the harness plug of front oxygen sensor.



(c). Remove the front oxygen sensor.

Installation

1. Installation the front oxygen sensor.

(a). The installation sequence is the reverse of the disassembly order.

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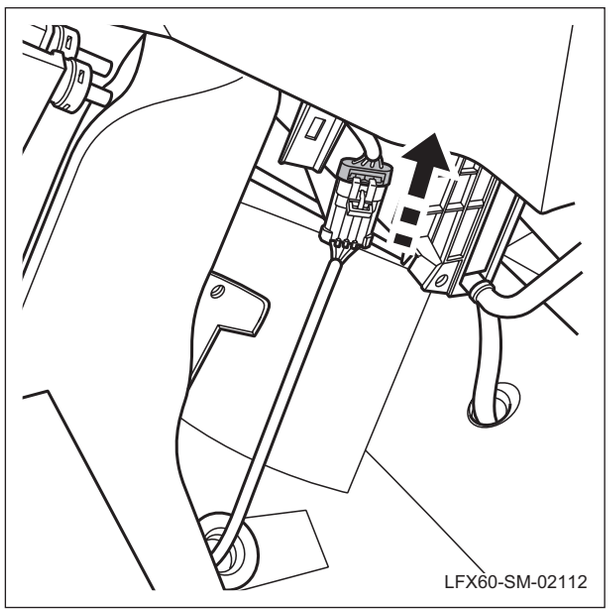
Replacement of Rear HO2S

Removal

1. Remove the rear oxygen sensor.

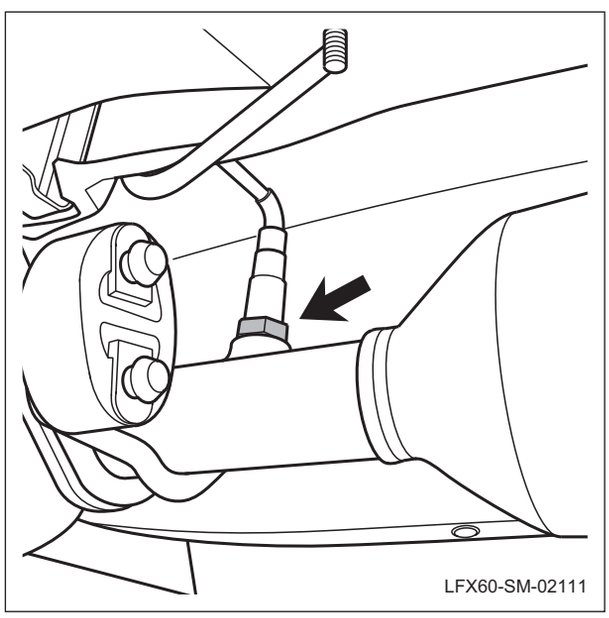
(a). Disconnect the battery negative connector.

(b). Remove the left decorative plate from the dashboard. **Reference: Replacement of the dashboard assembly.**



(c). Disconnect the harness plug of rear oxygen sensor.

(d). Lift the vehicle.



(e). Installation the rear oxygen sensor.

Installation

1. Installation the rear oxygen sensor.

(a). The installation sequence is the reverse of the disassembly order.

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AutoLibrary

02-Engine

Power suspension device.....2-691
Technical specifications 2-691
Structure and installation location.....2-693
Removal and Installation 2-696

AutoLibrary

AutoLibrary

AutoLibrary

AutoLibrary

Power suspension device

Technical specifications

Torque Specifications

Name	Torque range	
	Metric(Nm)	British(lb-ft)
Front suspension and subframe fixing bolts (MT)	75	55
Front suspension connecting bracket and transmission (MT)	60	44
Front suspension connecting bracket and front suspension (MT)	75	55
Rear suspension and subframe (MT)	75	55
Rear suspension connecting bracket and transmission (MT)	60	44
Rear suspension connecting bracket and rear suspension M12X1.25X100 (MT)	95	70
Rear suspension connecting bracket and rear suspension M10X1.25 (MT)	95	70
Left suspension and left suspension erection support (MT)	75	55
Left suspension and left suspension connecting bracket (MT)	75	55
Left suspension connecting bracket and transmission M10X1.25X60 (MT)	75	55
Left suspension connecting bracket and transmission M10X1.25X25 (MT)	60	44
Left suspension erection bracket and body (MT)	75	55
Right suspension and right suspension erection support (MT)	75	55
Right suspension and engine (MT)	75	55
Right suspension and body (MT)	75	55
Right suspension erection bracket and body (MT)	75	55
Front suspension and subframe fixing bolts (CVT)	75	55
Front suspension connecting bracket and transmission (CVT)	75	55
Front suspension connecting bracket and front suspension (CVT)	75	55
Rear suspension and subframe (CVT)	75	55
Rear suspension connecting bracket and transmission (CVT)	75	55
Rear suspension connecting bracket and rear suspension M12X1.25X100 (MT)	95	70
Rear suspension connecting bracket and rear suspension M10X1.25 (MT)	95	70
Left suspension and transmission	75	55
Left suspension erection bracket and body (CVT)	75	55

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Name	Torque range	
	Metric(Nm)	British(lb-ft)
Right suspension and right suspension erection support (MT)	75	55
Right suspension and engine (MT)	75	55
Right suspension and body (MT)	75	55
Right suspension erection bracket and body (CVT)	75	55

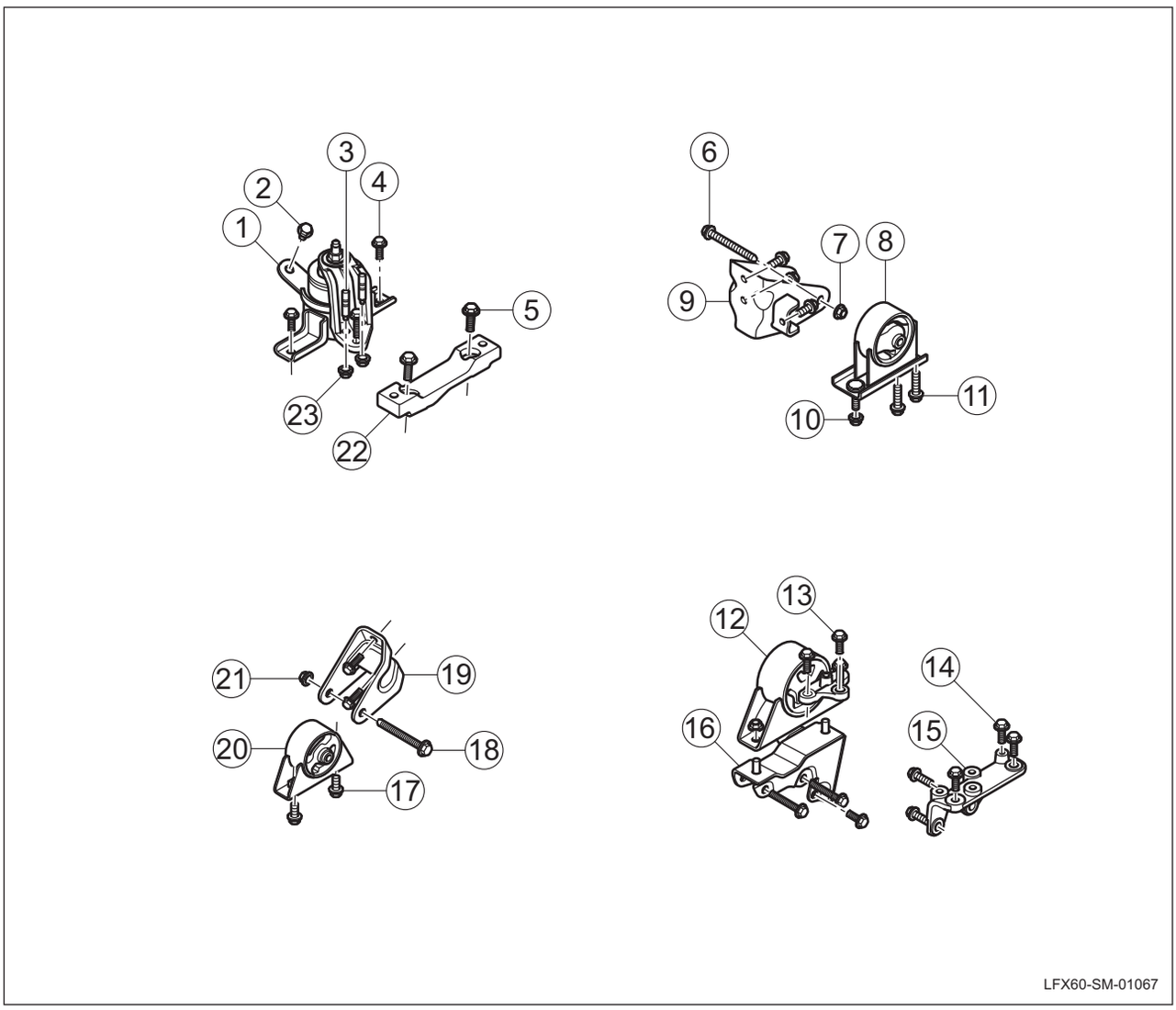
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Structure and installation location

Part exploded view

Power mounting system (MT)



LFX60-SM-01067

No.	Part Name
1	Right mounting assembly
2	Right mounting assembly fixing bolt
3	Right mounting assembly fixing screw rod
4	Right mounting assembly fixing bolt
5	Right mounting installation support fixing bolt
6	Rear mounting connecting bracket bolt
7	Rear mounting connecting bracket nut
8	Rear mounting assembly.
9	Rear mounting connecting bracket
10	Rear mounting assembly fixing nut

No.	Part Name
13	Left mounting assembly fixing bolt
14	Left suspension erection bracket bolts
15	Left suspension erection bracket
16	Front mounting connecting bracket
17	Front mounting assembly fixing bolt
18	Front suspension erection bracket bolts
19	Front mounting connecting bracket
20	Front mounting assembly.
21	Front mounting connecting bracket nut
22	Right mounting installation support

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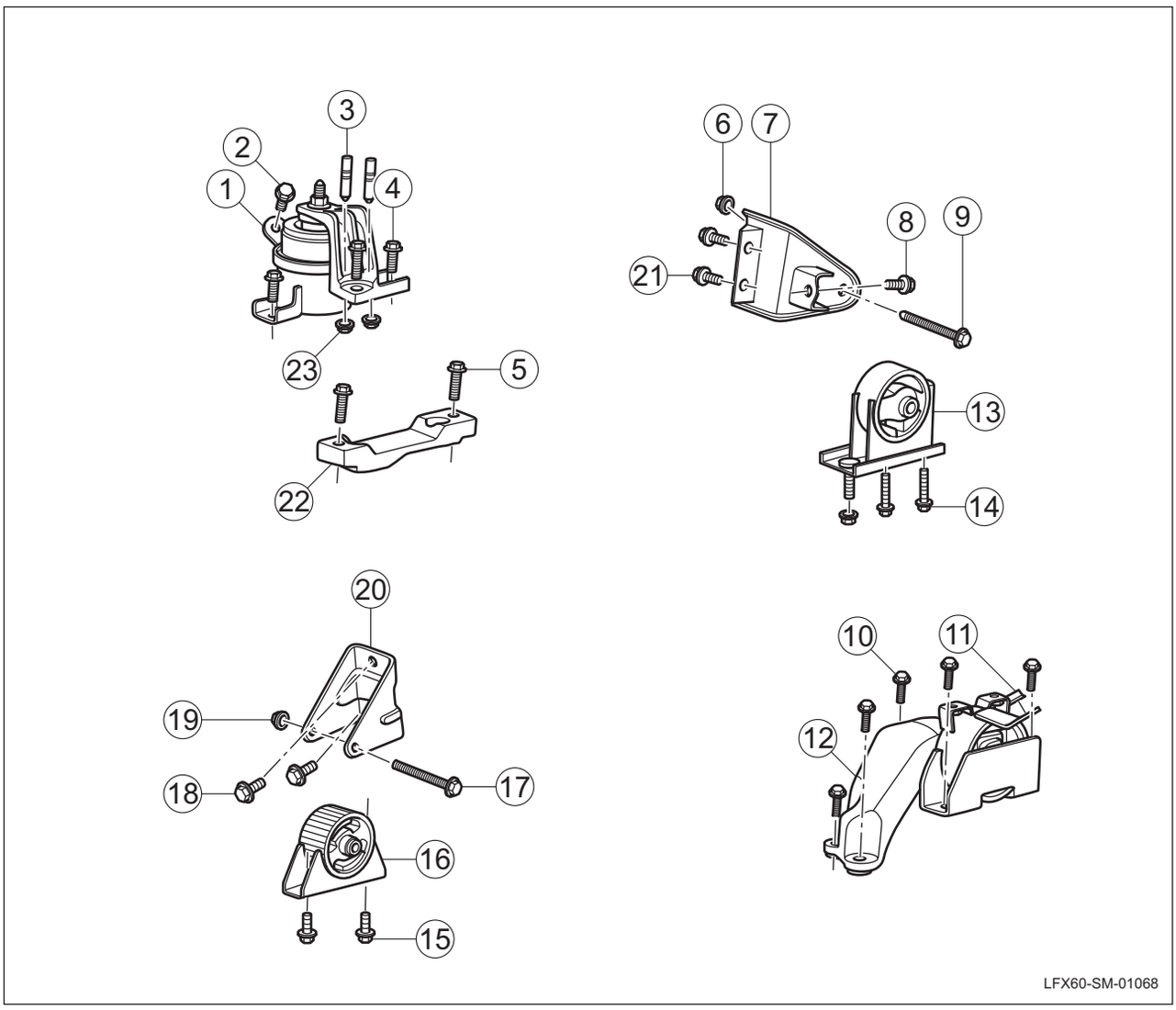
No.	Part Name
11	Rear mounting assembly fixing bolt
12	Left mounting assembly

No.	Part Name
23	Right mounting assembly fixing nut

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Power mounting system (CVT)



No.	Part Name
1	Right mounting assembly
2	Right mounting assembly fixing bolt
3	Right mounting assembly fixing screw rod
4	Right mounting assembly fixing bolt
5	Right mounting installation support fixing bolt
6	Rear mounting connecting bracket nut
7	Rear mounting connecting bracket
8	Rear mounting connecting bracket bolt
9	Rear mounting connecting bracket bolt
10	Left mounting assembly fixing bolt
11	Left mounting assembly fixing nut
12	Left mounting assembly

No.	Part Name
13	Rear mounting assembly.
14	Suspension components fixing bolts
15	Front mounting assembly fixing bolt
16	Front mounting assembly.
17	Front suspension erection bracket bolts
18	Front suspension erection bracket bolts
19	Front suspension erection bracket nut
20	Suspension connecting bracket
21	Rear mounting connecting bracket bolt
22	Right mounting installation support
23	Right mounting assembly fixing nut

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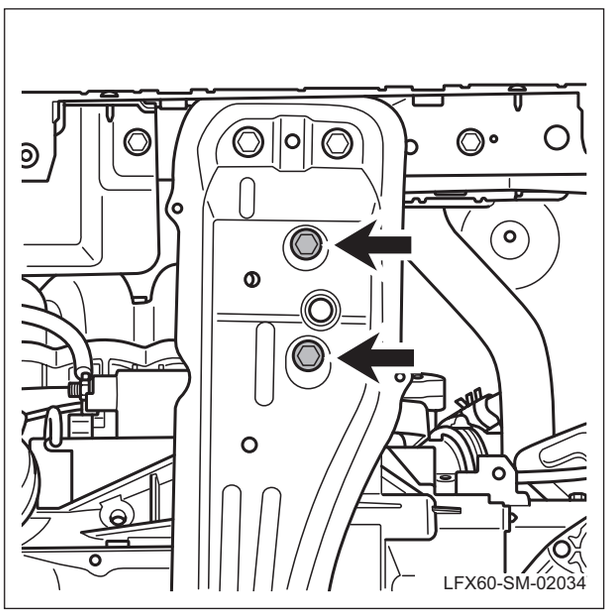
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Removal and Installation

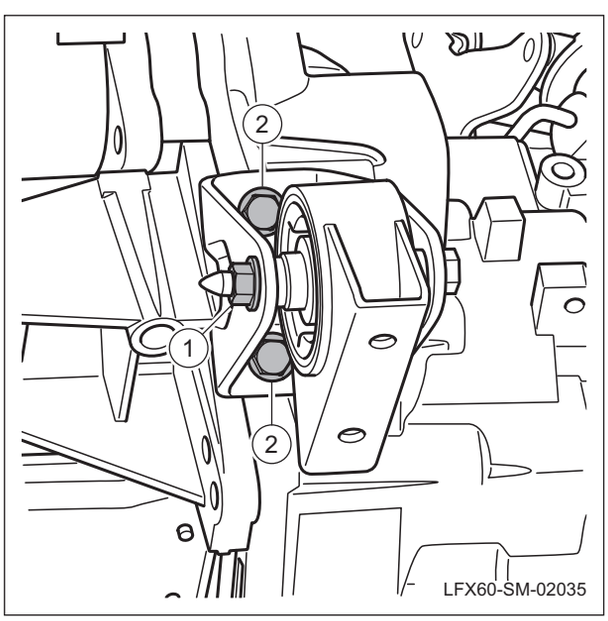
Front mounting assembly

Removal

1. Remove the front suspension components.



(a). Lift the jack to support the engine assembly.
(b). Remove the fixing bolts from the front suspension components.
(c). Remove the front suspension components.



(d). Remove the front suspension nut 1.
(e). Remove the fixing bolt 2 from the front suspension bracket.
(f). Remove the front suspension assembly.

Installation

1. Installation of the front suspension components.
(a). The installation sequence is the reverse of the disassembly order.

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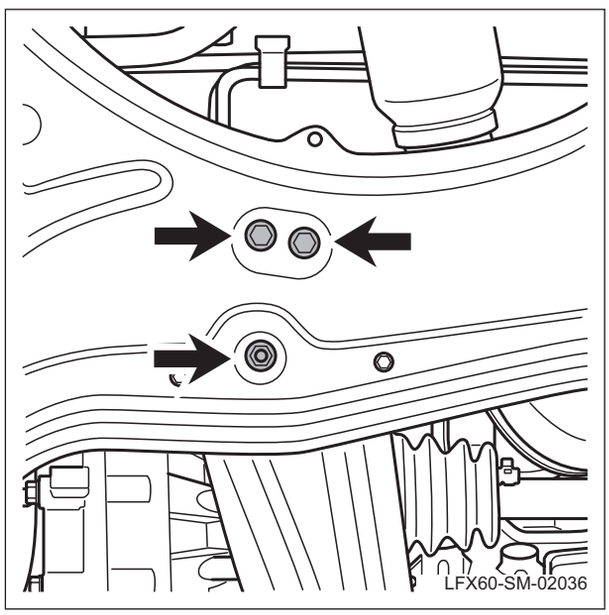
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Rear mounting assembly. (MT)

Removal

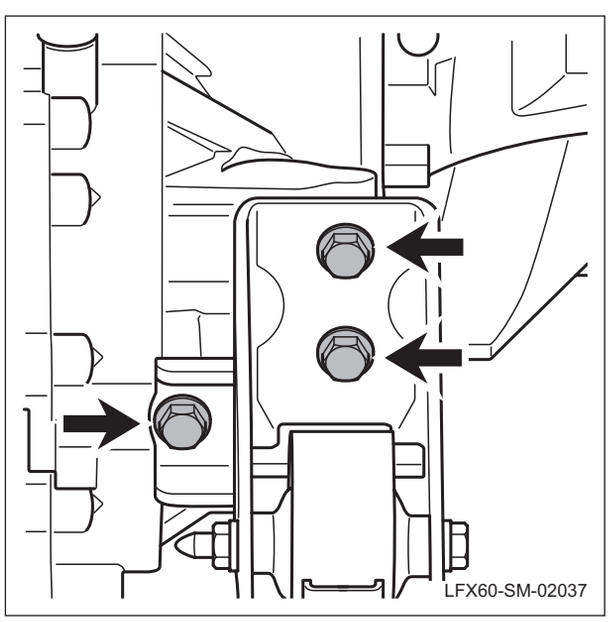
1. Remove the rear mounting assembly.

(a). Lift the vehicle.



(b). Lift the jack to support the engine assembly.

(c). Remove the rear mounting assembly fixing bolt and nut.



(d). Remove the rear mounting assembly fixing bolt.

(e). Remove the rear suspension components.

Installation

1. Install the rear mounting assembly.

(a). The installation sequence is the reverse of the disassembly order.

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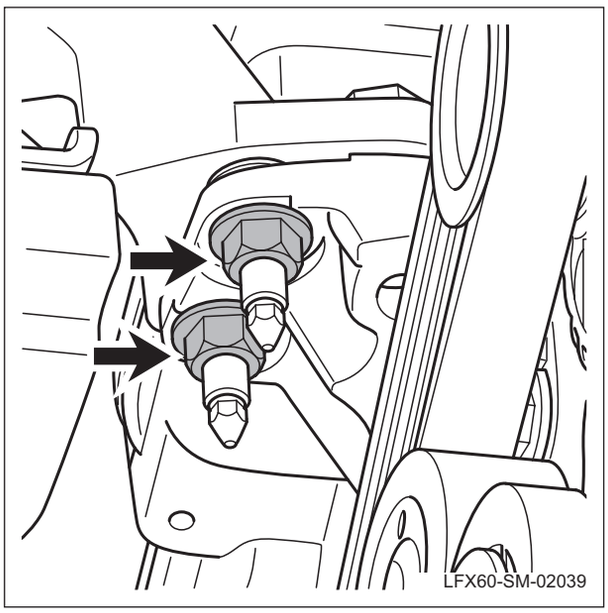
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Right mounting assembly

Removal

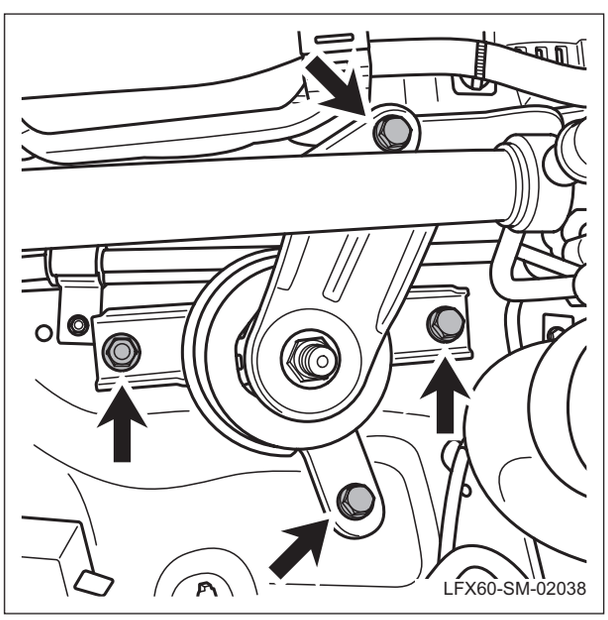
1. Remove the right suspension components.

(a). Lift the vehicle. **Refer to the vehicle lift and support.**



(b). Remove the fixing nuts from the right suspension components.

(c). Lift the jack to support the engine assembly.



(d). Remove the fixing bolts and nuts from the right suspension components.

(e). Remove the right suspension components.

Installation

1. Installation the right suspension components.

(a). The installation sequence is the reverse of the disassembly order.

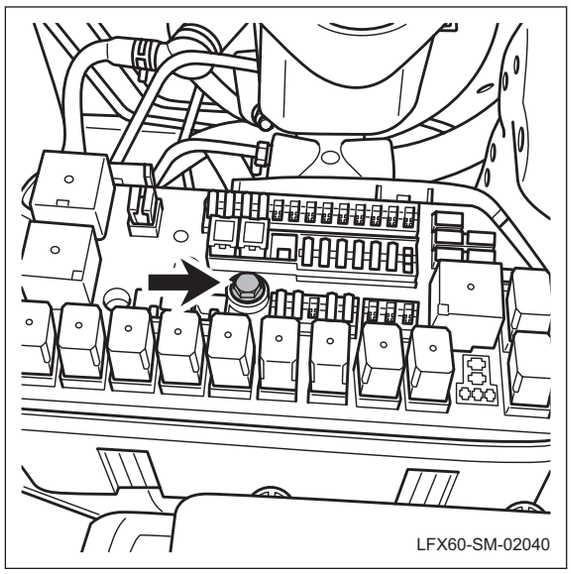
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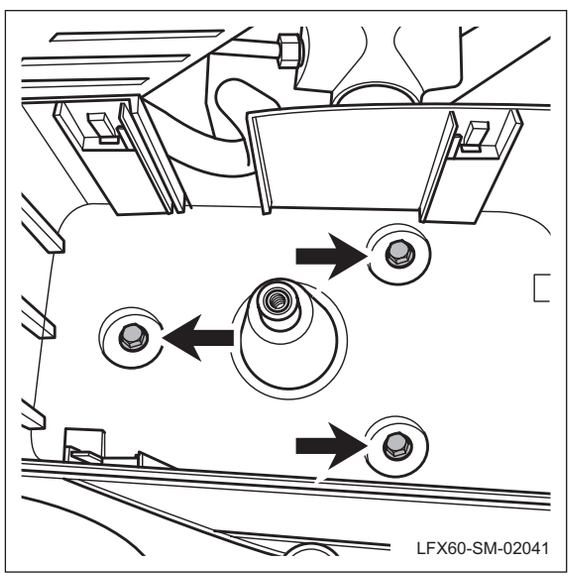
Left mounting assembly (MT)

Removal

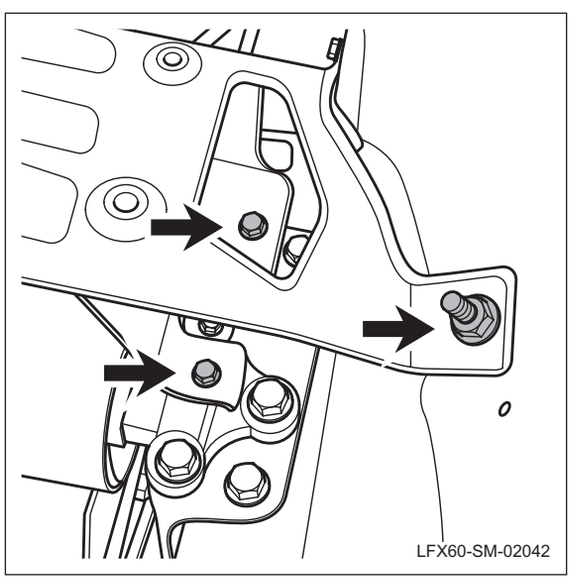
1. Remove the front left mounting assembly.



(a). Remove the engine compartment fuse box cap.
(b). Remove the engine compartment fuse assembly fixing bolt.
(c). Disconnect fuse box assembly from the lower housing of the fuse box.



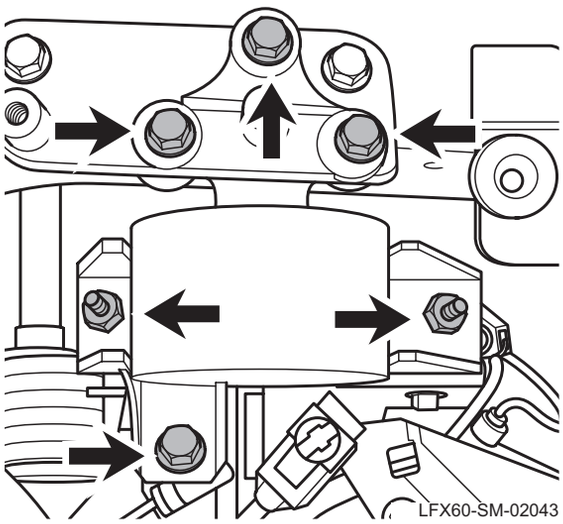
(d). Remove the fixing bolts from the lower housing of the fuse box in the engine compartment.



(e). Remove the fixing bolts and nuts from the fuse box bracket in the engine compartment.

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(f). Lift the jack to support the engine assembly.
(g). Remove the front left mounting assembly fixing bolt and nut.
(h). Take down the front left mounting assembly.

Installation

1. Install the left mounting assembly.

(a). The installation sequence is the reverse of the disassembly order.

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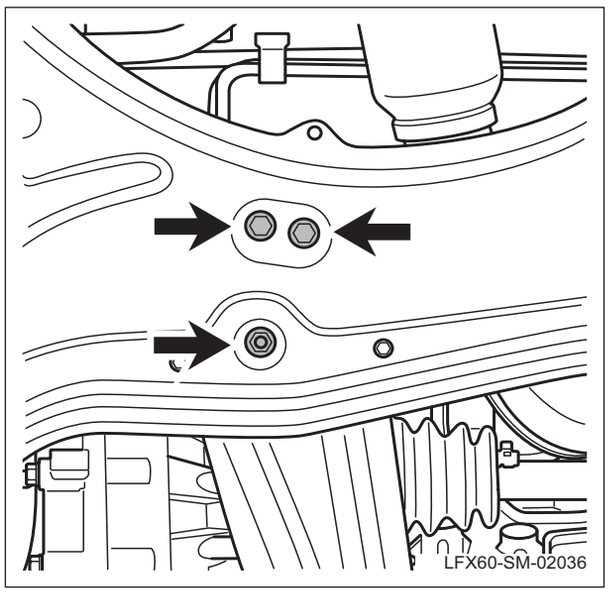
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Rear mounting assembly. (CVT)

Removal

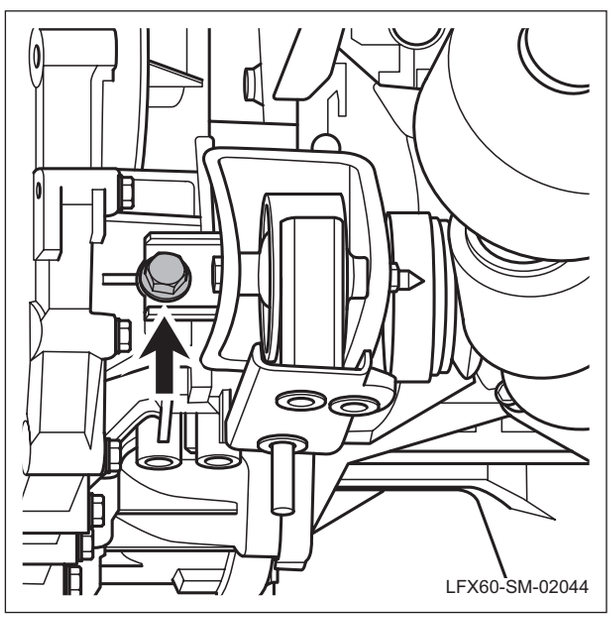
1. Remove the rear mounting assembly.

(a). Lift the vehicle.



(b). Lift the jack to support the engine assembly.

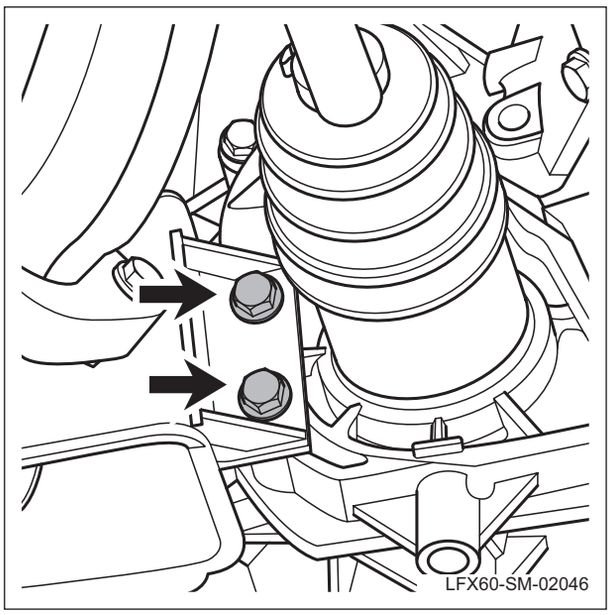
(c). Remove the rear mounting assembly fixing bolt and nut.



(d). Remove the rear mounting assembly fixing bolt.

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(e). Remove the rear mounting assembly fixing bolt.
(f). Remove the rear suspension components.

Installation

1. Install the rear mounting assembly.
(a). The installation sequence is the reverse of the disassembly order.

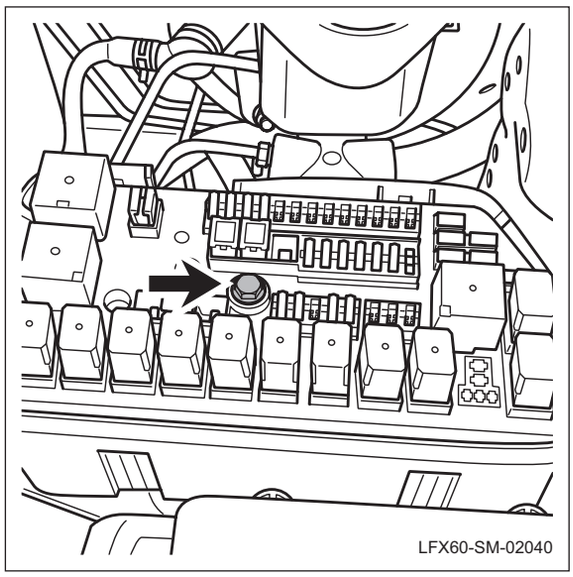
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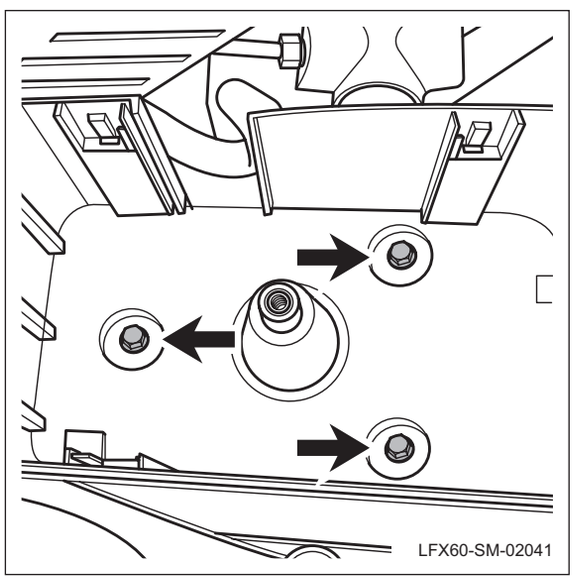
Left mounting assembly (CVT)

Removal

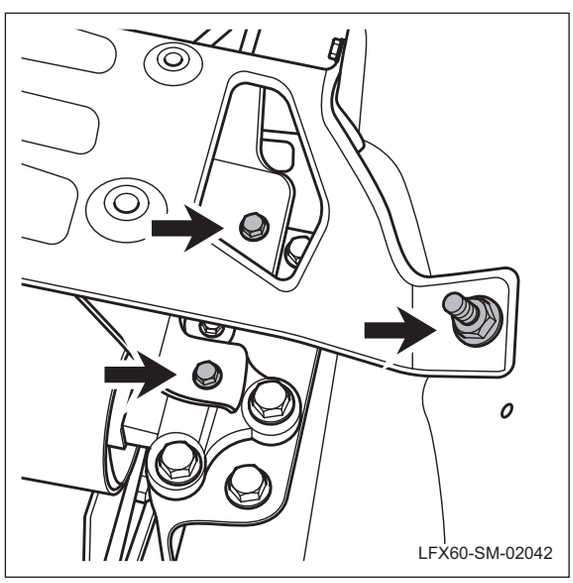
1. Remove the front left mounting assembly.



(a). Remove the engine compartment fuse box cap.
(b). Remove the engine compartment fuse assembly fixing bolt.
(c). Disconnect fuse box assembly from the lower housing of the fuse box.



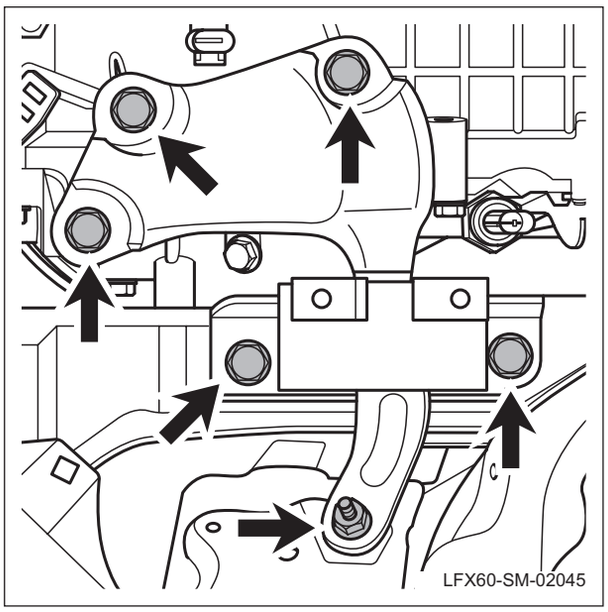
(d). Remove the fixing bolts from the lower housing of the fuse box in the engine compartment.



(e). Remove the fixing bolts and nuts from the fuse box bracket in the engine compartment.

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(f). Lift the jack to support the engine assembly.
(g). Remove the front left mounting assembly fixing bolt and nut.
(h). Take down the front left mounting assembly.

Installation

1. Install the left mounting assembly.
(a). The installation sequence is the reverse of the disassembly order.

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02- Engine

Engine anti-theft system..... 2-707

Preparation 2-707

Structure and installation location 2-708

Operating Principle 2-709

Diagnostic Information and Procedures 2-712

Removal and installation..... 2-721

AutoLibrary

AutoLibrary

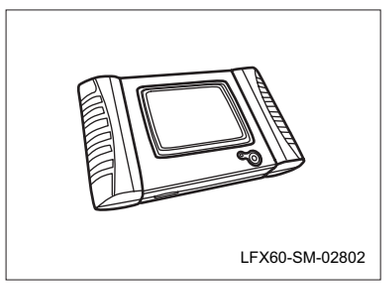
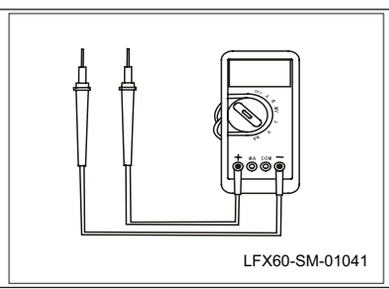
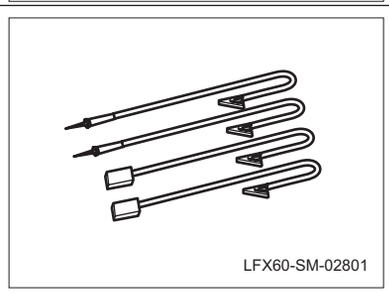
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Engine anti-theft system

Preparation

General maintenance tools

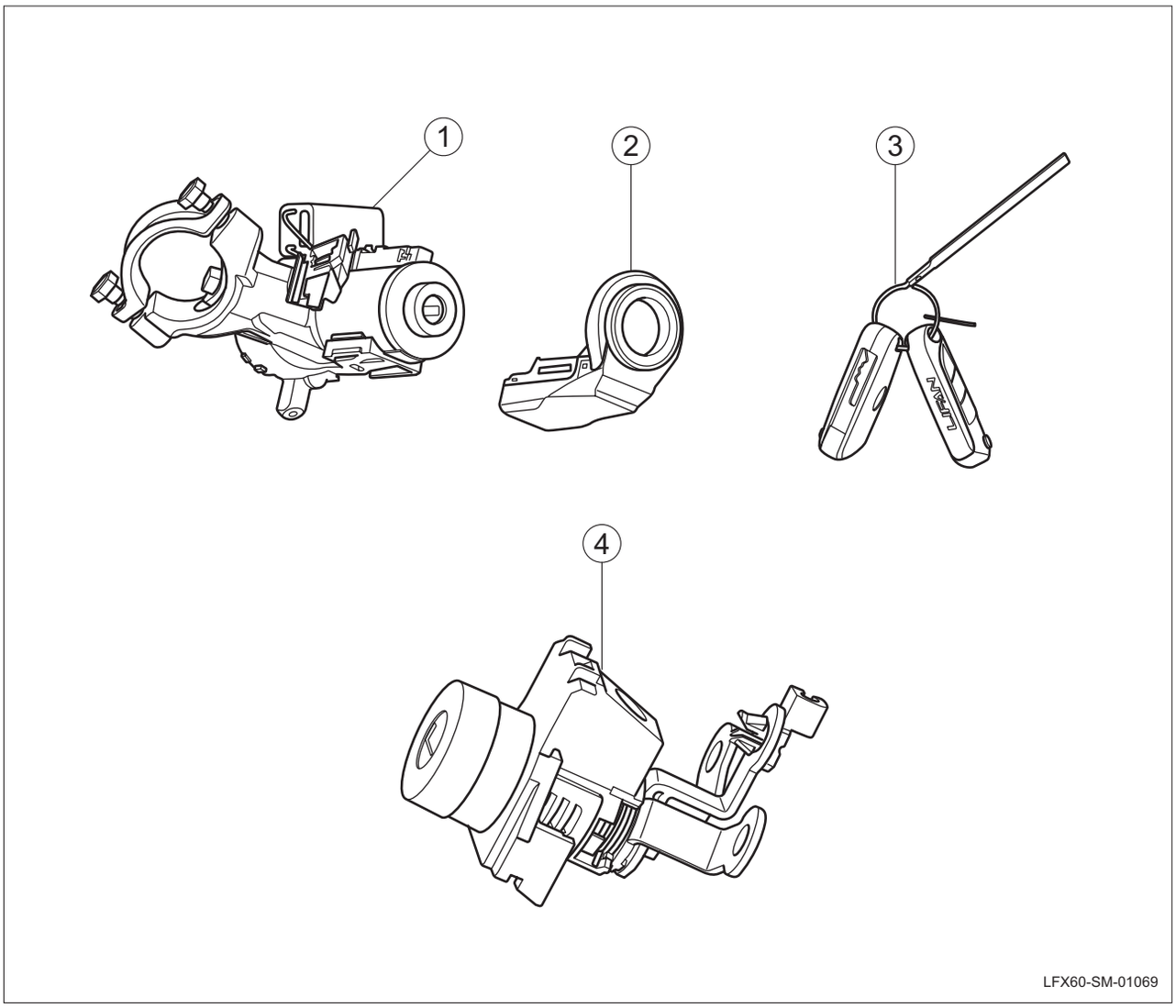
No.	Tool name	Tool figure	Tool code	Remarks
1	Diagnosis equipment	 LFX60-SM-02802	-	Read immobilizer DTC and data flow etc.
2	Digital universal meter	 LFX60-SM-01041	-	Measure the voltage and resistance
3	Conductor assembly	 LFX60-SM-02801	-	Testing circuit

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Structure and installation location

Part figure



No.	Part name
1	Ignition switch components
2	Security read-write recognition coil

No.	Part name
3	Fold the key
4	Left front door lock cylinder

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Operating Principle

System Overview

Auto electronic anti-theft system is a kind of world-class new auto anti-theft system. It is generally known as Immobilizer in the industry. This system uses RFID wireless identification technology and radio-frequency signal for transmission, calculation and validation. Compared with traditional after-sales anti-theft system and AlarmSystem, electronic anti-theft system features the following advantages:

- Electronic Alarm System (EAS), consisting of key, immobilizer and ECU, provides direct protection to the engine, which greatly improved the overall security of car.
- EAS adopts multi-level password verification by key, immobilizer and ECU for stronger system security.
- EAS adopts sensing method without any moving parts.
- No sound and light pollution, no malfunction.
- No extra operation, easy to use, no feeling of the existence of the system during normal use.
- It's not allowed to start the engine with jumper wires.

ⓘ Note

The electronic immobilizer is integrated in the front BCM assembly to realize the anti-theft function.

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The electronic immobilizer is integrated in the front BCM assembly to realize the anti-theft function.

System components

Electronic Alarm System is designed for engine. The system consists of a front body controller, a security read-write recognition coil and two remote keys with security cylinders. The security read-write recognition coil is installed on the head of the ignition lock cylinder. The security cylinder is installed in the plastic housing of the remote key.

Front BCM (Body Control Module)

Front BCM contains controller inside, and it consists of microprocessors and peripheral components for the communication between the security cylinder and ECU. When the power state is ON, if the remote key (security cylinder) and ECU are successfully authenticated during the specified short time, the ECU will release the engine, and the car can be started; on the contrary, the engine will not be started, and the anti-theft indicator will be flashing to alert the driver.

Front BCM is connected to the engine ECU through the body harness while following the communication protocol with ECU.

Logic description of body anti-theft function

Anti-theft status management

Initial power-up: The undefended status of the body should be stored in the Electrically Erasable Programmable Read-Only Memory (EEPROM). When BCM is normally on, the undefended status stored in EEPROM shall govern; but when the undefended status of the body changes later, the current status should be written to the EEPROM right now. When the current status is defended, cut off the normally-on state and restore it again, then the status becomes anti-theft status; when the current state is undefended, cut off the normally-on state and restore it again, then the status is still undefended; when the current status is alarm-triggered, cut off the normally-on state and restore it again, then the status is still alarm-triggered.

Alarm settings

To avoid body theft, BCM sets alarm conditions for the closed 4 doors, hood and trunk door.

Set the alarm conditions (or):

1. Remote locking;
2. Secondary locking.

ⓘ Note

- **When we've set alarm conditions for the car, the opened doors only perform the locking function, and the car gives sound and light hint that the doors are not closed; at this time, if the doors are closed, then we've set alarm conditions for the doors (except for the left front door, because it will be unlocked from locked when it's closed due to its mechanical structure).**
- **When the current status is defended, central unlocking and locking functions not valid.**

Alarm release

Release the alarm conditions (or):

1. Remote unlocking (doors and trunk door);
2. IMMO certified.

Action to release the alarm conditions:

Hazard warning light stops flashing and the speaker stops beeping.

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Trigger alarm

Trigger the alarm conditions (or):

1. Power supply (IG ON) is shorted;
2. Any of 4 doors and trunk door is Illegally opened.

Action to trigger the alarm conditions:

Hazard warning light flashes for 30s, and the speaker beeps 20 times.

Action to release the alarm conditions:

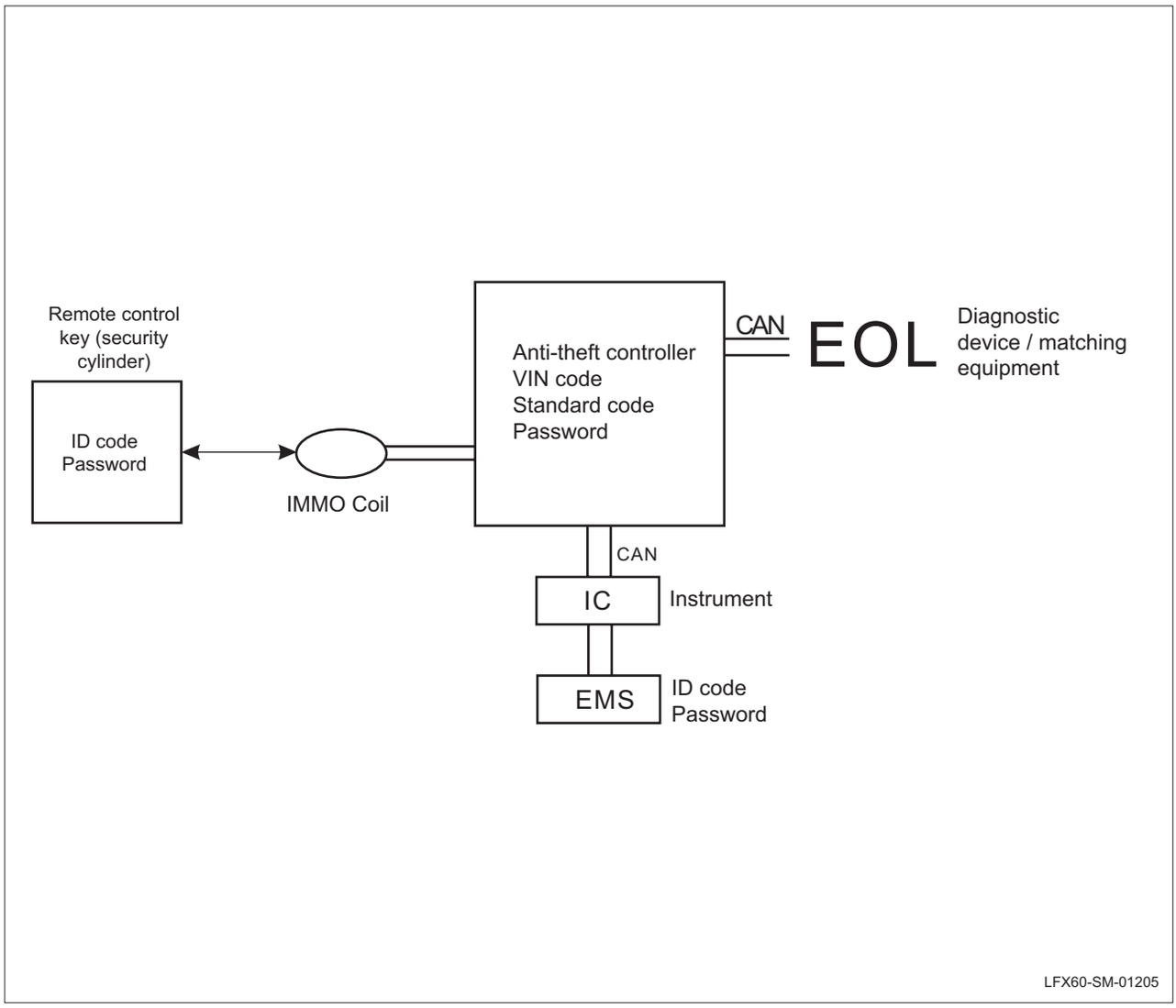
Hazard warning light stops flashing, the speaker stops beeping, and doors or trunk gets unlocked.

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Electronic anti-theft system

Connection between the electronic anti-theft system and the car is shown as below:



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Diagnostic Information and Procedures

Diagnosis Instructions

Before starting to diagnose a fault in the IMMO (immobilizer), familiarize yourself with the operating principle of the IMMO, and then start the system diagnostics, which helps to determine the correct troubleshooting steps in the event of a failure. More importantly, this also helps to determine whether the customer's situation belongs to normal operation.

Any troubleshooting of the IMMO should begin with the IMMO check, so as to instruct the service personnel to take the next logical step to troubleshoot. Comprehend and correctly use the diagnostic flow chart to shorten the diagnosis time and avoid the misjudgement.

General equipment

Digital universal meter
Diagnostic equipment of vehicle

Visual Inspection

1. Confirm the problem of the customer.
2. Visually check whether there is any obvious mechanical or electrical damage sign.

Visual inspection table

Mechanical	Electrical
• Key battery • Ignition key • Immobilizer identification coil	• Fuse • Harness or plug • BCM • ECM

3. If the observed or proposed problem is obvious and its cause is identified, rectify the cause before proceeding with next step.
4. If for the problem, there are no obvious findings, then confirm the fault and refer to the symptom table.

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List of fault symptoms

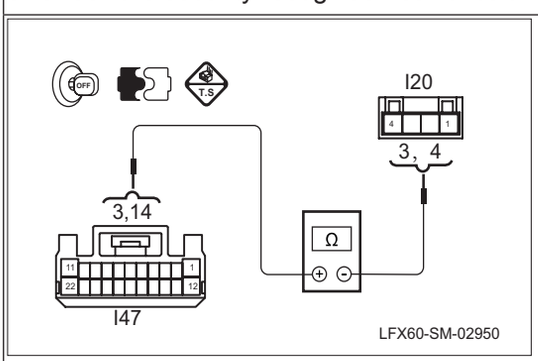
If the vehicle failed, where the control module did not detect the fault code, and visual inspection and general inspection did not locate the fault, it is recommended to troubleshoot according to the following table's diagnostic strategy and process.

Symptom	Possible point of failure	Recommended Measures
Key mismatch	• Wiring harness plug	• Check the harness plug
	• Ignition key	• Check or replace the key
	• Immobilizer identification coil	• Check or replace the security recognition coil
	• BCM	• Replace ECM **Refer to: Replacement of ECM**
	• ECM	• Replace the BCM **Refer to:Replacement of BCM**
ECM always detects that IMMO is not released	• Wiring harness plug	**Refer to: Diagnostic process for the problem that ECM always detects that IMMO is not released**
	• External environment signal interference	
	• Ignition key	
	• Immobilizer identification coil	
	• BCM	
	• ECM	
Automobile diagnosis device is not able to communicate with IMMO	• Harness or plug	**Refer to: Diagnostic process for the problem that the automobile diagnosis device is not able to communicate with IMMO**
	• Diagnostic interface	
	• BCM	

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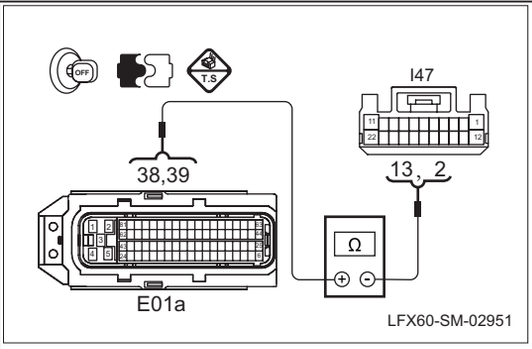
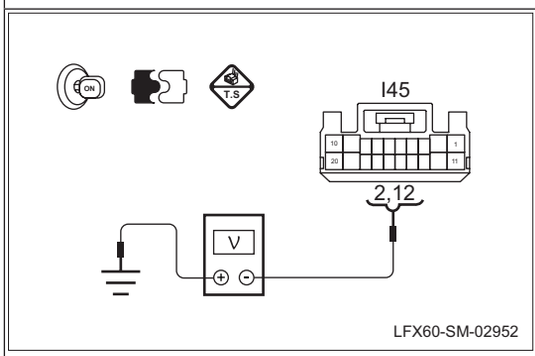
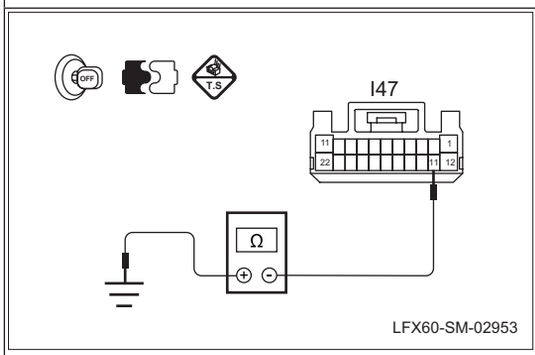
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Diagnostic process for the problem that ECM always detects that IMMO is not released

Test condition	Details/results/measures
1. Check the IMMO key.	
	A. Check if the key battery voltage is normal. B. Check if the key is evidently damaged. Is it OK after checking? →**Yes** To step 2. →**No** Replace the ignition key battery or the ignition key.
2. Re-match IMMO	
	A. Operate the ignition switch to turn the power to OFF and connect the diagnostic meter. B. Operate the ignition switch to turn the power to ON state. C. Re-match IMMO. Check whether it is normal? →**Yes** IMMO re-matched. →**No** To step 3.
3. Check the security recognition coil circuit.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the anti-theft identification coil harness plug I20. D. Disconnect BCM harness plug I47. E. Use a multimeter to measure the resistance between terminals 3 and 4 of harness plug I20 of security recognition coil and terminals 3 and 14 of BCM harness plug I47, respectively. **Standard value:Less than 5Ω** Is it OK after checking? →**Yes** To step 4. →**No** Check the security recognition coil circuit for fault; and replace the harness, if necessary.
4. Repair the CAN bus between BCM and ECM.	

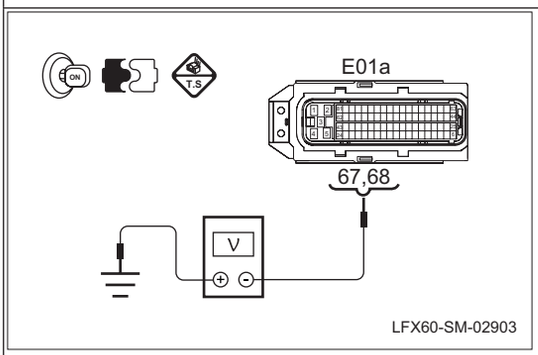
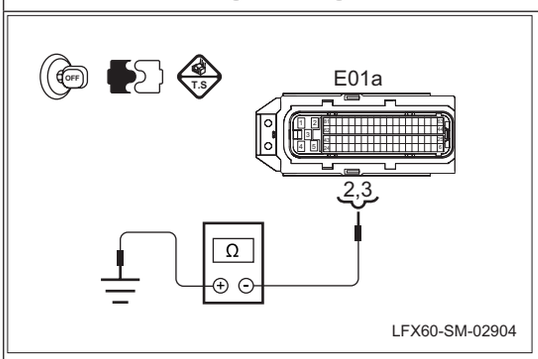
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Test condition	Details/results/measures
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the BCM harness plug I47. D. Disconnect the EMC harness plug E01a. E. Use a multimeter to measure the resistance between terminals 13 and 2 of BCM harness plug I47 and terminals 38 and 39 of ECM harness plug E01a, respectively. **Standard value:Less than 5Ω** Is it OK after checking? **→Yes** To step 5. **→No** Repair the CAN bus between BCM and ECM; replace the harness, if necessary.
5. Check the BCM power line.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the BCM harness plug I45. D. Connect the battery negative terminal. E. Operate the ignition switch to turn the power to ON state. F. Measure the voltage between the BCM harness plug I45 terminal 12, 2 and fixed ground point with the multimeter. **Standard value:11 ~ 14V** Is the voltage normal? **→Yes** To step 6. **→No** Repair the BCM power line fault and replace the harness if necessary.
6. Check the BCM ground line.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the BCM harness plug I47. D. Use a multimeter to measure the resistance between terminal 11 of BCM harness plug I47 and the ground point. **Standard value:Less than 5Ω** Is the resistance normal? **→Yes** To step 7. **→No** Repair the BCM ground line fault and replace the harness if necessary.

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Test condition	Details/results/measures
7. Check the ECM power supply line.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the EMC harness plug E01a. D. Connect the battery negative terminal. E. Operate the ignition switch to turn the power to ON state. F. Use a multimeter to measure the voltage between terminals 67 and 68 of ECM harness plug E01a and the reliable ground point. **Standard value:11 ~ 14V** Is the voltage normal? →**Yes** To step 8. →**No** Troubleshoot the ECM power supply line and replace the harness if necessary.
8. Check the ECM grounding line.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. A. Disconnect the EMC harness plug E01a. B. Use a multimeter to measure the resistance between terminals 2 and 3 of BCM harness plug E01a and the ground point G102a, respectively. **Standard value:Less than 5Ω** Is the resistance normal? →**Yes** To step 9. →**No** Troubleshoot the ECM grounding line and replace the harness if necessary.
9. Check the security recognition coil.	
	A. Replace the immobilizer identification coil. Refer to: Replacement of security recognition coil Is the system normal? →**Yes** Replace the security recognition coil. →**No** To step 10.
10. Check the BCM.	

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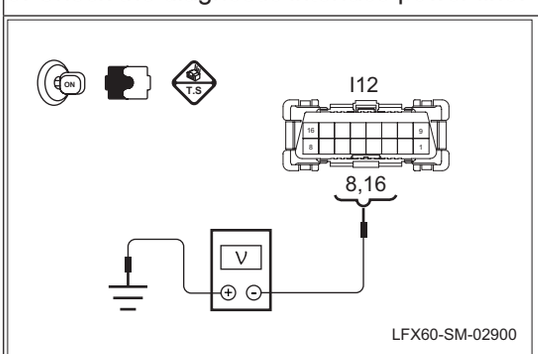
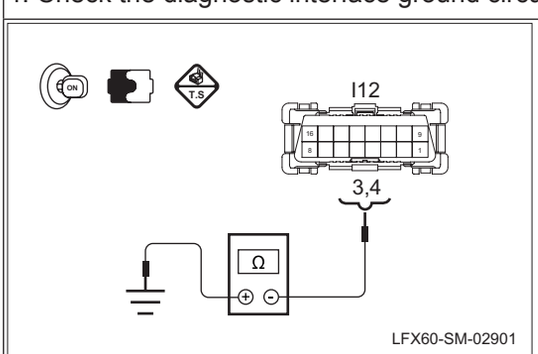
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Test condition	Details/results/measures
	A. Replace the BCM. Refer to:Replacement of BCM Is the system normal? →**Yes** Replace the BCM. →**No** To step 11.
11. Check ECM.	
	A. Replace ECM. **Refer to: Replacement of ECM** Confirm that the fault has been ruled out.

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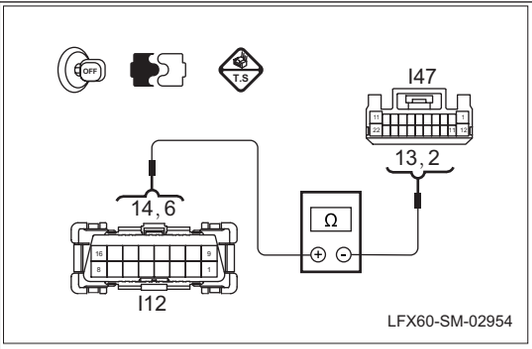
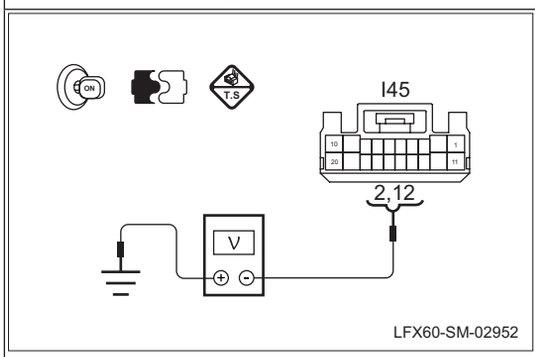
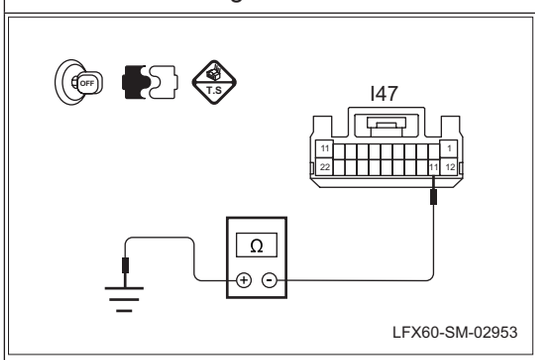
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Diagnostic process for the problem that the automobile diagnosis device is not able to communicate with IMMO

Test condition	Details/results/measures
1. Check BCM data.	
	A. Operate the ignition switch to turn the power to OFF and connect the diagnostic meter. B. Operate the ignition switch to turn the power to ON state. Turn on the diagnostic meter - use the latest software version. C. Read the BCM data on automobile diagnosis device. Can the diagnostic meter access to the engine system to read the data stream? →**Yes** There is intermittent fault and check the fault. →**No** To step 2.
2. Check other module data.	
	A. Read the airbag and ABS system data. Can the automobile diagnosis device enter the SRS, ABS and other systems to read the data stream? →**Yes** To step 5. →**No** To step 3.
3. Check the diagnostic interface power line.	
	A. Operate the ignition switch to turn the power to ON state. B. Measure the voltage between the terminal 8 and 16 of the diagnostic interface I12 and fixed ground point with the multimeter. **Standard value:11 ~ 14V** Is the voltage normal? →**No** Repair the diagnostic interface power line fault and replace the harness if necessary. →**Yes** To step 4.
4. Check the diagnostic interface ground circuit.	
	A. Operate the ignition switch to turn the power to OFF state. B. Use a multimeter to measure the resistance between terminals 3 and 4 of diagnostic interface I12 and the reliable ground point, respectively. **Standard value:Less than 5Ω** Is the resistance normal? →**Yes** To step 5. →**No** Repair the diagnostic interface ground circuit fault and replace the harness if necessary.

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Test condition	Details/results/measures
5. Check BCM communication line.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the BCM harness plug E01a. D. Use a multimeter to measure the resistance between terminals 13 and 2 of BCM harness plug I47 and terminals 14 and 6 of diagnostic interface I12, respectively. **Standard value:Less than 5Ω** Is the resistance normal? →**Yes** To step 6. →**No** Check the communication line between the BCM and the diagnostic interface, and replace the harness if necessary.
6. Check the BCM power line.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the BCM harness plug I45. D. Connect the battery negative terminal. E. Operate the ignition switch to turn the power to ON state. F. Measure the voltage between the BCM harness plug I45 terminal 12, 2 and fixed ground point with the multimeter. **Standard value:11 ~ 14V** Is the voltage normal? →**Yes** To step 7. →**No** Repair the BCM power line fault and replace the harness if necessary.
7. Check the BCM ground line.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. A. Disconnect the BCM harness plug I47. B. Use a multimeter to measure the resistance between terminal 11 of BCM harness plug I47 and the ground point. **Standard value:Less than 5Ω** Is the resistance normal? →**Yes** To step 8. →**No** Repair the BCM ground line fault and replace the harness if necessary.

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Test condition	Details/results/measures
8. Check the BCM.	
	A. Replace the BCM. **Refer to: Replacement of BCM** Confirm that the fault has been ruled out.

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Removal and installation

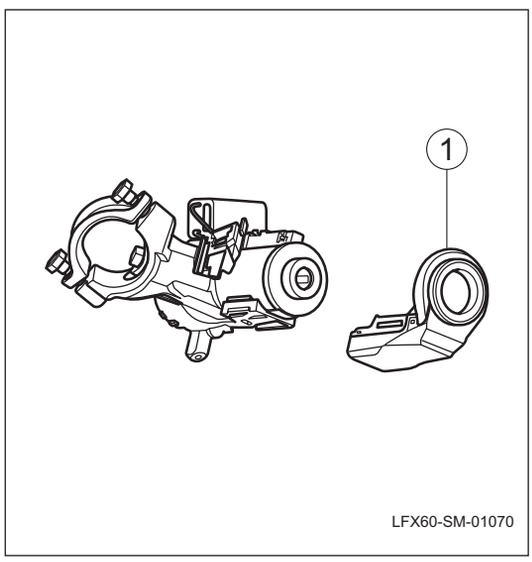
Replacement of security recognition coil

Removal

1. Remove the security recognition coil.

(a). Disconnect the battery negative connector.

(b). Remove the ignition switch components. **Reference: replacement of ignition switch components.**



(c). Use the appropriate tool to remove the security recognition coil.

Installation

1. Install the security recognition coil.

(a). The installation sequence is the reverse of the disassembly order.

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03- Transmission

Manual transmission assembly 3-725

Technical specifications 3-725

Precautions 3-727

Preparation 3-728

Structure and installation location 3-730

General Inspection 3-738

Operating Principle 3-740

Diagnostic Information and Procedures 3-743

Removal and Installation 3-752

Disassembly and installation 3-768

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Manual transmission assembly

Technical specifications

Technical specifications

Transmission model		L5MF25E1 (LD525MFA20)
Transmission type		5MT
Reduction ratio	1 gear	3.889
	2 gear	2.118
	3 gear	1.458
	4 gear	1.091
	5 gear	0.814
	R gear	3.6
	Final drive	4.0625
Gear oil capacity		2±0.1L

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Torque Specifications

Name	Torque range	
	Metric (Nm)	British (lb-ft)
Transmission drain plug	25	18
Transmission filler plug	25	18
Reverse-gear rocker bracket bolts	23	17
Connecting bolts between the transmission housing and clutch housing	23	17
Cable bracket fixing bolt	23	17
Output pressure plate nuts	26	19
Reverse-gear stop block locking bolts M8x32M8x32	20	15
Reverse-gear stop block locking bolts M8x38	20	15
Transmission housing end face bolts	20	15
Fork support bolt	20	15
Shift box bolt	20	15
Balancing weight tape reel nuts	26	19
Output shaft locking bolt	105	77
Fifth-gear shifting fork locating pin bolts	23	17
Fifth input gear reserve and shift guide block bolts	20	15
End cap bolt	10	7

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Precautions

Maintenance precautions

1. For maintenance work, it is necessary to use sealant or the equivalent. Apply the sealant to corresponding position on the surface of the transmission housing. If the housing is made of aluminum, the fastening bolts on the housing must be fastened to a specific torque with a torque wrench. In addition, it is very important to clean all the parts with the detergent or cleaning solution and dry air before reinstallation.
2. Compressed air tools can cause dust and other particles to fly out, resulting in damage to the eyes; so you should wear goggles in the use of compressed air.
3. Check and make sure that all parts are cleaned before assembling the transmission (except rubber parts and gaskets).
4. Replace all disposable parts (all kinds of oil seals, spring pins, O seals, etc.).
5. When sealing elements are installed, it is necessary to clean the residual sealant on the bonding surface.
6. To ensure that the sealing elements are oil-tight, the assembly should be completed within 3 minutes after the sealant is applied.
7. The removed rings, bearings, oil covers, etc. cannot be reused.
8. All bolts and nuts must be tightened in accordance with the specified tightening torque.
9. When installing the moving parts, apply some gear oil to these moving places, and then use some lubricating grease to the seal lips.
10. When the bearings are installed, do not use any rolling body to transfer the pressure. The oil seal can not be tilted during the installation process.
11. When the transmission is working normally, there shall be no leakage of lubricating oil.
12. Old clamping rings must be replaced with new ones, and the new clamping rings installed in place shall not be excessively open so as to avoid deformation.
13. The bolts and nuts used to fix the end caps, housings or brackets shall be loosened or tightened diagonally.

Third-level maintenance of transmission

First-level maintenance

1. In first-level maintenance, we should check the lubricant level which should be aligned to the lower edge of the filler port; add lubricant when the level is low, because too low level may cause poor lubrication and burn the bearings and gears, while too high oil level may cause overheating and oil spills.
2. In first -level maintenance, we should remove the ventilation valve for inspection and cleaning, because ventilation valve blockage will result in too high internal pressure and thus transmission fluid leakage.

Level II Maintenance

1. In the first second-level maintenance for a new car, replace the transmission lubricant and clean the transmission with kerosene.
2. After the first second-level maintenance, regularly check the quality of the lubricant.
3. In case the lubricant becomes diluted, thick, dirty and so on, it should be replaced.

Level III Maintenance

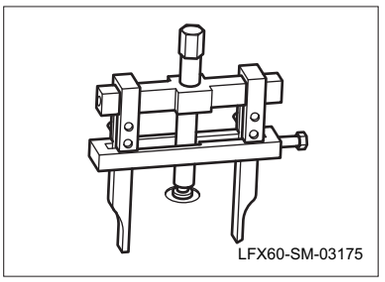
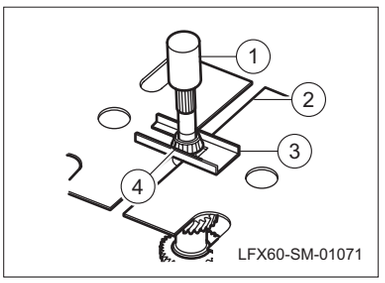
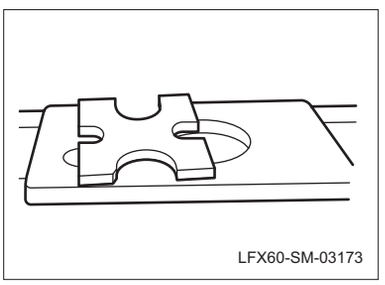
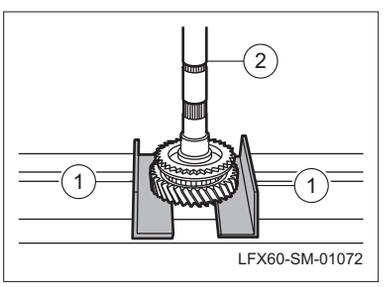
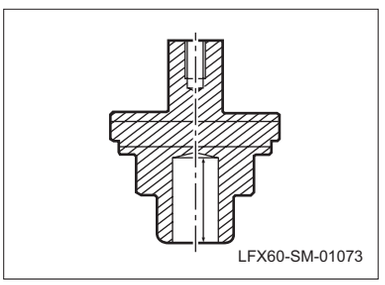
1. For third-level maintenance, we should conduct disassembling inspection, cleaning and replacement of oil.

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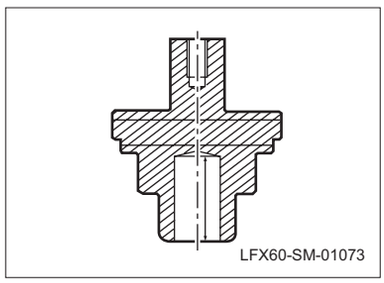
Preparation

Special maintenance tools

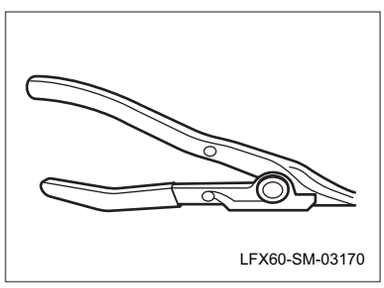
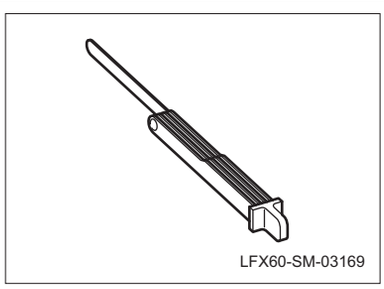
No.	Tool name	Tool figure	Tool code	Remarks
1	Puller	 LFX60-SM-03175	-	Used to pull out the input fifth gear hub and fifth output gear
2.	1. Installation of locating sleeve 2. Input shift disassembling tooling 1 3. Input shift disassembling tooling 2	 LFX60-SM-01071	-	Get the inner ring “4” from the front bearing of input shaft; and get the fourth input gear, the inner ring from the rear bearing of input shaft, and the fourth output gear gasket
3	Input shift disassembling tooling	 LFX60-SM-03173	-	Press the inner ring into the rear bearing of the input shaft; and press the fourth output gear shaft sleeve
4	1. Angle iron “1” 2. Installation of locating sleeve “2”	 LFX60-SM-01072	-	Press the first and second gear synchronizer hubs and corresponding gear sleeves, the gear output shaft of the first output gear, intermediate bearing, and bearing pressure plate
5	Transmission housing oil seal erecting tools	 LFX60-SM-01073	-	Used to erect transmission housing oil seals

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No.	Tool name	Tool figure	Tool code	Remarks
6	Clutch housing oil seal erecting tools	 LFX60-SM-01073	-	Used to erect clutch housing oil seals

General maintenance tools

No.	Tool name	Tool figure	Tool code	Remarks
1	Circlip pliers	 LFX60-SM-03170	-	Used to remove the clamp spring
2	Spacer gauge	 LFX60-SM-03169	-	To measure the gap

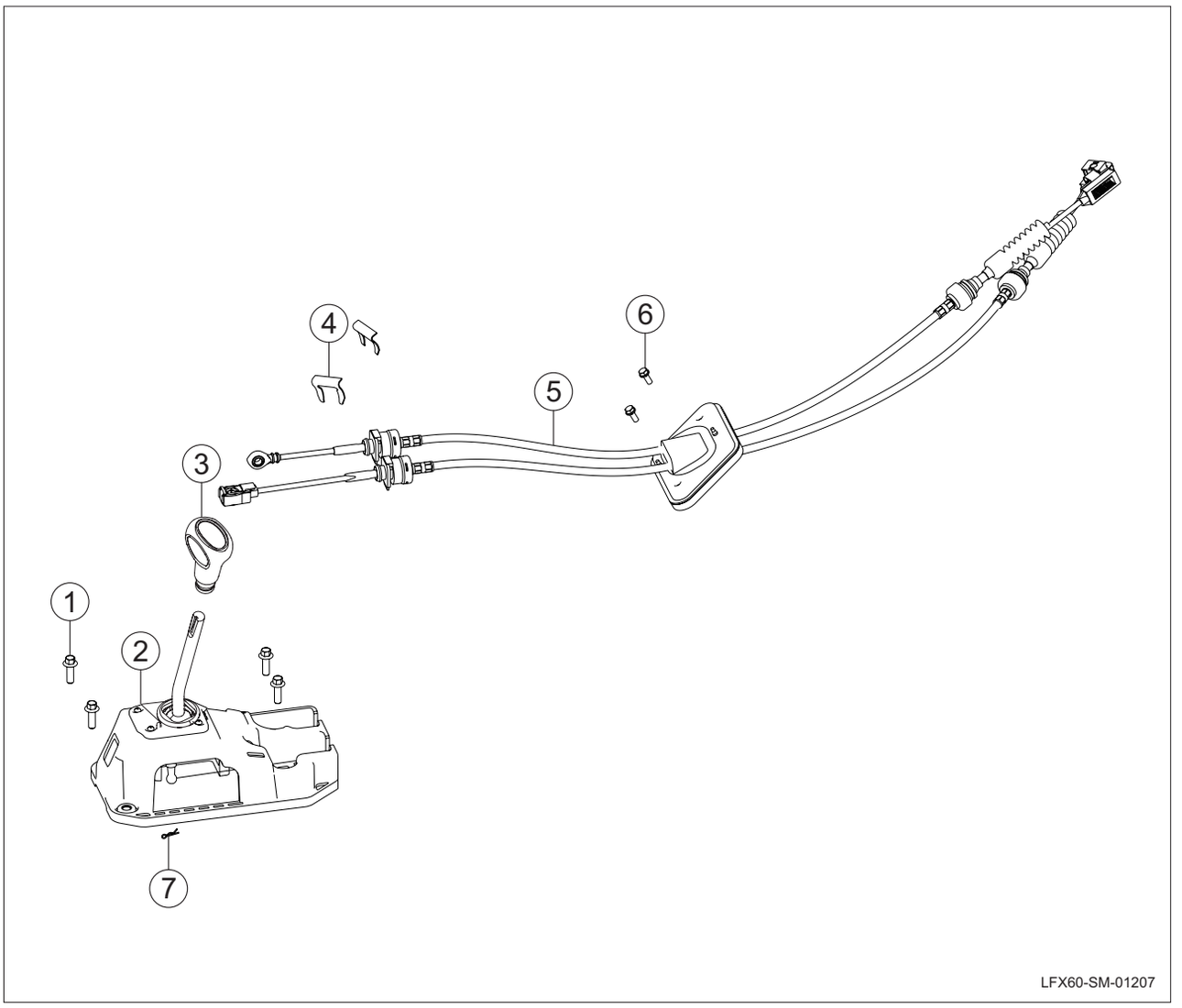
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Structure and installation location

Part exploded view

Gear shift control device



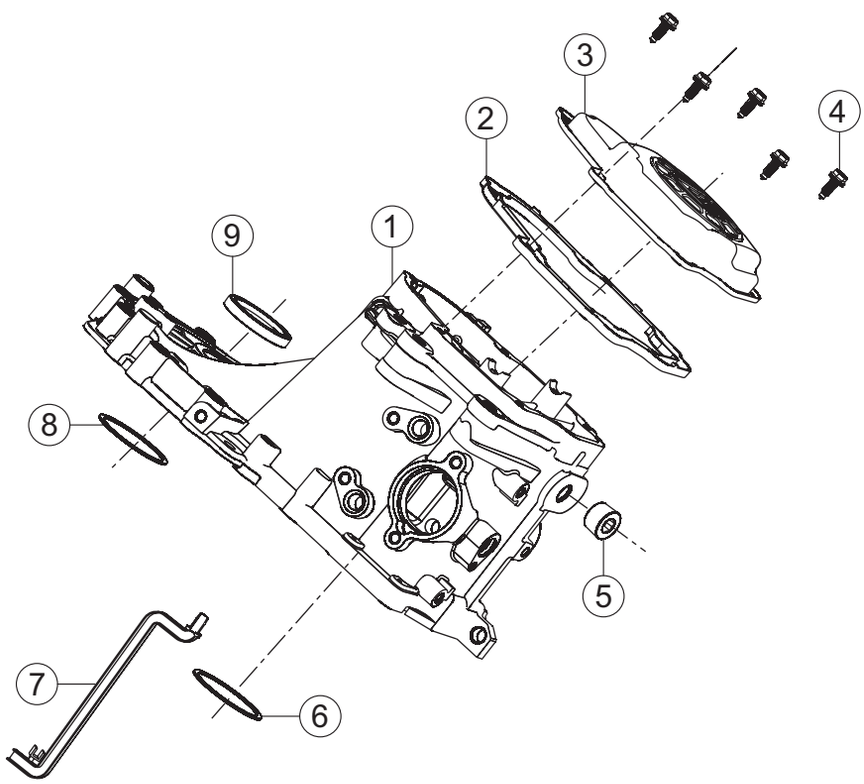
No.	Part name
1	Gear shift device fixing bolt
2	Gear shift device
3	Handle ball assembly
4	U-shaped clip

No.	Part name
5	Gear shift cable assembly
6	Gear shift cable fixing bolt
7	Lock pin

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Transmission housing



LFX60-SM-03400

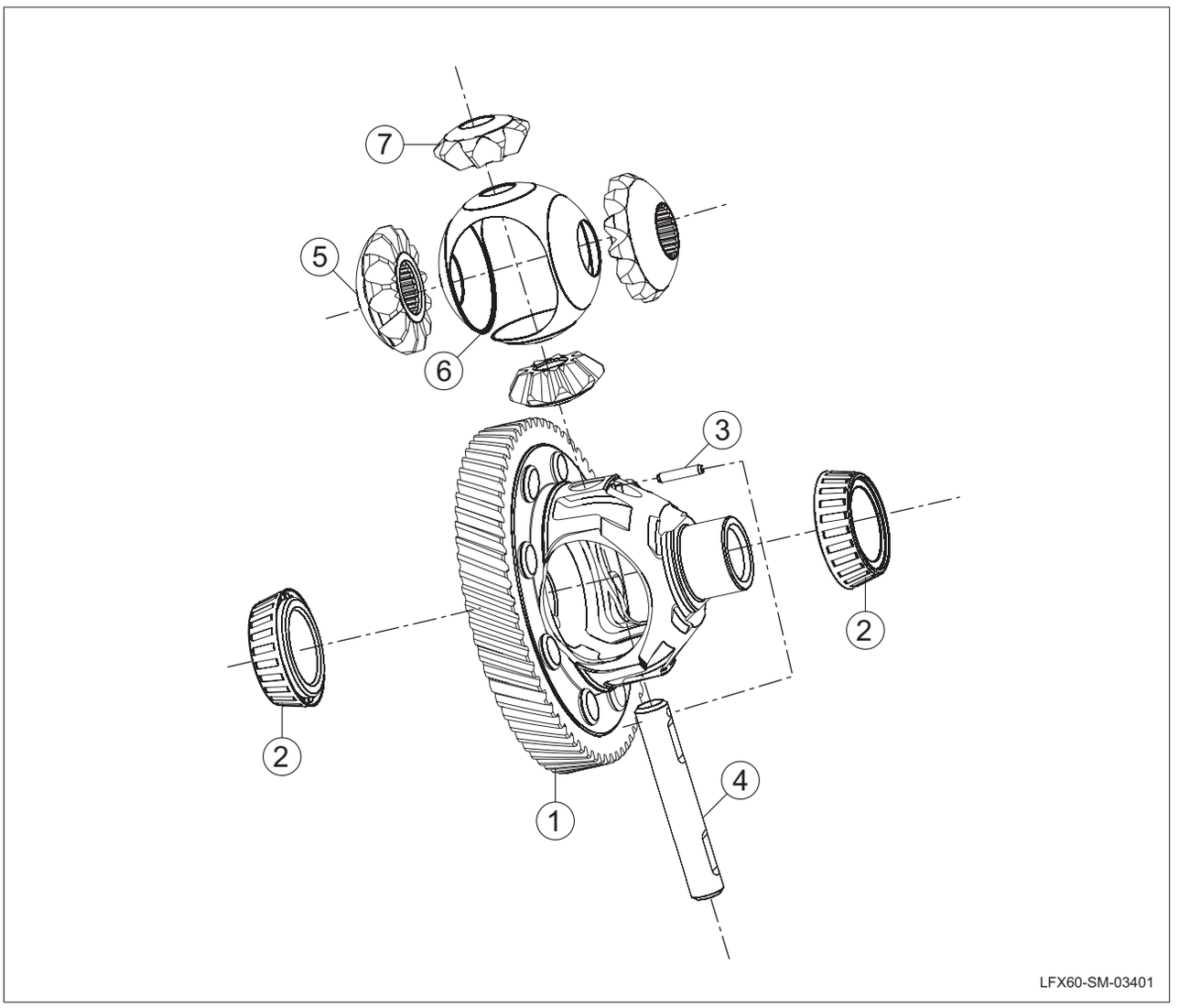
No.	Part name
1	Transmission housing
2	End cap sealing gasket
3	End cap
4	End cap bolt
5	Drain bolt

No.	Part name
6	Input shaft rear bearing adjusting gasket
7	Oil guide groove
8	Differential bearing adjusting gasket
9	Differential left oil seal

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Differential housing assembly



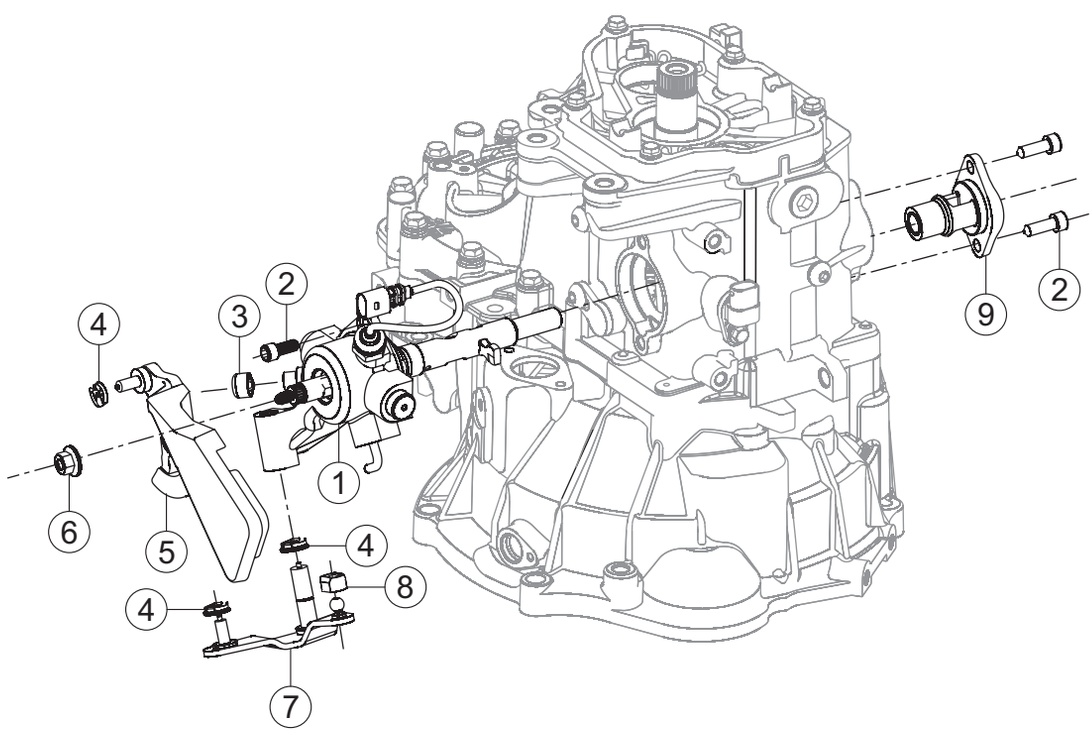
No.	Part name
1	Differential housing assembly
2	Differential bearing
3	Elastic cylindrical pin Φ5
4	Planetary gear shaft

No.	Part name
5	Half axle gear Φ5
6	Planetary half axle gear gasket
7	Planet gear

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Gear shift box



LFX60-SM-03402

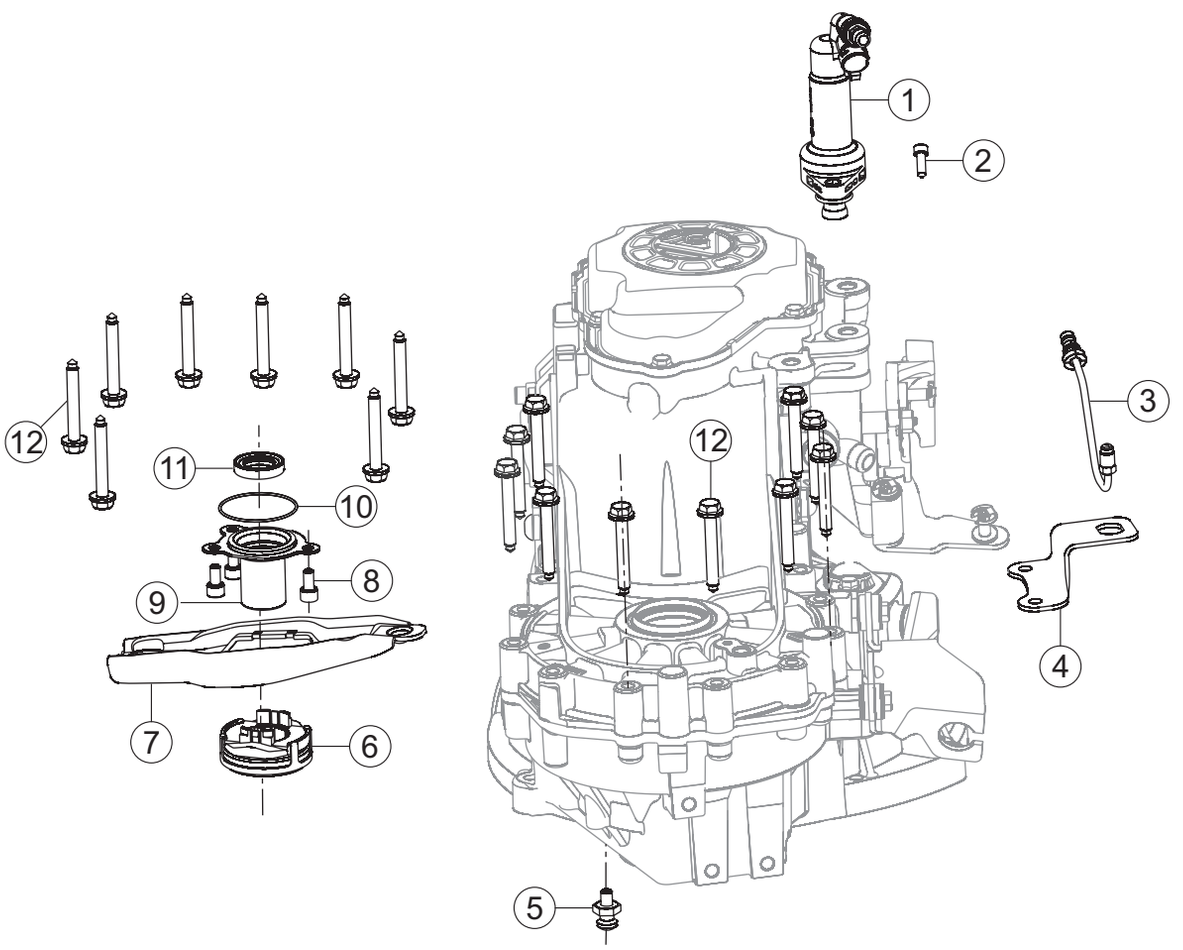
No.	Part name
1	Gear shift box assembly
2	Gear shift box bolts
3	Vent hole blocked
4	Transposition rocker clip
5	Gear shift rockers

No.	Part name
6	Gear shift rocker tape reel nuts
7	Gear shift rocker components
8	Gear shift rocker pin bush
9	Gear shift box rear base

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Appearance accessories



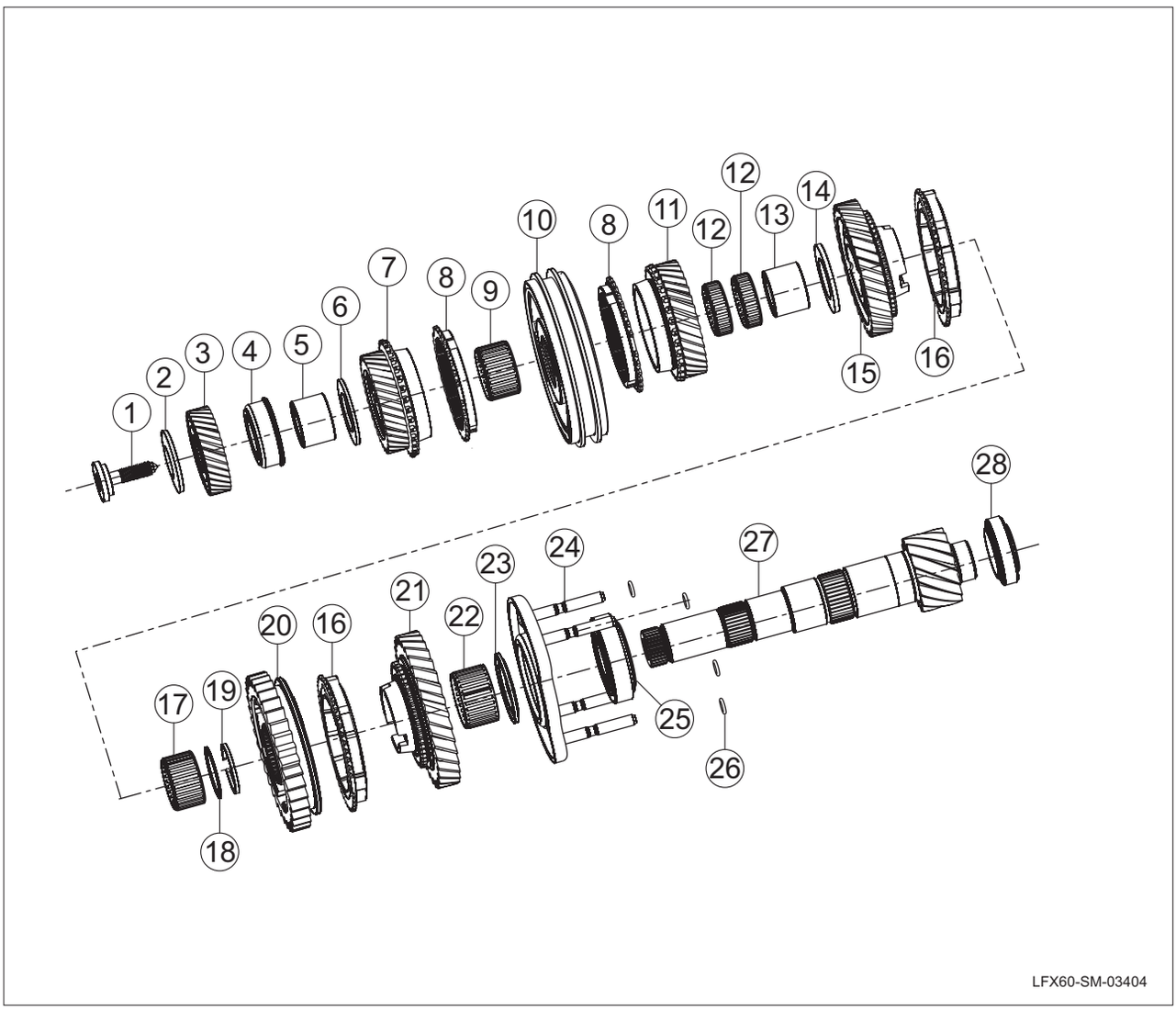
No.	Part name
1	Clutch slave cylinder
2	Clutch slave cylinder bolts
3	Slave cylinder pipe
4	Slave cylinder pipe bracket
5	Release fork support beam
6	Release bearing

No.	Part name
7	Flywheel
8	Input front bolts
9	Front end cap of input shaft
10	Input shaft cap oil seal
11	O-ring on front end cap of input shaft
12	Connecting bolt

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Output shaft



LFX60-SM-03404

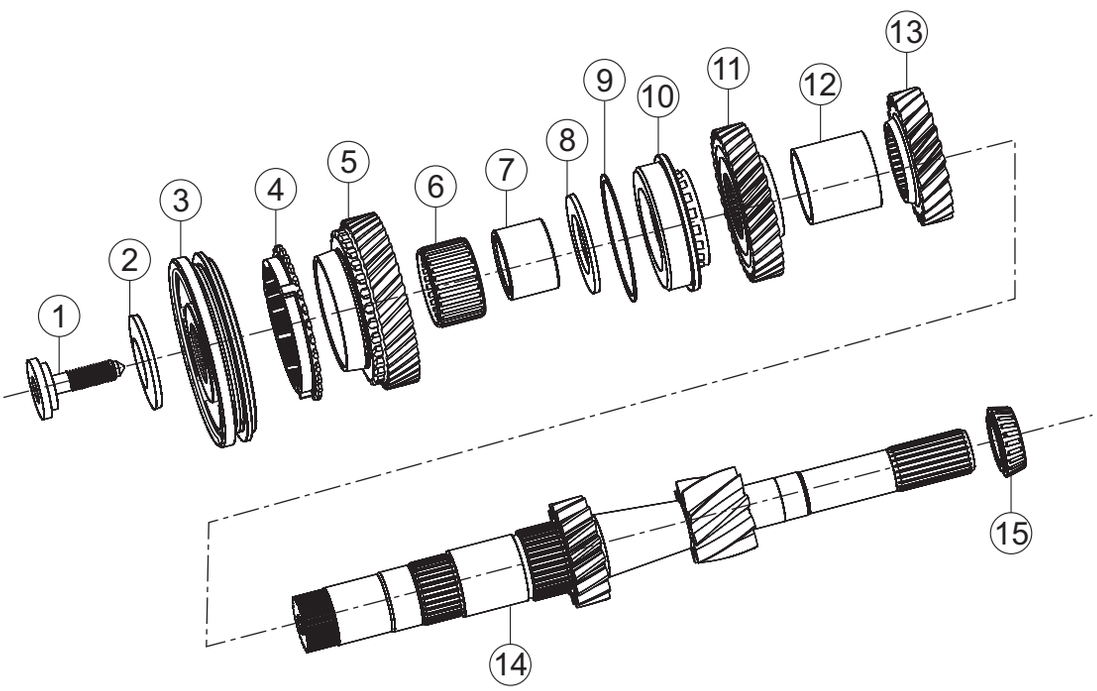
No.	Part name
1	Output shaft locking bolt
2	Locking bolt washer
3	Output shaft 5th gear
4	Output shaft rear bearing
5	Fourth-gear sleeve of output shaft
6	Fourth-gear gasket of output shaft
7	Fourth-gear assembly of output shaft
8	Third- and fourth-gear rings of output shaft
9	Needle bearing of the fourth output gear
10	Third and fourth output gear synchronizer assembly
11	Third -gear assembly of output shaft
12	Needle bearing of the third gear
13	Output shaft 3rd sleeve
14	Output shaft 2nd washer

No.	Part name
15	Output shaft 2nd gear assembly
16	Gear ring assembly of the first and second gears
17	Needle bearing of the second gear
18	Second gear gasket of output shaft
19	1st – 2nd gear synchronizer retainer
20	1st – 2nd gear synchronizer assembly
21	Output shaft 1st gear assembly
22	Output shaft 1st gear needle roller bearing
23	Output shaft 1st gear washer
24	Intermediate shaft pressure plate of output shaft
25	Output shaft intermediate bearing
26	O-ring of output shaft pressure plate
27	Output shaft
28	Front bearing of output shaft

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Input shaft



LFX60-SM-03405

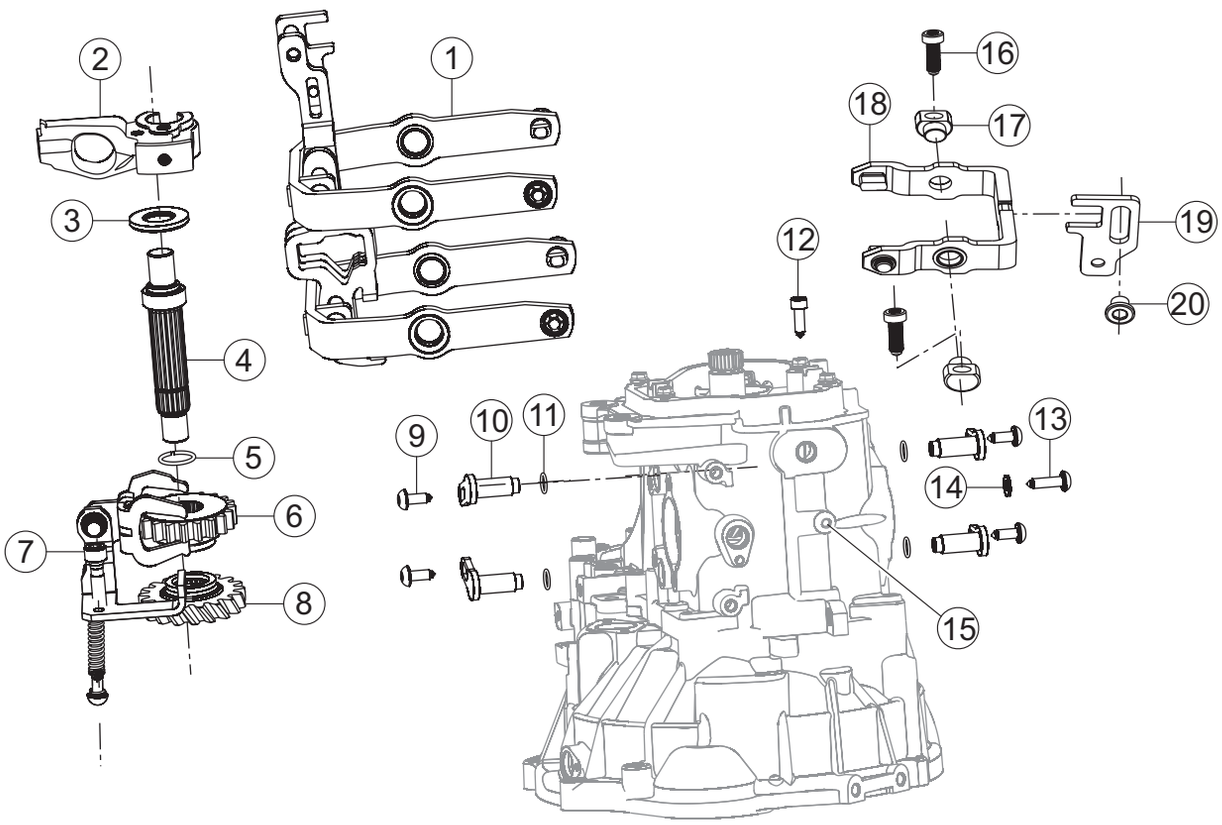
No.	Part name
1	Output shaft locking bolt
2	Locking bolt washer
3	Fifth gear synchronizer assembly
4	Fifth gear ring
5	Fifth gear assembly of input shaft
6	Needle bearing of the fourth gear
7	Input shaft 4th gear sleeve
8	Input shaft 4th gear washer

No.	Part name
9	Fourth gear adjusting gasket of input shaft
10	Rear bearing of input shaft
11	Fourth gear of input shaft
12	Third- and fourth- gear spacer bush of input shaft
13	Third gear of input shaft
14	Input shaft
15	Front bearing of input shaft

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Gear shift mechanism



LFX60-SM-03406

No.	Part name
1	Shifting fork assembly
2	Reverse gear stop block assembly
3	Reverse gear thrust bearing
4	Reverse gear shaft
5	Reverse gear shaft clamp spring
6	Reverse gear pinion
7	Reverse gear rocker bracket assembly
8	Constant mesh gear of reverse gear
9	Fork support bolt
10	Release fork support beam components

No.	Part name
11	R-ring of release fork support beam
12	Transmission housing endface bolt
13	Reverse-gear stop block locking bolt I
14	Bolt gasket of reverse gear shaft
15	Reverse-gear stop block locking bolt II
16	Shifting fork assembly bolts of the fifth gear
17	Shifting fork locating pin of the fifth gear
18	5^{th} gear shift fork
19	Reverse and shift guide block of the fifth input gear
20	Reverse and shift guide block bolts of the fifth input gear

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General Inspection

General Inspection

Visually check all parts for damage or excessive/uneven wear, and replace the damaged or worn parts that affect the normal performance.

Inspection Items:

- Burr: Locally raised edges on materials.
- Debris: Broken or fractured pieces or particles.
- Crack: Partially or completely separated surface crack from materials.
- Excessive wear: Exceptional wear or obvious wear beyond the normal degree.
- Distortion: Material slip caused by heavy pressure.
- Bonding: Soft metal particles are torn and adhered to hard metal surfaces.
- Grooves: Local crack or recess, usually the transfer of material rather than loss.
- Pitting: Metal surface stretch under contact pressure, where the heat generated by the metal friction causes color change.
- Stepped wear: Can see or feel the steps due to excessive wear between the adjacent contact surface and the non-contact surface.
- Uneven wear: Local unevenly distributed wear, including holes, bright spots, uneven polishing, and other visible signs.

Transmission inspection

1. Inspect the transmission housing for damage, cracks or other defects; if any, repair or replace the damaged parts.
2. Check the transmission for oil leakage; if there is oil leakage, repair leakage place.
3. Start the engine, step on the clutch, check the transmission the gears for smoothness, accuracy and abnormal sound; if problematic, solve the problem.

Transmission fluid inspection

1. Make sure the car is level and lift the car to check the oil level.
2. Check the transmission for leakage. If there is oil leakage, repair the problem in a timely manner.
3. Remove the transmission filler plug, and roughly check the oil level via the filler port. Remove the filler plug, if the transmission fluid spills from the port or you can see the transmission fluid has reached the port, then the oil level is normal. Otherwise, add transmission fluid up to the filler port.
4. Filling capacity: 2.0L.
5. Observe the quality of the transmission fluid, and replace it if it has deteriorated.

Shifting gears properly

1. The driver must drive the car properly, and start the car using the first gear. The engine should keep a relatively high speed in order to maintain sufficient power to avoid the shift impact due to lack of engine power. Use the appropriate gearshift timing and corresponding gear suitable for the current road conditions to avoid shift impact and sudden quick acceleration. It is strictly forbidden to downshift in non-emergency situations because forced downshift will exacerbate the early damage to the synchronizer and shift mechanism.
2. Choose the appropriate gearshift timing and do it in a normal manner. When shifting the gear, the clutch should be completely separated; do it softly instead of suddenly so as to synchronizer failure.
3. Don't start at a high speed so as to avoid gears collision.
4. While the car is traveling, do not always put the hand on the shift lever so as not to form premature wear on the shifting fork.
5. Reverse gear belongs to straight tooth slide type without reverse gear synchronizer, so you should first stop the car before using the reverse gear, or the reverse gear pair will collide with each other. Second, you must step on the clutch pedal for 1 ~ 2s before gently shifting the lever to avoid shift impact. Sometimes it's hard to move the lever to the reverse gear, and you can step on the clutch before doing it again.

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Full lubricating

1. Use the specified lubricants instead of low-quality lubricants, and different grades of lubricants can not be mixed.
2. Transmission gets lubricated by splash lubrication method. Add lubricant as required. That is: After the car is parked on the road, add lubricant to the filler port.

Internal cleaning

Note

Check the magnet for metal chipping before cleaning. The large and granular or irregular particles indicate there is cracking or similar damage; the small and dusty chipping indicates there is uneven or excessive wear. In case the metal chipping is found, ensure to carefully check the revolving parts and the matching parts for damage and wear.

1. Wash the parts in cleaning agent to remove the residual lubricants and deposits. Remove the deposits from holes with a brush. The parts that cannot be cleaned with a brush should be cleaned carefully, and don't scratch their metal bonding surfaces.
2. Dry the parts with low-pressure (max. 20psi) of compressed air. Don't wipe with a cloth because fiber may be left.

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Operating Principle

System Overview

The transmission provides five forward gears and one reverse gear through 3 synchronizers and an axis-input shaft, an intermediate shaft and a reverse gear shaft. All gears are constant mesh gears, yet the reverse gear is a combination of a constant mesh and a sliding gear. The first and second gears' synchronizer is mounted on the output shaft and interlocked with the first or second gear of the output shaft; the third and fourth gears' synchronizer is also mounted on the output shaft and interlocked with the third or fourth gear of the output shaft. The fifth gear synchronizer on the input shaft is meshed with the fifth gear mounted on the input shaft. The output shaft drives the main reduction gear and the differential device to force the front wheel driving shaft. For maintenance work, it is necessary to use sealant or the equivalent. Apply the sealant to corresponding position on the surface of the transmission housing. If the housing is made of aluminum, the fastening bolts on the housing must be fastened to a specific torque with a torque wrench. In addition, it is very important to clean all the parts with the detergent or cleaning solution and dry air before reinstallation.

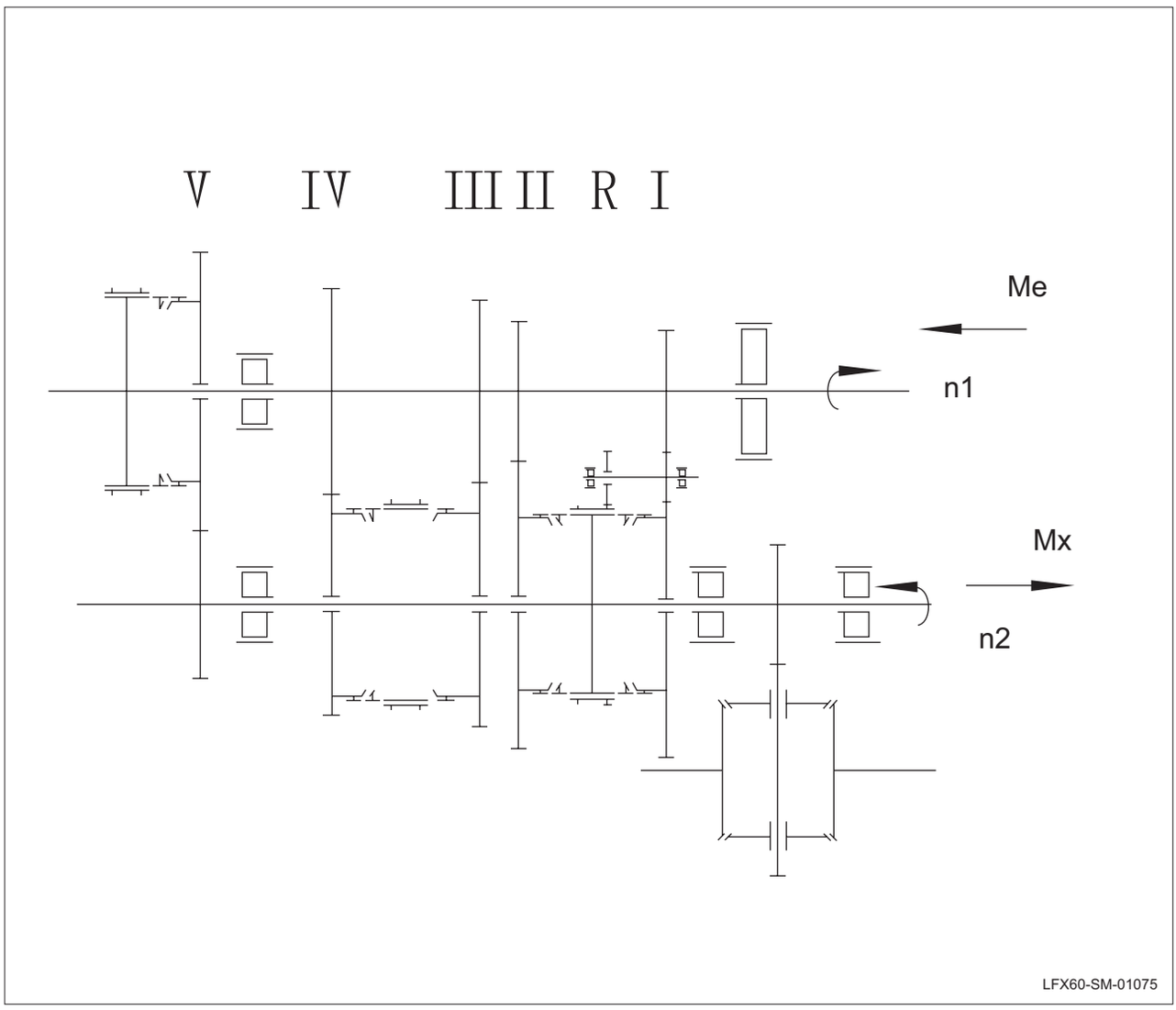
Gear shift mechanism

- The movement of gear shift lever drives the transmission shaft and the shift shaft via the transmission control shaft, then driving the transmission, shift lever, and fork via the transmission arm and yoke. The shift mechanism contains shift box assembly, rear end cover of shift box, shift shaft, shift positioning seat, reverse gear switch, shift rocker assembly, transposition rocker assembly, transposition rocker clip, transposition pin bushes 1 and 2, and balancing weight tape reel nuts; the internal shift mechanism contains reverse-gear rocker bracket assembly, shifting fork assembly, fifth-gear shifting fork, fifth reverse gear shifting fork guide block and bolts.
- In the shift mechanism, when shift rocker assembly and transposition rocker assembly change their positions, the shift pendulum in shift shaft assembly drives the shifting fork to realize the conversion between "R", "N" and "gears 1~5".
- Except the third and fourth gears that can be shifted directly, you have to push the lever to "N" first for the other gears.
- If we need to push the lever to "R", we've to release the lock of the entire lever retainer; if not, we cannot shift to "R".

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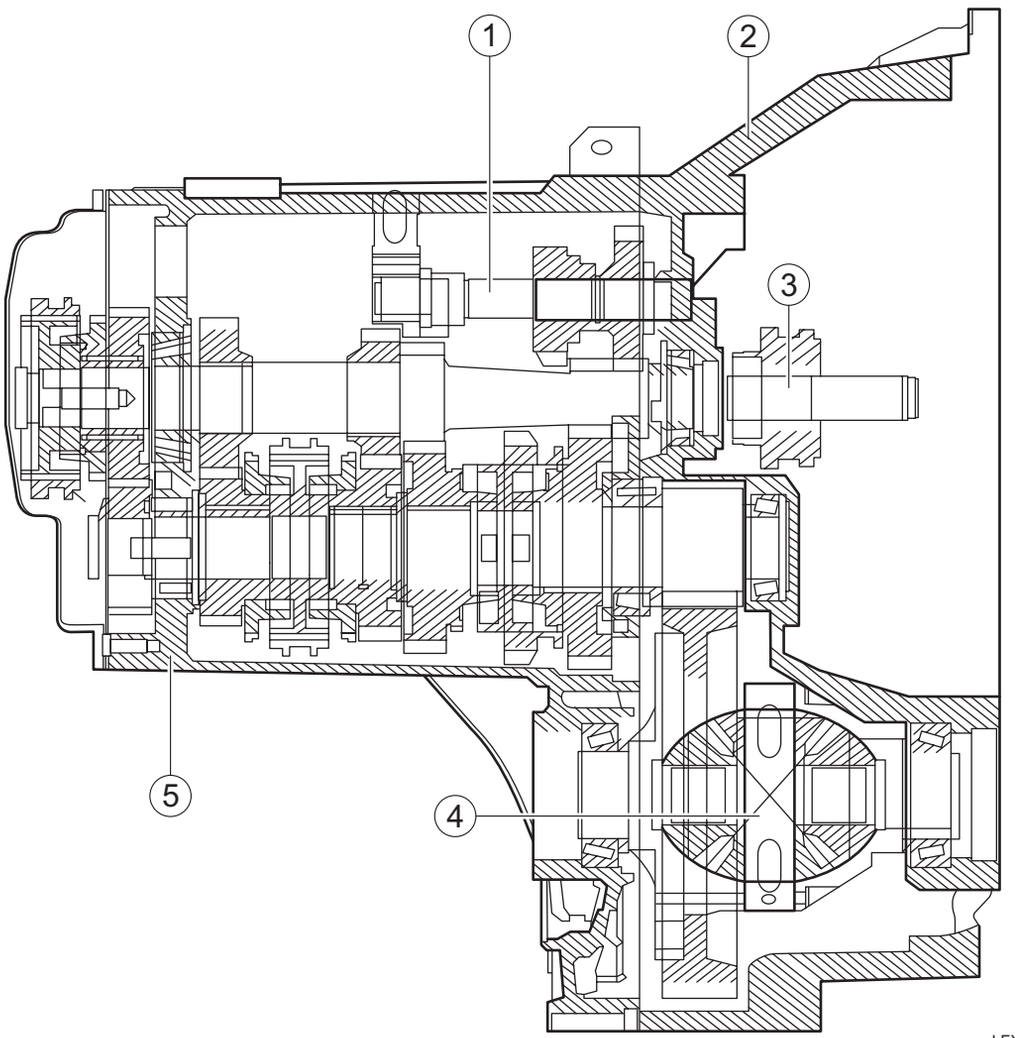
Variable-speed power transmission line



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Structure diagram of transmission



No.	Part name
1	Reverse gear shaft
2	Clutch housing
3	Input shaft

No.	Part name
4	Differential
5	Transmission housing

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Diagnostic Information and Procedures

Diagnosis Instructions

Before starting to diagnose a fault in the manual transmission, familiarize yourself with the operating principle of the transmission, and then start the transmission diagnostics, which helps to determine the correct troubleshooting steps in the event of a failure. More importantly, this also helps to determine whether the customer's situation belongs to normal operation.

Any troubleshooting of the manual transmission should begin with the transmission check, so as to instruct the service personnel to take the next logical step to troubleshoot. Comprehend and correctly use the diagnostic flow chart to shorten the diagnosis time and avoid the misjudgement.

General equipment

Spacer gauge
Circlip pliers

Visual Inspection

1. Confirm the problem of the customer.
2. Visually check whether there is any obvious mechanical or electrical damage sign.

Visual inspection table

Mechanical	Electrical
• Transmission fluid seal • Transmission housing • Transmission fasteners • Transmission shift lever • Transmission shift mechanism	• Gear switch • Reverse lamp switch • Fuse • Wiring harness • Electrical connector

3. If the observed or proposed problem is obvious and its cause is identified, rectify the cause before proceeding with next step.
4. If for the problem, there are no obvious findings, then confirm the fault and refer to the symptom table.

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List of fault symptoms

Symptom	Possible point of failure	Recommended Measures
Transmission leakage	• The transmission oil is excessive, and the oil level is too high	• Check and restore the oil level
	• Drain plug is loose	• Tighten the drain plug
	• Transmission fluid seal damaged	• Check and replace the transmission fluid
	• Transmission housing damaged	• Replace the transmission housing **Refer to: Disassembly and assembly of transmission**
	• Sealing gasket damaged	• Check and replace the transmission sealing gasket
	• Air vent blocked	• Clean and dredge the air vent
Transmission noise or abnormal sound	• Transmission fasteners get loose	• Tighten the transmission fasteners
	• Transmission suspension parts are abnormal	• Check and replace the abnormal transmission suspension parts
	• Transmission fluid shortage	• Add transmission fluid to the specific level
	• Transmission fluid gets dirty	• Replace the transmission oil **Refer to: Steps to drain and add transmission fluid**
	• Transmission bearing wear	• Check and replace the transmission bearing **Refer to: Disassembly and assembly of transmission**
	• Gears are severely worn or broken	• Check and replace the damaged gear **Refer to: Disassembly and assembly of transmission**
	• Gear surface bump or pitting	• Check and replace the damaged gear **Refer to: Disassembly and assembly of transmission**
	• Internal damage of clutch	• Check the clutch plate and pressure plate; replace the damaged parts **Refer to: Diagnostic process for transmission noise or abnormal sound**

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Symptom	Possible point of failure	Recommended Measures
Difficulty in gear shift	• Clutch brake fluid is want	• Check and add brake fluid
	• Clutch system air influx	• Clutch system air discharge **Refer to: Refer to: Clutch bleed procedures**
	• Clutch master cylinder fault	• Check and replace the clutch master cylinder **Refer to: Replacement of clutch master cylinder**
	• Clutch slave cylinder fault	• Check and replace the clutch slave cylinder **Refer to: Replacement of clutch wheel cylinder**
	• The clutch is not properly adjusted and the separation is not complete	• Check and adjust the clutch
	• Synchronizer gear ring damaged	• Check and replace the damaged components **Refer to: Disassembly and assembly of transmission**
	• Shift mechanism improperly adjusted	• Adjust the shift mechanism **Refer to: Diagnosis process for gear shift problem**
Shift mechanism is difficult to act	• External shift mechanism deformed	• Check and replace the damaged components
	• Shift level damaged	• Check and replace the shift lever **Refer to: Replacement of shift lever**
Transmission out of gear	• Fork shaft severely worn or deformed	• Check and replace the fork shaft
	• Shifting fork severely worn or deformed	• Check and replace the shifting fork **Refer to: Disassembly and assembly of transmission**
	• Gear axial clearance excessive, and gear gasket severely worn	• Check and adjust the gear axial clearance
	• Fork support beam or bearing worn or deformed	• Check and replace the worn or damaged parts
	• Synchronizer hub, gear sleeve or ring worn	• Check and replace the synchronizer **Refer to: Disassembly and assembly of transmission**
	• Shift mechanism worn or damaged	• Check and replace the shift mechanism
	• Fork shaft positioning ball and spring worn or damaged	• Check and replace the damaged components **Refer to: Diagnostic process for transmission out of gear**

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Diagnostic process for transmission noise or abnormal sound

ⓘ Note

In order to avoid personal injury caused by control errors, the road test should be carried out by two people for driving safety.

Test condition	Details/results/measures
1. General inspection.	
	A. Check if the engine and transmission support are broken, missing or damaged. B. Check if the transmission is interfering with the exhaust pipe and body. Is it OK after checking? →**Yes** To step 2. →**No** Repair the fault position.
2. Check the transmission fluid.	
	A. Check if the transmission fluid level is normal. B. Check if the transmission is dirty. Is it OK after checking? →**Yes** To step 3. →**No** Restore or replace the transmission fluid. **Refer to: Steps to drain and add transmission fluid**
3. Check the noise at the beginning of the clutch separation.	
	A. Start the engine, and gently step on but don't floor the accelerator pedal. Is there any noise? →**Yes** Clutch release bearing noise; replace the clutch release bearing. **Refer to: Replacement of clutch release bearing** →**No** To step 4.
4. Check the noise when the clutch is engaged.	
	A. Remove the transmission. Refer to: Replacement of transmission assembly B. Check the clutch plate and clutch pressure plate. Is it OK after checking? →**Yes** To step 5. →**No** Replace the clutch assembly. **Refer to: Replacement of clutch assembly**

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Test condition	Details/results/measures
5. Check the noise when the lever is geared and stays at "N".	
	A. Start the engine for road test, and check the noise when the lever is geared and stays at "N". Make sure if the transmission is noisy. →**Yes** Repair the transmission. **Refer to:Disassembly and assembly of transmission** →**No** To step 6.
6. Check the noise of other systems.	
	A. Check the noise of other systems. Confirm that the fault has been ruled out.

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Diagnosis process for gear shift problem

Test condition	Details/results/measures
1. General inspection.	
	A. Check the engine and transmission suspension for loosening, damage and other abnormalities. Is it OK after checking? →**Yes** To step 2. →**No** Fasten or replace the suspension device.
2. Check the clutch system.	
	A. Check if the clutch is completely separated and reliably combined. **Refer to: Clutch drag diagnosis** Is it OK after checking? →**Yes** To step 3. →**No** Repair or replace the damaged components.
3. Check the gear lever.	
	A. Check if the shift lever is worn, deformed, and the fasteners are loose. Is it OK after checking? →**Yes** To step 4. →**No** Repair or replace the damaged components.
4. Check the shift mechanism.	
	A. Check if the shift mechanism is worn, deformed, and the fasteners are loose. Is it OK after checking? →**Yes** To step 5. →**No** Repair or replace the damaged components.

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Test condition	Details/results/measures
5. Check the shift fork, fork shaft, synchronizer and gears self-lock/inter-locking devices the transmission.	
	A. Remove the transmission. **Refer to: Replacement of transmission assembly** B. Disassemble the transmission. **Refer to:Disassembly and assembly of transmission** C. Check if the transmission shift fork / fork shaft is damaged or deformed. D. Check if the transmission shift synchronizer is damaged. E. Check if the transmission self-lock / inter-locking devices are damaged. Is it OK after checking? →**Yes** Confirm that the fault has been ruled out. →**No** Repair or replace the damaged components.

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Diagnostic process for transmission out of gear

Test condition	Details/results/measures
1. Check the gear lever.	
	A. Check that the shift lever is installed properly. B. Check if the shift lever and shift cable positioning components are normal. Is it OK after checking? →**Yes** To step 2. →**No** Repair the fault position.
2. Check the transmission shift mechanism.	
	A. Check that the shift transmission is installed properly. Is it OK after checking? →**Yes** To step 3. →**No** Repair the fault position.
3. Check the transmission's gear self-lock and interlocking devices.	
	A. Remove the transmission. **Refer to: Replacement of transmission assembly** B. Disassemble the transmission. **Refer to:Disassembly and assembly of transmission** C. Check if the transmission's self-lock and interlocking devices are well located. Is it OK after checking? →**Yes** To step 4. →**No** Repair the fault position.
4. Check the transmission synchronizer.	
	A. Check if the synchronizer gear sleeve or the bonding surface is seriously worn. Is it OK after checking? →**Yes** To step 5. →**No** Repair or replace the damaged components.

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Test condition	Details/results/measures
5. Check the transmission fork and fork shaft.	
	A. Check if the transmission fork / fork shaft is deformed. Is it OK after checking? →**Yes** To step 6. →**No** Repair or replace the damaged components.
6. Check the gear's axial clearance and shaft runout.	
	A. Check if the gear's axial clearance and shaft runout are too obvious. Is it OK after checking? →**Yes** Reassemble. →**No** Repair or replace the damaged components.

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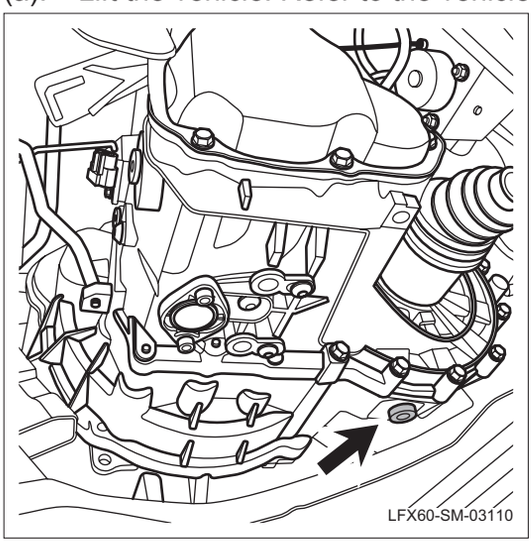
Removal and Installation

Transmission oil draining and filling procedures

Drain

1. Drain the transmission oil.

(a). Lift the vehicle. Refer to the vehicle lift and support

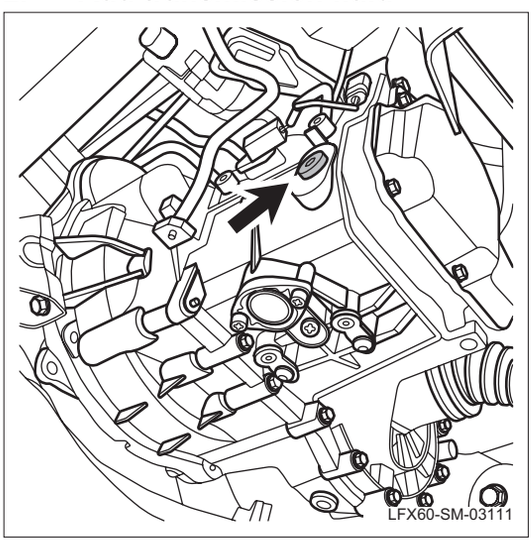


(b). Place the recovery container and remove the transmission oil drain screw plug.

Note:

During the installation, replace the new sealing gasket.

2. Add transmission fluid



(a). Remove the filing bolts.

(b). Insert the injector's filler pipe into the transmission port, add transmission fluid, and restore the plug.

Note

During the installation, replace the new sealing gasket.

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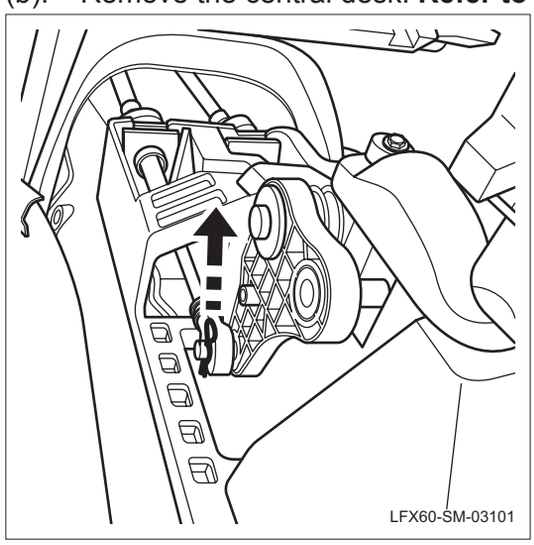
Replacement of shift mechanism

Removal

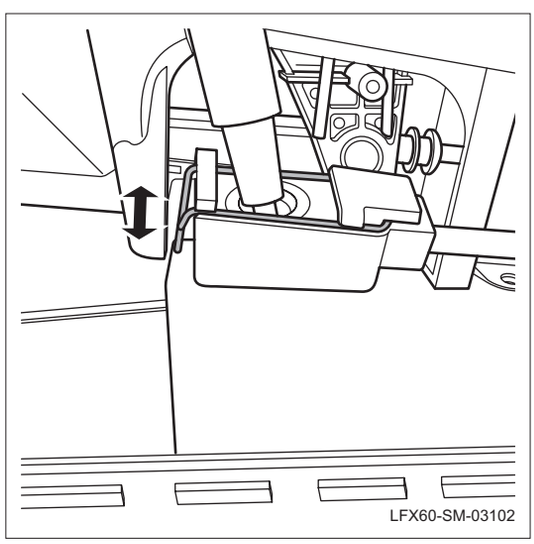
1. Remove the shift mechanism.

(a). Disconnect the battery negative connector.

(b). Remove the central desk. **Refer to the replacement of central desk assembly.**



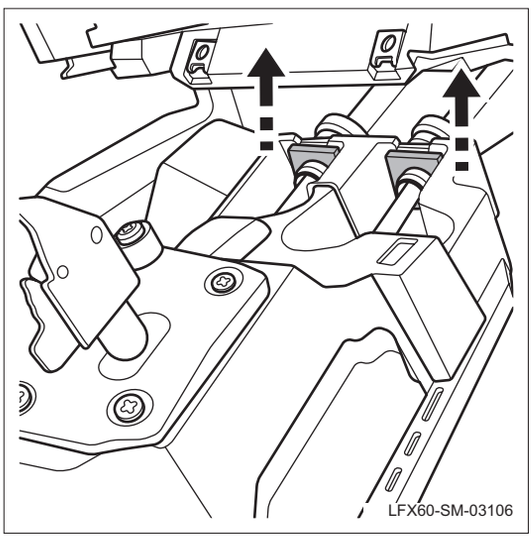
(c). Remove the left shift cable ball clamp, and remove the shift cable ball.



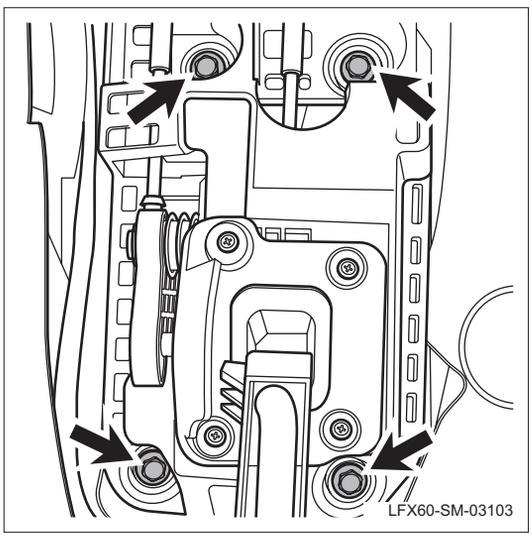
(d). Remove the right shift cable ball clamp, and remove the shift cable ball.

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(e). Remove the gear cable fixing device.



(f). Remove the fixing bolts from the shift mechanism.

(g). Remove the shift mechanism.

Installation

1. Install the shift mechanism.

(a) . The installation sequence is the reverse of the disassembly order.

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Replacement of shift and selector cable assembly

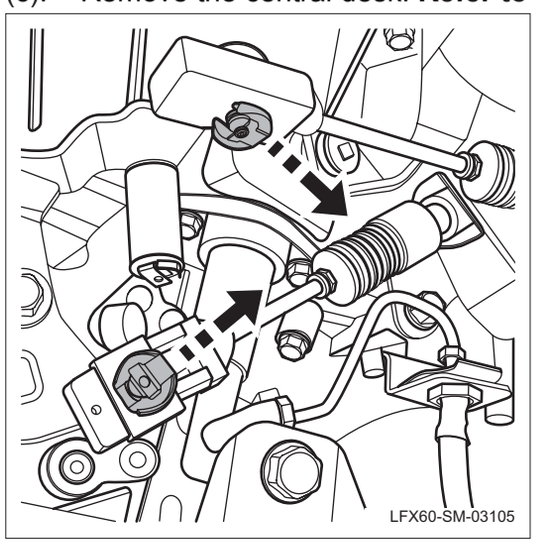
Removal

1. Remove the shift and selector cable assembly.

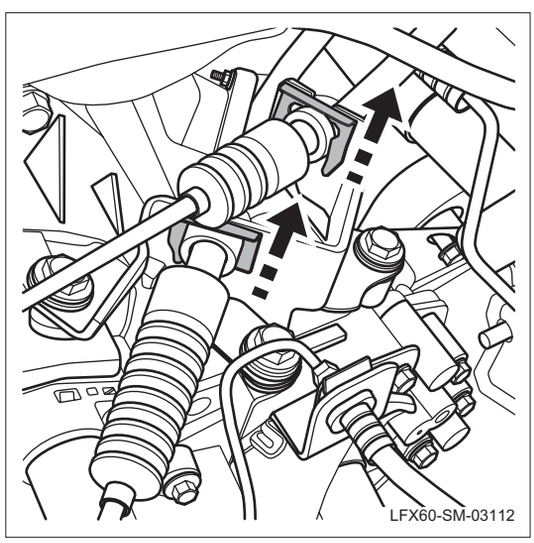
(a). Disconnect the battery negative connector.

(b). Remove the air filter assembly. **Refer to the replacement of air filter assembly.**

(c). Remove the central desk. **Refer to the replacement of central desk assembly.**



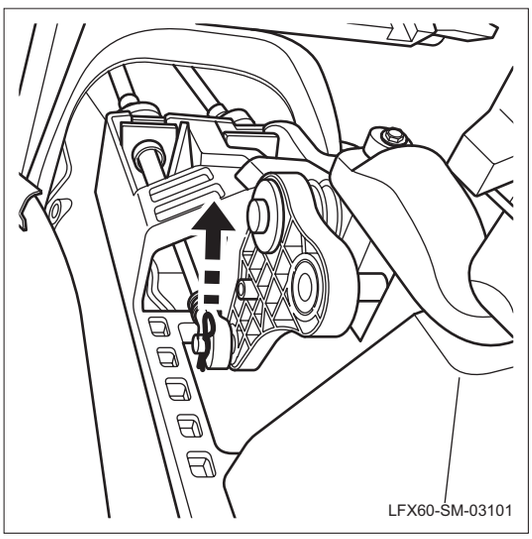
(d). Remove the clamps from the shift and selector cable.



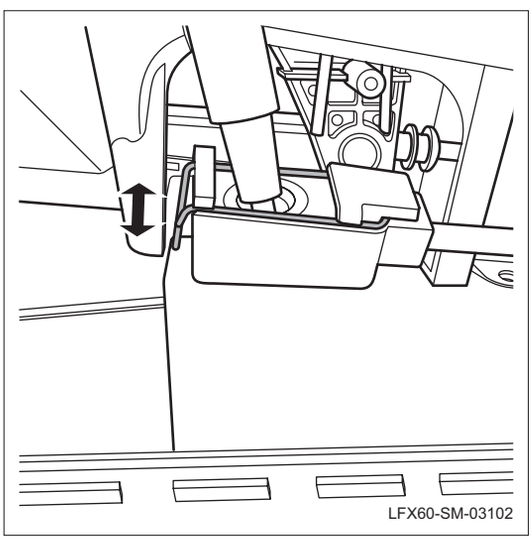
(e). Remove the fixing device from the shift and selector cable.

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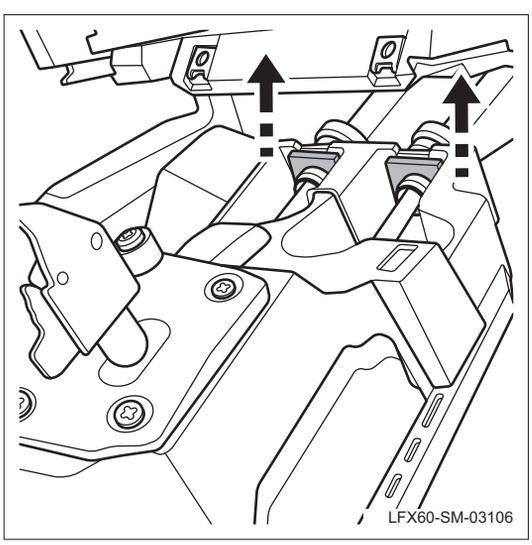
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(f). Remove the left shift cable ball clamp, and remove the shift cable ball.



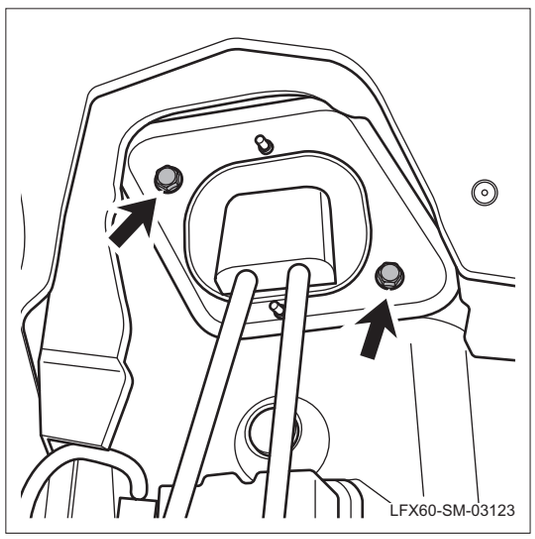
(g). Remove the left selector cable ball clamp, and remove the selector cable ball.



(h). Remove the gear cable fixing device.

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(i). Remove the fixing bolts from the shift and selector cable.

(j). Remove the shift and selector the cable assembly.

Installation

1. Install the shift and selector cable assembly.

(a). The installation sequence is the reverse of the disassembly order.

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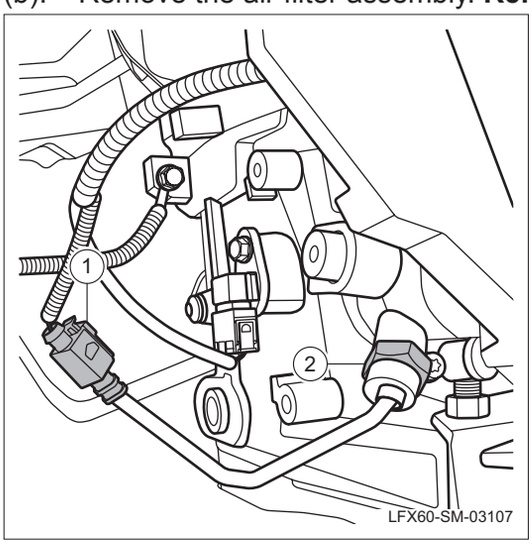
Replacement of reversing light switch assembly

Removal

1. Remove the reversing light switch assembly.

(a). Disconnect the battery negative connector.

(b). Remove the air filter assembly. **Refer to the replacement of air filter assembly.**



(c). Disconnect the harness plug 1 from the reversing light switch assembly.

(d). Remove the fixing bolt 2 from the reversing switch.

(e). Remove the reversing switch assembly.

Installation

1. The installation sequence is reverse to the removal sequence.

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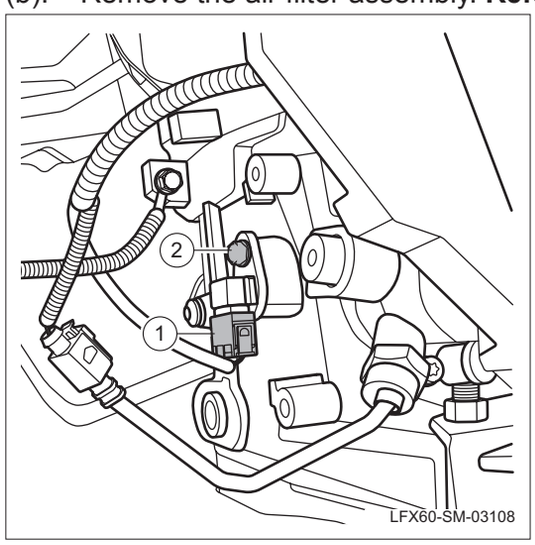
Replacement of neutral position switch

Removal

1. Remove the neutral position switch.

(a). Disconnect the battery negative connector.

(b). Remove the air filter assembly. **Refer to the replacement of air filter assembly.**



(c). Disconnect the harness plug 1 from the neutral position switch.

(d). Remove the fixing bolt 2 from the neutral position switch.

(e). Remove the neutral position switch assembly.

Installation

1. Install the neutral position switch.

(a). The installation sequence is the reverse of the disassembly order.

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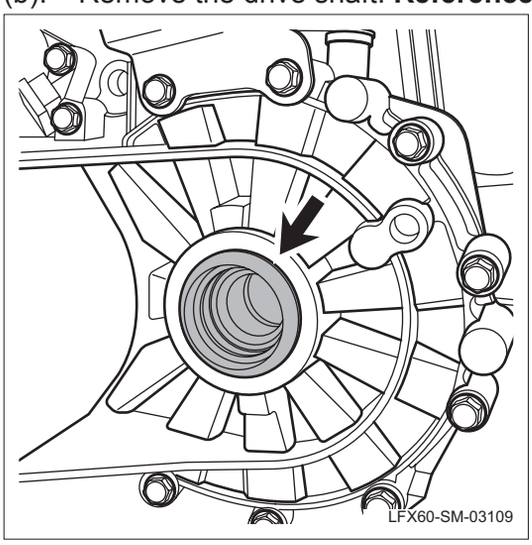
Replacement of drive shaft seal

Removal

1. Remove the drive shaft seal.

(a). Discharge the transmission fluid. **Reference: Steps to drain and add transmission fluid.**

(b). Remove the drive shaft. **Reference: Replacement of drive shaft.**



(c). Use appropriate tools to remove the drive shaft from the transmission.

Installation

1. Remove the drive shaft seal.

(a). The installation sequence is the reverse of the disassembly order.

❶ Note

When installing the oil seal, apply an appropriate amount to the oil seal.

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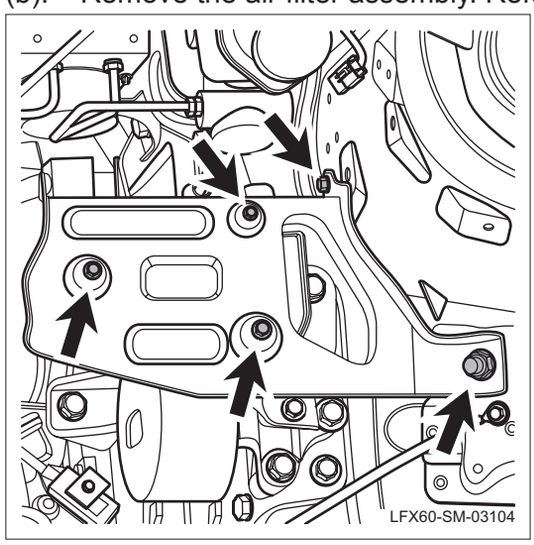
Replacement of drive shaft seal

Removal

1. Remove the transmission assembly.

(a). Disconnect the battery negative connector.

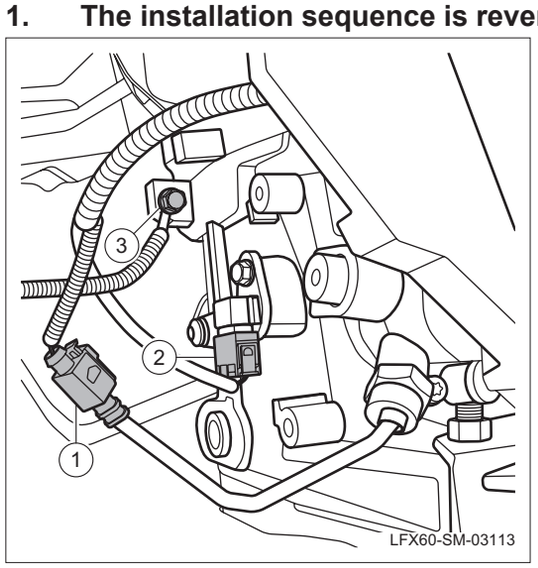
(b). Remove the air filter assembly. Reference: Replacement of air filter assembly.



(c). Remove the bolts and nuts from the fuse box holder.

Installation

1. The installation sequence is reverse to the removal sequence.



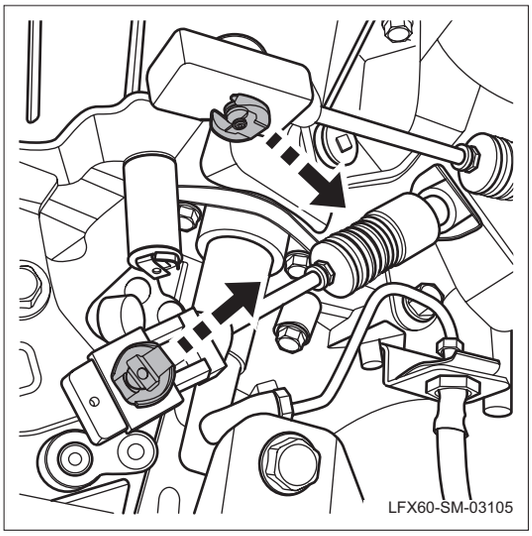
(d). Disconnect the harness plug 1 from the reversing light switch assembly.

(e). Disconnect the harness plug 2 from the neutral position switch.

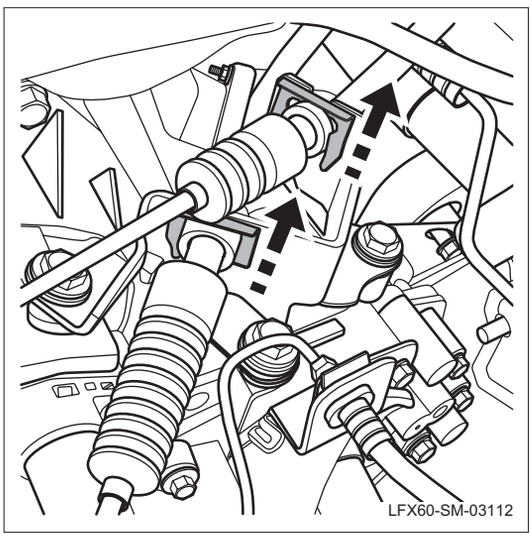
(f). Remove the fixing bolt 3 from the transmission grounding cable.

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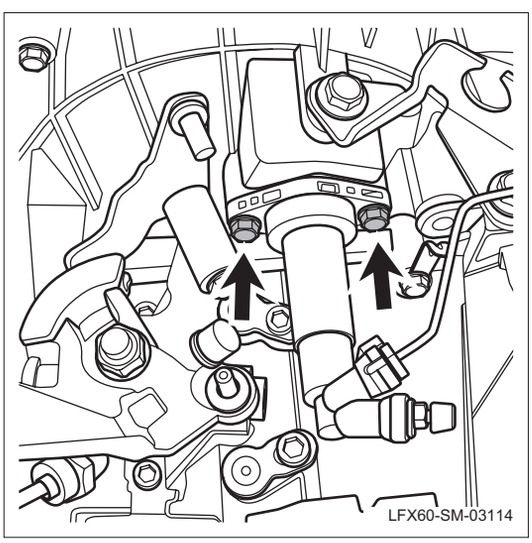
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(g). Remove the clamps from the shift and selector cable.



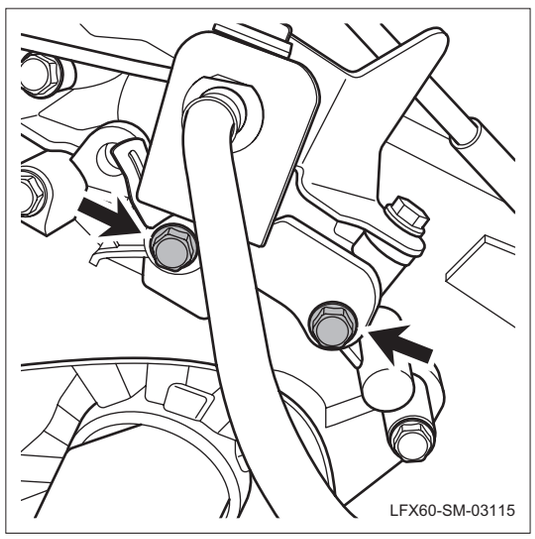
(h). Remove the clamps from the shift cable.



(i). Remove the fixing bolts from the clutch slave cylinder.

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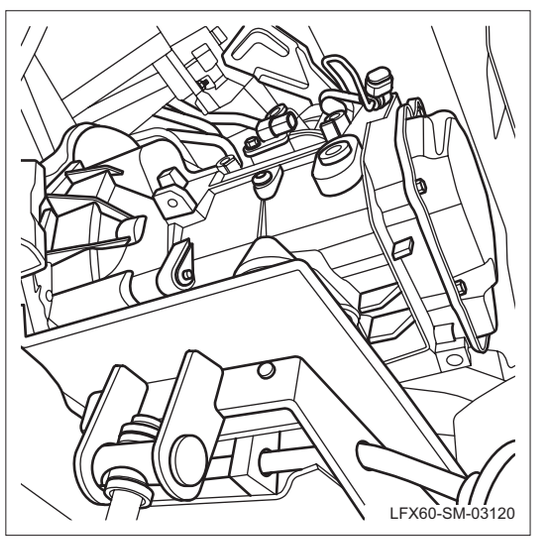


(j). Remove the bracket bolts from the pipes of clutch slave cylinder.

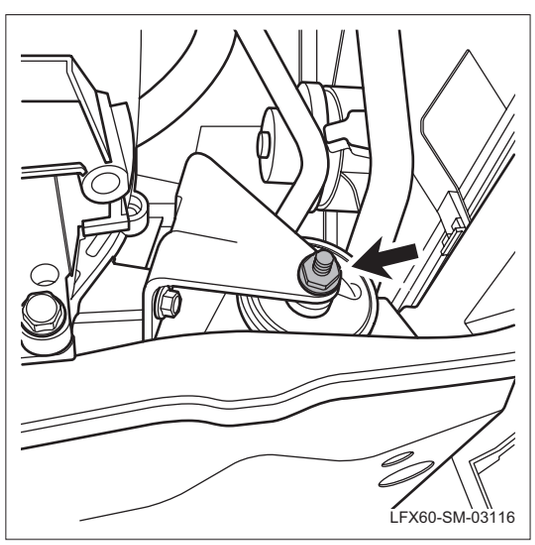
(k). Remove the starter assembly. **Reference: Replacement of the starter assembly.**

(l). Lift the vehicle. **Reference: Lifting and supporting of vehicle.**

(m). Discharge the transmission fluid. **Reference: Steps to drain and add transmission fluid.**



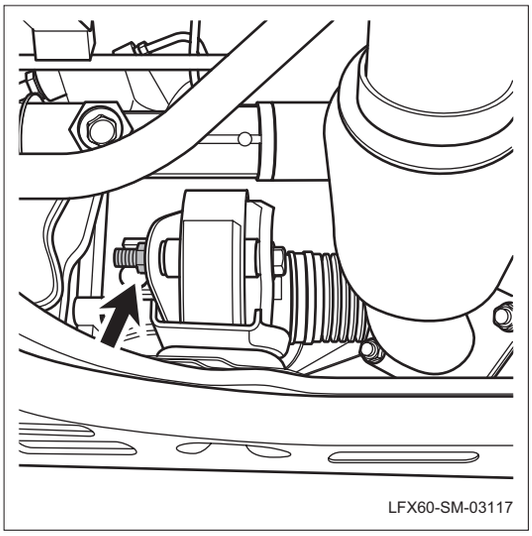
(n). Use the jack to support the transmission.



(o). Remove the connecting bracket bolts from the front suspension.

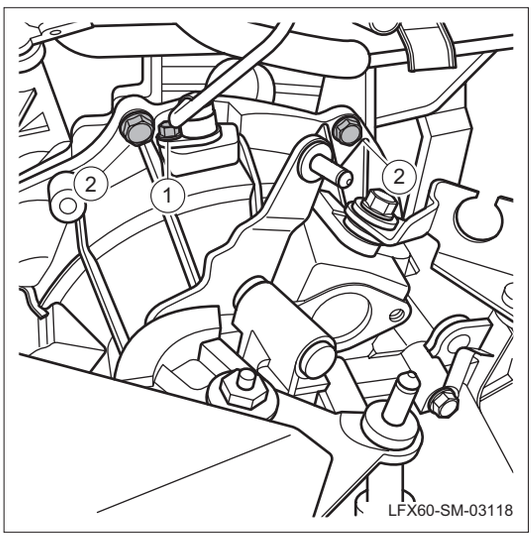
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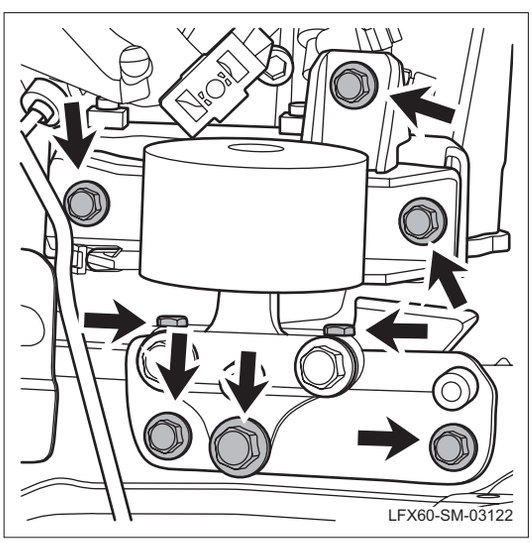
(p). Remove the connecting bracket bolts from the rear suspension.

(q). Remove the front subframe assembly.
Reference: Replacement of front subframe assembly.



(r). Remove the bolt 1 from the crankshaft position sensor, and remove the crankshaft position sensor.

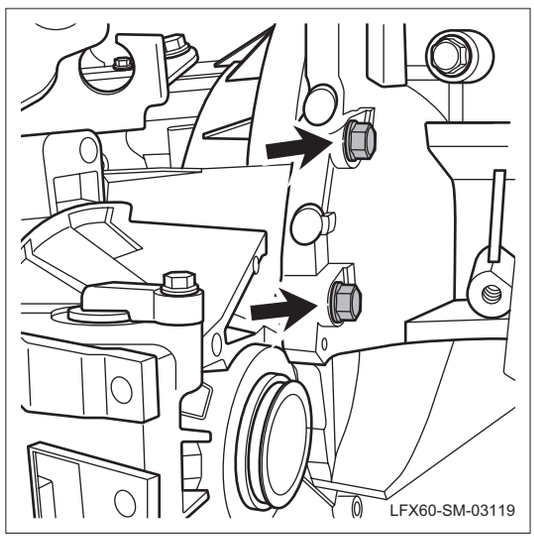
(s). Remove the bolt 2 connecting the transmission with the upper part of the engine.



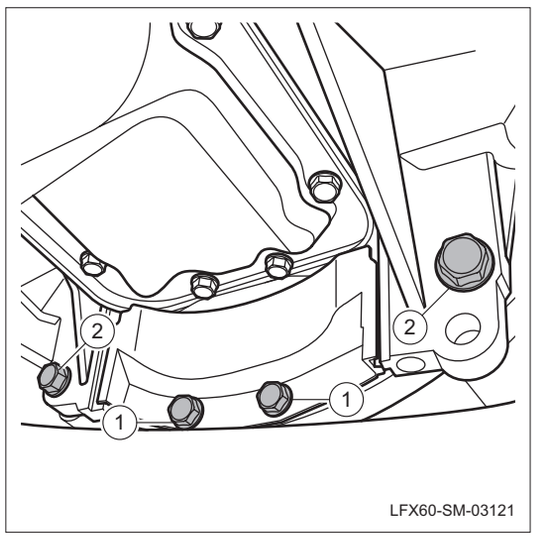
(t). Remove the fixing bolts from the left suspension.

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(u). Remove the bolt connecting the transmission with the rear part of the engine.



(v). Remove the fixing bolt 1 from the flywheel cover.
(w). Remove the bolt 2 connecting the transmission with the lower part of the engine.
(x). Slowly lower the jack, and disconnect the transmission from the engine.
(y). Remove the transmission assembly.

ⓘ Note:

This step requires someone else to assist.

Installation

1. Installation of transmission assembly.

(a). The installation sequence is the reverse of the disassembly order.
(b). Add transmission fluid. **Reference: Steps to drain and add transmission fluid.**

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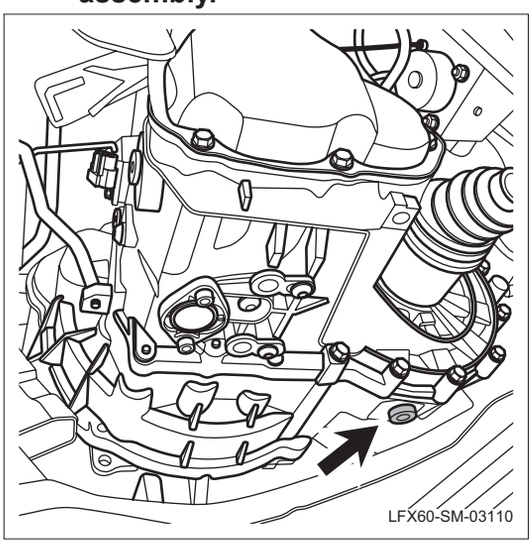
Replacement of main shaft oil seal

Removal

1. Remove the front oil seal from the transmission.

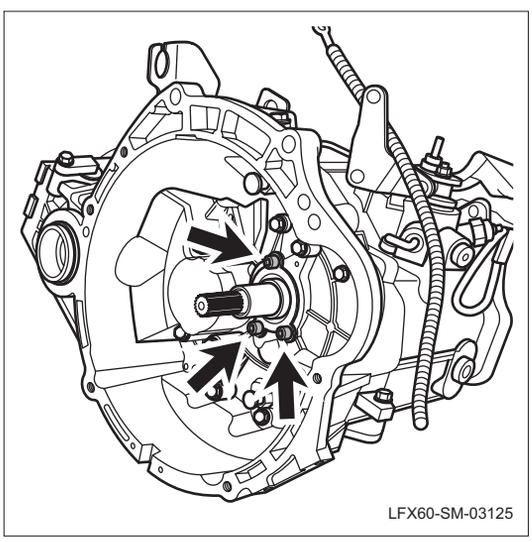
(a). Disconnect the battery negative connector.

(b). Remove the transmission assembly. **Reference: Replacement of the transmission assembly.**



(c). Remove the clutch release bearing.

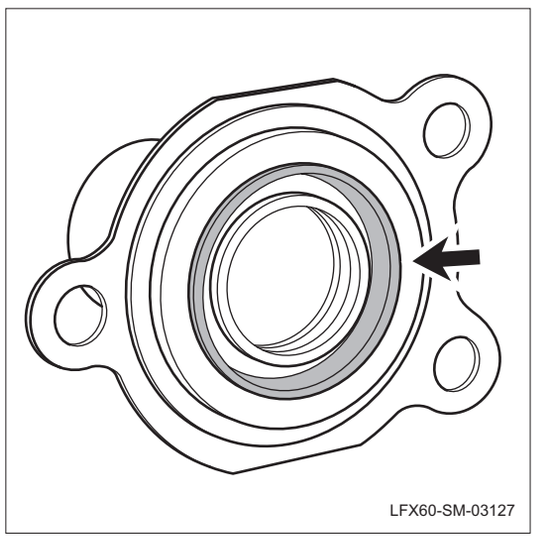
(d). Remove the clutch release fork.



(e). Remove the fixing bolts from the release bearing base.

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(f). Use appropriate tools to remove the front oil seal from the transmission.

Installation

1. Remove the front oil seal to the transmission.

(a). The installation sequence is the reverse of the disassembly order.

Note.

When installing the oil seal, apply an appropriate amount to the oil seal.

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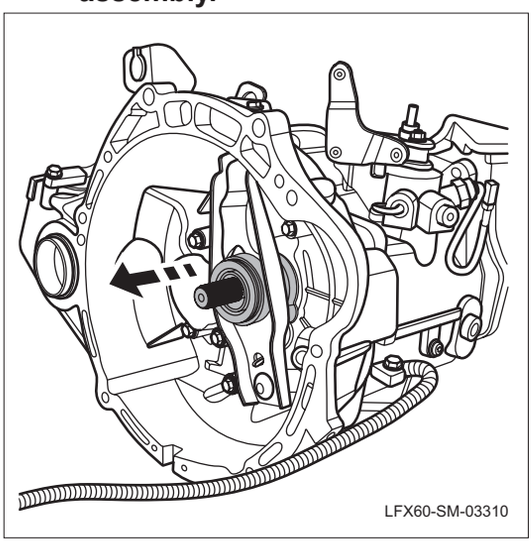
Disassembly and installation

Disassembly and installation of transmission assembly

Disassembly

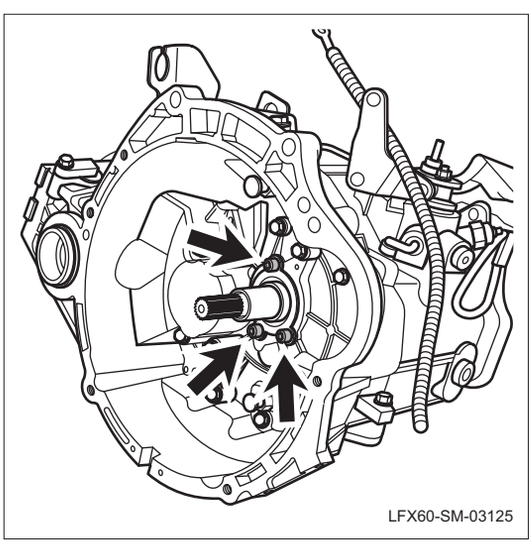
1. Disassemble the transmission assembly.

(a). Remove the transmission assembly. **Refer to: Replacement of the transmission assembly.**



(b). Remove the clutch release bearing.

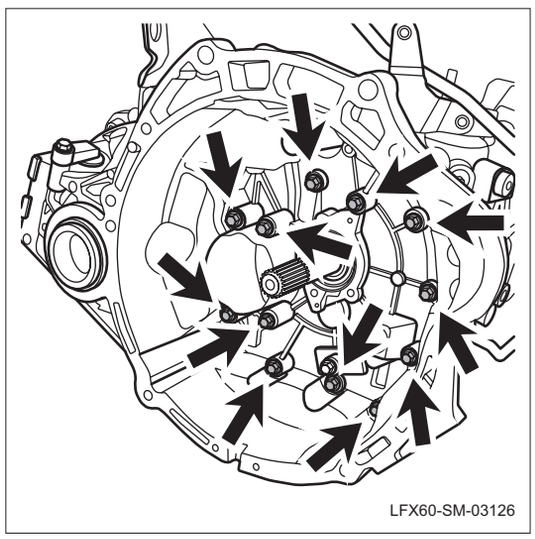
(c). Remove the clutch release fork.



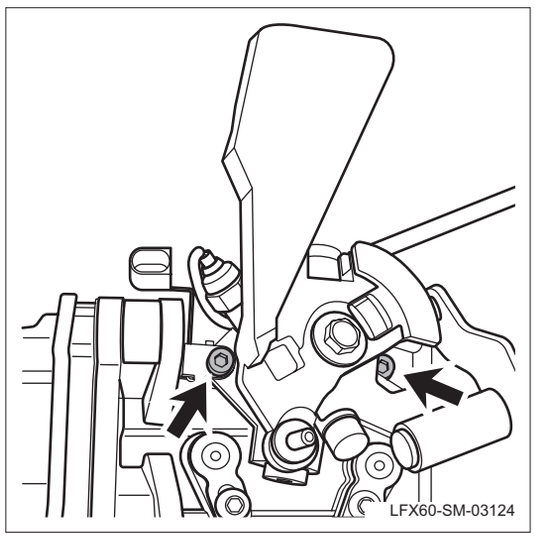
(d). Remove the fixing bolts from the release bearing base.

AutoLibrary

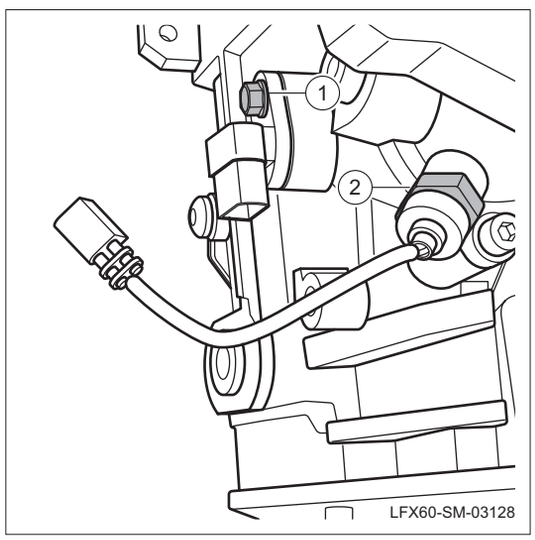
AutoLibrary



(e). Remove the connecting bolts and nuts from the transmission housing.



(f). Adjust the shift shaft to the neutral position, and remove the selector mechanism bolts and take out the selector mechanism from the transmission housing.

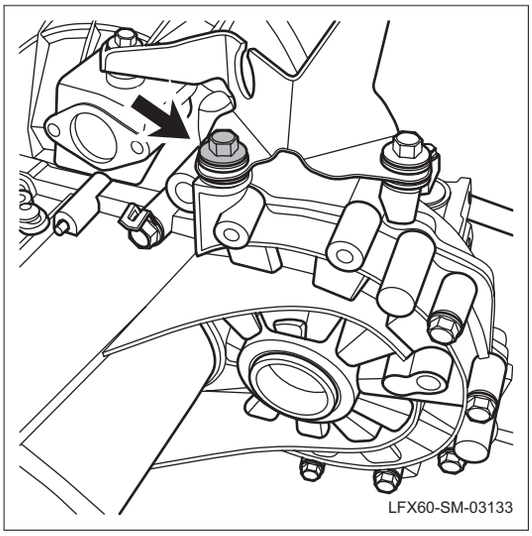


(g). Remove the fixing bolt 1 from the neutral position switch, and remove the neutral position switch.

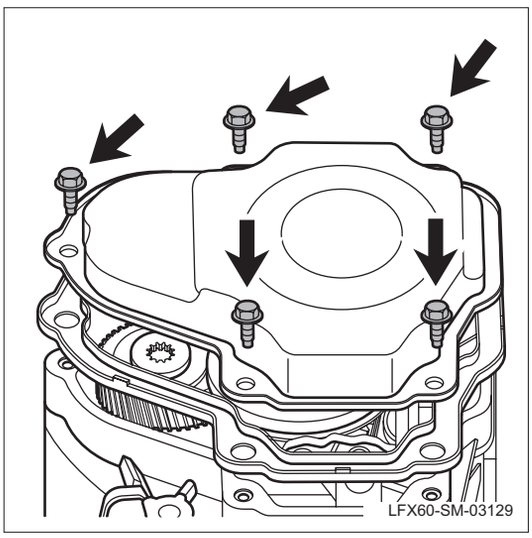
(h). Remove the lock nut 2 from the reverse switch, and remove the reverse switch.

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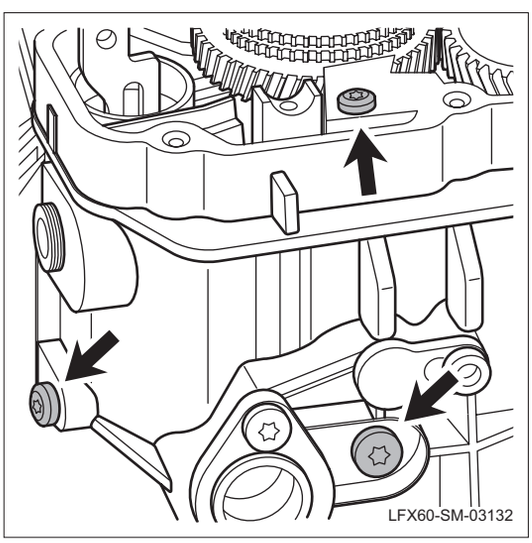


(i). Remove the fixing bolts from the shift cable bracket.



(j). Remove the fixing bolts from the transmission end cover.

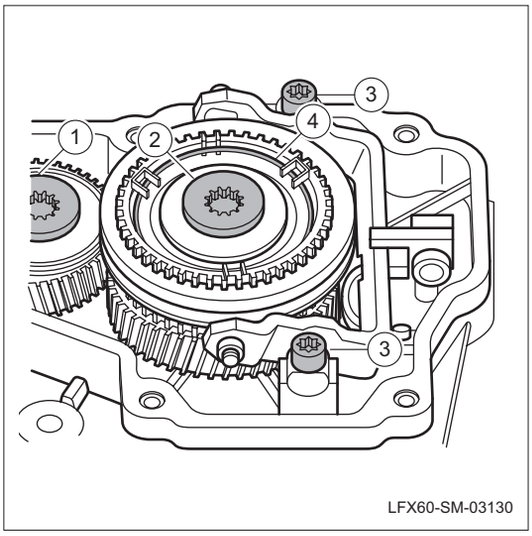
(k). Remove the sealing gasket from the transmission end cover.



(l). Remove the three locking bolts from the reverse-gear stop block.

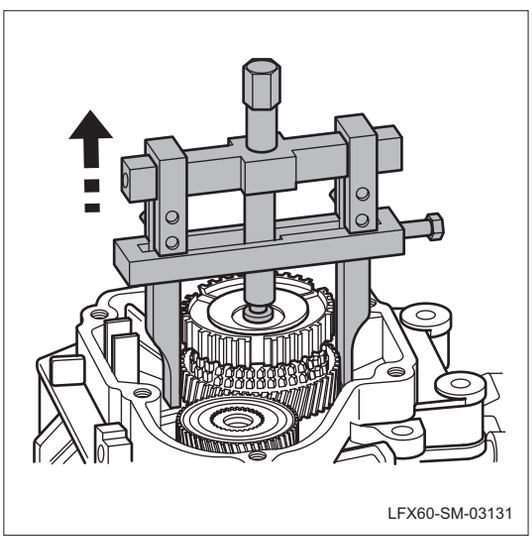
AutoLibrary

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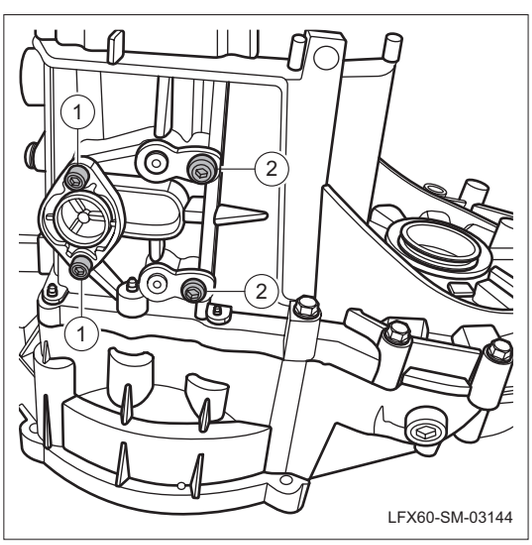


LFX60-SM-03130

(m). Remove the locking bolt 1 from input shaft.
(n). Remove the locking bolt 2 from input shaft.
(o). Remove the fixing bolt 3 from the fifth-gear fork, and take out the fork.
(p). Remove the spring 4 from the fifth-gear synchronizer, and take out the fifth-gear sleeve.


LFX60-SM-03131

(q). Use special tools to remove the fifth-gear synchronizer hub and the fifth output shaft gear, respectively.

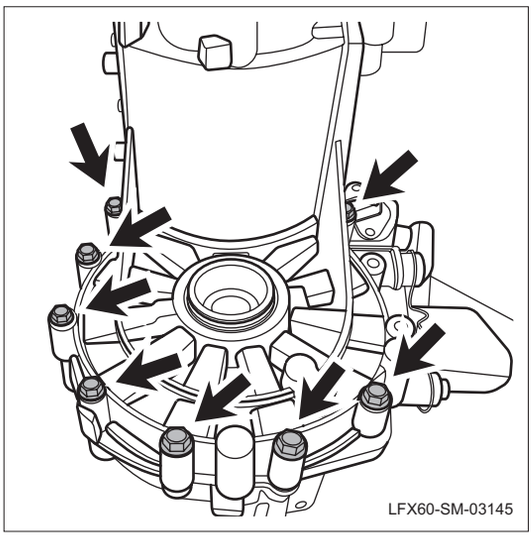


LFX60-SM-03144

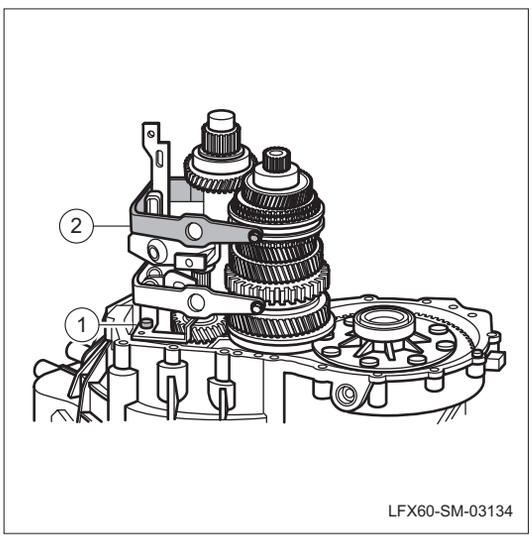
(r). Remove the bolts from the gear shift box.
(s). Remove the fixing bolt 2 from the fork support beam.

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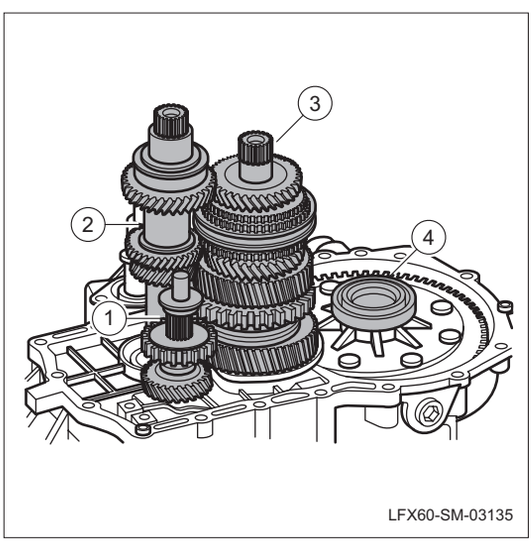

LFX60-SM-03145

(t). Remove the connecting bolts from the differential mechanism, and take out the transmission housing.



LFX60-SM-03134

(u). Remove the bolt 1 from the reverse gear rocker bracket.
(v). Take out the shift fork assembly 2.



LFX60-SM-03135

(w). Remove the reverse shaft assembly 1.
(x). Remove the input shaft assembly 2.
(y). Remove the output shaft assembly 3.
(z). Remove the differential assembly 4.

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Assembly

1. Installation of transmission assembly.

(a). Contrary to the order of disassembly.

Note:

Apply proper amount of sealant to the contact surface of transmission assembly housing.

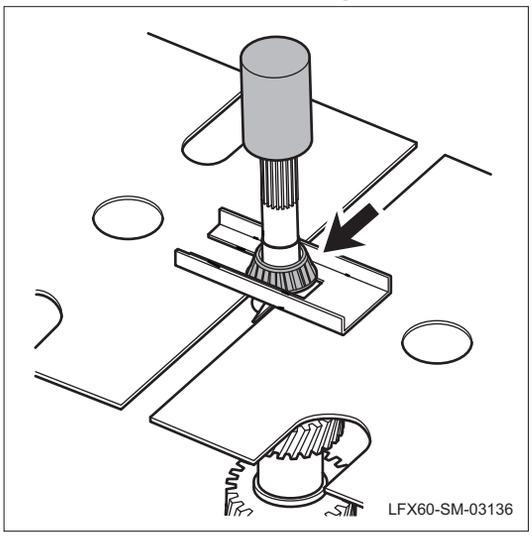
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Disassembly and installation of input shaft assembly

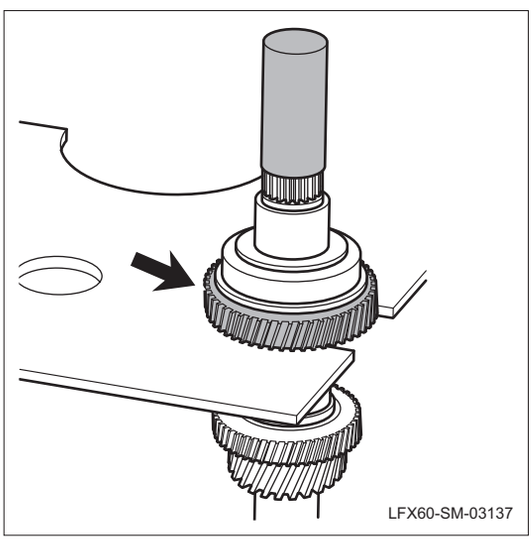
Disassembly

1. Disassemble the input shaft assembly.

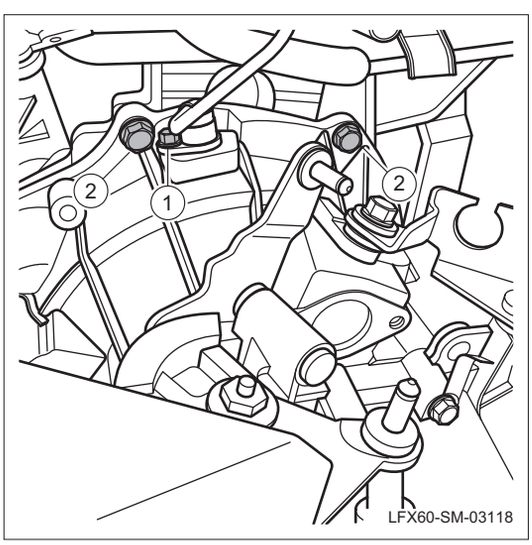


(a). Use a special tool to press the front bearing inner ring into the input shaft.

(b). Remove the front bearing from the input shaft.



(c). Use a special tool to take out the inner ring from the rear bearing of the fourth input gear and input shaft, and take out the fourth output gear gasket.



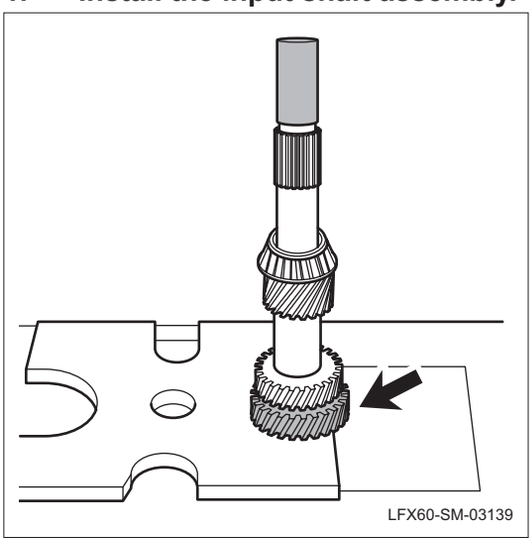
(d). Use special tools and hydraulic press to take out the third input gear, and get out the third and fourth input gear spacers.

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Assembly

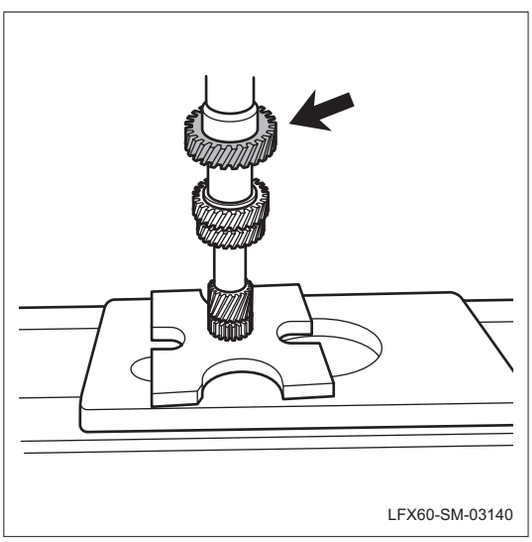
1. Install the input shaft assembly.



(a). Use special tools to press third input gear.
(b). Restore the third and fourth input gear spacers.

Note:

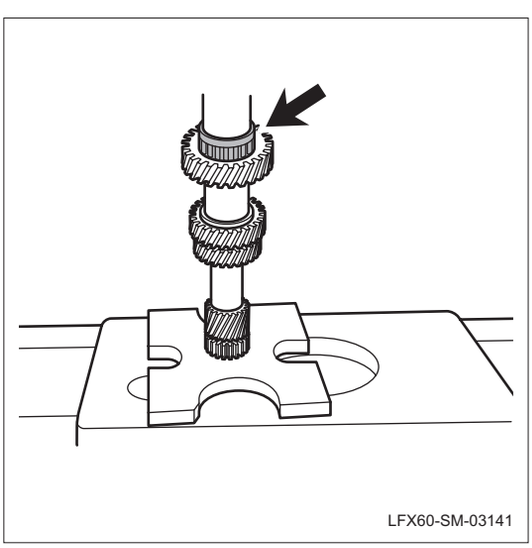
The end face with lug boss on the inner ring of the gear shall face the fourth gear during the installation.



(c). Use special tools to press fourth input gear.

Note:

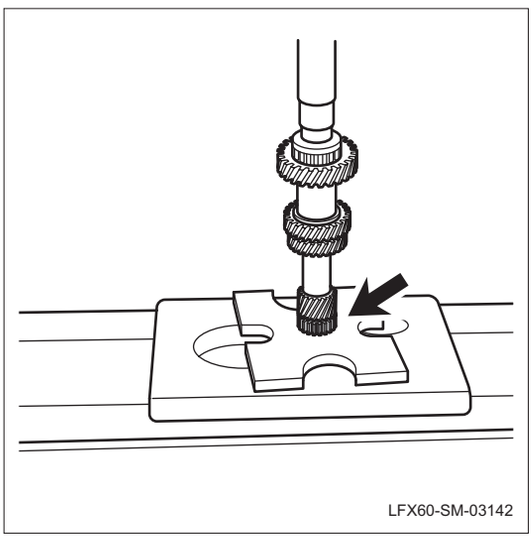
The end face with lug boss on the inner ring of the gear shall face the third gear during the installation.



(d). Use special tools to press the rear bearing inner ring into the input shaft.
(e). Install gasket for the fourth output gear.

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LFX60-SM-03142

(f). Use special tools to press the fourth output gear shaft sleeve.

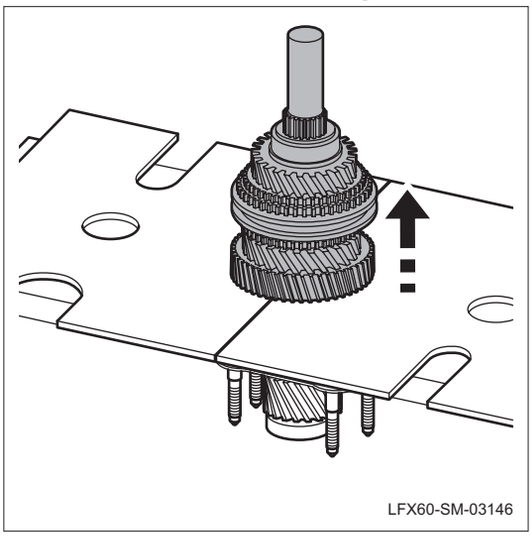
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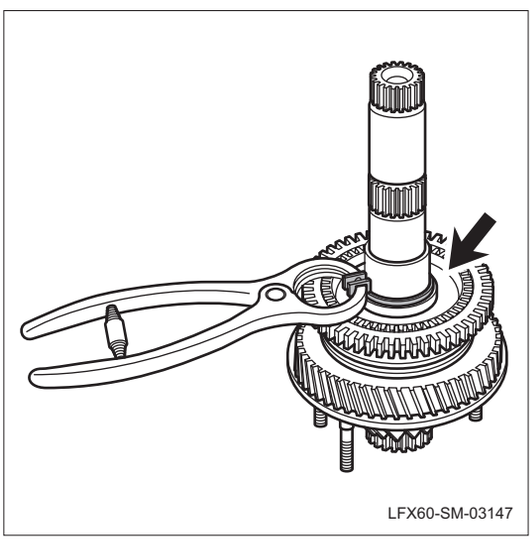
Disassembly and installation of output shaft assembly

Disassembly

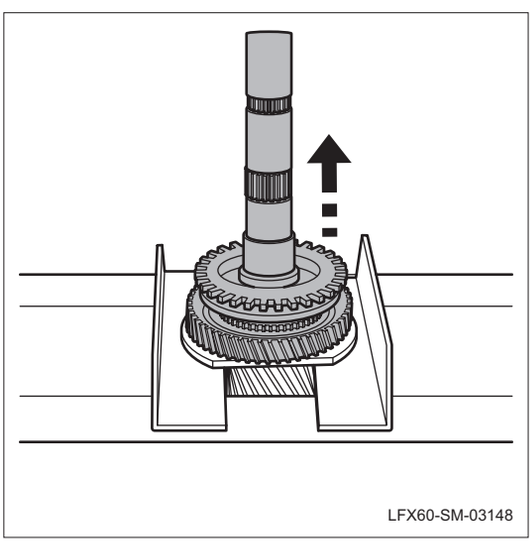
1. Disassemble the output shaft assembly 3.


LFX60-SM-03146

(a). Use appropriate tools to remove the second output gear, third gear and fourth gear synchronizer assembly, as well as the fourth output gear, fourth output gear gasket, and the rear shaft inner ring of the output shaft.


LFX60-SM-03147

(b). Use appropriate tools to remove the clamps from the first and second output gear synchronizers.


LFX60-SM-03148

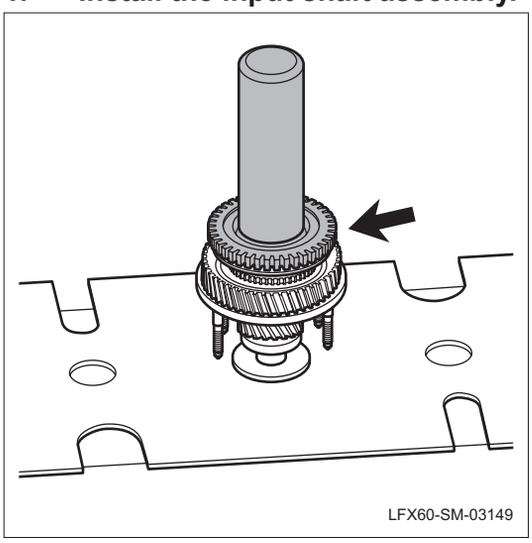
(c). Use appropriate tools to remove the first and second gear synchronizer hubs and corresponding gear sleeves, the gear output shaft of the first output gear, intermediate bearing, and bearing pressure plate

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Assembly

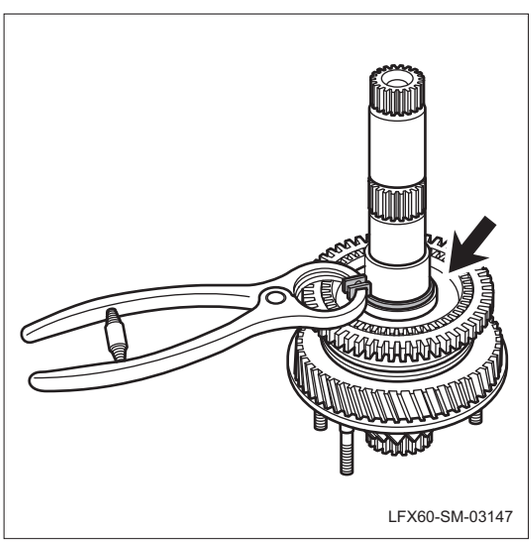
1. Install the input shaft assembly.


LFX60-SM-03149

(a). Use special tools to press third input gear.
(b). Restore the third and fourth input gear spacers.

Note:

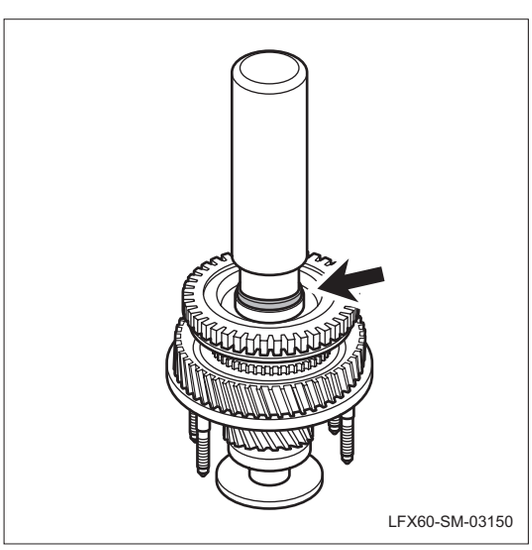
The end face with lug boss on the inner ring of the gear shall face the fourth gear during the installation.


LFX60-SM-03147

(c). Use special tools to press fourth input gear.

Note:

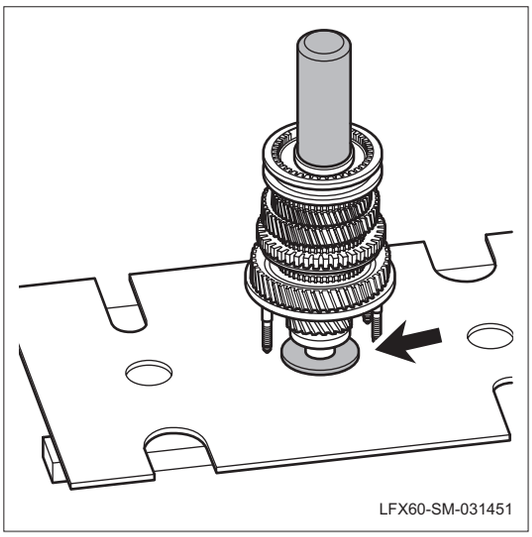
The end face with lug boss on the inner ring of the gear shall face the third gear during the installation.


LFX60-SM-03150

(d). Use special tools to press the rear bearing inner ring into the input shaft.
(e). Install gasket for the fourth output gear.

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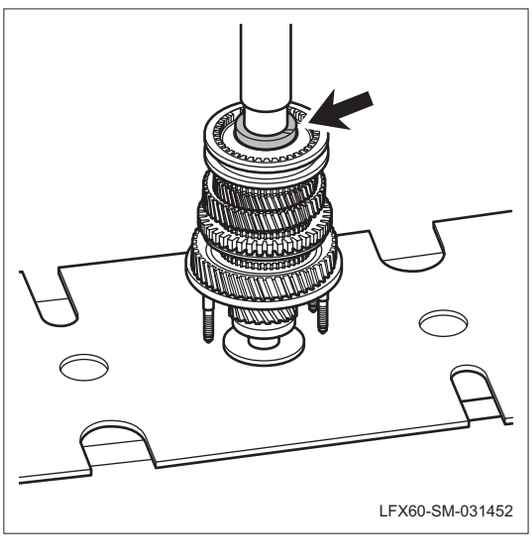
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(h). Use special tools to press the third and fourth gear synchronizer assembly.

Note:

Align the synchronizer gear ring notch with the boss position.

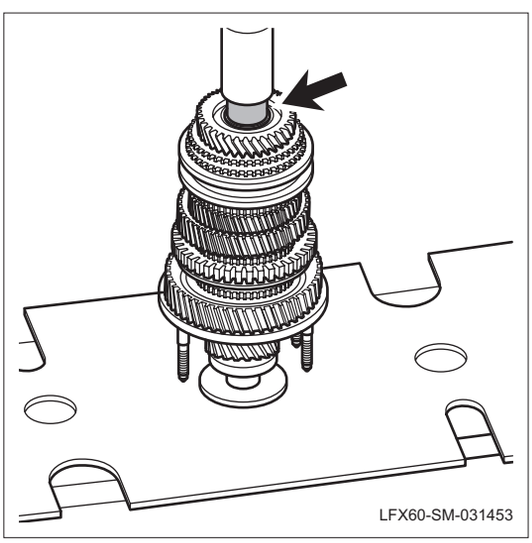


(i). Use a locating sleeve to press the fourth output gear shaft sleeve.

(j). Install the fourth gear synchronizer gear ring, fourth gear needle bearing, and the fourth output gear assembly.

Note:

Align the synchronizer gear ring notch with the boss position.



(k). Install the fourth output gear gasket (flat gasket) to the gear end face of fourth gear output, and use a locating sleeve to press the rear shaft inner ring of the output shaft into the output shaft.

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03 - transmission

Continuously variable transmission 3-783

Technical specifications.....3-783

Precautions 3-784

Preparation.....3-785

Structure and installation location 3-786

General Inspection 3-789

Operating Principle.....3-792

Diagnostic Information and Procedures.....3-797

DTC diagnosis and testing 3-808

Removal and Installation.....3-871

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Continuously variable transmission

Technical specifications

Torque Specifications

Name	Torque range	
	Metric(Nm)	British (Lb-ft)
Oil drain plug assembly	46	34
Oil pressure sensor assembly	18	13
Oil pipe hollow bolt	30	22
Fixing bolts for shift cable bracket	23	17
Fixing bolts for shift rocker	11	8
Locking nuts for shift rocker	22	16
Fixing bolts for pipe bracket	11	8

General specifications

Name	Specification
Transmission model	019CHD
Transmission type	Continuously variable transmission (CVT)
Layout	Transversal front drive
Starting clutch device	Hydraulic torque converter
Control modes	Electronic hydraulic control
Dimension (L × W × H)	385mm×55mm×05mm
Weight (no cooling lubricating oil contained)	78Kg
Central distance	204mm
Maximum permissible input torque	190 Nm
Main reduction ratio	5.141
Pulley speed ratio range	0.427-2.465
Oil type	Idemitsu SP3
Transmission oil level in total	8±2L

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Precautions

Provisions for vehicle towing

Introduction to towing methods

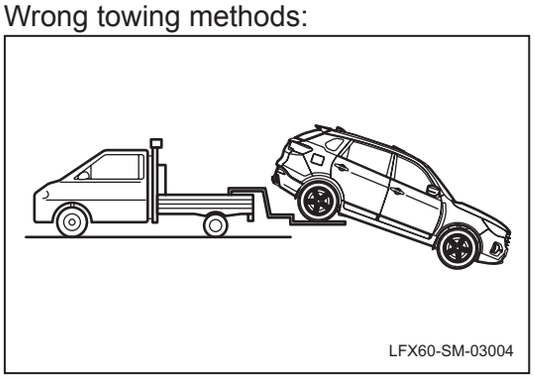
Towing the car properly can avoid unnecessary secondary damage.

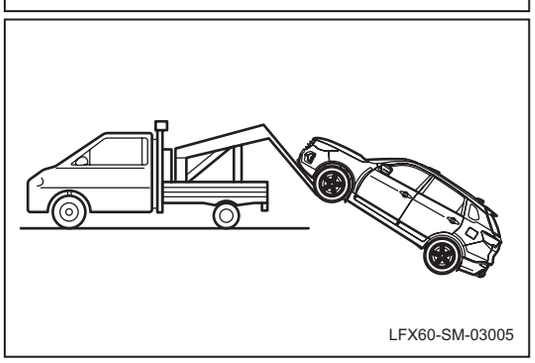
1. Use a (large) flat truck to erect the car completely for towing;
2. Erect the non-driving wheels by hard towing means, and then erect the driving wheels carrier for towing with a tablet truck (jockey wheel);
3. Erect the driving wheels carrier for towing by hard towing means.

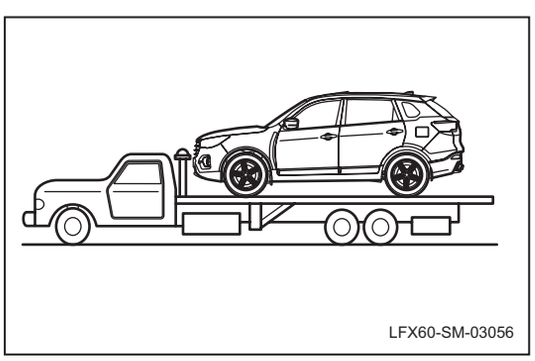
ⓘ Note.

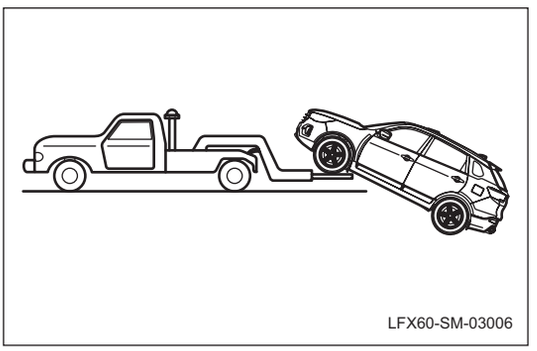
- **Do not use soft towing means to tow the driving wheels.**
- **Do not use soft towing means to tow the non-driving wheels.**

Wrong towing methods:


LFX60-SM-03004


LFX60-SM-03005


LFX60-SM-03056

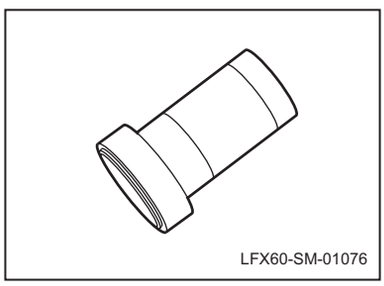
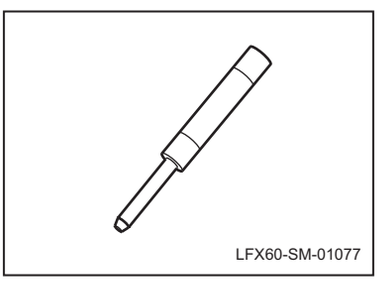

LFX60-SM-03006

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Preparation

Special maintenance tools

No.	Tool name	Tool figure	Tool code	Remarks
1	Differential oil seal installation and tooling	 LFX60-SM-01076	-	Installation of differential oil seal
2	Locating pin (shift rocker disassembly / installation and tooling)	 LFX60-SM-01077	-	For locating use

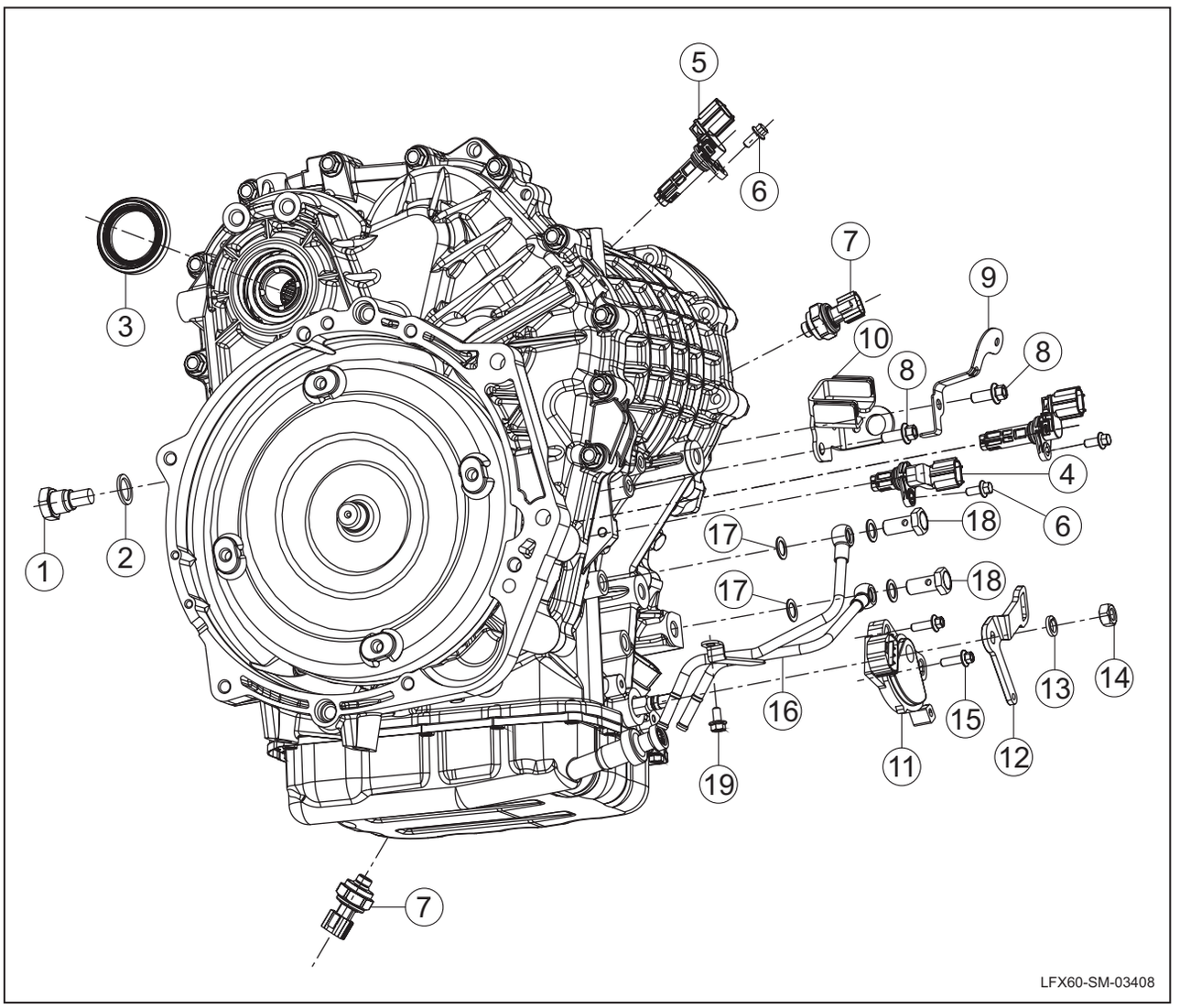
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Structure and installation location

Part exploded view

Transmission accessories



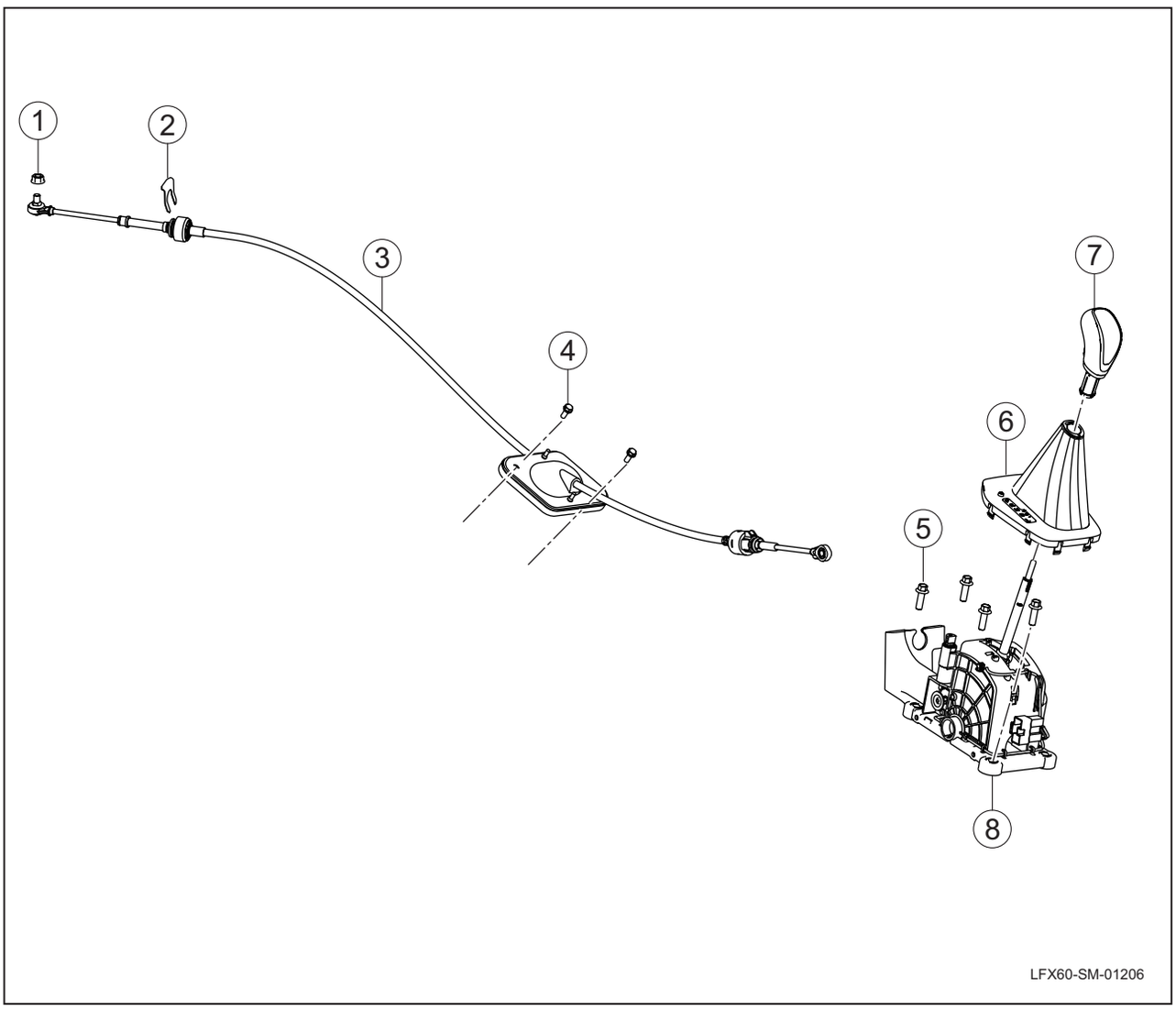
No.	Part name
1	Oil drain plug assembly
2	Sealing gasket
3	Differential oil seal
4	Speed sensor assembly
5	Speed sensor assembly
6	Hexagon flange bolt
7	Oil pressure sensor assembly
8	Hexagon flange bolt
9	harness bracket
10	Shift cable bracket assembly

No.	Part name
11	Gear switch assembly
12	Shift rocker
13	Spring washer
14	Hexagon nut
15	Hexagon flange bolt
16	Tubing assembly
17	Sealing gasket
18	Hollow bolt
19	Hexagon flange bolt

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Gear shift control device



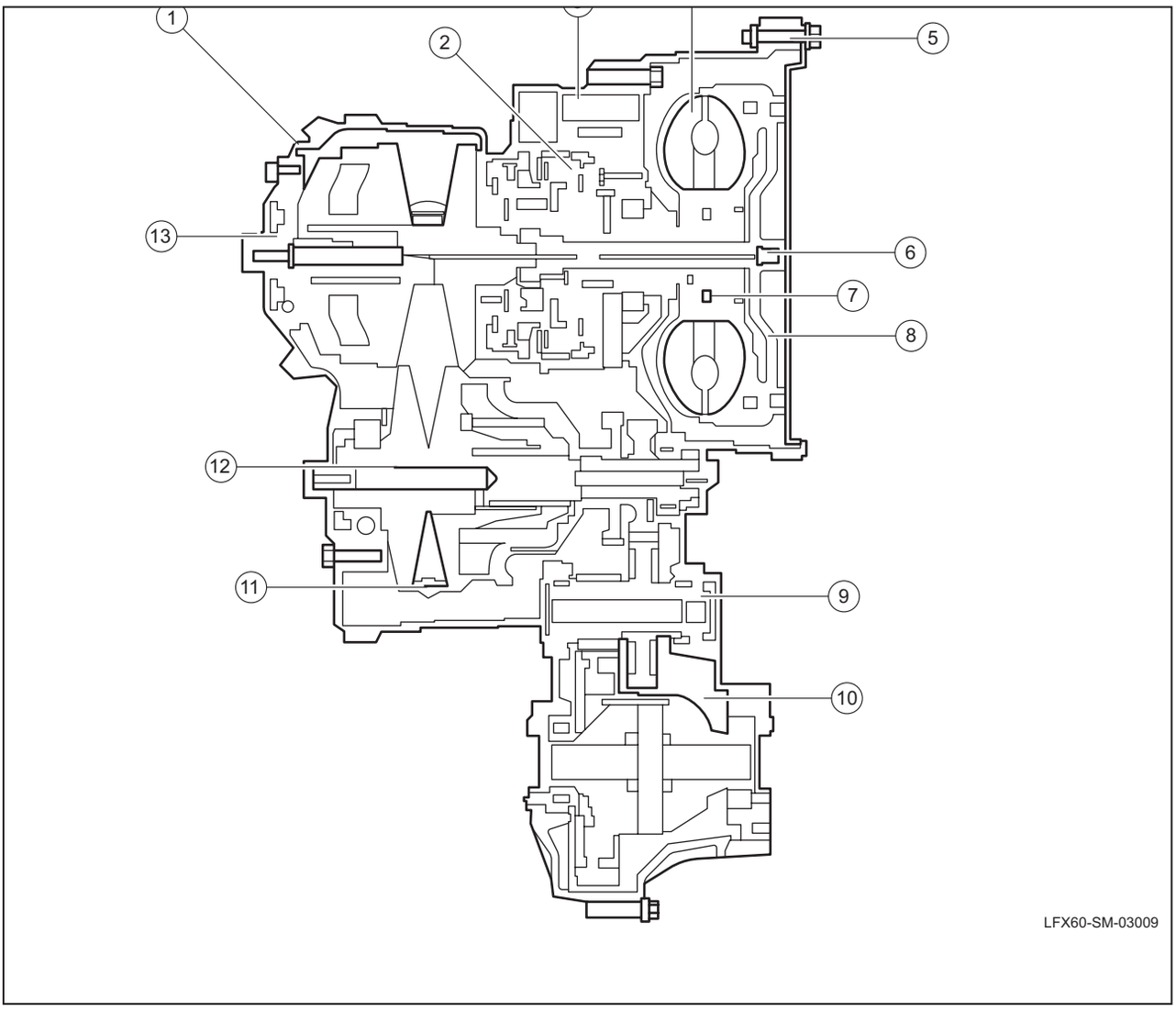
No.	Part name
1	Shift cable locking nut
2	U-shaped clip
3	Gear shift cable assembly
4	Gear shift cable fixing bolt

No.	Part name
5	Gear shift device fixing bolt
6	Shift panel
7	Handle ball assembly
8	Gear shift device

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Internal structure diagram



No.	Part name
1	Rear housing assembly
2	Forward clutch assembly
3	Transmission housing assembly
4	Hydraulic torque converter assembly
5	Torque converter housing assembly
6	Input shaft assembly
7	Thrust washer

No.	Part name
8	Oil pump assembly
9	Output shaft assembly
10	Differential assembly
11	Steel strip
12	Output belt pulley shaft assembly
13	Input belt pulley shaft assembly

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General Inspection

Provisions for use of oils and fluids

Oil specification

019CH series CVT can only use the ATFSP III transmission fluid specified by Zhejiang Wanliyang Transmission Co., Ltd.

Oil grade: ATFSP-III

Volume: 8L

Maintenance period

In order to extend the life of the transmission, replace the transmission fluid after the first 40,000km, and then you needn't do it again in the future.

Oil state inspection

The new transmission fluid should be red, but red color is not the indicator of quality; with the use of vehicle, the oil color will gradually deepen, and ultimately it may become light brown:

- **If the oil is dark brown accompanied by the smell of burnt something, you need to replace the transmission fluid and check the vehicle condition;**
- **If the oil is milky white or turbid, the oil has been mixed with water, and you need to replace the transmission fluid; check the water leaking points and make sure if the transmission is damaged;**

If the oil is black and mixed with a large number of powder, the CVT is abnormally worn, and you need to check and repair the transmission.

ⓘ Note.

Do not use other oil instead, the damaged caused by the use of other oil is not covered by the warranty.

Inspection of transmission fluid level

Please check the oil level in the order as below:

1. After a period of time of driving on the dynamic road, the oil temperature of the transmission reaches 80±5 ℃ or 25±5 ℃ (measured with a diagnostic instrument).
2. Stop the car on the ground, and pull the parking brake handle.
3. While the engine is idling, step on the brake pedal, switch between R, N, and D for 3 cycles staying at each position for 5s; finally, stop the selector lever in position "P" or "N".
4. Clear the dust and oil around the oil scale.
5. Pull the vent plug from the conduit of the valve housing, and wipe the oil scale with a lint-free paper and insert it into the conduit to prevent foreign matter from falling into the transmission.
6. Pull out the oil scale, record the scale position, and determine if the oil level is acceptable against the table.

Oil level	HOT area	COLD area
	Oil temperature: 80±5℃ , be accurate	Oil temperature: 25±5℃ , for reference
019CHD	A-A	a-a

- **If the oil level is within the corresponding range, the oil level is qualified.**
- **If not within the corresponding range, fill or discharge oil until the oil level rises to or falls into the middle position of the corresponding range to achieve the best performance.**

7. Finally, restore the vent plug into the conduit, and ensure the installation in place.

ⓘ Note

Transmission fluid is relatively hot, so protective equipment is necessary when removing the oil level bolts.

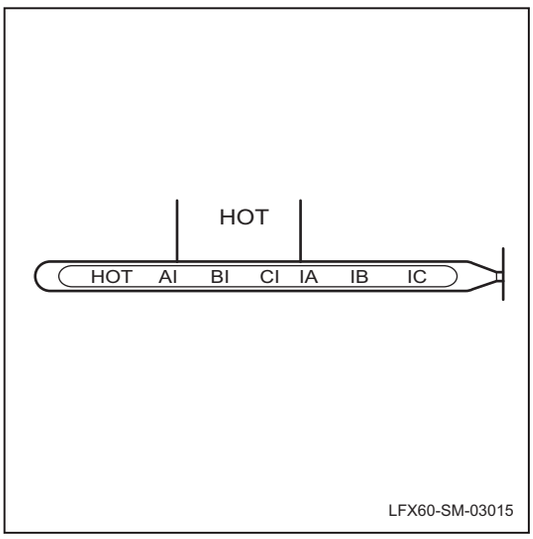
Example:

Example:

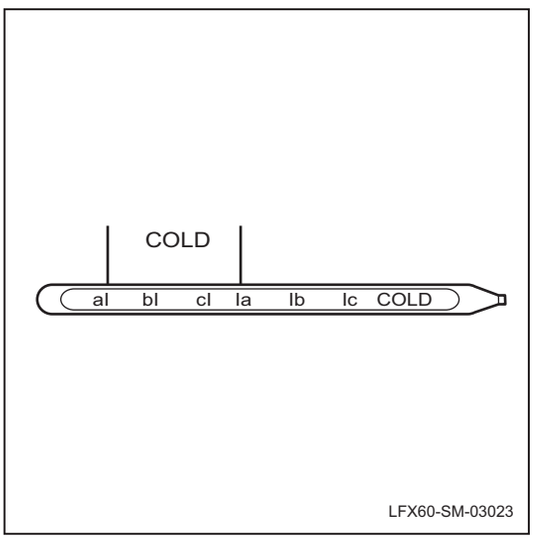
HOT oil level in the A-A range, and COLD oil level in the a-a range.

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LFX60-SM-03015



LFX60-SM-03023

Note:

- **It's not allowed to in the idle state to warm the ATF by slamming on the accelerator.**
- **Use the "HOT" mark on the transmission fluid scale as the standard for detecting the amount of transmission fluid. The "COLD" (or "C") mark is for reference only.**
- **When the transmission fluid is hot, the engine, the radiator and its piping system are very hot too, and the fan may be started, so you must be very careful in the course of operation to avoid burns**
- After the transmission has been repaired or the oil has been replaced, the oil level must be controlled at the middle position of the corresponding range.
- Every 100ml of oil means 3mm change in the scale for your reference.
- One side of the oil scale is used to measure the HOT oil level and the other side the COLD oil level.
- If the transmission fluid level is too low, the transmission fluid pump will suck air during normal operation, and then the air is compressed into bubbles into the electromagnetic valve oil pipes to lower the pressure, then the clutches or brakes will work weakly due to lack of pressure.
- If the transmission fluid is too much, the revolving parts in the transmission will stir the liquid to produce foam during the high-speed rotation, thus the same result as above.
- If there are too many bubbles, they are easy to get the transmission fluid oxidized at high temperatures and this affect the normal operation of the solenoid valves, clutches and brakes; and this can also cause the transmission fluid to spill out from the transmission vent holes, which may be easily mistook for transmission fluid spill.
- ATF replacement

1. Lift the vehicle with a lifter.
2. Remove the transmission fluid drain bolts.
3. Discharge the ATF.
4. And then re-tighten the oil plug, and do not forget the gasket.

   Tools: 24# socket spanner, and torque wrench.
5. Pull out the vent plug and add new ATF from the plug.

- Add same amount of ATF as the amounted discharged.
- If the transmission is new, you do not need to discharge the oil, and add 4.8±0.1L of oil directly.

6. After that, check the oil level as per 4.1.

Note:

- **Gaskets are disposable and must be replaced with new ones for each maintenance.**
- **Wipe the oil dipstick with the lint-free paper to prevent the foreign matter entering the transmission inside.**
- **The engine compartment contains high-temperature parts. In order to avoid accidents, remember not to spill the ATF onto these hot parts.**
- **After filling ATF, wipe off the spilled fluid.**
- **When replacing the ATF, the residual oil in the transmission needn't to be completely discharged.**
- **When replacing the ATF, clean the oil cooler.**

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Oil leak check

General method

1. Make sure that the leaking oil is transmission fluid.
2. Thoroughly clean the suspicious leaking points.
3. Run the vehicle by 24km or until it reaches the normal working temperature.
4. Stop the car on a clean paper or cardboard.
5. Turn off the engine.
6. Find oil droplets on paper.
7. Carry out the required maintenance.

Powder method

1. Thoroughly clean the suspicious leaking points with solvent.
2. Apply atomized powder (like foot powder) onto the suspicious places.
3. Run the vehicle by 24km or until it reaches the normal working temperature.
4. Turn off the engine.
5. Check these suspicious leaking points.
6. Find the leaking source along the powder's trajectory.
7. Carry out the required maintenance.

Dye and invisible light method

Liquid dyes and invisible light test components are available from different tool manufacturers.

1. Determine the amount of dye to be used according to the manufacturer's instructions.
2. Check the leaking points with invisible light.
3. Carry out the required maintenance.

Leakage reason

Identify the leaking points and trace the source along the leaking trajectory. The leakage reason must be identified in order to properly repair the problem. Before repairing the leakage problem, check for the following faults and make necessary repairs.

1. Oil level / oil pressure too high.
2. Vent holes blocked.
3. Fasteners tightened improperly.
4. Threads dirty or damaged.
5. Sealing surface twisted.
6. Sealing surface scratched, gigged or damaged in other ways.
7. Oil seal damaged or worn.
8. Cracks or pore on parts.
9. Improper sealants used (if any).
10. Improper sealing elements.
11. Cracks on parts.
12. Oil cooling pipe fittings improperly installed or damaged.
13. Sealing elements overly worn since bearings get loose or worn

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Operating Principle

System Overview

CVT realizes stepless variation of its speed by continuously changing the contact diameter between the driving, driven conical platens and steel belt, respectively. Working principle:

Transmission Control Unit (TCU) sends command signals to the four hydraulic valves in the hydraulic system at the right moment as needed by the driving conditions (vehicle speed, load, engine speed, etc.)

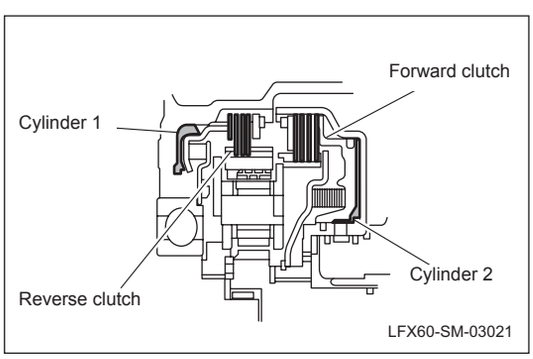
- Solenoid valves continuously adjust the working condition according to the instructions from TCU. These 4 solenoid valves work in different combinations of conditions, so that the flow and pressure of hydraulic oil change in a timely manner, thus the accurate manipulation of hydraulic actuators (e.g. cylinders, pistons, guiding valves, etc.).
- When the piston chamber pressure of the hydraulic driving and driven conical platens is continuously changed, the conical platens have corresponding axial movement with the changes in pressure, thus changing the radius of rotation of the steel belt to achieve a continuous change in transmission ratio for the purpose of stepless speed variation.

Description of mechanical parts

Mechanical composition of CVT

CVT consists of planetary gear components, multi-disc clutch, steel belt pulley and steel belt, intermediate shaft, differential, housing and oil pan.

Forward / reverse clutch



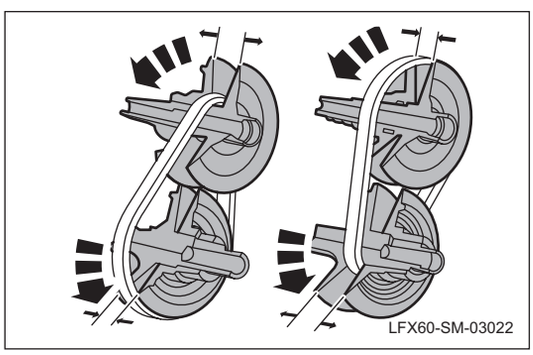
CVT uses wet multi-disk clutch with stable friction characteristics, excellent high temperature resistance and anti-stripping property, as well as good reliability; with advanced software control system, the transmission system has excellent static shift performance.

CVT realizes the action of forward and reverse gears through a planetary gear train, where the forward gear shares a roughly same speed ratio with the reverse gear so the pressure does not change obviously during the shift, which is conducive to precise control over the pressure to improve the driving comfort during gear shift.

The piston chamber 1 in the reverse brake is connected with the solenoid valve body through the transmission housing, and the pressure oil directly enters the piston chamber 1 of reverse brake through the solenoid valve body.

The spring baffle in the forward clutch is provided with a sealing structure which, in addition to acting as a spring baffle, cooperates with the piston to form a balancing chamber for balancing the pressure in the piston chamber 2, and cushioning the impact from the forward clutch, which improves the driving comfort during gear shift.

Steel strip



The CVT uses the latest generation of thrusting steel belt which with light weight, great speed ratio, large torque transmitting capacity, high transmission efficiency, and good durability.

The steel belt is tightened with two sets of conical platens to transfer energy using the friction between them. The friction radius of steel belt and conical platens is changed by adjusting the pressure so as to change the speed ratio of the transmission, thus the stepless speed variation.

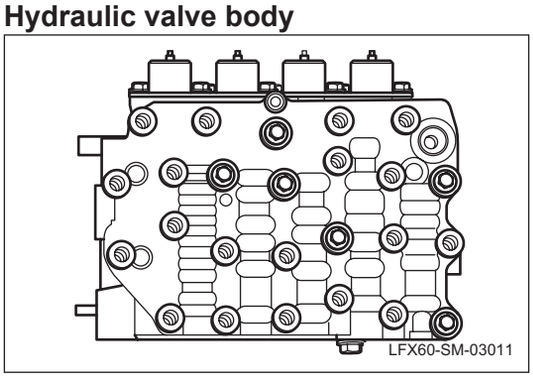
The steel belt, a highly flexible metal belt composed of a large number of V-sheet metals and two groups of metal rings, transfers energy in the presence of the conical platens on both sides.

The metal rings on both sides are composed of multiple layers of thin belt rings to guide the sheet metals correctly. The small thickness of steel belts is important to reduce operating noise. Many components contact with the belt pulley to reduce the pressure on contact surface, which is conducive to improving durability.

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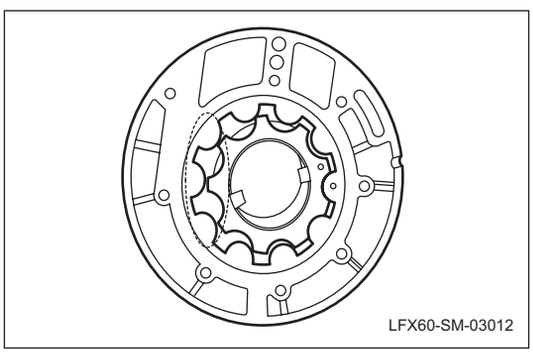
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Hydraulic valve body


LFX60-SM-03011

The hydraulic valve body of our CVT adopts independent split structure with a compact structure, good reliability, low loss, fast response and other advantages.

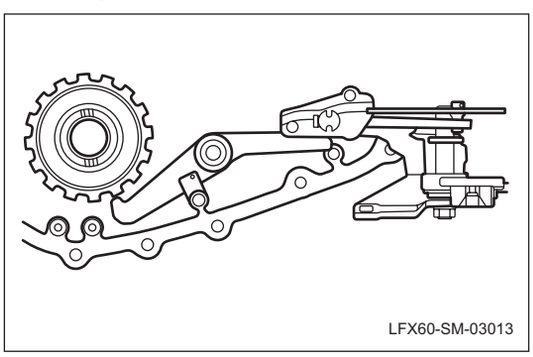
Oil pump


LFX60-SM-03012

The CVT uses advanced rotor pump featuring simple overall structure, compact size, smooth operation, high efficiency, good durability, low noise and so on.

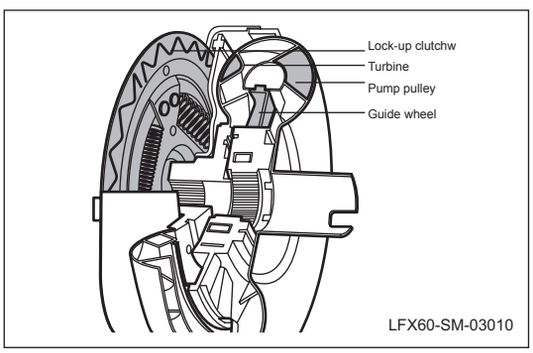
The engine directly drives the inner rotor to suck oil from the inside of the transmission, then the pressure oil is fed to the torque converter, pulley system, clutch system, cooling system, etc., meet the transmission requirements for hydraulic transmission, cooling and lubrication to ensure the normal operation of the transmission.

Parking mechanism


LFX60-SM-03013

The CVT adopts the parking form as shown in the figure. When the driver pushes the gear lever to P gear, the transmission gear shift arm will move as well. The drive rod moves to the left as shown in the figure and drives the parking ratchet tail to move upward and consequently force the parking ratchet head to move towards the parking wheel center, mesh the parking gear teeth and limit the parking wheel rotating. Since the parking wheel and transmission output shaft adopt the rigid connection, the parking action is realized. When the driver pushes the gear lever to exit P gear, the drive rod will move rightward as shown in the figure and does not apply force to the parking ratchet. Meanwhile, the retracting spring will pull the parking ratchet out of the parking gear teeth groove and thus disable the parking function.

Hydraulic Torque Converter



LFX60-SM-03010

The CVT adopts the parking form as shown in the figure. When the driver pushes the gear lever to P gear, the transmission gear shift arm will move as well. The drive rod moves to the left as shown in the figure and drives the parking ratchet tail to move upward and consequently force the parking ratchet head to move towards the parking wheel center, mesh the parking gear teeth and limit the parking wheel rotating. Since the parking wheel and transmission output shaft adopt the rigid connection, the parking action is realized. When the driver pushes the gear lever to exit P gear, the drive rod will move rightward as shown in the figure and does not apply force to the parking ratchet. Meanwhile, the retracting spring will pull the parking ratchet out of the parking gear teeth groove and thus disable the parking function.

The role of the torque converter is to transmit the torque output from the engine to the transmission. It transfers energy through the liquid flow with good cushioning properties and also torque amplification function.

The torque converter contains three components (turbine, pump pulley, and guide wheel) and absorbs shock secondary in two stages. It is locked by a lock-up clutch. With advanced software control system, the torque converter can be locked at low speeds, so the vehicle has excellent starting comfort, acceleration performance, climbing property, and also splendid fuel economy.

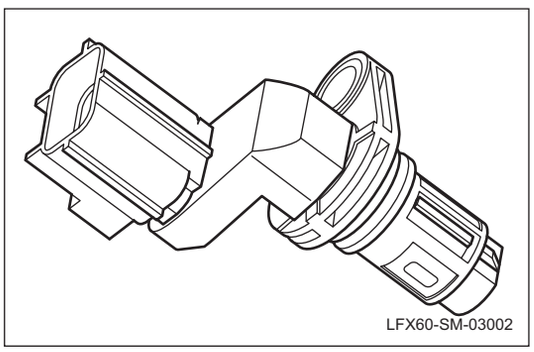
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Description of electronic control parts

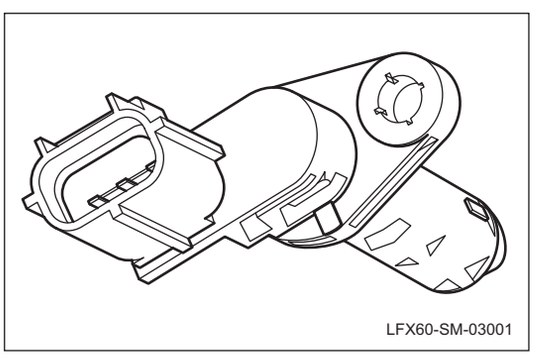
The control system includes sensors, transmission control unit (TCU), actuators and other components.

Input shaft speed sensor



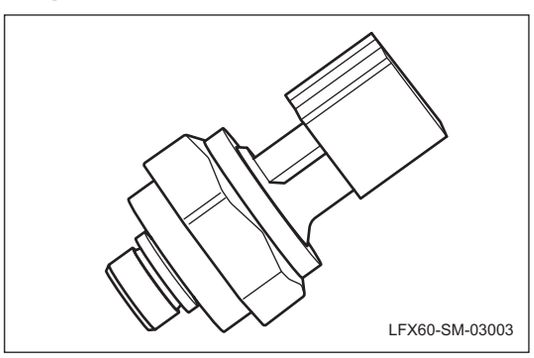
The input shaft speed sensor is a Hall sensor for detecting the rotational speed of the driving cone wheel. A crankshaft induction ring is mounted on the side of the driving cone wheel, and the corresponding sensor generates square wave signal.

Output shaft speed sensor



Output shaft speed sensor is a Hall sensor to directly detect the speed of the differential and indirectly detect the speed of the driven cone pulley.

Oil pressure sensor



CVT has two hydraulic sensors (for input and output shafts)

Wheel speed sensor

The transmission receives the wheel speed signal from the ABS system to determine if there is wheel slip.

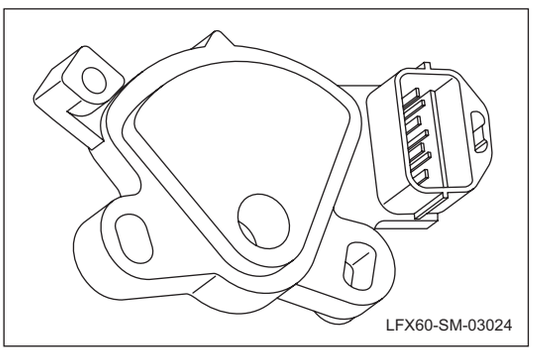
Brake switch

The brake switch signal provides the driver's deceleration signal. The transmission uses this signal to control the slip rate of the clutch.

Transmission Control Unit (TCU)

The transmission control unit (TCU) is used to receive the sensor signals for control over speed ratio, clutch, and clamping force

Gear switch



CVT self-learning

Self-learning condition

In the event of the following circumstances, the transmission needs to learn by itself, or you may feel not so smooth when you shift gears or start the car.

1. Driven for the first time as a new car.
2. TCU was replaced.
3. Transmission assembly was overhauled.

Self-learning process

1. Step on and hold the brake to keep the car still.
2. The engine is idling stably (do not turn on or off the air conditioner and other electrical equipment, because these behaviors may cause idling fluctuation).
3. When the transmission fluid is greater than 60℃ .
4. Move the shift lever to P (or N).
5. Start the engine
6. Standing for 2min.
7. Self-learning is completed.

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Note:

In order to achieve a good driving effect in a variety of conditions, the transmission needs to perform a self-learning operation at high temperature, low temperature, room temperature and other conditions.

Gear description

P (parking)

Get the output shaft of the transmission locked to prevent the driving wheels from moving, and use the handbrake when the vehicle is stopped for a long time.

- When the transmission stops at P (or N), the engine can be ignited yet the other gears can not be ignited.
- The shift mechanism has parking lock. To quit P, step on the brake pedal and switch the car to "KEY ON".
- If the lever cannot quit P, you can get it unlocked by mechanical means.
- It is forbidden to move the lever to P before the car is completely stopped. Otherwise, the car will be prone to being out of control.
- Do not replace position P with the hand brake, and, after the vehicle is completely stopped, pull the hand brake first before moving the lever to P.
- Do not park the car on a long ramp, and a safe parking slope should not be greater than 30%.

R (Reverse)

R (Reverse) for reversing motion.

- Before the shift lever is pushed to or pulled away from R, it is necessary to confirm that the car is completely stopped, or the transmission may be easily damaged.
- Before stopping the vehicle in D gear, check the environment and ensure the safety.

N (neutral)

When the lever stays at N, the driving wheels and transmission are both freely idling, which is suitable for a short-time stop.

- When the transmission stops at N (or P), the engine can be ignited yet the other gears can not be ignited.
- When the lever stays at N, if you do not pull the hand brake or step on the foot brake, the car will be rolling on the ramp, which may cause an accident.
- It is forbidden put the shift lever at N when the car is moving at a high speed, or the transmission may be easily damaged.
- Neutral taxiing is prohibited after the stalling of engine, or the transmission can be easily damaged.

D (drive)

Normal forward mode for stepless speed variation: when the shift lever stays at D, the transmission will automatically select the appropriate speed ratio according to the driver's intention.

- Make sure the car is completely stopped before moving the lever to D.
- Before stopping the vehicle in D gear, check the environment and ensure the safety.

Moving mode

This mode is activated when the shift lever is pushed to S/M from D; quit the mode by moving the lever back to D or shifting up or down.

Note:

Apply S/M as needed.

S/M (manual mode)

You can see a "+" and a "-" at S/M, also known as "M+" and "M-" .

- M+: Move the shift lever forward to speed up.
- M-: Move the shift lever backward to slow down.

CVT has seven forward gears. No matter the car is still or running, just push the shift lever to switch between M and D; unlike manual transmissions, it is allowed to shift the gears when the accelerator pedal is pressed. A driver can manually shift up or down to experience a shifting effect similar to manual transmission for more driving pleasure.

Note:

- Apply M as needed.
- You can move the shift lever from speed 1 to speed 7 or vice versa.
- In manual mode, the driver must shift the gear in a suitable operating condition to keep the engine away from the red line -- running with high loads for a long time.
- In manual mode: When the car slows down, the car will shift down automatically; when the engine runs too fast, you have to shift the gears at certain accelerator and speed conditions in manual mode. If these conditions are not met, the transmission does not perform any shift action even if the shift lever is pushed.

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- When driving on ice or low-attachment roads, you can switch to manual mode and put the shift lever at position 2 before starting the car, so that the car grips the ground well, or you can realize this function through snow mode.

L (low speed)

When driving downhill or along long-distance ramps, you can brake with the engine at this gear.

ℹ Note:

Apply L as needed.

Snow mode

Press the “SNOW”button, and TCU will enter the snow mode program. Snow mode is suitable for driving on low-grip roads. Press the button again to quit the snow mode.

- In snow mode, TCU controls the transmission to start the car at the second gear to avoid slip.
- When the car gets matched up with ESP, please do not turn on the snow mode of transmission and TCS function in ESP at the same time, because they will conflict with each other and weaken each other.

ℹ Note:

Apply "SNOW" mode as needed.

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Diagnostic Information and Procedures

Diagnosis Instructions

Before starting to diagnose a fault in the CVT control system, familiarize yourself with the operating principle of the CVT control system, and then start the system diagnostics, which helps to determine the correct troubleshooting steps in the event of a failure. More importantly, this also helps to determine whether the customer's situation belongs to normal operation.

Any troubleshooting of the CVT control system should begin with the CVT control system check, so as to instruct the service personnel to take the next logical step to troubleshoot. Understanding and using the CVT diagnostic flowchart correctly can reduce the diagnosis time and avoid misjudgment of components.

Visual Inspection

1. Confirm the problem raised by the customer.
2. Check the evident mechanical faults.

visual check table

Mechanical	Electrical
• Leakage • Shift level • Shift cable • Brake switch	• Fuse • Line • Harness plug • TCM

3. Solve the problem finding before the next step inspection.
4. If the observed or raised problem is the evident and the cause has been found, ensure to fix this fault before proceeding with the next step.
5. If the visual check is OK, check for the problems against the fault list.

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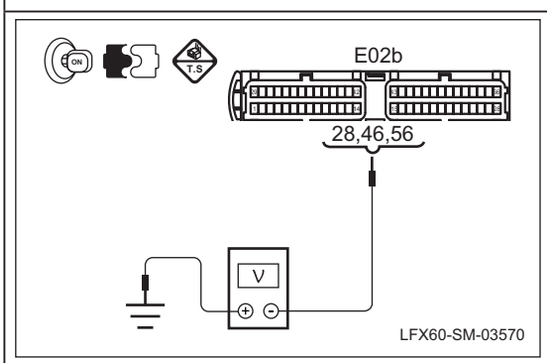
Fault symptom table

Symptom	Possible point of failure	Recommended measures
The fault indicator is not working properly	• Line fault	• Line fault maintenance
	• Instrument damage	• Replace the instrument **Refer to:replacement of instrument cluster assembly**
	• CAN bus fault	• Repair CAN bus
	• TCM	• Replace the TCM **Refer to:replacement of transmission control module (TCM)**
Difficulty in starting the car	• Self-learning not fully finished • Brake switch signal • Valve body fault • Transmission internal fault • TCM	**Refer to: Diagnostic process for difficulty in starting the car**
Shifting rush when car is running	• Self-learning not fully finished	• Repair the high oil temperature fault
	• Oil deterioration	• Replace the transmission oil **Refer to:transmission oil draining and filling procedures (CVT)**
	• Speed sensor of input belt pulley shaft	• Replace the speed sensor of input belt pulley shaft **Refer to: Replacement of the speed sensor of input shaft**
	• Output belt pulley shaft speed sensor	• Replace the speed sensor of output belt pulley shaft **Refer to: Replacement of the speed sensor of output shaft**
	• TCM damage	• Replace the TCM **Refer to:replacement of transmission control module (TCM)**
Manual mode can not be enabled	• Harness plug • The switch inside the shift lever assembly is damaged • TCM damage	**Refer to: Diagnostic process for the problem that the manual mode can not be enabled**
Transmission fluid temperature is too high	• Transmission fluid leakage/shortage	• Repair the leakage problem and add transmission fluid
	• Transmission fluid is polluted and the fluid quality gets poor	• Replace the transmission fluid
	• Filter blocked	• Replace the filter
	• Transmission cooler hose blocked or shrunken	• Repair or replace the transmission hose
	• Transmission fluid cooler performs abnormal	• Repair or replace the transmission fluid cooler
	• Vehicle overload	• No overloading
	• Drawn using wrong gears	• Get the car drawn using appropriate gears
	• Transmission internal fault	• Replace CVT assembly

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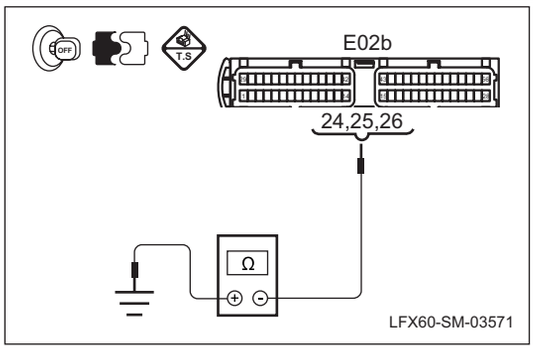
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Diagnostic process for difficulty in starting the car

Test condition	Details / Results / Measures
1. Check the trouble code.	
	A. Connect the diagnostic meter. B. Test CVT system with the vehicle diagnostic meter. Is there a fault code in the transmission system? →**Yes** Check the DTC. →**No** Step 2
2. Check the adaptive learning.	
	A. Check adaptive learning Is the self-learning finished? →**Yes** Step 3 →**No** Carry out adaptive learning.
3. Check the transmission fluid level.	
	A. Check transmission oil level Is the level normal? → **Yes** Step 4 → **No** Adjust the fluid level to the normal mark.
4. Check the transmission control module power supply.	
	A. Operate the start switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the TCM harness plug E02b. D. Connect the battery negative terminal. E. Operate the start switch to turn the power to ON state. F. Measure the voltage between the TCM harness plug E02b terminal 28, 46, 56 and the fixed ground point with the multimeter. **Standard value: 11 ~ 14V** Is the voltage normal? → **Yes** Step 5. → **No** Repair the TCM power line fault and replace the harness if necessary.

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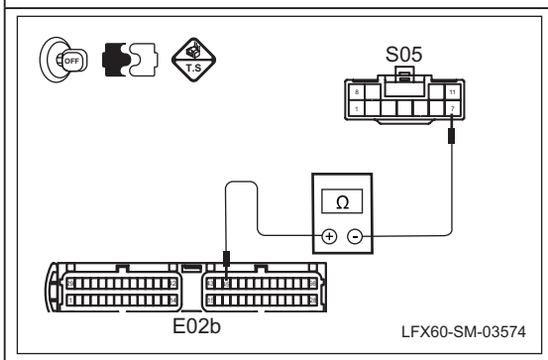
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Test condition	Details / Results / Measures
5. Check the TCM ground line.	
	A. Operate the start switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the TCM harness plug E02b. D. Measure the resistance between the TCM harness plug E02b terminal 24, 25, 56 and the fixed ground point with the multimeter. **Standard value: less than 5Ω** Is the resistance normal? → **Yes** Step 6. → **No** Repair the TCM ground line fault and replace the harness if necessary.
6. Check the transmission control module.	
	A. Replace the TCM. **Refer to:replacement of TCM** B. Execute the adaptive learning. **Refer to:CVT self-learning** Is the vehicle normal? → **Yes** Replace the TCM. → **No** Step 7
7. Check CVT for mechanical fault.	
	A. Replace the transmission assembly. **Refer to:replacement of the transmission assembly.** Confirm the fault is eliminated.

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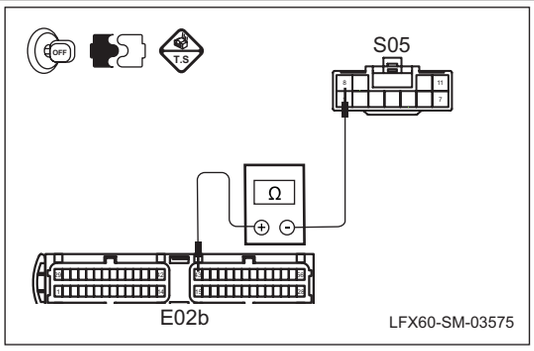
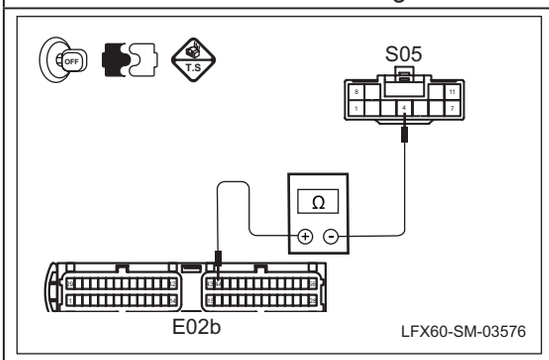
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Diagnostic process for failure to start manual mode

Test condition	Details / Results / Measures
1. Check the trouble code.	
	A. Connect the diagnostic meter. B. Test CVT system with the vehicle diagnostic meter. Is there CVT system DTC? → **Yes** Check the DTC. → **No** Step 2
2. Check the manual mode switch.	
	A. Check the manual mode switch. Is the switch normal? → **Yes** Step 3 → **No** Replace the shift lever assembly. Refer to:Replacement of gear lever assembly (CVT)
3. Check the S/M signal line.	
	A. Operate the start switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the TCM harness plug E02b. D. Disconnect the gear lever harness plug S05. E. Connect the battery negative terminal. F. Use a multimeter to measure the resistance between terminal 45 of transmission control module harness plug E02b and terminal 7 of shift lever harness plug S05. **Standard value: less than 5Ω** Is the resistance normal? → **Yes** Step 4 → **No** Check S/M signal line for fault; and replace the harness, if necessary.

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Test condition	Details / Results / Measures
4. Check the manual upshift signal line.	
	A. Operate the start switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the TCM harness plug E02b. D. Disconnect the gear lever harness plug S05. E. Measure the resistance between the TCM harness plug E02b terminal 43 and gear lever harness plug S05 terminal 8 with the multimeter. **Standard value: less than 5Ω** Is the resistance normal? → **Yes** Step 5 → **No** Check the manual upshift signal line for fault; and replace the harness, if necessary.
5. Check the manual downshift signal line.	
	A. Operate the start switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the TCM harness plug E02b. D. Disconnect the gear lever harness plug S05. E. Measure the resistance between the TCM harness plug E02b terminal 44 and gear lever harness plug S05 terminal 4 with the multimeter. **Standard value: less than 5Ω** Is the resistance normal? →**Yes** Step 5 → **No** Repair the open circuit fault of manual downshift signal line; and replace the harness, if necessary.
6. Check the shift lever assembly.	
	A. Replace the shift lever assembly. **Refer to:Replacement of gear lever assembly (CVT)** Is the troubleshooting successful? →**Yes** Replace the shift lever. →**No** Step 7
7. Replace the transmission control module.	
	A. Replace the TCM. **Refer to:Replacement of TCM** Confirm the fault is solved.

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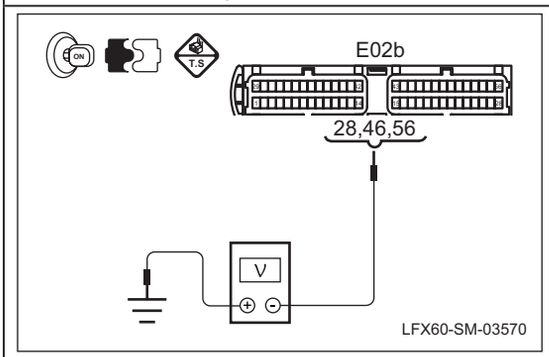
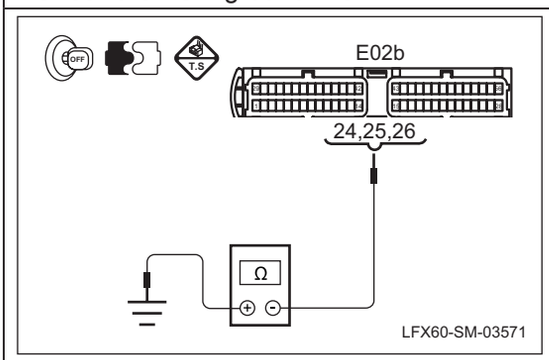
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Diagnostic process for driving impact

Test condition	Details / Results / Measures
1. Check the trouble code.	
	A. Connect the diagnostic meter. B. Test CVT system with the vehicle diagnostic meter. Is there CVT system DTC? → **Yes** Check the DTC. → **No** Step 2
2. Check if the transmission is in emergency mode.	
	A. oad test. B. Check if CVT can shift up and down in manual mode, and check if the vehicle speed increases as the engine speed increases. Is CVT in emergency mode? → **Yes** Repair the emergency mode problem. → **No** Step 3
3. Check the CVT harness plugs.	
	A. Check that CVT harness plug E02b is reliably connected without stripping or fouling. Is the result normal? →**Yes** Step 4 →**No** Repair the harness plug or replace the harness.
4. Check CVT adaptive learning.	
	A. Check CVT adaptive learning. Is the self-learning finished? →**Yes** Step 5 →**No** Carry out adaptive learning. **Refer to:CVT**

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Test condition	Details / Results / Measures
5. Check the transmission fluid.	
	A. Check the transmission fluid level and quality. Are the results normal? →**Yes** Step 6 → **No** Replace CVT fluid. **Refer to:Transmission oil draining and filling procedures (CVT)**
6. Check the TCM power line.	
	A. Operate the start switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the TCM harness plug E02b. D. Connect the battery negative terminal. E. Operate the start switch to turn the power to ON state. F. Measure the voltage between the TCM harness plug E02b terminal 28, 46, 56 and the fixed ground point with the multimeter. **Standard value: 11 ~ 14V** Is the voltage normal? →**Yes** Step 7. →**No** Repair the TCM power line fault and replace the harness if necessary.
7. Check the TCM ground line.	
	A. Operate the start switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the TCM harness plug E02b. D. Measure the resistance between the TCM harness plug E02b terminal 24, 25, 56 and the fixed ground point with the multimeter. **Standard value: less than 5Ω** Is the resistance normal? →**Yes** Step 8. →**No** Repair the TCM ground line fault and replace the harness if necessary.

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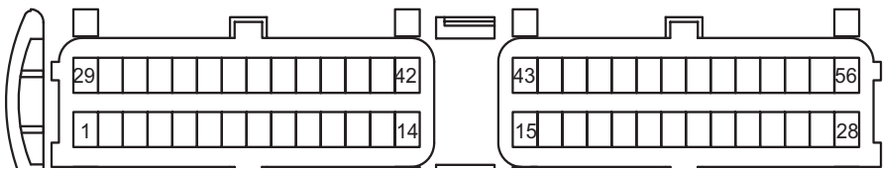
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Test condition	Details / Results / Measures
8. Check the TCM.	
	A. Replace TCM **Refer to:Replacement of transmission control module (TCM)** B. Execute the adaptive learning. **Refer to:CVT self-learning** Is the vehicle normal? →**Yes** Replace TCM →**No** Step 9
9. Repair the transmission's mechanical fault.	
	A. Repair the transmission's mechanical fault. Confirm the fault is solved.

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Control module terminal list



E02b

LFX60- SM -03577

Pin number	Wire diameter / Color	Function
1	-	-
2	-	-
3	1.25 R/G	Solenoid valve supply feedback
4	-	-
5	0.50 Y/G	Snow mode switch
6	0.50 Gr/R	Normally closed signal of the brake switch
7	0.50 Gr/W	Normally open signal of the brake switch
8	0.50 Bl/G	Power supply for input shaft pressure sensor
9	-	-
10	0.50 Bl/Y	Input shaft pressure sensor grounded
11	0.50 Bl/W	Input shaft pressure sensor signal
12	0.50 Bl/R	Output shaft pressure sensor grounded
13	0.50 Bl	Output shaft pressure sensor signal
14	0.50 W/G	Reverse gear signal
15	0.50 O	Position P signal
16	0.50 Br/G	N gear signal
17	0.50 Y	D gear signal
18	0.50 R/W	S gear signal
19	0.50 R/Y	Output shaft speed sensor grounded
20	0.50 Bl/B	Grounding
21	0.50 Br/B	Turbine speed sensor grounded
22	0.50 V/W	Turbine speed sensor signal

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Pin number	Wire diameter / Color	Function
23	0.50 P	Input shaft speed sensor grounded
24	2.00 B	Grounding
25	0.50 B	Grounding
26	2.00 B	Grounding
27	0.50 Gr/O	Power supply for input shaft speed sensor
28	0.75 B/W	IG power supply
29	-	-
30	0.50 Y/Bl	Solenoid valve lock for position P
31	0.50 Y/R	Start control signal
32	0.50 Br/V	Clutch solenoid valve control
33	0.50 W/R	Hydraulic torque converter solenoid valve control
34	0.50 Br/W	Hydraulic torque converter solenoid valve control
35	0.50 Br	Solenoid valve control for input shaft pressure
36	0.50 G/Bl	Output shaft pressure sensor power supply
37	-	-
38	-	-
39	-	-
40	-	-
41	0.50 R/W	PCAN-H
42	0.50 B/W	PCAN-L
43	0.50 Y/B	Upshift switch
44	0.50 R/Bl	Downshift switch
45	0.50 Gr/V	M/S mode switch
46	0.50 B/W	IG power supply
47	0.50W	Oil temperature sensor signal
48	-	-
49	0.50 B	Gear switch power feedback
50	0.50 V	Output shaft speed sensor signal
51	0.50 Br/Y	Input shaft speed sensor signal
52	-	-
53	-	-
54	0.50 G/W	Power supply for output shaft speed sensor
55	0.50 V/Gr	Power supply for turbine speed sensor
56	1.25 R	Power source

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DTC diagnosis and testing

DTC diagnostic instructions

Once the TCM has fault code, the fault light on the dashboard will light up.
When using the diagnostic tool to read DTC and find the fault code, first check if the fault code is a historical fault and make sure it did not appear in the last driving period (the detector shall show the "historical fault"). If it is a historical fault, delete the fault code and check if the fault code appear again. If it is a current fault rather than a historical fault (the detector shows "current fault"), it should be solved step by step following the fault codes listed below.

DTC troubleshooting table

DTC	Trouble code information	Diagnostic process
P0703	Brake signal is abnormal	**Refer to:P0703**
P0705	Transmission gear signal is abnormal	**Refer to:P0705**
P0716	Turbine speed signal range is abnormal	**Refer to:P0716**
P0730	Speed ratio control is abnormal	**Refer to:P0730**
P0792	Speed signal range of input belt pulley shaft is abnormal	**Refer to:P0792**
P0811	Forward clutch slips	**Refer to:P0811**
P081E	Reverse clutch slips	**Refer to:P081E**
P0842	Pressure sensor circuit A (input pulley shaft) is short to ground or open	**Refer to:P0842, , P0843**
P0843	pressure sensor A circuit (input belt pulley shaft)short power supply circuit	
P0847	pressure sensor B circuit (output belt pulley shaft) short to groundor open circuit	**Refer to:P0847, , P0848**
P0848	Pressure sensor circuit B (input pulley shaft) is short to power supply	
P0890	TCM main relay control circuit is short or open	**Refer to:P0890**
P0894	Torque converter clutch slips	**Refer to:P0894**
P0900	Clutch solenoid valve control circuit is open	**Refer to:P0900, , P0902 ,P0903**
P0902	Clutch solenoid valve control circuit is short to ground	
P0903	Clutch solenoid valve control circuit is short to power supply	
P0938	Transmission oil temperature too high	**Refer to:P0938, , P0939 ,P0940**
P0939	Transmission fluid temperature sensor circuit is short to ground	
P0940	Transmission fluid temperature sensor circuit is short to power supply or open	
P0960	Control circuit of pressure control solenoid valve "A" (input pulley shaft) is open	**Refer to:P0960, , P0962 ,P0963**
P0962	The control circuit of pressure control solenoid valve "A" (input pulley shaft) is short-circuited	
P0963	Pressure control solenoid valve “A” (input belt pulley shaft)control circuit short power supply	

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DTC	Trouble code information	Diagnostic process
P0964	Pressure control solenoid valve “B” (output belt pulley shaft)control circuit open circuit	**Refer to:P0964, , P0966 ,P0967**
P0966	Pressure control solenoid valve “B” (output belt pulley shaft)control circuit short circuit	
P0967	The control circuit of pressure control solenoid valve "B" (output pulley shaft) is short to power supply	
P0968	The control circuit of pressure control solenoid valve "C" (torque converter) is open	**Refer to:P0968, , P0970 ,P0971**
P0970	The control circuit of pressure control solenoid valve "C" (torque converter) is short-circuited	
P0971	The control circuit of pressure control solenoid valve "C" (torque converter) is short to power supply	
P1706	Steel belt slips	**Refer to:P1706**
P1745	Speed signal range of output belt pulley shaft is abnormal	**Refer to:P1745**
P2797	Input pulley shaft pressure control is abnormal	**Refer to:P2797**
P2798	output belt pulley shaft pressure control is abnormal	**Refer to:P2798**
U0100	ECM communication failure	**Refer to:U0100 ,U0121 ,U0401**
U0121	ABS communication fault	
U0401	ECM data reception is abnormal	

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DTC P0703

DTC description

DTC	Description	Definition
P0703	• Brake signal is abnormal	• Brake signal, received by TCM via CAN bus, is mainly used to determine the current acceleration / deceleration state, providing important information for the transmission fluid pressure, hydraulic torque converter, and intelligent shift control.

Possible causes

DTC	Detection strategy	Set the condition (control strategy)	Define the fault location
P0703	• Checking the hardware or harness	• When the valid bit of the brake signal received from the CAN bus is 1, the diagnostic condition is satisfied and the fault is being acknowledged.	• Brake switch • Brake switch line

Diagnostic process

Test condition	Details / Results / Measures
1. General check	
	A. Check the brake switch harness plugs, the engine control modules for damage, poor contact, aging, looseness and other problematic signs. Are the results normal? →**Yes** Step 2 →**No** Examine and repair the fault location.
2. Clear the trouble code.	
	A. Connect the equipment for diagnosing faults to the diagnostic interface. B. operate the start switch to turn the power to ON state. C. Clear the trouble code by using diagnostic equipment. Does the trouble code reappear? →**Yes** Step 3 → **No** Finish.

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Test condition	Details / Results / Measures
3. Check the brake switch for related faults.	
	A. Identify the brake switch faults. **Refer to:"P0703" fault diagnosis** **→Yes** Fault diagnosis **→Yes** Step 4. **→No** Repair the brake switch faults.
4. Check the CAN communication between TCM and ECM.	
	A. Check the CAN communication between TCM and ECM. **Refer to:"U0100" fault diagnosis** Confirms that the troubleshooting is successful.

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DTCP0705

DTC description

DTC	Description	Definition
P0705	• Transmission gear signal is abnormal	• Transmission gear (PRND) signal is processed by TCM circuit, and the low level signals are active. This is mainly used to determine the current driving mode to provide important information for the coupling and variable speed control of clutch.

Possible causes

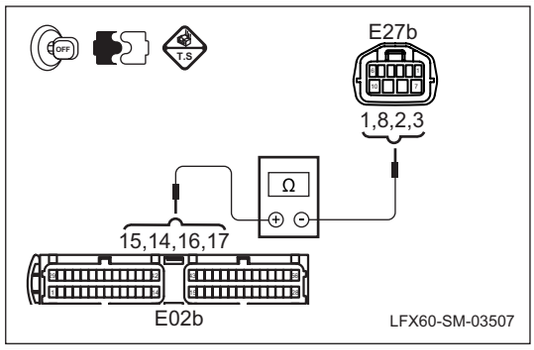
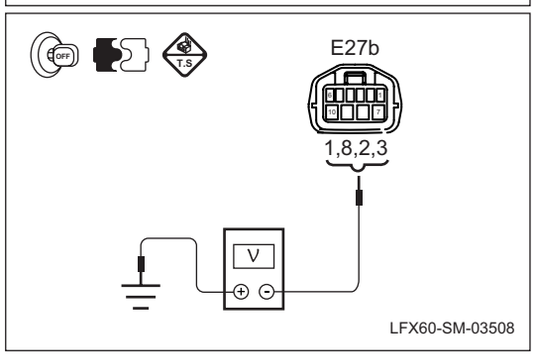
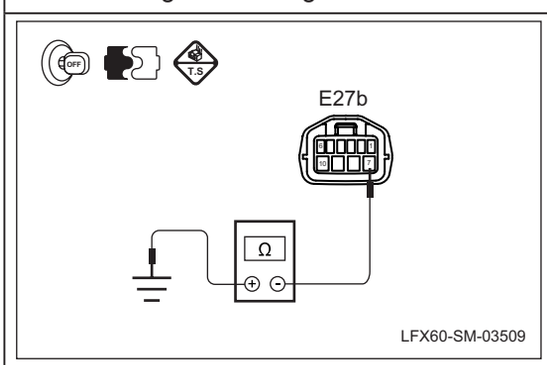
DTC	Detection strategy	Set the condition (control strategy)	Define the fault location
P0705	• Checking the hardware or harness	• When there are multiple or no read-in signals, the diagnostic condition is satisfied and the fault is being acknowledged. Once the error is confirmed, the fail safe mode will be active and the instrument panel indicator lamp will work.	• Gear switch harness • Gear switch

Diagnostic process

Test condition	Details / Results / Measures
1. General check	
	A. Check the transmission gear switch harness plugs and TCM for damage, poor contact, aging, looseness and other problematic signs. Are the results normal? →**Yes** Step 2 →**No** Examine and repair the fault location.
2. Clear the trouble code.	
	A. Connect the equipment for diagnosing faults to the diagnostic interface. B. operate the start switch to turn the power to ON state. C. Clear the trouble code by using diagnostic equipment. Does the trouble code reappear? →**Yes** Step 3 →**No** Finish.→No Finish.

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Test condition	Details / Results / Measures
3. Check the gear switch input line.	
 	A. Operate the start switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the gear switch harness plug E27b. D. Disconnect the TCM harness plug E02b. E. Use a multimeter to measure the resistance between terminal 1 of gear switch harness plug E27b and terminal 15 of transmission control module harness plug E02b. F. Measure the resistance between the gear switch harness plug E27b terminal 8 and transmission control module harness plug E02b terminal 14 with the multimeter. G. Measure the resistance between the gear switch harness plug E27b terminal 2 and transmission control module harness plug E02b terminal 16 with the multimeter. H. Measure the resistance between the gear switch harness plug E27b terminal 3 and transmission control module harness plug E02b terminal 17 with the multimeter. **Standard value: less than 5Ω** I. Connect the negative terminal 1 of the battery. J. Use a multimeter to measure the voltage between terminal 1 of gear switch harness plug E27b and the reliable ground point. K. Measure the voltage between the gear switch harness plug E27b terminal 8 and the fixed ground point with the multimeter. L. Measure the voltage between the gear switch harness plug E27b terminal 2 and the fixed ground point with the multimeter. M. Measure the voltage between the gear switch harness plug E27b terminal 3 and the fixed ground point with the multimeter. **Standard value:0V** Is the voltage normal? →**Yes** Step 4. →**No** Check the gear switch input line for fault; and replace the harness, if necessary.
4. Check the gear switch ground line.	
	A. Operate the start switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the gear switch harness plug E27b. D. Connect the battery negative terminal. E. Disconnect the harness plug E02b from the transmission control module. F. Use a multimeter to measure the resistance between terminal 7 of gear switch harness plug E27b and the reliable ground point. **Standard value: less than 5Ω** Is the resistance normal? →**Yes** Step 5 →**No** Check the gear switch ground line for fault; and replace the harness, if necessary.

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Test condition	Details / Results / Measures
5. Check the gear switch.	
	A. Operate the start switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the gear switch harness plug E27b. D. Use a multimeter to measure the resistance between terminals 1 and 7 of the gear switch when the shift lever stays at P. E. Measure the resistance between the terminal 8 and 7 of the gear switch at R gear with a multimeter. F. Measure the resistance between the terminal 2 and 7 of the gear switch at N gear with a multimeter. G. Measure the resistance between the terminal 3 and 7 of the gear switch at D gear with a multimeter. **Standard value: less than 5Ω** H. Use a multimeter to measure the resistance between terminals 1 and other terminals of the gear switch when the shift lever stays at P. I. Measure the resistance between terminal 8 and other terminals of the gear switch at R gear with a multimeter. J. Measure the resistance between terminal 2 and other terminals of the gear switch at N gear with a multimeter. K. Measure the resistance between terminal 3 and other terminals of the gear switch at D gear with a multimeter. **Standard value: 10MΩ or higher** Is the resistance normal? →**Yes** Step 6 →**No** Replace the gear switch.
6. Check the TCM.	
	A. Replace the TCM. **Refer to:Replacement of transmission control module (TCM)** Confirms that the troubleshooting is successful.

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DTCP0716

DTC description

DTC	Description	Definition
P0716	• Turbine speed signal range is abnormal	• The turbine speed signal is processed by TCM circuit and it is a kind of high frequency pulse signal. TCM works out the turbine speed according to the pulse signal. This is mainly designed for the hydraulic torque converter locking, clutch engagement and the variable speed control functions.

Possible causes

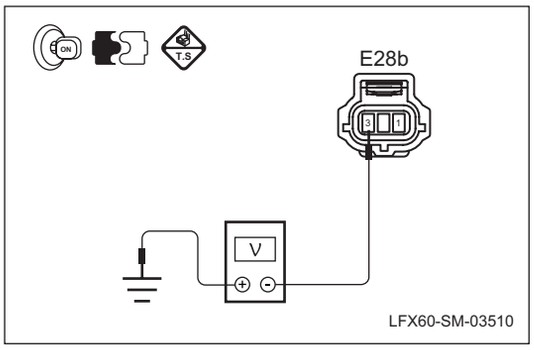
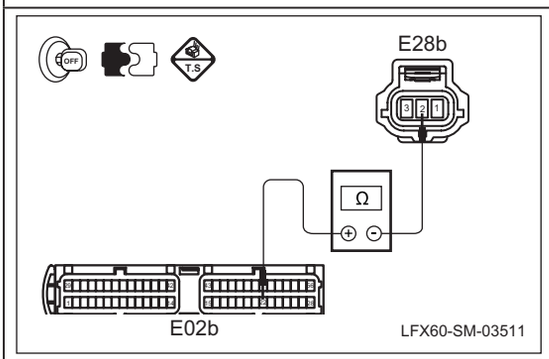
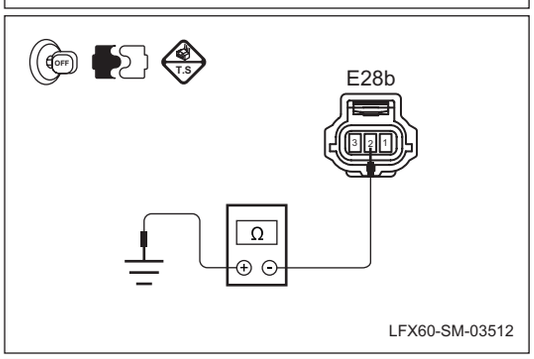
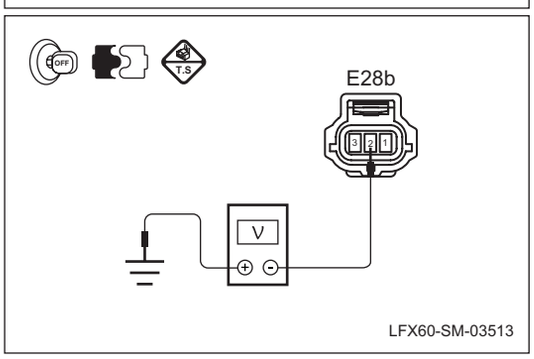
DTC	Detection strategy	Set the condition (control strategy)	Define the fault location
P0716	• Checking the hardware or harness	• When the turbine speed is equal to 0 when the car is running, the diagnostic condition is established and the fault is being acknowledged. Once the error is confirmed, the fail safe mode will be active, the alternative procedure will be executed and the instrument panel indicator lamp will work.	• Turbine speed sensor installed incorrectly • Turbine speed sensor line • Turbine speed sensor

Diagnostic process

Test condition	Details / Results / Measures
1. General check	
	A. Check the turbine speed sensor and transmission control module harness plugs for damage, poor contact, aging, looseness and other problematic signs. B. Check if the turbine speed sensor is installed incorrectly. Are the results normal? →**Yes** Step 2 →**No** Examine and repair the fault location.
2. Clear the DTC.	
	A. Connect the equipment for diagnosing faults to the diagnostic interface. B. operate the start switch to turn the power to ON state. C. Clear the trouble code by using diagnostic equipment. Does the trouble code reappear? →**Yes** Step 3. →**No** Finish.

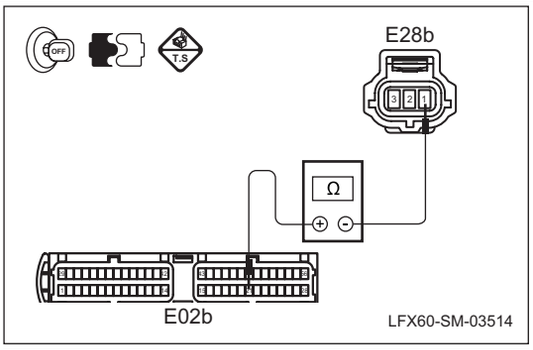
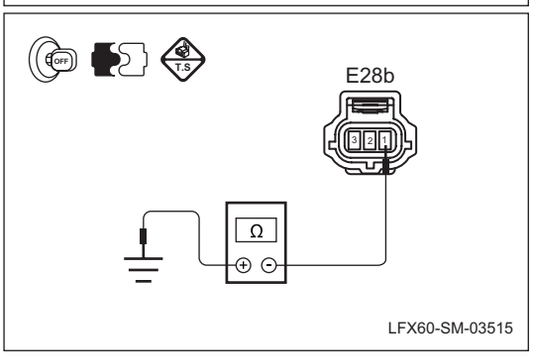
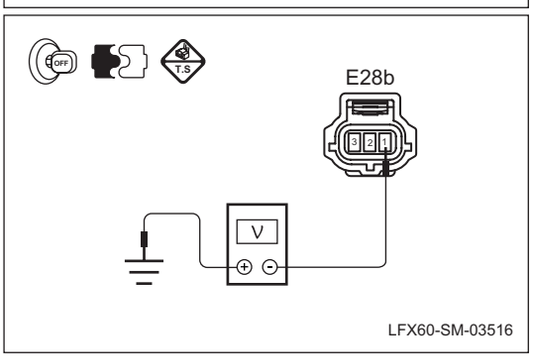
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Test condition	Details / Results / Measures
3. Check the turbine speed sensor power supply line.	
	A. Operate the start switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the turbine speed sensor harness plug E28b. D. Connect the battery negative terminal. E. operate the start switch to turn the power to ON state. F. Use a multimeter to measure the voltage between terminal 3 of turbine speed sensor harness plug E28b and the reliable ground point. **Standard value:4.5 ~ 5.5V** Is the voltage normal? →**Yes** Step 4. →**No** Repair the power line of turbine speed sensor; replace the harness, if necessary.
4. Check the turbine speed sensor signal line.	
  	A. Operate the start switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the turbine speed sensor harness plug E28b. D. Disconnect the TCM harness plug E02b. E. Measure the resistance between the turbine speed sensor harness plug E28b terminal 2 and TCM harness plug E02b terminal 22 with the multimeter. **Standard value: less than 5Ω** F. Measure the resistance between the turbine speed sensor harness plug E28b terminal 2 and the fixed ground point with the multimeter. **Standard value: 10MΩ or higher** G. Connect the battery negative terminal. H. Measure the voltage between the turbine speed sensor harness plug E28b terminal 2 and the fixed ground point with the multimeter. **Standard value:0V** Are the check results normal? →**Yes** Step 5. →**No** Repair the turbine speed sensor signal line fault and replace the harness if necessary.

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Test condition	Details / Results / Measures
5. Check the grounding line of turbine speed sensor.	
  	A. Operate the start switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the turbine speed sensor harness plug E28b. D. Disconnect the TCM harness plug E02b. E. Measure the resistance between the turbine speed sensor harness plug E28b terminal 1 and TCM harness plug E02b terminal 21 with the multimeter. **Standard value: less than 5Ω** F. Measure the resistance between the turbine speed sensor harness plug E28b terminal 1 and the fixed ground point with the multimeter. **Standard value: 10MΩ or higher** G. Connect the battery negative terminal. H. Measure the voltage between the turbine speed sensor harness plug E28b terminal 1 and the fixed ground point with the multimeter. **Standard value:0V** Are the results normal? **→Yes** Step 5. **→No** Repair the turbine speed sensor signal line fault and replace the harness if necessary.
6. Check the turbine speed sensor.	
	A. Replace the turbine speed sensor. Are the results normal? **→Yes** Step 7. **→No** Replace the turbine speed sensor
7. Check the TCM.	
	A. Replace the TCM. **Refer to:Replacement of transmission control module (TCM)** Confirms that the troubleshooting is successful.

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DTC P0730

DTC description

DTC	Description	Definition
P0730	• Speed ratio control is abnormal	• TCM obtains the target speed ratio according to the current driving mode, vehicle speed and accelerator pedal signal. The actual speed ratio is obtained by input belt pulley shaft speed and output belt pulley shaft speed. The variable speed control module realizes the speed ratio control through the comprehensive feedback control according to the above information.

Possible causes

DTC	Detection strategy	Set the condition (control strategy)	Define the fault location
P0730	• Checking the hardware or harness	• When the absolute value of the difference between the target speed ratio and the actual speed ratio is greater than a given value, the diagnostic condition is satisfied and the fault is being acknowledged. • Once the error is confirmed, the fail safe mode will be active and the instrument panel indicator lamp will work.	• Self-learning not completed • Input shaft pressure sensor • Input shaft pressure solenoid valve • Hydraulic system

Diagnostic process

Test condition	Details / Results / Measures
1. General check	
	A. Check the input shaft pressure sensor and input shaft pressure solenoid valve for damage, poor contact, aging, looseness and other problematic signs. Are the results normal? →**Yes** Step 2. →**No** Examine and repair the fault location.

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Test condition	Details / Results / Measures
2. Clear the trouble code.	
	A. Connect the equipment for diagnosing faults to the diagnostic interface. B. operate the start switch to turn the power to ON state. C. TCM self-learning. D. Use diagnostic tool to clear fault code. Does the trouble code reappear? →**Yes** Step 3. →**No** Finish.
3.Check the input shaft oil pressure sensor.	
	A. Check the input shaft pressure sensor fault. **Refer to: "P0842, P0843" DTC** Does the trouble code reappear? →**Yes** Step 4. →**No** Finish.
4. Check the input shaft pressure solenoid valve.	
	A. Check the input shaft pressure solenoid valve fault. **Refer to:"P0960,P0962,P0963" DTC** Does the trouble code reappear? →**Yes** Step 5. →**No** Finish.
5. Check the transmission hydraulic system.	
	A. Contact the related transmission technician for the data acquisition and analysis. Confirms that the troubleshooting is successful.

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DTC P0792

DTC description

DTC	Description	Definition
P0792	• Speed signal range of input belt pulley shaft is abnormal	• The speed signal of input belt pulley shaft is processed by TCM circuit and it is a kind of high frequency pulse signal. TCM works out the turbine speed according to the pulse signal. Mainly used for torque converter locking, clutch coupling and variable speed control.

Possible causes

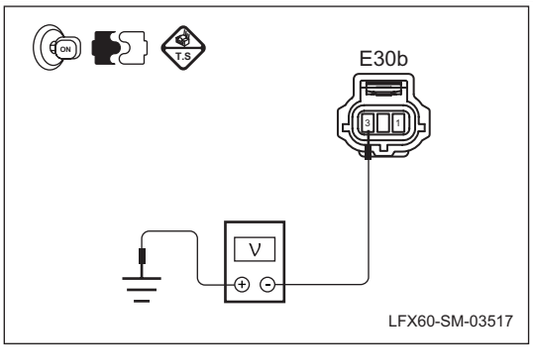
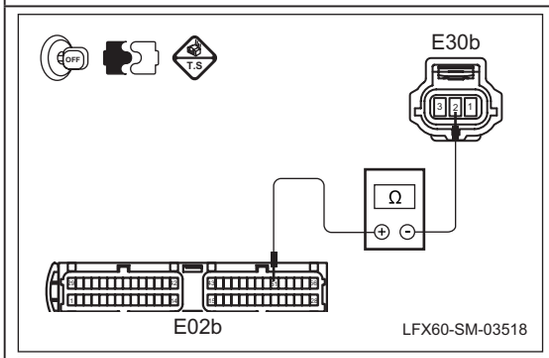
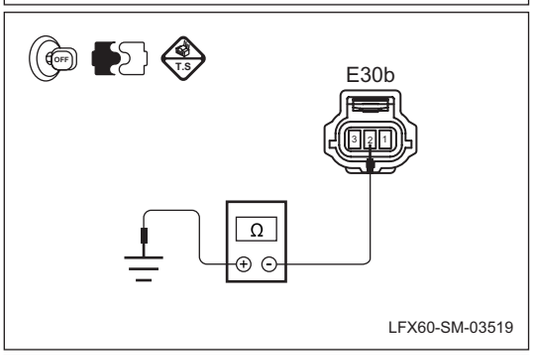
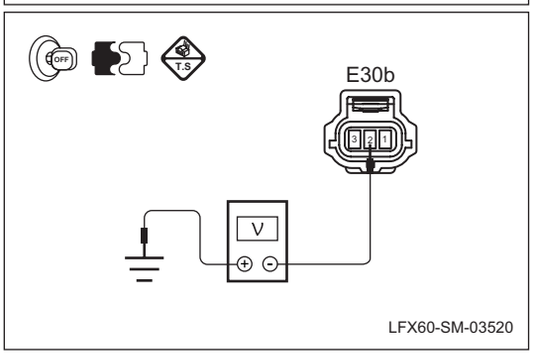
DTC	Detection strategy	Set the condition (control strategy)	Define the fault location
P0792	• Checking the hardware or harness	• When the input speed is equal to 0 while the car is running, the diagnostic condition is established and the fault is being acknowledged. Once the error is confirmed, the fail safe mode will be active, the alternative procedure will be executed and the instrument panel indicator lamp will work.	• Input shaft speed sensor line • Input shaft speed sensor

Diagnostic process

Test condition	Details / Results / Measures
1. General check	
	A. Check the input shaft speed sensor and transmission control module harness plugs for damage, poor contact, aging, looseness and other problematic signs. B. Check if the speed sensor is installed incorrectly. Are the results normal? →**Yes** Step 2. →**No** Examine and repair the fault location.
2. Clear the trouble code.	
	A. Connect the equipment for diagnosing faults to the diagnostic interface. B. Operate the start switch to turn the power to ON state. C. Clear the trouble code by using diagnostic equipment. Does the trouble code reappear? →**Yes** Step 3. →**No** Finish.

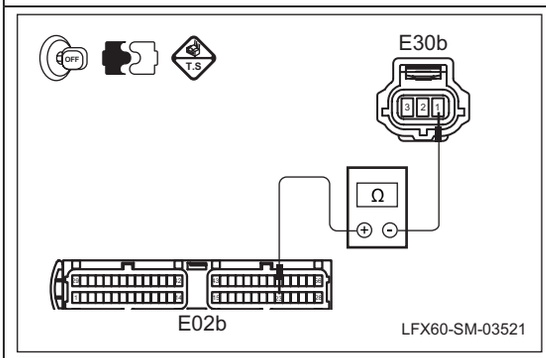
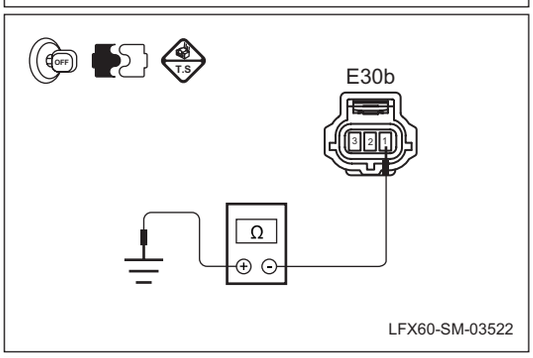
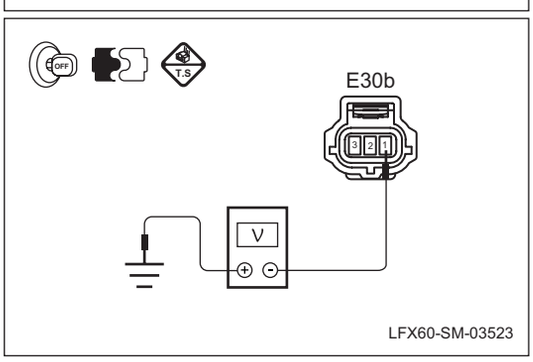
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Test condition	Details / Results / Measures
3. Check the input shaft speed sensor power supply line.	
	A. Operate the start switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the input shaft speed sensor harness plug E30b. D. Connect the battery negative terminal. E. Operate the start switch to turn the power to ON state. F. Use a multimeter to measure the voltage between terminal 3 of input shaft speed sensor harness plug E30b and the reliable ground point. **Standard value:4.5 ~ 5.5V** Is the voltage normal? **→Yes** Step 4. **→No** Repair the power line of input shaft speed sensor; replace the harness, if necessary.
4. Check the input shaft speed sensor signal line.	
  	A. Operate the start switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the input shaft speed sensor harness plug E30b. D. Disconnect the TCM harness plug E02b. E. Measure the resistance between the input shaft speed sensor harness plug E30b terminal 2 and TCM harness plug E02b terminal 51 with the multimeter. **Standard value: less than 5Ω** F. Measure the resistance between the input shaft speed sensor harness plug E30b terminal 2 and the fixed ground point with the multimeter. **Standard value: 10MΩ or higher** G. Connect the battery negative terminal. H. Measure the voltage between the input shaft speed sensor harness plug E30b terminal 2 and the fixed ground point with the multimeter. **Standard value:0V** Are the results normal? **→Yes** Step 5. **→No** Repair the signal line of input shaft speed sensor; replace the harness, if necessary.

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Test condition	Details / Results / Measures
5. Check the grounding line of input shaft speed sensor.	
 LFX60-SM-03521  LFX60-SM-03522  LFX60-SM-03523	A. Operate the start switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the input shaft speed sensor harness plug E30b. D. Disconnect the TCM harness plug E02b. E. Measure the resistance between the input shaft speed sensor harness plug E30b terminal 1 and TCM harness plug E02b terminal 23 with the multimeter. **Standard value: less than 5Ω** F. Measure the resistance between the input shaft speed sensor harness plug E30b terminal 1 and the fixed ground point with the multimeter. **Standard value: 10MΩ or higher** G. Connect the battery negative terminal. H. Measure the voltage between the input shaft speed sensor harness plug E30b terminal 1 and the fixed ground point with the multimeter. **Standard value:0V** Are the results normal? →**Yes** Step 5. →**No** Repair the signal line of input shaft speed sensor; replace the harness, if necessary.
6. Check the input shaft speed sensor.	
	A. Replace the input shaft speed sensor. Are the results normal? →**Yes** Step 7. →**No** Replace the input shaft speed sensor.
7. Check the TCM.	
	A. Replace the TCM. **Refer to:Replacement of transmission control module (TCM)** Confirms that the troubleshooting is successful.

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DTCP0811

DTC description

DTC	Description	Definition
P0811	• Forward clutch slips	• Clutch control is used to realize fast and smooth coupling of gear D.

Possible causes

DTC	Detection strategy	Set the condition (control strategy)	Define the fault location
P0811	• Checking the hardware or harness	• When the slip difference between the forward clutch input speed and output speed is relatively obvious after the coupling or locking, the diagnostic condition is established and the fault is being acknowledged. Once the error is confirmed, the fail safe mode will be active and the instrument panel indicator lamp will work.	• Turbine speed sensor • Clutch control solenoid valve • Hydraulic system • Forward clutch friction plate

Diagnostic process

Test condition	Details / Results / Measures
1. General check	
	A. Check the turbine speed sensor, clutch control solenoid valve and TCM harness plug for breakage, loose contact, aging or looseness. Are the results normal? →**Yes** Step 2. →**No** Examine and repair the fault location.
2. Clear the trouble code.	
	A. Connect the equipment for diagnosing faults to the diagnostic interface. B. operate the start switch to turn the power to ON state. C. Clear the trouble code by using diagnostic equipment. Does the trouble code reappear? →**Yes** Step 3. →**No** Finish.

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Test condition	Details / Results / Measures
3. Check the turbine speed sensor.	
	A. Check the turbine speed sensor fault. **Refer to:"P0716" DTC** Does DTC recur? →**Yes** Step 4. →**No** Finish.
4. Check the clutch solenoid valve.	
	A. Check the clutch solenoid valve fault. **Refer to:"P0900,,P0902,,P0903" DTC** Does DTC recur? →**Yes** Step 5. →**No** Finish.
5. Check the transmission hydraulic system.	
	A. Contact the related transmission technician for the data acquisition and analysis. Are the results normal? →**Yes** Step 6. →**No** Examine and repair the fault location.
6. Check the forward clutch friction plate.	
	A. Contact the related transmission technician for the check and analysis. Confirms that the troubleshooting is successful.

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DTC P081E

DTC description

DTC	Description	Definition
P081E	• Reverse clutch slips	• Clutch control is used to realize fast and smooth coupling of gear R.

Possible causes

DTC	Detection strategy	Set the condition (control strategy)	Define the fault location
P081E	• Checking the hardware or harness	• When the slip difference between the reverse clutch input speed and output speed is relatively obvious after the coupling or locking, the diagnostic condition is established and the fault is being acknowledged. Once the error is confirmed, the fail safe mode will be active and the instrument panel indicator lamp will work.	• Turbine speed sensor • Clutch solenoid valve • Hydraulic system • Reverse clutch friction plate

Diagnostic process

Test condition	Details / Results / Measures
1. General check	
	A. Check the turbine speed sensor, clutch control solenoid valve and TCM harness plug for breakage, loose contact, aging or looseness. Are the results normal? →**Yes** Step 2. →**No** Examine and repair the fault location.
2. Clear the trouble code.	
	A. Connect the equipment for diagnosing faults to the diagnostic interface. B. operate the start switch to turn the power to ON state. C. Clear the trouble code by using diagnostic equipment. Does the trouble code reappear? →**Yes** Step 3. →**No** Finish.

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Test condition	Details / Results / Measures
3. Check the turbine speed sensor.	
	A. Check the turbine speed sensor fault. **Refer to:"P0716" DTC** Does DTC recur? →**Yes** Step 4. →**No** Finish.
4. Check the clutch control solenoid valve.	
	A. Check the clutch solenoid valve fault. **Refer to:"P0900,,P0902,,P0903" DTC** Does DTC recur? →**Yes** Step 5. →**No** Finish.
5. Check the transmission hydraulic system.	
	A. Contact the related transmission technician for the data acquisition and analysis. Are the results normal? →**Yes** Step 6. →**No** Examine and repair the fault location.
6.Check the reverse clutch friction plate.	
	A. Contact the related transmission technician for the check and analysis. Confirms that the troubleshooting is successful.

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DTC P0842,P0843

DTC description

DTC	Description	Definition
P0842	• Pressure sensor circuit A (input pulley shaft) is short to ground or open	• The transmission hydraulic pressure sensor A (input belt pulley) detects the input shaft pressure from CVT and sends a signal to TCM.
P0843	• Pressure sensor circuit A (input pulley shaft) is short to power supply	

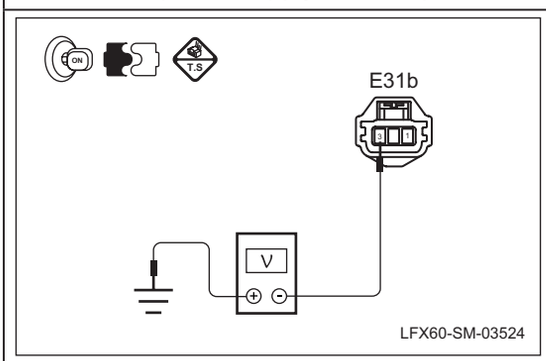
Possible causes

DTC	Detection strategy	Set the condition (control strategy)	Define the fault location
P0842	• Checking the hardware or harness	• When the oil pressure of hydraulic pressure sensor A is less than the minimum allowable value, the diagnostic condition is established and the fault is being acknowledged. Once the error is confirmed, the fail safe mode will be active, the alternative procedure will be executed and the instrument panel indicator lamp will work.	• Input shaft pressure sensor line • Input shaft pressure sensor
P0843		• When the oil pressure of hydraulic pressure sensor A is greater than the maximum allowable value, the diagnostic condition is established and the fault is being acknowledged. Once the error is confirmed, the fail safe mode will be active, the alternative procedure will be executed and the instrument panel indicator lamp will work.	

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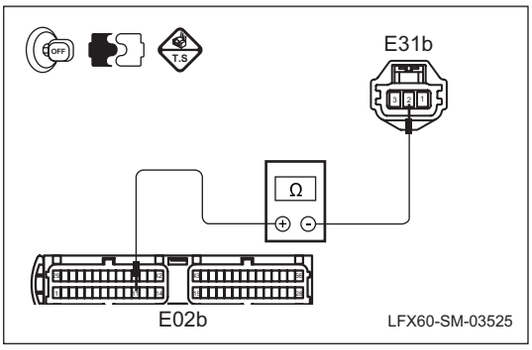
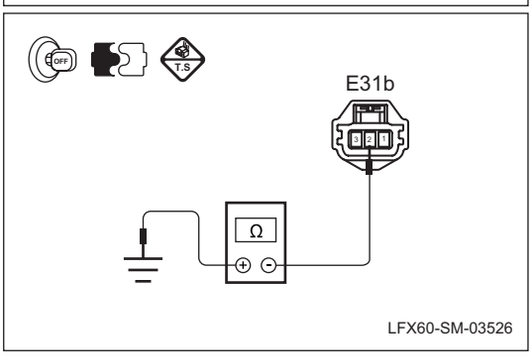
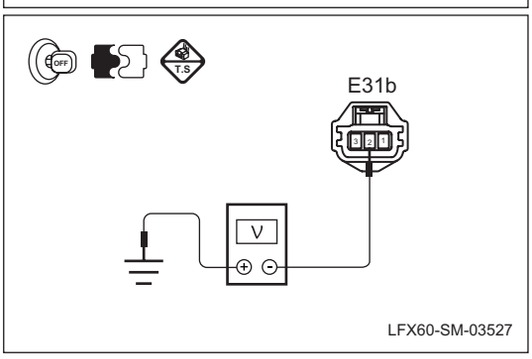
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Diagnostic process

Test condition	Details / Results / Measures
1. General check	
	A. Check the input belt pulley shaft pressure sensor and transmission control module harness plugs for damage, poor contact, aging, looseness and other problematic signs. B. Check if the input belt pulley shaft pressure sensor is installed incorrectly. Are the results normal? →**Yes** Step 2. →**No** Examine and repair the fault location.
2. Clear the DTC.	
	A. Connect the equipment for diagnosing faults to the diagnostic interface. B. operate the start switch to turn the power to ON state. C. Clear the trouble code by using diagnostic equipment. Does the trouble code reappear? →**Yes** Step 3. →**No** Finish.
3. Check the power supply line of input shaft speed sensor.	
	A. Operate the start switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the input shaft pressure sensor harness plug E31b. D. Connect the battery negative terminal. E. operate the start switch to turn the power to ON state. F. Use a multimeter to measure the voltage between terminal 3 of input shaft pressure sensor harness plug E31b and the reliable ground point. **Standard value:4.5 ~ 5.5V** Is the voltage normal? →**Yes** Step 4. →**No** Repair the power line of input shaft pressure sensor; replace the harness, if necessary.

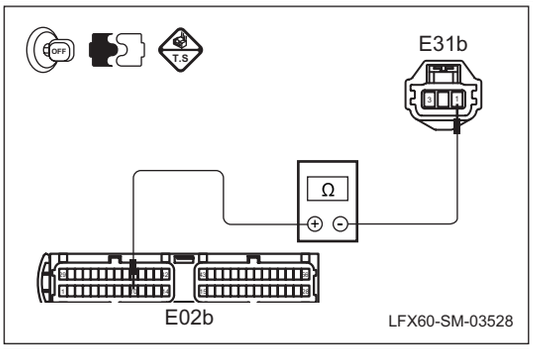
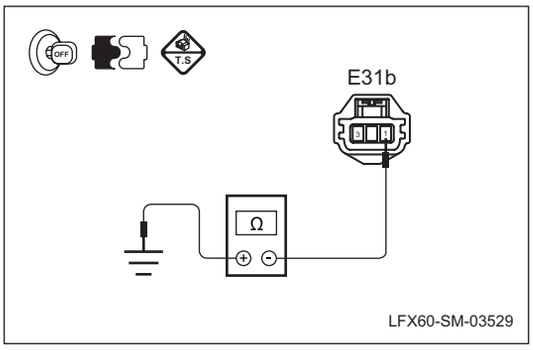
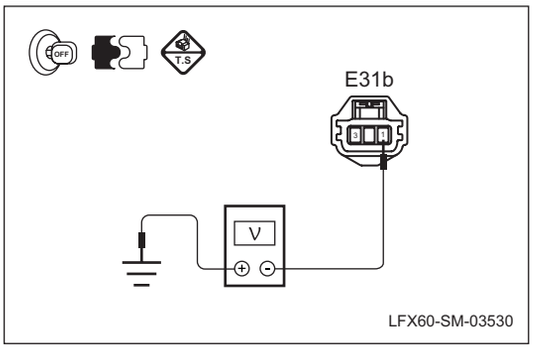
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Test condition	Details / Results / Measures
4. Check the power supply line of input shaft pressure sensor.	
  	A. Operate the start switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the input shaft pressure sensor harness plug E31b. D. Disconnect the TCM harness plug E02b. E. Use a multimeter to measure the resistance between terminal 2 of input shaft pressure sensor harness plug E31b and terminal 11 of transmission control module harness plug E02b. **Standard value: less than 5Ω** F. Measure the resistance between the input shaft pressure sensor harness plug E31b terminal 2 and the fixed ground point with the multimeter. **Standard value: 10MΩ or higher** G. Connect the battery negative terminal. H. Use a multimeter to measure the voltage between terminal 2 of input shaft pressure sensor harness plug E31b and the reliable ground point. **Standard value:0V** Are the results normal? →**Yes** Step 5. →**No** Repair the input shaft pressure sensor signal line fault and replace the harness if necessary.

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Test condition	Details / Results / Measures
5. Check the grounding line of input shaft pressure sensor.	
 LFX60-SM-03528  LFX60-SM-03529  LFX60-SM-03530	A. Operate the start switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the harness plug E31b from input belt pulley shaft pressure sensor. D. Disconnect the TCM harness plug E02b. E. Measure the resistance between the input shaft pressure sensor harness plug E31b terminal 1 and TCM harness plug E02b terminal 10 with the multimeter. **Standard value: less than 5Ω** F. Measure the resistance between the input shaft pressure sensor harness plug E31b terminal 1 and the fixed ground point with the multimeter. **Standard value: 10MΩ or higher** G. Connect the battery negative terminal. H. Measure the voltage between the input shaft pressure sensor E31b terminal 1 and the fixed ground point with the multimeter. **Standard value:0V** Are the results normal? →**Yes** Step 5. →**No** Repair the input shaft pressure sensor signal line fault and replace the harness if necessary.
6. Check the input shaft pressure sensor.	
	A. Disconnect the harness plug E31b from input shaft pressure sensor. F. Use a multimeter to measure the voltage between terminals 3 and 2 of input shaft pressure sensor. **Standard value:~10KΩ** Is the resistance normal? →**Yes** Step 7. →**No** Replace the input shaft pressure sensor.
7. Check the TCM.	
	A. Replace the TCM. **Refer to:Replacement of transmission control module (TCM)** Confirms that the troubleshooting is successful.

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DTC P0847,P0848

DTC description

DTC	Description	Definition
P0847	• Pressure sensor circuit B (output pulley shaft) is short to ground or open	• The transmission hydraulic pressure sensor B (output belt pulley) detects the input shaft pressure from CVT and sends a signal to TCM.
P0848	• Pressure sensor circuit B (input pulley shaft) is short to power supply	

Possible causes

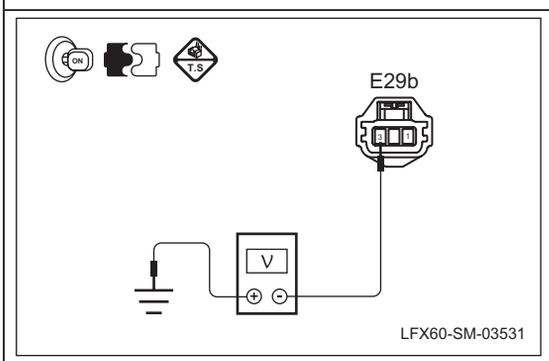
DTC	Detection strategy	Set the condition (control strategy)	Define the fault location
P0847	• Checking the hardware or harness	• When the oil pressure of hydraulic pressure sensor B is less than the minimum allowable value, the diagnostic condition is established and the fault is being acknowledged. Once the error is confirmed, the fail safe mode will be active, the alternative procedure will be executed and the instrument panel indicator lamp will work.	• Output shaft pressure sensor line • output shaft pressure sensor
P0848		• When the oil pressure of hydraulic pressure sensor B is greater than the maximum allowable value, the diagnostic condition is established and the fault is being acknowledged. Once the error is confirmed, the fail safe mode will be active, the alternative procedure will be executed and the instrument panel indicator lamp will work.	

Diagnostic process

Test condition	Details / Results / Measures
1. General check	
	A. Check the output shaft pressure sensor and transmission control module harness plugs for damage, poor contact, aging, looseness and other problematic signs. B. Check if the output belt pulley shaft pressure sensor is installed incorrectly. Are the results normal? →**Yes** Step 2. →**No** Examine and repair the fault location.

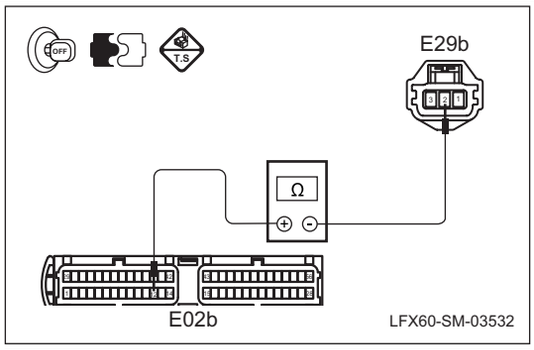
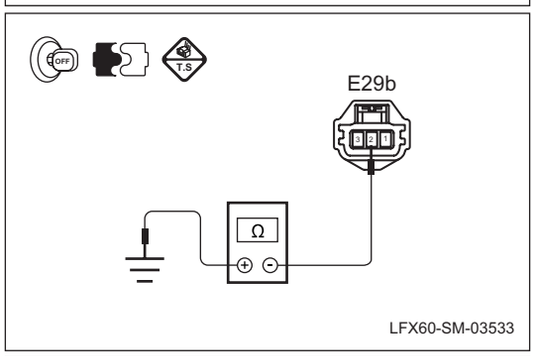
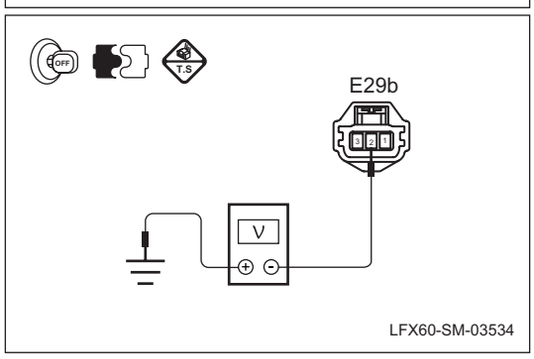
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Test condition	Details / Results / Measures
2. Clear the trouble code.	
	A. Connect the equipment for diagnosing faults to the diagnostic interface. B. Operate the start switch to turn the power to ON state. C. Clear the trouble code by using diagnostic equipment. Does the trouble code reappear? →**Yes** Step 3. →**No** Finish.
3. Check the power supply line of output shaft speed sensor.	
	A. Operate the start switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the output shaft pressure sensor harness plug E29b. D. Connect the battery negative terminal. E. Operate the start switch to turn the power to ON state. F. Measure the voltage between the output shaft pressure sensor harness plug E29b terminal 3 and the fixed ground point with the multimeter. **Standard value:4.5 ~ 5.5V** Is the voltage normal? →**Yes** Step 4. →**No** Repair the power line of output shaft pressure sensor; replace the harness, if necessary.

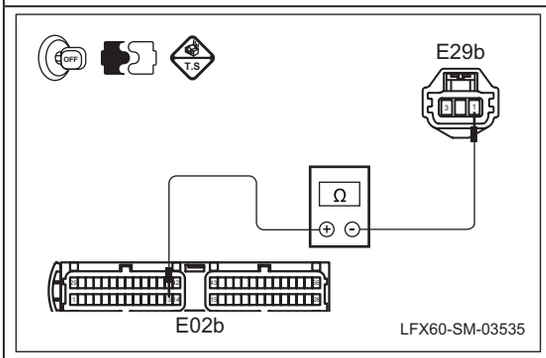
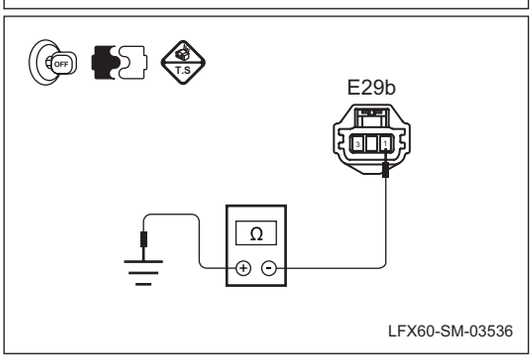
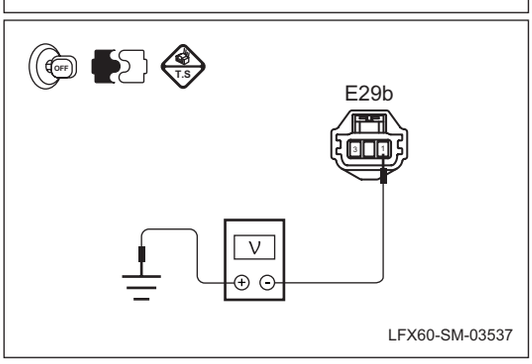
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Test condition	Details / Results / Measures
4. Check the power supply line of output shaft pressure sensor.	
  	A. Operate the start switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the output shaft pressure sensor harness plug E29b. D. Disconnect the TCM harness plug E02b. E. Measure the resistance between the output shaft pressure sensor harness plug E29b terminal 2 and TCM harness plug E02b terminal 12 with the multimeter. **Standard value: less than 5Ω** F. Measure the resistance between the output shaft pressure sensor harness plug E29b terminal 2 and the fixed ground point with the multimeter. **Standard value: 10MΩ or higher** G. Connect the battery negative terminal. H. Measure the voltage between the output shaft pressure sensor harness plug E29b terminal 2 and the fixed ground point with the multimeter. **Standard value:0V** Are the results normal? **→Yes** Step 5. **→No** Repair the output shaft pressure sensor signal line fault and replace the harness if necessary.

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Test condition	Details / Results / Measures
5. Check the grounding line of output shaft pressure sensor.	
  	A. Operate the start switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the output shaft pressure sensor harness plug E29b. D. Disconnect the TCM harness plug E02b. E. Measure the resistance between the output shaft pressure sensor harness plug E29b terminal 1 and TCM harness plug E02b terminal 13 with the multimeter. **Standard value: less than 5Ω** F. Measure the resistance between the output shaft pressure sensor harness plug E29b terminal 1 and the fixed ground point with the multimeter. **Standard value: 10MΩ or higher** G. Connect the battery negative terminal. H. Measure the voltage between the output shaft pressure sensor harness plug E29b terminal 1 and the fixed ground point with the multimeter. **Standard value:0V** Are the results normal? **→Yes** Step 5. **→No** Repair the output shaft pressure sensor signal line fault and replace the harness if necessary.
6. Check the output shaft pressure sensor.	
	A. Disconnect the output shaft pressure sensor harness plug E31b. B. Use a multimeter to measure the voltage between terminals 3 and 2 of output shaft pressure sensor. **Standard value:~10KΩ** Is the resistance normal? **→Yes** Step 7. **→No** Replace the output shaft pressure sensor.
7. Check the TCM.	
	A. Replace the TCM. **Refer to: Replacement of transmission control module (TCM)** Confirms that the troubleshooting is successful.

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DTC P0890

DTC description

DTC	Description	Definition
P0890	• TCM main relay control circuit is short or open	• TCM power supply relay is a switch-controlled solenoid valve that supplies power to all solenoid valves. TCM software system controls the solenoid valve switch to achieve the control over various types of solenoid valves in transmission control system.

Possible causes

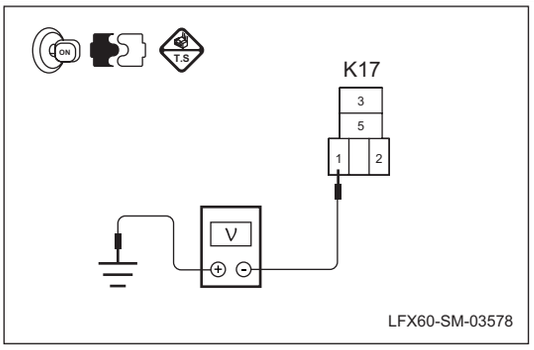
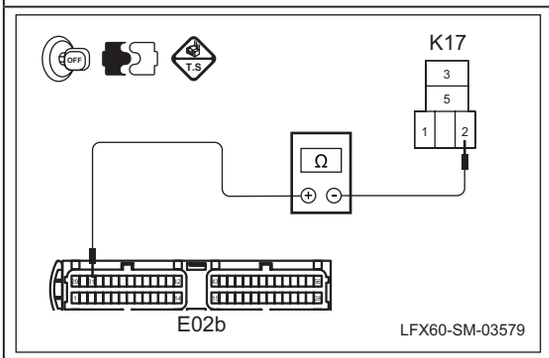
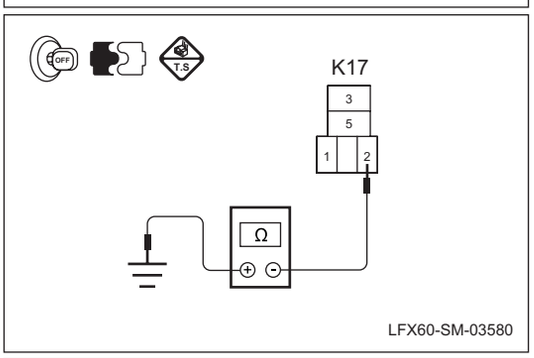
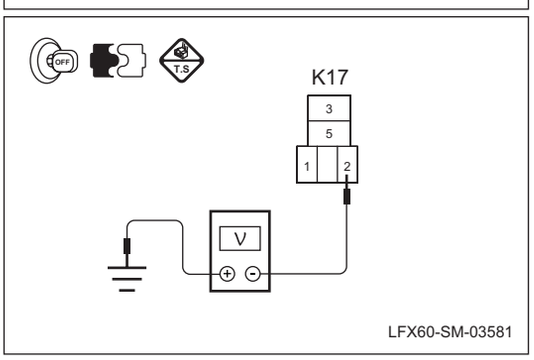
DTC	Detection strategy	Set the condition (control strategy)	Define the fault location
P0890	• Checking the hardware or harness	• When TCM power supply gives instruction and the output feedback voltage of solenoid valve is less than a certain value, the diagnostic condition is established and the fault is being acknowledged. Once the error is confirmed, the fail safe mode will be active and the instrument panel indicator lamp will work.	• Activation request relay line • start request relay

Diagnostic process

Test condition	Details / Results / Measures
1. General check	
	A. Check the activation request relay and transmission control module harness plugs for damage, poor contact, aging, looseness and other problematic signs. Are the results normal? →**Yes** Step 2. →**No** Examine and repair the fault location.
2. Clear the trouble code.	
	A. Connect the equipment for diagnosing faults to the diagnostic interface. B. operate the start switch to turn the power to ON state. C. Clear the trouble code by using diagnostic equipment. Does the trouble code reappear? →**Yes** Step 3. →**No** Finish.

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Test condition	Details / Results / Measures
3. Check the power supply line of activation request relay.	
	A. Operate the start switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Remove the start request relay K17. D. Connect the battery negative terminal. E. Operate the start switch to turn the power to ON state. F. Use a multimeter to measure the voltage between terminal 1 of relay K17 harness plug and the reliable ground point. **Standard value:11 ~ 14V** Is the voltage normal? →**Yes** Step 4. →**No** Repair the power supply line of activation request relay; replace the harness, if necessary.
4. Check the activation request relay control line.	
  	A. Operate the start switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Remove the start request relay K17. D. Disconnect the TCM harness plug E02b. E. Use a multimeter to measure the resistance between terminal 2 of activation request relay harness plug and terminal 31 of transmission control module harness plug E02b. **Standard value: less than 5Ω** F. Use a multimeter to measure the resistance between terminal 2 of relay K17 harness plug and the reliable ground point. **Standard value: 10MΩ or higher** G. Connect the battery negative terminal. H. Use a multimeter to measure the voltage between terminal 2 of relay K17 harness plug and the reliable ground point. **Standard value:0V** Are the results normal? →**Yes** Step 5. →**No** Repair the control line of activation request relay K17; replace the harness, if necessary.

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Test condition	Details / Results / Measures
5. Check the activation request relay.	
	A. Operate the start switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Remove the start request relay K17. D. Apply a battery voltage between terminals 1 and 2 of the activation request relay. E. Use a multimeter to measure the resistance between terminals 3 and 5 of activation request relay. **Standard value: less than 1Ω** Is the resistance normal? →**Yes** Step 6. →**No** Replace the activation request relay.
6. Check the TCM.	
	A. Replace the TCM. **Refer to:Replacement of transmission control module (TCM)** Confirms that the troubleshooting is successful.

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DTC P0894

DTC description

DTC	Description	Definition
P0894	• Torque converter clutch slips	• TCM obtains the locking control target according to the current driving mode, vehicle speed and accelerator pedal signal, achieving the closed control of lock-up clutch.

Possible causes

DTC	Detection strategy	Set the condition (control strategy)	Define the fault location
P0894	• Hardware or harness inspection	• When the slip difference between is relatively obvious after the hydraulic torque converter and lock-up clutch are coupled, the diagnostic condition is established and the fault is being acknowledged. Once the error is confirmed, the fail safe mode will be active and the instrument panel indicator lamp will work.	• Hydraulic torque converter solenoid valve or line • Hydraulic control circuit • Hydraulic torque converter

Diagnostic process

Test condition	Details / Results / Measures
1. General check	
	A. Check the hydraulic torque converter solenoid valve and transmission control module harness plug for damage, poor contact, aging, looseness and other problematic signs. Are the results normal? →**Yes** Step 2. →**No** Examine and repair the fault location.
2. Clear the trouble code.	
	A. Connect the equipment for diagnosing faults to the diagnostic interface. B. Operate the start switch to turn the power to ON state C. Clear the trouble code by using diagnostic equipment. Does the trouble code reappear? →**Yes** Step 3. →**No** Finish.

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Test condition	Details / Results / Measures
3. Check the hydraulic torque converter solenoid valve.	
	A. Check the hydraulic torque converter solenoid valve for fault. Refer to:“P0968, , P0970, , P0971” DTC Does DTC recur? →**Yes** Step 4. →**No** Finish.
4. Check the hydraulic control circuit.	
	A. Contact the relevant technical personnel of transmission for data acquisition and inspection. Are the results normal? →**Yes** Step 5. →**No** Examine and repair the fault location.
5. Check the hydraulic torque converter.	
	A. Contact the relevant technical personnel of transmission for inspection. Confirms that the troubleshooting is successful.

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DTC P0900,P0902,P0903

DTC description

DTC	Description	Definition
P0900	• Clutch solenoid valve control circuit is open	• Description: After the gear signal is sent to TCM, TCM activates the clutch control solenoid valve to control the clutch operation.
P0902	• Clutch solenoid valve control circuit is short to ground	
P0903	• Clutch solenoid valve control circuit is short to power supply	

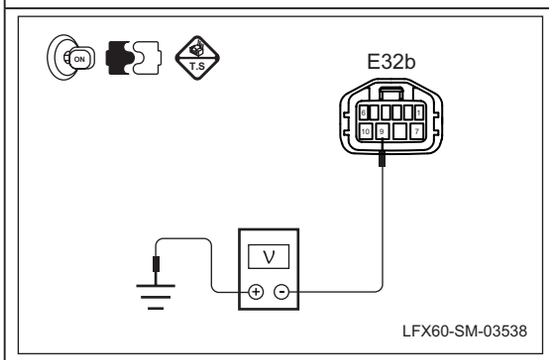
Possible causes

DTC	Detection strategy	Set the condition (control strategy)	Define the fault location
P0900	• Checking the hardware or harness	• Once the solenoid valve output feedback voltage is normal, the clutch solenoid valve feedback current is less than a certain value, while TCM power supply command is released, the diagnosis conditions will be established and the fault will be confirmed. Once the error is confirmed, the fail safe mode will be active and the instrument panel indicator lamp will work.	• Clutch solenoid valve line • Clutch solenoid valve
P0902		• When the solenoid valve output feedback voltage is normal, the clutch solenoid valve feedback current is greater than a certain value, and TCM power supply gives the instruction, the diagnostic condition is established and the fault is being acknowledged. Once the error is confirmed, the fail safe mode will be active and the instrument panel indicator lamp will work.	
P0903		• Once the solenoid valve output feedback voltage is normal, the clutch solenoid valve feedback current is less than a certain value, while TCM power supply command is released, the diagnosis conditions will be established and the fault will be confirmed. Once the error is confirmed, the fail safe mode will be active and the instrument panel indicator lamp will work.	

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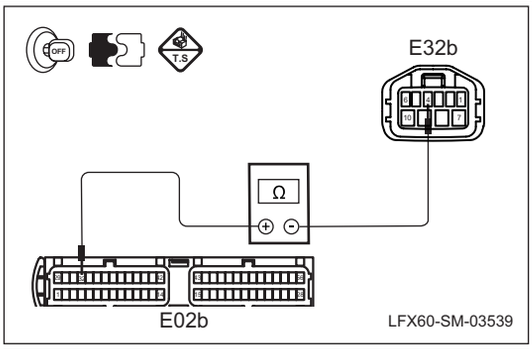
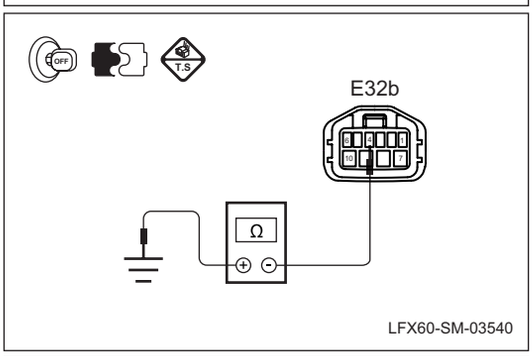
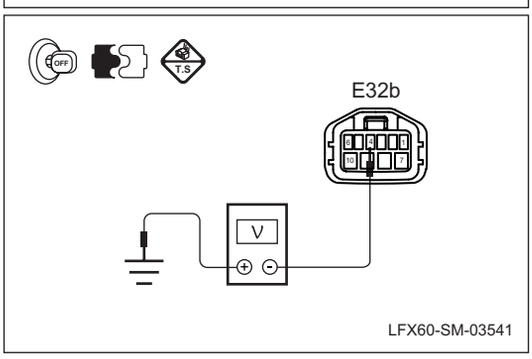
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Diagnostic process

Test condition	Details / Results / Measures
1. General check	
	A. Check the clutch solenoid valve and transmission control module harness plug for damage, poor contact, aging, looseness and other problematic signs. Are the results normal? →**Yes** Step 2. →**No** Examine and repair the fault location.
2. Clear the trouble code.	
	A. Connect the equipment for diagnosing faults to the diagnostic interface. B. Operate the start switch to turn the power to ON state C. Clear the trouble code by using diagnostic equipment. Does the trouble code reappear? →**Yes** Step 3. →**No** Finish.
3. Check the power supply line of clutch solenoid valve.	
	A. Operate the start switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the solenoid valve harness plug E32b. D. Connect the battery negative terminal. E. Operate the start switch to turn the power to ON state. F. Use a multimeter to measure the voltage between terminal 9 of clutch solenoid valve harness plug E32b and the reliable ground point. **Standard value:11 ~ 14V** Is the voltage normal? →**Yes** Step 4. →**No** Repair the power supply line of clutch solenoid valve; and replace the harness, if necessary.

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Test condition	Details / Results / Measures
4. Check the control line of clutch solenoid valve.	
  	A. Operate the start switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the solenoid valve harness plug E32b. D. Disconnect the TCM harness plug E02b. E. Measure the resistance between the solenoid valve harness plug E32b terminal 4 and TCM harness plug E02b terminal 32 with the multimeter. **Standard value: less than 5Ω** F. Measure the resistance between the solenoid valve harness plug E32b terminal 4 and the fixed ground point with the multimeter. **Standard value: 10MΩ or higher** G. Connect the battery negative terminal. H. Measure the voltage between the solenoid valve harness plug E32b terminal 4 and the fixed ground point with the multimeter. **Standard value:0V** Are the results normal? →**Yes** Step 5. →**No** Repair the control line of clutch solenoid valve; and replace the harness, if necessary.
5. Check the clutch solenoid valve.	
	A. Disconnect the solenoid valve harness plug E32b. B. Use a multimeter to measure the resistance between terminals 4 and 9 of clutch solenoid valve. **Standard value:10±0.6Ω** Is the resistance normal? →**Yes** Step 6. →**No** Replace the solenoid valve.
6. Check the TCM.	
	A. Replace the TCM. **Refer to:Replacement of transmission control module (TCM)** Confirms that the troubleshooting is successful.

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DTC P0938,P0939,P0940

DTC description

DTC	Description	Definition
P0938	• Transmission fluid temperature is too high	• CVT fluid temperature sensor detects CVT fluid temperature and sends signal to TCM.
P0939	• Transmission fluid temperature sensor circuit is short to ground	
P0940	• Transmission fluid temperature sensor circuit is short to power supply or open	

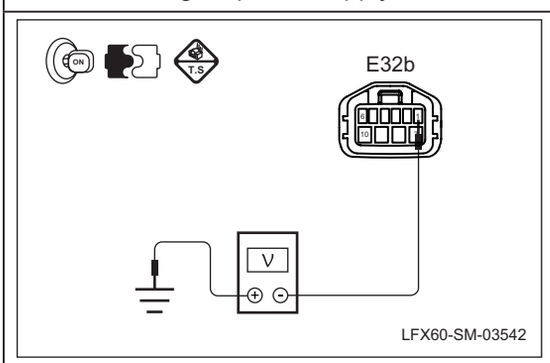
Possible causes

DTC	Detection strategy	Set the condition (control strategy)	Define the fault location
P0938	• Checking the hardware or harness	• When the engine speed is greater than 500rpmand CVT fluid temperature is greater than 128℃ , the diagnostic condition is established and the fault is being acknowledged. Once the error is confirmed, the fail safe mode will be active, the alternative procedure will be executed and the instrument panel indicator lamp will work.	• CVT fluid temperature sensor line • CVT oil temperature sensor
P0939		• Once the CVT oil temperature sensor voltage is less than a given minimum value, the diagnosis conditions will be established and the fault will be confirmed. Once the error is confirmed, the fail safe mode will be active, the alternative procedure will be executed and the instrument panel indicator lamp will work.	
P0940		• When the CVT fluid temperature sensor voltage is greater than a given maximum value, the diagnostic condition is established and the fault is being acknowledged. Once the error is confirmed, the fail safe mode will be active, the alternative procedure will be executed and the instrument panel indicator lamp will work.	

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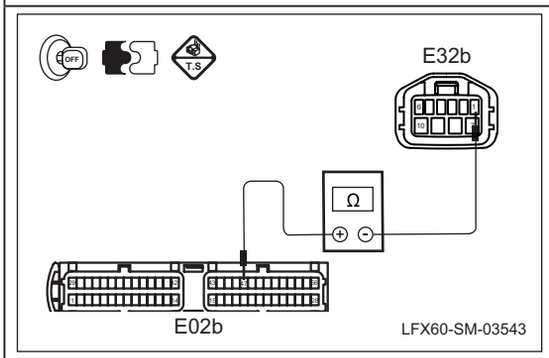
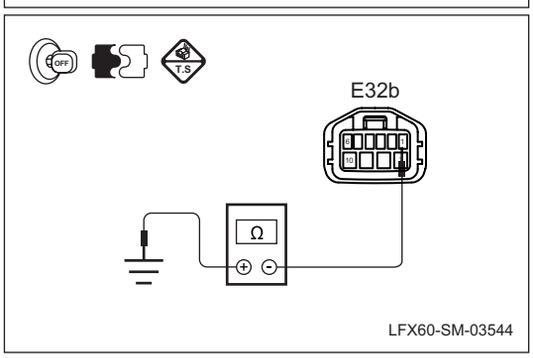
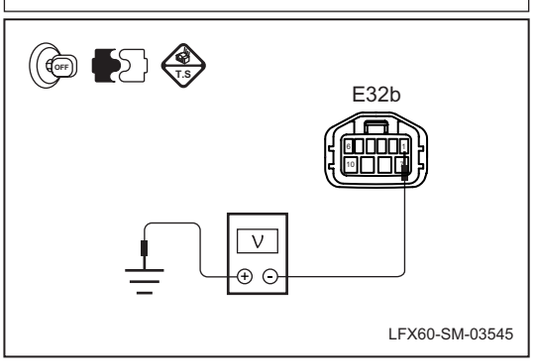
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Diagnostic process

Test condition	Details / Results / Measures
1. General check	
	A. Check the fluid temperature sensor and transmission control module harness plugs for damage, poor contact, aging, looseness and other problematic signs. B. Check the transmission cooling system. Are the results normal? →**Yes** Step 2. →**No** Examine and repair the fault location.
2. Clear the DTC.	
	A. Connect the equipment for diagnosing faults to the diagnostic interface. B. Operate the start switch to turn the power to ON state C. Clear the trouble code by using diagnostic equipment. Does the trouble code reappear? →**Yes** Step 3. →**No** Finish.
3. Check the signal power supply line of fluid temperature sensor.	
	A. Operate the start switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the solenoid valve harness plug E32b. D. Connect the battery negative terminal. E. Operate the start switch to turn the power to ON state. F. Measure the voltage between the solenoid valve harness plug E32b terminal 1 and the fixed ground point with the multimeter. **Standard value:4.5 ~ 5.5 V** Is the voltage normal? →**Yes** Step 4. →**No** Repair the signal power supply line of fluid temperature sensor; replace the harness, if necessary.

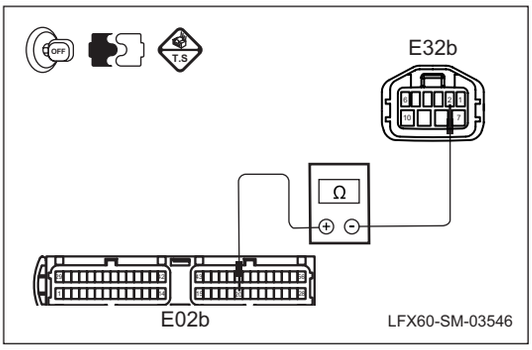
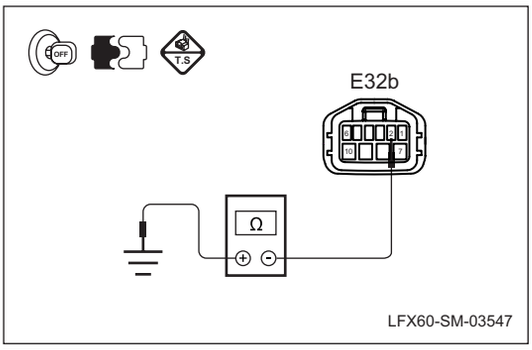
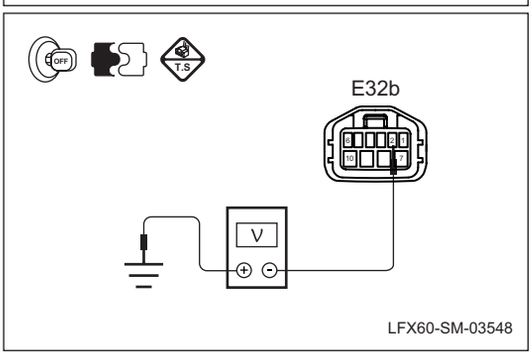
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Test condition	Details / Results / Measures
4. Check the signal line of fluid temperature sensor.	
  	A. Operate the start switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the solenoid valve harness plug E32b. D. Disconnect the TCM harness plug E02b. E. Measure the resistance between the solenoid valve harness plug E32b terminal 1 and TCM harness plug E02b terminal 47 with the multimeter. **Standard value: less than 5Ω** F. Measure the resistance between the solenoid valve harness plug E32b terminal 1 and the fixed ground point with the multimeter. **Standard value: 10MΩ or higher** G. Connect the battery negative terminal. H. Measure the voltage between the solenoid valve harness plug E32b terminal 1 and the fixed ground point with the multimeter. **Standard value:0V** Are the results normal? →**Yes** Step 5. →**No** Repair the oil temperature sensor control line fault and replace the harness if necessary.

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Test condition	Details / Results / Measures
5. Check the grounding line of fluid temperature sensor.	
 LFX60-SM-03546  LFX60-SM-03547  LFX60-SM-03548	A. Operate the start switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the solenoid valve harness plug E32b. D. Disconnect the TCM harness plug E02b. E. Measure the resistance between the solenoid valve harness plug E32b terminal 2 and TCM harness plug E02b terminal 20 with the multimeter. **Standard value: less than 5Ω** F. Measure the resistance between the solenoid valve harness plug E32b terminal 2 and the fixed ground point with the multimeter. **Standard value: 10MΩ or higher** G. Connect the battery negative terminal. H. Measure the voltage between the solenoid valve harness plug E32b terminal 2 and the fixed ground point with the multimeter. **Standard value:0V** Are the results normal? →**Yes** Step 6. →**No** Repair the oil temperature sensor control line fault and replace the harness if necessary.

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Test condition	Details / Results / Measures
6. Check the fluid temperature sensor.	
	A. Disconnect the solenoid valve harness plug E32b. B. Use a multimeter to measure the resistance between terminals 1 and 2 of fluid temperature sensor. **Standard value:~47.7 kΩ at -20** ℃ **Standard value:~29.5 kΩ at -10** ℃ **Standard value:~18.6 kΩ at 0** ℃ **Standard value:~12.08 kΩ at 10** ℃ **Standard value:~6.63 kΩ at 25** ℃ **Standard value:~1.53 kΩ at 70** ℃ **Standard value:~0.79 kΩ at 90** ℃ **Standard value:~0.38 kΩ at 120** ℃ Is the resistance normal? →**Yes** Step 7. →**No** Replace the solenoid valve.
7. check TCM	
	A. Replace the TCM. **Refer to:Replacement of transmission control module (TCM)** Confirms that the troubleshooting is successful.

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DTC P0960,P0962,P0963

DTC description

DTC	Description	Definition
P0960	• Control circuit of pressure control solenoid valve "A" (input pulley shaft) is open	• Accelerator pedal signal, gear signal, and vehicle speed signal are sent to TCM, and TCM starts the fluid pressure control solenoid valve "A" so as to control CVT to change the speed ratio.
P0962	• The control circuit of pressure control solenoid valve "A" (input pulley shaft) is short-circuited	
P0963	• Pressure control solenoid valve “A” (input belt pulley shaft)control circuit short power supply	

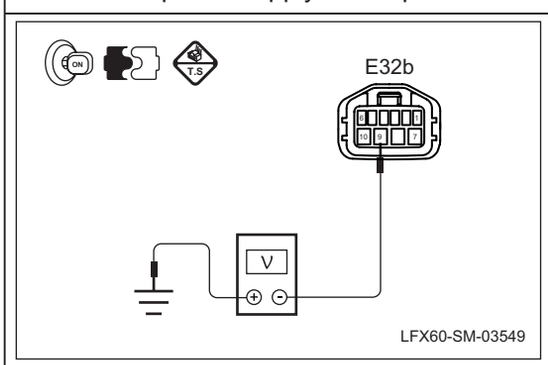
Possible causes

DTC	Detection strategy	Set the condition (control strategy)	Define the fault location
P0960	• Checking the hardware or harness	• When the solenoid valve output feedback voltage is normal, the feedback current of fluid pressure control solenoid valve "A" is less than a certain value, and TCM power supply gives the instruction, the diagnostic condition is established and the fault is being acknowledged. Once the error is confirmed, the fail safe mode will be active and the instrument panel indicator lamp will work.	• Pressure solenoid valve line of input shaft • Input shaft pressure solenoid valve
P0962		• When the solenoid valve output feedback voltage is normal, the fluid pressure control solenoid valve feedback current is greater than a certain value, and TCM power supply gives the instruction, the diagnostic condition is established and the fault is being acknowledged. Once the error is confirmed, the fail safe mode will be active and the instrument panel indicator lamp will work.	
P0963		• When the solenoid valve output feedback voltage is normal, the feedback current of fluid pressure control solenoid valve "A" is less than a certain value, and TCM power supply gives the instruction, the diagnostic condition is established and the fault is being acknowledged. Once the error is confirmed, the fail safe mode will be active and the instrument panel indicator lamp will work.	

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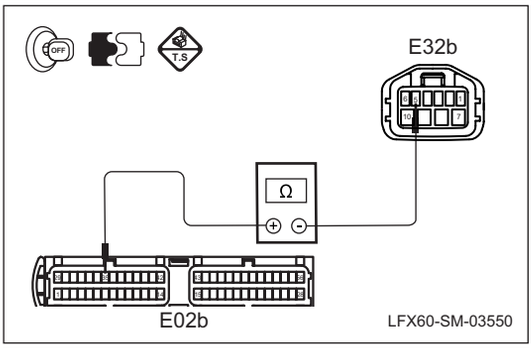
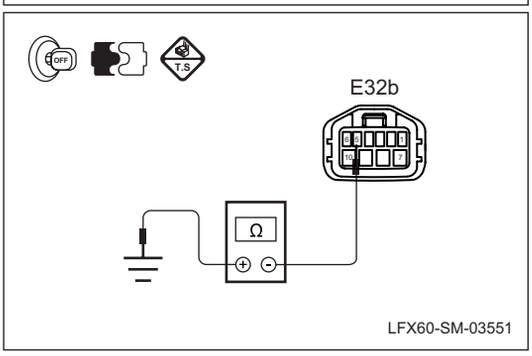
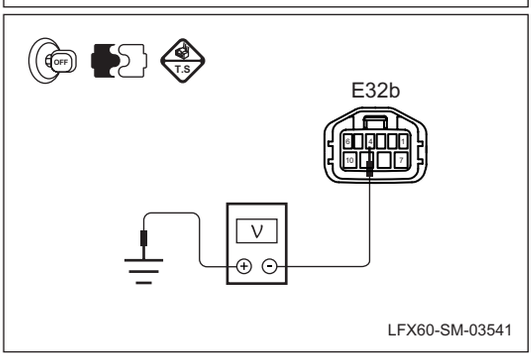
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Diagnostic process

Test condition	Details / Results / Measures
1. General check	
	A. Check the solenoid valve and TCM harness plug for breakage, loose contact, aging or looseness. Are the results normal? →**Yes** Step 2. →**No** Examine and repair the fault location.
2. Clear the DTC.	
	A. Connect the equipment for diagnosing faults to the diagnostic interface. B. Operate the start switch to turn the power to ON state C. Clear the trouble code by using diagnostic equipment. Does the trouble code reappear? →**Yes** Step 3. →**No** Finish.
3. Check the power supply line of pressure solenoid valve of input shaft.	
	A. Operate the start switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the solenoid valve harness plug E32b. D. Connect the battery negative terminal. E. Operate the start switch to turn the power to ON state. F. Measure the voltage between the solenoid valve harness plug E32b terminal 9 and the fixed ground point with the multimeter. **Standard value:11 ~ 14V** Is the voltage normal? →**Yes** Step 4. →**No** Repair the pressure solenoid valve line of input shaft; replace the harness, if necessary.

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Test condition	Details / Results / Measures
4. Check the control line of pressure solenoid valve of input shaft.	
  	A. Operate the start switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the solenoid valve harness plug E32b. D. Disconnect the TCM harness plug E02b. E. Measure the resistance between the solenoid valve harness plug E32b terminal 5 and TCM harness plug E02b terminal 35 with the multimeter. **Standard value: less than 5Ω** F. Measure the resistance between the solenoid valve harness plug E32b terminal 5 and the fixed ground point with the multimeter. **Standard value: 10MΩ or higher** G. Connect the battery negative terminal. H. Measure the voltage between the solenoid valve harness plug E32b terminal 5 and the fixed ground point with the multimeter. **Standard value:0V** Are the results normal? **→Yes** Step 5. **→No** Repair the input shaft pressure solenoid valve control circuit fault and replace the harness if necessary.
5. Check the input shaft pressure solenoid valve.	
	A. Disconnect the solenoid valve harness plug E32b. B. Use a multimeter to measure the voltage between terminals 9 and 4 of pressure solenoid valve of input shaft. **Standard value:10±0.6Ω** Is the resistance normal? **→Yes** Step 6. **→No** Replace the solenoid valve.
6. Check the TCM.	
	A. Replace the TCM. **Refer to:Replacement of transmission control module (TCM)** Confirms that the troubleshooting is successful.

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DTC P0964,P0966,P0967

DTC description

DTC	Description	Definition
P0964	• Pressure control solenoid valve “B” (output belt pulley shaft)control circuit open circuit	• Send the throttle pedal signal, gear signal and speed to TCM, TCM response signal starts oil pressurecontrol solenoid valve “B”, control CVT and change the speed ratio.
P0966	• Pressure control solenoid valve “B” (output belt pulley shaft)control circuit short circuit	
P0967	• The control circuit of pressure control solenoid valve "B" (output pulley shaft) is short to power supply	

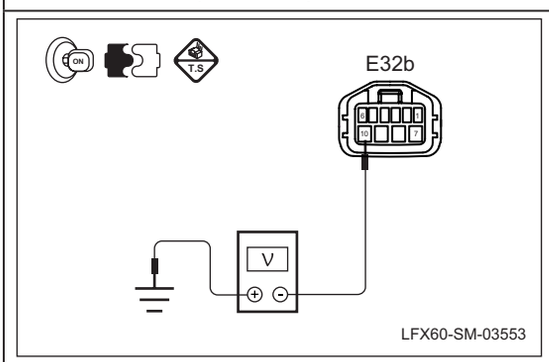
Possible causes

DTC	Detection strategy	Set the condition (control strategy)	Define the fault location
P0964	• Checking the hardware or harness	• Once the solenoid valve output feedback voltage is normal, the oil pressure control solenoid valve “B” feedback voltage is less than a certain value, while TCM power supply command is released, the diagnosis conditions will be established and the fault will be confirmed. Once the error is confirmed, the fail safe mode will be active and the instrument panel indicator lamp will work.	• Output shaft pressure solenoid valve line • Output shaft pressure solenoid valve
P0966		• Once the solenoid valve output feedback voltage is normal, the oil pressure control solenoid valve “B” feedback voltage is more than a certain value, while TCM power supply command is released, the diagnosis conditions will be established and the fault will be confirmed. Once the error is confirmed, the fail safe mode will be active and the instrument panel indicator lamp will work.	
P0967		• Once the solenoid valve output feedback voltage is normal, the oil pressure control solenoid valve “B” feedback voltage is less than a certain value, while TCM power supply command is released, the diagnosis conditions will be established and the fault will be confirmed. Once the error is confirmed, the fail safe mode will be active and the instrument panel indicator lamp will work.	

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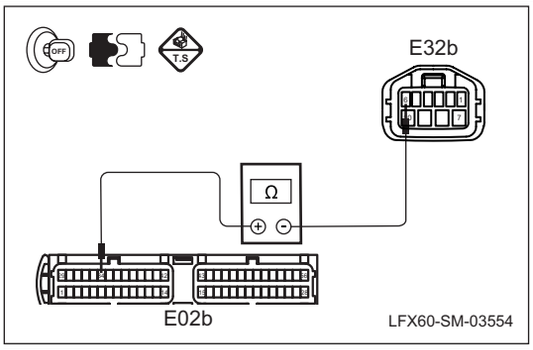
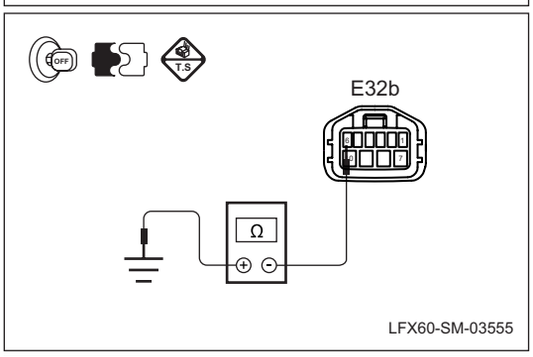
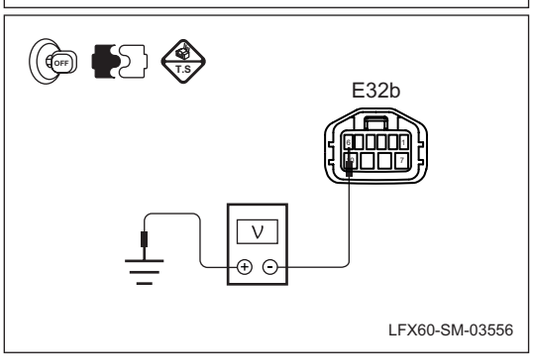
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Diagnostic process

Test condition	Details / Results / Measures
1. General check	
	A. Check the solenoid valve and TCM harness plug for breakage, loose contact, aging or looseness. Are the results normal? →**Yes** Step 2. →**No** Examine and repair the fault location.
2. Clear the trouble code.	
	A. Connect the equipment for diagnosing faults to the diagnostic interface. B. Operate the start switch to turn the power to ON state C. Clear the trouble code by using diagnostic equipment. Does the trouble code reappear? →**Yes** Step 3. →**No** Finish.
3. Check the output shaft pressure solenoid valve power supply circuit.	
	A. Operate the start switch to turn the power to OFF state. B .Disconnect the battery negative connector. C. Disconnect the solenoid valve harness plug E32b. D. Connect the battery negative terminal. E. Operate the start switch to turn the power to ON state. F. Measure the voltage between the solenoid valve harness plug E32b terminal 10 and the fixed ground point with the multimeter. **Standard value:11 ~ 14V** Is the voltage normal? →**Yes** Step 4. →**No** Repair the pressure solenoid valve line of output shaft; replace the harness, if necessary.

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Test condition	Details / Results / Measures
4. Check the output shaft pressure solenoid valve control circuit.	
  	A. Operate the start switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the solenoid valve harness plug E32b. D. Disconnect the TCM harness plug E02b. E. Measure the resistance between the solenoid valve harness plug E32b terminal 6 and TCM harness plug E02b terminal 34 with the multimeter. **Standard value: less than 5Ω** F. Measure the resistance between the solenoid valve harness plug E32b terminal 6 and the fixed ground point with the multimeter. **Standard value: 10MΩ or higher** G. Connect the battery negative terminal. H. Measure the voltage between the solenoid valve harness plug E32b terminal 6 and the fixed ground point with the multimeter. **Standard value:0V** Are the results normal? →**Yes** Step 5. →**No** Repair the pressure solenoid valve control line of output shaft; replace the harness, if necessary.
5. Check the output shaft pressure solenoid valve.	
	A. Disconnect the solenoid valve harness plug E32b. B. Measure the resistance between the output shaft pressure solenoid valve terminal 10 and 6 with the multimeter. **Standard value:10±0.6Ω** Are the results normal? →**Yes** Step 6. →**No** Replace the solenoid valve.
6. Check the TCM.	
	A. Replace the TCM. **Refer to:Replacement of transmission control module (TCM)** Confirms that the troubleshooting is successful.

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DTC P0968,P0970,P0971

DTC description

DTC	Description	Definition
P0968	• Pressure control solenoid valve “C” (hydraulic torque converter) control circuit open circuit	• Accelerator pedal signal, gear signal, and vehicle speed signal are sent to TCM, and TCM starts the fluid pressure control solenoid valve "C" so as to control the locking operation of torque converter.
P0970	• Pressure control solenoid valve “C” (hydraulic torque converter) control circuit short circuit	
P0971	• Pressure control solenoid valve “C” (hydraulic torque converter) control circuit short power supply circuit	

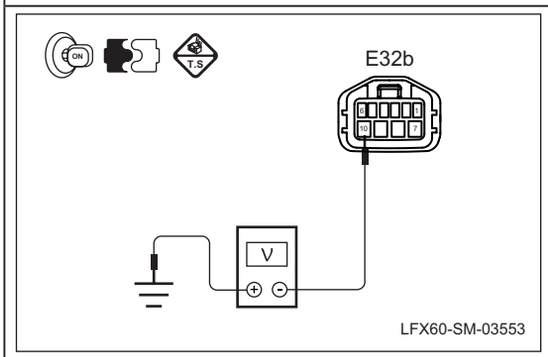
Possible causes

DTC	Detection strategy	Set the condition (control strategy)	Define the fault location
P0968	• Checking the hardware or harness	• When the solenoid valve output feedback voltage is normal, the feedback current of fluid pressure control solenoid valve "C" is less or greater than a certain value, and TCM power supply gives the instruction, the diagnostic condition is established and the fault is being acknowledged. Once the error is confirmed, the fail safe mode will be active and the instrument panel indicator lamp will work.	• Hydraulic torque converter solenoid valve line • Hydraulic torque converter solenoid valve
P0970		• Once the solenoid valve output feedback voltage is normal,oil pressure control solenoid valve “C” feedback current is more than a certain value, while TCM power supply command is released, the diagnosis conditions will be established and the fault will be confirmed. Once the error is confirmed, the fail safe mode will be active and the instrument panel indicator lamp will work.	
P0971		• Once the solenoid valve output feedback voltage is normal,oil pressure control solenoid valve “C” feedback current is less than a certain value, while TCM power supply command is released, the diagnosis conditions will be established and the fault will be confirmed. Once the error is confirmed, the fail safe mode will be active and the instrument panel indicator lamp will work.	

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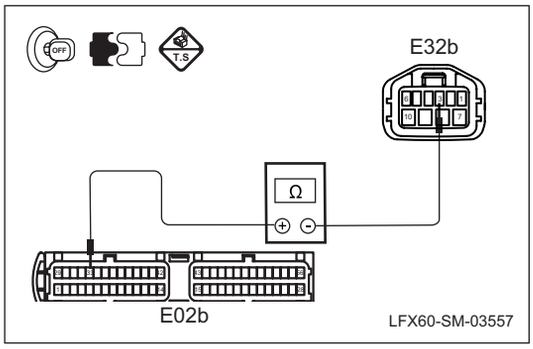
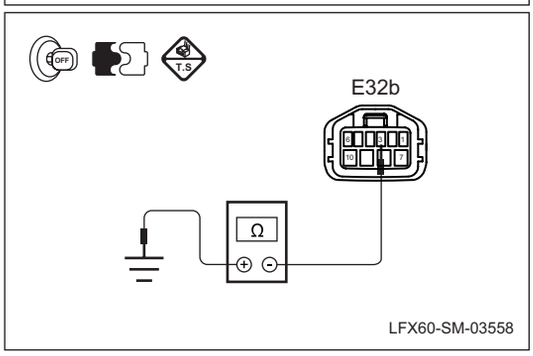
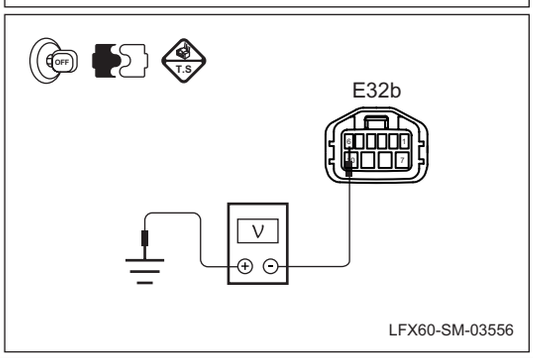
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Diagnostic process

Test condition	Details / Results / Measures
1. General check	
	A. Check the solenoid valve and transmission control module harness plug for damage, poor contact, aging, looseness and other problematic signs. Are the results normal? →**Yes** Step 2. →**No** Examine and repair the fault location.
2. Clear the trouble code.	
	A. Connect the equipment for diagnosing faults to the diagnostic interface. B. Operate the start switch to turn the power to ON state C. Clear the trouble code by using diagnostic equipment. Does the trouble code reappear? →**Yes** Step 3. →**No** Finish.
3. Check the power supply line of torque converter solenoid valve.	
	A. Operate the start switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the solenoid valve harness plug E32b. D. Connect the battery negative terminal. E. Operate the start switch to turn the power to ON state. F. Measure the voltage between the solenoid valve harness plug E32b terminal 10 and the fixed ground point with the multimeter. **Standard value:11 ~ 14V** Is the voltage normal? →**Yes** Step 4. →**No** Repair the power supply line of torque converter solenoid valve; and replace the harness, if necessary.

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Test condition	Details / Results / Measures
4. Check the control line of torque converter solenoid valve.	
  	A. Operate the start switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the solenoid valve harness plug E32b. D. Disconnect the TCM harness plug E02b. E. Measure the resistance between the solenoid valve harness plug E32b terminal 3 and TCM harness plug E02b terminal 33 with the multimeter. **Standard value: less than 5Ω** F. Measure the resistance between the solenoid valve harness plug E32b terminal 3 and the fixed ground point with the multimeter. **Standard value: 10MΩ or higher** G. Connect the battery negative terminal. H. Measure the voltage between the solenoid valve harness plug E32b terminal 3 and the fixed ground point with the multimeter. **Standard value:0V** Are the results normal? →**Yes** Step 5. →**No** Repair the control line of torque converter solenoid valve; and replace the harness, if necessary.
5. Check the hydraulic torque converter solenoid valve.	
	A. Disconnect the solenoid valve harness plug E32b. B. Use a multimeter to measure the resistance between terminals 10 and 6 of torque converter solenoid valve. **Standard value:10±0.6Ω** Are the results normal? →**Yes** Step 6. →**No** Replace the solenoid valve.
6. Check the TCM.	
	A. Replace the TCM. **Refer to:Replacement of transmission control module (TCM)** Confirms that the troubleshooting is successful.

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DTC P1706

DTC description

DTC	Description	Definition
P1706	• Steel belt slips	• After I/O speed, gear signal, accelerator pedal signal are sent to TCM, and TCM speed ratio control module controls the speed ratio and monitors the steel belt to ensure reliable and stable CVT speed ratio.

Possible causes

DTC	Detection strategy	Set the condition (control strategy)	Define the fault location
P1706	• Checking the hardware or harness	• When the actual speed ratio exceeds the normal range, the diagnostic condition is satisfied and the fault is being acknowledged. Once the error is confirmed, the fail safe mode will be active and the instrument panel indicator lamp will work.	• Sensor, solenoid valve • Hydraulic system failure • Engine torque overshot • Transmission parts abnormally worn

Diagnostic process

Test condition	Details / Results / Measures
1. General check	
	A. Check the solenoid valve, sensors, and transmission control module harness plugs for damage, poor contact, aging, looseness and other problematic signs. Are the results normal? →**Yes** Step 2. →**No** Examine and repair the fault location.
2. Clear the trouble code.	
	A. Connect the equipment for diagnosing faults to the diagnostic interface. B. operate the start switch to turn the power to ON state. C. Clear the trouble code by using diagnostic equipment. Does the trouble code reappear? →**Yes** Step 3. →**No** Finish.

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Test condition	Details / Results / Measures
3. Check the transmission speed sensor.	
	A. Check the input shaft speed sensor for fault. **Refer to:"P0792" DTC** B. Check the transmission output shaft speed sensor fault. **Refer to:"P1745" DTC** Does DTC recur? →**Yes** Step 4. →**No** Finish.
4. Check the pressure sensor.	
	A. Check the input shaft pressure sensor fault. **Refer to:"P0842, P0843" DTC** B. Check the output shaft pressure sensor fault. **Refer to:"P0847, P0848" DTC** Does DTC recur? →**Yes** Step 5. →**No** Finish.
5. Check the pressure control valve.	
	A. Check the input shaft pressure solenoid valve fault. **Refer to:"P0960, P0962, P0963" DTC** B. Check the output shaft pressure solenoid valve for fault. **Refer to:"P0964, P0966, P0967" DTC** **Refer to:** Does DTC recur? →**Yes** Step 6. →**No** Finish.
6. Check the hydraulic control system.	
	A. Contact the related transmission technician for the data acquisition and analysis. Are the results normal? →**Yes** Step 7. →**No** Examine and repair the fault location.

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Test condition	Details / Results / Measures
7. Check the engine torque for overshooting.	
	A. Contact the relevant technical personnel to detect and repair the engine torque. Check if the system is normal. →**Yes** Step 8. →**No** Examine and repair the fault location.
8. Check the transmission parts for abnormal wear.	
	A. Contact the related transmission technician for the check and analysis. Confirms that the troubleshooting is successful.

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DTC P1745

DTC description

DTC	Description	Definition
P1745	• Speed signal range of output belt pulley shaft is abnormal	• The speed signal of output belt pulley shaft is processed by TCM circuit and it is a kind of high frequency pulse signal. TCM works out the turbine speed according to the pulse signal. This is mainly designed for the hydraulic torque converter locking, clutch engagement and the variable speed control functions.

Possible causes

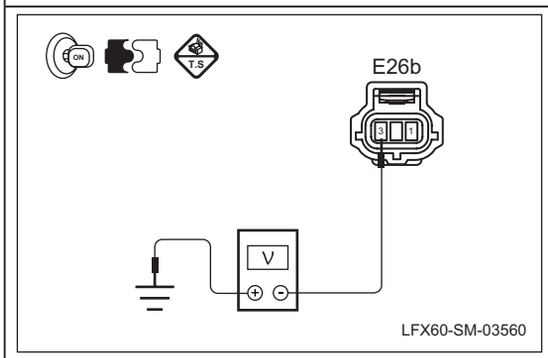
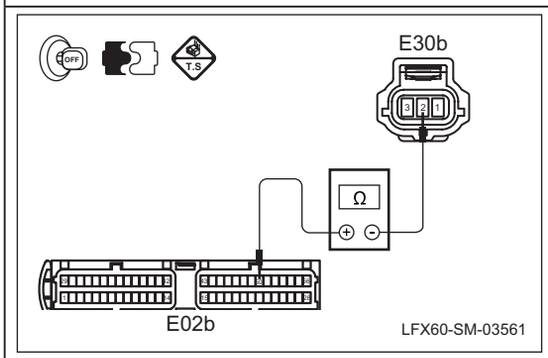
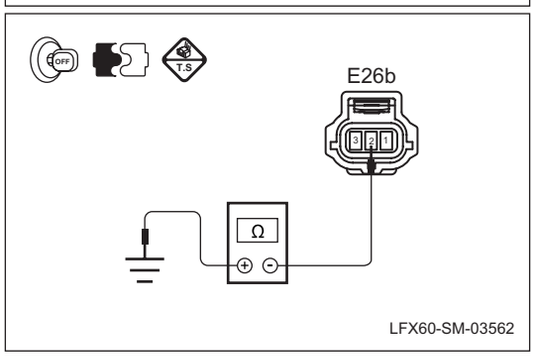
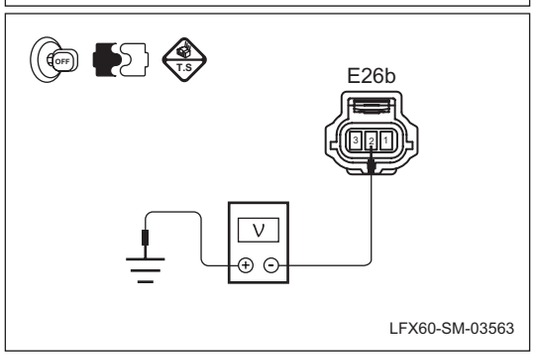
DTC	Detection strategy	Set the condition (control strategy)	Define the fault location
P1745	• Checking the hardware or harness	• When the output speed is equal to 0 while the car is running, the diagnostic condition is established and the fault is being acknowledged. Once the error is confirmed, the fail safe mode will be active, the alternative procedure will be executed and the instrument panel indicator lamp will work.	• Output shaft speed sensor line • Output shaft speed sensor

Diagnostic process

Test condition	Details / Results / Measures
1. General check	
	A. Check the output shaft speed sensor and transmission control module harness plugs for damage, poor contact, aging, looseness and other problematic signs. B. Check if the output speed sensor is installed incorrectly. Are the results normal? →**Yes** Step 2. →**No** Examine and repair the fault location.
2. Clear the trouble code.	
	A. Connect the equipment for diagnosing faults to the diagnostic interface. B. Operate the start switch to turn the power to ON state. C. Clear the trouble code by using diagnostic equipment. Does the trouble code reappear? →**Yes** Step 3. →**No** Finish.

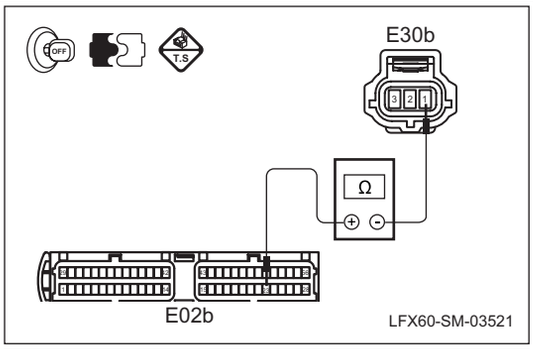
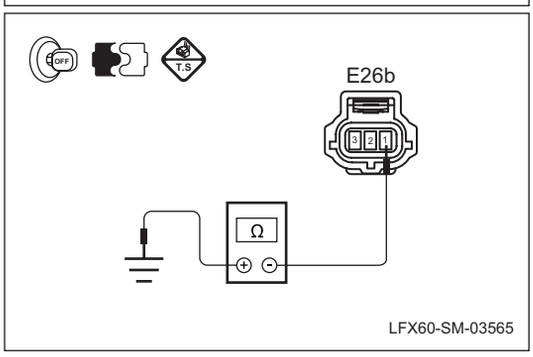
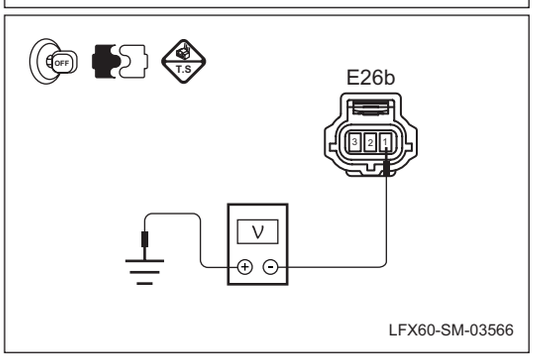
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Test condition	Details / Results / Measures
3. Check the output shaft speed sensor power supply line.	
	A. Operate the start switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the harness plug E30b from the output shaft speed sensor. D. Connect the battery negative terminal. E. Operate the start switch to turn the power to ON state. F. Use a multimeter to measure the voltage between terminal 3 of output shaft speed sensor harness plug E30b and the reliable ground point. **Standard value:4.5 ~ 5.5 V** Is the voltage normal? **→Yes** Step 4. **→No** Repair the power line of output shaft speed sensor; replace the harness, if necessary.
4. Check the output shaft speed sensor signal line.	
  	A. Operate the start switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the output shaft speed sensor harness plug E26b. D. Disconnect the TCM harness plug E02b. E. Measure the resistance between the output shaft speed sensor harness plug E26b terminal 2 and TCM harness plug E02b terminal 50 with the multimeter. **Standard value: less than 5Ω** F. Use a multimeter to measure the resistance between terminal 2 of output shaft speed sensor harness plug E26b and the reliable ground point. **Standard value: 10MΩ or higher** G. Connect the battery negative terminal. H. Measure the voltage between the output shaft speed sensor harness plug E26b terminal 2 and fixed ground point with the multimeter. **Standard value:0V** Are the results normal? **→Yes** Step 5. **→No** Repair the output shaft speed sensor signal line fault and replace the harness if necessary.

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Test condition	Details / Results / Measures
5. Check the grounding line of output shaft speed sensor.	
  	A. Operate the start switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the output shaft speed sensor harness plug E26b. D. Disconnect the TCM harness plug E02b. E. Measure the resistance between the output shaft speed sensor harness plug E26b terminal 1 and TCM harness plug E02b terminal 19 with the multimeter. **Standard value: less than 5Ω** F. Use a multimeter to measure the resistance between terminal 1 of output shaft speed sensor harness plug E26b and the reliable ground point. **Standard value: 10MΩ or higher** G. Connect the battery negative terminal. H. Use a multimeter to measure the voltage between terminal 1 of output shaft speed sensor harness plug E26b and the reliable ground point. **Standard value:0V** Are the results normal? **→Yes** Step 5. **→No** Repair the output shaft speed sensor signal line fault and replace the harness if necessary.
6. Check the output shaft speed sensor.	
	A. Replace the output shaft speed sensor. Are the results normal? **→Yes** Step 7. **→No** Replace the output shaft speed sensor.
7. Check the TCM.	
	A. Replace the TCM. **Refer to:Replacement of transmission control module (TCM)** Confirms that the troubleshooting is successful.

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DTC P2797

DTC description

DTC	Description	Definition
P2797	• Input pulley shaft pressure control is abnormal	• CVT fluid pressure control module controls the main pressure according to the current fluid pressure and target fluid pressure, achieving the stable control over speed ratio.

Possible causes

DTC	Detection strategy	Set the condition (control strategy)	Define the fault location
P2797	• Checking the hardware or harness	• When the difference between the target fluid pressure and the actual fluid pressure is greater than a given value, the diagnostic condition is satisfied and the fault is being acknowledged. Once the error is confirmed, the fail safe mode will be active or the alternative procedure will be executed or the instrument panel indicator lamp will work.	• Input shaft pressure sensor signal • Input shaft pressure solenoid valve • Hydraulic system

Diagnostic process

Test condition	Details / Results / Measures
1. General check	
	A. Check the pressure solenoid valve, pressure sensor and TCM harness plug for breakage, loose contact, aging or looseness. Are the results normal? →**Yes** Step 2. →**No** Examine and repair the fault location.
2. Clear the trouble code.	
	A. Connect the equipment for diagnosing faults to the diagnostic interface. B. Operate the start switch to turn the power to ON state C. Clear the trouble code by using diagnostic equipment. Does the trouble code reappear? →**Yes** Step 3. →**No** Finish.

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Test condition	Details / Results / Measures
3. Check the input shaft pressure sensor.	
	A. Check the input shaft pressure sensor for fault. **Refer to:"P0842, P0843" DTC** Does DTC recur? →**Yes** Step 4. →**No** Finish.
4. Check the input shaft pressure control valve.	
	A. Check the input shaft pressure control valve for fault. **Refer to:"P0960, P0962, P0963" DTC** Does DTC recur? →**Yes** Step 5. →**No** Finish.
5. Check the hydraulic control system.	
	A. Contact the related transmission technician for the data acquisition and analysis. Confirms that the troubleshooting is successful.

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DTC P2798

DTC description

DTC	Description	Definition
P2798	• Output pulley shaft pressure control is abnormal	• CVT fluid pressure control module controls the auxiliary pressure according to the current fluid pressure and target fluid pressure, achieving the reliable transfer of CVT system power.

Possible causes

DTC	Detection strategy	Set the condition (control strategy)	Define the fault location
P2798	• Checking the hardware or harness	• When the difference between the target fluid pressure and the actual fluid pressure is greater than a given value, the diagnostic condition is satisfied and the fault is being acknowledged. Once the error is confirmed, the fail safe mode will be active or the alternative procedure will be executed or the instrument panel indicator lamp will work.	• Output shaft pressure sensor signal • Output shaft pressure control solenoid valve • Hydraulic system

Diagnostic process

Test condition	Details / Results / Measures
1. General check	
	A. Check the pressure solenoid valve, pressure sensor and TCM harness plug for breakage, loose contact, aging or looseness. Are the results normal? →**Yes** Step 2. →**No** Examine and repair the fault location.
2. Clear the DTC.	
	A. Connect the equipment for diagnosing faults to the diagnostic interface. B. Operate the start switch to turn the power to ON state C. Clear the trouble code by using diagnostic equipment. Does the trouble code reappear? →**Yes** Step 3. →**No** Finish.

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Test condition	Details / Results / Measures
3. Check the output shaft pressure sensor.	
	A. Check the output shaft pressure sensor for fault. **Refer to:"P0847, P0848" DTC** Does DTC recur? →**Yes** Step 4. →**No** Finish.
4. Check the input shaft pressure control valve.	
	A. Check the output shaft pressure control valve for fault. **Refer to:"P0964, P0966, P0967" DTC** Does DTC recur? →**Yes** Step 5. →**No** Finish.
5. Check the hydraulic control system.	
	A. Contact the related transmission technician for the data acquisition and analysis. Confirms that the troubleshooting is successful.

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DTC U0100,U0121,U0401

DTC description

DTC	Description	Definition
U0100	• ECM communication fault	• Engine cooling water temperature, altitude coefficient, intake air temperature and brake signal are sent to TCM through CAN network for clutch control, variable speed control and torque converter control.
U0121	• ABS communication fault	• ABS speed, ABS working status and brake signals are sent to TCM through CAN network for variable speed control and torque converter control.
U0401	• ECM data reception is abnormal	• Engine speed, engine output torque and accelerator pedal signals are sent through the vehicle's CAN network to TCM for clutch control, variable speed control and torque converter control.

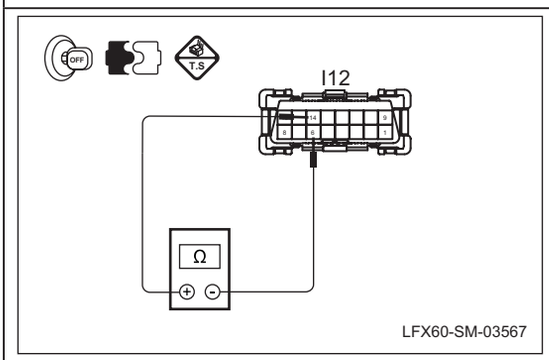
Possible causes

DTC	Detection strategy	Set the condition (control strategy)	Define the fault location
U0100	• Checking the hardware or harness	• When the engine cooling water temperature, altitude coefficient, intake air temperature and brake signal TCM received are equal to the default failure value, the diagnostic condition is satisfied and the fault is being acknowledged. Once the error is confirmed, the fail safe mode will be active and the frozen frame will be saved.	• Engine sensor • CAN circuit fault • ABS sensor
U0121		• When ABS speed, ABS working status and brake signals TCM received are equal to the default failure value, the diagnostic condition is satisfied and the fault is being acknowledged. Once the error is confirmed, the fail safe mode will be active and the frozen frame will be saved.	
U0401		• When engine speed, engine output torque and accelerator pedal signals TCM received are equal to the default failure value, the diagnostic condition is satisfied and the fault is being acknowledged. Once the error is confirmed, the fail safe mode will be active and the instrument panel indicator lamp will work.	

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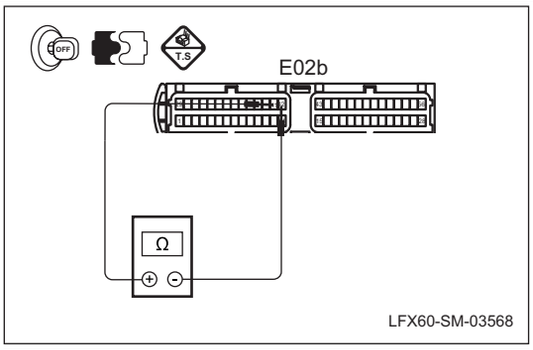
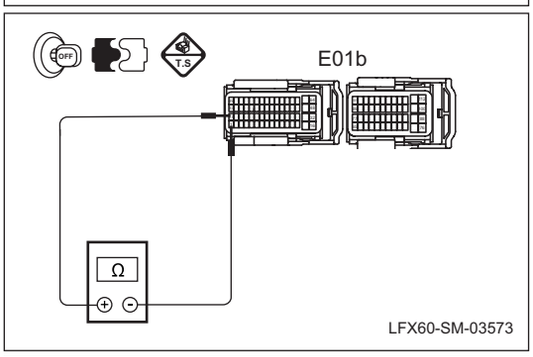
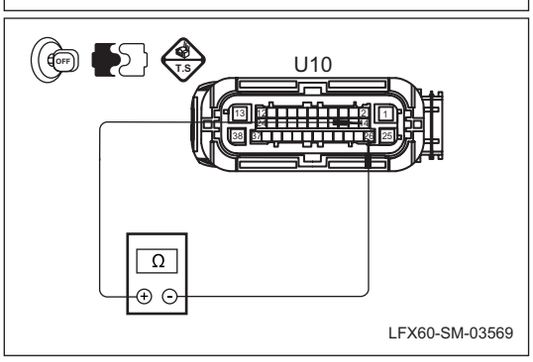
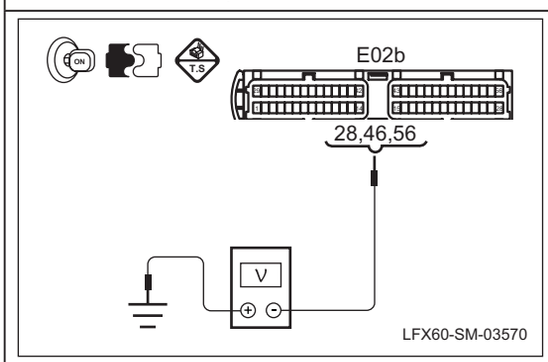
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Diagnostic process

Test condition	Details / Results / Measures
1. General check	
	A. Check the engine control module, transmission control module, and ABS control module harness plugs for damage, poor contact, aging, looseness and other problematic signs. Are the results normal? →**Yes** Step 2. →**No** Examine and repair the fault location.
2. Clear the trouble code.	
	A. Connect the equipment for diagnosing faults to the diagnostic interface. B. Operate the start switch to turn the power to ON state C. Read the trouble code by using diagnostic equipment. Is there any other DTC? →**Yes** Eliminate other DTCs first. **Refer to:corresponding DTC list** →**No** Step 3.
3. Clear the trouble code.	
	A. Connect the equipment for diagnosing faults to the diagnostic interface. B. Operate the start switch to turn the power to ON state C. Clear the trouble code by using diagnostic equipment. Does the trouble code reappear? →**Yes** Step 4. →**No** Finish.
4. Check CAN bus terminal resistance.	
	A. Operate the start switch to turn the power to OFF state. B. Use a multimeter to measure the resistance between terminals 6 and 14 of OBD diagnostic interface I12. **Standard value:60±5Ω** →**Yes** Step 5. →**No** Examine and repair the fault location.

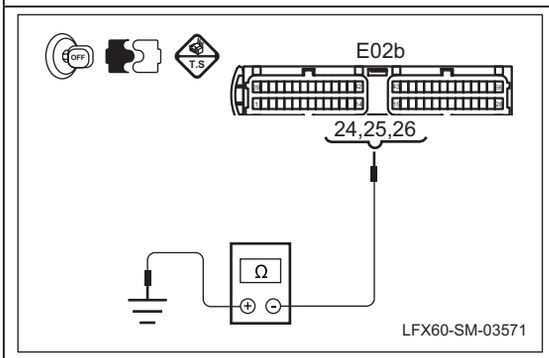
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Test condition	Details / Results / Measures
5. Check the CAN line of each control module.	
  	A. Operate the start switch to turn the power to OFF state. B. Disconnect the battery negative cable. C. Disconnect the harness plug E02b from the transmission. D. Use a multimeter to measure the resistance between terminals 41 and 42 of transmission control module harness plug E02b. **Standard value:60±5Ω** E. Connect the harness plug E02b to the transmission control module. F. Disconnect the harness plug E01b from the engine control module. G. Use a multimeter to measure the resistance between terminals 1 and 17 of engine control module harness plug E01b. **Standard value:120±5Ω** H. Connect the harness plug E01b to the engine control module. I. Disconnect the harness plug U10 from ABS control module. J. Measure the resistance between the ABS control module harness plug U10 terminal 14 and terminal 26 with the multimeter. **Standard value:60±5Ω** Are the results normal? **→Yes** Step 6. **→No** Examine and repair the fault location.
6. Check the TCM power line.	
	A. Operate the start switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the TCM harness plug E02b. D. Connect the battery negative terminal. E. Operate the start switch to turn the power to ON state. F. Measure the voltage between the TCM harness plug E02b terminal 28, 46, 56 and the fixed ground point with the multimeter. **Standard value:11 ~ 14V** Is the voltage normal? **→Yes** Step 7. **→No** Repair the TCM power line fault and replace the harness if necessary.

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Test condition	Details / Results / Measures
7. Check the grounding circuit of transmission control module.	
	A. Operate the start switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the TCM harness plug E02b. D. Measure the resistance between the TCM harness plug E02b terminal 24, 25, 56 and the fixed ground point with the multimeter. **Standard value: less than 5Ω** Is the resistance normal? →**Yes** Step 8. →**No** Repair the TCM ground line fault and replace the harness if necessary.
8. Check the TCM.	
	A. Replace the TCM. **Refer to:Replacement of transmission control module (TCM)** Is the system normal? →**Yes** Replace the TCM. →**No** Step 9.
9. Check ABS or engine control module.	
	A. Replace ABS or engine control module. **Refer to: Replace the engine or ABS control module** **C**onfirm that the fault has been eliminated.

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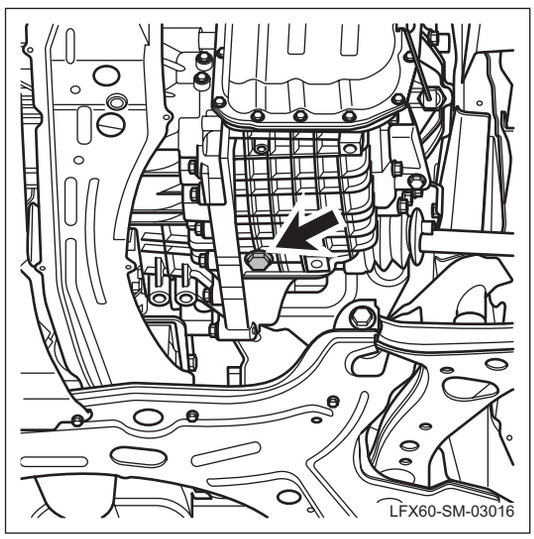
Removal and Installation

Transmission oil draining and filling procedures

Emission

1. Drain the transmission oil.

(a). Lift the vehicle. **Refer to the vehicle lift and support.**



(b). Place the recovery container and remove the transmission oil drain screw plug.

(c). After the transmission fluid is discharged, tighten the drain plug, do not forget the sealing gasket, and change the drain plug gasket.

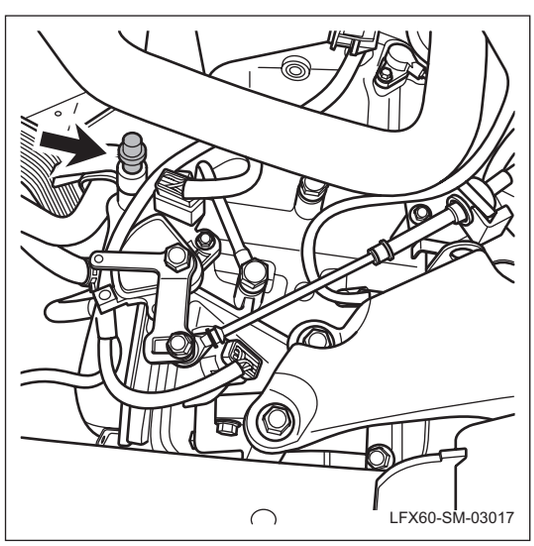
Torque: 46Nm

Filling

1. Add transmission fluid.

(a). Lower the vehicle. **Reference: Lifting and supporting of vehicle.**

(b). Remove the air filter assembly. **Refer to the replacement of air filter assembly.**



(c). Pull out the vent plug and add new ATF from the plug.

(d). Add the same amount of ATF as the amount discharged.

(e). Use the appropriate tool to add 8L of ATF as required.

Note:

- **Wipe the oil dipstick with the lint-free paper to prevent the foreign matter entering the transmission inside.**
- **Wipe the oil dipstick with the lint-free paper to prevent the foreign matter entering the transmission inside.**
- **The engine compartment contains high-temperature parts. In order to avoid accidents, remember not to spill the ATF onto these hot parts.**
- **After filling ATF, wipe off the spilled fluid.**
- **When replacing the ATF, clean the oil cooler.**

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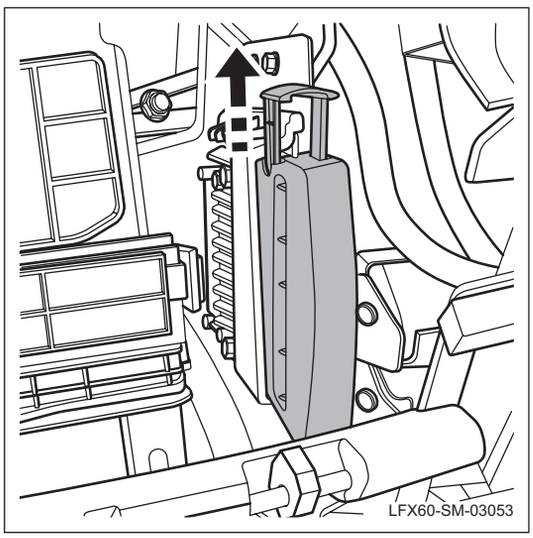
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Replacement of transmission control module
Removal

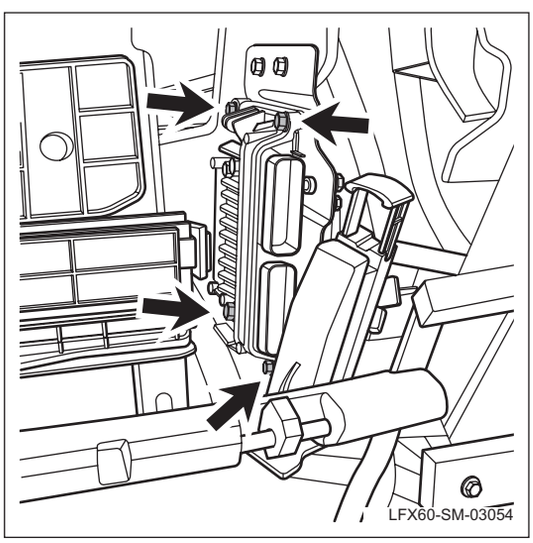
1. Remove the transmission control module.

(a). Disconnect the battery negative terminal.

(b). Remove the left glovebox. **Reference: Replacement of the dashboard assembly.**



(c). Disconnect the harness plug from the transmission control module.



(d). Remove the fixing bolts from the transmission control module.

Installation

1. Install the transmission control module.

(a). The installation sequence is the reverse of the disassembly order.

(b). Execute CVT self-learning. **Reference: CVT self-learning.**

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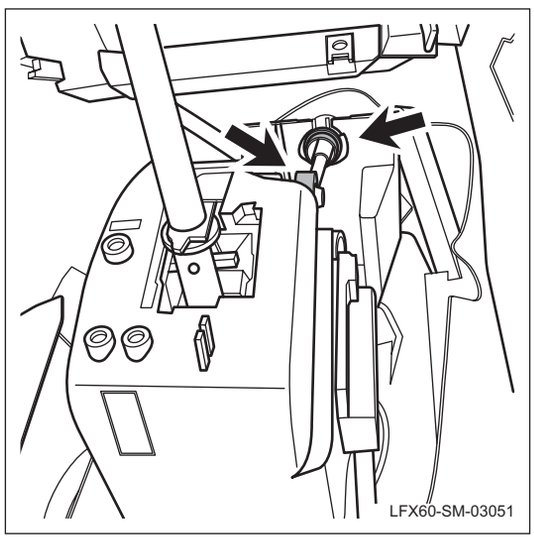
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Replacement of transmission operating mechanism
Removal

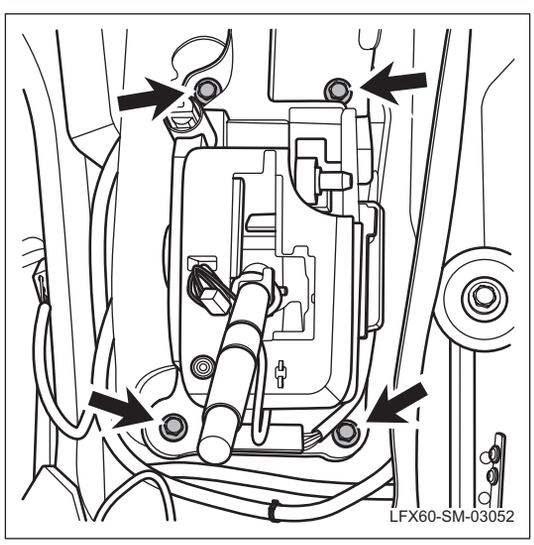
1. Remove the transmission operating mechanism.

(a). Disconnect the battery negative terminal.

(b). Remove the center console assembly. **Reference: Replacement of the center console assembly.**



(c). Remove the shift cable.



(d). Remove the fixing bolts from the transmission operating mechanism.

(e). Take out the transmission operating mechanism.

Installation

1. Install the transmission operating mechanism.

(a). The installation sequence is the reverse of the disassembly order.

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Replacement of transmission shift cable

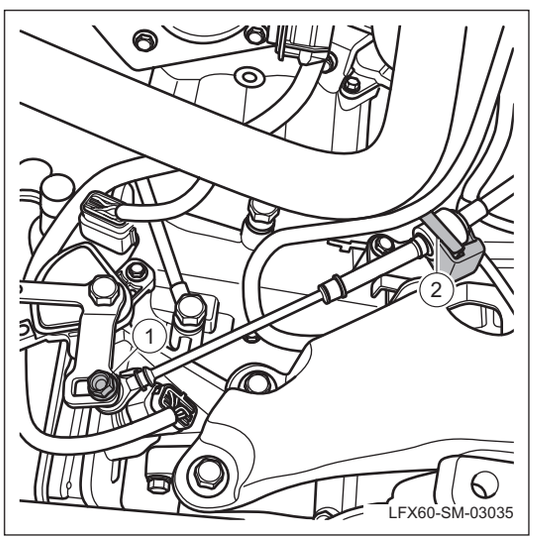
Removal

1. Remove the transmission shift cable.

(a). Disconnect the battery negative terminal.

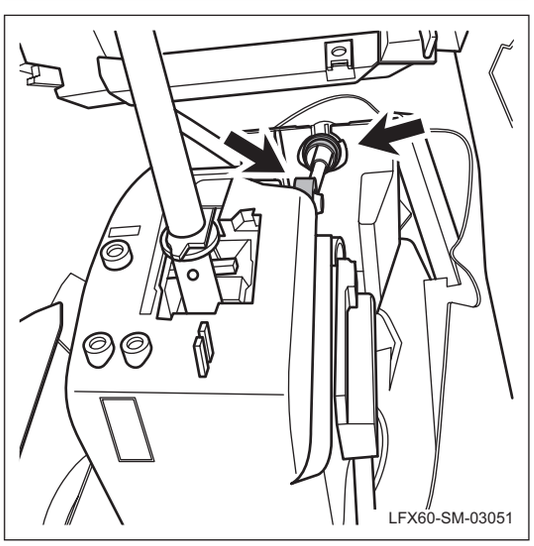
(b). Remove the air filter assembly. **Refer to the replacement of air filter assembly.**

(c). Remove the center console assembly. **Reference: Replacement of the center console assembly.**



(d). Remove the fixing bolt 1 from the shift cable.

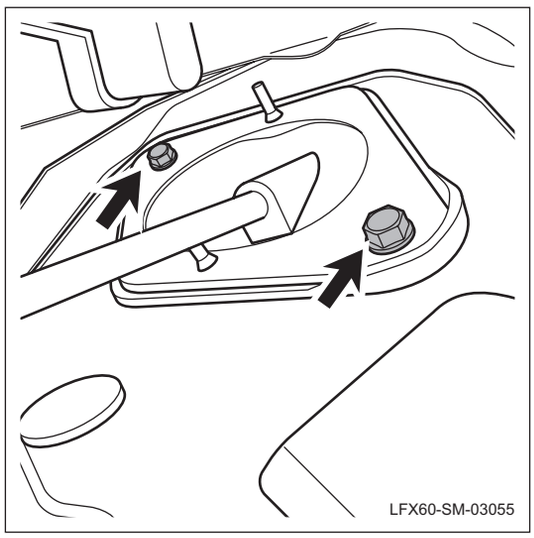
(e). Remove the fixing device 2 from the shift cable.



(f). Remove the shift cable.

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(g). Remove the fixing bolts from the shift cable.

(h). Take out the shift cable assembly.

Installation

1. Install the transmission shift cable.

(a). The installation sequence is the reverse of the disassembly order.

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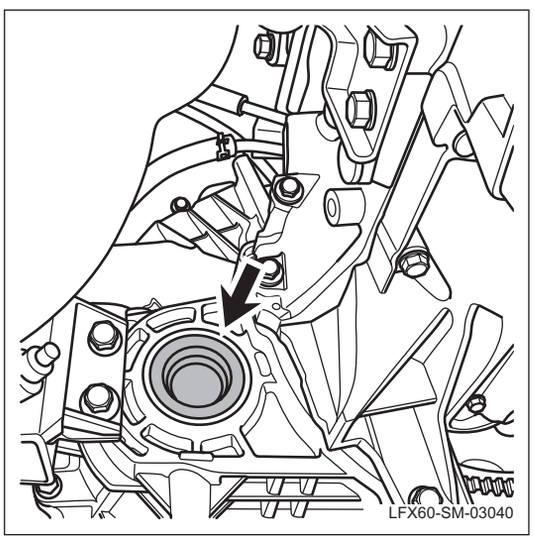
Replacement of differential oil seal
Removal

1. Remove the differential oil seal.

(a). Lift the vehicle. **Refer to the vehicle lift and support.**

(b). Discharge the transmission fluid with a returnable container. **Reference: Steps to drain and add transmission fluid.**

(c). Remove the drive shaft. **Refer to: Drive shaft replacement.**



(d). Use appropriate tools to remove the oil seal from the transmission.

Installation

1. Installation of differential oil seal.

(a). The installation sequence is the reverse of the disassembly order.

ⓘ Note:

- **Because of the interference fit between the oil seal and transmission, deformation is inevitable in the removal process, and the damaged parts cannot continue to be used.**
- **Oil seals should be installed with even force so as not to damage the oil seals.**
- **The components of the transmission require high accuracy, so you should be careful in the disassembling and assembling process so as not to scratch or damage them (i.e. finished surface of housings).**
- **Install the oil seals vertically.**

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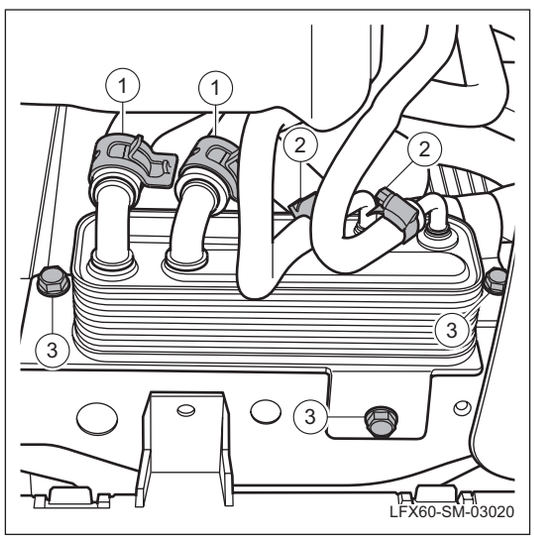
Replacement of oil cooler assembly
Removal

1. Remove the oil cooler assembly.

(a). Lift the vehicle. **Refer to the vehicle lift and support.**

(b). Remove the left engine bottom panel.

(c). Discharge the antifreeze with a returnable container. **Reference: Replacement of antifreeze.**



(d). Remove the oil cooler water pipe clamp 1, and take out the water cooler pipe.

(e). Remove the oil cooler fuel line clamp 2, and take down the oil cooler water pipe.

(f). Remove the fixing bolt 3 from the oil cooler assembly.

(g). Remove the oil cooler assembly.

Installation

1. Install the oil cooler assembly.

(a). The installation process is reverse to the removal process.

△ **Note:**

- **Do not remove violently so as not to damage the transmission tubing assembly.**
- **Avoid foreign matter from entering the transmission from the inlet of tubing assembly.**
- **Transmission cooling hose is connected to the internal oil passage of transmission, so ensure that the hose is clean.**

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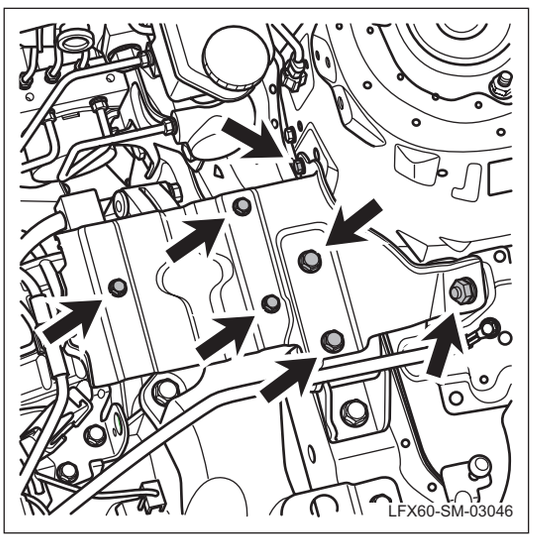
Replacement of CVT assembly
Removal

1. Remove the CVT assembly.

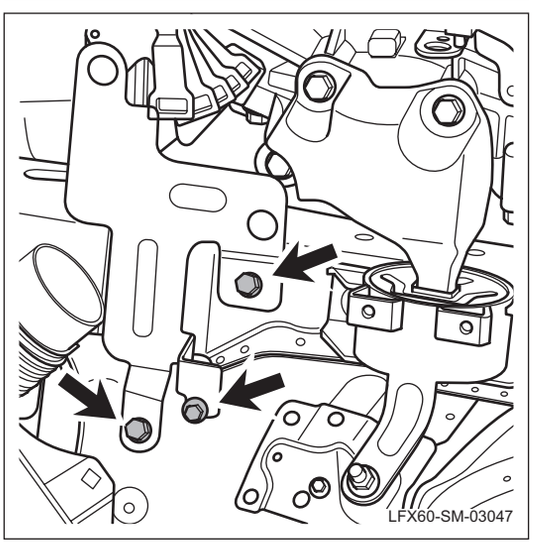
(a). Disconnect the battery negative terminal.

(b). Remove the air filter assembly. **Reference: Replacement of air filter assembly.**

(c). Remove the fuse box.



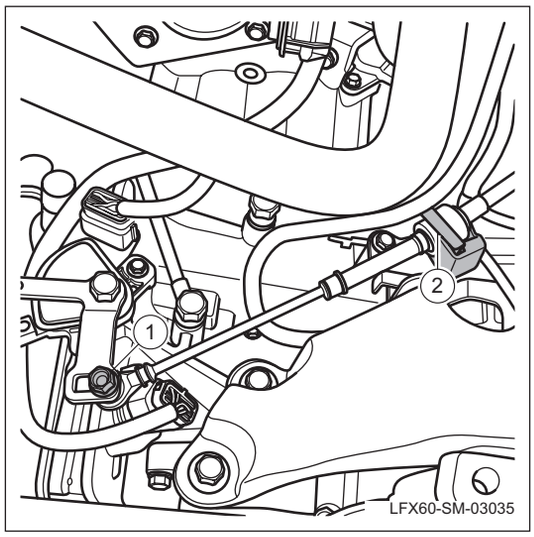
(d). Remove the fixing bolts from the fuse box holder.



(e). Remove the fixing bolts from the air filter holder.

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(f). Remove the nut 1 from the shift cable.

(g). Remove the clamp 2 from the shift cable.

(h). Remove the shift cable.

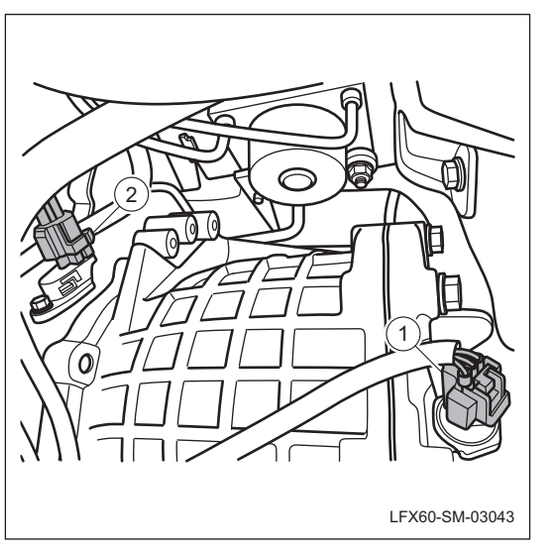


(i). Disconnect the harness plug 1 from the gear switch.

(j). Disconnect the harness plug 2 from the turbine speed sensor.

(k). Disconnect the harness plug 3 from the input shaft speed sensor.

(l). Disconnect the harness plug 4 from the transmission.

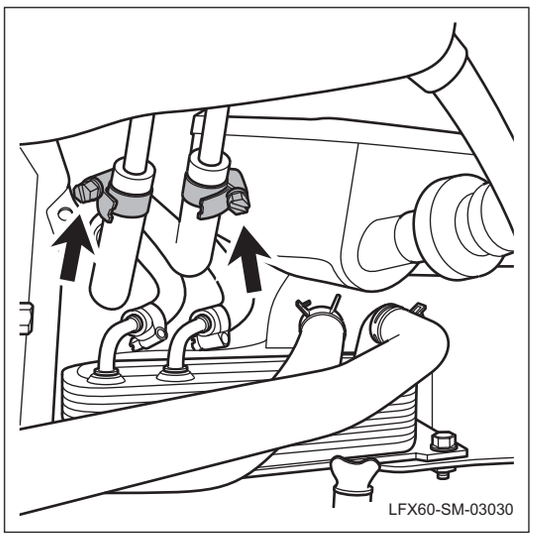


(m). Disconnect the harness plug 1 from the output shaft fluid pressure sensor.

(n). Disconnect the harness plug 2 from the output shaft speed sensor.

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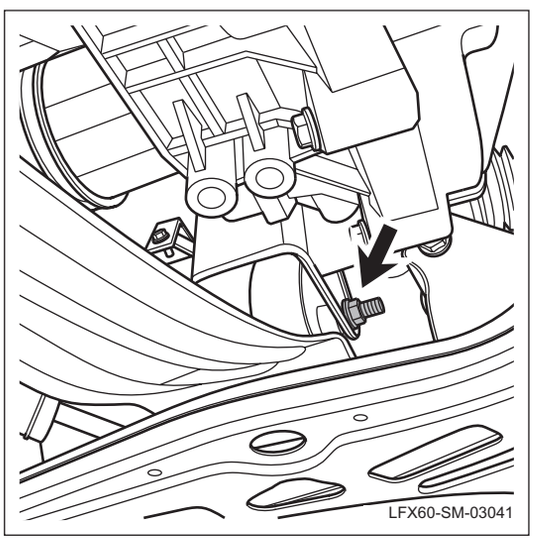
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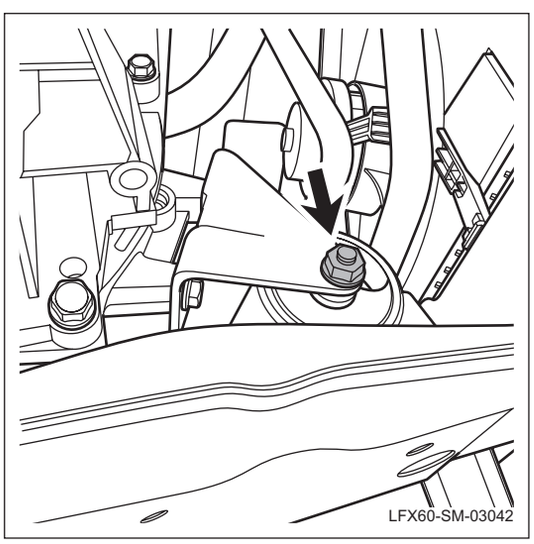
(o). Remove the oil cooler hose.

(p). Remove the starter. Reference: Replacement of the starter.

(q). Lift the vehicle. Reference: Lifting and supporting of vehicle.



(r). Remove the connecting bracket bolts from the rear suspension.



(s). Remove the front mounting connecting bracket bolt.

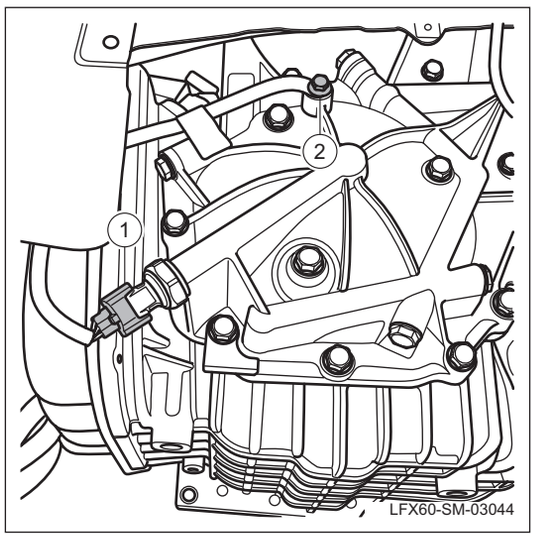
(t). Remove the front subframe. **Reference: Replacement of front subframe.**

(u). Remove the drive shaft. **Reference: Replacement of drive shaft.**

(v). Discharge the transmission fluid. **Reference: Steps to replace transmission fluid.**

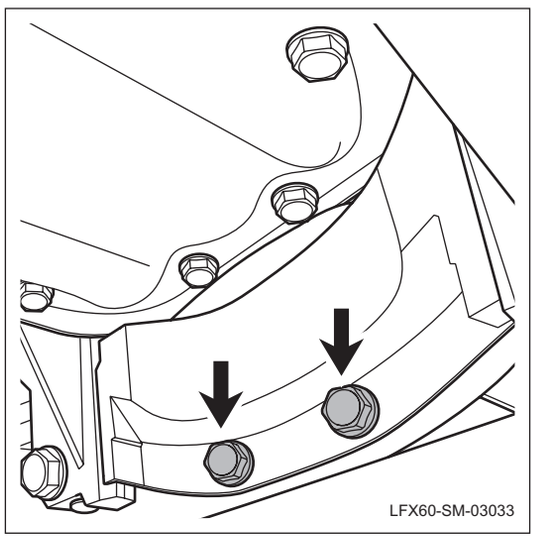
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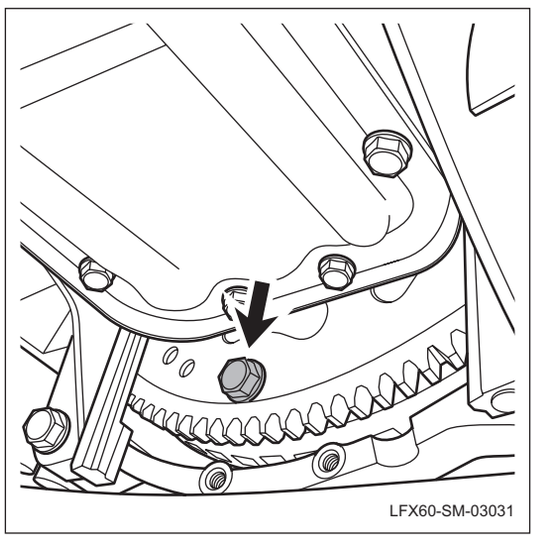


(w). Disconnect the harness plug 1 from the input shaft fluid pressure sensor.

(x). Remove the bond strap 2.



(y). Remove the fixing bolts from the flywheel baffle.



(z). Remove the connecting bolts from the first torque converter.

(aa). Turn the crankshaft by 90°, remove the second bolt and continue in the same direction.

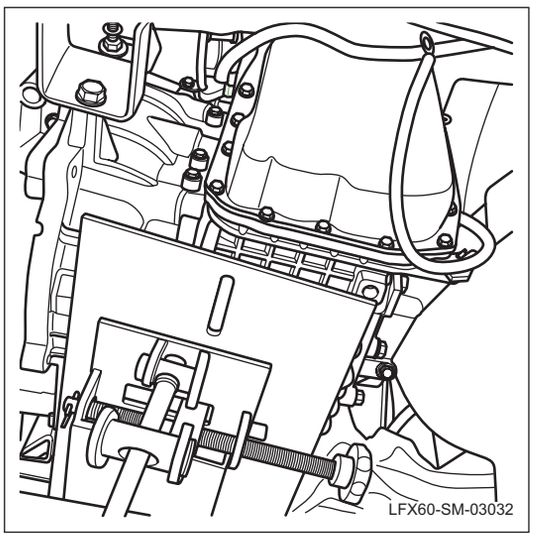
(ab). Turn the crankshaft by 90°, remove the third bolt and continue in the same direction.

(ac). Turn the crankshaft by 90°, and remove the last bolt.

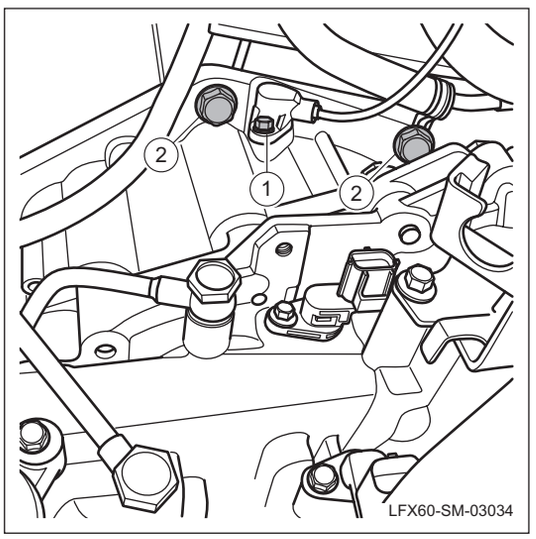
Tightening torque: as a torque of 55Nm

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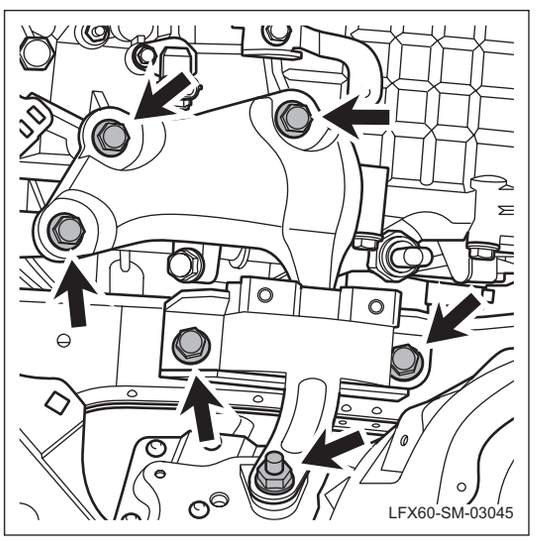


(ad). Use the jack to support the transmission.



(ae). Remove the speed sensor bolt 1 and remove the speed sensor.

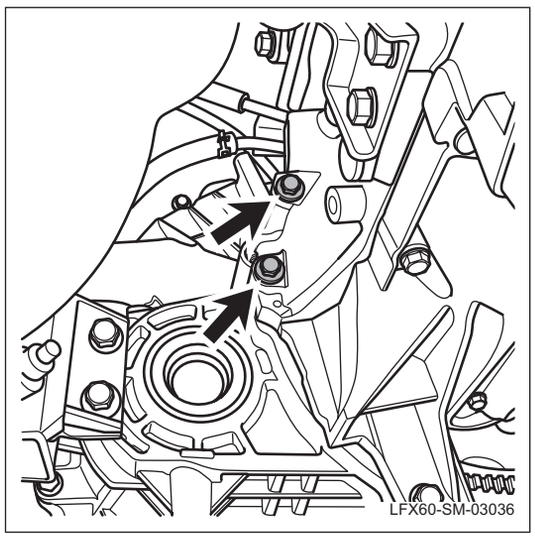
(af). Remove the connecting bolt 2 between the transmission and the upper part of the engine.



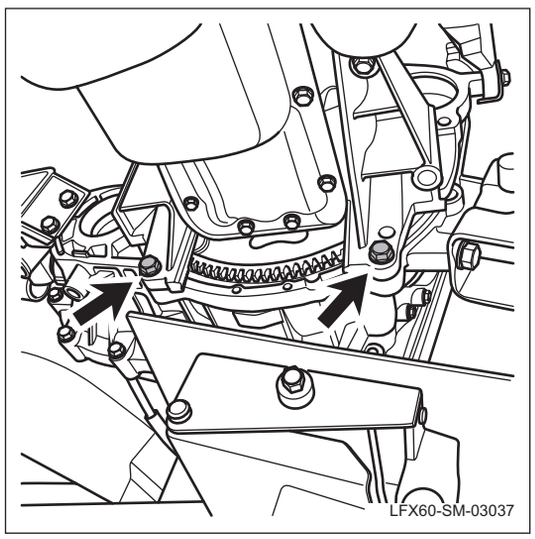
(ag). Remove the fixing bolts from the left suspension of the transmission.

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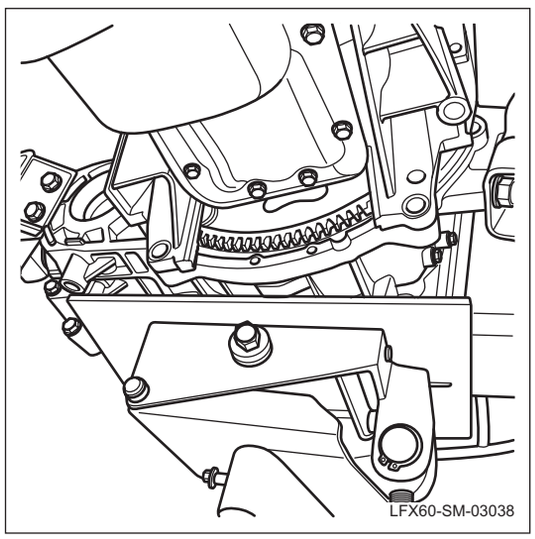
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(ah). Remove the connecting bolt between the transmission and the rear part of the engine.



(ai). Remove the connecting bolt between the transmission and the lower part of the engine.



(aj). Slowly lower the jack, and disconnect the transmission from the engine.

Installation

1. Install the CVT assembly.

(a). The installation process is reverse to the removal process.

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△ **Note:**

- **After the assembly is removed from the car, disconnect the transmission from the engine.**
- **Before removing the powertrain, discharge the transmission fluid.**
- **When disassembling the transmission, make sure that the bolts connecting the torque converter with the flexible disc should be removed first, and the torque converter should be removed together with the transmission so as to prevent the torque converter from falling off.**
- **If the torque converter accidentally fell off, you need to re-install it but don't do it forcibly so as not to damage the transmission parts.**
- **Hydraulic torque converter is a high-precision component which has higher requirements for rotational inertia. In case of accidental bump and deformation, you need to replace with a new torque converter.**
- **During the disconnection of the engine from the transmission, be careful not to damage the peripheral parts of the transmission such as cooling tubing, pressure sensor, etc. The damaged parts need to be replaced as required, if necessary.**

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03 - transmission

Clutch.....3-887
Technical specifications.....3-887
Precautions 3-888
Structure and installation location 3-890
General Inspection 3-892
Operating Principle.....3-893
Diagnostic Information and Procedures.....3-894
Removal and Installation.....3-909

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Clutch
Technical specifications

General specification

Name	Specification
The height from clutch pedalto the floor	mm
Clutch driven plate wear limit value	mm
Clutch pedal free stroke	mm

Torque Specifications

Name	Torque range	
	Metric (Nm)	British (lb-ft)
Bolt connecting clutch pedal and bracket		
Clutch wheel cylinder fixing bolt		
Clutch master cylinder fixing nut		
Clutch plate fixing bolt		
Clutch wheel cylinder fuel line terminal nut		
Clutch outlet hard pipe nut		

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Precautions

1. The recommended clutch hydraulic oil is brake fluid "DOT4". Do not use gasoline or kerosene and other mineral oil, or it will corrode the rubber parts of hydraulic system.
2. Do not reuse the discharged clutch hydraulic oil.
3. Do not splash the clutch hydraulic oil onto the paint face.
4. Clutch platen can not be cleaned with gasoline.
5. In the release bearing fills the lubricating oil. Do not wash it with oil or other liquids.
6. When installing the clutch, heat-and-pressure-resistant lubricating oil should be properly used to lubricate the driven plate spline and transmission 1 shaft spline to ensure the free move of driven plate on the transmission 1 shaft spline. Excessive lubrication will cause the friction plate to slip.
7. When the friction plate is worn to a specified wear limit, the driven plate assembly should be timely replaced to avoid the slip of the clutch which may scratch the plate and the flywheel.

ⓘ Note:

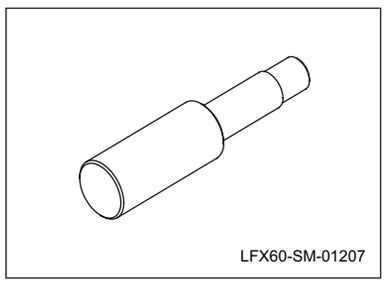
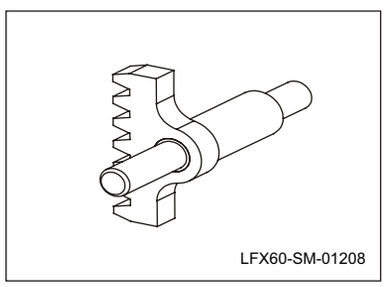
Clean the clutch friction plate with a vacuum cleaner rather than compressed air.

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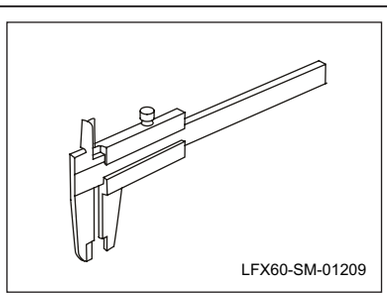
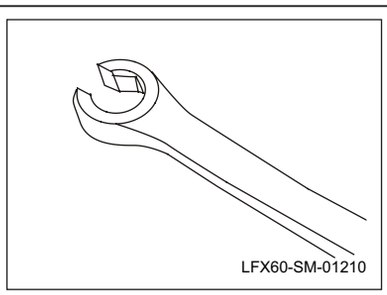
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Preparation

Special maintenance tools

No.	Tool name	Tool figure	Tool code	Remarks
1	clutch plate positioning tool	 LFX60-SM-01207	-	Position the clutch plate and driven plate during installation
2	Flywheel brake	 LFX60-SM-01208	-	Prevent the flywheel from rotating when remove the clutch platen

General maintenance tools

No.	Tool name	Tool figure	Tool code	Remarks
1	caliper	 LFX60-SM-01209	-	Measure the wear condition of the clutch
2	Wrench of oil pipe	 LFX60-SM-01210	-	Remove the bolt of oil pipe and the clutch deflation screw plug

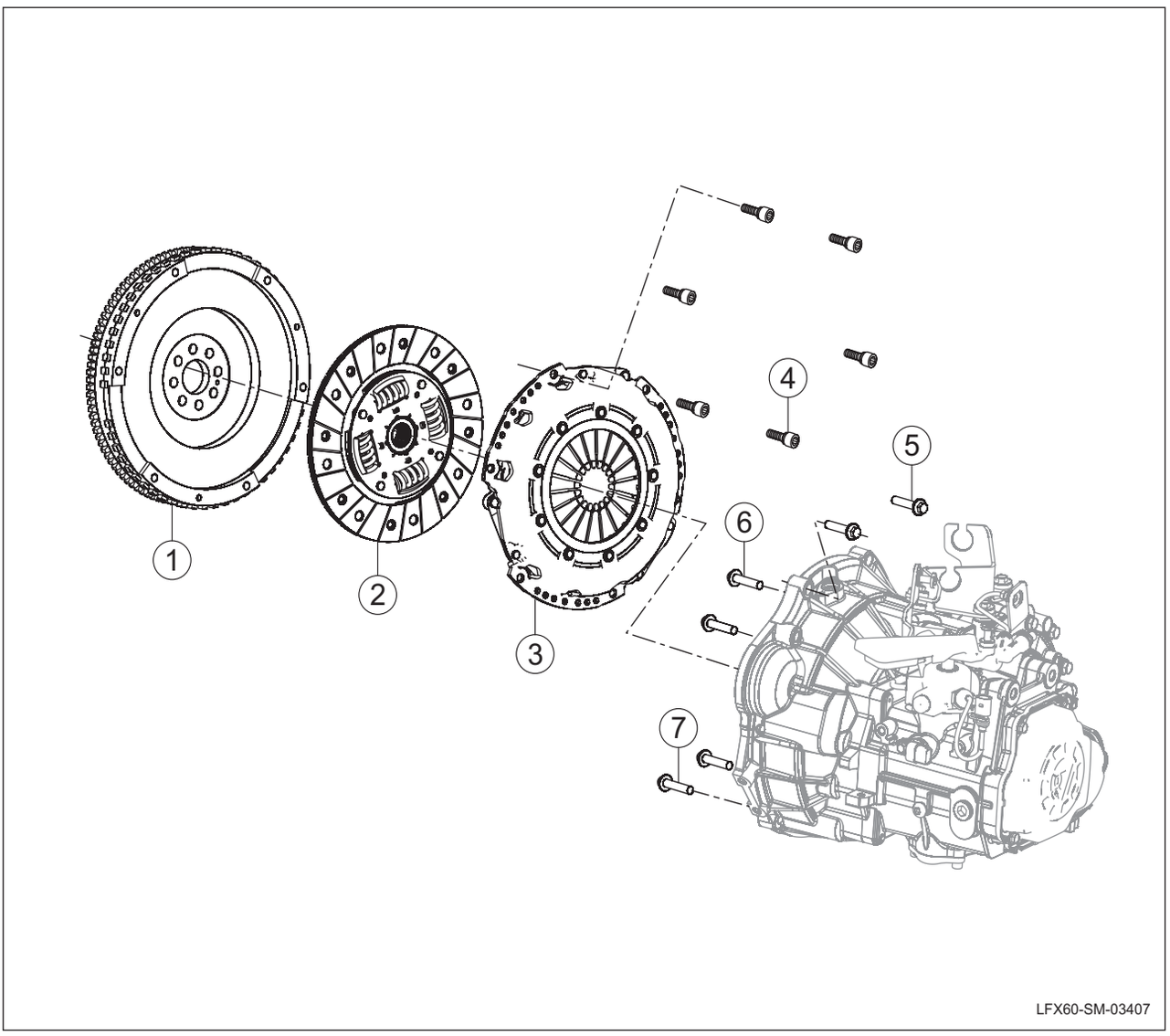
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Structure and installation location

Part exploded view

Driven plate of clutch platen



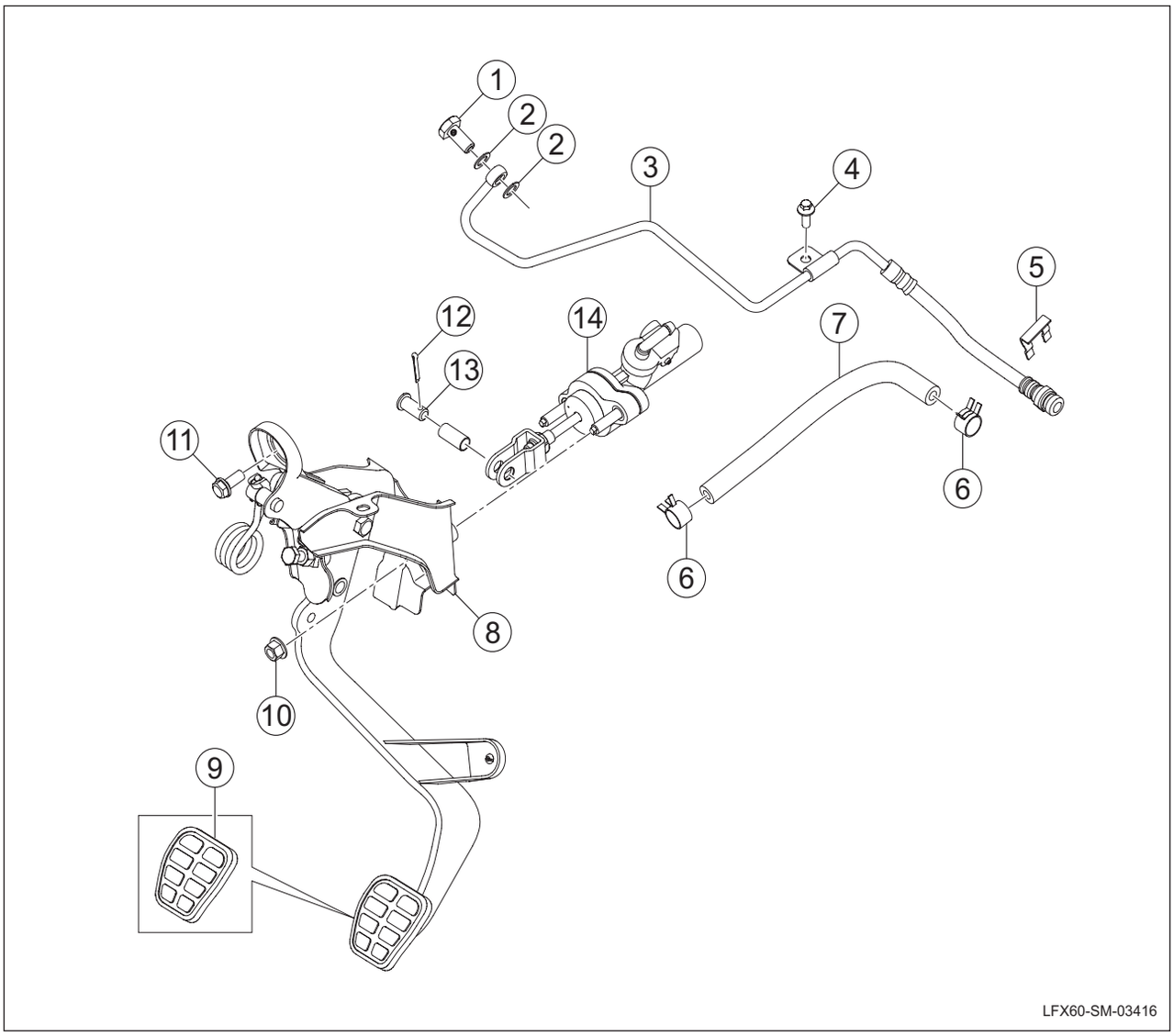
No.	Part name
1	Flywheel assembly
2	Clutch driven plate assembly
3	Clutch plate assembly
4	Clutch platen bolts

No.	Part name
5	Transmission bolt III
6	Transmission bolt II
7	Transmission bolt I

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Clutch control mechanism



No.	Part name
1	Clutch hollow bolts
2	Gasket
3	Clutch control oil pipe
4	Hexagon flange bolts
5	U shaped ring
6	Steel strip type elastic hose clamp
7	Clutch control oil pipe II

No.	Part name
8	Clutch pedal assembly
9	Pedal pad
10	All-metal hexagon flange locknut
11	Hexagon bolts and taper spring washer assembly
12	Lock pin
13	Pin
14	clutch master cylinder assembly

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General Inspection

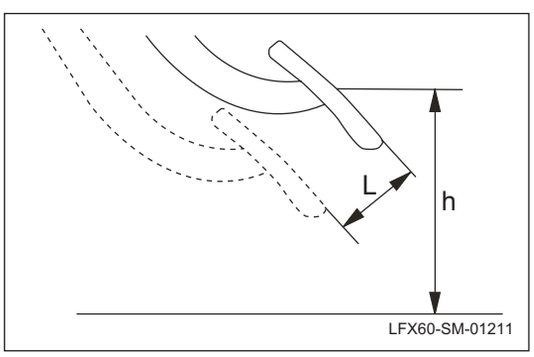
Clutch inspection

1. If you cannot cut off the clutch unless the clutch pedal is almost floored while the engine is idling, or when you step on the clutch pedal and feel it's hard to shift gears or hear harsh impact from the transmission gears, or the car starts moving while the clutch pedal is not released after engaging a gear, the clutch cannot be released completely.
2. Reasons for clutch slip: the free travel of clutch pedal is too small, and the release bearing is often pressed on the diaphragm spring, so the platen is always semi-separated; clutch platen spring is too soft or broken; the screws connecting clutch with flywheel get loose, etc.
3. If the clutch has abnormal sound in use, it is not normal. It is because of the serious wear of release bearing, weak or broken retracting spring, fault in diaphragm spring bracket, etc.

Clutch pedal inspection

1. Check that the height h of the clutch pedal is correct. Adjust it if not.

Height from pedal to floor: 160±15mm



2. Step on the pedal until you feel the resistance, and check that the free travel L of clutch pedal is correct. Adjust it if not.

Pedal free travel: ≤ 10mm

Inspection of clutch friction plate assembly

⚠ Warning:

It is strictly forbidden to use wax-based cleaning agents or solvents to clean the clutch friction plate assembly.

1. Clean the clutch friction plate assembly.
2. Check the clutch friction plate assembly for the following problems:

- Oil pollution.
- Scorch trace.
- Thickness.
- Spring damage.
- Replace the clutch friction plate assembly, if necessary.

Inspection of clutch platen assembly

1. Clean the clutch platen assembly.
2. Check the clutch platen assembly for the following problems:

- Damage or wear of diaphragm spring.
- Scorch trace.
- Distortion.
- Flat.
- Replace the clutch platen assembly, if necessary.

Inspection of clutch master cylinder

1. Check the clutch clutch master cylinder for the following problems:

- Master cylinder leak.
- Fasteners on the master cylinder get loose.

Inspection of clutch slave cylinder

1. Check the clutch slave cylinder for the following problems:

- Slave cylinder leak.
- Fasteners on the slave cylinder get loose.

Inspection of clutch high switch

1. Keep the clutch pedal in a free status (not pressed).
2. Install the clutch pedal switch and make the clutch pedal switch post rod fully retract and then tighten the clutch switch fixing nut.

Clutch low level switch inspection

1. Keep the clutch pedal in a totally pressed status.
2. Install the clutch pedal switch and make the clutch pedal switch post rod fully retract and then tighten the clutch switch fixing nut.

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Operating Principle

System overview

The clutch system consists of a clutch and clutch control mechanism where the clutch is composed of a clutch friction plate assembly and a clutch platen assembly connected to the flywheel. The clutch control mechanism is mainly composed of clutch pedal bracket assembly, clutch master cylinder, clutch tubing, clutch slave cylinder, clutch release fork, and release bearing. In the normal working condition, the clutch friction plate assembly is connected to the flywheel under the pressure of the clutch platen assembly to transmit the engine power to the transmission assembly. When the clutch pedal is pressed, the clutch pedal pressure is passed to the clutch slave cylinder through the clutch master cylinder and the clutch tubing, then the putter of clutch slave cylinder pushes the release fork. The clutch release moves the release bearing forward to push the clutch platen assembly to separate the clutch friction plate assembly from the flywheel, thus interrupting the power transfer between the engine and the transmission. When the clutch pedal is released, the spring pressure in the clutch platen assembly pushes the platen forward towards the clutch friction plate assembly to recombine the clutch friction plate assembly with the flywheel.

Clutch master cylinder

The clutch master cylinder is equipped with a clutch oil reservoir and outlet pipe, and the clutch master pump will transfer the pressure acting on the clutch pedal to the clutch slave cylinder in a hydraulic manner.

Clutch wheel cylinder

The clutch slave cylinder is mounted on the left side of the transmission, and the slave cylinder has an inlet pipe connected through hollow nuts and also a bleed screw. Hydraulic oil pushes the clutch slave cylinder putter which then controls the release fork.

Release fork

The release fork drives the release bearings so as to achieve the purpose of separation control.

Release bearing

Clutch release bearings are used to reduce the friction between the clutch platen assembly and the clutch fork.

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Diagnostic Information and Procedures

Diagnosis Instructions

Before starting to diagnose a fault in the clutch system, familiarize yourself with the operating principle of the clutch system, and then start the system diagnostics, which helps to determine the correct troubleshooting steps in the event of a failure. More importantly, this also helps to determine whether the customer's situation belongs to normal operation.

Any troubleshooting of the clutch system should begin with the clutch system check, so as to instruct the service personnel to take the next logical step to troubleshoot. Understanding and using the clutch diagnostic flowchart correctly can reduce the diagnosis time and avoid misjudgment of components.

Visual Inspection

1. Confirm the problem raised by the customer.
2. Check the evident mechanical faults.

Visual check list

Mechanical	Electrical
• Clutch oil pot • Clutch master cylinder • Clutch wheel cylinder • Clutch release fork • Clutch release bearing • Clutch plate assembly • Clutch friction plate assembly • Clutch pedal bracket assembly	• Clutch switch • Harness plug • Line

3. Solve the problem finding before the next step inspection.
4. If the observed or raised problem is the evident and the cause has been found, ensure to fix this fault before proceeding with the next step.
5. If no problem is found through the visual check, confirm the fault and refer to the fault symptom list.

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Fault symptom list

Symptom	Possible point of failure	Recommended measures
Clutch fluid leakage	• Clutch oil pot • Clutch master cylinder • Clutch wheel cylinder • Clutch line	**Refer to: Diagnostic process for brake fluid leakage**
Clutch slip	• Clutch pedal free stroke • Clutch pedal bonding • Clutch plate assembly • Clutch friction plate assembly • Flywheel	**Refer to: Diagnostic process for clutch slip**
Clutch delay	• Clutch fluid shortage • Air in clutch fluid • Clutch pedal free stroke • Clutch plate assembly • Clutch friction plate assembly • Release bearing • Transmission main shaft	**Refer to: Diagnostic process for clutch delay**
Clutch clamping (hard to push the pedal)	• Clutch pedal bracket assembly	• Check if the clutch pedal shaft is rusted, deformed and damaged
	• Incorrect brake fluid	• Check if the fluid in the master cylinder is correct. If the brake fluid is found incorrect, replace the clutch master cylinder and slave cylinder, flush the hydraulic pipeline and add correct fluid.
	• Brake fluid polluted	• Check the brake fluid for water • Check the brake fluid for dust or debris • Check if the brake fluid is polluted. If the brake fluid is polluted, replace the clutch master cylinder and slave cylinder, flush the hydraulic pipeline and add correct fluid.
	• Clutch hydraulic pipeline twisted or deformed	• Check if the hydraulic hose is kinked or damaged, and repair or replace the clutch hydraulic hose if damaged.
	• Hydraulic pipeline rusted	• Clean or replace the hydraulic pipeline
Clutch pedal pulsates	• Clutch pedal and clutch pedal shaft poorly lubricated • Clutch friction plate assembly unevenly worn • Pressure plate spring fatigue with uneven clearance • Flywheel	**Refer to: Diagnostic process for clutch pedal pulsating**

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Symptom	Possible point of failure	Recommended measures
The clutch is rattling	• Platen diaphragm spring is too soft	• Replace the clutch platen assembly **Refer to: replacement of clutch plate assembly**
	• Release bearing damaged	• Replace the release bearing **Refer to: replacement of clutch release bearing**
	• Clutch friction plate assembly polluted by oil	• Solve the oil leakage problem and replace the clutch friction plate assembly, if necessary.
	• Friction plate damping spring damaged	• Replace the clutch friction plate assembly **Refer to: replacement of clutch plate assembly**
Clutch clatters or shakes	• Engine support • Surface of clutch friction plate assembly polluted by oil • Diaphragm spring • Clutch plate assembly • Surface of clutch friction plate assembly • Flywheel	**Refer to: Diagnostic process for clutch clattering or shaking**
Clutch vibration	• Engine parts in contact with the frame • Accessories belt • Flywheel bolt • Flywheel • Clutch platen unbalanced	**Refer to: Diagnostic process for clutch vibration**
The noise is excessive	• Clutch pedal free stroke • Clutch release bearing • Clutch release bearing poorly lubricated • Guide bearing • Excessive crankshaft axial clearance	**Refer to: Diagnostic process for significant noise**
Difficulty in gears shift	• Brake fluid shortage • Air in clutch line • Clutch pedal free stroke • Manual transmission fault	**Refer to: Diagnosis process for difficulty in gears shift**

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Diagnostic process for brake fluid leakage

Test condition	Details/results/measures
1. Check the clutch oil pot.	
	A. Check the clutch oil pot for damage. B. Check the sealing element for aging. C. Check whether the installation is correct. Is it OK after checking? →**Yes** To step 2. →**No** Repair or replace the damaged components.
2. Check the clutch master cylinder.	
	A. Check the clutch master cylinder for leak. Is it OK after checking? →**Yes** To step 3. →**No** Replace the master cylinder. **Refer to: Replacement of the clutch master cylinder.**
3. Check the clutch wheel cylinder.	
	A. Check the clutch wheel cylinder for leak. Is it OK after checking? →**Yes** To step 4. →**No** Replace the clutch wheel cylinder. **Refer to: Replacement of the clutch wheel cylinder.**
4. Replace the clutch line.	
	A. Replace the clutch line. B. Fill the brake fluid and bleed the clutch system. Confirm that the fault has been ruled out.

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Diagnostic process for clutch slip

Test condition	Details/results/measures
1. Confirm the fault phenomenon.	
	A. Fix the wheels, apply the parking brake and depress the brake pedal. B. Start the engine and engage the 4th gear. C. Run the engine at the speed of 2,000rpm and slowly release the clutch pedal. Does the engine stall when the clutch pedal completely releases? →**Yes** The clutch is normal. →**No** To step 2.
2. Check the clutch pedal free stroke.	
	A. Check the clutch pedal free stroke, which should be more than 7mm and less than 10mm. Is it OK after checking? →**Yes** To step 3. →**No** Adjust the clutch pedal free stroke.
3. Check the clutch pedal control ability.	
	A. Check whether the clutch pedal shaft lubrication is normal. Is it OK after checking? →**Yes** To step 4. →**No** Lubricate the clutch pedal shaft.
4. Check the clutch master cylinder.	
	A. Release the clutch master cylinder and check whether the master cylinder return is normal. Is it OK after checking? →**Yes** To step 5. →**No** Replace the clutch master cylinder. Refer to: Replacement of the clutch master cylinder.

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Test condition	Details/results/measures
5. Check the clutch wheel cylinder.	
	A. Check whether the clutch wheel cylinder can automatically return. Is it OK after checking? →**Yes** To step 6. →**No** Replace the clutch wheel cylinder. **Refer to: Replacement of the clutch wheel cylinder.**
6. Check the clutch.	
	A. Remove the transmission. **Refer to: Replacement of the transmission assembly.** B. Check the clutch for oil leak and contamination. Is it OK after checking? →**Yes** To step 7. →**No** Repair the oil leak fault.
7. Check the clutch friction plate assembly.	
	A. Check the clutch friction plate assembly for oil stain, overhardening or damage. B. Check the thickness of clutch friction plate assembly. Is it OK after checking? →**Yes** To step 8. →**No** Replace the clutch friction plate assembly. **Refer to: Replacement of the clutch friction plate assembly.**
8. Check the clutch plate assembly.	
	A. Check the clutch plate assembly for excessive wear, buckling and fracture. B. Check the plate diaphragm spring for damage. Is it OK after checking? →**Yes** To step 9. →**No** Replace the clutch plate assembly. **Refer to: Replacement of the clutch friction plate assembly.**
9. Replace the flywheel.	
	A. Replace the flywheel. **Refer to: Replacement of the flywheel.** B.Carry out trial run. Confirm that the fault has been ruled out.

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Diagnostic process for clutch delay

Test condition	Details/results/measures
1. Check the brake fluid.	
	A. Check the brake fluid level, color and taste. B. Check the clutch line for leak. Is it OK after checking? →**Yes** To step 2. →**No** Repair the fault, fill or replace the brake fluid.
2. Check the brake fluid for air admission.	
	A. Check the brake fluid for air admission. Is it OK after checking? →**Yes** To step 3. →**No** Bleed the clutch. **Refer to: Clutch bleed procedures**
3. Check the clutch pedal free stroke.	
	A. Check the clutch pedal free stroke, which should be more than 7mm and less than 10mm. Is it OK after checking? →**Yes** To step 4. →**No** Adjust the free stroke of clutch pedal bracket assembly.
4. Check the clutch plate assembly.	
	A. Check the clutch plate assembly for excessive wear, buckling and fracture. B. Check the plate diaphragm spring for damage. Is it OK after checking? →**Yes** To step 5. →**No** Replace the clutch plate assembly. **Refer to: Replacement of the clutch friction plate assembly.**

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Test condition	Details/results/measures
5. Check the clutch friction plate assembly.	
	A. Check the clutch friction plate assembly for deformation. B. Check the clutch friction plate assembly spline groove for corrosion or damage. Is it OK after checking? →**Yes** To step 6. →**No** Replace the clutch friction plate assembly. **Refer to: Replacement of the clutch friction plate assembly.**
6. Check the release bearing.	
	A. Check the release bearing for damage. Is it OK after checking? →**Yes** To step 7. →**No** Replace the release bearing. **Refer to: Replacement of the release bearing.**
7. Replace the transmission main shaft.	
	A. Replace the transmission main shaft. **Refer to: Disassembly and assembly of transmission** B. Carry out trial run. Confirm that the fault has been ruled out.

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Clutch pedal bracket assembly pulse diagnosis flow

Test condition	Details/results/measures
1. Check the clutch pedal bracket assembly.	
	A. Check whether the installation of clutch pedal bracket assembly mechanism is normal. B. Check whether the clutch pedal rotation pivot lubrication is normal. Is it OK after checking? →**Yes** To step 2. →**No** Install the clutch pedal bracket assembly again and lubricate the rotation pivot.
2. Check the clutch friction plate assembly.	
	A. Remove the transmission. **Refer to: Replacement of the transmission assembly.** B. Check the clutch friction plate assembly for stiffening and deformation. C. Check the clutch friction plate assembly for uneven wear. D. Check the clutch friction plate assembly damping spring for uneven distribution. Is it OK after checking? →**Yes** To step 3. →**No** Replace the clutch friction plate assembly. **Refer to: Replacement of the clutch friction plate assembly.**
3. Check the clutch plate assembly.	
	A. Check the clutch plate surface for deformation. B. Check the clutch plate assembly diaphragm spring for fracture or absence. C. Check the clutch plate surface for uneven wear. Is it OK after checking? →**Yes** To step 4. →**No** Replace the clutch plate assembly. **Refer to: Replacement of the clutch friction plate assembly.**
4. Replace the flywheel.	
	A. Replace the flywheel. **Refer to: Replacement of the flywheel.** B. Carry out trial run. Confirm that the fault has been ruled out.

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Diagnostic process for clutch clattering or shaking

Test condition	Details/results/measures
1. Check the clutch for click noise or dithering.	
	A. Start the engine, engage the first gear and run the engine at the speed of 1,200 ~ 1,500rpm. B. Slowly release the clutch pedal. C. Check clutch for dithering upon the vehicle start. Is it OK after checking? →**Yes** The clutch is normal. →**No** To step 2.
2. Check the engine/transmission mounting.	
	A. Check the engine/transmission mounting fixing bolt for looseness. B. Check the engine/transmission mounting for excessive wear and aging of rubber. Is it OK after checking? →**Yes** To step 3. →**No** Repair or replace the damaged components.
3. Check the clutch plate assembly.	
	A. Check the clutch plate assembly for the abnormal wear. Is it OK after checking? →**Yes** To step 4. →**No** Replace the clutch plate assembly. **Refer to: Replacement of the clutch friction plate assembly.**
4. Check the clutch friction plate assembly.	
	A. Check the clutch friction plate assembly for oil stain or burning. Is it OK after checking? →**Yes** To step 5. →**No** Replace the clutch friction plate assembly. **Refer to: Replacement of the clutch friction plate assembly.**

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5. Replace the flywheel.	
	A. Replace the flywheel. **Refer to: Replacement of the flywheel.** B. Carry out trial run. Confirm that the fault has been ruled out.

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Diagnostic process for clutch vibration

Test condition	Details/results/measures
1. Check the engine components and bodywork for interference.	
	A. Lift the vehicle. **Refer to: Vehicle lift and support** B. Check the engine mounting linkage for interference with the bodywork or frame. C. Check the exhaust manifold or other engine components for interference with the bodywork or frame. Is it OK after checking? **→Yes** To step 2. **→No** Repair the fault position.
2. Check the accessory drive vibration.	
	A. In the case of engine torque variation, check the accessory for vibration while engaging or releasing the clutch. B. Loosen the accessory driving belt and check for vibration. C. Check whether the vibration stops when the accessory driving belt is removed. Is it OK after checking? **→Yes** To step 3. **→No** Repair or replace the damaged components.
3. Check the clutch plate assembly.	
	A. Remove the transmission assembly. **Refer to: Replacement of the transmission assembly.** B. Check the end face run-out of clutch plate assembly. C. Check the wear height of clutch plate assembly release lever. Is it OK after checking? **→Yes** To step 4. **→No** Replace the clutch plate assembly. **Refer to: Replacement of the clutch friction plate assembly.**

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Test condition	Details/results/measures
4. Check the clutch friction plate assembly.	
	A. Check the clutch friction plate assembly for stiffening, deformation and thickness limit. B. Check the end face run-out of clutch friction plate assembly. Is it OK after checking? →**Yes** To step 5. →**No** Replace the clutch friction plate assembly. **Refer to: Replacement of the clutch friction plate assembly.**
5. Replace the flywheel.	
	A. Remove the transmission. **Refer to: Replacement of the transmission assembly.** B. Check the clutch friction plate assembly for stiffening and deformation. C. Check the clutch friction plate assembly for uneven wear. D. Check the clutch friction plate assembly damping spring for uneven distribution. Is it OK after checking? →**Yes** To step 3. →**No** Replace the clutch friction plate assembly. **Refer to: Replacement of the clutch friction plate assembly.**

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Clutch noise high diagnosis flow

Test condition	Details/results/measures
1. General inspection.	
	A. Check the engine and transmission support for cracking, absence and damage. B. Check the transmission for interference with the exhaust pipe and bodywork and whether the transmission support includes the stone or other foreign matters. Is it OK after checking? →**Yes** To step 2. →**No** Repair the fault position.
2. Check the noise in the early stage of clutch release.	
	A. Start the engine and depress the clutch pedal gently without depressing to the end. Is there any noise? →**Yes** Replace the clutch release bearing. Refer to: Replacement of the release bearing. →**No** To step 3.
3. Check the noise upon clutch engagement.	
	A. Remove the transmission. **Refer to: Replacement of the transmission assembly.** B. Check the wear of clutch friction plate assembly torsional spring. Is it OK after checking? →**Yes** To step 4. →**No** Replace the clutch friction plate assembly. **Refer to: Replacement of the clutch friction plate assembly.**
4. Check the noise when a gear engaged and in neutral gear.	
	A. Start the engine and check the noise when a gear engaged and in neutral gear. Is there any transmission noise? →**Yes** Repair the transmission. →**No** To step 5.
6. Check the other noise.	
	A. Check the other noise. Confirm that the fault has been ruled out.

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Diagnosis process for difficulty in gears shift

Test condition	Details/results/measures
1. Check the clutch system.	
	A. Check whether the clutch system release is complete and the engagement is reliable. **Refer to: Diagnosis for difficulty in gears shift** **Is it OK after checking?** **→Yes** To step 2. **→No** Repair or replace the damaged components.
2. Check the gear lever and gear lever positioning assembly.	
	A. Check the gear lever for deformation and abnormal installation. B. Check the gear lever positioning assembly for abnormal installation and excessive wear. Is it OK after checking? **→Yes** To step 3. **→No** Repair or replace the damaged components.
3. Check the transmission inside shift fork, fork shaft, synchronizer assembly and self-locking mechanism.	
	A. Remove the transmission. **Refer to: Replacement of transmission assembly (MT)** **Refer to: Disassembly and assembly of transmission (MT)** B. Check the shift fork and fork shaft for deformation and damage. C. Check whether the synchronizer assembly is normal. D. Check the fork shaft self-locking mechanism. Is it OK after checking? **→Yes** To step 4. **→No** Repair or replace the damaged components
4. Replace the transmission or engine support.	
	A. Replace the transmission or engine support. **Refer to: Replacement of mounting device** Confirm the fault is eliminated

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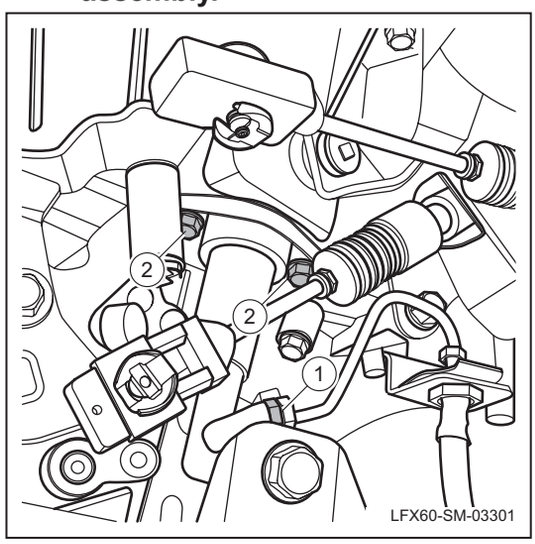
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Removal and Installation

Clutch bleed procedures

1. Bleed the clutch.

(a). Remove the air filter element assembly. **Refer to the replacement of air filter element assembly.**



(b). Loosen the bleed bolt.

(c). Connect the vinyl plastics hose to the wheel cylinder bleed bolt and depress the clutch pedal slowly for several times.Depress the clutch pedal to the end, loosen the bleed bolt until the brake fluid flows out and then tighten the bleed bolt.

(d). Repeat the above operation until no bubble occurs and then tighten the bleed bolt.

Note:

- **This procedure requires two persons to complete.**
- **The oil level in the clutch pot must be normal.**
- **Fill the brake fluid to MAX mark.**

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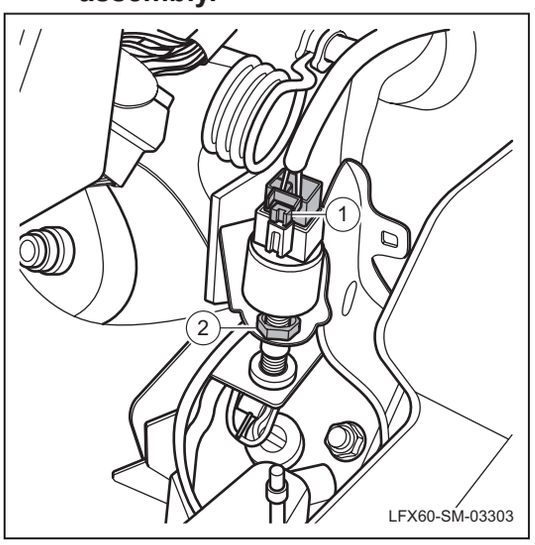
Replacement of clutch switch

Removal

1. Remove the clutch switch.

(a). Disconnect the battery negative connector.

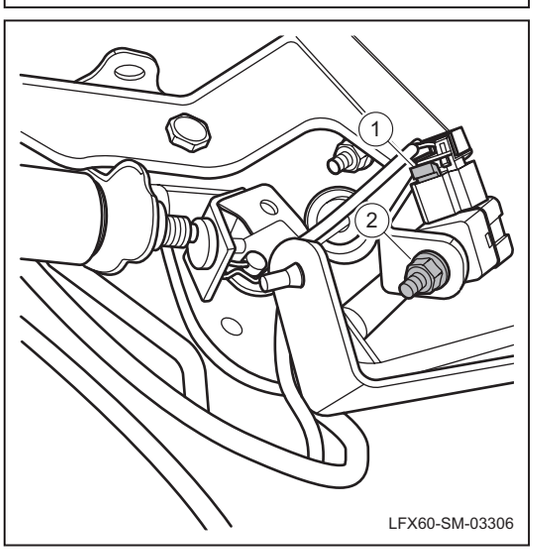
(b). Remove the dashboard lower left panel assembly. **Refer to the replacement of dashboard assembly.**



(c). Disconnect the clutch high-mounted switch harness plug 1.

(d). Unscrew the clutch high-mounted switch fixing nut 2.

(e). Rotate the clutch high-mounted switch counter-clockwise to take it out.



(f). Disconnect the clutch low-mounted switch harness plug 1.

(g). Remove the clutch low-mounted switch fixing nut 2.

(h). Take out the clutch low-mounted switch.

Installation

1. Install the clutch switch.

(a). The installation sequence is the reverse of the disassembly order.

ℹ Note:

During the installation, adjust the clutch to the proper position.

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Replacement of clutch pedal bracket assembly

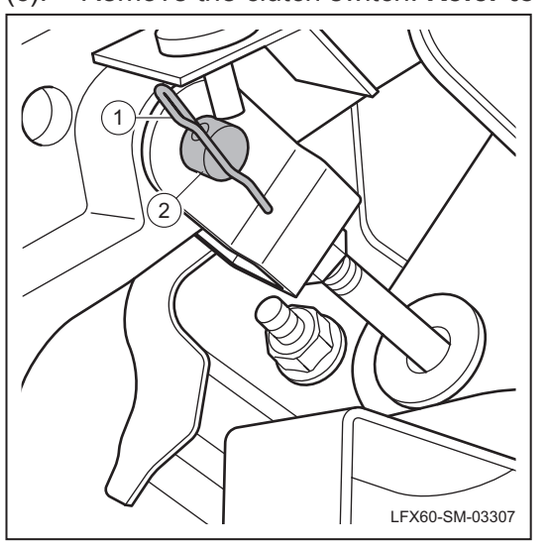
Removal

1. Remove the clutch pedal bracket assembly.

(a). Disconnect the battery negative connector.

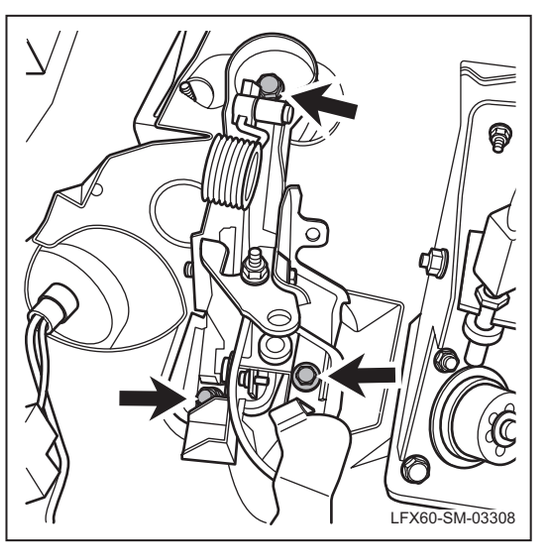
(b). Remove the dashboard lower left panel assembly. **Refer to the replacement of dashboard assembly.**

(c). Remove the clutch switch. **Refer to the replacement of clutch switch.**



(d). Remove the clutch master cylinder push rod fixing plunger detent 1.

(e). Remove the clutch master cylinder push rod fixing plunger 2.



(f). Remove the clutch pedal bracket fixing bolt.

(g). Take down the clutch pedal bracket assembly.

Installation

1. Install the clutch pedal bracket assembly.

(a). The installation sequence is the reverse of the disassembly order.

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Replacement of clutch master cylinder

Removal

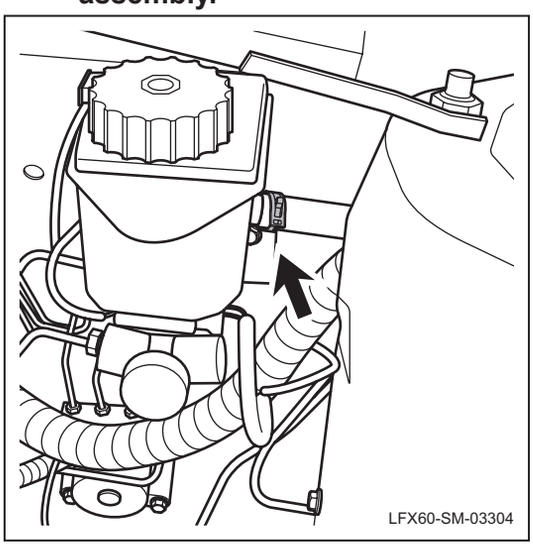
1. Remove the clutch master cylinder.

(a). Remove the battery negative terminal.

(b). Remove the brake master cylinder. **Refer to the replacement of brake master cylinder.**

(c). Remove the vacuum booster. **Refer to the replacement of vacuum booster.**

(d). Remove the dashboard lower left panel. **Refer to the replacement of dashboard assembly.**

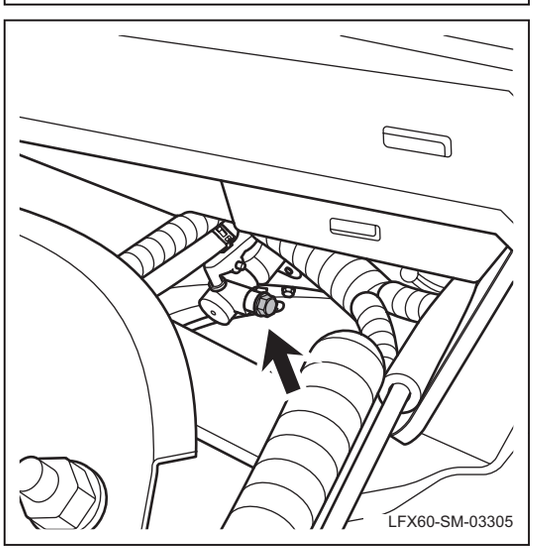


(e). Remove the clutch master cylinder oil inlet hose clamp and take down the hose.

ⓘ Note:

Seal the inlet pipe to prevent the oil lose and the ingress of dirt.

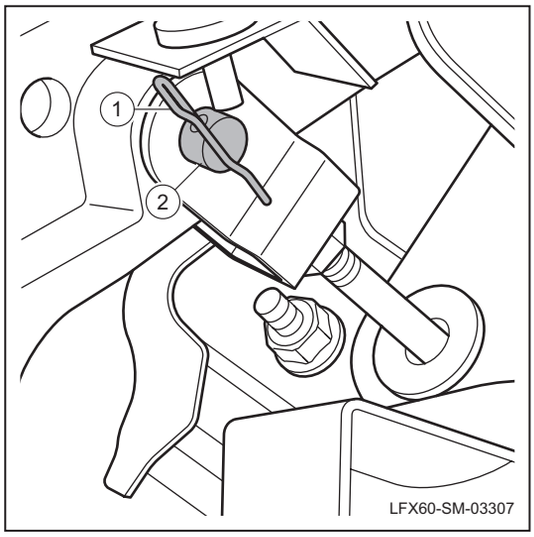
If the brake fluid splashes onto the paint face, immediately rinse it with the cool water.



(f). Remove the clutch master cylinder oil outlet pipe fixing nut.

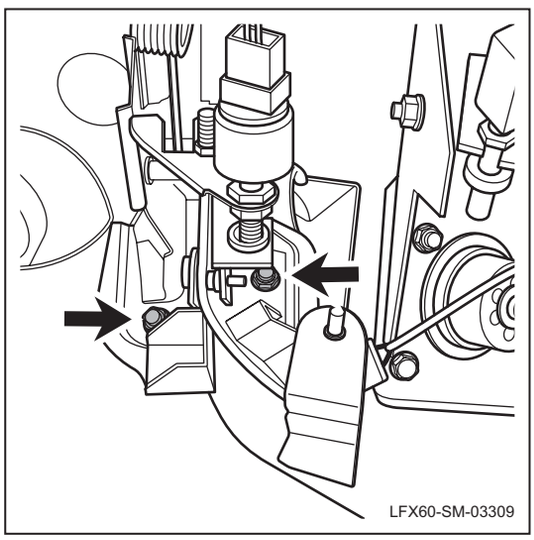
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(g). Remove the clutch master cylinder push rod fixing plunger detent 1.

(h). Remove the clutch master cylinder push rod fixing plunger 2.



(i). Remove the clutch master cylinder fixing bolt.

(j). Take down the clutch master cylinder.

Installation

1. Install the clutch master cylinder.

(a). The installation sequence is the reverse of the disassembly order.

(b). Fill the brake fluid. **Refer to the brake fluid draining and filling procedures.**

(c). Bleed the clutch. **Refer to the clutch bleed procedures.**

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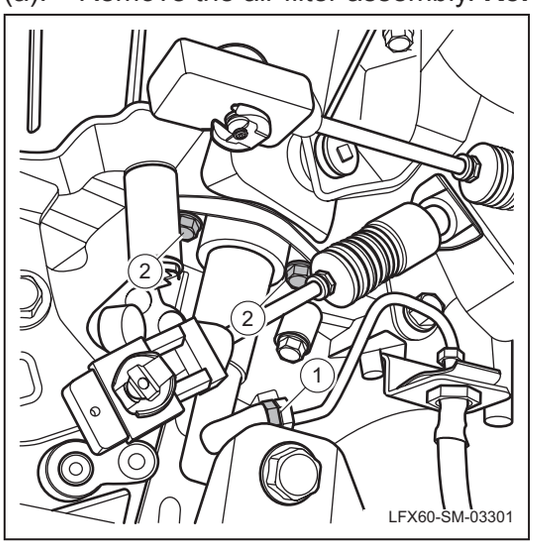
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Replacement of clutch wheel cylinder

Removal

1. Remove the clutch wheel cylinder.

(a). Remove the air filter assembly. **Refer to the replacement of air filter assembly.**



(b). Remove the clutch wheel cylinder oil pipe clamp and disconnect the wheel cylinder oil pipe 1.

(c). Remove the clutch wheel cylinder fixing bolt 2.

(d). Take out the clutch wheel cylinder.

Note:

Seal the inlet pipe to prevent the oil lose and the ingress of dirt.

If the brake fluid splashes onto the paint face, immediately rinse it with the cool water.

Installation

1. Install the clutch wheel cylinder.

(a). The installation sequence is the reverse of the disassembly order.

(b). Fill the brake fluid. **Refer to the brake fluid draining and filling procedures.**

(c). Bleed the clutch. **Refer to the clutch bleed procedures.**

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Replacement of release bearing

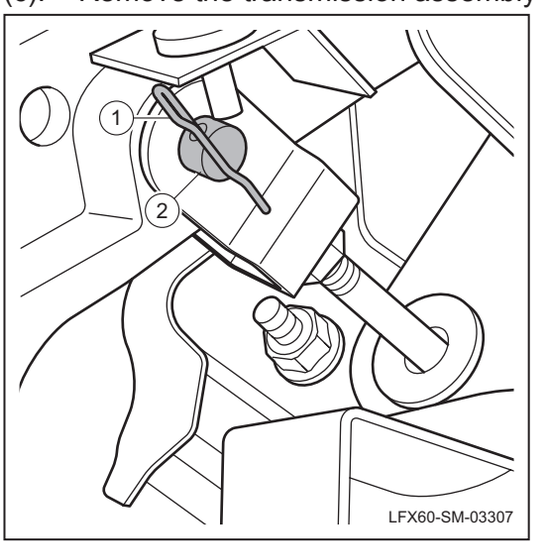
Removal

1. Remove the release bearing.

(a). Disconnect the battery negative connector.

(b). Lift the vehicle. **Refer to the vehicle lift and support.**

(c). Remove the transmission assembly. **Refer to the removal of transmission assembly.**



(d). Remove the release bearing.

Installation

1. Install the release bearing.

(a). The installation sequence is the reverse of the disassembly order.

ⓘ Note:

Apply the right amount of grease to the release fork.

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Replacement of clutch plate assembly

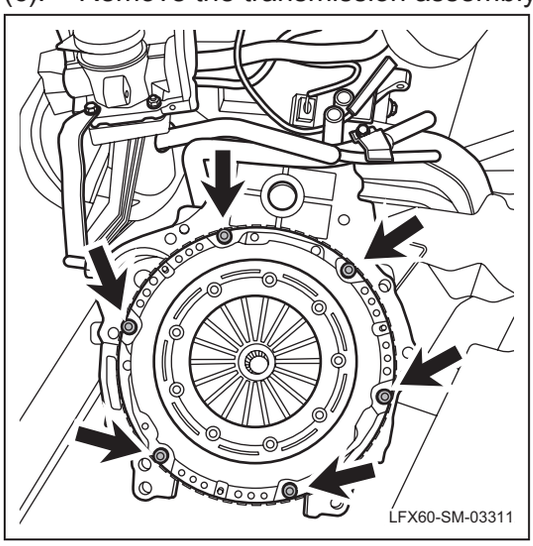
Removal

1. Remove the clutch plate assembly.

(a). Disconnect the battery negative connector.

(b). Lift the vehicle. Refer to the vehicle lift and support.

(c). Remove the transmission assembly. Refer to the removal of transmission assembly.



(d). Remove the clutch plate assembly fixing bolt.

(e). Take down the clutch plate assembly.

(f). Take down the clutch friction plate assembly.

Installation

1. Install the clutch plate assembly.

(a). The installation sequence is the reverse of the disassembly order.

ⓘ Note:

During the installation, adjust the clutch friction plate assembly to make it concentric with the flywheel center through the special tool.

AutoLibrary

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04 - transmission system

Drive Shaft.....4-919
Technical specifications.....4-919
Precautions 4-920
Structure and installation location 4-922
General Inspection 4-923
Operating Principle.....4-924
Diagnostic Information and Procedures.....4-925
Removal and Installation.....4-934

AutoLibrary

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Drive Shaft

Technical specifications

Torque Specifications

Name	Torque range	
	Metric (Nm)	British (lb-ft)
Connecting bolt of propeller shaft and front brake	280	207

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Precautions

Precautions

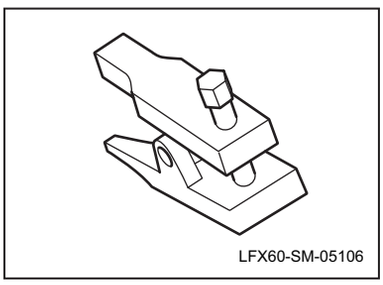
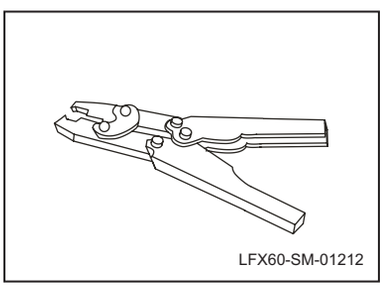
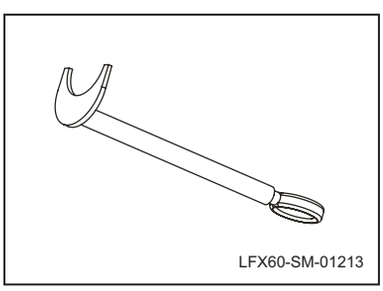
1. Do not remove the steering knuckles and other parts which are not subjected to overhaul.
2. In the operation, must avoid dirt the parts and prevent foreign body entered into the parts.
3. Clean the disassembled parts with the gasoline except the rubber parts and weather them dry or wipe with the paper.
4. After the suspension parts is repaired, be sure to check the wheel alignment.
5. The oil will shorten the service life of rubber bushing. Must clean the spilled oil completely.
6. The one-off parts should not be reused.
7. Check the parts carefully before repairing or replacing them.
8. After installation, must check the specified torques of all fasteners.
9. Plug the brake oil pipe with the rubber cap to prevent the brake fluid leak when removing the pipe.
10. When installing the suspension or rubber bushing, must eventually tighten then under the conditions of the tires are grounded and there is no-load on the vehicle.

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Preparation

Special Maintenance Tools

No.	Tool name	Tool figure	Tool code	Remarks
1	Ball head removal	 LFX60-SM-05106	-	Remove the connecting ball joint between the swing arm and the knuckle
2	Clamp fastening tool	 LFX60-SM-01212	-	Fasten the dust cover clamp
3	Drive shaft removal tool	 LFX60-SM-01213	-	Remove the drive shaft from the transmission

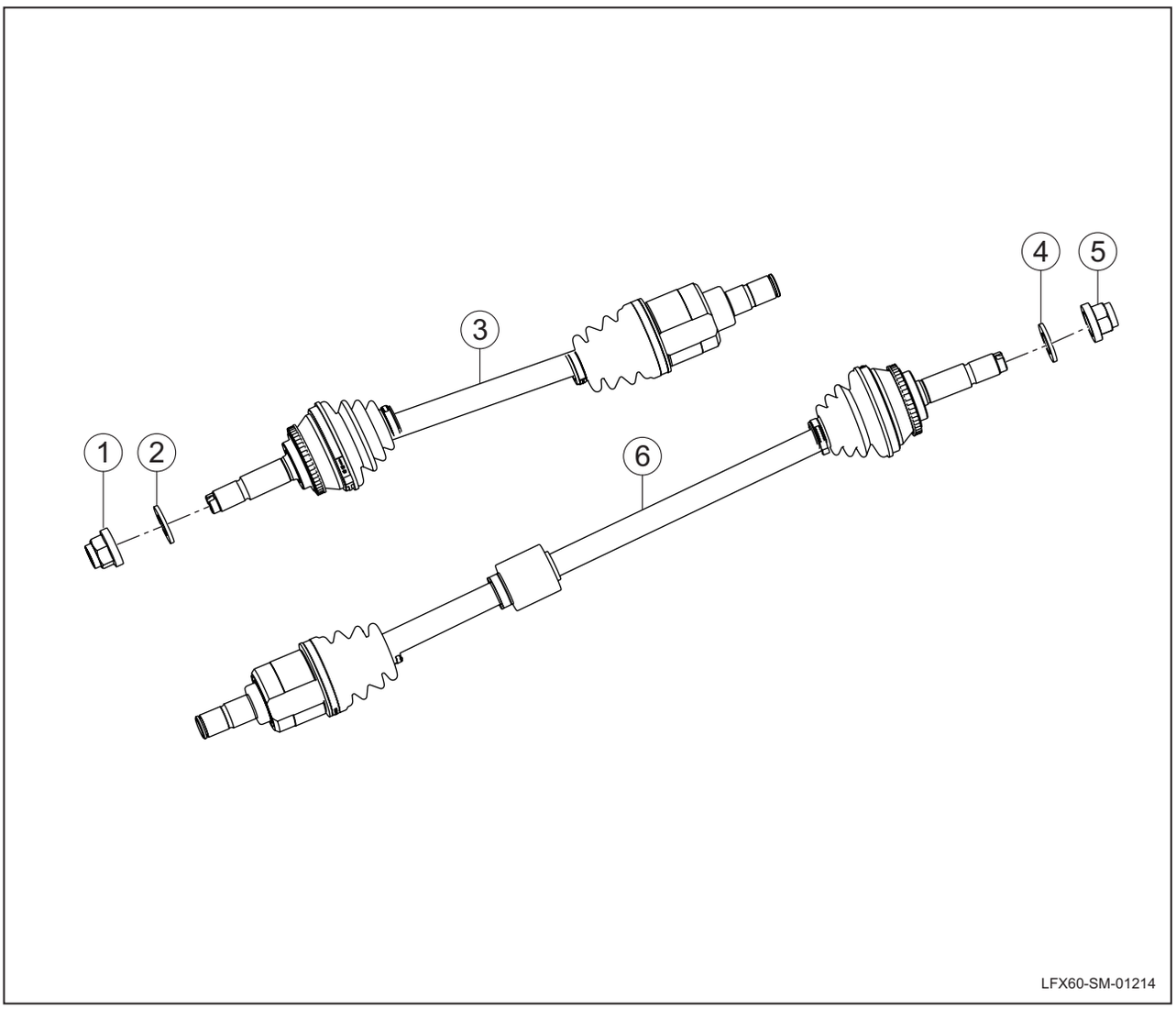
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Structure and installation location

Part exploded view

Drive Shaft



No.	Part name
1	Left propeller shaft nut
2	Left propeller shaft plain washer
3	Left propeller shaft assembly

No.	Part name
1	Right propeller shaft nut
2	Right propeller shaft plain washer
3	Right propeller shaft assembly

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General Inspection

Inspection of propeller shaft

- Check and ensure the outside ball joint play is not excessive.
- Check and ensure the inside ball joint can slide smoothly in the thrust direction.
- Check and ensure the inside ball joint radial play is not excessive.
- Check the sheath for damage.
- Check the snap ring of the side connecting the transmission.

ⓘ Note:

Take special care during the propeller shaft removal, installation, disassembly and assembly. Ensure to observe the following instructions:

- Do not push or pull the constant velocity universal joint while removing the propeller shaft.
- The operating angle of constant velocity universal joint should not exceed 22.5°.
- Check the polished surface and spline for damage.
- Do not allow the dust boot to contact the sharp edge, hot engine or exhaust system.
- Do not allow the propeller shaft to fall since this may result in the dust boot internal damage, which cannot be seen from the outside.
- Do not use the propeller shaft as a prying tool while installing other parts.Do not hang the propeller shaft at discretion.Knocking the universal joint cage from the outside will damage the constant velocity universal joint.

Inspection of propeller shaft oil seal

- Check whether the oil seal lip and seal spring are intact.
- Check whether the junction plane of propeller shaft and oil seal is smooth without rust, scratch or burr.
- Check the mounting face of the transmission side oil seal for rust, scratch or burr.

Inspection of power train vibration

ⓘ Note:

- **Compared to the high speed shake, the power train vibration frequency is higher while the amplitude is lower.The power train vibration is directly related to the vehicle speed and generally obvious at any speed.In general, the power train vibration appears as the chassis vibration or the noise of hum or rumble.**
- **The power train vibration exists in any driving mode while the symptom depends on the vehicle accelerating, decelerating, crawl or motoring.To reproduce the power train vibration, apply the brake slightly to simulate the road resistance.**

1. Carry out the road test in different driving mode such as the acceleration, deceleration, crawl, motoring and idling in neutral gear to confirm the fault phenomenon.

ⓘ Note:

Do not adjust or change the tire pressure or vehicle load before the road test.

2. Lift the vehicle.

Refer to the vehicle lift and support.

3. Check the following components:

- Tire.
- Propeller shaft fasteners.
- Propeller shaft.
- Cage dust boot.
- Stabilizer bar and rubber sheath.

Check the above components for dirt adhesion, fastener loosenes, scratch, bending, deformation or damage etc.If so, clear the dirt in time or replace the new components, carry out the road test again and check whether the faults are solved.

4. Ensure the tire can normall rotate by using the twin post lift.Start the engine, engage a gear, make the propeller shaft rotate and accelerate to the road test speed at which the fault occurs to confirm the vibration.
5. If the vibration is not evident, check the non-drive wheel with the wheel balancer to determine if the vibration is caused by the wheel imbalance.If necessary, balance the non-drive wheel and repeat the road test.If the vibration is still evident, continue the next step testing.
6. Mark the driving wheel position relative to the wheel bolt and remove the wheel. Install all the wheels to the reverse position and repeat the road acceleration test.If the vibration disappears, check the wheel and tire balance; if not, continue the next step testing.
7. Remove the wheel and check the radial run-out of hub or propeller shaft flange. If the radial run-out is oversized, rotate the propeller shaft by a certain angle,

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install it again and then test the run-out. If the run-out is still oversized, check the propeller shaft bearing and propeller shaft for damage and deformation.If so, replace the damage components, carry out the road test and check whether the fault is solved.

Operating Principle

System description

The transmission system is designed to transmit the torque generated by the engine and passing through the transmission.The engine torque is exported from the transmission end and transmitted to the propeller shaft and driving wheel through the differential.If the left and right wheel speed is different, the propeller shaft and planetary gear in the differential will be in differential running to prevent the vehicle sliding when the left and right wheel speed is different in the case of vehicle turning and consequently prevent the excessive wear of the tires.

Propeller shaft

The propeller shaft transmits the torque from the engine to the wheels.To adapt the vehicle and engine vertical motion, the propeller shaft should run at the different length and angle. The constant velocity universal joint allows the variation o propeller shaft length in the axial motion.

Both ends of the propeller shaft are equipped with the constant velocity universal joint.

- The inside constant velocity universal joint (consisting of the constant velocity, 3-pin section, roller, steel ball and universal joint housing) is installed to the driving axle.
- The inside constant velocity universal joint is fixed to the differential with the differential spring ring.
- The outside constant velocity universal joint (consisting of the steel ball, ball retainer and universal joint housing) is installed to the wheel side.
- The outside constant velocity universal joint is fixed to the hub bearing.

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Diagnostic Information and Procedures

Diagnosis Instructions

Before the propeller shaft fault diagnosis, learn about the operating principle of propeller shaft fisrt.This helps to determine the correct fault diagnosis procedures and whether the conditions described by the customer are the nomral operation.

The propeller shaft fault diagnosis must start from the inspection of propeller shaft.Instruct the maintenance man to take the next logic procedures and complete the fault diagnosis. Understanding and using the diagnostic flowchart correctly reduces diagnostic time and avoids misjudgment of components.

Visual Inspection

1. Confirm the problem raised by the customer.
2. Check the evident mechanical faults.

Visual inspection table

Mechanical
• Propeller shaft fasteners • Propeller shaft • Dust boot • Tire • Stabilizer bar and rubber sheath

3. Solve the problem finding before the next step inspection.
4. If the observed or raised problem is the evident and the cause has been found, ensure to fix this fault before proceeding with the next step.
5. f no problem is found through the visual check, confirm the fault and refer to the fault symptom list.

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List of fault symptoms

Symptom	Possible Cause	Recommended Measures
Propeller shaft abnormal noise	• Propeller shaft universal joint insufficient lubrication or contamination • Propeller shaft contacts other components	**Refer to: Propeller shaft abnormal noise diagnosis flow**
Clunk upon acceleration after the neutral gear coasting	• Universal joint sheath cracking or damage • Constant velocity universal joint wear or damage	**Refer to: Clunk upon acceleration after the neutral gear coasting diagnosis flow**
Vibration upon high speed running	• Wheel imbalance	• Balance the wheel
	• Excessive front wheel radial run-out	• Repair or replace the wheel
	• Incorrect installation of propeller shaft	**Refer to: Replacement of propeller shaft**
Dithering or vibration upon acceleration	• The improper assembly height causes the excessive angle of 3-ball-and-spigot universal joint • Propeller shaft excessive wear or damage	**Refer to: Diagnosis flow for dithering or vibration upon acceleration**
Inside constant velocity cage joint uncoupling	• The propeller shaft retainer ring falling off or not correctly installed to the differential	• Replace the retainer ring
	• Incorrect assembly of engine and transmission	• Check the engine mounting bracket for damage and wear
	• Engine bracket or chassis distortion or bending	• Measure the chassis
	• Forward mounting component wear or damage	• Check the bushing for wear or components (such as the stabilizer bar and suspension arm) for distortion and replace them if necessary
Crash, rattle or grating upon driving	• Propeller shaft universal joint insufficient lubrication or contamination	• Check, clean them and replace the grease if necessary
	• Propeller shaft contacts other components	• Check and repair if necessary
	• Wheel bearing, brake components, mounting components or steering components wear or damage	• Check and repair if necessary
Drive shaft is disengagement	• Propeller shaft and transmission connection side snap ring deformation • Propeller shaft deformation • Front strut deformation • Propeller shaft tightening nut damage	**Refer to: Propeller shaft falling diagnosis flow**
Shimmy upon low speed	• Tire dynamic balance error • Wheel alignment incorrect • Hub bearing damage • Propeller shaft damage • Strut damage • Stabilizer bar and bushing wear or damage	**Refer to: Inspection of power train vibration**

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Propeller shaft abnormal noise diagnosis flow

Test condition	Details/results/measures
1.Check the propeller shaft for contact with other components.	
	A. Lift the vehicle. B. Check the propeller shaft for twisting by foreign body or contact with other components. Is it OK after checking? →**Yes** To step 2. →**No** Clean the sundries and repair the fault parts.
2. Check the propeller shaft dust boot.	
	A. Check the propeller shaft dust boot for breakage. B. Check whether the installation of propeller shaft dust boot is correct. C. Check the propeller shaft universal joint for oil leak. Is it OK after checking? →**Yes** To step 3. →**No** Properly deal with failed parts.
3. Check the propeller shaft.	
	A. Remove the propeller shaft. B. Check the propeller shaft. **Refer to: Inspection the propeller shaft.** Is it OK after checking? →**Yes** Confirm that the fault has been ruled out. →**No** Replace the propeller shaft assembly. **Refer to: Replacement of the propeller shaft assembly.**

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Clunk upon acceleration after the neutral gear coasting diagnosis flow

Note:

- **The clunk upon coasting acceleration or start from zero may be caused by the propeller shaft inside universal joint wear or damage.**
- **The damage of propeller shaft inside universal joint is generally caused by the insufficient grease or foreign matter and dirt in the universal joint, which is usually caused by the cracking or damage of the inside universal joint packing gland.**

Test condition	Details/results/measures
1. Check the propeller shaft dust boot.	
	A. Check the propeller shaft dust boot for breakage. B. Check whether the installation of propeller shaft dust boot is correct. C. Check the propeller shaft universal joint for oil leak. Is it OK after checking? →**Yes** To step 2. → **No** Handle the trouble area
2. Check the propeller shaft.	
	A. Remove the propeller shaft. B. Check the propeller shaft. **Refer to: Inspection the propeller shaft.** C. Any seizing or resistance of the universal joint motion may indicate the damage that causes fault Is it OK after checking? →**Yes** Confirm that the fault has been ruled out. →**No** Replace the propeller shaft assembly. **Refer to: Replacement of the propeller shaft assembly.**

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Diagnosis flow for dithering or vibration upon acceleration

Test condition	Details/results/measures
1. Check the front strut assembly.	
	A. Check the front strut assembly for deformation. Is it normal? →**Yes** To step 2. →**No** Handle the fault parts and replace the front strut assembly if necessary.
2. Check the swing arm ball head	
	A. Check the swing arm ball head for excessive gap or breakage etc. Is it OK after checking? →Yes To step 3. →No Replace the lower swing arm ball head.
3. Check the swing arm and mounting bolts.	
	A. Remove the swing arm mounting bolts to check for looseness. B. Check the swing arm bushing for damage etc. Is it OK after checking? →**Yes** To step 4. →**No** Handle the fault parts and replace the swing arm assembly if necessary.
4. Check the propeller shaft dust boot.	
	A. Check the propeller shaft dust boot for breakage. B. Check whether the installation of propeller shaft dust boot is correct. C. Check the propeller shaft universal joint for oil leak. Is it OK after checking? →**Yes** To step 5. →**No** Handle the trouble area

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Test condition	Details/results/measures
5. Check the propeller shaft.	
	A. Remove the propeller shaft. B. Check the propeller shaft. Refer to: Inspection the propeller shaft. C. Any seizing or resistance of the universal joint motion may indicate the damage that causes fault. Is it OK after checking? →**Yes** Confirm that the fault has been ruled out. →**No** Replace the propeller shaft assembly. **Refer to: Replacement of the propeller shaft assembly.**

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Propeller shaft falling diagnosis flow

Test condition	Details/results/measures
1. Check the propeller shaft.	
	A. Check the propeller shaft dust boot for breakage. B. Check whether the installation of propeller shaft dust boot is correct. C. Check the propeller shaft for bending or deformation. Is it normal? →**Yes** To step 2. →**No** Handle the trouble area
2. Check the propeller shaft and transmission side snap ring.	
	A. Remove the propeller shaft. B. Check the propeller shaft and transmission side snap ring. Refer to: Inspection the propeller shaft. Is it OK after checking? →**Yes** To step 3. →**No** Replace the propeller shaft assembly.
3.Check the front strut.	
	A. Check the front strut assembly for deformation. Is the inspection result normal? →**Yes** To step 4. →**No** Replace the front strut
4.Check the propeller shaft lock nut	
	A. Check the propeller shaft lock nut for damage. Is it OK after checking? →**Yes** Confirm that the fault has been ruled out. →**No** Replace the lock nut

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Propeller shaft shimmy diagnosis flow

Test condition	Details/results/measures
1. Check the propeller shaft.	
	A. Check the propeller shaft dust boot for breakage. B. Check whether the installation of propeller shaft dust boot is correct. C. Check the propeller shaft for bending or deformation. D. Check the propeller shaft balancing weight for damage or falling. Is it normal? →**Yes** To step 2. →**No** Properly deal with failed parts.
2. Check the propeller shaft and transmission side snap ring.	
	A. Remove the propeller shaft. B. Check the propeller shaft and transmission side snap ring. **Refer to: Inspection the propeller shaft.** Is it OK after checking? →**Yes** System normal. →**No** Replace the propeller shaft assembly.

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Entire vehicle shimmy at low speed diagnosis flow

Test condition	Details/results/measures
1. Check the wheels.	
	A. Check whether the tire run-out is normal. Refer to: Check the wheel run-out Check whether it is normal? →**Yes** To step 2. →**No** Properly deal with failed parts.
2. Check the wheel alignment.	
	A. Check whether the wheel alignment is normal. Is it OK after checking? →**Yes** To step 3. →**No** Replace the propeller shaft assembly.
3. Check the propeller shaft.	
	A. Check the front strut assembly for deformation. Is the inspection result normal? →**Yes** To step 4. →**No** Replace the front strut
4. Check the suspension system.	
	A. Check the suspension system. Is it OK after checking? →**Yes** Confirm that the fault has been ruled out. →**No** Handle the trouble area

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Removal and Installation

Replacement of propeller shaft

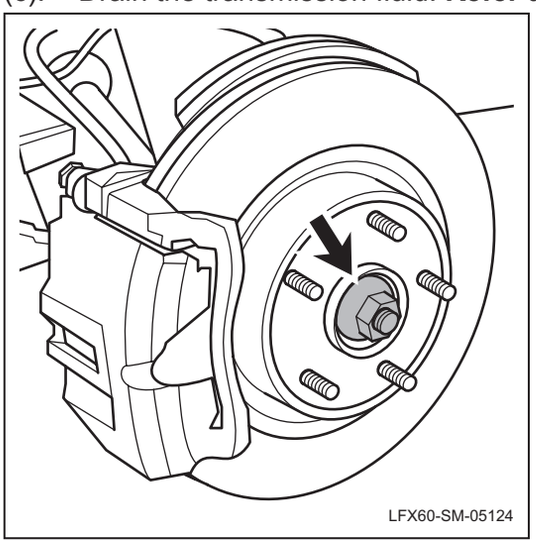
Removal

1. Remove the drive shaft.

(a). Lift the vehicle. **Refer to the vehicle lift and support.**

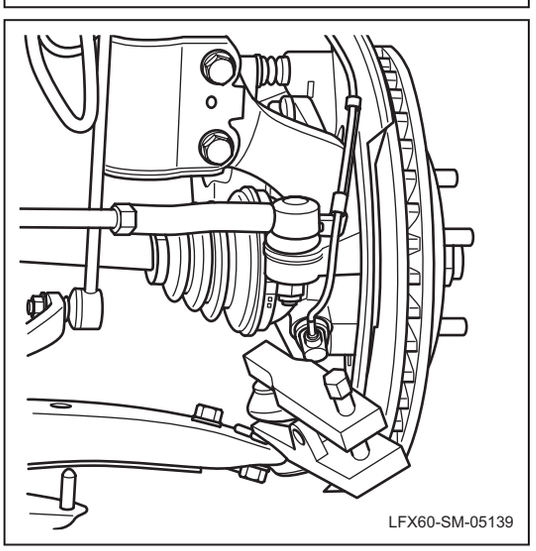
(b). Remove the tire. **Refer to: Tire replacement.**

(c). Drain the transmission fluid. **Refer to the replacement of transmission fluid.**



(d). Remove the propeller shaft nut.

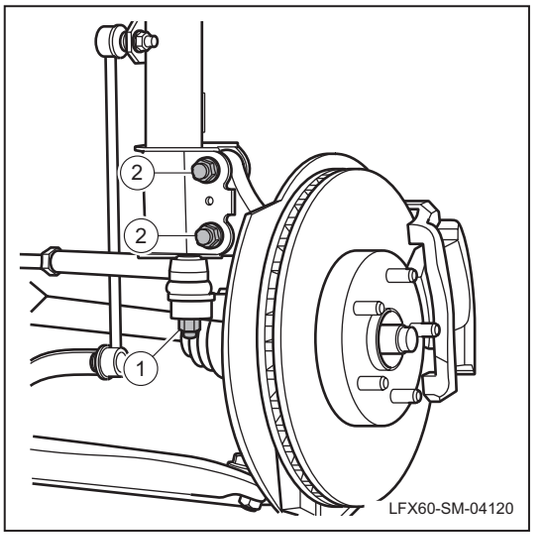
Torque: 280Nm



(e). Disconnect the lower swing arm and steering knuckle with the ball head puller.

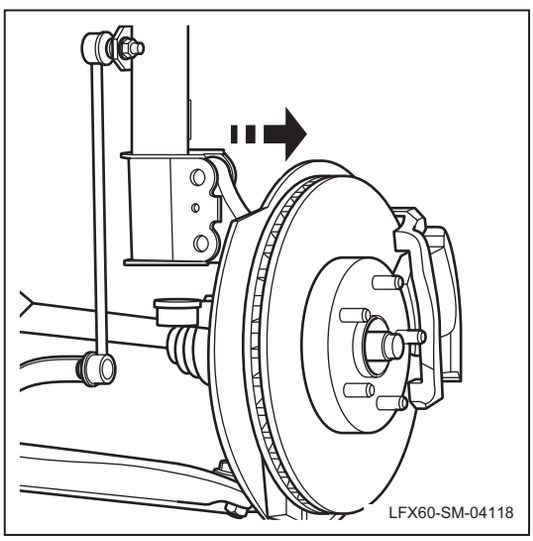
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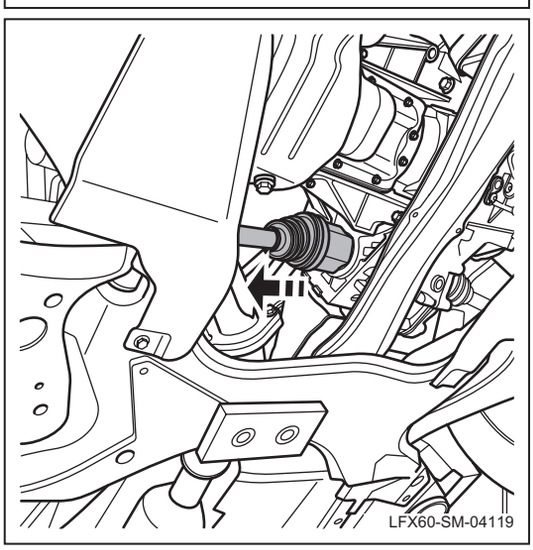


(f). Remove the tie rod ball nut 1 and disconnect the steering tie rod out side ball head with the ball head puller.

(g). Remove the vibration absorber fixing bolt



(h). Separate the propeller shaft and steering knuckle.



(i). Remove the propeller shaft with the appropriate tool.

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Installation

1. Install the drive shaft.

(a). The installation sequence is the reverse of the disassembly order.

❶ Note:

Fill the transmission fluid.Refer to the replacement of transmission fluid.

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Replacement of inside constant velocity universal joint

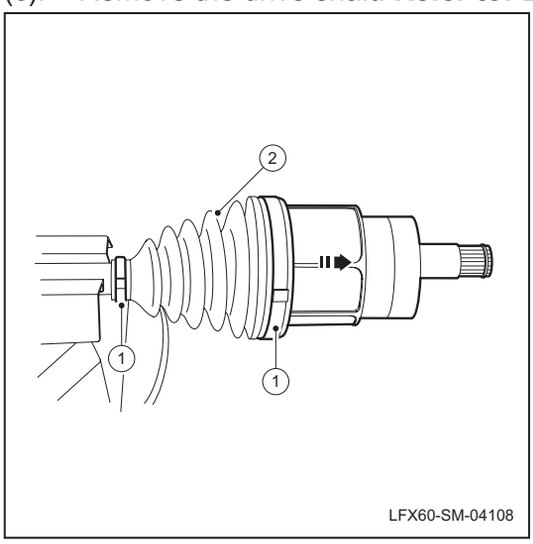
Removal

1. Remove the inside constant velocity universal joint and dust boot.

(a). Lift the vehicle. **Refer to the vehicle lift and support.**

(b). Remove the tire. **Refer to: Tire replacement.**

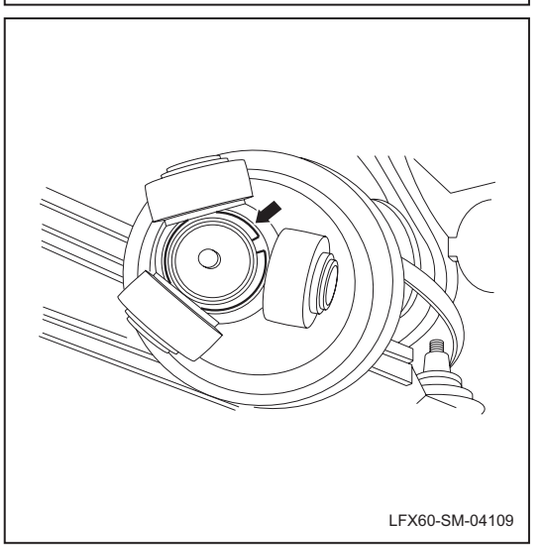
(c). Remove the drive shaft. **Refer to: Drive shaft replacement.**



LFX60-SM-04108

(d). Remove the dust boot clamp 1 with the appropriate tool.

(e). Uncouple the dust boot 2.


LFX60-SM-04109

(f). Remove the inside constant velocity universal joint snap ring with the appropriate tool.

(g). Remove the inside constant velocity universal joint and dust boot.

Installation

1. Install the inside constant velocity universal joint and dust boot.

(a). The installation sequence is the reverse of the disassembly order.

Note:

Replace the all the snap rings and clamps.

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Replacement of outside constant velocity universal joint

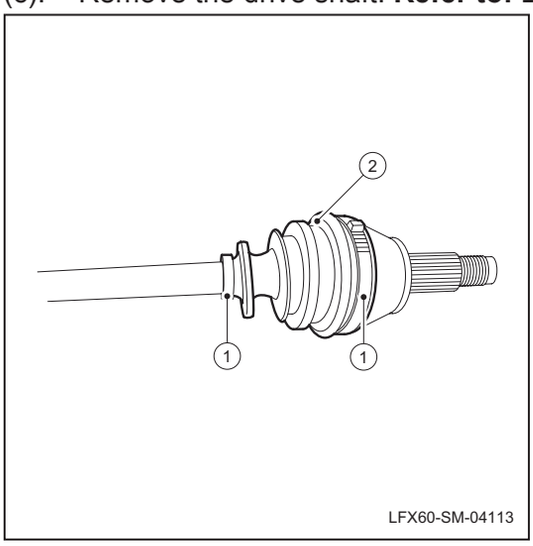
Removal

1. Remove the outside constant velocity universal joint and dust boot.

(a). Remove the tire. **Refer to the replacement of tire.**

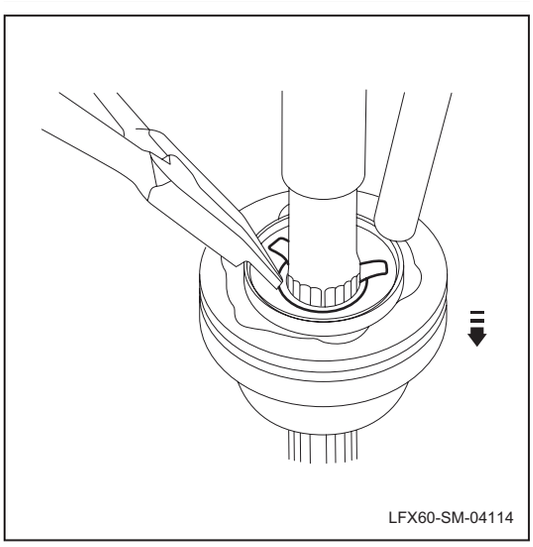
(b). Lift the vehicle. **Refer to the vehicle lift and support.**

(c). Remove the drive shaft. **Refer to: Drive shaft replacement.**



(d). Remove the dust boot clamp 1 with the appropriate tool.

(e). Uncouple the dust boot 2.



(f). Push off the snap ring with the pliers and take down the constant velocity universal joint with the copper rod by tapping.

Installation

1. Outside constant velocity universal joint and dust boot.

(a). The installation sequence is the reverse of the disassembly order.

Note:

Replace the all the snap rings and clamps during the installation.

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05 - Driving system

Front suspension.....5-941

Technical specifications.....5-941

Precautions 5-942

Preparation.....5-943

Structure and installation location 5-944

General Inspection 5-947

Operating Principle.....5-949

Diagnostic Information and Procedures.....5-951

Removal and Installation.....5-966

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Front suspension

Technical specifications

General specifications

Name		Specification	
Front wheel alignment parameters	Front wheel toe	-2±2mm (total)	-1±1mm (single side)
		- 0°16′ ± 16′(total)	-0°8′ ± 8′(single side)
	Front wheel outer incination angle	-0°42′±48′ (no load)	
	Kingpin caster angle	-2°44′±30′(no load)	
	Kingpin outer inclination angle	-11°2′ ±30′(no load)	
Rear wheel alignment parameters	Rear wheel toe	-0.8±2mm (total)	-0.42±1mm (single side)
		-0°6′ 43″± 16′(total)	-0°3′ 22″±8′(single side)
		-0°42′ ± 30′(adjustable)	

Torque Specifications

Name	Torque range	
	Metric (Nm)	British (Lb-ft)
Front vibration absorber upper and bodywork connection	60	44
Front vibration absorber and brake connection	210	154
Fix the stabilizer bar and stabilizer bar connecting rod	60	44
Fixing front stabilizer bar press plate	23	17
Bolt, A front sub-frame and bodywork connection	180	133
Resonator and front sub-frame connection	60	44
Ball pin and steering knuckle connection	100	74
Reinforced plate and front sub-frame connection	75	55

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Precautions

Precautions

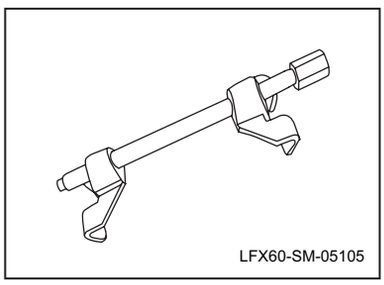
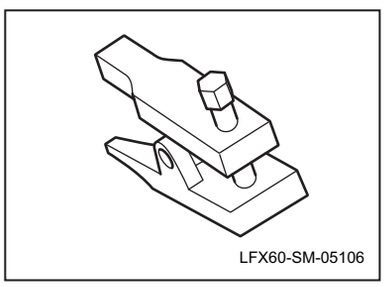
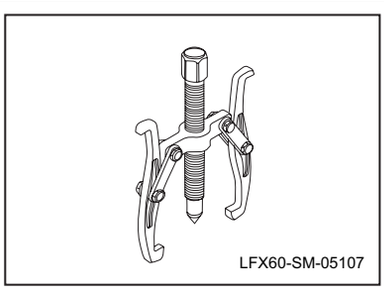
1. Do not remove the steering knuckles and other parts which are not subjected to overhaul.
2. In the operation, must avoid dirt the parts and prevent foreign body entered into the parts.
3. Clean the disassembled parts with the gasoline except the rubber parts and weather them dry or wipe with the paper.
4. After the suspension parts is repaired, be sure to check the wheel alignment.
5. The oil will shorten the service life of rubber bushing. Must clean the spilled oil completely.
6. The one-off parts should not be reused.
7. Check the parts carefully before repairing or replacing them.
8. After installation, must check the specified torques of all fasteners.
9. Plug the brake oil pipe with the rubber cap to prevent the brake fluid leak when removing the pipe.
10. When installing the suspension or rubber bushing, must eventually tighten then under the conditions of the tires are grounded and there is no-load on the vehicle.

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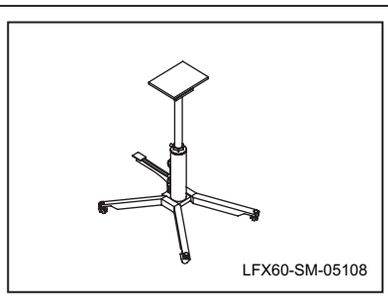
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Preparation

Special Maintenance Tools

No.	Tool name	Tool figure	Tool code	Remarks
1	Spring compressor	 LFX60-SM-05105	-	Compress the spring while removing the shock absorber spring
2	Ball-head remover	 LFX60-SM-05106	-	Remove the connecting ball joint between the swing arm and the knuckle
3	Puller	 LFX60-SM-05107	-	Remove hubs and hub bearings

General Maintenance Tools

No.	Tool name	Tool figure	Tool code	Remarks
1	Bracket	 LFX60-SM-05108	-	Lift the front sub-frame

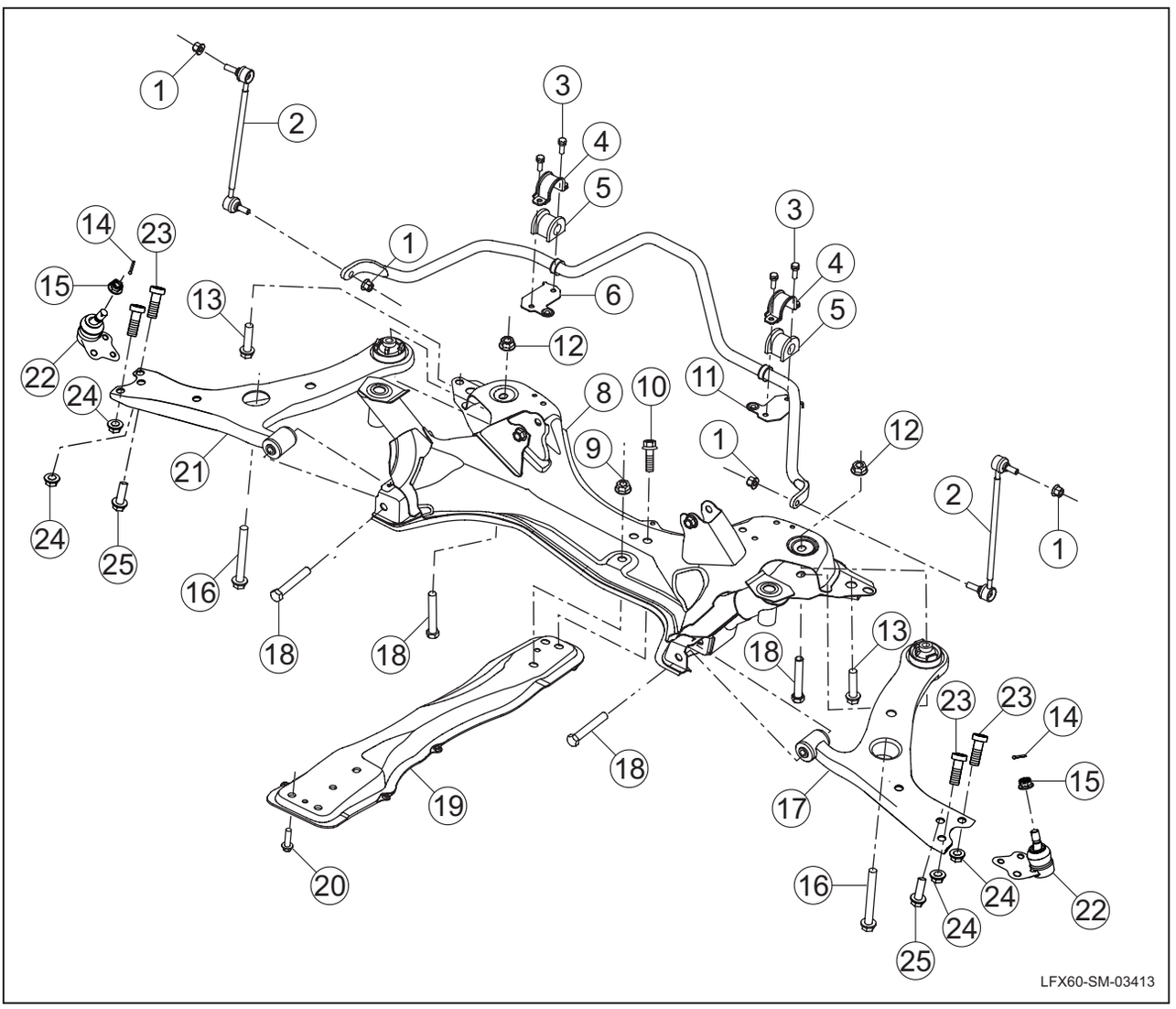
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Structure and installation location

Part exploded view

Front suspension



No.	Part name
1	Hex flange nut
2	Connecting rod assembly for front transverse stabilizer bar
3	Hexagon head bolt and taper elastic washer assembly
4	Front lateral stabilizer bar buffer block upper right pressing plate
5	Buffer sleeve for front transverse stabilizer bar
6	Front lateral stabilizer bar buffer block upper right pressing plate
7	Front lateral stabilizer bar components
8	Front deputy frame assembly
9	Hex flange nut

No.	Part name
13	Hexagon flange bolt
14	Cotter pin
15	Slotted nut with hexagon flange
16	Hexagon flange bolt
17	Left front swing arm assembly
18	Hexagon flange bolt
19	Reinforced plate assembly
20	Hexagon flange bolt
21	Right front swing arm assembly
22	Ball pin assembly

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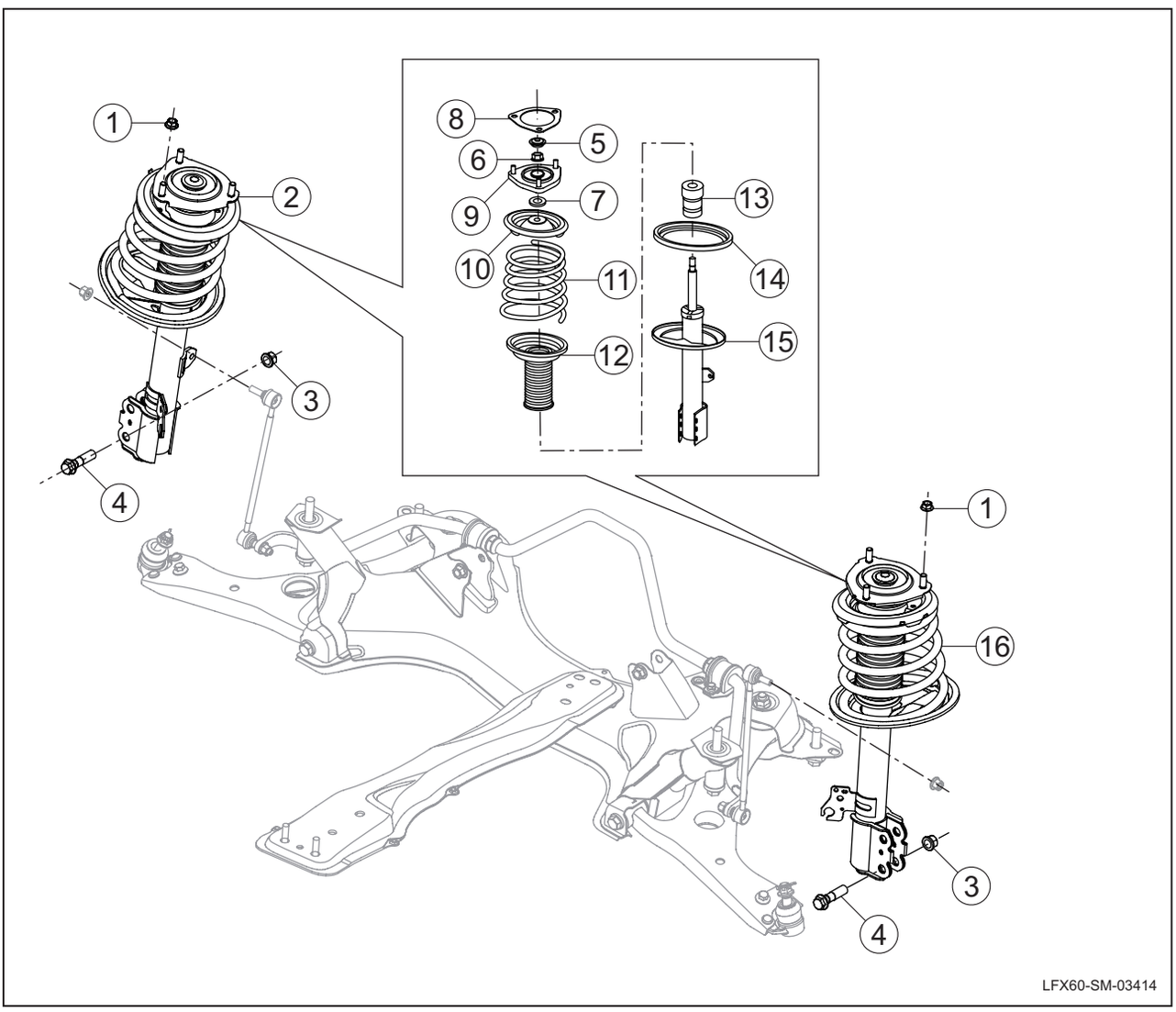
No.	Part name
10	Hexagon flange bolt
11	Front stabilizer bar bumping block lower left press plate
12	Hex flange nut

No.	Part name
23	Bolt
24	Hex flange nut
25	Hexagon flange bolt

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Front vibration absorber



No.	Part name
1	Hex flange nut
2	Right front shock absorber and spring assembly
3	Hex flange nut
4	Hexagon flange bolt
5	Front vibration absorber upper support seat plug
6	All-metal hexagon flange lock nut
7	Bearing oil seal
8	Front vibration absorber upper support seat gasket

No.	Part name
9	Front strut upper mounting support assembly
10	Front spring upper support seat assembly
11	Front spring
12	Vibration absorber dust boot
13	Front limiting bumping block
14	Front spring lower washer
15	Front vibration absorber assembly
16	Front right vibration absorber assembly

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General Inspection

Inspection of front vibration absorber

1. Lift the vehicle. **Refer to the vehicle lift and support.**
2. Check the vibration absorber for the following abnormal conditions.

- Front vibration absorber fastener looseness.
- Front vibration absorber oil leak.
- Front vibration absorber deformation.
- Front vibration absorber rubber seat aging, wear.
- Front vibration absorber plane bearing wear and abnormal noise.

Note:

The oil film (exudation) is allowed to occur on the front and rear vibration control system. Oil impregnate means the thick oil film accumulates on the outside of the vibration absorber shell.It is noted due to the abundant dust it absorbs.The oil impregnate is normal for the vibration absorber and it need not be replaced.The oil leak means the entire vibration control system suspension is covered by the oil while the oil drops onto the ground.The vibration absorber should be replaced.

3. Remove the front vibration absorber. **Refer to the replacement of front vibration absorber assembly.**
4. Measure the front vibration absorber length in free state.
5. Clamp the vibration absorber lower end union link to the bench clamp, pull the vibration damping rod for several time and there should be stable resistance. The upward resistance should be higher than the downward resistance. If the resistance is instable or there is no resistance, it indicates the vibration absorber is oil absent or the valve parts are damaged and should be replaced.
6. The vibration absorber should be replaced due to the inside oil starvation or valve part damage.

Note:

When removing the vibration absorber dust boot/stopper, prevent the excessive pushing of the vibration absorber push rod in the compression process so as to avoid the vibration absorber internal damage.

Place the vibration absorber on the jaw vice vertically and compress it.The compression action should be smooth and consistent.

The following conditions are abnormal.

- Vibration absorber piston rod and oil storage cylinder seizing.
- Vibration absorber oil leak.
- Vibration absorber tick tone.
- Vibration absorber return fault after installation.
- Noise (the slight swish is normal).
- With the vibration absorber push rod fully extended, the vibration absorber piston rod present swing relative to the vibration absorber shell.

Check the front swing arm and swing arm ball head

1. Lift the vehicle. **Refer to the vehicle lift and support.**
2. Check the front swing arm for evident deformation or impact.
3. Check the front swing arm ball head dust boot and front swing arm rubber bushing for evident damage.
4. Measure the steering torque of front swing arm ball head with the measuring tool.

Check the front stabilizer bar and connecting rod

1. Lift the vehicle. **Refer to the vehicle lift and support.**
2. Check the front stabilizer bar and connecting rod for the following abnormal conditions.

- Check the front stabilizer bar and connecting rod for evident deformation or impact.
- Check the front stabilizer bar and connecting rod fasteners for looseness.
- Check the stabilizer bar bushing for abnormal wear.
- Check the stabilizer bar connecting rod ball head for abnormal wear.

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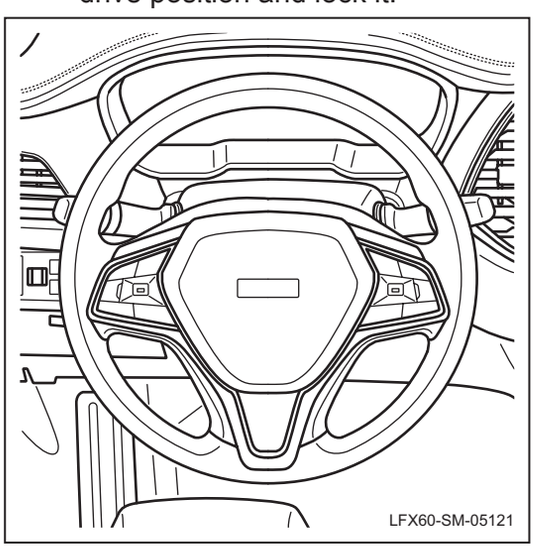
Toe-in adjustment procedure

Note:

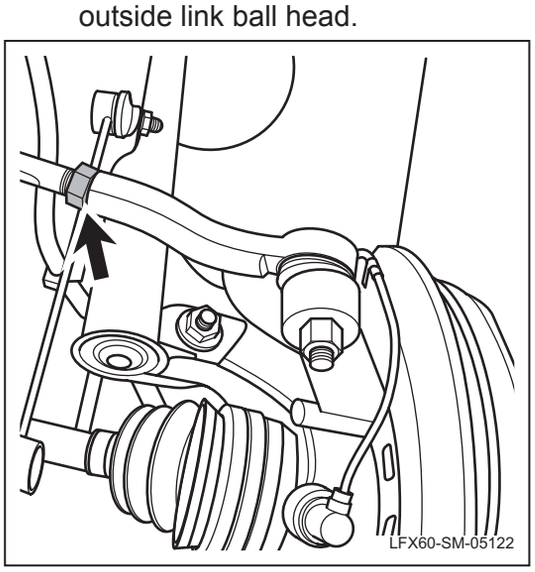
The toe-in adjustment should be made on the wheel alignment testing equipment. Check the following items before the adjustment.

- Check the tire pressure.
- Check the suspension and ensure the suspension system is in the normal position when the vehicle is pressed.
- Check the steering system components.
- Ensure the vehicle is under the kerb weight, the spare tire, jack and other driver's tools are complete and take out the rest tools or goods.

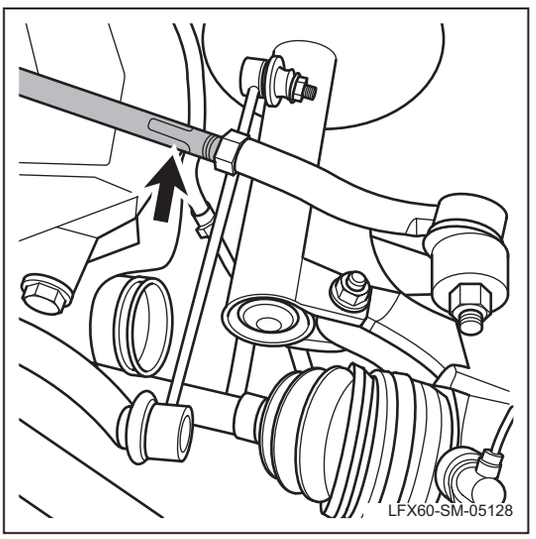
1. Turn the steering wheel to the straight drive position and lock it.



2. Unscrew the lock nuts at both ends of the outside link ball head.



3. Rotate the inside link counterclockwise or clockwise according to the measurement until the toe-in is acceptable.



Note:

The adjustment volume at both sides (in the opposite direction) should be the same and the link difference should not exceed 3mm.

4. Tighten the lock nuts at both sides and check the toe-in.
5. Repeat the above operation until the toe-in is acceptable.

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Operating Principle

System description

The primary objective of the vehicle engineering is to ensure the steering and suspension system safe and reliable and allow the sufficient strength for each component to withstand and absorb the extreme impact.The steering system and front/rear suspension system must maintain the definite geometrical relationship with the bodywork.The steering system and suspension system require the front wheels to return automatically so as to minimize the front wheel rolling resistance and road frictional force and consequently enable the driver to control the vehicle direction with ease.The comprehensive wheel alignment inspection includes measuring the front/rear wheel toe-in angle and camber angle.The wheel alignment can ensure all the 4 wheels can rotate in the same direction accurately.After the geometrical positioning, the optimal fuel economical efficiency and tire life can be achieved and the steering performance can be optimized.

Front vibration absorber

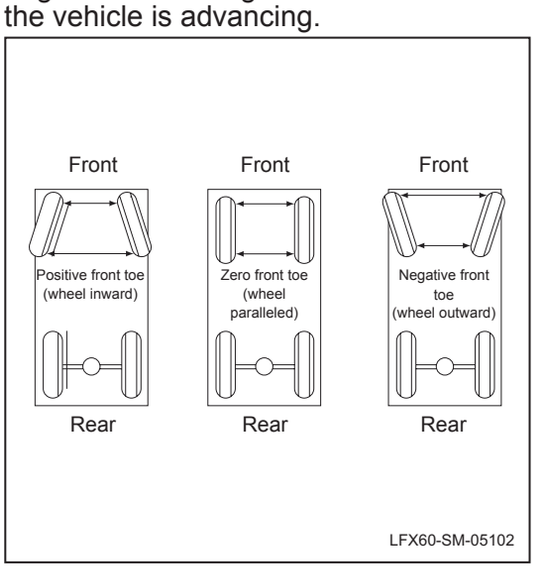
The suspension system elastic elements can generate the vibration due to the impact.To enhance the riding comfort, the suspension system elastic elements are connected with vibration absorber in parallel. The vibration absorber is mainly designed to restrain the elastic element oscillation upon rebounding after the absorption of shocks and the impact from the road surface. When passing the rough road, though the elastic element can filtrate the road vibration, the reciprocation of the elastic element self cannot be avoided. The vibration absorber is designed to restrain such motion. If the vibration absorber is too soft, the bodywork will jump up and down; if the vibration absorber is too hard, the oversize resistance will interfere with the normal operation of the elastic elements. During the suspension system refitting, the hard vibration absorber should match the hard spring, while the spring hardness related to the vehicle weight closely. Therefore, the heavy vehicle employs the harder vibration absorber in general.

Front stabilizer bar and stabilizer bar connecting rod

The front stabilizer bar is the torsion bar spring made of spring steel and installed to the vehicle front end in the transverse direction. The rod middle is connected to the front sub-frame through the rubber bushing while the both ends are connected to the front vibration absorber through the stabilizer bar to reduce the vehicle transverse side-tipping and enhance the smoothness.The front stabilizer bar is in fact a transverse torsion bar spring.In terms of function, it is a special elastic element.If the bodywork only presents the vertical motion, the deformation of suspension of both sides is the same and the front stabilizer bar does not work. In the case of vehicle turning, the bodywork will tilt, the suspension run-out of both sides is different and the outside suspension will forward press the front stabilizer bar to result in the distortion while the stabilizer bar elastic force will prevent the wheel uplifting and consequently maintain the bodywork balanced and stable in the traverse position.

Toe-in

The toe-in is the distance between the left and right tire center lines measured at the same axle shaft height viewed from the vehicle front. The difference the wheel front end distance to the rear end distance is the toe-in angle.If the front end distance is larger than the rear end distance, the toe-in is negative; otherwise, the toe-in is positive.The toe-in can counteract the tiny deviation of the wheel support system when the vehicle rolls forward.The specified toe-in angle is the setting value for toe-in of 0° when the vehicle is advancing.



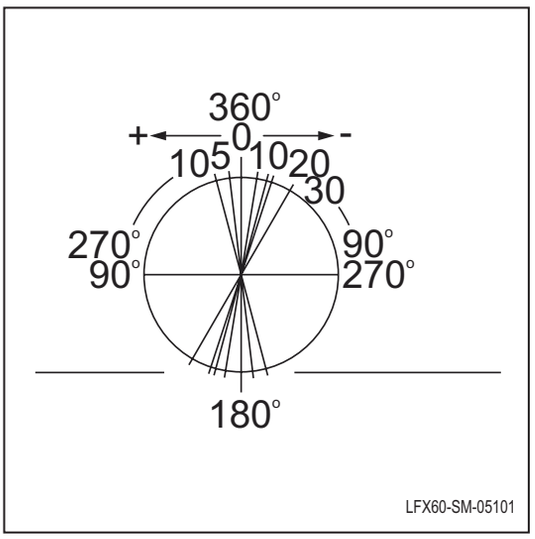
The incorrect toe-in will result in the abnormal wear of tires and reduce the fuel economical efficiency.Since the steering and suspension system components wear increases along with the vehicle driving, the toe-in should be adjusted to compensate such wear.

Kingpin caster angle

The caster angle is the pitch or castor of the steering axis top point deviation from the vertical plane when viewed from the vehicle side.The castor is positive (+) while the pitch is negative (-).The caster angle impacts the vehicle linear stability at the high speed running and wheel alignment function.

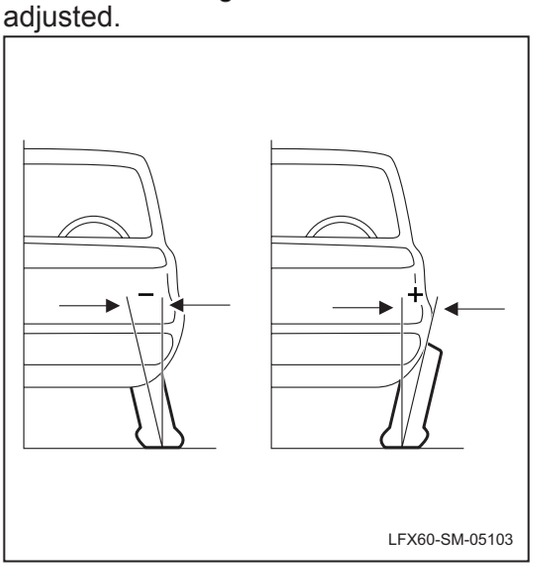
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Outer inclination angle

The camber angle is the angle of tire top deviation from the vertical plane when viewed from the vehicle front end.The camber angle is positive (+) in the case of outward tire inclination; the camber angle is negative (-) in the case of inward tire inclination.The camber angle is the angle deviation from the vertical plane and it impacts the direction control and tire wear.If the positive camber angle is too large, the rapid wear of outside tire shoulder will occur; if the negative camber angle is too large, the rapid wear of inside tire shoulder will occur. The camber angle of this vehicle cannot be adjusted.



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Diagnostic Information and Procedures

Diagnosis Instructions

Before the front suspension system fault diagnosis, learn about the operating principle of front suspension system fisrt.This helps to determine the correct fault diagnosis procedures and whether the conditions described by the customer are the nomral operation.

The front suspension system fault diagnosis must start from the inspection of front suspension system.Instruct the maintenance man to take the next logic procedures and complete the fault diagnosis.Comprehend and correctly use the diagnostic flow chart to shorten the diagnosis time and avoid the misjudgement.

Visual Check

1. Confirm the problem raised by the customer.
2. Check the evident mechanical faults.

Visual inspection table

Mechanical
• Front suspension fastener • Front swing arm • Front swing arm ball head • Vibration absorber • Front stabilizer bar • Stabilizing connecting rod • Rubber bushing • Front deputy frame

3. Solve the problem finding before the next step inspection.
4. If the observed or raised problem is the evident and the cause has been found, ensure to fix this fault before proceeding with the next step.
5. If no problem is found through the visual check, confirm the fault and refer to the fault symptom list.

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List of fault symptoms

Symptom	Possible point of failure	Recommended Measures
Different height of bodywork side to side	• Wheel and tire, tire pressure • Front vibration absorber • Rear vibration absorber • Front swing arm and front swing arm ball head	**Refer to: Diagnosis flow for different height of bodywork side to side**
Wheel tread error	• Front suspension component • Rear suspension component • Front wheel bearing • Incorrect wheel alignment	**Refer to: Diagnosis flow for wheel tread error**
Abnormal front tire wear	• Incorrect wheel alignment • Wheel and tire, tire pressure • Front wheel bearing • Front suspension component	**Refer to: Diagnosis flow for abnormal front tire wear**
Bodywork swing while running	• Wheel and tire • Front wheel bearing • Rear suspension component • Front suspension component • Steering system	**Refer to: Diagnosis flow for bodywork swing while running**
Front suspension noise	• Front suspension component fastener looseness • Front vibration absorber and rubber seat • Vibration absorber plane bearing • Front swing arm and front swing arm ball head • Front stabilizer bar and rubber gasket • Front stabilizer bar link rod and rubber gasket • Front wheel bearing	**Refer to: Diagnosis flow for front suspension noise**

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Symptom	Possible point of failure	Recommended Measures
Symptom Riding comfort (the front suspension too soft or too hard)	• Wheel and tire, abnormal tire pressure • Check the front vibration absorber • Rear vibration absorber • Rear helical spring	**Refer to: Diagnosis flow for riding comfort (the rear suspension too soft or too hard)**

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Diagnosis flow for different height of bodywork side to side

Test condition	Details/results/measures
1. Check the wheel, tire and tire pressure.	
	A. Check the wheel and tire specification. B. Check whether the tire pressure is normal. Is it OK after checking? →**Yes** To step 2. →**No** Adjust the tire pressure or replace the wheel and tire. **Refer to: Replacement of the wheel.**
2.Check the front vibration absorber.	
	A. Check the front vibration absorber for oil leak. B. Check the vibration absorber rubber seat for abnormal wear. C. Check the vibration absorber spring for damage. Is it OK after checking? →**Yes** To step 3. →**No** Replace the vibration absorber damaged components.
3. Check the rear vibration absorber.	
	A. Check the rear vibration absorber for oil leak. B. Check the rear helical spring for damage. Is it OK after checking? →**Yes** To step 4. →**No** Replace the rear vibration absorber. **Refer to: Replacement of the rear vibration absorber.** Replace the rear helical spring. **Refer to: Replacement of the rear helical spring.**
4. Check the front swing arm.	
	A. Check the front swing arm for deformation. B. Check the front swing arm rubber bushing for wear. Is it OK after checking? →**Yes** To step 5. →**No** Replace the front swing arm. **Refer to: Replacement of the front swing arm.**

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Test condition	Details/results/measures
5.Vibration absorber working stand test	
	A. Lift the vehicle. B. Remove the vibration absorber. C. Carry out the vibration absorber working stand test. Refer to: Vibration absorber working stand test Is it OK after checking? →**Yes** Repair other suspension components. →**No** Replace the vibration absorber. **Refer to: Replacement of the front vibration absorber assembly.** **Refer to: Replacement of the rear vibration absorber.**

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Diagnosis flow for wheel tread error

Test condition	Details/results/measures
1. Check the front suspension components.	
	A. Lift the vehicle. B. Check the front suspension components for damage. Is it OK after checking? →**Yes** To step 2. →**No** Repair or replace the damaged components.
2. Check the rear suspension components.	
	A. Check the rear suspension components for damage. Is it OK after checking? →**Yes** To step 3. →**No** Repair or replace the damaged components.
3. Wheel alignment.	
	A. Carry out the wheel alignment. Confirm the fault is solved

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Diagnosis flow for abnormal tire wear

Test condition	Details/results/measures
1. Check the wheel, tire and tire pressure.	
	A. Check the wheel and tire specification. B. Check whether the tire pressure is normal. Is it OK after checking? →**Yes** To step 2. →**No** Adjust the tire pressure or replace the wheel and tire. Refer to: Replacement of the wheel.
2. Check the wheel balance.	
	A. Lift the vehicle. B. Remove the wheel. **Refer to: Replacement of the wheel.** C. Check the wheel dynamic balance on the balancing machine. Is it OK after checking? →**Yes** To step 3. →**No** Balance the wheel.
3. Check the front suspension components.	
	A. Check the front suspension fasteners for looseness. B. Check the front suspension components for damage. Is it OK after checking? →**Yes** To step 4. →**No** Repair or replace the damaged components.
4. Check the rear suspension components.	
	A. Check the rear suspension fasteners for looseness. B. Check the rear suspension components for damage. Is it OK after checking? →**Yes** To step 5. →**No** Repair or replace the damaged components.
5. Wheel alignment.	
	A. Check the rear suspension components for damage. Is it OK after checking? →**Yes** To step 3. →**No** Repair or replace the damaged components.

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Diagnosis flow for front suspension noise

Note:

Before the front suspension noise diagnosis and repair, determine the tire, exhaust system, interior/exterior trims, rear suspension, steering system, clutch and transmission propeller shaft are free of abnormal noise.

Test condition	Details/results/measures
1. Check the front suspension fasteners for looseness.	
	A. Lift the vehicle. B. Check the front suspension fasteners for looseness. Is it OK after checking? →**Yes** To step 2. →**No** Tighten or replace the front suspension fasteners.
2. Check the front vibration absorber.	
	A. Check the front vibration absorber for leak. B. Check the rubber seat for aging and wear. C. Check the front vibration absorber plane bearing for abnormal noise. Is it OK after checking? →**Yes** To step 3. →**No** Replace the front vibration absorber. **Refer to: Replacement of the front vibration absorber assembly.**
3. Check the front swing arm and front swing arm ball head.	
	A. Check the front swing arm rubber bushing for excessive wear. B. Check the front swing arm ball head for damage. Is it OK after checking? →**Yes** To step 4. →**No** Replace the front swing arm or front swing arm ball head. **Refer to: Replacement of the front swing arm assembly.**

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Test condition	Details/results/measures
4. Check the front stabilizer bar and rubber bushing.	
	A. Check the front stabilizer bar fasteners for looseness. B. Check the front stabilizer bar rubber bushing for aging and wear. Is it OK after checking? →**Yes** To step 5. →**No** Replace the front stabilizer bar or rubber bushing. **Refer to:Replacement of front stabilizer bar**
5. Check the stabilizer bar connecting rod.	
	A. Check the stabilizer bar connecting rod fasteners for looseness. B. Check the stabilizer bar link rod ball head for wear clearance. Is it OK after checking? →**Yes** To step 6. →**No** Replace the front stabilizer bar connecting rod. **Refer to: Replacement of connecting rod assembly**
6. Check the front wheel bearing.	
	A. Seize the wheel bottom and top and shake it forcibly to check the bearing for excessive looseness. B. Rotate the front wheel and check the working conditions. Is it OK after checking? →**Yes** To step 7. →**No** Replace the front wheel bearing.
7. Check the other noise.	
	A. Check the other noise. B. Carry out trial run. Confirm the fault is eliminated

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Diagnosis flow for abnormal driving trace (unable to maintain linear driving)

Test condition	Details/results/measures
1. Check the wheel, tire and tire pressure.	
	A. Check the wheel and tire specification. B. Check whether the tire pressure is normal. Is it OK after checking? →**Yes** To step 2. →**No** Adjust the tire pressure or replace the wheel and tire. **Refer to: Replacement of the wheel.**
2. Check the front wheel bearing.	
	A. Check the front wheel bearing for looseness or excessive wear. Is it OK after checking? →**Yes** To step 3. →**No** Replace the front wheel bearing.
3.Check the steering system.	
	A. Check the steering system fasteners for looseness. B. Check the steering system components for damage. Is it OK after checking? →**Yes** To step 4. →**No** Repair or replace the damaged components.
4. Check the front suspension components.	
	A. Check the front suspension fasteners for looseness. B. Check the front suspension components for damage. Is it OK after checking? →**Yes** To step 5. →**No** Repair or replace the damaged components.

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Test condition	Details/results/measures
5. Check the rear suspension components.	
	A. Check the rear suspension fasteners for looseness. B. Check the rear suspension components for damage. Is it OK after checking? →**Yes** To step 6. →**No** Repair or replace the damaged components.
6. Wheel alignment.	
	A. Carry out the wheel alignment. B. Carry out trial run. Confirm that the fault has been ruled out.

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Diagnosis flow for vibration upon driving

Test condition	Details/results/measures
1. Check the wheel, tire and tire pressure.	
	A. Check the wheel and tire specification. B. Check whether the tire pressure is normal. Is it OK after checking? →**Yes** To step 2. →**No** Adjust the tire pressure or replace the wheel and tire. **Refer to: Replacement of the wheel.**
2. Check the front wheel bearing.	
	A. Seize the wheel bottom and top and shake it forcibly to check the bearing for excessive looseness. B. Rotate the front wheel and check the wheel bearing working conditions. Is it OK after checking? →**Yes** To step 3. →**No** Replace the front wheel bearing.
3. Check the rear wheel bearing.	
	A. Seize the wheel bottom and top and shake it forcibly to check the bearing for excessive looseness. B. Rotate the rear wheel and check the wheel bearing working conditions. Is it OK after checking? →**Yes** To step 4. →**No** Replace the rear wheel bearing.
4. Check the front suspension components.	
	A. Check the front suspension fasteners for looseness. B. Check the front suspension components for damage. Is it OK after checking? →**Yes** To step 5. →**No** Repair or replace the damaged components.

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Test condition	Details/results/measures
5. Check the rear suspension components.	
	A. Check the rear suspension fasteners for looseness. B. Check the rear suspension components for damage. Is it OK after checking? →**Yes** To step 6. →**No** **Repair or replace the damaged components.**
6. Check the steering system components.	
	A. Check the steering system fasteners for looseness. B. Check the steering system components for damage. Is it OK after checking? →**Yes** To step 7. →**No** Repair or replace the damaged components.
7. Wheel alignment.	
	A. Carry out the wheel alignment. B. Carry out trial run. Confirm that the fault has been ruled out.

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Diagnosis flow for riding comfort (the rear suspension too soft or too hard)

Test condition	Details/results/measures
1. Check the wheel, tire and tire pressure.	
	A. Check the wheel and tire specification. B. Check whether the tire pressure is normal. Is it OK after checking? →**Yes** To step 2. →**No** Adjust the tire pressure or replace the wheel and tire. **Refer to: Replacement of the wheel.**
2. Check the front vibration absorber.	
	A. Lift the vehicle. B. Check the front vibration absorber for oil leak. C. Check the front vibration absorber spring for deformation and fracture. Is it OK after checking? →**Yes** To step 3. →**No** Replace the front vibration absorber assembly. **Refer to: Replacement of the front vibration absorber assembly.**
3. Check the rear vibration absorber.	
	A. Check the rear vibration absorber for oil leak. Is it OK after checking? →**Yes** To step 4. →**No** Replace the rear vibration absorber. **Refer to: Replacement of the rear vibration absorber.**
4. Check the rear helical spring.	
	A. Check the rear suspension fasteners for looseness. B. Check the rear suspension components for damage. Is it OK after checking? →**Yes** To step 6. →**No** Repair or replace the damaged components.

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Test condition	Details/results/measures
5. Vibration absorber working stand test.	
	A. Lift the vehicle. B. Remove the vibration absorber. C. Carry out the vibration absorber working stand test. Is it OK after checking? →**Yes** Repair other suspension components. →**No** Replace the vibration absorber. **Refer to: Replacement of the front vibration absorber assembly.** **Refer to: Replacement of the rear vibration absorber.**

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Removal and Installation

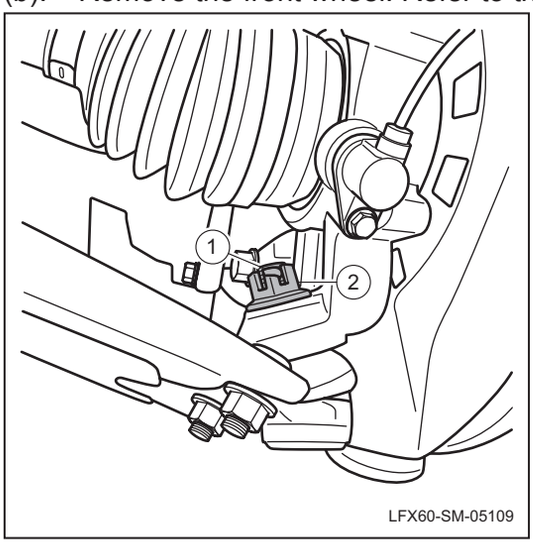
Replacement of front swing arm assembly

Removal

1. Remove the front swing arm assembly.

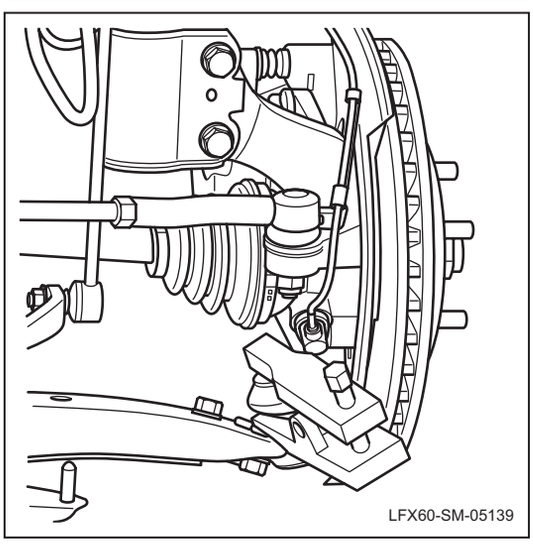
(a). Lift the vehicle. Refer to the vehicle lift and support.

(b). Remove the front wheel. Refer to the replacement of wheel.



(c). Remove the front swing arm ball head ball pin 1.

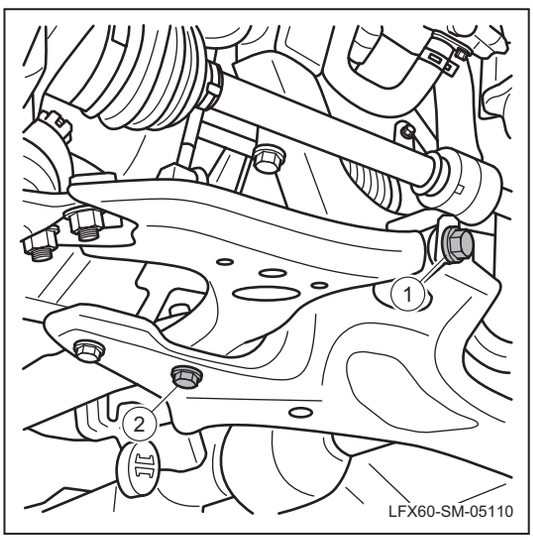
(d). Remove the front swing arm ball head fixing nut 2.



(e). Disconnect the front swing arm ball head and front steering knuckle with the ball head puller.

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(f). Remove the front swing arm assembly fixing bolt 1.

Torque: 180Nm

(g). Remove the front swing arm assembly fixing bolt 2.

Torque: 180Nm

(h). Take down the front swing arm assembly.

Installation

1. Install the front swing arm assembly.

(a). The installation sequence is the reverse of the disassembly order.

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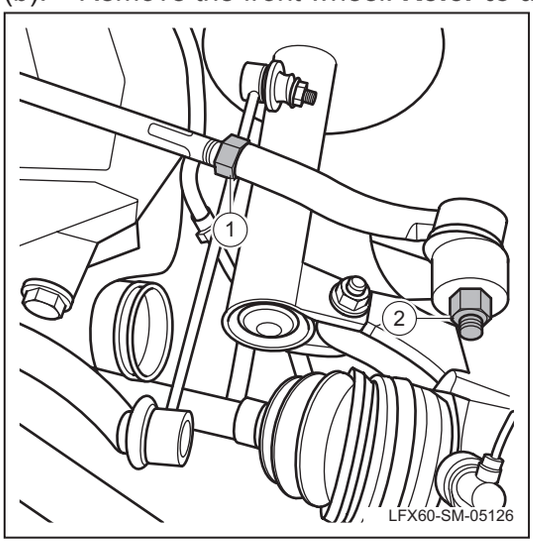
Replacement of steering tie rod outside ball head

Removal

1. Removal the steering tie rod outside ball head.

(a). Lift the vehicle. **Refer to the vehicle lift and support.**

(b). Remove the front wheel. **Refer to the replacement of wheel.**



(c). Unscrew the lock nut 1 of the outside link ball head.

(d). Remove the fixing nut 2 of steering tie rod outside ball head.

(e). Disconnect the steering tie rod outside ball head with the ball head puller.

(f). Remove the steering tie rod outside ball head.

Installation

1. Install the steering tie rod outside ball head.

(a). The installation sequence is the reverse of the disassembly order.

❶ Note:

After replacing the outside link ball head, carry out the wheel alignment.

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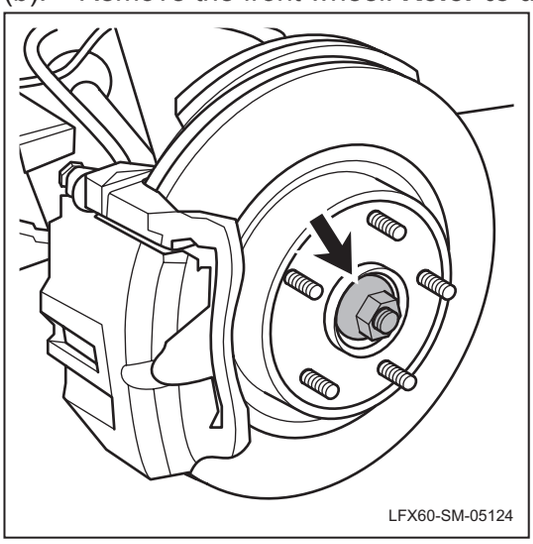
Replacement of front wheel steering knuckle

Removal

1. Remove the front wheel steering knuckle.

(a). Lift the vehicle. **Refer to the vehicle lift and support.**

(b). Remove the front wheel. **Refer to the replacement of wheel.**

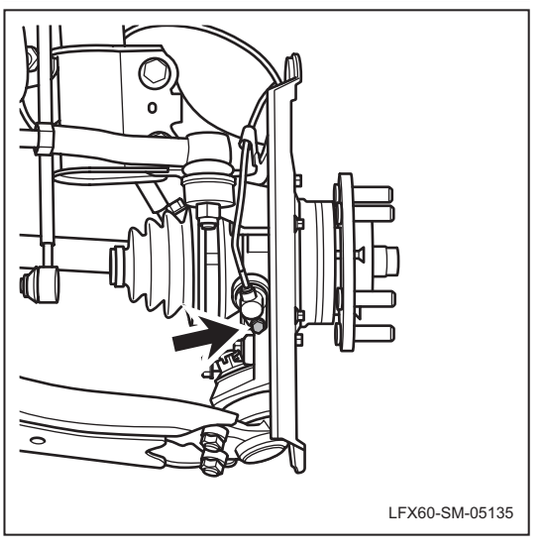

LFX60-SM-05124

(c). Depress the brake pedal and remove the propeller shaft connecting nut.

Torque: 280Nm

(d). Remove the brake tongs.Refer to the replacement of front brake tongs.

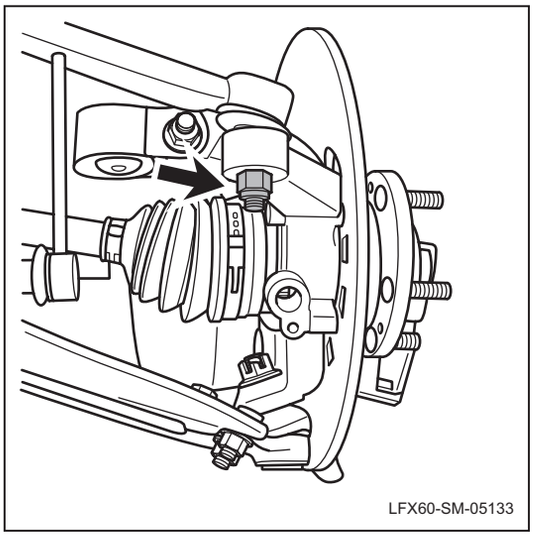
(e). Remove the front brake disc.Refer to the replacement of front brake disc.


LFX60-SM-05135

(f). Remove the wheel speed sensor.

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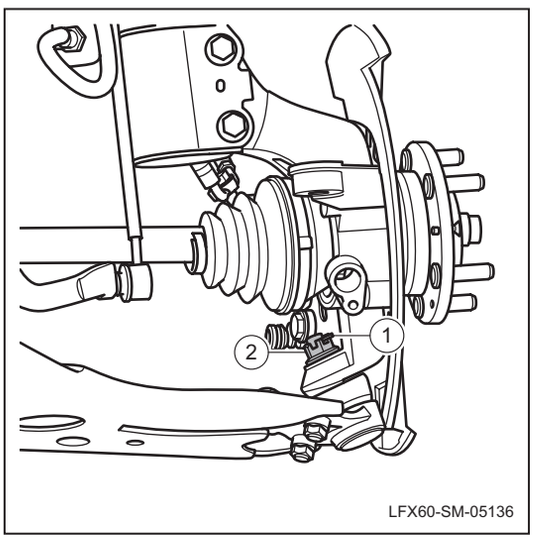
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LFX60-SM-05133

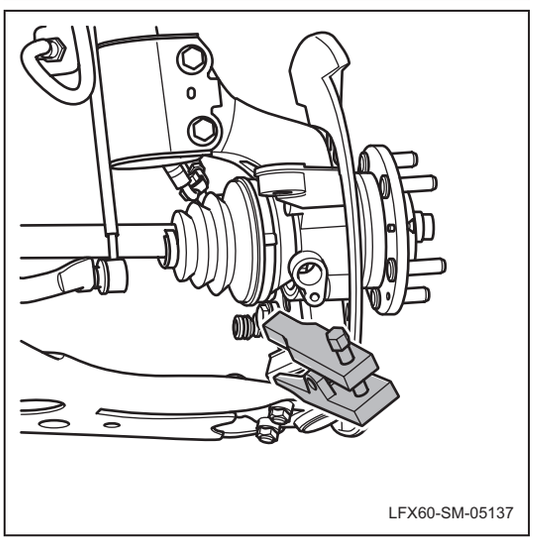
(g). Remove the fixing nut of steering tie rod outside ball head.

(h). Disconnect the steering tie rod outside ball head with the ball head puller.



LFX60-SM-05136

(i). Remove the front swing arm ball head ball pin 1 and fixing nut 2.



LFX60-SM-05137

(j). Disconnect the front swing arm ball head with the ball head puller.

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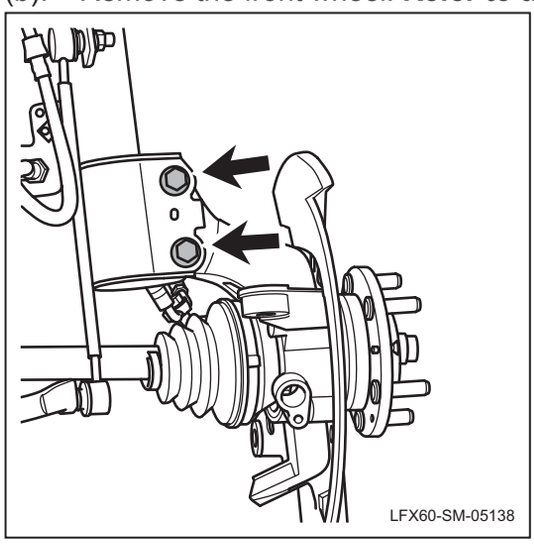
Replacement of front wheel steering knuckle

Removal

1. Remove the front wheel steering knuckle.

(a). Lift the vehicle. **Refer to the vehicle lift and support.**

(b). Remove the front wheel. **Refer to the replacement of wheel.**



(k). Remove the fixing bolt of vibration absorber and steering knuckle.

Torque: 210Nm

(l). Take down the front wheel steering knuckle.

Installation

1. Install the front wheel steering knuckle.

(a). The installation sequence is the reverse of the disassembly order.

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Replacement of front stabilizer bar

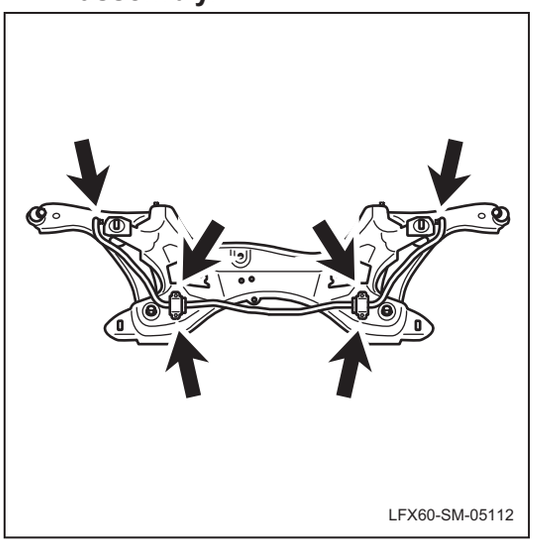
Removal

1. Remove the front stabilizer bar.

(a). Lift the vehicle. **Refer to the vehicle lift and support.**

(b). Remove the front wheel. **Refer to the replacement of wheel.**

(c). Remove the front sub-frame assembly. **Refer to the replacement of front sub-frame assembly.**



(d). Remove the front stabilizer bar fixing bolt and take down the front stabilizer bar.

Installation

1. Install the front stabilizer bar.

(a). The installation sequence is the reverse of the disassembly order.

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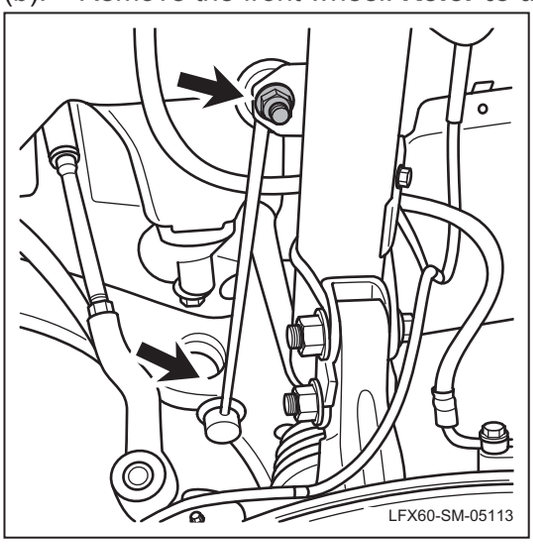
Replacement of front stabilizer bar connecting rod assembly

Removal

1. Remove the front stabilizer bar connecting rod assembly.

(a). Lift the vehicle. **Refer to the vehicle lift and support.**

(b). Remove the front wheel. **Refer to the replacement of wheel.**



(c). Remove the fixing nut of front stabilizer bar connecting rod.

Torque: 60Nm

(d). Take down the front stabilizer bar connecting rod assembly.

Installation

1. Install the front stabilizer bar connecting rod assembly.

(a). The installation sequence is the reverse of the disassembly order.

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Replacement of front vibration absorber assembly

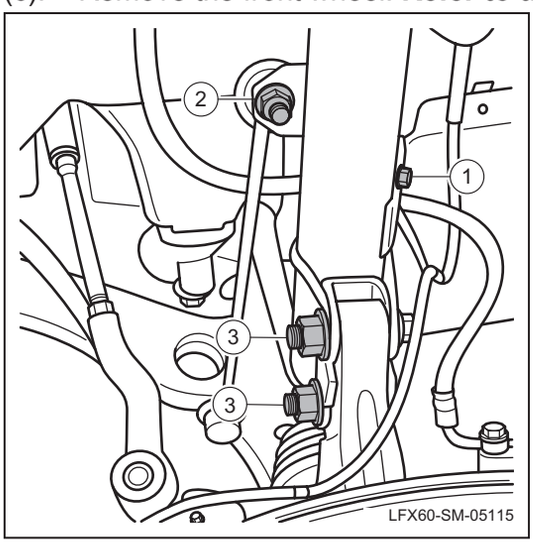
Removal

1. Remove the front vibration absorber assembly.

(a). Remove the upper fixing nut of front vibration absorber assembly.

(b). Lift the vehicle. **Refer to the vehicle lift and support.**

(c). Remove the front wheel. **Refer to the replacement of wheel.**



(d). Remove the fixing bolt 1 of the front wheel speed sensor harness.

(e). Remove the front brake fluid pipe fixing clip.

(f). Remove the fixing nut 2 of front stabilizer bar connecting rod.

(g). Remove the fixing nut assembly 3 of front vibration absorber assembly and front steering knuckle.

Torque: 210Nm

(h). Take down the front vibration absorber assembly.

1. Install the front vibration absorber assembly.

(a). The installation sequence is the reverse of the disassembly order.

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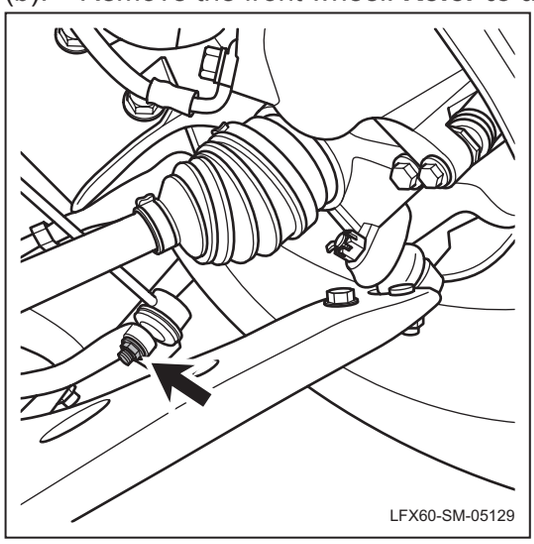
Replacement of front sub-frame assembly

Removal

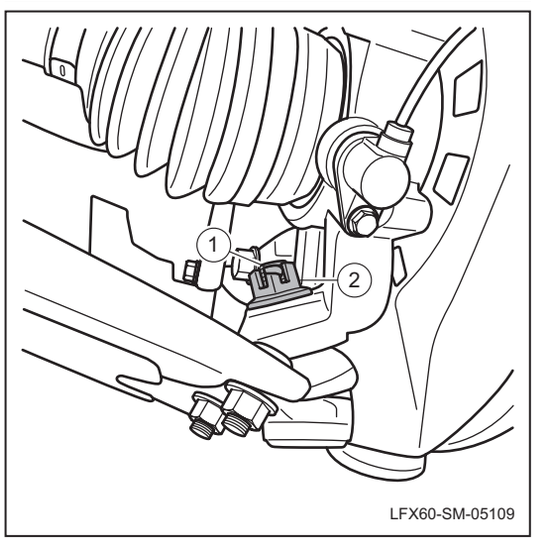
1. Remove the front sub-frame assembly.

(a). Lift the vehicle. **Refer to the vehicle lift and support.**

(b). Remove the front wheel. **Refer to the replacement of wheel.**



(c). Remove the lower fixing nut of front stabilizer bar connecting rod.

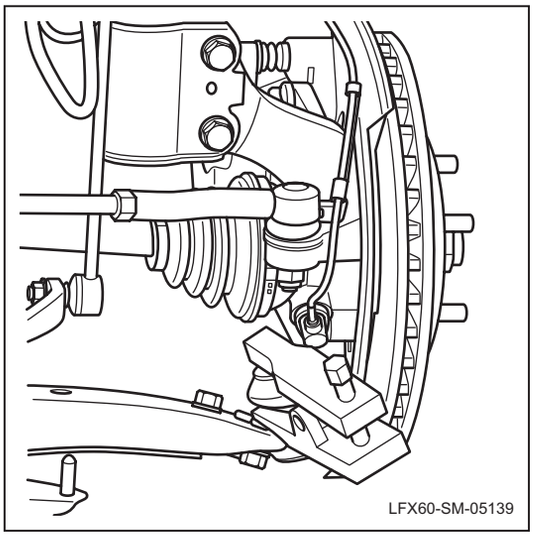


(d). Remove the front swing arm ball head ball pin 1.

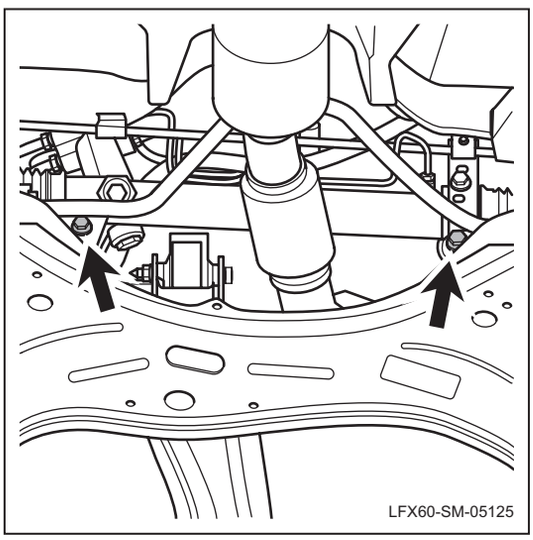
(e). Remove the front swing arm ball head fixing nut 2.

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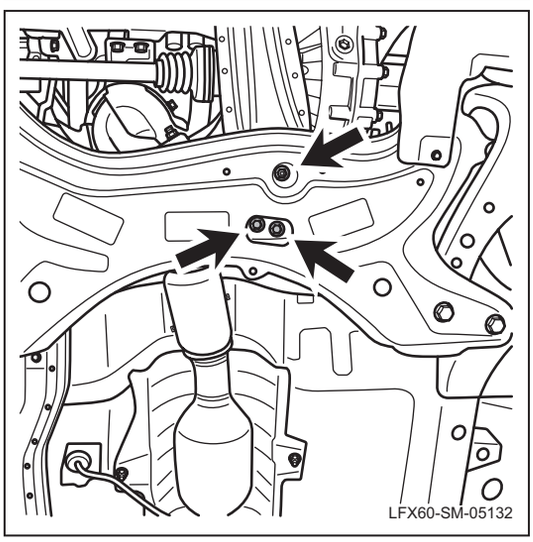
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(f). Disconnect the front swing arm ball head and front steering knuckle with the ball head puller.



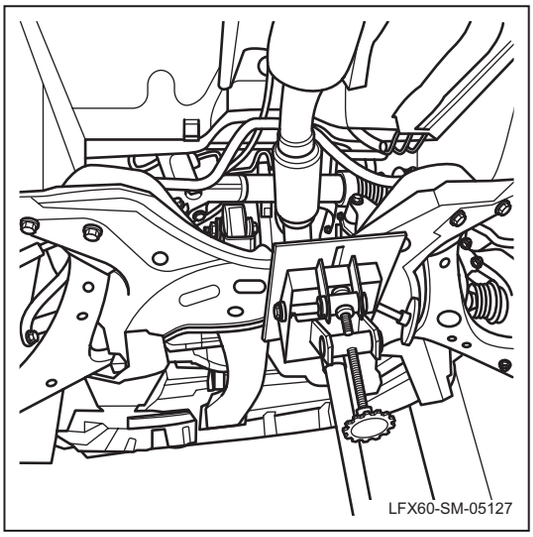
(g). Remove the steering gear fixing bolts.
Torque: 90Nm



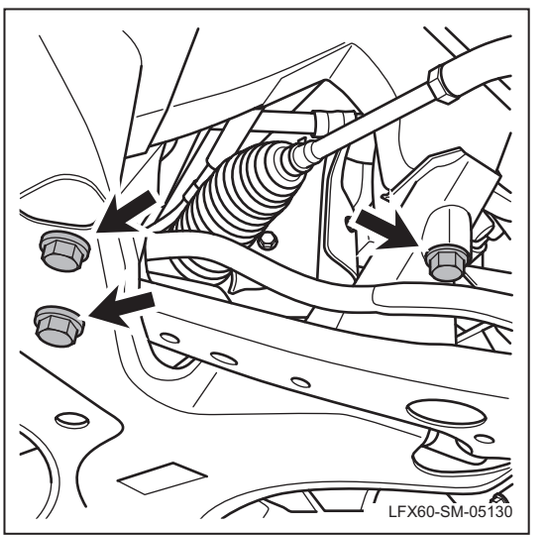
(h). Remove the 2 fixing bolts and 1 fixing nut of transmission rear mounting.

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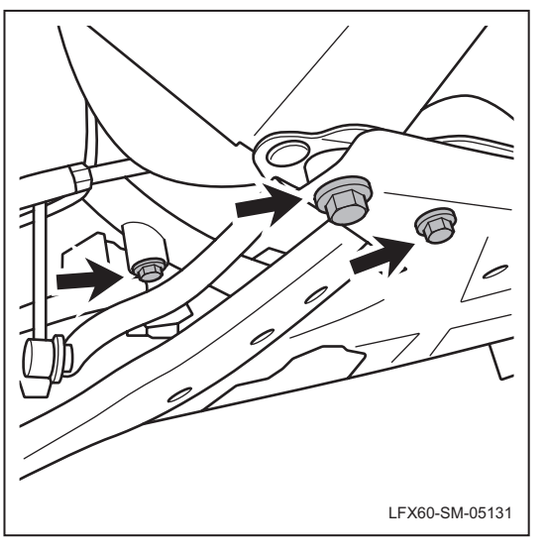


(i). Support the front sub-frame assembly with the jack.



(j). Remove the front sub-frame assembly right fixing bolt.

Torque: 180Nm



(k). Remove the front sub-frame assembly left fixing bolt.

Torque: 180Nm

(l). Slowly set down the jack and take down the front sub-frame assembly.

Installation

1. Install the front sub-frame assembly.

(a). The installation sequence is the reverse of the disassembly order.

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05 - Driving system

Rear suspension 5-981

Technical specifications.....5-981

Precautions 5-982

Preparation.....5-983

Structure and installation location 5-984

General Inspection 5-986

Operating Principle.....5-987

Diagnostic Information and Procedures.....5-988

Removal and Installation.....5-993

AutoLibrary

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Rear suspension

Technical specifications

General specifications

Name		Specification	
Front wheel alignment parameters	Front wheel toe	-2±2mm (total)	-1±1mm (single side)
		- 0°16′ ± 16′(total)	-0°8′ ± 8′(single side)
	Front wheel outer incination angle	-0°42′±48′ (no load)	
	Kingpin caster angle	-2°44′±30′(no load)	
	Kingpin outer inclination angle	-11°2′ ±30′(no load)	
Rear wheel alignment parameters	Rear wheel toe	-0.8±2mm (total)	-0.42±1mm (single side)
		-0°6′ 43″± 16′(total)	-0°3′ 22″±8′(single side)
	Rear wheel toe	-0°42′ ± 30′(adjustable)	

Torque Specifications

Name	Torque range	
	Metric(Nm)	British (Lb-ft)
Rear sub-frame front section and bodywork connection	90	66
Upper and lower cross arm and rear longitudinal arm connection	90	66
Rear sub-frame and upper cross arm connection	90	66
Rear longitudinal arm and bodywork connection (eccentric bolt)	90	66
Rear sub-frame and lower swing arm connection	120	89
Fixing rear stopper support assembly	23	17
Rear stabilizer bar fixing plate connection	23	17
Rear vibration absorber bracket and rear longitudinal arm	70	52
Vibration absorber mounting bracket and longitudinal arm connection	60	44
Rear vibration absorber upper and bodywork connection	70	52
Fix the stabilizer bar and stabilizer bar connecting rod	60	44

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Precautions

Precautions

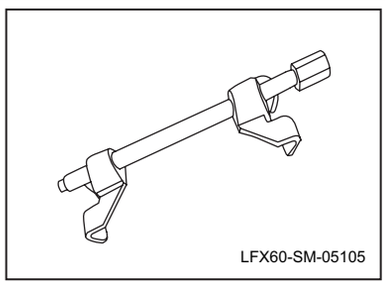
1. Do not remove the steering knuckles and other parts which are not subjected to overhaul.
2. In the operation, must avoid dirt the parts and prevent foreign body entered into the parts.
3. Clean the disassembled parts with the gasoline except the rubber parts and weather them dry or wipe with the paper.
4. After the suspension parts is repaired, be sure to check the wheel alignment.
5. The oil will shorten the service life of rubber bushing. Must clean the spilled oil completely.
6. The one-off parts should not be reused.
7. Check the parts carefully before repairing or replacing them.
8. After installation, must check the specified torques of all fasteners.
9. Plug the brake oil pipe with the rubber cap to prevent the brake fluid leak when removing the pipe.
10. When installing the suspension or rubber bushing, must eventually tighten then under the conditions of the tires are grounded and there is no-load on the vehicle.

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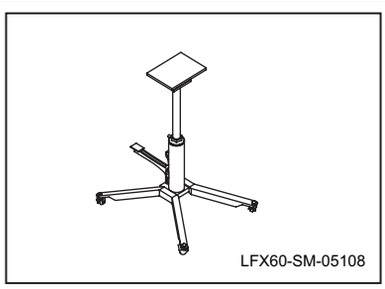
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Preparation

Special Maintenance Tools

No.	Tool name	Tool figure	Tool code	Remarks
1	Spring compressor	 LFX60-SM-05105	-	Compress the spring while removing the shock absorber spring

General Maintenance Tools

No.	Tool name	Tool figure	Tool code	Remarks
1	Bracket	 LFX60-SM-05108	.	Lift the front sub-frame

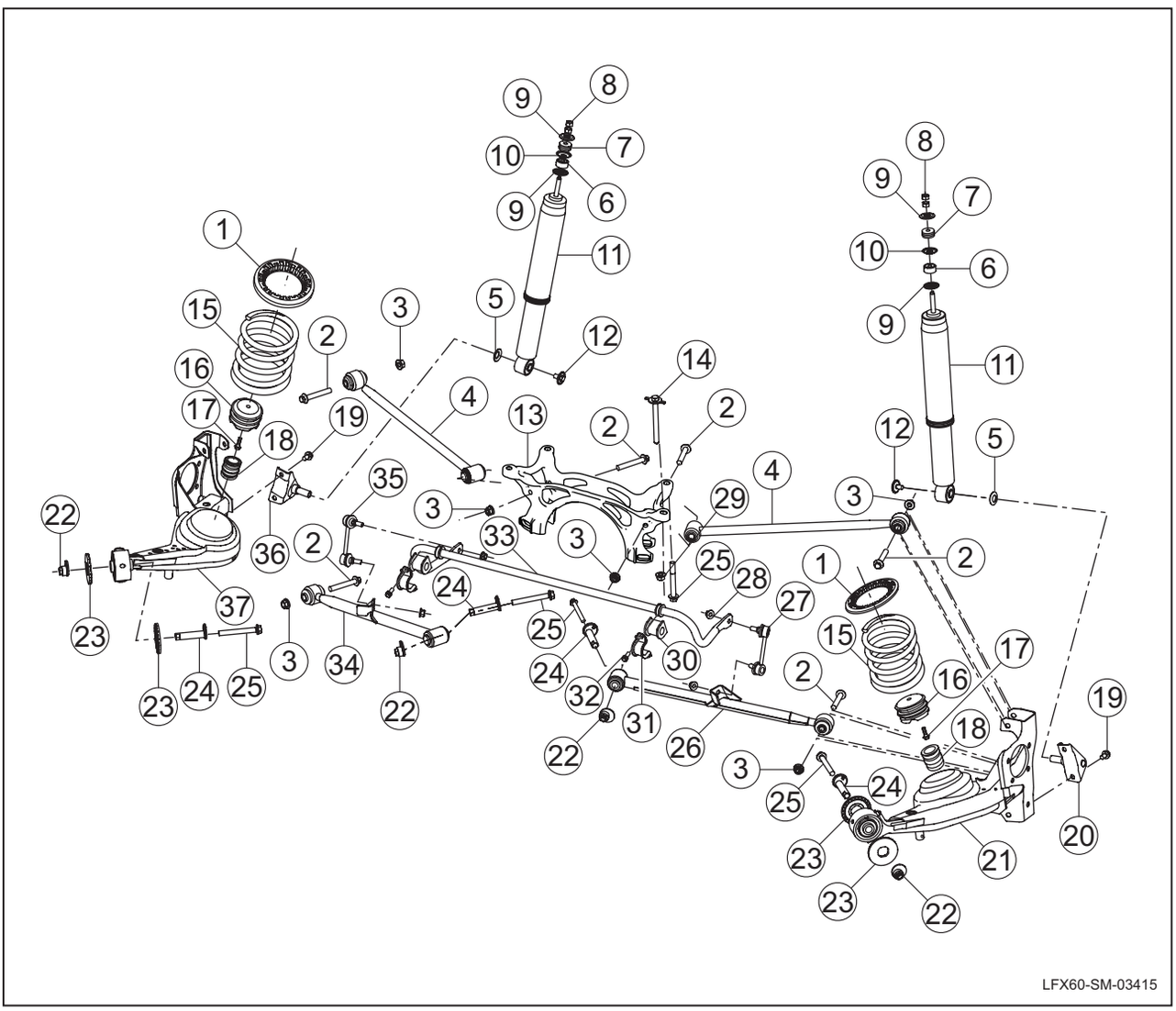
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Structure and installation location

Part exploded view

Rear suspension



No.	Part name
1	Spring upper pad
2	Hexagon flange bolt
3	Hex flange nut
4	Rear suspension and front upper transverse arm assembly
5	Rear vibration absorber lower mounting gasket II
6	Crash pad
7	Crash pad II
8	Hex flange nut
9	Upper mounting gasket
10	Upper mounting gasket II

No.	Part name
20	Rear vibration absorber left mounting bracket assembly
21	Rear suspension front left lower longitudinal arm assembly
22	Eccentric sleeve
23	Crash pad
24	Eccentric shaft
25	Hexagon flange bolt
26	Rear suspension front left lower cross arm assembly
27	Rear stabilizer bar left connecting rod assembly
28	Hex flange nut
29	Hex flange nut

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No.	Part name
11	Rear shock absorber assembly (RR)
12	Rear vibration absorber lower mounting bolt
13	Rear sub-frame assembly
14	Rear sub-frame front mounting bolt assembly
15	Rear spring assembly
16	Rear stopper support assembly
17	Hexagon head bolt and spring washer assembly
18	Rear stopper
19	Hexagon flange bolt

No.	Part name
30	Buffer sleeve of rear transverse stabilizer bar
31	Rear stabilizer bar bumping block upper left press plate
32	Hexagon head bolt and spring washer assembly
33	Rear transverse stabilizer bar assembly.
34	Rear suspension front right lower cross arm assembly
35	Rear stabilizer bar right connecting rod assembly
36	Rear vibration absorber right mounting bracket assembly
37	Rear suspension front right lower longitudinal arm assembly

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General Inspection

Inspection of rear vibration absorber

1. Lift the vehicle. **Refer to the vehicle lift and support.**
2. Check the rear vibration absorber for the following abnormal conditions.

- Rear vibration absorber fixing bolt looseness.
- Rear vibration absorber deformation.
- Rear vibration absorber bushing aging, wear.
- Rear vibration absorber leak.

Note:

The oil film (exudation) is allowed to occur on the front and rear vibration control system.Oil impregnate means the thick oil film accumulates on the outside of the vibration absorber shell.It is noted due to the abundant dust it absorbs.The oil impregnate is normal for the vibration absorber and it need not be replaced.The oil leak means the entire vibration control system suspension is covered by the oil while the oil drops onto the ground.The vibration absorber should be replaced.

3. Remove the rear vibration absorber. Refer to the replacement of rear vibration absorber.
4. Measure the rear vibration absorber length in free state.
5. Clamp the vibration absorber lower end union link to the bench clamp, pull the vibration damping rod for several time and there should be stable resistance. The upward resistance should be higher than the downward resistance. If the resistance is instable or there is no resistance, it indicates the vibration absorber is oil absent or the valve parts are damaged and should be replaced.

Vibration absorber working sta4

The vibration absorber is full of compressed gas inside and at full length when not limited.If not, it indicates the vibration absorber is damaged and must be replaced.Check the total length of the vibration control system.If the total length is not reached, it means a certain component is unacceptable and the vibration control system should be replaced.

Place the vibration absorber on the jaw vice vertically and compress it.The compression action should be smooth and consistent.

The following conditions are abnormal.

- Vibration absorber piston rod and oil storage cylinder seizing.
- Vibration absorber oil leak.
- Vibration absorber tick tone.
- Vibration absorber return fault after installation.
- Noise (the slight swish is normal).
- With the vibration absorber push rod fully extended, the vibration absorber piston rod present swing relative to the vibration absorber shell.

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Operating Principle

System description

This vehicle adopts the independent rear suspension system, which are featured with the following advantages: simple suspension structure, light in weight, low assembly working hours.low space occupation, spring vibration damping system easy to lay out and facilitating the control of wheel motion ratio relative to the spring damping and low toe-in and tread change in the suspension motion.In the case of lateral force, the camber angle change is low, the linear stability is excellent and the rear tire wear is low, which can maintain the vehicle riding comfort and control stability.The rear suspension system mainly consists of the rear longitudinal arm assembly, rear helical spring, rear vibration absorber and rear bumping block.

Part instructions

Rear vibration absorber

The suspension system elastic elements can generate the vibration due to the impact.To enhance the riding comfort, the suspension system elastic elements are connected with vibration absorber in parallel.The vibration absorber is mainly designed to restrain the elastic element oscillation upon rebounding after the absorption of shocks and the impact from the road surface.When passing the rough road, though the elastic element can filtrate the road vibration, the reciprocation of the elastic element self cannot be avoided. The vibration absorber is designed to restrain such motion. If the vibration absorber is too soft, the bodywork will jump up and down; if the vibration absorber is too hard, the oversize resistance will interfere with the normal operation of the elastic elements. During the suspension system refitting, the hard vibration absorber should match the hard spring, while the spring hardness related to the vehicle weight closely. Therefore, the heavy vehicle employs the harder vibration absorber in general.

Rear helical spring

The rear helical spring is the main elastic element of the rear suspension system.It can filtrate the vibration from the road through the compression deformation of helical spring when the vehicle is running on the rough road.As one of the main components of rear suspension system, it constitutes the intact suspension system together with other components to enhance the vehicle riding comfort.

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Diagnostic Information and Procedures

Diagnosis Instructions

Before the rear suspension system fault diagnosis, learn about the operating principle of rear suspension system fisrt.This helps to determine the correct fault diagnosis procedures and whether the conditions described by the customer are the nomral operation.

The rear suspension system fault diagnosis must start from the inspection of rear suspension system.Instruct the maintenance man to take the next logic procedures and complete the fault diagnosis. Comprehend and correctly use the diagnostic flow chart to shorten the diagnosis time and avoid the misjudgement.

Visual Inspection

1. Confirm the problem raised by the customer.
2. Check the evident mechanical faults.

Visual inspection table

Mechanical
• Rear suspension fastener • Rear vibration absorber • Rear helical spring • Rear vibration absorber base • Longitudinal arm bushing

3. Solve the problem finding before the next step inspection.
4. If the observed or raised problem is the evident and the cause has been found, ensure to fix this fault before proceeding with the next step.
5. If no problem is found through the visual check, confirm the fault and refer to the fault symptom list.

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List of fault symptoms

Symptom	Possible point of failure	Recommended Measures
Rear suspension noise while running	• Rear suspension fastener looseness • Rear vibration absorber • Longitudinal arm bushing • Rear helical spring support assembly	**Refer to: Diagnosis flow for rear suspension noise while running**
Riding comfort (the rear suspension too soft or too hard) diagnosis flow	• Wheel and tire, abnormal tire pressure • Rear vibration absorber • Rear helical spring	**Refer to: Riding comfort (the rear suspension too soft or too hard) diagnosis flow**

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Diagnosis flow for rear suspension noise while running

ℹ Note:

Before the rear suspension noise diagnosis and repair, determine the tire, exhaust system, interior/exterior trims, front suspension, steering system, clutch, transmission propeller shaft and wheel bearing are free of abnormal noise.

Test condition	Details/results/measures
1. Check the wheel, tire and tire pressure.	
	A. Lift the vehicle. B. Check the rear suspension fasteners for looseness. Is it OK after checking? →**Yes** To step 2. →**No** **Refer to: Reinstall or replace the fasteners.**
2. Check the rear helical spring support assembly.	
	A. Check the rear helical spring support assembly for shift or excessive wear. Is it OK after checking? →**Yes** To step 3. →**No** Replace the rear helical spring support assembly.
3. Check the rear longitudinal arm bushing.	
	A. Check the rear longitudinal arm bushing for wear and damage. Is it OK after checking? →**Yes** To step 4. →**No** Replace the rear longitudinal arm bushing.
4. Check the rear vibration absorber.	
	A. Check the rear vibration absorber for oil leak etc. B. Check the rear vibration absorber bumping block and the dust boot for damage. C.Remove the rear vibration absorber. **Refer to: Replacement of the rear vibration absorber.** D. Carry out the vibration absorber working stand test. **Refer to: Vibration absorber working stand test** Is it OK after checking? →**Yes** To step 5. →**No** Replace the damaged components.

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Test condition	Details/results/measures
5. Check the other noise.	
	A. Check the other noise. Refer to: Noise, vibration and harshness B. Carry out trial run. Confirm that the fault has been ruled out.

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Riding comfort (the rear suspension too soft or too hard) diagnosis flow

Test condition	Details/results/measures
1. Check the wheel, tire and tire pressure.	
	A. Check the wheel and tire specification. B. Check whether the tire pressure is normal. Is it OK after checking? →**Yes** To step 2. →**No** Adjust the tire pressure or replace the wheel and tire. **Refer to: Replacement of the wheel.**
2. Check the rear vibration absorber.	
	A. Check the rear vibration absorber for oil leak etc. B. Remove the rear vibration absorber. **Refer to: Replacement of the rear vibration absorber.** C. Carry out the vibration absorber working stand test. Refer to: Vibration absorber working stand test Is it OK after checking? →**Yes** To step 3. →**No** **Refer to: the replacement of rear vibration absorber.**
3.Replace the rear helical spring.	
	A. Replace the rear helical spring. **Refer to: Replacement of the rear helical spring.** B. Carry out trial run. Confirm that the fault has been ruled out.

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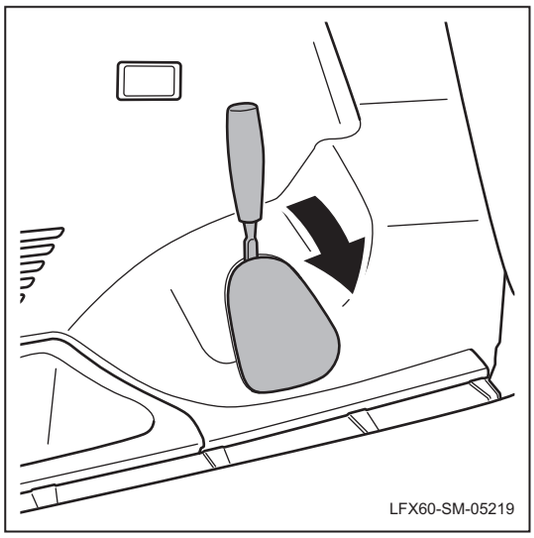
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Removal and Installation

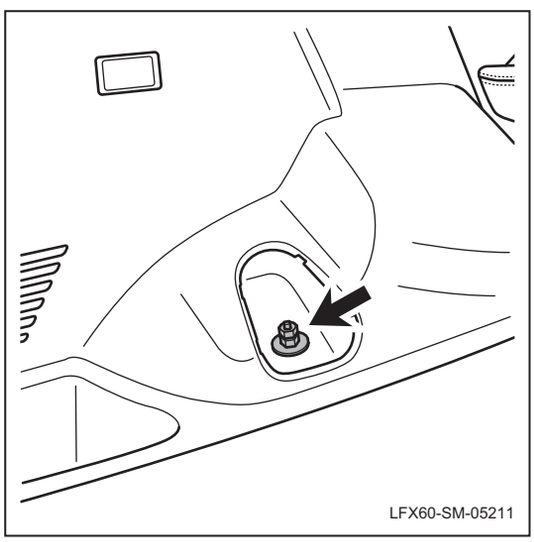
Replacement of rear vibration absorber

Removal

1. Remove the rear vibration absorber.



(a). Pry off the decorative cover plate.



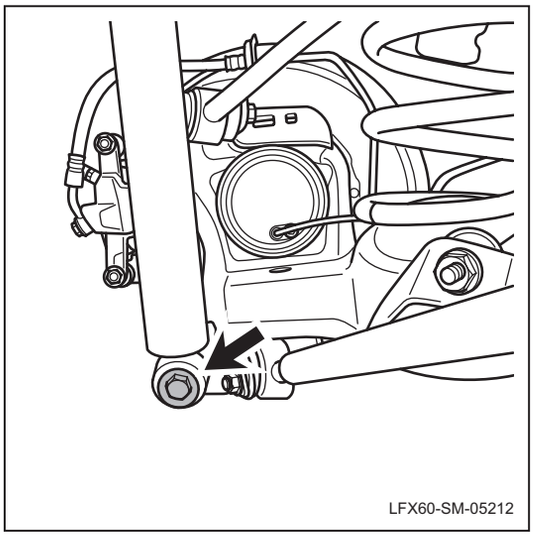
(b). Remove the rear vibration absorber upper end fixing nut.

(c). Lift the vehicle. **Refer to the vehicle lift and support.**

(d). Remove the rear wheel. **Refer to the replacement of wheel.**

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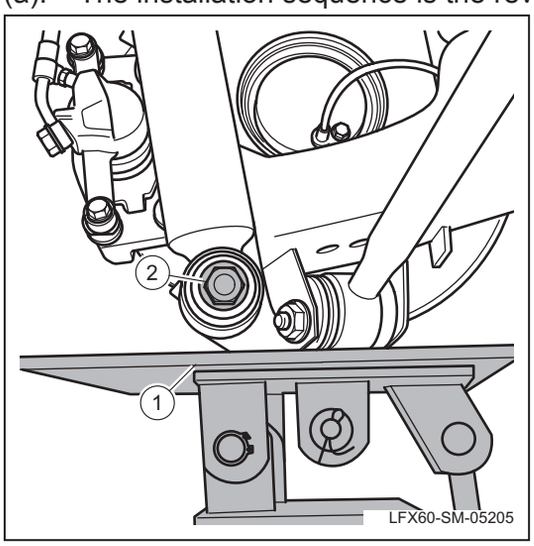
(e). Remove the vibration absorber lower end fixing bolt.

(f). ake down the vibration absorber.

Installation

1. Install the rear vibration absorber.

(a). The installation sequence is the reverse of the disassembly order.



(a). Support the rear suspension with the jack 1.

(b). Install the rear vibration absorber and tighten the bolt 2.

Torque: 60Nm

(c). Install the rear vibration absorber upper end fixing nut.

(d). Install the rear wheel.Refer to the replacement of wheel.

(e). Lower the vehicle.Refer to the vehicle lift and support.

ⓘ Note:

When using the jack, ensure the bearing point is in the middle position of jack to prevent the jack sliding and causing injury.

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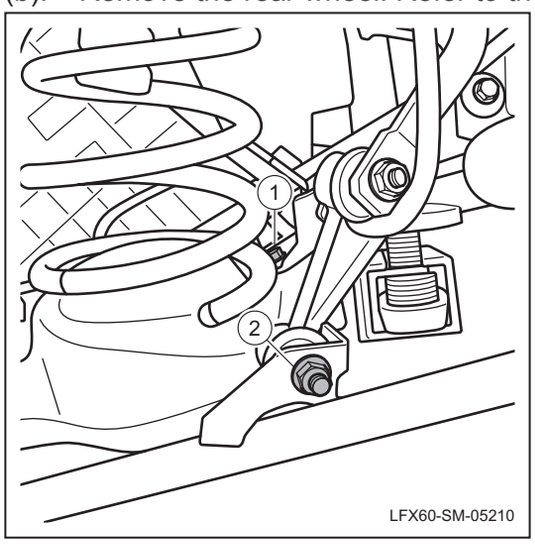
Replacement of rear helical spring

Removal

1. Remove the rear helical spring.

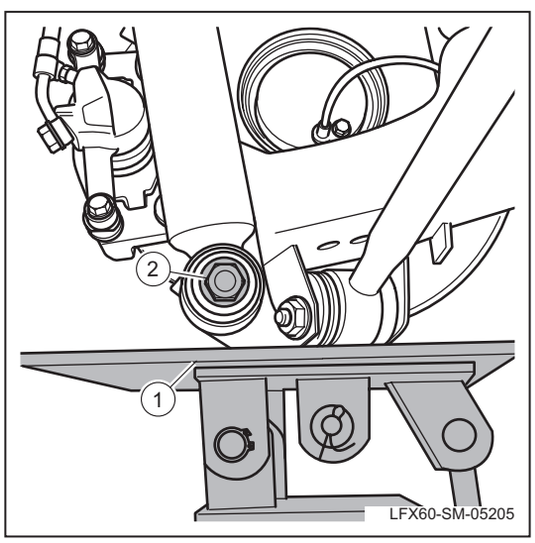
(a). Lift the vehicle. **Refer to the vehicle lift and support.**

(b). Remove the rear wheel. Refer to the replacement of wheel.



(c). Remove the rear brake hose fixing bolt 1.

(d). Remove the fixing bolt 2 of rear stabilizer bar connecting rod.



(e). Support the rear suspension with the jack 1.

(f). Remove the rear vibration absorber bolt 2.

(g). Slowly lower the jack and take out the helical spring from the lower end.

ⓘ Note:

When using the jack, ensure the bearing point is in the middle position of jack to prevent the jack sliding and causing injury.

Installation

1. Install the rear vibration absorber.

(a). The installation sequence is the reverse of the disassembly order.

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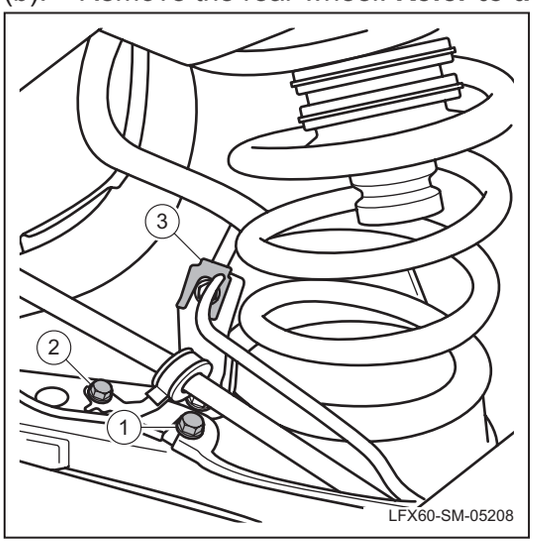
Replacement of longitudinal arm

Removal

1. Remove the longitudinal arm.

(a). Lift the vehicle. **Refer to the vehicle lift and support.**

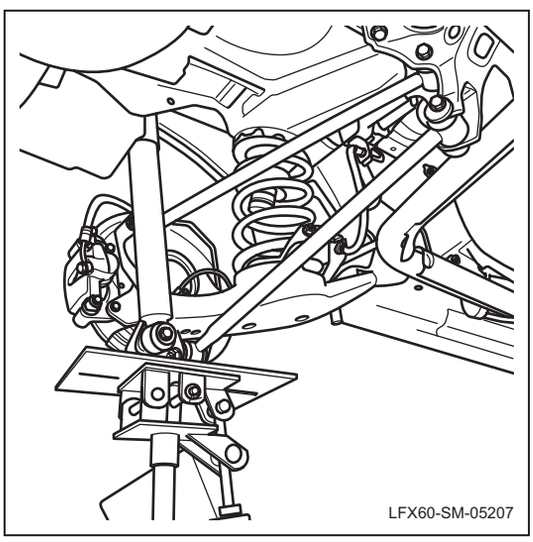
(b). Remove the rear wheel. **Refer to the replacement of wheel.**



(c). Remove the wheel speed sensor harness fixing bolt 1.

(d). Remove the hand brake cable tube fixing bolt 2.

(e). Remove the brake hose fixing bolt 3.



(f). Support the rear suspension with the jack.

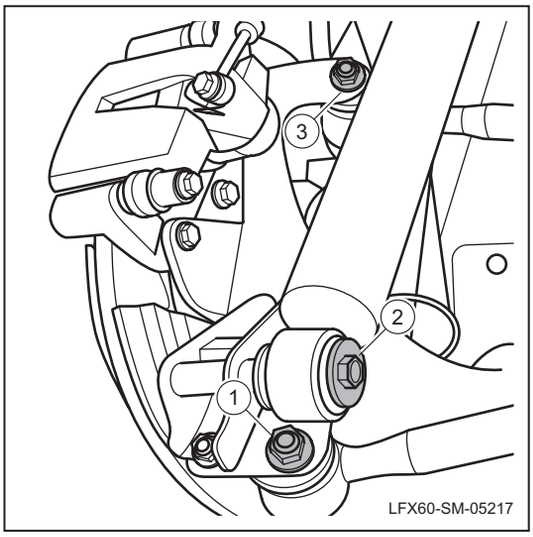
Installation

1. Install the rear vibration absorber.

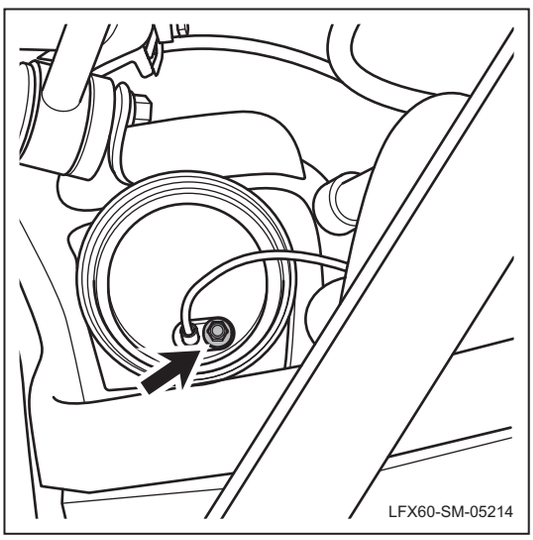
(a). The installation sequence is the reverse of the disassembly order.

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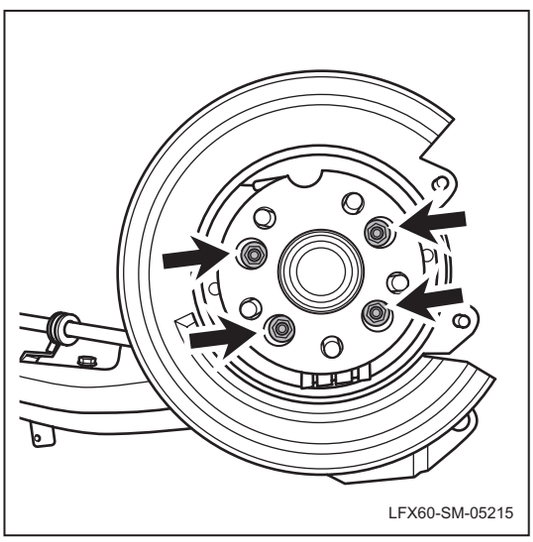
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(g). Remove the rear left lower cross arm fixing bolt 1.
(h). Remove the vibration absorber lower end bolt 2.
(i). Remove the rear left upper cross arm fixing bolt 3.



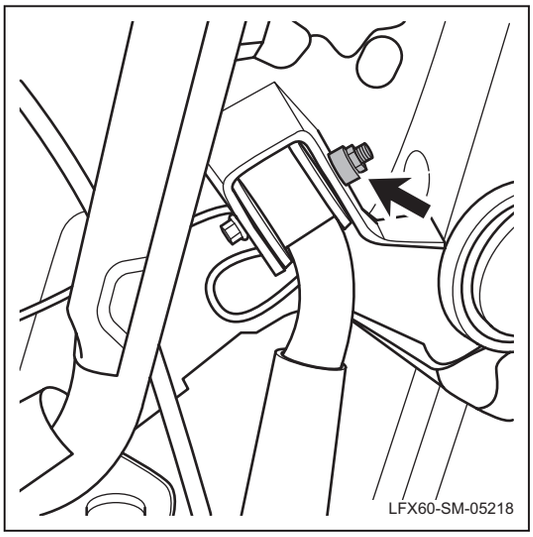
(j). Remove the wheel speed sensor fixing bolt and take it down.
(k). Remove the rear brake tongs. **Refer to: the replacement of rear brake tongs.**
(l). Remove the brake disc. **Refer to: the replacement of rear brake disc.**



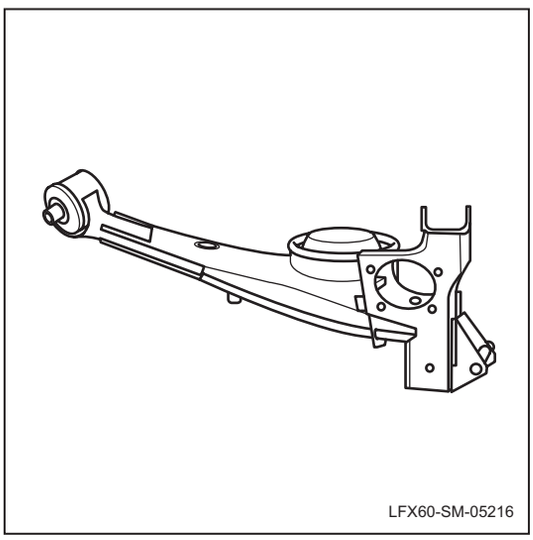
(m). Remove the 4 fixing bolts connecting the longitudinal arm and hub.

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(n). Remove the longitudinal arm front fixing bolt.



(o). Slowly set down the jack and take down the longitudinal arm.

Installation

1. Install the longitudinal arm.

(a). The installation sequence is the reverse of the disassembly order.

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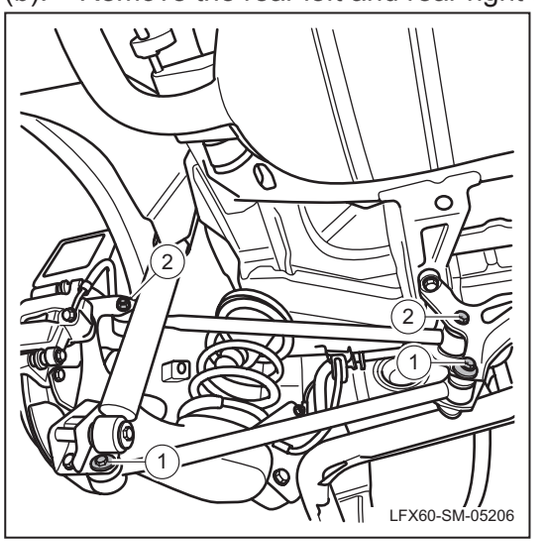
Replacement of rear suspension assembly

Removal

1. Remove the rear suspension assembly.

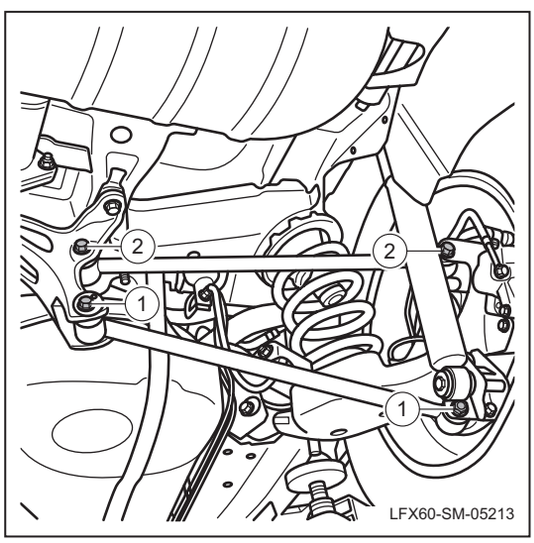
(a). Lift the vehicle. **Refer to: the vehicle lift and support.**

(b). Remove the rear left and rear right wheels. **Refer to: the replacement of wheel.**



(c). Remove the rear left lower cross arm fixing bolt assembly 1.

(d). Remove the rear left upper cross arm fixing bolt assembly 2.

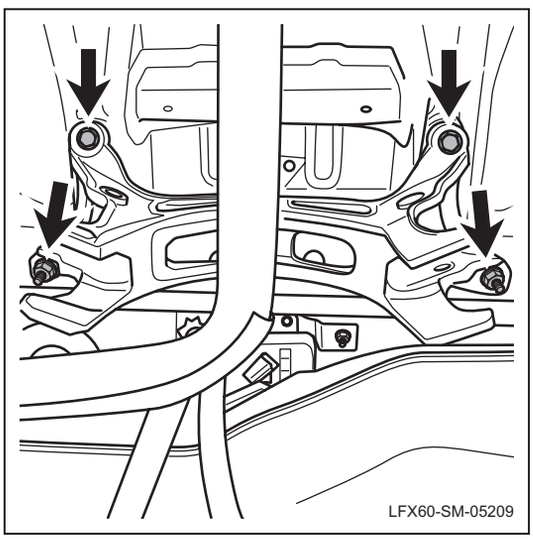


(e). Remove the rear right lower cross arm fixing bolt assembly 1.

(f). Remove the rear right upper cross arm fixing bolt assembly 2.

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(g). Remove the 4 fixing bolts of the rear suspension.
(h). Take down the rear suspension assembly.

Installation

1. Install the rear suspension assembly.

(a). The installation sequence is the reverse of the disassembly order.

❶ Note:

After removing the rear suspension, carry out the wheel alignment.

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05 - Driving system

Wheels and tires 5-1003
Technical specifications.....5-1003
Precautions 5-1004
Preparation.....5-1005
Structure and installation location 5-1007
General Inspection 5-1008
Operating Principle..... 5-1011
Diagnostic Information and Procedures.....5-1013
Removal and Installation.....5-1016

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Wheels and tires

Technical specifications

Torque Specifications

Name	Torque range	
	Metric(Nm)	British (Lb-ft)
Spare wheel regulator	120	89

General specifications

Wheel run-out (under half load)	Front wheel upward run-out	74.6mm
	Front wheel downward run-out	96.4mm
	Total travel	171mm
	Rear wheel upward run-out	95.8mm
	Rear wheel downward run-out	130.2mm
	Total travel	226mm
Tire pressure (no load)		230Kpa/230Kpa/250Kpa
Tire pressure(under full load)		230Kpa/230Kpa/250Kpa
Tire specification		225/55ZR18 102W
Rim model		17X6.5J;18X7J;16X6.5J;
Spare tire specification		215/65R16 102H

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Precautions

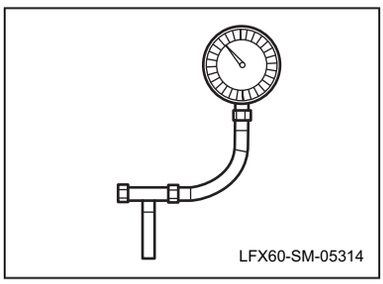
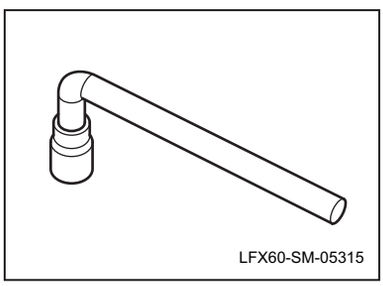
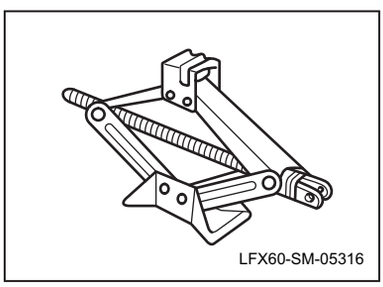
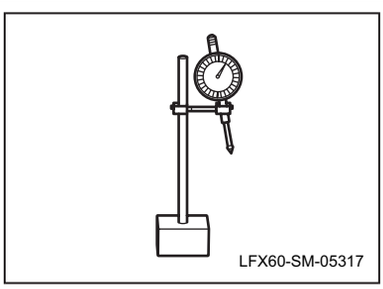
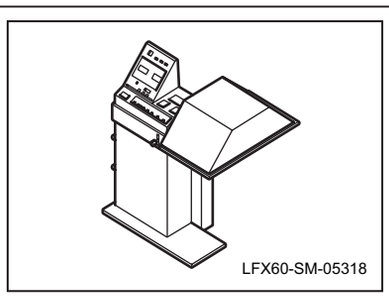
1. Radial tires, belted tires or diagonal ply tires can not be mixed on the vehicles; otherwise they may cause a typical handling hazard, resulting in loss of control of the vehicle.
2. In use, must perform the regular transposition of wheels, so as to reduce the eccentric wear of front wheel tires and ensure the vehicle driving performance and prolong the service life of tires.
3. Must use the dedicated tires for Lifan vehicles, and it is not allowed to install different specifications or patterns of tires on one vehicle.
4. In use, must timely wash any mud and sand attached on the tires, to avoid wheel shaking at high speed and damage of tires.
5. Do not apply the oil or lubricant on bolts or nuts.
6. Observe the instructions for the jack operation.
7. Do not allow any body part to be under the jacked vehicle; otherwise it will result in the physical injury.
8. When the vehicle is lifted with the jacks, the engine can not be started or operated.
9. Park the vehicle on a flat and solid ground, tightly apply the parking brake and set the transmission in neutral position. If necessary, place the blocks below the tires to be replaced in the diagonal direction.
10. To stop the wheels, place the wheel stopper in the back of front wheel or the back of rear wheel.
11. Confirm that the jack is placed on the flat and solid ground, confirm that the jack is arranged on the right support point. When the vehicle is jacked, if the jack position is incorrect, the vehicle may be damaged or fall from the jack, resulting in injuries.
12. Do not jack the vehicle if there is person in the vehicle.

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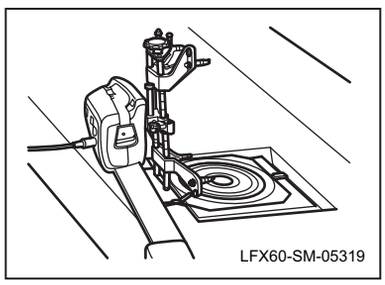
Preparation

Special Maintenance Tools

No.	Tool name	Tool figure	Tool code	Remarks
1	Tire pressure gauge	 LFX60-SM-05314	-	Check the tire pressure
2	Wheel wrench	 LFX60-SM-05315	-	Remove the wheel nut
3	Jack	 LFX60-SM-05316	-	Lift the vehicle
4	Dial indicator	 LFX60-SM-05317	-	Check the wheels for axial and radial runout
5	Balancing machine	 LFX60-SM-05318	-	Check and adjust the wheel balance

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No.	Tool name	Tool figure	Tool code	Remarks
6	Wheel alignment machine	 LFX60-SM-05319	-	Check the wheel alignment

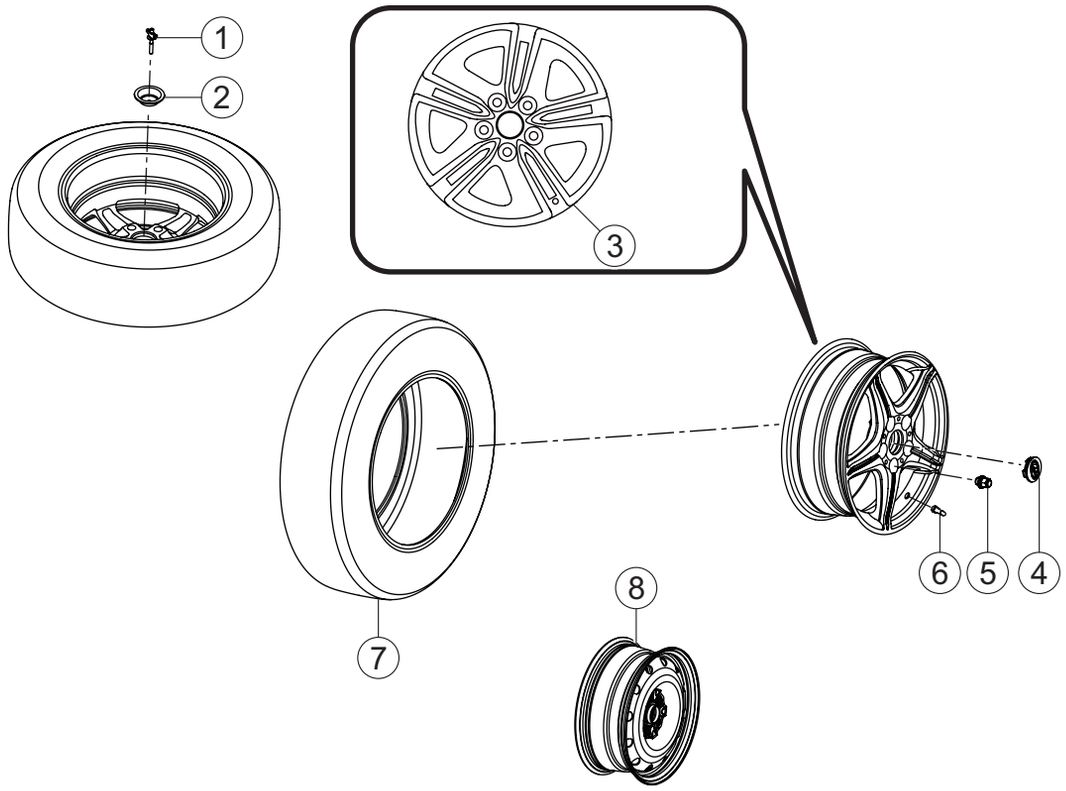
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Structure and installation location

Part exploded view

Wheel and tire



LFX60-SM-03411

No.	Part name
1	Spare tire screw rod assembly
2	Spare tire fixing plate assembly
3	Aluminium rim
4	Center logo

No.	Part name
5	Wheel nut assembly
6	Valve assembly
7	Tire assembly
8	Wheel rim

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General Inspection

General Inspection

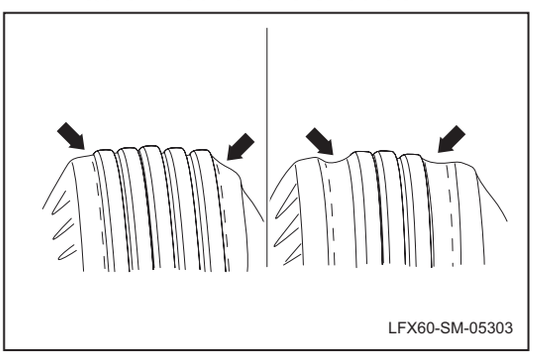
⚠ Warning:

- **Unless for emergency (the temporary use), do not use the tires of different types in the same vehicle, such as the radial tire, bias tire or bias cord tire.**
- **Do not start the vehicle while replacing the tire since the wheel landing may cause the vehicle to move.**
- **The tire sealant on the market is the inflammable substance.Please frequently remind the customer of not using such substance.**
- **Wear the safety goggles or mask when repairing the wheel and tire assembly.**
- **After replacing the wheel or the wheel bolts are loosened, tighten the wheel nuts again after the vehicle runs for 800km.**
- **If the wheel nuts are not tightened in the required mileage, the wheels may separate from the bodywork with the vehicle running.**
- **The axle shaft, wheel and tire are specified with the maximum load; do not overload.**
- **Do not grind the aluminum alloy wheel with the steel wool or clean it with the detergent.**
- **Before removing the tire valve core, reduce the tire pressure by pressing the valve core piston.**
- **Failing to observe the above instructions may result in the physical injury.**

Inspection of tire wear

The abnormal tire wear is usually caused by the excessive camber angle or excessive toe-in.In some cases, the incorrect toe-in setting or suspension component wear may result in the severe "cave" or "scalloping" tire wear. Sometimes, the incorrect toe-in setting may cause the other abnormal wear.

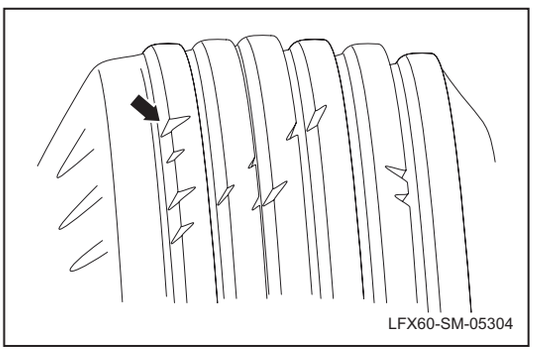
1. Quick wear of tire shoulder.



Causes of abrasion:

- Insufficient tire inflation.
- Do not carry out tire exchange.

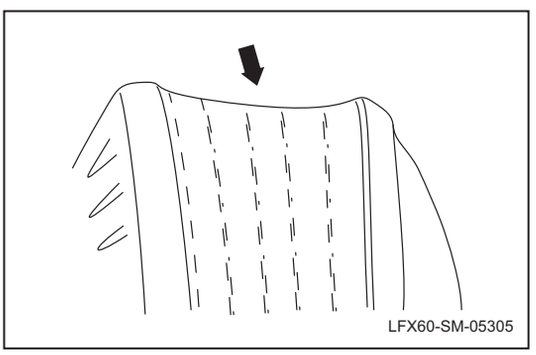
2. Tire tread flaw.



Causes of abrasion:

- Insufficient inflation.
- Too high vehicle speed.

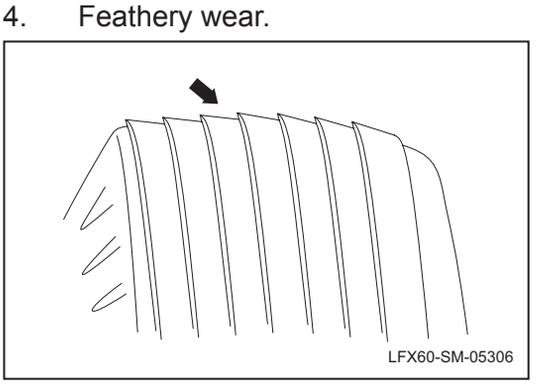
3. Quick central wear.



Causes of abrasion:

- Excessive tire inflation.
- Do not carry out tire exchange.

4. Feathery wear.



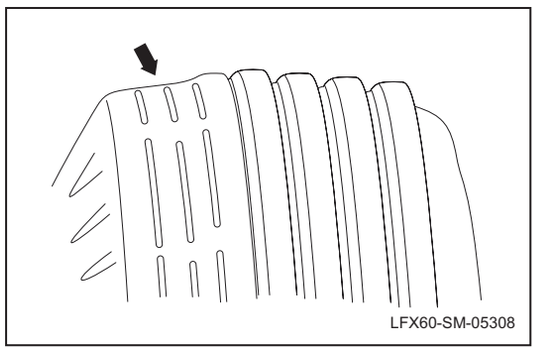
Causes of abrasion:

- Incorrect toe-in.

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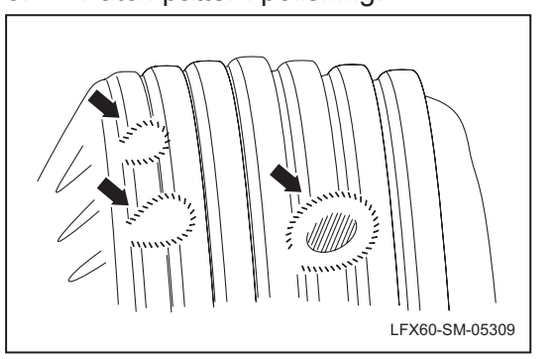
5. Single side wear.



Causes of abrasion:

- Excessive inclination.

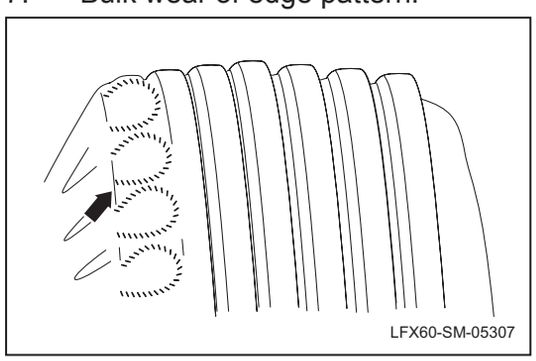
6. Patch pattern polishing.



Causes of abrasion:

- Wheel imbalance.
- Tire defect.

7. Bulk wear of edge pattern.

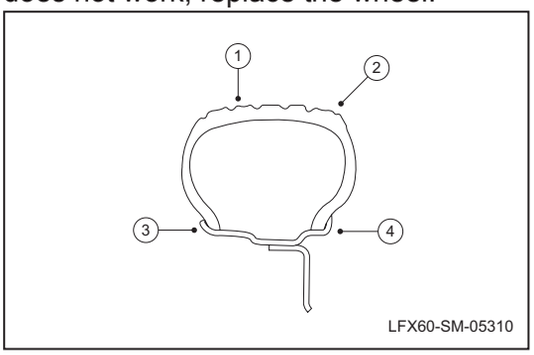


Causes of abrasion:

- Do not carry out tire exchange.
- Suspension component wear or improper adjustment.

Inspection of tire run-out

Measure the wheel run-out with the dial gauge on board or off board.In both case the installation surface should be correct.The measurement can be made with or without the tire installed.Measure the wheel end face run-out at the rim flange inside position 3 and outside position 4.Fix the dial gauge to the wheel position 1 and measure the tire radial run-out and measure the free longitudinal run-out at position 2.Slowly rotate the wheel by one turn and record the dial gauge reading.If the measurement does not meet the requirement, subject the tire to the dynamic balance.If this does not work, replace the wheel.



Inspection of tire vibration

The tire vibration diagnostic program starts from the road test.The road test and interview with the customer (if possible) can provide many information for locating the vibration source. The road test should be made on the level road surface.In the case of vibration, note and record the following items:

- The vehicle speed when the vibration occurs.
- Which type of vibration occurs in each gear at each speed.
- The mechanical vibration or audible vibration.

The variation of the following conditions will impact the vibration:

- Engine torque.
- Vehicle speed.
- Engine speed.

The vibration falls into torque sensitive type, vehicle speed sensitive type and engine speed sensitive type.Below description helps to distinguish the vibration source.

1. Torque sensitive type.

It means the vibration can be better or worse along with the accelerating, decelerating, constant speed, vehicle stationary or application of engine torque.

2. Vehicle speed sensitive type.

It means the vibration usually occurs at the same vehicle speed and is not impacted by the engine torque, speed or transmission gear.

3. Engine speed sensitive type.

It means the vibration will occur at different vehicle speed as the transmission engages the different gear.Sometimes, this can be distinguished by the engine speed increase or decrease with the transmission in neutral gear or by the stalling test with the transmission engaging a gear.

If the condition is too sensitive to the engine speed, it does not relate to the tire most likely.

If the tire noise is detected while no dithering or oscillation phenomenon during the road test, the noise is generated by the contact of tire

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and road surface.The high tire noise normally means the tire is flat or the pressure is too low and the tire slaps the road to generate the noise.Different from the axle shaft noise, the tire noise can maintain the same in a certain vehicle speed range.For details, refer to the road test procedure.

Preliminary inspection before tire alignment

Check the following items before the tire alignment:

- Check whether the wheel and tire models are consistent.
- Check whether the tire inflation pressure is appropriate.
- Check whether the tire tread wear is normal.
- Check whether the wheel bearings are loose.
- Check the vehicle height under kerb weight state.
- Check whether the suspension components are normal.
- Check whether the steering components are normal.

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Operating Principle

System description

The genuine wheel and tire are designed to offer the normal operation performance so long as the tire pressure reaches the required value no matter the load reaches the rated full load or not.The following items can impact the tire life:

- The correct tire pressure.
- The wheel alignment.
- The driving skill.

The following driving practice can increase the tire wear:

- Sharp turn.
- Too fast acceleration.
- Emergency braking.

Meaning of identifications on the sidewall of tire

The tire model, size, load index and applicable speed rating are indicated by the letter and number code stamped on the side wall.To interpret the code, refer to the tire identification table.For the purpose of illustration, the table uses the tire specification of P215/65R16 102H. For the all-weather tire, the side wall also is provided with M+S, M & S or MS (indicating the towing on the mud and snow field).The overload or light load marks XL or LL can be stamped on the side wall as well.If no XL or LL mark is found on the side wall, the tire can be determined as the standard load tire.

Tire identification table:

P	Tire type	P - passenger car
		T - spare tire
		C - commercial vehicle
		LT - light truck
215	End face width	In mm
65	Height to width ratio	End face height/ width
R	Structure type	R - radial
		B - bias
16	Wheel diameter	In inch
102	Load index	Consult the tire supplier
H	Speed grade	Refer to the tire speed rating table

Speed rating correspondence table:

Speed grade	Max.speed (km/h)
S	180
T	190
H	210
V	240
W	270
Y	300
ZR	Above 240

Tire inflation description

The inflation pressure for the tires of all models is subjected to the thoroughful calculation to guarantee the following items:

- Steering mobility.
- Driving comfort.
- Maximum wear resistance of tire tread.
- High impact resistance.
- Longer tire life.

Check the tire inflation pressure every month or before the long distance trip.To achive the best measurement results, please the meet the following conditions:

- The tires are in cold state.
- The driving distance is less than 1 mile (1.6km).
- The vehicle parks more than 3h.

Tire exchange description

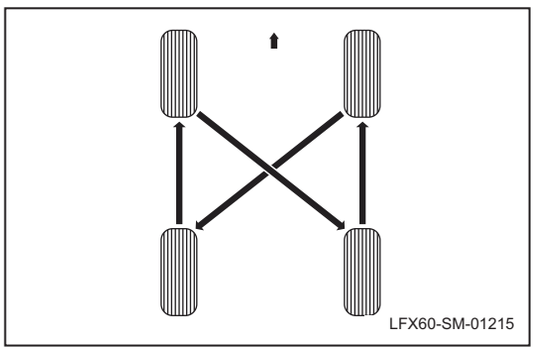
The tire wear of the front/rear tires varies from the load while the vehicle running.To avoid the single side wear of the tire, exchange the wheels periodically to make the tire wear uniform and consequently prolong the tire life.It is suggested that the tires should be exchanged every 5,000km to 8,000km driving to:

- Maintain the tire wear and tire fatigue uniform and ensure the stability and economical efficiency.
- Check the tire conditions, detect the tire damage in time and prevent the accidents.
- Use the optimal state tires for the steering wheels so as to enhance the vehicle stability and safety.

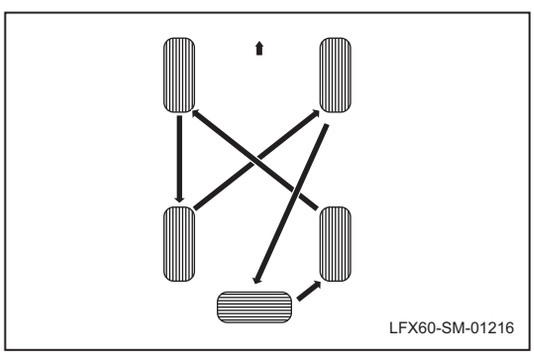
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Crosswise exchange of tires:



Exchange of tires when the spare tire is used:



Part instructions

Using the non-genuine wheels may result in the following conditions:

- The damage of wheel bearing, wheel fasteners and wheel.
- The tire failure due to the change of parts clearance.
- The vehicle damage due to the change of ground clearance.
- The poor steering stability due to the change of friction radius.
- The inaccurate indication of speedometer and odometer.

Replace the wheel if the following conditions occur.

- The wheel bolt hole is elongated.
- Severe wheel corrosion.
- Wheel bending or dent deformation.
- Excessive radial run-out of wheel.

Tire chain operating instructions

The tire chain manufacturer designates the applicable tire chain size for each type tire to ensure the installation appropriate.

- Ensure to purchase the correct tire chain.
- If the tire chain is too slack due to the incorrect size, do not insert the rubber setting block in the slack part or the gap.
- Observe the installation guide of the tire chain manufacturer.

Since the use of tire chain can generate the negative impact on the vehicle operation, the driver must be aware of the following aspects:

- Adjust the vehicle speed according to the road surface conditions.
- Avoid sharp turn.
- Avoid the wheel brake locking.

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Diagnostic Information and Procedures

Diagnosis Instructions

Before the wheel and tire system fault diagnosis, learn about the operating principle of wheel and tire system fisrt.This helps to determine the correct fault diagnosis procedures and whether the conditions described by the customer are the nomral operation.

The wheel and tire system fault diagnosis must start from the inspection of wheel and tire system. Instruct the maintenance man to take the next logic procedures and complete the fault diagnosis. Comprehend and correctly use the diagnostic flow chart to shorten the diagnosis time and avoid the misjudgement.

Visual Inspection

1. Confirm the problem raised by the customer.
2. Check the evident mechanical faults.

Visual inspection table

Mechanical
• Tire wear mark • Whether there is tire flaw • Whether there is abnormal wear of tire • Whether there is wheel deformation • Tire nut • Tire bolt

3. Solve the problem finding before the next step inspection.
4. If the observed or raised problem is the evident and the cause has been found, ensure to fix this fault before proceeding with the next step.
5. If no problem is found through the visual check, confirm the fault and refer to the fault symptom list.

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List of fault symptoms

Symptom	Possible point of failure	Recommended Measures
Excessive wear of tire edge	• Insufficient tire pressure	• Adjust the tire pressure
	• Vehicle turn at high speed	• Avoid the vehicle turn at high speed
	• Vehicle overload	• Do not overload.
	• Incorrect wheel alignment	• Carry out the wheel alignment
Excessive wear of tire crown	• Tire pressure too high	• Adjust the tire pressure
	• Frequent acceleration or braking	• Correct it if necessary
Tire or other excessive wear	• Incorrect tire pressure	• Adjust the tire pressure
	• Tire exchange required	• Exchange the tires
	• Incorrect wheel alignment	• Carry out the wheel alignment
	• Front suspension or rear suspension abnormal	• Replace the damaged components.
	• Wheel bearing looseness, wear	• Adjust or replace the bearing
	• Wheel or tire radial run-out excessive	• Repair or replacement of damaged components
Wheel rusting or corrosion	• Improper maintenance	• Clean and apply paint
Difficult wheel installation	• Incorrect method or parts not match, including the wheel bolts and nuts	• Use the correct parts
	• Parts rusting, wear, damage	• Clean or replace

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Symptom	Possible point of failure	Recommended Measures
Vehicle vibration caused by the wheel or tire	• Tire pressure too high	• Adjust the tire pressure
	• Wheel or tire out of balance	• Balance the tires and wheels
	• Abnormal tire wear	• Check the abnormal wear causes and replace tire if necessary
	• Tire admission of water	• Drain the water
	• Wheel bending	• Replace the wheel • Refer to: Replacement of the wheel.
	• Incorrect tire bead installation	• Rotate the wheel on the vehicle to check the tire and wheel conjunction.If any part is found swing upon the wheel rotation, it indicates the wheel and tire are not well assembled.Remove the tire and clean the conjunction.
	• Wheel or tire radial run-out excessive	• Measure the wheel or tire radial run-out with the dial gauge.If the radial run-out is out of the specified limit, further check the wheel bolt radial run-out and replace the bolt if the radial run-out exceeds the limit.
	• Wheel nut damage or wheel bolt hole enlarged	• Tighten or replace the damaged components
	• Foreign matter between the wheel mounting face and hub	• Clean the mounting face
	• Brake disc out of balance	• Check the brake disc for earth, debris or heavy dirt; check the brake disc for imbalance due to the excessive wear and damage
	• Wheel bearing looseness, damage	• Repair or replacement of damaged components
Wheel bolt thread damage	• Excessive torque	• Replace the damaged bolt and tighten the wheel nut to the required torque
Wheel nut damage	• Wheel looseness	• Replace the bolt and nut and tighten the wheel nut to the required torque
Wheel nut seizing	• Excessive torque of wheel nut	• •Replace the nut and tighten the wheel nut to the required torque
	• Corrosion	• In the case of slight corrosion, remove it with the iron brush; in the case of severe corrosion, install the new bolts and nuts.If the fault still occurs, lubricate the first 3 threads of the wheel bolts with the graphite-base lubricating oil.
	• Vehicle overload	• Do not overload.

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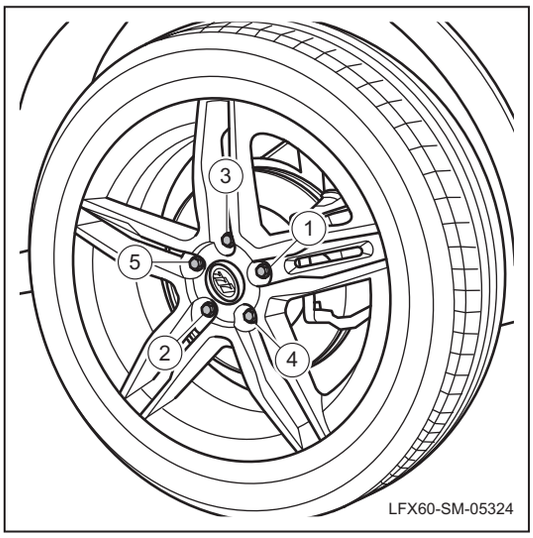
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Removal and Installation

Replacement of wheel

Removal

1. Remove the wheel.



(a). Loosen the wheel nuts in the sequence of 1 - 2 -3 - 4-5, as shown in the figure.

(b). Lift the vehicle. **Refer to the vehicle lift and support.**

(c). Remove the wheel nut.

Torque: 120Nm

(d). Take down the wheel.

Installation

1. Install the wheel.

(a). The installation sequence is the reverse of the disassembly order.

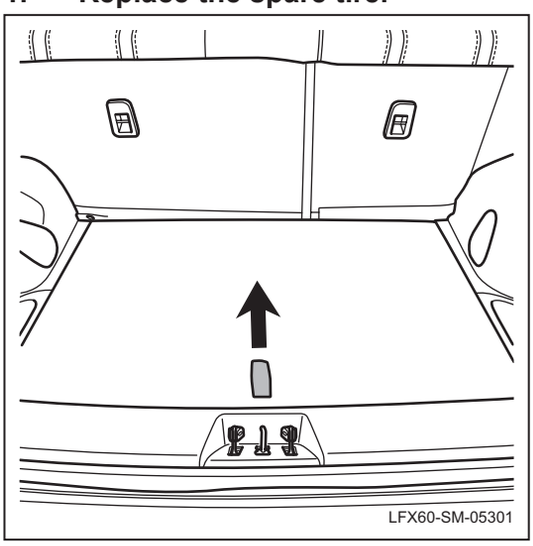
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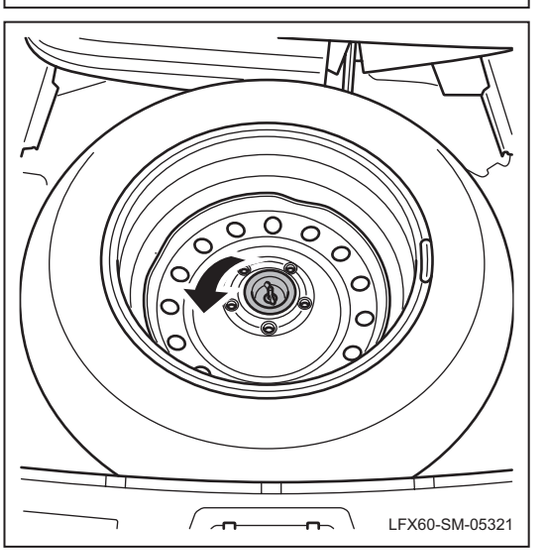
Replacement of spare tires

Removal

1. Replace the spare tire.



(a). Open hatchback.
(b). Remove the spare tire cover plate.



(c). Remove the spare tire fixing cover.
(d). Remove the spare tire.

Installation

1. Install the spare tire.

(a). The installation sequence is the reverse of the disassembly order.

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05 - driving system

Four-wheel alignment 5-1021
Technical Specifications.....5-1021
Precautions.....5-1022
Preparation 5-1023
General Inspection.....5-1024
Operating Principle 5-1025
Diagnostic Information and Procedures ..5-1026

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Four-wheel alignment

Technical Specifications

General specification

Name		Specification	
Front wheel alignment parameters	Front wheel toe	-2±2mm (total)	-1±1mm (single side)
		-0°16′ ± 16′ (total)	-0°8′ ± 8′ (single side)
	Front wheel outer incination angle	-0°42′ ± 48′ (no load)	
	Kingpin rear inclination	-2°44′ ± 30′ (no load)	
	Kingpin outer inclination angle	-11°2′ ± 30′ (no load)	
Rear wheel alignment parameters	Rear wheel toe	-0.84 ± 2mm (total)	-0.42 ± 1mm (single side)
		-0°6′ 43″± 16′ (total)	-0°3′ 22″± 8′ (single side)
	Rear wheel outer inclination	-0°42′ ± 30′(adjustable)	

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Precautions

Precautions

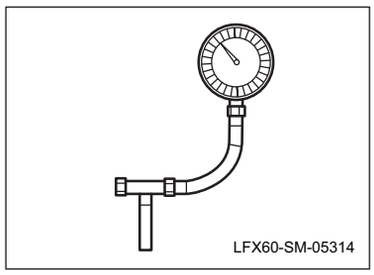
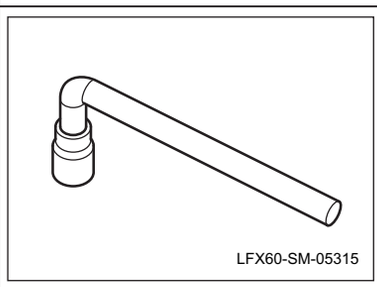
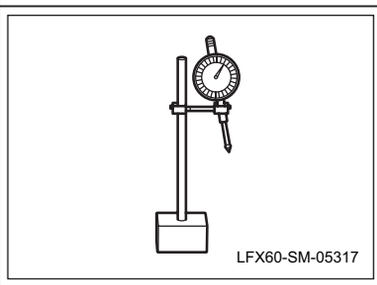
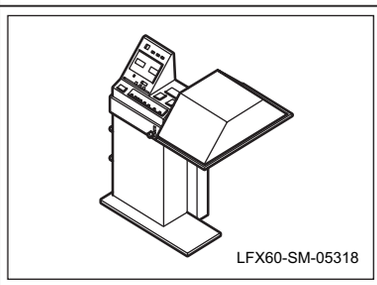
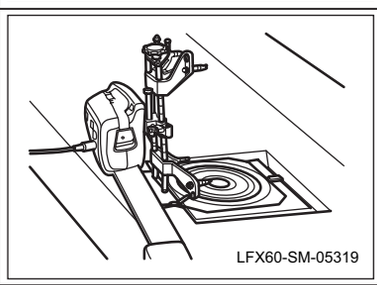
1. Check the front and rear suspensions of car for damages or deformations.
2. Check the wheel bearing gap, and replace the front wheel bearing if necessary.
3. Check the conditions of rims and tires.
4. Check the steering linkage and ball joint for loosening.
5. Park the car (without luggage or person) on flat ground, shake the wheels, and check its front suspension for loosening.
6. Check the assembly bushing for wears.
7. Check the damping force of shock absorber. If it's unqualified, replace it.

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Preparation

Special maintenance tools

No.	Tool name	Tool drawing	Tooling code	Remarks
1	Tire pressure gauge	 LFX60-SM-05314	-	Check the tire pressure
2	Wheel wrench	 LFX60-SM-05315	-	Remove the wheel nut
4	Dial Gauge	 LFX60-SM-05317	-	Check the wheels for axial and radial runout
5	Balancing machine	 LFX60-SM-05318	-	Check and adjust the wheel balance
6	Four-wheel alignment	 LFX60-SM-05319	-	Check the wheel alignment

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General Inspection

General Inspection

Preparation

ℹNote:
Misalignment of four wheel locations will cause the direction deviation, wrong return of steering wheel, tire leaning-grind or Heel-and-Toe Wears, etc

1. Tire size and pressure shall conform to the provisions of original manufacturer.
2. The rim deformation shall be within the specified range.
3. The ball joint of suspension system should have no loosening.

ℹNote:
Manually hold the wheel, move it up and down, left and right, to check its swing.

4. Good braking performance.

Site requirements

1. The surface of inspected site should be flat and horizontal as possible.
2. Place both torque angle indicators separately into the reserved holes with the same thickness of torque angle indicator.

ℹNote:
If there is no reserve pits, after the two front wheels are placed on the angle gauge, the two rear wheels should be padded with a flat board with the same thickness of the angle gauge.

Correct placement of car

1. Lift the car, place its both front wheels on the torque angle indicator, and make the extension line of kingpin centerline basically through the center of torque angle indicator.
2. Turn the steering wheel, and make the car straight.

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Operating Principle

System overview

Front wheel toe

- The toe-in should be checked and adjusted with a special four-wheel locating tester.
- According to the demands of tester, prepare for the adjustment before locating the wheels, and adopt a steering wheel limiter available on the market to fix the steering wheel in straight forward position (the steering wheel must be at ±5 from its center position, and the lower clamping flange bolt of steering shaft must be horizontal).
- Turn the toe-in adjusting lever to adjust its length until it reaches the specified value when required.
- Tighten the locking nut, reinstall the jacket circlip, and check whether the locking nut is tightened or the jacket is in correct position.
- After adjusting the toe-in of front wheel, check whether the steering wheel is horizontal, otherwise the locking nut of steering wheel should be loosened,and the steering wheel should be adjusted to horizontal position to make the locking nut of steering wheel tightened to specified torque.

Check of front wheel steering angle

- After replacing the tie rod joint or adjusting the toe-in, check its steering angle. If the steering angle of front wheel is unqualified, check and adjust the length of left or right tie rod.

Caster angle

- The kingpin caster angle should be ensured in design structure, and needn't be adjusted during the use.
- The main function of its caster angle is to make the car driving right ahead. If its caster angle is positive, the inner side of car will drop upon steering the front wheel, which can make the chassis lifted, thus the load on steering knuckle will be increased. If the caster angles of both wheels are the same, the car will return right ahead after steering it. It can increase the stability of steering wheel to increase its positive caster angle, but its acting force will be increased while steering; it can reduce the stability of steering wheel to reduce its positive caster angle, but its force will be reduced while steering. Its caster angle can't influence the tire wears, and it's used to stabilize the driving direction of car and it can return automatically while steering. If the car is equipped with a traditional mechanical steering gear, its caster angle will become small and even near to a negative value, thus it's easy to steer the car. If the car is equipped with a power steering gear, its caster angle is usually set to a higher positive caster angle, thus it will make the driver sensible to steer the car, its steering force will be increased in case of increasing its positive caster angle, but the straight driving stability of car can be increased.

Camber angle

- Under the normal conditions, it's not required to adjust the camber angle after assembling the independent suspension and wheel steering knuckle. In case of finding out that the camber angle of wheel is deviated from its tolerance range for any other reason, adopt the connecting bolts of independent suspension and steering knuckle for calibration.
- Before the calibration, first check (visually check) the parts of driving system for damages, and replace the damaged parts.
- In case of finding out the camber angle of front wheel outside the tolerance, loosen the connecting bolts of front shock absorber and steering knuckle, and move the wheel for calibration.

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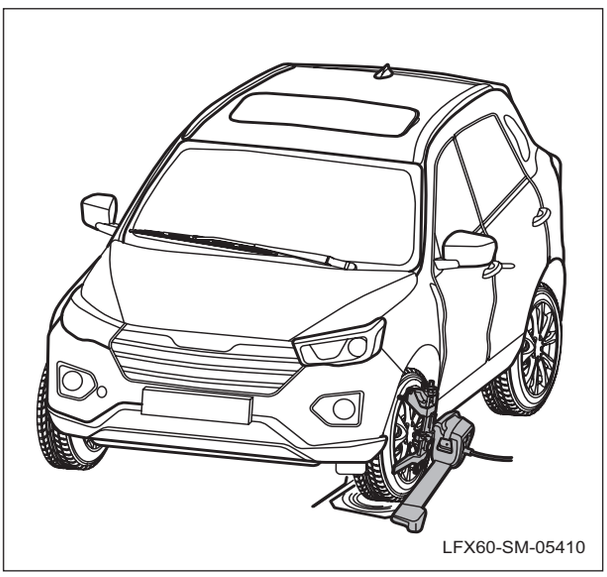
Diagnostic Information and Procedures

fault detection

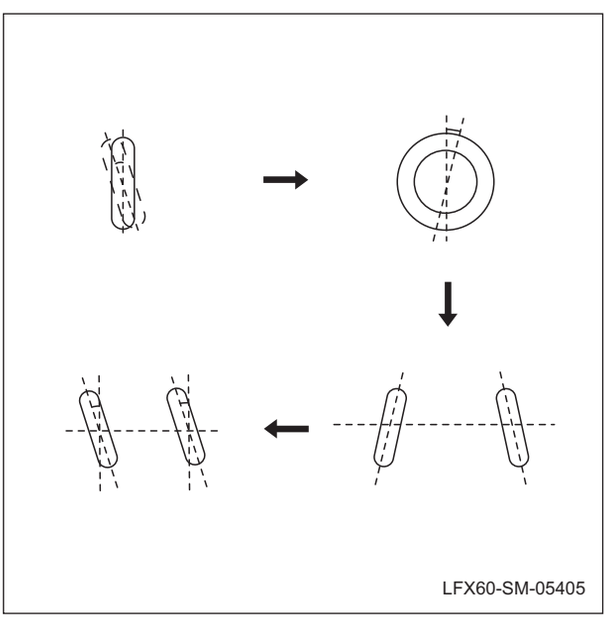
△Tips:

In order to prevent the front wheel from rolling while turning the steering wheel, make the front wheel braked.

1. Instrument installation and test sequence



(a). Install the instruments.



(b). Test and adjustment sequence of four-wheel location: kingpin caster angle, kingpin inclination angle, front wheel camber angle and front wheel toe-in.

△Tips:

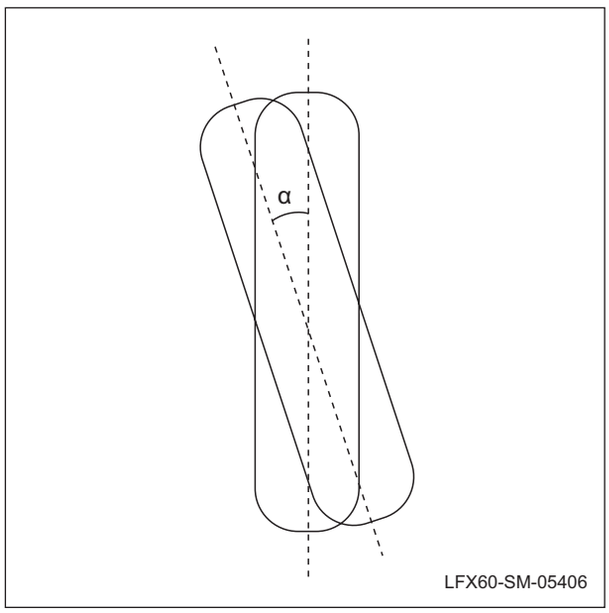
If any parameter of four-wheel location needs to be adjusted, make a full adjustment as per the above sequence.

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Test of front wheel camber angle

1. Test the camber angle of front wheel.



(a). Rotate the steering wheel to make it in the horizontal position approximately.

(b). Test the camber angle data of front wheel.

△**Tips:**

Under the normal conditions, it's not required to adjust the camber angle after assembling the independent suspension and wheel steering knuckle. In case of finding out that the camber angle of wheel is deviated from its tolerance range for any other reason, first check (visually check) the parts of driving system for damages, and replace the damaged parts before the calibration.

(c). In case of finding out the camber angle of front wheel outside the tolerance, loosen the connecting bolts of front shock absorber and steering knuckle for adjustment.

Front wheel camber angle:-0°2′±48′(no load)

△**Tips:**

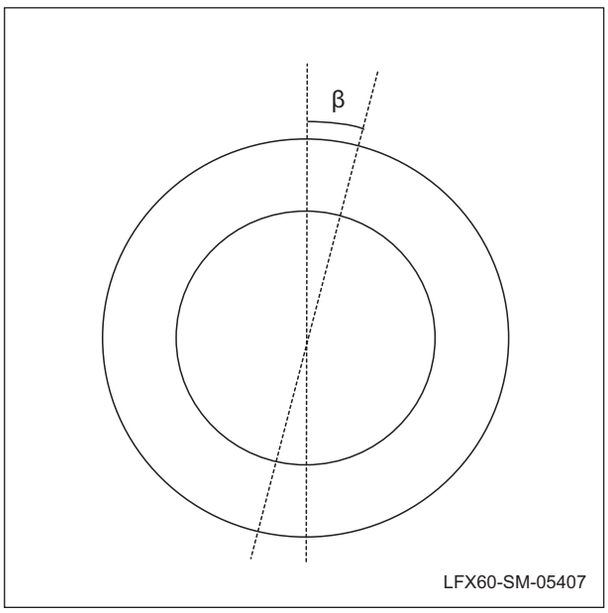
If its tested value is unqualified, it's required to adjust and test the suspension system.

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Check of kingpin inclination angle

1. Check of kingpin inclination angle.



(a). Turn the steering wheel, and the instrument screen will display the test report after finishing turning it.

Kingpin caster angle:-2°44′ ± 30′ (no load)

△**Tips**:

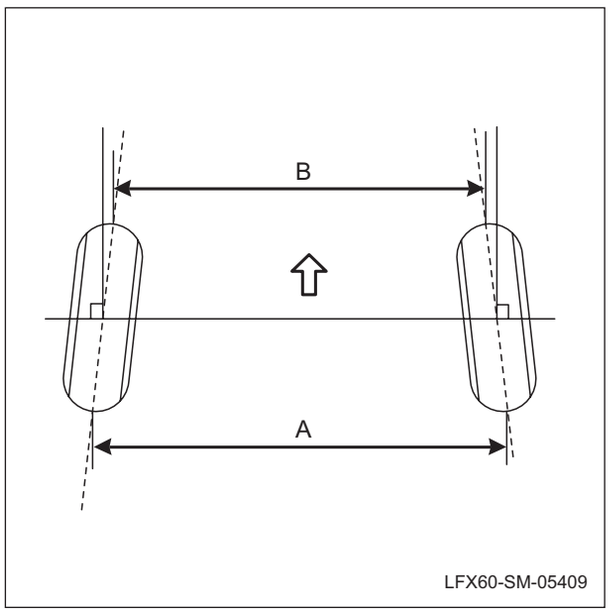
If the test results do not meet the requirement, check the suspension system.

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Adjustment of kingpin inclination angle

1. Adjustment of kingpin inclination angle.



(a). Loosen the fixing bolts of front steering knuckle and shock absorber.

(b). Adopt the four-wheel locating adjustment bolts to adjust the front-wheel caster angle and kingpin inclination angle to correct values.

(c). Tighten the fixing bolts.

Kingpin inclination angle:-11°2′ ± 30′ (no load)

△Tips:

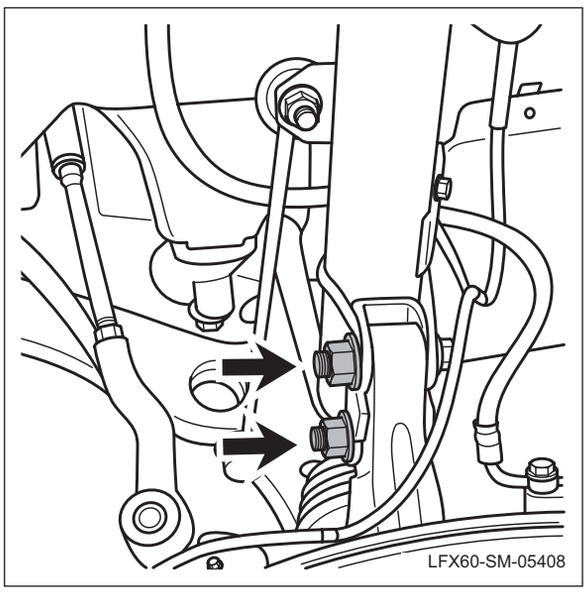
If the test results do not meet the requirement, check the suspension system.

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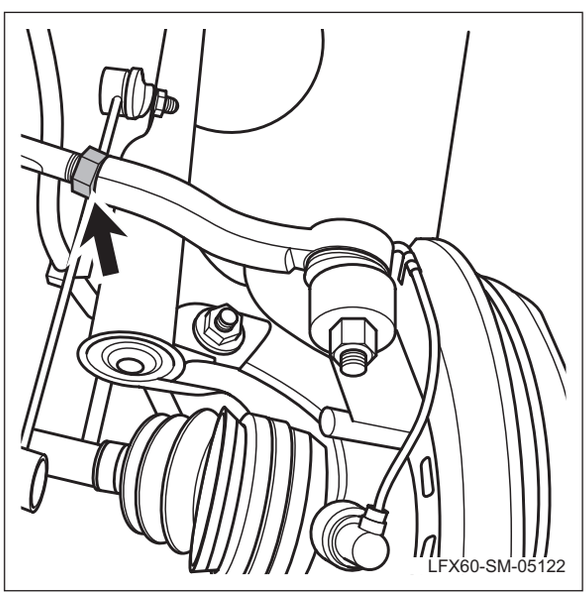
Test and adjustment of front wheel toe-in

1. Adjust the toe-in of front wheel.

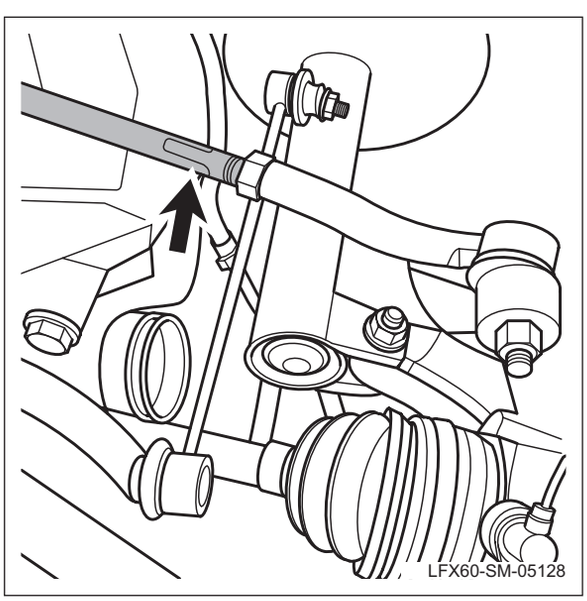


(a). Make the car in straight driving position.
(b). Adopt an instrument to test the toe-in of front wheel.

△**Tips:**
Check the toe-in, and adjust it if its toe-in is technically unqualified.
Front wheel toe-in: -0º16′±16′(total)



(c). Loosen the locking nut of steering tie rod.



(d). Turn the steering tie rod until the instrument displays correct toe-in.
(e). Tighten the locking nut of steering tie rod after adjusting it.

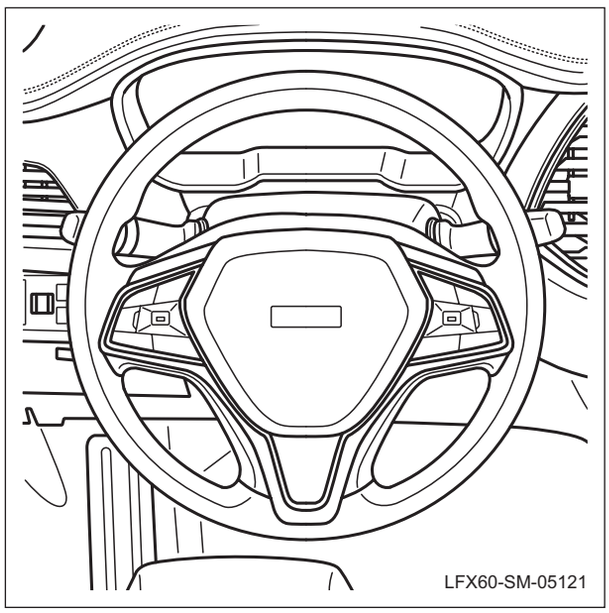
△**Tips:**
- **Adjust the wheel on the other side reversely at the same amplitude to get the correct toe-in value.**
- **Clamp the steering tie rod in case of tightening the locking nut of steering tie rod.**

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Test of front wheel maximum steering angle

1. Test the large steering angle of front wheel.



(a). Keep the vehicle placement status for the wheel alignment test.

(b). Depress the brake pedal, to brake the wheels.

(c). Turn the steering wheel to the left and right limit positions, to measure the maximum steering angle of the both front wheels.

△**Tips:**

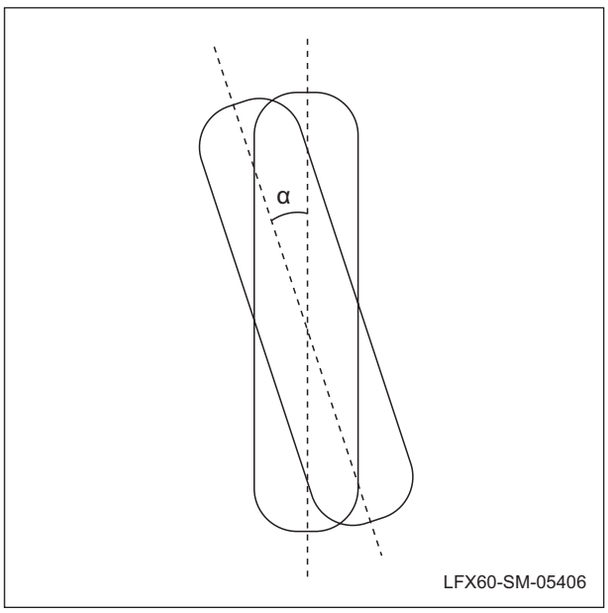
If the maximum steering angle to be measured does not meet the requirements, must check the suspension system parts for bending or damage.

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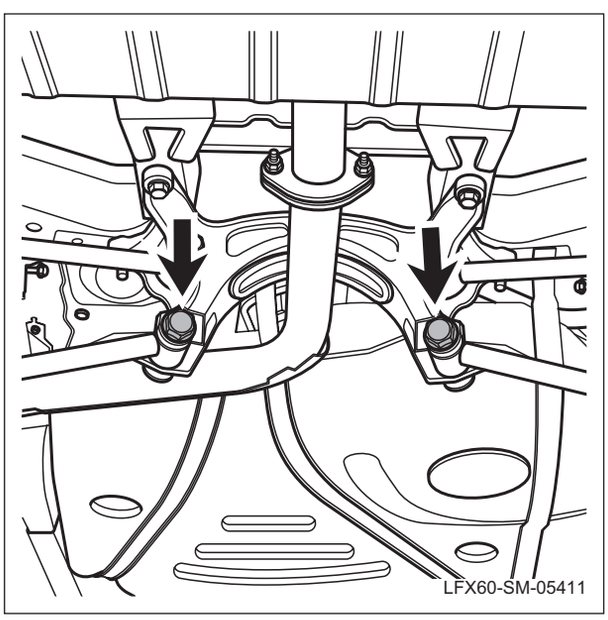
Test and adjustment of rear wheel camber angle

1. Test and adjustment of rear wheel camber angle.



(a). Rotate the steering wheel to make it in the horizontal position approximately.

(b). Read the front wheel camber from the instrument display.
Rear wheel camber angle: -0°42′ ± 30′



(c). Adjusting bolt of rear wheel camber angle

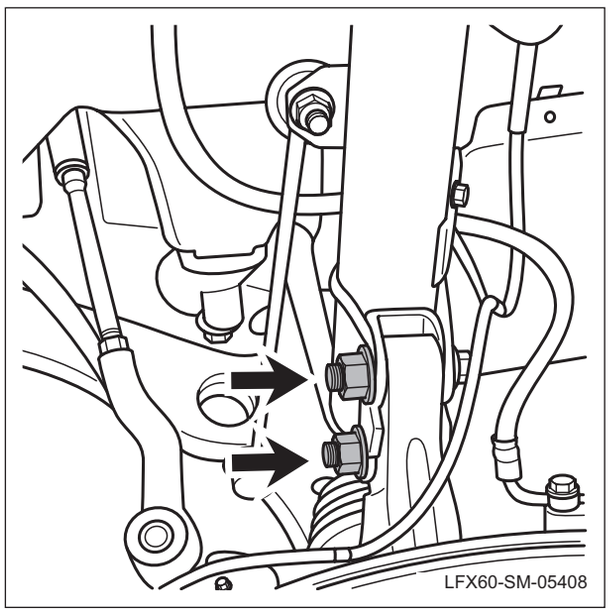
△**Tips:**
If its tested value is unqualified, the suspension system needs to be adjusted or tested.

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Check the rear wheel toe

1. Check the rear wheel toe.



(a). Rotate the steering wheel to make it in the horizontal position approximately.

(b). Read the front wheel camber from the instrument display.

Rear wheel toe: -0°6′ 43″± 16′

△Tips:

If the test results do not meet the requirement, check the suspension system.

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06-steering system

Hydraulic power steering system 6-1037
Technical Specifications.....6-1037
Precautions.....6-1038
Preparation 6-1039
Structure and installation location....6-1040
General Inspection.....6-1042
Operating Principle 6-1043
Diagnostic Information and Procedures..6-1044
Removal and Installation 6-1056

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Hydraulic power steering system

Technical Specifications

eneral Specifications

Name		Specification
The free stroke of the steering wheel		Less than 10
Temperature of steering fluid		-40 ˚C to 135 ˚C
Peak value of steering torque		5Nm
Pressure of steering fluid pump		8Mpa
Steering fluid	Specification	ATF220
	Filling capacity	1.6L

Torque Specifications

Name	Torque range	
	Metric (Nm)	British (Lb-ft)
Dust cover fixing bolt	10	7
Steering reservoir support mounting bolt	10	7
Steering return pipe fixing support bolt	10	7
Steering support fixing bolt	70	52
Steering pump mounting bolt	90	66
High pressure pipe and steering pump locking bolt	45	33
High pressure pipe and steering gear locking nut	45	33
Return pipe and steering gear locking nut	45	33

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Precautions

Precautions

Precautions before repair

1. When there an abnormal clearance, clicking, or swing, analyze immediately the fault causes and eliminate the fault.
2. When checking the steering system, park the vehicle on a level and dry surface.

Maintenance precautions

1. During the repair, replace the bearing upon finding out its seizure or loosening, etc.
2. During the repair, replace the locking bolt or nut in case of finding out at least three damaged threads.
3. Don't weld any part of hydraulic steering gear or system linkage lever in any mode.
4. After installing the steering gear, check its portability and flexibility. You can't feel heavy steering or loosening while turning the steering wheel, and measure the maximum steering angle of front wheel.
5. After repairing the steering system, refill the steering fluid into it and drain the air out of hydraulic system in time.
6. Each bolt of steering system must be fixed up to the specified torque.
7. After testing and repairing the hydraulic steering gear and other steering gears, check the locations of wheels.

Other attentions

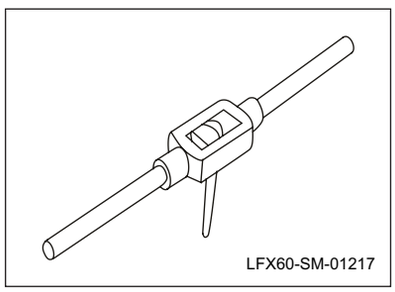
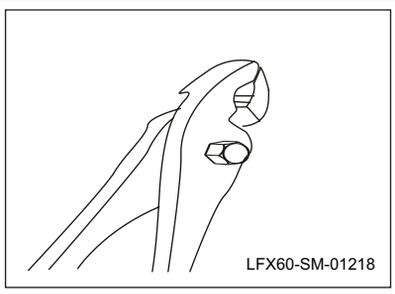
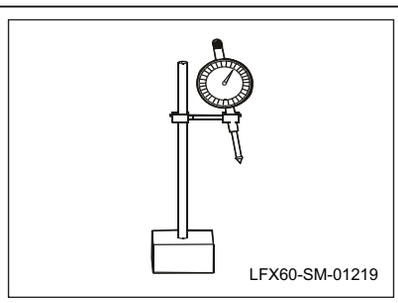
1. Check the hydraulic oil for reduction, deterioration or excessive impurities. Refill or change the hydraulic oil in time in case of finding out any adverse situation.
2. In case of adding the hydraulic oil, its brand should be the same as that of original hydraulic oil in power steering system. It will cause the damages and leakage of hose or sealing part to apply the incorrect hydraulic oil, so it's prohibited to mix them.
3. If any abnormal steering noise, heavy operation or seizure occurs while driving, stop the car for repair, find out and remove its faults.
4. Access to check the tires and keep their pressure qualified.
5. Check the steering system parts frequently for abnormal impact, and replace any damaged part or faulty part in time.
6. The duration of steering wheel in steering limit position shall not exceed 3s, otherwise the steering pump may be damaged.
7. If the steering wheel is locked, do not move the vehicle; otherwise it will damage the steering system parts.
8. Ensure no knocking or wears of pipes, free loosening or tightening of each pipe section and no dead bends during the use.

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Preparation

Speical service tool

No.	Tool name	Tool drawing	Tooling code	Remarks
1	Left-hand rotation screw tap	 LFX60-SM-01217	-	Remove the ignition switch special bolt
2	Lier	 LFX60-SM-01218	-	Remove the combination switch fastening clamp
3	Dial indicator	 LFX60-SM-01219	-	Measure the steering shaft clearance

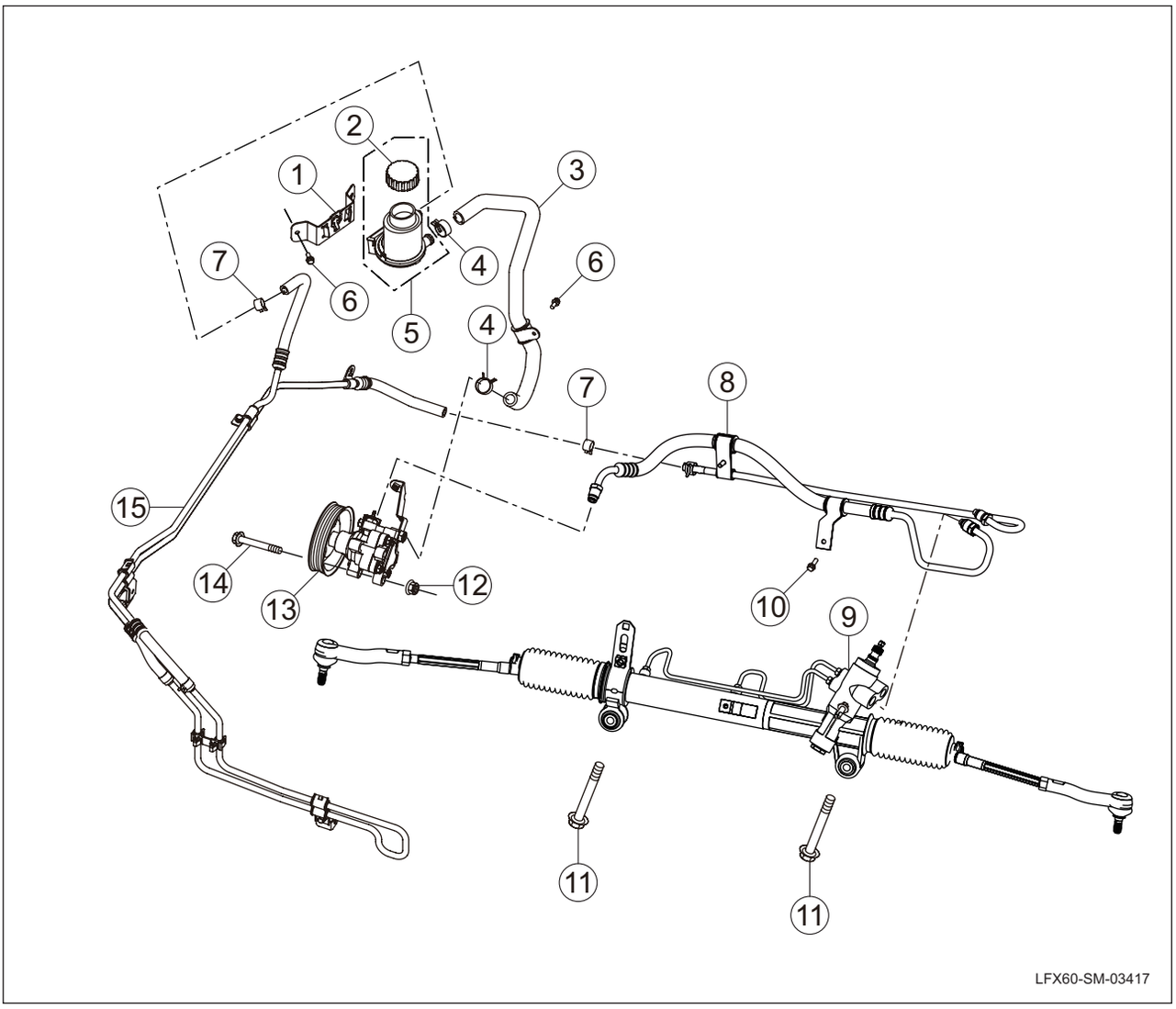
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Structure and installation location

Part exploded view

Steering gear



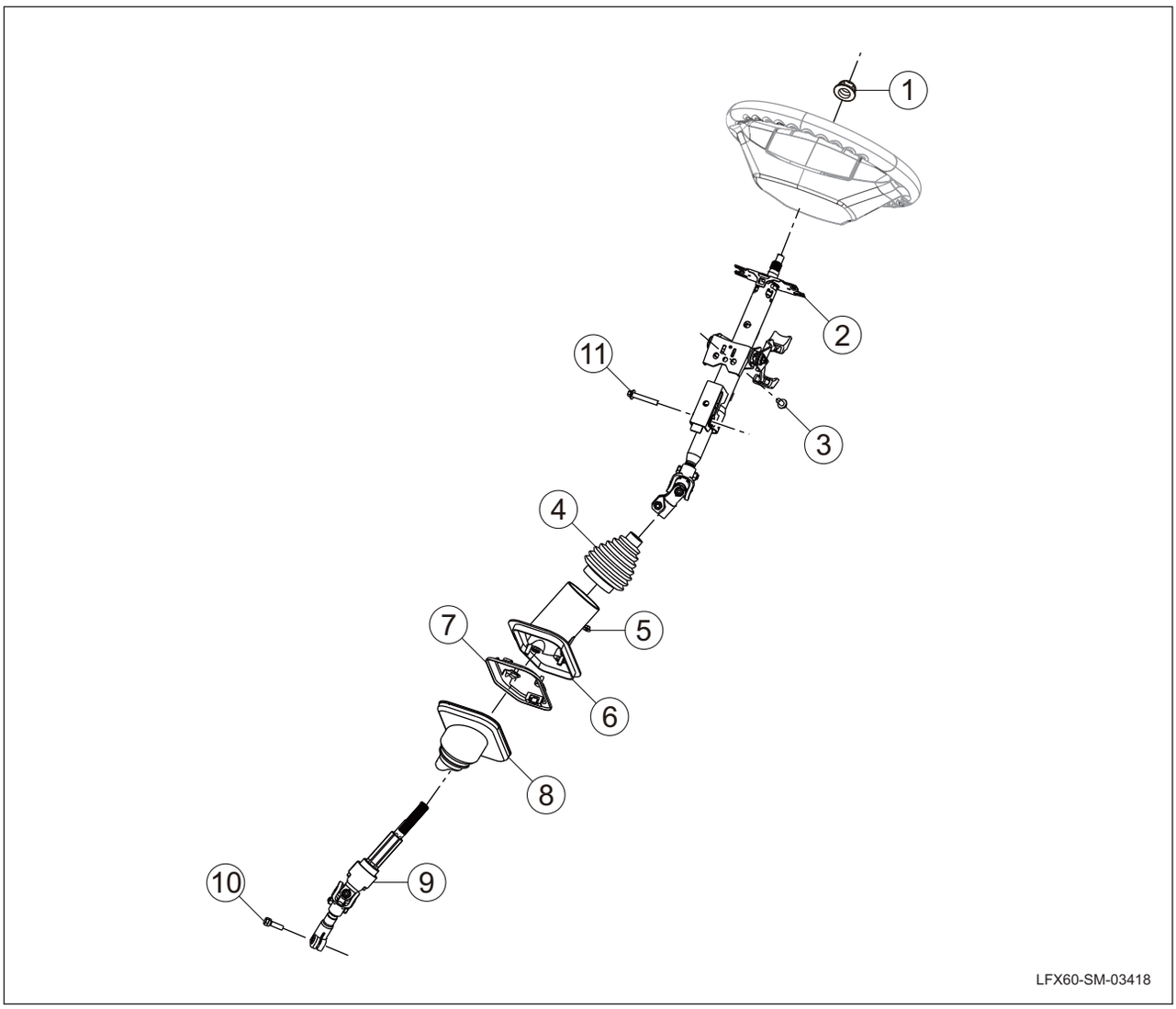
No.	Part name
1	Power steering reservoir support assembly
2	Steering reservoir cover assembly
3	Steering pump and oil outlet pipe
4	Hoop, worm drive hose, type A
5	Power steering reservoir assembly
6	Hexagon flange bolt
7	Steel strip elastic clamp
8	Return pipe II

No.	Part name
9	Steering gear assembly
10	Hexagon head bolt, spring washer and plain washer subassembly
11	Hexagon flange bolt
12	Hex flange nut
13	Power steering oil pump assembly
14	Hex flange nut
15	Steering gear inlet/outlet pipe assembly

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Steering column



No.	Part name
1	Hex flange nut
2	Upper steering shaft assembly
3	Hexagon flange bolt
4	Steering column dust coverIII
5	Hex flange nut

No.	Part name
6	Steering column dust coverII
7	Dust cover mounting support
8	Steering column dust coverII
9	Lower steering shaft assembly
10	Hexagon flange bolt

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General Inspection

General Inspection

Check of power steering pump

Check whether any of the following abnormal conditions occurs to the power steering pump belt:

- Check it for wrong teeth.
- Check it for cracks.
- Check it for excessive wears.
- Check the tension of belt, and replace the steering pump belt if necessary.

Note:

If its tension is unqualified, adjust or replace the belt or pump belt tension pulley as per the standards.

Check of steering wheel free clearance

Note:

Check the steering wheel in the case that the engine stops and the car is fixed forward on the ground.

Check the steering system for abnormal conditions below:

- Whether the ball end of steering tie rod is worn or loosened.
- Whether the cross joint of steering column drive shaft is worn or loosened.
- Internal wears of steering gear.
- Loosening of steering component fastener.

If the free clearance of steering wheel is not within the specified range, repair or replace the damaged parts.

Check of steering column drive shaft

Check the steering column drive shaft for abnormal conditions below:

- Loosening of steering column drive shaft fastener
- Excessive wears or clearance of cross joints on both drive ends
- The steering column drive shaft can't extend/retract freely or is seized.

If the steering column drive shaft is abnormal, repair or replace the damaged parts in time.

Check of steering gear

Check the steering gear for abnormal conditions below:

- Loosening of steering gear fastener
- Abnormal noises inside the steering gear
- Seizure of steering gear rotation
- Cracking of steering gear case
- Oil leakage of steering gear
- Wears or loosening of steering gear pitman head

If the steering gear is abnormal, repair or replace the damaged parts in time.

Check of steering tie rod ball joint

Check the steering tie rod ball joint for abnormal conditions below:

- Loosening or improper installation of tie rod ball joint fixing nut
- Damages of steering tie rod ball joint dust cover
- Wears or excessive clearance of steering tie rod ball head

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Operating Principle

System overview

The power steering system equipped for this car type is a mechanical hydraulic power steering system, which applies the power steering fluid as a power transmission medium, and makes the power steering pump produce the power to push the mechanical steering gear, thus its steering operation can be realized. The power steering pump of mechanical hydraulic power steering system is driven by car engine. After the car starts, this system will work regardless of steering. It will steer at the low speed of engine, and the power steering pump needs a higher power output to get more steering power. In case of turning the steering wheel to limit position, avoid any stay of over 5s in limit position, otherwise the power steering system will be damaged. In case of turning the steering wheel, the power steering fluid will open the valve on one end of bi-directional piston, and its pressure will provide the auxiliary power required to push the piston movement according to the turning direction of steering wheel.

Part description

Steering column

The steering column is equipped with a strictly tested multi-way steering wheel lock, which has a high-security lock cylinder. The steering column and its upper end are fixed on the periphery of instrument panel. The steering wheel is fixed on the steering column assembly via fixing nuts, and connected to the steering gear though its drive shaft. It transmits the force applied to the steering wheel by the driver to the steering gear. The driver can operate the control arm of steering column to adjust the height of steering wheel as per the driving habits, so as to improve its driving comfort.

Steering tie rod

The function of steering tie rod is to transmit the movement of steering gear to steering knuckle, thus its steering operation can be realized. The toe-in value of front wheel can be changed by adjusting the length of tie rod on left or right side.

Steering gear

The function of steering gear is to change the steering torque and steering angle of steering wheel properly (mainly including speed reduction and torque increase), and output them to the steering tie rod mechanism, thus the steering operation of car can be realized.

Power steering pump

The power steering pump is a mechanical hydraulic pump, and produces the power (via the attachment driving belt driven by the engine) for the steering system to push the steering gear, thus its power steering operation can be realized.

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Diagnostic Information and Procedures

Diagnosis Instructions

Before diagnosing the faults of hydraulic power steering system, first know and understand the operating principle of hydraulic power steering system,and then start the diagnosis of hydraulic power steering system, thus it can determine the correct fault diagnosis procedures and it's more important to determine whether the client's problem is within the range of normal operation if any fault occurs.

The diagnosis of any fault for hydraulic power steering system should start from the test of hydraulic power steering system, and tell the next logic step to repairmen for fault diagnosis. It can shorten the diagnostic time and avoid any wrong judgement of its parts to understand and correctly use the diagnostic flow chart.

Visual Inspection

1. Confirm the problem raised by the customer.
2. Check the evident mechanical faults.

Visual inspection table

Mechanical
• Boosting pump belt • Steering tie rod • Steering tie rod ball joint • Steering gear • Steering column • Steering knuckle • Steering pipe • Booster pump

3. Solve the problem finding before the next step inspection.
4. If the observed or raised problem is the evident and the cause has been found, ensure to fix this fault before proceeding with the next step.
5. If no problem is found through the visual check, confirm the fault and refer to the fault symptom list.

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List of fault symptoms

Symptom	Possible point of failure	Recommended Measures
Car runout	• Wheel and tire, tire pressure • Left or right wheel base • Front suspension component • Driving height • Steering system components • Incorrect wheel alignment	**Refer to:Diagnostic procedures for car runout**
Heavy steering	• Missing of steering fluid • Air mixed into steering fluid • Tensile force of steering pump belt • Blockage of steering pump pipe • Steering boosting pump • Steering column • Damages of steering gear	**Refer to:Diagnostic procedures for heavy steering**
High noises of steering system (standstill of steering wheel)	• Missing of steering fluid • Air mixed into steering fluid • Boosting pump belt • Interference of steering pipes • Steering boosting pump	**Refer to:Diagnostic procedures for high noises of steering system(standstill of steering wheel)**
Clicking in case of turning to left or right	• Front suspension component • Outside link ball head • Inside link ball head • Steering gear • Steering column	**Refer to:Diagnostic procedures for clicking in case of turning to left or right**
Shaking of steering wheel while braking	• Wheel and tire, tire pressure • Brake disc • Incorrect wheel alignment • Outside link ball head • Inside link ball head • Upper and lower arm ball joints • Lower arm and its ball joint • Steering gear	**Refer to:Diagnostic procedures for steering wheel shaking while braking**

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Diagnostic procedures for car runout

⚠Warning:
In order to avoid personal injury caused by control loss of car, its road test should be performed by both persons, so as to keep its driving safety. Be sure to maintain the proper control of steering wheel . It may lead to personal injury not to follow these instructions.

Test condition	Details/results/measures
1. Check the car for runout.	
	A. Drive the car on flat and straight road at 88 km/h, and ensures no side wind or high wind while driving. B. Drive the car back and forth at least twice. If the car is 3.6m deviated from its track within 7s, it indicates the runout of car. Does the car run out? →**Yes** To step 2. →**No** Adjust the steering wheel for alignment.
2. Check the wheel, tire and tire pressure.	
	A. Check the all the wheels and tire models to see if consistent. B. Check whether the wear degree of all tires is similar. C. Check the tires for bulge or cracking etc. D. Check the tire pressure. Is it OK after checking? →**Yes** To step 3. →**No** Adjust the tire pressure or replace the wheel and tire. **Refer to: Replacement of wheel**
3. Check the influences of tires on the fault.	
	A. Lift the vehicle. B. Change the front left or right wheel. **Refer to: Replacement of wheel** Does the car run out? →**Yes** To step 4. →**No** The fault has been removed.

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Test condition	Details/results/measures
4. Check left or right wheel base.	
	A. Check left or right wheel base. Are the left and right wheel bases the same? →**Yes** To step 5. →**No** Calibrate the left or right wheel base.
5. Check the front suspension components.	
	A. Check the front suspension fasteners for looseness. B. Whether the rubber bushing is aged or abraded. C. Whether the suspension components are damaged. Is it OK after checking? →**Yes** To step 6. →**No** Repair or replace the damaged components.
6. Check the driving height.	
	A. Check the uniformity of car driving height. **Refer to: Diagnosis flow for different height of bodywork side to side** Is it OK after checking? →**Yes** To step 7. →**No** Remove the inconformity of driving height.
7. Check the steering system components.	
	A. Check the steering system fasteners for looseness. B. Check the steering tie rod for deformation. C. Check the steering components for wears or loosening. Is it OK after checking? →**Yes** To step 8. →**No** Repair or replace the damaged components.
8. Wheel alignment.	
	A. Carry out the wheel alignment. B. Carry out trial run. Confirm that the fault has been ruled out.

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Diagnostic procedures for heavy steering

Test condition	Details/results/measures
1. Check the boosting fluid.	
	A. Check whether the level of steering fluid is normal. B. Check whether the boosting fluid meets the standard requirements. Is it OK after checking? →**Yes** To step 2. →**No** Refill or change the standard steering fluid.
2. Check whether the steering fluid is mixed into air.	
	A. Start the engine, and observe the fluid for air bubbles. Is it OK after checking? →**Yes** To step 3. →**No** Boosting system bleed. **Refer to : Power steering system bleed procedures**
3. Check the boosting pump belt.	
	A. Check whether the boosting pump belt installation is correct. B. Check the boosting pump belt for abrasion and fracture. C. Check the boosting pump belt tension. Is it OK after checking? →**Yes** To step 4. →**No** Replace the power steering pump belt or adjust the tension of its belt.
4. Check the fluid pipe of power steering pump.	
	A. Check the power steering pump fluid pipe for blockage. B. Check the power steering pump return pipe for blockage. C. Check the boosting pump belt tension. Is it OK after checking? →**Yes** To step 5. →**No** Repair or replace the fluid line of power steering pump.

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Test condition	Details/results/measures
5. Check the steering boosting pump.	
	A. Check the power steering pump for wears or abnormal noises. B. Check the pressure of power steering pump. **Refer to:Check of fuel pump pressure** Is it OK after checking? →**Yes** To step 6. →**No** Replace the power steering pump. **Refer to: Replacement of the power steering pump**
6. Check the steering column.	
	A. Check whether the floor covering can impair the steering column. B. Check the rotation of steering column for abnormal noises. Is it OK after checking? →**Yes** To step 7. →**No** Repair the fault parts or replace the steering column. **Refer to: Replacement of the steering column**
7. Check the steering gear.	
	A. Check the steering gear for fluid leakage. B. Check the steering gear for abnormal noises or damages. Is it OK after checking? →**Yes** To step 8. →**No** Replace the steering gear. **Refer to: Replacement of the steering gear**

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Diagnostic procedures for high noises of steering system(standstill of steering wheel)

Test condition	Details/results/measures
1. Check the boosting fluid.	
	A. Check the steering fluid for missing. B. Check whether the boosting fluid meets the standard requirements. Is it OK after checking? →**Yes** To step 2. →**No** Refill or change the power steering fluid.
2. Check whether the steering fluid is mixed into air.	
	A. Start the engine, and check the steering fluid for air bubbles. Is it OK after checking? →**Yes** To step 3. →**No** Boosting system bleed. **Refer to: Power steering system bleed procedures**
3. Check the boosting pump belt.	
	A. Check whether the boosting pump belt installation is correct. B. Check the boosting pump belt for abrasion and fracture. C. Check the boosting pump belt tension. Is it OK after checking? →**Yes** To step 4. →**No** Replace the belt or adjust the tension of power steering pump belt.
4. Check the tension pulley.	
	A. Check the tension pulley tightening bolt for loosening. B. Check the tension pulley for abnormal noises. C. Check the tension of tension pulley. Is wheel inspection normal? →**Yes** To step 5. →**No** Repair replacement of damaged components

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Test condition	Details/results/measures
5. Check the steering pipeline.	
	A. Check the steering pipeline fastener for loosening. B. Check the steering pipeline for interference. Is it OK after checking? →**Yes** To step 6. →**No** Repair or replace the damaged components.
6. Check the steering boosting pump.	
	A. Check the fasteners of power steering pump for loosening. B. Check the power steering pump for abnormal noises. Is it OK after checking? →**Yes** To step 7. →**No** Repair or replace the damaged components.
7. Check the other noise.	
	A. Check the other noise. Determine the fault for removal.

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Diagnostic procedures for clicking in case of turning to left or right

Test condition	Details/results/measures
1. Check the front suspension components.	
	A. Check the front suspension fasteners for looseness. B. Whether the rubber bushing is aged or abraded. C. Whether the suspension components are damaged. Is it OK after checking? →**Yes** To step 2. →**No** Repair or replace the damaged components.
2. Check the outside link ball head.	
	A. Check the outside link ball head fixing nut for looseness. B. Check the outside link ball head for abrasion and looseness. C. Check the front vibration absorber plane bearing for abnormal noise. Is it OK after checking? →**Yes** To step 3. →**No** Tighten the outside link ball head fixing nut or replacement of outside link ball head. **Refer to: Replacement of outside link ball head**
3. Check the inside link ball head.	
	A. Check the inside link ball head fixing nut for looseness. B. Check the inside link ball head for abrasion and looseness. Is wheel inspection normal? →**Yes** To step 4. →**No** Tighten the fixing nut of inner tie rod ball joint or replace it. **Refer to:Replacement of steering inner tie rod ball joint**
4. Check the steering gear.	
	A. Check the steering gear fastener for loosening. B. Check the plumbing arm ball joint of steering gear for wears or loosening. C. Check the fixing nut of steering gear plumbing arm ball joint for loosening, and check its ball joint for wears or loosening. D. Check the rotation of steering gear for abnormal noises. Is it OK after checking? →**Yes** To step 5. →**No** Repair replacement of damaged components

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Test condition	Details/results/measures
5. Check the steering column.	
	A. Check whether the floor covering can impair the steering column. B. Check the steering column fastener for loosening. C. Check the rotation of steering column for abnormal noises. Is it OK after checking? →**Yes** To step 6. →**No** Repair the fault parts or replace the steering column. **Refer to: Replacement of steering column**
6. Check the other noise.	
	A. Check the other noise. B. Carry out trial run. Confirm that the fault has been ruled out.

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Diagnostic procedures for steering wheel shaking while braking

Test condition	Details/results/measures
1. Check the wheel, tire and tire pressure.	
	A. Check the all the wheels and tire models to see if consistent. B. Check whether the wear degree of all tires is similar. C. Check the tires for bulge or cracking etc. D. Check the tire pressure. Is it OK after checking? →**Yes** To step 2. →**No** Adjust the tire pressure or replace the wheel and tire. **Refer to: Replacement of wheel**
2. Check the brake disc.	
	A. Check the brake disc for excessive wears, deformation or uneven surface. B. Check the brake plate. Is it OK after checking? →**Yes** To step 3. →**No** Replace the brake disc or brake plate. **Refer to: Replacement of brake disc**
3. Check the wheel alignment.	
	A. Check whether the location of wheel is standard. Is it OK after checking? →**Yes** To step 4. →**No** Locate the wheel.
4. Check the outside link ball head.	
	A. Check the outside link ball head fixing nut for looseness. B. Check the outside link ball head for abrasion and looseness. Is it OK after checking? →**Yes** To step 5. →**No** Tighten the outside link ball head fixing nut or replacement of outside link ball head. **Refer to "Replacement of Steering Outer Tie Road Ball Joint".**

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Test condition	Details/results/measures
5. Check the inside link ball head.	
	A. Check the inside link ball head fixing nut for looseness. B. Check the inside link ball head for abrasion and looseness. Is it OK after checking? →**Yes** To step 6. →**No** Repair or replace the damaged components.
6. Swing arm and swing arm ball joint.	
	A. Check the fasteners of swing arm and swing arm ball joint for loosening. B. Check the swing arm rubber bushing and swing arm ball joint for wears or loosening. Is it OK after checking? →**Yes** To step 7. →**No** Repair or replace the damaged components.
7. Check the steering gear.	
	A. Replace the steering gear. B. Carry out trial run. Confirm that the fault has been ruled out.

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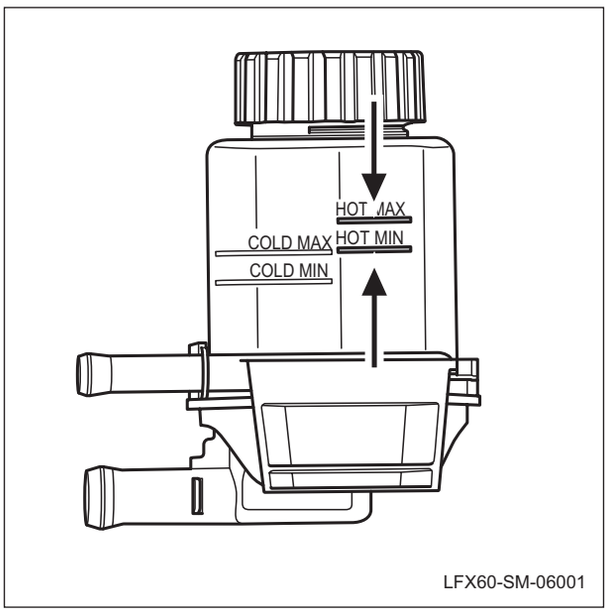
AutoLibrary

Removal and Installation

Exhausting procedures of steering system

Exhaust

1. Exhausting of steering system



(a). When the engine stops, turn the steering wheel from one to another locked position, and repeat it several times.

(b). Start the engine, and make it running at idling speed. Check the fluid, and ensure that its level is above the minimum scale.

(c). Turn the steering wheel back and forth, but it shouldn't be turned to its locked position on any side.

(d). Turn the steering wheel to left or right, until no air bubbles or milky fluid exists in the fluid reservoir. Exhaust the air out of system, and ensure that the fluid level is above the minimum scale.

(e). Check whether the fluid level is changed within the standard range in case of stopping or running the engine.

(f). For any vehicle for road test, ensure the normal function and no abnormal noises of its steering system.

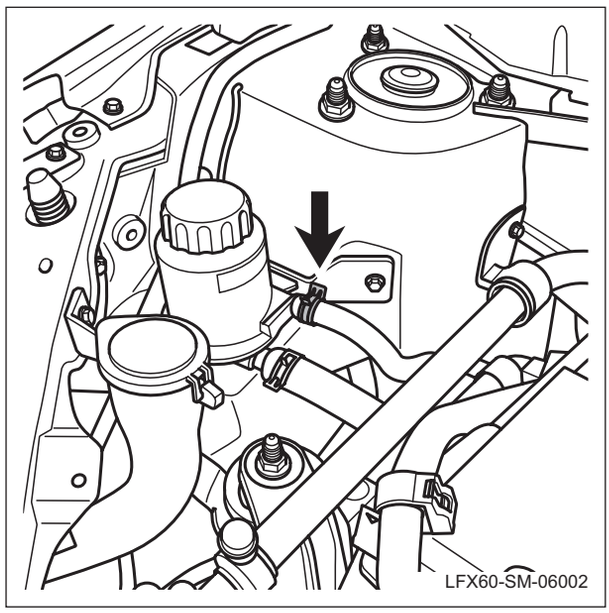
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Procedure for Discharging and Filling in Steering Oil

Discharge

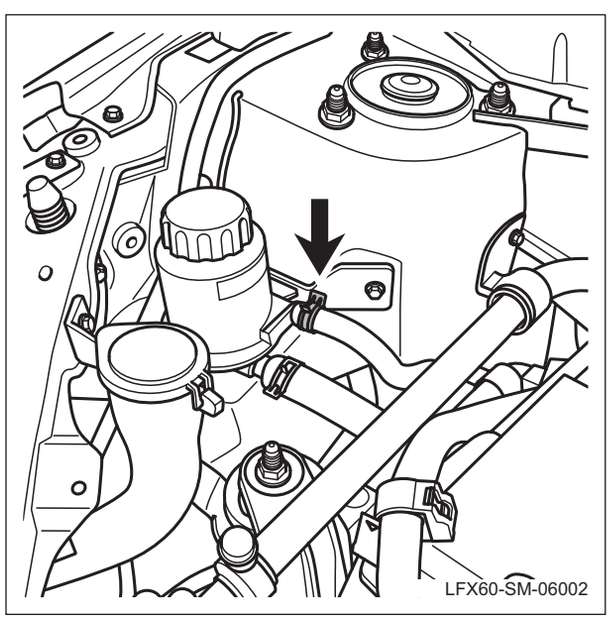
1. Discharge steering oil.



(a). Dismount the bar clasp of return tube and disconnect the tube.
(b). Connect the vessel tube to the return tube to discharge the steering oil into the vessel.
(c). Start the engine idling and rotate the steering wheel back and forth. But do not rotate it to the locking position at any side. Discharge the steering oil completely.

Filling

1. Fill in the steering oil.



(a). Install the return tube, fix the tube bar clasp and fill in the steering oil to the highest scale.
(b). Steering system exhaust. **Reference: Procedure for Steering System Exhaust.**

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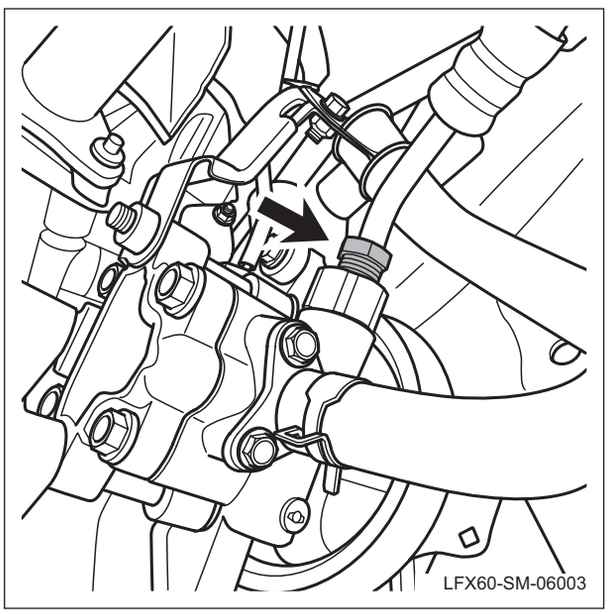
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Replacement of Booster Pump Flowline

Removal

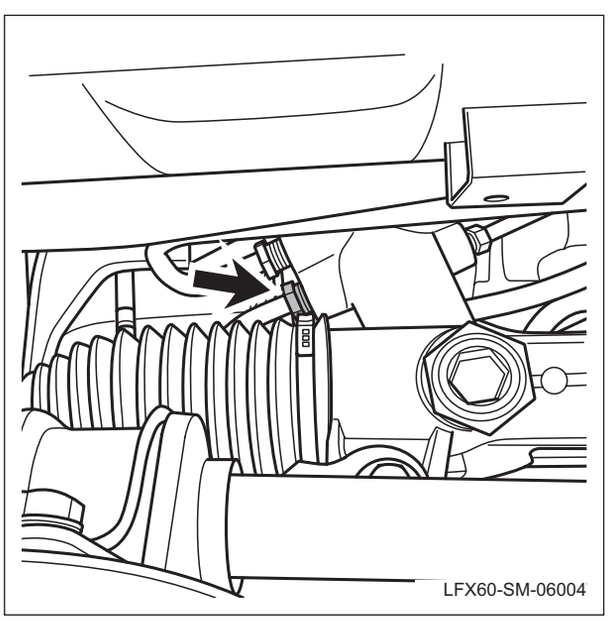
1. Dismount the booster pump flowline.

(a). Drain the steering boosting fluid, **refer to steering boosting fluid draining and filling procedures.**



(b). Lift the vehicle. **Refer to the vehicle lift and support.**

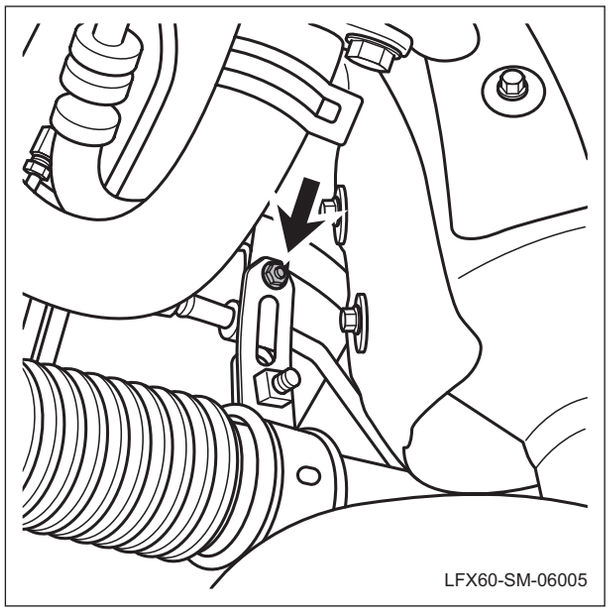
(c). Dismount the locknuts of booster pump flowline and booster pump.



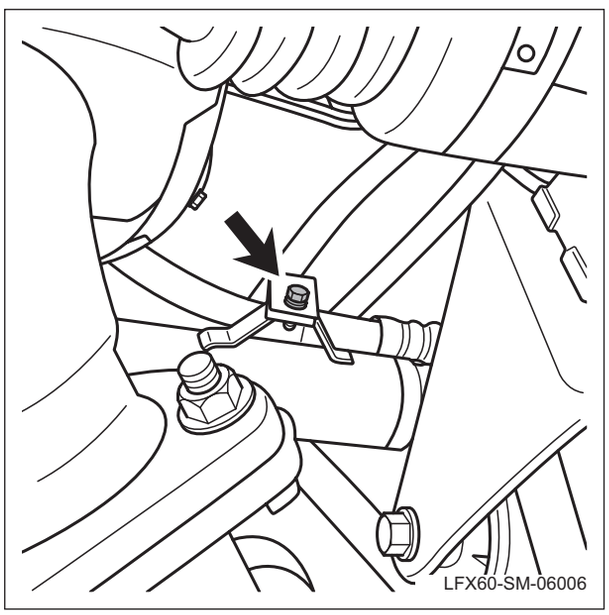
(d). Dismount the locknuts of flowline and steering device.

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(e). Dismount the bolt of fixing stand of booster pump.



(f). Dismount the bolt of fixing stand of booster pump flowline.
(g). Detach the assembly of booster pump flowline.

Installation

1. Install the booster pump flowline.
(a). The installation sequence is the reverse of the disassembly order.
(b). Fill the steering boosting fluid, **refer to steering boosting fluid draining and filling procedures.**

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Replacement of Return Tube

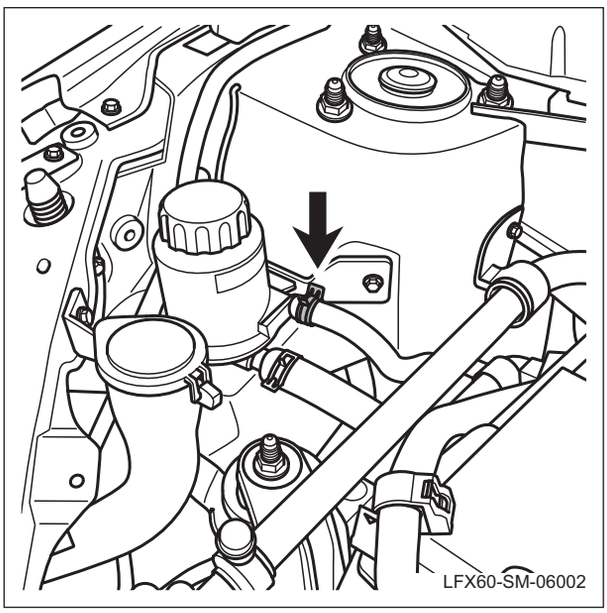
Removal

1. Remove the return tube.

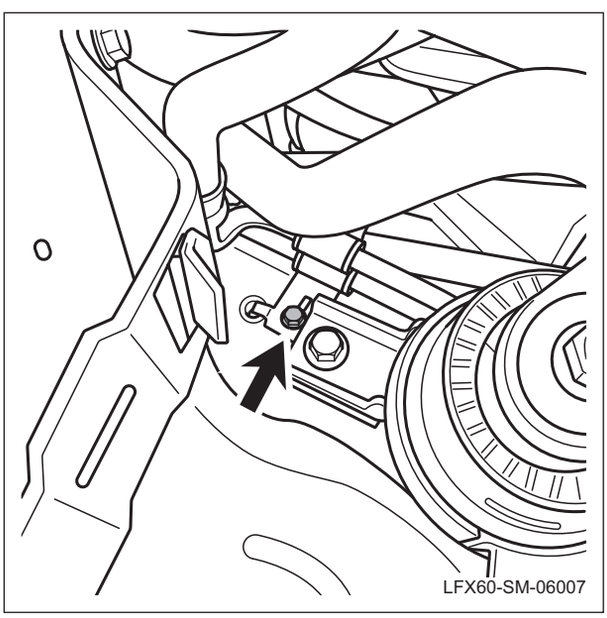
(a). Drain the steering boosting fluid, **refer to steering boosting fluid draining and filling procedures.**

(b). Remove the front bumper assembly. **Refer to the replacement of front bumper assembly.**

(c). Remove the front combination lamp. **Refer to the replacement of front combination lamp.**



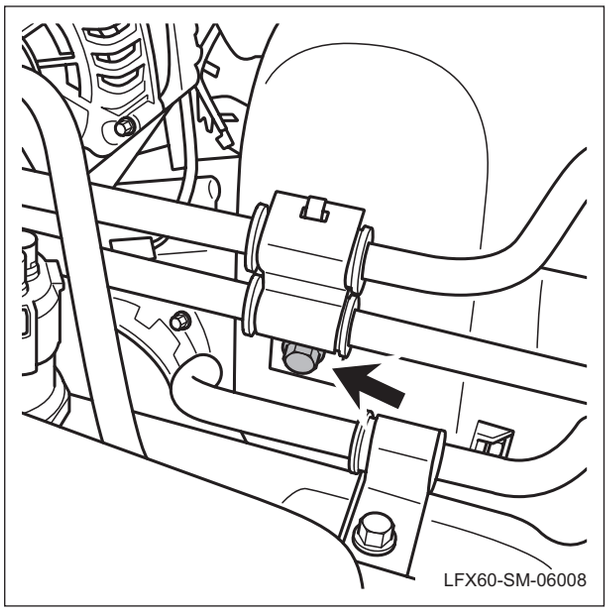
(d). Dismount the bar clasp of return tube and disconnect the tube.



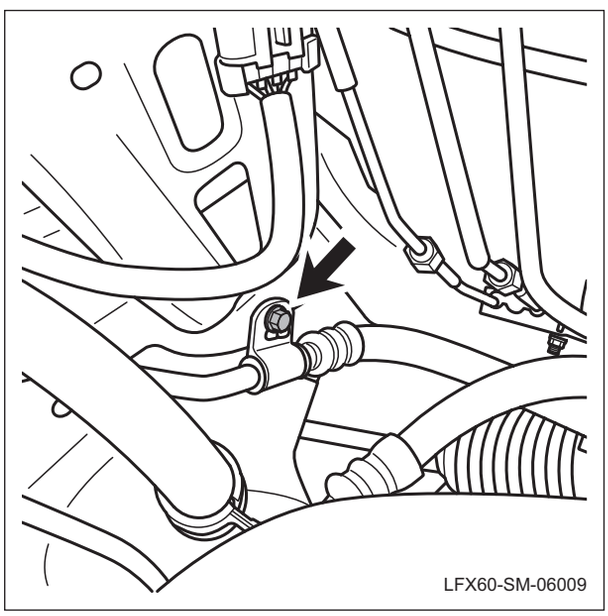
(e). Dismount the tap bolt of return tube.

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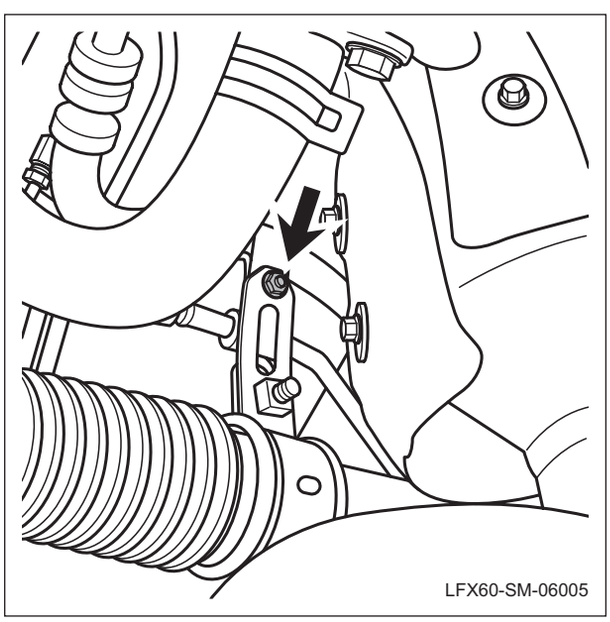
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(f). Dismount the tap bolt of return tube.



(g). Dismount the tap bolt of return tube.

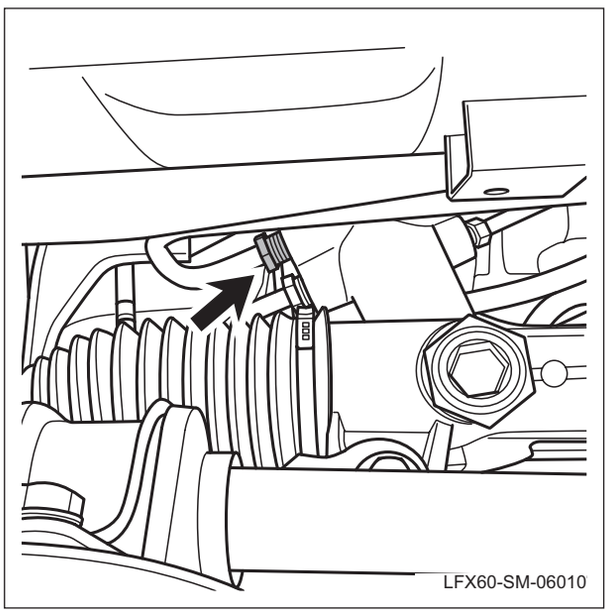


(h). Lift the vehicle. **Reference:Vehicle Lifting and Supporting**

(i). Dismount the tap bolt of return tube.

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(j). Dismount the locknut of return tube.
(k). Detach the return tube.

Installation

1. Install the return tube.

(a). The installation sequence is the reverse of the disassembly order.
(b). Install front combination light. **Refer to replacement of Front Combination Light**
(c). Install the assembly of front bumper. **Refer to replacement of Front Bumper**
(d). Filling in the steering oil. **Reference: Procedure for Discharging and Filling in Steering Oil.**

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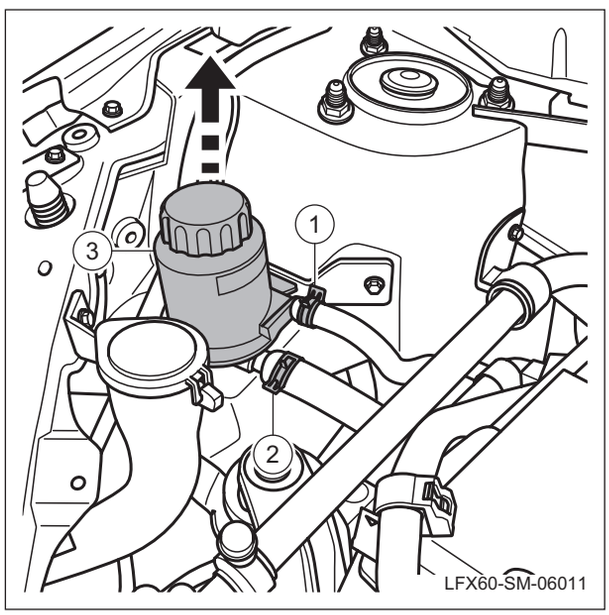
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Replacement of Steering Oiler

Removal

1. Dimount the steering oiler.

(a). Drain the steering boosting fluid, **refer to steering boosting fluid draining and filling procedures.**



(b). Dismount the bar clasp of return tube and disconnect the return tube 1.

(c). Dismount the bar clasp of flowline and disconnect the flowline 2.

(d). Detach the steering oiler 3.

Installation

1. Install the steering oiler.

(a) The installation sequence is the reverse of the disassembly order.

(b). Fill the steering boosting fluid, **refer to steering boosting fluid draining and filling procedures.**

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Replacement of Steering Booster Pump

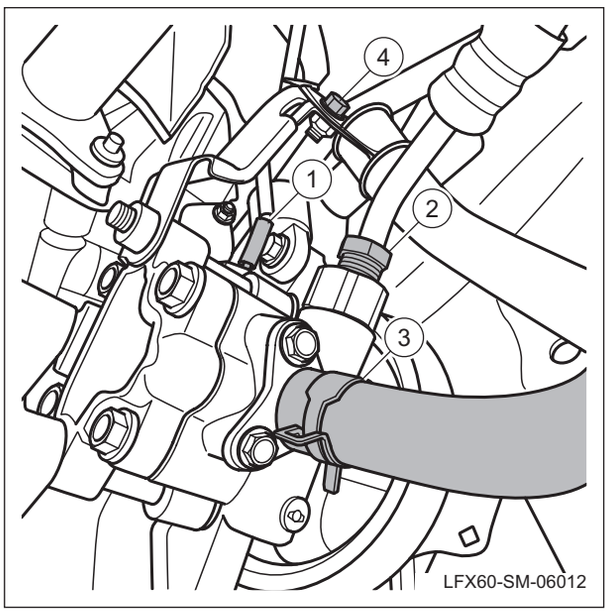
Removal

1. Dismount the steering booster pump.

(a). Drain the steering boosting fluid, **refer to steering boosting fluid draining and filling procedures.**

(b). Remove the accessory belt. **Refer to replacement of accessory belt.**

(c). Disconnect the battery negative terminal.

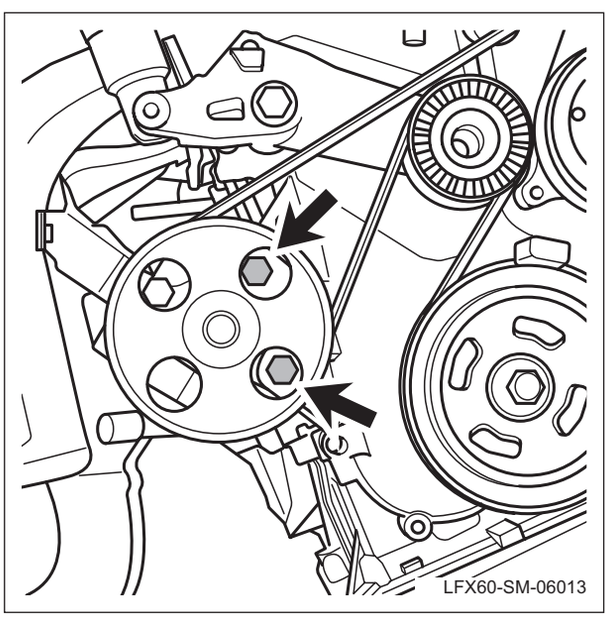


(d). Diconnect the harness plug 1 of steering booster pump.

(e). Dismount the locknuts of booster pump flowline and booster pump.

(f). Dismount the bar clasp and disconnect the sucker 3 of steering booster pump.

(g). Dismount the tap bolt 4 of sucker stand of steering booster pump.



(h). Dismount the tap bolt of steering booster pump and detach the pump.

Installation

1. Install the steering booster pump.

(a). The installation sequence is the reverse of the disassembly order.

(b). Install the accessories belt. **Refer to: Accessories belt replacement.**

(c). Fill in the steering booster oil. **Reference: Procedure for Discharging and Filling in Steering Booster Oil.**

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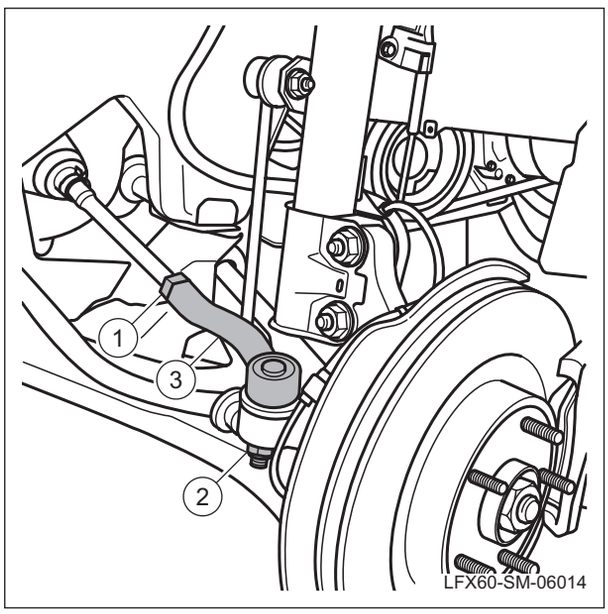
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Replacement of Steering Outer Tie Road Ball Joint

Removal

1. Dismount the bulb of steering pull rod.

(a). Dismount the front wheeel.**Refer to replacement of Wheel.**



(b). Undo the grip nut 1 of steering pull rod bulb.

(c). Dismount the grip nut 2 of steering pull rod bulb.

(d). Dismount the bulb 3 of steering pull rod.

Installation

1. The installation sequence is reverse to the removal sequence.

(a). Install the front wheel. **Refer to replacement of Wheel.**

(b). Adjust the toe-in. **Reference: Adjustment of toe-in**

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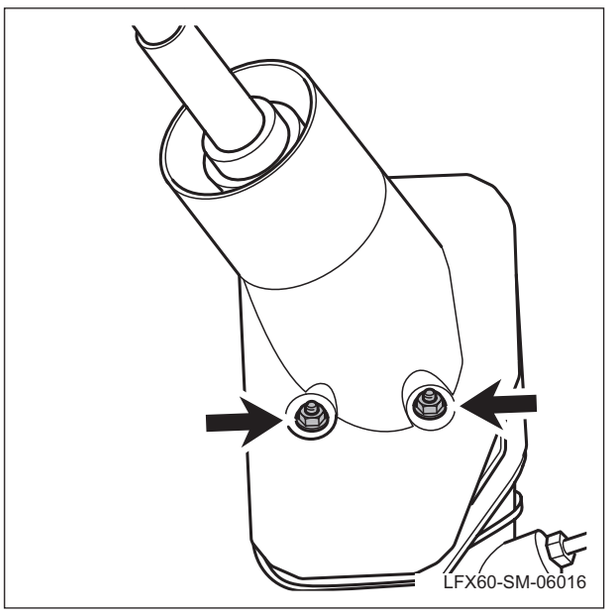
Replacement of Steering Device

Removal

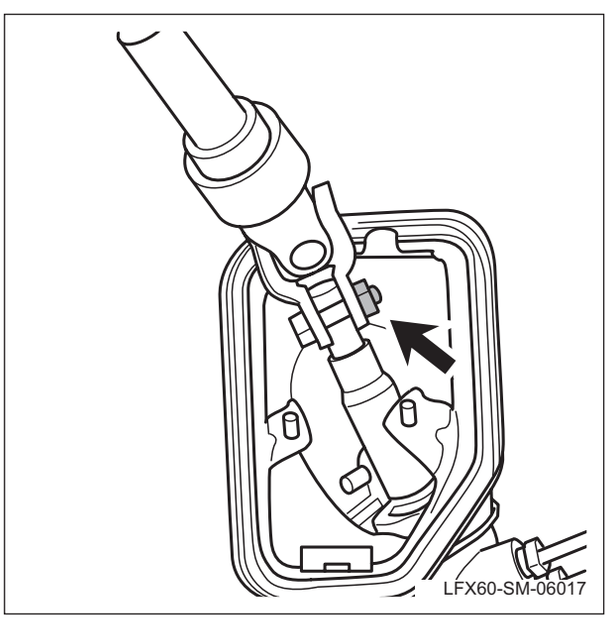
1. Dismount the steering device.

(a). Drain the steering boosting fluid, **refer to steering boosting fluid draining and filling procedures.**

(b). Dismount the assembly of front sub-frame.**Reference: replacement of Front Sub-frame Assembly**



(c). Dimount the tap bolt of steering device dirt-proof boot.



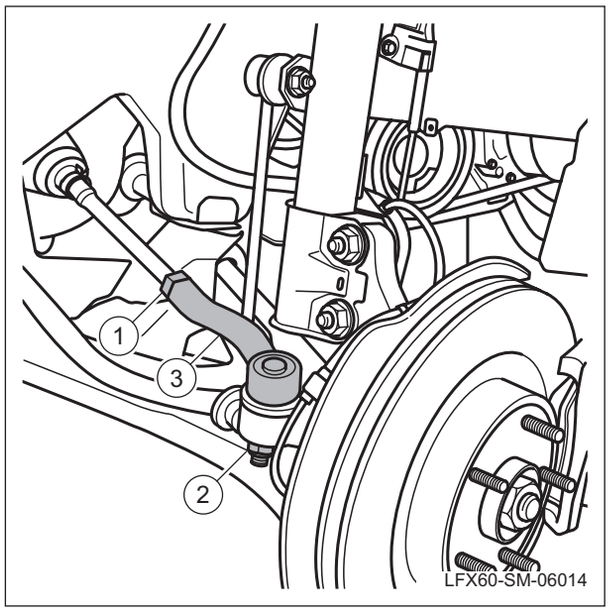
(d). Dismount the nut connecting the steering device and transmission shaft of steering column.

ℹNote:

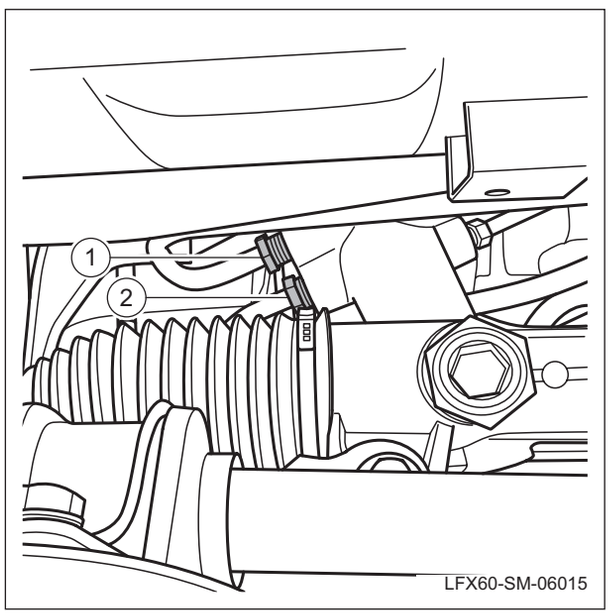
Adjust the steering wheel to the horizontal position and fix it to prevent rotating.

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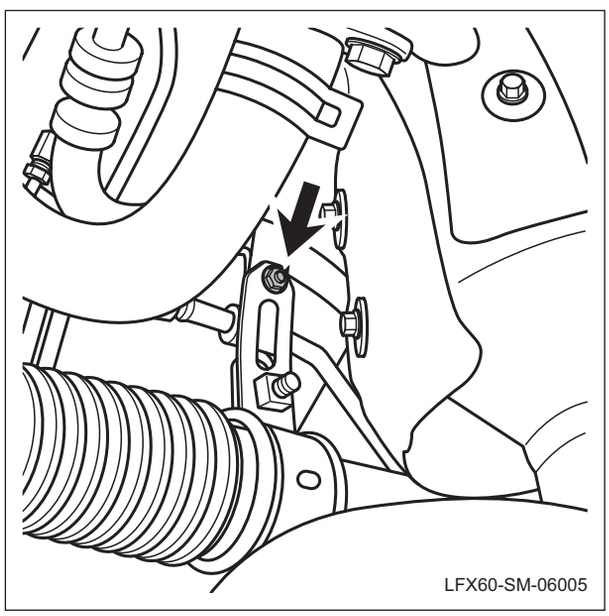
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(e). Undo the grip nut 1 of steering pull rod bulb.
(f). Dismount the grip nut 2 of steering pull rod bulb.
(g). Dismount the bulb 3 of steering pull rod.



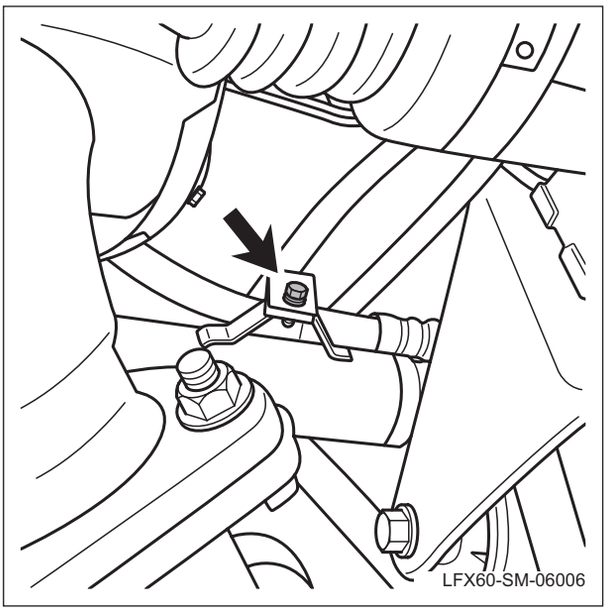
(h). Dismount the locknut 1 of steering device sucker.
(i). Dismount the locknut 2 of steering device flowline.



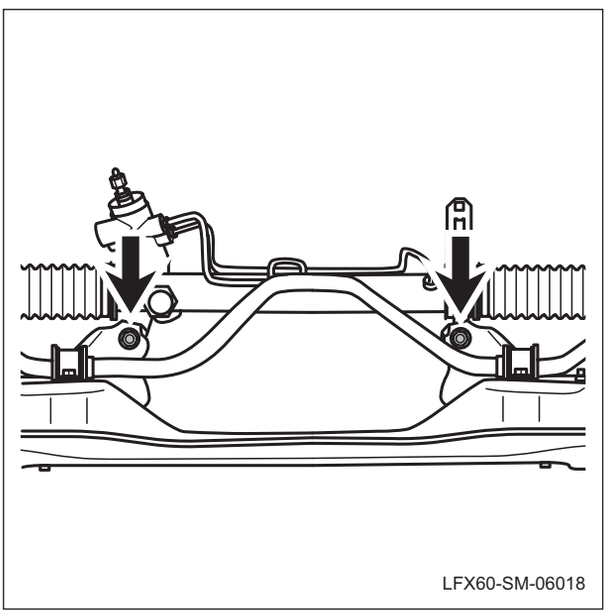
(j). Dismount the tap bolt of return tube.

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(k). Dismount the fixing stand bolt of booster pump flowline.



(l). Dismount the tap bolt of steering device.
(m). Detach the steering device.

Installation

1. The installation sequence is reverse to the removal sequence.
(a). Install the assembly of front sub-frame, **refer to the replacement of Front Sub-frame Assembly.**
(b). Fill the steering boosting fluid, **refer to steering boosting fluid draining and filling procedures.**

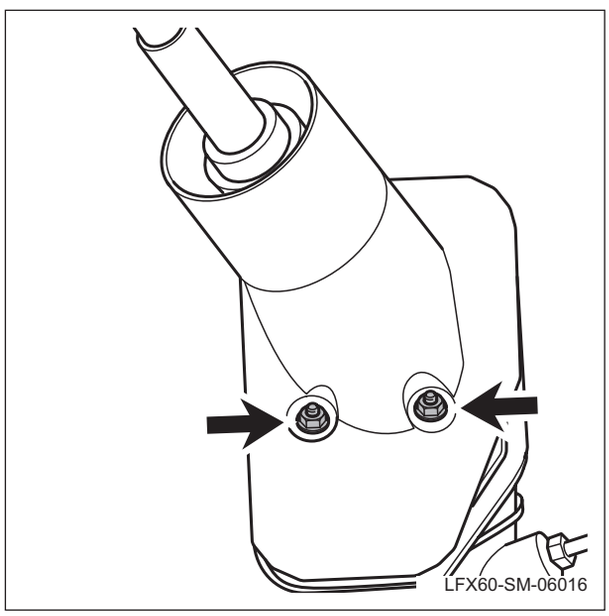
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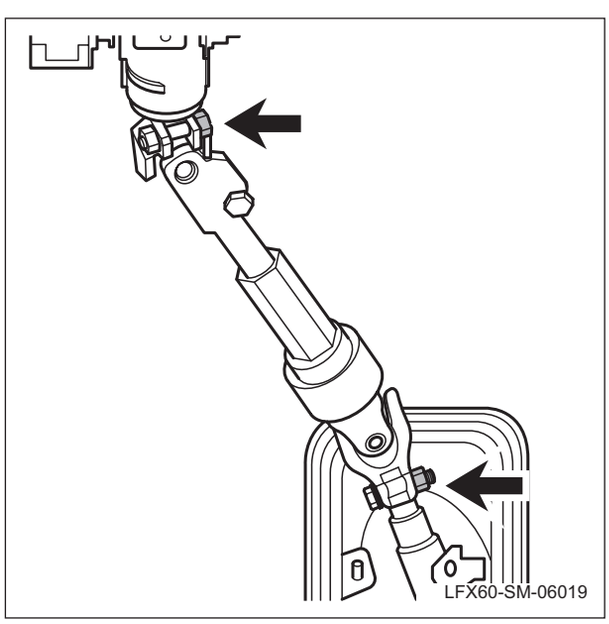
Replacement of Steering Column Transmission Shaft Assembly

Removal

1. Dismount the assembly of steering column transmission shaft.



(a). Dismount the tap bolt of steering device dirt-proof boot.



(b). Dismount the tap bolt of steering column transmission shaft.

ℹNote:

Adjust the steering wheel to the horizontal position and fix it to prevent rotating.

(c). Detach the transmission shaft of steering column

Installation

1. Install the assembly of steering column transmission shaft.

(a). The installation sequence is the reverse of the disassembly order.

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Replacement of Steering Column Assembly

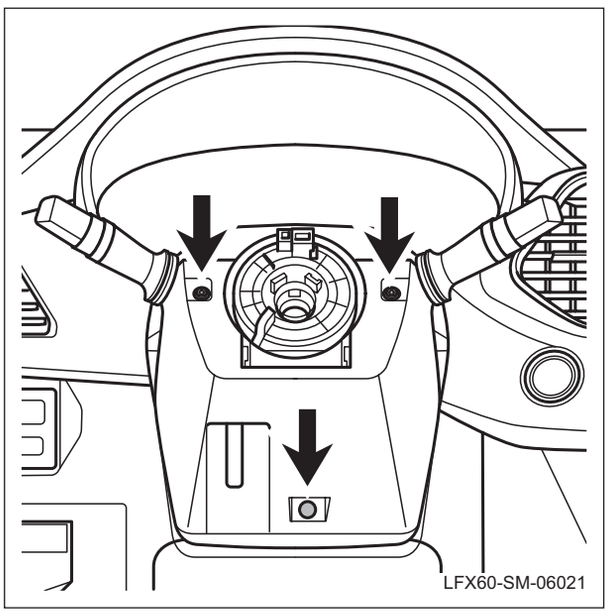
Removal

1. Remove the steering column assembly.

(a). Disconnect the battery negative connector.

(b). Dismount the multi-functional steering wheel. **Reference: replacement of Multi-functional Steering Wheel.**

(c). Dismount the Left lower guard plate of dashboard. **Refer to replacement of Dashboard Assembly.**

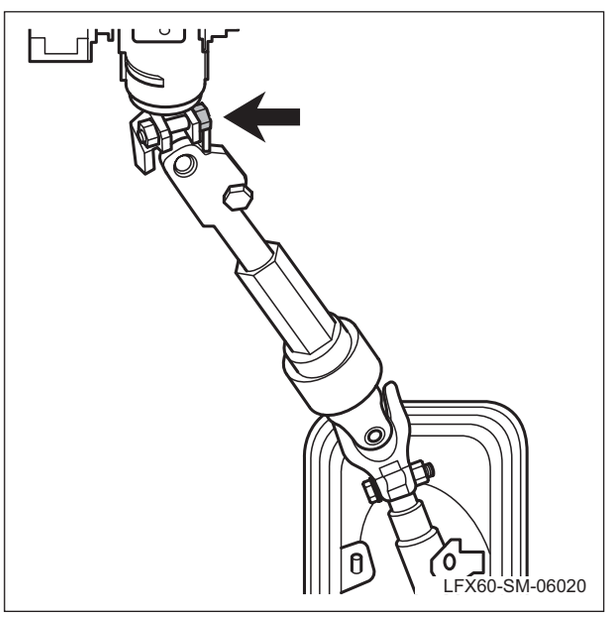


(d). Remove the multi-function steering wheel upper and lower shield fixing bolt.

(e). Take down the multi-function steering wheel upper and lower shield.

(f). Remove the clock spring. **Refer to the replacement of clock spring.**

(g). Dismount the combination switch.**Refer to replacement of Combination Switch**

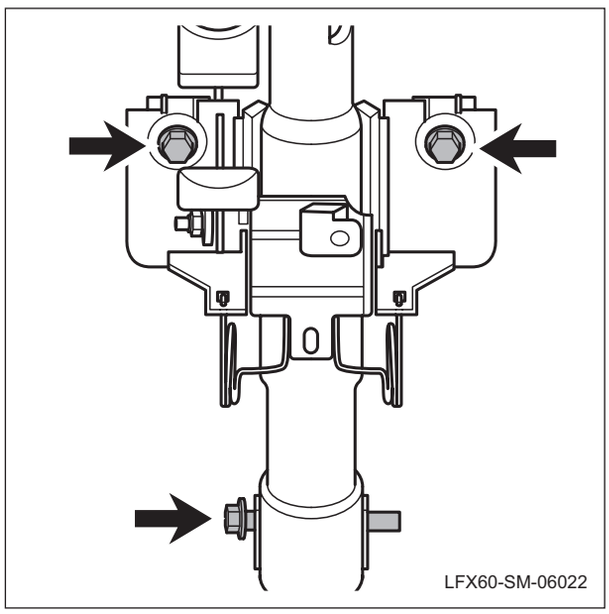


(h). Dismount the bolt connecting the steering column and steering column transmission shaft.

(i). Disconnect the harness plug of steering column and detach the harness fastener of steering column.

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(j). Dismount the tap bolt of steering column.
(k). Detach the steering column assembly.

Installation

1. The installation sequence is reverse to the removal sequence.

(a). Install the combination switch.**Refer to replacement of Combination Switch**
(b). Install the clock spring. **Replacement of Clock Spring.**
(c). Install the multi-functional steering wheel. **Reference: replacement of Multi-functional Steering Wheel.**
(d). Install the left lower guard plate of dashboard. **Replacement of Left Lower Guard Plate of Dashboard**

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07 - Brake system

Service brake system.....7-1075
Technical specifications 7-1075
Precautions.....7-1076
Preparation 7-1077
Structure and installation location....7-1078
General Inspection.....7-1084
Operating Principle 7-1086
Diagnostic Information and Procedures..7-1087
Removal and installation.....7-1103

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Service brake system

Technical specifications

General specifications

Name		Specification
Brake pedal height from the ground		21.3mm
Front brake disc	Standard thickness	11mm
	Wear limit thickness	2mm
Rear brake lining	Standard thickness	10.2mm
	Wear limit thickness	2mm
Front brake disc	Standard thickness	25mm
	Wear limit thickness	23mm
Rear brake disc	Standard thickness	10mm
	Wear limit thickness	8mm
Brake fluid model		DOT4
Amount of Brake fluid Filling		0.825L

Torque Specifications

Name	Torque range	
	Metric (Nm)	British (lb-ft)
Fixing blot of brake pedal	23	17
Fixing nut of brake pedal	23	17
Connecting bolt of front brake caliper and pipeline	45	33
Connecting bolt of rear brake caliper and pipeline	45	33
Connecting nut between the brake master cylinder and the vacuum booster	23	17
Connecting bolt of braketube and brake cylinder	16	12
Connecting nut between the vacuum booster and the body	23	17
Fixed bolt of brake caliper	Front: 95 , rear: 75	Front: 70 , rear: 55
Fixed bolt of brake caliper	27	20
Locknut of brake pipe of brake master cylinder	16	12

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Precautions

Precautions

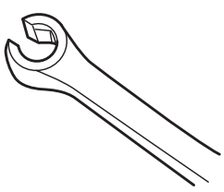
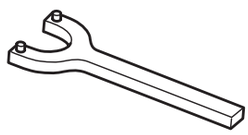
1. The brake performance seriously impacts the driving safety. Therefore, the good function of braking system shall always be maintained and the maintenance shall be performed if any problem is found.
2. Check the braking system regularly and perform maintenance to eliminate potentail safety problems.
3. Use the brake fluid recommended by Lifan and it should not be mixed with other types of brake fluid.
4. Do not use other liquid to replace the brake fluid so as to avoid the sub-assembly of hydraulic system from being damaged.
5. Because of the strong corrosive characteristics of brake fluid, when performing the maintenance for the braking system, avoid the skin and vehicle paint from being contacted with the fluid. Flush with a great deal of clean water if getting in contact with the fluid by accident.
6. During the repairing process, avoid the friction disc and braking wheel from being contacted with the oil. If failing the avoidance, clean it up with a piece of gauze.
7. When dismounting the piston of brake caliper, do not tread on the brake pedal so as to avoid the piston from getting out, which will result in the damage of piston dirt-proof boot.
8. During maintenance, clean the brake cylinder and brake friction disc thoroughly to minimize the damage caused by the particles in the air and other objects.
9. When performing the maintenance for the brake caliper, use clean brake fluid to wash all the parts of brake caliper.
10. Do not reuse the discharged brake fluid which shall be stored in a special sealed vessel.
11. During exhausting, observe the brake fluid level in the braking oiler. Add the fluid when it reaches the lowest scale.
12. Fill in the brake fluid. After finishing exhaust, check if the braking system leaks.If yes, timely eliminate the problem to ensure safty driving.

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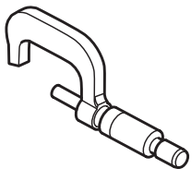
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Preparation

General and special tools

No.	Tool name	Tool drawing	Tooling code	Remarks
1	Oil pipe wrench	 LFX60-SM-07001	-	Remove the oil pipe joint nut
2	Remover for rear brake piston	 LFX60-SM-07002	-	Remove the rear brake cylinder piston

General service tool

No.	Tool name	Tool drawing	Tooling code	Remarks
1	Dial Gauge	 LFX60-SM-07003	-	Measure the front and rear brake discs
2	Micrometer screw gauge	 LFX60-SM-07004	-	Measure the brake disc thickness

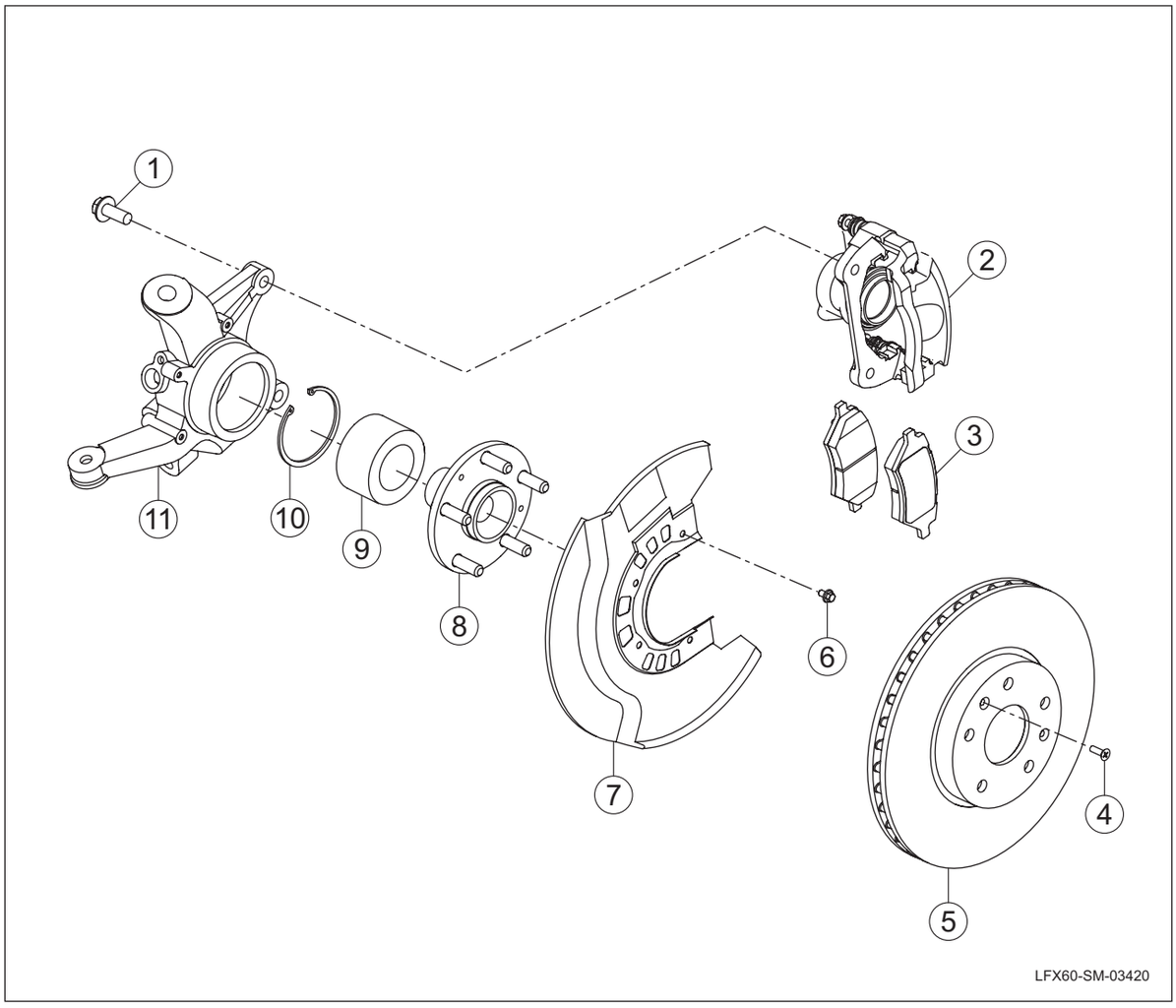
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Structure and installation location

Part exploded view

Front brake disc



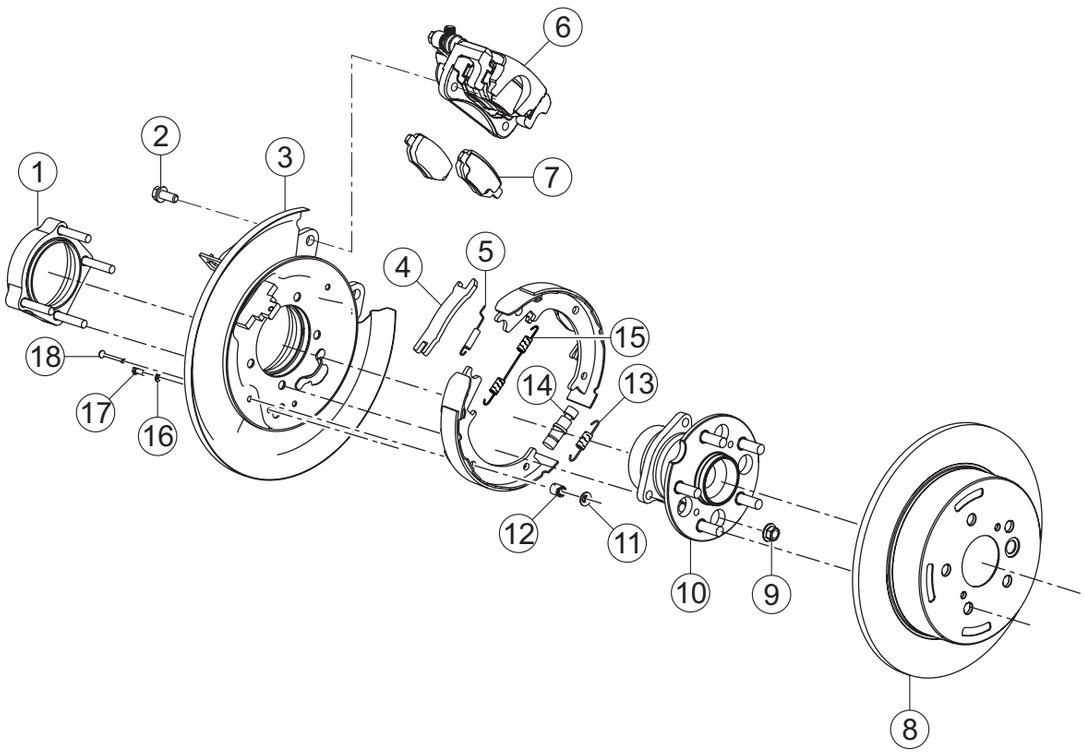
No.	Part name
1	Hexagon flange bolt
2	Front brake caliper assembly
3	Front brake pad Kit
4	Cross slot sunk screw
5	Front brake disc
6	Hexagon flange bolt

No.	Part name
7	Front brake baseboard
8	Front wheel hub unit assembly
9	Front wheel hub bearing
10	Bearing retainer
11	Front steering knuckle

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Rear brake disc



LFX60-SM-03419

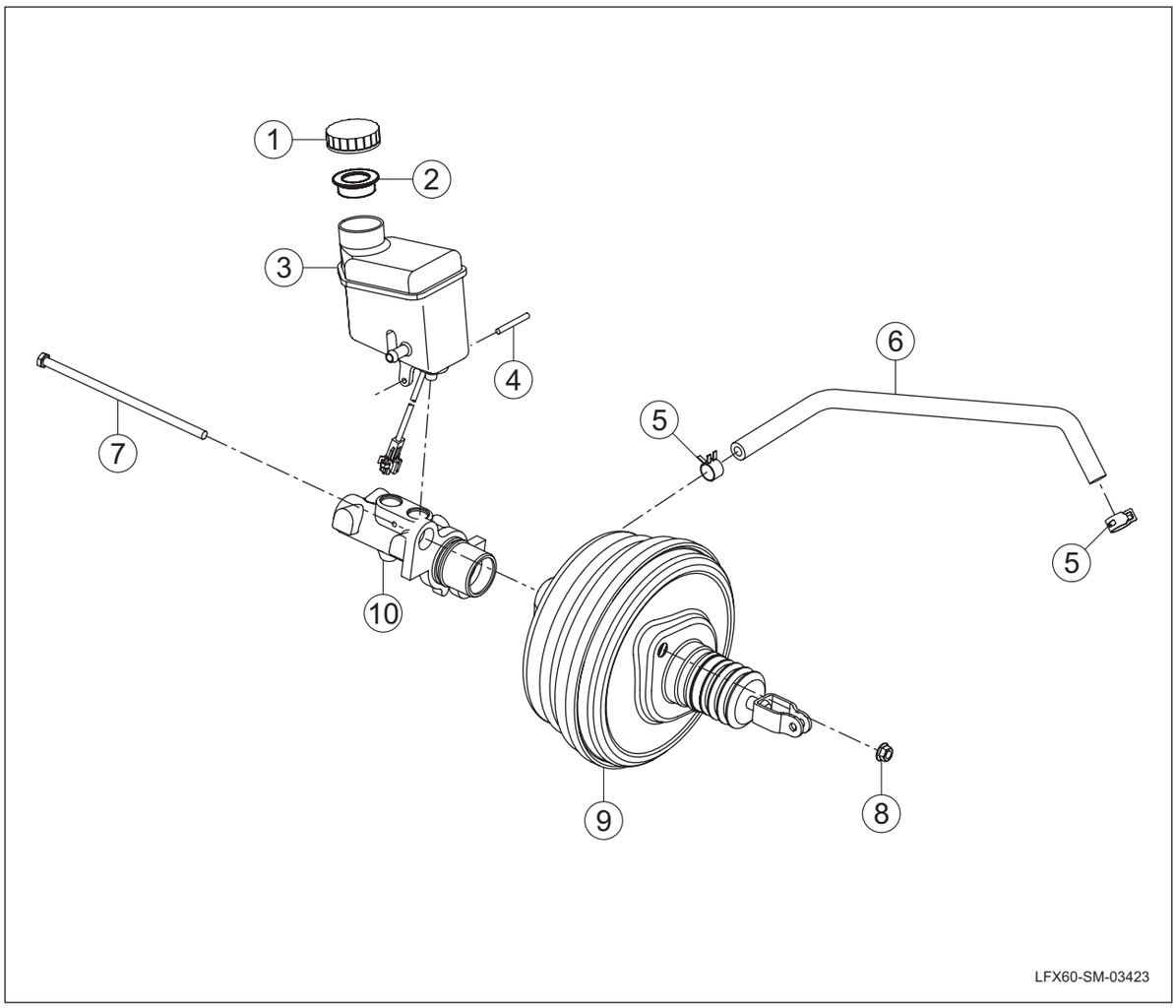
No.	Part name
1	Rear connecting seat assembly
2	Hexagon head bolt and taper elastic washer assembly
3	Rear brake baseboard assembly
4	Brake shoe support plate
5	Brake shoe return spring
6	Rear Brake Caliper assembly
7	Brake shoe assembly
8	Rear brake disc
9	Hex flange nut

No.	Part name
10	Rear hub
11	Baseboard fixing seat
12	Spring of baseboard fixing seat
13	Fixing spring of brake shoe adjusting pull rod
14	Brake shoe adjuster assembly
15	Upper tension spring of brake shoe
16	Plain washer
17	Hexagon head bolt
18	Fixing rod of baseboard

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Brake master pump



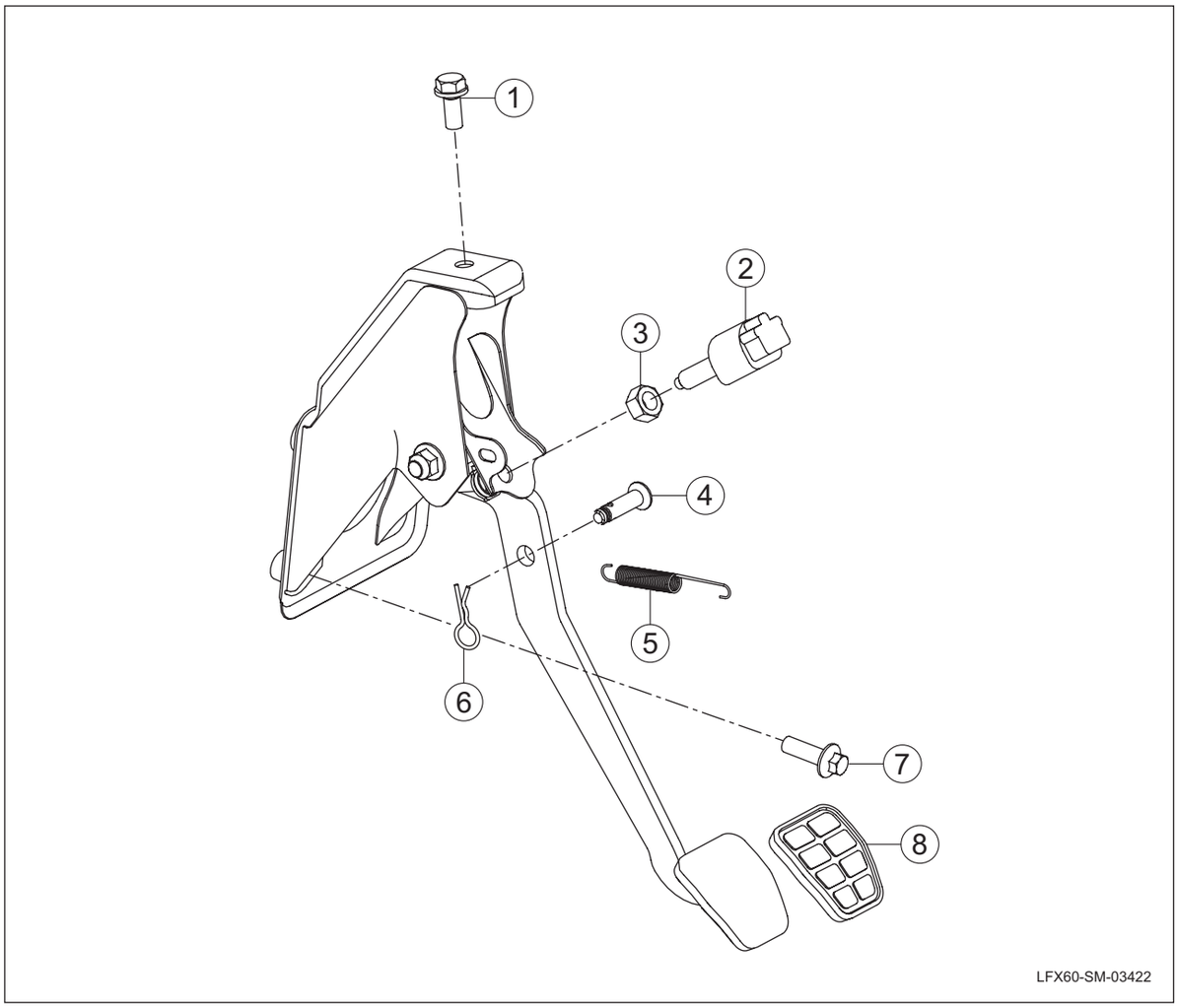
No.	Part name
1	Assembly of brake oiler cap
2	Filter screen
3	Assembly of brake oiler
4	Connecting pin of brake oiler
5	Steel strip elastic hoop
6	Vacuum booster hose

No.	Part name
7	Tap bolt of vacuum booster
8	Hex flange nut
9	Vacuum booster
10	Kit of brake master pump with oiler assembly
11	Connecting nut of brake master pump

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brake pedal



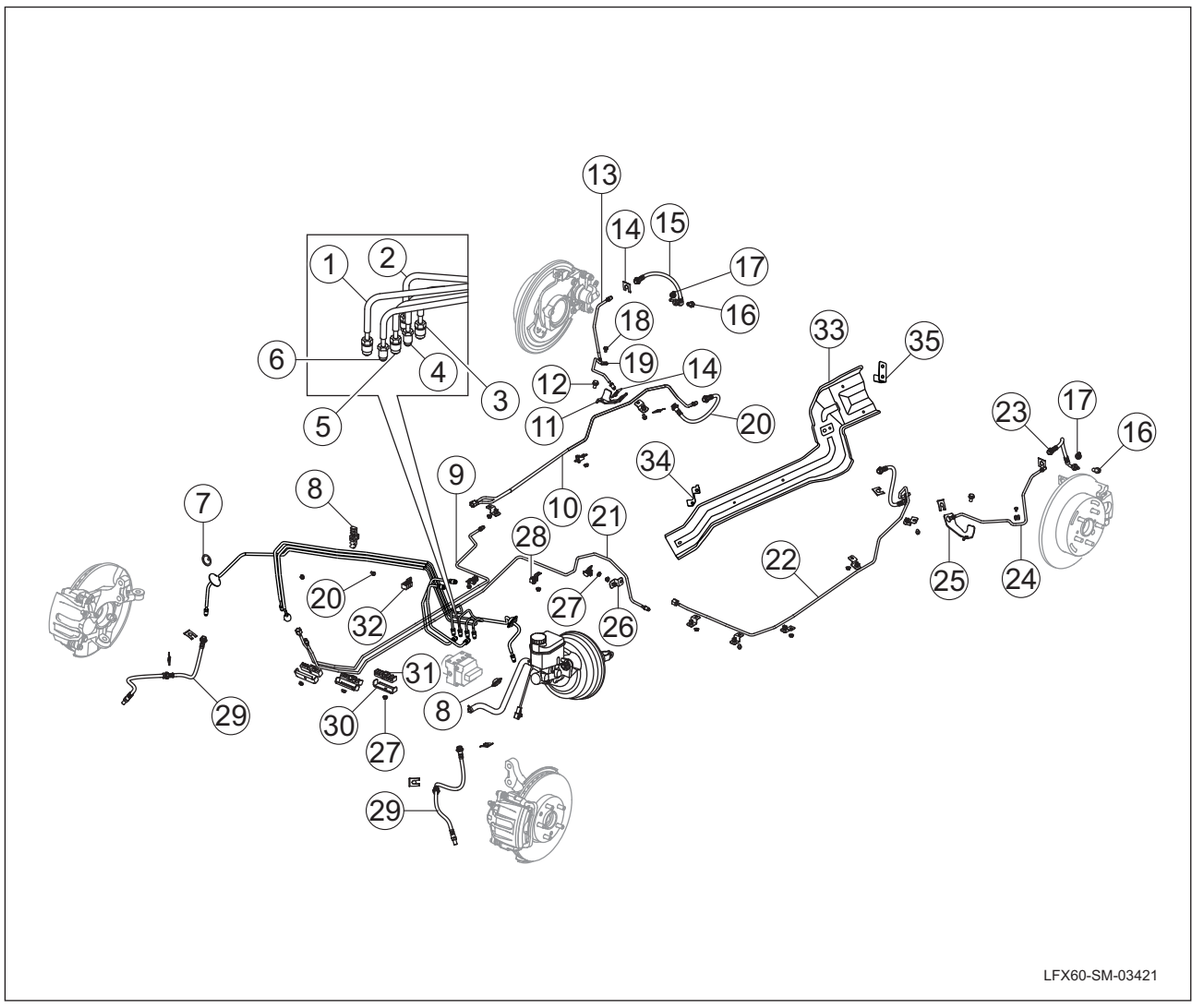
No.	Part name
1	Hexagon head bolt and taper elastic washer assembly
2	Brake pedal switch
3	Hex thin nut
4	Pin

No.	Part name
5	Return spring
6	Bolt
7	Hexagon flange bolt
8	brake pedal

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Brake line



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No.	Part name
1	Main flowline of brake master pump
2	Secondary flowline of brake master pump
3	Left front brake pipe I
4	Right rear brake pipe I
5	Left rear brake pipe I
6	Right front brake pipe I
7	Through hole rubber sleeve of front wheel brake tube
8	Five-hole pipe clamp
9	Right rear brake tube II
10	Right rear brake tube III
11	Brake pipe support
12	Hexagon head bolt and taper elastic washer assembly
13	Right rear brake tube IV
14	U type card
15	Right rear brake tube II
16	Hollow bolt
17	Copper gasket
18	Hexagon head bolt and taper elastic washer assembly

No.	Part name
19	Assembly III of brake tube fixing clip
20	Left rear brake hose assembly
21	Left rear brake tube II
22	Left rear brake tube III
23	Left rear brake tube assembly
24	Left rear brake tube IV
25	Brake tube fixing clip
26	Pipe clamp
27	Hex flange nut
28	Double pipe clamp
29	front brake tube
30	Stand for Assembly VIII of brake tube fixing clip
31	Pipe Clamp for assembly VIII of brake tube fixing clip
32	Six-hole pipe clamp
33	Fuel brake hose guard
34	Guard bracket II
35	Guard bracket I

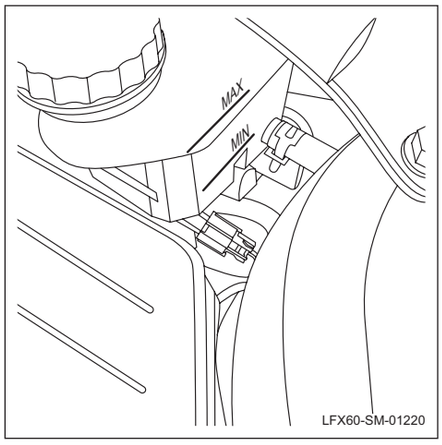
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General Inspection

General Inspection

Check the level of fluid reservoir



Check the brake fluid level which should be beween the MIN (mininum) and MAX (maximum) levels.

ℹNote:

If the brake fluid level is low, check if there is any leakage and if the disc brake friction plate is worn excessively. If necessary, fill in new brake fluid to the fluid reservoir after repairing and replacing relevant parts.

Check the brake pad

1. Check the brake pad regularly and measure it. If exceeding the specification, replace the brake pad.
2. If it is necessary, must replace the disc brake pad according to the axle set.
3. Check if the friction surface of disc brake pad cracks, breaks or gets damaged.

Brake caliper inspection

1. Inspect the brake caliper shell for cracks, serious wear or damage; if any of above cases occurs, replace the brake caliper.
2. Check if the gasket ring of piston dirt-proof boot of brake caliper cracks, breaks,gets aged and is not properly installed in the brake caliper. Replace the brake caliper if there is any problem mentioned above.
3. Check if there is any brake fluid leakage around the gasket ring of piston dirt-proof boot of brake caliper and on the disc brake pad. If yes, replace the brake caliper.
4. Check if the brake caliper piston can get into the brake caliper cylinder smoothly and the stroke is complete. The movement of brake caliper piston in the brake caliper cylinder shall be smooth and even. If the brake caliper piston gets detained or is hard to reach the bottom, replace the brake caliper.

Inspection of Guide Vane of Brake Pad

1. Check if the guide vane of brake pad is missed, seriously corroded or bent.
2. If there is any problem mentioned above, replace the guide vane of disc brake pad to ensure the brake pad to slide smoothly along the guide vane of disc brake pad without being detained.

Inspection of Floating Pin of Brake Caliper

Check the floating pin of brake caliper to see if there are the following problems:

- Detained
- Stuck
- Jacket cracked or broken
- Jacket missed

If there is any problem mentioned above, replace the brake caliper and gasket ring of dirt-proof boot.

Inspection of Brake Disc Surface and Wearing

Clean the friction surface of brake disc with industrial alcohol or permissible equivalent brake detergent.

Check if there is any problem belwo on the friction surface of brake disc:

- Serious rusting and/or corrosive pitting
- Slight surface rusting
- Cracking and/or burt spot
- Serious color changing to blueing
- Depth scratch on friction surface of brake disc

If there is any or several problems mentioned above on the friction surface of brake disc, the surface of brake disc needs to be trimed or replaced.

ℹNote:

Replace the brake packing block as well after the brake disc surface finishing or replacement.

Measurement of Brake Disc Thickness

1. Clean the brake disc friction surface with the industrial alcohol or the similar brake rinsing agent.

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2. Measure and record the minimum thickness for 4 or more than 4 points evenly distributed along the brake disc circle with a micrometer. Make sure to measure only in the contacting area of brake pad surface and keep the same distance between the micrometer and outside edge of brake disc for each measurement.
3. If the brake dis thickness exceeds the specification, he surface of brake disc needs to be trimed or replaced.

Note:

Replace the brake packing block as well after the brake disc surface finishing or replacement.

Measurement of End Runout after Brake Disk Assembled

Note:

When the brake disc is dismouned from the hub/axle flange, remove the rust or filth on the hub/axle flange and the fitting surface of brake disc. Otherwise, it may result in excessive end runout after the brake disc assembled. Then the brake moves up and down

1. Dismount the brake disc.
2. Clean the brake disc friction surface with the industrial alcohol or the similar brake rinsing agent.
3. Install the brake disc on the hub/axle flange.
4. Install and tighten the grip nut.
5. Install the base of dial indicator on the knuckle and set up the measuring point of dial indicator to let it contact the friction surface of brake disc in 90° and keep it from the outside edge of brake disc about 13mm (metrics) or 0.5in (British system)
6. Rotate the brake disc until the reading on the dial indicator reaches minimum and turns the dial indicator to zero.
7. Rotate the brake disc until the reading on the dial indicator reaches maximum.
8. Mark and record the end runout.
9. Compare the end runout after the brake disc assembled with the specification.
10. If the end runout after the brake disc assembled exceeds the specification, check the bearing axial clearance and axle hub runout. If they are normal and the brake disc thickness is within the required range, trim the brake disc surface to ensure the proper flatness.

Inspection of Brake Booster Airightness

1. Switch off the engine, then tread the braking pedal once per 5s to let the vacuum pressure become the ambient pressure. Tread the braking pedal to the end to start the engine. When the vacuum pressure gets to the standard, confirm the clearance between the braking pedal and floor getting shortened.
2. Run the engine at idling for about 1 min. Stop the engine when vacuum occurs in the booster. Tread the braking pedal as usual to let the vacuum pressure become the ambient pressure. Confirm the distance between the braking pedal and floor getting increased slowly.
3. Tread the braking pedal when the engine is running and hold it to stop the engine. The pedal stroke should not have any chagne after treading the pedal for 30s.

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Operating Principle

System overview

Front Disc Brake

The caliper of front disc brake is a single piston which is installed on the knuckle with two bolts. When treading the braking pedal, the caliper moves towards outside under the function of hydraulic pressure. The braking pressure forces the brake-block on the brake disc. The friction reduces the rotation of wheel to brake the vehicle. In the case of brake plate abrasion, the piston will further move to fill up the gap. When the brake pedal pressure and piston hydraulic pressure are released, the piston rubber sealing parts will restore the original shape to maintain the gap between the brake disc and brake plate as the original.

Front Disc Brake-block

Apply the mechanical output force from the hydraulic brake tongs to the brake disc friction surface.

Front brake disc

Use the mechanical output force produced on the disc surface by the disc brake-block to reduce the rotation of tire and wheel assembly to brake the vehicle.

Front Caliper

Receive the liquid pressure of the brake master cylinder and convert the liquid pressure into the mechanical output force to apply to the inside brake plate; when the master cylinder returns, the brake tongs piston will automatically return.

Front Caliper Stand

Fix the friction block of brake disc and caliper in the place to maintain a proper fitting position with the hydraulic caliper. When the mechanical output force acts on the brake-block, it makes the brake-block slide.

Front Disc Caliper Shaft Pin

Used to install the hydraulic caliper and fix the caliper in the place to keep a proper fitting position with the caliper stand. When the mechanical output forces acts, it makes the caliper slide in relation to the brake-block.

Rear Disc Brake

The caliper of rear disc brake is a single piston which is installed on the rear axle with two bolts. When treading the braking pedal, the caliper moves towards outside under the function of hydraulic pressure. The braking pressure forces the brake-block on the brake disc. The friction reduces the rotation of tire and wheel assembly to brake the vehicle. In the case of brake plate abrasion, the piston will further move to fill up the gap. When the brake pedal pressure and piston hydraulic pressure are released, the piston rubber sealing parts will restore the original shape to maintain the gap between the brake disc and brake plate as the original.

The mechanical output force from the hydraulic caliper piston acts on the internal brake-block. When the piston pushes the internal brake-block towards outside, the caliper housing pulls the external brake-block towards inside so as to evenly distribute the output force. The brake-block acts the output forces to the friction surfaces of disc to reduce the rotation of tire and wheel assembly. It is very important for evenly distributing the braking force that the brake-block guide vane and floating pin of caliper functions well.

Rear Disc Brake-block

Apply the mechanical output force from the hydraulic brake tongs to the brake disc friction surface.

Rear brake disc

Use the mechanical output force produced on the disc friction surface by the disc brake-block to reduce the rotation of tire and wheel assembly to brake the vehicle.

Rear Caliper

Receive the liquid pressure of the brake master cylinder and convert the liquid pressure into the mechanical output force to apply to the inside brake plate; when the master cylinder returns, the brake tongs piston will automatically return.

Rear Caliper and Caliper Stand

Used to fix the disc brake-block and caliper in the place to keep a proper fitting positon with the hydraulic caliper. When the mechanicl output force acts on the brake-block, it makes the brake-block slide.

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Diagnostic Information and Procedures

Diagnosis Instructions

Before diagnosis, first understand and get familiar with the working principle of braking system. This is helpful to determine the correct procedures of diagnosis when the trouble occurs. More important, it is also helpful to determine if the status described by the client is normal operation.

Any diagnosis for the braking system shall start from the inspection for the braking system, then guide the maintenance personnel to take next logic procedure to perform diagnosis. Comprehend and correctly use the diagnostic flow chart to shorten the diagnosis time and avoid the misjudgement.

Visual Inspection

ℹNote:

Before the diagnosis, ensure the brake system warning indicator lamp is normal.

1. Confirm the problem raised by the customer.
2. Check the evident mechanical faults and hydraulic faults.

Visual inspection table

Mechanical
• Tire pressure • Wheel and tire • Braking fluid level • Braking pipeline

3. Solve the problem finding before the next step inspection.
4. If the observed or raised problem is the evident and the cause has been found, ensure to fix this fault before proceeding with the next step.
5. If no problem is found through the visual check, confirm the fault and refer to the fault symptom list.

Cautions for Diagnosis

- Replacement for any part should be taken seriously as it may affect the function of braking system and cause dangers in driving. Standard parts made by Lifan shall be used.
- When performing the maintenance for the braking system, it is very critical to keep the parts and site clean.
- If there is any leakage of braking fluid, the assembly must be dismounted. If there is any abnormal problem, a new assembly must be used.
- When dismounting the braking assembly, seal the connecting position on the braking pipeline to avoid impurities such as dust, mud, etc. from getting into the pipeline.
- When dismounting or installing the braking pipeline, do not damage the braking pipeline or deform it.
- When installing the braking pipeline or braking hose, make sure not to twist or bent it.
- The braking hose must be kept far away from the absorber oil, grease, etc.
- After the braketube and brake hose are installed, make sure they do not interfere with other assembly.
- Do not allow the brake fluid to stick on the paint of vehicle body. If failing to do so, clean it immediately.

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List of fault symptoms

Symptom	Possible Cause	Recommended Measures
Braking not even-off tracking	• Tire pattern and pressure not identical	• Replace the tire and adjust the tire pressure.
	• Brake tube and hose (twisted and/or deformed)	• Replace the brake tube and /or hose.
	• Brake-block (cracked, twisted or oil stained)	• Clean or replace the brake-block **Refer to: replacement of front brake packing block** **Refer to: replacement of rear brake packing block**
	• Front brake disc abnormal worn and/or deformed	• Replace the front brake disc **Refer to: Replacement of front brake disc**
	• Rear brake disc abnormal worn and/or deformed.	• Replace the rear brake disc **Refer to: replacement of rear brake disc**
	• Caliper/wheel cylinder detained	• Repair or replace the brake wheel cylinder or caliper **Refer to: replacement of front brake caliper** **Refer to: replacement of rear brake caliper**
	• ABS control failure	• Repair the ABS control **Refer to: ABS warning lamp always on diagnosis flow**
	• Incorrect wheel alignment	• Perform wheel positioning inspection
Shaking when braking-vibrating	• Brake-block worn, broken or oil stained	• Replace the brake plate **Refer to: replacement of front brake packing block** **Refer to: replacement of rear brake packing block**
	• Front brake disc abnormal worn, twisted, deformed,out-of-round	• Replace the front brake disc **Refer to: replacement of front brake disc**
	• Rear brake disc abnormal worn, twisted, deformed, out-of-round	• Replace the rear brake disc **Refer to: Replacement of rear brake disc**
	• Caliper bolt loose	• Tighten the caliper bolt
	• Caliper sliding resistance too big	• Replace the caliper if necessary **Refer to: replacement of front brake caliper** **Refer to: replacement of rear brake caliper**
	• Hub bolt loose or missing	• Tighten or replace the hub bolt
Braking pedal sunk rapidly	• Hydraulic system leaking	• Repair the leak, fill the brake fluid and bleed **Refer to: brake system bleed procedures**
	• There is air in the system.	• Fill the brake fluid and bleed **Refer to: brake system bleed procedures**
	• Gasket ring of master piston of brake master cylinder worn or cylinder body cracking	• Replace the brake master cylinder **Refer to: replacement of brake master cylinder**

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Symptom	Possible Cause	Recommended Measures
Braking pedal position low or feeling soft	• Brake plate excessive wear	• Replace the brake plate **Refer to: replacement of front brake packing block** **Refer to: Replacement of rear brake packing block**
	• Vent on the oil tank cover blocked or getting dirty	• Clean the vent
	• There is air in the system.	• Fill the brake fluid and bleed **Refer to: brake system bleed procedures**
Braking locked when treading the brake slightly	• Brake-block not installed properly	• Reinstall the brake-block **Refer to: replacement of front brake packing block** **Refer to: replacement of rear brake packing block**
	• ABS control failure	• Repair the ABS control **Refer to: ABS warning lamp always on diagnosis flow**
When treading the pedal and holding it, the pedal sinks slowly	• Leakage or air in the system	• Repair the leak, fill the brake fluid and bleed **Refer to: brake system bleed procedures**
	• Brake master cylinder in trouble	• Check the brake master cylinder. Replace it if it is in trouble **Refer to: replacement of brake master cylinder**
Brake pedal stroke oversize	• Brake plate excessive wear	• Replace with a new brake-block **Refer to: replacement of front brake packing block** **Refer to: replacement of rear brake packing block**
	• Brake disc excessively worn	• Replace with a a new brake disc **Refer to: replacement of brake disc**
	• Braking clearance self-adjusting function abnormal	• Check the caliper return function. If necessary, replace the caliper assembly
Braking dragging	• Parking brake acting (hand brake not released fully)	• Release the hand brake
	• Caliper stuck	• Repair or replace the caliper **Refer to: replacement of front brake caliper** **Refer to: Replacement of rear brake caliper**
	• Brake-block detained	• Repair or replace the brake-block **Refer to: replacement of front brake packing block** **Refer to: Replacement of rear brake packing block**
	• Vacuum booster detained	• Adjust the push rod length of vacuum booster or replace the vacuum booster. **Refer to: replacement of vacuum booster**
	• Braking pedal free stroke (not sufficient)	
Braking boosting effect poor	• Engine induction system leaking	• Check the vacuum of induction system. Replace it if necessary.
	• Vacuum boosting hose leaking	**Refer to: inspection of vacuum booster**
	• Vacuum boosting hose check-valve failing	

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Symptom	Possible Cause	Recommended Measures
Braking system noisy	• Brake-block (excessively worn, cracked, twisted, getting dirty, smooth)	• Replace the brake plate **Refer to: replacement of front brake packing block** **Refer to: replacement of rear brake packing block**
	• Spring strip (loose or abnormal deformed)	• Replace the spring strip **Refer to: replacement of front brake packing block** **Refer to: replacement of rear brake packing block**
	• Tap bolt of caliper stand (loose)	• Tighten or replace the fixing bolt
	• Tap bolt of caliper (loose)	• Tighten or replace the fixing bolt
	• Caliper shaft pin (worn seriously)	• Replace the caliper **Refer to: replacement of front brake caliper** **Refer to: replacement of rear brake caliper**
	• Front brake disc abnormal worn, out-of-round, cracked and/or twisted.	• Replace the front brake disc **Refer to: replacement of front brake disc**
	• Rear brake disc abnormal worn, out-of-round, cracked and/or twisted.	• Replace the rear brake disc **Refer to: replacement of rear brake disc**
	• Braking pedal return spring fatigue	• Replace the return spring. **Refer to: replacement of brake pedal**
	• Braking pedal push rod bent or deformed	• Replace the push rod. **Refer to: replacement of brake pedal**
	• Vacuum booster	• Check the vacuum booster.Replace it if necessary. **Refer to: inspection of vacuum booster**
	• Brake master cylinder	• Check the brake master cylinder. Replace it if necessary. **Refer to: replacement of brake master cylinder**

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Diagnosis Procedures for Braking not even---off-tracking

Test condition	Details/results/measures
1. Road test vehicle	
	A. Perform a road test for the vehicle. B. Check if braking is off-tracking. Is there braking off-tracking? →**Yes** To step 2. →**No** The vehicle is normal.
2. Check the tread pattern and tire pressure.	
	A. Check if the tire pattern identical B. Check if the tire pressure is normal. Is it OK after checking? →**Yes** To step 3. →**No** Replace the tire or regulate the tire pressure.
3. Check the brake plate.	
	A. Check if the brake-block is worn abnormally. Is there abnormal wear or oil leak? →**Yes** Clean or replace the brake-block. **Refer to: replacement of front brake packing block** **Refer to: replacement of rear brake packing block** →**No** To step 4.
4. Check the front brake disc.	
	A. Check the front brake disc for abnormal wear or torsional deformation. Is it OK after checking? →**No** Replace the front brake disc. **Refer to: replacement of front brake disc** →**Yes** To step 5.

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Test condition	Details/results/measures
5. Check the rear brake disc.	
	A. Check the rear brake disc for abnormal wear or deformation. Is it OK after checking? →**No** Replace the rear brake disc. →**Yes** To step 6.
6. Check the brake tongs.	
	A. Check the brake tongs for seizing. Is it OK after checking? →**No** Repair or replace the brake tongs. **Refer to: replacement of front brake caliper** **Refer to: replacement of rear brake caliper** →**Yes** To step 7.
7. Check the braking pipeline.	
	A. Check if the brake tube and hose are twisted or deformed. Is it OK after checking? →**Yes** To step 8. →**No** Replace the brake tube and/or hose.
8. Check the ABS control	
	A. Check if the ABS control fails Is it OK after checking? →**Yes** To step 9. →**No** Check the ABS control **Refer to: ABS warning lamp always on diagnosis flow**
9. Check the wheel alignment.	
	A. Check whether the wheel alignment is normal. Is it OK after checking? →**No** Adjust the wheel positioning. **Refer to: Toe-in adjustment procedure** →**Yes** Confirm the repair is finished.

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Diagnostic Procedures for Braking Shaking-Vibrating.

Test condition	Details/results/measures
1. Subject the vehicle to the road test.	
	A. Brake at 40~80km/h on a flat rod. B. Check if there is braking shaking-vibrating. Is there braking shaking-vibrating? →**Yes** To step 2. →**No** The vehicle is normal.
2. Check the brake plate.	
	A. Check if the brake-block is worn abnormally, broken or stained with oil. Is it OK after checking? →**Yes** To step 3. →**No** Replace the brake plate. **Refer to: replacement of front brake packing block** **Refer to: replacement of rear brake packing block**
3. Check the front brake disc.	
	A. Check the front brake disc for abnormal wear or torsional deformation. Is it OK after checking? →**No** Replace the front brake disc. **Refer to: replacement of front brake disc** →**Yes** To step 4.
4. Check the rear brake disc.	
	A. Check the rear brake disc for abnormal wear or deformation. Is it OK after checking? →**No** Replace the rear brake disc. →**Yes** To step 5.

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Test condition	Details/results/measures
5. Check the brake tongs.	
	A. Check if the caliper bolt is loose. B. Check if the sliding part is lack of lubrication. C. Check if the hub bolt is loose or missed. Is it OK after checking? →**No** Tighten the caliper bolt, lubricate the sliding part, tighten or replace the hub bolt. →**Yes** Confirm the repair is finished.

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Diagnostic Procedures of Braking Pedal Sunk Rapidly

Test condition	Details/results/measures
1. Subject the vehicle to the road test.	
	A. Carry out the road test and depress the brake pedal. B. Check if the pedal braking force is normal Is the pedal braking force normal →**Yes** The vehicle is normal. →**No** To step 2.
2. Check the brake fluid level.	
	A. Check the level of brake fluid in the fluid tank. Is it OK after checking? →**Yes** To step 3. →**No** Check if the brake fluid tank or braking pipeline leaks.
3. Increase Pressure for Braking system	
	A. Rapidly tread the braking pedal for 5 times. Does the braking pedal height rises and maintains? →**Yes** Check the parking braking and adjust it if necessary. If the problem still exists, exhaust the braking system. **Refer to: brake system bleed procedures** →**No** To step 4.
4. Check the brake system for leak.	
	A. Test the braking pipeline status. Is the leak detected? →**Yes** Repair the leak part and replace the corresponding component if necessary. Add the brake fluid and exhaust →**No** To step 5.

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Test condition	Details/results/measures
5. Perform the inspection for the bypass status of brake master cylinder	
	A. Test the bypass status. Is it OK after checking? →**No** Replace the brake master cylinder. **Refer to: replacement of brake master cylinder** →**Yes** Confirm the repair is finished.

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Diagnostic Procedures for Braking Pedal Position Low or Feeling Soft

Test condition	Details/results/measures
1. Subject the vehicle to the road test.	
	A. Carry out the road test and depress the brake pedal. B. Check if the feeling for the braking pedal is soft. Is it OK after checking? →**Yes** The vehicle is normal. →**No** To step 2.
2. Check the brake fluid level.	
	A. Check the brake fluid level. Is it OK after checking? →**Yes** To step 3. →**No** Check if the braking system parts leak. Replace the broken parts, add brake fluid and exhaust.
3. Check the vent on the fluid tank cover.	
	A. Check if the vent on the fluid tank cover is blocked or gets dirty. Is the vent on the fluid tank cover blocked or dirty? →**Yes** Clean the fluid tank cover. →**No** To step 4.
4. Braking system exhausting	
	A. Braking system exhausting. **Refer to: brake system bleed procedures** →**No** Confirm the maintenance done.

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Diagnostic Procedures for Braking locking when braking lightly

Test condition	Details/results/measures
1. Subject the vehicle to the road test.	
	A. Carry out the road test and depress the brake pedal. B. Check if the braking is locked. Is it OK after checking? →**Yes** The vehicle is normal. →**No** To step 2.
2. Check the tread pattern and tire pressure.	
	A. Check if the tire is excessively worn or the tire pressure is abnormal. Is it OK after checking? →**Yes** To step 3. →**No** Replace the tire or regulate the tire pressure.
3. Check the brake plate.	
	A. Check if the brake-block is installed properly,containinated by oil or excessively worn. Is there abnormal wear or oil leak? →**Yes** Clean or replace the brake-block. **Refer to: replacement of front brake packing block** **Refer to: replacement of rear brake packing block** →**No** To step 4.
4. Check the ABS control system	
	A. Check if the ABS control fails. Is it OK after checking? →**No** Check the ABS control **Refer to: ABS warning lamp always on diagnosis flow** →**Yes** To step 5.

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Test condition	Details/results/measures
5. Check the vacuum booster.	
	A. Check if the vacuum booster is normal. Is it OK after checking? →**No** Replace the vacuum booster. **Refer to: replacement of vacuum booster** →**Yes** To step 6.
6. Check the brake tongs.	
	A. Check the brake tongs for seizing. Is it OK after checking? →**No** Repair or replace the brake tongs. **Refer to: replacement of front brake caliper** **Refer to: replacement of rear brake caliper** →**Yes** Confirm the repair is finished.

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Diagnostic Procedures for Pedal Sinking Slowly When Treading and Holding Pedal

Test condition	Details/results/measures
1. Check if the trouble phenomenon exists.	
	A. Check if the pedal sinks slowly when treading the braking pedal and holding it. Is it OK after checking? →**Yes** The vehicle is normal. →**No** To step 2.
2. Check the brake fluid level.	
	A. Check the brake fluid level. Is it OK after checking? →**Yes** To step 5. →**No** To step 3.
3. Check the brake system for leak.	
	A. Check if the brake and clutch system leak externally? Is the leak detected? →**Yes** Repair the leak part and replace the corresponding component if necessary. Add brake fluid and exhaust. →**No** To step 4.
4. Check if there is air in the braking system	
	A. Check if there is air in the braking system. Is there air in the braking system? →**Yes** Exhaust of the braking system **Refer to: brake system bleed procedures** →**No** To step 5.
5. Check the brake master cylinder.	
	A. Check if the brake master cylinder is normal Is it OK after checking? →**No** Replace the brake master cylinder. **Refer to: replacement of brake master cylinder** →**Yes** Confirm the repair is finished.

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Diagnostic Procedures for Braking Dragging

Test condition	Details/results/measures
1. Check the parking braking.	
	A. Release the parking braking handle and check if the parking braking is completely released. Is it OK after checking? →**Yes** To step 2. →**No** Check the parking braking system.
2. Check the brake tongs.	
	A. Check the brake tongs for seizing. Is it OK after checking? →**No** Repair or replace the brake tongs. **Refer to: replacement of front brake caliper** **Refer to: replacement of rear brake caliper** →**Yes** To step 3.
3. Check the brake plate.	
	A. Check if the brake-block detains. Is it OK after checking? →**Yes** To step 4. →**No** Replace the brake plate. **Refer to: replacement of front brake packing block** **Refer to: replacement of rear brake packing block**
4. Check the vacuum booster.	
	A. Check if the brake booster detains. Is it OK after checking? →**No** Replace the brake booster. **Refer to: replacement of vacuum booster** →**Yes** To step 5.

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Test condition	Details/results/measures
5. Check the free stroke of braking pedal.	
	A. Check if the free stroke of braking pedal is normal. Is it OK after checking? →**No** Adjust the push rod length of vacuum booster. →**Yes** Confirm the repair is finished.

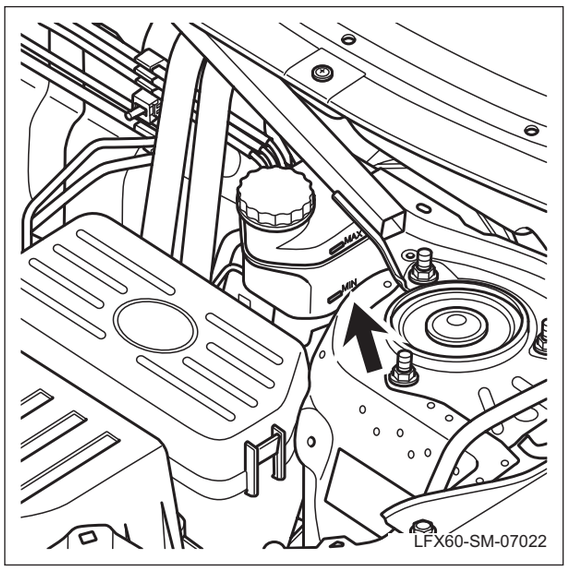
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Removal and installation

Procedure for Braking System Exhaust

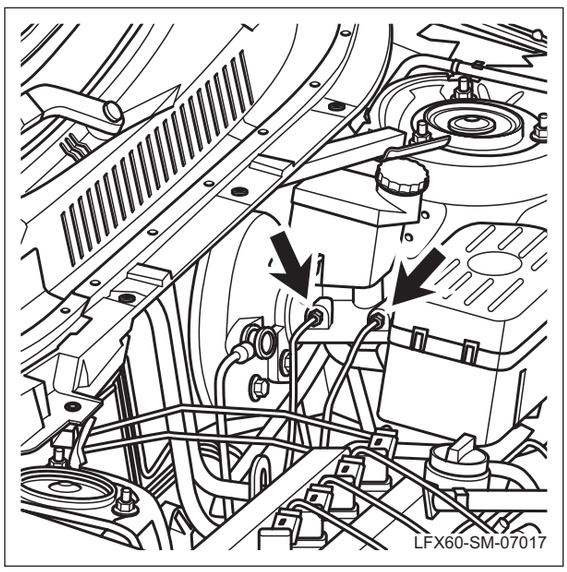
1. Exhaust



(a). Fill in brake fluid to the fluid tank.

ℹNote:

- **If the braking system is repaired or suspecting there is air in the braking pipeline, need to exhaust the braking system.**
- **Before exhausting the brake, shift the gear change lever to the neutral position and pull up the parking brake.**
- **When exhausting the brake, fill in the brake fluid and keep the level between the MIN (minimum) and MAX (maximum) scales of fluid tank. If the brake fluid leaks to the paint surface, clean it immediately.**



(b). Exhausting the brake master cylinder.

ℹNote:

- **If the brake master cylinder is re-installed or the fluid tank gets empty, exhaust the air in the master cylinder.**
- **To avoid the brake fluid from sticking, cover the paint surface with a piece of rag.**
- **The brake fluid is corrosive. Avoid it in direct contact with skin, eye, etc.**

(c). Disconnect the braking pipeline from the brake master cylinder.

(d). Tread the braking pedal slowly and hold it.

(e). Block the outlet with fingers and release the braking pedal.

ℹNote:

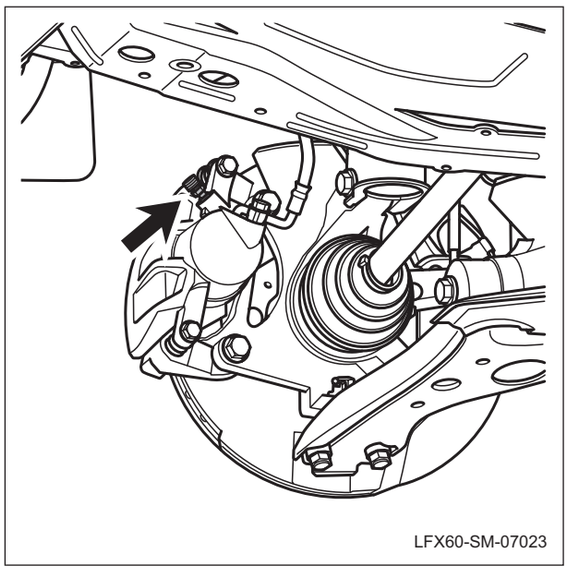
When performing the procedure, wear the approved goggles and gloves to reduce the risk to personal injury.

(f). Repeat the above steps 3-4 times.

(g). Install the braking pipeline of brake master cylinder and tighten the nut.

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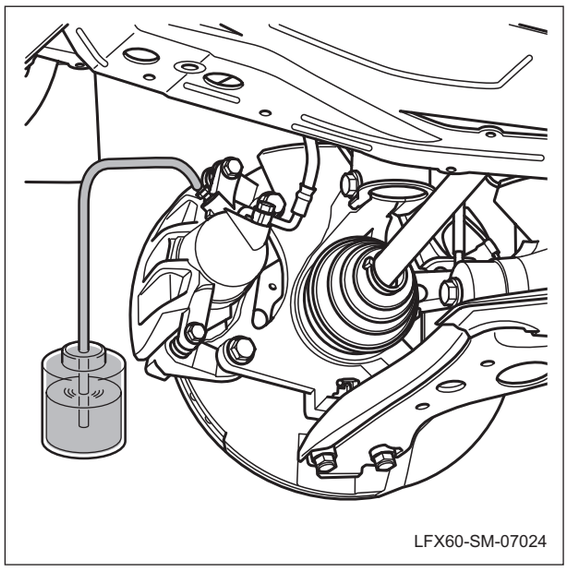
(h). Detach the dust cap of bleedscrew of brake cylinder.

❶Note:

Exhaust the air in the braking pipeline from the wheel farthest from the brake master cylinder.

(i). Connect the ethylene tube to the relief plug

(j). Tread the braking pedal several times and release the relief plug under the status of braking pedal treaded.

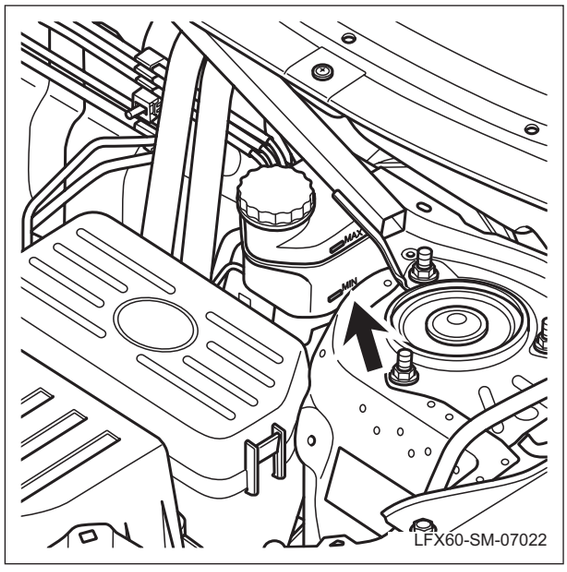


(k). No bubbles when the brake fluid flows out. Tighten the relief plug and release the braking pedal.

(l). Repeat the above steps (j) and (k) until exhaust all the air in the brake fluid.

(m). Completely tighten the relief plug.

(n). Repeat the above steps for each wheel to exhaust the air in each braking pipeline.



(o). Check the brake fluid level to ensure it is between the MIN (minimum) and MAX (maximum) scales.

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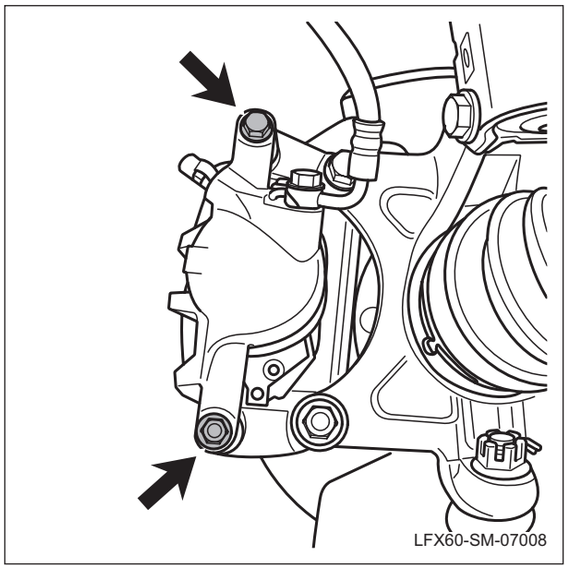
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Replacement of Front Brake Pad

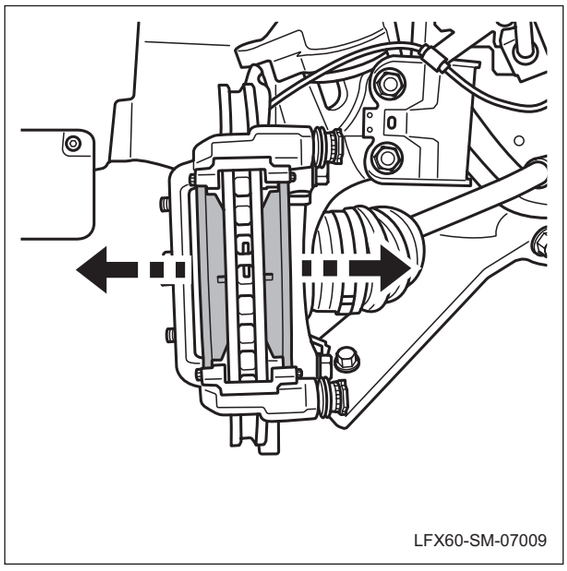
Removal

1. Dismount the front brake pad.

(a). Remove the wheel. **Refer to the replacement of wheel.**



(b). Dismount the tap bolt of front caliper.
(c). Detach the front caliper.
(d). Suspend the front caliper on the suitable position of carframe.



(e). Detach the brakeblock.

Installation

1. The installation sequence is reverse to the removal sequence.

(a). Reset the caliper piston with a proper tool.
(b). After installation, tread the braking pedal more than two times with force.
(c). Check the brake fluid level and fill in the fluid if necessary.

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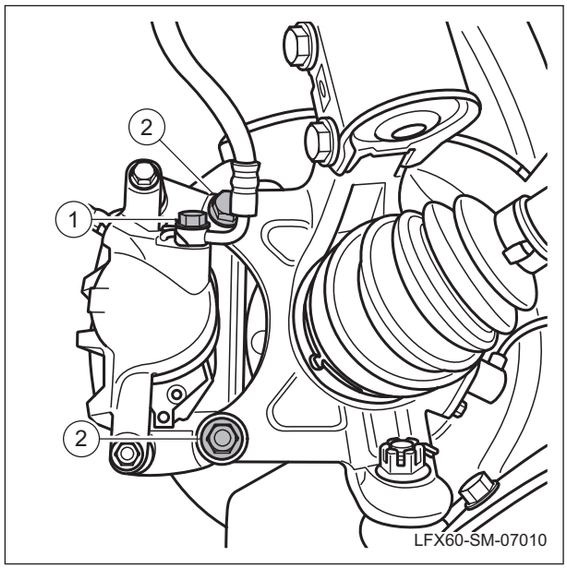
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Replacement of Front Caliper

Removal

1. Dismount the front caliper.

(a). Remove the wheel. **Refer to the replacement of wheel.**



(b). Dismount the connecting bolt 1 beween the brake tube and brake cylinder.

(c). Dismount the tap bolt 2 of front caliper.

(d). Detach the front caliper.

Note:

- **Seal the brake hose to prevent the oil lose and the ingress of dirt.**
- **If the brake fluid splashes onto the paint face, immediately rinse it with the cool water.**

Installation

1. Install the front caliper.

(a). The installation sequence is the reverse of the disassembly order.

(b). Bleed the brake system. **Refer to the brake system bleed procedures.**

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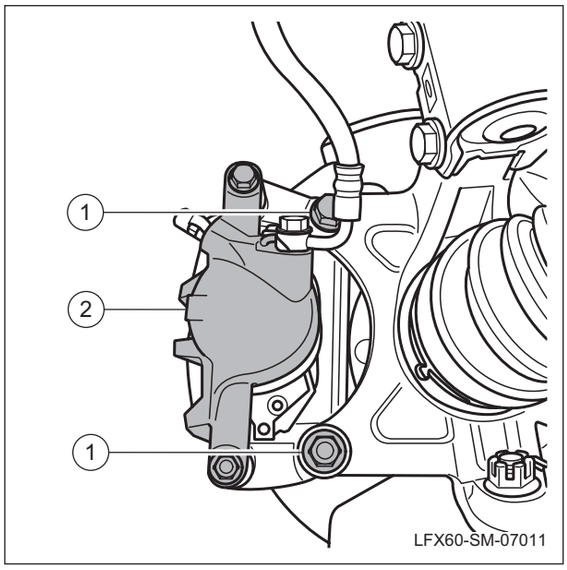
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Replacement of Front Brake Disc

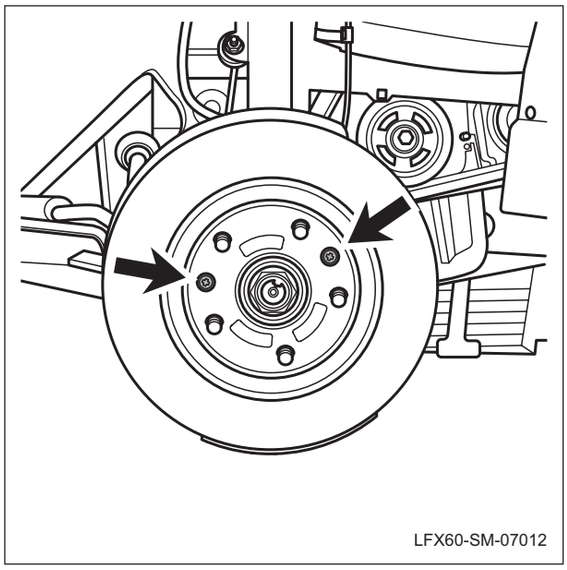
Removal

1. Dismount the front brake disc.

(a). Remove the wheel. **Refer to the replacement of wheel.**



(b). Dismount the tap bolt 1 of front caliper.
(c). Move away the front caliper 2



(d). Dismount the tap bolt of front brake disc.
(e). Detach the front brake disc.

Installation

1. Install the front brake disc.

(a). The installation sequence is the reverse of the disassembly order.
(b). Bleed the brake system. **Refer to the brake system bleed procedures**.

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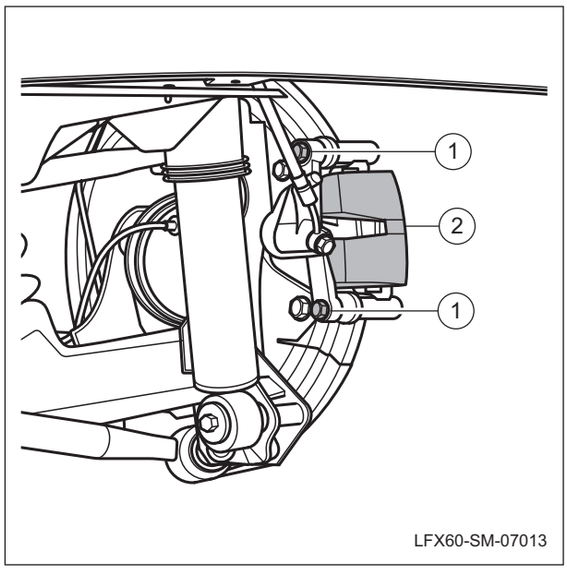
Replacement of rear brake packing block

Removal

1. Remove the rear brake packing block

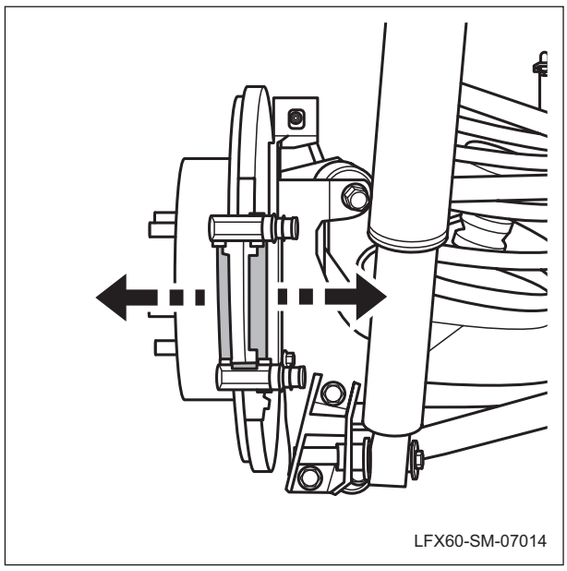
(a). Disconnect the battery negative cable.

(b). Remove the wheel. **Refer to the replacement of wheel.**



(c). Dismount the tap bolt 1 of rear caliper.

(d). Move away the rear caliper 2.



(e). Dismount the brake pad.

Installation

1. Install the rear brake pad.

(a). The installation sequence is the reverse of the disassembly order.

(b). Reset the caliper piston with a proper tool

(c). Exhaust the braking system,**refer to procedure of Braking System Exhaust.**

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Replacement of rear brake caliper

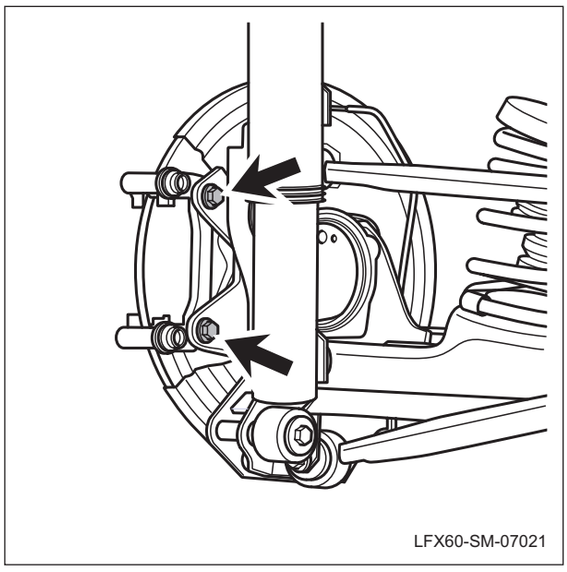
Removal

1. Remove the rear brake caliper.

(a). Disconnect the battery negative connector.

(b). Remove the wheel. **Refer to the replacement of wheel.**

(c). Dismount the rear brake pad,**refer to replacement of Rear Brake Pad.**



(d). Dismount the tap bolt of rear caliper and detach the caliper.

Installation

1. Install the rear caliper.

(a). The installation sequence is the reverse of the disassembly order.

(b). Bleed the brake system. **Refer to the brake system bleed procedures.**

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Replacement of rear brake disc

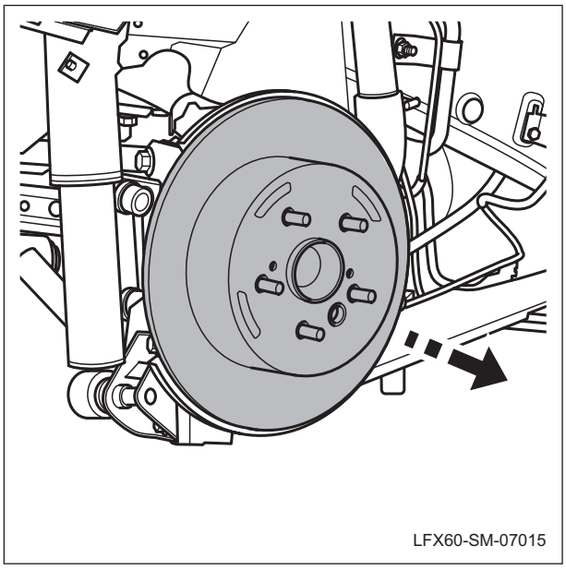
Removal

1. Dismount the rear brake disc.

(a). Remove the wheel. **Refer to the replacement of wheel.**

(b). Dismount the rear brake pad, **refer to replacement of Rear Brake Pad.**

(c). Dismount the rear caliper, **refer to replacement of Rear Caliper.**



(d). Detach the rear brake disc.

Installation

1. Install the rear brake disc.

(a). The installation sequence is the reverse of the disassembly order.

(b). Bleed the brake system. **Refer to the brake system bleed procedures.**

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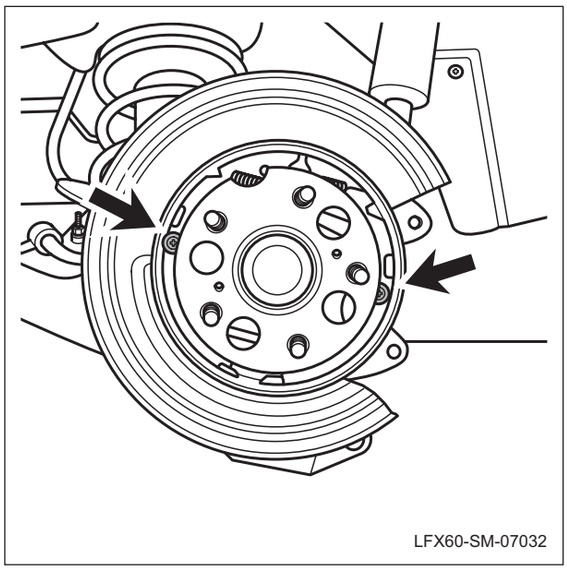
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Replacement of Rear Brake Shoe

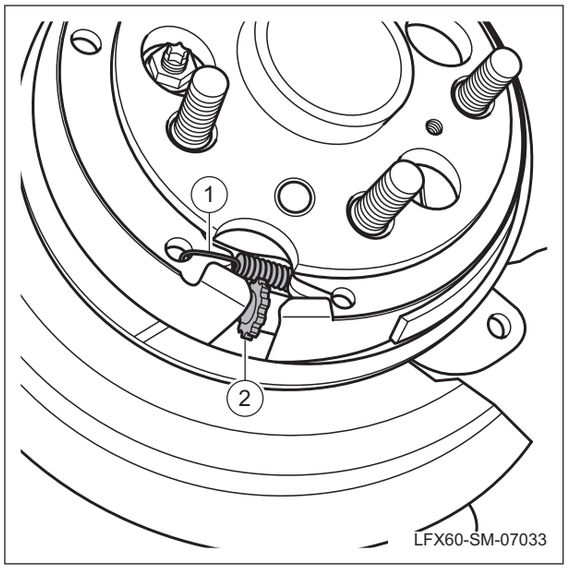
Removal

1. Dismount the rear brake shoe.

(a). Remove the wheel. **Refer to the replacement of wheel.**
(b). Dismount the rear caliper, **refer to replacement of Caliper.**
(c). Dismount the rear brake disc, **Refer to replacement of Rear Brake Disc.**


LFX60-SM-07032

(d). Dismount the spring with a proper tool.
(e). Dismount the lower spring 1 of rear brake shoe.

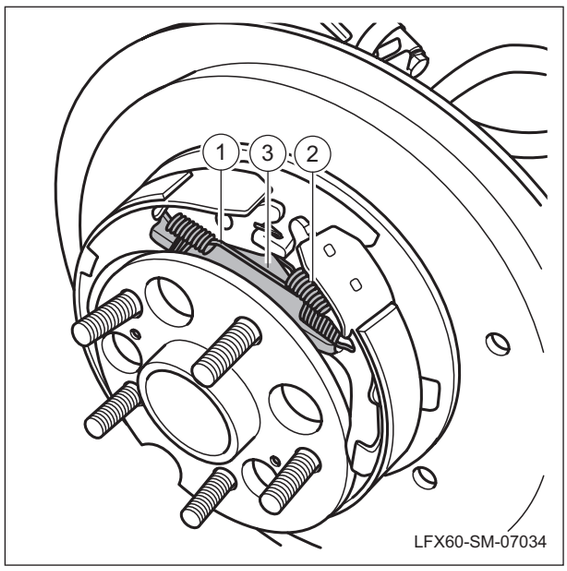


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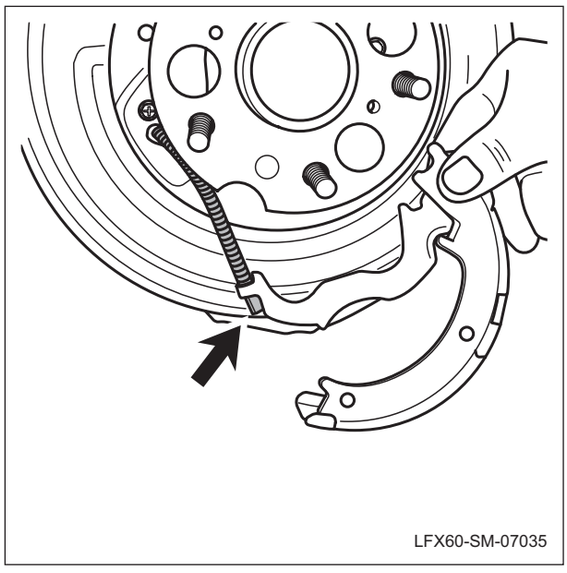
(f). Dismount the adjusting block 2 of rear brake shoe.

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(g). Dismount the upper spring 1 of rear brake shoe.
(h). Dismount the upper spring 2 of rear brake shoe.
(i). Dismount the rear brake clearance adjuster 3.



(j). Dismount the rear brake cable.
(k). Detach the rear brake shoe plate.

Installation

1. Install the rear brake shoe plate.

(a). The installation sequence is the reverse of the disassembly order.

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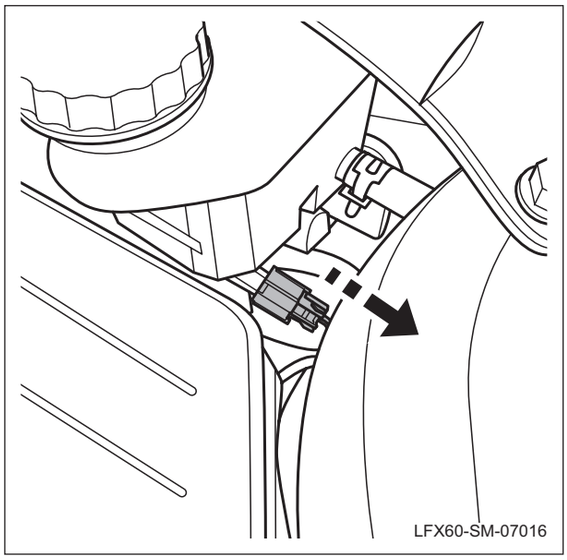
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Replacement of Brake Master Cylinder

Removal

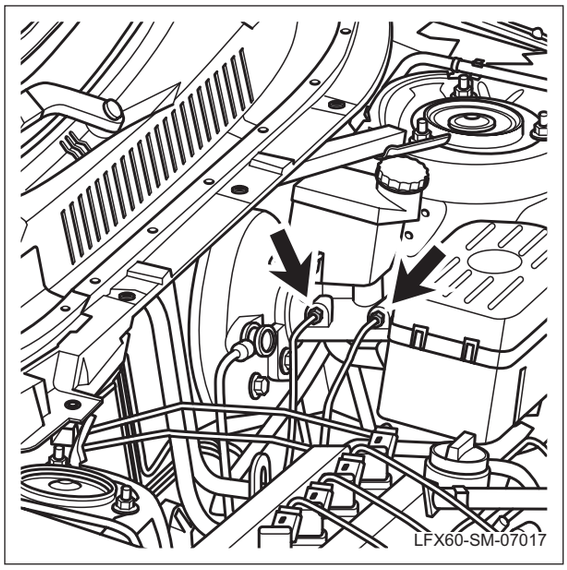
1. Dismount the brake master cylinder.

(a). Disconnect the battery negative connector.



(b). Drain the brake fluid.

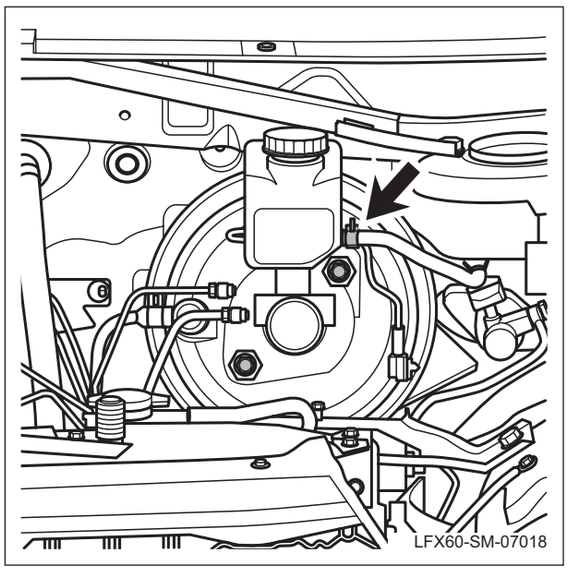
(c). Disconnect the harness connector of brake fluid level sensor.



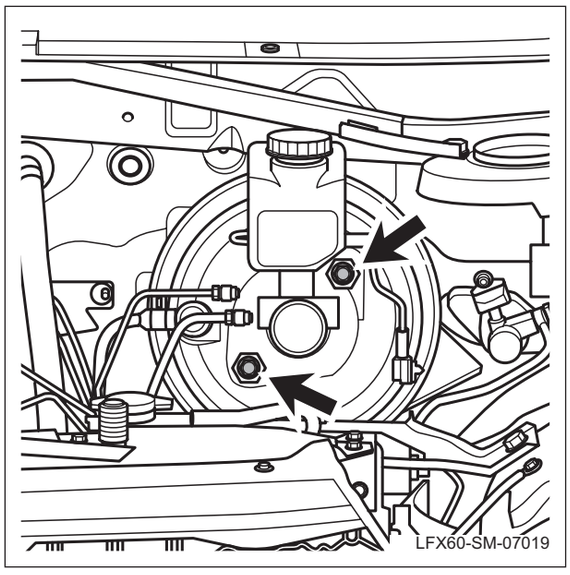
(d). Dismount the brake tube nut of brake master cylinder and disconnect the brake tube.

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(e). Dismount the bar clasp of oil inlet hose of clutch master cylinder and disconnect the hose.



(f). Dismount the tap bolt of brake master cylinder.
(g). Detach the brake master cylinder.

Installation

1. Install the brake master cylinder.

(a). The installation sequence is the reverse of the disassembly order.
(b). Bleed the brake system. **Refer to the brake system bleed procedures.**

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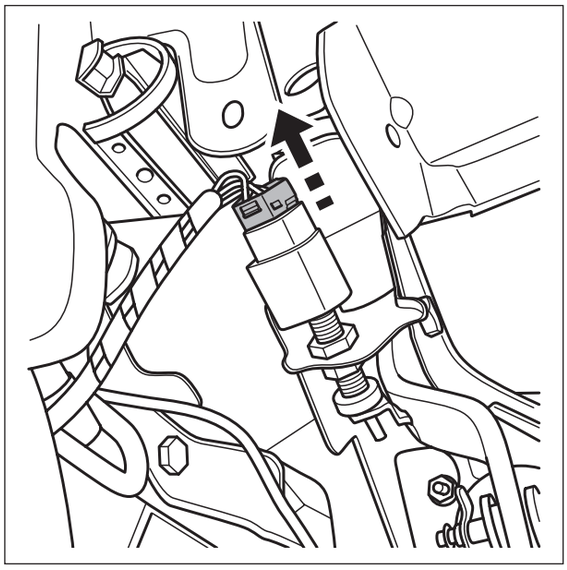
Replacement of Braking Pedal

Removal

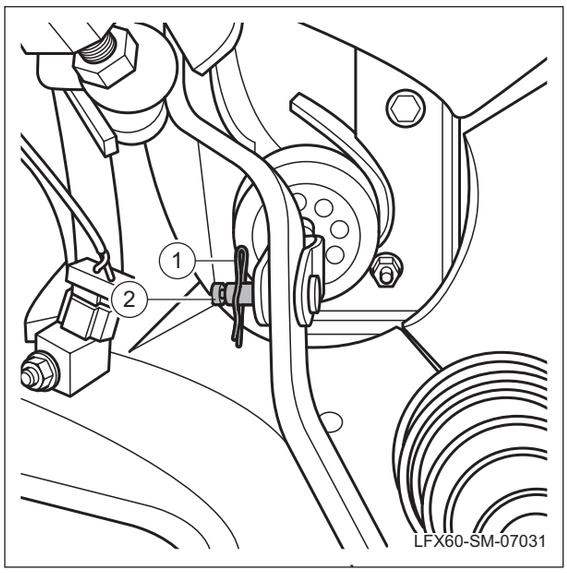
1. Dismount the braking pedal.

(a). Disconnect the battery negative connector.

(b). Remove the dashboard lower left panel assembly. **Refer to the replacement of dashboard assembly.**



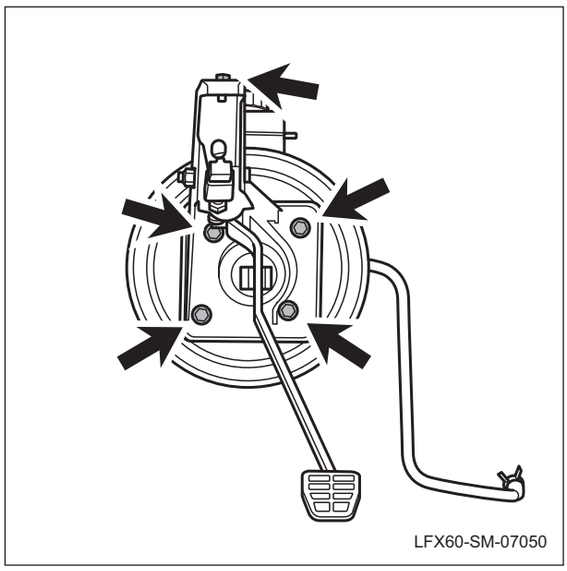
(c). Disconnect the harness plug of braking light switch.



(d). Dismount the pull rod pin 1 of braking pedal and detach the pull rod pin 2.

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(e). Dismount the tap bolt and nut of braking pedal.
(f). Detach the braking pedal.

Installation

1. Install the braking pedal.
(a). The installation sequence is the reverse of the disassembly order.

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Replacement of Vacuum Booster

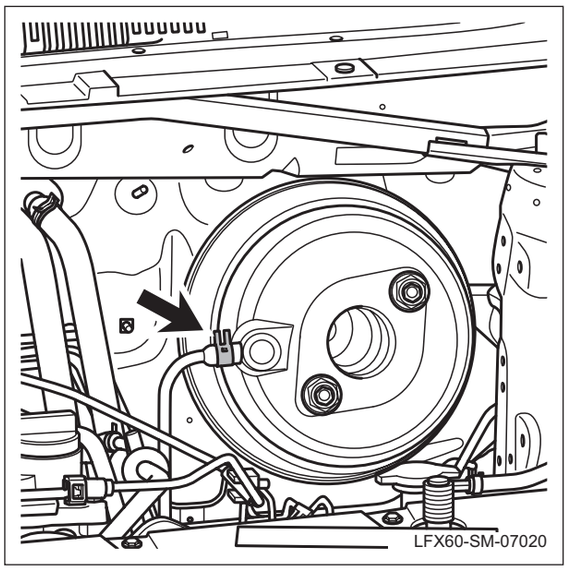
Removal

1. Dismount the vacuum booster.

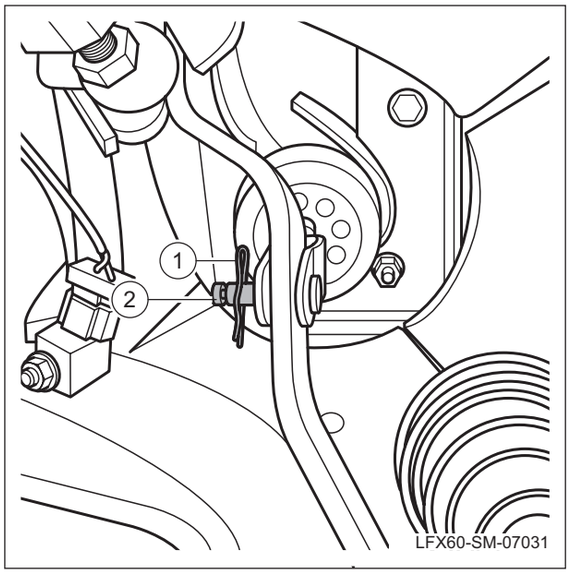
(a). Disconnect the battery negative connector.

(b). Dismount the left low shield assembly of dashboard, **refer to replacement of dashboard assembly**

(c). Dismount the brake master cylinder, **refer to replacement of brake master cylinder.**



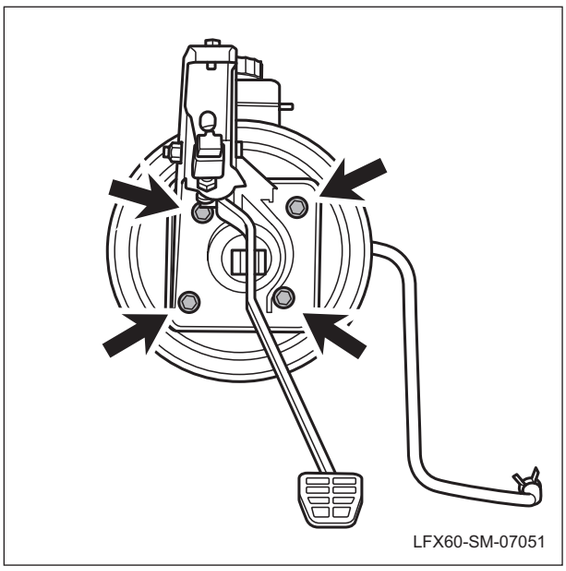
(d). Dismount the bar clasp of vacuum hose and detach the vacuum hose.



(e). Dismount the pull rod pin 1 of braking pedal and detach the pull rod pin 2.

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(f). Dismount the tap bolt and nut of vacuum booster.
(g). Detach the vacuum booster.

Installation

1. Install the vacuum booster.
(a). The installation sequence is the reverse of the disassembly order.
(b). Bleed the brake system. **Refer to the brake system bleed procedures.**

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07 - Brake system

Mechanical parking system 7-1121
Technical specifications 7-1121
Precautions 7-1122
Preparation 7-1123
Structure and installation location 7-1124
General Inspection 7-1125
Operating Principle 7-1126
Diagnostic Information and Procedures .. 7-1127
Removal and installation 7-1133

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Mechanical parking system

Technical specifications

Torque Specifications

Name	Torque range	
	Metric (Nm)	British (lb-ft)
Bolt for parking braking operating gear	23	17
Bolt for parking cable bracket	10	7

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Precautions

Precautions

1. In case that the conventional brake is normal, check and adjust the parking brake.
2. After the parking brake system is repaired, its performance must be tested to ensure its safety and reliability.
3. Before checking the parking brake system, park the vehicle on a level ground and use triangular woods to block the wheels.
4. Do not re-use the removed snap buckles or tie strips.
5. The parking brake cable has a plastic sheath and is not need for regular lubrication.
6. Check regularly. Check once per 10000km driving.

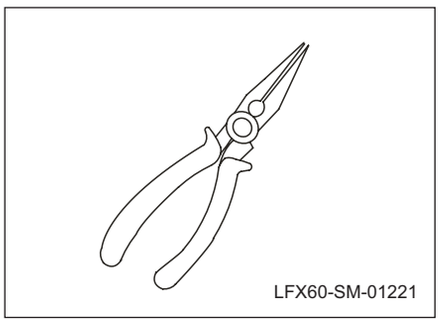
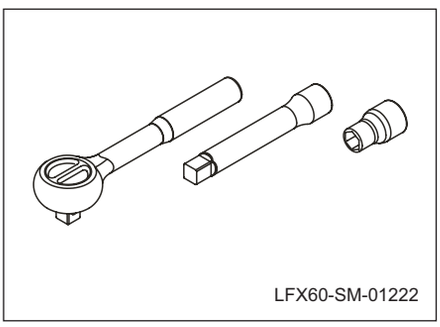
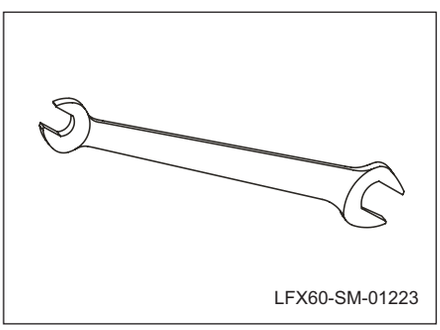
- Check the parking brake for operation.
- Check the stroke of parking braking operating arm
- Check each connection for loosening.
- Check the parking brake system for normal function.

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Preparation

General service tool

No.	Tool name	Tool drawing	Tooling code	Remarks
1	Long nose pliers	 LFX60-SM-01221	-	Remove the parking brake cable rear lock tab
2	Quick wrench and socket components	 LFX60-SM-01222	-	Remove the fxingfixing bolt
3	Open-end wrench	 LFX60-SM-01223	-	Adjust the parking brake cable

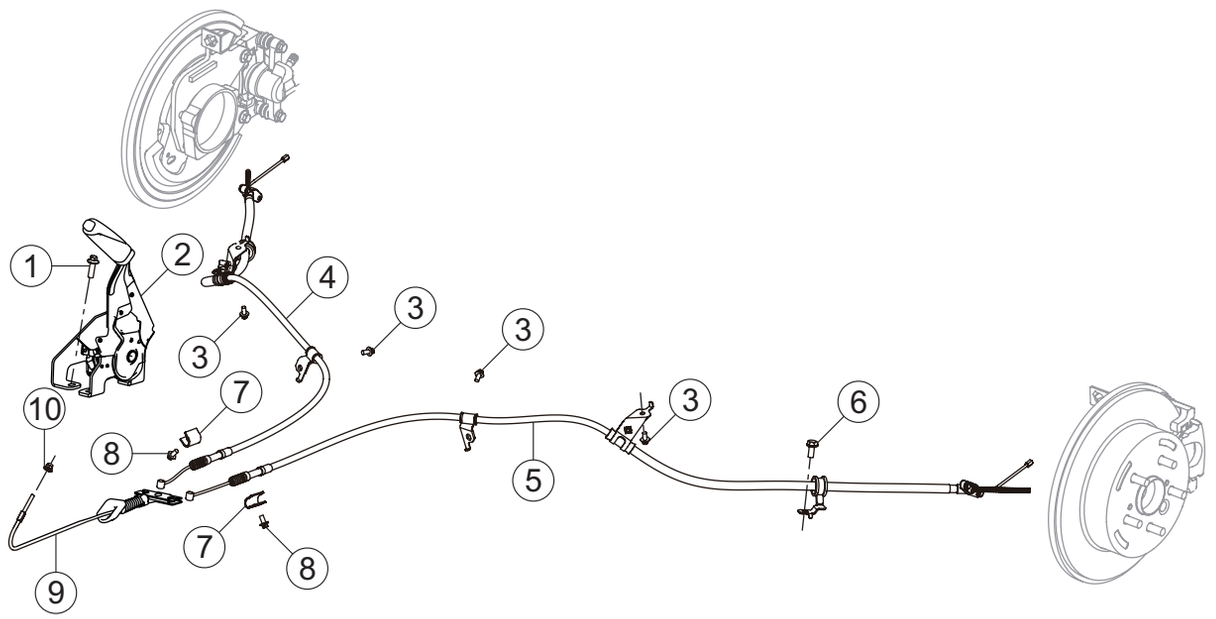
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Structure and installation location

Part exploded view

Parking brake



LFX60-SM-03424

No.	Part name
1	Hexagon flange bolt
2	Assembly of Parking Braking Operating Arm
3	Hexagon head bolt and taper elastic washer assembly
4	Right parking brake cable assembly
5	Left parking brake cable assembly

No.	Part name
6	Hexagon head bolt and taper elastic washer assembly
7	Fixing buckle of parking brake cable
8	Hexagon head bolt, spring washer and plain washer subassembly
9	Front assembly of parking brake cable
10	Hex flange nut

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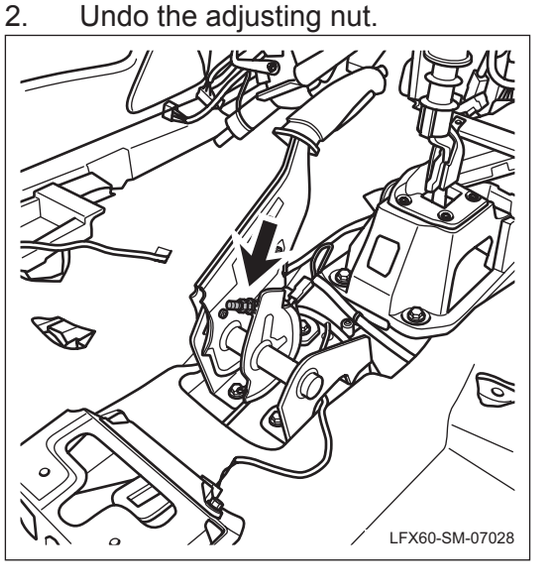
General Inspection

Adjustment of Parking Brake Cable

ℹNote:

Before the diagnosis, ensure the brake system warning indicator lamp is normal.

1. Put down the parking brake handle.
2. Undo the adjusting nut.



3. Ignite and tread hard the braking pedal more than 5 times
4. Pull the parking cable 10 times with all strength, then adjust the cable.

ℹNote:

Adjust to pull up the parking brake handle until the ratch sounds 5-7 times.

5. Tighten the adjusting nut.
6. Test to see if the parking brake is normal.

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Operating Principle

System overview

Function description

The parking brake system can be used for long-term safe parking of the vehicle for and facilitate the start on the ramp; during the vehicle running, if the service brake system is faulty, the parking brake system can be used for emergency braking.

constituent part

The parking brake system consists of the parking brake pedal, cable, brakes and other devices.

Operating Principle

When applying the parking brake, pull the parking lever, to drive the cable to allow the brake to play the parking role.

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Diagnostic Information and Procedures

Diagnosis Instructions

Before diagnosis, first understand and get familiar with the working principle of mechanical parking system. This is helpful to determine the correct procedures of diagnosis when the trouble occurs. More important, it is also helpful to determine if the status described by the client is normal operation.

Any diagnosis for the mechanical parking system shall start from the inspection for the mechanical parking system, then guide the maintenance personnel to take next logic procedure to perform diagnosis.Comprehend and correctly use the diagnostic flow chart to shorten the diagnosis time and avoid the misjudgement.

General equipment

Digital multimeter

Visual Inspection

1. Confirm the problem of the customer.
2. Visually check whether there is any obvious mechanical or electrical damage sign.

Visual inspection table

Mechanical	Electrical
• Parking brake handle • Parking brake cable • Parking brake shoe plate • Return Spring of Brake shoe	• Harness or plug • Parking brake switch

3. If the problem observed or pointed is obvious and the reason is already found, correct the reason first before going to the next step.
4. If for the problem, there are no obvious findings, then confirm the fault and refer to the symptom table.

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List of fault symptoms

Symptom	Possible Cause	Recommended Measures
Parking brake not released (dragging)	• Parking brake cable too tight	• Adjust the parking brake cable **Refer to: adjustment of parking brake cable**
	• Rear shoe plate adjusting clearance too small	• Adjust the rear brake shoe plate. **Refer to: replacement of Parking Brake Cable**
	• Brake cable seizing	• Repair or replace the brake cable.
	• Rear brake plate detaining	• Repair or replace the rear brake shoe plate.
	• Rear brake plate return spring (fatigued and cracked)	• Replace the return spring of brake shoe plate. **Refer to: replacement of rear brake shoe plate**
Parking brake invalid,parking force poor	• Rear brake shoe plate excessively worn	• Replace the rear brake shoe plate. **Refer to: replacement of rear brake shoe plate**
	• Parking brake handle stroke too big	• Adjust the parking brake cable **Refer to: adjustment of parking brake cable**
	• Brake cable seizing	• Repair or replace the parking brake cable. **Refer to: adjustment of parking brake cable**
Parking brake indicator always on	• Harness or plug	**Refer to: diagnosis Procedures for Parking Brake Indicator Always On**
	• Parking brake switch	
	• Instrument cluster	
Ignition switch is ON and when vehicle is parked, the parking indicator is off	• Harness or connector	**Refer to: diagnosis Procedures for Parking Indicator Off When Ignition Switch On and Vehicle Parked**
	• Parking brake switch	
	• Instrument cluster	

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Diagnosis Procedure for Parking Brake Not Released (Dragging)

Test condition	Details/results/measures
1. Check the parking brake handle.	
	A. Check if the parking brake handle is fully released. Is the handle fully released? →**Yes** To step 2. →**No** Adjust the parking brake handle.
2. Check the brake cable.	
	A. Completely release the parking brake lever. B. Check if the parking brake cable detains, is too tight, etc. Is it OK after checking? →**Yes** To step 3. →**No** Adjust or replace the braking cable. **Refer to: adjustment of parking brake cable**
3. Check the rear brake shoe plate control gap.	
	A. Check the rear brake shoe plate retracting spring for falling or fracture. Is it OK after checking? →**Yes** Confirm the repair is finished. →**No** Replace the rear brake shoe plate retracting spring.
4. Check the return spring of rear braking shoe plate.	
	A. Check the rear brake shoe plate retracting spring for falling or fracture. Is it OK after checking? →**Yes** Confirm the repair is finished. →**No** Replace the rear brake shoe plate retracting spring.

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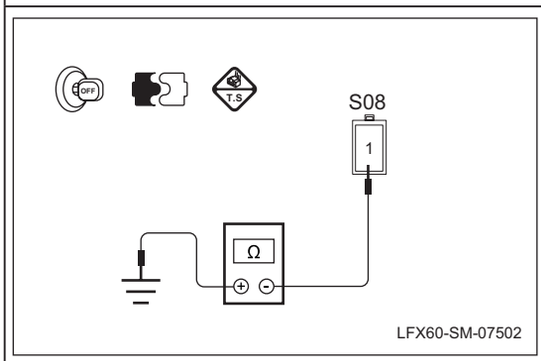
Diagnosis Procedure for Parking Brake Invalid/Braking Force Poor

Test condition	Details/results/measures
1. Check the stroke of parking brake handle.	
	A. Check if the stroke of parking brake handle is normal. Is it OK after checking? →**Yes** To step 2. →**No** Adjust the stroke of parking brake handle. **Refer to: adjustment of parking brake cable**
2. Check the parking brake cable.	
	A. Check if the parking brake cable detains. Is it OK after checking? →**Yes** To step 3. →**No** Repair or replace the parking brake cable. **Refer to:Replacement of Parking Brake Cable**
3. Check the rear brake shoe plate control gap.	
	A. Completely release the parking brake lever. B. Check if the adjusting clearance of rear breaking shoe plate is too big. Is it OK after checking? →**No** To step 4. →**Yes** Re-adjust the clearance of braking shoe plate.
4. Check the rear braking shoe plate.	
	A. Check if the rear braking shoe plate is worn excessively. Is it OK after checking? →**Yes** Confirm the repair is finished. →**No** Replace the rear braking shoe plate. **Refer to: replacement of rear brake shoe plate**

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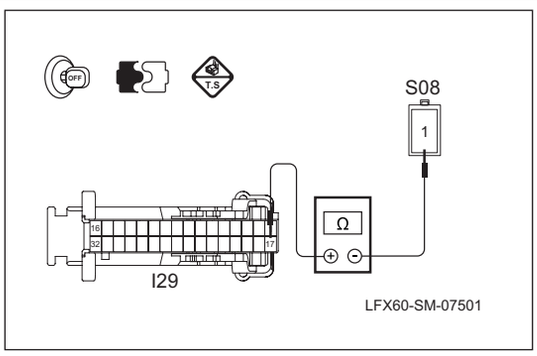
Diagnosis Procedure for Parking Brake Indicator Always On

Test condition	Details/results/measures
1. Check the parking indicator lamp switch.	
	A. Check if the parking braking switch is off when releasing the parking brake handle. Is the switch closed? →**Yes** Repair, adjust or replace the parking brake switch. →**No** To step 2.
2. Check the parking brake switch line.	
 LFX60-SM-07502	A. Operate the ignition switch to turn the power to OFF state.. B. Disconnect the battery negative connector. C. Disconnect the parking brake switch harness plug S08. D. Measure the resistance between No.1 terminal of harness plug S08 of parking braking switch and the reliable grounding with a multimeter. **Standard value: 10MΩ or higher** Is the resistance normal? →**Yes** To step 3. →**No** Repair the parking brake switch line fault and replace the harness if necessary.
3. Check the instrument cluster.	
	A. Replace the instrument cluster. **Refer to: replacement of instrument cluster** Confirm that the fault has been ruled out.

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Diagnosis Procedures for Parking Indicator Off When Ignition Switch On and Vehicle Parked

Test condition	Details/results/measures
1. Check the parking indicator lamp switch.	
	A. Check if the parking braking switch is off when pulling up the parking brake handle. Is the switch closed? →**Yes** To step 2. →**No** Repair, adjust or replace the parking brake switch.
2. Check the parking brake switch line.	
	A. Operate the ignition switch to turn the power to OFF state.. B. Disconnect the battery negative connector. C. Disconnect the parking brake switch harness plug S08. D. Disconnect the instrument cluster harness plug I29. E. Measure the resistance between No.1 terminal of harness plug S08 of parking braking switch and No.17 termianl of harness plug I29 of combination instrument with a multimeter. **Standard value: less than 5Ω** Is the resistance normal? →**Yes** To step 3. →**No** Repair the parking brake switch line fault and replace the harness if necessary.
3. Check the instrument cluster.	
	A. Replace the instrument cluster. **Refer to: Replacement of instrument cluster** Confirm that the fault has been ruled out.

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Removal and installation

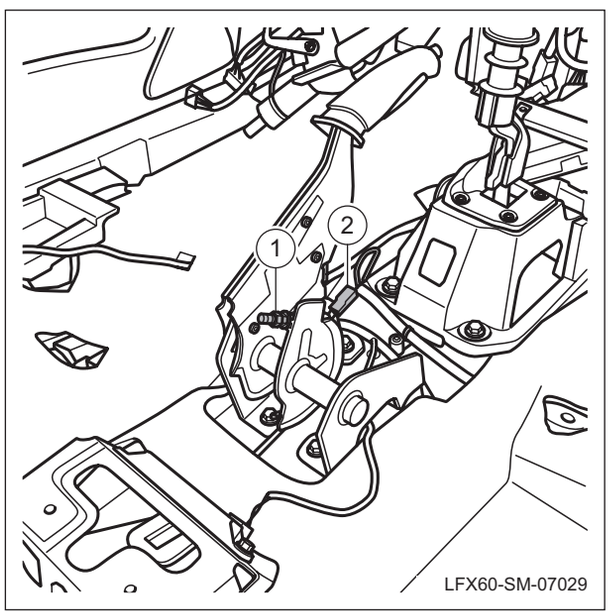
Replacement of Parking Brake Handle

Removal

1. Dismount the parking brake handle.

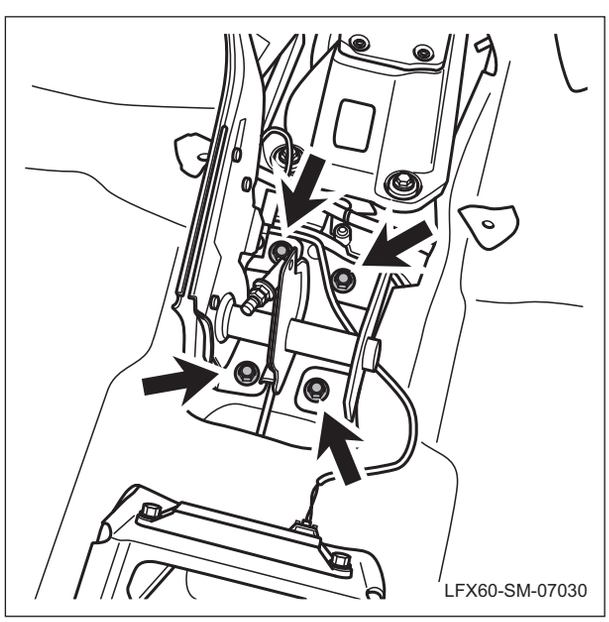
(a). Disconnect the battery negative connector.

(b). Remove the central desk. **Refer to the replacement of central desk assembly.**



(c). Dismount the adjusting nut 1 of parking brake cable.

(d). Diconnect the harness connector 2 of parking brake switch.



(e). Dismount the tap bolt of parking brake handle.

(f). Detach the parking brake handle.

Installation

1. Install the parking brake handle.

(a). The installation sequence is the reverse of the disassembly order.

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Replacement of parking braking cable

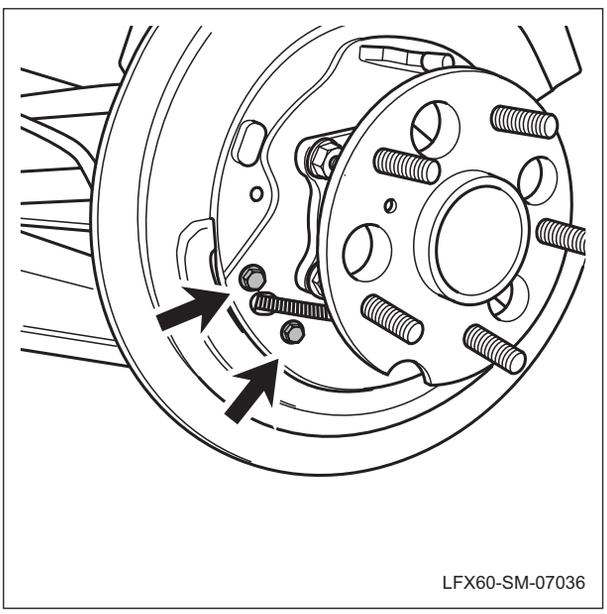
Removal

1. Dismount the parking braking cable.

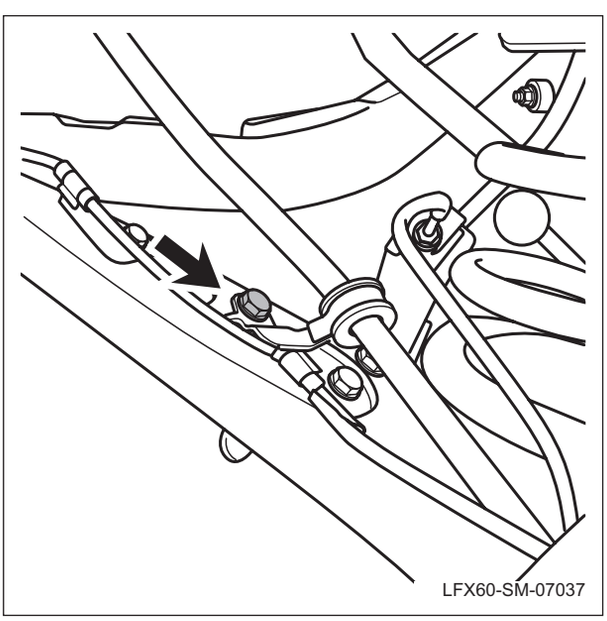
(a). Disconnect the battery negative connector.

(b). Lift the vehicle,**Reference: Vehicle Lifting and Supporting**

(c). Dismount the left and right rear braking shoes, **refer to replacement of Rear Braking Shoe**



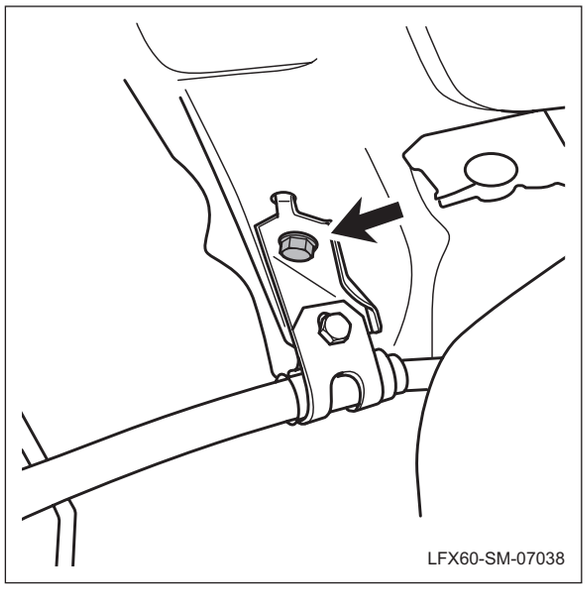
(d). Dismount the tap bolts of left and right parking braking cables.



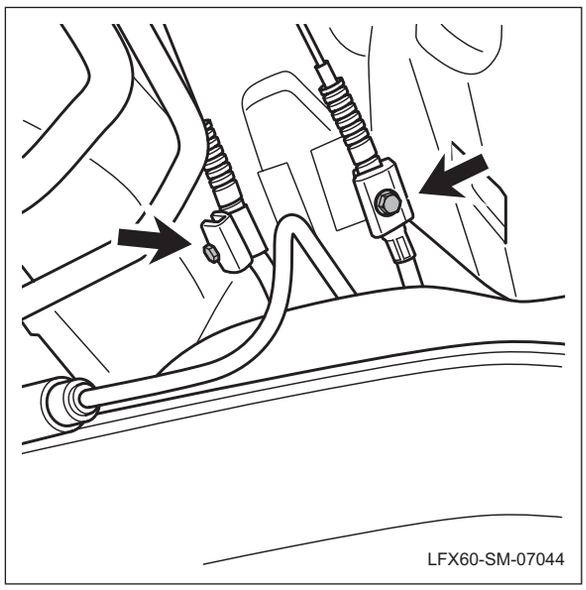
(e). Dismount the tap bolts of left and right parking braking cables.

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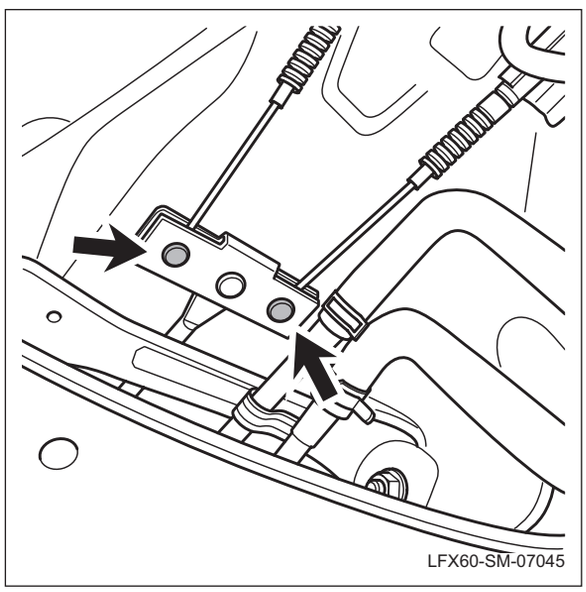
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(f). Dismount the tap bolt of bottom stand of parking braking cable.


LFX60-SM-07044

(g). Dismount the bottom tap bolts of left and right parking braking cables.


LFX60-SM-07045

(h). Release the parking brake handle.
(i). Detach the parking braking cable.

Installation

1. The installation sequence is reverse to the removal sequence.

(a). Adjust the parking cable,**Reference: Adjustment of Parking Cable**

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07 - Brake system

ABS TCS EBD ESP brake system 7-1139

Technical specifications 7-1139

Precautions 7-1140

Preparation 7-1141

Hydraulic schematic diagram 7-1142

General Inspection 7-1144

Removal and installation 7-1210

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ABS TCS EBD ESP brake system

Technical specifications

Torque Specifications

Name	Torque range	
	Metric (Nm)	British (lb-ft)
Tap bolt of ABS/ESP stand	23	17
Connection between brake tube and ABS/ESP control unit, Connecton between brake tube and pipe	16	12

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Precautions

Precautions

1. When the vehicle is powered or the engine starts, there is a short time with the sound of “buzz”. This is the self-inspection of ABS/ESP system. It is a normal phenomenon.
2. Before performing the diagnosis for the ABS/ESP system, make sure the braking system is normal without any trouble.
3. There is sound generated when ABS/ESP system is normally working, which is mainly refl ected in following aspects:

- The sound generated by the actuation of the motor in ABS/ESP control unit, the solenoid and the oil Refl ux pump.
- The sound generated by rebounding of brake pedal.
- The sound generated from the impacting of suspension and body caused by emergency braking.

4. The following two cases show that ABS/ESP system detects a fault:

a. Switch on the ignition and the system self-inspection completes. The ABS/ESP warning lamp keeps on.

b. During driving, the ABS/ESP warnng lamp keeps on all the time.

⚠Warning:

At this point, the driver may make the common brake, but the braking force should be reduced as possible, to prevent the wheels from locking. After the alarm indicator is lit, the vehicle should be driven immediately carefully to the authorized service station for maintenance, in order to prevent the traffic accidents from more faults.

5. The maintenance for the ABS/ESP system must be performed by a mechanics who is specially trained and grasps the maintenance skills. The parts for replacement must be from the original factory.
6. Attentions shall be paid to the following points when connecting the harness of ABS/ESP electrical control unit and wheel speed sensor:

a. Before unplugging the harness of ABS/ESP electrical control unit and wheel speed sensor, put the ignition status of vehicle at OFF and disconnect the negative pole of storage battery.

b. Make sure the connectors dry and clean to aviod any foreign object from getting into.

c. The connection for the harness of ABS/ESP electrical control unit must be installed in place along the horizontal and vertical directions.

7. When connecting the braking pipeline of ABS/ESP electrical control unit, make sure the connection correct. The ABS/ESP electrical control unit cannot judge if the braking pipeline is connected correctly. The incorrect connection may lead to serious accidents.
8. The ABS/ESP control unit can only be replaced entirely. It cannot be dismounted or replaced/exchanged partially. Lifan does not provide individual spare parts and guarantee for the disassembled ABS/ESP control unit. For dismounted or partially replaced/exchanged ABS/ESP control unit, Lifan is not responsible for any bad result. After the maintenance of ABS/ESP system, it must be tested to eliminate the trouble thoroughly before delivering it to the client.

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Preparation

General and special tools

No.	Tool name	Tool drawing	Tooling code	Remarks
1	Vehicle diagnosis	 LFX60-SM-02802	-	Read system error code, data stream, etc.

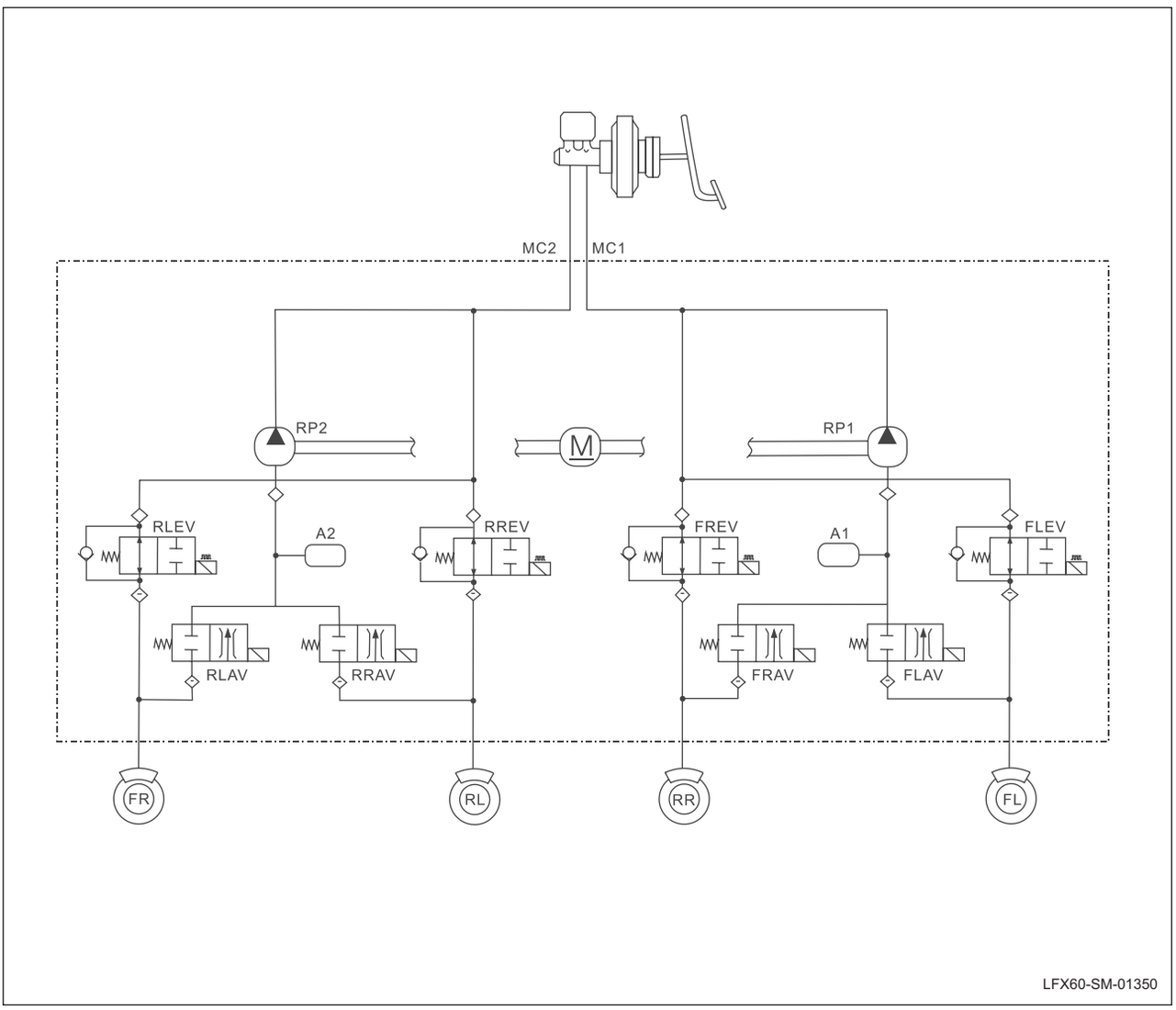
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Hydraulic schematic diagram

Hydraulic schematic diagram

ABS Hydraulic schematic diagram



LFX60-SM-01350

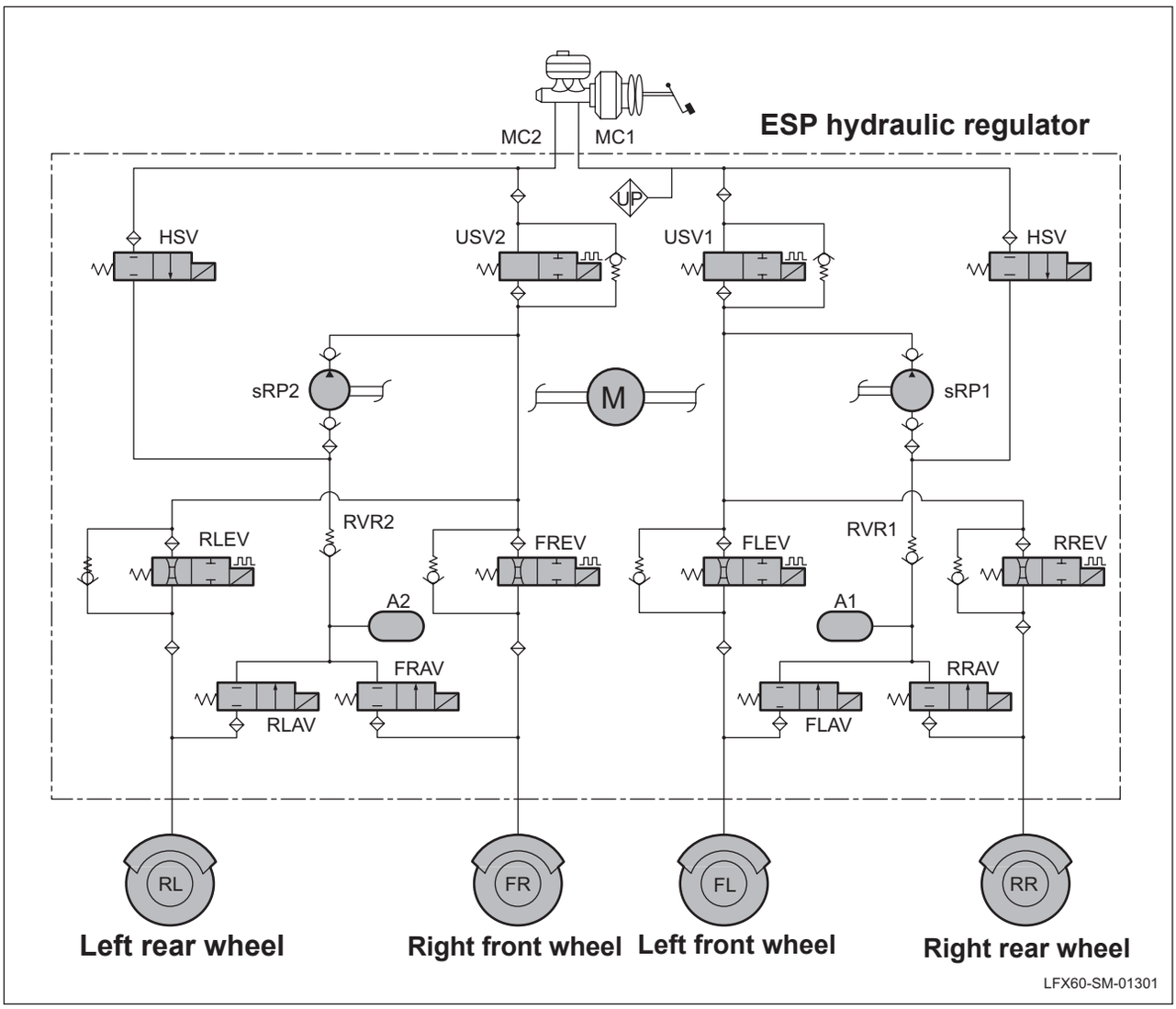
No.	Part name
MC1	Brake master cylinder first circuit
MC2	Brake master cylinder second circuit
M	Motor
RP1	Return pump 1
RP2	Return pump 2
A1	Accumulator 1
A2	Accumulator 2
FL	Left front wheel
FR	Right front wheel
R	Left rear wheel

No.	Part name
RR	Right rear wheel
FLEV	Front left wheel oil inlet valve
FLAV	Front left wheel oil outlet valve
FREV	Front right wheel oil inlet valve
FRAV	Front right wheel oil outlet valve
RLEV	Rear left wheel oil inlet valve
RLAV	Rear left wheel oil outlet valve
RREV	Rear right wheel oil inlet valve
RRA	Rear right wheel oil outlet valve

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ESP Hydraulic schematic diagram



No.	Part name
MC	Master cylinder
HU	Hydraulic unit
HSV	high-pressure valves
USV	Loop control valve
M	Reflux pump motor

No.	Part name
sRP	Reflux pump
EV	Input valve
AV	Output valve
A	Accumulator
UP	Pressure sensor

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General Inspection

Road Test

⚠Warning:

The mechanic for road test must be trained and has good driving skills.

Performing the road test is to compare the actual braking function of vehicle with the standard braking fucntion expected by the driver.The capability of correctly comparing and judging the braking function depends on the experience of mechanics. The mechanics must have ccomplete knowledge of working principles of braking system and been guided systematically so as to correctly compare and find the problems.

Confirm if the vehicle meets the following conditions before the road test.

- The tires are not worn excessively and the patterns of left and right tires are almost the same.
- The tire pressue is within the specified range.
- The wheel positioning is accurate.
- The brake fluid level is normal.
- The working indicator of braking system is normal and does not have any error code.

The road test must be performed on a dry, clean and relatively flat road. An experienced mechanics will select a route suitable for the braking diagnosis of road test. The surface of road shall be flat, not have gravel or rough. It is mainly because gravel and rough surface make the adhesions beween the tires and road surface are different. The arched road surface is not suitable too because the weight of vehicle body concentrates mostly on the two lower wheels. Once the route is determined and used often, the factor of road shall not be considered.

Before the road test, firstly understand the trouble described by the client. According to the description, the mechanics connects the possible reasons with the symptoms. Some of parts will be regarded as suspect reasons while the others will be eliminated. More important is to check or eliminate unsafe hidden problems before the road test according to the description of client. The description of client is also helpful to focus the problem on specific parts, speed or status and determine the method of road test.

The road test shall start from the inspection of general braking function. According to the description of client, check the braking under different speeds with different treading forces on the pedal. When determining the problem in the front or rear braking system, first use the pedal braking, then use the parking braking. If the symptoms (dragging, vibrating,bouncing rhythmically) only occur during parking braking, it means the problem is in the rear braking system.

During the road test, avoid the braking from locking. This does not mean the braking is valid. Powerful braking while keeping the wheels rotating can stop the vehicle in shorter distance than braking locking.

If the problem is obvious in the test, confirm the problem is the same as the description. If the problem is not obvious, use the information in the description, try to reproduce the status.

If the problem exisits, use the diagnosis list to define the problem in the specific sub-system and relevant status description. Use the described pheonomenon to shorten the list of possible reasons to specific parts or status.

Inspection of Hydraulic Leakage

ℹNote:

In normal situation, with the wearing of brake-block, the level of brake fluid descends gradually. If the brake-block wearing exceeds the specification, it will cause the brake fluid level too low. If the wearing of brake-block is within the specification and the level of brake fluid is too low, it means the system leaks.

ℹNote:

If the vehicle drives in the rain or in the snow, the leaked mark may be washed off because the brake fluid is water soluble.

Please check according to the method below.

a. Confirm if the brake fluid level is too low or descends too fast.
b. Check the appearance for the mark of brake fluid leakage.
c. Dismount the front wheel, refer to: replacement of Tire.
d. Check the leakage of front brake cylinder and the wearing of brake-block.
e. Discmount the brake master cylinder, refer to: replacement of Brake Master Cylinder.
f. Check the leakage of piston seal of brake master cylinder.
g. Repair the possible troubles above and exhaust the braking system.

Inspection of Braking Pedal Stroke Allowance

When feeling the stroke of braking pedal is too much or reaches the bottom during braking, check the braking pedal stroke allowance.

a. Put the transmission at idling, pull up the parking brake and run the engine at idling.
b. Tread the braking pedal 3-4 times lightly.
c. Keep 15s to compensate the vacuum of booster.

ℹNote:

Resistance increases and feel the pedal reaches the bottom.

d. Tread the braking pedal until it stops moving downward or the resistance does not increase.

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e. Tread the braking pedal to increase the engine to 2,000rpm.

ℹNote:

The increase in the vacuum of engine intake manifold makes the braking pedal descend (additioanl movement).

f. Release the accelerating pedal and observe the braking pedal descending when the engine speed reduces to idling.

Inspection of Vacuum Booster

a. Check if the brake fluid level is normal.
b. Put the transmission at idling, pull up the parking brake and run the engine (idling).
c. Switch off the engine, tread and release the braking pedal several times to eliminate the vacuum in the system. Then tread the braking pedal and hold it.
d. Start the engine. If the vacuum system acts, the braking pedal moves downward. If not feeling the pedal descending, the vacuum boosting system does not act.
e. Detach the vacuum hose at one side of vacuum booster. When the engine works at idling, the vacuum in the intake manifold acts in the end of hose vacuum booster. Feel it with the hands or measure it with a vacuum meter. If there is no vacuum or it is very small, check if the vacuum hose is blocked, sealed or leaks. Make sure all the unused outlets of vacuum tube are blocked, the joints are ok and the vacuum tube is normal. It means the vacuum in the intake manifold acts. Reconnect the vacuum hose to the vacuum booster and repeat Step (d). If still not feeling the braking pedal descending, replace the vacuum booster.
f. Run the engine for 10s at 1,000rpm. Switch off the engine for 10min. Tread the braking pedal hard. The feel for the braking pedal shall be the same as the engine works (boosting normal).
g. If the feel for the braking pedal is hard, check and confirm the check valve of vacuum hose is normal. If the trouble still exists when re-testing, replace the vacuum booster.
h. If the feel for the braking pedal is soft, exhaust the braking system.

Inspection of Brake Master Cylinder

ℹNote:

Before diagnosis, make sure the brake fluid level and warning indicator work normally and there is no any error code in the braking system.

Normally, the earliest and most powerful method for any trouble in the braking system is the feel to the braking pedal. When diagnosing the trouble in the brake master cylinder, check the feel of braking pedal and use it as the evidance for the braking problem. Check the brake warning indicator flash and brake fluid level.

Normal situation

In general, the changes in the braking pedal feel or stroke indicate there may be problems in the braking system. However, the status below normal and it does not indicate the brake master cylinder may need to be repaired:

- New braking system design differs from the previous one. The force required for treading the braking pedal is relatively light.
- When the brake works normally, the brake fluid level shall descend. When the brake is released, the level rises.The total brake fluid does not change.
- The mastr cylinder is fixed on the housing of brake booster. There is marks of brake fluid.
- The brake fluid level height descends when the brake-block is worn.

Abnormal Situation

The changes in the braking pedal feel or stroke indicate there may be problems in the braking system. The status below is abnormal and it indicates the brake master cylinder may need to be repaired.

Symptom	Brake master cylinder
Tread the braking pedal. It rapidly descends.	• External leakage (cracking, joint, seal component)
Tread and keep the braking pedal. It slowly descends.	• External leakage • Internal leakage (seal components in the master cylinder aged)
Tread the braking pedal. It is too low or feels soft.	• Fuel feed hole or vent of storage tank blocked. • Air in the hydraulic system
The braking pedal returns too slow.	• Compensate opening blocked • Master cylinder spring broken (fatigued)
Tread the braking pedal slightly. Rear braking locked	• ABS system
Brake pedal stroke oversize	• Internal leakage

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Bypass Status Test

Observe the level in the liquid storage kettle of brake master cylider. If the brake fluid level maintains no change after treading the braking pedal several times, measure the torque required for the wheel rotating backward when braking acts as follows

a. Lift the vehicle. **Reference: Vehicle Lifting and Supporting**

b. Tread the braking pedal with a force of 445N and hold it for about 15s. When the braking still acts, apply certain torque on the wheel. If any wheel rotates, replace the brake master cylinder.

Leakage not Due to Pressure

Any status when there is no oil in the liquid storage kettle of brake master cylinder may be caused by two kinds of leakage not due to pressure

Type 1: The liquid storage kettle cap of brake master cylinder may leak externally because of incorrect positions of the pad and cap.

Type 2: The gasket of brake fluid tank may leak externally. Install a new seal to prevent such kind of leakage.

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Diagnostic Information and Procedures

Diagnosis Instructions

Before diagnosis, first understand and get familiar with the working principle of ABS/ESP system. This is helpful to determine the correct procedures of diagnosis when the trouble occurs. More important, it is also helpful to determine if the status described by the client is normal operation.

Any diagnosis for the ABS/ESP system shall start from the inspection for the ABS/ESP system, then guide the maintenance personnel to take next logic procedure to perform diagnosis. Comprehend and correctly use the diagnostic flow chart to shorten the diagnosis time and avoid the misjudgement.

General equipment

Name
Diagnostic equipment of vehicle
Digital multimeter

Visual Inspection

Note:

Before the diagnosis, ensure the brake system warning indicator lamp is normal.

1. Confirm the problem raised by the customer.
2. Check the evident mechanical faults and hydraulic faults.

Visual inspection table

Mechanical	Electrical
• Wheel speed sensor	• Fuse • Line • ABS/SEP

3. Check the system lines easy to see or can be seen.
4. If the observed or raised problem is the evident and the cause has been found, ensure to fix this fault before proceeding with the next step.
5. If no problem is found through the visual check, confirm the fault and refer to the fault symptom list.

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List of fault symptoms

Symptom	Possible reasons	Recommended Measures
Intermittent fault	• Clear DTC	**Refer to: troubleshooting process for intermittent failure**
	• Carry out the simulation test	
	• Check and shake the harness, joint and terminal	
ABS warning lamp always on	• Harness plug	**Refer to: ABS warning lamp always on**
	• Wheel speed sensor	
	• ABS module	
	• Instrument cluster	
ABS function invalid	• Fuse	• Replace the fuse
	• Harness plug	• Check or replace the harness
	• Wheel speed sensor	• Replace the wheel speed sensor. **Refer to:Replacement of Wheel Speed Sensor**
	• ABS module	• Replace the ABS control module **Refer to:Replacement of ABS/ESP Control Module**

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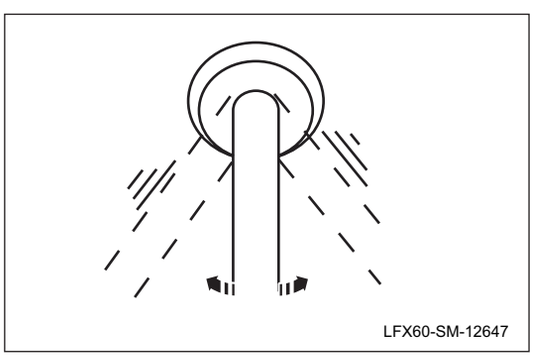
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Intermittent fault diagnostic flow

ℹNote:
- **Clear DTC.**
- **Carry out the simulation test.**
- **Check and shake the harness and harness plug.**

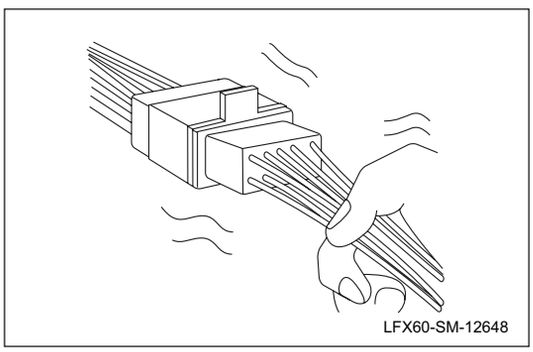
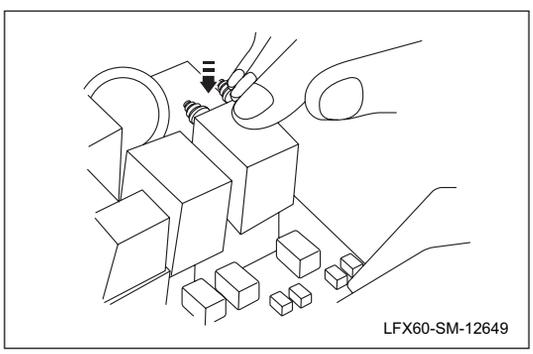
When the fault cannot be confirmed in DTC check, the fault may occur in use occasionally. At this point, check all the lines and parts which may cause the fault.In many cases, the basic inspection shown in the flow chart below can quickly and effectively locate the fault parts, in particular the loose contact of harness plug.

Fault definition: There is no the fault at present, but the history fault diagnosis code indicates that the fault has occurred. Or the customer reports this fault while the fault does not relate to the DTC and the fault symptom cannot be reproduced currently.

Test condition	Details/results/measures
1. Vibration method	
	A. If the fault occurs or the fault is more severe or the engine vibration occurs when the vehicle is running on the rough road, go to Step 2. **ℹNote:** **Several causes can result in the vehicle or engine vibration fault. Check the following:** 1. The plug is not inserted in position. 2. There is no sufficient gap for the harness. 3. The harness layout passes across the bracket or moving parts. 4. The harness is arranged too near to the high temperature parts. 5. The wiring is incorrect, not clamped or the loose harness causes the wiring pinched between parts. 6. The plug joints, vibration parts and the harness passing positions should be checked as the key points. For example, the harness passing through the fire wall and bodywork plate.
2. Method of checking the switch plug or harness.	
 LFX60-SM-12647	A. Connect the diagnostic equipment to the diagnostic interface. B. Operate the ignition switch to turn the power to ON state (shut down the engine). C. Access the data flow of the switch you are checking. D. Turn on the switch manually. E. While monitoring the data stream, gently shake each plug or harness horizontally and horizontally. F. If the data stream value is instable, check whether the contact is loose.

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Test condition	Details/results/measures
3. Method of checking the sensor plug or harness.	
 LFX60-SM-12648	A. Connect the diagnostic equipment to the diagnostic interface. B. Operate the ignition switch to turn the power to ON state (shut down the engine). C. Access the data flow of the switch you are checking. D. While monitoring the data stream, gently shake each plug or harness horizontally and horizontally. E. If the data stream value is instable, check whether the contact is loose.
4. Method of checking the actuator or relay.	
 LFX60-SM-12649	A. Connect the diagnostic equipment to the diagnostic interface. B. Operate the ignition switch to turn the power to ON state (shut down the engine). **ⓘNote:** **If the engine is started, perform the following steps during its operation in idling mode.** C. Prepare the output status control function well for the actuator or relay you are checking. D. After the output status control function is activated, use a finger to vibrate the actuator or relay 3s. If you hear an unstable "click" sound, check for any improper connection or improper installation of the actuator and/or relay. **ⓘNote:** **A strongly vibrating relay may cause the relay to be disconnected.**
5. Simulate the fault by the road test and read the data stream.	
	A. Connect the diagnostic equipment to the diagnostic interface. B. Simulate the fault by the road test and read the data stream. C. If the data stream value is instable or the malfunction occurs, repair or replace the parts.

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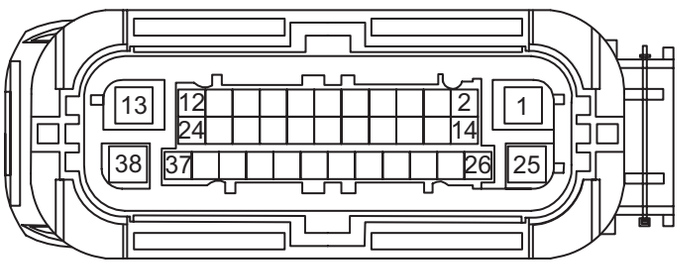
Diagnostic Procedures for ABS Warning Lamp Always On

Test condition	Details/results/measures
1. General inspection.	
	A. Check if the ABS/ESP module harness plug is broken, in poor contact, aged, loose, etc. Is it OK after checking? →**Yes** To step 2. →**No** Repair the fault position.
2. Check if there is any error code in the ABS.	
	A. Connect the diagnostic equipment. B. Operate the ignition switch to turn the power to ON state. C. Enter into the ABS system and check if there is any error code in the system. Is there a trouble code? →**No** To step 3. →**Yes** Carry out the relevant fault diagnosis according to the DTC.
3. Check the vehicle communication system.	
	A. Check whether the vehicle communication system is normal. Is it OK after checking? →**Yes** To step 4. →**No** Check the communication system for fault.
4. Check the ABS control module.	
	A. Replace the ABS control module. **Refer to: replacement of ABS/ESP module** Is the fault solved? →**Yes** Replace the ABS control module →**No** To step 5.
5. Check the instrument cluster.	
	A. Replace the instrument cluster. **Refer to: replacement of instrument cluster** Confirm the fault is solved

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Control module terminal list



U10

LFX60-SM-07516

Terminal No.	Wire diameter/color	Terminal description
U10-01	4.00 R	Power source
U10-02	0.30 P/G	Wheel speed signal output
U10-03	-	-
U10-04	0.50 Br/O	Right front wheel speed sensor signal
U10-05	-	-
U10-06	-	-
U10-07	-	-
U10-08	0.50 Br/Gr	Left front wheel speed sensor signal -
U10-09	-	-
U10-10	-	-
U10-11	-	-
U10-12	0.30 Y/R	ESP switching signal
U10-13	4.00 B	Grounding
U10-14	0.30 Bl/W	PCAN-L
U10-15	-	-
U10-16	0.50 Br/B	Right front wheel speed sensor signal +
U10-17	0.50 Br/W	Right rear wheel speed sensor signal +
U10-18	0.50 Br/G	Left rear wheel speed sensor signal -
U10-19	0.50 Br/Bl	Left front wheel speed sensor signal +
U10-20	0.50 O/W	Yaw rate sensor signal-
U10-21	-	-
U10-22	-	-

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Terminal No.	Wire diameter/color	Terminal description
U10-23	-	-
U10-24	-	-
U10-25	2.50 BI/R	Power source
U10-26	0.30 BI/B	PCAN-H
U10-27	-	-
U10-28	0.50 R/W	Power source
U10-29	0.50 Br/Y	Right rear wheel speed sensor signal -
U10-30	0.50 BI/W	Brake signal input
U10-31	0.50 Br/P	Left rear wheel speed sensor signal +
U10-32	-	-
U10-33	0.50 O/B	Yaw rate sensor signal +
U10-34	-	-
U10-35	-	-
U10-36	-	-
U10-37	-	-
U10-38	2.50 B ,	Grounding

AutoLibrary

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DTC list

DTC	DTC information
C190004	ECU voltage high
C190104	ECU voltage too low
C100004	ECU error (hardware, microcontroller error)
C101008	ECU error (common software problem)
C006B06	ABS/ESP abnormal control (too long control time etc.)
C003108	Front left wheel speed sensor signal error (off-limit, loss, disturbance, discontinuity)
C003200	Front left wheel speed sensor: signal line short to ground/open circuit: power line open circuit
C00A000	Front left wheel speed sensor power line short to ground
C00A100	Front left wheel speed sensor signal line short to battery
C00A900	Front left wheel speed sensor common error
C003408	Front right wheel speed sensor signal error (off-limit, loss, disturbance, discontinuity)
C003500	Front right wheel speed sensor: signal line short to ground/open circuit: power line open circuit
C00A200	Front right wheel speed sensor power line short to ground
C00A300	Front right wheel speed sensor signal line short to battery
C00AA00	Front right wheel speed sensor common error
C003708	Rear left wheel speed sensor signal error (off-limit, loss, disturbance, discontinuity)
C003800	Rear left wheel speed sensor: signal line short to ground/open circuit: power line open circuit
C00A400	Rear left wheel speed sensor power line short to ground
C00A500	Rear left wheel speed sensor signal line short to battery
C00AB00	Rear left wheel speed sensor common error
C003A08	Rear right wheel speed sensor signal error (off-limit, loss, disturbance, discontinuity)
C003B00	Rear right wheel speed sensor: signal line short to ground/open circuit: power line open circuit
C00A600	Rear right wheel speed sensor power line short to ground
C00A700	Rear right wheel speed sensor signal line short to battery
C00AC00	Rear right wheel speed sensor common error
C109904	General error of wheel speed sensor (sensor position exchanged, multiple sensor errors)
C004460	Pressure sensor error (signal)
C004510	Pressure sensor error (line)
C004008	Braking light switch error, not clear
C006108	Transverse acceleration sensor: signal error
C006208	Longitudinal acceleration sensor: signal

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DTC	DTC information
C006308	Yaw rate sensor: signal error
C019604	Yaw rate sensor group variety error (hardware fault, temperature, range, internal error)
C00A800	Yaw rate sensor group variety calibrated or calibration failure
C006102	Lateral acceleration sensor of external yaw rate sensor cluster: signal error
C006202	Longitudinal acceleration sensor of external yaw rate sensor cluster: signal error
C006302	Yaw rate sensor of external yaw rate sensor cluster: signal error
U012308	Lose contact with yaw rate sensor module
U051308	Invalid data from yaw rate sensor module
U000500	CAN bus voltage high
U000700	CAN bus voltage too low
C100104	CAN hardware error
U000104	CAN bus close error
U100104	CAN passive error
C106600	Steering angle sensor calibrate error
C046008	Steering angle sensor error (signal)
U012604	Lose contact with steering angle sensor
U012608	SAS data broken (data length control, cyclic redundancy code verification, real-time counter error)
C001004	Valve error, front left inlet valve
C001104	Valve error, front left outlet valve
C001404	Valve error, front right inlet valve
C001504	Valve error, front right outlet valve
C001804	Valve error, front left inlet valve
C001904	Valve error, front left outlet valve
C001C04	Valve error, rear right inlet valve
C001D04	Valve error, rear right outlet valve
C000104	Valve error, USV1
C000204	Valve error, USV2
C000304	Valve error, HSV1
C000404	Valve error, HSV2
C109504	Valve relay error
C002004	Return pump error
C007208	General valve error (high temperature protection, invalid signal, hardware fault)
C104C04	PATA switch error

AutoLibrary

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DTC	DTC information
C121208	Variable code error
C108C08	Reverse gear switch signal normally high/low
U015504	Lose contact with instrument
U042308	Data from IC invalid (the data length control, CRC, real time counter error)
U014004	Lose contact with BCM
U014008	BCM data invalid (the data length control, CRC, real time counter error)
U010004	Lose communication with EMS1
U030104	Lose communication with EMS2
U010008	EMS data broken (data length control, cyclic redundancy code verification, real-time counter error /EMS signal invalid)
U010104	Lose contact with TCU1
U030204	Lose contact with TCU2
U010108	TCU data broken (data length control, cyclic redundancy code verification, real-time counter error /EMS signal invalid)

AutoLibrary

AutoLibrary

DTC diagnosis flow index

DTC	Description	Diagnostic process
C003108	Front left wheel speed sensor signal error (off-limit, loss, disturbance, discontinuity)	**Refer to: DTC C003108, C003200, C00A000, C00A100, C00A900, C003408, C003500, C00A200, C00A300, C00AA00, C003708, C003800, C00A400, C00A500, C00AB00, C003A08, C003B00, C00A600, C00A700, C00AC00, C109904**
C003200	Front left wheel speed sensor: signal line short to ground/open circuit: power line open circuit	
C00A000	Front left wheel speed sensor power line short to ground	
C00A100	Front left wheel speed sensor signal line short to battery	
C00A900	Front left wheel speed sensor common error	
C003408	Front right wheel speed sensor signal error (off-limit, loss, disturbance, discontinuity)	
C003500	Front right wheel speed sensor: signal line short to ground/open circuit: power line open circuit	
C00A200	Front right wheel speed sensor power line short to ground	
C00A300	Front right wheel speed sensor signal line short to battery	
C00AA00	Front right wheel speed sensor common error	
C003708	Rear left wheel speed sensor signal error (off-limit, loss, disturbance, discontinuity)	
C003800	Rear left wheel speed sensor: signal line short to ground/ open circuit: power line open circuit	
C00A400	Rear left wheel speed sensor power line short to ground	
C00A500	Rear left wheel speed sensor signal line short to battery	
C00AB00	Rear left wheel speed sensor common error	
C003A08	Rear right wheel speed sensor signal error (off-limit, loss, disturbance, discontinuity)	
C003B00	Rear right wheel speed sensor: signal line short to ground/open circuit: power line open circuit	
C00A600	Rear right wheel speed sensor power line short to ground	
C00A700	Rear right wheel speed sensor signal line short to battery	
C00AC00	Rear right wheel speed sensor common error	
C004460	Pressure sensor error (signal)	**Refer to: DTC C004460, C004510**
C004510	Pressure sensor error (line)	
C00400	Braking light switch error, not clear	**Refer to: DTC C0040**

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DTC	Description	Diagnostic process
C190004	ECU voltage high	**Refer to: DTC C190004, C190104**
C190104	ECU voltage too low	
C100004	ECU error (hardware, microcontroller error)	**Refer to: DTC C100004, C101008, C006B06**
C101008	ECU error (common software problem)	
C006B06	ABS/ESP abnormal control (too long control time etc.)	
C006108	Transverse acceleration sensor: signal error	**Refer to: DTC C006108, C006208**
C006208	Longitudinal acceleration sensor: signal error	
C006308	Yaw rate sensor:Signal error	**Refer to: DTC C006308, C019604, C00A800, C006102, C006202, C006302, U012308, U051308**
C019604	Yaw rate sensor group variety error (hardware fault, temperature, range, internal error)	
C00A800	Yaw rate sensor group variety calibrated or calibration failure	
C006102	Lateral acceleration sensor of external yaw rate sensor cluster: signal error	
C006202	Longitudinal acceleration sensor of external yaw rate sensor cluster: signal error	
C006302	Yaw rate sensor of external yaw rate sensor cluster: signal error	
U012308	Lose contact with yaw rate sensor module	
U051308	Invalid data from yaw rate sensor module	
U000500	CAN bus voltage high	**Refer to: DTC C100104, U000500, U000700, U000104, U100104**
U000700	CAN bus voltage too low	
C100104	CAN hardware error	
U000104	CAN bus close error	
U100104	CAN passive error	
C106600	Steering angle sensor calibrate error	**Refer to: DTC C106600, C046008, U012604, U012608**
C046008	Steering angle sensor error (signal)	
U012604	Lose contact with steering angle sensor	
U012608	SAS data broken (the data length control, CRC, real time counter error)	

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DTC	Description	Diagnostic process
C001004	Valve error, front left inlet valve	**Refer to: DTC C001004, C001104, C001404, C001504, C001804, C001904, C001C04, C001D04, C000104, C000204, C000304, C000404, C109504, C002004, C007208**
C001104	Valve error, front left outlet valve	
C001404	Valve error, front right inlet valve	
C001504	Valve error, front right outlet valve	
C001804	Valve error, front left inlet valve	
C001904	Valve error, front left outlet valve	
C001C04	Valve error, rear right inlet valve	
C001D04	Valve error, rear right outlet valve	
C000104	Valve error, USV1	
C000204	Valve error, USV2	
C000304	Valve error, HSV1	
C000404	Valve error, HSV2	
C109504	Valve relay error	
C002004	Return pump error	
C007208	General valve error (high temperature protection, invalid signal, hardware fault)	
C104C04	PATA switch error	**Refer to: DTC C104C04**
C108C08	Reverse gear switch signal normally high/low	**Refer to: DTC C108C08**
C121208	Variable code error	**Refer to: DTC C121208, U015504, U042308, U014004, U014008, U010004, U030104, U010008, U010104, U030204, U010108**
U015504	Lose contact with instrument	
U042308	Data from IC invalid (the data length control, CRC, real time counter error)	
U014004	Lose contact with BCM	
U014008	BCM data invalid (the data length control, CRC, real time counter error)	
U010004	Lose communication with EMS1	
U030104	Lose communication with EMS2	
U010008	EMS data broken (data length control, cyclic redundancy code verification, real-time counter error /EMS signal invalid)	
U010104	Lose contact with TCU1	
U030204	Lose contact with TCU2	
U010108	TCU data broken (data length control, cyclic redundancy code verification, real-time counter error /EMS signal invalid)	

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DTC C190004,C190104

DTC description

DTC	Description	Definition
C190004	• ECU voltage too high	• ECU working voltage abnormal
C190104	• ECU voltage too low	

Possible reasons

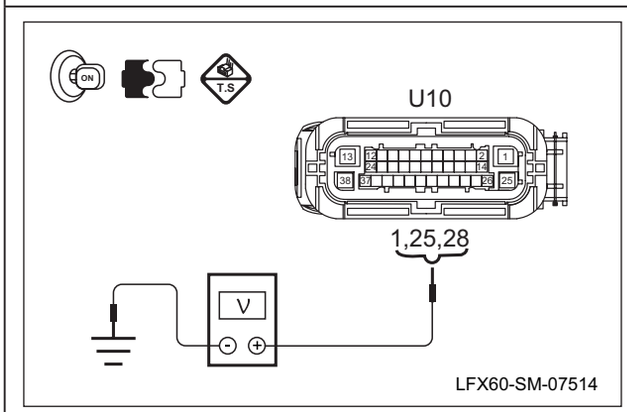
DTC	Check the strategy	Set the condition (control strategy)	Define the fault location
C190004	• Hardware and line	• Power supply voltage of hydraulic control unit higher than normal working range	• Charge system • ECU power line • ECU
C190104		• Power supply voltage of hydraulic control unit lower than normal working range	

Diagnostic process

Test condition	Details/results/measures
1. General inspection.	
	A. Check if the relevant harness plugs are broken, in poor contact, aged, loose, etc. Is it OK after checking? →**Yes** To step 2. →**No** Repair the fault position.
2. Read the DTC with the diagnostic meter.	
	A. Connect the diagnostic meter and check the system for the other relevant DTCs. Is it OK after checking? →**Yes** To step 3. →**No** Carry out the relevant fault diagnosis according to the DTCs.

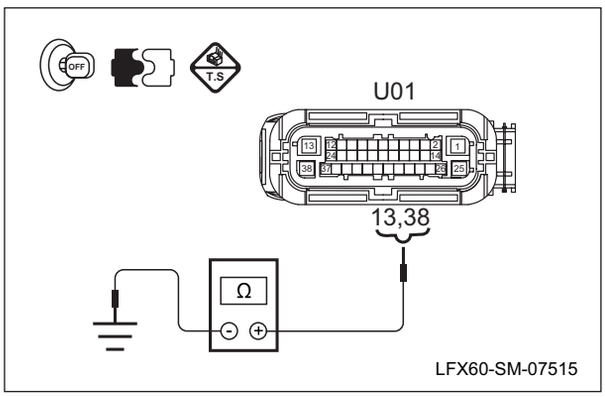
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Test condition	Details/results/measures
3. Check whether the DTC can be cleared.	
	A. Connect the diagnostic meter and clear BCM DTC. B. Start the engine and check whether the DTC occurs again. Does DTC occur? →**Yes** To step 4. →**No** System normal.
4. Check the power supply system of vehicle.	
	A. Check whether the power supply system of vehicle is normal. Is it OK after checking? →**Yes** To step 5. →**No** Check the power supply system for fault.
5. Check the ABS/ESP fuse.	
	A. Check the fuse SB08, FS21 and FS22. **Fuse rated capacity: SB08(40 A), FS21(25 A) and FS22(10A)** Is the fuse normal? →**Yes** To step 6. →**No** Replace the fuse.
6. Check the ABS/ESP power line.	
	A. Operate the ignition switch to turn the power to OFF state.. B. Disconnect the battery negative connector. C. Disconnect the ABS/ESP harness plug U10. D. Connect the battery negative terminal. E. Operate the ignition switch to turn the power to ON state. F. Measure the voltage between the ABS/ESP harness plug U10 terminal 1, 25, 28 and the fixed ground point with the multimeter. **Standard value: 11 ~ 14 V** Is the voltage normal? →**Yes** To step 7. →**No** Repair the ABS/ESP power line open circuit fault and replace the harness if necessary.

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Test condition	Details/results/measures
7. Check the ground line of ABS/ESP control module.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative cable. C. Disconnect the ABS/ESP harness plug U10. D. Measure the resistance between the ABS/ESP harness plug U130 terminal 13, 38 and the fixed ground point with the multimeter. **Standard value: less than 5Ω** Is the resistance normal? →**Yes** To step 8. →**No** Repair the ABS/ESP ground line open circuit fault and replace the harness if necessary.
8. Check the ABS/ESP control module.	
	A. Replace the ABS/ESP control module. **Refer to: replacement of ABS/ESP module** Confirm that the fault has been ruled out.

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DTC C100004, C101008, C006B06

DTC description

DTC	Description	Definition
C100004	• ECU error (hardware, microcontroller error)	• ECU error
C101008	• ECU error (common software problem)	
C006B06	• ABS/ESP abnormal control (too long control time etc.)	

Possible reasons

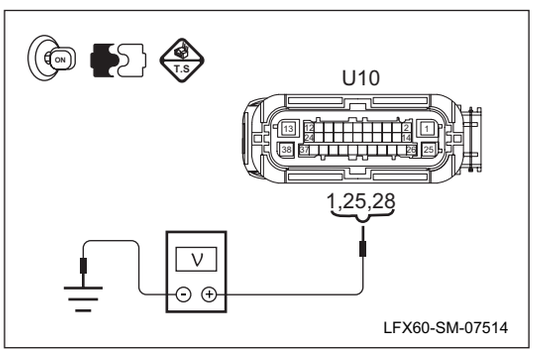
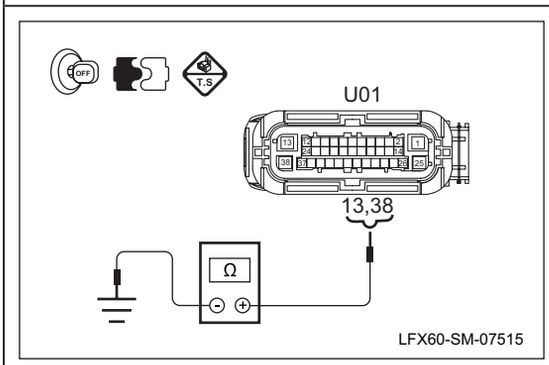
DTC	Check the strategy	Set the condition (control strategy)	Define the fault location
C100004	• Hardware and line	• ECU error	• ECU power line • ECU
C101008			
C006B06			

Diagnostic process

Test condition	Details/results/measures
1. General inspection.	
	A. Check the related harness plugs for breakage, loose contact, aging or looseness. Is it OK after checking? →**Yes** To step 2. →**No** Repair the fault position.
2. Read the DTC with the diagnostic meter.	
	A. Connect the diagnostic meter and check the system for the other relevant DTCs. Is it OK after checking? →**Yes** To step 3. →**No** Carry out the relevant fault diagnosis according to the DTCs.

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Test condition	Details/results/measures
3. Check whether the DTC can be cleared.	
	A. Connect the diagnosis equipment to eliminate ABS error code. B. Start the engine and check whether the DTC occurs again. Does DTC occur? →**Yes** To step 4. →**No** System normal.
4. Check the ABS/ESP power line.	
	A. Operate the ignition switch to turn the power to OFF state.. B. Disconnect the battery negative connector. C. Disconnect the ABS/ESP harness plug U10. D. Connect the battery negative terminal. E. Operate the ignition switch to turn the power to ON state. F. Measure the voltage between the ABS/ESP harness plug U10 terminal 1, 25, 28 and the fixed ground point with the multimeter. **Standard value: 11 ~ 14 V** Is the voltage normal? →**Yes** To step 5. →**No** Repair the ABS/ESP power line open circuit fault and replace the harness if necessary.
5. Check the ground line of ABS/ESP control module.	
	A. Operate the ignition switch to turn the power to OFF state.. B. Disconnect the battery negative cable. C. Disconnect the ABS/ESP harness plug U10. D. Measure the resistance between the ABS/ESP harness plug U130 terminal 13, 38 and the fixed ground point with the multimeter. **Standard value: less than 5Ω** Is the resistance normal? →**Yes** To step 6. →**No** Repair the ABS/ESP ground line open circuit fault and replace the harness if necessary.
6. Check the ABS/ESP control module.	
	A. Replace the ABS/ESP control module. **Refer to: replacement of ABS/ESP module** Confirm that the fault has been ruled out.

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DTC C003108, C003200, C00A000, C00A100, C00A900, C003408, C003500, C00A200, C00A300, C00AA00, C003708, C003800, C00A400, C00A500, C00AB00, C003A08, C003B00, C00A600, C00A700, C00AC00, C109904

DTC description

DTC	Description	Definition
C003108	• Left front wheel speed sensor signal error (exceeding the range, missed, interfered, discontinuous)	• Wheel speed sensor signal error
C003200	• Left front wheel speed sensor: signal circuit short/open to ground, power supply circuit open	• Wheel speed sensor line fault
C00A000	• Power supply circuit of left front wheel speed sensor short to ground	
C00A100	• Left front wheel speed sensor circuit short to the battery	
C00A900	• General error of left front wheel speed sensor	
C003408	• Right front wheel speed sensor signal error (exceeding the range, missed, interfered, discontinuous)	• Wheel speed sensor signal error
C003500	• Right front wheel speed sensor: signal circuit short/open to ground, power supply circuit open	• Wheel speed sensor circuit error
C00A200	• Power supply circuit of right front wheel speed sensor short to ground	
C00A300	• Right front wheel speed sensor circuit short to the battery	
C00AA00	• General error of right front wheel speed sensor	
C003708	• Left rear wheel speed sensor signal error (exceeding the range, missed, interfered, discontinuous)	• Wheel speed sensor signal error
C003800	• Left rear wheel speed sensor: signal circuit short/open to ground, power supply circuit open	• Wheel speed sensor line fault
C00A400	• Power supply circuit of left rear wheel speed sensor short to ground	
C00A500	• Left rear wheel speed sensor circuit short to the battery	
C00AB00	• General error of left front wheel speed sensor	
C003A08	• Right rear wheel speed sensor signal error (exceeding the range, missed, interfered, discontinuous)	• Wheel speed sensor signal error
C003B00	• Right rear wheel speed sensor: signal circuit short/open to ground, power supply circuit open	• Wheel speed sensor line fault
C00A600	• Power supply circuit of right rear wheel speed sensor short to ground	
C00A700	• Right rear wheel speed sensor circuit short to the battery	
C00AC00	• General error of right rear wheel speed sensor	
C109904	• Wheel speed sensor general error (sensor position exchanged, multiple sensor errors)	

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Possible reasons

DTC	Check the strategy	Set the condition (control strategy)	Define the fault location
C003108	• Hardware and line	• Exceed the maximum speed • No left front wheel speed signal in the monitoring time when the speed more than 43.2kph. • Accelerate from static to 12kph, left front wheel speed is missing. • Accelerate from static to 18kph, left front wheel speed is missing once • Interference in left front wheel speed and signal interference.	• Left front wheel speed sensor • Line
C003200		• Left front sensor signal circuit short to ground or circuit open	• Line
C00A000		• Left front wheel sensor signal circuit connecting to ground	
C00A100		• Left front wheel sensor signal circuit connecting to battery	
C00A900		• Left front wheel sensor circuit error (no exact reason found)	
C003408	• Circuit and hardware	• Exceed the maximum speed • No right front wheel speed signal in the monitoring time when the speed more than 43.2kph. • Accelerate from static to 12kph, right front wheel speed is missing. • Accelerate from static to 18kph, right front wheel speed is missing once • Interference in right front wheel speed and signal interference.	• Right front wheel speed sensor • Line
C003500		• Right front sensor signal circuit short to ground or circuit open	• Line
C00A200		• Right front wheel sensor signal circuit connecting to ground	
C00A300		• Right front wheel sensor signal circuit connecting to battery	
C00AA00		• Right front wheel sensor circuit error (no exact reason found)	

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DTC	Check the strategy	Set the condition (control strategy)	Definition of Error
C003708	• Circuit and hardware	• Exceed the maximum speed • No left rear wheel speed signal in the monitoring time when the speed more than 43.2kph. • Accelerate from static to 12kph, left rear wheel speed is missing. • Accelerate from static to 12kph, left rear wheel speed is missing once • Interference in left rear wheel speed and signal interference.	• Left rear wheel speed sensor • Line
C003800		• Left rear sensor signal circuit short to ground or circuit open	• Line
C00A400		• Left rear wheel sensor signal circuit connecting to ground	
C00A500		• Left rear wheel sensor signal circuit connecting to battery	
C00AB00		• Left rear wheel sensor circuit error (no exact reason found)	
C003A08	• Circuit and hardware	• Exceed the maximum speed • No right rear wheel speed signal in the monitoring time when the speed more than 43.2kph. • Accelerate from static to 12kph, right rear wheel speed is missing. • Accelerate from static to 18kph, right rear wheel speed is missing once • Interference in right rear wheel speed and signal interference.	• Right rear wheel speed sensor • Line
C003B00		• Right rear sensor signal circuit short to ground or circuit open	• Line
C00A600		• Right rear wheel sensor signal circuit connecting to ground	
C00A700		• Right rear wheel sensor signal circuit connecting to battery	
C00AC00		• Right rear wheel sensor circuit error (no exact reason found)	
C109904		• Hardware error	• Wheel speed sensor

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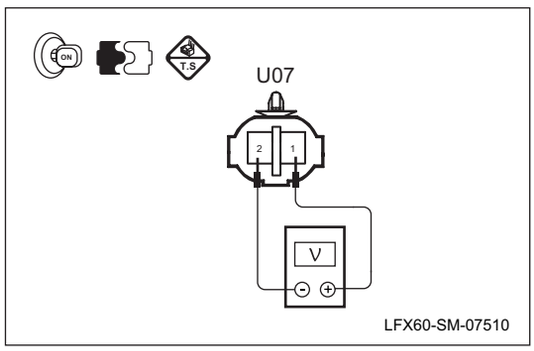
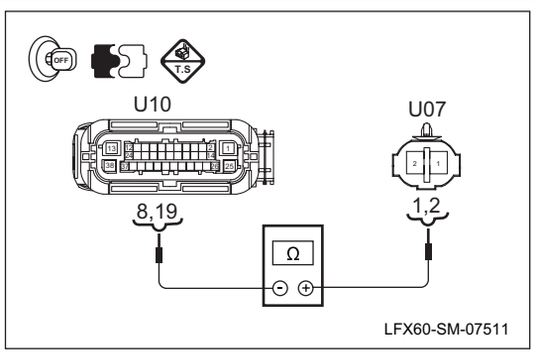
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Diagnostic process

Test condition	Details/results/measures
1. General inspection.	
	A. Check if the relevant harness plugs are broken, in poor contact, aged, loose, etc. Check if the wheel speed sensor is broken obviously. B. Check if the appearance of gear ring is broken, covered with dust and mud. Is it OK after checking? →**Yes** To step 2. →**No** Repair the fault position.
2. Read the DTC with the diagnostic meter.	
	A. Connect the diagnostic meter and check the system for the other relevant DTCs. Is it OK after checking? →**Yes** To step 3. →**No** Carry out the relevant fault diagnosis according to the DTCs.
3. Check whether the DTC can be cleared.	
	A. Connect the diagnostic meter and access the ABS system to clear DTC. B. Start the engine and check whether the DTC occurs again. Does DTC occur? →**Yes** To step 4. →**No** System normal.

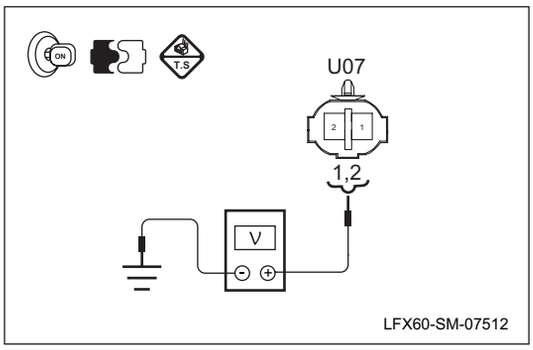
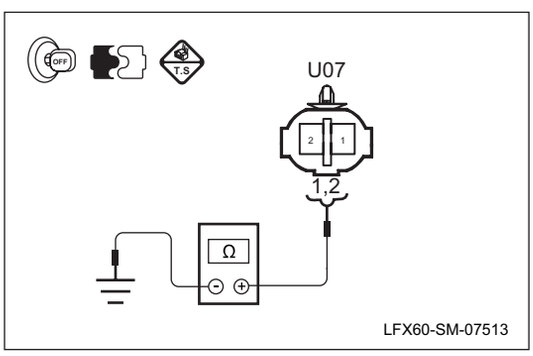
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Test condition	Details/results/measures
4. Check the working voltage of left front wheel speed sensor (left front wheel for example).	
	A. Operate the ignition switch to turn the power to OFF state.. B. Disconnect the battery negative connector. C. Disconnect the front left wheel speed sensor U07. D. Connect the battery negative terminal. E. Operate the ignition switch to turn the power to ON state. F. Measure the voltage between No.1 and 2 terminals of left front wheel speed sensor U07 with a multimeter. **Standard value: 4.5 ~ 5.5 V** Is the voltage normal? →**No** To step 5. →**Yes** Replace the left front wheel speed sensor. **Refer to: Replacement of Front Wheel Sensor**
5. Check the continuity of speed sensor signal circuit of left front wheel.	
	A. Operate the ignition switch to turn the power to OFF state.. B. Disconnect the battery negative connector. C. Disconnect the ABS/ESP harness plug U10. D. Left front wheel speed sensor U07 E. Measure the resistance between No.19 terminal of ABS/ESP harness plug U10 and No.1 terminal of left front wheel speed sensor U07 a multimeter. **Standard value: less than 5Ω** F. Measure the resistance between No.8 terminal of ABS/ESP harness plug U10 and No.2 terminal of left front wheel speed sensor U07 a multimeter. **Standard value: less than 5Ω** Is the resistance normal? →**Yes** To step 6. →**No** Check if there is an open circuit in the speed sensor signal circuit of left front wheel.If necessary, replace the harness.

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Test condition	Details/results/measures
6. Check if there is a short circuit between the speed sensor signal circuit of left front wheel and power supply.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the front left wheel speed sensor U07. D. Connect the battery negative terminal. E. Operate the ignition switch to turn the power to ON state. F. Measure the voltage between No.1 and 2 terminals of left front wheel speed sensor U07 and the reliable grounding with a multimeter. **Standard value: 0 V** Is the voltage normal? →**Yes** To step 7. →**No** Check if there is a short circuit between the speed sensor signal circuit of left front wheel and the power supply. If necessary, replace the harness.
7. Check if there is a short circuit between the speed sensor signal circuit of left front wheel and the grounding.	
	A. Operate the ignition switch to turn the power to OFF state.. B. Disconnect the battery negative connector. C. Disconnect the front left wheel speed sensor U07. D. Measure the resistance between No.1 and 2 terminals of left front wheel speed sensor U07 and the reliable grounding with a multimeter. **Standard value: 10MΩ or higher** Is the resistance normal? →**Yes** To step 8. →**No** Check if there is a short circuit between the speed sensor signal circuit of left front wheel and the grounding. If necessary, replace the harness.
8. Check the ABS/ESP power line.	

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Test condition	Details/results/measures
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the ABS/ESP harness plug U10. D. Connect the battery negative terminal. E. Operate the ignition switch to turn the power to ON state. F. Measure the voltage between the ABS/ESP harness plug U10 terminal 1, 25, 28 and the fixed ground point with the multimeter. **Standard value: 11 ~ 14 V** Is the voltage normal? →**Yes** To step 9. →**No** Repair the ABS/ESP power line open circuit fault and replace the harness if necessary.
9. Check the ground line of ABS/ESP control module.	
	A. Operate the ignition switch to turn the power to OFF state.. B. Disconnect the battery negative cable. C. Disconnect the ABS/ESP harness plug U10. D. Measure the resistance between the ABS/ESP harness plug U130 terminal 13, 38 and the fixed ground point with the multimeter. **Standard value: less than 5Ω** Is the resistance normal? →**Yes** To step 10. →**No** Repair the ABS/ESP ground line open circuit fault and replace the harness if necessary.
10. Replace the ABS/ESP control module.	
	A. Replace the ABS/ESP control module. **Refer to: replacement of ABS/ESP module** Confirm that the fault has been ruled out.

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DTC C004460, C004510

DTC description

DTC	Description	Definition
C004460	• Pressure sensor error (signal)	• Pressure sensor • Line
C004510	• Pressure sensor error (circuit)	

Possible reasons

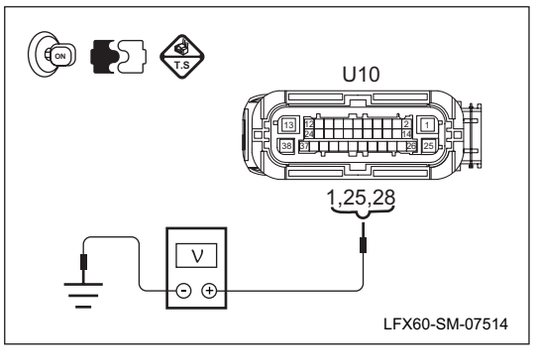
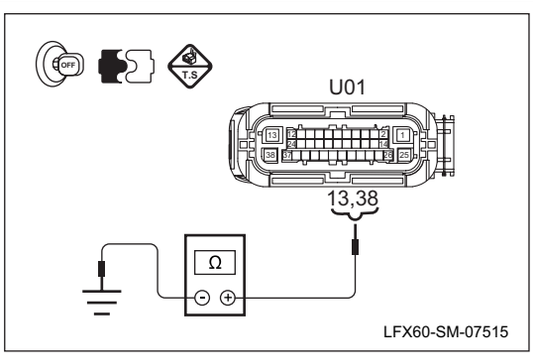
DTC	Check the strategy	Set the condition (control strategy)	Define the fault location
C004460	• Hardware and circuit	• Pressure sensor defective	• Pressure sensor • Line
C004510		• Master cylinder circuit 1 of pressure sensor error	

Diagnostic process

Test condition	Details/results/measures
1. General inspection.	
	A. Check the related harness plugs for breakage, loose contact, aging or looseness. Is it OK after checking? →**Yes** To step 2. →**No** Fix the problem.
2. Read the DTC with the diagnostic meter.	
	A. Connect the diagnostic meter and check the system for the other relevant DTCs. Is it OK after checking? →**Yes** To step 3. →**No** Carry out the relevant fault diagnosis according to the DTCs.
3. Check whether the DTC can be cleared.	
	A. Connect the diagnosis equipment and enter the ESP diagnositic system to eliminate the error code. B. Start the engine and check whether the DTC occurs again. Does DTC occur? →**Yes** To step 4. →**No** System normal.

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Test condition	Details/results/measures
4. Check the ABS/ESP power line.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the ABS/ESP harness plug U10. D. Connect the battery negative terminal. E. Operate the ignition switch to turn the power to ON state. F. Measure the voltage between the ABS/ESP harness plug U10 terminal 1, 25, 28 and the fixed ground point with the multimeter. **Standard value: 11 ~ 14 V** Is the voltage normal? →**Yes** To step 5. →**No** Repair the ABS/ESP power line open circuit fault and replace the harness if necessary.
5. Check the ground line of ABS/ESP control module.	
	A. Operate the ignition switch to turn the power to OFF state.. B. Disconnect the battery negative cable. C. Disconnect the ABS/ESP harness plug U10. D. Measure the resistance between the ABS/ESP harness plug U130 terminal 13, 38 and the fixed ground point with the multimeter. **Standard value: less than 5Ω** Is the resistance normal? →**Yes** To step 6. →**No** Repair the ABS/ESP ground line open circuit fault and replace the harness if necessary.
6. Check the ABS/ESP control module.	
	A. Replace the ABS/ESP control module. **Refer to: replacement of ABS/ESP module** Confirm that the fault has been ruled out.

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DTC C004008

DTC description

DTC	Description	Definition
C004008	• Braking light switch wrong: signal not clear	• Braking switch error

Possible reasons

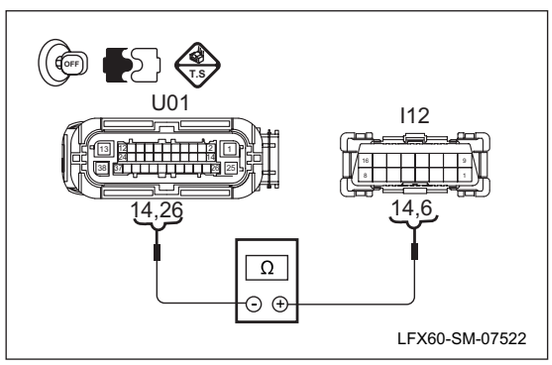
DTC	Check the strategy	Set the condition (control strategy)	Define the fault location
C004008	• Hardware and circuit	• Hardware and line • Pressure signal is set up without any hardware signal position. In the meanwhile no pump is working. • Pressure signal higher than threshold and no BLS hardware position • Air pedal treaded without active control, BLS signal position. • Too long time for braking light switch and throttle pedal setting up at the same time	• Line • Braking light switch • ABS/ESP module

Diagnostic process

Test condition	Details/results/measures
1. General inspection.	
	A. Check the related harness plugs for breakage, loose contact, aging or looseness. B. Check if the clearance of braking light switch is within the normal range. Is it OK after checking? →**Yes** To step 2. →**No** Repair and replace the fault position.
2. Read the DTC with the diagnostic meter.	
	A. Connect the diagnostic meter and check the system for the other relevant DTCs. Is it OK after checking? →**Yes** To step 3. →**No** Carry out the relevant fault diagnosis according to the DTCs.

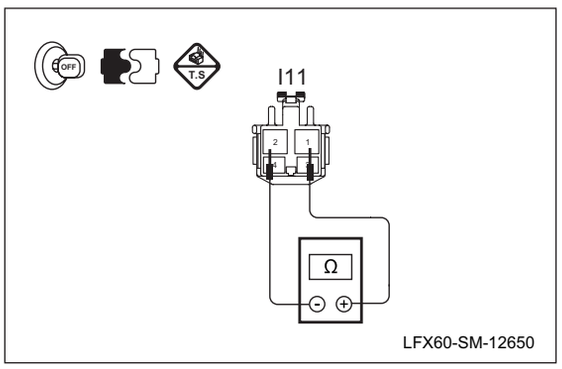
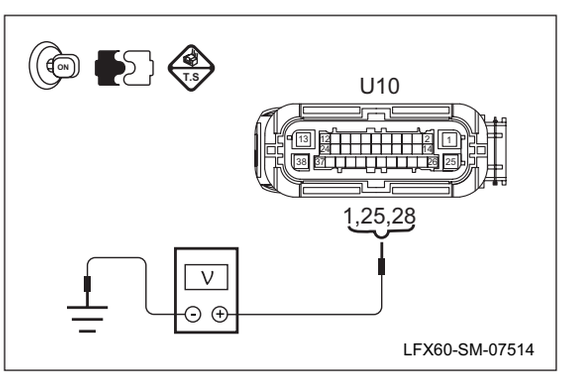
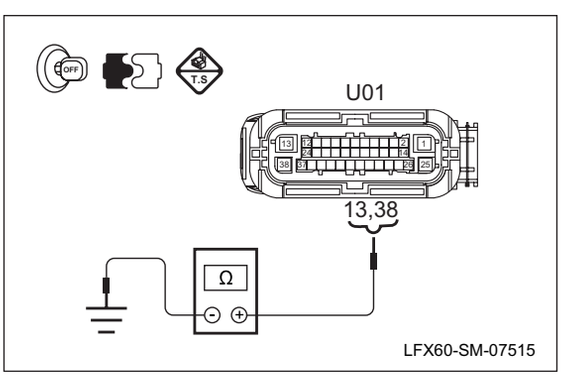
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Test condition	Details/results/measures
3. Check whether the DTC can be cleared.	
	A. Connect the diagnosis equipment and enter into ABS to eliminate the error code. B. Start the engine and check whether the DTC occurs again. Does DTC occur? →**Yes** To step 4. →**No.** System normal.
4. Check the fuse.	
	A. Check the stop lamp switch fuse FS10 and FS11. **Fuse rated capacity: FS10(10 A), FS11(15 A)** Is it OK after checking? →**Yes** To step 5. →**No** Replace the fuse.
5. Check the stop lamp switch power line.	
	A. Operate the start switch to set the power mode to the “OFF” state. B. Disconnect the battery negative connector. C. Disconnect the stop lamp switch harness plug I11. D. Connect the battery negative terminal. E. Measure the voltage between the brake switch harness plug I11 terminal 2 and fixed ground point with the multimeter. **Standard value: 11 ~ 14 V** Is the voltage normal? →**Yes** To step 6. →**No** Check if there is any problem in the power supply circuit of braking light switch. If necessary, replace the harness.

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Test condition	Details/results/measures
6. Check the stop lamp switch.	
	A. Operate the start switch to set the power mode to the “OFF” state. B. Disconnect the battery negative connector. C. Disconnect the stop lamp switch harness plug I11. D. Depress the brake pedal and measure the resistance between the brake switch terminal 1 and 2 with the multimeter. **Standard value: less than 1Ω** Is the resistance normal? **→Yes** To step 7. **→No** Replace the brake light switch. **Refer to: Replacement of Braking Light Switch**
7. Check the ABS/ESP power line.	
	A. Operate the ignition switch to turn the power to OFF state.. B. Disconnect the battery negative connector. C. Disconnect the ABS/ESP harness plug U10. D. Connect the battery negative terminal. E. Start the switch to turn the power to ON mode. F. Measure the voltage between the ABS/ESP harness plug U10 terminal 1, 25, 28 and the fixed ground point with the multimeter. **Standard value: 11 ~ 14 V** Is the voltage normal? **→Yes** To step 8. **→No** Repair the ABS/ESP power line open circuit fault and replace the harness if necessary.
8. Check the grounding circuit of ABS/ESP control module	
	A. Operate the ignition switch to turn the power to OFF state.. B. Disconnect the battery negative cable. C. Disconnect the ABS/ESP harness plug U10. D. Measure the resistance between the ABS/ESP harness plug U130 terminal 13, 38 and the fixed ground point with the multimeter. **Standard value: less than 5Ω** Is the resistance normal? **→Yes** To step 9. **→No** Repair the ABS/ESP ground line open circuit fault and replace the harness if necessary.

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Test condition	Details/results/measures
9. Check the ABS/ESP control module.	
	A. Replace the ABS/ESP control module. **Refer to: replacement of ABS/ESP module** Confirm that the fault has been ruled out.

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DTC C006108, C006208

DTC description

DTC	Description	Definition
C006108	• Transverse acceleration sensor: signal error	• Transverse acceleration sensor signal abnormal
C006208	• Longitudinal acceleration sensor: signal error	• Longitudinal acceleration sensor signal abnormal

Possible reasons

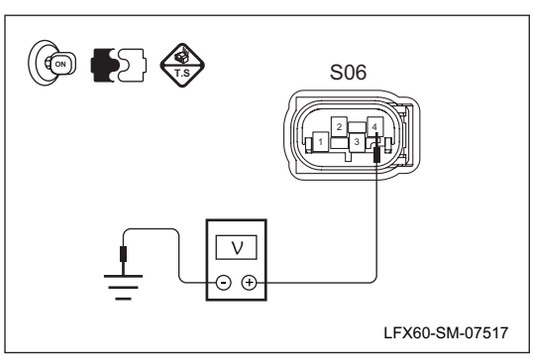
DTC	Check the strategy	Set the condition (control strategy)	Define the fault location
C006108	• Hardware and line	• Transverse acceleration offset exceeding threshold (2.25m/s²)	• Line • Acceleration sensor • ABS/ESP control module
C006208		• Longitudinal acceleration offset exceeding threshold (2.25m/s²)	

Diagnostic process

Test condition	Details/results/measures
1. General inspection.	
	A. Check the related harness plugs for breakage, loose contact, aging or looseness. Is it OK after checking? →**Yes** To step 2. →**No** Repair the fault position.
2. Read the DTC with the diagnostic meter.	
	A. Connect the diagnostic meter and check the system for the other relevant DTCs. Is it OK after checking? →**Yes** To step 3. →**No** Carry out the relevant fault diagnosis according to the DTCs.

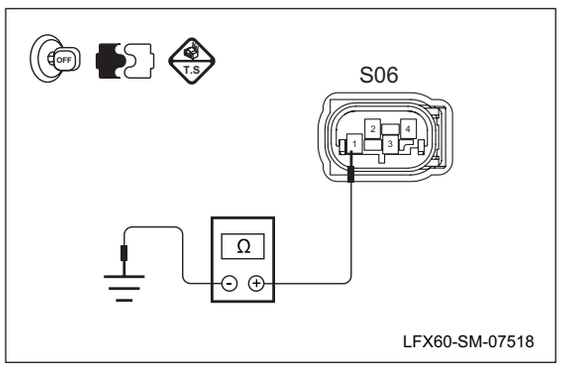
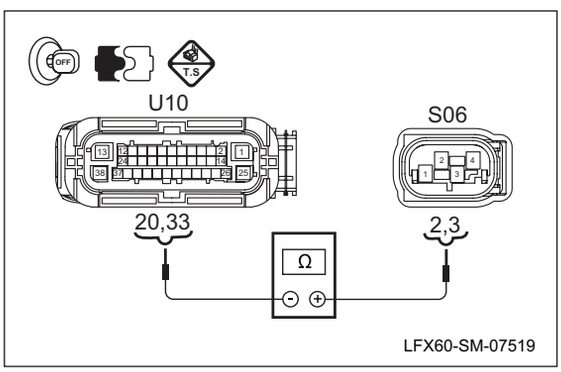
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Test condition	Details/results/measures
3. Check whether the DTC can be cleared.	
	A. Connect the diagnostic meter and access the ABS system to clear DTC. B. Start the engine and check whether the DTC occurs again. Does DTC occur? →**Yes** To step 4. →**No** System normal.
4. Check the sway sensor fuse.	
	A. Check the fuse FS22. **Fuse rated capacity: 10A** Is the fuse normal? →**Yes** To step 5. →**No** Replace the fuse.
5. Check the sway sensor power line.	
	A. Operate the ignition switch to turn the power to OFF state.. B. Disconnect the battery negative connector. C. Disconnect the sway sensor harness plug S06. D. Connect the battery negative terminal. E. Operate the ignition switch to turn the power to ON state. F. Measure the voltage between the sway sensor harness plug S06 terminal 4 and the fixed ground point with the multimeter. **Standard value: 11 ~ 14 V** Is the voltage normal? →**Yes** To step 6. →**No** Repair the sway sensor power line open circuit fault and replace the harness if necessary.

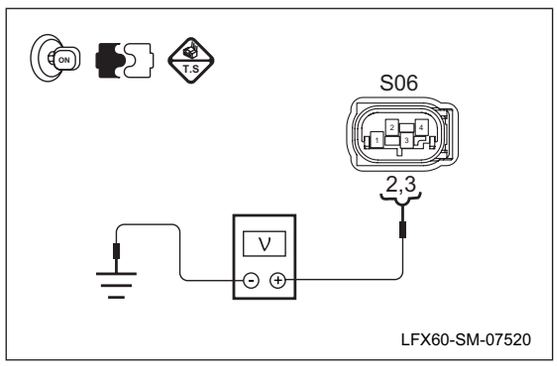
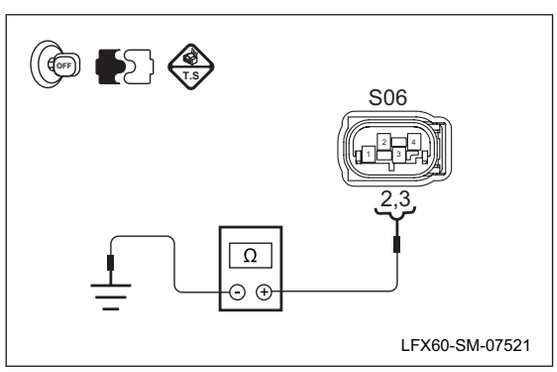
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Test condition	Details/results/measures
6. Check the sway sensor ground line.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative cable. C. Disconnect the sway sensor harness plug S06. D. Measure the resistance between the sway sensor harness plug S06 terminal 1 and the fixed ground point with the multimeter. **Standard value: less than 5Ω** Is the resistance normal? →**Yes** To step 7. →**No** Repair the sway sensor ground line open circuit fault and replace the harness if necessary.
7. Check the conductivity of sway sensor signal line.	
	A. Operate the ignition switch to turn the power to OFF state.. B. Disconnect the battery negative connector. C. Disconnect the ABS/ESP harness plug U10. D. Disconnect the sway sensor harness plug S06. E. Measure the resistance between the ABS/ESP harness plug U10 terminal 20 and the sway sensor harness plug S06 terminal 2 with the multimeter. **Standard value: less than 5Ω** F. Measure the resistance between the ABS/ESP harness plug U10 terminal 33 and the sway sensor harness plug S06 terminal 3 with the multimeter. **Standard value: less than 5Ω** Is the resistance normal? →**Yes** To step 8. →**No** Repair the sway sensor signal line open circuit fault and replace the harness if necessary.

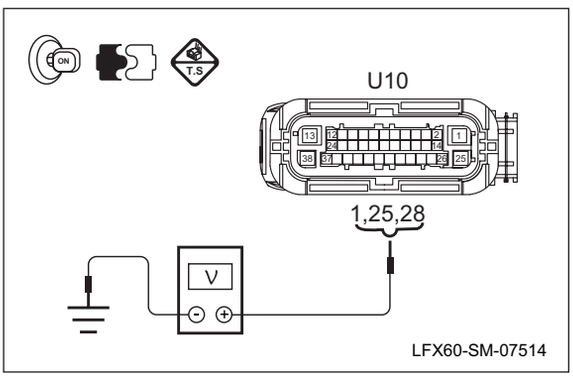
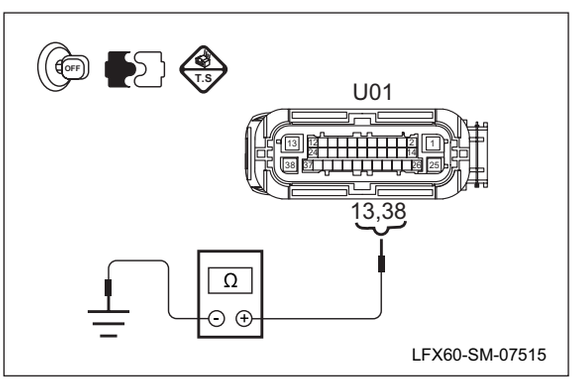
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Test condition	Details/results/measures
8. Check the sway sensor signal line and power for short circuit.	
 LFX60-SM-07520	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the sway sensor harness plug S06. D. Connect the battery negative terminal. E. Operate the ignition switch to turn the power to ON state. F. Measure the voltage between the sway sensor harness plug S06 terminal 2, 3 and the fixed ground point with the multimeter. **Standard value: 0 V** Is the voltage normal? **→Yes** To step 9. **→No** Check if there is a short circuit between the sensor signal circuit and power supply. If necessary, replace the harness. Wire harness
9. Check the sway sensor signal line and ground for short circuit.	
 LFX60-SM-07521	A. Operate the ignition switch to turn the power to OFF state.. B. Disconnect the battery negative connector. C. Disconnect the sway sensor harness plug S06. D. Measure the resistance between the sway sensor harness plug S06 terminal 2, 3 and the fixed ground point with the multimeter. **Standard value: less than 5Ω** Is the voltage normal? **→Yes** To step 10. **→NO** Repair the sway sensor signal line and ground short circuit fault and replace the harness if necessary.

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Test condition	Details/results/measures
10. Check the ABS/ESP power line.	
	A. Operate the ignition switch to turn the power to OFF state.. B. Disconnect the battery negative connector. C. Disconnect the ABS/ESP harness plug U10. D. Connect the battery negative terminal. E. Operate the ignition switch to turn the power to ON state. F. Measure the voltage between the ABS/ESP harness plug U10 terminal 1, 25, 28 and the fixed ground point with the multimeter. **Standard value: 11 ~ 14 V** Is the voltage normal? →**Yes** To step 11. →**No** Repair the ABS/ESP power line open circuit fault and replace the harness if necessary.
11. Check the ground line of ABS/ESP control module.	
	A. Operate the ignition switch to turn the power to OFF state.. B. Disconnect the battery negative connector. C. Disconnect the ABS/ESP harness plug U10. D. Measure the resistance between the ABS/ESP harness plug U130 terminal 13, 38 and the fixed ground point with the multimeter. **Standard value: less than 5Ω** Is the resistance normal? →**Yes** To step 12. →**No** Repair the ABS/ESP ground line open circuit fault and replace the harness if necessary.
12. Check the sway sensor.	
	A. Replace the sway sensor. **Refer to: replacement of the sway sensor** Is the fault solved? →**Yes** Replace the sway sensor. →**No** To step 13.
13. Check the ABS/ESP control module.	
	A. Replace the ABS/ESP control module. **Refer to: replacement of ABS/ESP module** Confirm that the fault has been ruled out.

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DTC C006308, C019604, C00A800, C006102, C006202, C006302, U012308, U051308

DTC description

DTC	Description	Definition
C006308	• Yaw rate sensor:Signal error	• Signal error
C019604	• Yaw rate sensor group variety error (hardware fault, temperature, range, internal error)	
C00A800	• Yaw rate sensor group variety calibrated or calibration failure	• Sensor calibration error
C006102	• Lateral acceleration sensor of external yaw rate sensor cluster: signal error	• Signal error
C006202	• Longitudinal acceleration sensor of external yaw rate sensor cluster: signal error	
C006302	• Yaw rate sensor of external yaw rate sensor cluster: signal error	
U012308	• Lose contact with yaw rate sensor module	• Invalid signal
U051308	• Invalid data from yaw rate sensor module	

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Possible reasons

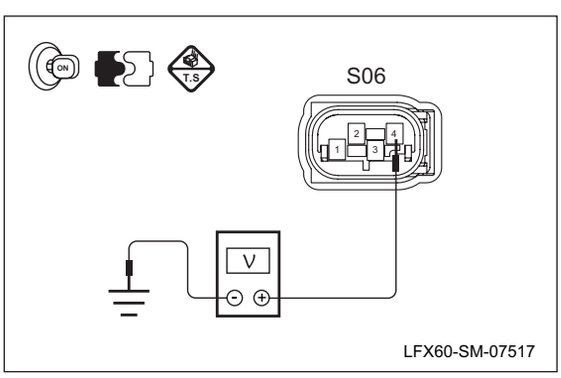
DTC	Check the strategy	Set the condition (control strategy)	Define the fault location
C006308	• Hardware and line	• Yaw rate sensor absolute value more than 30°/s at prohibition • Yaw rate sensor absolute value more than 94.75°/s at any time • Comparing measured yaw rate and calculted yaw rate from other sensor signal, seems unauthentic	• Sensor • ABS/ESP module
C019604		• Yaw rate sensor receives demand information ID0 smaller than 4ms frequency from ECU	• Sensor • ABS/ESP module
C00A800		• Vehicle not at the level when calibrating, wrong hardware assembly, sensor offset error • When calibrating； Receiving 10 wrong longitudinal acceleration values	• Sensor • ABS/ESP module
C006102		• Lateral acceleration sensor invalid	• Sensor • ABS/ESP module
C006202		• Longitudinal acceleration sensor invalid	• Sensor • ABS/ESP module
C006302		• Yaw rate sensor invalid	• Sensor • ABS/ESP module
U012308		• Data not received	• Line • Sensor • ABS/ESP module
U051308		• Received data invalid	• Sensor • ABS/ESP module

Diagnostic process

Test condition	Details/results/measures
1. General inspection.	
	A. Check the related harness plugs for breakage, loose contact, aging or looseness. Is it OK after checking? →**Yes** To step 2. →**No** Repair the fault position.

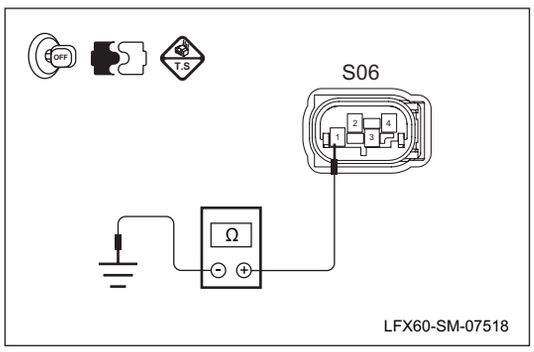
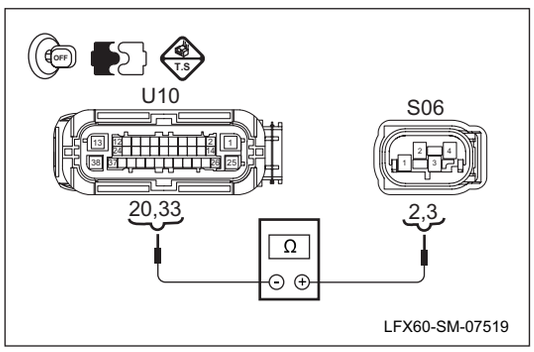
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Test condition	Details/results/measures
2. Read the DTC with the diagnostic meter.	
	A. Connect the diagnostic meter and check the system for the other relevant DTCs. Is it OK after checking? →**Yes** To step 3. →**No** Carry out the relevant fault diagnosis according to the DTCs.
3. Check whether the DTC can be cleared.	
	A. Connect the diagnostic meter and access the ABS system to clear DTC. B. Start the engine and check whether the DTC occurs again. Does DTC occur? →**Yes** To step 4. →**No** System normal.
4. Check the sway sensor fuse.	
	A. Check the fuse FS22. **Fuse rated capacity: 10A** Is the fuse normal? →**Yes** To step 5. →**No** Replace the fuse.
5. Check the sway sensor power line.	
	A. Operate the ignition switch to turn the power to OFF state.. B. Disconnect the battery negative connector. C. Disconnect the sway sensor harness plug S06. D. Connect the battery negative terminal. E. Operate the ignition switch to turn the power to ON state. F. Measure the voltage between the sway sensor harness plug S06 terminal 4 and the fixed ground point with the multimeter. **Standard value: 11 ~ 14 V** Is the voltage normal? →**Yes** To step 6. →**No** Repair the sway sensor power line open circuit fault and replace the harness if necessary.

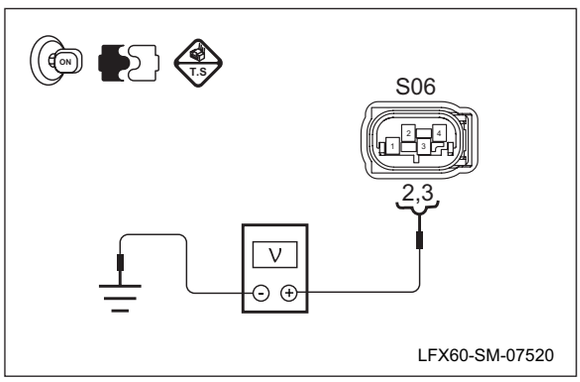
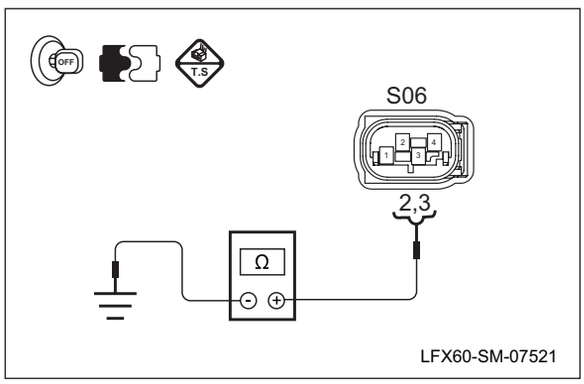
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Test condition	Details/results/measures
6. Check the sway sensor ground line.	
	A. Operate the ignition switch to turn the power to OFF state.. B. Disconnect the battery negative connector. C. Disconnect the sway sensor harness plug S06. D. Measure the resistance between the sway sensor harness plug S06 terminal 1 and the fixed ground point with the multimeter. **Standard value: less than 5Ω** Is it OK after checking? **→Yes** To step 7. **→No** Repair the sway sensor ground line open circuit fault and replace the harness if necessary.
7. Check the conductivity of sway sensor signal line.	
	A. Operate the ignition switch to turn the power to OFF state.. B. Disconnect the battery negative cable. C. Disconnect the ABS/ESP harness plug U10. D. Disconnect the sway sensor harness plug S06. E. Measure the resistance between the ABS/ESP harness plug U10 terminal 20 and the sway sensor harness plug S06 terminal 2 with the multimeter. **Standard value: less than 5Ω** F. Measure the resistance between the ABS/ESP harness plug U10 terminal 33 and the sway sensor harness plug S06 terminal 3 with the multimeter. **Standard value: less than 5Ω** Is the resistance normal? **→Yes** To step 8. **→No** Repair the sway sensor signal line open circuit fault and replace the harness if necessary.

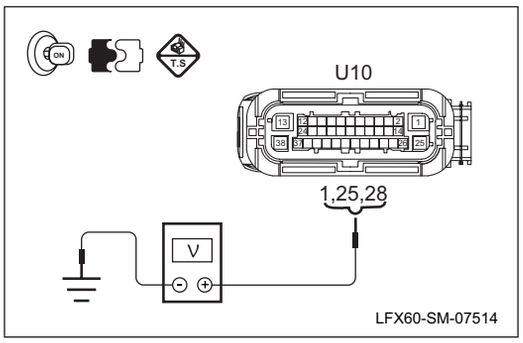
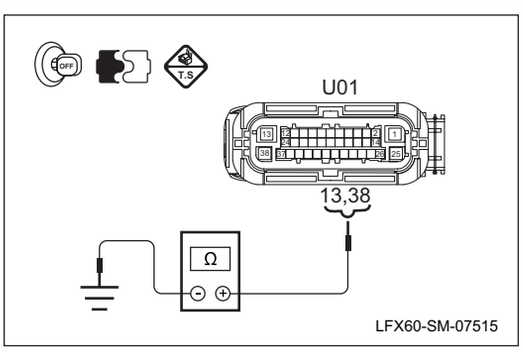
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Test condition	Details/results/measures
8. Check the sway sensor signal line and power for short circuit.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the sway sensor harness plug S06. D. Connect the battery negative terminal. E. Operate the ignition switch to turn the power to ON state. F. Measure the voltage between the sway sensor harness plug S06 terminal 2, 3 and the fixed ground point with the multimeter. **Standard value: 0 V** Is the voltage normal? →**Yes** To step 9. →**No** Check if there is a short circuit between the Yaw rate sensor signal circuit and power supply. If necessary, replace the harness.
9. Check the sway sensor signal line and ground for short circuit.	
	A. Operate the ignition switch to turn the power to OFF state.. B. Disconnect the battery negative connector. C. Disconnect the sway sensor harness plug S06. D. Measure the resistance between the sway sensor harness plug S06 terminal 2, 3 and the fixed ground point with the multimeter. **Standard value: less than 5Ω** Is the voltage normal? →**Yes** To step 10. →**No** Repair the sway sensor signal line and ground short circuit fault and replace the harness if necessary.

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Test condition	Details/results/measures
10. Check the ABS/ESP power line.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the ABS/ESP harness plug U10. D. Connect the battery negative terminal. E. Operate the ignition switch to turn the power to ON state. F. Measure the voltage between the ABS/ESP harness plug U10 terminal 1, 25, 28 and the fixed ground point with the multimeter. **Standard value: 11 ~ 14 V** Is the voltage normal? →**Yes** To step 11. →**No** Repair the ABS/ESP power line open circuit fault and replace the harness if necessary.
11. Check the ground line of ABS/ESP control module.	
	A. Operate the ignition switch to turn the power to OFF state.. B. Disconnect the battery negative cable. C. Disconnect the ABS/ESP harness plug U10. D. Measure the resistance between the ABS/ESP harness plug U130 terminal 13, 38 and the fixed ground point with the multimeter. **Standard value: less than 5Ω** Is the resistance normal? →**Yes** To step 12. →**No** Check if there is an open circuit in the ABS/ESP grounding circuit. If necessary, replace the harness.
12. Check the sway sensor.	
	A. Replace the sway sensor. **Refer to: replacement of the sway sensor** Is the fault solved? →**Yes** Replace the sway sensor. →**No** To step 13.
13. Replace the ABS/ESP control module.	
	A. Replace the ABS/ESP control module. **Refer to: replacement of ABS/ESP module** Confirm that the fault has been ruled out.

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DTC C100104, U000500, U000700, U000104, U100104

DTC description

DTC	Description	Definition
C100104	• CAN hardware error	• CAN network communication circuit abnormal
U000500	• CAN bus voltage too high	
U000700	• CAN bus voltage too low	
U000104	• CAN bus off error	
U100104	• CAN passive error	

Possible reasons

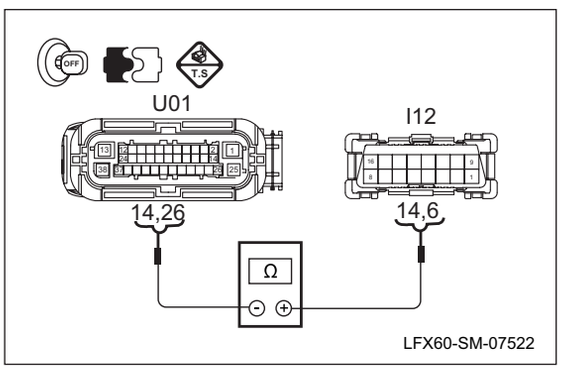
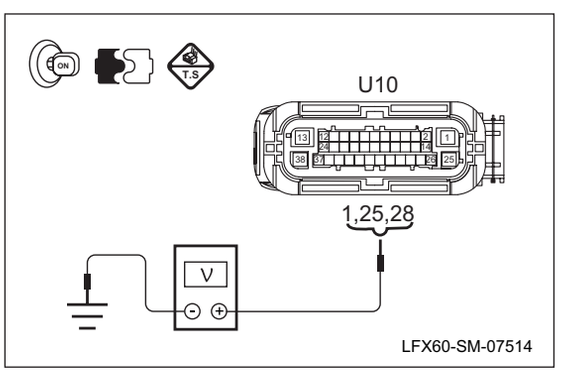
DTC	Check the strategy	Set the condition (control strategy)	Define the fault location
C100104	• Hardware and line	• CAN bus commnunication abnormal	• CAN bus • ABS/ESP module
U000500			
U000700			
U000104			
U100104			

Diagnostic process

Test condition	Details/results/measures
1. General inspection.	
	A. Check the related harness plugs for breakage, loose contact, aging or looseness. Is it OK after checking? →Yes To step 2. →No Repair the fault position.
2. Read the DTC with the diagnostic meter.	
	A. Connect the diagnostic meter and check the system for the other relevant DTCs. Is it OK after checking? →Yes To step 3. →No Carry out the relevant fault diagnosis according to the DTCs.

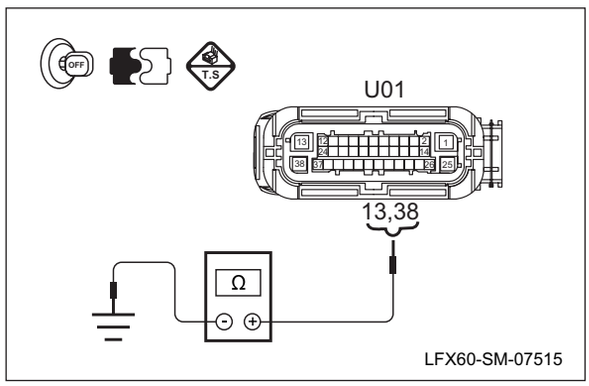
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Test condition	Details/results/measures
3. Check whether the DTC can be cleared.	
	A. Connect the diagnostic meter and access the ABS / ESP to clear DTC. B. Start the engine and check whether the DTC occurs again. Does DTC occur? →**Yes** To step 4. →**No** System normal.
4. Check the CAN bus.	
	A. Operate the ignition switch to turn the power to ON state. B. Disconnect the battery negative connector. C. Disconnect the plug U10 of ABS/ESP harness. D. Measure the resistance between No.6 and 14 terminals of diagnosis interface 112 and No.26 and 14 terminals of ABS/ESP harness plug with a multimeter. **Standard value: less than 5Ω** Is the resistance normal? →**Yes** To step 5. →**No** Check if there is a short circuit between the CAN bus and power supply. If necessary, replace the harness.
5. Check the ABS/ESP power line.	
	A. Operate the ignition switch to turn the power to OFF state.. B. Disconnect the battery negative connector. C. Disconnect the ABS/ESP harness plug U10. D. Connect the battery negative terminal. E. Perform the ignition to let the power mode to “ON” F. Measure the voltage between the ABS/ESP harness plug U10 terminal 1, 25, 28 and the fixed ground point with the multimeter. **Standard value: 11 ~ 14 V** Is the voltage normal? →**Yes** To step 6. →**No** Check if there is an open circuit in the power supply circuit of ABS/ESP. If necessary, replace the harness.

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Test condition	Details/results/measures
6. Check the ground line of ABS/ESP control module.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the ABS/ESP harness plug U10. D. Measure the resistance between the ABS/ESP harness plug U130 terminal 13, 38 and the fixed ground point with the multimeter. **Standard value: less than 5Ω** Is the resistance normal? →**Yes** To step 7. →**No** Repair the ABS/ESP ground line open circuit fault and replace the harness if necessary.
7. Check the ABS/ESP control module.	
	A. Replace the ABS/ESP control module. **Refer to: replacement of ABS/ESP module** Confirm that the fault has been ruled out.

07

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DTC C106600, C046008, U012604, U012608

DTC description

DTC	Description	Definition
C106600	• Steering angle sensor calibrate error	• Sensor calibration error
C046008	• Steering angle sensor error (signal)	• Sensor signal serror
U012604	• Lose contact with steering angle sensor	• Angle sensor not found.
U012608	• SAS data broken (the data length control, CRC, real time counter error)	• Data abnormal

Possible reasons

DTC	Check the strategy	Set the condition (control strategy)	Define the fault location
C106600	• Hardware and line	• Received value from Calibration status signal of angle sensor is “not calibrated”	• ABS/ESP module
C046008		• Angle sensor offset exceeding limit(15°) • Unauthentic signal obliquity	• Sensor • ABS/ESP module
U012604		• CAN information from SAS not received by ESP.	• CAN bus • ABS/ESP module
U012608		• Angle sensor data broken and received by ESP. (the data length control, CRC, real time counter error)	• Sensor • ABS/ESP module

Diagnostic process

Test condition	Details/results/measures
1. General inspection.	
	A. Check the related harness plugs for breakage, loose contact, aging or looseness. Is it OK after checking? →**Yes** To step 2. →**No** Repair the fault position.

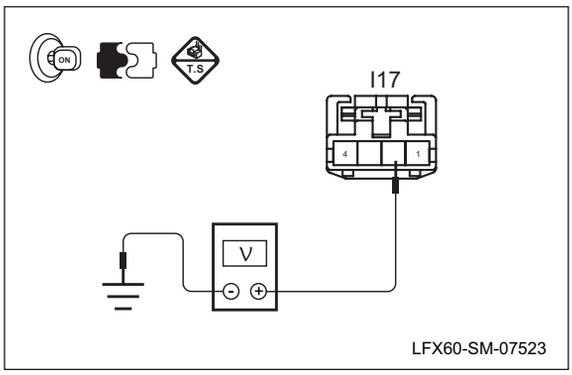
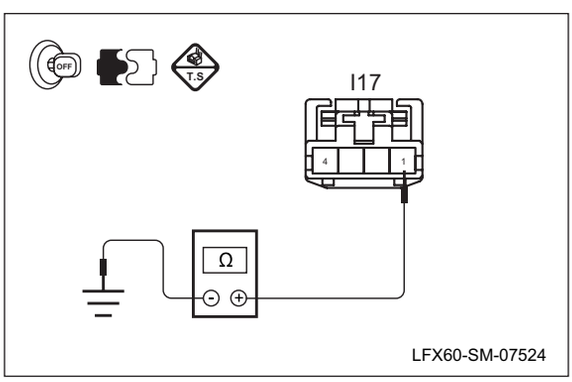
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Test condition	Details/results/measures
2. Read the DTC with the diagnostic meter.	
	A. Connect the diagnostic meter and check the system for the other relevant DTCs. Is it OK after checking? →**Yes** To step 3. →**No** Carry out the relevant fault diagnosis according to the DTCs.
3. Check whether the DTC can be cleared.	
	A. Connect the diagnostic meter and access the ABS / ESP system to clear DTC. B. Start the engine and check whether the DTC occurs again. Does DTC occur? →**Yes** To step 4. →**No** System normal.
4. Calibrate the angle sensor.	
	A. Connect the diagnostic equipment. B. Calibrate the angle sensor. Is the system normal? →**Yes** Calibrate the angle sensor. →**No** To step 5.
5. Check the fuse of angle sensor.	
	A. Check the fuse FS22. **Fuse rated capacity: 10A** Is the fuse normal? →**Yes** To step 6. →**No** Replace the fuse.

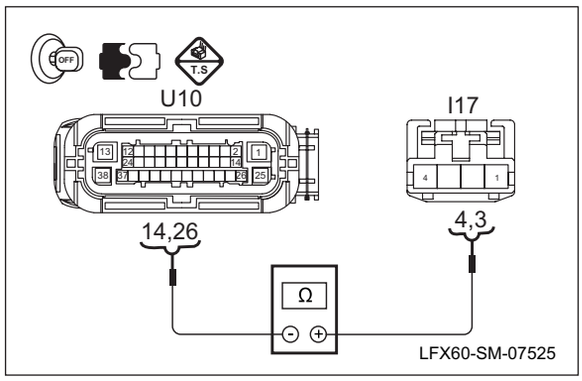
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Test condition	Details/results/measures
6. Check the power supply circuit of angle sensor.	
 LFX60-SM-07523	A. Operate the ignition switch to turn the power to OFF state.. B. Disconnect the battery negative connector. C. Disconnect the steering angle sensor harness plug I17. D. Connect the battery negative terminal. E. Operate the ignition switch to turn the power to ON state. F. Measure the voltage beween No.2 termianl of angle sensor harness plug 117 and the reliable groudning with a multimeter. **Standard value: 11 ~ 14 V** Is the voltage normal? →**Yes** To step 7. →**No** Check if there is an open circuit problem in the angle sensor power supply circuit. If necessary, replace the harness.
7. Check the grounding circuit of angle sensor.	
 LFX60-SM-07524	A.vOperate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the steering angle sensor harness plug I17. D. Measure the resistance beween No.1 termianl of angle sensor harness plug 117 and the reliable groudning with a multimeter. **Standard value: less than 5Ω** Is the resistance normal? →**Yes** To step 8. →**No** Check if there is an open circuit problem in the angle sensor grounding circuit. If necessary, replace the harness.

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Test condition	Details/results/measures
8. Check the CAN circuit of angle sensor.	
	A. Operate the ignition switch to turn the power to OFF state.. B. Disconnect the battery negative connector. C. Disconnect the ABS/ESP harness plug U10 and the angle sensor harness plug 117. D. Measure the resistance beween No.14 termianl of ABS/ESP harness plug U10 and No.4 terminal of angle sensor harness plug 117 with a multimeter. **Standard value: less than 5Ω** E. Measure the resistance beween No.26 termianl of ABS/ESP harness plug U10 and No.3 terminal of angle sensor harness plug 117 with a multimeter. **Standard value: less than 5Ω** Is the resistance normal? →**Yes** To step 8. →**No** Check if there is an open circuit problem in the angle sensor signal circuit. If necessary, replace the harness.
8. Check the angle sensor.	
	A. Replace the angle sensor. **Refer to: Replacement of Angle Sensor** Is the fault solved? →**Yes** Replace the angle sensor. →**No** To step 9.
9. Check the ABS/ESP control module.	
	A. Replace the ABS/ESP control module. **Refer to: replacement of ABS/ESP module** Confirm that the fault has been ruled out.

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DTC C001004, C001104, C001404, C001504, C001804, C001904, C001C04, C001D04, C000104, C000204, C000304, C000404, C109504, C002004, C007208

DTC description

DTC	Description	Definition
C001004	• Valve error, front left inlet valve	• Feedback error of front left inlet valve
C001104	• Valve error, front left outlet valve	• Feedback error of front left outlet valve
C001404	• Valve error, front right inlet valve	• Feedback error of front right inlet valve
C001504	• Valve error, front right outlet valve	• Feedback error of front right outlet valve
C001804	• Valve error, front left inlet valve	• Feedback error of front left inlet valve
C001904	• Valve error, front left outlet valve	• Feedback error of front left outlet valve
C001C04	• Valve error, rear right inlet valve	• Feedback error of rear right inlet valve
C001D04	• Valve error, rear right outlet valve	• Feedback error of rear right outlet valve
C000104	• Valve error, USV1	• USV1 trouble feedback error
C000204	• Valve error, USV2	• USV2 trouble feedback error
C000304	• Valve error, HSV1	• HSV1 trouble feedback error
C000404	• Valve error, HSV2	• HSV2 trouble feedback error
C109504	• Valve relay error	• Relay error
C002004	• Return pump error	• Return pump error
C007208	• General valve error (Over temperature protection, signal invalid, hardware error)	• Valve error

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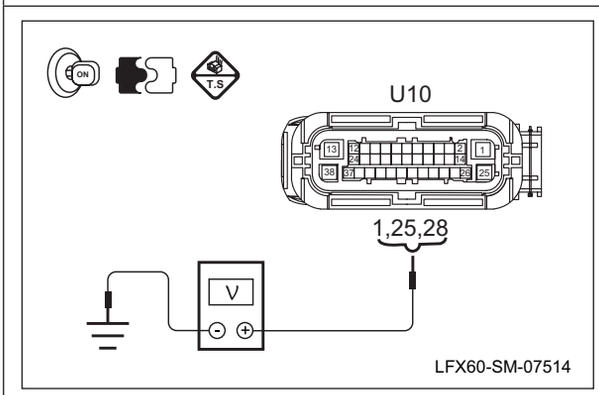
Possible Cause

DTC	Check the strategy	Set the condition (control strategy)	Define the fault location
C001004	• Hardware and line	• The left front inlet valve feedback by driven	• Line • ABS/ESP module
C001104		• The left front outlet valve feedback by driven	
C001404		• The right front inlet valve feedback by driven	
C001504		• The right front outlet valve feedback by driven	
C001804		• The left rear inlet valve feedback by driven	
C001904		• The left rear outlet valve feedback by driven	
C001C04		• The right rear inlet valve feedback by driven	
C001D04		• The right rear outlet valve feedback by driven	
C000104		• USV1 fault due to drive valve feedback	
C000204		• USV2 fault due to drive valve feedback	
C000304		• HSV1 fault due to drive valve feedback	
C000404		• HSV2 fault due to drive valve feedback	
C109504		• Relay relay does not switch on or Valve relay status displayed by valve relay status bit of MultiIC (multiple integrated circuits) is switched off	
C002004		• The drive line of internal motor relay interferes between uC (connecting cable) and ASIC (application specific integrated circuit) • Short circuit fault in the motor relay • Overload in the motor relay • Electrical fault in the motor circuit (eg motor interference, motor relay • Short circuit, ASIC (application specific integrated circuit) internal fault) • Damage to RFP due to over-temperature RFP (return pump) drive exceeds limits	
C007208		• Valve relay power supply circuit conversion resistance is too high, powerless power supply system, such as high current consumption or unstable supply voltage • The supply line of valve relay is interrupted. This may be due to a defective fuse bad or damage to the car cable, or the relay supply line is supplied with very appropriate low voltage • The activation time of valve exceeds the time permitted in the diagnostics	

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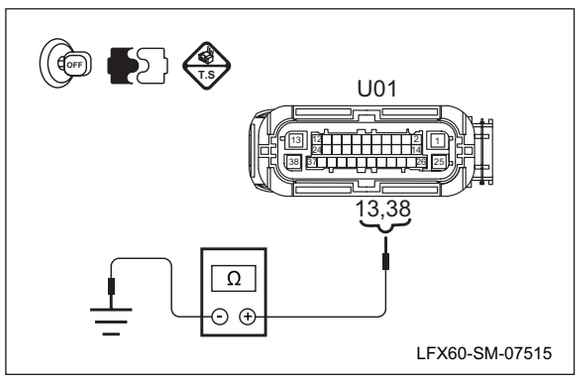
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Diagnostic process

Test condition	Details/results/measures
1. General inspection.	
	A. Check the related harness plugs for breakage, loose contact, aging or looseness. Is it OK after checking? →**Yes** To step 2. →**No** Repair the fault position.
2. Read the DTC with the diagnostic meter.	
	A. Connect the diagnostic meter and check the system for the other relevant DTCs. Is it OK after checking? →**Yes** To step 3. →**No** Carry out the relevant fault diagnosis according to the DTCs.
3. Check whether the DTC can be cleared.	
	A. Connect the diagnostic meter and access the ABS / ESP to clear DTC. B. Start the engine and check whether the DTC occurs again. Does DTC occur? →**Yes** To step 4. →**No** System normal.
4. Check the ABS/ESP power line.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the ABS/ESP harness plug U10. D. Connect the battery negative terminal E. Operate the ignition switch to turn the power to ON state. F. Measure the voltage between the ABS/ESP harness plug U10 terminal 1, 25, 28 and the fixed ground point with the multimeter. **Standard value: 11 ~ 14 V** Is the voltage normal? →**Yes** To step 5. →**No** Repair the ABS/ESP power line open circuit fault and replace the harness if necessary.

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Test condition	Details/results/measures
5. Check the ground line of ABS/ESP control module.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the ABS/ESP harness plug U10. D. Measure the resistance between the ABS/ESP harness plug U130 terminal 13, 38 and the fixed ground point with the multimeter. **Standard value: less than 5Ω** Is the resistance normal? →**Yes** To step 6. →**No** Repair the ABS/ESP ground line open circuit fault and replace the harness if necessary.
6. Check the ABS/ESP control module.	
	A. Replace the ABS/ESP control module. **Refer to the replacement of ABS/ESP module** Confirm that the fault has been ruled out.

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DTC C104C04

DTC description:

DTC	Description	Definition
C104C04	• PATA switch error	• Abnormal switch status

Possible Cause

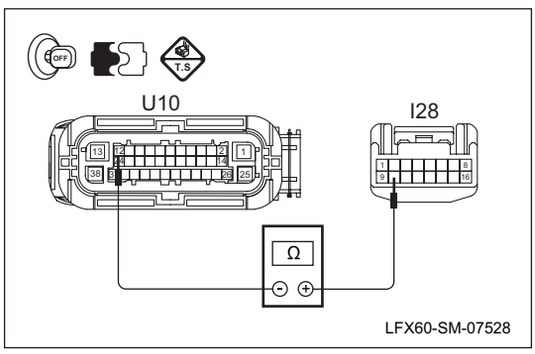
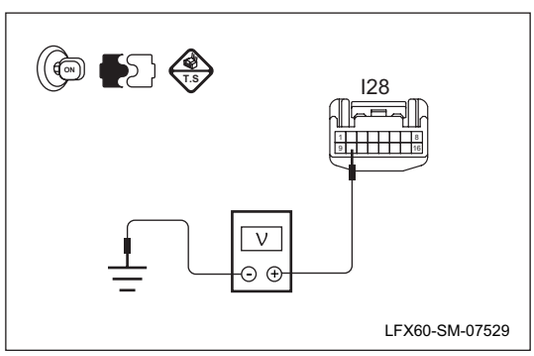
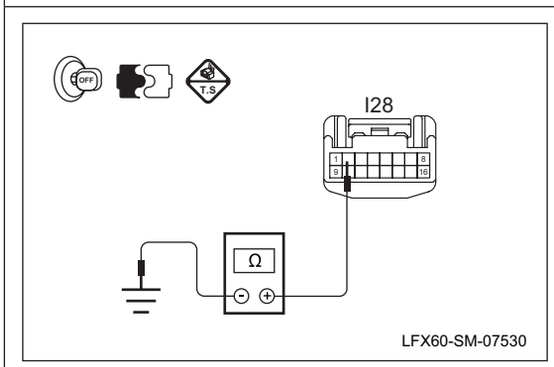
DTC	Check the strategy	Set the condition (control strategy)	Define the fault location
C104C04	• Hardware and line	• The PATA switch is pressed down for more than 10s	• Line • Dashboard switch • ABS/ESP module

Diagnostic process

Test condition	Details/results/measures
1. General inspection.	
	A. Check the related harness plugs for breakage, loose contact, aging or looseness. Is it OK after checking? →**Yes** To step 2. →**No** Repair the fault position.
2. Read the DTC with the diagnostic meter.	
	A. Connect the diagnostic meter and check the system for the other relevant DTCs. Is it OK after checking? →**Yes** To step 3. →**No** Carry out the relevant fault diagnosis according to the DTCs.
3. Check whether the DTC can be cleared.	
	A. Connect the diagnostic meter and access the ABS /ESP system to clear DTC. B. Start the engine and check whether the DTC occurs again. Does DTC occur? →**Yes** To step 4. →**No** System normal.

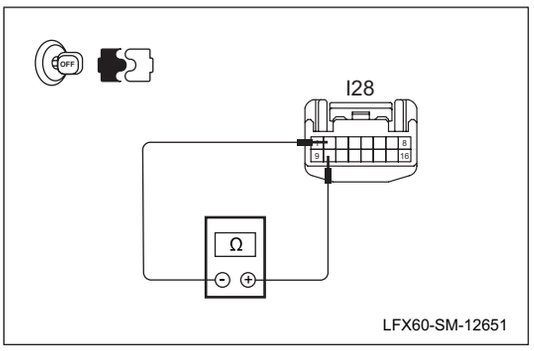
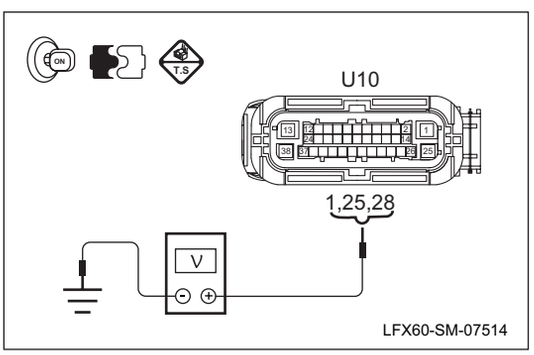
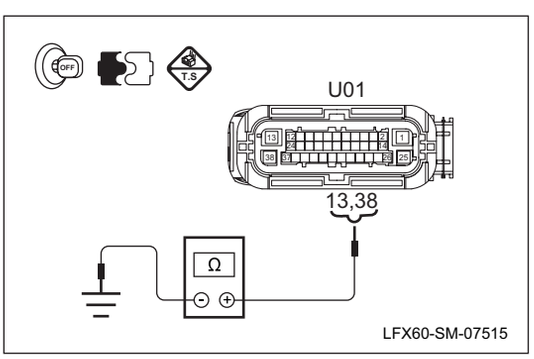
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Test condition	Details/results/measures
4. Check the continuity of the dashboard switch signal circuit.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the ABS/ESP harness plug U10. D. Disconnect the dashboard switch harness plug I28. E. Measure the resistance between the No. 12 terminal of the ABS / ESP harness plug U10 and the No. 10 terminal of the dashboard switch harness plug I28 with a multimeter. Standard value: Less than 5Ω Is it OK after checking? →Yes To step 5. →No Check the dashboard switch signal circuit for open circuit failure, and replace the wiring harness if necessary.
5. Check the dashboard switch signal circuit and power supply for short circuit.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the dashboard switch harness plug I28. D. Connect the battery negative terminal E. Operate the ignition switch to turn the power to ON state. F. Measure the voltage between No. 10 terminal of the harness plug I28 of the dashboard switch and the reliable grounding with a multimeter. Standard value: 0 V Is it OK after checking? →Yes To step 6. →No Check the dashboard switch signal circuit and power supply for short circuit failure, and replace the wiring harness if necessary.
6. Check the dashboard switch ground line.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the dashboard switch harness plug I28. D. Measure the resistance between No. 2 terminal of the harness plug I28 of the dashboard switch and the reliable grounding with a multimeter. Standard value: Less than1Ω Is it OK after checking? →Yes To step 7. →No Check the dashboard switch grounding circuit for open circuit failure, and replace the wiring harness if necessary.

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Test condition	Details/results/measures
7. Check the dashboard switch.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the dashboard switch harness plug I28. D. Press down the dashboard switch, and measure the resistance between No. 2 and No. 10 terminal of the dashboard switch I28 with a multimeter. **Standard value: Less than 5Ω** Is the resistance normal? →**Yes** To step 8. →**No** Repair the ABS/ESP ground line open circuit fault and replace the harness if necessary.
8. Check the ABS/ESP power line.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the ABS/ESP harness plug U10. D. Connect the battery negative terminal E. Operate the ignition switch to turn the power to ON state. F. Measure the voltage between the ABS/ESP harness plug U10 terminal 1, 25, 28 and the fixed ground point with the multimeter. **Standard value: 11 ~ 14 V** Is it OK after checking? →**Yes** To step 9. →**No** Repair the ABS/ESP power line open circuit fault and replace the harness if necessary.
9. Check the ground line of ABS/ESP control module.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the ABS/ESP harness plug U10. D. Measure the resistance between the ABS/ESP harness plug U130 terminal 13, 38 and the fixed ground point with the multimeter. **Standard value: Less than 5Ω** Is the resistance normal? →**Yes** To step 10. →**No** Repair the ABS/ESP ground line open circuit fault and replace the harness if necessary.

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Test condition	Details/results/measures
10. Check the ABS/ESP control module.	
	A. Replace the ABS/ESP control module. **Refer to the replacement of ABS/ESP module** Confirm that the fault has been ruled out.

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DTC C108C08

DTC description

DTC	Description	Definition
C108C08	• Reverse switch signal is permanently high / low	• Abnormal reverse switch signal

Possible Cause

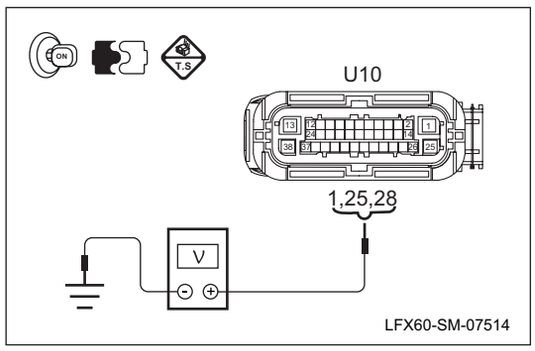
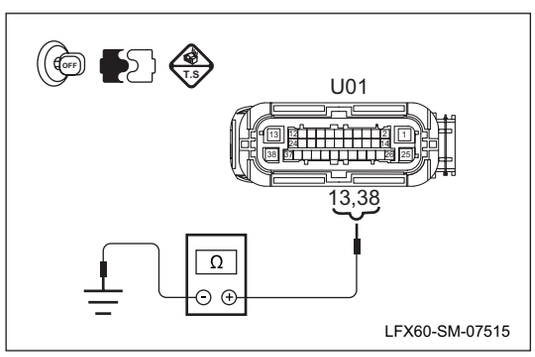
DTC	Check the strategy	Set the condition (control strategy)	Define the fault location
C108C08	• Hardware and line	• The reverse signal displays "in use" for 20s at speeds greater than 40 km / d	• CAN line • Reverse switch • ABS/ESP module

Diagnostic process

Test condition	Details/results/measures
1. General inspection.	
	A. Check the related harness plugs for breakage, loose contact, aging or looseness. Is it OK after checking? →**Yes** To step 2. →**No** Repair the parts.
2. Read the DTC with the diagnostic meter.	
	A. Connect the diagnostic tool to check if the ECM / TCU system has a fault in reverse switch signal. Does it exist? →**Yes** Jump to ECM / TCU system fault code diagnosis. →**No** To step 3.

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Test condition	Details/results/measures
3. Check the ABS/ESP power line.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the ABS/ESP harness plug U10. D. Connect the battery negative terminal E. Operate the ignition switch to turn the power to ON state. F. Measure the voltage between the ABS/ESP harness plug U10 terminal 1, 25, 28 and the fixed ground point with the multimeter. **Standard value: 11 ~ 14 V** Is the voltage normal? →**Yes** To step 4. →**No** Repair the ABS/ESP power line open circuit fault and replace the harness if necessary.
4. Check the ground line of ABS/ESP control module.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the ABS/ESP harness plug U10. D. Measure the resistance between the ABS/ESP harness plug U130 terminal 13, 38 and the fixed ground point with the multimeter. **Standard value: Less than 5Ω** Is it OK after checking? →**Yes** To step 5. →**No** Repair the ABS/ESP ground line open circuit fault and replace the harness if necessary.
5. Check the ABS/ESP control module.	
	A. Replace the ABS/ESP control module. **Refer to the replacement of ABS/ESP module** Confirm that the fault has been ruled out.

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DTC C121208, U015504, U042308, U014004, U014008, U010004, U030104, U010008, U010104, U030204, U010108

DTC description:

DTC	Description	Definition
C121208	• Incorrect variable code	• Module fault
U015504	• Lost contact with the dashboard	• Lost communication with the dashboard
U042308	• Data from IC invalid(the data length control, CRC, real time counter error)	• Invalid dashboard data received
U014004	• Lost contact with the BCM	• Lost communication with the BCM
U014008	• BCM data invalid (the data length control, CRC, real time counter error)	• Invalid BCM data received
U010004	• Lose contact with EMS1	• Lose communication with EMS1
U030104	• Lose contact with EMS2	• Lose communication with EMS2
U010008	• EMS data broken (data length control, cyclic redundancy code verification, real-time counter error /EMS signal invalid)	• EMS data broken
U010104	• Lose contact with TCU1	• Lose communication with TCU1
U030204	• Lose contact with TCU2	• Lose communication with TCU2
U010108	• TCU data broken(data length control, cyclic redundancy code verification, real-time counter error /TCU signal invalid)	• TCU data broken

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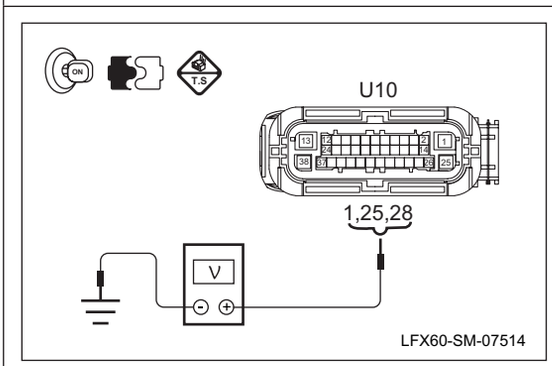
Possible reasons

DTC	Check the strategy	Set the condition (control strategy)	Define the fault location
C121208	• Hardware and line	• (Electrically erasable read-only memory) is empty or invalid • (Electrically erasable read-only memory) has a problem	• Line • ABS/ESP module
U015504		• ESP does not receive CAN data from the dashboard	• CAN line • Dashboard • ABS/ESP module
U042308		• The data information of IC received by ESP is corrupted (the data length control, CRC, real time counter error)	
U014004		• SP does not receive CAN data from BCM (body control model)	• CAN line • BCM • ABS/ESP module
U014008		• The data information of BCM received by ESP is corrupted (the data length control, CRC, real time counter error)	
U010004		• CAN messages from EMS1 are not received by ESP	• CAN line • EMS1 • EMS2 • ABS/ESP module
U030104		• CAN messages from EMS2 are not received by ESP	
U010008		• The EMS information received by ESP is corrupted (data length control, cyclic redundancy check, real-time counter) or invalid EMS information received by ESP	
U010104		• CAN messages from TCU2 are not received by ESP	• CAN line • TCU • ABS/ESP module
U030204		• CAN messages from TCU2 are not received by ESP	
U010108		• The TCU information received by ESP is corrupted (data length control, cyclic redundancy check, real-time counter) or invalid TCU information received by ESP	

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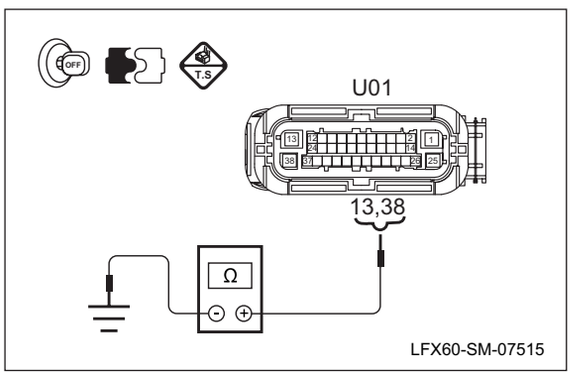
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Diagnostic process

Test condition	Details/results/measures
1. General inspection.	
	A. Check the related harness plugs for breakage, loose contact, aging or looseness. Is it OK after checking? →**Yes** To step 2. →**No** Repair the parts.
2. Read the DTC with the diagnostic meter.	
	A. Connect the diagnostic meter and check the system for the other relevant DTCs. Is it OK after checking? →**Yes** To step 3. →**No** Carry out the relevant fault diagnosis according to the DTCs.
3. Check whether the DTC can be cleared.	
	A. Connect the diagnostic meter and access the ABS /ESP to clear DTC. B. Start the engine and check whether the DTC occurs again. Does DTC occur? →**Yes** To step 4. →**No** System normal.
4. Check the ABS/ESP power line.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the ABS/ESP harness plug U10. D. Connect the battery negative terminal E. Operate the ignition switch to turn the power to ON state. F. Measure the voltage between the No. 1, 25, 28 terminals of the ABS / ESP harness plug U10 and the reliable grounding with a multimeter. **Standard value: 11 ~ 14 V** Is the voltage normal? →**Yes** To step 5. →**No** Repair the ABS/ESP power line open circuit fault and replace the harness if necessary.

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Test condition	Details/results/measures
5. Check the ground line of ABS/ESP control module.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the ABS/ESP harness plug U10. D. Measure the resistance between the ABS/ESP harness plug U130 terminal 13, 38 and the fixed ground point with the multimeter. **Standard value: Less than 5Ω** Is the resistance normal? →**Yes** To step 6. →**No** Repair the ABS/ESP ground line open circuit fault and replace the harness if necessary.
6. Check the vehicle communication system.	
	A. Check whether the vehicle communication system is normal. Is it OK after checking? →**Yes** To step 7. →**No** Check the communication system for fault.
7. Check the ABS/ESP control module.	
	A. Replace the ABS/ESP control module. **Refer to the replacement of ABS/ESP module** Confirm that the fault has been ruled out.

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Removal and installation

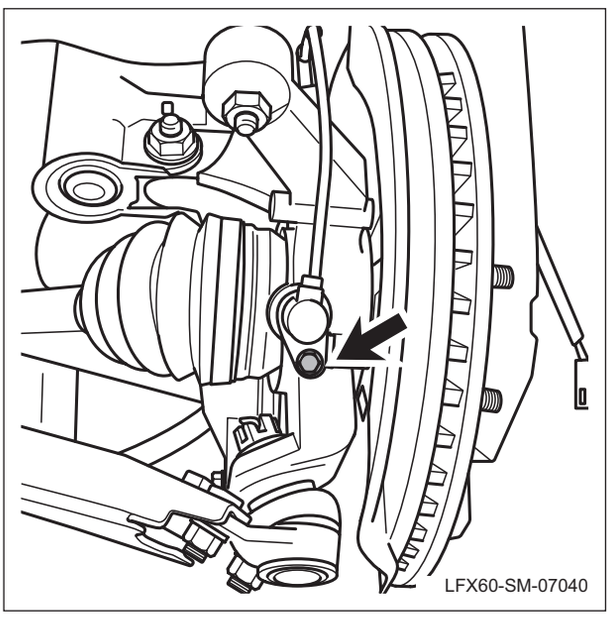
Replacement of front wheel speed sensor

1. Remove the front wheel speed sensor.

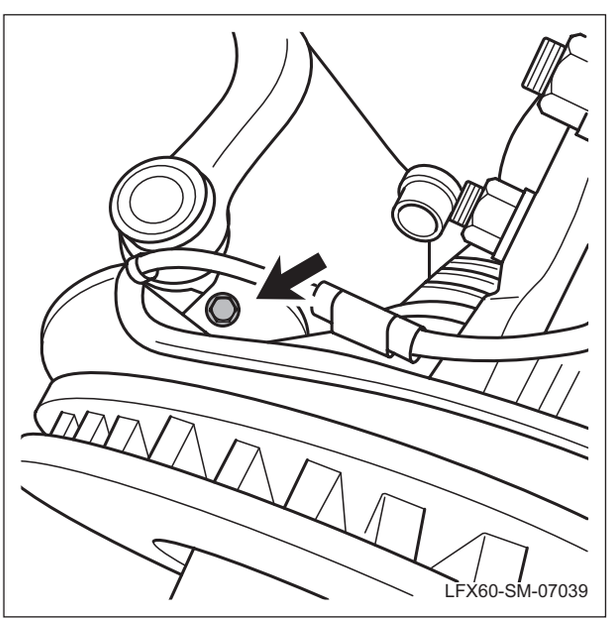
(a). Disconnect the battery negative connector.

(b). Lift the vehicle. **Refer to the vehicle lift and support.**

(c). Remove the front wheels, **refer to:Tire Replacement.**



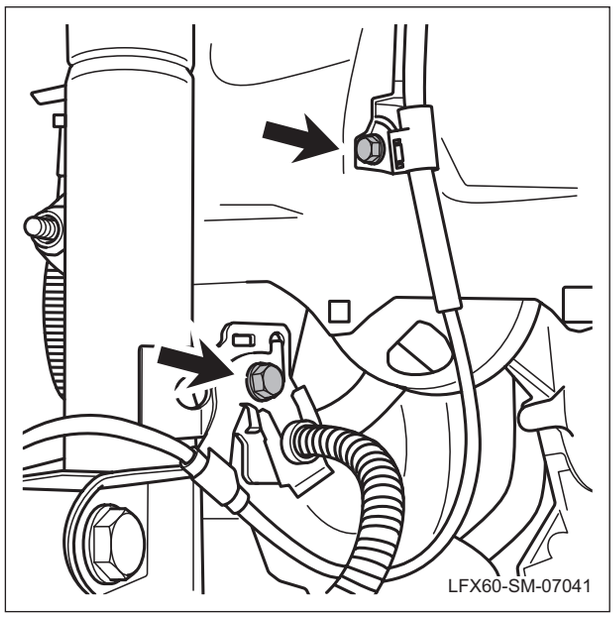
(d). Remove the fixing bolts of the front wheel speed sensor.



(e). Remove the fixing bolts of the harness bracket for the front wheel speed sensor.

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(f). Remove the fixing bolts of the harness bracket for the front wheel speed sensor.
(g). Remove the fender and disconnect the sensor connector.
(h). Take off the front wheel speed sensor.

ⓘNote:
Do not pull the wheel speed sensor wiring harness.

Installation

1. Install the front wheel speed sensor.

(a). The installation sequence is the reverse of the disassembly order.

ⓘNote:

- **Before installation, clean the sensor mounting holes and the surfaces of the gear and brake disc.**
- **The harness should not be twisted after installation.**

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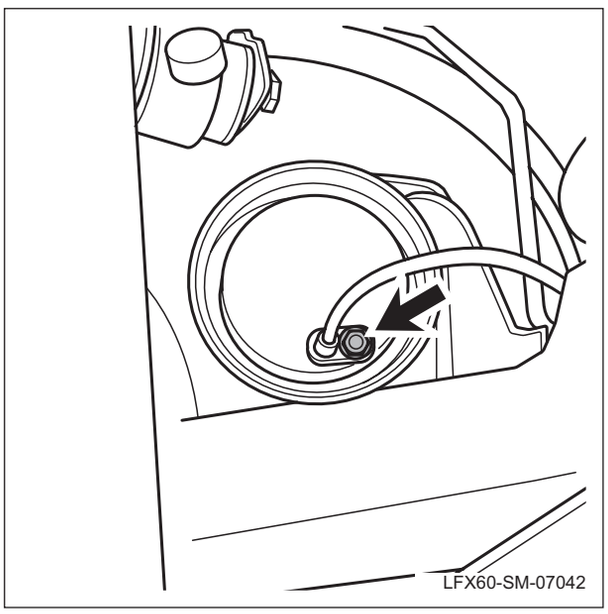
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Replacement of rear wheel speed sensor

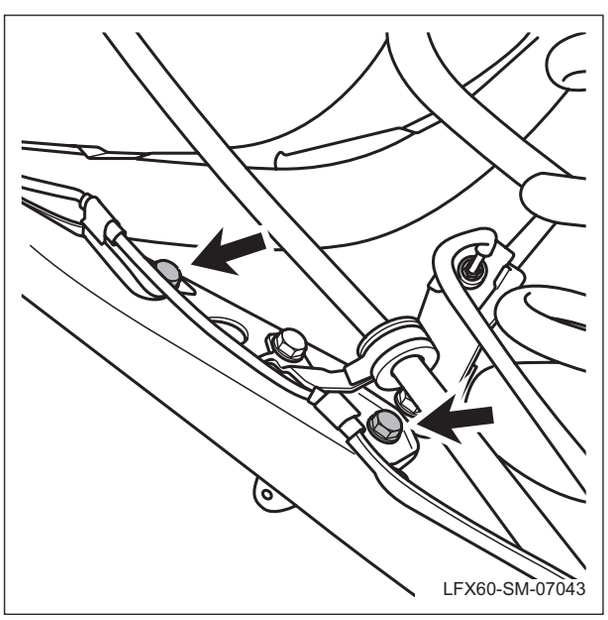
1. Remove the rear wheel speed sensor.

(a). Disconnect the battery negative connector.

(b). Remove the rear wheels, refer to:Tire Replacement.



(c). Remove the fixing bolts of the rear wheel speed sensor.



(d). Remove the fixing bolts of the harness bracket for the rear wheel speed sensor.

(e). Remove the C pillar lower decorative panel. Refer to the replacement of C pillar lower decorative panel.

(f). Disconnect the harness plug.of the rear wheel speed sensor

(g). Take off the rear wheel speed sensor.

ⓘNote:

Do not pull the wheel speed sensor wiring harness.

Installation

1. Install the rear wheel speed sensor.

(a). The installation sequence is the reverse of the disassembly order.

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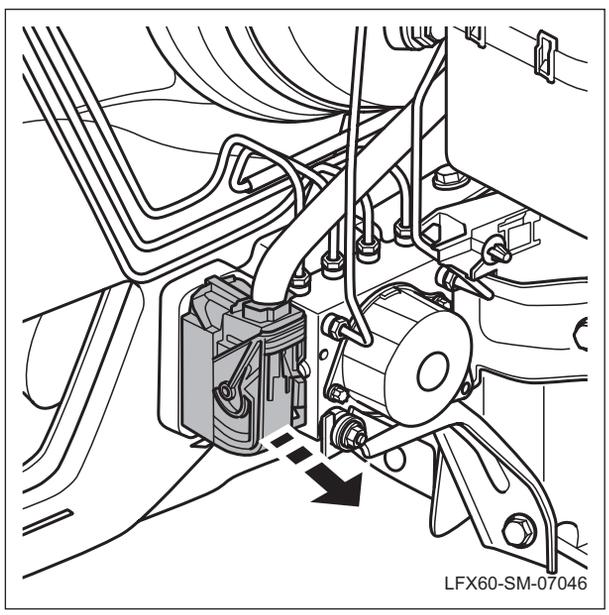
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ABS / ESP module assembly replacement

Removal

1. Remove the ABS / ESP module assembly.

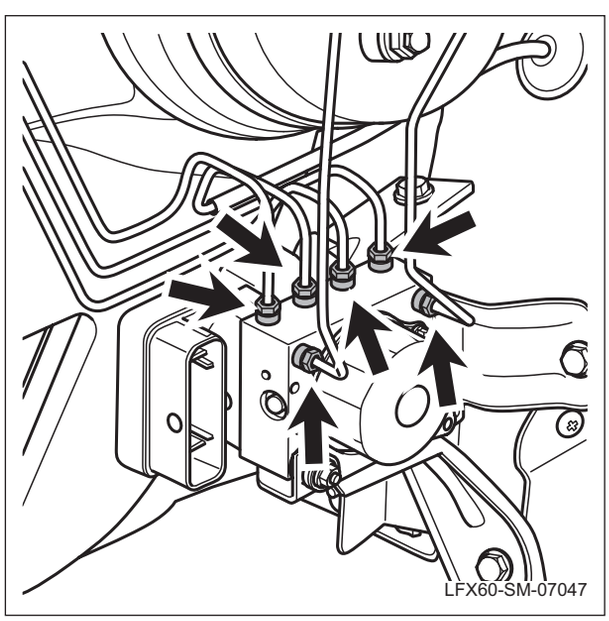
(a). Disconnect the battery negative connector.



(b). Disconnect the harness plug of the ABS / ESP module assembly.

Note:

Fold up the clip of harness plug for the ABS / ESP module, and disconnect the harness plug of ABS / ESP module.



(c). Empty the brake fluid.

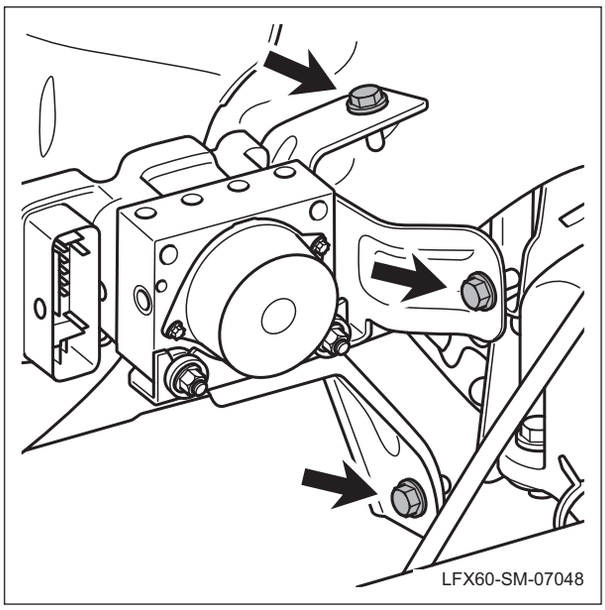
(d). Remove the brake tube and the ABS / ESP module assembly.

Note:

- **Seal the brake hose to prevent the oil lose and the ingress of dirt.**
- **If the brake fluid splashes onto the paint face, immediately rinse it with the cool water.**

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(e). Remove the fixing bolts of the bracket for ABS / ESP module assembly.
(f). Remove the ABS / ESP module assembly.

Installation

1. Install the ABS / ESP module assembly.
(a). The installation sequence is the reverse of the disassembly order.
(b). Brake system exhaust, refer to:Exhaust process of brake system.

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Replacement of steering sensor

Removal

1. Remove the steering sensor.

(a). Remove the spiral cable assembly, **refer to the replacement of spiral cable assembly.**

(b). Remove the steering angle sensor.

Installation

1. Install the steering sensor.

(a). The installation sequence is the reverse of the disassembly order.

Note:

When disassembling and installing or replacing the steering angle sensor, perform the intermediate position adjustment for the steering angle sensor.

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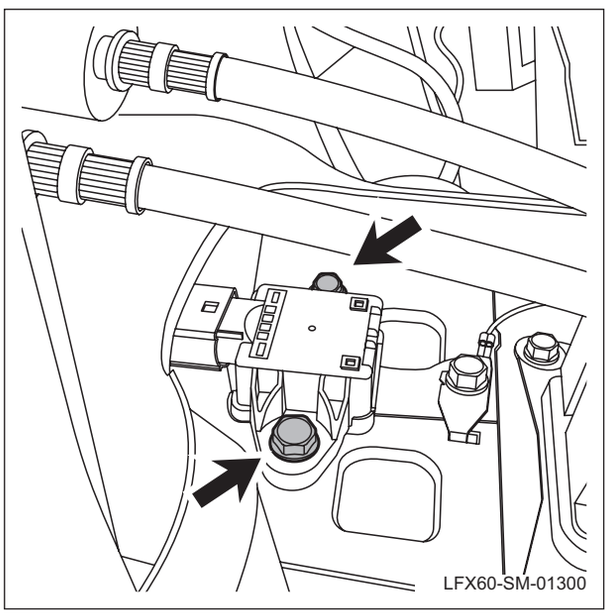
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Replacement of yaw rate sensor

Removal

1. Remove the yaw rate sensor.

(a). Remove the front lower panel of the console, **refer to the replacement of the console assembly.**



(b). Disconnect the harness plug of the yaw rate sensor.

(c). Remove the mounting bolts of the yaw rate sensor.

(d). Take off the yaw rate sensor.

Installation

1. Install the yaw rate sensor.

(a). The installation sequence is the reverse of the disassembly order.

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08- Electric air conditioning system

Electric air conditioning system 8-1219
Technical specifications.....8-1219
Precautions 8-1220
Structure and installation location 8-1221
General Inspection 8-1223
Air conditioner schematic 8-1226
Operating Principle.....8-1228
Diagnostic Information and Procedures.....8-1230
Removal and installation 8-1250

AutoLibrary

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Electric air conditioning system

Technical specifications

Torque Specifications

Name	Torque range	
	Metric (Nm)	British (lb-ft)
Air conditioning compressor mounting bolts	25	18

Components

Compressor model		WXH-106-AP
Condenser assembly	Type	Parallel-flow
	Specification D×H× W mm	625×397×16mm
	Heat exchanging capacity	≥ 4.5m / s Surface wind speed 13.1kW
Evaporator core	Type	Stack-up type
	Specification D×H× W mm	58×255×255
	Refrigeration capacity	Inlet air volume 423 m³/h, refrigerating capacity ≥ 4.2KW
Heater element	Type	Stack-up type
	Specification D×H× W mm	27×220×180
	Heat capacity	6L/h flow, with 350 m³/h air volume, the collected volume ≥ 4.5kW
Air flow adjustment		8 gear
Max air flow		Face cooling ≥ 423m³/h
		Feet heating ≥ 300 m³/h
Refrigerant	Type	R134a
	Filling volume	540g±20g
Lubricating oil	Type	PAG56
	Filling volume	120ml
A/C system	Max cooling power	At the compressure speed of 1800 rpm ≥ 4.8kW
	Temperature adjustment range	18℃ ~32

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Precautions

Note:

Following precautions must be observed during inspection and repair of A/C system, otherwise may cause vehicle damaged and personal injury.

1. Special gloves and glasses must be used, because the refrigerant has extremely low freezing point and strong volatile, it can cause chilblain or blind if touch skin or eyes.
2. If the refrigerant is spilled onto skin or eyes, wash with clean water immediately, then seek medical treatment from hospital. Never touch hurt skin or eye with your hand or tissue.
3. Working related to refrigerant must be conducted in areas with good ventilation. Released refrigerant may cause oxygen deficit phenomena.
4. Working related to refrigerant must be conducted in clean atmosphere without damp and/or dust, which may flow into A/C system causing damage.
5. A leak detector should be prepared during working related to refrigerant. Leaking should be prevent, because leaked R134a may set off reaction with hot items causing noxious gas.
6. Only R134a should be used as refrigerant for this vehicle. Any other refrigerant has adverse effects on system components.
7. R134a refrigerant and R12 refrigerant are not compatible, so they can not be mixed even with very few amount
8. No kindling or flammable items should be exist in areas of working related to refrigerant. Spacial care must be taken to avoid the refrigerant container exposed in heat sources because this may cause explosion.
9. The R134a is stored with high pressure, thus the container should never be exposed in high temperature conditions. If necessary, c heck to ensure temperature of storage areas is below 52℃ .
10. Caps should be used to prevent water, dust etc. getting into components of A/C system. The caps should be removed before work, and reinstalled after work.
11. It is advisable to avoid any work related to A/C system in rainy days because moisture has extremely adverse impact on system.
12. After the air conditioner system is disassembled, the O-ring seal must be coated with refrigerant oil, especially on the bolt-type connection parts, and manual installation at first and then fixed with a special tool
13. In assembly of flanged connection, the nuts and bolts should be tightened with pipes pushed gently.
14. Operation requirement should be adhered to install A/C, any torque above specification or excessive force on O seals may cause leaking of refrigerant.
15. No hose may be twist.
16. Any components should be removed before the refrigerant is totally recovered. If not, internal pressure of system may push out refrigerant and oil, causing environmental pollution.
17. After replacement of A/C component, refrigeration oil should be added along with refrigerant .
18. Refrigerant R134a must be used for this vehicle.

- R134a refrigerants that all indicators such as ingredients, moisture content, impurities, and non-condensable gases are qualified must be used.
- The filling amount of refrigerant must strictly comply with the provisions of the vehicle factory, too much or too little will have bad influence on the cooling effect of air conditioner.
- Before filling the refrigerant, thoroughly check that if the sealing seals of each pipe joint are intact and the parts are leaked.
- Before the compressor can operate, it can be filled from the low pressure side and the high pressure side. After the compressor is running, it can only be filled slowly from the low pressure side.
- After the R134a refrigerant is added, it shall be checked for leak carefully with electronic leak detector.

19. Add refrigerant oil properly.

- The type and grade of refrigerant oil of specified by the manufacturer must be used and different types and grades of refrigerant oil can not be mixed, otherwise the compressor will be damaged.
- Filling shall in strict accordance with the provisions of the amount, note that the refrigerant oil hinders heat transfer, excessive filling will seriously reduce the air conditioner effect; generally no need to fill refrigerant oil, for refrigerant oil has been filled by the manufacturers; when replacing parts (except for compressors), the same type of refrigerant oil shall be added properly.
- Since the refrigeration oil is highly easy to absorb water, shorten the air contact time so long as possible.
- The refrigerant oil should be filled from the compressor exhaust port before vacuumize.

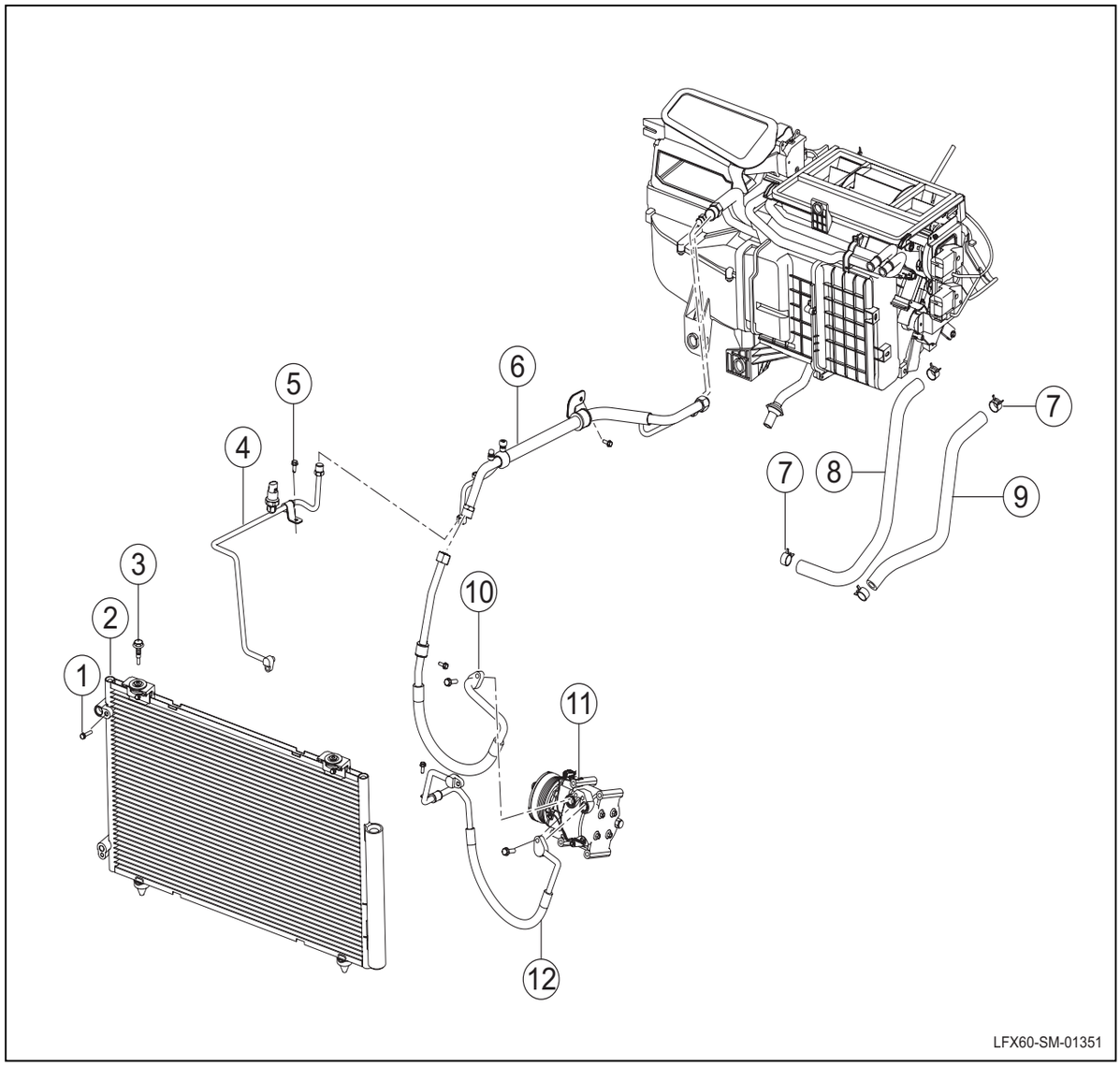
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Structure and installation location

Part exploded view

Air conditioner piping system



LFX60-SM-01351

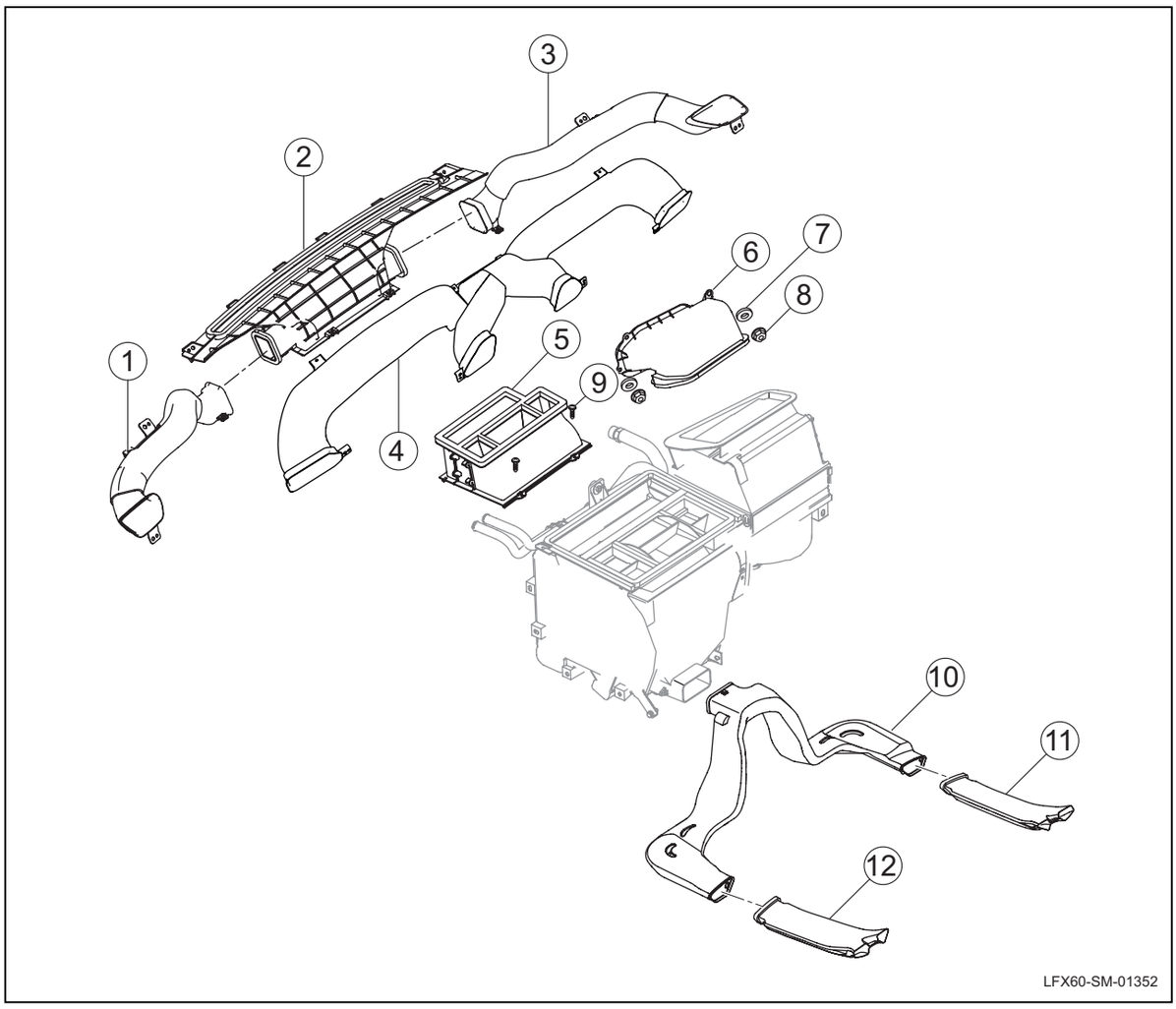
No.	Part name
1	Hexagon head bolt and taper elastic washer assembly
2	Condenser assembly
3	Condenser mounting bolts
4	High pressure pipe of A/C
5	Hexagonal bolts
6	High and low pressure coaxial tube

No.	Part name
7	Steel strip elastic clamp
8	Heater inlet pipe
9	Heater outlet pipe
10	Low pressure pipe of A/C
11	Compressor
12	Compressor exhaust pipe

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Ventilation device



No.	Part name
1	Left defrost duct
2	Central defrost duct components
3	Right blowing face air duct assembly
4	Central blowing duct assembly
5	Central transition duct assembly
6	New air duct assembly
7	Plain washer

No.	Part name
8	Hexagon nuts M6
9	Cross recessed pan head tapping screws, large washer assembly
10	Rear feet blowing middle air duct
11	Rear feet blowing right wind fairing assembly
12	Rear feet blowing left wind fairing assembly

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General Inspection

General equipment

Name
Digital multimeter
Refrigerant recovery and filling machine
Pressure gage
Thermometer
Electronic leak detector
UV leak detector
Sprayer

⚠Warning:

- **Before servicing the electrical system, disconnect the negative terminal of the battery, and welding or steam cleaning operations on or near the vehicle with air conditioner piping or components are prohibited.**
- **Do not use water, corrosive solvents or flammable and explosive solvents to clean the air conditioner system. It is recommended to use R-141b, heptane and other cleaning agents.**

The operating efficiency and service life of the air conditioner system depends on the chemical stability of the refrigeration system. Contaminants can change the stability of refrigerant and refrigerant oil when the refrigeration system is contaminated by foreign matter such as dust, air or moisture. And also affect the relationship between pressure and temperature, reduce efficiency, and may lead to corrosion and abnormal wear and tear of the system parts and components. Please check the air conditioner system as described below:

- Before disconnecting the plug, clean the plug and the oil around the plug to reduce the possibility of oil entering the system.
- Immediately after the pipe is disconnected, tighten the ends of the plug with a cap, stopper or tape to prevent oil, foreign matter and moisture from entering.
- Keep all tools clean and dry, including pressure gauge components and all parts for replacement.
- Add refrigerant oil with clean and dry conveyors and containers to ensure that the refrigerant oil is not contaminated.
- Operate as quickly as possible to shorten the time that the air conditioner system is exposed to the air.
- The air conditioner system must be re-emptied and refilled after exposure to air. All parts are dry and sealed before leaving the factory, and these sealed parts can only be opened at the time of installation. Before unpacking, all parts should be at room temperature, prevent moisture in the air from condensing into the parts inside the system, and re-seal all parts as soon as possible.

ⓘNote:

- **Do not store the refrigerant at sun exposure or next to a heat sour e.**
- **The refrigerant can not be discharged directly into the atmosphere in any case.**
- **Refrigerants such as R-134a (tetrafluoroethane) and R-12 (dichlorodifluoromethane) are not mixable.**
- **The type and grade of refrigerant oil of specified by the compressor manufacturer must be used and different types and grades of refrigerant oil can not be mixed, otherwise the compressor will be damaged.**
- **Since the refrigeration oil is highly easy to absorb water, shorten the air contact time so long as possible.**

Refrigeration system testing

If you suspect a problem with the air conditioner system, check the following:

- Check the outer surface of the radiator and condenser core to ensure that the airflow is not blocked by dust, leaves or other foreign matter.
- Check the surface between the condenser and the radiator as well as all outer surfaces.
- Check that if the condenser core, hose and connecting pipe are blocked or kinked.
- Check the operation of the blower motor.
- Check all air conditioner lines for leak or blocking.
- Check that if the compressor clutch is slipping.
- Check the compressor belt tension.

Quick inspection for Refrigeration piping

⚠Warning:

In some cases, the refrigerant piping and air conditioner components may be extremely hot or extremely cold. When checking the refrigerant piping or air conditioner unit, care should be taken when touching is required. Failure to follow this statement can result in personal injury.

- The air conditioner piping from the compressor to the condenser should be hot.
- The air conditioner piping from the condenser to the expansion valve should be warm, but not as hot as the air conditioner piping described above.
- Determine the temperature difference between the condenser heat and the air outlet by measuring the temperature. Depending on the ambient temperature, the temperature difference should be greater than 20 °C. If

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the temperature difference is less than 20 °C, check the condenser heat sink for foreign matter or damage, and if the radiator fan operation is normal.

- The air conditioner piping between the expansion valve and the evaporator should be cold from the installation point of expansion valve. Depending on the climate, the surface of the air conditioner piping may also freeze.
- The air conditioner piping between the evaporator and the compressor should be cold.
- Test the temperature of evaporator core output piping and prepare the following when measuring:
- Open all windows.
- Set the air distribution to the head outlet and open the air outlet for all vents.
- Turn on external circulation mode.
- Select the lowest blower switch setting.
- Select the lowest temperature setting.

ℹNote:

The temperature measurement can not be performed using a non-contact thermometer because the surface temperature radiation can lead to incorrect measurements.

1. Connect the temperature sensor to the evaporator core output piping. The temperature sensor must be mounted as close as possible to the evaporator core, connecting the temperature sensor to the digital multimeter.
2. Start the engine and allow the engine to run idle for several minutes.
3. Turn on the air conditioner, after 3min, measure the surface temperature of the evaporator core output piping.
4. If the measured temperature is 4 °C or less, the air conditioner system is normal. If the temperature is too high, the cooling of air conditioner system is not enough, continue to the next inspection step.

Frequent failure of the refrigeration system and its causes:

• Poor or no cooling

The air conditioner piping or the drying bottle is blocked or hindered, by comparing the temperature of the air conditioner piping or the surface of the drying bottle to find out the blocked or hindered position. The place with temperature difference is the place blocked or hindered.

ℹNote:

It is normal to have a temperature difference between the piping before and after the expansion valve. When the blocked or hindered place is found, check the relevant parts and replace the parts with new ones if necessary.

- The cooling performance is reduced (the compressor returns to normal after about 6 minutes of stopping)

This is due to the presence of moisture in the system, causing the expansion valve to freeze. In order to ensure that the moisture is completely removed from the refrigerant circuit, the time for evacuation must be extended to 2 to 3 hours and the drying bottle must be replaced with a new one.

Refrigeration system leak test

When you suspect that the system leaks the refrigerant, it should be tested for sure. The leak test should also be performed when the maintenance operation you are performing affects the piping or plugs. Leakage usually occurs at the refrigerant plug or interface. The cause of the leak usually includes the following faults:

- The mounting torque of the parts is not appropriate.
- The seal is damaged.
- Dust or fibers on O-rings.

There shall be appropriate pressure in the air conditioner system for leak detection, at least 340kPa. But compressed air is not allowed in the system; otherwise moisture, dust or other impurities of the air will increase the burden of desiccant or pollute the system. Leak check of refrigeration system uses the following methods.

Electronic leak detection

1. Use the electronic leak detector to inspect the entire piping of the refrigeration system carefully.

ℹNote:

Electronic leak detectors are sensitive to front window glass washings, solvents and cleaning agents and certain vehicle adhesives. The surface must be wiped clean, to avoid incorrect reading. Make sure that all surfaces are dry so as not to damage the electronic leak detector.

1. Move at 25 ~ 50mm / s to detect each connection for one whole circle.
2. Within 6mm from the probe tip to the detection surface.
3. Do not block the air inlet.
4. If a leak is detected, the audible alarm will change from 1 ~ 2 per second to continuous alarm. Adjust the balance control; maintain the alarm sound to 1 to 2 sounds per second.
5. Even if a leak has been detected, all parts of the following must be tested:

- Evaporator inlet and outlet.

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- Inlet and outlet of drying bottle.
- Condenser inlet and outlet.
- Brazing and welding parts.
- Damaged parts.
- Front and rear cover of compressor.
- All plugs and connectors.
- Test the high and low pressure service port / service valve.

Leak detection by fluorescent dye

Note:

- **Some vehicles have signs of refrigerant oil and refrigerant at the air conditioner pipe joints, which may be left for ease of installation of air conditioner piping and lubrication of spring lock interface of air conditioner piping. When the connector is suspected to leak, wipe the parts clean and use the R-134a Electronic Leak Detector to check for leaks.**
- **The leaks can be precisely positioned by the yellow-green light of the tracer. Since there may be more than one leak, normally each part should be checked.**

1. Add 7.4mm fluorescent tracer to the air conditioner refrigerant system.
2. After running the air conditioner system for 15min, turns off the engine.
3. Use an ultraviolet lamp to check all parts of the air conditioner system to determine the leak.
4. If a leak is found, recycle the refrigerant with the fluorescent tracer, repair or replace the leaked part, and refill the refrigerant with the fluorescent tracer into the air conditioner system.
5. Use oily solvents to remove traces of any fluorescent tracer on piping or components.
6. Run the air conditioner system for a few minutes and use the UV lamp again to check all parts of the air conditioner system and confirm the troubleshooting.

Leak detection by soap solution

For large leakage in the connection part of refrigerant piping, soapy water can be sprayed around the piping to see whether bubble is generated on the surface. This method is relatively simple and convenient, but the system microleakage can not be detected.

Leak detection by vacuum

1. Recycle the refrigerant and vacuumize the system (approx. 30 min).

Note:

If the air conditioner system is filled with refrigerant, then some of the refrigerant will remain in the refrigeration oil of the compressor. The remaining refrigerant will still evaporate and will cause a slight increase in the reading of the pressure gauge (up to 2 divisions) during the leak test, but this increase in pressure does not mean that the air conditioner system is leaking.

2. Turn off the manual valves for refrigerant on the high and low pressure gauge of the recycling and filling machine.
3. Observe the low pressure gauge on the refrigerant recycling and filling machine.

- If the reading on the gauge is increased by more than 2 kPa, it means that the system is leaked. You need to fill about 300g refrigerant for the leak check.
- If there is no leakage in the system, continue with the filling procedure.

Leak check for evaporator core

Evaporator core leakage is difficult to find, test the evaporator core according to the following procedures:

1. Set the blower speed to the maximum for at least 15 minutes.
2. Turn off the blower.
3. Wait for 10min.
4. Remove the blower speed regulation module.
5. Insert the leak detector probe as close as possible to the evaporator core, and a continuous alarm sound appears when the leak detector detects a leak.

Leak check for compressor shaft seal

1. Use the workshop compressed air to blow the rear and the compressor / front of pulley for at least 15s.
2. Wait for 1~2 min.
3. Detect at the front of the pulley. A continuous alarm sound appears when the leak detector detects a leak.

Refrigerant oil quality inspection

- Contrast method

Take the standard refrigerant oil into the test tube as standard oil, and then take the refrigerant oil to be checked into a tube of the same size for comparison. If the color of the refrigerant oil to be checked is light yellow or orange, it can be used; if it has become dirty solution of red brown, it can not be used.

- Dropping method

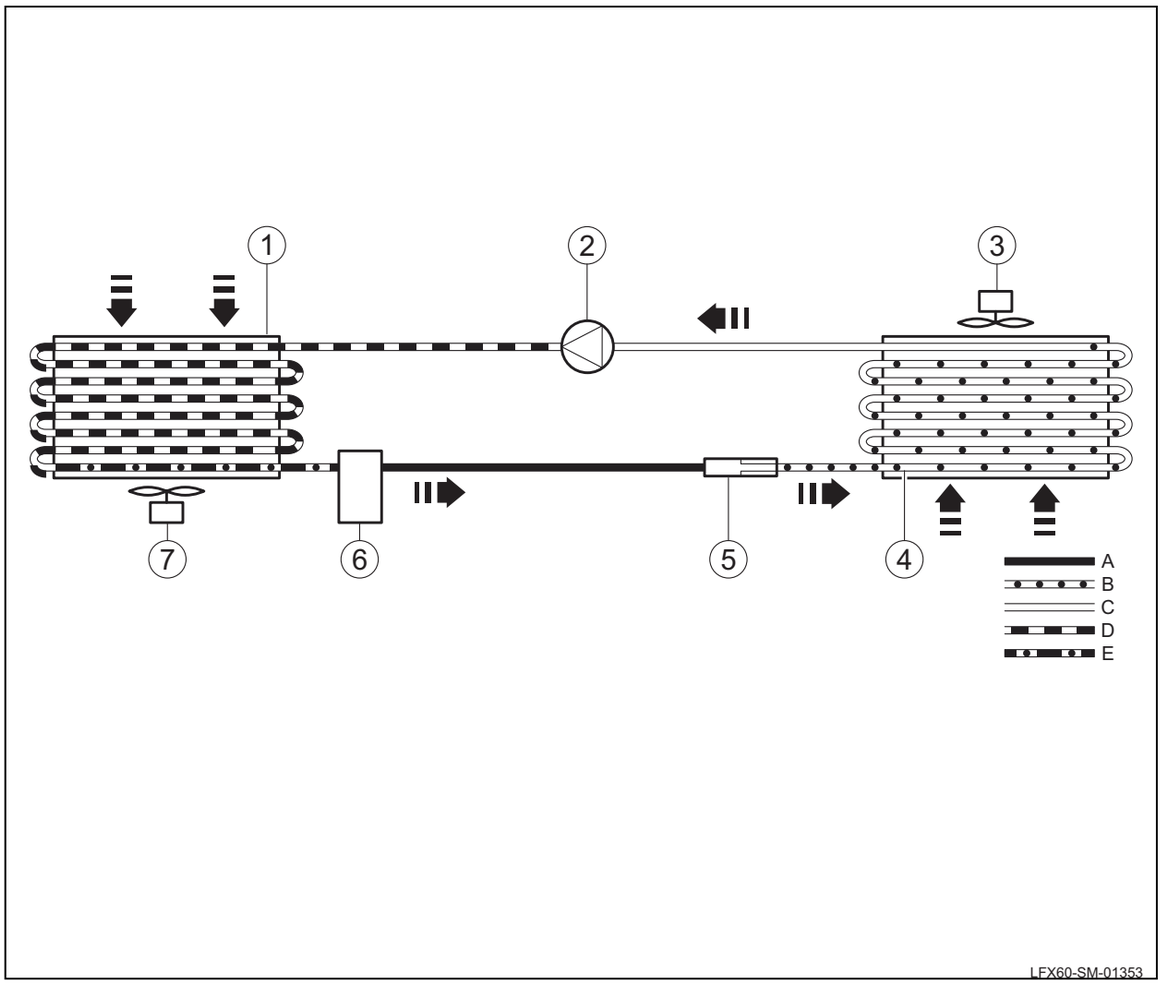
Remove the refrigerant oil to be checked and drop it on a clean white sheet and observe the color of the oil droplets after a while. If the color is light and in uniform distribution, it means that there are no impurities in the oil, and it can be used; if the central part of the oil droplets has black spots, indicating that the oil has deteriorated, and it can not be used.

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Air conditioner schematic

Refrigerating system



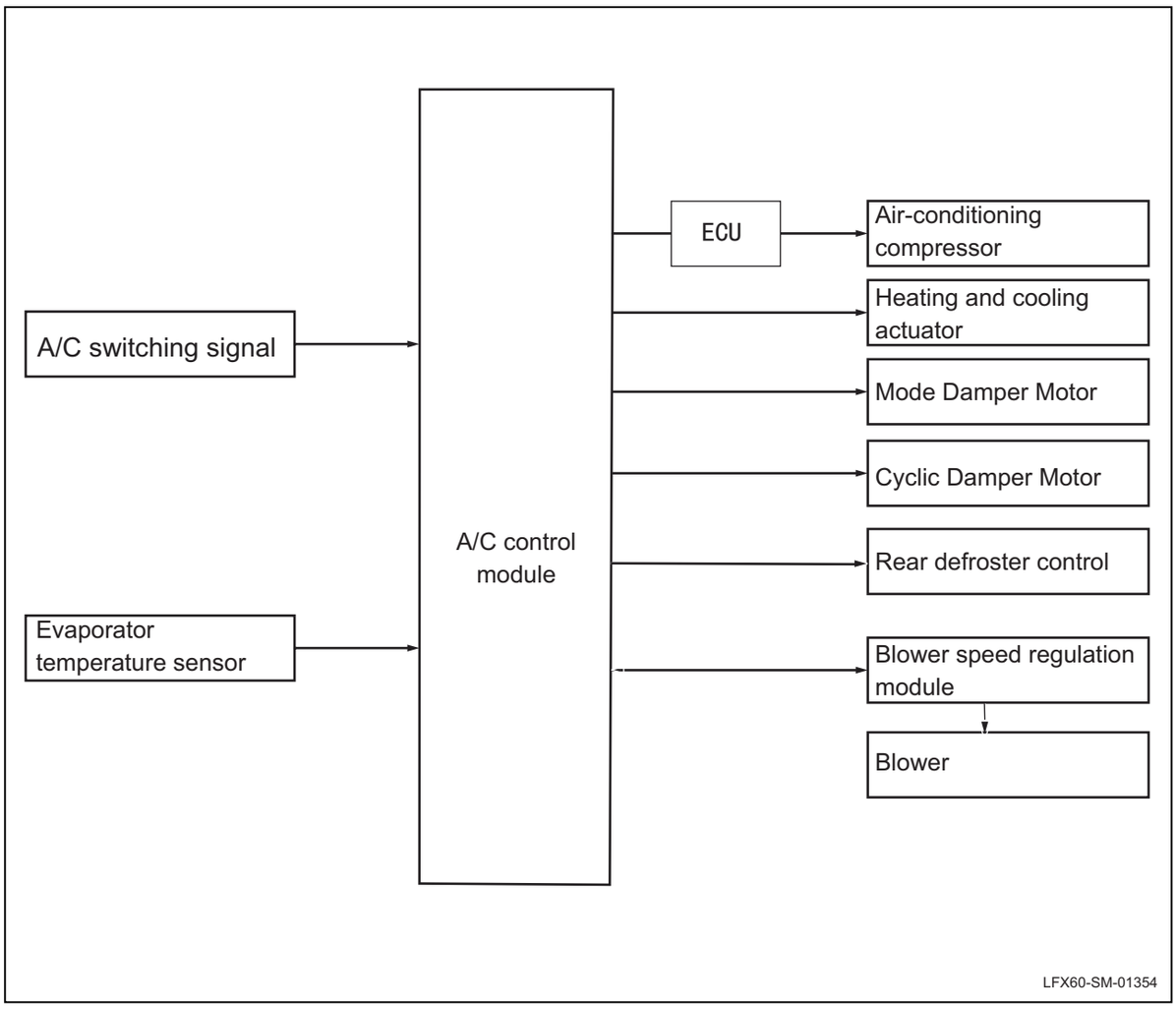
No.	Part name
1	Condenser
2	Compressor
3	Blower assembly
4	Evaporator assembly
5	Expansion Valve
6	Drying bottle

No.	Part name
7	Cooling fan
A	High pressure, medium temperature and liquid state
B	Low pressure, low temperature and liquid state
C	Low pressure, low temperature and gas state
D	High pressure, high temperature and gas state
E	High pressure, high temperature and gas-liquid mixing state

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Air conditioner control



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Operating Principle

System overview

The air conditioner system is designed for the vehicle to provide a comfortable ride environment regardless of the external weather conditions. The system controls the air entering the passenger compartment by performing the following functions:

- Cooling down
- Drying
- Heating
- Circulating

Fresh air from the air conditioner first get into the wind hood, then go through the air conditioner air filter, blower assembly, evaporator box assembly, warm water tank assembly, duct, and then reach the various outlet, into the space inside the vehicle. The air conditioner system consists of the following components:

- Cooling System
- Heater system
- Air distribution system
- Air-conditioning control system

The air conditioner system has the following characteristics:

- Filter the air into the car
- Provide a suitable temperature for the car
- Electricity ventilation
- Front windshield defrost

The driver can adjust the front air conditioner controller to achieve the following functions:

- Adjust the temperature inside the cab
- Blower speed
- Outflow mode
- Front windscreen defrost
- Rear windscreen defrost

Refrigerating system

The purpose of cooling is achieved by the heat absorption during the refrigerant transition from liquid to gas. The cooling process consists of the compression process, the cooling process (exothermic), the throttling process and the evaporation process (endothermic).

1. Compression process

The compressor draws the low temperature and low pressure gas at the outlet of the evaporator, compresses it into gas with high temperature and high pressure, and then feeds it into the condenser.

2. Cooling process (exothermic)

The high temperature and high pressure gas enters the condenser and exchanges heat with the air. The cooling fan blows the heat into the atmosphere and cools the refrigerant into liquid.

3. Throttle process

The liquid refrigerant with medium temperature and high pressure is throttled and depressurized by the expansion valve, to discharge the expansion device in a mist (fine droplets).

4. Evaporation process (endothermic)

The refrigerant mist throttled and depressurized by the expansion valve get into the evaporator to evaporate into a gas. Evaporation process absorbs the heat around and reduces the temperature inside the vehicle.

Compressor

The air conditioner compressor is driven pulley rotated by the compressor clutch, which is transmitted from the belt driven by the engine crankshaft. When the compressor clutch solenoid is not energized, the compressor pulley is free to rotate. The compressor pulley idles at this time, does not drive the compressor shaft. When the clutch coil is energized, the clutch disc and hub are pushed toward the pulley. The magnetic force locks the clutch disc and the pulley as one to drive the compressor shaft, and the compressor starts to operate.

Condenser, liquid storage drying bottle

The high-pressure high-temperature refrigerant vapor from the air-conditioning compressor flows into the condenser. The condenser is made of aluminum tubes and cooling fins which allow rapid heat transfer of the high-pressure high-temperature refrigerant vapor. The cooling fins condense the high-pressure high-temperature refrigerant vapor to high-pressure medium-temperature liquid by heat dissipation. The internal structure of the liquid storage drying bottle can ensure that when the high-pressure high-temperature gas-liquid mixed refrigerant enters, only the high-pressure medium-temperature liquid refrigerant exit the drying bottle. The drying solution has a desiccant that absorbs the moisture in the refrigeration system and the desiccant can not be reused.

Expansion throttle device

The expansion throttle device throttles and decompresses the high pressure liquid refrigerant from the condenser or the liquid storage drying bottle, to adjust and control the amount of the liquid refrigerant entering the evaporator, to accommodate the change in the cooling load. At the same time, to prevent the hydraulic phenomenon and abnormal overheating of the evaporator outlet steam.

Expansion valve is mainly composed of thin film and the valve shell, which is a neck expansion valve, which adjust the refrigerant flow according to the refrigerant pressure and temperature.

When the cooling requirement is low, the valve closes to reduce the amount of refrigerant.

When the cooling requirement is high, the valve will open slightly so that more refrigerant will

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pass to the evaporator.

Evaporator

The evaporator is located on the refrigerant piping between the expansion throttle device and the compressor, and is used to vaporize the liquid refrigerant after throttling and depressurization, to absorb the heat of the outside air. The cold wind was blown into the compartment, to achieve the purpose of cooling.

The evaporator cools and dries the air, and its tilted mounting position provides good runoff and reduces condensate and odor residue.

Refrigerant R-134a, refrigerant oil

Vehicles use R-134a refrigerant, refrigerant R-134a is non-toxic, flame retardant, transparent, colorless liquefied gas. Refrigerants have the following effects in air conditioner systems:

- Absorb heat
- Transfer heat
- Release heat

The refrigerating oil acts as a lubricant in the operation of the compressor to reduce the degree of friction and wear during the operation of the compressor, thereby extending the service life of the compressor. The refrigerating oil acts as a sealing between the piston and the cylinder surface of the compressor, and the rotation between the rotating bearings, to prevent the refrigerant from leaking. Refrigerant oil is used for lubrication in the compressor between the moving parts, it can take away the heat generated during the operation, so that the moving parts maintain a low temperature, thereby enhancing the efficiency and the reliability of use of the compressor.

Be sure to follow the instructions and carry out the following repairs:

- Recycle of refrigerants
- Recycle of refrigerant oil
- Filling of refrigerant
- Filling of refrigerant oil

⚠Warning:

- The amount of refrigerant oil should not exceed the maximum amount of filling.
- The filling amount of the refrigerant should not exceed the maximum filling amount.
- In strict accordance with the standard filling procedure, it should be operated by professionals,Otherwise it may cause harm to the person.

AC pressure switch

Air conditioner pressure switch is a three-state pressure switch, for air conditioner pressure signal transmission.

Heating system

The heat generated by the engine is transfered through the warm water pipes into the warm water tank, which can provide the vehicle a suitable temperature in cold weather. When heating is needed, the driver simply adjust the temperature adjustment knob on the air conditioner controller to drive the temperature adjuster motor, which controls the cold / warm air throttle for temperature adjustment.

The heating system is mainly composed of heat exchangers, blowers and corresponding piping, and the heated air is controlled by the throttle to get into the passenger compartment.

Air distribution system

The air distribution system distributes the cold and hot air produced by the cooling and heating system, according to different situations and the requirements of the crew from the different outlet of the wind, so that the passenger compartment temperature and air velocity are kept in a certain range, to form a more comfortable environment. The air distribution system is mainly composed of an intake pipe, an air mixing pipe and a gas distribution pipe. The air conditioner filter is located on the right side of the HVAC assembly on the right side of the cab, to filter the dust in the air circulation.

HVAC assembly

HVAC assembly is located in the dashboard, includes the blower, blower motor speed control module, dust filter, heater core, evaporator, expansion valve, mixed throttle control motor and a variety of air deflection throttle , and ventilation duct.

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Diagnostic Information and Procedures

Diagnosis Instructions

Before the diagnose of the electric air conditioner system, familiarize yourself with the working principle of the electric air conditioner system, and then start the electric air conditioner system diagnostics, which helps not only to determine the correct troubleshooting step in the event of a failure, and more importantly

It helps to determine the condition described by the customer is normal or not.

Any troubleshooting of the electric air conditioner system should take the electric air conditioner system check as a starting point and instruct the service personnel to take the next logical step, for troubleshooting. Comprehend and correctly use the diagnostic flow chart to shorten the diagnosis time and avoid the misjudgement.

General equipment

Digital multimeter
Diagnostic equipment of vehicle
Thermometer
Electronic leak detector
Pressure gage
Refrigerant recovery and filling machine

Visual Inspection

1. Confirm the problem of the customer.
2. Visually check whether there is any obvious mechanical or electrical damage sign.

Visual check table

Mechanical	Electrical
• Attachment belt • Refrigerant • Compressor • Expansion valve • Air conditioner piping • Condenser • Air conditioner filter • Air conditioner outlet pipe	• Fuse • Harness or plug • A/C pressure switch • A/C control panel • Blower speed control module • Blower • Cool and heat throttle motor • Mode throttle motor • New return throttle motor • Compressor

3. If the observed or raised problem is the evident and the cause has been found, ensure to fix this fault before proceeding with the next step.
4. f for the problem, there are no obvious findings, then confirm the fault and refer to the symptom table.

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List of fault symptoms

Symptom	Possible Cause	Recommended Measures
Water from air conditioner leak into the vehicle	• The drain-pipe of evaporator is blocked	• Clean the drain pipe
	• The drain-pipe of evaporator falls off	• Reinstall the evaporator drain pipe
	• The evaporator housing is damaged	• Replace the evaporator housing **Refer to: Replacement of HVAC**
Abnormal air conditioner pressure (both high and low pressure are high)	• The refrigeration system is mixed with air	• Vacuumize, refill the refrigerant
	• Refrigerant overcharged	• Recover the surplus refrigerant
	• Too many refrigerant lubricants	• Re-fill the refrigerant by standard procedure
	• Poor heat dissipation of condenser	• Clean the condenser surface or replace the condenser **Refer to: Replacement of condenser**
	• The cooling fan is operating abnormally	• Check the cooling fan
Abnormal air conditioner pressure (both high and low pressure are low)	• Refrigerant insufficient	• Check for refrigerant failure and refill the refrigerant
Abnormal air conditioner pressure (High pressure is normal, low pressure is high)	• Expansion valve failure	• Check or replace the expansion valve **Refer to: Replacement of expansion valve**
	• Refrigerant overcharged	• Recover the surplus refrigerant
	• Compressor fault	• Check and replace the compressor **Refer to: Replacement of compressor**
Abnormal air conditioner pressure (High pressure is normal, low pressure is low)	• Refrigerant insufficient	• Refill refrigerant
	• Expansion valve blocked by ice	• Replace the liquid storage drying bottle
	• Dirt on evaporator surface or internal blocking	• Clean or replace the evaporator • Refer to: **Replacement of the evaporator**
The evaporator is frozen	• Evaporator temperature sensor failure	• Check and replace the evaporator temperature sensor **Refer to: Replacement of evaporator temperature sensor**
	• The refrigerant is overfilled	• Recover the surplus refrigerant
	• The amount of air passing through the evaporator is insufficient	• Check that if the blower is operating properly and that the air conditioner filter is blocked
	• Expansion valve failure	• Check or replace the expansion valve **Refer to: Replacement of expansion valve.**

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Symptom	Possible Cause	Recommended Measures
Air conditioner is not cooling (normal air volume)	• Refrigerant leaks, missing	• Check the refrigerant for leak and refill the refrigerant
	• The compressor belt slips and falls off	• Check the accessory belt
	• The compressor does not operate	**Refer to: Compressor out of operation diagnosis flow**
	• Temperature flap fault	• Check if the temperature throttle is jammed and the hybrid throttle is operating
	• The compressor is damaged	• Replace the compressor **Refer to: Replacement of compressor**
A/C refrigerating output insufficient	• Refrigerant leaks, not enough	**Refer to: A/C refrigerating output insufficient diagnosis flow**
	• A/C filter clogging	
	• The compressor belt slips	
	• Fan fan is operating abnormally	
	• Condenser dissipation abnormal	
	• Air conditioner piping is blocked	
	• Temperature flap fault	
	• Blower fault	
	• Compressor fault	
A/C refrigerating output insufficient	• Air in cooling system	**Refer to: A/C refrigerating output insufficient diagnosis flow**
	• Heater water pipe clogging	
	• Heater radiator surface dirty or inside clogging	
	• Blower fault	
	• Temperature mixing flap fault	
Lack of heating	• Air in cooling system	**Refer to: Diagnostic process for lack of heating**
	• Heater water pipe clogging	
	• Heater radiator surface dirty or inside clogging	
	• Blower fault	
	• Temperature mixing flap fault	
Compressor out of operation	• The refrigerant is completely leaked	**Refer to: Compressor out of operation diagnosis flow**
	• Compressor fuses	
	• Harness and plug	
	• Compressor relay	
	• A/C pressure switch	
	• Evaporator temperature sensor	
	• A/C control panel	
	• Compressor	
	• ECM	

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Symptom	Possible Cause	Recommended Measures
Abnormal air volume	• Air duct blocked	• Clean the duct
	• Duct leaks	• Reinstall or replace the duct
	• A/C filter clogging	• Replace the air conditioner filter **Refer to:Replacement of air conditioner filter**
	• Blower fault	• Check or replace the blower **Refer to: Replacement of blower**
	• Air conditioner control panel failure	• Check or replace the air conditioner control panel **Refer to: Replacement of A/C control panel**
Blower out of operation	• Harness and plug	**Refer to:Diagnostic process for blower does not operate**
	• Blower fuses	
	• Blower relay	
	• Blower fault	
	• A/C control panel	

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Diagnostic process for lack of cooling

Test condition	Details/results/measures
1. Check the outlet temperature of air conditioner dashboard.	
	A Start the engine at 2,000 rpm and measure the outlet air temperature of the air panel. Is the outlet temperature too high? →**Yes** After completing the following adjustment, measure again and check whether the system is normal. • Switch to internal circulation mode. • Move the vehicle is into the shade. • Adjust the cool and heat throttle to the lowest temperature. →**No** To step 2.
2. Check the air output of the A/C dashboard air outlet	
	A. Adjust the blower speed to the maximum. B. Check whether the air output of the A/C dashboard air outlet is too low. Is the air output too low? →**Yes** After completing the following adjustment, measure again and check whether the system is normal. • Check the A/C filter for clogging and replace it if necessary. • Check the blower. • Check the blower speed regulation module. • Check the air outlet line. →**No** To step 3.

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Test condition	Details/results/measures
3. Check the refrigerant pressure.	
	A. Connect the A/C pressure test meter. B. start the engine, turn on the air conditioner. C. With engine speed of 2000rpm, measure the high and low pressure of the air conditioner system. **Standard value:** **High pressure 1.40 ~ 1.75 MPa** **Low pressure 0.25 ~ 0.35 MPa** Is it OK after checking? →**No** To step 4. →**Yes** Carry out the following adjustment or repair and check whether the system is normal. • If both the high and the low pressure of the air conditioner are high, check whether the piping of the refrigeration system is blocked. Check if the refrigerant is too much; drain too much refrigerant and refrigerant oil. Replace the expansion valve. • If the air conditioner pressure is high but the low pressure is low, clean and replace the blocked high pressure pipe; replace the expansion valve. • If the air conditioner pressure is low but the low pressure is high, add the refrigeration oil, repair or replace the compressor. • If both the air conditioner high pressure and low pressure are low, then repair, replace the leaked components of air conditioner system, according to the standard provisions for the filling of air conditioner refrigerant. • If the air conditioner pressure is low but low pressure is vacuum, replace the liquid storage drying bottle, replace the expansion valve, clean or replace the blocked low pressure pipe, extend the system vacuum time, fill the standard air conditioner refrigerant specified by manufacturer.
4. Check the operating status of the compressor.	
	A. Check the compressor belt for slipping. B. Check that if the compressor clutch is normal. C. Check that if the compressor working condition is normal. Is it OK after checking? →**Yes** To step 5. →**No** Carry out the following adjustment or repair and check whether the system is normal. • Check and adjust the compressor belt. • Check the compressor clutch coil. • Check the compressor control circuit. • Check the air conditioner pressure switch. • Check the evaporator temperature sensor. • Check the compressor. • Check the A/C control panel. • Check the ECM.

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Test condition	Details/results/measures
5. Check the air conditioner cooling system.	
	A. Check the condenser for serious dirt. Is it OK after checking? →**Yes** To step 6. →**No** Clean the air conditioner condenser.
6. Check the engine cooling system.	
	A. Check the following parts of the engine cooling system. • Is the coolant missing? • Whether the thermostat is operating properly. • Operating status of the cooling fan. • Status of the radiator. • Status of the radiator windshield. Adjust and repair according to the check situation to, and confirm that the system is operating properly.

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Diagnostic process for lack of heating

Test condition	Details/results/measures
1. Check the engine cooling system.	
	A. Check the temperature of engine coolant. B. Is the temperature of engine coolant at 82 °C? Is it OK after checking? →**Yes** To step 2. →**No** Make the following adjustments and repairs and confirm that the system is operating properly. • Extend the engine running time. • Check the cooling system for air. • Check that if the thermostat is operating properly. • Check if the warm water pipes are blocked.
2. Check the air output of the A/C dashboard air outlet	
	A. Adjust the blower speed to the maximum. B. Check whether the air output of the A/C dashboard air outlet is too low. Is the air output too low? →**Yes** After completing the following adjustment, measure again and check whether the system is normal. • Check the A/C filter for clogging and replace it if necessary. • Check the blower. • Check the blower speed regulation module. • Check the air outlet line. →**No** To step 3.
3. Check the temperature throttle.	
	A. Adjust the temperature to the highest. B. Check that if the temperature throttle is operating properly. Is it OK after checking? →**Yes** To step 4. →**No** Carry out the following adjustment and repair and check whether the system is normal. • Adjust the temperature throttle mechanism, • Check the temperature throttle mechanical actuator and the cool and heat throttle motor. • Check that if the duct is leaking or blocking. • Check the A/C control panel.

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Test condition	Details/results/measures
4. Check the internal and external circulation throttle.	
	A. Adjust to internal circulation mode. B. Check whether the internal and external circulation throttle is operating properly. Is it OK after checking? →**No** To step 5. →**Yes** Carry out the following adjustment and repair and check whether the system is normal. • Adjust the internal and external circulation throttle mechanism, • Check the internal and external circulation throttle mechanical actuators and the internal and external circulation throttle motors.
5. Check the heating water tank.	
	A. Replace the heating water tank. **Refer to: Replacement of heating water tank** Confirm that the fault has been ruled out.

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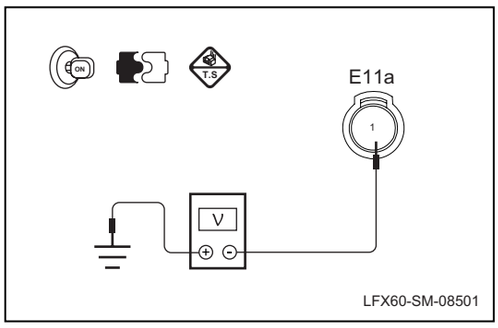
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Compressor out of operation diagnosis flow

Test condition	Details/results/measures
1. General inspection.	
	A. Check if the compressor belt is off. B. Check the compressor harness plug for aging, shedding, damage and other abnormalities. Is it OK after checking? →**Yes** To step 2. →**No** Repair the fault position.
2. Check the engine DTC.	
	A. Read and see if there is a DTC in the engine control system by using automotive diagnostic equipment. Is there a DTC? →**Yes** **Refer to: Diagnostic trouble code (DTC) list. Perform DTC diagnostic procedure.** →**No** To step 3.
3. Input and output function test.	
	A. Start the engine. B. Press down the power key of the diagnostic device for the vehicle with a fault. C. Select the following items on the menu:Power System / Engine System (Delphi VVT ETC) / I/O Control Function Unit / Air Conditioner Clutch. Is the compressor operating properly? →**Yes** To step 10. →**No** To step 4.

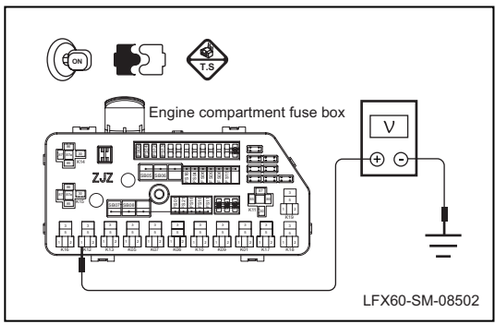
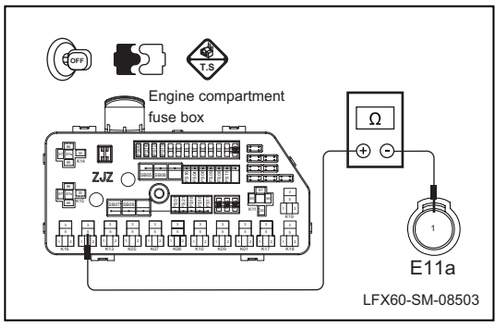
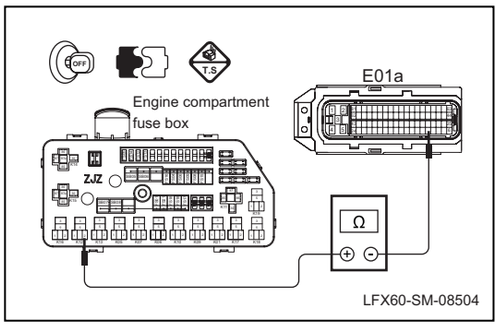
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Test condition	Details/results/measures
4. Check the compressor input voltage.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the harness plug E11a of the compressor. D. Connect the battery negative terminal E. Start the engine. F. Press down the power key of the diagnostic device for the vehicle with a fault. G. Select the following items on the menu:Power System / Engine System (Delphi VVT ETC) / I/O Control Function Unit / Air Conditioner Clutch. H. Measure the voltage between the No. 1 terminal of the harness plug E11a of the compressor and the reliable grounding with a multimeter. **Standard value: 11 ~ 14 V** Is the voltage normal? →**Yes** Replace the compressor. →**No** To step 5.
5. Check the compressor fuses.	
	A. Check the compressor fuses FS16. **Fuse rated capacity: 10 A** Is it OK after checking? →**Yes** To step 6. →**No** Replace the compressor fuse.
6. Check the air conditioning compressor relay.	
	A. Operate the ignition switch to turn the power to OFF state. B. Replace the K12 air conditioner compressor relay with a new one. C. Start the engine. D. Turn on the air conditioner and set the air conditioner in the cooling and running state. Check if the compressor is operating properly? →**Yes** Replace the air conditioner compressor relay. →**No** To step 7.

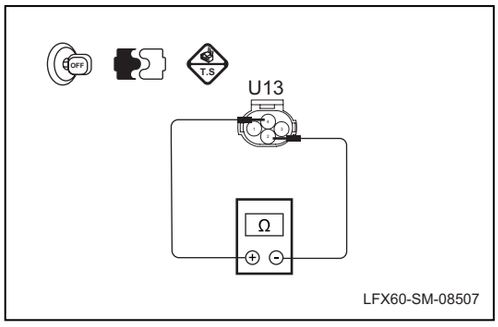
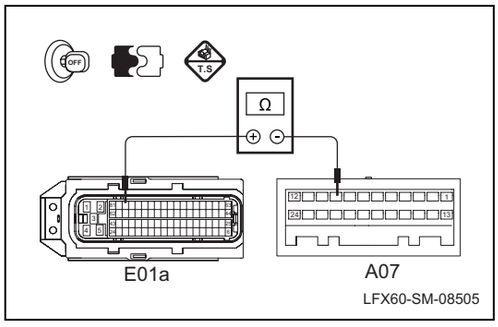
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Test condition	Details/results/measures
7. Check the air conditioning compressor relay power supply line.	
	A. Operate the ignition switch to turn the power to OFF state. B. Remove the K12 air conditioner compressor relay. C. Operate the ignition switch to turn the power to ON state. D. Measure the voltage between No. 1, 3 terminals of the K12 air conditioner compressor relay of the front compartment electrical box and the reliable ground point with a multimeter. **Standard value: 11 ~ 14 V** Is the voltage normal? →**Yes** To step 8. →**No** Check the air conditioner compressor relay power circuit for failure, and replace the front compartment electrical box as necessary.
8. Check the compressor input voltage circuit.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Remove the K12 A/C compressor relay. D. Disconnect the harness plug E11a of the compressor. E. Measure the resistance between No. 5 terminal of K12 air conditioner compressor relay of the front compartment electrical box and No. 1 terminal of the compressor harness plug E11a with a multimeter. **Standard value: Less than 5Ω** Is the resistance normal? →**Yes** To step 9. →**No** Check the compressor input voltage circuit for failure, and replace the front compartment electrical box as necessary.
9. Check the compressor relay control circuit.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Remove the K12 A/C compressor relay. D. Disconnect the ECM harness connector E01a. E. Measure the resistance between the engine compartment fuse box K12 A/C compressor relay terminal 2 and the compressor harness plug E01a terminal 10 with the multimeter. **Standard value: Less than 5Ω** Is the resistance normal? →**Yes** To step 21. →**No** Check the compressor relay control circuit for failure, and replace the front compartment electrical box as necessary.

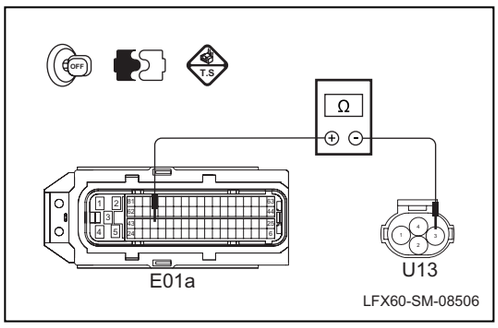
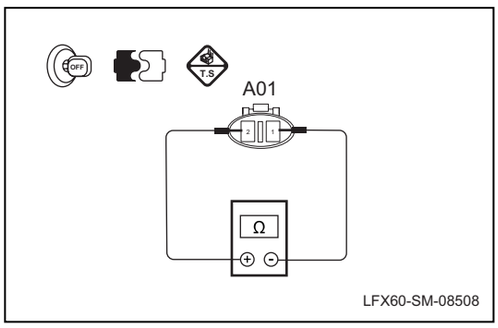
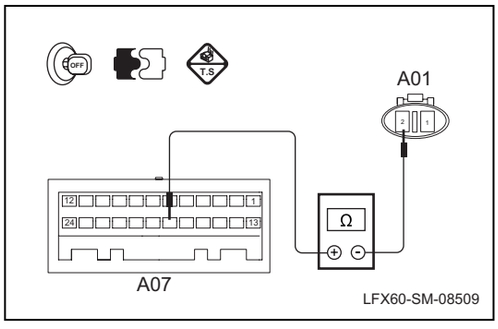
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Test condition	Details/results/measures
10. Check the refrigerant.	
	A. Connect the A/C pressure test meter. B. Check if the refrigerant leaks or is missing. Is it OK after checking? →**No** To step 11. →**Yes** Check the refrigerant for leak failure, refill the refrigerant. **Refer to: Recycling and filling procedures for air conditioner refrigerants**
11. Check the test pressure switch.	
	A. Fill the refrigerant by standard procedure. B. Operate the ignition switch to switch the power mode to "OFF". C. Disconnect the negative connector of the battery. D. Disconnect the A/C pressure switch harness plug U13. E. Measure the resistance between the No. 2 and No. 4 terminals of the air conditioner pressure switch U13 with a multimeter. **Standard value: Less than 5Ω** F. Measure the resistance between the No. 1 and No. 43 terminals of the air conditioner pressure switch U13 with a multimeter. **Standard value: 10MΩ or higher** Is it OK after checking? →**Yes** To step 12. →**No** Replace the air conditioner pressure switch. **Refer to: Replacement of air conditioner pressure switch**
12. Check the A/C switch feedback signal circuit.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the ECM harness connector E01a. D. Disconnect the A/C control panel harness plug A07. E. Measure the resistance between the No. 79 terminal of the ECM harness plug E01a and the No. 9 terminal of the harness plug A07 of the air conditioner control panel with a multimeter. **Standard value: Less than 5Ω** Is the resistance normal? →**Yes** To step 13. →**No** Check the A/C switch feedback signal circuit for open circuit failure and replace the wiring harness if necessary.

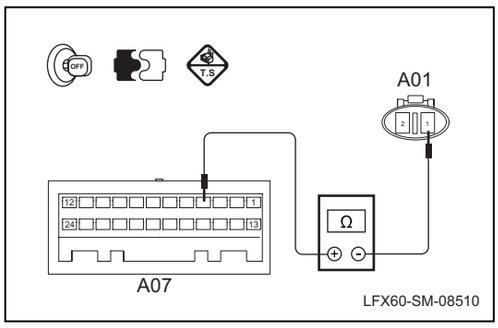
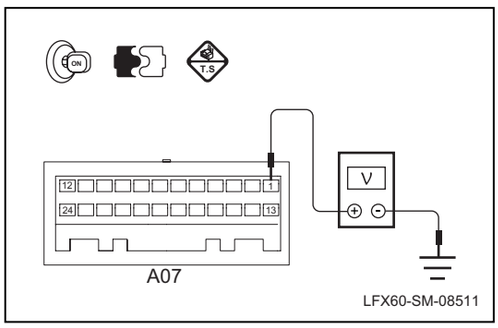
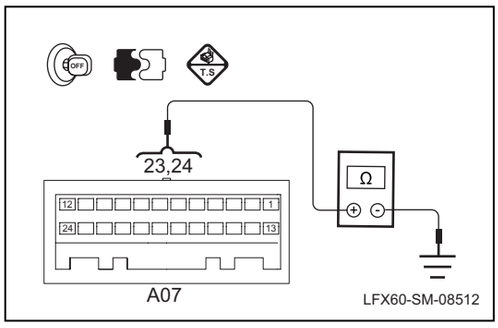
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Test condition	Details/results/measures
13. Check the A / C switch signal circuit.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the ECM harness connector E01a. D. Disconnect the A/C pressure switch harness plug U13. E. Measure the resistance between the No. 40 terminal of the ECM harness plug E01a and the No. 3 terminal of the harness plug U13 of the air conditioner pressure switch with a multimeter. **Standard value: Less than 5Ω** Is the resistance normal? →**Yes** To step 14. →**No** Check the A/C switch signal circuit for open circuit failure and replace the wiring harness if necessary.
14. Check the evaporator temperature sensor.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the temperature harness plug A01a of evaporator. D. Measure the resistance between the No. 1 and No. 2 terminal of the evaporator temperature harness plug A01 with a multimeter. Is the resistance normal? →**Yes** To step 15. →**No** Replace the evaporator temperature sensor **Refer to: Replacement of evaporator temperature sensor**
15. Check the evaporator temperature sensor signal circuit.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the evaporator temperature harness plug A01. D. Disconnect the A/C control panel harness plug A07. E. Measure the resistance between the evaporator temperature harness plug A01 terminal 2 and A/C control panel harness plug A07 terminal 18 with the multimeter. **Standard value: Less than 5Ω** Is the resistance normal? →**Yes** To step 16. →**No** Check and repair the evaporator temperature sensor signal circuit.

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Test condition	Details/results/measures
16. Check the evaporator temperature sensor signal grounding circuit.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the evaporator temperature harness plug A01. D. Disconnect the A/C control panel harness plug A07. E. Measure the resistance between the evaporator temperature harness plug A01 terminal 1 and A/C control panel harness plug A07 terminal 4 with the multimeter. **Standard value: Less than 5Ω** Are the resistance and the voltage normal? **→Yes** To step 17. **→No** Check the evaporator temperature sensor signal grounding circuit for failure, and replace the wiring harness if necessary.
17. Check the air conditioner control panel power supply circuit.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the A/C control panel harness plug A07. D. Connect the battery negative terminal E. Operate the ignition switch to turn the power to ON state. F. Measure the voltage between No. 1 terminal of the harness plug A07 of the air conditioner control panel and the reliable grounding with a multimeter. **Standard value: 11 ~ 14 V** Is the voltage normal? **→Yes** To step 18. **→No** Check the air conditioner control panel power supply circuit for failure and replace the wiring harness if necessary.
18. Check the air conditioner control panel grounding circuit.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the A/C control panel harness plug A07. D. Measure the resistance between No. 23, 24 terminal of the harness plug A07 of the air conditioner control panel and the reliable grounding with a multimeter. **Standard value: Less than 5Ω** Is the resistance normal? **→Yes** To step 19. **→No** Check the air conditioner control panel grounding circuit for failure and replace the wiring harness if necessary.

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Test condition	Details/results/measures
19. Check the A/C control panel.	
	A. Replace the A/C control panel. **Refer to: Replacement of A/C control panel** Is the troubleshooting successful? →**Yes** Replace the air conditioner control panel. →**No** To step 20.
20. Check ECM.	
	A. Replace ECM. **Refer to: Replacement of ECM** Confirm that the fault has been ruled out.

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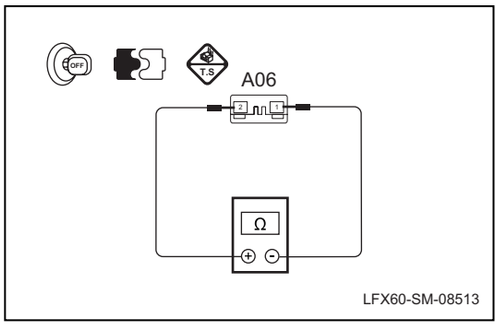
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Blower out of operation diagnosis flow

Test condition	Details/results/measures
1. General inspection.	
	A. Check the blower harness connector for aging, shedding, damage and other abnormalities. Is it OK after checking? →**Yes** To step 2. →**No** Repair the fault position.
2. Check the K18 blower fuses.	
	A. Check the blower fuse SB09. **Fuse rated capacity: 30 A** Is it OK after checking? →**Yes** To step 3. →**No** Replace the blower fuses.
3. Check the blower relay.	
	A. Operate the ignition switch to turn the power to OFF state. B. Replace the K18 blower relay with a new one. C. Operate the ignition switch to turn the power to ON state. D. Turn on the blower and check if the blower is operating properly Is the blower normal? →**Yes** Replace the K18 blower relay. →**No** To step 4.
4. Check the blower relay power supply circuit.	
	A. Operate the ignition switch to turn the power to OFF state. B. Remove the K18 blower relay. C. Operate the ignition switch to turn the power to ON state. D. Measure the voltage between No. 1 and 3 terminals of the K18 blower relay of the dashboard electrical box and the reliable ground point with a multimeter. **Standard value: 11 ~ 14 V** Is the voltage normal? →**Yes** To step 5. →**No** Check the blower relay power circuit for failure, replace the dashboard electrical box as necessary.

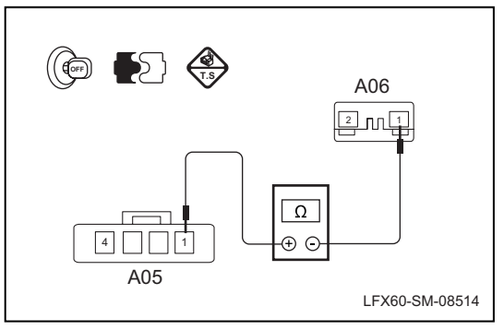
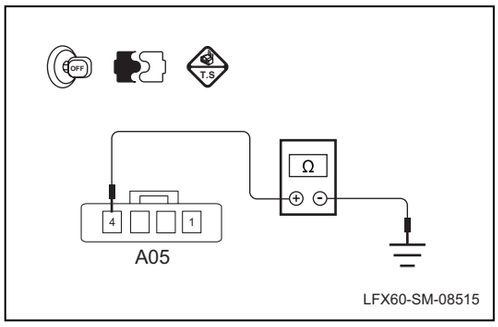
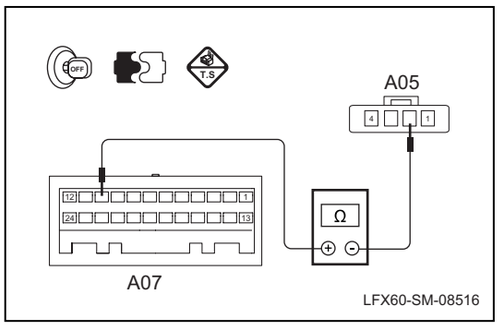
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Test condition	Details/results/measures
5. Check the blower relay control circuit.	
	A. Operate the ignition switch to turn the power to OFF state. B. Remove the K18 blower relay. C. Measure the resistance between No. 2 terminal of the K18 blower relay of the dashboard electrical box and the reliable ground point with a multimeter. **Standard value: Less than 5Ω** Is the resistance normal? → **Yes** To step 6. → **No** Check the blower relay control circuit for failure and replace the wiring harness if necessary.
6. Check the blower.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the blower harness plug A06. D. When measured with a multimeter, the No. 1 and No. 2 terminals of the blower should be conducting. Is it OK after checking? →**Yes** To step 7. →**No** Replace the blower. **Refer to: Replacement of blower**
7. Check the blower input voltage circuit.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Remove the K18 blower relay. D. Disconnect the harness plug A06 of the blower. E. Measure the resistance between the No. 5 terminal of the K18 blower relay of the dashboard electrical box and No. 2 of the harness plug A06 of the blower with a multimeter. **Standard value: Less than 5Ω** Is the resistance normal? →**Yes** To step 8. →**No** Check the blower input voltage circuit for failure, and replace the dashboard electrical box as necessary.

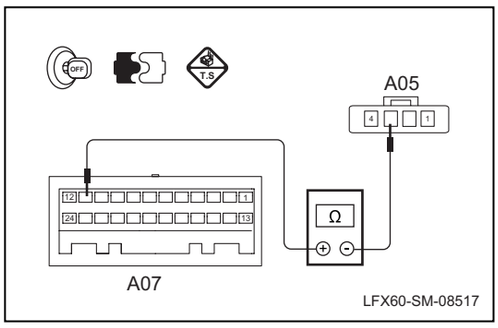
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Test condition	Details/results/measures
8. Check the blower grounding circuit.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the blower harness plug A06. D. Disconnect the harness plug A05 of blower speed control module. E. Measure the resistance between the No. 1 terminal of the harness plug A06 of blower and No. 1 terminal of the harness plug A05 of the blower speed control module with a multimeter. **Standard value: Less than 5Ω** Is the resistance normal? **→Yes** To step 9. **→No** Check the blower input voltage circuit for failure and replace the wiring harness if necessary.
9. Check the grounding circuit of the blower speed control resistor.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the blower speed regulation module harness plug A05. D. Measure the resistance between No. 4 terminal of the harness plug A05 of the blower speed control module and the reliable grounding with a multimeter. **Standard value: Less than 5Ω** Is the resistance normal? **→Yes** To step 10. **→No** Check the grounding circuit of the blower speed control resistor for failure and replace the wiring harness if necessary.
10. Check the control signal circuit of the blower speed control resistor.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the blower speed regulation module harness plug A05. D. Disconnect the A/C control panel harness plug A07. E. Measure the resistance between the No. 2 terminal of the harness plug A05 of blower speed control module and the No. 10 terminal of the air conditioner control panel A07 with a multimeter. **Standard value: Less than 5Ω** Is the resistance normal? **→Yes** To step 11. **→No** Repair the blower speed regulation resistance control signal line fault and replace the harness if necessary.

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Test condition	Details/results/measures
11. Check the feedback signal circuit of the blower speed control resistor.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the blower speed regulation module harness plug A05. D. Disconnect the A/C control panel harness plug A07. E. Measure the resistance between the No. 3 terminal of the harness plug A05 of blower speed control module and the No. 11 terminal of the air conditioner control panel A07 with a multimeter. **Standard value: Less than 5Ω** Is the resistance normal? →**Yes** To step 12. →**No** Repair the blower speed regulation resistance control signal line fault and replace the harness if necessary.
12. Check the blower speed control resistor.	
	A. Replace the blower speed control resistor. **Refer to: Replacement of blower speed control resistor** Is the troubleshooting successful? →**Yes** Replace the blower speed regulation resistance. → **No** To step 13.
13. Check the A/C control panel.	
	A. Replace the A/C control panel. **Refer to: Replacement of A/C control panel** Confirm that the fault has been ruled out.

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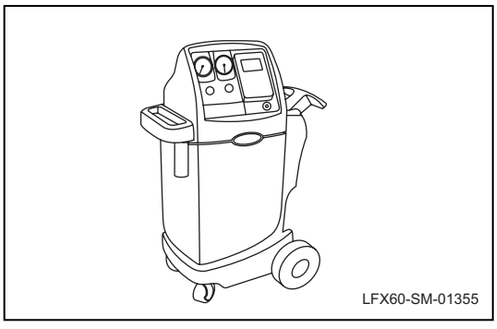
Removal and installation

Recycling and filling procedures for air conditioner refrigerants

Recycle

1. Recycle of the air conditioner refrigerants.

a. Refrigerant recycling and filling machine can complete the recovery, emptying and refilling procedures of air conditioning system with one connection. During recovery and emptying, the refrigerant is filtered to ensure that the refrigerant filled in the air conditioning system is clean and dry.



⚠Warning:

Refrigerant-related operations should be carried out in a well-ventilated environment without inhalation of refrigerant vapor. Avoid inhalation of vapor or mist of air conditioning refrigerant R-134a (tetrafluoroethane) and lubricating oil. Contact them will irritate the eyes, nose and throat. Works should be performed in a well-ventilated area.When removing R-134a from the air conditioning system, use a certified service facility (R-134a Recycling Equipment) that meets the requirements of SAE (American Society of Automotive Engineers) J 2210.If the system is accidentally discharged, the workspace must be ventilated before continuing maintenance..More information about health and safety is available from the refrigerant and lubricating oil manufacturers.

b. Connect the hose of high pressure side with quick connector to the high pressure side connector of the vehicle air conditioning system.

c. Open joint valve on the high pressure side.

d. Connect the hose of low pressure side with quick connector to the low pressure side connector of the vehicle air conditioning system.

e. Open joint valve on the low pressure side..

f. Check the the pressure gauge on the high pressure and low pressure side of the control panel on the refrigerant recycling and filling machine to ensure the air conditioning system pressure. If there is no pressure, there is no recyclable refrigerant in the system.

g. Open valves on the high pressure side and low pressure side.

h. Connect the refrigerant recycling and filling machine to appropriate power socket.

i. Turn on the main power switch.

j. Start the recycling process. Refer to the operation instructions supplied by the manufacturer and further learn about the use of refrigerant recovery and filling machine.

k. Check the low pressure side pressure gauge of control panel. If the air conditioning system pressure is kept at zero, the recovery is completed.

l. If the data indication of the low pressure side pressure gauge is not zero, then the system still has refrigerant in it. Recover the remaining refrigerant. Repeat this step until the system pressure remains at zero for 2 minutes.

Empty the refrigerants.

a. The refrigerant tank of Refrigerant Recycling and Filling Machine must be filled with sufficient amount of R-134a refrigerant for filling. Check the amount of refrigerant in the tank. If the refrigerant is less than 2 kg, add new refrigerant is to the refrigerant tank. Refer to the instructions of the Refrigerant Recycling and filing Machine for how to add the refrigerant. Check that the hoses of high pressure side and low pressure side are connected to the air conditioning system and open the valves of high pressure side and low pressure side on the control panel of the refrigerant recycling and filling machine.

b. Operate according to the operation procedure of the refrigerant recycling and filling machine, start the vacuum pump and start the empty program.

c. Check the system for leaks. Refer to the operation instructions supplied by the manufacturer and further learn about the use of refrigerant recovery and filling machine.

Lubricating oil filling, refilling of refrigeration system

ℹNote:

It is necessary to replenish the lubricating oil discharged from the air conditioning system during the recovery of the refrigerant.

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a. Use the lubricants used exclusively for the R-134a system.
b. Refer to the manufacturer's instruction manual for details on how to use the refrigerant recycling and filling machine and add the specified lubricating oil to the vehicle air conditioning system.
c. When the filled oil reaches the required level, close the valve.

Filling

1. Filling of the air conditioner refrigerants.
a. Open the low pressure side valve on the control panel.
b. Open the high pressure side valve on the control panel.
c. Refer to the manufacturer's instruction manual for details on how to use the refrigerant recycling and filling machine.
d. Fill the air conditioner with the specified amount of refrigerant, make sure that the unit of measurement is correct (ie kilograms, kilograms or pounds).
e. Start filling.
2. After the refrigerant filling is complete, do the following:
a. Close the valves of the high and low pressure side on the control panel of refrigerant recycling and filling machine, both valves should be closed.
b. Start the vehicle air conditioning system.
c. Keep the engine running until the readings of the pressure gauge on the high pressure side and the low pressure side is stable.
d. Compare the readings with the system specifications.
e. Check the outlet temperature of evaporator to ensure that the air conditioning system operates in accordance with system specifications.
f. Turn off the air conditioning system.
g. Disconnect the hoses of the high and low pressure side from the vehicle.
h. Perform the cleaning operation of the air conditioning hose according to the instructions of the refrigerant recycling and filling machine.

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Replacement of the air conditioner control panel

Removal

1. Remove the air conditioner control panel.

(a). Remove the air conditioner control panel, **refer to the replacement of the dashboard assembly.**

Installation

1. Install the air conditioner control panel.

(a). Install the air conditioner control panel, **refer to the replacement of the dashboard assembly.**

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Replacement of compressor

Removal

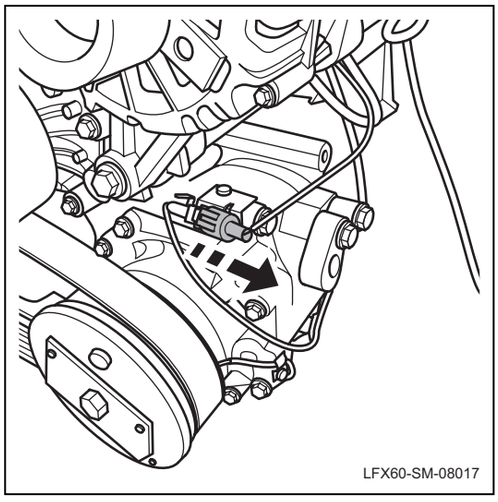
1. **Remove the compressor to evaporator front section line.**

(a). Recycle refrigerant, **refer to the recycling and filling procedures for air conditioner refrigerants**

(b). Disconnect the battery negative terminal .

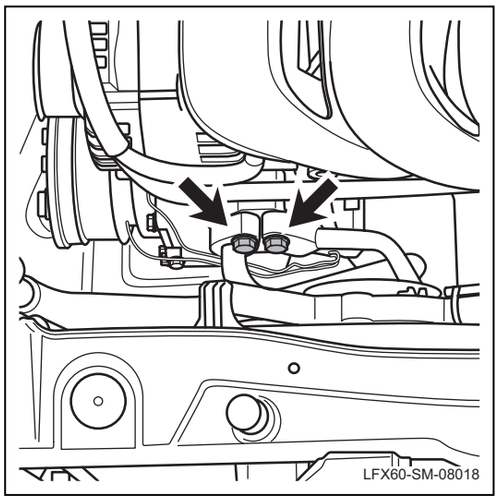
(c). Remove the compressor belt, **refer to the replacement of the compressor belt.**

(d). Lift the vehicle, **refer to:Lifting and support of the vehicle.**



(e). Remove the bottom guard of the engine.

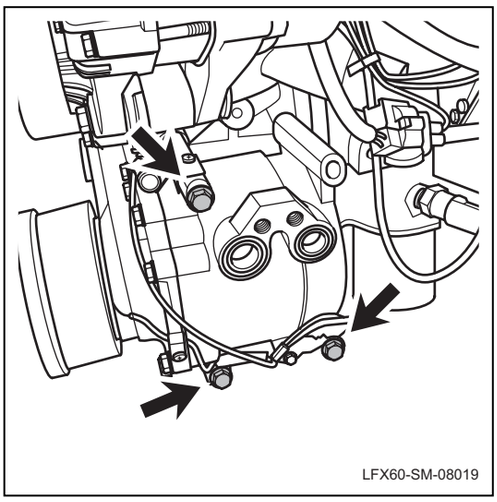
(f). Disconnect the harness plug of the compressor.



(g). Remove the fixing bolts of the air conditioner compressor piping.

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(h). Remove the fixing bolts of the compressor.
(i). Take off the compressor.

Installation

1. Install the compressor.
(a). The installation sequence is the reverse of the disassembly order.
(b). Fill the A/C refrigerant. **Refer to the A/C refrigerant recovery and filling procedures.**
(c). Check for refrigeration system leak.

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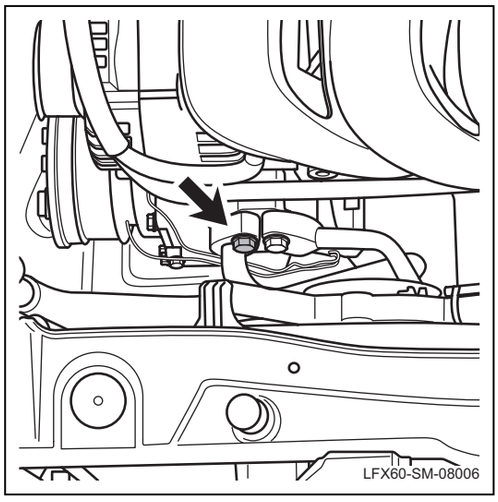
AutoLibrary

Replacement of the front piping from compressor to evaporator

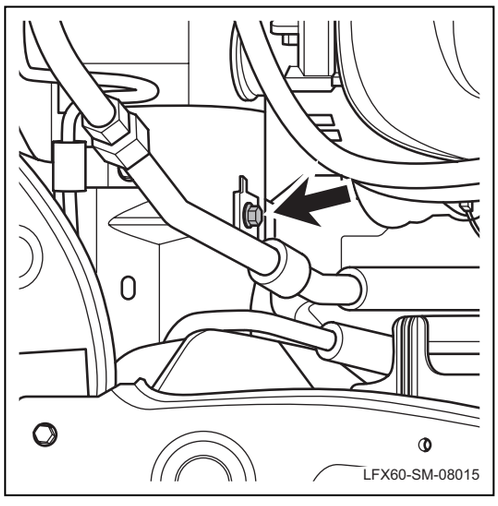
Removal

1. Remove the compressor to evaporator front section line.

(a). Recover the refrigerant. **Refer to the A/C refrigerant recovery and filling procedures.**



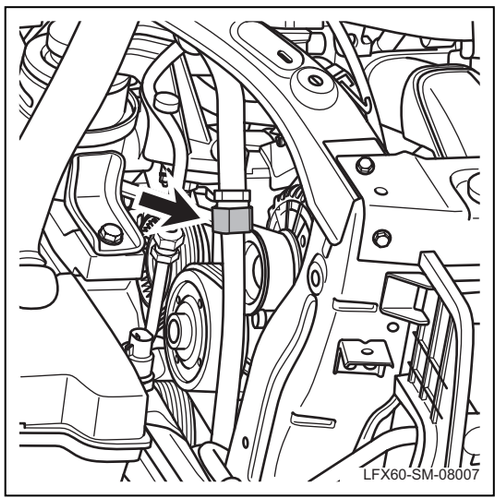
(b). Remove the pipe fixing bolts on the compressor.



(c). Remove the fixing bolts of bracket for the air conditioner piping.

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(d). Remove the lock nut of the compressor piping.
(e). Take off the front piping from compressor to evaporator.

Installation

1. Install the front piping from compressor to evaporator.
(a). The installation sequence is the reverse of the disassembly order.
(b). Fill the A/C refrigerant. **Refer to the A/C refrigerant recovery and filling procedures.**
(c). Check for refrigeration system leak.

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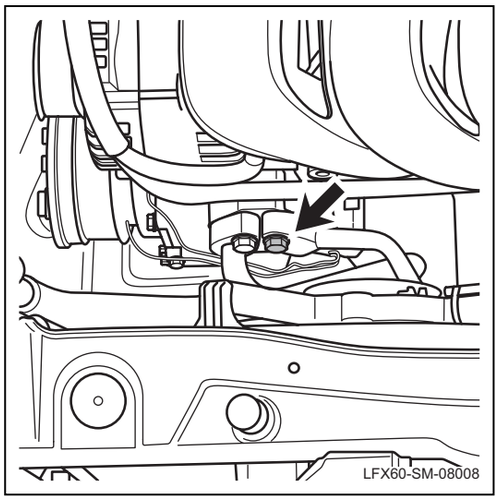
Replacement of the piping from compressor to condenser

Removal

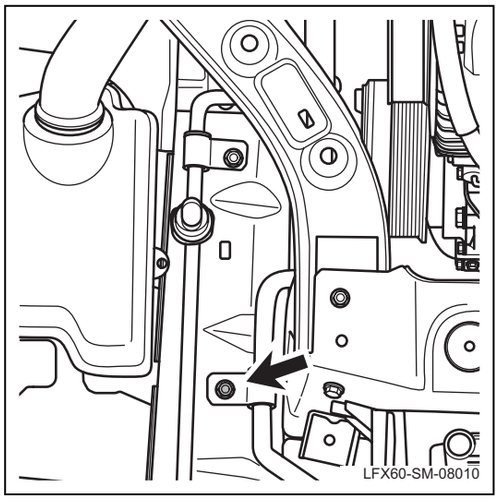
1. Remove the piping from compressor to condenser.

(a). Recover the refrigerant. **Refer to the A/C refrigerant recovery and filling procedures.**

(b). Remove the front bumper and grid assembly. **Refer to the replacement of front bumper assembly.**



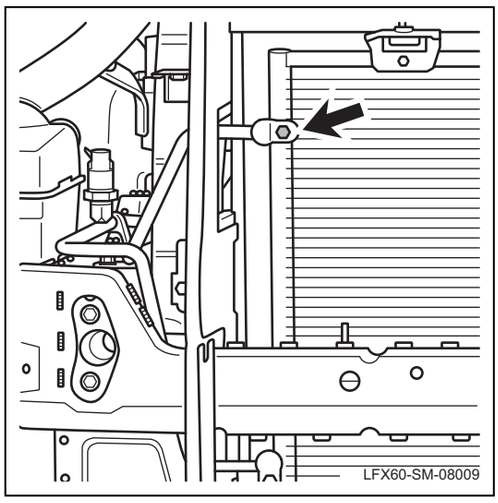
(c). Remove the pipe fixing bolts on the compressor.



(d). Remove the fixing bolts of bracket for the air conditioner piping.

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(e). Remove the pipe fixing bolts on the condenser.
(f). Take off the piping from compressor to condenser.

Installation

1. Install the piping from compressor to condenser.
(a). The installation sequence is the reverse of the disassembly order.
(b). Fill the A/C refrigerant. **Refer to the A/C refrigerant recovery and filling procedures.**
(c). Check for refrigeration system leak.

AutoLibrary

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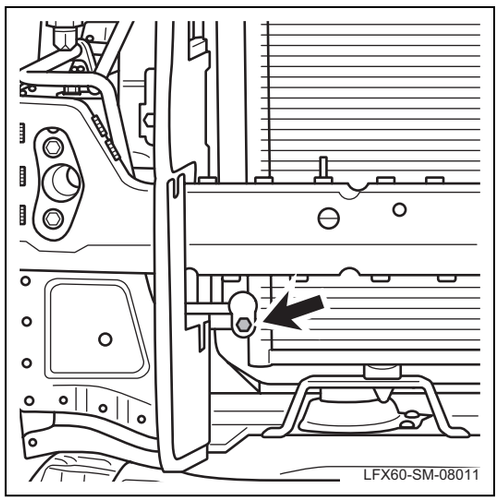
Replacement of the front piping from condenser to evaporator

Removal

1. Remove the front piping from condenser to evaporator

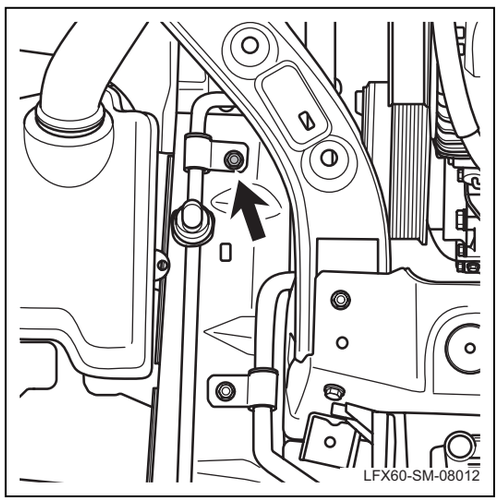
(a). Recover the refrigerant. Refer to the A/C refrigerant recovery and filling procedures.

(b). Remove the front bumper and grid assembly. Refer to the replacement of front bumper assembly.



(c). Remove the pipe fixing bolts on the condenser.

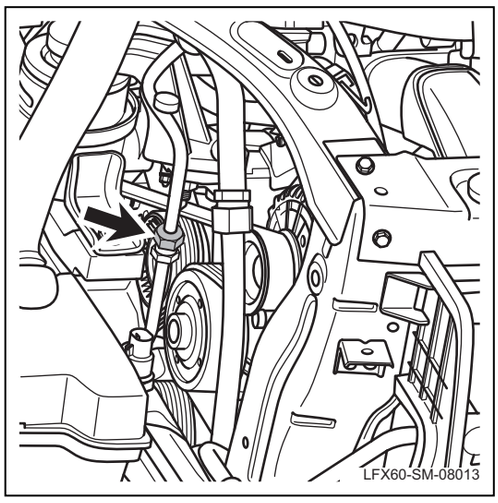
(d). Disconnect the harness plug of air conditioner pressure switch.



(e). Remove the fixing bolts of bracket for the air conditioner piping.

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(f). Remove the lock nut of air conditioner piping.
(g). Take off the front piping from condenser to evaporator

Installation

1. Install the condenser to evaporator front section line.
(a). The installation sequence is the reverse of the disassembly order.
(b). Fill the A/C refrigerant. Refer to the A/C refrigerant recovery and filling procedures.
(c). Check for refrigeration system leak.

AutoLibrary

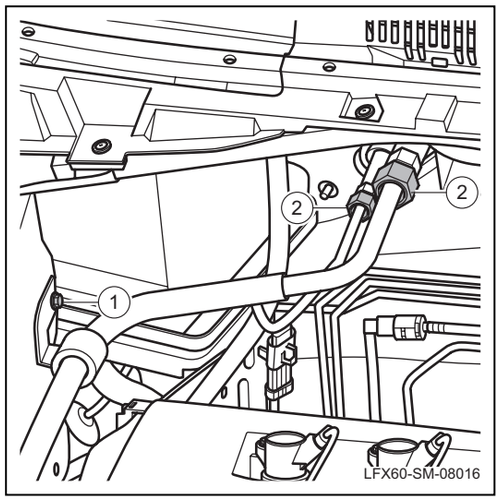
AutoLibrary

Replacement of the front piping of evaporator

Removal

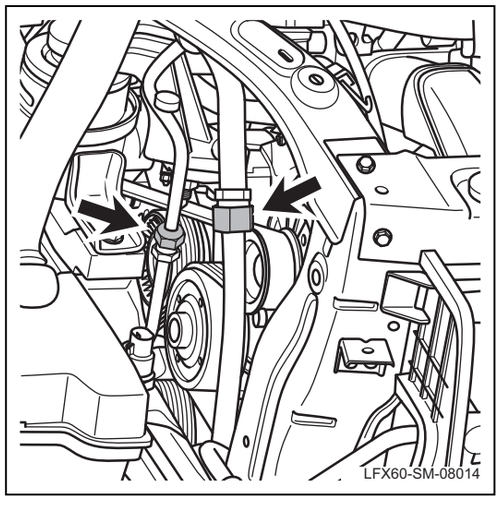
1. Remove the front piping of evaporator

(a). Recover the refrigerant. Refer to the A/C refrigerant recovery and filling procedures.



(b). Remove the fixing bolts 1 of bracket for the air conditioner piping.

(c). Remove the lock nut 2 of the front piping of evaporator



(d). Remove the lock nut of air conditioner piping.

(e). Take off the front piping of evaporator.

Installation

1. Install the condenser to evaporator front section line.

(a). The installation sequence is the reverse of the disassembly order.

(b). Fill the A/C refrigerant. **Refer to the A/C refrigerant recovery and filling procedures.**

(c). Check for refrigeration system leak.

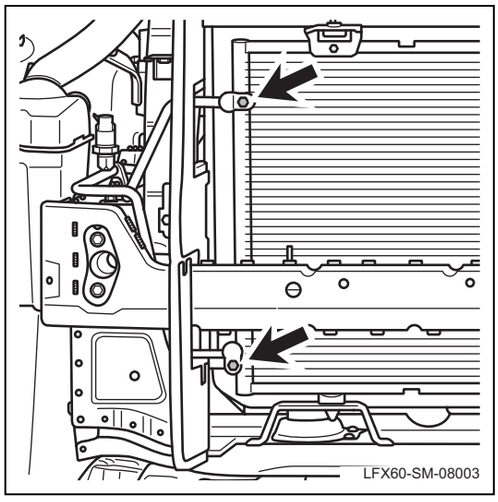
AutoLibrary

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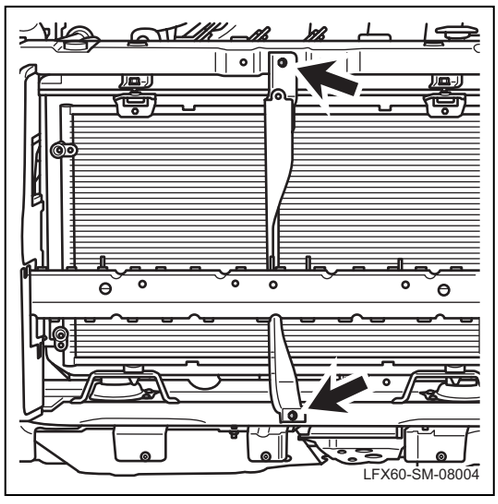
Replacement of condenser

Removal

1. Remove the condenser.
(a). Disconnect the battery negative cable.
(b). Remove the front bumper. **Refer to the replacement of front bumper assembly.**
(c). Remove the hood lock, **refer to the replacemen of hood lock.**
(d). Remove the ambient temperature sensor, **refer to the replacement of ambient temperature sensor.**
(e). Recycle the refrigerant, **refer to the recycling and filling procedures for air conditioner refrigerants**



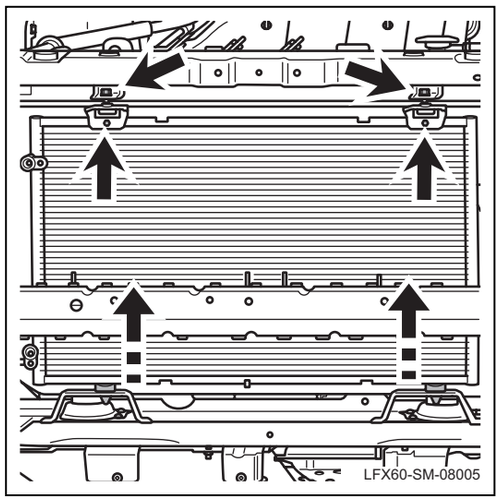
(f). Remove the fixing bolts of the condenser piping.



(g). Remove the lock nut of the front braket.

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(h). Remove the fixing bolts of the condenser bracket.
(i). Take off the condenser assembly upwards.

Installation

1. The installation sequence is reverse to the removal sequence.
(a). The installation sequence is the reverse of the disassembly order.
(b). Fill the A/C refrigerant. **Refer to the A/C refrigerant recovery and filling procedures.**
(c). Check for refrigeration system leak.

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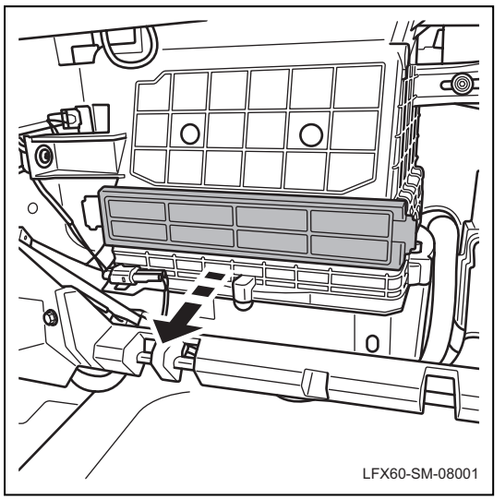
AutoLibrary

Replacement of air conditioner filter

Removal

1. Remove the air conditioner filter

(a). Remove the glovebox, **refer to the replacement of the dashboard assembly.**



(b). Remove the housing of air conditioning filter and take off the air conditioning filter.

Installation

1. Install the air conditioner filter

(a). The installation sequence is the reverse of the disassembly order.

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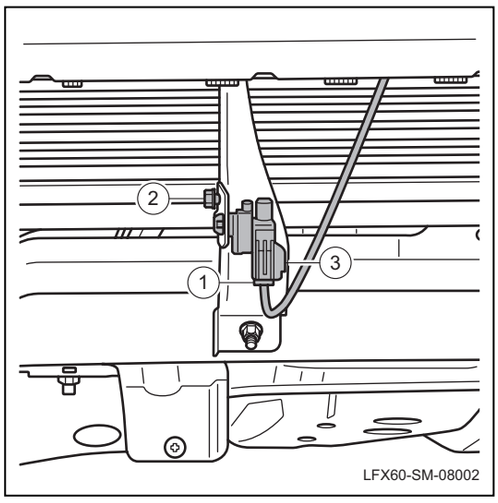
Replacement of ambient temperature sensor

Removal

1. Remove the ambient temperature sensor.

(a). Disconnect the battery negative connector.

(b). Remove the front bumper. Refer to the replacement of front bumper assembly.



(c). Disconnect the harness plug 1 of the ambient temperature sensor.

(d). Remove the fixing bolts 2 of bracket for ambient temperature sensor.

(e). Take off the ambient temperature sensor 3.

Installation

1. Install the ambient temperature sensor.

(a). The installation order is the reverse of the disassembly order.

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Replacement of HVAC assembly

Removal

1. Remove the HVAC assembly.

(a). Recover the refrigerant. **Refer to the A/C refrigerant recovery and filling procedures.**

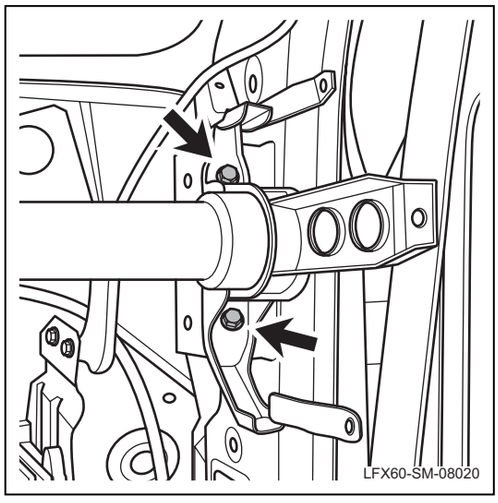
(b). Recycling of engine coolant, **refer to the recycling and filling procedures for coolant.**

(c). Disconnect the battery negative terminal.

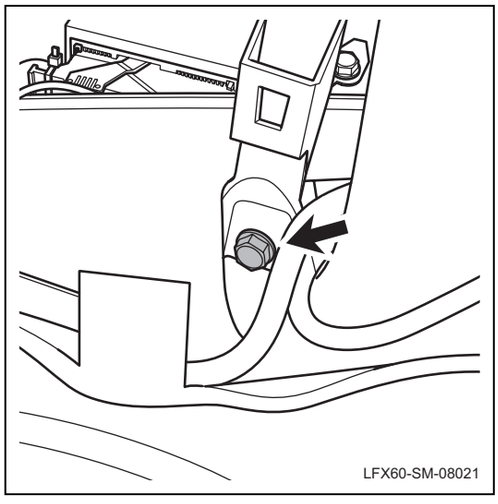
(d). Remove the console, **refer to the replacement of the console assembly.**

(e). Remove the dashboard, **refer to the replacement of the dashboard assembly.**

(f). Remove the front cover, **refer to the replacement of the front ventilation cover assembly.**



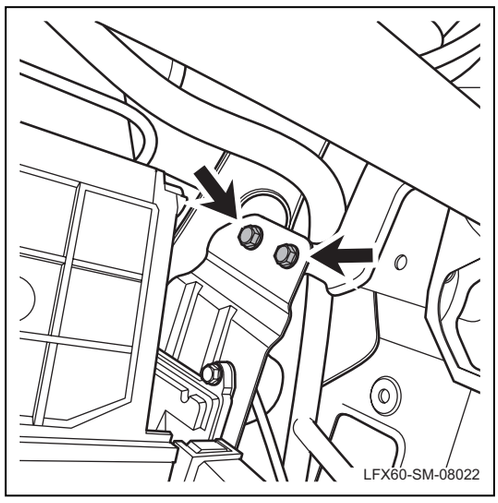
(g). Remove the left and right fixing bolts of dashboard pipe column beam.



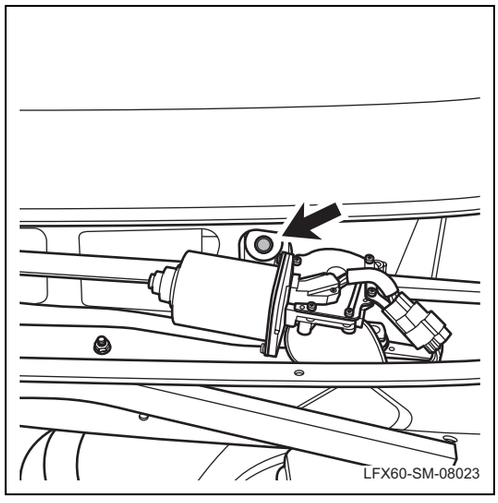
(h). Remove the lower fixing bolts of dashboard pipe column beam.

AutoLibrary

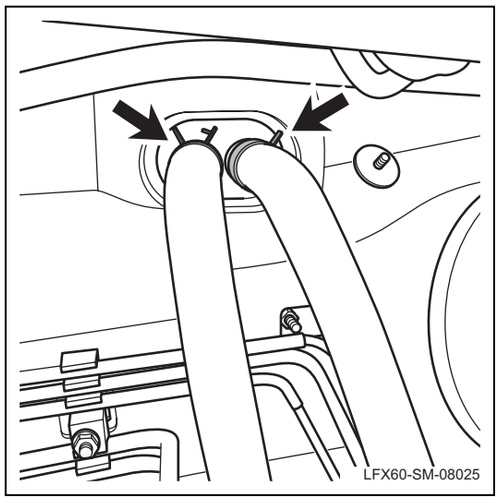
AutoLibrary



(i). Remove the fixing bolts of the ECU module bracket and the pipe beam.



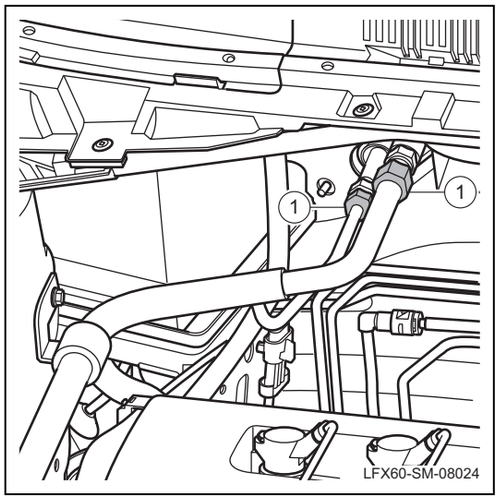
(j). Remove the front fixing bolts of dashboard pipe column beam.
(k). Disconnect the harness clip and harness plug of the dashboard pipe column beam.
(l). Take off the dashboard pipe column beam.



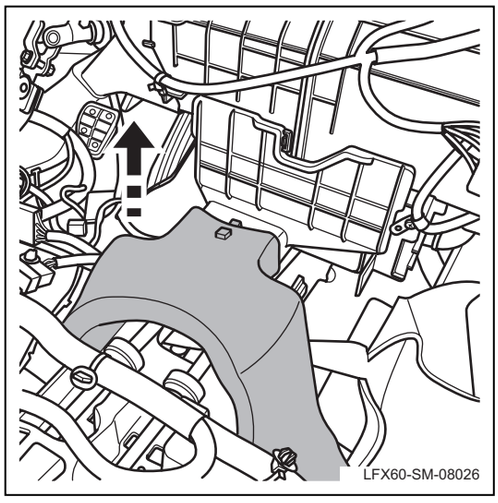
(m). Remove the clamp of heating water pipe.
(n). Remove the heating water pipes.

AutoLibrary

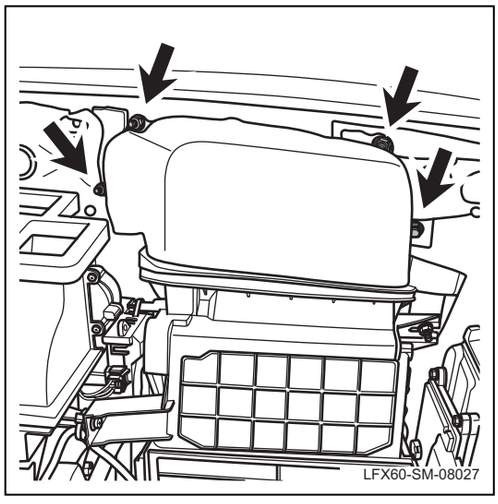
AutoLibrary



(o). Remove the lock nut 1 of air conditioner piping.
(p). Remove the air conditioner piping.



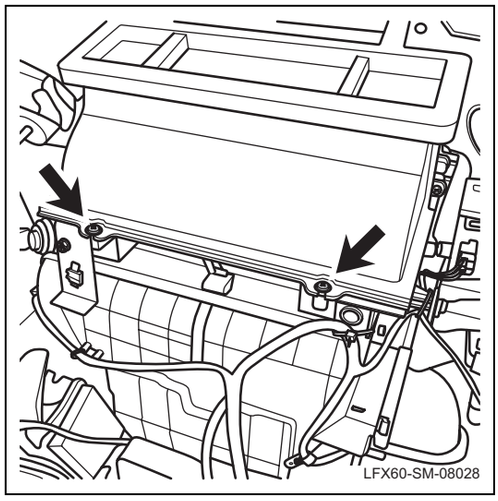
(q). Remove the floor duct.



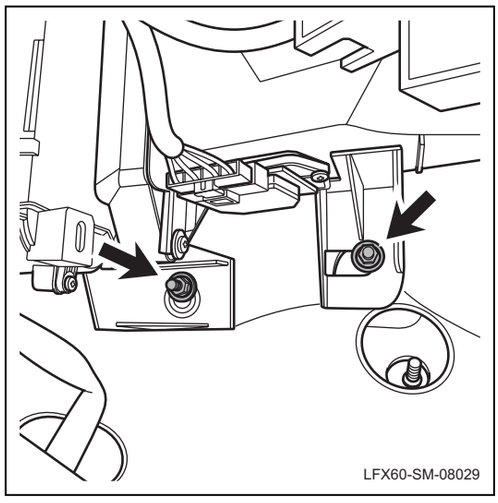
(r). Remove the fixing nut of HVAC assembly.

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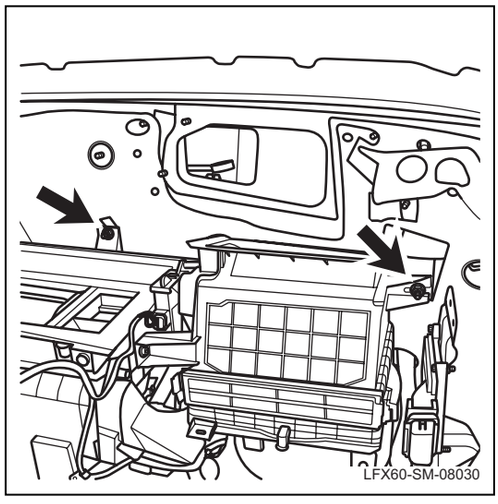
AutoLibrary



(s). Remove the fixing screws of the upper outlet of HVAC assembly and take it off.



(t). Remove the lower fixing nut of HVAC assembly.



(u). Remove the fixing nut of HVAC assembly.
(v). Take off the HVAC assembly.

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Installation

1. Install the evaporator assembly.

(a). The installation sequence is the reverse of the disassembly order.

(b). Fill the A/C refrigerant. **Refer to the A/C refrigerant recovery and filling procedures.**

(c). Check for refrigeration system leak.

AutoLibrary

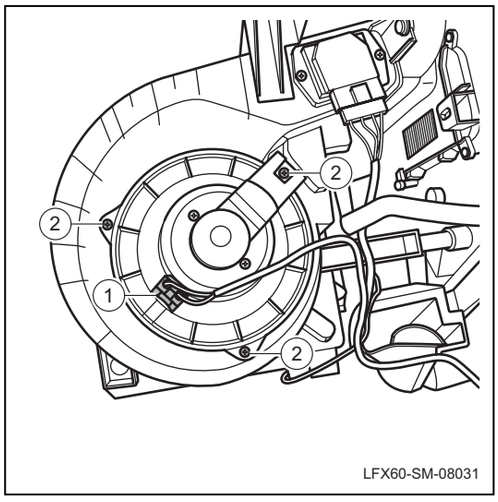
AutoLibrary

Replacement of blower motor

Removal

1. Remove the blower motor.

(a). Disconnect the battery negative cable.



(b). Disconnect the harness connector 1 of blower motor.

(c). Remove the fixed screw 2 of the blower motor.

(d). Take off the blower motor.

Installation

1. Install the blower motor.

(a). The installation sequence is the reverse of the disassembly order.

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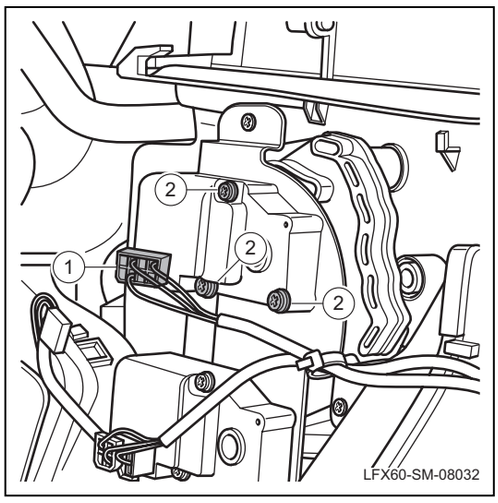
Replacement of mode throttle motor

Removal

1. Remove the mode throttle motor.

(a). Disconnect the battery negative connector.

(b). Remove the dashboard lower left panel assembly. Refer to the replacement of dashboard assembly.



(c). Disconnect the harness connector 1 of mode throttle motor.

(d). Remove the fixing screw 2 of mode throttle motor.

(e). Take off the mode throttle motor.

Installation

1. Install the mode throttle motor.

(a). The installation sequence is the reverse of the disassembly order.

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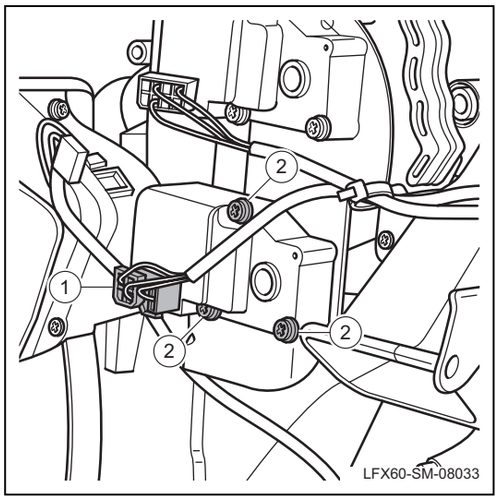
Replacement of cool and heat throttle motor

Removal

1. Remove the cool and heat throttle motor.

(a). Disconnect the battery negative connector.

(b). Remove the dashboard lower left panel assembly. **Refer to the replacement of dashboard assembly.**



(c). Disconnect the harness connector 1 of cool and heat throttle motor.

(d). Remove the fixing screw 2 of cool and heat throttle motor.

(e). Take off the cool and heat throttle motor.

Installation

1. Install the cool and heat throttle motor.

(a). The installation sequence is the reverse of the disassembly order.

AutoLibrary

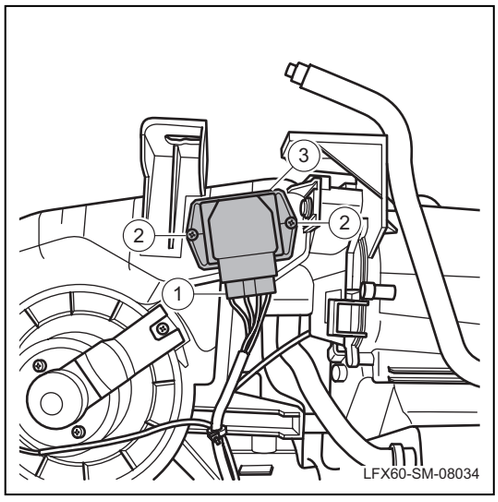
AutoLibrary

Replacement of blower speed control module

Removal

1. Remove the blower speed regulation module.

(a). Disconnect the battery negative cable.



(b). Disconnect the harness plug 1 of blower speed control module.

(c). Remove the fixed screw 2 of the blower speed control module.

(d). Take off the blower speed control module

Installation

1. Install the blower speed control module

(a). The installation sequence is the reverse of the disassembly order.

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Replacement of new return throttle motor

Removal

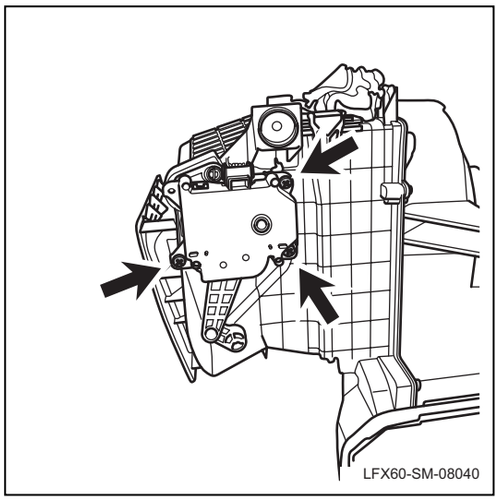
1. Remove the new return throttle motor.

(a). Disconnect the battery negative cable.

(b). Recover the refrigerant. **Refer to the A/C refrigerant recovery and filling procedures.**

(c). Recover the engine coolant. **Refer to engine coolant draining and filling procedures.**

(d). Remove the HVAC assembly. **Refer to the replacement of HVAC assembly.**



(e). Remove the blower tank and evaporator tank connecting bolt and separate them.

(f). Disconnect the harness connector 1 of new return throttle motor.

(g). Remove the fixing screw of the new return throttle motor.

(h). Take off the new return throttle motor.

Installation

1. Install the new return throttle motor.

(a). The installation sequence is the **reverse of the disassembly order.**

(b). Install the HVAC assembly, **refer to the replacement of HVAC.**

(c). Fill the refrigerant, **refer to the A/C refrigerant recovery and filling procedures.**

(d). Fill the engine coolant, **refer to the engine coolant draining and filling procedures.**

(e). Connect the battery negative terminal

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Replacement of heating water tank

Removal

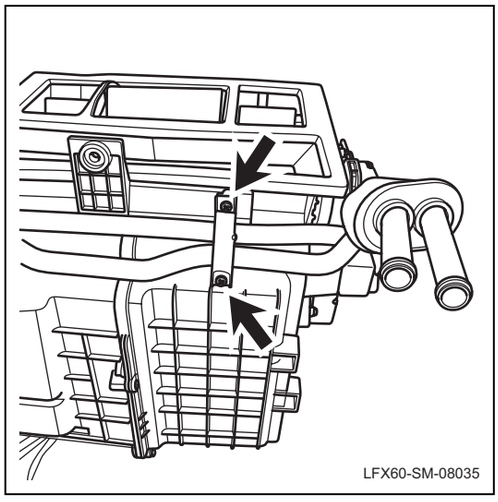
1. Remove the heating water tank

(a). Recover the refrigerant. **Refer to the A/C refrigerant recovery and filling procedures.**

(b). Recycling of engine coolant, **refer to the recycling and filling procedures for engine coolant.**

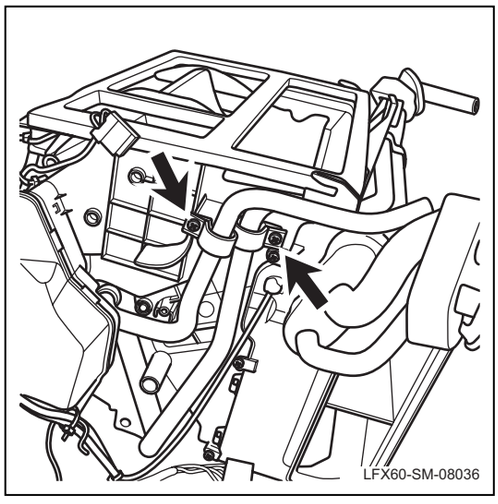
(c). Disconnect the battery negative terminal.

(d). Remove the HVAC assembly. **Refer to the replacement of HVAC assembly.**



(e). Remove the blower tank and evaporator tank connecting bolt and separate them.

(f). Remove the fixing screw of heating water tank.

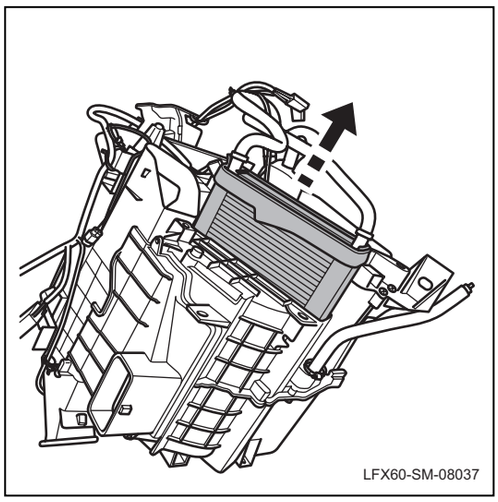


(g). Remove the fixing screw of heating water tank.

(h). Disconnect the harness snap and the fixing screw of HVAC assembly.

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(i). Take off the heating water tank.

Installation

1. Install the heating water tank.

(a). The installation sequence is the **reverse of the disassembly order.**
(b). Install the HVAC assembly, **refer to the replacement of HVAC.**
(c). Fill the refrigerant, **refer to the A/C refrigerant recovery and filling procedures.**
(d). Fill the engine coolant, **refer to the engine coolant draining and filling procedures.**
(e). Connect the battery negative terminal

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Replacement of expansion valve

Removal

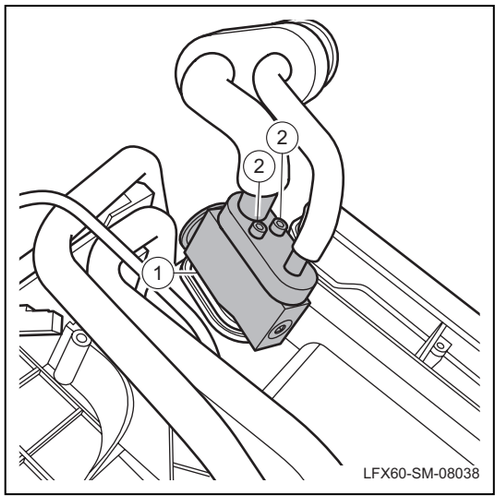
1. Remove the expansion valve.

(a). Disconnect the battery negative connector.

(b). Recover the refrigerant. **Refer to the A/C refrigerant recovery and filling procedures.**

(c). Recycling of engine coolant, **refer to the recycling and filling procedures for engine coolant.**

(d). Remove the HVAC assembly, **refer to the replacement of HVAC assembly.**



(e). Remove the fixing bolt 2 of expansion valve.

(f). Take off the expansion valve 1.

Installation

1. Install the expansion valve.

(a). The installation sequence is the reverse of the disassembly order.

(b). Install the HVAC assembly, **refer to the replacement of the HVAC assembly.**

(c). Filling of engine coolant, **refer to the recycling and filling procedures for engine coolant.**

(d). Refill refrigerant, **refer to the recycling and filling procedures for air conditioner refrigerants**

(e). Connect the battery negative terminal

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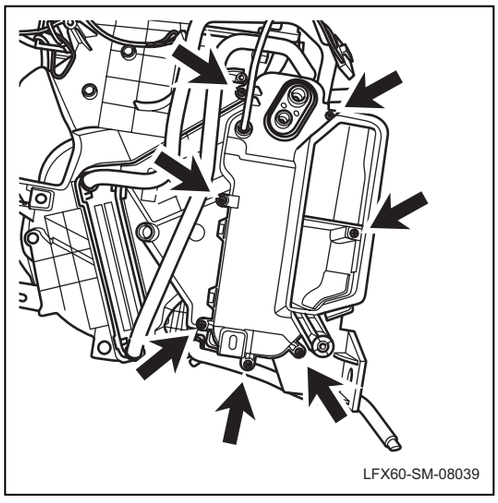
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Replacement of the evaporator

Removal

1. Remove the evaporator.

(a). Disconnect the battery negative connector.
(b). Recover the refrigerant, **refer to the A/C refrigerant recovery and filling procedures.**
(c). Recover the engine coolant, **refer to engine coolant draining and filling procedures.**
(d). Remove the HVAC assembly, **refer to the replacement of HVAC assembly.**
(e). Remove the expansion valve, **refer to the replacement of expansion valve.**


LFX60-SM-08039

(f). Remove the connecting bolts of the blower housing and the evaporator housing and separate them.
(g). Remove the fixing screw of evaporator upper cover.
(h). Take off the evaporator.

Installation

1. Install the evaporator.

(a). The installation sequence is the reverse of the disassembly order.
(b). Install the expansion valve, **refer to the replacement of expansion valve.**
(c). Install HVAC assembly, **refer to the replacement of HVAC assembly.**
(d). Fill the engine coolant,**refer to the engine coolant draining and filling procedures.**
(e). Refill refrigerant, **refer to the recycling and filling procedures for air conditioner refrigerants.**
(f). Connect the negative connector of the battery.

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09 - safety protection device

Seatbelt.....9-1283
Technical specifications.....9-1283
Precautions 9-1284
Preparation.....9-1285
Structure and installation location 9-1286
General Inspection 9-1287
Operating Principle.....9-1288
Diagnostic Information and Procedures.....9-1289
Removal and Installation.....9-1301

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Seatbelt

Technical specifications

Torque Specifications

Name	Torque range	
	Metric (Nm)	British (lb-ft)
Fixing bolt of the front seat belt height adjuster	45	33
Fixing bolts for front seat belt retractor / rear seat belt	45	33
Fixing bolts for back seat belt / rear seat belt retractor	45	33
Rear middle seat belt retractor	45	33

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Precautions

Precautions

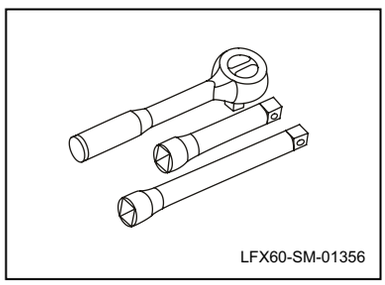
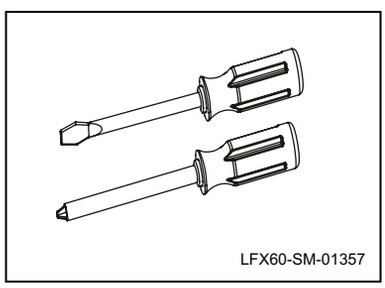
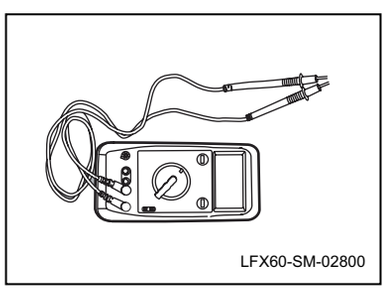
1. Change seatbelt with worn or split webbing and dysfunctional buckle.
2. After collision evolving tension on seatbelt, change the seatbelt, even there is no damage found on it.
3. It is forbidden to insert anything into the buckle. Never modify or remove the seatbelt.
4. Mild detergent should be used to clean dirty seatbelt. Corrosive detergent, dye and dry cleaning agent may impair strength of seatbelt seriously.
5. If the webbing of seatbelt is worn, split or floppy due to chemical or sunshine, it must be changed.
6. If metal joint of seatbelt deformed, distorted or rusted, it must be changed.
7. Performance requirement of the retractor: rewind freely in installed orientation.
8. Performance requirement of the adjuster: easy adjustment, hold webbing of seatbelt tightly and reliable.
9. Performance requirement of the buckle lock: obvious feeling of insertion and release, no self release. The system should not be failure.

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Preparation

General service tool

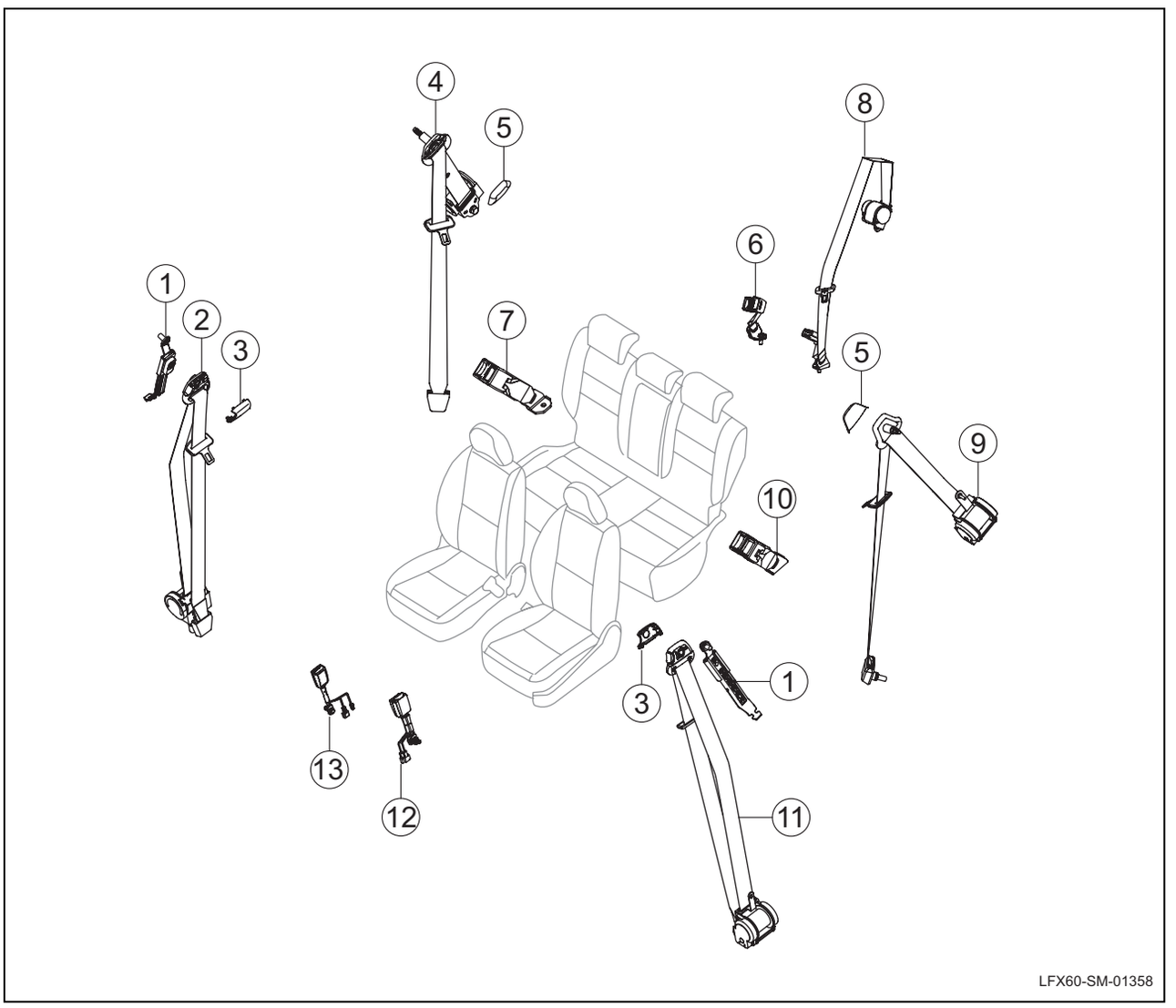
No.	Tool name	Tool drawing	Tooling code	Remarks
1	Fast wrench and hedger	 LFX60-SM-01356	-	Tighten or remove bolts and nuts
2	Screwdriver	 LFX60-SM-01357	-	To remove and install the screw and pry the snap ring etc.
3	Digital multimeter	 LFX60-SM-02800	-	Measure the voltage and resistance

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Structure and installation location

Part exploded view



No.	Part name
1	Front seat belt height adjustment device
2	Right front seatbelt retractor
3	Front seat belt ring cover
4	Right rear seatbelt retractor
5	Rear seat belt ring cover
6	Rear middle lock
7	Right rear harness

No.	Part name
8	Rear middle retractor
9	Left rear seatbelt retractor
10	Left rear seatbelt buckle
11	Left front seatbelt retractor
12	Left front seatbelt buckle
13	Right front seatbelt buckle

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General Inspection

Seat belt inspection

1. Contraction is not normal

If the seat belt does not retract properly, check that if the anchor cover and the mounting plate are properly installed and do not rub against the seat belt. If necessary, make sure that the seat belt does not rub against one end of the retractor cover groove. If necessary, adjust the retractor to place the seat belt in a central position by loosening the fixing bolt and retighten the bolt.

2. Simple test

When the vehicle is stationary and parked on a flat road surface, tightly grasp the seat belt and pulling it out quickly. The retractor must be locked within 25 cm to prevent more of the belt from coming out. In this test, any seat belt retractor from which the belt is pulled out can not be reused, and a new seat belt must be installed.

Seat belt buckle inspection

1. Insert the seat belt into the buckle and pull the seat belt firmly to make sure that the buckle does not release.
2. Remove the driver seat belt buckle, observe the seat belt warning light status on dashboard, and confirm the display is normal.

Front seat belt height adjuster inspection

1. Adjust the front seat belt height adjuster, seat belt height adjuster should be free to adjust, no jamming phenomenon.
2. Check that the seat belt height adjuster can be reliably adjusted in a position that does not slide.

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Operating Principle

System overview

⚠Warning:
The vehicle is equipped with a safety device, such that failure to follow the correct operating procedures will lead to the following

- **The airbag unexpectedly deploys.**
- **The safety device is disabled when necessary.**

⚠Warning:
Strictly observe the following rules to prevent the above conditions:

- **Before proceeding, make sure that if you are servicing on the safety device parts, around them, or on their lines.**
- **If you are performing maintenance on a safety device assembly, around it, or on its line, remove the safety device.**

The seat belt is a safety protection device that protects the driver and the passenger, in conjunction with the airbag. The airbag cannot substitute the belt. The driver and passenger must always be fastened with the seat belt and adjust to the most appropriate condition according to the body.

Seatbelt

A three-point and crossing safety belt is used in all seats. The front seat belt retractor is mounted on the bottom of the B-pillar and incorporates a torsion bar load limiting device. This device consists of a (torsion bar) retractor rolling bar mounted on a pivot. Once the sensor locks the retractor slider and the preset load is activated, it will reverse and release additional seat belt.

Seat belt buckle

The seat belt buckle, together with the seat belt, forms a passenger protection device. The driver's seat belt buckle is internally integrated with a seat belt warning light switch. When the driver is not buckled up in the process of driving, the seat belt warning light on the dashboard will continue to light up, to remind the driver of the seat belt for the protection the driver's driving safety.

Seat belt height adjuster

The front seat belt is equipped with a seat belt height adjuster, and the occupant can adjust the seat belt height by adjusting the seat belt height adjuster according to the body shape. Make occupants more comfortable in the use of seat belts, but also better protect the safety of occupants.

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Diagnostic Information and Procedures

Diagnosis Instructions

Before the diagnose of the seat belt system, familiarize yourself with the working principle of the seatbelt system, and then start the seat belt system diagnostics, which helps not only to determine the correct troubleshooting step in the event of a failure, and more importantly Any troubleshooting of the seat belt system should take the seat belt system check as a starting point and instruct the service personnel to take the next logical step to troubleshoot.

Determine the condition described by the customer is normal or not. Understanding and using the diagnostic flowchart correctly reduces diagnostic time and avoids misjudgment of components.

General equipment

Name
Diagnostic equipment of vehicle
Digital multimeter

Visual Inspection

1. Confirm the problem raised by the customer.
2. Check for evident mechanical and electrical faults.

Visual check table

Mechanical	Electrical
• Belt retractor • Belt buckle	• Fuse • Line • Harness connector • Instrument cluster • Occupant detecting sensor

3. Solve the problem finding before the next step inspection.
4. If the observed or raised problem is the evident and the cause has been found, ensure to fix this fault before proceeding with the next step.
5. If no problem is found through the visual check, confirm the fault and refer to the fault symptom list.

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List of fault symptoms

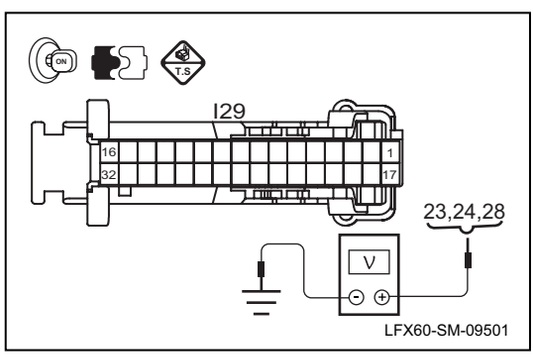
If the fault occurs but the fault diagnosis code (DTC) is not stored in the control module and the fault can not be confirmed in the basic inspection, the fault diagnosis and troubleshooting should be performed according to the order listed in the table below.

Symptom	Possible point of failure	Recommended Measures
The seat belt can not be retracted	• Belt retractor	• Replace the belt assembly
The seat belt can not be locked	• Belt retractor	• Replace the belt assembly
Seat belt buckle out of function, buckle off	• Belt buckle	• Replace the seat belt buckle
The driver's seat belt warning light does not light up	• Line • Harness connector • Belt buckle • Instrument cluster	**Refer to: The diagnostic process for the driver's seat belt warning light does not light up**
The driver's seat belt safety warning light keeps on	• Line • Belt buckle • Instrument cluster	**Refer to: The diagnostic process for the driver's seat belt warning light keeps on**
The passenger's seat belt warning light does not light up	• Line • Harness connector • Belt buckle • Instrument cluster • Occupant detecting sensor	**Refer to: The diagnostic process for the passenger's seat belt warning light does not light up**
The passenger's seat belt safety warning light keeps on	• Line • Belt buckle • Instrument cluster • Occupant detecting sensor	**Refer to: The diagnostic process for the passenger's seat belt warning light keeps on**

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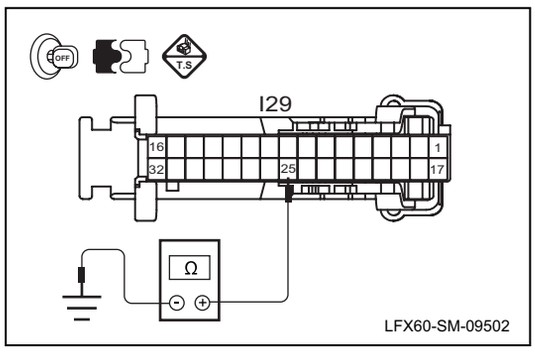
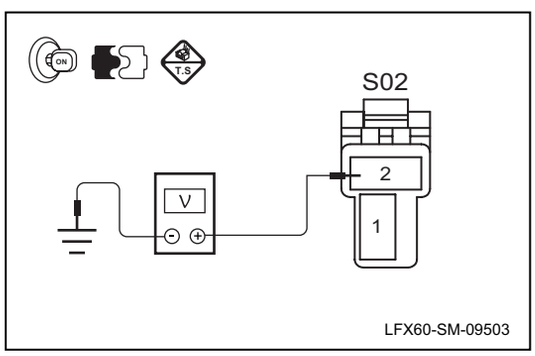
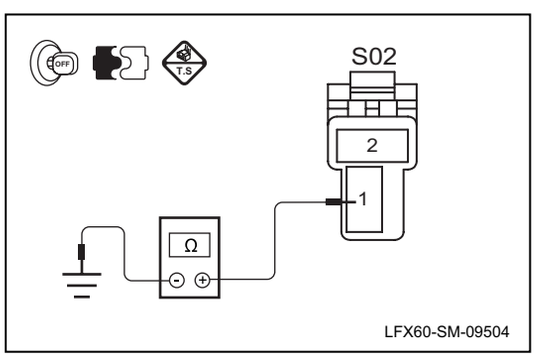
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The diagnostic process for the driver's seat belt warning light does not light up

Test condition	Details/results/measures
1. General inspection.	
	A. Check the instrument cluster harness plugs for breakage, loose contact, aging or looseness. Is it OK after checking? →**Yes** To step 2. →**No** Repair the fault position.
2. Check the instrument cluster fuse.	
	A. Check the instrument cluster fuse FS01, FS06, FS14. **Fuse rated capacity: FS01 (10A), FS06 (20A), FS14 (10A)** Is the system normal? →**Yes** To step 3. →**No** Replace the fuse of same model.
3. Check the instrument cluster power.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative cable. B. Disconnect the instrument cluster harness plug I29. C. Connect the battery negative terminal and operate the start switch to turn the power to ON state. D. Measure the voltage between the instrument cluster harness plug I29 terminal 23, 24 28 and the fixed ground point with the multimeter. **Standard voltage: 11 ~ 14 V** Is it OK after checking? →**Yes** To step 4. →**No** Repair the instrument cluster power line open circuit fault and replace the harness if necessary.

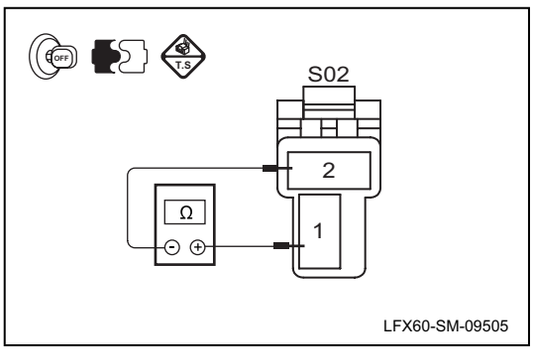
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Test condition	Details/results/measures
4. Check the instrument cluster ground wire.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative cable. B. Disconnect the instrument cluster harness plug I29. C. Measure the resistance between No. 25 terminal of the harness plug I29 of the instrument cluster and the reliable grounding with a multimeter. **Standard resistance: less than 5 Ω** Is it OK after checking? **→Yes** To step 5. **→No** Check the wiring harness between the No. 25 terminal of the harness plug I29 and the ground point for open circuit fault, and replace the wiring harness if necessary.
5. Check the power supply for driver's seat belt buckle.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative cable. B. Disconnect the driver belt buckle harness plug S02. C. Connect the battery negative terminal and operate the start switch to turn the power to ON state. D. Measure the voltage between the No. 1 terminal of the harness plug S02 of the driver's belt buckle and the ground point with a multimeter. **Standard voltage: 11 ~ 14 V** Is it OK after checking? **→Yes** To step 6. **→No** Check the circuits of the driver's belt buckle for open circuit fault, and replace the wiring harness if necessary.
6. Check the grounding circuit for driver's seat belt buckle.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative cable. B. Disconnect the driver belt buckle harness plug S02. C. Measure the resistance between the No. 1 terminal of the harness plug S02 of the driver's belt buckle and the ground point with a multimeter. **Standard resistance: less than 5 Ω** Is it OK after checking? **→Yes** To step 7. **→No** Check the wiring harness between the No. 1 terminal of the harness plug S02 of the driver's belt buckle and the ground point for open circuit fault, and replace the wiring harness if necessary.

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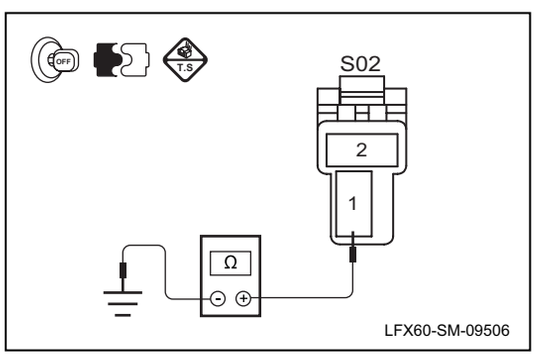
Test condition	Details/results/measures
7. Check the driver's belt buckle.	
	A. Operate start switch to switch the power mode to “OFF” state, disconnect the negative connector of the battery. B. Disconnect the harness plug S02 of the seat belt buckle. C. Measure the resistance between the No. 1 and No. 2 terminal of the harness plug S02 of the belt buckle with a multimeter. **Standard resistance: less than 1 Ω** Is it OK after checking? →**Yes** To step 8. →**No** Replace the belt buckle. Refer to the replacement of front belt buckle
8. Replace the instrument cluster.	
	A. Replace the instrument cluster. **Refer to the replacement of instrument cluster assembly** Verify that the system is operated normally.

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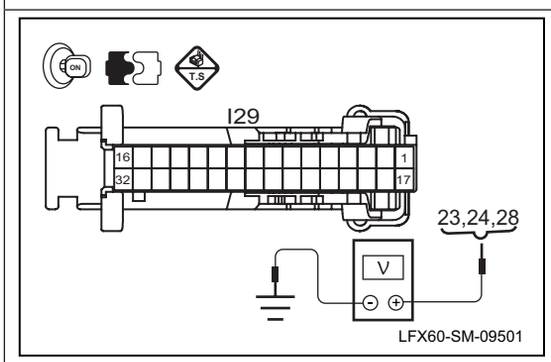
The diagnostic process for the driver's seat belt warning light keeps on

Test condition	Details/results/measures
1. Check if the driver's seat belt is buckled up.	
	A. Check whether the belt is correctly fastened. Is the belt correctly fastened? →**Yes** To step 2. →**No** Fasten the belt and test whether the system is normal.
2. Check the driver's belt buckle.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the driver belt buckle harness plug S02. C. Operate start switch to switch the power mode to "ON" state, observe for whether the seat belt warning light is off. Does the belt warning lamp turn off? →**Yes** Replace the belt buckle. **Refer to the replacement of belt buckle** →**No** To step 3.
3. Check the signal cable of driver's seat belt warning light.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative cable. B. Disconnect the driver belt buckle harness plug S02. C. Measure the resistance between the No. 1 terminal of the harness plug S02 of the driver's belt buckle and the reliable ground point with a multimeter. **Standard resistance: 10MΩ or higher** Is it OK after checking? →**Yes** To step 4. →**No** Check the wiring harness between the No. 1 terminal of the harness plug S02 of the driver's belt buckle and the ground point for short circuit fault, and replace the wiring harness if necessary.
4. Replace the instrument cluster.	
	A. Replace the instrument cluster. **Refer to the replacement of instrument cluster assembly** Verify that the system is operated normally.

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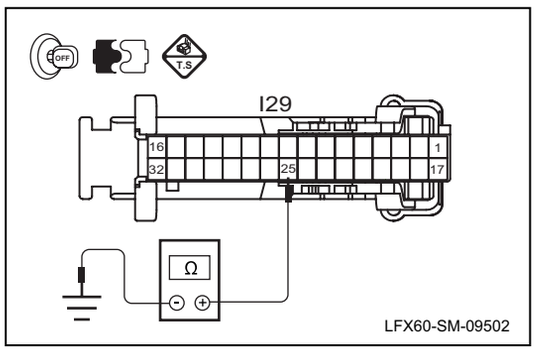
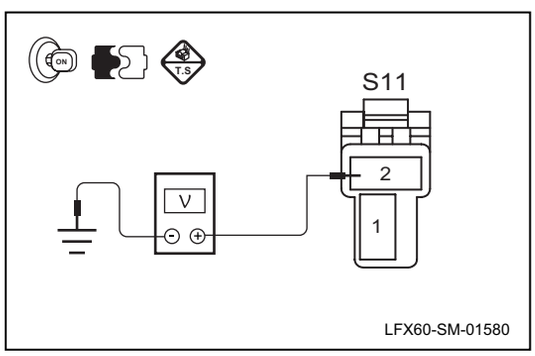
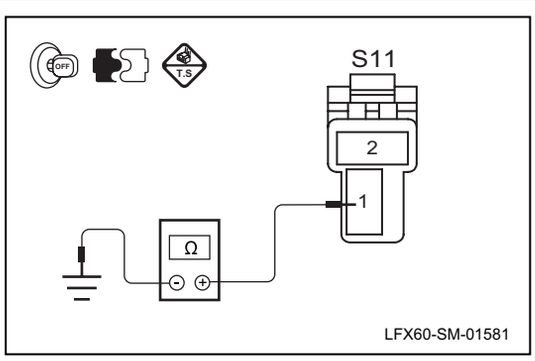
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The diagnostic process for the passenger's seat belt warning light does not light up

Test condition	Details/results/measures
1. General inspection.	
	A. Check the instrument cluster harness plugs for breakage, loose contact, aging or looseness. Is it OK after checking? →**Yes** To step 2. →**No** Examine and repair the fault location.
2. Check the instrument cluster fuse.	
	A. Check the instrument cluster fuse FS01, FS06, FS14. **Fuse rated capacity: FS01 (10A), FS06 (20A), FS14 (10A)** Is the system normal? →**Yes** To step 3. →**No** Replace the fuse of same model.
3. Check the instrument cluster power.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative cable. B. Disconnect the instrument cluster harness plug I29. C. Connect the battery negative terminal and operate the start switch to turn the power to ON state. D. Measure the voltage between the instrument cluster harness plug I29 terminal 23, 24 28 and the fixed ground point with the multimeter. **Standard voltage: 11 ~ 14 V** Is it OK after checking? →**Yes** To step 4. →**No** Repair the instrument cluster power line open circuit fault and replace the harness if necessary.

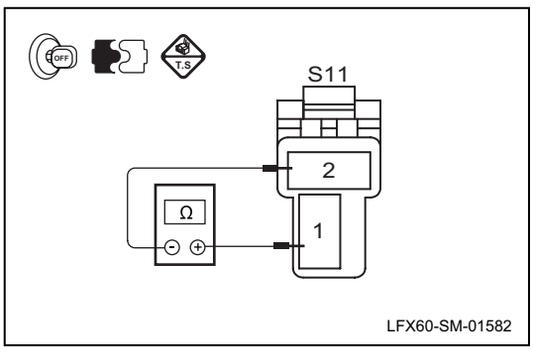
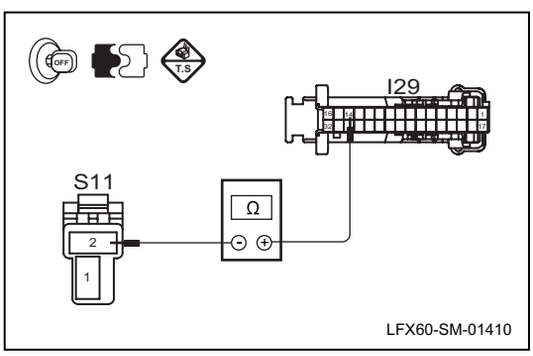
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Test condition	Details/results/measures
4. Check the instrument cluster ground wire.	
 LFX60-SM-09502	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative cable. B. Disconnect the instrument cluster harness plug I29. C. Measure the resistance between No. 25 terminal of the harness plug I29 of the instrument cluster and the reliable grounding. **Standard resistance: Less than 5 Ω** Is it OK after checking? **→Yes** To step 5. **→No** Check the wiring harness between the No. 25 terminal of the harness plug I29 and the ground point for open circuit fault, and replace the wiring harness if necessary.
5. Check the power supply for passenger's seat belt buckle.	
 LFX60-SM-01580	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative cable. B. Disconnect the assistant driver belt buckle harness plug S11. C. Connect the battery negative terminal and operate the start switch to turn the power to ON state. D. Measure the voltage between the No. 2 terminal of the harness plug S11 of the passenger's belt buckle and the ground point with a multimeter. **Standard voltage: 11 ~ 14 V** Is it OK after checking? **→Yes** To step 6. **→No** Check the circuits of the passenger's belt buckle for open circuit fault, and replace the wiring harness if necessary.
6. Check the grounding circuit for passenger's seat belt buckle.	
 LFX60-SM-01581	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative cable. B. Disconnect the assistant driver belt buckle harness plug S11. C. Measure the resistance between the No. 1 terminal of the harness plug S11 of the passenger's belt buckle and the ground point with a multimeter. **Standard resistance: less than 5 Ω** Is it OK after checking? **→Yes** To step 7. **→No** Check the wiring harness between the No. 1 terminal and the ground point of the harness plug S11 of the passenger's belt buckle for open circuit fault, and replace the wiring harness if necessary.

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Test condition	Details/results/measures
7. Check the assistant driver's belt buckle.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the assistant driver belt buckle harness plug S11. C. Measure the resistance between the No.1 and No.2 terminal of the harness plug S11 of the passenger's belt buckle with a multimeter. **Standard resistance: less than 1 Ω** Is it OK after checking? **→Yes** To Step 8. **→No** Replace the belt buckle. Refer to: Replacement of front belt buckle
8. Check the circuit of occupant detection sensor.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B.Disconnect the assistant driver belt buckle harness plug S11. C. Disconnect the instrument cluster harness plug I29. D. Measure the voltage between the No.2 terminal of the harness plug S11 of the passenger's belt buckle and the No.14 of I29 with a multimeter. **Standard resistance:less than 5 Ω** Is it OK after checking? **→Yes** To Step 9. **→No** Check the wiring harness between the No.2 terminal of the harness plug S11 of the passenger's belt buckle and the instrument cluster for open circuit fault, and replace the wiring harness if necessary.
9. Check the occupant detecting sensor.	
	A. Check whether the occupant detecting signal is normal. **Standard value: less than 150Ω (with occupant detecting); if belt not fastened, signal lamp on; if belt fastened, signal lamp off.** **Standard value: more than 10kΩ (with occupant detecting), signal lamp off.** **Standard value: signal lamp off if no occupant detecting.** Is it OK after checking? **→Yes** To Step 10. **→No** Replace the occupant detecting sensor.

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Test condition	Details/results/measures
10. Replace the instrument cluster.	
	A. Replace the instrument cluster. **Refer to: Replacement of instrument cluster assembly** Verify that the system is operated normally.

AutoLibrary

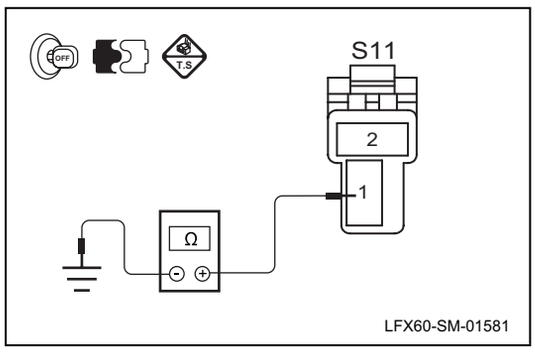
AutoLibrary

The diagnostic process for the passenger's seat belt warning light keeps on

Test condition	Details/results/measures
1. Check if the passenger's seat belt is buckled up.	
	A. Check whether the belt is correctly fastened. Is the belt correctly fastened? →**Yes** To Step 2. →**No** Fasten the belt and test whether the system is normal.
2. Check the assistant driver's belt buckle.	
	A. Operate the start switch to turn the power to OFF state. B. Disconnect the assistant driver belt buckle harness plug S11. C. Operate start switch to switch the power mode to "ON" state, observe for whether the seat belt warning light is off. Does the belt warning lamp turn off? →**Yes** Replace the belt buckle. **Refer to: Replacement of belt buckle** →**No** To Step 3.
3. Check the occupant detecting sensor.	
	A. Check whether the occupant detecting signal is normal. **Standard value: less than 150Ω (with occupant detecting); if belt not fastened, signal lamp on; if belt fastened, signal lamp off.** **Standard value: more than 10kΩ (with occupant detecting), signal lamp off.** **Standard value: signal lamp off if no occupant detecting.** Is it OK after checking? →**Yes** To Step 4. →**No** Replace the occupant detecting sensor.

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Test condition	Details/results/measures
4. Check the signal cable of passenger's seat belt warning light.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the assistant driver belt buckle harness plug S11. C. Measure the resistance between the No.1 terminal of the harness plug S11 of the passenger's belt buckle and the reliable ground point with a multimeter. **Standard resistance: 10MΩ or higher** Is the resistance normal? →**Yes** To Step 5. →**No** Check the wiring harness between the No.1 terminal of the harness plug S11 of the passenger's belt buckle and the ground point for failure, and replace the wiring harness if necessary.
5. Replace the instrument cluster.	
	A. Replace the instrument cluster. **Refer to: Replacement of instrument cluster assembly** Verify that the system is operated normally.

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Removal and Installation

Replacement of front seat belt buckle

Removal

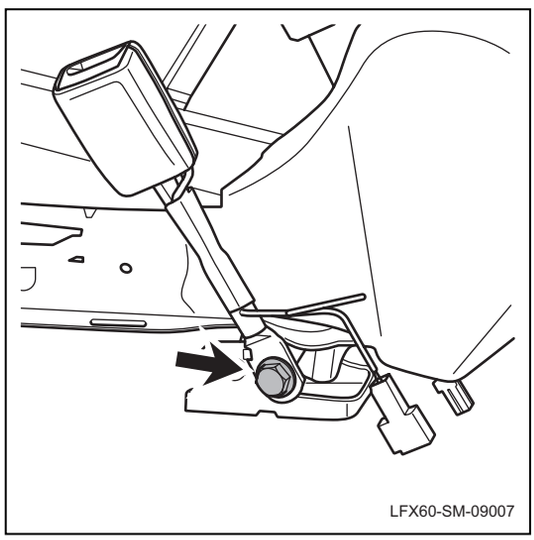
1. Remove the front seat belt buckle.

(a). Disconnect the battery negative connector.

Note:

Disconnect the battery negative terminal, wait for 90s at least and then continue operation.

(b). Remove the front seat assembly. **Refer to: Replacement of front row seat assembly.**



(c). Remove the fixing bolts of the front seat belt buckle.

(d). Take of the front seat belt buckle.

Installation

1. Install the front seat belt buckle.

(a). The installation sequence is the reverse of the disassembly order.

(b). Install the front seat assembly. **Refer to: Replacement of front row seat assembly.**

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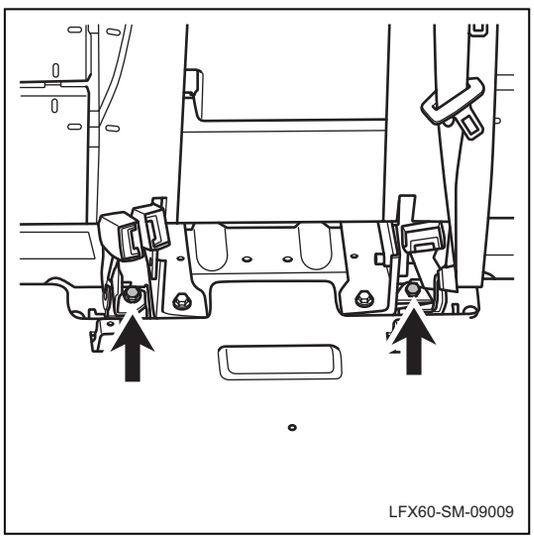
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Replacement of rear seat belt buckle assembly

Removal

1. Remove the rear seat belt buckle assembly.

(a). Remove the rear seat cushion, **refer to:Replacement of the rear seat cushion.**



(b). Remove the fixing bolts of the rear seat belt buckle assembly.

(c). Take off the rear seat belt buckle assembly.

Installation

1. Install the rear seat belt buckle assembly.

(a). The installation sequence is the reverse of the disassembly order.

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Replacement of front seat belt assembly

Removal

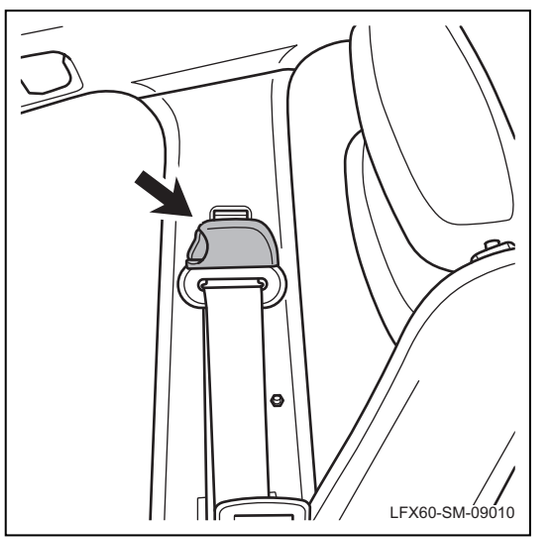
1. Remove the front seat belt assembly.

(a). Disconnect the battery negative connector.

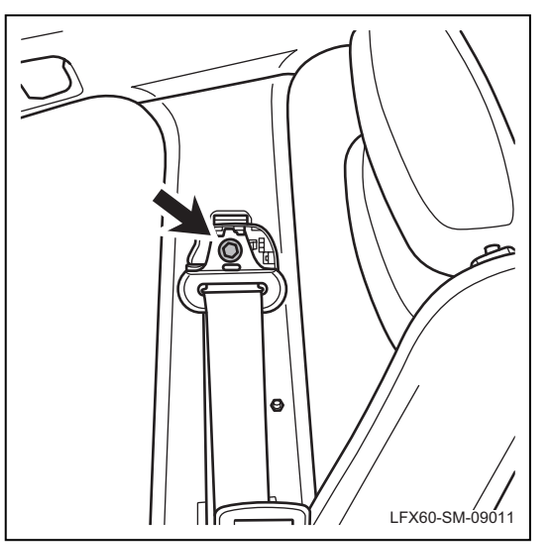
Note:

Disconnect the battery negative terminal, wait for 90s at least and then continue operation.

(b). Remove the B pillar lower decorative panel. **Refer to the replacement of B pillar lower decorative panel.**



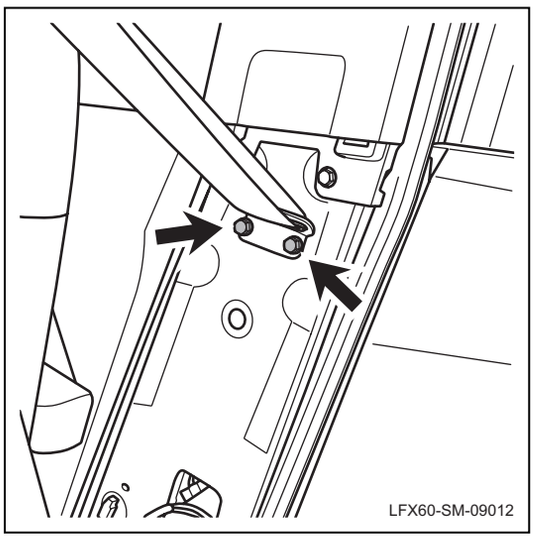
(c). Remove the trim cover of fixing bolts of the front seat belt assembly.



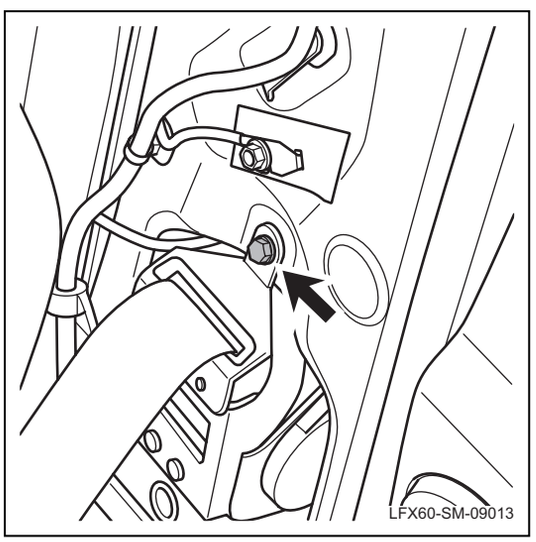
(d). Remove the fixing bolts of the front seat belt assembly.

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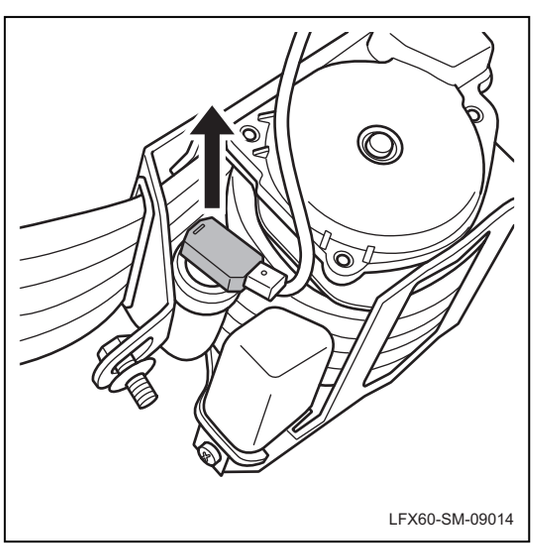
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(e). Remove the fixing bolts of stop collar for the front seat belt assembly.



(f). Remove the fixing bolts of the front seat belt assembly.



(g). Disconnect the harness plug of seat belt pretensioner.
(h). Take of the front seat belt assembly.

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Installation

1. Install the front seat belt assembly.

(a). The installation sequence is the reverse of the disassembly order.

(b). Install the lower trim panel of B-pillar, **refer to:Replacement of the lower trim panel of B-pillar.**

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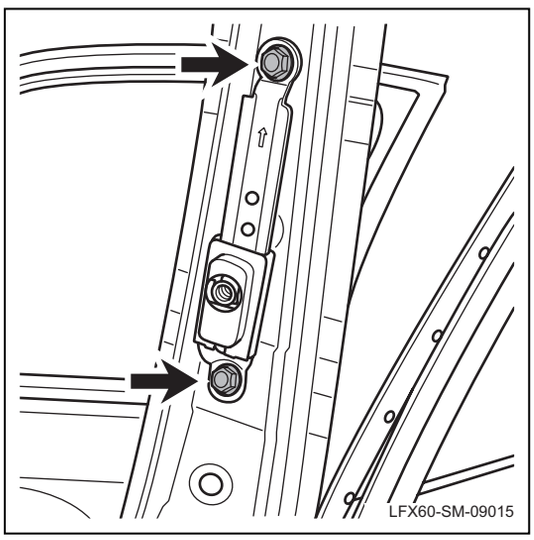
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Replacement of front seat belt adjuster

Removal

1. Remove the front seat belt adjuster.

(a). Remove the upper trim panel of B-pillar, **refer to:Replacement of the upper trim panel of B-pillar.**



(b). Remove the fixing bolts of the front seat belt adjuster.

(c). Take off the front seat belt adjuster.

Installation

1. Install the front seat belt adjuster.

(a). The installation sequence is the reverse of the disassembly order.

(b). Install the upper trim panel of B-pillar, **refer to:Replacement of the upper trim panel of B-pillar.**

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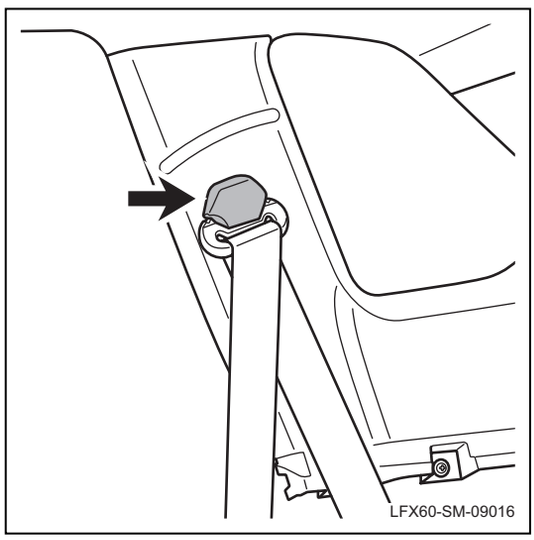
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Replacement of rear seat belt assembly

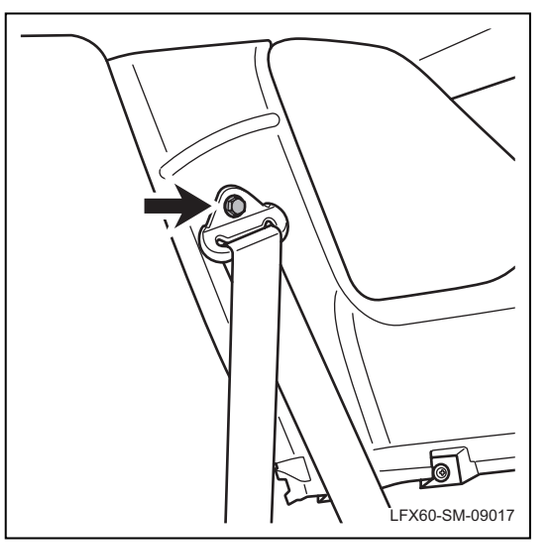
Removal

1. Remove the rear seat belt assembly.

(a). Remove the C pillar lower decorative panel. **Refer to the replacement of C pillar lower decorative panel.**



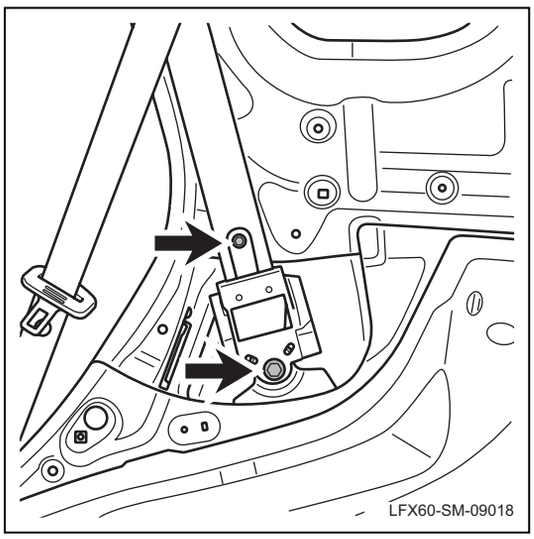
(b). Remove the trim cover of fixing bolts of the seat belt.



(c). Remove the fixing bolts of the seat belt.

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(d). Remove the fixing bolts of the seat belt retractor.
(e). Take of the rear seat belt assembly.

Installation

1. Install the rear seat belt assembly.
(a). The installation sequence is the reverse of the disassembly order.
(b). Remove the C pillar lower decorative panel. **Refer to the replacement of C pillar lower decorative panel.**

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09 - Safety protection device

Airbag system 9-1311
Technical specifications..... 9-1311
Precautions 9-1312
Preparation.....9-1313
Structure and installation location 9-1314
Operating Principle.....9-1315
Diagnostic Information and Procedures.....9-1317
Removal and Installation.....9-1355

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Airbag system

Technical specifications

Torque Specifications

Name	Torque range	
	Metric (Nm)	British(lb-ft)
Airbag ECU and floor connection bolts	9	7

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Precautions

⚠Warning:

- Failure to follow the correct procedure may result in a sudden deployment of the airbag and even a serious accident. Meanwhile, any incorrect action on airbag system can cause malfunction of the system.
- It is important to make sure that the ignition switch is turned OFF and the battery is disconnected from the positive and negative poles for 90 seconds.(The safety system is equipped with a backup power supply, so if it is operated within 90s of the positive and negative poles of the battery is disconnected, may lead to the airbag to deploy suddenly).
- Do not expose the airbag assembly to hot air or open flames.

ℹNote:

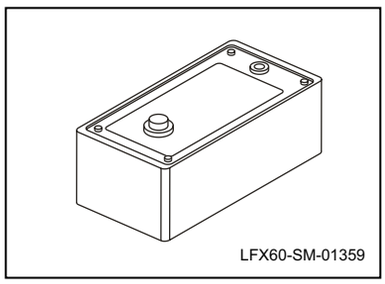
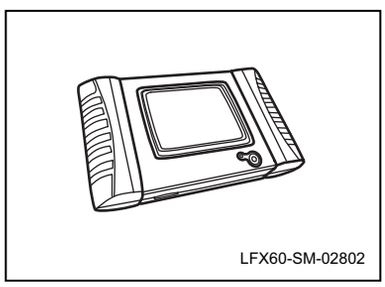
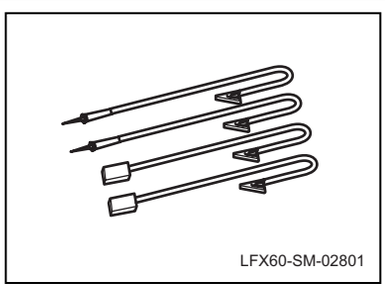
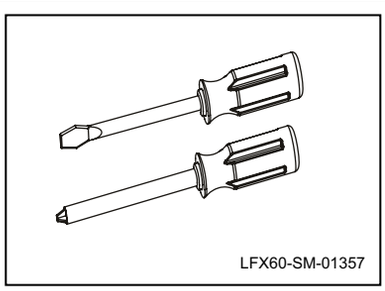
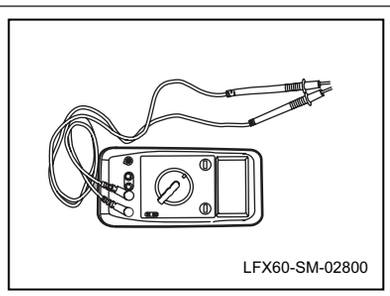
- Because it is difficult to confirm the failure of the airbag system, the diagnostic trouble code (DTC) will be the most important source of information for troubleshooting. Examine DTC before disconnect the battery in troubleshooting of the airbag system.
- Even if the impact is very small, and the airbag assembly is not deployed, the speaker button assembly and the airbag electronic control unit (SRS ECU) should be checked.
- If an airbag electronic control unit (SRS ECU) may be impacted during maintenance, be sure to disconnect the connector of airbag electronic control unit (SRS ECU) first.
- Do not use airbag system parts removed from another vehicle. Always replace with new parts.
- Do not disassemble the speaker button assembly.
- If the horn button assembly falls on the ground or cracks, pits, or other defects on the housing, be sure to replace with new parts.
- For failure check of system circuit, digital multimeter with high impedance should be used.
- The information label is affixed to the parts of the airbag system, and the precautions on the label must be followed.
- When the negative connector of battery is disconnected, the memory of the electronic clock and audio system will be cleared. Record all necessary data before repair. Reset electronic clock and audio system after repair. Standby power supply other than the vehicle must not be used to keep data memory. The standby power supply will power airbag system, so that the airbag may deploy suddenly in repair.
- Do not disassemble or repair the driver's and front passenger's airbag module and airbag electronic control unit (SRS ECU) assembly for recycle or other reasons.
- The airbag ECU, airbag module, clock spring, etc.should be removed when the painting operation is likely to cause an impact due to overheating (above 93 °C).
- The connector of Airbag electronic control unit (SRS ECU) assembly , the connector between the airbag electronic control unit (SRSECU) assembly and clock spring , the connector between the clock spring and the driver airbag module and the connector between the front passenger airbag module and the airbag electronic control unit (SRS ECU) are equipped with a protective mechanism to prevent accidental deployment of the airbag. All requirements must be followed in repair of airbag system to avoid injury for sudden deployment and other parts.
- During the maintenance of the airbag system, the airbag module must be loaded immediately after removal from the transport equipment.If the work is terminated, the airbag module should be returned to the conveyor and the airbag module can not be placed in an unattended place.When storing the removed airbag module, place the deployment face of airbag up.
- Do not place the airbag assembly in a high temperature environment or open flame.
- • After the airbag system is repaired, do not rush to connect the airbag module to the circuit.The electrical inspection should be carried out before the airbag module can be accessed.
- When the airbag system is connected to the power supply, no person is allowed in the vehicle.
- After the airbag system is repaired, check that if the SRS warning light is working properly.
- The airbag has a certain service life.If airbag life is reached, airbag and label must be replaced.

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Preparation

General maintenance tools

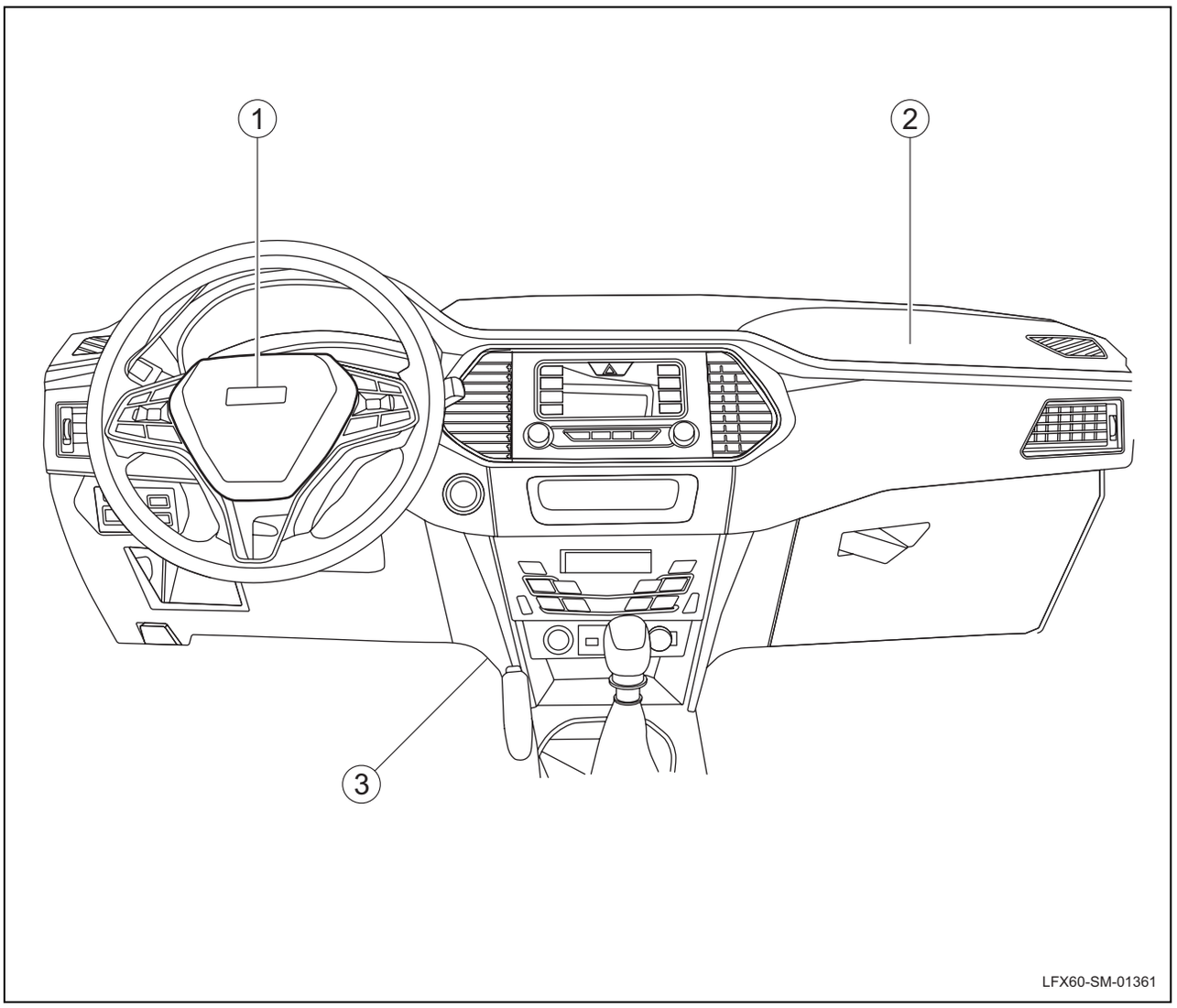
No.	Tool name	Tool figure	Tool code	Remarks
1	Special tool for airbag firing	 LFX60-SM-01359	-	Firing the airbag
2	Diagnosis equipment	 LFX60-SM-02802	-	Fault diagnose of airbag system
3	Wiring group	 LFX60-SM-02801	-	Testing circuit
4	Screwdriver	 LFX60-SM-01357	-	To remove and install the screw and pry the snap ring etc.
5	Digital universal meter	 LFX60-SM-02800	-	Measure the voltage and resistance

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Structure and installation location

Component Location Plan



No.	Part Name
1	Driver Airbag
2	Passenger safety

No.	Part Name
3	Airbag control unit

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Operating Principle

System Overview

⚠Warning:

The vehicle is equipped with the airbag systems; any failure to follow the correct operating procedures will lead to the following cases:

- **The airbag unexpectedly deploys.**
- **The airbag system does not work if required.**

⚠Warning:

Strictly observe the following rules to prevent the above conditions:

- **Before working, confirm whether you are working on the airbag system component, around the airbag or on the line.**
- **Remove the airbag system if you are carrying out maintenance operations on the airbag system components, around them, or on their lines.**

The airbag system (SRS AIRBAG) is a safety protection device used in conjunction with seat belts. The airbag cannot substitute the belt. The driver and occupants must always be fastened with the seat belt and adjust to the most appropriate condition according to the body.

ⓘNote:

Strictly observe the following rules to prevent the above conditions:

The airbag system can not replace the seat belt function.Failure to wear a seat belt may cause serious personal injury when the airbag is detonated.The airbag system is designed to protect the driver and passengers when the vehicle is severely impacted. When there is any frontal vehicle collision to meet the airbag detonation conditions, the airbag ECU will send a signal to trigger the gas charging system of driver and copilot airbag. The gas charging system will produce a chemical reaction in an instant so as to fill gas into airbag and buffer the forward impaction speed of front-row driver and passengers, and prevent drivers and front-row passengers from hitting the steering wheel and the upper/lower instrument panel directly. At the same time, airbag ECU also sends signals to the seat belt pre-tightening device so as to tighten the seat belt backwards.

The airbag system consists of the following components:

- Combination instrument assembly
- Airbag control module
- Driver's airbag
- Passenger airbag

Airbag indicator

The airbag indicator is located in the dashboard assembly to inform the driver of the airbag system failure and to verify that the airbag control unit is communicating with the dashboard.When operate start switch to switch the power mode to "ON" state, make sure that the airbag indicator is on.If the indicator light remains on, it is not extinguished or flashes, you must check the failure of the entire airbag system.

⚠Warning:

If the airbag system is faulty, it may cause the airbag unable to deploy, or deploy the airbag when the collision does not reach the set severity.

Airbag control unit

⚠Warning:

- **The airbag control unit has a redundant power supply, and the airbag can still be deployed after the battery voltage is lost during the collision.**
- **Disconnect the negative connector of battery for more than 90s before servicing the airbag system to ensure safety.**
- **In order to prevent accidental deployment of the airbag and cause personal injury, the undeveloped airbag module shall not be disposed as conventional workshop waste. Safely discard the unexpanded airbag module by using the expansion program. If the sealed container is damaged during the scrapping process, some of the substances contained in the unexpanded module may cause serious illness or personal injury.**

The airbag control unit, which is a microprocessor, is the control center of the airbag system.When the vehicle is impacted, the airbag control unit compares the detected collision signal with the value in the memory. When the generated signal value exceeds the stored value, the airbag control unit issues an ignition command to each of the ignition circuits to deploy the airbag.When the airbag is deployed, the airbag control unit records the status of the airbag system and lights on the airbag indicator on the instrument cluster.After the vehicle is started, the airbag control unit will perform continuous diagnostic monitoring of the electrical components and circuits of the airbag system.If the airbag control unit detects a fault, a fault diagnosis code is stored and the airbag indicator light is illuminated to inform the driver the failure.

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Driver airbag, passenger airbag

⚠Warning:
When transporting an unexpanded airbag module:

- **Do not carry wires or plugs on the airbag module.**
- **Make sure the airbag opening is not facing you or someone else.**

The driver airbag module includes a housing, an inflatable airbag, an ignition detonator, and a gas generating agent.When the vehicle is impacted in the front and the impact force is large enough, the airbag control unit will issue an ignition command to the ignition circuit to deploy the airbag.And then, the gas will rapidly expand the airbag.Once it is filled with gas, the airbag will discharge gas via the vent holes. All the harness connector terminal of airbag control unit (driver airbag, passenger airbag deployment circuit) has a short-circuit bar.When the plug is disconnected, the short-circuit bar will short the airbag inflatable module deploy circuit, to prevent the airbag from accidentally deploy during maintenance.

Clock Spring

⚠Warning:
Improper installation of the clock spring assembly can damage the internal spring coil of the clock spring, which may cause a coil failure, resulting in an airbag not working properly, thus resulting in personal injury.

The airbag clock spring is on the steering column and below the steering wheel.The clock spring can maintain a continuous electrical contact between the driver's airbag deployment circuit and the driver's airbag when the steering wheel is rotated.

Airbag harness system

The airbag system harness connects the airbag control unit, the inflatable module, the expansion circuit, and the data circuit through a waterproof plug.The harness of airbag system deploy circuit shall be yellow for identification. When repairing the harness of airbag system, follow the appropriate tests and circuit repair procedures in this manual.

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Diagnostic Information and Procedures

Diagnosis Instructions

Before the diagnoses of the airbag system, read the system overview first.Understand and become familiar with the working principle of the airbag system, and then start the airbag system diagnosis, so that in the event of failure to help determine the correct fault diagnosis steps, more importantly, it also helps determine whether the situation described by the customer is normal operating.

Any troubleshooting of the airbag system should take the airbag system check as a starting point and instruct the service personnel to take the next logical step to troubleshoot. Comprehend and correctly use the diagnostic flow chart to shorten the diagnosis time and avoid the misjudgement.

Visual Inspection

ⓘNote:

- **When storing unexpanded airbag modules, make sure that the airbag opening is not facing the surface of the loaded airbag module. "Airbag openings shall not point downward.Do not place any objects on the airbag module.There should be enough space around the airbag for the airbag to unfold unexpectedly. Otherwise, people will be injured."**
- **Do not immerse undeveloped airbag modules in water or expose them to other liquids.**
- **Do not deploy unexpanded airbag modules near fire or in high temperature areas to prevent the airbag from being accidentally unfolded and people from being injured.**

1. Confirm the problem raised by the customer.
2. Visually check whether there is any obvious mechanical or electrical damage sign.

Visual inspection table

Mechanical	Electric apparatus
• Steering wheel • Driver's seat • Dashboard assembly	• Fuse • Line • Driver's airbag • Passenger airbag • Clock spring • Airbag control module • Instrument cluster

3. Check the airbag system lines that are easy to observe or can be seen.

Wiring harness and fulcrum of the vibration should be the main parts thoroughly checked.If failure is caused by vibration, tt is advisable to gently vibrate the potentially defective parts with your fingers and check for malfunctions.

- Gently shake the plug in the vertical and horizontal directions.
- Gently shake the harness in the vertical and horizontal directions.

4. If the observed or raised problem is the evident and the cause has been found, ensure to fix this fault before proceeding with the next step.
5. If no problem is found through the visual check, confirm the fault and refer to the fault symptom list.

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List of fault symptoms

Symptom	Possible Cause	Recommended Measures
Intermittent fault	• Clear DTC • Carry out the simulation test • Check and shake the harness, harness plug	**Refer to: Intermittent fault diagnostic flow**
The airbag indicator does not light up	• Fuse • Line fault • Instrument cluster • Airbag control module	**Refer to: The diagnostic process for the airbag indicator does not light up**
The airbag indicator always light up	• Fuse, circuit • There is a collision occurrence record • Performed non-canonical operations • The number of times recorded in the airbag control unit exceeds the specified number of collisions • Instrument cluster • Airbag control module • Airbag • Battery	**Refer to: The diagnostic process for the airbag indicator always light up**

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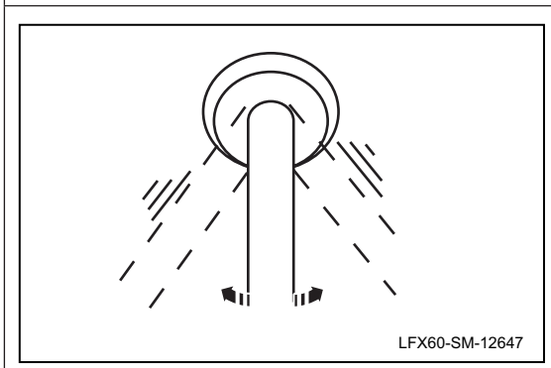
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Troubleshooting process for intermittent failure

Note:
- **Clear DTC.**
- **Carry out the simulation test.**
- **Check and shake the harness and harness plug.**

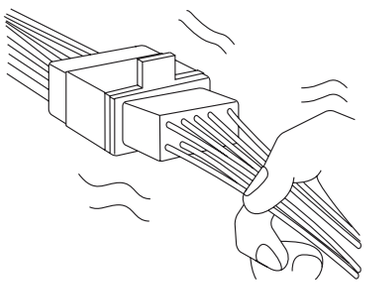
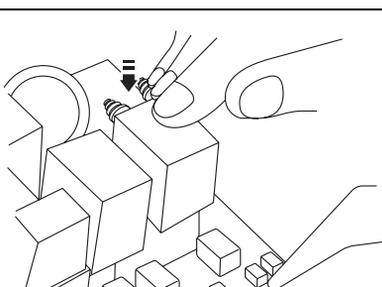
If DTC examination cannot confirm the fault and the fault occurs occasionally during the use, In this case, confirm all the circuits and parts that may cause the fault. In many cases, the basic inspection shown in the flow chart below can quickly and effectively locate the fault parts, in particular the loose contact of harness plug.

Definition: the fault does not occur currently but the historical fault diagnosis records show that the fault ever occurred. Or the customer reports this fault while the fault does not relate to the DTC and the fault symptom cannot be reproduced currently.

Test condition	Details/results/measures
1. Vibration method	
	A. If the fault occurs or the fault is more severe or the engine vibration occurs when the vehicle is running on the rough road, go to Step 2. **Note:** **Several causes can result in the vehicle or engine vibration fault. Check the following items:** B. The plug is not fully in place. C. The harness does not have enough clearance. D. The wiring harness is arranged across the bracket or moving part. E. The wiring harness is placed too close to the high temperature parts. F. Incorrect wiring, improperly tightened or loosened wiring will cause the wiring to be squeezed between the parts. G. The connection of the plug, the vibrating part, and the position through which the harness passes are important areas that need to be inspected, for example:the harness passes through the firewall and the body panel.
2. Inspection method for switch plug or harness	
 LFX60-SM-12647	A. Connect the diagnostic meter to the diagnostic interface (DLC). B. Operate the start switch to make the power mode to the ON State (shut down the engine). C. Access the data flow of the switch you are checking. D. Turn on the switch manually. E. While monitoring the data stream, gently shake each plug or harness horizontally and horizontally." F. If the data stream value is instable, check whether the contact is loose.

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Test condition	Details/results/measures
3. Method of checking the sensor plug or harness.	
 LFX60-SM-12648	A. Connect the diagnostic meter to the diagnostic interface (DLC). B. Operate the start switch to turn the power to ON state (shut down the engine). C. Access the data flow of the switch you are checking. D. While monitoring the data stream, gently shake each plug or harness horizontally and horizontally. E. If the data flow is not stable, check whether the connection is bad.
4. Method of checking the actuator or relay.	
 LFX60-SM-12649	A. Connect the diagnostic meter to the diagnostic interface (DLC). B. Operate the start switch to turn the power to ON state (shut down the engine). **Note:** **"If the engine is started, perform the following steps during its operation in idling mode."** C. Prepare the output status control function for the actuator or relay being checking. D. After the output status control function is activated, use a finger to vibrate the actuator or relay 3s." If you hear an unstable "click" sound, check for any improper connection or improper installation of the actuator and/or relay. **Note:** **Strongly vibrating relay may cause the relay to be disconnected.**
5. Simulate the fault by the road test and read the data stream.	
	A. Connect the diagnostic meter to the diagnostic interface (DLC). B. Simulate the fault by the road test and read the data stream. C. If the data stream value is instable or the malfunction occurs, repair or replace the parts.

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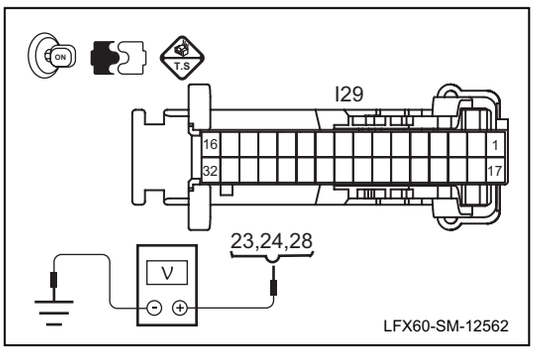
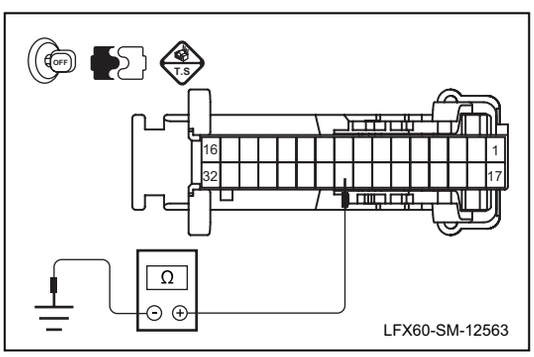
The diagnostic process for the airbag indicator does not light up

⚠Warning:
Before repairing the airbag system, disconnect the battery negative terminal more than 90s to ensure safety.

Test condition	Details/results/measures
1. General inspection.	
	A. Check the clock spring, instrument cluster harness plug and airbag module harness plug for breakage, loose contact, aging or looseness. Is it OK after checking? →**Yes** To Step 2. →**No** Repair the abnormal part.
2. Check the trouble code.	
	A. Connect the diagnostic equipment. B. Operate the start switch to set the power mode to the "on" state. C. Access the instrument system and SRS system to check the system for DTC. Is there a trouble code? →**No** To Step 3. →**Yes** Carry out the relevant fault diagnosis according to the DTC.
3. Check the fuse.	
	A. Check the fuse FS23, FS24, FS30. **Fuses rated capacity are:5A, 10 A, 25 A.** Is the fuse normal? →**Yes** To Step 4. →**No** Check the fuse circuit, replace with fuses of different rated capacity

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Test condition	Details/results/measures
4. Check the instrument cluster power line.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the instrument cluster harness plug I29. C. Connect the battery negative terminal and operate the start switch to turn the power to ON state. D. Measure the voltage between the instrument cluster harness plug I29 terminal 23, 24, 28 and the fixed ground point with the multimeter. **Standard voltage: 11 ~ 14 V** Is the voltage normal? →**Yes** To Step 5. →**No** Repair the instrument cluster power line fault and replace the harness if necessary.
5. Check the instrument cluster ground line.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the instrument cluster harness plug I29. C. Measure the resistance between the instrument cluster harness plug I29 terminal 25 and the fixed ground point with the multimeter. **Standard resistance: less than 5 Ω** Is the resistance normal? →**Yes** To Step 6. →**No** Repair the instrument cluster ground line open circuit fault and replace the harness if necessary.
6. Check the communication system between the instrument cluster and SRS.	
	A. Check the communication system between the instrument cluster and SRS. Is the communication system normal? →**Yes** To Step 7. →**No** Repair the communication system fault between the instrument cluster and SRS and replace the harness if necessary.

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Test condition	Details/results/measures
7. Replace the instrument cluster.	
	A. Replace the instrument cluster. **Refer to: Replacement of instrument cluster** Is the system normal? →**Yes** Fault solved. →**No** To Step 8.
8. Replace the airbag control unit.	
	A. Replace the airbag control unit. **Refer to: Replacement of airbag control module** Verify that the system is operated normally.

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The diagnostic process for the airbag indicator always light up

⚠Warning:
Before repairing the airbag system, disconnect the battery negative terminal more than 90s to ensure safety.

Test condition	Details/results/measures
1. General inspection.	
	A. Check the clock spring, instrument cluster harness plug and airbag module harness plug for breakage, loose contact, aging or looseness. Is it OK after checking? →**Yes** To Step 2. →**No** Repair the abnormal part.
2. Check the trouble code.	
	A. Connect the diagnostic equipment. B. Operate the start switch to set the power mode to the "on" state. C. Enter the airbag system and check the system for the presence of the fault code. Is there a trouble code? →**No** To Step 3. →**Yes** Carry out the relevant fault diagnosis according to the DTC.
3. Check the communication system between the instrument cluster and the airbag.	
	A. Check the communication system between the instrument cluster and the airbag. Is the communication system normal? →**Yes** To Step 4. →**No** Check communication system between the instrument cluster and the SRS for failure and repair, replace if necessary,
4. Replace the instrument cluster.	
	A. Replace the instrument cluster. **Refer to: Replacement of instrument cluster** Is the system normal? →**Yes** Fault solved. →**No** To Step 5.

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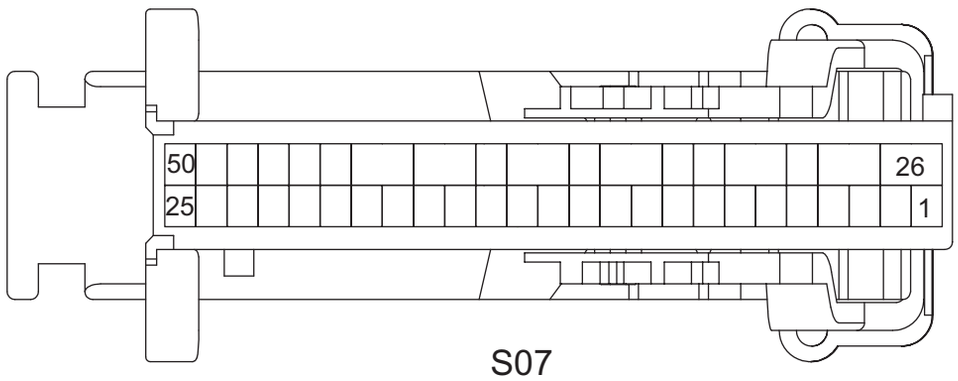
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Test condition	Details/results/measures
5. Replace the airbag control unit.	
	A. Replace the airbag control unit. **Refer to: Replacement of airbag control module.** Verify that the system is operated normally.

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Control module terminal list



S07

LFX60-SM-12677

Terminal number	Wire diameter/color	Terminal description
S07-01	0.50 G/Bl	Drive signal of Left warning seat belt is low
S07-02	0.50 B/Bl	Drive signal of Left warning seat belt is high
S07-03	0.50 Br	Drive signal of Right warning seat belt is high
S07-04	0.50 Bl	Drive signal of Right warning seat belt is low
S07-05	0.50 R/Y	Power source
S07-06	B	Grounding
S07-07	-	-
S07-08	-	-
S07-09	-	-
S07-10	0.50 Br	Drive signal of driver airbag is high
S07-11	0.50 V	Drive signal of driver airbag is low
S07-12	-	-
S07-13	0.50W	Drive signal of passenger airbag is low
S07-14	0.50 P	Drive signal of passenger airbag is high
S07-15	0.30 Bl/B	PCAN-H
S07-16	-	-
S07-17	-	-
S07-18	-	-
S07-19	-	-
S07-20	-	-
S07-21	-	-
S07-22	-	-

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Terminal number	Wire diameter/color	Terminal description
S07-23	-	-
S07-24	-	-
S07-25	-	-
S07-26	-	-
S07-27	-	-
S07-28	-	-
S07-29	-	-
S07-30	-	-
S07-31	-	-
S07-32	-	-
S07-33	-	-
S07-34	0.30Br/O	Collision signal output
S07-35	-	-
S07-36	-	-
S07-37	-	-
S07-38	-	-
S07-39	-	-
S07-40	0.30 Bl/W	PCAN-L

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DTC (DTC) List

Fault code (DTC)	Faultdescription
B111717	The voltage is too high
B111716	The voltage is too low
B10101B	High resistance of driver’s airbag circuit
B10101A	Low resistance of driver’s airbag circuit
B101011	Driver’s airbag circuit short to ground
B101012	Driver’s airbag circuit short to power
B10111B	High resistance of co-driver’s airbag circuit
B10111A	Low resistance of co-driver’s airbag circuit
B101111	Co-driver’s airbag circuit short to ground.
B101112	Co-driver’s airbag circuit short to power
B10121B	Driver's preloader resistance too high
B10121A	Driver's preloader resistance too low
B101211	Driver’s airbag tensioner resistance circuit short to ground
B101212	Driver’s airbag tensioner resistance circuit short to power
B10131B	Hi resistance circuit of co-driver’s airbag tensioner
B10131A	Lo resistance circuit of co-driver’s airbag tensioner
B101311	Co-driver’s airbag tensioner short to ground
B101312	Co-driver’s airbag tensioner short to power
B100049	Internal fault (replace ACU)
B105000	Frontal impact record (change the ACU)
B103414	Hard wire collision output channel 1 short to ground
B103412	Hard wire collision output channel 1 short to power
B103413	Hard wire collision output channel 2 short to ground
B103411	Hard wire collision output channel 2 short to power
B100100	Mismatch vehicle model
B105600	Continuous failure condition of watchdog
U007300	CAN bus off-line
U015500	IC signal loss

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DTC diagnosis flow index

DTC	Description	Diagnostic process
B111717	The voltage is too high	**Refer to: DTC B111717, B111716**
B111716	The voltage is too low	
B10101B	High resistance of driver's airbag circuit	**Refer to: DTC B10101B, B10101A, B101011, B101012**
B10101A	Low resistance of driver's airbag circuit	
B101011	Driver's airbag circuit short to ground	
B101012	Driver's airbag circuit short to power	
B10111B	High resistance of co-driver's airbag circuit	**Refer to: DTC B10111B, B10111A, B101111, B101112**
B10111A	Low resistance of co-driver's airbag circuit	
B101111	Co-driver's airbag circuit short to ground.	
B101112	Co-driver's airbag circuit short to power	
B10121B	Driver's preloader resistance too high	**Refer to: DTC B10121B, B10121A, B101211, B101212**
B10121A	Driver's preloader resistance too low	
B101211	Driver's airbag tensioner resistance circuit short to ground	
B101212	Driver's airbag tensioner resistance circuit short to power	
B10131B	Hi resistance circuit of co-driver's airbag tensioner	**Refer to: DTC B10131B, B10131A, B101311, B101312**
B10131A	Lo resistance circuit of co-driver's airbag tensioner	
B101311	Co-driver's airbag tensioner short to ground	
B101312	Co-driver's airbag tensioner short to power	
B100049	Internal fault (replace ACU)	**Refer to: DTC B100049, B105000**
B105000	Frontal impact record (change the ACU)	
B103414	Hard wire collision output channel 1 short to ground	**Refer to: DTC B103414, B103412, B100100, B105600**
B103412	Hard wire collision output channel 1 short to power	
B100100	Mismatch vehicle model	
B105600	Continuous failure condition of watchdog	
U007300	CAN bus off-line	**Refer to: DTC U007300, U015500**
U01550	IC signal loss	

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DTC B111717, B111716

DTC description

DTC	Description	Definition
B111717	The voltage is too high	• Airbag control unit monitors system operating voltage abnormal
B111716	The voltage is too low	

Possible reasons

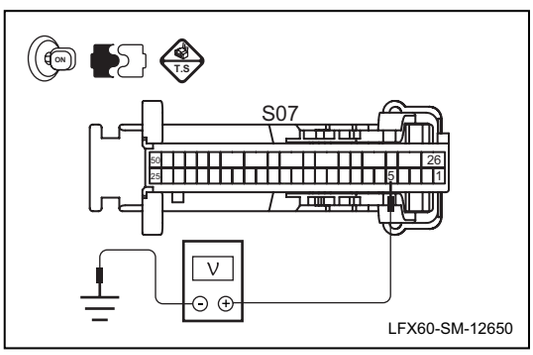
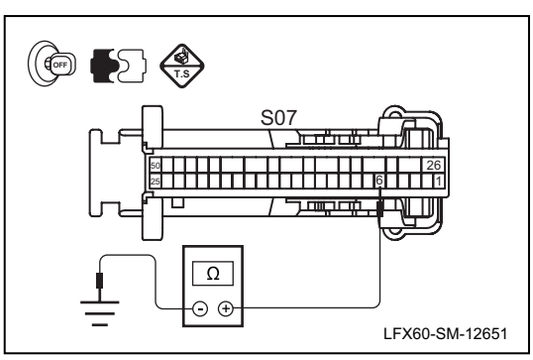
DTC	Check the strategy	Set the condition (control strategy)	Define the fault location
B111717	Line and check the hardware	Voltage exceeds 17 V and maintains 10s	• Charging system • Failure of airbag control unit and its circuit
B111716		Voltage less than 17V and maintains 10s	

Diagnostic process

Test condition	Details/results/measures
1. General inspection.	
	A. Check the airbag control unit harness plug for breakage, loose contact, aging or looseness. Is it OK after checking? →**Yes** To Step 2. →**No** Repair the fault parts.
2. Read the DTC with the diagnostic meter.	
	A. Connect the diagnostic meter and check the system for the other relevant DTCs. Is it OK after checking? →**Yes** To Step 3. →**No** Carry out the relevant fault diagnosis according to the DTCs.
3. Check whether the DTC can be cleared.	
	A. Connect the diagnostic meter and access the airbag system to clear DTC. B. Start the engine and check whether the DTC occurs again. Does DTC occur? →**Yes** To Step 4. →**No** System normal.

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Test condition	Details/results/measures
4. Check the power supply system of vehicle.	
	A. Check whether the power supply system of vehicle is normal. Is it OK after checking? →**Yes** To Step 5. →**No** Check the power supply system for fault.
5. Check the airbag control module power line.	
 LFX60-SM-12650	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the airbag control module harness plug S07. C. Connect the battery negative terminal and operate the start switch to turn the power to ON state. D. Measure the voltage between the airbag control module harness plug S07 terminal 5 and the fixed ground point with the multimeter. **Standard voltage: 11 ~ 14 V** Is the voltage normal? →**Yes** To Step 6. →**No** Repair the airbag control module power line open circuit fault and replace the harness if necessary.
6. Check the airbag control module ground line.	
 LFX60-SM-12651	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the airbag control module harness plug S07. C. Measure the resistance between No.6 terminal of the harness plug S07 of the airbag control module and the reliable grounding. **Standard resistance: less than 5 Ω** Is the resistance normal? →**Yes** To Step 7. →**No** Check the airbag control module grounding circuit for open circuit failure, and replace if necessary. Harness.
7. Replace the airbag control unit.	
	A. Replace the airbag control unit. **Refer to: Replacement of airbag control module** Verify that the system is operated normally.

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DTC B10101B, B10101A, B101011, B101012

DTC description

DTC	Description	Definition
B10101B	High resistance of driver's airbag circuit	• When the airbag control unit, based on the diagnostic current sent to the driver airbag power supply circuit, according to the situation of current changes in the circuit monitoring, compared to the stored preset standard value, set the fault code corresponding to the diagnostic results.
B10101A	Low resistance of driver's airbag circuit	
B101011	Driver's airbag circuit short to ground	
B101012	Driver's airbag circuit short to power	

Possible reasons

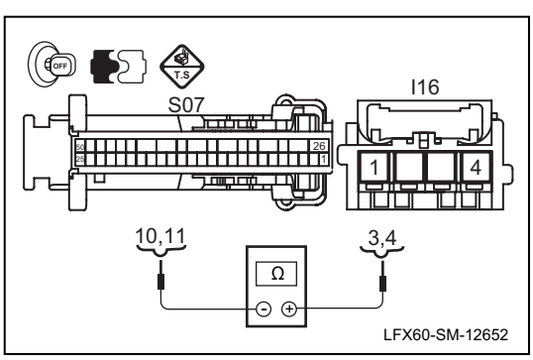
DTC	Check the strategy	Set the condition (control strategy)	Define the fault location
B10101B	Line and check the hardware	• Line short to the ground or open circuit • Line short to power • Line short circuit	• Line fault • Clock spring • Driver airbag • Airbag control module
B10101A			
B101011			
B101012			

Diagnostic process

Test condition	Details/results/measures
1. General inspection.	
	A. Check the airbag control unit and driver's side airbag harness plug for breakage, loose contact, aging or looseness. Is it OK after checking? →**Yes** To Step 2. →**No** Repair the fault parts.
2. Read the DTC with the diagnostic meter.	
	A. Connect the diagnostic tool to check whether the system has any other related trouble code.Whether the Check is normal? →**Yes** To Step 3. →**No** Carry out the relevant fault diagnosis according to the DTCs.

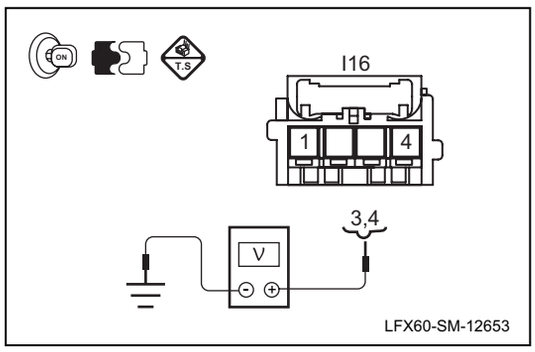
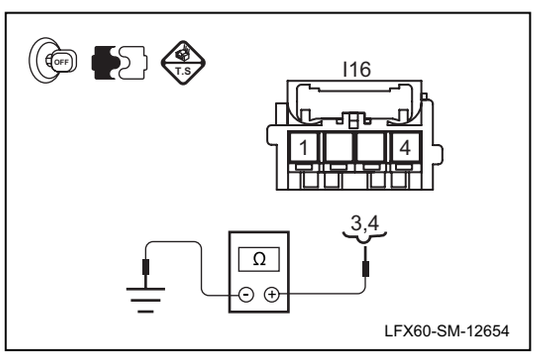
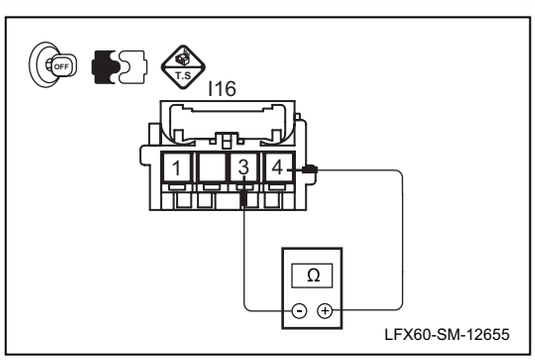
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Test condition	Details/results/measures
3. Check whether the DTC can be cleared.	
	A. Connect the diagnostic meter and access the airbag system to clear DTC. B. Start the engine and check whether the DTC occurs again. Does DTC occur? →**Yes** To Step 4. →**No** System normal.
4. Check the clock spring.	
	A. Check that if the horn switch, multi-function steering wheel on the control button is normal, check the clock spring for signs of damage. Make sure the clock spring is normal? →**Yes** To Step 5. →**No** Clock failure, replace the clock spring. **Refer to: replacement of clock spring.**
5. Check the drive signal circuit of the driver's airbag for continuity.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the harness plug S07 of the airbag control module, and disconnect harness plug I16 of the driver's airbag. C. Measure the resistance between the No.11 terminal of the harness plug S07 of the airbag control module and the No.3 terminal of the harness plug I16 of the driver airbag. D. Measure the resistance between the No.10 terminal of the harness plug S07 of the airbag control module and the No.4 terminal of the harness plug I16 of the driver airbag. **Standard resistance: less than 1 Ω** Is the resistance normal? →**Yes** To Step 6. →**No** Check the drive signal circuit of the driver airbag for open circuit failure, replace the wiring harness if necessary.

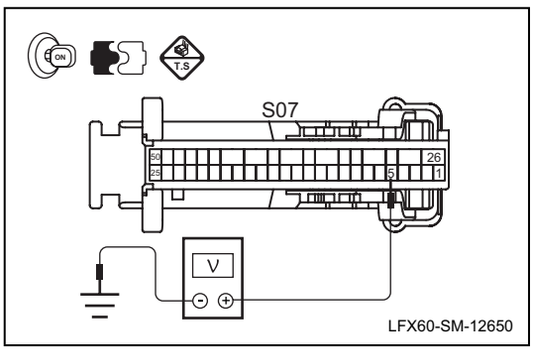
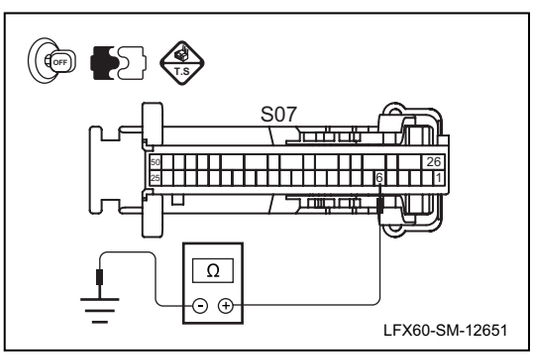
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Test condition	Details/results/measures
6. Check the drive signal circuit of the driver airbag and power supply for short circuit.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the driver's airbag harness plug I16. C. Connect the battery negative terminal and operate the start switch to turn the power to ON state. D. Measure the voltage between the No.3, 4 terminals of the harness plug I16 of the driver airbag and the reliable grounding with a multimeter. **Standard voltage: 0V** Is the voltage normal? →**Yes** To Step 7. →**No** Check the drive signal circuit of the driver airbag and power supply for short circuit failure, and replace the wiring harness if necessary.
7. Check the drive signal circuit of the driver airbag and grounding for short circuit.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the driver's airbag harness plug I16. C. Measure the resistance between the No.3, 4 terminals of the harness plug I16 of the driver airbag and the reliable grounding with a multimeter. **Standard resistance:10MΩ or higher** Is the resistance normal? →**Yes** To Step 8. →**No** Check the drive signal circuit of the driver airbag and grounding for short circuit failure, and replace the wiring harness if necessary.
8. Check the drive signal circuits of the driver‘s side airbag for short circuit with each other.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the driver's airbag harness plug I16. C. Measure the resistance between the No.3 and No.4 terminals of the harness plug I16 of the driver airbag with a multimeter. **Standard resistance: 10MΩ or higher** Is it OK after checking? →**Yes** To Step 9. →**No** Check the drive signal circuits of the driver’s airbag for short circuit failure with each other, and replace the wiring harness if necessary.

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Test condition	Details/results/measures
9. Check the airbag control module power line.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the airbag control module harness plug S07. C. Connect the battery negative terminal and operate the start switch to turn the power to ON state. D. Measure the voltage between the airbag control module harness plug S07 terminal 5 and the fixed ground point with the multimeter. **Standard voltage: 11 ~ 14 V** Is it OK after checking? →**Yes** To Step 10. →**No** Repair the airbag control module power line open circuit fault and replace the harness if necessary.
10. Check the airbag control module ground line.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the airbag control module harness plug S07. C. Measure the resistance between the airbag control module harness plug S07 terminal 6 and the fixed ground point with the multimeter. **Standard resistance: less than 5 Ω** Is it OK after checking? →**Yes** To Step 11. →**No** Repair the airbag control module ground line open circuit fault and replace the harness if necessary.
11. Replace the driver airbag.	
	A. Replace the driver's side airbag. **Refer to: Replacement of the driver airbag** Is it OK after checking? →**Yes** The fault is solved and the system is normal. →**No** To Step 12.
12. Replace the airbag control unit.	
	A. Replace the safety control unit. **Refer to: Replacement of airbag control module** Verify that the system is operated normally.

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DTC B10111B, B10111A, B101111, B101112

DTC description

DTC	Description	Definition
B10111B	High resistance of co-driver's airbag circuit	• When the airbag control unit, based on the diagnostic current sent to the passenger airbag power supply circuit, according to the situation of current changes in the circuit monitoring, compared to the stored preset standard value, set the fault code corresponding to the diagnostic results.
B10111A	Low resistance of co-driver's airbag circuit	
B101111	Co-driver's airbag circuit short to ground.	
B101112	Co-driver's airbag circuit short to power	

Possible reasons

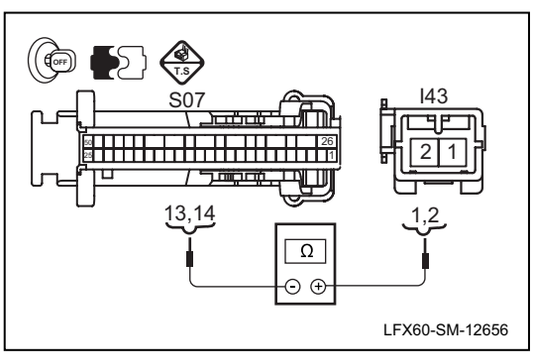
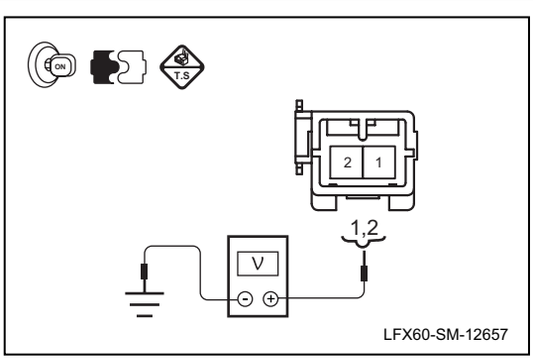
DTC	Check the strategy	Set the condition (control strategy)	Define the fault location
B10101B	Line and check the hardware	• Line short to the ground or open circuit • Line short to power • Line short circuit	• Line fault • Passenger airbag • Airbag control module
B10101A			
B101011			
B101012			

Diagnostic process

Test condition	Details/results/measures
1. General inspection.	
	A. Check the airbag control unit and driver's side airbag harness plug for breakage, loose contact, aging or looseness. Is it OK after checking? →**Yes** To Step 2. →**No** Repair the fault parts.
2. Read the DTC with the diagnostic meter.	
	A. Connect the diagnostic meter and check the system for the other relevant DTCs. Is it OK after checking? →**Yes** To Step 3. →**No** Carry out the relevant fault diagnosis according to the DTCs.

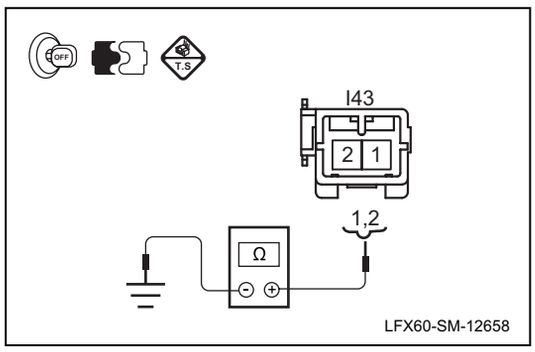
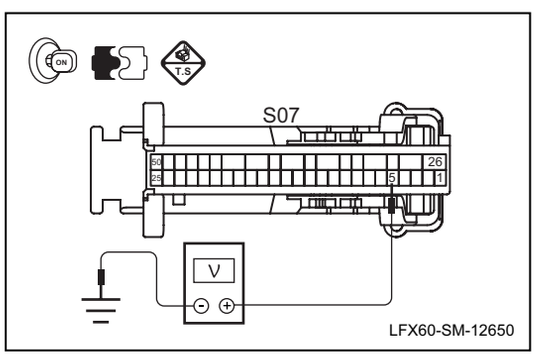
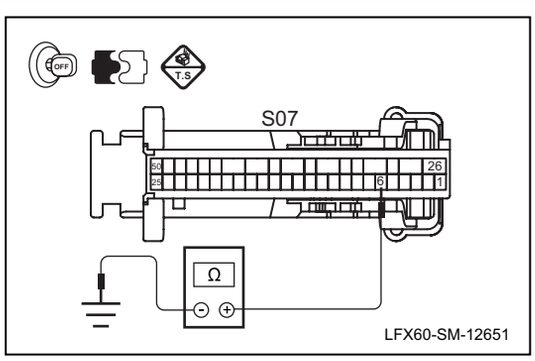
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Test condition	Details/results/measures
3. Check whether the DTC can be cleared.	
	A. Connect the diagnostic meter and access the airbag system to clear DTC. B. Start the engine and check whether the DTC occurs again. Does DTC occur? →**Yes** To Step 4. →**No** System normal.
4. Check the drive signal circuit of the passenger's airbag for continuity.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the airbag control module harness plug S07. C. Disconnect the harness plug I43 of the passenger airbag. D. Measure the resistance between the No.14 terminal of the harness plug S07 of the airbag control module and the No.2 terminal of the harness plug I43 of the passenger airbag. E. Measure the resistance between the No.13 terminal of the harness plug S07 of the airbag control module and the No.1 terminal of the harness plug I43 of the passenger airbag. **Standard resistance: less than 5 Ω** Is it OK after checking? →**Yes** To Step 5. →**No** Check the drive signal circuit of the passenger airbag for open circuit failure, and replace the wiring harness if necessary.
5. Check the drive signal circuit of the passenger airbag and power supply for short circuit.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the assistant driver's airbag harness plug I43. C. Connect the battery negative terminal and operate the start switch to turn the power to ON state. D. Measure the voltage between the No.1, 2 terminals of the harness plug I43 of the passenger airbag and the reliable grounding with a multimeter. **Standard voltage: 0 V** Is the voltage normal? →**Yes** To Step 6. →**No** Check the drive signal circuit of the passenger airbag and power supply for short circuit failure, and replace the wiring harness if necessary.

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Test condition	Details/results/measures
6. Check the drive signal circuit of the passenger airbag and grounding for short circuit.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the assistant driver's airbag harness plug I43. C. Measure the resistance between the No.1, 2 terminals of the harness plug I43 of the passenger airbag and the reliable grounding with a multimeter. **Standard resistance: 10MΩ or higher** Is the resistance normal? →**Yes** To Step 7. →**No** Check the drive signal circuit of the driver airbag and grounding for short circuit failure, and replace the wiring harness if necessary.
7. Check the airbag control module power line.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the airbag control module harness plug S07. C. Connect the battery negative terminal and operate the start switch to turn the power to ON state. D. Measure the voltage between the airbag control module harness plug S07 terminal 5 and the fixed ground point with the multimeter. **Standard voltage: 11 ~ 14 V** Is it OK after checking? →**Yes** To Step 8. →**No** Repair the airbag control module power line open circuit fault and replace the harness if necessary.
8. Check the airbag control module ground line.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the airbag control module harness plug S07. C. Measure the resistance between the airbag control module harness plug S07 terminal 6 and the fixed ground point with the multimeter. **Standard resistance: less than 5 Ω** Is the resistance normal? →**Yes** To Step 9. →**No** Repair the airbag control module ground line open circuit fault and replace the harness if necessary.

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Test condition	Details/results/measures
9. Replace the passenger airbag.	
	A. Replace the driver's side airbag. **Refer to: Replacement of the passenger airbag** Is it OK after checking? →**Yes** The fault is solved and the system is normal. →**No** To Step 11.
10. Replace the airbag control unit.	
	A. Replace the airbag control unit. **Refer to: Replacement of airbag control module** Verify that the system is operated normally.

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DTC B10121B, B10121A, B101211, B101212

DTC description

DTC	Description	Definition
B10121B	Driver's preloader resistance too high	• When the airbag control unit, based on the diagnostic current sent to the driver belt pretensioner power supply circuit, according to the situation of current changes in the circuit monitoring, compared to the stored preset standard value, set the fault code corresponding to the diagnostic results.
B10121A	Driver's preloader resistance too low	
B101211	Driver's airbag tensioner resistance circuit short to ground	
B101212	Driver's airbag tensioner resistance circuit short to power	

Possible reasons

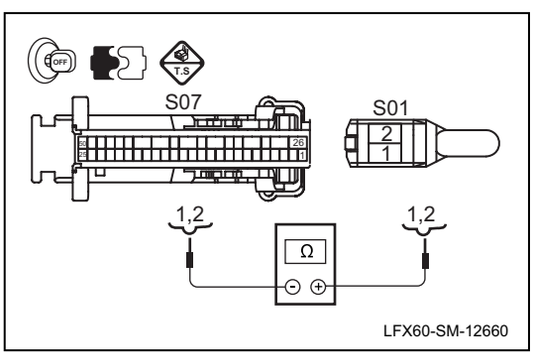
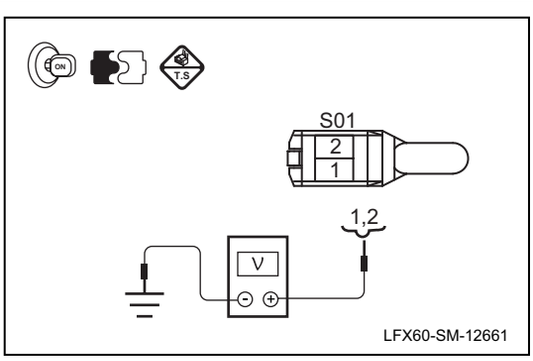
DTC	Check the strategy	Set the condition (control strategy)	Define the fault location
B10121B	Line and check the hardware	• Line short to the ground or open circuit • Line short to power • Line short circuit	• Line fault • Driver's belt pretensioner • Airbag control module
B10121A			
B101211			
B101212			

Diagnostic process

Test condition	Details/results/measures
1. General inspection.	
	A. Check the harness plug of the airbag control unit, and the driver's belt pretensioner for any signs of damage, poor contact, aging, loose and so on. Is it OK after checking? →**Yes** To Step 2. →**No** Repair the fault parts.
2. Read the DTC with the diagnostic meter.	
	A. Connect the diagnostic meter and check the system for the other relevant DTCs. Is it OK after checking? →**Yes** To Step 3. →**No** Carry out the relevant fault diagnosis according to the DTCs.

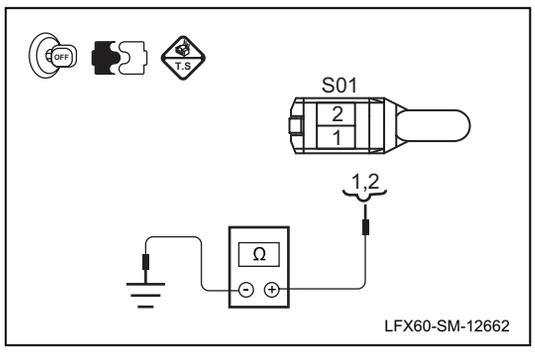
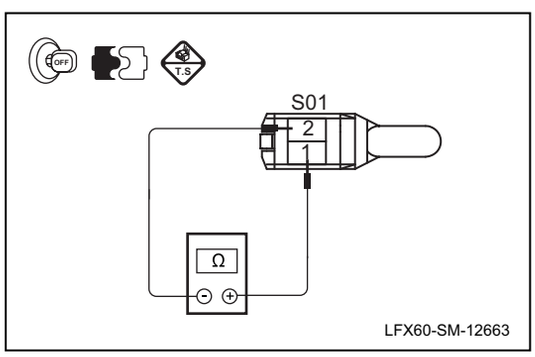
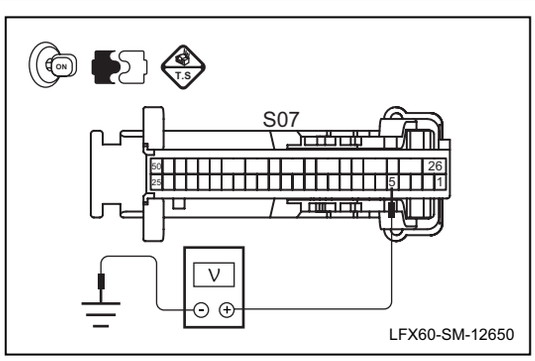
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Test condition	Details/results/measures
3. Check whether the DTC can be cleared.	
	A. Connect the diagnostic meter and access the airbag system to clear DTC. B. Start the engine and check whether the DTC occurs again. Does DTC occur? →**Yes** To Step 4. →**No** System normal.
4. Check the signal circuit of the driver's belt pretensioner for continuity.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the airbag control module harness plug S07. C. Disconnect of the harness plug S01 of the driver's belt pretensioner. D. Measure the resistance between the No.1 terminal of the harness plug S07 of the airbag control module and the No.1 terminal of the harness plug S01 of the driver's belt pretensioner. E. Measure the resistance between the No.2 terminal of the harness plug S07 of the airbag control module and the No.2 terminal of the harness plug S01 of the driver's belt pretensioner. **Standard resistance: less than 5 Ω** Is it OK after checking? →**Yes** To Step 5. →**No** Check the signal circuit of the driver's belt pretensioner for open circuit failure, and replace the wiring harness if necessary.
5. Check the drive signal circuit of the driver's belt pretensioner and power supply for short circuit.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the driver's side preloader harness plug S01. C. Connect the battery negative terminal and operate the start switch to turn the power to ON state. D. Measure the voltage between the No.1, 2 terminals of the harness plug S01 of the driver's belt pretensioner and the reliable grounding with a multimeter. **Standard voltage: 0V** Is the voltage normal? →**Yes** To Step 6. →**No** Check the drive signal circuit of the driver's belt pretensioner and power supply for short circuit failure, and replace the wiring harness if necessary.

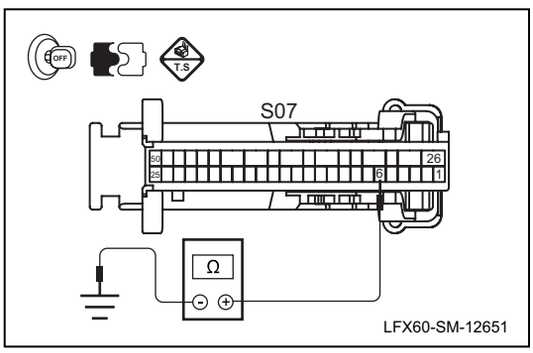
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Test condition	Details/results/measures
6. Check the drive signal circuit of the driver's belt pretensioner and grounding for short circuit.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the driver's side preloader harness plug S01. C. Measure the resistance between the No.1, 2 terminals of the harness plug S01 of the driver's belt pretensioner and the reliable grounding with a multimeter. **Standard resistance: 10MΩ or higher** Is the resistance normal? **→Yes** To Step 7. **→No** Check the drive signal circuit of the driver's belt pretensioner and grounding for short circuit failure, and replace the wiring harness if necessary.
7. Check the drive signal circuit of the passenger's belt pretensioner and power supply for short circuit.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the driver's side preloader harness plug S01. C. Measure the resistance between the No.1 and No.2 terminals of the harness plug S01 of the driver's belt pretensioner with a multimeter. **Standard resistance: 10MΩ or higher** Is the resistance check normal? **→Yes** To Step 8. **→No** Check the drive signal circuit of the driver's belt pretensioner for short circuit failure with each other, and replace the wiring harness if necessary.
8. Check the airbag control module power line.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the airbag control module harness plug S07. C. Connect the battery negative terminal and operate the start switch to turn the power to ON state. D. Measure the voltage between the airbag control module harness plug S07 terminal 5 and the fixed ground point with the multimeter. **Standard voltage: 11 ~ 14 V** Is the voltage normal? **→Yes** To Step 9. **→No** Repair the airbag control module power line open circuit fault and replace the harness if necessary.

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Test condition	Details/results/measures
9. Check the airbag control module ground line.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the airbag control module harness plug S07. C. Measure the resistance between the airbag control module harness plug S07 terminal 6 and the fixed ground point with the multimeter. **Standard resistance: less than 5 Ω** Is it OK after checking? →**Yes** To Step 10. →**No** Repair the airbag control module ground line open circuit fault and replace the harness if necessary.
10. Replace the driver's belt pretensioner	
	A. Replace the driver's belt pretensioner Is the system normal? →**Yes** The fault is solved and the system is normal. →**No** To Step 11.
11. Replace the airbag control unit.	
	A. Replace the airbag control unit. **Refer to: Replacement of airbag control module** Verify that the system is operated normally.

09

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DTC B10131B, B10131A, B101311, B101312

DTC description

DTC	Description	Definition
B10131B	Hi resistance circuit of co-driver's airbag tensioner	• When the airbag control unit, based on the diagnostic current sent to the passenger belt pretensioner power supply circuit, according to the situation of current changes in the circuit monitoring, compared to the stored preset standard value, set the fault code corresponding to the diagnostic results.
B10131A	Lo resistance circuit of co-driver's airbag tensioner	
B101311	Co-driver's airbag tensioner short to ground	
B101312	Co-driver's airbag tensioner short to power	

Possible reasons

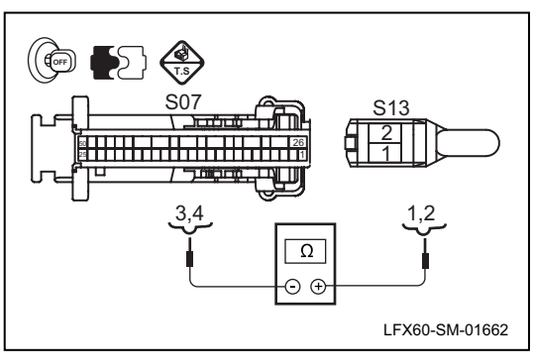
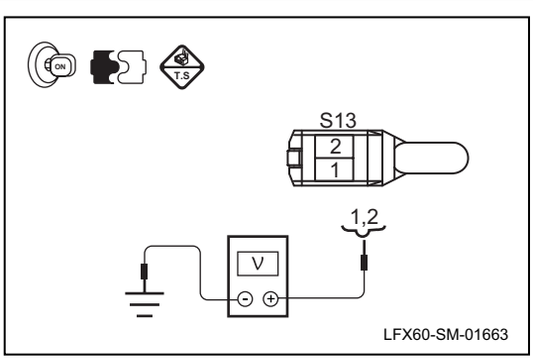
DTC	Check the strategy	Set the condition (control strategy)	Define the fault location
B10131B	Line and check the hardware	• Line short to the ground or open circuit • Line short to power • Line short circuit	• Line fault • Passenger's belt pretensioner • Airbag control module
B10131A			
B101311			
B101312			

Diagnostic process

Test condition	Details/results/measures
1. General inspection.	
	A. Check the harness plug of the airbag control unit, and the belt pretensioner on the passenger side for any signs of damage, poor contact, aging, loose and so on. Is it OK after checking? →**Yes** To Step 2. →**No** Repair the fault parts.
2. Read the DTC with the diagnostic meter.	
	A. Connect the diagnostic meter and check the system for the other relevant DTCs. Is it OK after checking? →**Yes** To Step 3. →**No** Carry out the relevant fault diagnosis according to the DTCs.

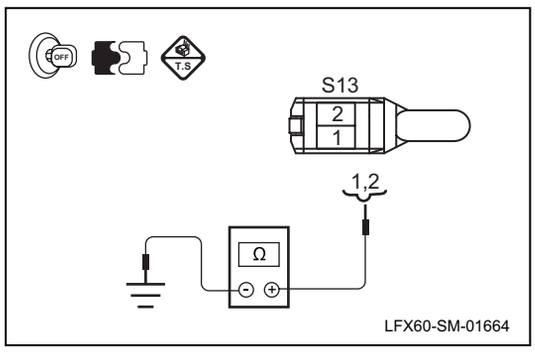
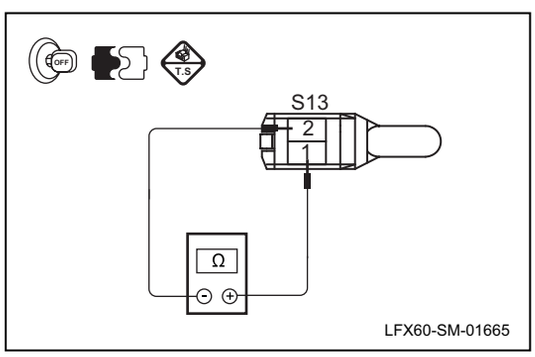
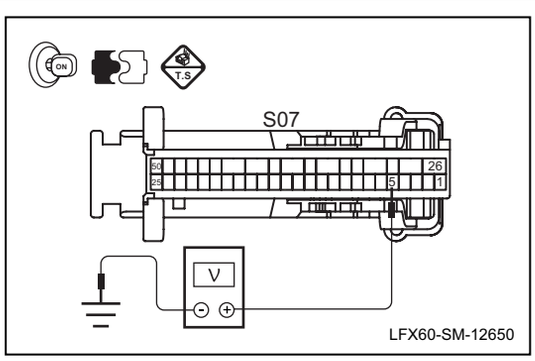
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Test condition	Details/results/measures
3. Check whether the DTC can be cleared.	
	A. Connect the diagnostic meter and access the airbag system to clear DTC. B. Start the engine and check whether the DTC occurs again. Does DTC occur? →**Yes** To Step 4. →**No** System normal.
4. Check the signal circuit of the passenger's belt pretensioner for continuity.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the harness plug S07 of the airbag control module, and disconnect harness plug S13 of the passenger's belt pretensioner. C. Measure the resistance between the No.3 terminal of the harness plug S07 of the airbag control module and the No.2 terminal of the harness plug S13 of the passenger's belt pretensioner. D. Measure the resistance between the No.4 terminal of the harness plug S07 of the airbag control module and the No.1 terminal of the harness plug S13 of the passenger's belt pretensioner. **Standard resistance: less than 5 Ω** Is it OK after checking? →**Yes** To Step 5. →**No** Check the signal circuit of the passenger's belt pretensioner for open circuit failure, and replace the wiring harness if necessary.
5. Check the drive signal circuit of the passenger's belt pretensioner and power supply for short circuit.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the assistant driver's side preloader harness plug S13. C. Connect the battery negative terminal and operate the start switch to turn the power to ON state. D. Measure the voltage between the No.1, 2 terminals of the harness plug S13 of the passenger's belt pretensioner and the reliable ground with a multimeter. **Standard voltage: 0V** Is it OK after checking? →**Yes** To Step 6. →**No** Check the drive signal circuit of the passenger's belt pretensioner and power supply for short circuit failure, and replace the wiring harness if necessary.

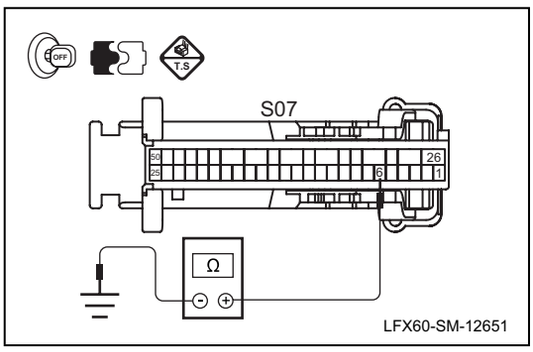
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Test condition	Details/results/measures
6. Check the drive signal circuit of the passenger's belt pretensioner and grounding for short circuit.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the assistant driver's side preloader harness plug S13. C. Measure the resistance between the No.1, 2 terminals of the harness plug S13 of the passenger's belt pretensioner and the reliable ground with a multimeter. **Standard resistance: 10MΩ or higher** Is it OK after checking? **→Yes** To Step 7. **→No** Check the drive signal circuit of the passenger's belt pretensioner and grounding for short circuit failure, and replace if necessary.
7. Check the drive signal circuits of the passenger's belt pretensioner for short circuit with each other.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the assistant driver's side preloader harness plug S13. C. Measure the resistance between the No.1 and No.2 terminals of the harness plug S13 of the passenger's belt pretensioner with a multimeter. **Standard resistance: 10MΩ or higher** Is it OK after checking? **→Yes** To Step 8. **→No** Check the drive signal circuit of the passenger's belt pretensioner for short circuit failure with each other, and replace the wiring harness if necessary.
8. Check the airbag control module power line.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the airbag control module harness plug S07. C. Connect the negative connector of the battery, start the switch so that the power mode is in "ON" state. D. Measure the voltage between No.5 terminal of the harness plug S07 of the airbag control module and the reliable grounding. **Standard voltage: 11 ~ 14 V** Is it OK after checking? **→Yes** To Step 9. **→No** Check the power supply circuit of the airbag control module circuit for open circuit failure, and replace the wiring harness if necessary.

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Test condition	Details/results/measures
9. Check the airbag control module ground line.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the airbag control module harness plug S07. C. Measure the resistance between the airbag control module harness plug S07 terminal 6 and the fixed ground point with the multimeter. **Standard resistance: less than 5Ω** Is it OK after checking? →**Yes** To Step 10. →**No** Repair the airbag control module ground line open circuit fault and replace the harness if necessary.
10. Replace the assistant driver's side preloader.	
	A. Replace the assistant driver's side preloader. Is the system normal? →**Yes** The fault is solved and the system is normal. →**No** To Step 11.
11. Replace the airbag control unit.	
	A. Replace the airbag control unit. **Refer to: Replacement of airbag control module** Verify that the system is operated normally.

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DTC B100049, B105000

DTC description

DTC	Description	Definition
B100049	Internal fault (replace ACU)	• ACU internal fault
B105000	Frontal impact record (replace ACU)	

Possible reasons

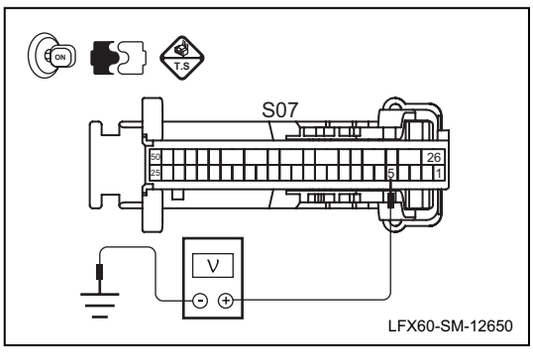
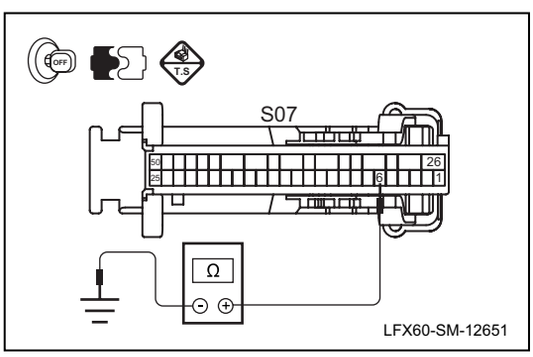
DTC	Check the strategy	Set the condition (control strategy)	Define the fault location
B100049		• Internal fault	• Internal fault
B105000		• A collision has occurred	

Diagnostic process

Test condition	Details/results/measures
1. General inspection.	
	A. Check the airbag control unit harness plug for breakage, loose contact, aging or looseness. Is it OK after checking? →**Yes** To Step 2. →**No** Repair the fault parts.
2. Read the DTC with the diagnostic meter.	
	A. Connect the diagnostic meter and check the system for the other relevant DTCs. Is it OK after checking? →**Yes** To Step 3. →**No** Carry out the relevant fault diagnosis according to the DTCs.
3. Check whether the DTC can be cleared.	
	A. Connect the diagnostic meter and access the airbag system to clear DTC. B. Start the engine and check whether the DTC occurs again. Does DTC occur? →**Yes** To Step 4. →**No** System normal.

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Test condition	Details/results/measures
4. Check the airbag control module power line.	
 LFX60-SM-12650	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the airbag control module harness plug S07. C. Connect the battery negative terminal and operate the start switch to turn the power to ON state. D. Measure the voltage between the airbag control module harness plug S07 terminal 5 and the fixed ground point with the multimeter. **Standard voltage: 11 ~ 14 V** Is it OK after checking? →**Yes** To Step 5. →**No** Repair the airbag control module power line open circuit fault and replace the harness if necessary.
5. Check the grounding circuit of the airbag control module	
 LFX60-SM-12651	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the airbag control module harness plug S07. C. Measure the resistance between the airbag control module harness plug S07 terminal 6 and the fixed ground point with the multimeter. **Standard resistance: less than 5 Ω** Is it OK after checking? →**Yes** To Step 6. →**No** Repair the airbag control module ground line open circuit fault and replace the harness if necessary.
6. Replace the assistant driver's side preloader.	
	A. Replace the assistant driver's side preloader. Is the system normal? →**Yes** The fault is solved and the system is normal. →**No** To Step 7.
7. Replace the airbag control unit.	
	A. Replace the airbag control unit. **Refer to: Replacement of airbag control module.** Verify that the system is operated normally.

09

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DTC B103414, B103412, B100100, B105600

DTC description

DTC	Description	Definition
B103414	Hard wire collision output channel 1 short to ground	• The system has detected a circuit fault
B103412	Hard wire collision output channel 1 short to power	
B100100	Mismatch vehicle model	
B105600	Continuous failure condition of watchdog	

Possible reasons

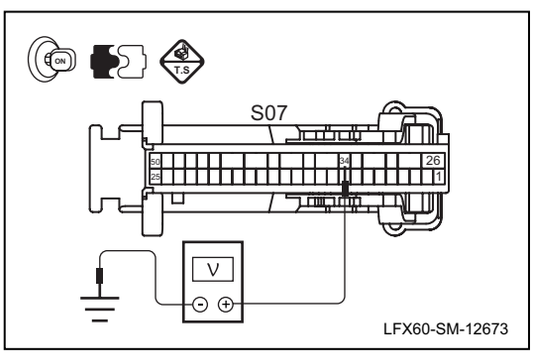
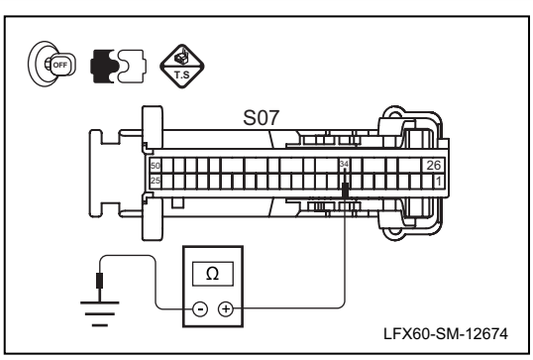
DTC	Check the strategy	Set the condition (control strategy)	Define the fault location
B10131B	Line and check the hardware	• Line short to the ground or open circuit • Line short to power • Line short circuit	• Line fault • Airbag control module
B10131A			
B101311			
B101312			

Diagnostic process

Test condition	Details/results/measures
1. General inspection.	
	A. Check the harness plug of the airbag control unit, and the belt pretensioner on the passenger side for any signs of damage, poor contact, aging, loose and so on. Is it OK after checking? →**Yes** To Step 2. →**No** Repair the fault parts.
2. Read the DTC with the diagnostic meter.	
	A. Connect the diagnostic meter and check the system for the other relevant DTCs. Is it OK after checking? →**Yes** To Step 3. →**No** Carry out the relevant fault diagnosis according to the DTCs.

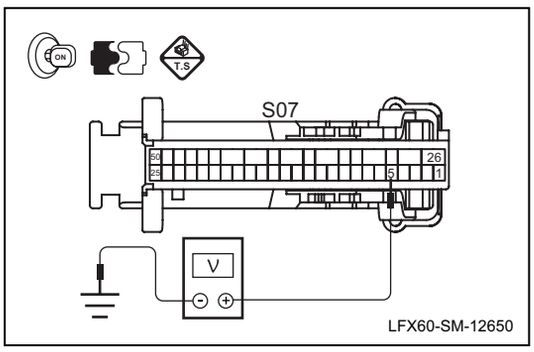
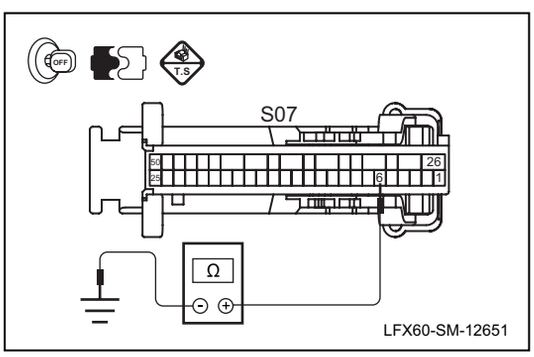
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Test condition	Details/results/measures
3. Check whether the DTC can be cleared.	
	A. Connect the diagnostic meter and access the airbag system to clear DTC. B. Start the engine and check whether the DTC occurs again. Does DTC occur? →**Yes** To Step 4. →**No** System normal.
4. Check the airbag output signal circuit and power supply for short circuit.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the airbag control module harness plug S07. C. Measure the voltage between No.34 terminal of the harness plug S07 of the airbag control module and the reliable grounding. **Standard voltage: 0V** Is it OK after checking? →**Yes** To Step 5. →**No** Check the airbag output signal circuit and power supply for failure, and replace the wiring harness if necessary.
5. Check the airbag output signal circuit and grounding for short circuit.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the airbag control module harness plug S07. C. Connect the battery negative terminal and operate the start switch to turn the power to ON state. D. Measure the resistance between No.34 terminal of the harness plug S07 of the airbag control module and the reliable grounding. **Standard resistance: 10MΩ or higher** Is it OK after checking? →**Yes** To Step 6. →**No** Check the airbag output signal circuit and grounding for short circuit failure, and replace the wiring harness if necessary.

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Test condition	Details/results/measures
6. Check the airbag control module power line.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the airbag control module harness plug S07. C. Connect the battery negative terminal and operate the start switch to turn the power to ON state. D. Measure the voltage between the airbag control module harness plug S07 terminal 5 and the fixed ground point with the multimeter. **Standard voltage: 11 ~ 14 V** Is it OK after checking? →**Yes** To Step 7. →**No** Repair the airbag control module power line open circuit fault and replace the harness if necessary.
7. Check the airbag control module ground line.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the airbag control module harness plug S07. C. Measure the resistance between the airbag control module harness plug S07 terminal 6 and the fixed ground point with the multimeter. **Standard resistance: less than 5 Ω** Is it OK after checking? →**Yes** To Step 8. →**No** Repair the airbag control module ground line open circuit fault and replace the harness if necessary.
9. Replace the airbag control unit.	
	A. Replace the airbag control unit. **Refer to: Replacement of airbag control module** Verify that the system is operated normally.

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DTC U007300, U015500

DTC description

DTC	Description	Definition
U007300	CAN bus off-line	• Airbag control unit monitors system operating voltage abnormal
U015500	IC signal loss	

Possible reasons

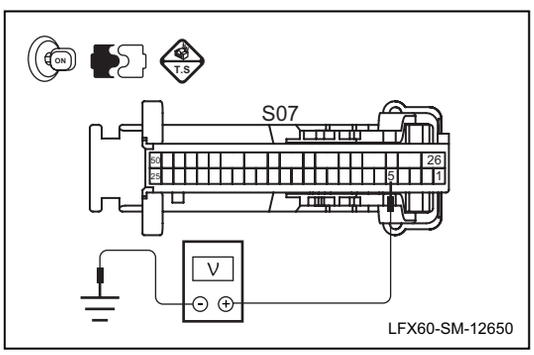
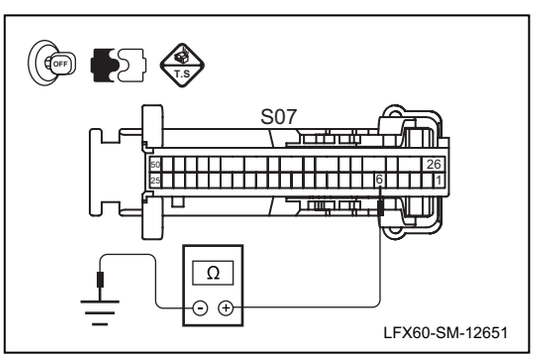
DTC	Check the strategy	Set the condition (control strategy)	Define the fault location
U007300	Line and check the hardware	• The CAN bus is offline for more than 400 ms • The dashboard signal is lost for more than 200 ms	• CAN bus • Airbag control module
U015500			

Diagnostic process

Test condition	Details/results/measures
1. General inspection.	
	A. Check the harness plug of the airbag control unit for any signs of damage, poor contact, aging, loose and so on. Is it OK after checking? →**Yes** To Step 2. →**No** Repair the fault parts.
2. Read the DTC with the diagnostic meter.	
	A. Connect the diagnostic meter and check the system for the other relevant DTCs. Is it OK after checking? →**Yes** To Step 3. →**No** Carry out the relevant fault diagnosis according to the DTCs.
3. Check whether the DTC can be cleared.	
	A. Connect the diagnostic meter and access the airbag system to clear DTC. B. Start the engine and check whether the DTC occurs again. Does DTC occur? →**Yes** To Step 4. →**No** System normal.

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Test condition	Details/results/measures
4. Check the vehicle communication system.	
	A. Check whether the vehicle communication system is normal. Is it OK after checking? →**Yes** To Step 5. →**No** Check the communication system for fault.
5. Check the airbag control module power line.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the airbag control module harness plug S07. C. Connect the battery negative terminal and operate the start switch to turn the power to ON state. D. Measure the voltage between the airbag control module harness plug S07 terminal 5 and the fixed ground point with the multimeter. **Standard voltage: 11 ~ 14V** Is it OK after checking? →**Yes** To Step 6. →**No** Repair the airbag control module power line open circuit fault and replace the harness if necessary.
6. Check the airbag control module ground line.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the airbag control module harness plug S07. C. Measure the resistance between the airbag control module harness plug S07 terminal 6 and the fixed ground point with the multimeter. **Standard resistance: less than 5 Ω** Is it OK after checking? →**Yes** To Step 7. →**No** Repair the airbag control module ground line open circuit fault and replace the harness if necessary.
7. Replace the airbag control unit.	
	A. Replace the airbag control unit. **Refer to: Replacement of airbag control module** Verify that the system is operated normally.

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Removal and Installation

Replacement of the driver airbag

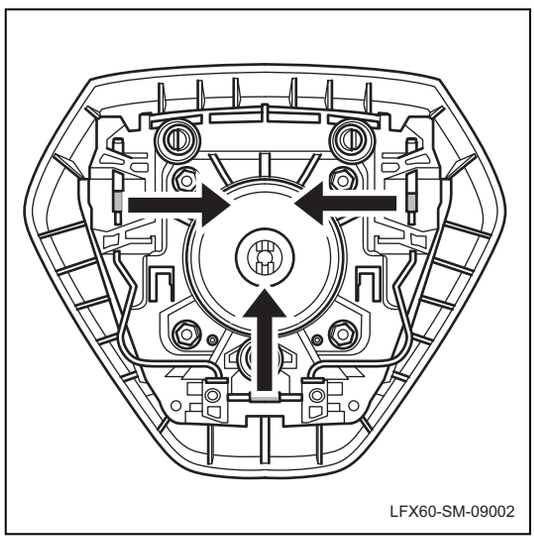
Removal

1. Remove the driver's airbag.

(a). Disconnect the battery negative connector.

Note:

Disconnect the battery negative terminal, wait for 90s at least and then continue operation.

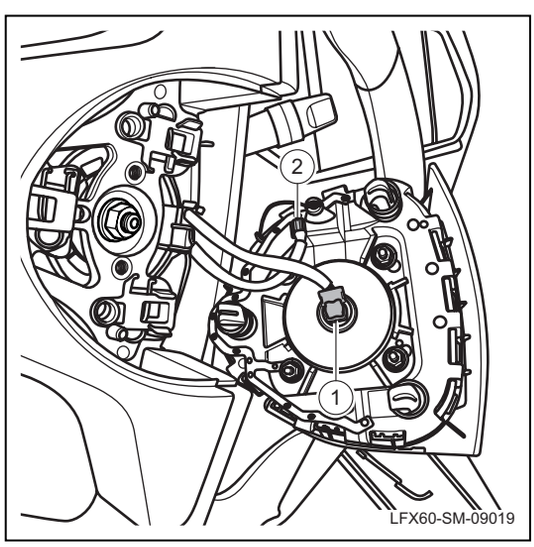


(b). Use the appropriate tool to pry the driver's airbag retainer in the direction of the arrow.

Note:

Use tape to wrap around the appropriate tool to avoid damage to the lower surface of the steering wheel.

(c). Turn over the driver airbag.



(d). Disconnect the harness plug 1 of the driver airbag.

(e). Disconnect the harness plug 2 of speaker.

Note:

Do not pull the harness of the driver's airbag.

(f). Take off the driver airbag assembly, and place in a safe position.

Note:

It is very dangerous to put airbag module facing down. Burst bladder can make the module bouncing, which may cause serious injury. Position the module facing up.

Installation

1. Install the driver airbag.

(a). The installation sequence is the reverse of the disassembly order.

(b). Check and clear the airbag fault code.

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Replacement of the passenger airbag

Removal

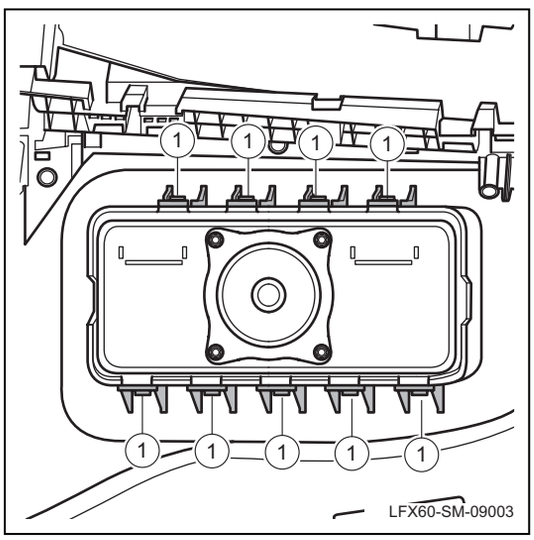
1. Remove the passenger airbag

(a). Disconnect the battery negative connector.

ℹNote:

Disconnect the battery negative terminal, wait for 90s at least and then continue operation.

(b). Install the upper body of dashboard, **refer to:Replacement of the upper body of dashboard.**



(c). Gently pry the connection tab 1 of occupant airbag and dashboard.

⚠Warning:

Disassemble of the front passenger airbag is not allowed.

(d). Take off the passenger airbag, and place in a safe position.

ℹNote:

It is very dangerous to put airbag module facing down. Burst bladder can make the module bouncing, which may cause serious injury. Position the module facing up.

Installation

1. Install passenger airbag

(a). The installation sequence is the reverse of the disassembly order.

(b). Remove the upper body of dashboard, **refer to:Replacement of the dashboard assembly.**

(c). Check and clear the airbag fault code.

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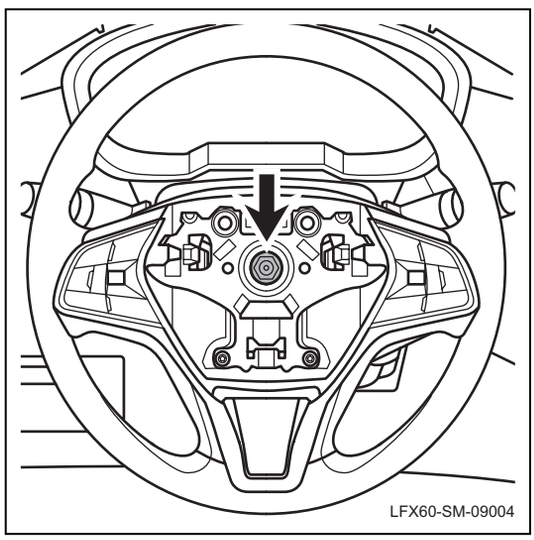
Replacement of multi-function steering wheel

Removal

1. Remove the multi-function steering wheel.

(a). Disconnect the battery negative connector.

(b). Remove the driver's airbag. **Refer to the replacement of driver's airbag.**



(c). Remove the lock nut of the multi-function steering wheel.

Note:

Before pulling out the steering wheel, make assembly mark on the steering shaft and the steering wheel to ensure that the parts can be mounted to the original position during installation.

(d). Pull out the multi-function steering wheel.

Installation

1. Install the multi-function steering wheel.

(a). The installation sequence is the reverse of the disassembly order.

(b). Install the driver airbag, **refer to:Replacement of the driver airbag.**

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Replacement of clock spring

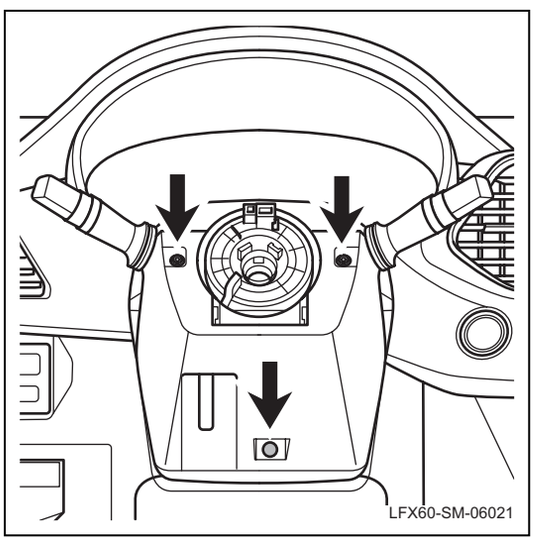
Removal

1. Remove the clockspring.

(a). Disconnect the battery negative connector.

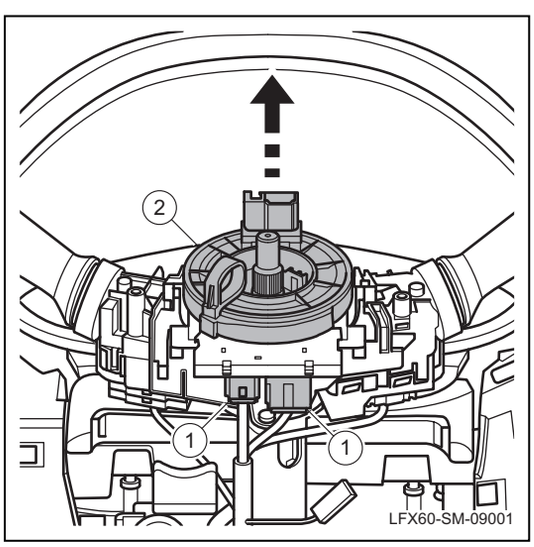
(b). Remove the driver's airbag. **Refer to the replacement of driver's airbag.**

(c). Remove the multi-function steering wheel, **refer to:Replacement of multi-function steering wheel.**



(d). Remove the multi-function steering wheel upper and lower shield fixing bolt.

(e). Take down the multi-function steering wheel upper and lower shield.



(f). Disconnect the harness plug 1 of clock spring.

(g). Separate the jaws of the clock spring, remove the clock spring 2.

ℹNote:

Mark the clockspring or fix it with adhesive tape for reusing.

Installation

1. Install the clockspring.

(a). The installation sequence is the reverse of the disassembly order.

(b). Install the multi-function steering wheel, **refer to:Replacement of multi-function steering wheel**

(c). Install the driver airbag, **refer to:Replacement of the driver airbag.**

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Replacement of airbag control module

Removal

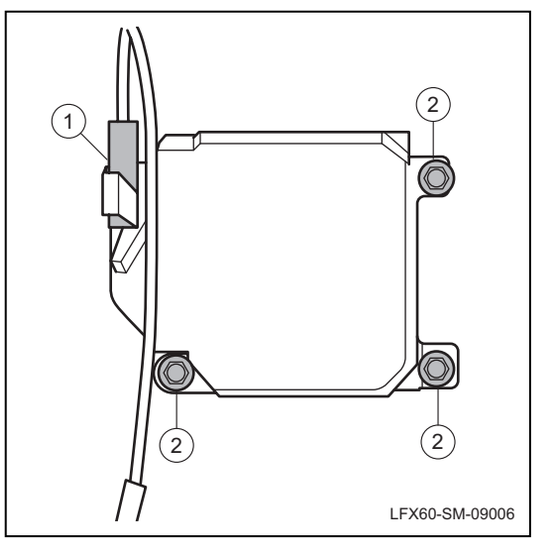
1. Remove the airbag control module.

(a). Disconnect the battery negative connector.

Note:

Disconnect the battery negative terminal, wait for 90s at least and then continue operation.

(b). Remove the sub-dashboard, **refer to:Replacement of sub-dashboard.**



(c). Disconnect the harness plug 1 of the airbag control module.

(d). Remove the fixing bolts 2 of the airbag control module.

(e). Take off the airbag control module.

Installation

1. Install the airbag control module.

(a). The installation sequence is the reverse of the disassembly order.

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Scrapped airbag

Scrapped

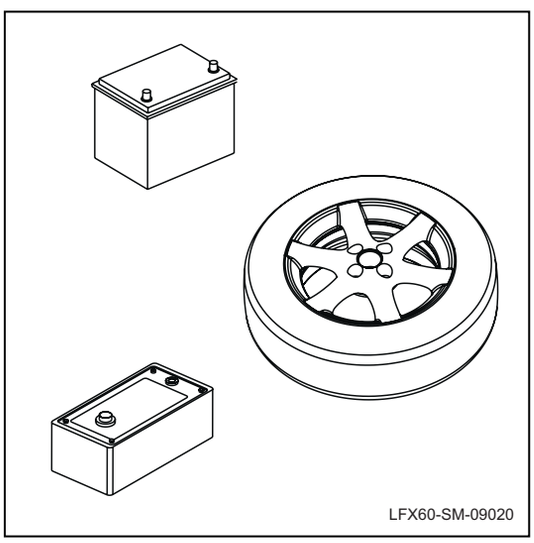
1. Scrapped airbag.

△Tips:

When dispose vehicle or airbag module, the discarded airbag should be fired, this can eliminate any risk of burning in certain circumstances. Please follow the steps below to detonate, if the abandoned driver airbag can not detonate by accident, please contact Lifan dealer maintenance department.

⚠Warning:

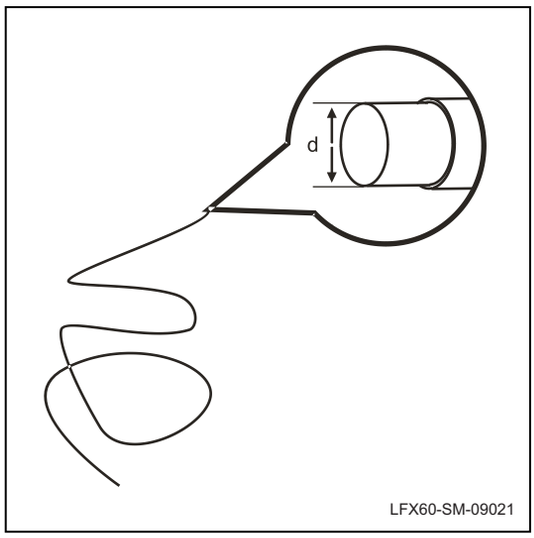
- **Never dispose driver's airbag module not fired.**
- **When detonating the airbag, a great explosion will occur.It is advisable to detonate at the outdoor without affecting nearby residents.**
- **The special tool for firing from Lifan should be used to fire discarded airbag. Operate this in a place far from the electrical interference.**
- **Any operation of firing should be conducted 10m away from airbag in firing operation.**
- **The airbag will be hot after fired. Wait for at least 30min before touching.**
- **Safety gloves and goggle should be worn to handle fired airbag.**
- **Do not splash the water onto the detonated airbag assembly.**
- **Clean your hand after operation.**



(a). Prepare the special tool for airbag firing
(b). Prepare a battery as power supply to fire airbag.
(c). Prepare a discarded wheel with rim and some discarded wheel without rim, and some cardboard boxes and weights.

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(d). Prepare some discarded vehicle harness.

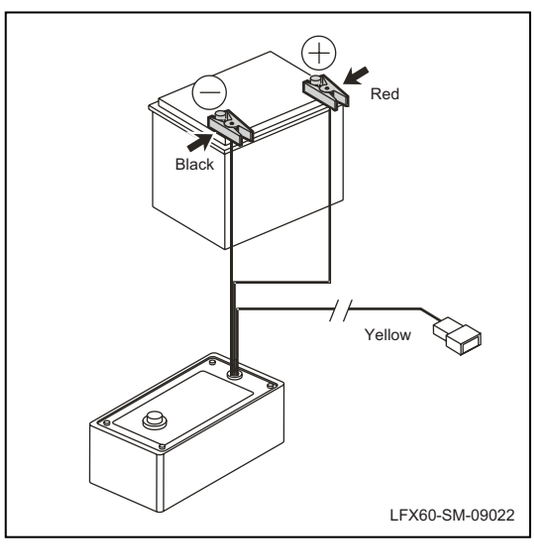
△**Tips:**

The diameter d of the bare portion of the wire harness should be > 1.3 mm to meet the requirement that the cross-sectional area of the bare portion of the wire harness is greater than 1.25 mm².

⚠**Warning:**

The harness are used to tie the airbag in firing operation. Thicker or thinner harness may break when the airbag burst. This is very dangerous, so the choice of bundled harness or equivalent must be reliable.

(e). Choose a suitable open area.

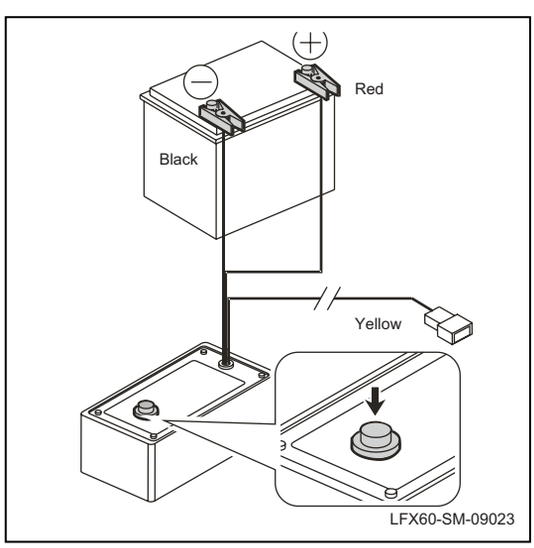


(f). Check the performance of the special tools for airbag detonation.

(g). Connect the special tools for airbag detonation to the battery.

△**Tips:**

Hold red clip of the special tool onto positive post of the battery, while black one onto negative. The yellow connector is for airbag module. Leave it alone in this step.



(h). Press down the activation switch of the special tools for airbag detonation to check that if the switch diode lamp is lit.

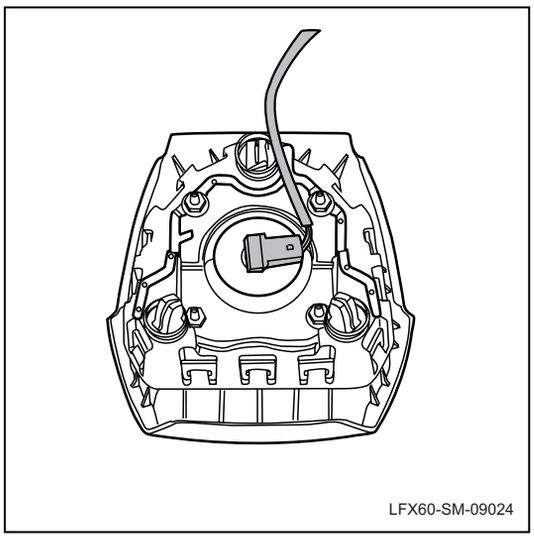
⚠**Warning:**

If the LED does not light, the special should not be used because of fault.

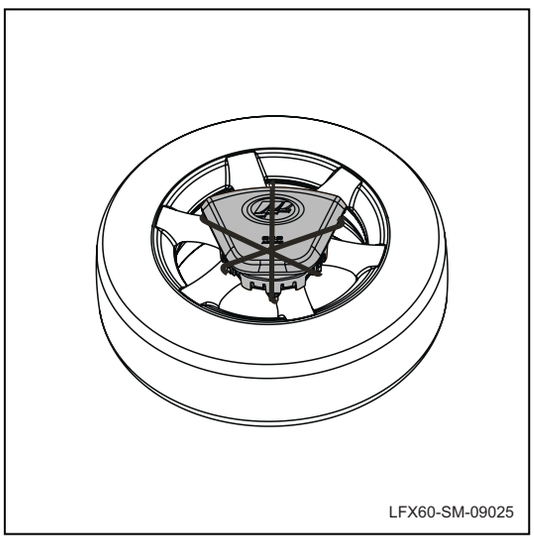
(g). Disconnect the special tools for airbag detonation from the battery.

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LFX60-SM-09024

(j). Connect the driver airbag adapter to the driver's airbag module.


LFX60-SM-09025

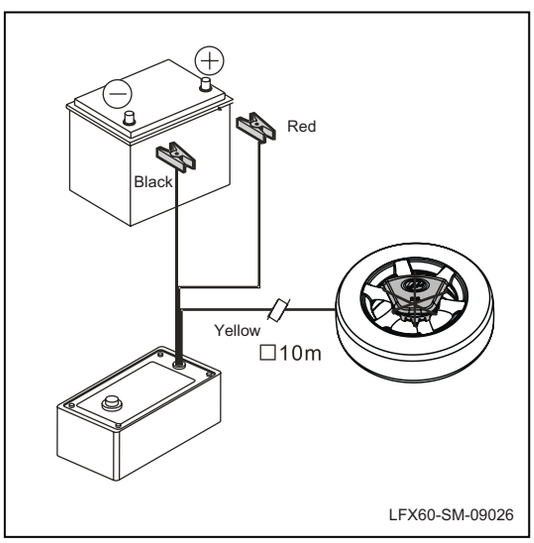
(k). Fix the driver's airbag with the harness to the prepared wheel.

△**Tips:**

Expansion of driver's airbag can damage wheel, thus discarded wheels should be used.

⚠**Warning:**

- **Make sue the airbag is bond tightly with harness or equivalent. It is very dangerous if the harness are break when the airbag bursts during firing.**
- **Make sure to bind the driver's airbag facing up. If the metal side of airbag faces up, it can cut the harness during burst of airbag, which can cause risk of flying airbag. This is very dangerous.**



LFX60-SM-09026

(l). Connect the driver airbag adapter to the yellow connector on the special tools for airbag detonation.

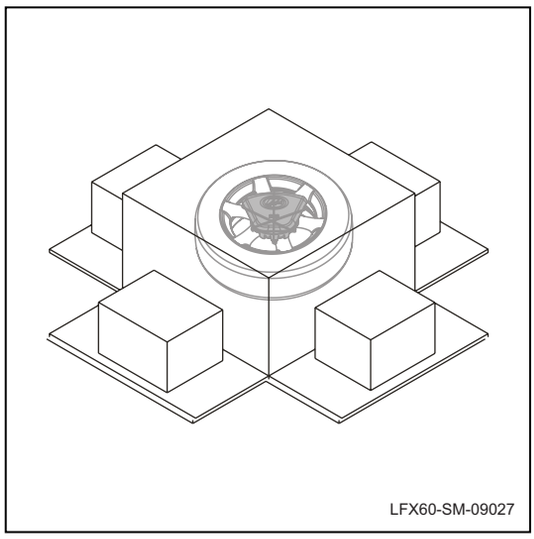
△**Tips:**

Leave the secondary latch of the cascade lock unengaged to avoid damage to connector and harness of the special tool. Make sure binding harness are loose than that of outside. The cascade lock and loose binding harness prevents excessive shock in burst of airbag, to protect harness of the special tool.

(m). Move the special tools for airbag detonation away for 10m from the bundled airbag.

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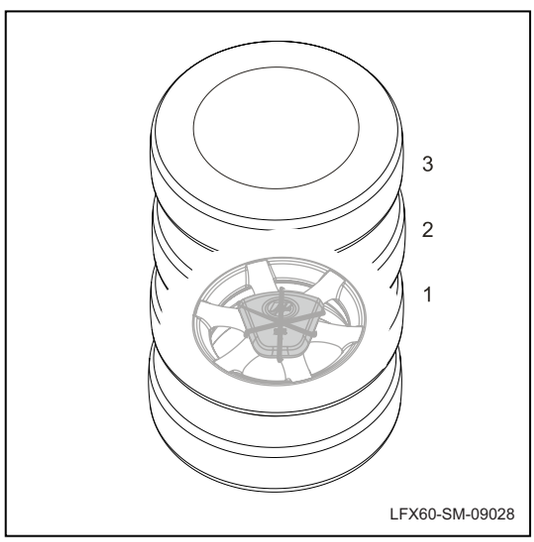
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LFX60-SM-09027

(n). Cover the bundled airbag module with a cardboard box or a used tire.

Cardboard cover method:

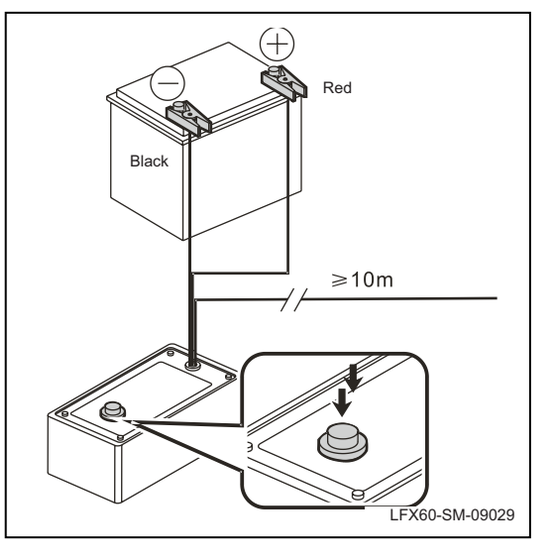
Cover the airbag module bond to wheel with a cardboard box bigger then wheel, put 190N weight on the box. As shown in the Figure.



LFX60-SM-09028

Tire cover method:

Cover the airbag module bond to wheel with at least three discarded wheel (without rim). As shown in the Figure.



LFX60-SM-09029

(o). Connect the red and black clamps of the special tools for the airbag detonation to the positive and negative terminals of the backup battery.

(p). Check to ensure that there is no person or animal within 10m distance to the bundled airbag.

(q). Press down the detonation switch to detonate the airbag.

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(r). Remove the driver's airbag module from the steel ring.

(s). Put the driver's airbag in the plastic bag, tighten the pocket, handle the driver's airbag module as the disposal of the used parts.

⚠Warning:

- **The airbag will be hot after fired. Wait for at least 30min before touching.**
- **Safety gloves and goggle should be worn to handle fired airbag.**
- **Do not splash the water onto the detonated airbag assembly.**
- **Clean your hand after operation.**

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10 - Bodywork

Fender.....10-1367
Technical specifications.....10-1367
Structure and installation location
.....10-1368
Removal and Installation...10-1369

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Fender

Technical specifications

Torque Specifications

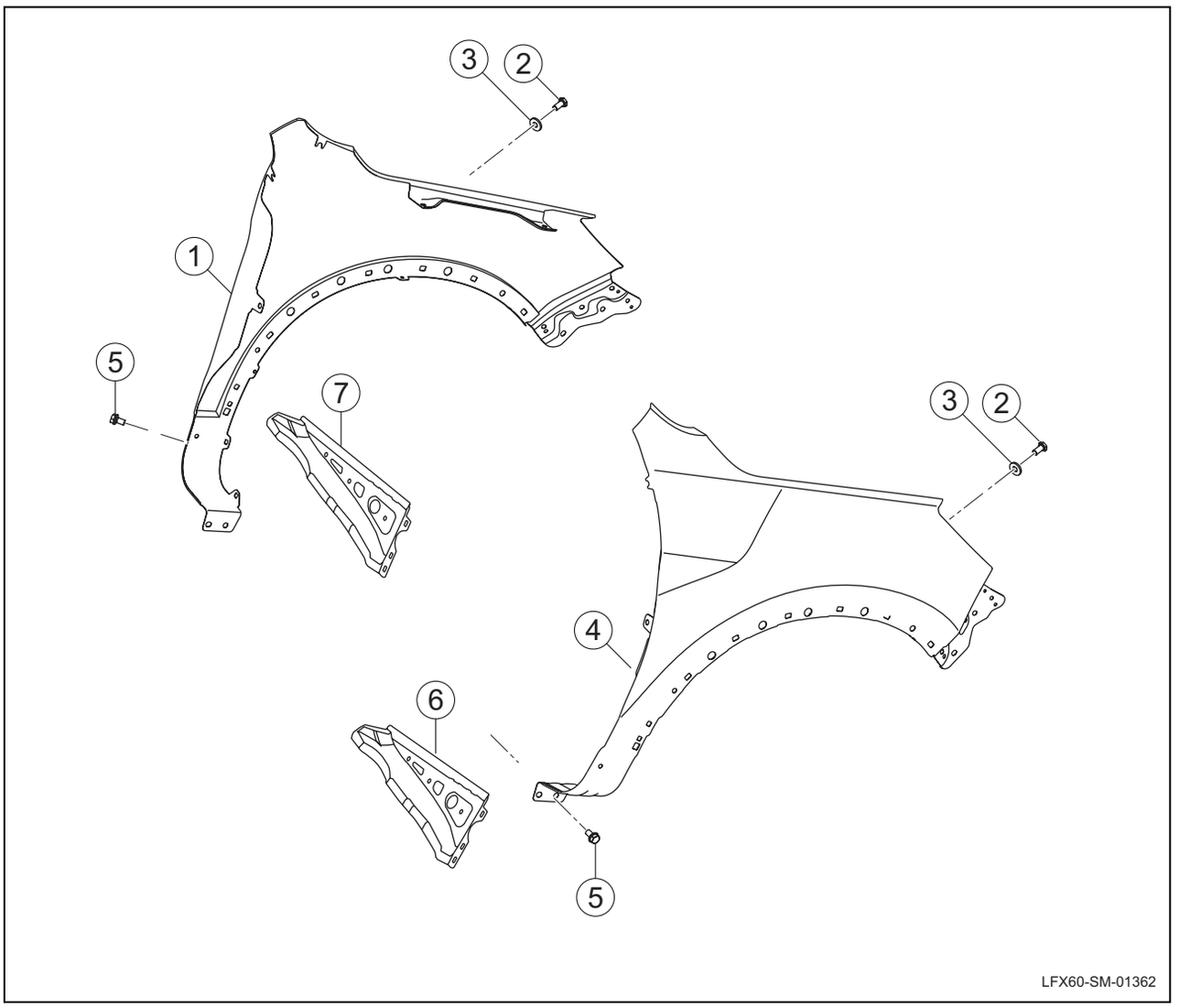
Name	Torque range	
	Metric(Nm)	British(lb-ft)
Mounting bolts of fender	9	7
Front fender connection bracket and body bolts	9	7

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Structure and installation location

Component Location Plan



No.	Part Name
1	Left fender
2	Hexagon head bolts
3	Big washer
4	Right fender

No.	Part Name
5	Hexagon head bolt and taper elastic washer assembly
6	Right front suspension beam outer plate
7	Left front suspension beam outer plate

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Removal and Installation

Front fender

Removal

1. Remove the front fender.

(a). Disconnect the battery negative connector.

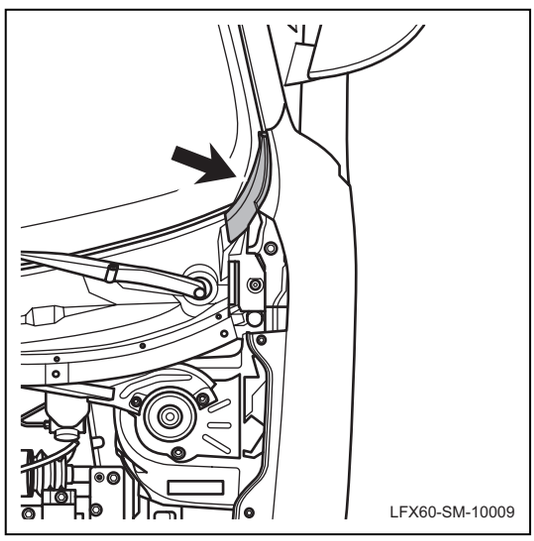
(b). Remove the front bumper assembly. **Refer to the replacement of front bumper assembly.**

(c). Remove the front combination lamp. **Refer to the replacement of front combination lamp.**

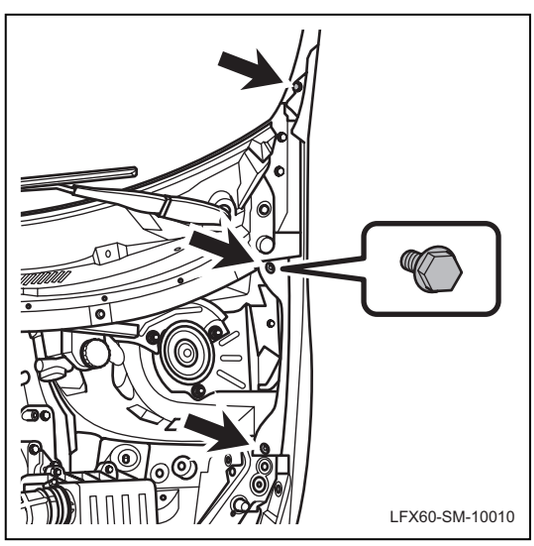
(d). Remove the mounting bracket of the front bumper, **refer to:Replacement of mounting bracket ot the front bumper.**

(e). Remove the front trim panel assembly of the left panel, **refer to:Replacement of the front trim panel assembly of the left panel.**

(f). Remove the front wheel cover liner, **refer to:Replacement of front wheel cover liner.**



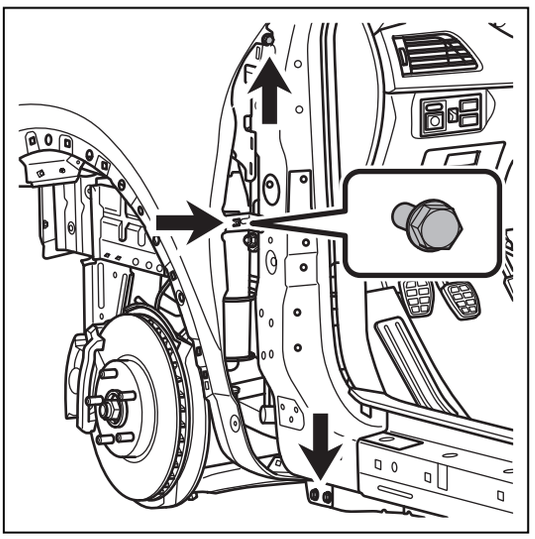
(g). Remove the left trim panel assembly of ventilation cover.



(h). Remove the fixing bolts of the front fender.

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(i). Remove the fixing bolts of the front fender.
(J). Take off the front fender.

Installation

1. Install the front fender.

(a). The installation sequence is the reverse of the disassembly order.

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10 - Bodywork

Engine cover 10-1373
Removal and Installation...10-1373

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Engine cover

Removal and Installation

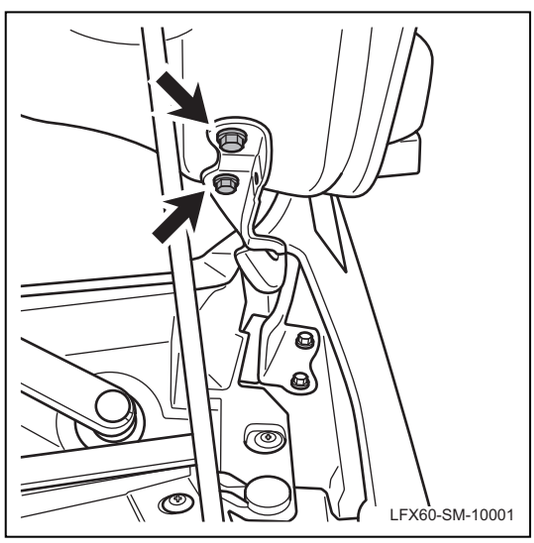
Replacement of the hood assembly

Removal

ⓘNote:

- **Because the hood is heavy, two people are required to operate.**
- **Protective tape or wipes are used during disassembly and installation to prevent damage.**

1. Remove the hood assembly.



(a). Support the engine hood assembly with the appropriate material to prevent it falling.

⚠Warning:

When removing the hood assembly, if there is no suitable material to support the hood assembly, it may cause injury.

(b). Remove the engine hood hinge fixing bolt.

△Tips:

Removal methods of hinges on both sides are the same.

(c). Take off the hood assembly.

Installation

1. Install the hood.

(a). The installation sequence is the reverse of the disassembly order.

ⓘNote:

Check the rotating parts of hood hinge for poor lubrication.If necessary, apply grease.

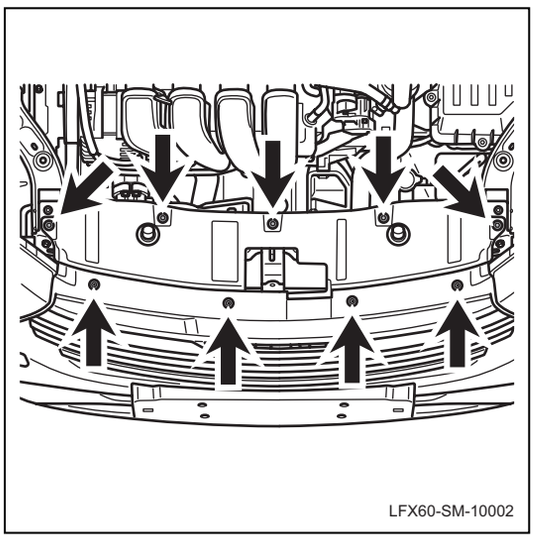
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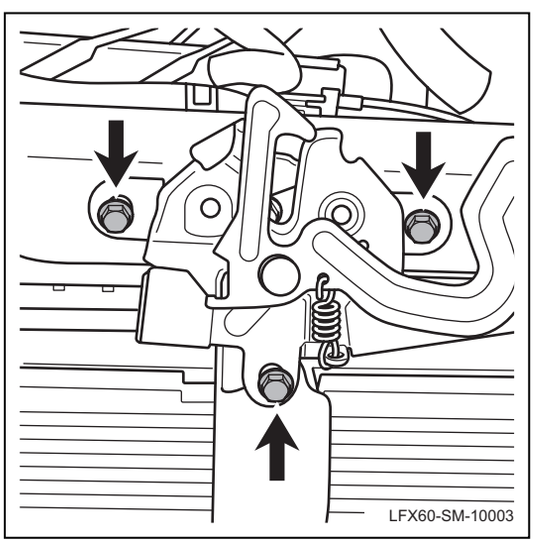
Replacement of the hood lock

Removal

1. Remove the hood lock.

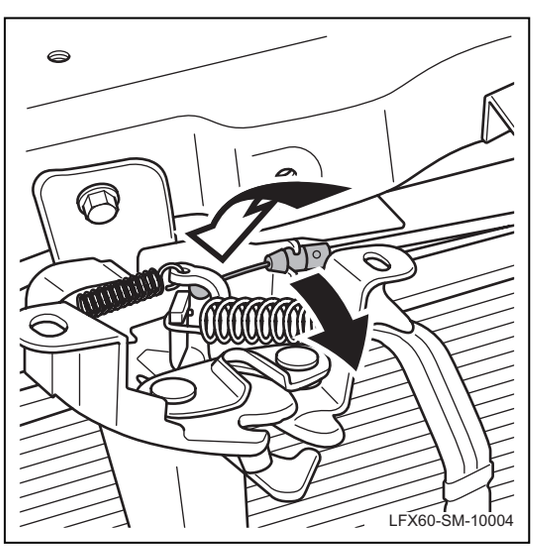


(a). Open the hood.
(b). Remove the fixing bolts of the upper trim panel of front bumper.
(c). Take off the upper trim panel of front bumper.



(d). Remove the fixing bolts of hood lock.

ℹNote:
Before removing, make the assembly mark for the installation location of hood lock.



(e). Remove the connection between the hood lock cable and the hood lock.
(f). Take off the hood lock.

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Installation

1. Install the hood lock.

(a). The installation sequence is the reverse of the disassembly order.

❶Note:

Check if the hood lock cable is properly engaged with the hood lock.

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Replacement of the hood lock cable

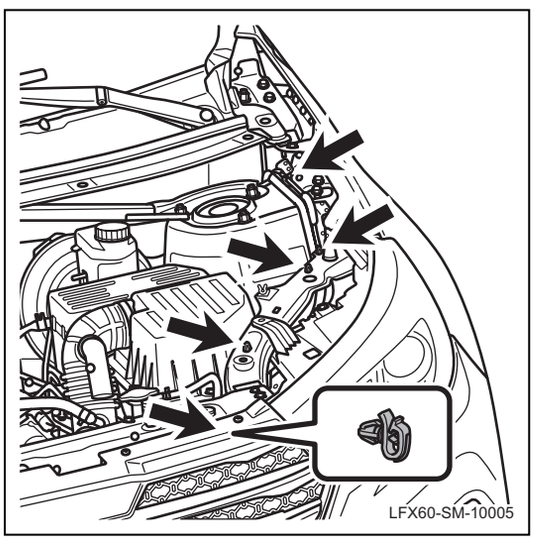
Removal

1. Remove the hood lock cable.

(a). Remove the hood lock, **refer to:Replacemen of hood lock.**

(b). Remove the left lower panel of dashboard, **refer to:Replacement of the left lower panel of dashboard.**

(c). Remove the hood handle assembly, **refer to:Replacement of the hood handle assembly.**



(d). Remove the fixing clip of hood lock cable.

(e). Take off the hood lock cable.

Installation

1. Install the hood lock cble.

(a). The installation sequence is the reverse of the disassembly order.

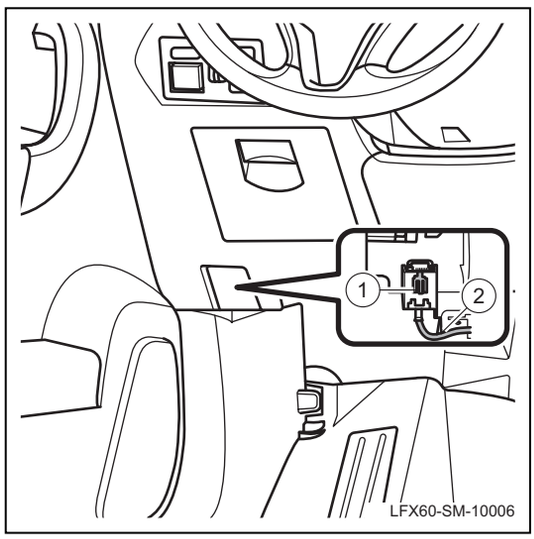
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Replacement of the hood handle assembly

Removal

1. Remove the hood handle assembly.



(a). Press down the fixing clip 1 of hood handle assembly.
(b). Remove the connection between the hood lock cable and the hood handle assembly.
(c). Take off the hood handle assembly.

Installation

1. Install the hood handle assembly.
(a). The installation sequence is the reverse of the disassembly order.

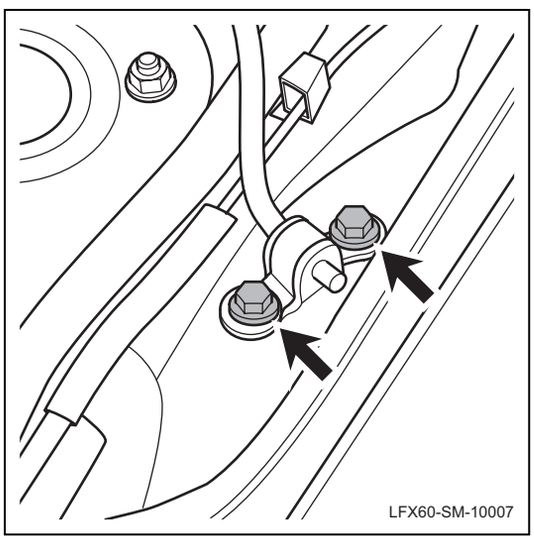
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Replacement of the hood pole

Removal

1. Remove the hood pole.



(a). Support the engine hood assembly with the appropriate material to prevent it falling.

⚠Warning:

If there is no suitable material to support the hood assembly, it may cause injury.

(b). Remove the fixing bolts of hood pole.

(c). Take off the hood pole.

Installation

1. Install the hood pole.

(a). The installation sequence is the reverse of the disassembly order.

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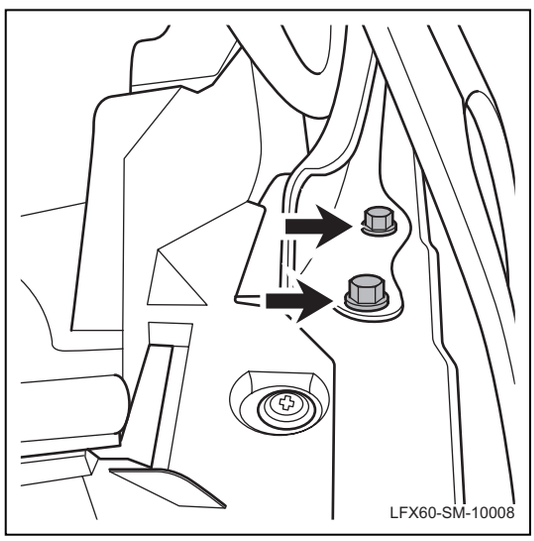
AutoLibrary

Replacement of the hood hinge

Removal

1. Remove thehood hinge.

(a). Remove the hood assembly, **refer to:Replacement of hood assembly.**



(b). Remove the engine hood hinge fixing bolt.

Note:

Before removing, make the assembly mark for the installation location of hood hinge.

(c). Take off the hood hinge.

Note:

Removal methods of hood hinges on both sides are the same.

Installation

1. Install the hood hinge.

(a). Adjust the mounting position of hood hinge

(b). The installation order is the reverse of the disassembly order.

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10 - Bodywork

Car door.....10-1383
Operating Principle.....10-1383
Removal and Installation...10-1384

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Car door

Operating Principle

System Overview

The door system is mainly composed of window glass, outside door handle, inside door handle, door lock assembly, electric glass lifter assembly, door seal, window groove, door limiter, door hinge, door trim and some accessories.The main function of the door system is to enable access of driver and occupant through the door opening and closing, enable good communication between the door and the outside environment through the door window opening and closing, while the door system can also protect the inner space of the vehicle effectively in the event of side impact occurs, to reduce the damage of the occupants to the maximum extent.In addition, the door system is a closed system, and it can effectively block the dust, noise, water and other substances from into the car, to create a good car environment for the drivers and occupants. The door system is an important part of the car, the removal and installation must follow the following operations to ensure the normal function of the door system.

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Removal and Installation

Replacement of front door assembly

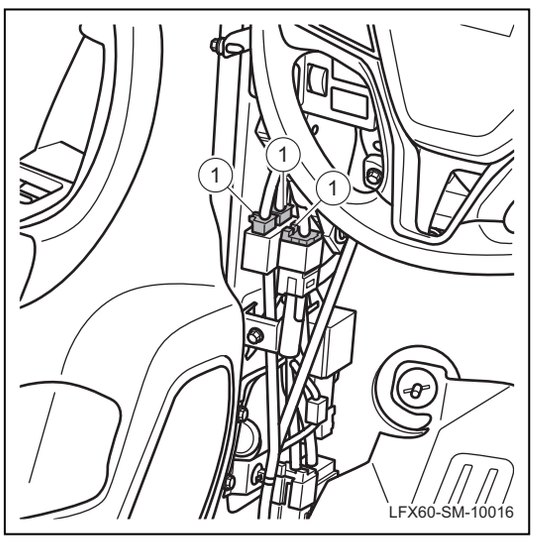
Removal

1. Remove the front door assembly.

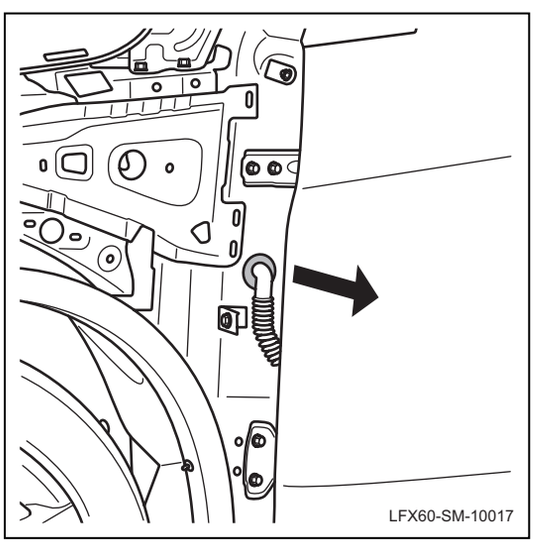
ℹNote:

Because the front door is heavy, two people are required to operate.

(a). Remove the A pillar lower decorative panel. **Refer to the replacement of A pillar lower decorative panel.**



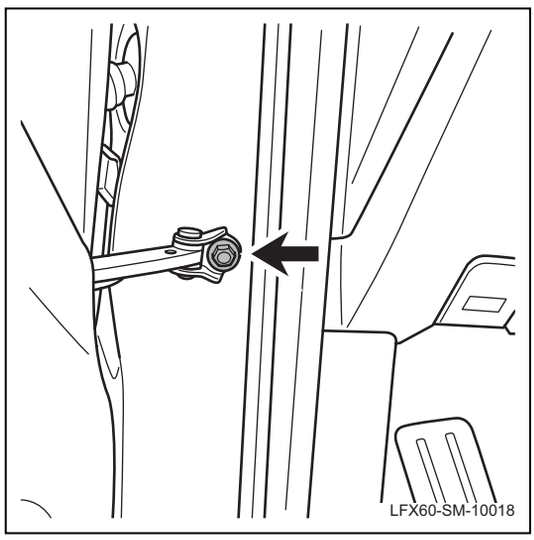
(b). Disconnect the harness plug 1 of front door.



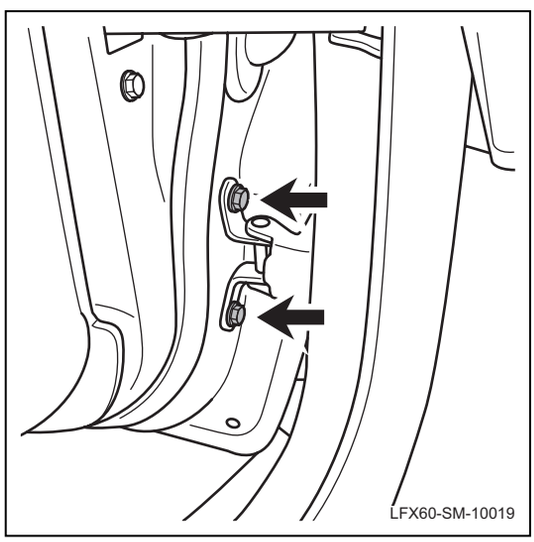
(c). Disengage the seal coat of front door harness.

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(d). Remove the fixing bolts of front door stopper.



(e). Remove the fixing bolts of front door hinge.

△**Tips:**

The removal and installation of upper and lower hinge are the same.

(f). Remove front door assembly.

10

Installation

1. Install the front door assembly.

(a). The installation sequence is the reverse of the disassembly order.

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Replacement of rear door assembly

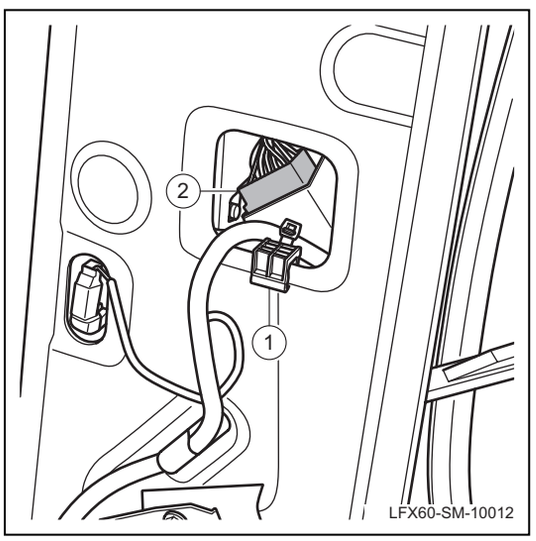
Removal

1. Remove the rear door assembly.

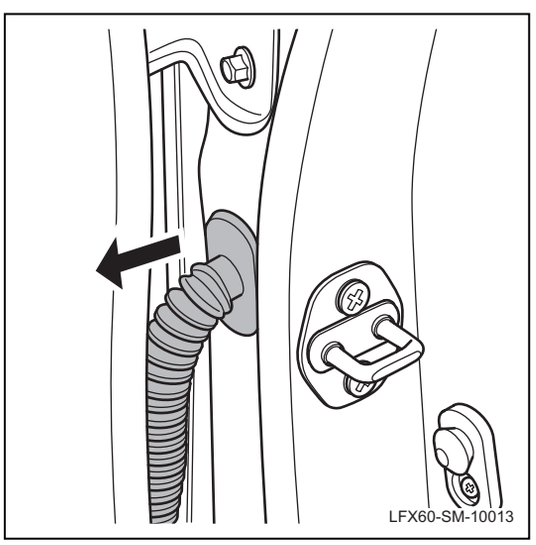
Note:

Because the rear door is heavy, two people are required to operate.

(a). Remove the B pillar lower decorative panel. **Refer to the replacement of B pillar lower decorative panel.**



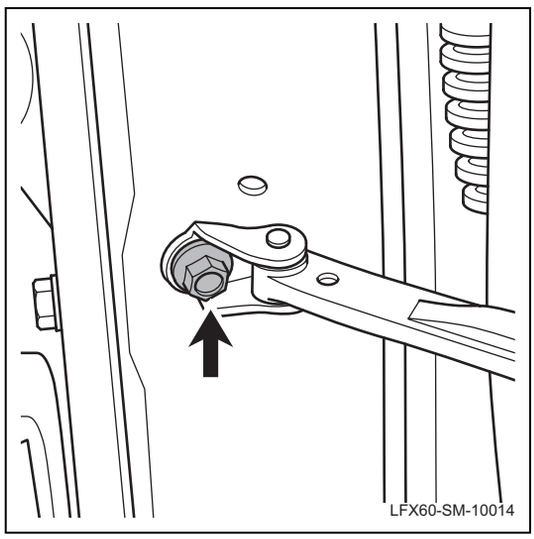
(b). Disconnect the harness clip 1 of the rear door.
(c). Disconnect the harness plug 1 of rear door.



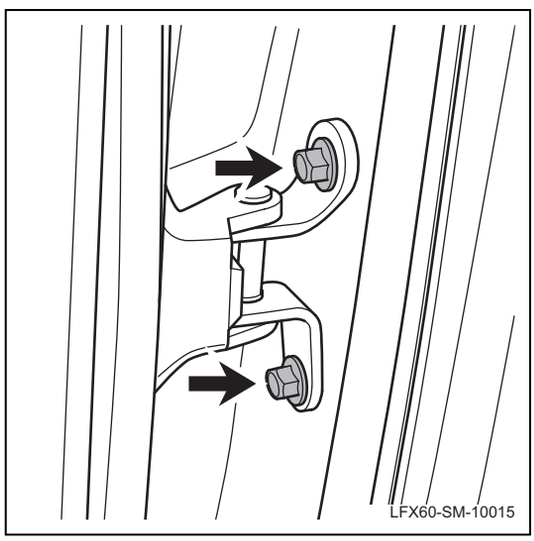
(d). Disengage the seal coat of rear door harness.

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(e). Remove the fixing bolts of rear door stopper.



(f). Remove the fixing bolts of rear door hinge.

△**Tips:**

The removal and installation of upper and lower hinge are the same.

(g). Remove rear door assembly.

10

Installation

1. Install the rear door assembly.

(a). The installation sequence is the reverse of the disassembly order.

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Replacement of back door assembly

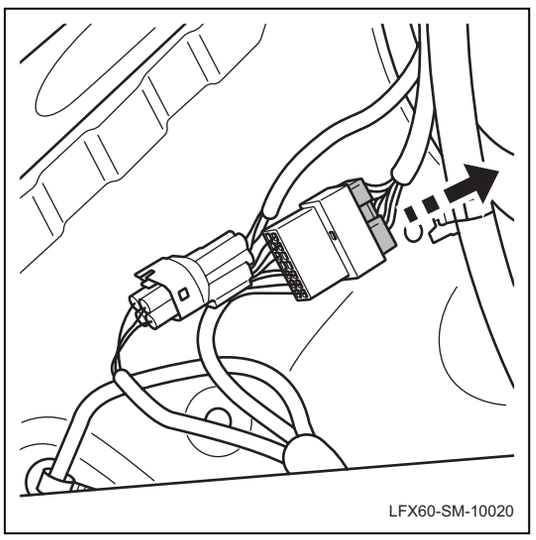
Removal

1. Remove the back door assembly.

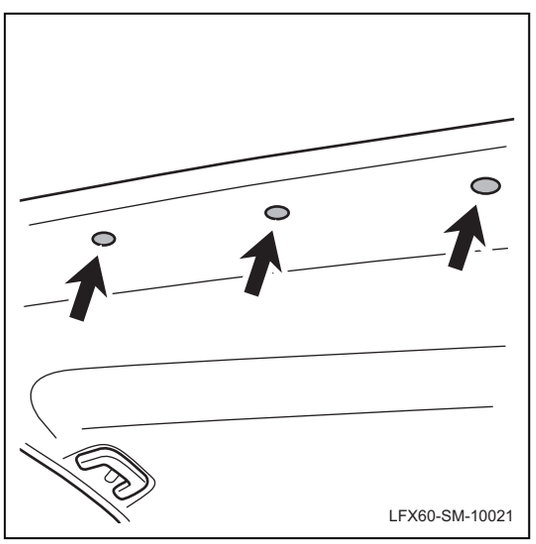
ℹNote:

Because the back door is heavy, two people are required to operate.

(a). Remove the C pillar upper trim board. Refer to the replacement of C pillar upper trim board.



(b). Disconnect the harness plug of the rear door.
(c). Remove the seal of back door.



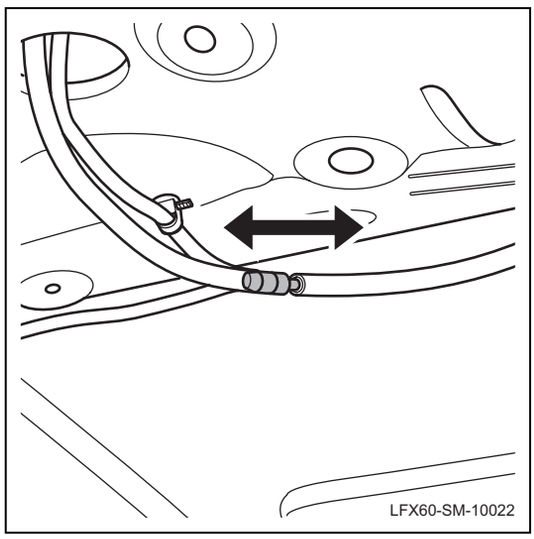
(d). Remove the fixing clip of ceiling.
(e). Open part of the ceiling.

ℹNote:

Do not bend the roof.

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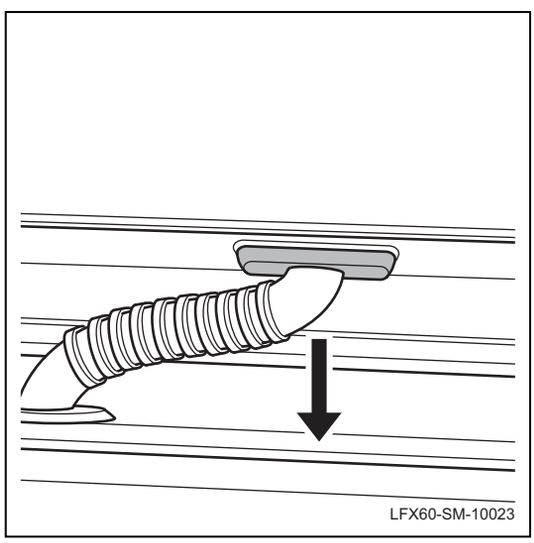
AutoLibrary



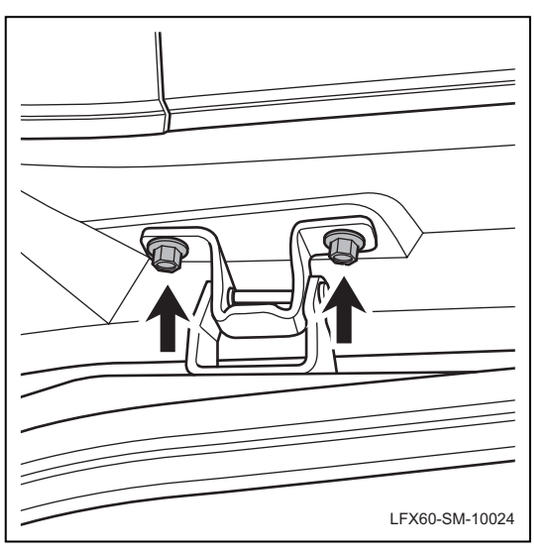
(f). Remove the rear wiper pipe.

ℹNote:

To avoid leakage of the window wash liquid, the water pipe should be sealed at both ends



(g). Disengage the seal coat of back door harness.



(h). Remove the fixing bolts of back door hinge.

△Tips:

The removal and installation of left and right hinge are the same.

(i). Remove rear door assembly.

Installation

1. Install the back door assembly.

(a). The installation sequence is the reverse of the disassembly order.

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10 - Bodywork

Glass 10-1393
Operating Principle.....10-1393
Removal and Installation...10-1394

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Glass

Operating Principle

System Overview

The whole vehicle glass includes front windshield, back door glass, rear corner window glass and front door glass, and rear door glass. The whole vehicle glass and white body, body opening and closing parts, other doors and windows, etc.together form a closed driving space, while playing a part in transmission of light, which can provide driver a good sense of vision.The front windshield and the back door glass and the side window are sealed by the sealant on the frame of the vehicle body. The cured sealant has certain hardness and elasticity, and is waterproofing.If you need to replace the front windshield and the back door glass and side window glass, you must first remove the original glass, and remove the residual sealant on the window frame.

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Removal and Installation

Replacement of front windshield

Removal

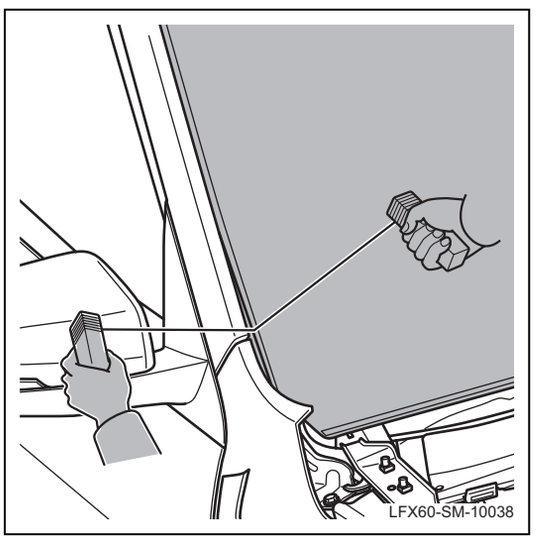
1. Remove the front windshield

(a). Remove the front wiper arm, **refer to:Replacement of the front wiper arm.**

(b). Remove the ventilation cover assembly, **refer to:Replacement of the ventilation cover assembly.**

(c). Remove the rearview mirror, **refer to:the replacement of the rearview mirror.**

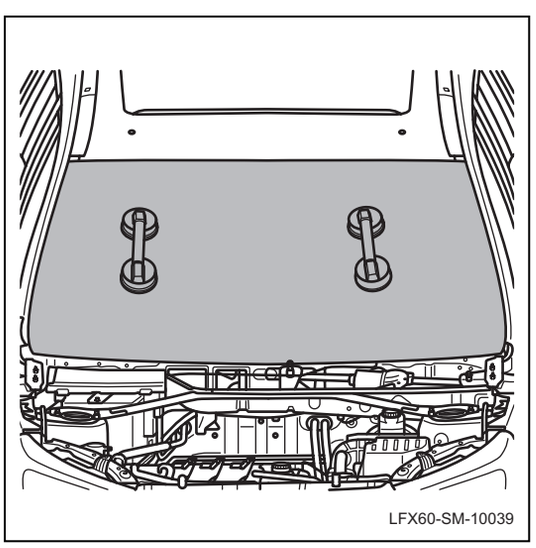
(d). Remove the A-pillar trim panel, **refer to:Replacement of A-pillar trim panel.**



(e). Use a thin steel wire to cut glass adhesive around the front windshield glass.

Note:

Wrap a block on each end of the thin steel wire, and operate with two men cooperated to facilitate the removal.When operating, place a plastic gasket on the dashboard to protect the dashboard from being scratched.



(f). Remove the front windshield using a glass suction cup.

Note:

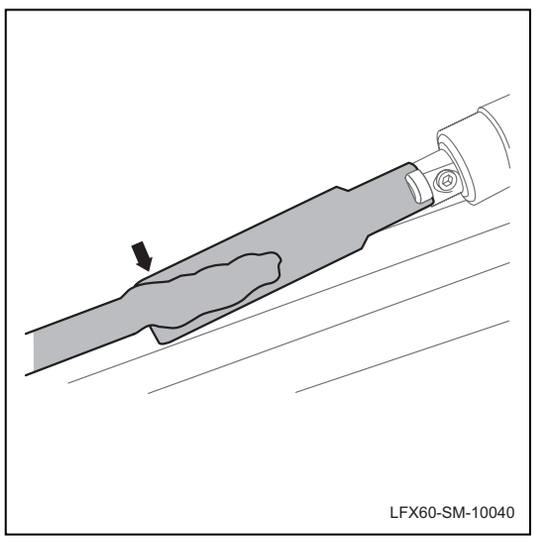
This step requires the assistance from others. Do not scratch the finish while taking down the glass.

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Installation

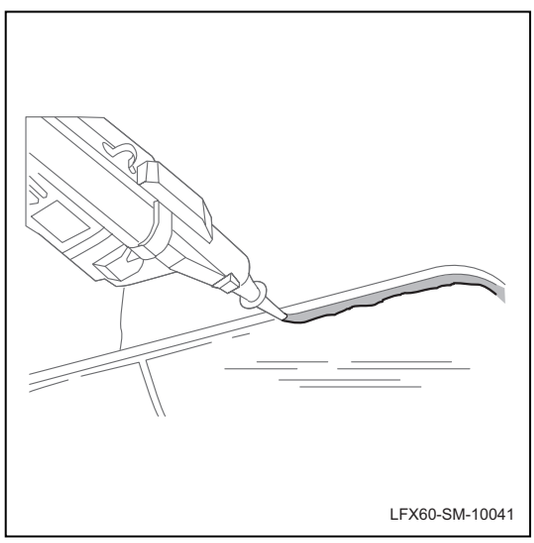
1. Install the front windshield glass


LFX60-SM-10040

(a). Use the blade to remove the glass adhesive on the front windshield glass and the glass window frame.

Note:

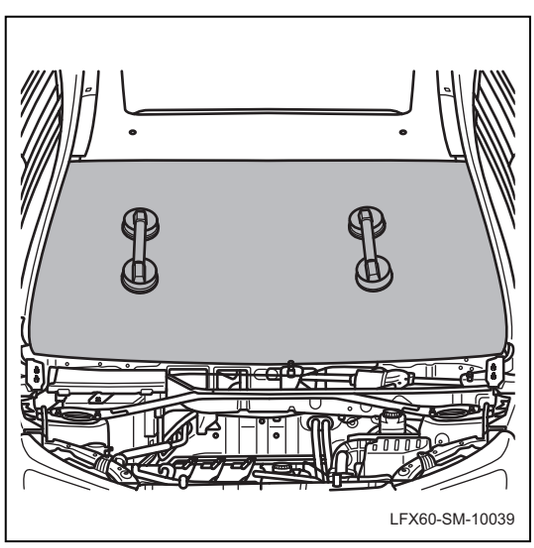
Make sure that the surface to be bonded is clean and free from foreign matter.Use a hot air gun to dry the door glass and the glass adhesive seam (25 ° C), and dry out all the moiusture.


LFX60-SM-10041

(b). Use a mix / spray gun to apply a thin layer of PU adhesive to the edge of the front windshield glass.

Note:

Discard the first 100mm PU bonding agent since the service life of this section will be short. To avoid water leak, cover any bonding fracture point with 20mm bonding agent.


LFX60-SM-10039

(c). With the help of another technician, take up the glass with the suction cup and press it in position.

Note:

Use the appropriate tape to secure the windshield in the correct position until the PU adhesive is cured.

(d). Install the A-pillar trim panel, **refer to:Replacement of A-pillar trim panel.**

(e). Install the rearview mirror, **refer to:the replacement of the rearview mirror.**

(f). Install the ventilation cover assembly, refer to:Replacement of the ventilation cover assembly.

(g). Install the front wiper arm, **refer to:Replacement of the front wiper arm.**

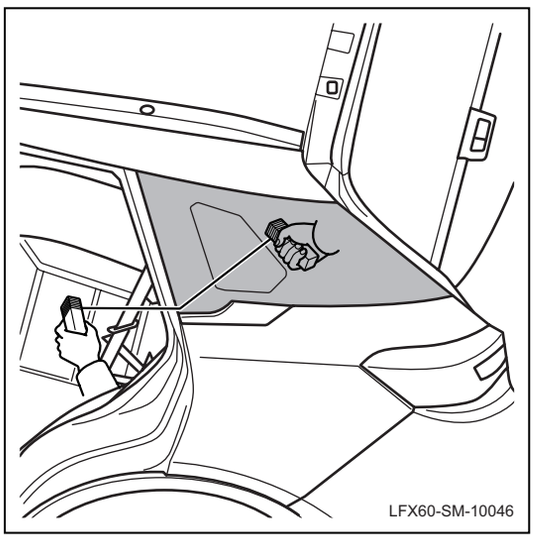
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Replacement of side window glass

Removal

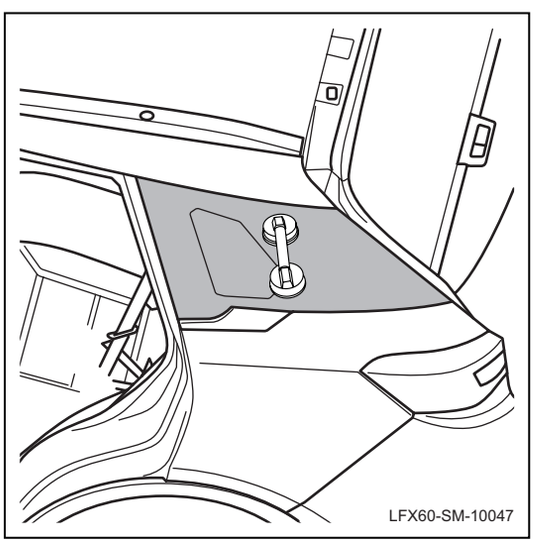
1. Remove the side window glass.



(a). Use a thin steel wire to cut glass adhesive around the side glass window.

Note:

Tie the wood block to both ends of the fine wire and have two persons to do this.



(b). Remove the side window glass using a glass suction cup.

Note:

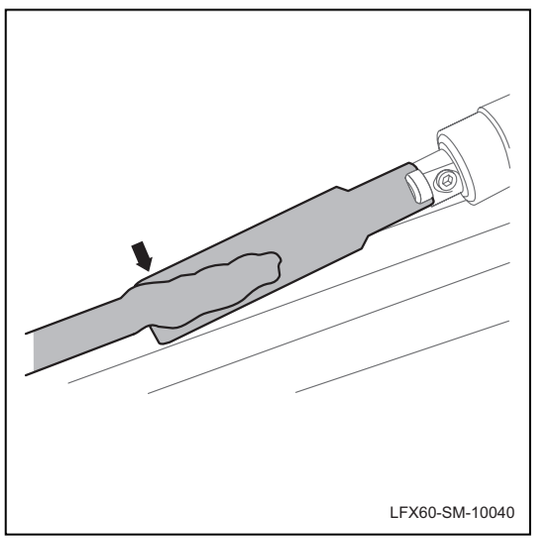
This step requires the assistance from others. Do not scratch the finish while taking down the glass.

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Installation

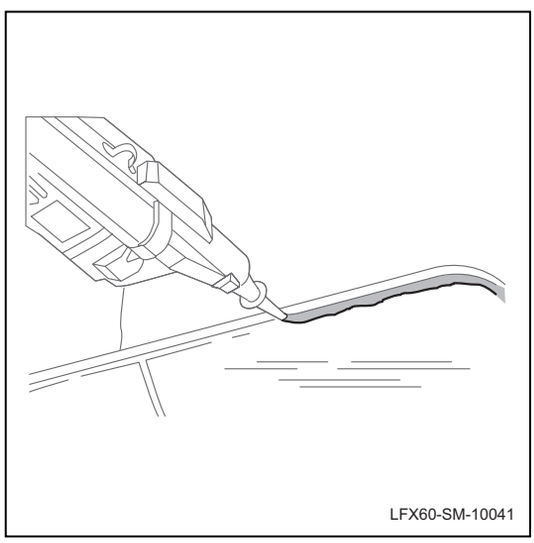
1. Install the side window glass.



(a). Use the blade to remove the glass adhesive on the side window glass and the glass window frame.

Note:

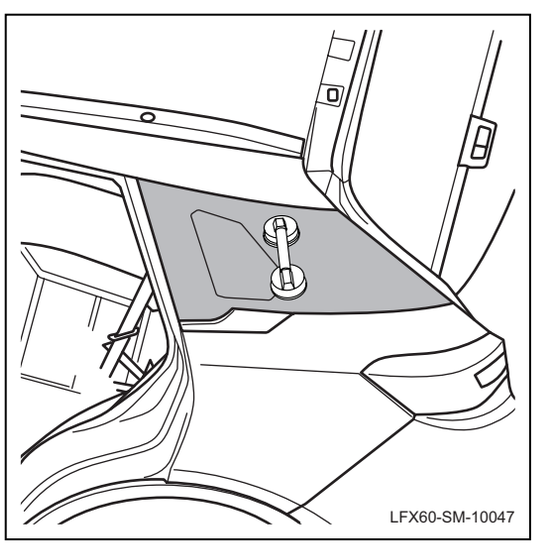
Ensure the bonding face is clean without foreign matter, heat the hatch glass edge and glass bonding seam with the hot air gun to reach 25°C and dry off any moisture.



(b). Use a mix / spray gun to apply a thin layer of PU adhesive to the edge of the side window glass.

Note:

Discard the first 100mm PU bonding agent since the service life of this section will be short. To avoid water leak, cover any bonding fracture point with 20mm bonding agent.



(c). With the help of another technician, take up the glass with the suction cup and press it in position.

Note:

Fix the hatch glass to the correct position with the appropriate tape until the PU bonding agent cures.

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Replacement of back door glass

Removal

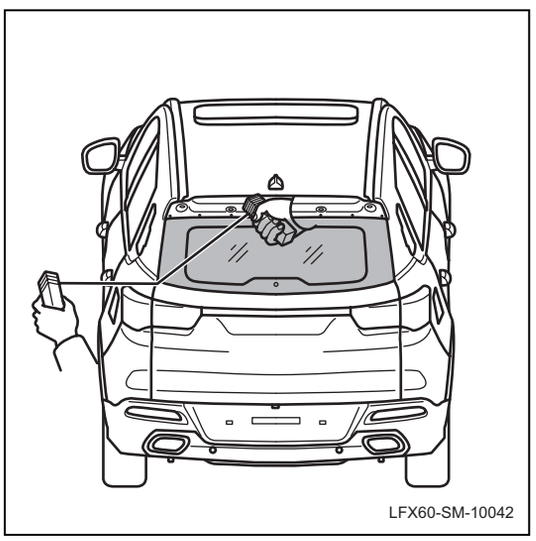
1. Remove the back door glass.

(a). Remove the back door trim panel, **refer to:Replacement of the back door trim panel.**

(b). Remove the high brake light, **refer to:Replacement of high brake light.**

(c). Remove the rear wiper motor and connecting rod assembly, **refer to:Replacement of rear wiper motor and connecting rod assembly.**

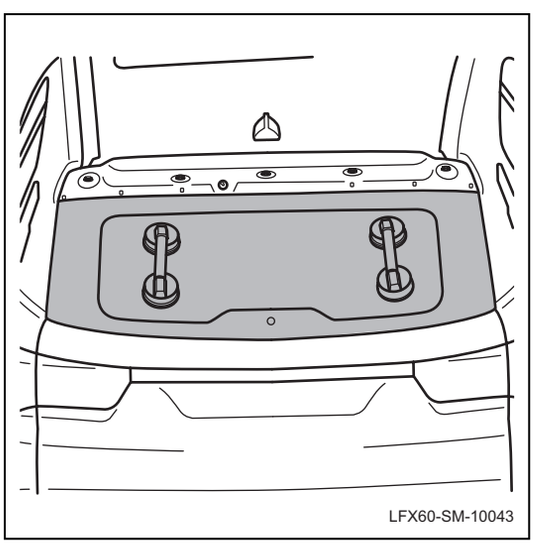
(d). Disconnect the harness connector of back door glass defroster.


LFX60-SM-10042

(e). Use a thin steel wire to cut glass adhesive around the back door glass.

ℹNote:

Tie the wood block to both ends of the fine wire and have two persons to do this.


LFX60-SM-10043

(f). Remove the back door glass using a glass suction cup.

ℹNote:

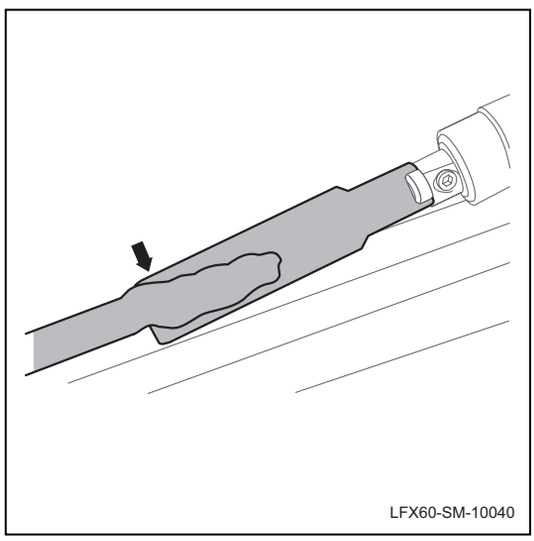
This step requires the assistance from others. Do not scratch the finish while taking down the glass.

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Installation

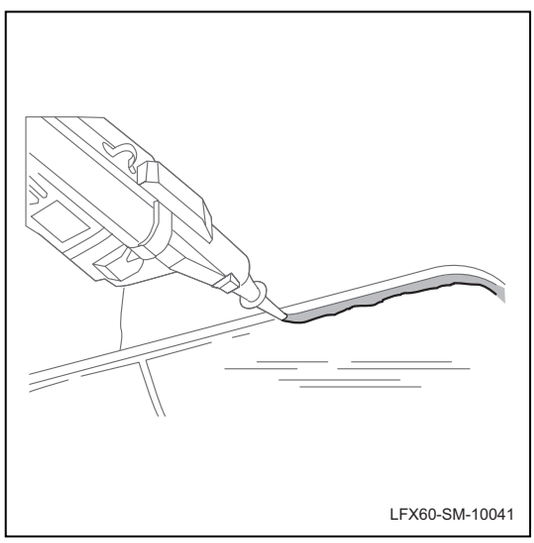
1. Install the back door glass.


LFX60-SM-10040

(a). Use the blade to remove the glass adhesive on the back door glass and the glass window frame.

Note:

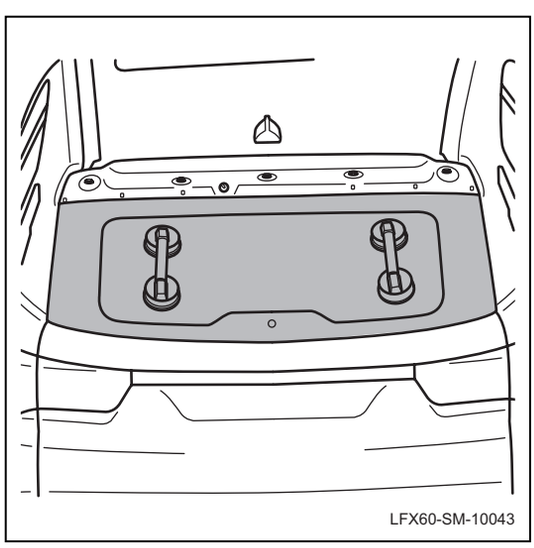
Ensure the bonding face is clean without foreign matter, heat the hatch glass edge and glass bonding seam with the hot air gun to reach 25°C and dry off any moisture.


LFX60-SM-10041

(b). Use a mix / spray gun to apply a thin layer of PU adhesive to the edge of the back door glass.

Note:

Discard the first 100mm PU bonding agent since the service life of this section will be short. To avoid water leak, cover any bonding fracture point with 20mm bonding agent.


LFX60-SM-10043

(c). With the help of another technician, take up the glass with the suction cup and press it in position.

Note:

Fix the hatch glass to the correct position with the appropriate tape until the PU bonding agent cures.

(d). Connect the harness connector of back door glass defroster.

(e). Install the rear wiper motor and connecting rod assembly, **refer to:Replacement of rear wiper motor and connecting rod assembly.**

(f). Install the high brake light, **refer to:Replacement of high brake light.**

(g). Install the back door trim panel, **refer to:Replacement of the back door trim panel.**

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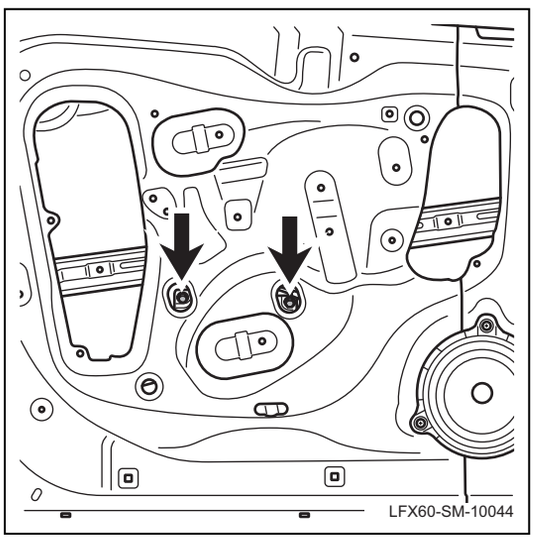
AutoLibrary

Replacement of front door glass

Removal

1. Remove the front door glass.

(a). Remove the front door interior trim board. **Refer to the replacement of front door interior trim board.**



(b). Remove the front door water-proof membrane.

(c). Operate the front door glass lifter switch, and adjust the front door glass lifter position.

(d). Remove the fixing bolts of front door glass.

(e). Take off the front door glass.

Installation

1. Install the front door glass.

(a). The installation sequence is the reverse of the disassembly order.

AutoLibrary

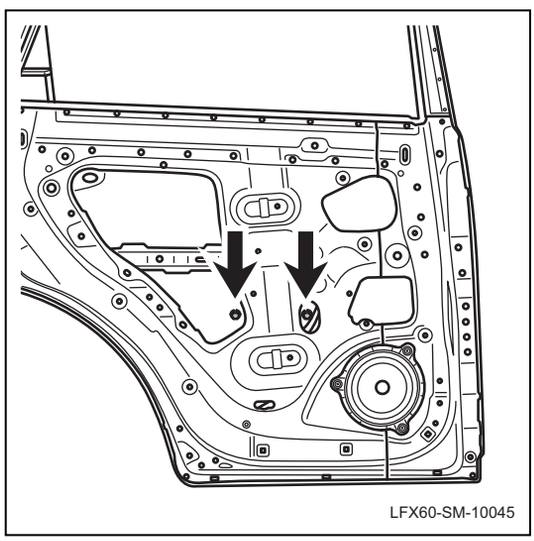
AutoLibrary

Replacement of rear door glass

Removal

1. Remove the rear door glass.

(a). Remove the rear door interior trim board. **Refer to the replacement of rear door interior trim board.**



(b). Remove the rear door water-proof membrane.
(c). Operate the rear door glass lifter switch, and adjust the rear door glass lifter position.
(d). Remove the fixing bolts of rear door glass.
(e). Take off the rear door glass.

Installation

1. Install the rear door glass.

(a). The installation sequence is the reverse of the disassembly order.

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10 - Bodywork

Door handles, door locks and doors.....10-1405
Removal and Installation...10-1405

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Door handles, door locks and doors

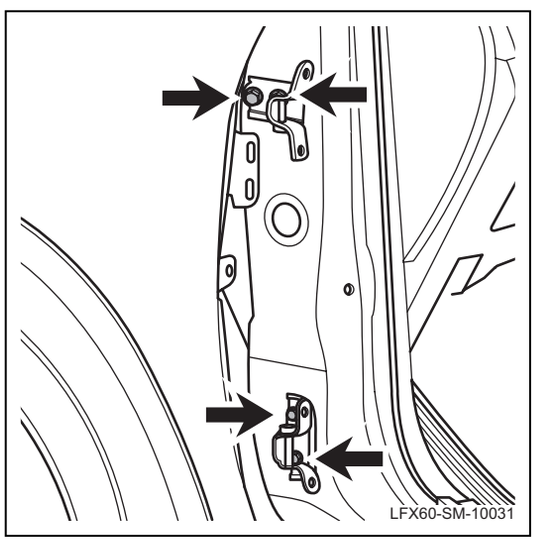
Removal and Installation

Replacement of front door hinge

Removal

1. Remove the front door hinge.

(a). Remove the front door assembly, **refer to:Replacement of front door assembly.**



(b). Remove the fixing bolts of front door hinge.

(c). Take off the front door hinge.

Installation

1. Install the front door hinge.

(a). The installation sequence is the reverse of the disassembly order.

AutoLibrary

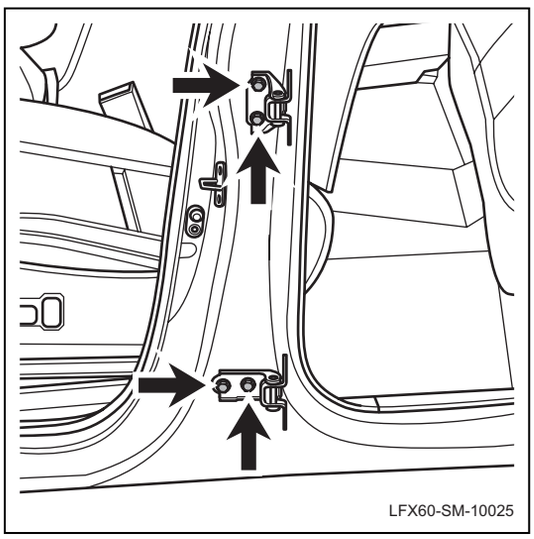
AutoLibrary

Replacement of rear door hinge

Removal

1. Remove the rear door hinge.

(a). Remove the rear door assembly, **refer to:Replacement of rear door assembly.**



(b). Remove the fixing bolts of rear door hinge.

(c). Take off the rear door hinge.

Installation

1. Install the rear door hinge.

(a). The installation sequence is the reverse of the disassembly order.

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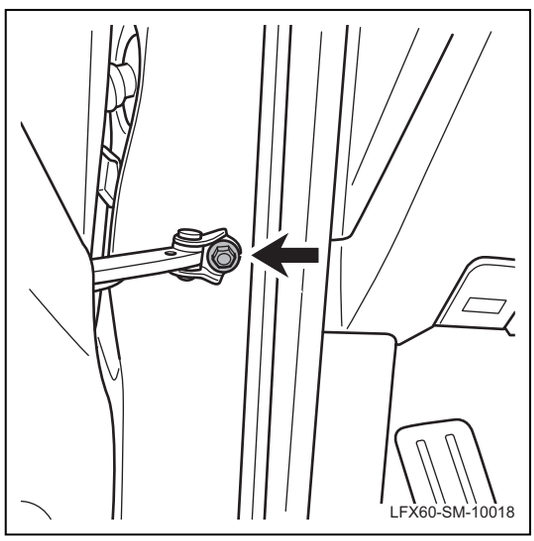
Replacement of the door stopper

Removal

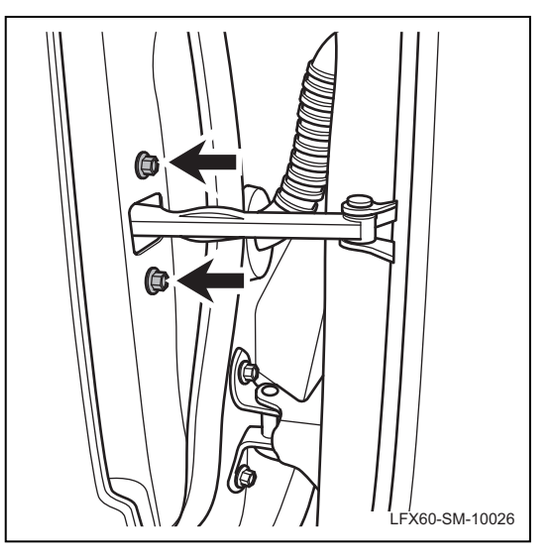
1. Remove the door stopper.

(a). Remove the front door interior trim board. **Refer to the replacement of front door interior trim board.**

(b). Remove the waterproof film of the front door.



(c). Remove the fixing bolts of door stopper.



(d). Remove the fixing bolts of door stopper.

(e). Take off the door stopper.

10

Installation

1. Install the door stopper.

(a). The installation sequence is the reverse of the disassembly order.

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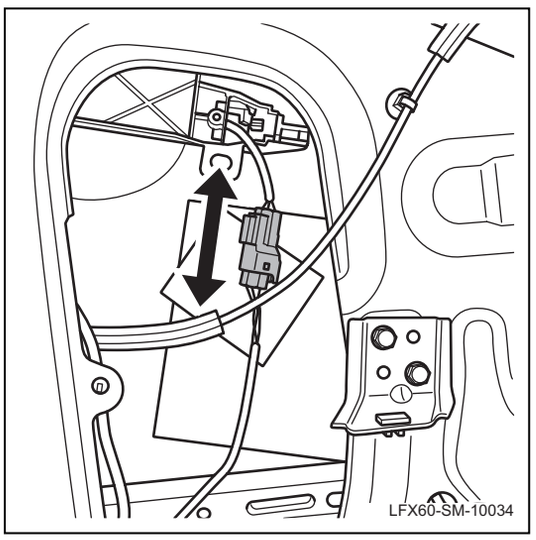
Replacement of the outside handle assembly of the front door

Removal

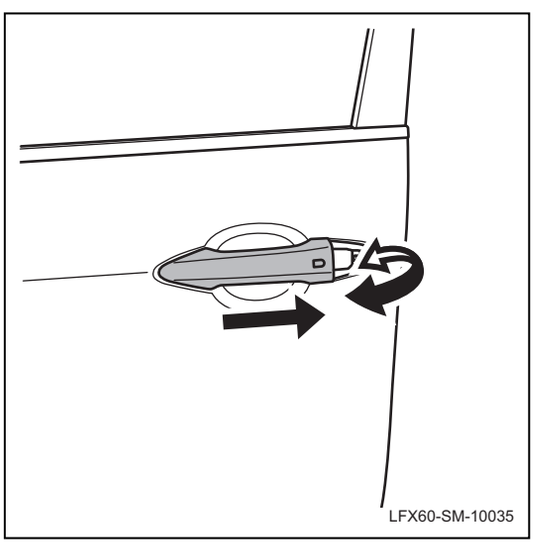
1. Remove the outside handle assembly of the front door

(a). Remove the front door trim panel, **refer to:Replacement of the front door trim panel.**

(b). Remove the front door lock barrel. **Refer to the replacement of front door lock barrel.**



(c). Disconnect the antenna plug of the left front door handle.



(d). Remove the outside handle assembly of the front door

Installation

1. Install the outside handle assembly of the front door

(a). The installation sequence is the reverse of the disassembly order.

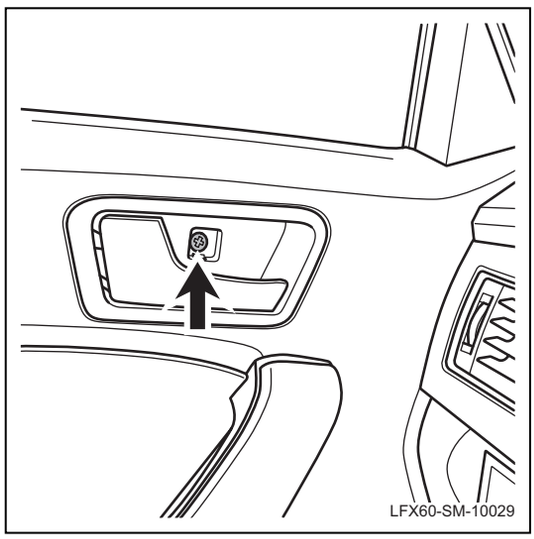
AutoLibrary

AutoLibrary

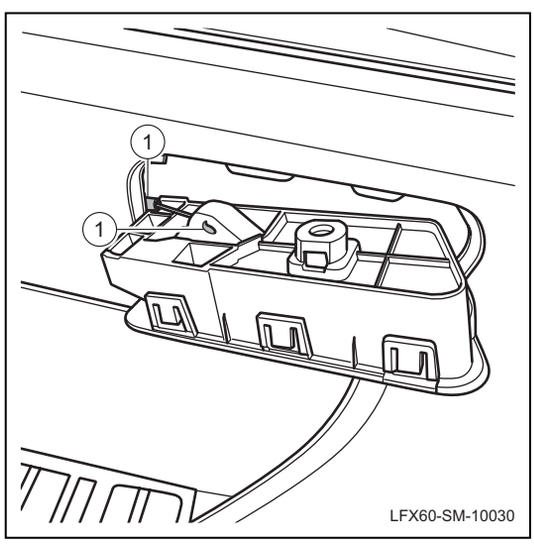
Replacement of the inside handle assembly of the front door

Removal

1. Remove the inside handle assembly of the front door



(a). Remove the trim cover of fixing bolts of inside handle assembly of the front door
(b). Remove the fixing bolts of inside handle assembly of the front door



(c). Remove the inside handle assembly of the front door
(d). Disconnect the inside handle cable 1 of the front door
(e). Take off the inside handle assembly of the front door

10

Installation

1. Install the inside handle assembly of the front door

(a). The installation sequence is the reverse of the disassembly order.

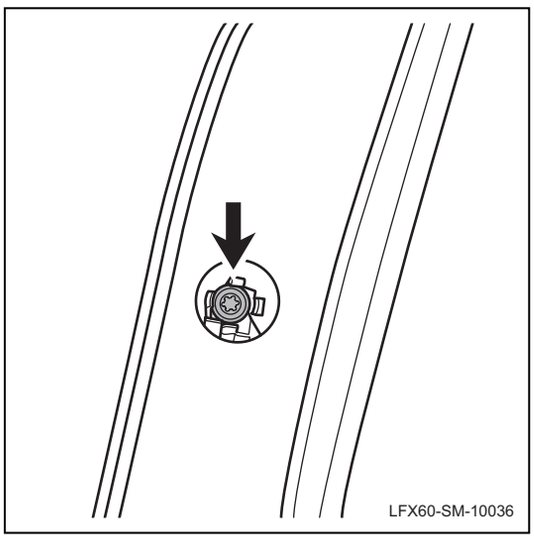
AutoLibrary

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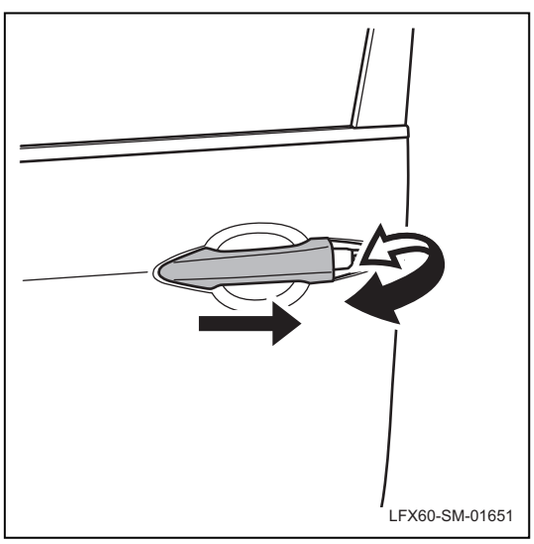
Replacement of the outside handle assembly of the rear door

Removal

1. Remove the outside handle assembly of the rear door



(a). Remove the fixing bolt trim cover of the outside handle.
(b). Remove the fixing bolt of the outside handle.
(c). Take off the outside handle trim cover.



(d). Remove the outside handle assembly of the rear door

Installation

1. Install the outside handle assembly of the rear door

(a). The installation sequence is the reverse of the disassembly order.

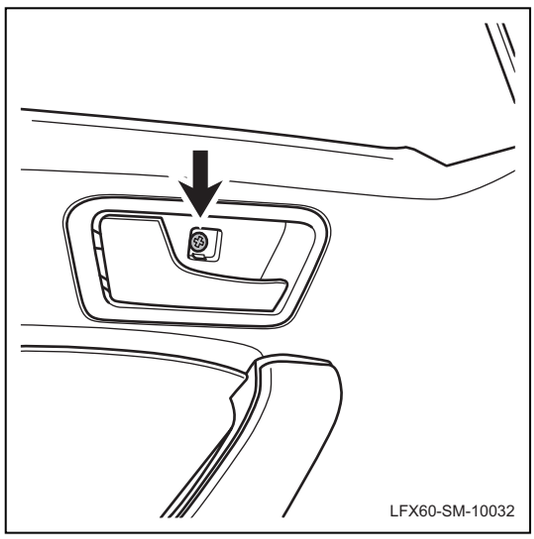
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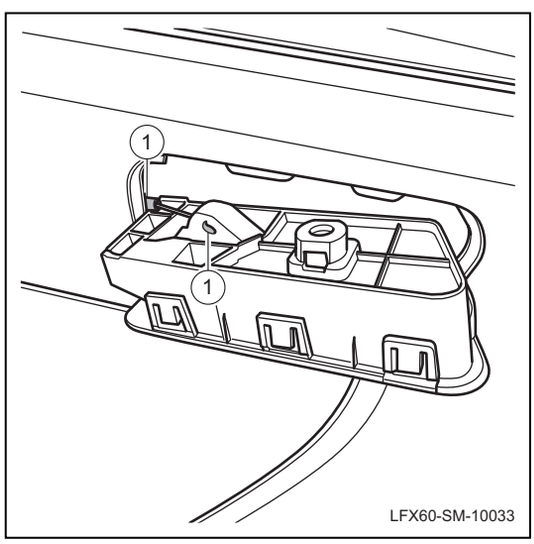
Replacement of the inside handle assembly of the rear door

Removal

1. Remove the inside handle assembly of the rear door



(a). Remove the fixing bolt trim cover
(b). of the rear door inside handle.Remove the fixing bolts of the rear door inside handle.



(c). Remove the inside handle assembly of the rear door
(d). Disconnect the inside handle cable 1 of the rear door
(e). Take off the inside handle assembly of the rear door

10

Installation

1. Install the inside handle assembly of the rear door

(a). The installation sequence is the reverse of the disassembly order.

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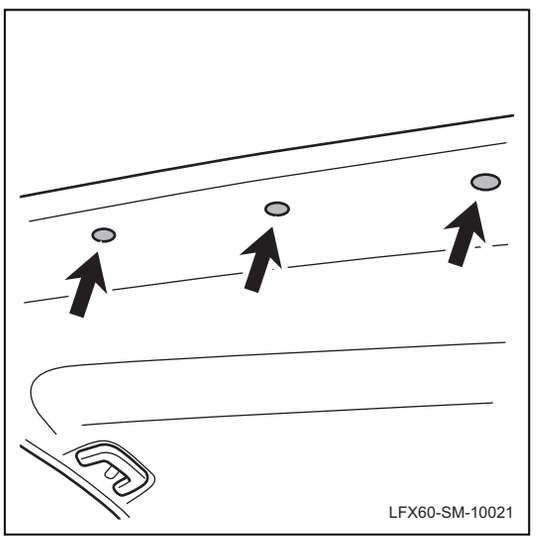
Replacement of back door hinge

Removal

1. Remove the back door hinge.

(a). Remove the C-pillar trim panel, **refer to:Replacement of C-pillar trim panel.**

(b). Remove the back door assembly, **refer to:Replacement of back door assembly.**

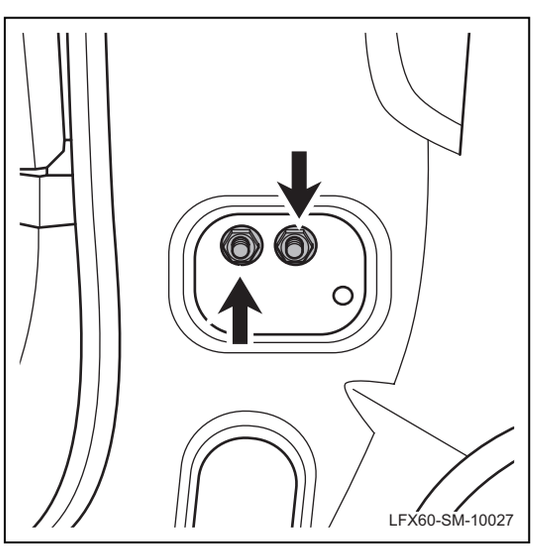


(c). Remove the fixing clip of ceiling.

(d). Open part of the ceiling.

ⓘNote:

Do not bend the roof.



(e). Remove the fixing nut of back door hinge.

△Tips:

The removal and installation of left and right hinge are the same.

(f). Take off the back door hinge.

Installation

1. Install the back door hinge.

(a). The installation sequence is the reverse of the disassembly order.

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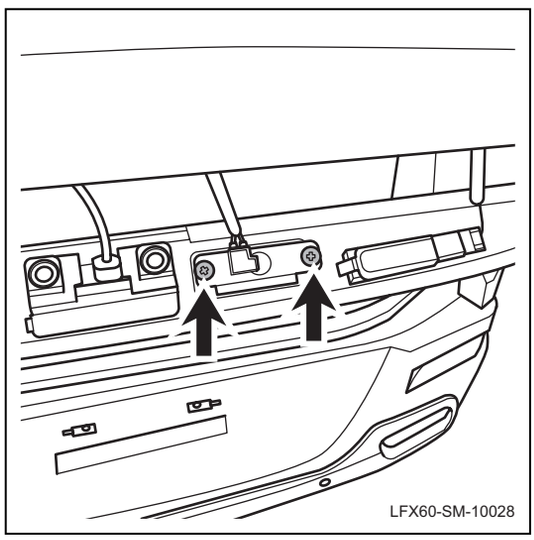
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Replacement of outside open switch of back door

Removal

1. Remove the outside open switch of back door.

(a). Removal of the trim panel components of the rear license plate lights, **refer to:the replacement of the trim panel components of the rear license plate lights**



(b). Remove the fixing screws of outside open switch of back door.

(c). Take off the outside open switch of back door.

Installation

1. Install the outside open switch of back door.

(a). The installation sequence is the reverse of the disassembly order.

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10 - Bodywork

Filler cap 10-1417
Removal and Installation...10-1417

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Filler cap

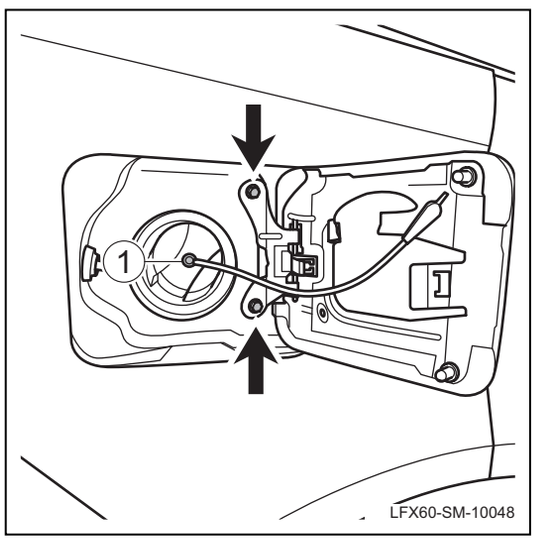
Removal and Installation

Replacement of the fuel filler cover

Removal

1. Remove the filler cover.

(a). Open the filler cover.



(b). Remove the fixing bolts of the fuel filler cover.
(c). Disengage the limiting rope 1 of fuel filler.
(d). Take off the filler cover.

Installation

1. Install the filler cover.

(a). The installation sequence is the reverse of the disassembly order.

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10 - Bodywork

Shelf curtains 10-1421
Removal and Installation...10-1421

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Shelf curtains

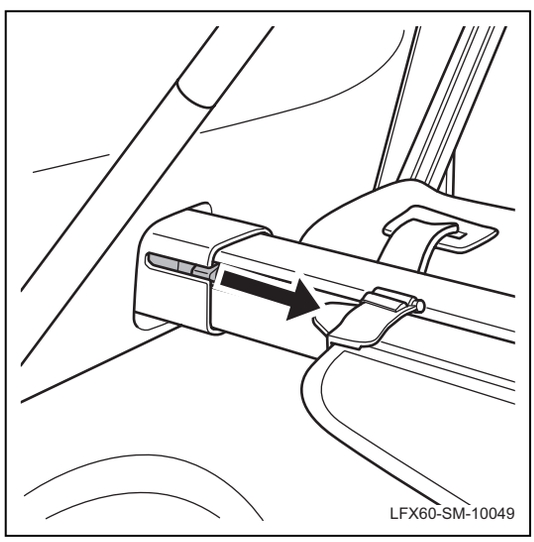
Removal and Installation

Replacement of the rear rack curtain assembly

Removal

1. Remove the rear rack curtain assembly.

(a). Open hatchback.



(b). Disassemble and take off the rear rack curtain.

△**Tips:**

Removal methods on both sides are the same.

Installation

1. Install the rear rack curtain assembly.

(a). The installation sequence is the reverse of the disassembly order.

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11 - Interior trims/exterior trims

Dashboard and console 11-1425
Technical specifications..... 11-1425
Precautions 11-1426
Structure and installation location
..... 11-1427
Removal and installation ... 11-1429

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Dashboard and console

Technical specifications

Torque Specifications

Name	Torque range	
	Metric(Nm)	British(lb-ft)
The pipe beam is connected to the side panel and floor	25	18
The mounting bracket of console is connected to the floor	25	18
The console is connected to the mounting bracket	7	5

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Precautions

Precautions

1. Cover the bodywork with the cloth or gasket while removing and installing various parts to avoid scuffing.
2. Ensure to cover the component with the rag or ethene tape when removing (separating) the component with the screwdriver or similar tool.
3. Replace the deformed and damaged clips.
4. If the part cannot be reused, it must be replaced.
5. Ensure to tighten the bolt and nut to the required torque.
6. After the installation, check whether all the parts work normally.
7. Do not use the sharp tools to remove the dashboard and console, use tool wrapped with a cloth to disassemble.
8. If you want to disconnect the plug between the steps, first disconnect the negative connector of battery.
9. The apron cannot be removed forcibly, be sure to remove all fixed bolts.

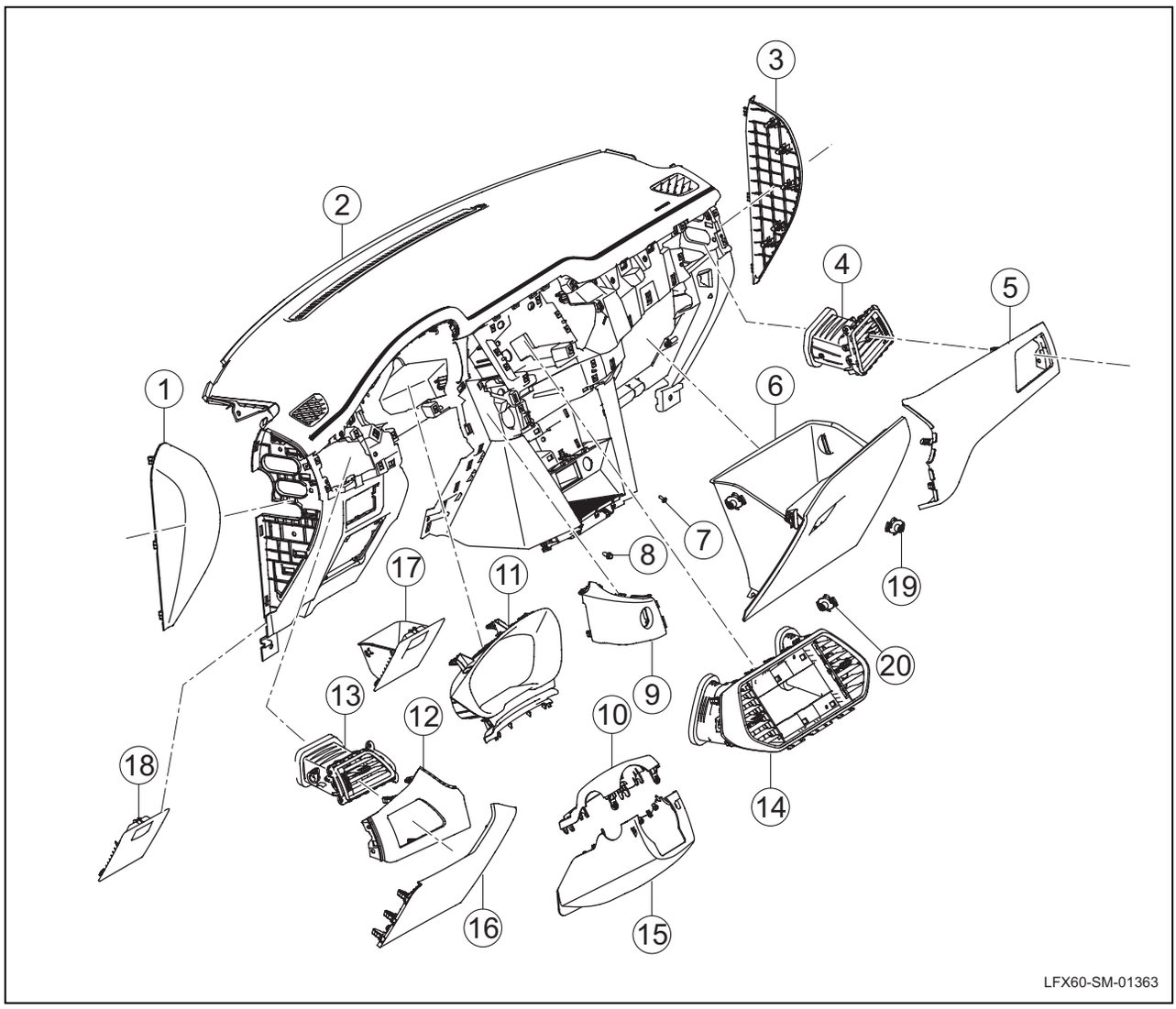
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Structure and installation location

Part exploded view

Instrument Panel



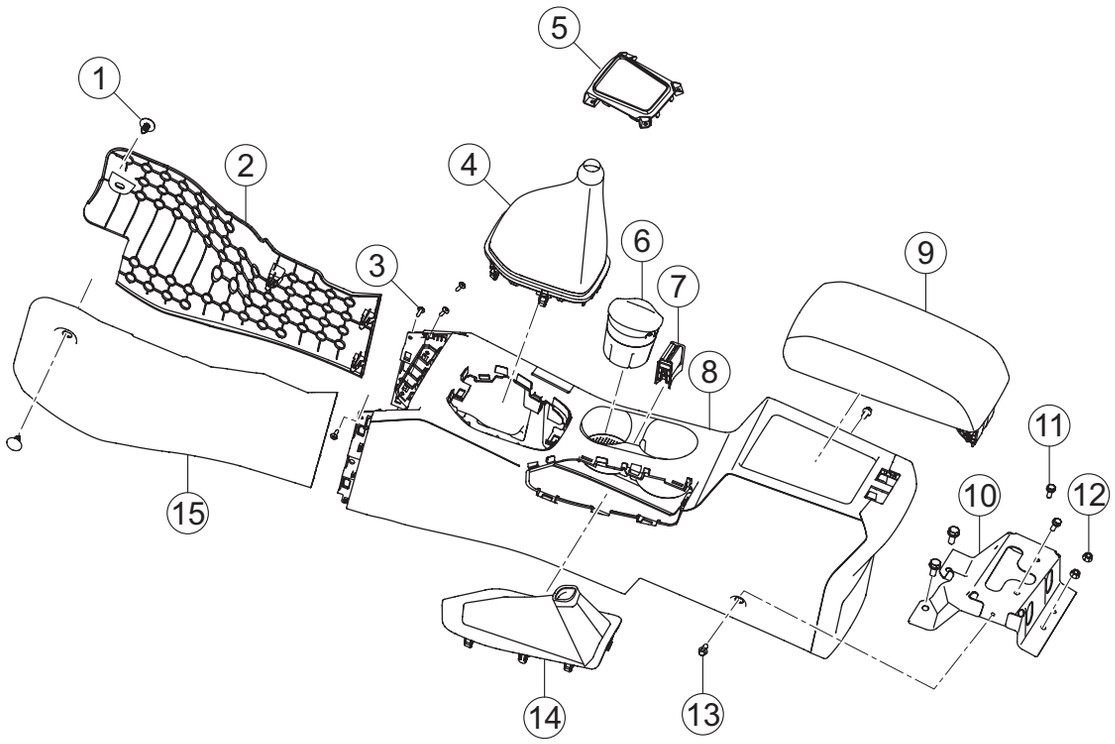
No.	Part Name
1	Left dashboard end cover assembly
2	Dashboard body assembly
3	Right dashboard end cover assembly
4	Right dashboard outlet assembly
5	Dashboard right trim panel assembly
6	Dashboard glove box assembly
7	Cross recessed pan-head self-tapping screws and flat washer assemblies
8	Hexagon flange tapping screw
9	Button start switch panel assembly of dashboard
10	Steering column upper shroud assembly

No.	Part Name
11	Combination instrument components
12	Dashboard left trim panel assembly
13	Dashboard left outlet assembly
14	Dashboard middle outlet assembly
15	Steering column lower shroud assembly
16	Dashboard Lower left panel assembly
17	Dashboard bill box assembly
18	GLONASS loudspeaker cover
19	Right stopper of dashboard storage box
20	Left stopper of dashboard storage box

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Console



LFX60-SM-01364

No.	Part Name
1	Plastic clamp
2	Right front board assembly of console
3	Cross recessed large half-round head self-tapping screw
4	Hex flange nut
5	Hex flange nut
6	Moving ashtray assembly
7	Holding mechanism assembly of console cup holder
8	Console assembly

No.	Part Name
9	Central console armrest assembly
10	Mounting bracket assembly of console
11	Hexagon head bolt and taper elastic washer assembly
12	Hex flange nut M6
13	Hexagon head bolt and taper elastic washer assembly
14	Handbrake mounting plate assembly
15	Left front board assembly of console

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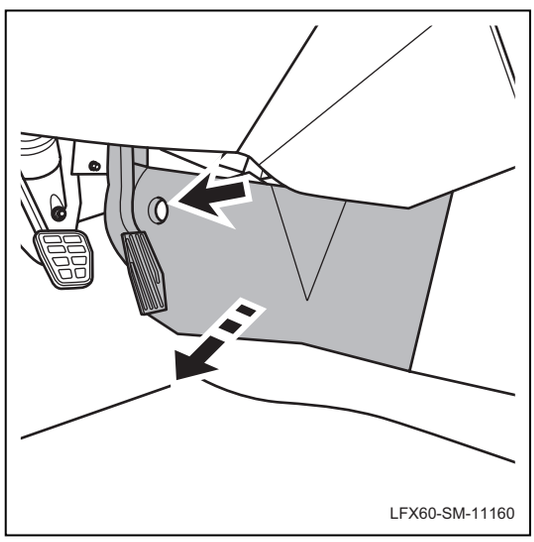
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Removal and installation

Replacement of the console assembly

Removal

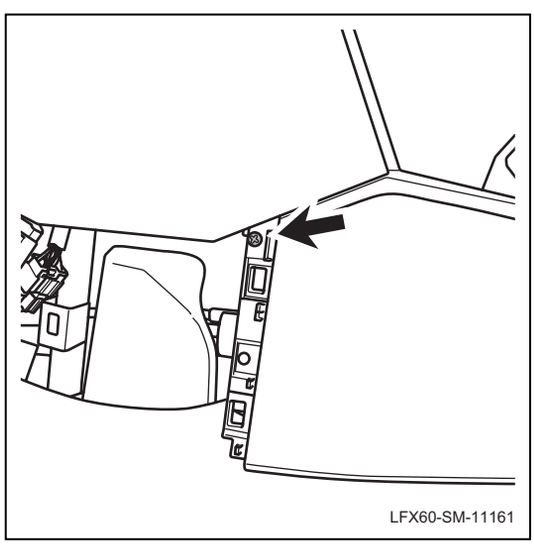
1. Remove the console assembly.



(a). Remove the left and right front board of console.

Note:

- **Please force on the board clip, directly pull the console board by hand.**
- **Removal methods on both sides are similar.**



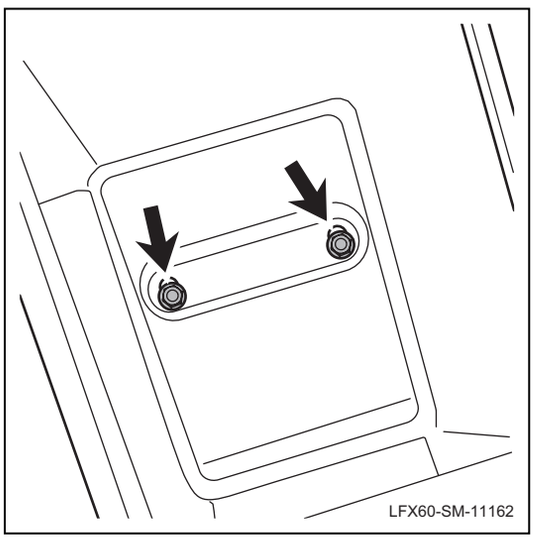
(b). Remove the left and right side fixing screws of the console.

Note:

Removal methods on both sides are similar.

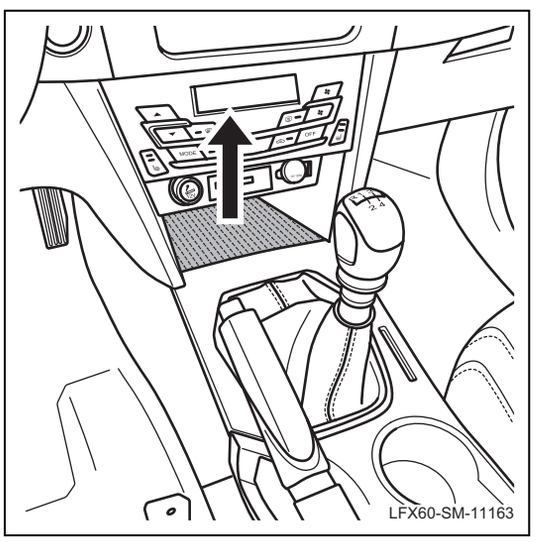
AutoLibrary

AutoLibrary

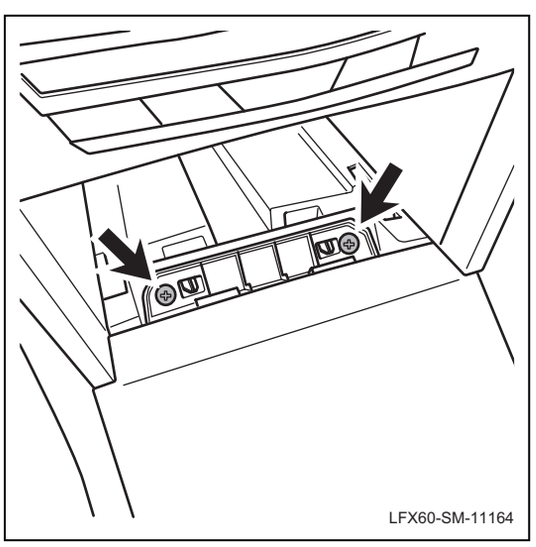


(c). Open the console armrest assembly and take off the bottom pad of the console storage box.

(d). Remove the fixing bolts in the console armrest box.



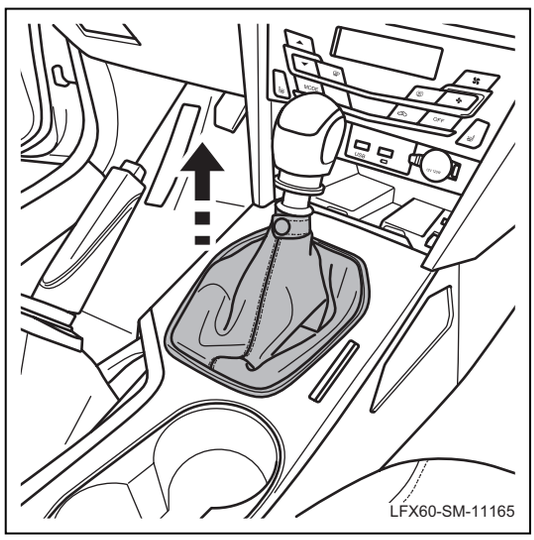
(e). Remove the front panel of console.



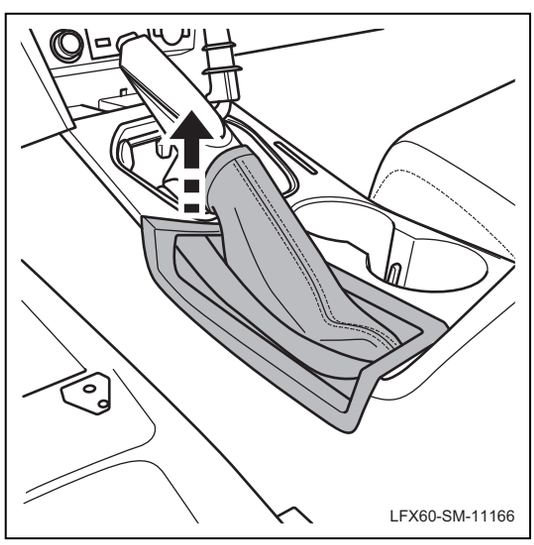
(f). Remove the front fixing screw of console.

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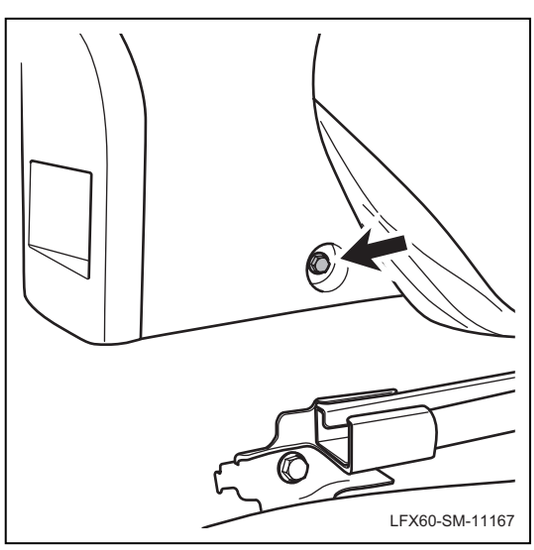
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(g). Removing the fixing sleeve assembly of shifter panel leather sheath.



(h). Remove the leather sheath and panel assembly of parking brake handle.



(i). Move the seat forward and remove the left and right fixing screws on the rear of the console.

(j). Take off the console assembly.

Installation

1. Install the console assembly.

(a). The installation sequence is the reverse of the disassembly order.

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Replacement of dashboard assembly

Removal

1. Remove the fascia console assembly.

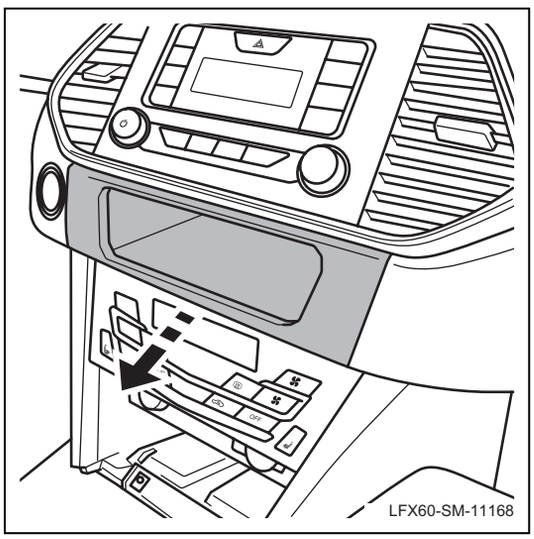
(a). Disconnect the battery negative connector.

(b). Remove the A pillar upper trim board. **Refer to the replacement of A pillar upper trim board.**

(c). Remove the A pillar lower decorative panel. **Refer to the replacement of A pillar lower decorative panel.**

(d). Remove the console, **refer to:Replacement of console.**

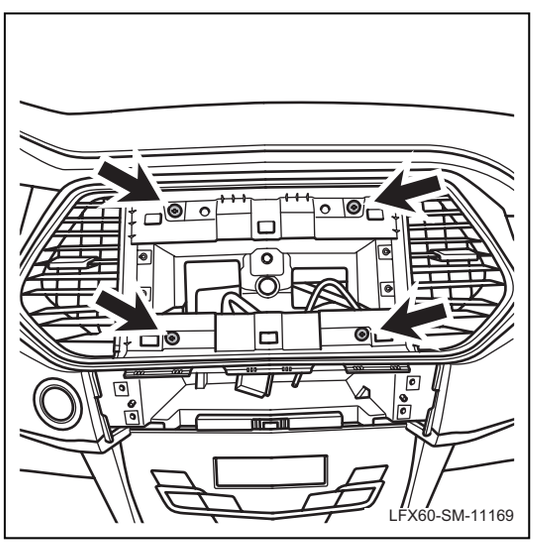
(e). Remove the upper and lower cover of steering column, **refer to:Replacement of the upper and lower cover of steering column.**



(f). Remove the dashboard glasses box.

(g). Remove the radio unit (low configuration), **refer to:Replacement of the radio unit.**

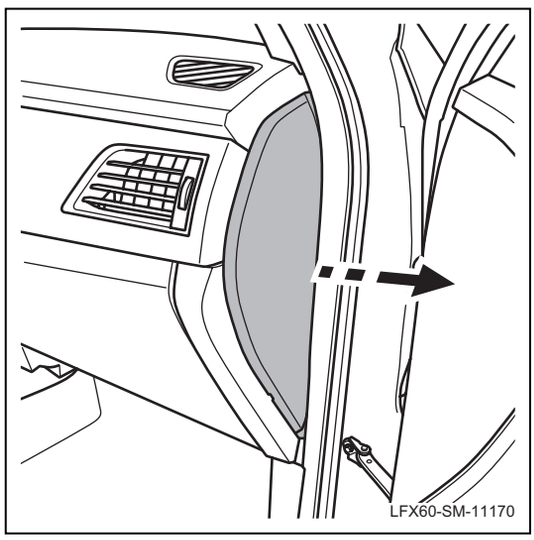
(h). Remove the radio / MP5 player display (high configuration), **refer to:Replacement of radio / MP5 player display.**



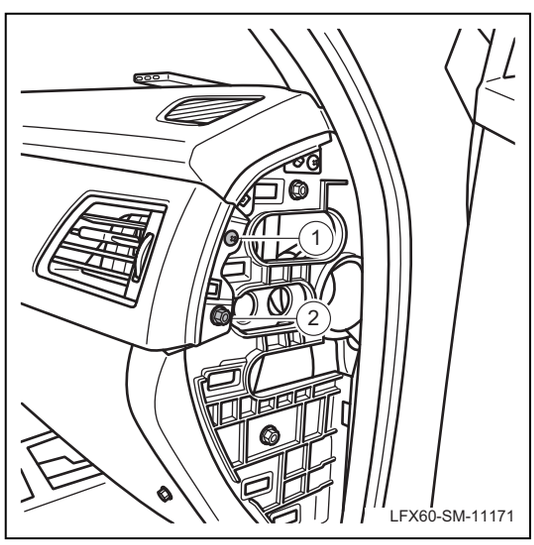
(i). Disassemble the fixing screw grating trim panel of the air conditioner outlet on dashboard and remove the grating trim panel of the air conditioner outlet.

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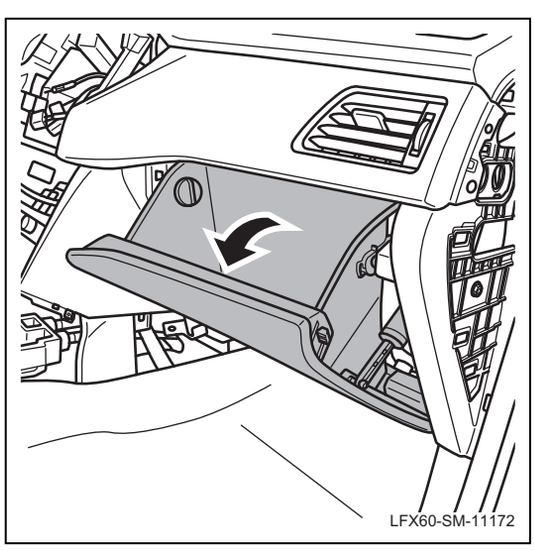
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(j). Use the appropriate tool to remove the right cover of the dashboard.



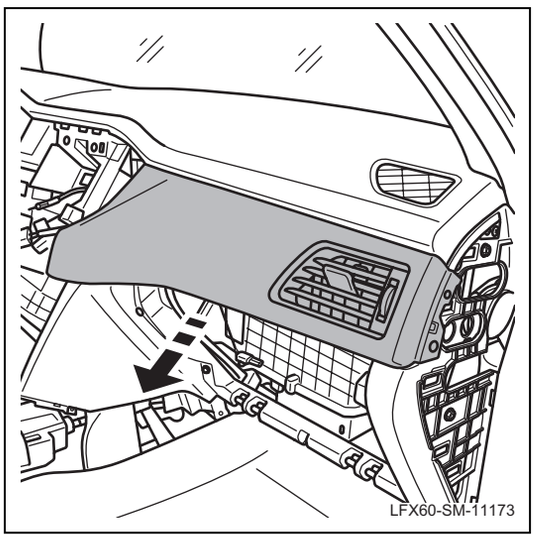
(k). Remove the fixing bolts 2 and fixing screws 1 of the right trim panel of dashboard .



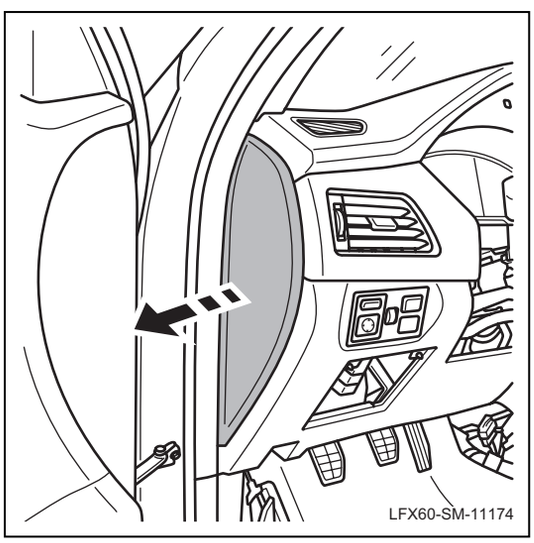
(l). Remove the dashboard glove box.

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(m). Remove the right trim panel of the dashboard.



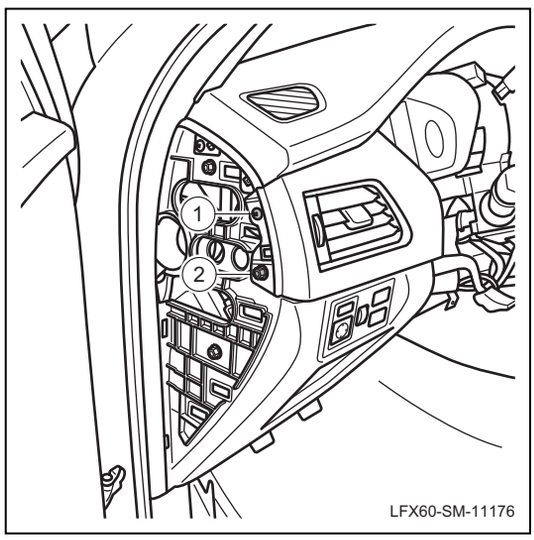
(n). Remove the dashboard lower panel assembly
(o). Remove the driver airbag, **refer to:Replacement of the driver airbag.**
(p). Remove the steering wheel, **refer to:Replacement of multi-function steering wheel.**
(q). Remove the clock spring, **refer to:Replacement of clock spring.**
(r). Remove the combination switch, **refer to:Replacement of combination switch.**
(s). Remove the instrument cluster, **refer to:Replacement of instrument cluster.**



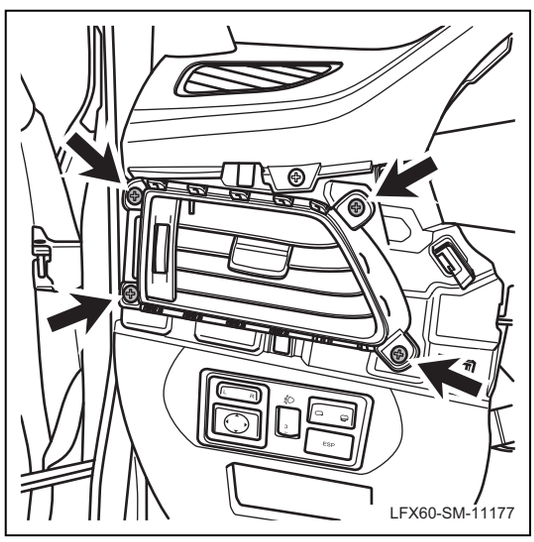
(t). Remove the dashboard lower left panel assembly
(u). Disconnect the harness plug of diagnostic connector and remove the dashboard left lower panel.

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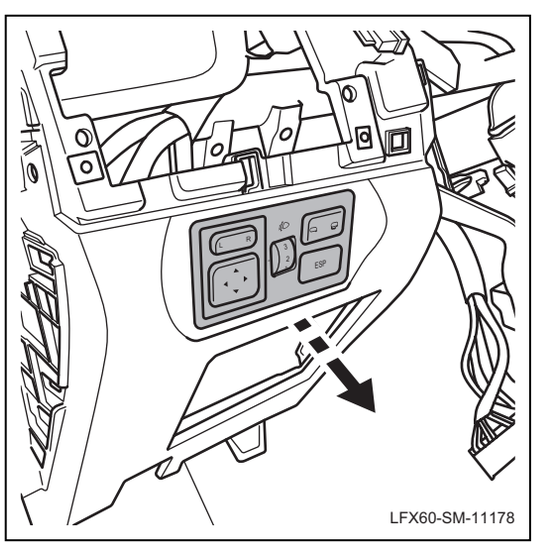
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(v). Remove the fixing bolts 2 and screws 1of grating trim panel of the air conditioner outlet on the left side of dashboard.



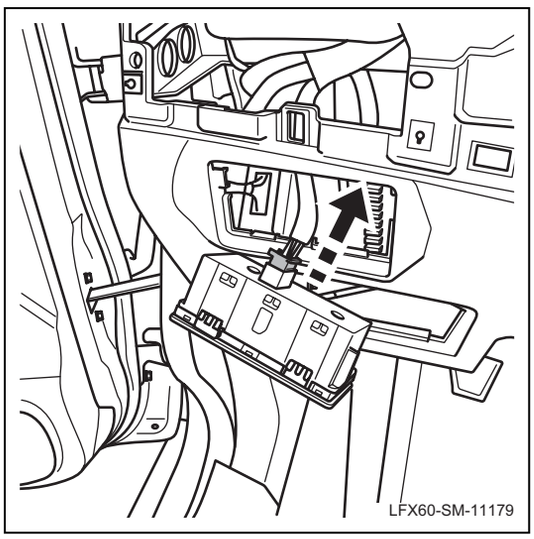
(w). Remove the fixing screw of outlet assembly on the left side of dashboard.



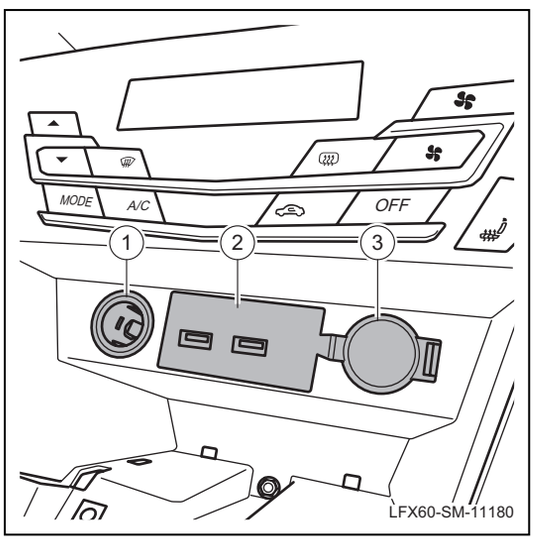
(x). Remove the dashboard switch assembly.

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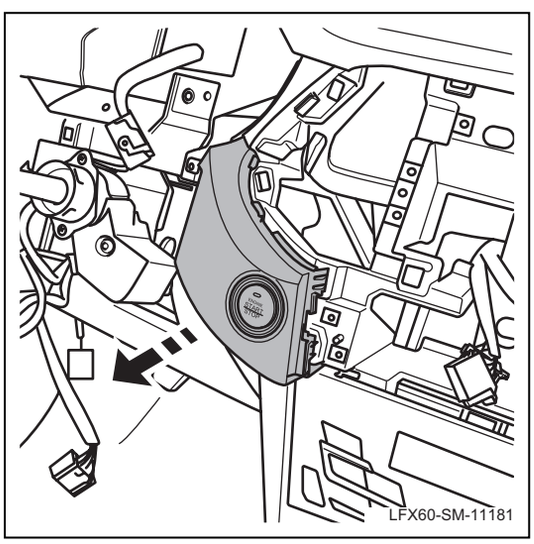
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(y). Disconnect the harness plug of dashboard switch assembly.



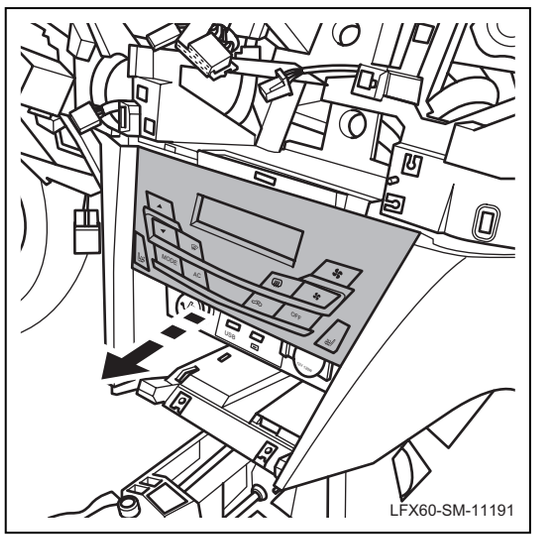
(z). Remove the cigarette lighter base 1.
(aa). Remove the USB and charging interface 2.
(ab). Remove the output power outlet.



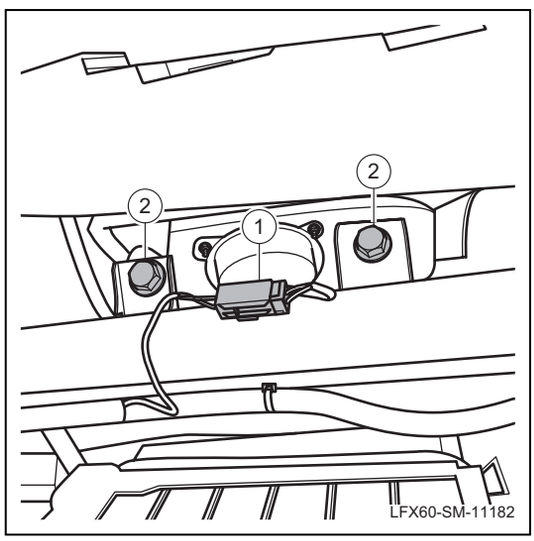
(ac). Remove the button start switch panel assembly.

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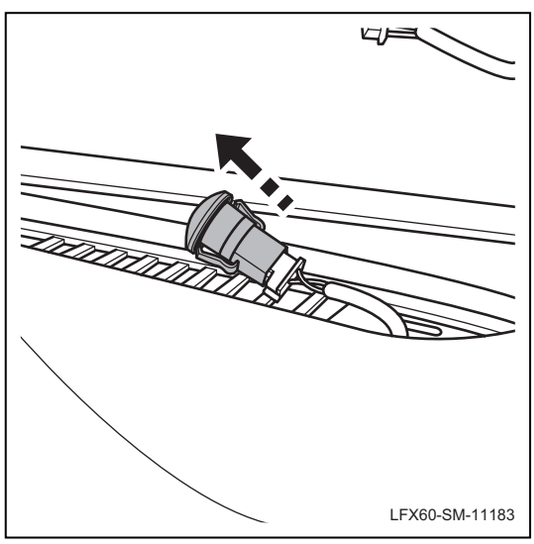
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(ad). Remove the air conditioner control panel.
(ae). Disconnect the harness plug on the back of air conditioner control panel connector and remove it.



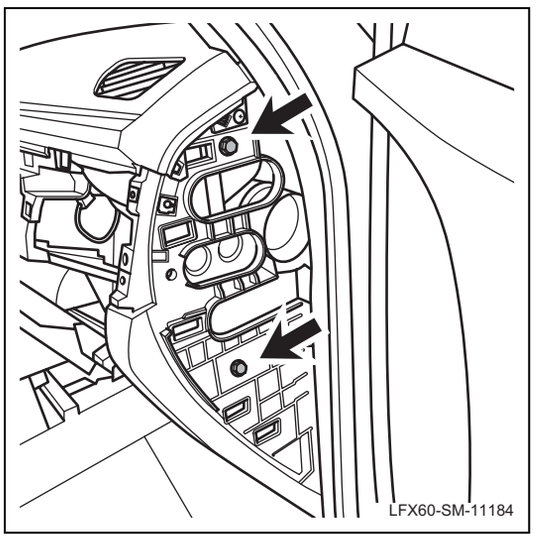
(af). Disconnect the harness plug 1 of the passenger airbag.
(ag). Remove the fixing bolts 2 of passenger airbag.



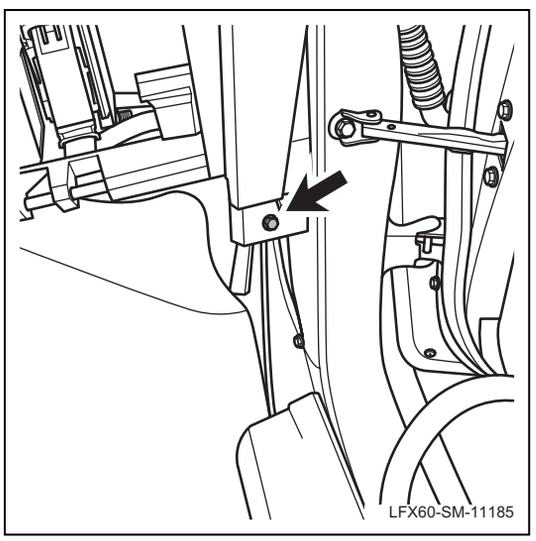
(ah). Remove the sunlight sensor and disconnect the sensor harness plug.

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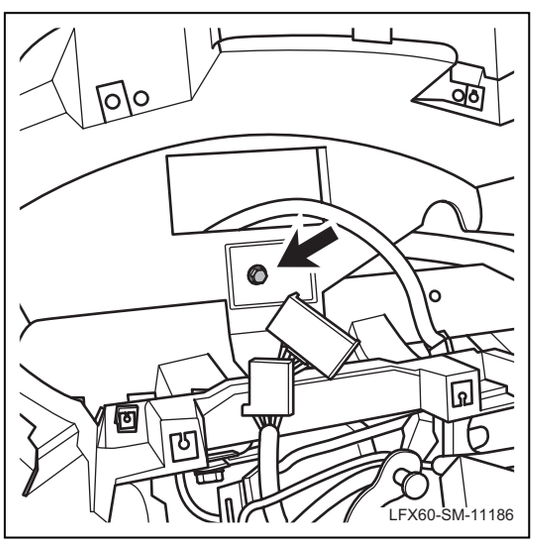
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(ai). Remove the left and right fixing screws of the dashboard.



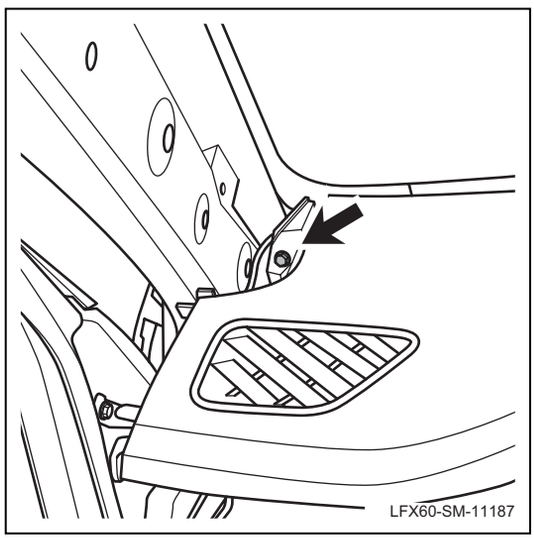
(aj). Remove the fixing screws of A-pillar lower trim panel (both left and right sides).



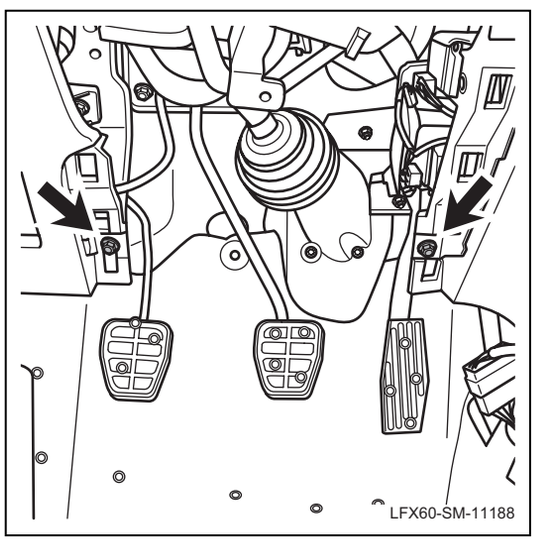
(ak). Remove the inner fixing screws of the instrument cluster.

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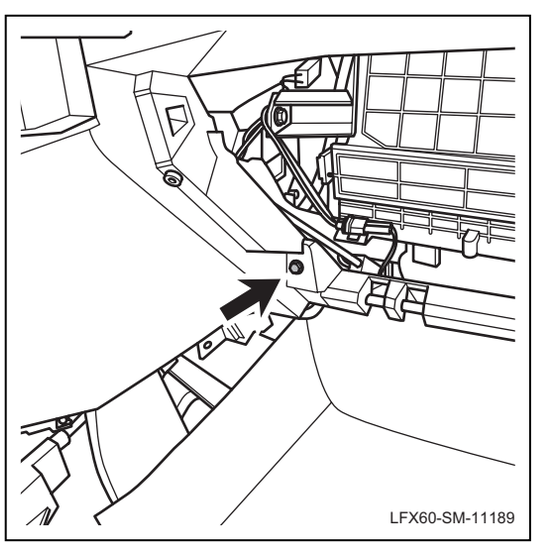
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(al). Remove the screws of A-pillar upper trim plate. (Both the left and right side)



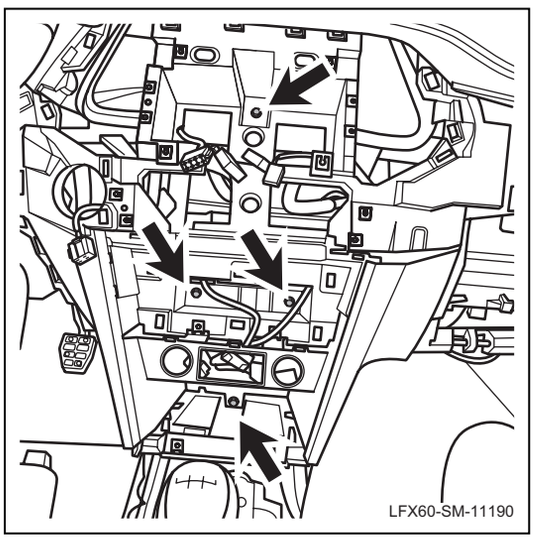
(am). Remove the inner fixing screws of the left lower board of dashboard.



(an). Remove the lower mounting screws of the glove box.

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(ao). Remove the middle fixing screws of the dashboard.
(ap). With the help of the assistant, lift the dashboard assembly.

Installation

1. Install the dashboard assembly.

(a). The installation sequence is the reverse of the disassembly order.

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11 - Interior trims/exterior trims

Seat 11-1443
Technical specifications..... 11-1443
Precautions 11-1444
Operating Principle..... 11-1445
Diagnostic Information and Procedures..... 11-1446
Removal and installation ... 11-1456

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Seat

Technical specifications

Torque Specifications

Name	Torque range	
	Metric(Nm)	British(lb-ft)
Fixing bolts of the front seat mounting	65	48
Fixing bolts of the rear seat mounting	65	48

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Precautions

1. Cover the bodywork with the cloth or gasket while removing and installing various parts to avoid scuffing.
2. Ensure to cover the component with the rag or ethene tape when removing (separating) the component with the screwdriver or similar tool.
3. Replace the deformed and damaged clips.
4. If the part cannot be reused, it must be replaced.
5. Ensure to tighten the bolt and nut to the required torque.
6. After the installation, check whether all the parts work normally.
7. Follow the steps below to clean the parts.

- Water-soluble stains:soak the soft cloth in warm water, then wring it out and wipe on the stains.And then wipe with a soft dry cloth.
- Oil:Wet the soft cloth in warm water with mixed neutral detergent (concentration:2 to 3%) and wipe on the stains.Dip the cloth in clean water, then wring it out and wipe clean the detergent.Wipe with a soft dry cloth.

8. Do not use organic solvents such as thinner, benzene, alcohol and gasoline.
9. For leather seats, use a leather seat cleaner.

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Operating Principle

System Overview

Electric seat switch

- Built-in tilt switch, slide switch and lift switch to control the power supply of each motor.
- Installed on the outer trim of the seat cushion.

Electric seat system

Regardless of the location of the ignition switch, the power seat switch can be operated because the power supply is always supplied to the power seat switch.

Sliding operation

When operating the slide switch in the power seat switch, the sliding motor operates and the seat position can be adjusted forward and backward

Tilting operation

When operating the tilt switch in the power seat switch, the tilting motor operates and the seat backrest position can be adjusted

Lift operation

When operating the lift switch in the power seat switch, the lifting motor operates and the seat cushion position can be adjusted up and down.

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Diagnostic Information and Procedures

Diagnosis Instructions

Before the failure diagnose of the seat system, familiarize yourself with the familiarity of the seat system, and then start the seat system diagnostics, which helps to determine the correct troubleshooting step in the event of a failure, and more importantly, it also helps determine whether the situation described by the customer is normal operating.

Any troubleshooting of the seat system should take the seat system check as a starting point and instruct the service personnel to take the next logical step to troubleshoot. Comprehend and correctly use the diagnostic flow chart to shorten the diagnosis time and avoid the misjudgement.

Visual Inspection

1. Confirm the problem raised by the customer.
2. Check for evident mechanical and electrical faults.

Visual inspection table

Mechanical	Electrical
• Seat adjustment switch • Seat slider is damaged • Front/rear adjustment motor damage • The backrest adjuster motor is damaged • Up and down adjustment motor damage	• Line • Fuse • Wiring harness plug

3. Solve the problem finding before the next step inspection.
4. If the observed or raised problem is the evident and the cause has been found, ensure to fix this fault before proceeding with the next step.
5. If no problem is found through the visual check, confirm the fault and refer to the fault symptom list.

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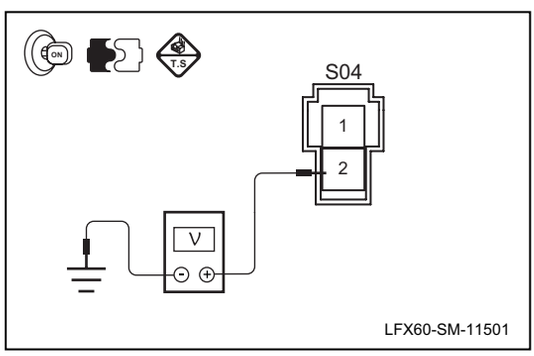
List of fault symptoms

Symptom	Possible point of failure	Recommended Measures
All adjuster motors do not work	• Fuse • Wiring harness plug • Line	**Refer to: Diagnostic process for all the adjuster motor does not operate**
The back and forth adjuster motor for driver's seat does not operate	• Wiring harness plug • Seat adjustment switch • Line • Front/rear adjustment motor damage	**Refer to: Diagnostic process for back and forth adjuster motor for driver's seat does not operate**
The up and down adjuster motor for driver's seat does not operate	• Wiring harness plug • Seat adjustment switch • Line • Up and down adjustment motor damage	**Refer to: Diagnostic process for the up and down adjuster motor for driver's seat does not operate**
The backrest adjuster motor for driver's seat does not operate	• Wiring harness plug • Adjustment switch • Line • Backrest adjuster motor	**Refer to: Diagnostic process for backrest adjuster motor for driver's seat does not operate**

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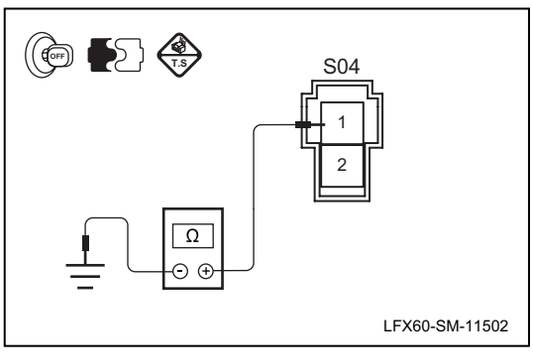
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Diagnostic process for all the adjuster motor does not operate

Test condition	Details/results/measures
1. General inspection.	
	A. Check the seat harness plugs for breakage, loose contact, aging or looseness. Is it OK after checking? →**Yes** To Step 2. →**No** Repair the fault parts.
2. Check the fuse.	
	A. Check the fuse FS26. Fuse rated capacity: 20 A Is it OK after checking? →**Yes** To Step 2. →**No** Replace the fuse.
3. Check the electric seat power.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the seat power harness plug S04. C. Connect the battery negative terminal and operate the start switch to turn the power to ON state. D. Measure the voltage between the No.2 terminal of the harness plug S04 of the power supply for seats and the reliable grounding with a multimeter. **Standard voltage: 11 ~ 14V** Is the voltage normal? →**Yes** To Step 4. →**No** Repair the electric seat power line open circuit fault and replace the harness if necessary.

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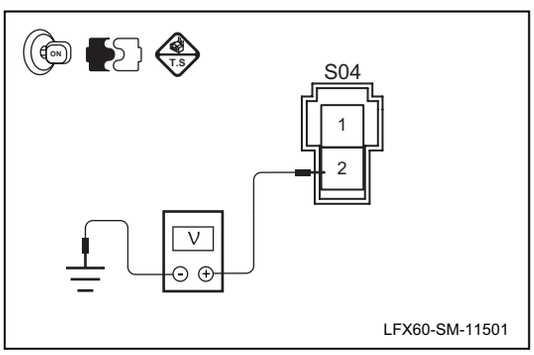
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Test condition	Details/results/measures
4. Check the electric seat ground line.	
	A. Operate the start switch to turn the power to OFF state. B. Disconnect the seat power harness plug S04. C. Measure the resistance between the seat power harness plug S04 terminal 1 and fixed ground point with the multimeter. **Standard value: less than 5** Is the resistance normal? →**Yes** To Step 5. →**No** Repair the electric seat ground line open circuit fault.
5. Check the seat adjustment switch.	
	A. Operate the start switch to turn the power to OFF state. B. Disconnect the battery negative terminal. C. Remove the seat adjustment switch and replace it with the normal switch of the same model. D. Connect the negative connector of battery, operate the seat adjustment switch, and check the seat adjustment function. Is the system normal? →**Yes** Replace the driver's seat adjustment switch. **Refer to: Replacement of driver's seat adjustment switch** →**No** To Step 6.
6. Check the adjuster motor for driver’s seat	
	A. Replacement of driver’s seat adjuster motor. **Refer to: Replacement of driver's seat front/rear adjustment motor** **Refer to: Replacement of driver's seat backrest adjustment motor** Confirms that the troubleshooting is successful.

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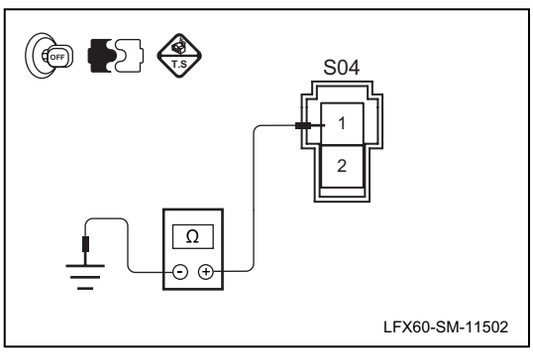
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Diagnostic process for back and forth adjuster motor for driver's seat does not operate

Test condition	Details/results/measures
1. General inspection.	
	A. Check the seat harness plugs for breakage, loose contact, aging or looseness. Is it OK after checking? →**Yes** To Step 2. →**No** Repair the fault parts.
2. Check the fuse.	
	A. Check the fuse FS26. **Fuse rated capacity: 20 A** Is it OK after checking? →**Yes** To Step 2. →**No** Replace the fuse.
3. Check the electric seat power.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the seat power harness plug S04. C. Connect the battery negative terminal and operate the start switch to turn the power to ON state. D. Measure the voltage between the seat power harness plug S04 terminal 2 and fixed ground point with the multimeter. **Standard voltage: 11 ~ 14 V** Is the voltage normal? →**Yes** To Step 4. →**No** Repair the electric seat power line open circuit fault and replace the harness if necessary.

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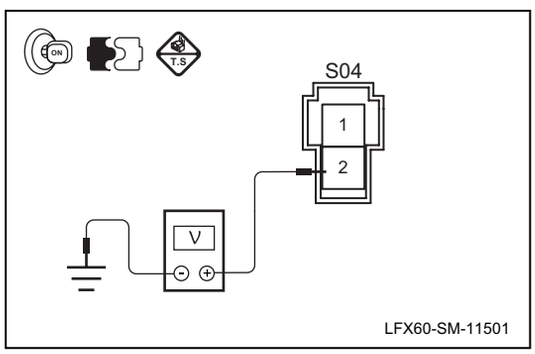
AutoLibrary

Test condition	Details/results/measures
4. Check the electric seat ground line.	
	A. Operate the start switch to turn the power to OFF state. B. Disconnect the seat power harness plug S04. C. Measure the resistance between the seat power harness plug S04 terminal 1 and fixed ground point with the multimeter. **Standard resistance:less than 5** Is the resistance normal? →**Yes** To Step 5. →**No** Repair the electric seat ground line open circuit fault.
5. Check the seat adjustment switch.	
	A. Operate the start switch to turn the power to OFF state. B. Disconnect the battery negative terminal. C. Remove the seat adjustment switch and replace it with the normal switch of the same model. D. Connect the negative connector of battery, operate the seat adjustment switch, and check back and forth adjustment function of the seat. Is the system normal? →**Yes** Replace the driver's seat adjustment switch. **Refer to: Replacement of driver's seat adjustment switch** →**No** To Step 6.
6. Check the back and forth adjuster motor for driver’s seat	
	A. Replacement of back and forth adjuster motor of driver’s seat. **Refer to: Replacement of driver's seat front/rear adjustment motor** Confirms that the troubleshooting is successful.

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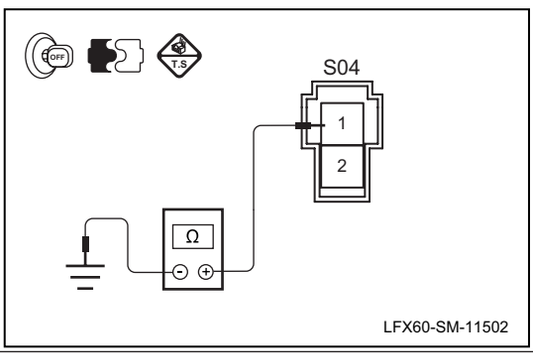
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Diagnostic process for the up and down adjuster motor for driver's seat does not operate

Test condition	Details/results/measures
1. General inspection.	
	A. Check the seat harness plugs for breakage, loose contact, aging or looseness. Is it OK after checking? →**Yes** To Step 2. →**No** Repair the fault parts.
2. Check the fuse.	
	A. Check the fuse FS26. **Fuse rated capacity: 20 A** Is it OK after checking? →**Yes** To Step 2. →**No** Replace the fuse.
3. Check the electric seat power.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the seat power harness plug S04. C. Connect the battery negative terminal and operate the start switch to turn the power to ON state. D. Measure the voltage between the seat power harness plug S04 terminal 2 and fixed ground point with the multimeter. **Standard voltage: 11 ~ 14 V** Is the voltage normal? →**Yes** To Step 4. →**No** Repair the electric seat power line open circuit fault and replace the harness if necessary.

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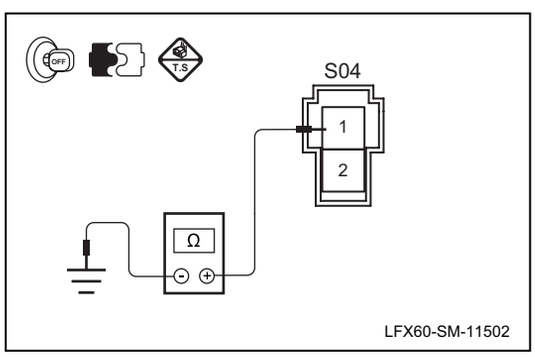
AutoLibrary

Test condition	Details/results/measures
4. Check the electric seat ground line.	
	A. Operate the start switch to turn the power to OFF state. B. Disconnect the seat power harness plug S04. C. Measure the resistance between the seat power harness plug S04 terminal 1 and fixed ground point with the multimeter. **Standard resistance:less than 5** Is the resistance normal? →**Yes** To Step 5. →**No** Repair the electric seat ground line open circuit fault.
5. Check the seat adjustment switch.	
	A. Operate the start switch to set the power mode to the “OFF” state. B. Disconnect the battery negative connector. C. Remove the seat adjustment switch and replace it with the normal switch of the same model. D. Connect the negative connector of battery, operate the seat adjustment switch, and check the up and down adjustment function of the seat. Is the system normal? →**Yes** Replace the driver's seat adjustment switch. **Refer to: Replacement of driver's seat adjustment switch** →**No** To Step 6.
6. Check the up and down adjuster motor for driver’s seat	
	A. Replace the up and down adjuster motor of driver's seat. **Refer to: Replacement of the up and down adjuster motor of driver's seat** Confirms that the troubleshooting is successful.

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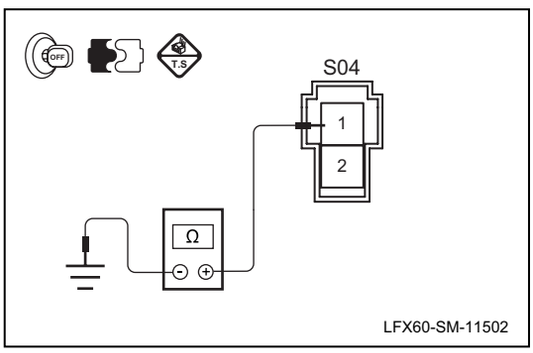
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Diagnostic process for backrest adjuster motor for driver's seat does not operate

Test condition	Details/results/measures
1. General inspection	
	A. Check the seat harness plugs for breakage, loose contact, aging or looseness. Is it OK after checking? →**Yes** To Step 2. →**No** Repair the fault parts.
2. Check the fuse.	
	A. Check the fuse FS26. **Fuse rated capacity: 20A** Is it OK after checking? →**Yes** To Step 3. →**No** Replace the fuse.
3. Check the electric seat power.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the seat power harness plug S04. C. Connect the battery negative terminal and operate the start switch to turn the power to ON state. D. Measure the voltage between the No.2 terminal of the harness plug S04 of the power supply for seats and the reliable grounding. **Standard voltage: 11 ~ 14V** Is the voltage normal? →**Yes** To Step 4. →**No** Repair the electric seat power line open circuit fault and replace the harness if necessary.

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Test condition	Details/results/measures
4. Check the electric seat ground line.	
	A. Operate the start switch to set the power mode to the “OFF” state. B. Disconnect the seat power harness plug S04. C. Measure the resistance between the No.1 terminal of the harness plug S04 of the power supply for seats and the reliable grounding. **Standard Resistance:less than 5 Ω** Is the resistance normal? →**Yes** To Step 5. →**No** Repair the electric seat ground line open circuit fault.
5. Check the seat adjustment switch.	
	A. Operate the start switch to set the power mode to the “OFF” state. B. Disconnect the battery negative connector. C. Remove the seat adjustment switch and replace it with the normal switch of the same model. D. Connect the negative connector of battery, operate the seat adjustment switch, and check the seat adjustment function. Is the system normal? →**Yes** Replace the driver's seat adjustment switch. **Refer to: Replacement of driver's seat adjustment switch** →**No** To Step 6.
6. Check the backrest adjuster motor for driver’s seat	
	A. Replace the backrest adjuster motor of driver's seat. **Refer to: Replacement of driver's seat backrest adjustment motor** Confirms that the troubleshooting is successful.

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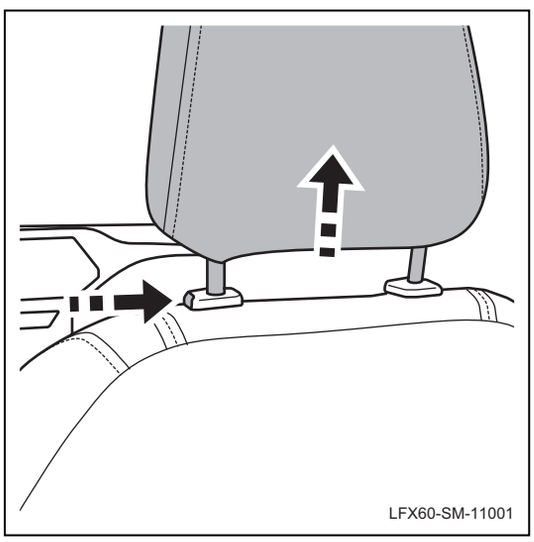
AutoLibrary

Removal and installation

Replacement of headrest assembly

Removal

1. Remove the headrest assembly.



(a). Press the headrest adjustment button.
(b). Take off the headrest assembly.

Installation

1. Install the headrest assembly.
(a). The installation sequence is the reverse of the disassembly order.

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Replacement of driver's seat assembly

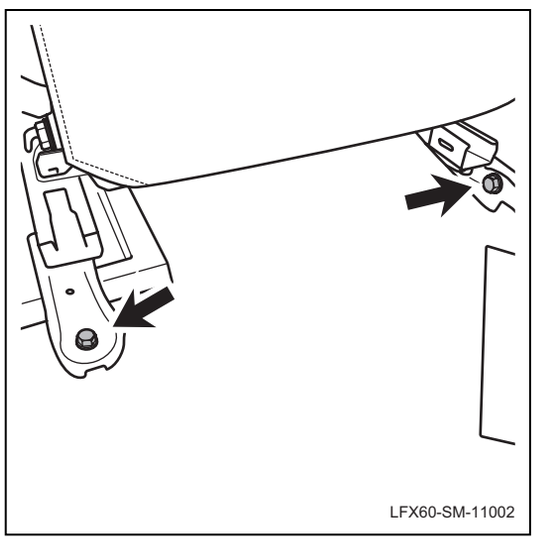
Removal

1. Remove the driver's seat assembly

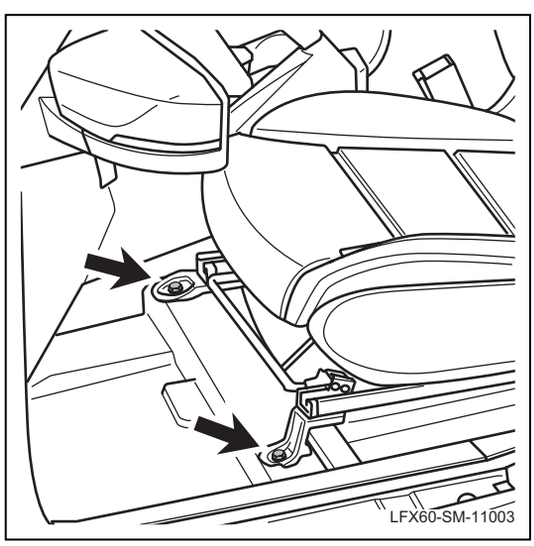
(a). Disconnect the battery negative connector.

(b). Remove the headrest assembly, **refer to:Replacement of headrest assembly.**

(c). Remove the trim cover of rear fixing bolts for driver's seat assembly.



(d). Adjust the driver's seat assembly to the most forward position.Remove the rear fixing bolts for driver's seat assembly.



(e). Remove the trim cover of front fixing bolts for driver's seat assembly.

(f). Adjust the driver's seat assembly to the most backward position.Remove the front fixing bolts for driver's seat assembly.

(g). Separate the harness plug and harness fixing clip on the bottom of the seat.

(h). Take off the driver's seat assembly

Installation

1. Install the driver's seat assembly.

(a). The installation sequence is the reverse of the disassembly order.

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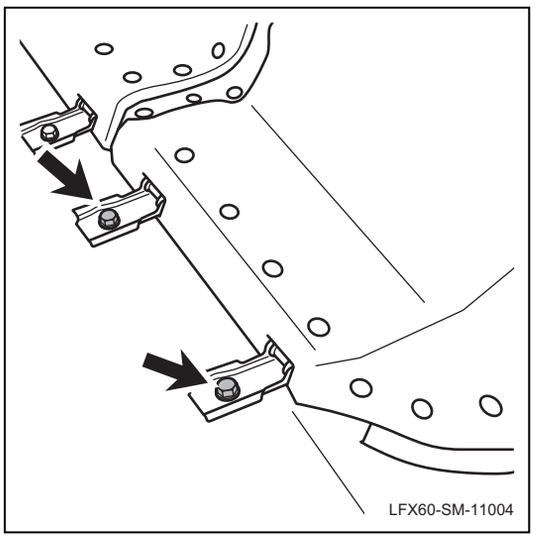
AutoLibrary

Replacement of rear right seat assembly

Removal

1. Remove the rear right seat assembly.

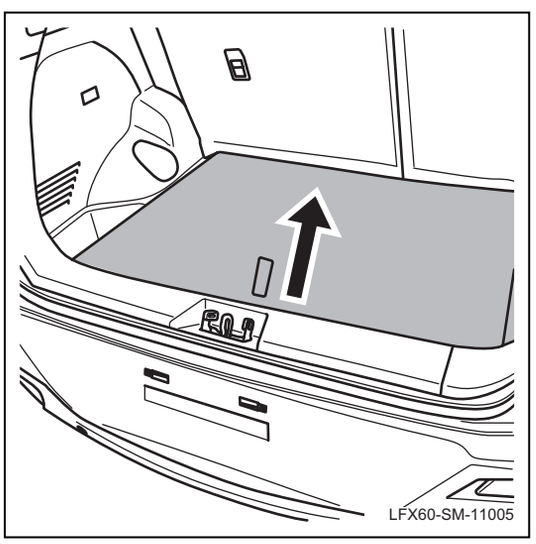
(a). Remove the headrest assembly. **Refer to the replacement of headrest assembly.**



(b). Turn over the rear right seat cushion.

(c). Remove the fixing bolts of the rear right seat cushion.

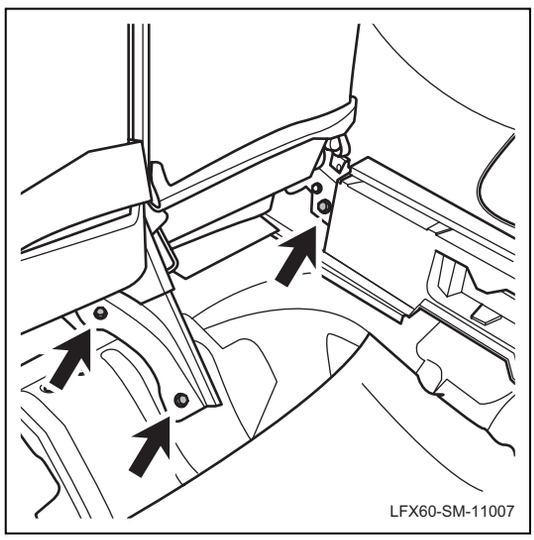
(d). Take off the rear right seat cushion.



(e). Remove the spare tire cover plate decorative parts.

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(f). Lay down the rear right seat backrest.
(g). Remove the fixing bolts of the rear right seat backrest.
(h). Take off the rear right seat assembly.

Installation

1. Install the rear right seat assembly.

(a). The installation sequence is the reverse of the disassembly order.

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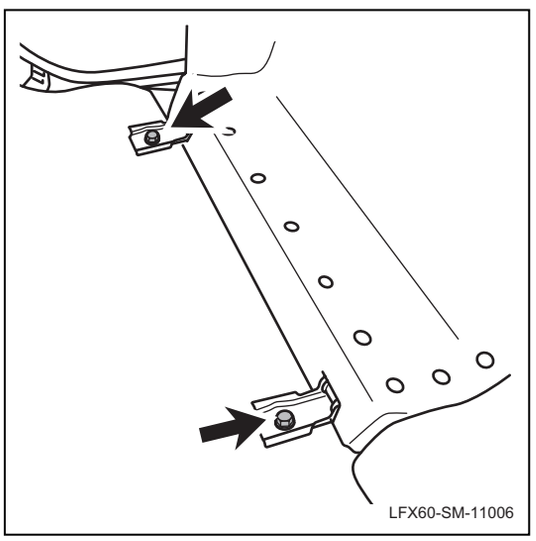
AutoLibrary

Replacement of rear left seat assembly

Removal

1. Remove the rear left seat assembly.

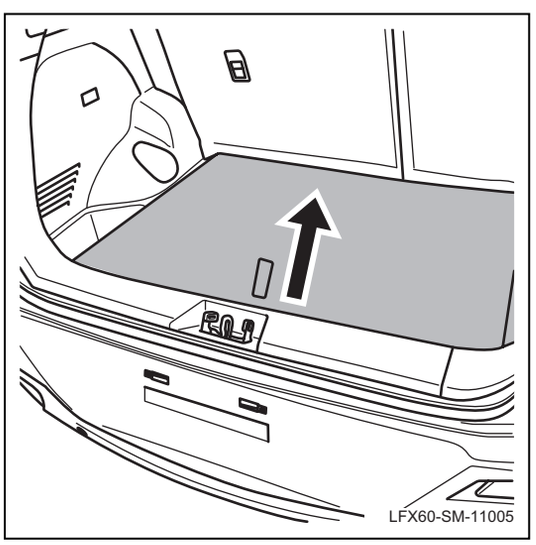
(a). Remove the headrest assembly. **Refer to the replacement of headrest assembly.**



(b). Turn over the rear left seat cushion.

(c). Remove the fixing bolts of the rear left seat cushion.

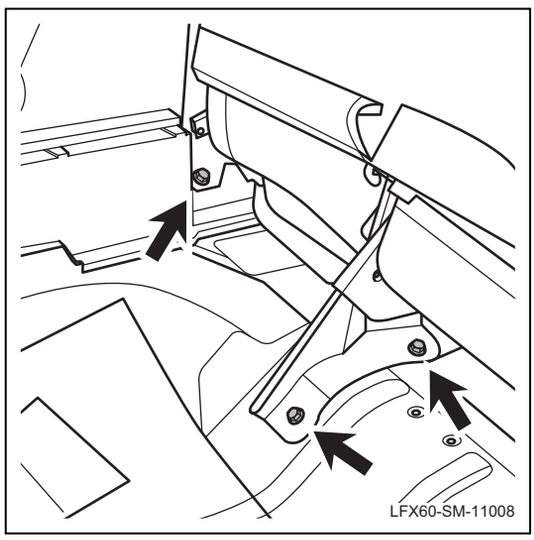
(d). Take off the rear left seat cushion.



(e). Remove the spare tire cover plate decorative parts.

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(f). Lay down the rear left seat backrest.
(g). Remove the fixing bolts of the rear left seat backrest.

Installation

1. Install the rear left seat assembly.
(a). The installation sequence is the reverse of the disassembly order.

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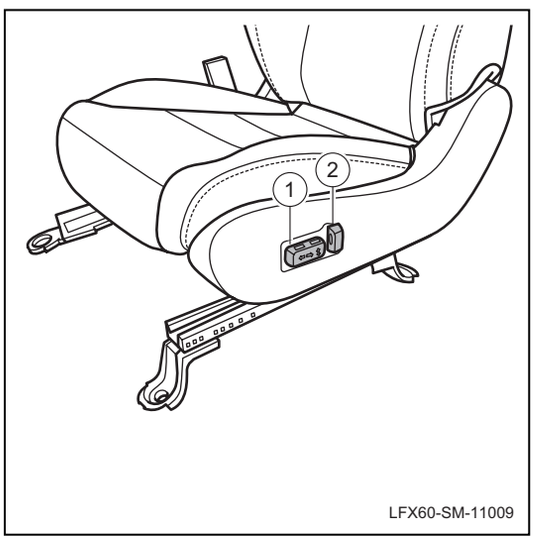
AutoLibrary

Replacement of seat adjustment switch

Removal

1. Remove the seat adjustment switch.

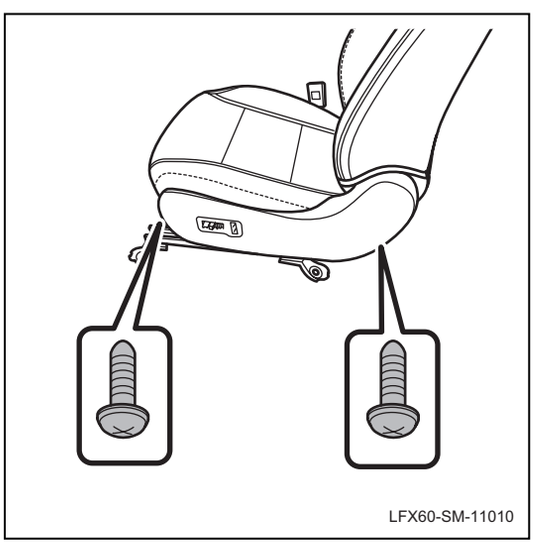
(a). Disconnect the battery negative connector.



LFX60-SM-11009

(b). Remove the adjustment knob 1 of seat cushion adjustment switch.

(c). Remove the adjustment knob 2 of seat backrest adjustment switch.

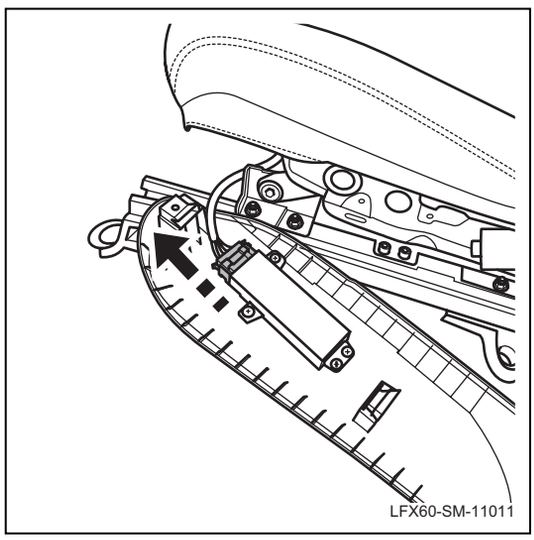

LFX60-SM-11010

(d). Remove the front and rear fixing screws of seat trim panel.

(e). Move the seat trim panel to the outside.

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(f). Disconnect the harness plug of seat adjustment switch.
(g). Remove the seat trim panel.
(h). Remove the fixing screw of seat adjustment switch, and take off the adjustment switch.

Installation

1. Install the seat adjustment switch.

(a). The installation sequence is the reverse of the disassembly order.

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Replacement of the adjuster motor of driver's seat cushions

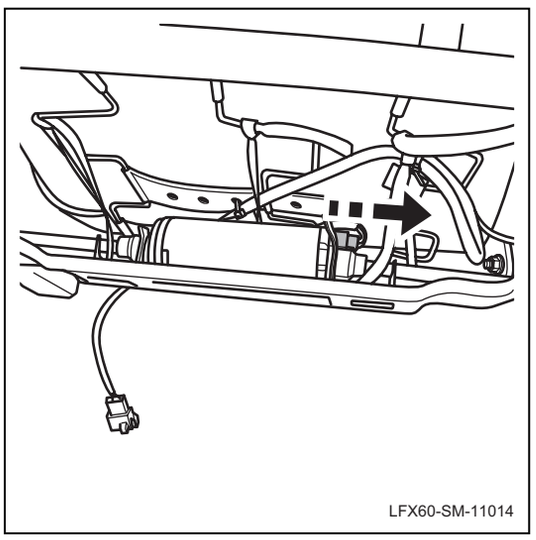
Removal

1. Remove the adjuster motor of driver's seat cushions.

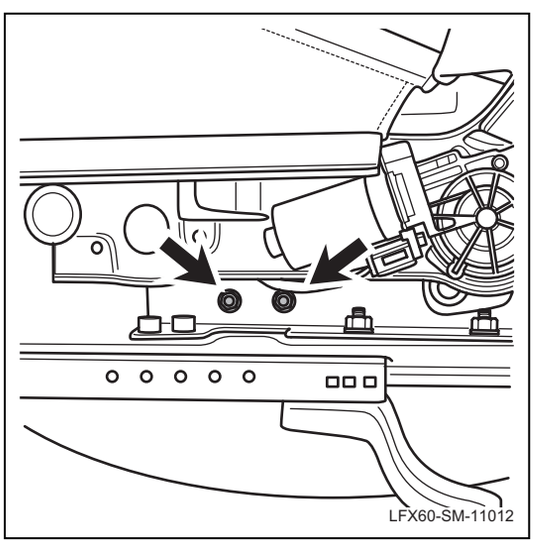
(a). Disconnect the battery negative connector.

(b). Remove the driver's seat assembly. **Refer to the replacement of driver's seat assembly.**

(c). Remove the seat exterior trim board. **Refer to the replacement of seat adjustment switch.**



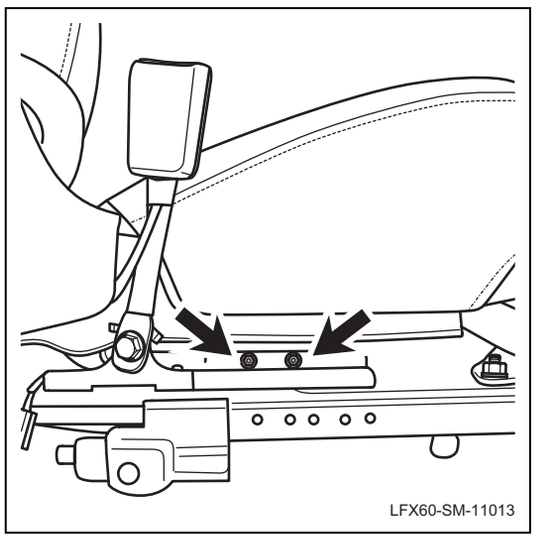
(d). Disconnect the harness plug of the adjuster motor.



(e). Remove the fixing screw on the left side of the adjuster motor.

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(f). Remove the fixing screw on the right side of the adjuster motor.

(g). Take off the adjuster motor of driver's seat cushions.

Installation

1. Install the adjuster motor of driver's seat cushions.

(a). The installation sequence is the reverse of the disassembly order.

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Replacement of the adjuster motor of driver's seat backrest

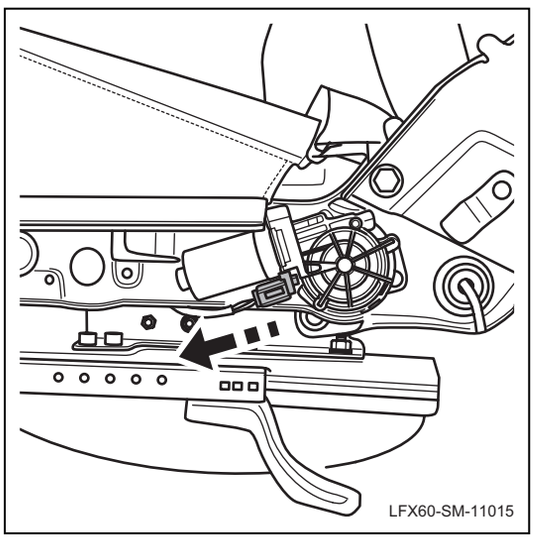
Removal

1. Remove the adjuster motor of driver's seat backrest.

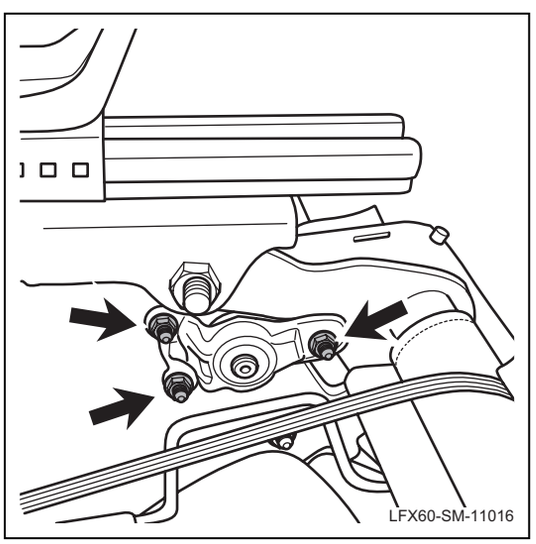
(a). Disconnect the battery negative connector.

(b). Remove the driver's seat assembly. **Refer to the replacement of driver's seat assembly.**

(c). Remove the seat exterior trim board. **Refer to the replacement of seat adjustment switch.**



(d). Disconnect the harness plug of the adjuster motor of driver's seat backrest.



(e). Remove the fixing nut of the adjuster motor of driver's seat backrest.

(f). Take off the adjuster motor of driver's seat backrest.

Installation

1. Install the adjuster motor of driver's seat backrest.

(a). The installation sequence is the reverse of the disassembly order.

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11- Interior trim

Interior trim..... 11-1469
Precautions 11-1469
Preparation..... 11-1470
Removal and installation ... 11-1471

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Interior trim

Precautions

Precautions

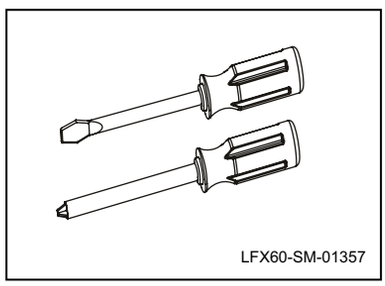
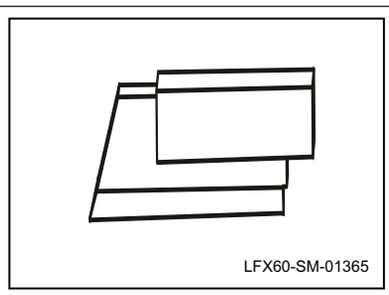
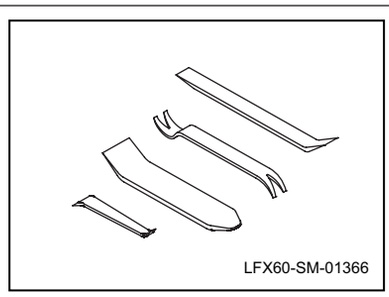
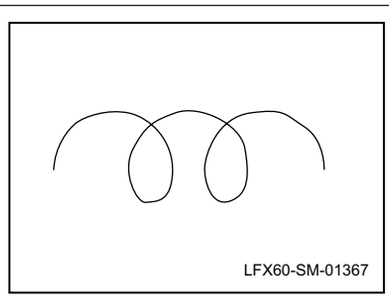
1. Do not remove the interior trim board with the sharp tool. Instead, cover the tool with the cloth when removing the board.
2. If the harness plug should be removed, disconnect the battery negative terminal first.
3. Before the repair, fit the protective sheath over the seats and steering wheel.
4. Do not pull the harness while disconnecting the system component plug so as to prevent damaging the harness.
5. Remove the interior and exterior trims system components. Use the special tools.
6. During the removal of interior and exterior trim system components, if it is difficult to remove, do not take down the component forcedly. Check for buckle or screw omission before operating.
7. Avoid the oil or chemicals contacting the interior trims or exterior trims so as to prevent the corrosion.

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Preparation

General maintenance tools

No.	Tool name	Tool figure	Tool code	Remarks
1	Screwdriver	 LFX60-SM-01357	-	To remove and install the screw and pry the snap ring etc.
2	Knife	 LFX60-SM-01365	-	Cut glass sealing apart
3	Interior and exterior trims pry plate	 LFX60-SM-01366	-	Remove the interior/ exterior trims
4	Steel wire	 LFX60-SM-01367	-	Remove windshield

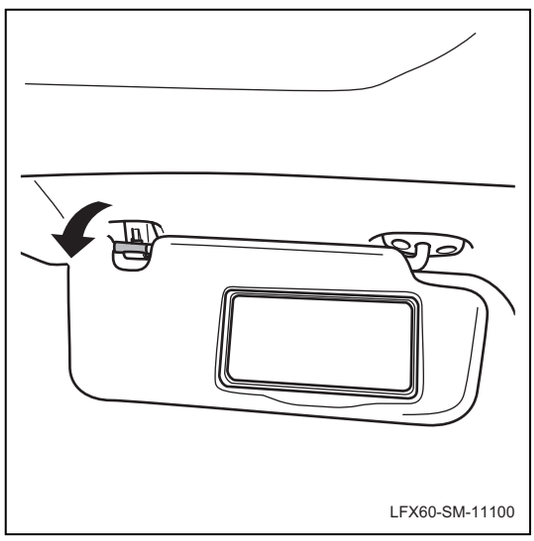
AutoLibrary

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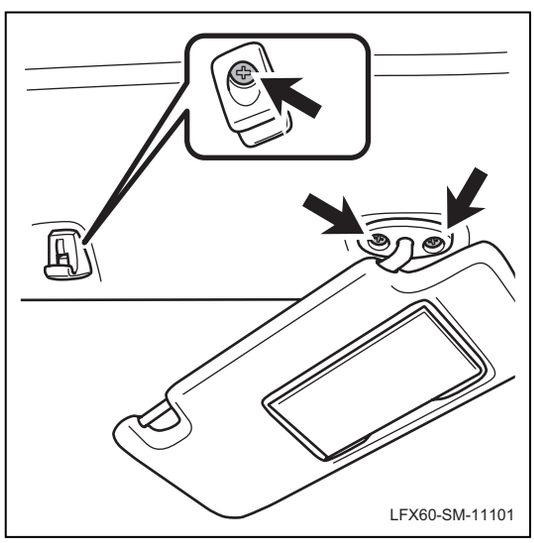
Removal and installation

Replacement of the sun visor

1. Remove the sun visor.



(a). Remove the sun visor from the hook.



(b). Remove the fixing screw of the sun visor and hook.
(c). Take off the sun visor.

Installation

1. Install the sun visor.
(a). The installation sequence is the reverse of the disassembly order.

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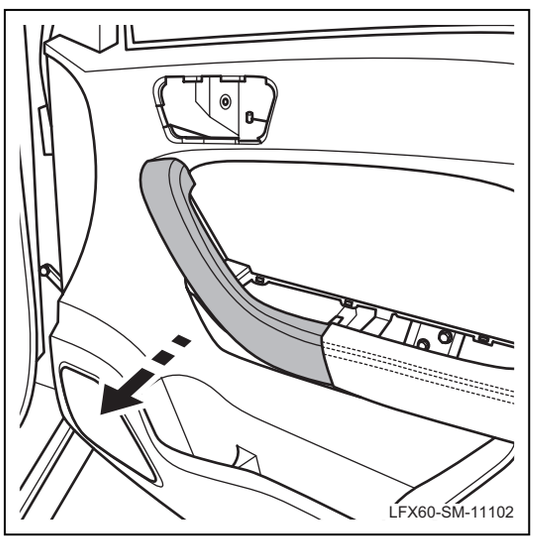
Replacement of front door inner board

Removal

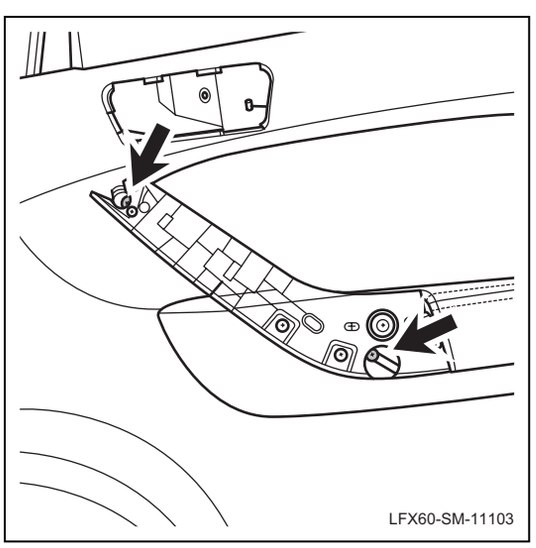
1. Remove the front door inner board.

(a). Remove the handhold of front door inner board, **refer to:Replacement of handhold of front door inner board.**

(b). Remove the power window switch, **refer to:Replacement of the power window switch.**



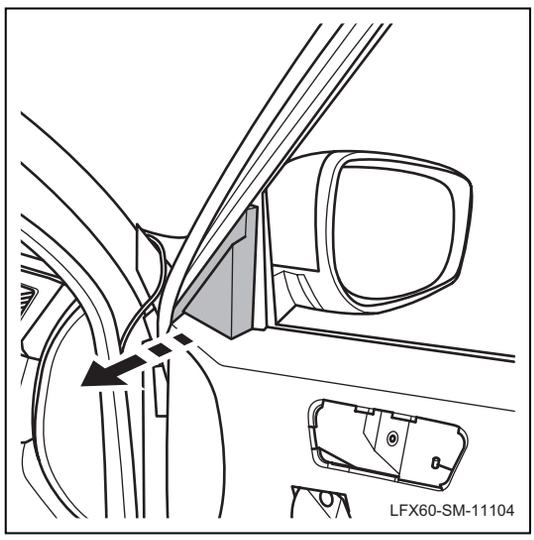
(c). Use the appropriate tool to remove the trim panel of handhold.



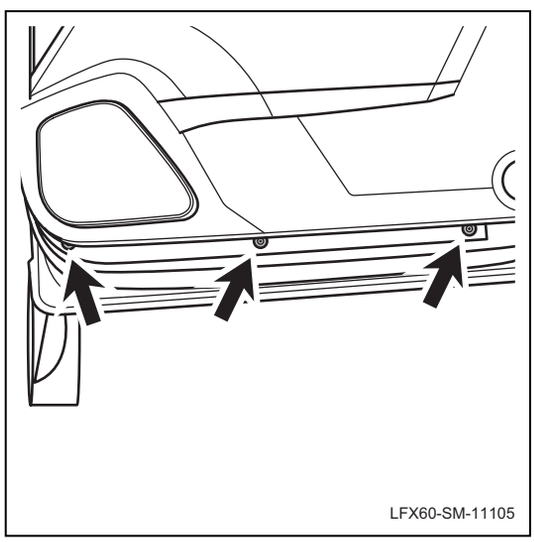
(d). Remove the pull decorative panel inside fixing screw.

AutoLibrary

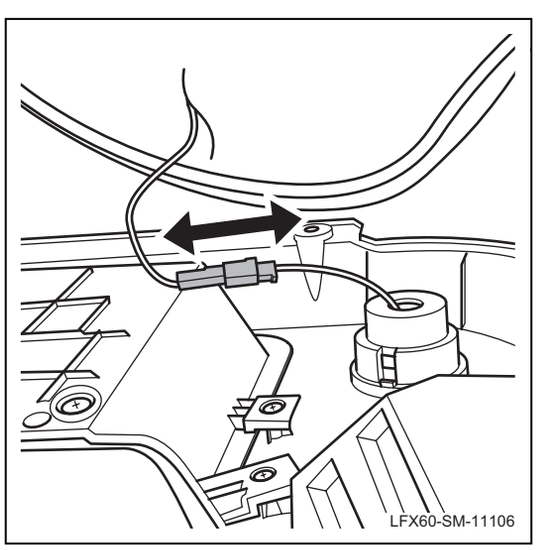
AutoLibrary



(e). Remove the pull decorative panel inside fixing screw.



(f). Remove the lower fixing screws on the front door inner board.



(g). Use the appropriate tool to remove the front door inner board.
(h). Disconnect the harness plug of speaker, and take off the front door inner board.

Installation

1. Install the front door inner board.

(a). The installation sequence is the reverse of the disassembly order.

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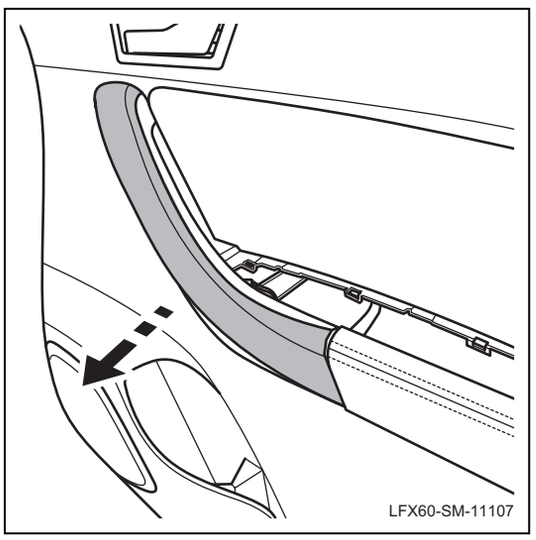
Replacement of rear door inner board

Removal

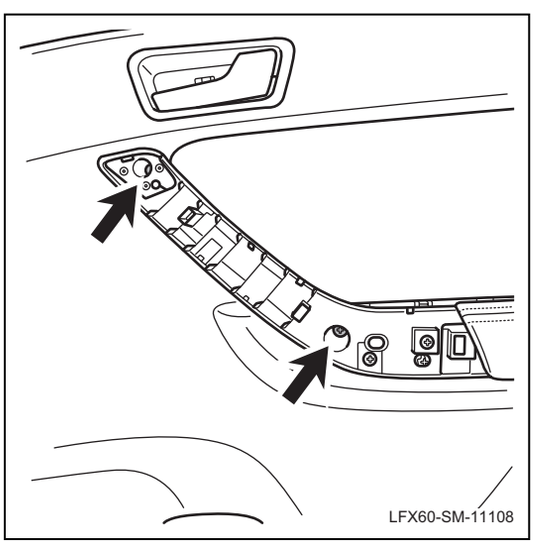
1. Remove the rear door inner board.

(a). Remove the handhold of rear door inner board, **refer to:Replacement of handhold of inner board.**

(b). Remove the power window switch of the rear door, **refer to:Replacement of the power window switch.**



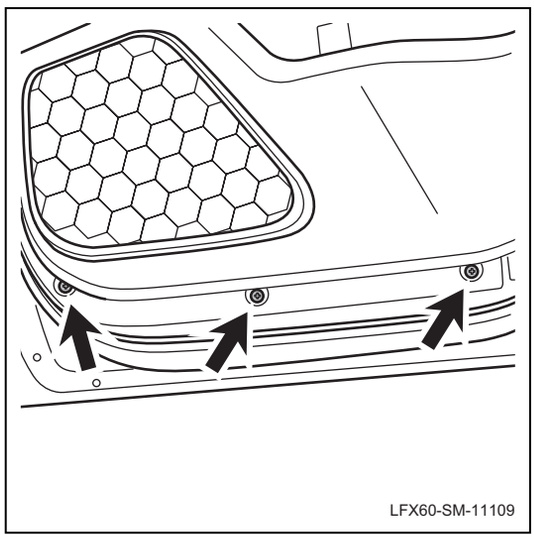
(c). Use the appropriate tool to remove the handhold cover of rear door.



(d). Remove the fixing screws of rear door handhold.

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(e). Remove the lower fixing screws of rear inner board.
(f). Remove the rear door inner board.

Installation

1. Install the rear door inner board.
(a). The installation sequence is the reverse of the disassembly order.

AutoLibrary

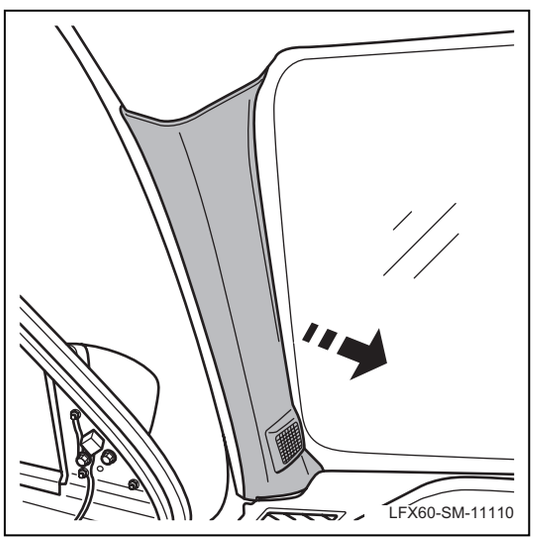
AutoLibrary

Replacement of A pillar upper trim board

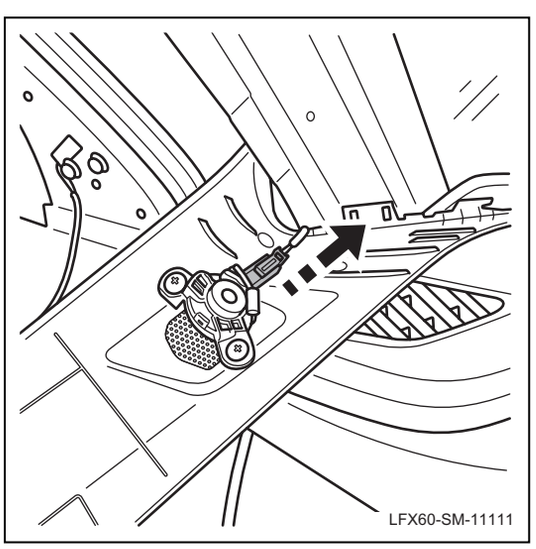
Removal

1. Remove the upper trim panel of the A-pillar.

(a). Disconnect the battery negative connector.



(b). Remove the door seal.
(c). Use the appropriate tool to remove the upper trim panel of the A-pillar.



(d). Disconnect the harness plug of the front tweeter.
(e). Take off the upper trim panel of the A pillar.

Installation

1. The installation sequence is reverse to the removal sequence.

ℹNote:

During the installation, ensure to install the trim board buckle in position.

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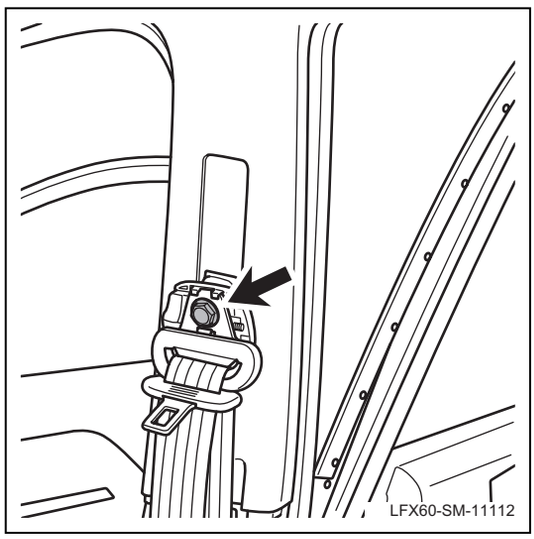
AutoLibrary

Replacement of B pillar upper trim board

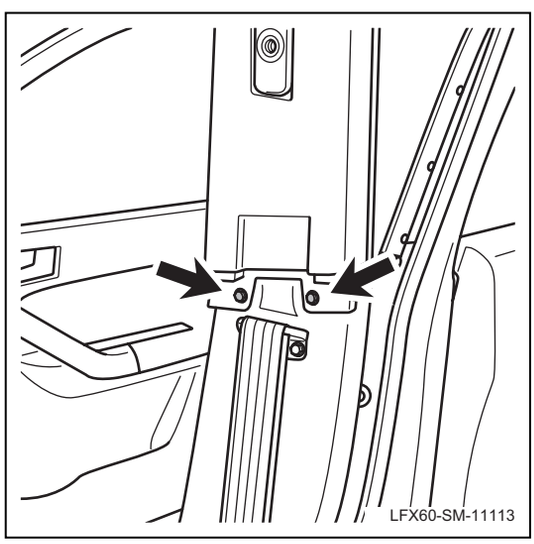
Removal

1. Remove the B pillar upper trim board.

(a). Remove the B pillar lower decorative panel. **Refer to the replacement of B pillar lower decorative panel.**



(b). Use the appropriate tool to remove the trim cover of the upper bolt of front seat belt and remove the upper fixing bolts of front seat belt.



(c). Remove the screws of B-pillar upper trim plate.

(d). Use the appropriate tool to remove the upper trim panel of the B-pillar.

11

Installation

1. Install the B pillar upper decorative panel.

(a). The installation sequence is the reverse of the disassembly order.

ℹNote:

During the installation, ensure to install the trim board buckle in position.

AutoLibrary

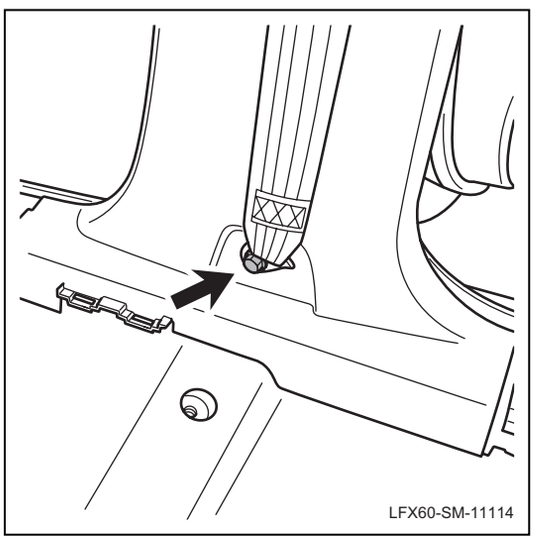
AutoLibrary

Replacement of B pillar lower trim board

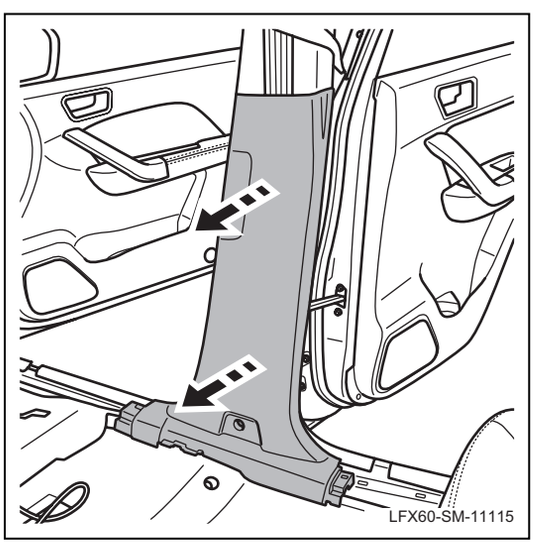
Removal

1. Remove the B pillar lower trim board.

(a). Remove the front and rear door sill, **refer to:Replacement of front and rear door sill.**



(b). Remove the trim part of fixing bolt of seat belt and remove the lower mounting bolts of front seat belt.



(c). Remove the B pillar lower trim board.

Installation

1. Install the B pillar upper decorative panel.

(a). The installation sequence is the reverse of the disassembly order.

ℹNote:

During the installation, ensure to install the trim board buckle in position.

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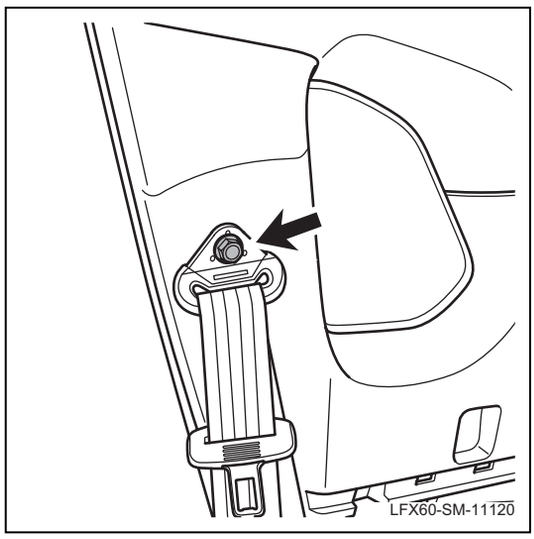
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Replacement of C pillar upper trim board

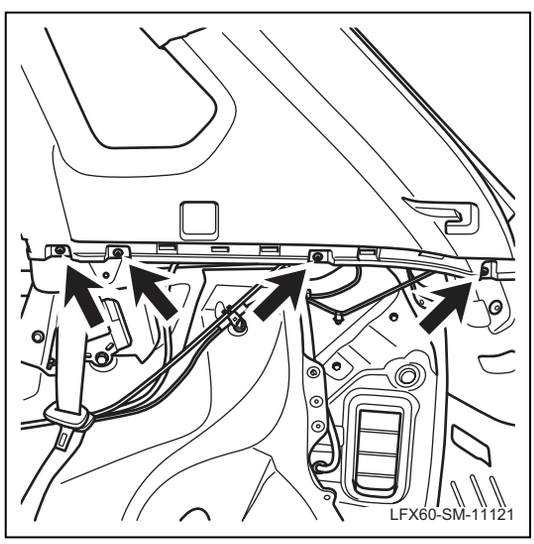
Removal

1. Remove the C pillar upper trim board.

(a). Remove the C pillar lower decorative panel. **Refer to the C pillar lower decorative panel.**



(b). Remove the upper fixing bolts of the rear seat belt.



(c). Remove the fixing screws of upper trim panel on the C-pillar, and remove the upper trim panel of C-pillar.

11

Installation

1. Install the C pillar lower decorative panel.

(a). The installation sequence is the reverse of the disassembly order.

Note:

During the installation, ensure to install the trim board buckle in position.

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Replacement of C pillar lower trim board

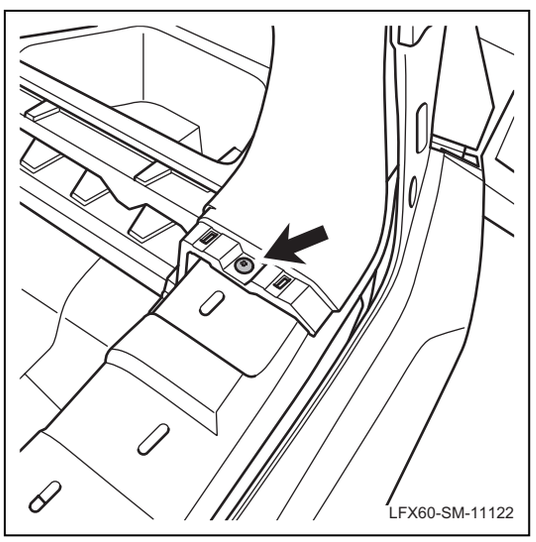
Removal

1. Remove the C pillar lower trim board.

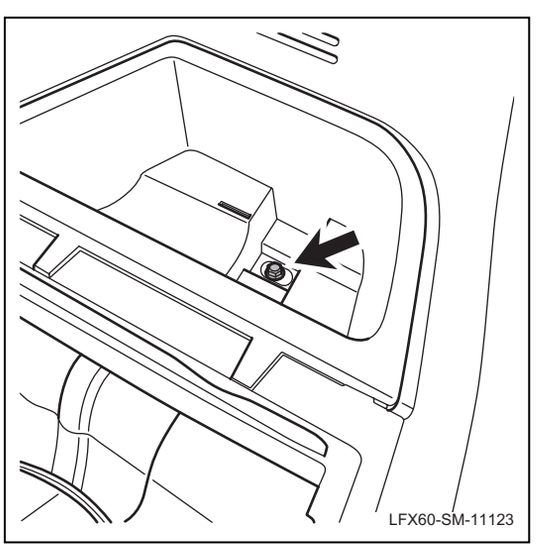
(a). Remove the rear seat, **refer to:Replacement of the rear seat assembly.**

(b). Remove the trim panel of rear door sill, **refer to:Replacement of the trim panel of rear door sill.**

(c). Remove the rear trim panel of trunk, **refer to:Replacement of the rear trim panel of trunk.**



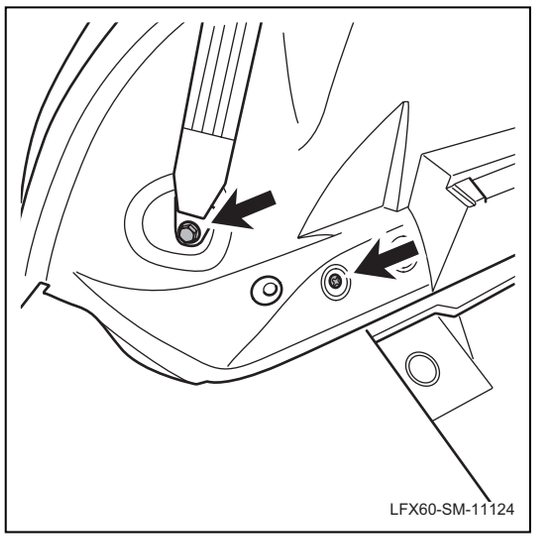
(d). Remove the fixing screws of the lower trim panel of C-pillar.



(e). Remove the inner fixing bolts of the lower trim panel of C-pillar.

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(f). Remove the lower fixing bolt of the rear seat belt and the fixing screws of C-pillar lower trim panel.

(g). Use the appropriate tool to remove the lower trim panel of the C-pillar.

Installation

1. Install the C pillar lower decorative panel.

(a). The installation sequence is the reverse of the disassembly order.

Note:

During the installation, ensure to install the trim board buckle in position.

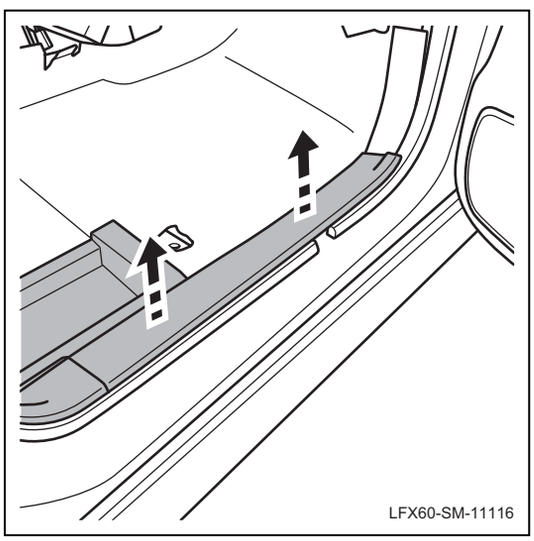
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Replacement of the trim panel of front door sill

Removal

1. Remove the trim panel of front door sill.



(a). Remove the trim panel of front door sill.

Installation

1. Install the trim panel of front door sill.

(a). The installation sequence is the reverse of the disassembly order.

ℹNote:

During the installation, ensure to install the trim board buckle in position.

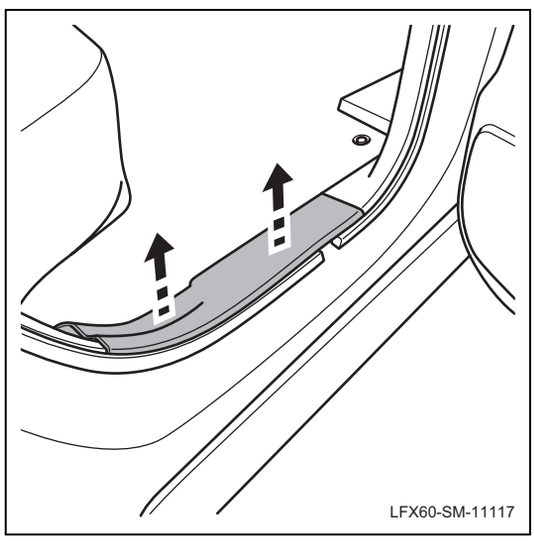
AutoLibrary

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Replacement of the trim panel of rear door sill

Removal

1. Remove the trim panel of rear door sill.



(a). Remove the trim panel of rear door sill.

Installation

1. Install the trim panel of rear door sill.

(a). The installation sequence is the reverse of the disassembly order.

Note:

During the installation, ensure to install the trim board buckle in position.

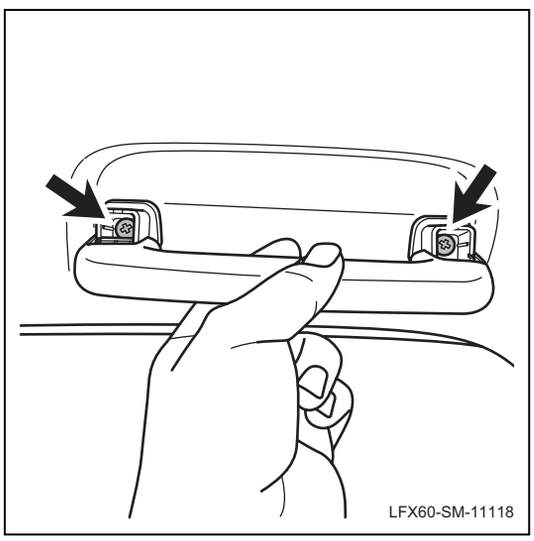
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Replacement of safety handhold

Removal

1. Remove the safety handhold.



(a). Remove the fixing bolt cover of safety handhold.
(b). Remove fixing bolts for safety handle.
(c). Take off the safety handhold.

Installation

1. Install the safety handhold.
(a). The installation sequence is the reverse of the disassembly order.

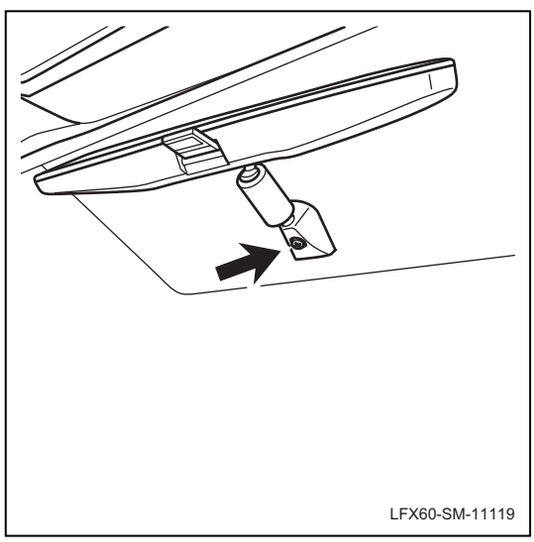
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Replacement of interior rearview mirror

Removal

1. Remove the interior rearview mirror



(a). Remove the fixing screw of the rearview mirror and take off the rearview mirror.

Installation

1. The installation sequence is reverse to the removal sequence.

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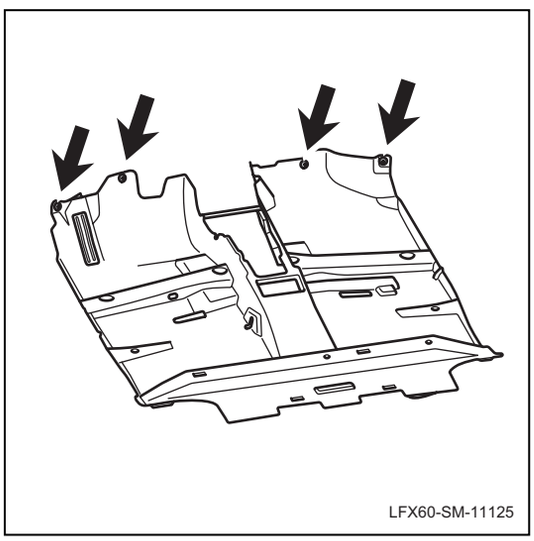
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Replacement of carpet inside the vehicle

Removal

1. Remove the front carpet inside the vehicle.

(a). Disconnect the battery negative connector.
(b). Remove the front seat, **refer to:Replacement of the front seat assembly.**
(c). Remove the rear seat, **refer to:Replacement of the rear seat assembly.**
(d). Remove the front and rear door sill trim panel, **refer to:Replacement of the door sill trim panel.**
(e). Remove the left and right lower trim panel of B-pillar, **refer to:Replacement of the lower trim panel of B-pillar.**
(f). Remove the left and right lower trim panel of A-pillar, **refer to:Replacement of the lower trim panel of A-pillar.**
(g). Remove the sub-dashboard, **refer to:Replacement of the console assembly.**



(h). Disconnect the shielded harness plug and clip, use scissors to cut the edges and corners.
(i). Remove the fixing clip of carpet clip and take off the carpet assembly.

Installation

1. Install the front carpet inside the vehicle.

(a). The installation sequence is the reverse of the disassembly order.

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Replacement of the inner trim of roof

Removal

1. Remove the front inner trim of roof.

(a). Remove the left and right upper trim panel of A-pillar, **refer to:Replacement of the upper trim panel of A-pillar.**

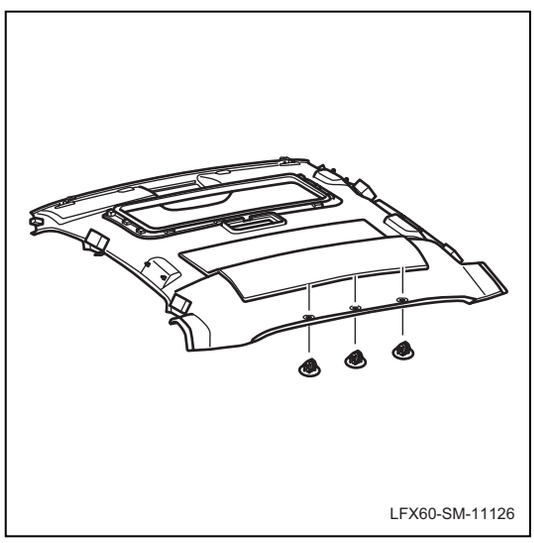
(b). Remove the left and right upper trim panel of B-pillar, **refer to:Replacement of the upper trim panel of B-pillar.**

(c). Remove the left and right sun visor, **reference:Replacement of sun visor.**

(d). Remove the rearview mirror, **refer to:the replacement of the rearview mirror.**

(e). Remove the front interior lights, **refer to:Replacement of the front interior lights.**

(f). Remove the safety handhold, **refer to:Replacement of safety handhold**


LFX60-SM-11126

(g). Remove the plastic clip of the inner trim of roof.

(h). With the help of the assistant, remove the inner trim of roof from the inside of the vehicle.

11

Installation

1. Install the front inner trim of roof.

(a). The installation sequence is the reverse of the disassembly order.

ⓘNote:

Before Installing plastic clamp, be sure to sort out roof wiring to prevent it from being pressed in the roof.

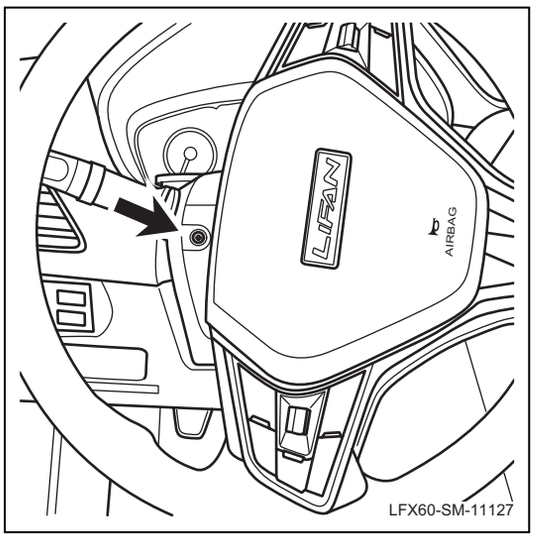
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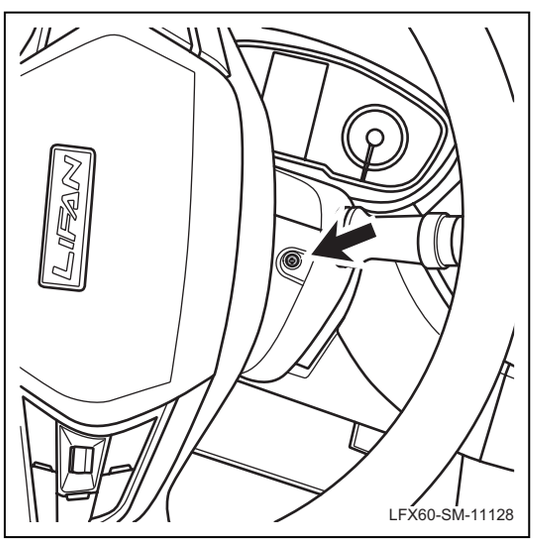
Replacement of Steering Column Cover

Removal

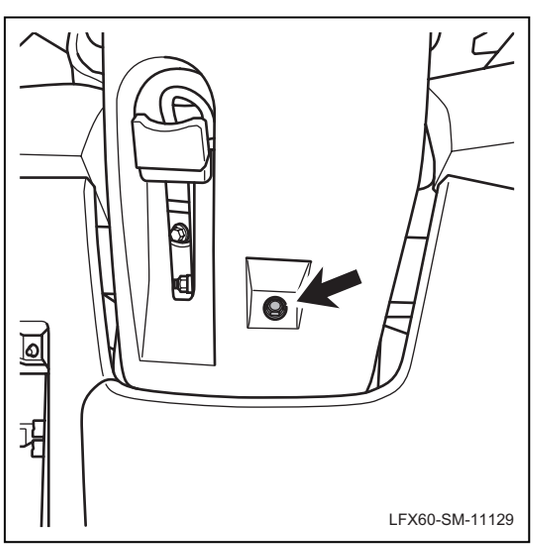
1. Remove the steering column cover.



(a). Turn the steering wheel and remove the left side fixing screw of steering column cover.



(b). Turn the steering wheel and remove the right side fixing screw of steering column cover.



(c). Remove the fixing screw of the lower cover of steering column.

(d). Remove the upper and lower cover of steering column, respectively.

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Installation

1. Install the steering column cover.

(a). The installation sequence is the reverse of the disassembly order.

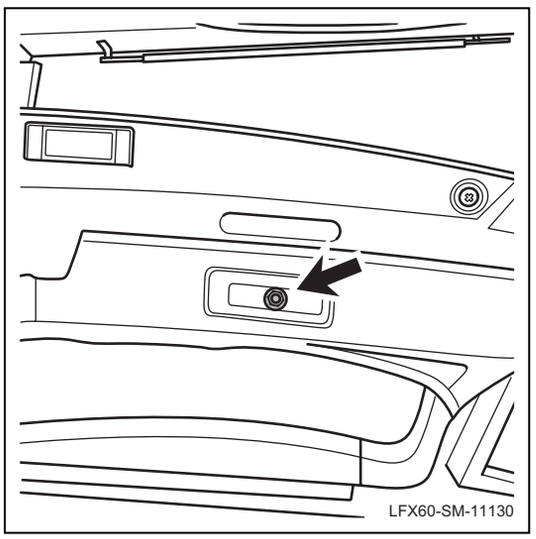
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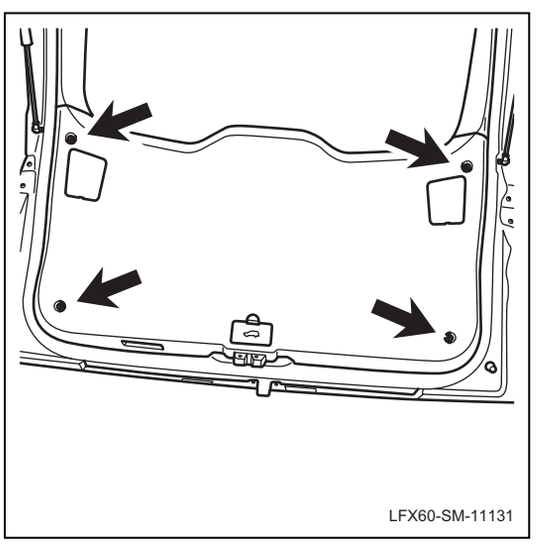
Replacement of the back door trim panel

Removal

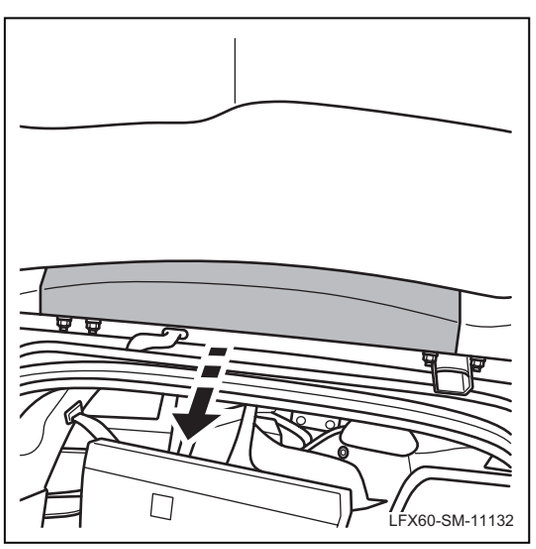
1. Remove the back door trim panel.



(a). Remove the fixing bolts of the back door trim panel.



(b). Remove the fixing bolts of the back door trim panel, and remove the back door trim panel.



(c). Remove the back door upper panel.
(d). Remove the fixing bolts of the left and right panel of back door.
(e). Take off the left and right panel of back door.

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Installation

1. Install the back door trim panel.

(a). The installation sequence is the reverse of the disassembly order.

❶Note:

During the installation, ensure to install the trim board buckle in position.

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11- Exterior trim

Exterior trim 11-1495
Precautions.....11-1495
Preparation 11-1496
Removal and installation...11-1497

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Exterior trim

Precautions

Precautions

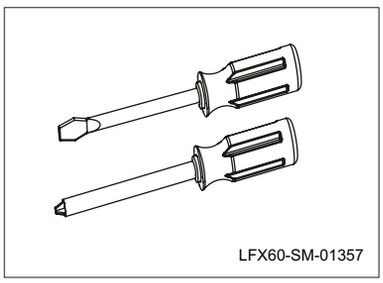
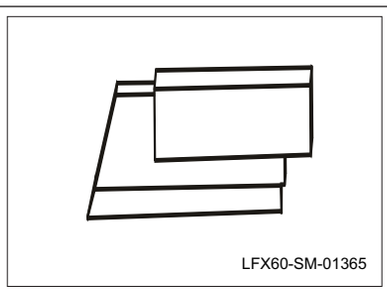
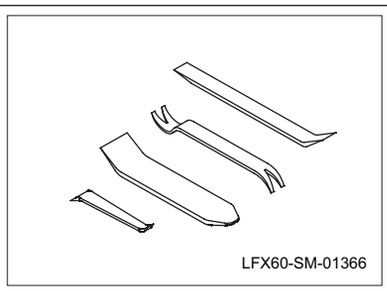
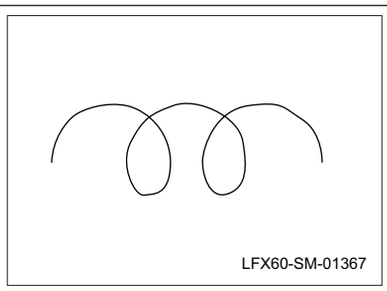
1. Do not remove the interior trim board with the sharp tool. Instead, cover the tool with the cloth when removing the board.
2. If the harness plug should be removed, disconnect the battery negative terminal first.
3. Before the repair, fit the protective sheath over the seats and steering wheel.
4. Do not pull the harness while disconnecting the system component plug so as to prevent damaging the harness.
5. Remove the interior and exterior trims system components. Use the special tools.
6. During the removal of interior and exterior trim system components, if it is difficult to remove, do not take down the component forcedly. Check for buckle or screw omission before operating.
7. Avoid the oil or chemicals contacting the interior trims or exterior trims so as to prevent the corrosion.

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Preparation

General maintenance tools

No.	Tool name	Tool figure	Tool code	Remarks
1	Screwdriver	 LFX60-SM-01357	-	To remove and install the screw and pry the snap ring etc.
2	Knife	 LFX60-SM-01365	-	Cut glass sealing apart
3	Interior and exterior trims pry plate	 LFX60-SM-01366	-	Remove the interior/ exterior trims
4	Steel wire	 LFX60-SM-01367		Remove the windshield.

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Removal and installation

Replace the front bumper assembly

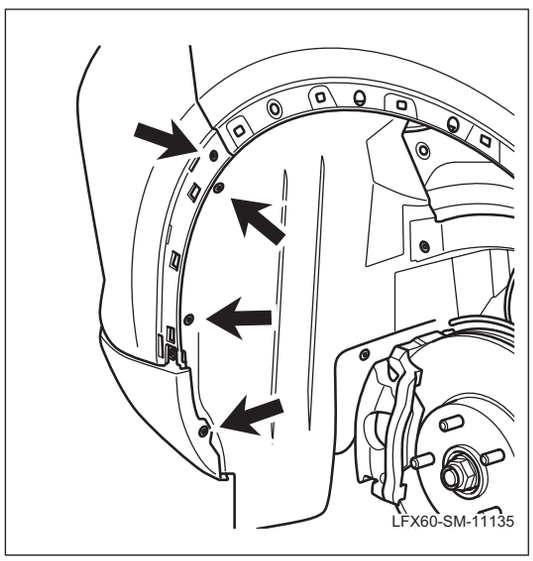
1. Remove the front bumper assembly.

(a). Disconnect the battery negative connector.Disconnect the battery negative connector.

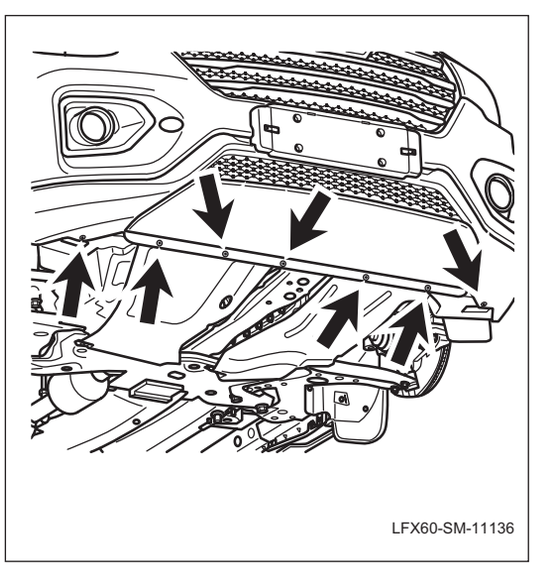
(b). Lift the vehicle. Refer to the vehicle lift and support.

(c). Remove the wheel. Refer to the replacement of tire.

(d). Dissaemble front wheel eyebrow assembly by refering to replacement of the front wheel eyebrow.



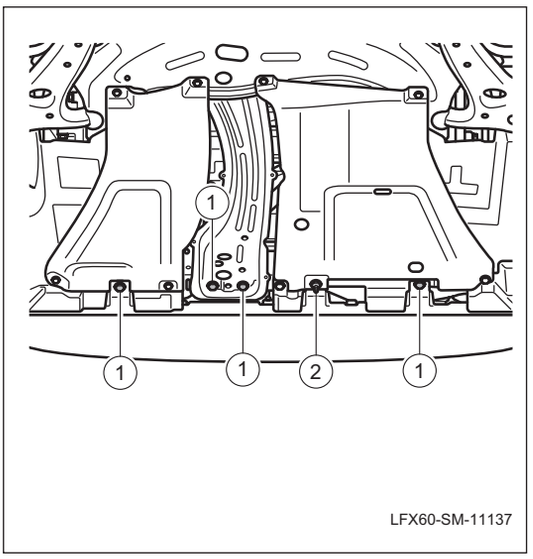
(e). Dissamble plastic fixing screws in front of front wheel covers on both sides.



(f). Dissemble fixing screws under the front bumper.

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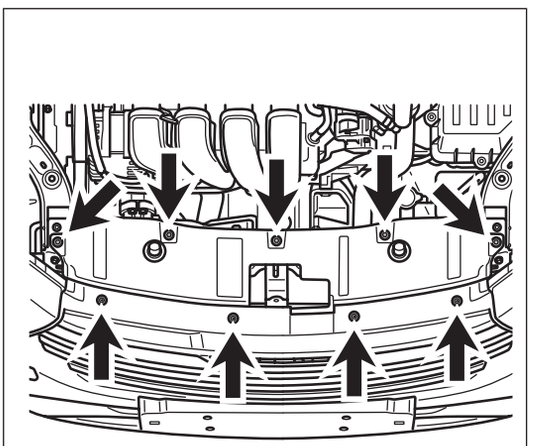
AutoLibrary



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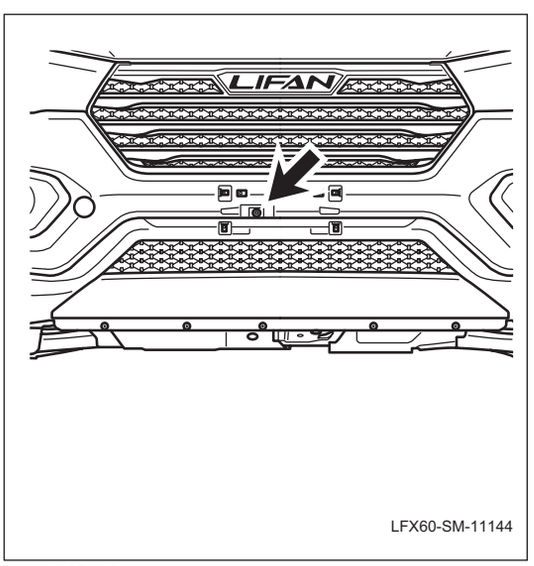
(g). Dissaemble fixing bolt 1 under the front bumper.

(h). Dissaemble fixing nut 2 under the front bumper.


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(i). Disssemble fixing bolts and screws above the front bumper.

(j). Disssemble the front license plate frame.



LFX60-SM-11144

(k). Disssemble fixing bolts at the bottom of the license plate frame of the front bumper .

(l). Remove the assembly of the front bumper and disconnect harness plug of the front fog light and front reserver sensor.

Installation

1. Install assembly of the front bumper.

(a). The installation sequence is the reverse of the disassembly order.

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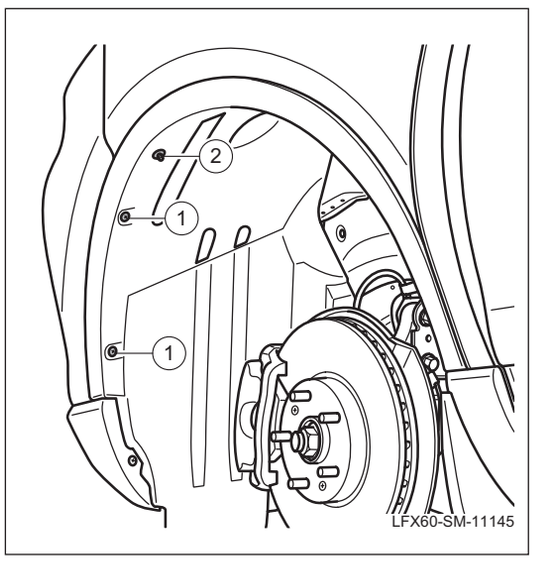
Replace the front wheel eyebrow

Removal

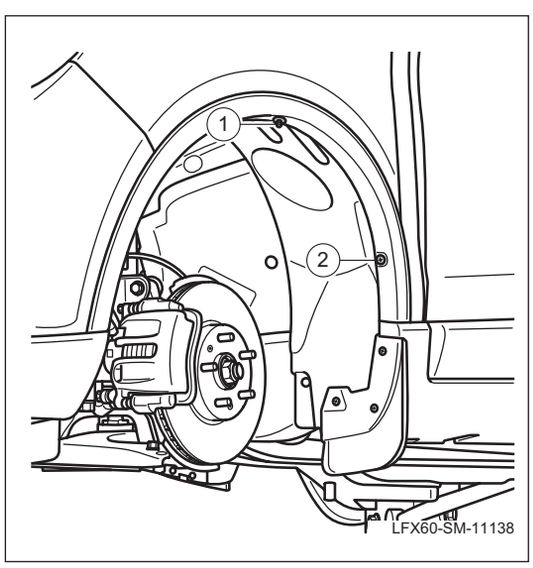
1. Disssemble the assembly of the front wheel eyebrow.

(a). Lift the vehicle. Refer to the vehicle lift and support.

(b). Remove the wheel. Refer to the replacement of tire.



(c). Dsiassemble the fixing screw 1 and fixing fastener 2 of the front wheel eyebrow.



(d). Dsiassemble the fixing screw 2 and fixing fastener 1 of the front wheel eyebrow.

(e). Remove assembly of the front wheel eyebrow.

11

Installation

1. Install the front wheel trim assembly.

(a). The installation sequence is the reverse of the disassembly order.

Note:

During the installation, ensure to install the buckle in position.

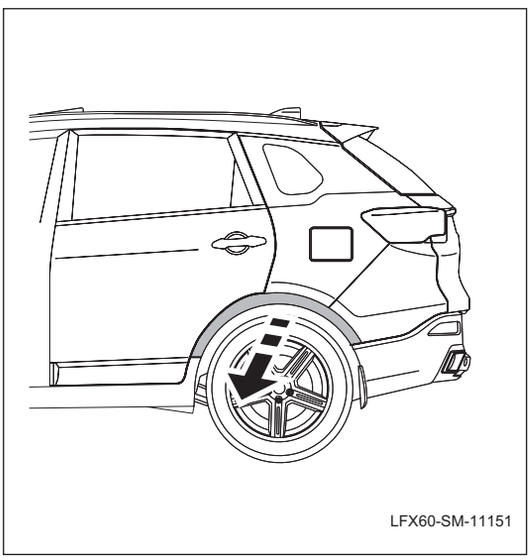
AutoLibrary

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Replace the rear wheel eyebrow

Removal

1. Disssemble the assembly of the rear wheel eyebrow.



(a). Disasemble the rear wheel eyebrow by using a proper tool.

Installation

1. Install the front wheel trim assembly.

(a). The installation sequence is the reverse of the disassembly order.

Note:

During the installation, ensure to install the buckle in position.

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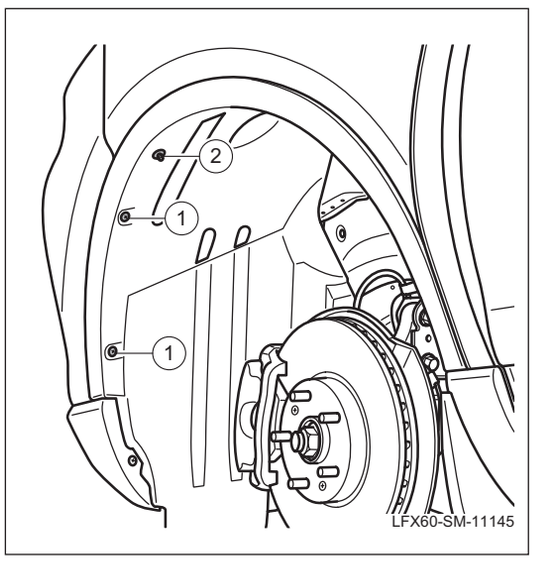
Replace the dashboard

Removal

1. Disassemble the dashboard.

(a). Lift the vehicle. **Refer to the vehicle lift and support.**

(b). Remove the wheel. **Refer to the replacement of tire.**



(c). Disassemble fixing screws of the dashboard.

(d). Remove a dashboard.

Installation

1. Install a front dashboard.

(a). The installation sequence is the reverse of the disassembly order.

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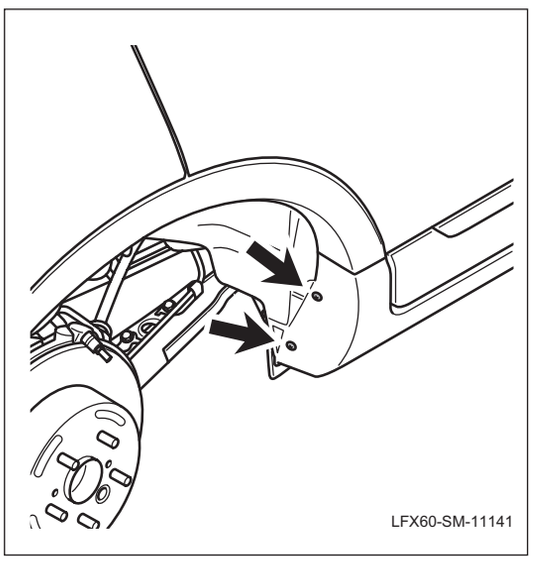
Replace the side skirtboard

Removal

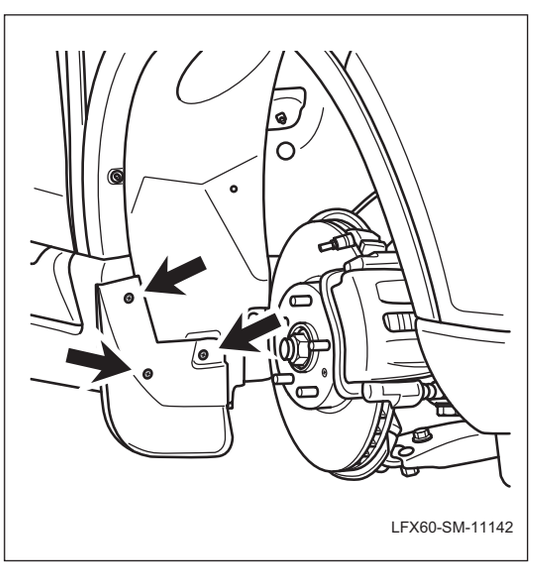
1. Disassemble the side skirtboard.

(a). Lift the vehicle. Refer to the vehicle lift and support.

(b). Remove the wheel. Refer to the replacement of tire.



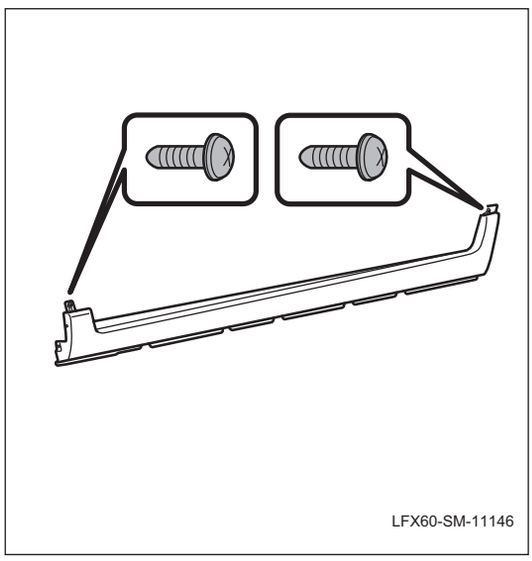
(c). Disassemble fixing screws behind the side skirtboard.



(d). Disassemble fixing screws before the side skirtboard.

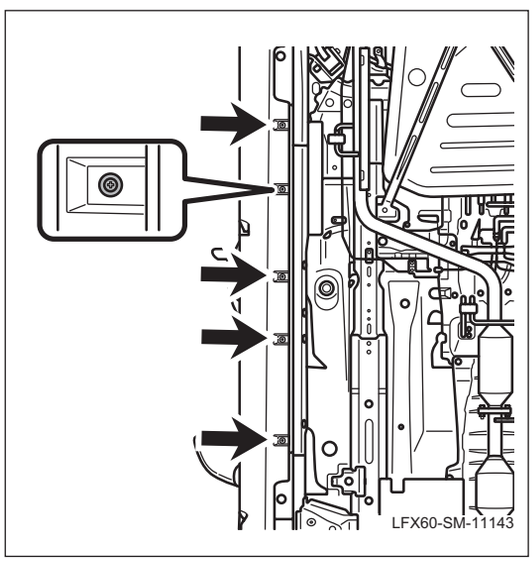
AutoLibrary

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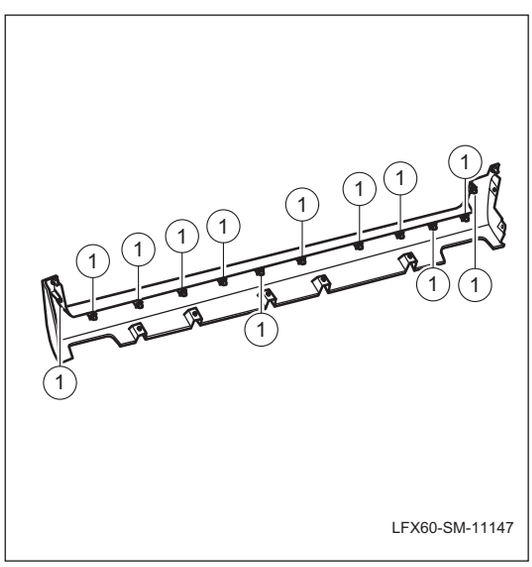


(e). For how to disassemble the wheel eyebrow assembly, refer to replacement of the wheel eyebrow assembly.

(f). Dissemble fixing screws on both sides of the side skirtboard.



(g). Disassemble fixing screws at the bottom of the side skirtboard.



(h). Dissasemble the fixing fastener 1 of the side skirtboard by using a proper tool.

(i). Remove a side skirtboard.

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Installation

1. Install the side skirtboard.

(a). The installation sequence is the reverse of the disassembly order.

Note:

During the installation, ensure to install the buckle in position.

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Replace the rear bumper assembly

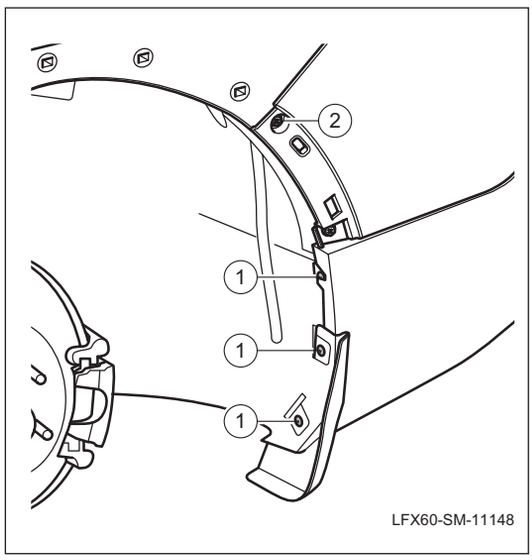
Removal

1. Remove the rear bumper assembly.

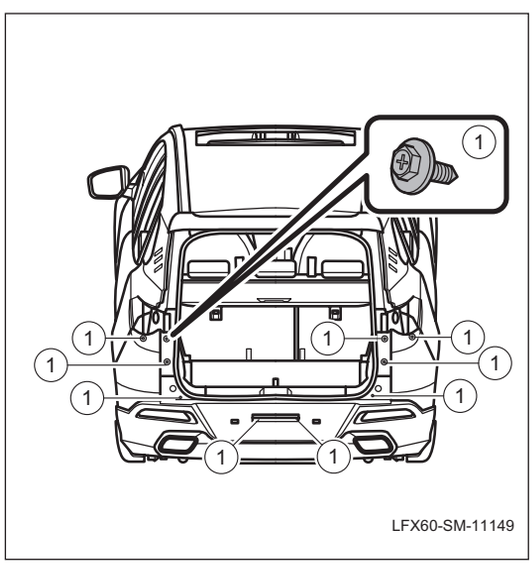
(a). Lift the vehicle. Refer to the vehicle lift and support.

(b). Remove the wheel. Refer to the replacement of tire.

(c). For how to disassemble the wheel eyebrow, refer to replacement of the wheel eyebrow assembly.



(d). Disassemble the fixing screw 1 and fixing bolt 2 on left and right side of the rear bumper.



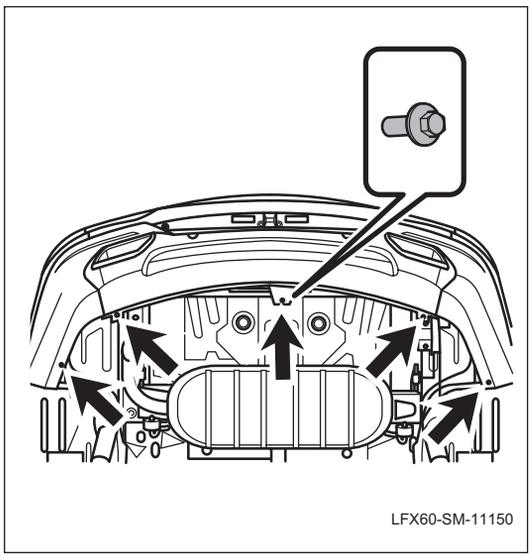
(e). For how to disassemble the rear combined lights, refer to replacement of the rear combined light.

(f). Disassemble the fixing screw 1 of the rear bumper.

11

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(g). Disassemble five fixing bolts at the bottom of the rear bumper.
(h). Disconnect the harness plug of the rear fog light and reverse sensor.
(i). Remove assembly of the rear bumper.

Installation

1. Install assembly of the rear bumper.

(a). The installation sequence is the reverse of the disassembly order.

❶ Note:

During the installation, ensure to install the buckle in position.

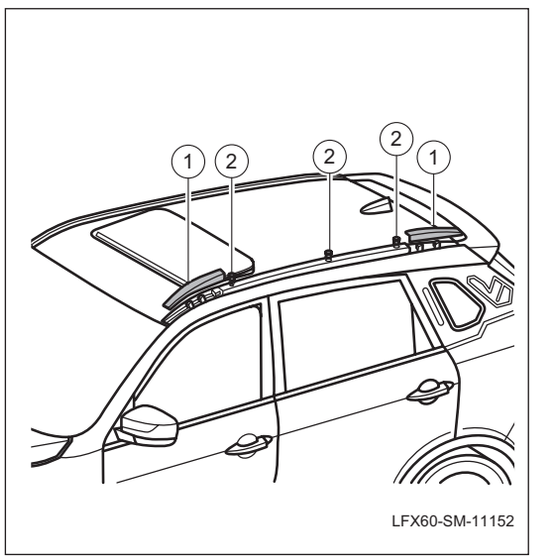
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Replace the luggage carrier assembly

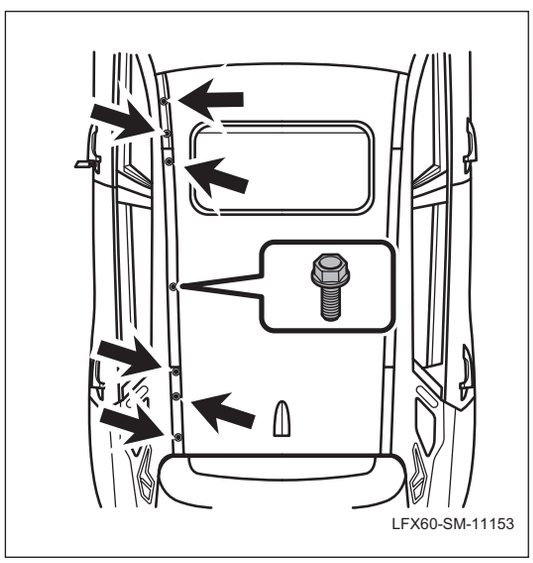
Removal

1. Remove the luggage carrier assembly.

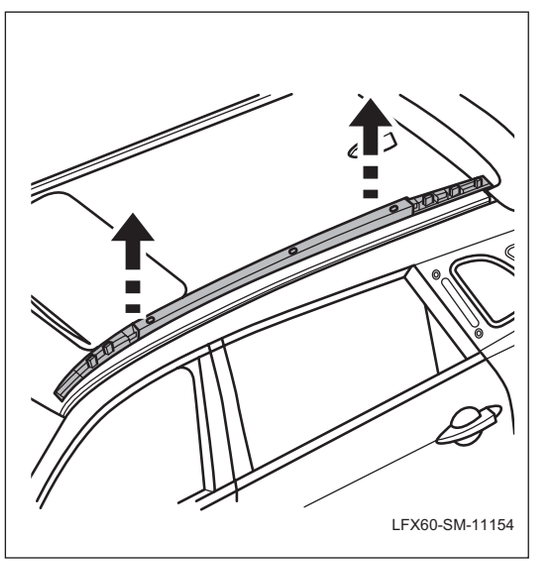


LFX60-SM-11152

(a). Remove the decorative board 1 and decorative cover 2 on the luggage carrier.


LFX60-SM-11153

(b). Disassemble fixing bolts of the luggage carrier assembly.


LFX60-SM-11154

(c). Remove the luggage carrier assembly.

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Installation

1. Install the luggage carrier assembly.

(a). The installation sequence is the reverse of the disassembly order.

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12 - Electrical system

Lighting System.....12-1511

Technical specifications 12-1511

Precautions..... 12-1512

Preparation 12-1513

Structure and installation location 12-1514

General Inspection..... 12-1516

Operating Principle 12-1517

Diagnostic Information and Procedures 12-1520

Removal and Installation .. 12-1568

AutoLibrary

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Lighting System

Technical specifications

Bulb specifications

Name	Specification	Bulb tyoe	Model
Passing Light	12V 55W	Bulb	H7
Headlights on full beam	12V 55W	Bulb	H7
Front fog light	12V 55W	Bulb	H3
Backup light	12V 16W	Bulb	W16W
Forward/rear steering light	12V 21W	Bulb	Forward turn signal H21W Backward turn signal PY21W
Rear fog light	12V 21W	Bulb	P21W
License plate light	/	LED	/
Luggage compartment light	12V 5W	Bulb	W5W
Front/rear position light	/	LED	/
Daytime running light	/	LED	/
Brake light	/	LED /	/

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Precautions

Precautions

Battery notices in check

1. When a battery is used, do not make test instrument probes of the anode and cathode close to each other too much. Otherwise, it will lead to a short circuit.

Notices on replacement of a big bulb

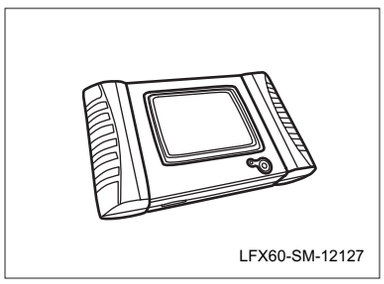
1. When the temperature is higher, the halogen light will break, even a layer of oil film on its surface may damage the bulb.
2. Be careful of operation on the halogen light.
   Because of extremely high pressure inside the bulb, falling, impact and other damage may cause the bulb burst and broken.
3. When a bulb is replaced, if the bulb disassembled from the vehicle is placed for a long period, the lightshade may be coated with some dust and moisture.
4. Make sure to replace with bulbs of same power.
5. Make sure to tightly install the light holder after a bulb is replaced. Clearance around the lamp holder may cause lens unclear, water can also get into lamp cavity through the clearance.

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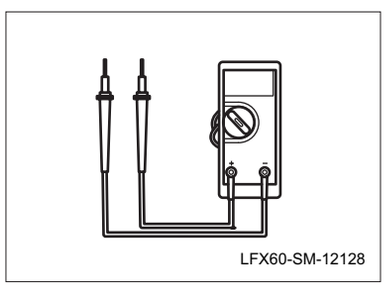
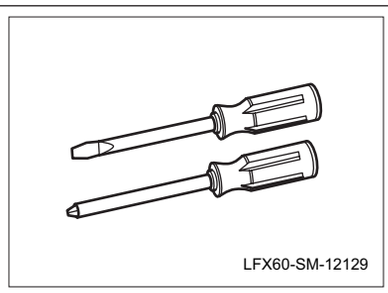
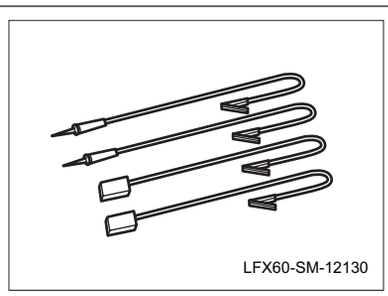
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Preparation

Special Maintenance Tools

No.	Tool name	Tool figure	Tool code	Remarks
1	Diagnosis equipment	 LFX60-SM-12127	-	Lighting system troubleshooting

General Maintenance Tools

No.	Tool name	Tool figure	Tool code	Remarks
1	Digital universal meter	 LFX60-SM-12128	-	Measure the voltage and resistance
2	Screw driver	 LFX60-SM-12129	-	For screw and panel removal
3	Conductor assembly	 LFX60-SM-12130	-	Testing circuit

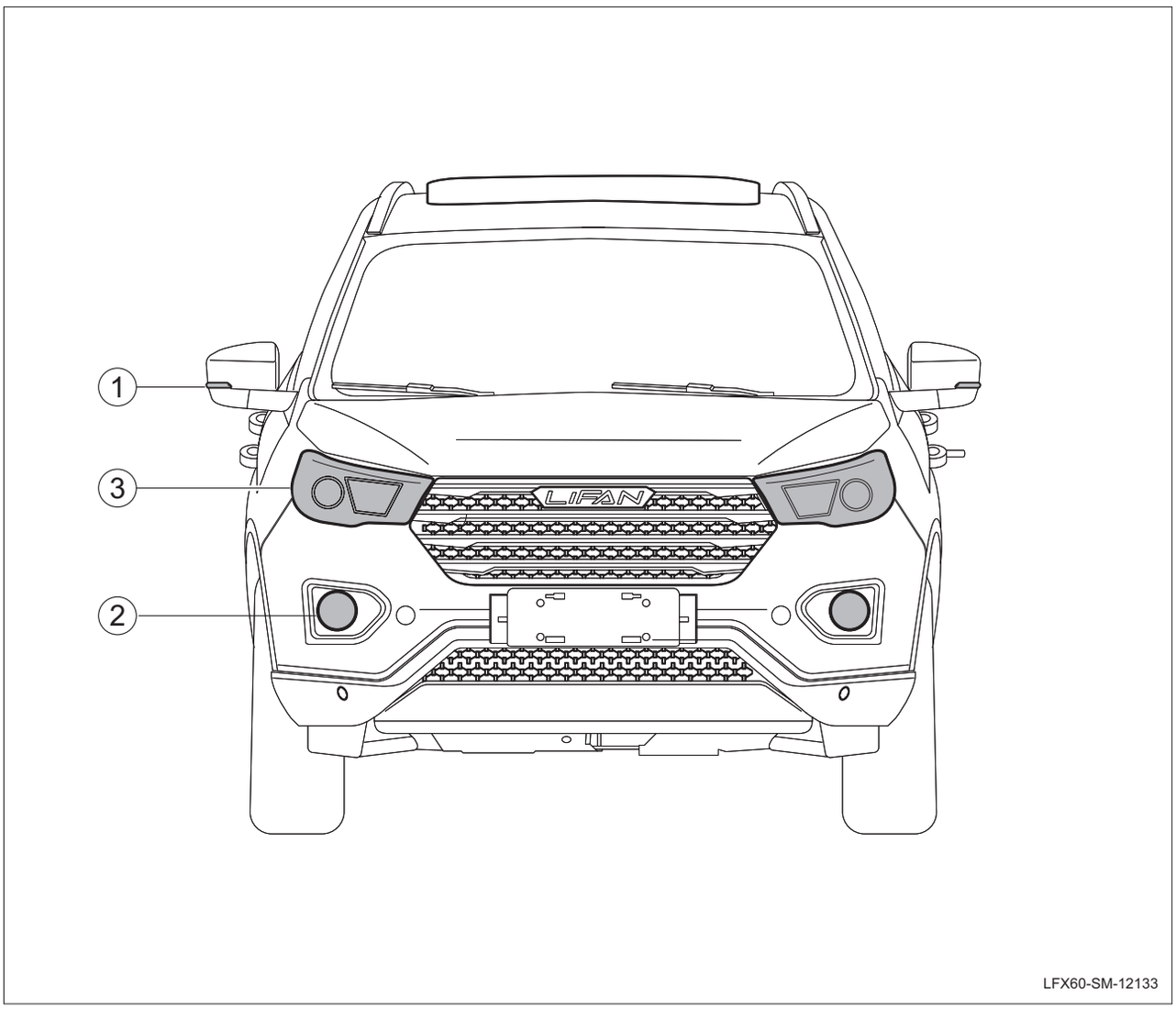
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Structure and installation location

Component Location Plan

Front vehicle lighting



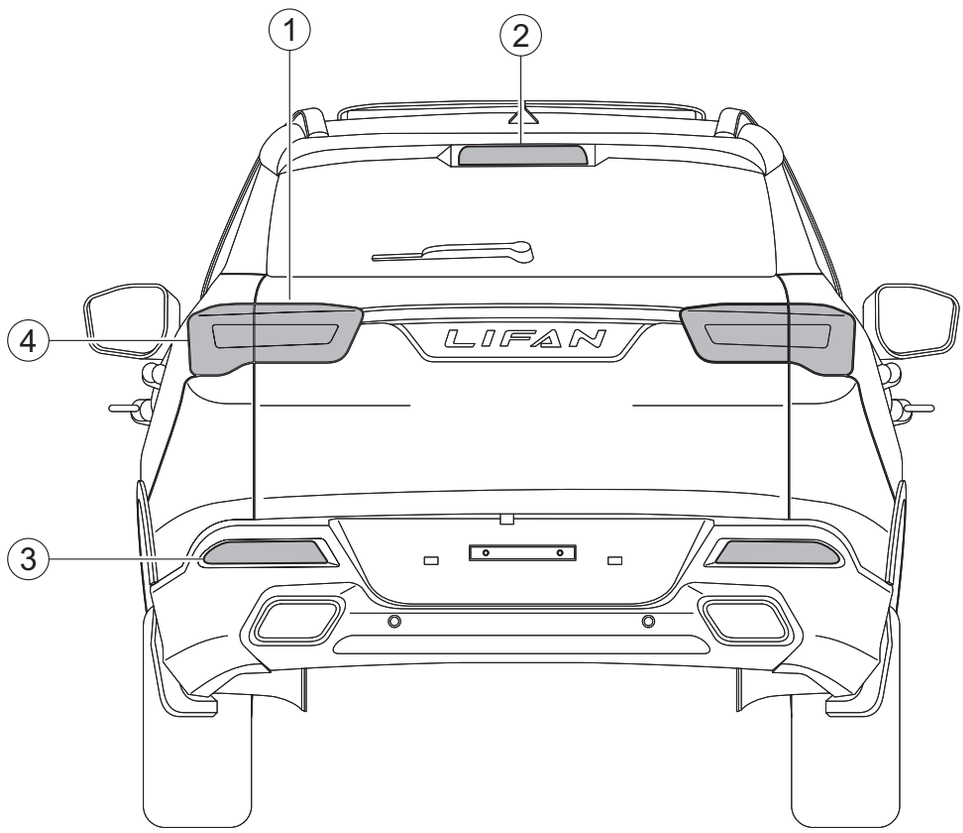
No.	Part name
1	Steering light
2	Front fog light

No.	Part name
3	Front combination Light

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Rear vehicle lighting



LFX60-SM-12134

No.	Part name
1	Rear combined light II
2	Rear fog light

No.	Part name
3	High braking light
4	Rear combined light I

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General Inspection

General Inspection

Park the vehicle in a safe place and apply the parking brake.

ⓘ Note:

Ensure that the battery voltage is not less than 12V when checking the lighting system.

1. Shift the ignition switch to ON
2. Turn on lights of the ligthing system in turn and check functions of lights of the lighting system.

Phenomenon: The light turns on or off under control of the switch.

Check the engine compartment central control box fuse and relay

1. Turn on the central control box cover inside the engine bay.
2. Check the fuse and relay of the lighting system.

Phenomenon: The fuse should be connected and the relay is operated properly.

△ Tips:

Related fuses of the lighting system in the central control box of the engine bay include front fog light fuse, distant light fuse, dipped headlight fuse, front fog light relay, distant light relay and dipped headlight relay.

ⓘ Note

Please refer to the mark on the rear cover of the fuse box according to different vehicle configurations or different positions of some fuses.

Check the fuse of the central control box inside the control cabin.

1. Disassemble the lower guard board on the left side of the dashboard.
2. Check fuses of the lighting system.

Phenomenon: The fuse should be connected.

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Operating Principle

System description

Note

For driving safety, do not operate this switch in driving.

Functions of dipped headlight

Turn on dipped headlight:

The dipped headlight turns off. If the following conditions are satisfied, the dipped headlight turns on (and):

1. The ignition switch is in ON gear;
2. The switch signal of the dipped headlight is a low level;
3. The position lamp is on (except in the case of fault).

Turn off dipped headlight;

The dipped headlight turns on. If the following conditions are satisfied, the dipped headlight turns off (or):

1. The swittch signal of the dipped headlight switches from a low level to suspension state.
2. The power is in the ON position and the switch signal of the dipped headlight is a low level. When the postion light and dipped headlight turn on, after it shifts to OFF position, the position light and dipped headlight will keep on for about 5min. After 5 min, the position light and dipped headlight will instantly turn off. If locking is performed remotely within 5min, the position light and dipped headlight will turn off after 15s. If locking is performed remotely after 5min, the position light and dipped headlight will turn on for 15s.

Functions of high beam

When the distant light is on, if the following conditions are satisfied, the distant light turns off (or);

1. The switch signal of the distant light switches from a valid status to an invalid status;
2. The ignition switch is in the ON position and the switch signal of the distant light is a valid status. When the postion light, dipped headlight and the distant light turn on, after it shifts to OFF position, the position light and dipped headlight will keep on for about 5min. After 5 min, the position light and dipped headlight will instantly turn off. If locking is performed remotely within 5min, the position light and dipped headlight will turn off after 15s. If locking is performed remotely after 5min, the position light and dipped headlight will turn on for 15s.

Functions of front fog light

Turn on front fog light:

The front fog light turns off. If the following conditions are satisfied, the front fog light will turn on (and):

1. The ignition switch is in ON gear;
2. The switch signal of the front fog light is a low level.
3. The position lamp is on (except in the case of fault).

Turn off the front fog light:

The front fog light turns on. If the following conditions are satisfied, the front fog light will turn off (or):

1. Turn the ignition switch to OFF gear;
2. The switch signal of the front fog light switches from the low level to suspension state;
3. The switch signal of the position light switches from the low level to suspension state;

Functions of rear fog light

Functions of rear fog light:

Turn on rear fog light:

The rear fog light turns off. If the following conditions are satisfied, the rear fog light will turn on (and):

1. The ignition switch is in ON gear;
2. The switch signal of the rear fog light is a low level (the rear fog light status before outage is memorized. If the rear fog light is on before outage, it will switch to ON position and turn on in case of next booting).
3. The position light, dipped headlight or position light and front fog light turn on (except position light and dipped headlight failure).

Turn off the rear fog light:

The rear fog light turns on. If the following conditions are satisfied, the rear fog light will turn off (or):

1. Turn the ignition switch to OFF gear;
2. The ignition switch is in the ON position and the switch signal of the rear fog light switches from suspension state to the low level;
3. The ignition switch is in the ON level and the switch signal of the position light switches from the low level to suspension status;
4. The ignition switch is in the ON level and the switch signal of the front fog light switches from the low level to suspension status;

Function of position light

Turn on position light:

The position light turns off. When the following conditions are satisfied, the position light turns on.

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Turn on position light (and);

1. Any ignition switch;
2. When the position light switch shifts from the suspension status to the low level, the position light turns on. If the daytime light turns on, it turns off.

Turn off the position light:

Turn on the position light. If the following conditions are satisfied, the position light turns off.

Conditions for turning off the position light (or):

1. The position light switch shfts from the low level to suspension status at any ignition switch;
2. The ignition switch shifts from ON to ENGINE ON to OFF. The driving door status changes from On status (suspension) to Off status (low level).
3. The power is in OFF position and the position light turns on. When the battery voltage reaches 11.5V, the BCM turns off the position light, license plate light and all backlights to prevent the battery from over-discharging.

Daytime light function

The daytime light turns on:

Conditions for turning on the daytime light (and)

1. The CAN packet with “Engine status information” as “Running” is received from the bus (after EMS packet is timeout, the default engine status of the BCM is EngineStop).
2. The position light is under the suspension status.

Daytime light turns off:

Conditions for turning off the daytime light (or):

1. The CAN packet with “Engine status information” as “Engine Stop” is received from the bus;
2. The position light switch shifts from the suspension status to a low level

Functions of steering light and emergency light

1. When the power of the whole vehicle is ON position, the steering switch shifts to the valid status and the corresponding steering light flickers. The flickering frequency (75±2) time/min. After the steering light shifts to the invalid status, the corresponding steering light is off.
2. Single trigger lane changing function: After the left/right steering light swith turns on and turns off in 300ms, the left/right steering light will flicker three time to remind lane change.

ⓘ Note

When both the steering light and emergency light switch are valid, the final started function is preferential.

3. The ignition switch is pressed at any point. The dangerous warning light switch shifts to valid status (inch, When BCM is connected to the city power supply for the first time, it is off by default. It is on after one-time detection and is off after detection again). The steering light flickers on both sides and the warning light switch does not flicker.

ⓘ Note

- **Both the steering light switch and danger warning light turn on and the switch turns on. Both the steering switch and danger warning light turn on and the switch turns on.**
- **When the daytime driving light is on, the steerling light turns on and the daytime driving light on the side of the steering light turns off. The front position light turns on. After the steering light turns off, the front position light on the side the steering light turns off and the daytime light turns on. The daytime driving light on other side of the steering light will keep on and the position light keeps off. When the daytime driving light is on, the danger warning light turns on, the left and right daytime driving light turns off and the front position light is on. After the danger warning light is off, the front position light is off and the daytime light is on.**
- **One external front or rear steerling light fails. The steering light turns on in this direction. The steering light flickers at the double frequency, namely (150±5) time/min. The danger warning light turns on and the danger warning light flickers at the normal frequency.**

Automatic headlight function

The AUTOM switch signal of the lamplight shifts to the valid status and the headlight automatically turns on. The intelligent lamplight system autoamtically turns on and off the position light and dipped headlight according to the strength of the external light.

1. When the power is in ON position, the environmental light sensor will change from the dayntime mode to the night mode. The position light and dipped headlight will turn on after 500ms delay. The environmental light sensor changes from the night mode to the daytime mode and the position light and dipped headlight turns off after 1s delay.
2. The power is in OFF position. The environmetnal light sensor is under the night mode. The position light and dipped headlight are on for 15s via the remote unlocking and remote locking.

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3. The power is in ON position. The environmental light sensor is under the night mode. After power off and shift to OFF position, the position light and dipped headlight will keep on for about 5min. After 5mmin, the position light and dipped headlight will instantly turn off. If remote locking is performed in 5min, the position light and dipped headlight will turn off after 15s. If remote locking is performed after 5min, the position light and dipped headlight are on for 15s.

The following items are configured for the “position light and dipped headlight are on for 15s” in the item (2) and (3):

The power is in ON position and the vehicle rate is not more than 3km/h. When BCM receives the “IC_ Follow Home Time ConfigSignal” signal from the instrument, the on time of the position light and dipped headlight are set as 15s, 30s, 45s and 60s according to the signal value 1, 2, 3 and 4. The “BCM/PEPS_ Follow Home Time Indication” are set as 0, 1, 2 and 3.

Indoor ceiling light function

When any of the following conditions is satisfied, the light will gradually turn on or off and the gradual change time is 2s.

The indoor ceiling light is off. If the following conditions are satisfied, the light can turn on (or):

1. Any door of four doors is opened;
2. When four doors are closed, the light turns on for 30s in case of remote unlocking, central control unlocking and mechanical key unmlocking.
3. When the four doors are closed, the ignition switch shifts from other gears to OFF gear and the light turns on for 15s;
4. When the whole vehicle powers off and final opened door is closed, the door turns for 15s.

ⓘ Note

When any of above conditions is satisfied and the environmental light sensor is under night detection mode, the ceiling light can turn on.

Off function of indoor ceiling light

When the indoor ceiling light is on and the following conditions are satisfied, the light can turn off (or):

1. When four doors are closed and the ignition switch is shifited to ON gear, the light turns off.
2. When four doors are closed, the light turns off in case of remote control locking, centrla control locking and mechanical locking locking.
3. When four doors are not fully closed, the light turns off after 10min timeout;
4. When the ignition switch is in ON gear and all doors are closed, the light turns off.

Functions of surpassing light

When the surpassing light switch signal shifts from the suspension to the low level at any ignition switch, the surpassing light turns on. The surpassing light switch signal shifts from the valid status to the invalid status and the surpassing light turns off.

Lamplight energy saving function

Condition for enabling the energy saving output (and):

1. When the power is in OFF position, keep the output;
2. When the power is in OFF position, perform output in case of four door status change, remote control unlocking and mechanical unlocking.

Conditions for turning off energy saving out (or):

1. After the power position shifts from the non-OFF position to OFF position, the indoor light and door light turn off after BCM counts time for 8 min. If the four-door status changes in this period, the indoor light and door light turn off after 8 mins.
2. Four doors turn off and the output is closed after remote locking, mechanical locking and second locking.

Key lighting function

Light ring lamplight indication of key

The inigition key is in KEY out, the main driving door is opened and the key light ring is on for 30 s. It is detected that the main driver door is closed in 30s and the key light ring turns off after 15s delay. When the ignition is in ON position, the key light ring instantly turns off. After the ignition key is pulled out, the key light ring turns on and turns off after 15s.

Functions of Reverseing light

Turn on reversing light

The reversing light is off. When the following conditions are satisfied, the light turns on (and):

1. The power status is in ON position;
2. BCM receive s the signal of " IC_ reverse lamp switch status value =1" from the instrument.

Turn off the reversing light

The reversing light is on. When the following conditions are satisfied, the light can turn off (or):

1. The power status is in OFF or ACC position;
2. BCM receive s the signal of " IC_ reverse lamp switch status value =0" from the instrument.

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Diagnostic Information and Procedures

Diagnosis Instructions

Before the lighting system failure is diagnosed, please first read the system overview to know and familiarize the working principle of the lighting system and then start system diagnosis. When a failure occurs, these knowledge can assist you to identify correct failure diagnosis steps. More importantly, these knowledge can assist you to check if conditions described by the customer are normal.

Any failure diagnisis of the lighting system should start with lighting system check. It can guide repairers to take enxt logic step and diagnose failures. Comprehend and correctly use the diagnostic flow chart to shorten the diagnosis time and avoid the misjudgment.

General equipment

Digital multimeter
Diagnostic equipment of vehicle

Visual Inspection

1. Confirm the problem of the customer.
2. Visually check visible failures of electric appliances and eliminate bulb damage problem.

Visual inspection table

Mechanical
• Fuse • Line • Switch • Bulb

3. If the observed or raised problem is the evident and the cause has been found, ensure to fix this fault before proceeding with the next step.
4. If for the problem, there are no obvious findings, then confirm the fault and refer to the symptom table.

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List of fault symptoms

If the vehicle fails, no trouble code is detected by the engine control module (ECM), and no significant fault location is found after visual inspection and general inspection, it is recommended that troubleshooting should be carried out according to diagnostic ideas and processes of the table below.

Symptom	Possible point of failure	Recommended Measures
Brake Light Malfunctioning	• Fuse • Line • Bulb • Brake switch	**Refer to: Stop lamp out of operation diagnosis flow**
Brake Light keeps on	• Line • Brake switch	**Refer to: Diagnosis flow for constant on brake light**
One or more brake lights are not on	• Line • Bulb	**Refer to: Diagnosis flow for off one or more brake lights**
The steering signal light does not operate	• Fuse • Line • Bulb • Lamp cluster switch • BCM	**Refer to: Diagnosis flow for non-operating signal light**
One or more steering signal lights do not operate	• Line • Bulb • Lamp cluster switch • BCM	**Refer to: Diagnosis flow for one or more steering signal lights**
One or more steering signal lights keep on (no flickering)	• Line • BCM	**Refer to: Diagnosis flow for one or more off steering signal lights (no flickering)**
Position Light Malfunctioning	• Line • Bulb • Lamp cluster switch • Position lamp relay	**Refer to: Diagnosis flow for non-operating position light**
The position light keeps on	• Line • Lamp cluster switch • Position lamp relay	**Refer to: Diagnosis flow for constant on position light**
Front Fog Light Malfunctioning	• Fuse • Line • Bulb • Lamp cluster switch • Front fog lamp relay	**Refer to: Diagnosis flow for non-operating front fog light**
Front Fog Light keeps on	• Line • Lamp cluster switch • Front fog lamp relay	**Refer to: Diagnosis flow for on front fog light**
Rear Fog Light Malfunctioning	• Fuse • Line • Bulb • Rear fog lamp relay • Lamp cluster switch	**Refer to: Diagnosis flow for non-operating rear fog light**
Rear Fog Light keeps on	• Fuse • Line • Bulb • Rear fog lamp relay • Lamp cluster switch	**Refer to: Diagnosis flow for on rear fog light**
Back-up Light Malfunctioning	• Line • Fuse • Bulb • Reverse lamp switch	**Refer to: Diagnosis flow for non-operating reversing light**

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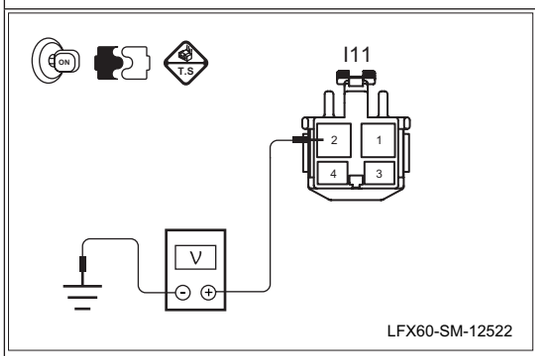
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Symptom	Possible point of failure	Recommended Measures
The dipped headlight does not operate	• Fuse • Line • Bulb • Relay of dipped headlight • BCM • Lamp cluster switch	**Refer to: Diagnosis flow for non-operating dipped headlight**
The distant light does not operate	• Fuse • Line • Bulb • Relay of high beam • Lamp cluster switch • BCM	**Refer to: Diagnosis flow for non-operating high beam**
The passing light does not work	• Line • Lamp cluster switch	**Refer to: Diagnosis flow for non-operating passing light**
The license plate light does not work	• Line • Fuse • Bulb • Position lamp relay • Lamp cluster switch	**Refer to: Diagnosis flow for non-operating license plate light**
The front reading light does not work	• Line • Fuse • Bulb • Front reading lamp switch • Door touch switch • BCM	**Refer to: Diagnosis flow for non-operating front reading light**
The rear reading light does not work	• Line • Fuse • Bulb • Rear ceilinng light swithc	**Refer to: Diagnosis flow for non-operating rear reading light**
The indoor light keeps on	• Line • Front reading lamp switch	**Refer to: Diagnosis flow for on indoor light**

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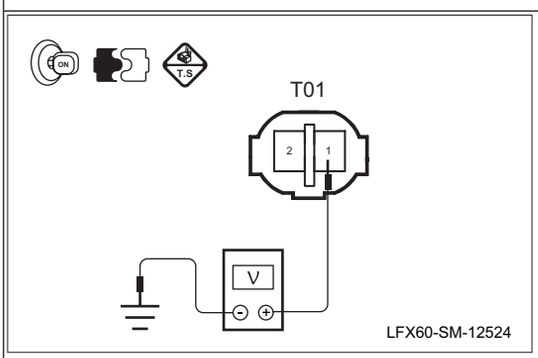
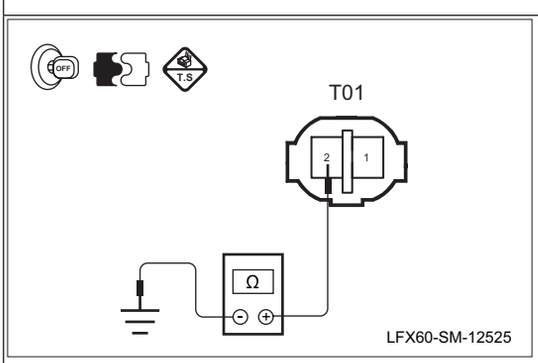
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Stop lamp out of operation diagnosis flow

Test condition	Details/results/measures
1. General inspectionGeneral inspection..	
	A. Check the stop lamp switch harness plug and lamp assembly harness plug for breakage, loose contact, aging or looseness. Is it OK after checking? →**Yes** To step 2. →**No** Examine and repair the fault location.
2. Check the fuse.	
	A. Check the switch fuse FS11 of the brake light. **Fuse rated capacity: 20 A** Is it OK after checking? →**Yes** To step 3. →**No** Replace the fuse of same model.
3. Check the stop lamp switch power line.	
	A. Operate the start switch to set the power mode to the “OFF” state.Operate the start switch to set the power mode to the “OFF” state. B. Disconnect the battery negative connector. C. Disconnect the stop lamp switch harness plug I11. D. Connect the battery negative terminalConnect the battery negative terminal.. E. Measure the voltage between the brake switch harness plug I11 terminal 2 and fixed ground point with the multimeter. **Standard value: 11 ~ 14 V** Is the voltage normal? →**Yes** To step 4. →**No** Repair the switch power line failure of the brake light. If necessary, replace the harness.

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Test condition	Details/results/measures
4. Check the stop lamp switch.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the stop lamp switch harness plug I11. D. Depress the brake pedal and measure the resistance between the brake switch terminal 1 and 2 with the multimeter. **Standard value: less than 1Ω** Is the resistance normal? →**Yes** To step 5. →**No** Replace the brake light switch. **Refer to: Replacement of stop lamp switch..**
5. Check the stop lamp power line.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the high-mounted stop lamp switch harness plug T01. D. Connect the battery negative terminal. E. Depress the brake pedal and measure the voltage between the brake switch harness plug T01 terminal 1 and the fixed ground point with the multimeter. **Standard value: 11 ~ 14 V** Is the voltage normal? →**Yes** To step 6. →**No** Repair the stop lamp power line fault and replace the harness if necessary.
6. Check the grounding line of the brake light.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the high-mounted stop lamp switch harness plug T01. D. Connect the battery negative terminal. E. Measure the resistance between the terminal 2 of the brake switch harness plug T01 and reliable grounding by using a multimeter. **Standard value: less than 5Ω** Is the resistance normal? →**Yes** To step 7. →**No** Repair the grounding line failure of the brake light. If necessary, replace the harness.

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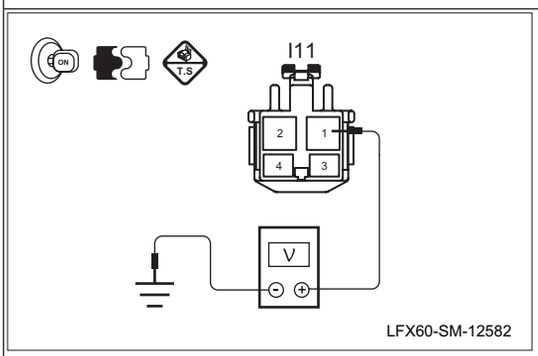
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Test condition	Details/results/measures
7. Replace the brake light assembly.	
	A. Replace the brake light assembly. **Refer to: Replace the rear combined light.** **Refer to:Replacement of high-mounted stop lamp switch.** Confirm that the fault has been ruled out.

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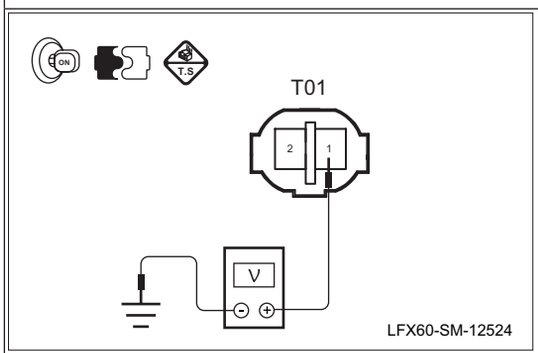
Diagnosis flow for constant on brake light

Test condition	Details/results/measures
1. General inspection.	
	A. Check the stop lamp switch harness plug and lamp assembly harness plug for breakage, loose contact, aging or looseness. Is it OK after checking? →**Yes** To step 2. →**No** Examine and repair the fault location.
2. Check the stop lamp switch.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the stop lamp switch harness plug I11. D. Completely release the brake pedal and measure the resistance between the terminal 1 and 2 of the brake switch. **Standard value: 10MΩ or higher** Is the resistance normal? →**Yes** To step 3. →**No** Replace the brake light switch. **Refer to: Replacement of stop lamp switch.**
3. Check the stop lamp power line.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the stop lamp switch harness plug I11. D. Connect the battery negative terminal. E. Operate the start switch to set the power mode to the "ON" state. F. Measure the voltage between the terminal 1 of the brake switch harness plug I11 and reliable grounding by using a multimeter. **Standard value: 0V** Repair the stop lamp power line fault and replace the harness if necessary.

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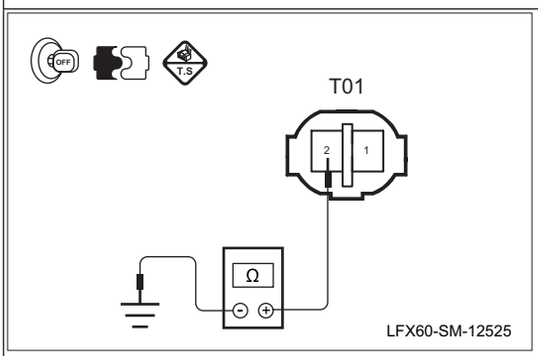
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Diagnosis flow for off one or more brake lights (with high brake light as one example)

Test condition	Details/results/measures
1. General inspection.	
	A. Check the harness plug of the lamplight assembly is damaged, is in bad contact, is aging and falls off. Is it OK after checking? →Yes To step 2. →No Examine and repair the fault location.
2. Check if other brake lights can work normally.	
	A. Push down the brake pedal and check if other brake lightes can work normally. Check if other brake lights can work normally. →Yes To step 3. →No Repair malfunction failure of all brake lights. **Refer to:** Stop lamp out of operation diagnosis flow
3. Check power lines of the high brake light.	
	A. Operate the start switch to set the power mode to the “OFF” state. B. Disconnect the battery negative connector. C. Disconnect the high-mounted stop lamp switch harness plug T01. D. Connect the battery negative terminal. E. Depress the brake pedal and measure the voltage between the brake switch harness plug T01 terminal 1 and the fixed ground point with the multimeter. **Standard value: 11 ~ 14 V** Is the voltage normal? →**Yes** To step 4. →**No** Repair the power line failure of the higher brake light. If necessary, replace the harness.

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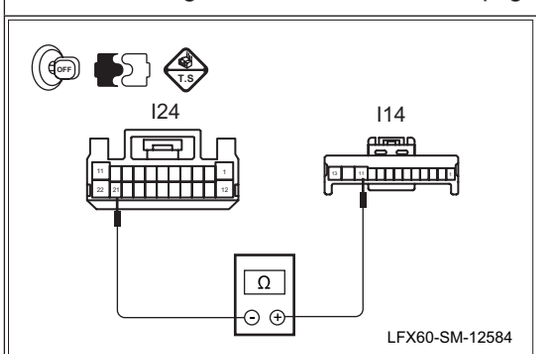
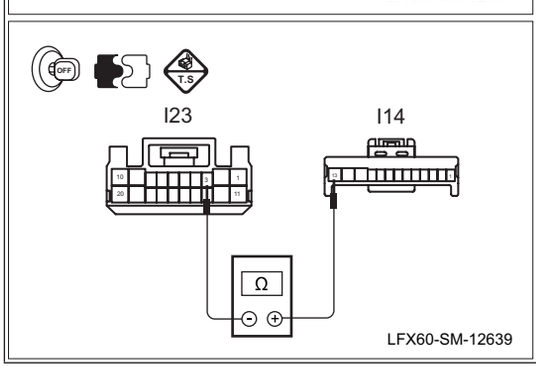
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Test condition	Details/results/measures
4. Check the grounding line of high brake light.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the high-mounted stop lamp switch harness plug T01. D. Measure the resistance between the terminal 2 of the high brake light harness plug T01 and reliable grounding by using a multimeter. **Standard value: less than 5Ω** Is the resistance normal? →**Yes** To step 4. →**No** Repair the grounding line failure of the higher brake light. If necessary, replace the harness.
5. Replace the high brake light assembly.	
	A. Replace the high brake light assembly. **Refer to: Replacement of high-mounted stop lamp switch.** Confirm that the fault has been ruled out.

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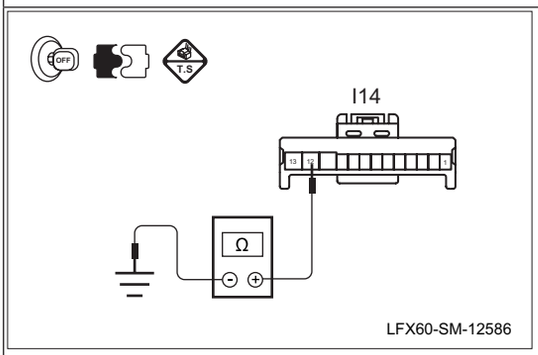
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Diagnosis flow for non-operating signal light (High configuration)

Test condition	Details/results/measures
1. General inspection.	
	A. Check the turn lamp harness plug for breakage, loose contact, aging or looseness. Is it OK after checking? →**Yes** To step 2. →**No** Examine and repair the fault location.
2. Check the lamp cluster switch.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the lamp cluster switch harness plug I14. D. Operate the lamp cluster switch to the left turn or right turn position. E. Measure the resistance among the terminal 11, 13 and 12 of the turn signal switch by using a multimeter. **Standard value: less than 1Ω** Is the resistance normal? →Yes To step 3. →**No** Replace the lamp cluster switch. **Refer to: Replace the lamplight combined switch.**
3. Check the signal line between the lamplight combined switch and PEPS.	
 	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the lamp cluster switch harness plug I14. D. Disconnect the PEPS harness plug I23 and I24. E. Measure the resistance between the terminal 11 of the lamplight combined switch harness plug I14 and terminal 21 of the PEPS harness plug I24 by using a multimeter. F. Measure the resistance between the terminal 13 of the lamplight combined switch harness plug I14 and terminal 3 of the PEPS harness plug I23 by using a multimeter. **Standard value: less than 5Ω** Is the resistance normal? →**Yes** To step 4. →**No** Repair the signal line failure between the lamplight combined switch and PEPS. If necessary, replace the harness.

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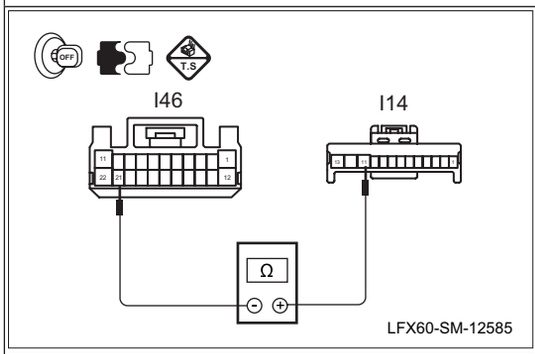
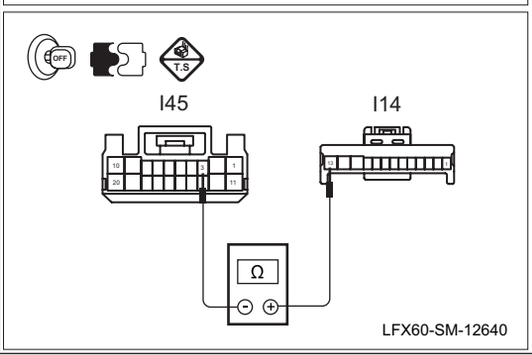
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Test condition	Details/results/measures
4. Check the grounding line of the lamplight combined switch.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the lamp cluster switch harness plug I14. D. Measure the resistance between the terminal 12 of the lamplight combined switch harness plug I14 and reliable grounding by using a multimeter. **Standard value: less than 5Ω** Is the resistance normal? →**Yes** To step 5. →**No** Repair the grounding line failure of the lamplight combined switch. If necessary, replace the harness.
5. Check the PEPS module.	
	A. Replace the PEPS module. Confirm that the fault has been ruled out.

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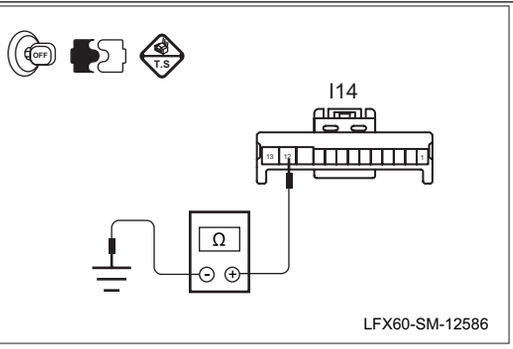
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Diagnosis flow for non-operating signal light (standard configuration)

Test condition	Details/results/measures
1. General inspection.	
	A. Check the turn lamp harness plug for breakage, loose contact, aging or looseness. Is it OK after checking? →**Yes** To step 2. →**No** Examine and repair the fault location.
2. Check the lamp cluster switch.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the lamp cluster switch harness plug I14. D. Operate the lamp cluster switch to the left turn or right turn position. E. Measure the resistance among the terminal 11, 13 and 12 of the lamplight combined switch by using a multimeter. **Standard value: less than 1Ω** Is the resistance normal? →**Yes** To step 3. →**No** Replace the lamp cluster switch. **Refer to: Replacement of cluster switch.Refer to: Replacement of cluster switch.**
3. Check the signal line between the lamplight combined switch and BCM.	
 	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the lamp cluster switch harness plug I14. D. Disconnect the BCM harness plug I45 and I46。 E. Measure the resistance between the terminal 11 of the lamplight combined switch harness plug I14 and terminal 21 of the BCM hardness plug I46 by using a multimeter. F. Measure the resistance between the terminal 13 of the lamplight combined switch harness plug I14 and terminal 3 of the BCM hardness plug I45 by using a multimeter. **Standard value: less than 5Ω** Is the resistance normal? →**Yes** To step 4. →**No** Repair th signal line failure between the turn signal switch and BCM. If necessary, replace the harness.

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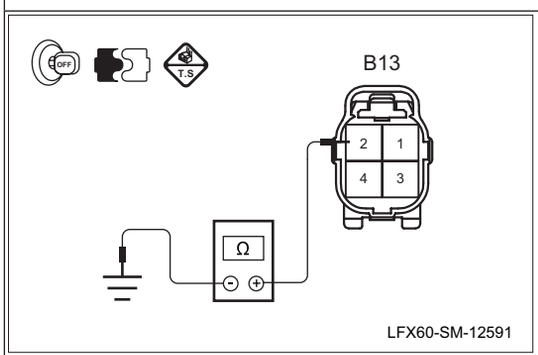
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Test condition	Details/results/measures
4. Check the grounding line of the steering switch.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the steering switch harness plug I14. D. Measure the resistance between the terminal 12 of the turn signal switch harness plug I14. **Standard value: less than 5Ω** Is the resistance normal? →**Yes** To step 5. →**No** Repair the grounding line break failure of the turn signal switch. If necessary, replace the harness.
5. Check the BCM.	
	A. Replace the BCM module. Confirm that the fault has been ruled out.

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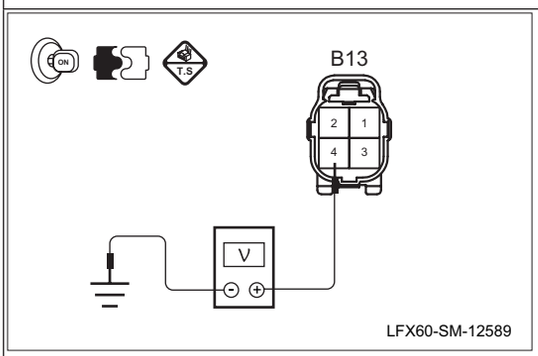
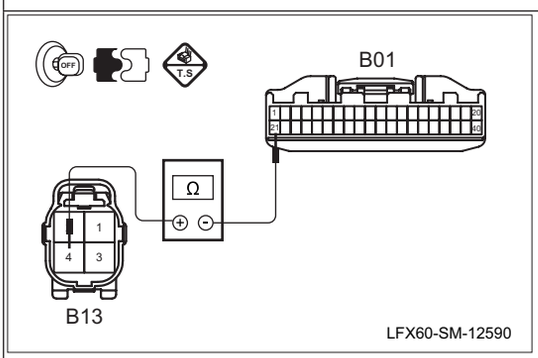
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Diagnosis procedure about one or more turn signals are not operated (with the left rear steering light as one example)

Test condition	Details/results/measures
1. General inspection.	
	A. Check the turn lamp harness plug for breakage, loose contact, aging or looseness. Is it OK after checking? →**Yes** To step 2. →**No** Examine and repair the fault location.
2. Check if other several steering lights can work normally.	
	A. Check if other several steering lights can work normally. Is it normal? →**Yes** To step 3. →**No** Repair malfunction failure of the steering light. **Refer to: Diagnosis flow for non-operating signal light(High configuration)** **Refer to: Diagnosis flow for non-operating signal light (standard configuration)**
3. Check the grounding line of the left rear steering light.	
	A. Operate the start switch to set the power mode to the “OFF” state. B. Disconnect the battery negative connector. C. Disconnect the rear left combination lamp harness plug B13. D. Measure the resistance between the terminal 2 of the left rear combined light harness plug B13 and the reliabile grounding point. **Standard value: less than 5Ω** Is the resistance normal? →**Yes** To step 4. →**No** Repair the grounding line break failure of the left rear steering light. If necessary, replace the harness.

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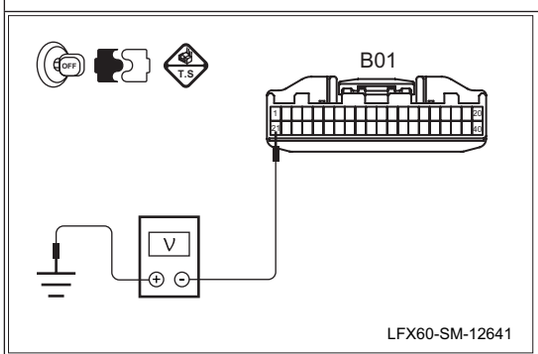
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Test condition	Details/results/measures
4. Check the rear left turn lamp power line.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the rear left combination lamp harness plug B13. D. Connect the battery negative terminal. E. Operate the start switch to set the power mode to the "ON" state. F. Turn on the left steering light and measure the volage between the terminal 4 of the left rear combined light harness plug B13 and reliable grounding by using a multimeter. **Standard value:** **Continuously change in 0~14 V** Is the voltage normal? →**Yes** Replace the steering bulb. →**No** Step 5.
5. Check the line between the left rear steering light and PEPS.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the PEPS harness plug B01. D. Disconnect the harness plug B13 of the left rear combined light. E. Measure the resistance between the terminal 21 of PEPS harness plug B01 and left rear brake light harness plug B13 by using a multimeter. **Standard value: less than 5Ω** Is the resistance normal? →**Yes** To step 6. →**No** Repair the line failure between the left rear steering light and PEPS. If necessary, replace the harness.
6. Check the PEPS module.	
	A. Replace the PEPS module. Confirm that the fault has been ruled out.

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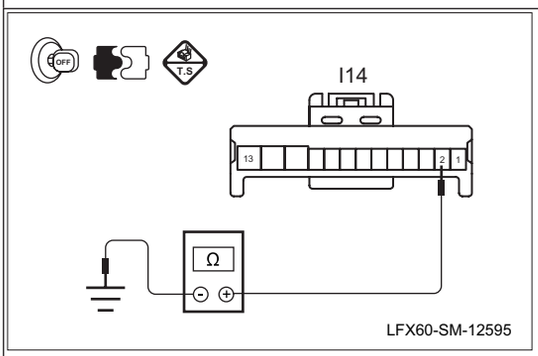
Diagnosis flow for one or more on steering signal lights (no flickering) (with the left rear steering light as one example)

Test condition	Details/results/measures
1. General inspection.	
	A. Check the turn lamp harness plug for breakage, loose contact, aging or looseness. Is it OK after checking? →**Yes** To step 2. →**No** Examine and repair the fault location.
2. Check the rear left turn lamp power line.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the PEPS harness plug B01. D. Disconnect the harness plug B13 of the left rear brake light. E. Connect the battery negative terminal. F. Measure the voltage between the terminal 21 of the PEPS harness plug B01 and reliable grounding by using a multimeter. **Standard value: 0 V** Is the voltage normal? →**Yes** To step 3. →**No** Repair the power line failure of the left rear steering light. If necessary, replace the harness.
3. Check the PEPS module.	
	A. Replace the PEPS module. Confirm that the fault has been ruled out.

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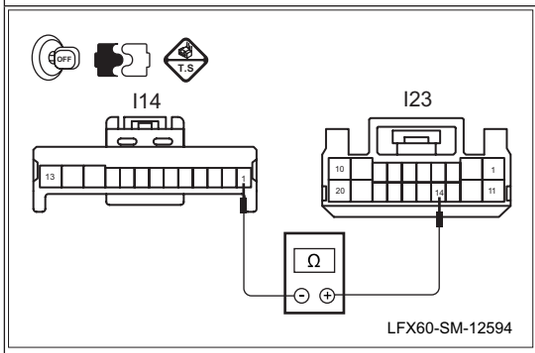
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Diagnosis flow for non-operating position light

Test condition	Details/results/measures
1. General inspection.	
	A. Check the cluster switch harness plug and combination head lamp connector for breakage, loose contact, aging or looseness. Is it OK after checking? →**Yes** To step 2. →**No** Examine and repair the fault location.
2. Check the cluster switch.	
	A. Operate the start switch to set the power mode to the “OFF” state. B. Disconnect the battery negative connector. C. Disconnect the cluster switch harness plug I14. D. Shift the combined switch to the small light position and measure the resistance between the terminal 1 and 2 of the combined switch by using a multimeter. **Standard value: less than 1Ω** Is the resistance normal? →**Yes** To step 3. →**No** Replace the steering switch. **Refer to: Replacement of cluster switch.Refer to: Replacement of cluster switch.**
3. Check the grounding ine of the position light switch.	
	A. Operate the start switch to set the power mode to the “OFF” state. B. Disconnect the battery negative connector. C. Disconnect the cluster switch harness plug I14. D. Measure the resistance between the cluster switch harness plug I14 terminal 2 and the fixed ground point with the multimeter. **Standard value: less than 5Ω** Is the resistance normal? →**Yes** To step 4. →**No** Repair the switch grounding line failure of the position light switch. If necessary, replace the harness.

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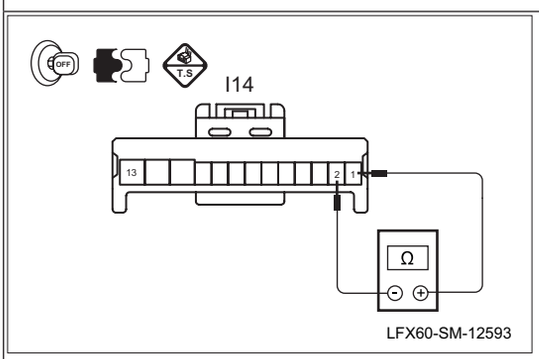
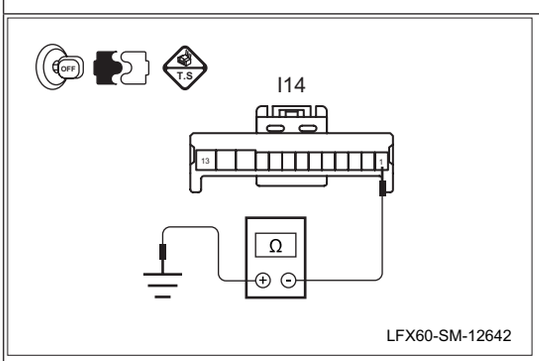
Test condition	Details/results/measures
4. Check the position lamp signal line between the cluster switch and PEPS.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the harness plug I14 of the steering switch. D. Disconnect the harness plug I23 of the PEPS. E. Measure the resistance between the terminal 1 of the combined switch harness plug I14 and the terminal 14 of the PEPS harness plug I23. **Standard value: less than 5Ω** Is the resistance normal? →**Yes** To step 5. →**No** Repair the line failure between the combined switch and PEPS. If necessary, replace the harness.
5. Check the PEPS module.	
	A. Replace the PEPS module. Confirm that the fault has been ruled out.

12

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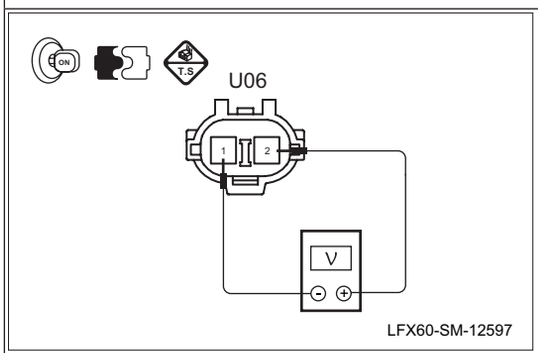
Diagnosis flow for constant on position light

Test condition	Details/results/measures
1. General inspection.	
	A. Check the cluster switch harness plug and combination head lamp connector for breakage, loose contact, aging or looseness. Is it OK after checking? →**Yes** To step 2. →**No** Examine and repair the fault location.
2. Check the cluster switch.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the steering switch harness plug I14. D. Shift the turn signal switch to other positions and measure the resistance between the terminal 1 and 2 of the combined switch harness plug I14. **Standard value: 10MΩ or higher** Is the resistance normal? →**Yes** To step 3. →**No** Replace the steering switch. **Refer to: Replacement of cluster switch.**
3. Check the position lamp signal line between the cluster switch and PEPS.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the cluster switch harness plug I14. D. Disconnect the harness plug I23 of the PEPS module. E. Measure the resistance between the terminal 1 of the combined switch harness plug I14 and the reliabile grounding point. **Standard value: 10MΩ or higher** Is the resistance normal? →**Yes** To step 4. →**No** Repair the position light line failure of the combined switch. If necessary, replace the harness.
4. Check the PEPS module.	
	A. Replace the PEPS module. Confirm that the fault has been ruled out.

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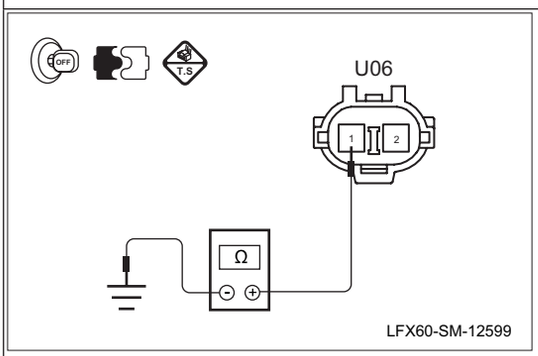
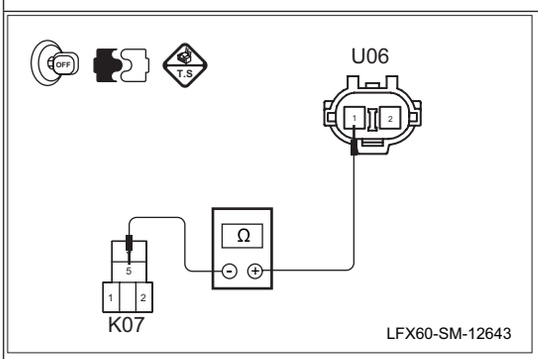
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Diagnosis flow for non-operating front fog light

Test condition	Details/results/measures
1. General inspection.	
	A. Check the harness plug of the front fog light and combined switch are damaged, are in bad contact, are aging and fall off. Is it OK after checking? →**Yes** To step 2. →**No** Examine and repair the fault location.
2. Check the fuse.	
	A. Check the switch fuse FS06 of the brake light. **Fuse rated capacity: 15A** Is it OK after checking? →**Yes** To step 3. →**No** Replace the fuse of same model.
3. Check the power voltage of the front fog light.	
	A. Operate the start switch to set the power mode to the “OFF” state. B. Disconnect the battery negative connector. C. Disconnect the front fog lamp harness plug U06\U15. D. Connect the battery negative terminal. E. Start the switch to turn the power to ON mode. F. Turn on the front fog light and measure the voltage between the terminal 1 and 2 of the front fog light harness plug U06\U15. **Standard value: 11 ~ 14 V** Is the voltage normal? →**No** To step 4. →**Yes** Replace the front fog light bulb. **Refer to: Replace the front fog light bulb.**

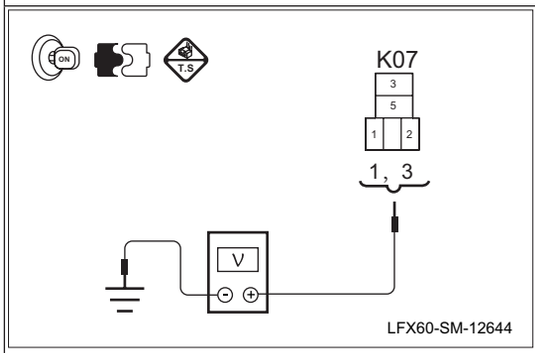
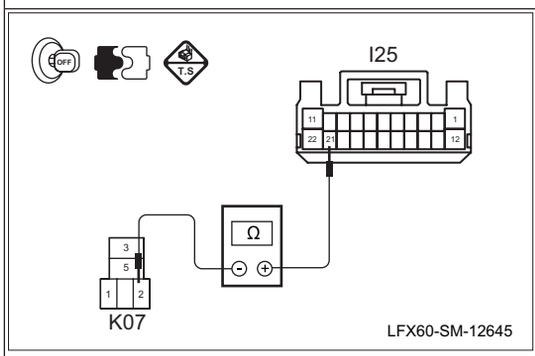
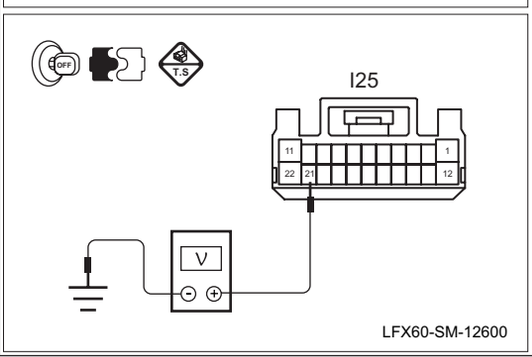
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Test condition	Details/results/measures
4. Check the grounding line of the front fog light.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the front fog lamp harness plug U06\U15. D. Measure the resistance between the terminal 1 of the front fog light harness plug U06\U15 and reliable grounding by using a multimeter. **Standard value: less than 5Ω** Is the resistance normal? →**Yes** To step 5. →**No** Repair the grounding line failure of the front fog light. If necessary, replace the harness.
5. Check the power line of the front fog light.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the front fog lamp harness plug U06\U15. D. Remove the front fog lamp relay K07. E. Measure the resistance between the terminal 2 of the front fog light harness plug U06\U15 and the terminal 5 of the front fog light relay K07 by using a multimeter. **Standard value: less than 5Ω** Is the resistance normal? →**Yes** To step 6. →**No** Repair the power line failure of the front fog light. If necessary, replace the harness.
6. Check of the relay K07 of the front fog light.	
	A. Replace the front fog light relay of same model and check if the system can work normally. Is it OK after checking? →**No** To step 7. →**Yes** Replace the relay of same model.

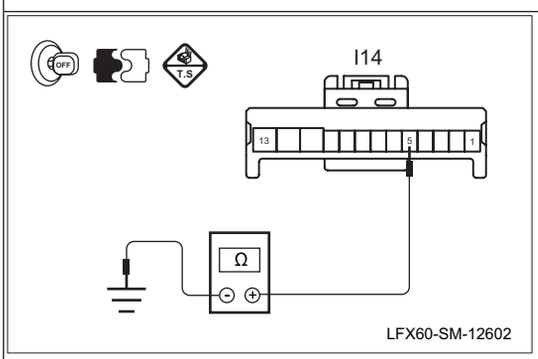
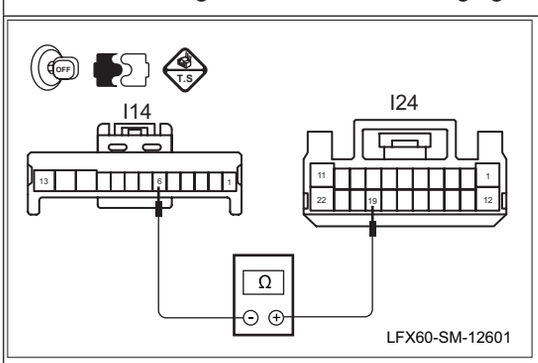
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Test condition	Details/results/measures
7. Check the power line of the front fog light relay.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disassembly the relay K07 of the front fog light. D. Connect the battery negative terminal. E. Start the switch to turn the power to ON mode. F. Measure the resistance between the terminal 1 and 3 of the front fog light relay K07 and the reliabile grounding point. **Standard value: 11 ~ 14 V** Is the voltage normal? →**Yes** To step 8. →**No** Repair the K07 power line failure of the front fog light relay. If necessary, replace the harness.
8. Check the control signal line of the front fog relay K07.	
 	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the PEPS harness plug I25. D. Remove the front fog lamp relay K07. E. Measure the resistance between the terminal 21 of the PEPS harness plug I25 and the terminal 2 of the front fog relay K07 by using a multimeter. **Standard value: less than 5Ω** F. Connect the battery negative terminal. G. Measure the voltage between the PEPS harness plug I25 terminal 21 and the fixed ground point with the multimeter. **Standard value: 0 V** Is it OK after checking? →**Yes** To step 9. →**No** Repair the power line break failure of the front fog light. If necessary, replace the harness.

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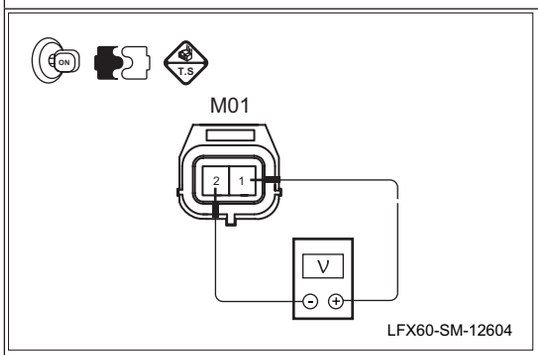
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Test condition	Details/results/measures
9. Check the front fog light switch.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the cluster switch harness plug I14. D. Turn the front fog light and measure the resistance between the terminal 5 and 6 of the combined switch. **Standard value: less than 1Ω** Is the resistance normal? →**Yes** To step 10. →**No** Replace the front fog light switch. **Refer to: Replacement of cluster switch.**
10. Check the grounding line of the front fog light switch.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the cluster switch harness plug I14. D. Measure the resistance between the cluster switch harness plug I14 terminal 5 and the fixed ground point with the multimeter. **Standard value: less than 5Ω** Is the resistance normal? →**Yes** To step 11. →**No** Repair the switch grounding line failure of the fog light. If necessary, replace the harness.
11. Check the signal line of the front fog light switch.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the PEPS harness plug I24. D. Disconnect the cluster switch harness plug I14. E. Measure the resistance between the terminal 19 of the PEPS harness plug I24 and the terminal 6 of the combine switch harness plug I14 by using a multimeter. **Standard value: less than 5Ω** Is the resistance normal? →**Yes** To step 12. →**No** Repair the switch signal line break failure of the front fog light. If necessary, replace the harness.
12. Check the PEPS module.	
	A. Replace the PEPS module. Confirm that the fault has been ruled out.

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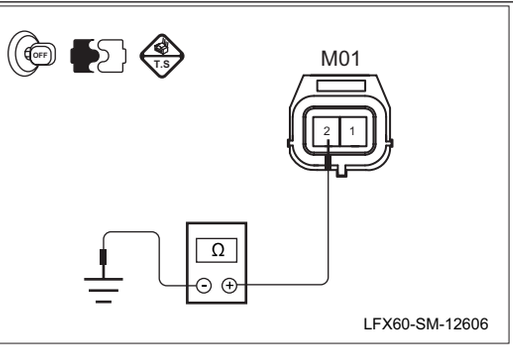
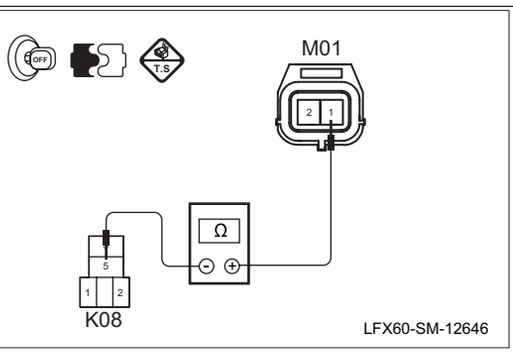
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Diagnosis flow for non-operating rear fog light

Test condition	Details/results/measures
1. General inspection.	
	A. Check the harness plug of the rear fog light and combined switch are damaged, are in bad contact, are aging and fall off. Is it OK after checking? →**Yes** To step 2. →**No** Examine and repair the fault location.
2. Check the fuse.	
	A. Check the switch fuse FS07 of the brake light. **Fuse rated capacity: 10A** Is it OK after checking? →**Yes** To step 3. →**No** Replace the fuse of same model.
3. Check the power voltage of the rear fog light.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the front fog lamp harness plug M01\M05. C. Connect the battery negative terminal. D. Start the switch to turn the power to ON mode. E. Turn on the front fog light and measure the voltage between the terminal 1 and 2 of the front fog light harness plug M01\M05. **Standard value: 11 ~ 14 V** Is the voltage normal? →**No** To step 4. →**Yes** Replace the rear fog light bulb. **Refer to: Replace the rear fog light bulb.**

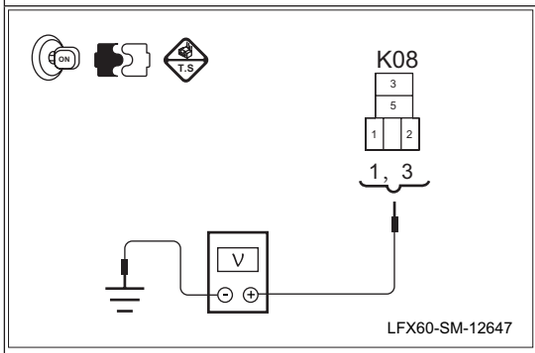
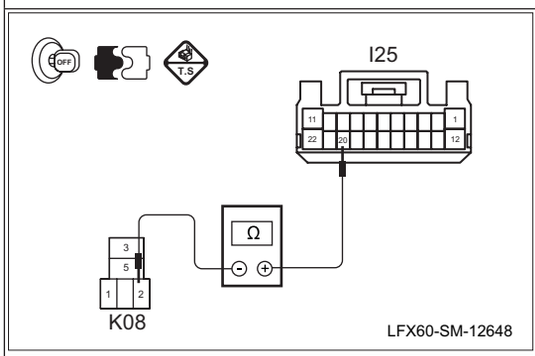
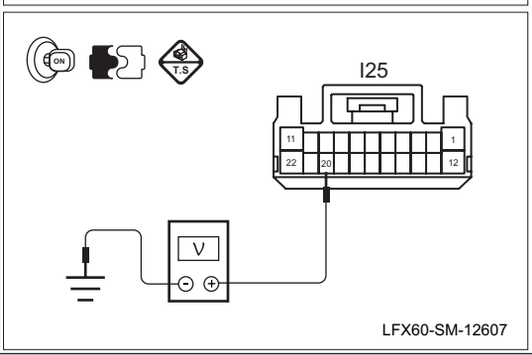
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Test condition	Details/results/measures
4. Check the grounding line of the rear fog light.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the rear fog lamp harness plug M01\M05. D. Measure the resistance between the terminal 2 of the rear fog light harness plug M01\M05 and the reliabile grounding point. **Standard value: less than 5Ω** Is the resistance normal? →**Yes** To step 5. →**No** Repair the grounding line failure of the rear fog light. If necessary, replace the harness.
5. Check the power line of the rear fog light.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the rear fog lamp harness plug M01\M05. D. Remove the rear fog lamp relay K08. E. Measure the resistance between the terminal 2 of the rear fog light harness plug M01\M05 and the terminal 5 of the rear fog light relay K08 by using a multimeter. **Standard value: less than 5Ω** Is the resistance normal? →**Yes** To step 6. →**No** Repair the power line failure of the rear fog light. If necessary, replace the harness.
6. Check of the relay K08 of the rear fog light.	
	A. Replace the rear fog light relay of same model and check if the system can work normally. Is it OK after checking? →**No** To step 7. →**Yes** Replace the relay of same model.

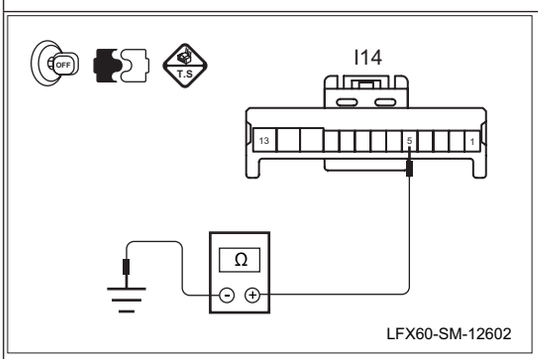
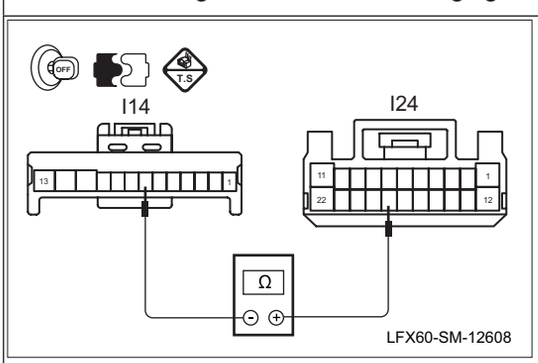
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Test condition	Details/results/measures
7. Check the power line of the rear fog light relay.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disassembly the relay K08 of the rear fog light. D. Connect the battery negative terminal. E. Start the switch to turn the power to ON mode. F. Measure the resistance between the terminal 1 and 3 of the rear fog light relay K08 and the reliabile grounding point. Standard value: 11 ~ 14V Is the voltage normal? →**Yes** To step 8. →**No** Repair the K07 power line failure of the rear fog light relay. If necessary, replace the harness.
8. Check the control signal line of the rear fog relay K07.	
 	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the PEPS harness plug I25. D. Remove the rear fog lamp relay K08. E. Measure the resistance between the terminal 20 of the PEPS harness plug I25 and the terminal 2 of the rear fog relay K08 by using a multimeter. **Standard value: less than 5Ω** F. Connect the battery negative terminal. G. Measure the voltage between the PEPS harness plug I25 terminal 20 and the fixed ground point with the multimeter. **Standard value: 0 V** Is it OK after checking? →**Yes** To step 9. →**No** Repair the power line break failure of the rear fog light. If necessary, replace the harness.

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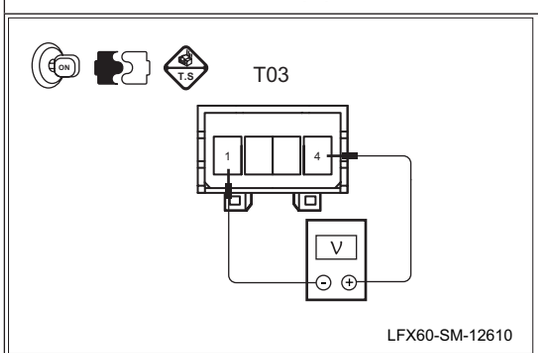
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Test condition	Details/results/measures
9. Check the rear fog light switch.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the cluster switch harness plug I14. D. Turn on the rear fog light and measure the resistance between the terminal 5 and 7 of the combined switch. **Standard value: less than 1Ω** Is the resistance normal? →**Yes** To step 10. →**No** Replace the rear fog light switch. **Refer to: Replacement of cluster switch.**
10. Check the grounding line of the rear fog light switch.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the cluster switch harness plug I14. D. Measure the resistance between the cluster switch harness plug I14 terminal 5 and the fixed ground point with the multimeter. **Standard value: less than 5Ω** Is the resistance normal? →**Yes** To step 11. →**No** Repair the switch grounding line failure of the rear fog light. If necessary, replace the harness.
11. Check the signal line of the rear fog light switch.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the PEPS harness plug I24. D. Disconnect the cluster switch harness plug I14. E. Measure the resistance between the terminal 18 of the PEPS harness plug I24 and the terminal 7 of the combined switch harness plug I14. **Standard value: less than 5Ω** Is the resistance normal? →**Yes** To step 12. →**No** Repair the switch signal line break failure of the rear fog light. If necessary, replace the harness.
13. Check the PEPS module.	
	A. Replace the PEPS module. Confirm that the fault has been ruled out.

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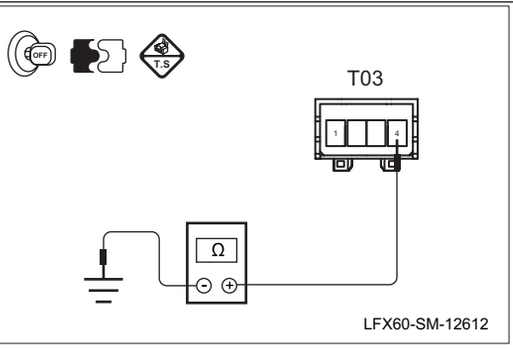
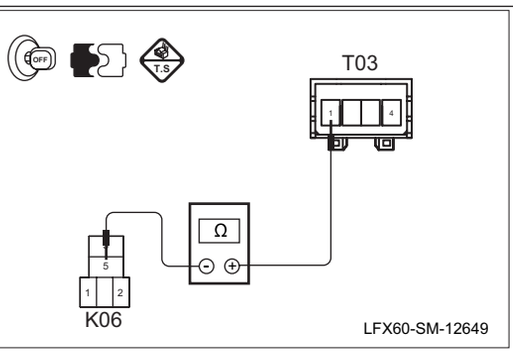
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Diagnosis flow for non-operating reversing light (MT)

Test condition	Details/results/measures
1. General inspection.	
	A. Check the reverse lamp harness plug and cluster switch harness plug for breakage, loose contact, aging or looseness. Is it OK after checking? →**Yes** To step 2. →**No** Examine and repair the fault location.
2. Check the fuse.	
	A. Check the reverse lamp switch fuse FS05. **Fuse rated capacity: 10A** Is it OK after checking? →**Yes** To step 3. →**No** Replace the fuse of same model.
3. Check the reverse lamp power line.	
	A. Operate the start switch to set the power mode to the “OFF” state. B. Disconnect the battery negative connector. C. Disconnect the rear combination lamp harness plug T03\T05. D. Connect the battery negative terminal. E. Start the switch to turn the power to ON mode. F. Turn the gear lever to reverse gear position and measure the voltage between the combination lamp harness plug T03\T05 terminal 1 and terminal 4 with the multimeter. **Standard value: 11 ~ 14 V** Is the voltage normal? →**No** To step 4. →**Yes** Replace the faulty brake light bulb. **Refer to: Replacement of brake light bulb.**

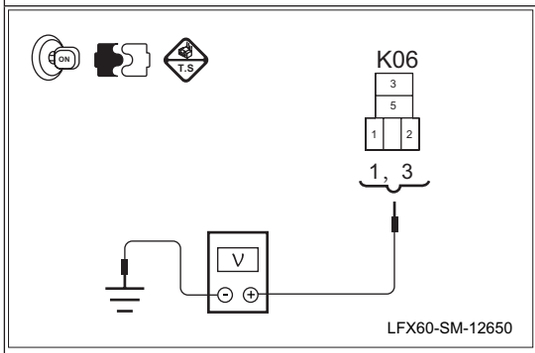
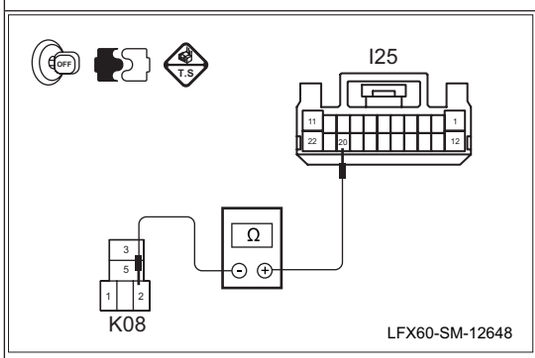
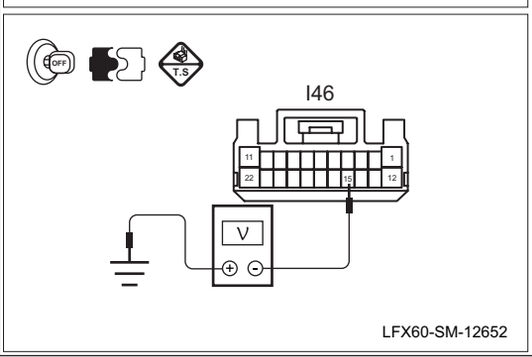
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Test condition	Details/results/measures
4. Check the reverse lamp ground line.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the rear fog lamp harness plug T03\T05. D. Measure the resistance between the reverse lamp harness plug T03\T05 terminal 4 and the fixed ground point with the multimeter. **Standard value: less than 5Ω** Is the resistance normal? →**Yes** To step 5. →**No** Repair the reverse lamp ground line open circuit fault and replace the harness if necessary.
5. Check the reverse lamp power line.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the rear combination lamp harness plug T03\T05. D. Remove the reverse lamp relay K06. E. Measure the resistance between the combination lamp harness plug T03\T05 terminal 1 and reverse lamp relay K06 terminal 5 with the multimeter. **Standard value: less than 5Ω** Is the resistance normal? →**Yes** To step 6. →**No** Repair the reverse lamp power line fault and replace the harness if necessary.
6. Check the reverse lamp relay K06.	
	A. Replace the reverse lamp relay of the same model and check whether the system is normal. Is it OK after checking? →**No** To step 7. →**Yes** Replace the relay of same model.

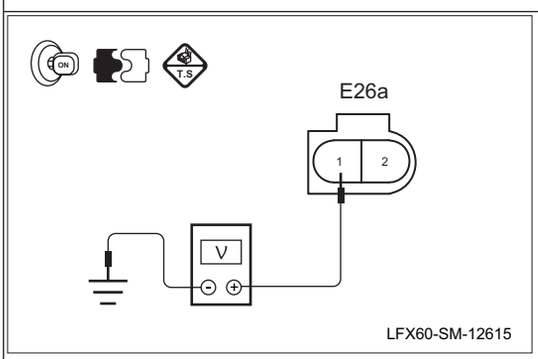
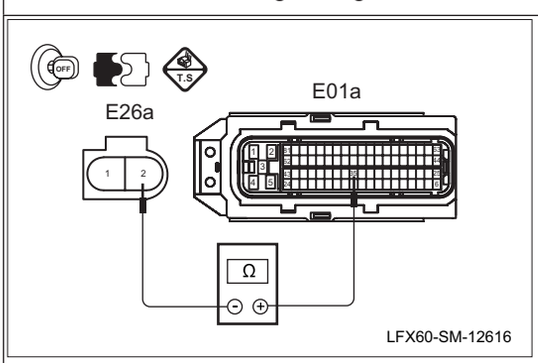
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Test condition	Details/results/measures
7. Check the reverse lamp relay power line.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Remove the reverse lamp relay K06. D. Connect the battery negative terminal. E. Start the switch to turn the power to ON mode. F. Measure the voltage between the reverse lamp relay K06 terminal 1, 3 and the fixed ground point with the multimeter. **Standard value: 11 ~ 14 V** Is the voltage normal? →**Yes** To step 8. →**No** Repair the reverse lamp relay K06 power line fault and replace the harness if necessary.
8. Check the reverse lamp relay control signal line.	
 	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the BCM harness plug I46. D. Remove the reverse lamp relay K06. E. Measure the resistance between the terminal 15 of the BCM harness plug I46 and the terminal 2 of the reversing light relay K06 by using a multimeter. **Standard value: less than 5Ω** F. Connect the battery negative terminal. G. Measure the voltage between the terminal 15 of the BCM harness plug I46 and reliable grounding by using a multimeter. **Standard value: 0 V** Is it OK after checking? →**Yes** To step 9. →**No** Repair the reverse lamp power line open circuit fault and replace the harness if necessary.

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Test condition	Details/results/measures
9. Check the reversing light switch.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the reverse lamp switch harness plug E26a. D. Place the gear rod in the reverse position and measure the resistance between the terminal 1 and 2 of the reversing light switch by using a multimeter. **Standard value: less than 1Ω** Is the resistance normal? →**Yes** To step 10. →**No** Replace the reversing light switch.
11. Check the power line of the reversing light switch.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the reverse lamp switch harness plug E26a. D. Connect the battery negative terminal. E. Start the switch to turn the power to ON mode. F. Measure the resistance between the terminal 1 of the reversing light switch harness plug E26a and the reliabile grounding point. **Standard value: 11 ~ 14 V** Is the voltage normal? →**Yes** To step 12. →**No** Repair the switch power line failure of the reversing light. If necessary, replace the harness.
12. Check the reverse gear signal line.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the reverse lamp switch harness plug E26a. D. Disconnect the ECU harness plug E01a. E. Measure the resistance between the terminal 2 of the reversing light switch harness plug E26a and the terminal 35 of the ECU harness plug E01a. **Standard value: less than 5Ω** Is the resistance normal? →**Yes** To step 13. →**No** Repair the reverse gear signal line fault and replace the harness if necessary.

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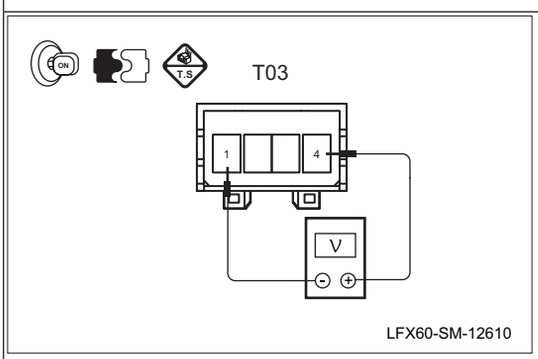
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Test condition	Details/results/measures
13. Check the communication line between the BCM and ECM.	
	A. Check the communication line between the BCM and ECM. **Refer to: "U0140"fault diagnosis** Is it OK after checking? →**Yes** To step 12. →**No** Repair the communication line between the BCM and ECM.
14. Check the BCM.	
	A. Replace the BCM module. Confirm that the fault has been ruled out.

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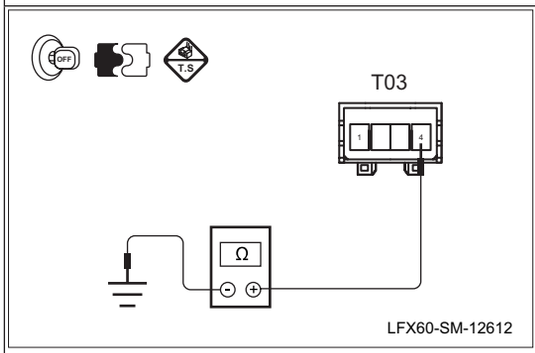
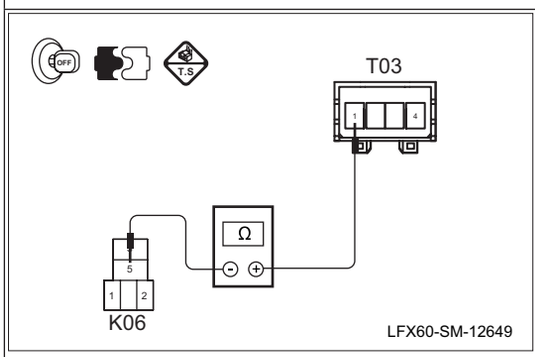
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Diagnosis flow for non-operating reversing light (CVT)

Test condition	Details/results/measures
1. General inspection.	
	A. Check the reverse lamp harness plug and cluster switch harness plug for breakage, loose contact, aging or looseness. Is it OK after checking? →**Yes** To step 2. →**No** Examine and repair the fault location.
2. Check the fuse.	
	A. Check the reverse lamp switch fuse FS05. **Fuse rated capacity: 10A** Is it OK after checking? →**Yes** To step 3. →**No** Replace the fuse of same model.
3. Check the reverse lamp power line.	
	A. Operate the start switch to set the power mode to the “OFF” state. B. Disconnect the battery negative connector. C. Disconnect the rear combination lamp harness plug T03\T05. D. Connect the battery negative terminal. E. Start the switch to turn the power to ON mode. F. Turn the gear lever to reverse gear position and measure the voltage between the combination lamp harness plug T03\T05 terminal 1 and terminal 4 with the multimeter. **Standard value: 11 ~ 14 V** Is the voltage normal? →**No** To step 4. →**Yes** Replace the faulty brake light bulb. **Refer to: Replacement of brake light bulb.**

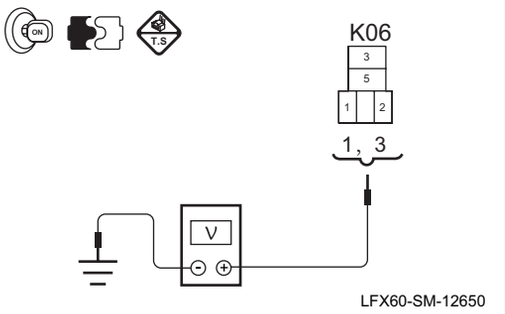
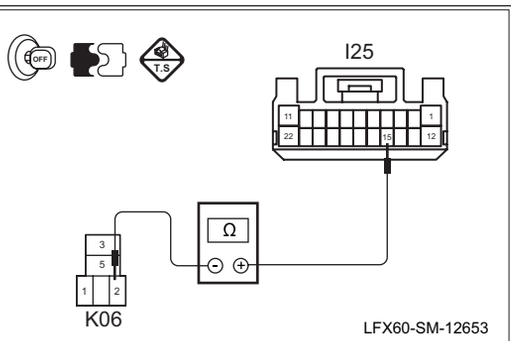
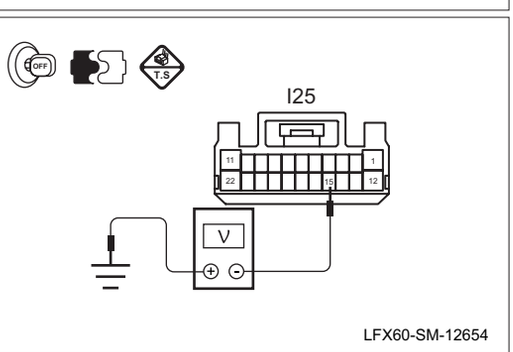
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Test condition	Details/results/measures
4. Check the reverse lamp ground line.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the rear fog lamp harness plug T03\T05. D. Measure the resistance between the reverse lamp harness plug T03\T05 terminal 4 and the fixed ground point with the multimeter. **Standard value: less than 5Ω** Is it OK after checking? →**Yes** To step 5. →**No** Repair the reverse lamp ground line open circuit fault and replace the harness if necessary.
5. Check the reverse lamp power line.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the rear combination lamp harness plug T03\T05. D. Remove the reverse lamp relay K06. E. Measure the resistance between the combination lamp harness plug T03\T05 terminal 1 and reverse lamp relay K06 terminal 5 with the multimeter. **Standard value: less than 5Ω** Is the resistance normal? →**Yes** To step 6. →**No** Repair the reverse lamp power line fault and replace the harness if necessary.
6. Check the reverse lamp relay K06.	
	A. Replace the reverse lamp relay of the same model and check whether the system is normal. Is it OK after checking? →**No** To step 7. →**Yes** Replace the relay of same model.

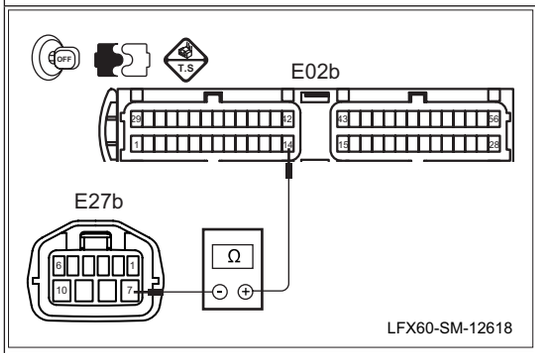
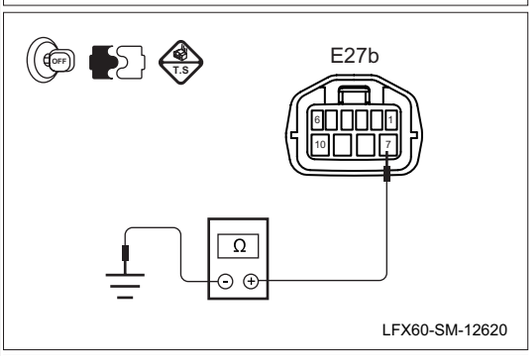
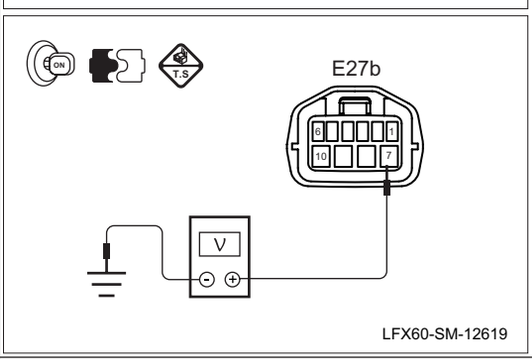
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Test condition	Details/results/measures
7. Check the reverse lamp relay power line.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Remove the reverse lamp relay K06. D. Connect the battery negative terminal. E. Start the switch to turn the power to ON mode. F. Measure the voltage between the reverse lamp relay K06 terminal 1, 3 and the fixed ground point with the multimeter. **Standard value: 11 ~ 14 V** Is the voltage normal? →**Yes** To step 8. →**No** Repair the reverse lamp relay K06 power line fault and replace the harness if necessary.
8. Check the reverse lamp relay control signal line.	
 	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the PEPS harness plug I25. D. Remove the reverse lamp relay K06. E. Measure the resistance between the terminal 15 of the PEPS harness plug I25 and the terminal 2 of the reversing light relay K06 by using a multimeter. **Standard value: less than 5Ω** F. Connect the battery negative terminal. G. Measure the voltage between the PEPS harness plug I25 terminal 15 and the fixed ground point with the multimeter. **Standard value: 0 V** Is it OK after checking? →Yes To step 9. →No Repair the reverse lamp power line open circuit fault and replace the harness if necessary.
9. Check the gear switch.	
	A. Replace the gear switch of same model and check if the system works normally. Is it OK after checking? →**Yes** To step 10. →**No** Replace the gear switch.

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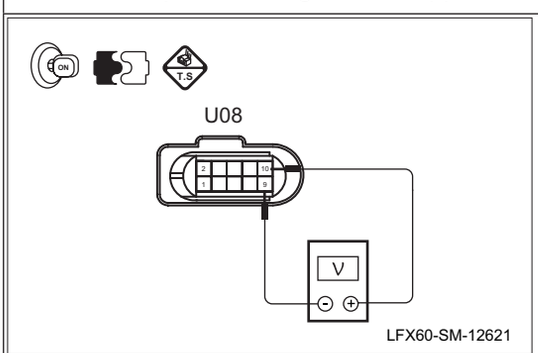
Test condition	Details/results/measures
10. Check the reverse gear signal line.	
  	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the gear switch harness plug E27b. D. Disconnect the TCU harness plug E02b. E. Measure the resistance between the terminal 7 of the gear switch harness plug E27b and the the terminal 14 of the TCU harness plug E02b. **Standard value: less than 5Ω** F. Measure the resistance between the terminal 7 of the gear switch harness plug E27b and the reliabile grounding point. **Standard value: 10MΩ or higher** G. Connect the battery negative terminal. H. Measure the voltage between the terminal 7 of the gear switch harness plug E27b and the reliabile grounding point. **Standard value: 0 V** Is it OK after checking? →**Yes** To step 11. →**No** Repair the reverse gear signal line fault and replace the harness if necessary.
12. Check the communication line between the PEPS and ECM.	
	A. Check the communication line between the PEPS and ECM. **Refer to: "U0140" fault diagnosis** Is it OK after checking? →**Yes** To step 13. →**No** Repair the communication line between the PEPS and ECM.
13. Check the PEPS.	
	A. Replace the PEPS module. Confirm that the fault has been ruled out.

12

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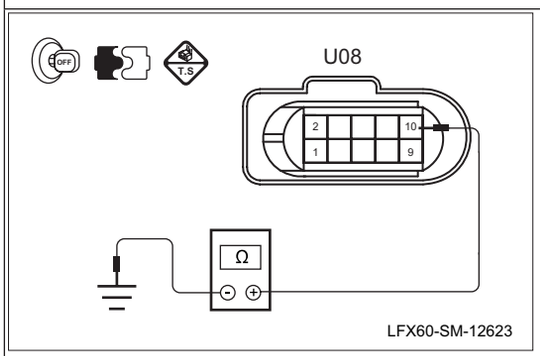
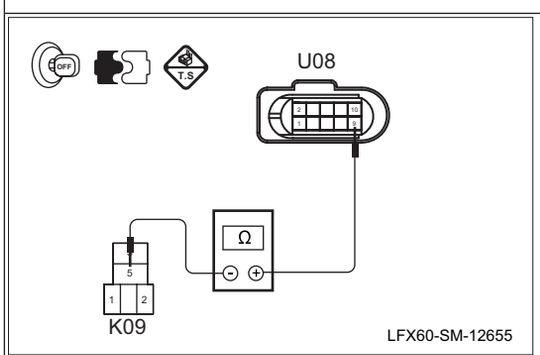
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Diagnosis flow for non-operating dipped headlight

Test condition	Details/results/measures
1. General inspection.	
	A. Check the combination lamp harness plug and cluster switch harness plug for breakage, loose contact, aging or looseness. Is it OK after checking? →**Yes** To step 2. →**No** Examine and repair the fault location.
2. Check the fuse.	
	A. Check if the fuse FS08 of the dipped headlight. **Fuse rated capacity: 15A** Is it OK after checking? →**Yes** To step 3. →**No** Replace the fuse of same model.
3. Check the power voltage of the dipped headlight.	
	A. Operate the start switch to set the power mode to the “OFF” state. B. Disconnect the battery negative connector. C. Disconnect the front combination lamp harness plug U08\U12. D. Connect the battery negative terminal. E. Turn on the dipped headlight and measure the voltage between the terminal 9 and 10 of the front combined light harness plug U08\U12 by using a multimeter. **Standard value: 11 ~ 14 V** Is the voltage normal? →**No** To step 4. →**Yes** Replace the dipped headlight bulb. **Refer to: Replacement of the dipped headlight bulb.**

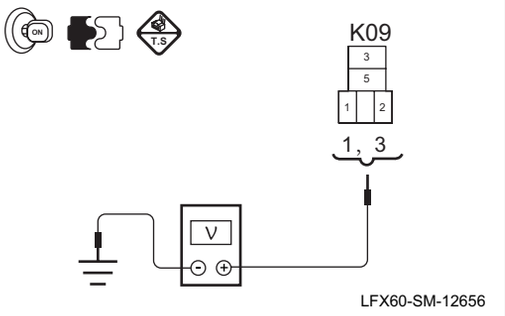
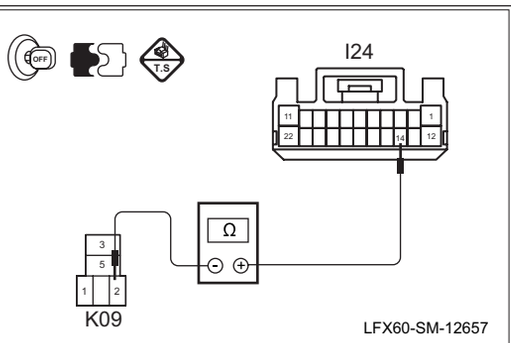
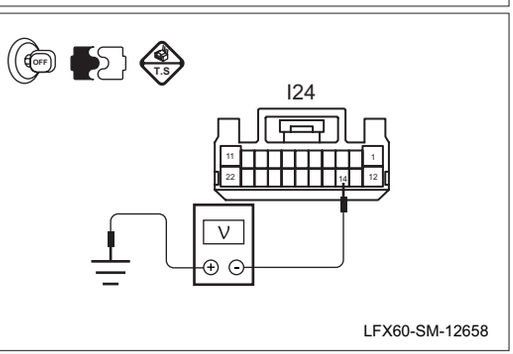
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Test condition	Details/results/measures
4. Check the grounding line of the dipped headlight.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the harness plug U08\U12 of the front combinedlight. C. Measure the resistance between the terminal 10 of the front combined light harness plug U08\U12 and reliable grounding by using a multimeter. **Standard value: less than 5Ω** Is the resistance normal? →**Yes** To step 5. →**No** Repair the grounding line break failure of the dipped headlight. If necessary, replace the harness.
5. Check the power line of the dipped headlight.	
	A. Operate the start switch to set the power mode to the “OFF” state. B. Disconnect the battery negative connector. C. Disconnect the front combination lamp harness plug U08\U12. D. Remove the dipped headlight relay K09. E. Measure the resistance between the terminal 9 of the front combined light harness plug U08\U12 and the terminal 5 of the distant light relay K09 by using a multimeter. **Standard value: less than 5Ω** Is the resistance normal? →**Yes** To step 6. →**No** Repair power line failures of the dipped headlight. If necessary, replace the harness.
6. Check the dipped headlight relay K09.	
	A. Replace the dipped headlight relay of same model and check if the system works normally. Is it OK after checking? →**No** To step 7. →**Yes** Replace the relay of same model.

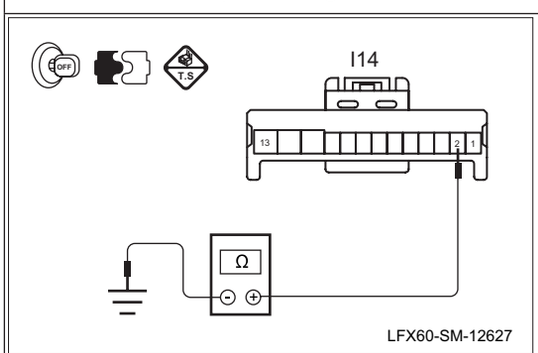
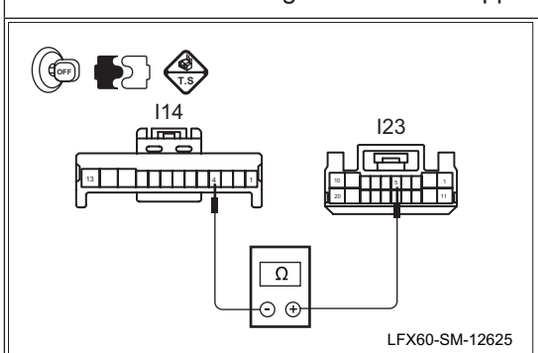
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Test condition	Details/results/measures
7. Check the power line of the dipped headlight relay.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Remove the dipped headlight relay K09. D. Connect the battery negative terminal. E. Start the switch to turn the power to ON mode. F. Measure the voltage between the terminal 1 and 3 of the dipped headlight relay K09 and the reliabile grounding point. **Standard value: 11 ~ 14 V** Is the voltage normal? →**Yes** To step 8. →**No** Repair the K09 power line failure of the dipped headlight relay. If necessary, replace the harness.
8. Check the control signal line of the dipped headlight relay.	
 	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the PEPS harness plug I24. D. Remove the dipped headlight relay K09. E. Measure the resistance between the terminal 14 of the PEPS harness plug I24 and the terminal 2 of the dipped headlight relay K09 by using a multimeter. **Standard value: less than 5Ω** F. Connect the battery negative terminal. G. Measure the voltage between the PEPS harness plug I24 terminal 14 and the fixed ground point with the multimeter. **Standard value: 0 V** Is it OK after checking? →**Yes** To step 9. →**No** Repair the power line break failure of the dipped headlight. If necessary, replace the harness.

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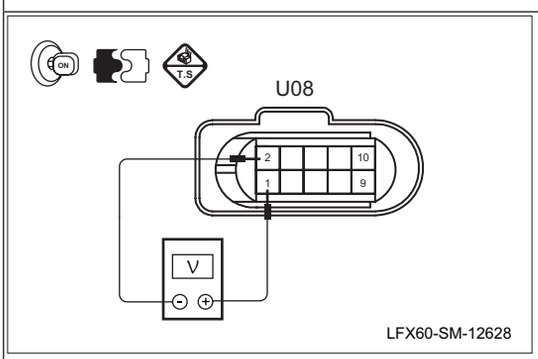
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Test condition	Details/results/measures
9. Check the dipped headlight switch.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the cluster switch harness plug I14. D. Measure the resistance between the cluster switch terminal 2 and 4. **Standard value: less than 1Ω** Is the resistance normal? →**Yes** To step 10. →**No** Replace the dipped headlight switch. **Refer to: Replacement of cluster switch.**
10. Check the lamp switch ground line.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the harness plug I14 of the combined switch. C. Measure the resistance between the terminal 2 of the combined switch harness plug I14 and the reliabile grounding point. **Standard value: less than 5Ω** Is the resistance normal? →**Yes** To step 11. →**No** Repair grounding line break failures of the lamplight switch. If necessary, replace the harness.
11. Check the control signal line of the dipped headlight switch.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the PEPS harness plug I23. D. Disconnect the cluster switch harness plug I14. E. Measure the resistance between the PEPS harness plug I23 terminal 5 and the cluster switch harness plug I14 terminal 4. **Standard value: less than 5Ω** Is the resistance normal? →**Yes** To step 12. →**No** Repair switch control signal line failures of the dipped headlight. If necessary, replace the harness.
12. Check the PEPS module.	
	A. Replace the PEPS module. Confirm that the fault has been ruled out.

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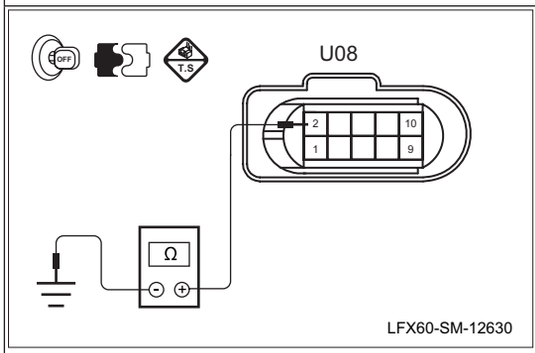
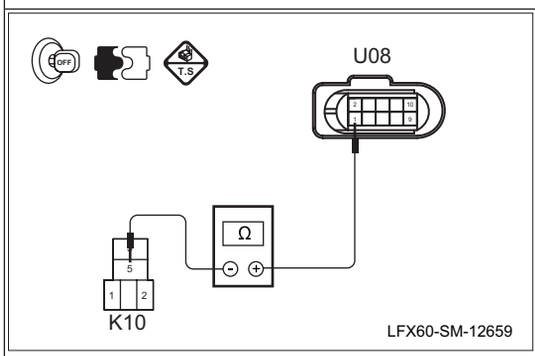
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Diagnosis flow for non-operating high beam

Test condition	Details/results/measures
1. General inspection.	
	A. Check the combination lamp harness plug and cluster switch harness plug for breakage, loose contact, aging or looseness. Is it OK after checking? →**Yes** To step 2. →**No** Examine and repair the fault location.
2. Check the fuse.	
	A. Check if the fuse FS09 of the **high beam**. **Fuse rated capacity: 10A** Is it OK after checking? →**Yes** To step 3. →**No** Replace the fuse of same model.
3. Check the high beam power line.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the front combination lamp harness plug U08\U12. D. Connect the battery negative terminal. E. Turn on the high beam and measure the voltage between the terminal 1 and 2 of the front combined light harness plug U08\U12 by using a multimeter. **Standard value: 11 ~ 14 V** Is the voltage normal? →**No** To step 4. →**Yes** Replace the high beam bulb. **Refer to: Replacement of the high beam bulb.**

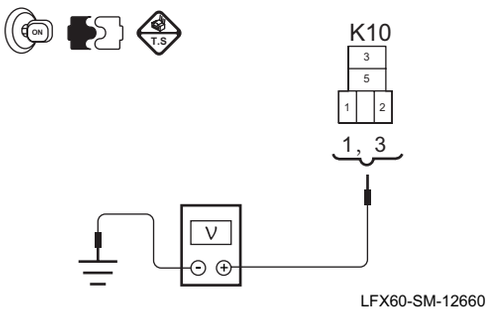
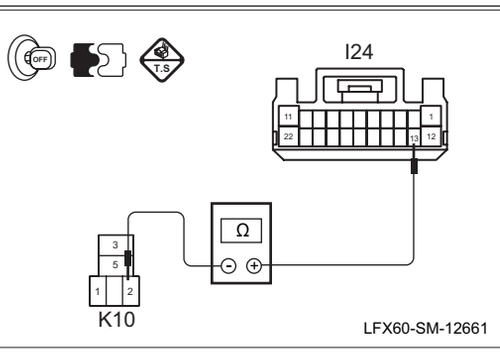
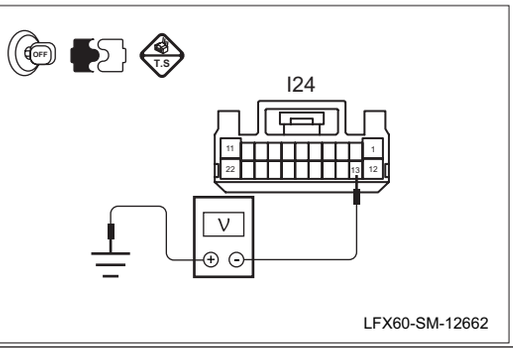
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Test condition	Details/results/measures
4. Check the grounding line of the high beam.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the front combination lamp harness plug U08\U12. D. Measure the resistance between the terminal 2 of the front combined light harness plug U08\U12 and the reliabile grounding point. **Standard value: less than 5Ω** Is the resistance normal? **→Yes** To step 5. **→No** Repair grounding line failures of the distant light. If necessary, replace the harness.
5. Check the high beam power line.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the front combination lamp harness plug U08\U12. D. Remove the high beam relay K10. E. Turn on the distant light and measure the resistance between the terminal 1 of the front combined light harness plug U08\U12 and the terminal 5 of the distant light relay K10. **Standard value: less than 5Ω** Is the resistance normal? **→Yes** To step 6. **→No** Repair the high beam power line open circuit fault and replace the harness if necessary.
6. Check the high beam relay K10.	
	A. Replace the high beam relay of same model and check if the system works normally. Is it OK after checking? **→No** To step 7. **→Yes** Replace the relay of same model.

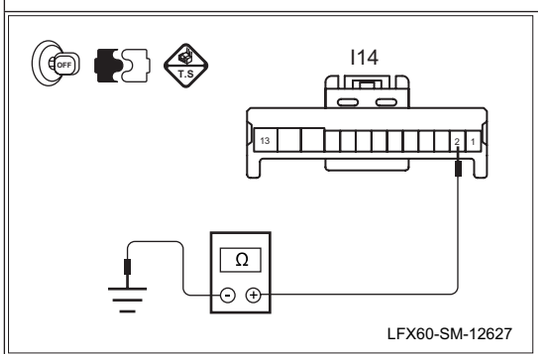
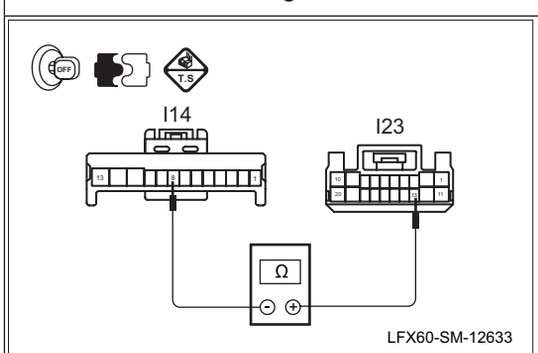
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Test condition	Details/results/measures
7. Check the power line of the high beam relay.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Remove the high beam relay K10. D. Connect the battery negative terminal. E. Start the switch to turn the power to ON mode. F. Measure the voltage between the terminal 1 and 3 of the high beam relay K10 and the reliabile grounding point. **Standard value: 11 ~ 14 V** Is the voltage normal? →**Yes** To step 8. →**No** Repair the K10 power line failure of the high beam relay. If necessary, replace the harness.
8. Check the control signal line of the high beam relay.	
 	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the PEPS harness plug I24. D. Remove the high beam relay K10. E. Measure the resistance between the terminal 13 of the PEPS harness plug I24 and the terminal 2 of the high beam relay K10 by using a multimeter. **Standard value: less than 5Ω** F. Connect the battery negative terminal. G. Measure the voltage between the PEPS harness plug I24 terminal 13 and the fixed ground point with the multimeter. **Standard value: 0V** Is it OK after checking? →**Yes** To step 9. →**No** Repair the high beam power line open circuit fault and replace the harness if necessary.

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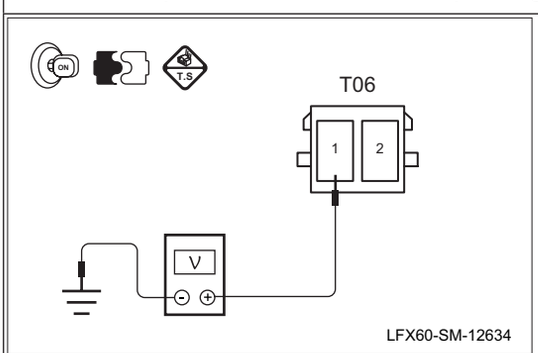
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Test condition	Details/results/measures
9. Check the high beam switch.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the cluster switch harness plug I14. D. Measure the resistance between the cluster switch terminal 2 and 8. **Standard value: less than 1Ω** Is the resistance normal? →**Yes** To step 9. →**No** Replace the high beam switch. **Refer to: Replacement of cluster switch.**
10. Check the lamp switch ground line.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the cluster switch harness plug I14. D. Measure the resistance between the cluster switch harness plug I14 terminal 2 and the fixed ground point with the multimeter. **Standard value: less than 5Ω** Is the resistance normal? →**Yes** To step 11. →**No** Repair grounding line failures of the lamplight switch. If necessary, replace the harness.
11. Check the control signal line of the distant light.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the PEPS harness plug I23. D. Disconnect the cluster switch harness plug I14. E. Measure the resistance between the PEPS harness plug I23 terminal 13 and the cluster switch harness plug I14 terminal 8. **Standard value: less than 5Ω** Is the resistance normal? →**Yes** To step 12. →**No** Repair switch control signal line break failures of the distant light. If necessary, replace the harness.
12. PEPS failure.	
	A. Replace the PEPS module. Confirm that the fault has been ruled out.

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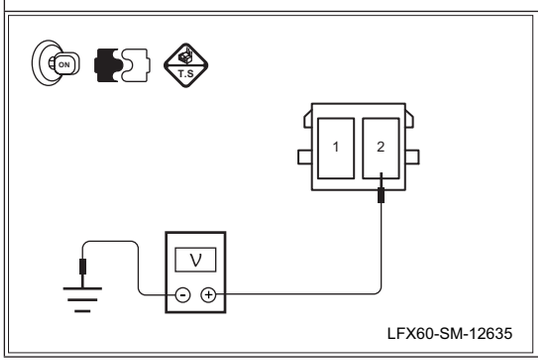
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Diagnosis flow for non-operating license plate light

Test condition	Details/results/measures
1. General inspection.	
	A. Check the harness plug for breakage, loose contact, aging or looseness. Is it OK after checking? →**Yes** To step 2. →**No** Examine and repair the fault location.
2. Check if the position light works normally.	
	A. Check if the position light works normally. Is it OK after checking? →**Yes** To step 3. →**No** Repair the faulty position light. **Refer to: Diagnosis flow for non-operating position light.**
3. Check the power line of the license plate light.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the license lamp harness plug T06\T10. D. Connect the battery cathode connector and turn on the position light. E. Measure the voltage between the terminal 1 of the license plate light harness plug T06\T10 and the reliabile grounding point. **Standard value: 11 ~ 14 V** Is the voltage normal? →**Yes** To step 4. →**No** Repair power line break failures of the license plate light. If necessary, replace the harness.

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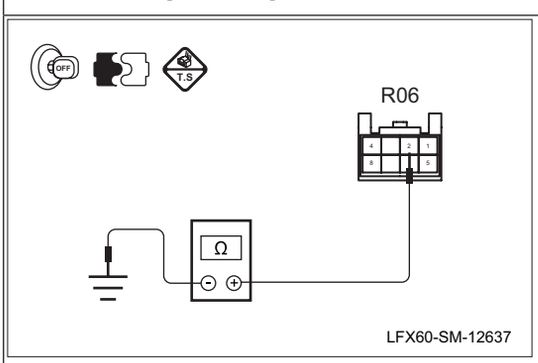
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Test condition	Details/results/measures
4. Check the grounding line of the license plate light.	
	A. Operate the start switch to set the power mode to the “OFF” state. B. Disconnect the battery negative connector. C. Disconnect the license lamp harness plug T06\T10. D. Measure the resistance between the terminal 2 of the license plate harness plug T06\T10 and the reliabile grounding point. **Standard value: less than 5Ω** Is the resistance normal? →**Yes** To step 5. →**No** Repair grounding line failures of the license plate light. If necessary, replace the harness.
5. Replace the license plate light.	
 LFX60-SM-12635	A. Replace the license plate light. **Refer to: Replace the license plate light.** Confirm that the fault has been ruled out.

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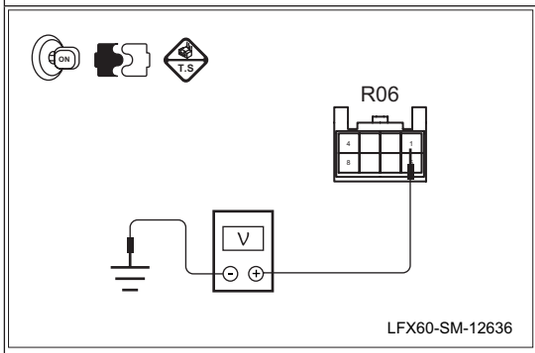
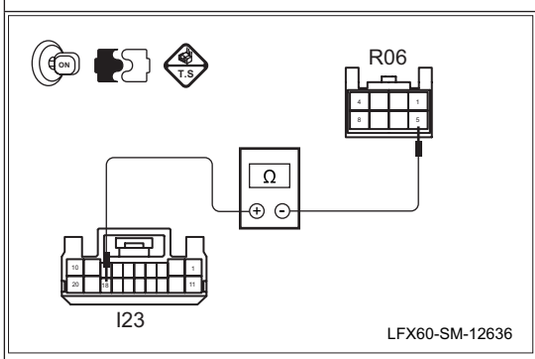
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Diagnosis flow for non-operating front reading light

Test condition	Details/results/measures
1. General inspection.	
	A. Check the harness plug for breakage, loose contact, aging or looseness. Is it OK after checking? →**Yes** To step 2. →**No** Examine and repair the fault location.
2. Confirm the operation status of the reading light when the front reading light switch is located at different positions.	
	A. Shift the reading light to “ON” or “Door” position and check if the reading light can work. Confirm if the front reading light does not work. →**Yes** To step 3.
3. Check the grounding line of the front reading light.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the harness plug R06 of the front reading light. C. Measure the resistance between the terminal 2 of the front reading light harness plug R06 and the reliabile grounding point. **Standard value: less than 5Ω** Is the resistance normal? →**Yes** To step 4 →**No** Repair grounding line failures of the front reading light. If necessary, replace the harness.

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Test condition	Details/results/measures
4. Check the power voltage of the front reading light.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the front reading lamp harness plug R06. D. Connect the battery negative terminal. E. Operate the start switch to set the power mode to the "ON" state. F. Measure the voltage between the terminal 1 of the front reading light harness plug R06 and the reliabile grounding point. **Standard value: 11 ~ 14 V** Is the voltage normal? →**Yes** Replace the front reading light. **Refer to: Replacement of the front reading light.** →**No** To step 5.
5. Check the power line of the front reading light.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the front reading lamp harness plug R06. D. Disconnect the PEPS harness plug I23. E. Measure the resistance between the terminal 5 of the front reading light harness plug R06 and the terminal 18 of the PEPS harness plug I23. **Standard value: less than 5Ω** Is the resistance normal? →**Yes** Replace the PEPS module. **Refer to: replacement of PEPS module** →**No** Repair power line failures of the front reading light. If necessary, replace the harness.

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Removal and Installation

Replace the combined switch

Removal

1. Disassemble the combined switch.

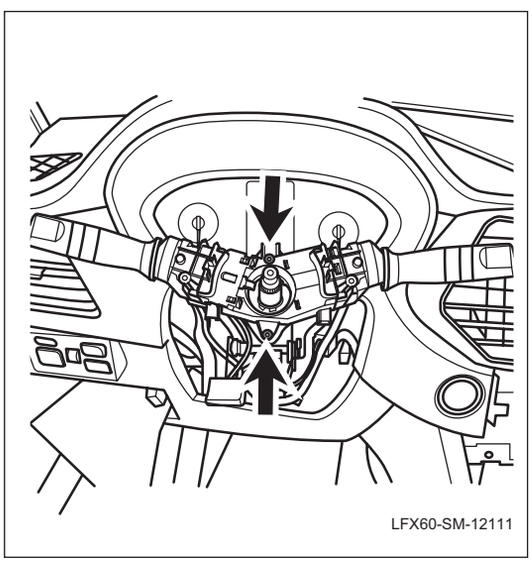
(a). Disconnect the battery negative connector.

(b). Remove the driver's airbag. **Refer to: replacement of the driver's airbag.**

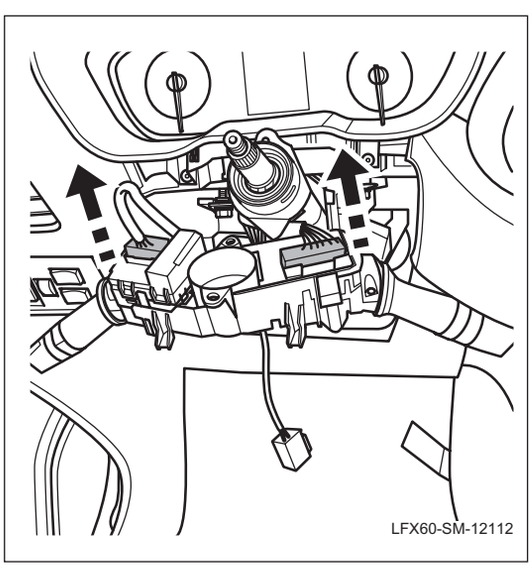
(c). Remove the steering wheel. **Refer to: replacement of the steering wheel.**

(d). Remove the steering column hood. **Refer to: replacement of the steering column hood.**

(e). Disassemble the clock spring, **refer to: replacement of the clock spring.**



(f). Disassemble two fixing screws of the combined switch.



(g). Disconnect the harness plug of the combined switch.

(h). Remove the combined switch.

Installation

1. Install the combined switch.

(a). The installation sequence is the reverse of the disassembly order.

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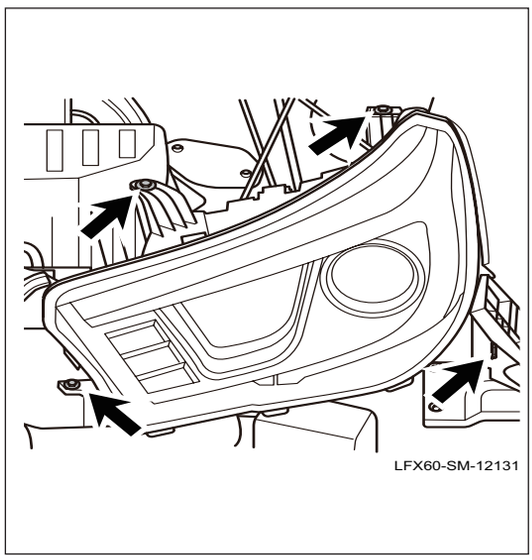
Replace the front combined light

Removal

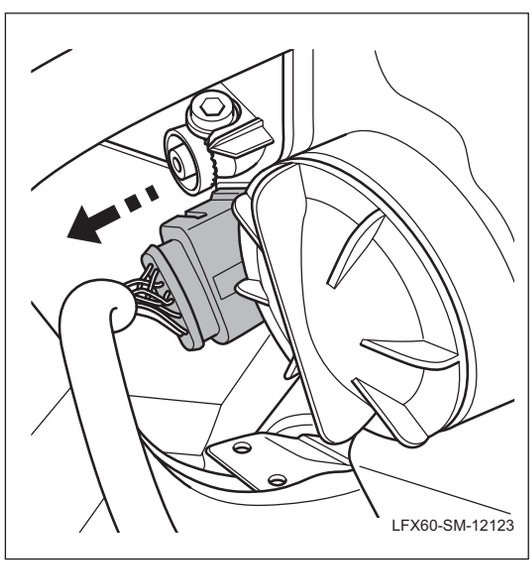
1. Disassemble front combined light.

(a). Disconnect the battery negative connector.

(b). Remove the front bumper. **Refer to the replacement of front bumper.**



(c). Disassemble fixing bolts of the front combined light.



(d). Disconnect the harness plug of the front combined light.

(e). Remove the front combined light.

Installation

1. Install the front combined light.

(a). The installation sequence is the reverse of the disassembly order.

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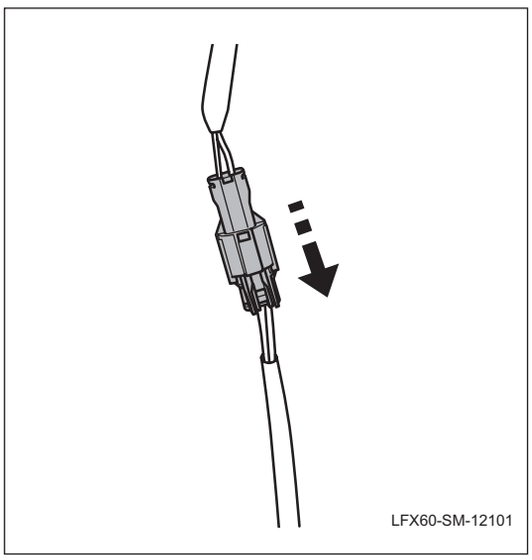
Replace the front fog light

Removal

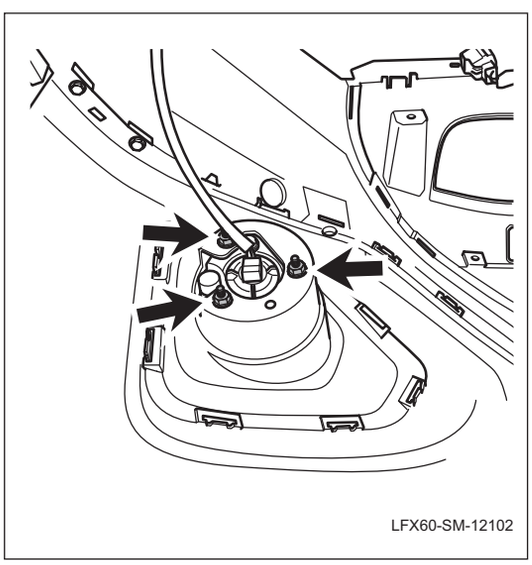
1. Remove the front fog light.

(a). Disconnect the battery negative connector.

(b). Remove the front bumper. **Refer to the replacement of front bumper.**



(c). Disconnect the harness plug of the front fog light.



(d). Disassemble fixing screws of the front fog light.

(e). Remove the front fog light.

Installation

1. Install the front fog light.

(a). The installation sequence is the reverse of the disassembly order.

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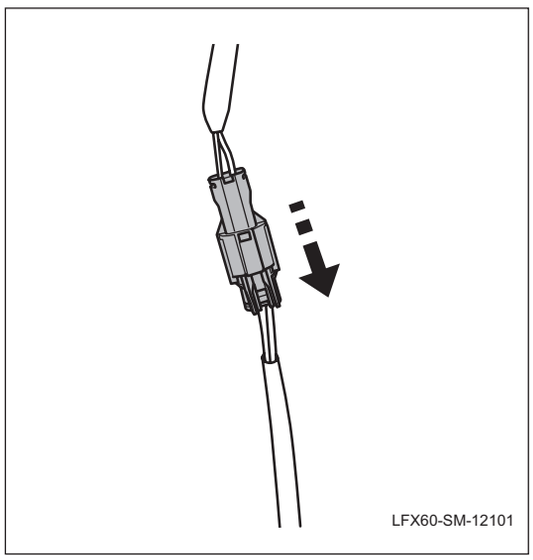
Replace the rear fog light

Removal

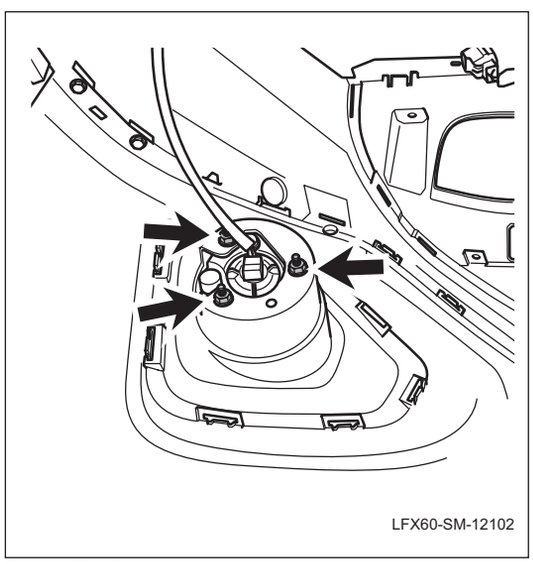
1. Remove the rear fog light.

(a). Disconnect the battery negative connector.

(b). Remove the rear bumper. **Refer to the replacement of rear bumper.**



(c). Disconnect the harness plug of the rear fog light.



(d). Disassemble fixing screws of the rear fog light.

(e). Remove the rear fog light.

Installation

1. Install the rear fog light.

(a). The installation sequence is the reverse of the disassembly order.

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Replace the danger warning switch.

Removal

1. Disassemble danger warning switch.

(a). Disconnect the battery negative connector.

(b). Disassemble the air-conditioning controller assembly, **refer to: replacement of the air-conditioner controller.**

Installation

1. Install the danger warning switch.

(a). The installation sequence is the reverse of the disassembly order.

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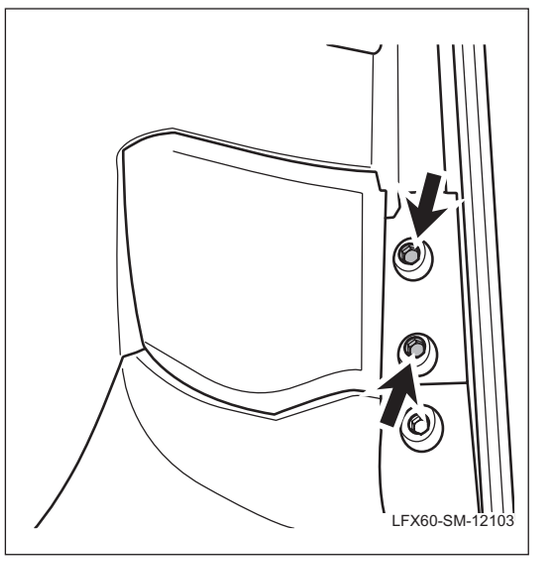
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Replace the rear combined light of the vehicle body.

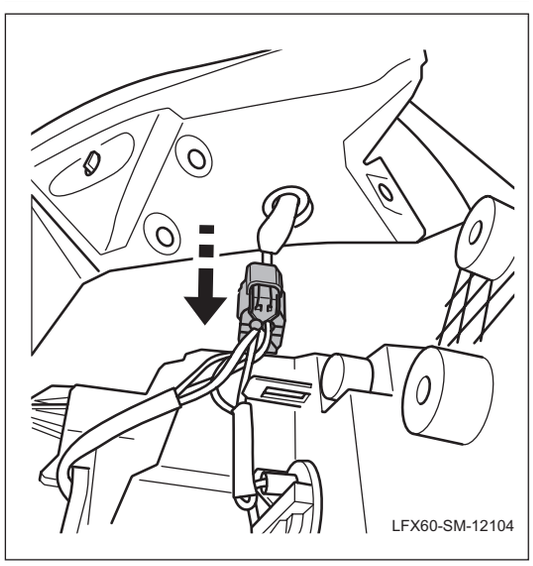
Removal

1. Disassemble the rear combined light of the vehicle body.

(a). Disconnect the battery negative connector.



(b). Disassemble fixing bolts of the rear combined light of the vehicle body.



(c). Disconnect the harness plug of the rear combined light of the vehicle body.

(d). Remove the rear combined light of the vehicle body.

Installation

1. Install the rear combined light of the vehicle body.

(a). The installation sequence is the reverse of the disassembly order.

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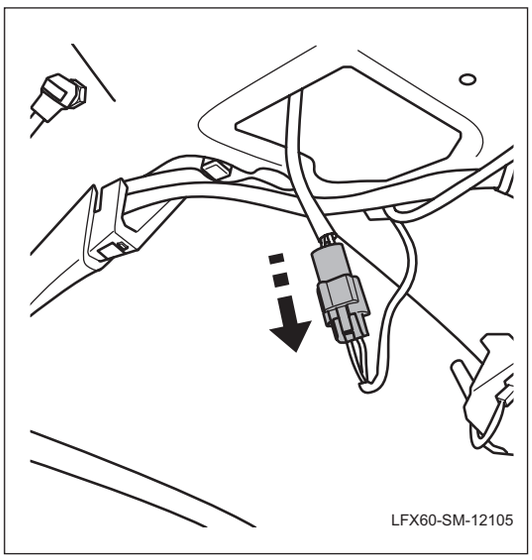
Replace the rear combined light of the back door

Removal

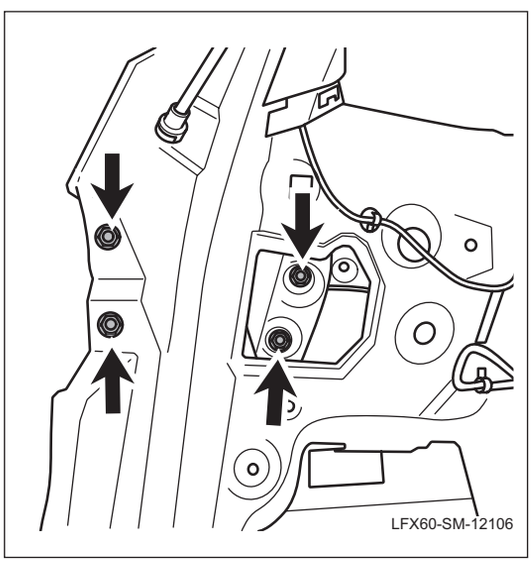
1. Disassemble the rear combined light of the back door.

(a). Disconnect the battery negative connector.

(b). Disassemble the internal decorative board of the rear door, **refer to: replacement of internal decorative board of the spare door.**



(c). Disconnect the harness plug of the rear combined light of the back door



(d). Disassemble fixing nuts of the rear combined light of the back door.

(e). Remove the rear combined light of the back door.

Installation

1. Install the rear combined light of the back door.

(a). The installation sequence is the reverse of the disassembly order.

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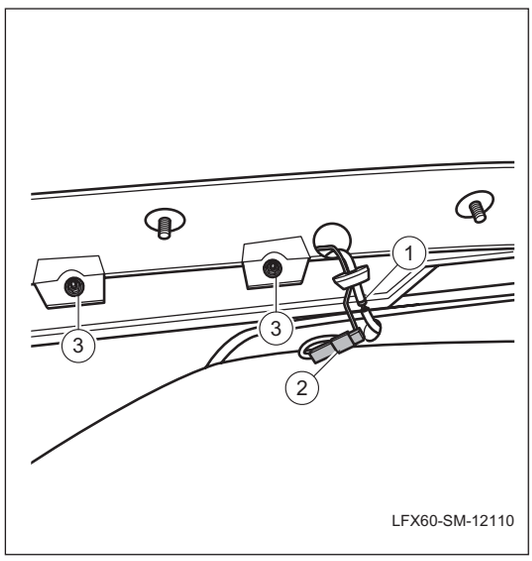
AutoLibrary

Replace the high brake light

Removal

1. Disassemble the high brake light.

(a). Disassemble the spoiler assembly, **refer to: replacement of the spoiler assembly.**



(b). Remove the washer sprayer hose 1 of the rear washer.

(c). Disassemble the harness plug 2 of the high brake light.

(d). Disassemble the fixing bolt 3 of the high brake light.

(e). Remove the high brake light.

(f). Disassemble the rear washer sprayer.

Installation

1. Install the high brake light.

(a). The installation sequence is the reverse of the disassembly order.

AutoLibrary

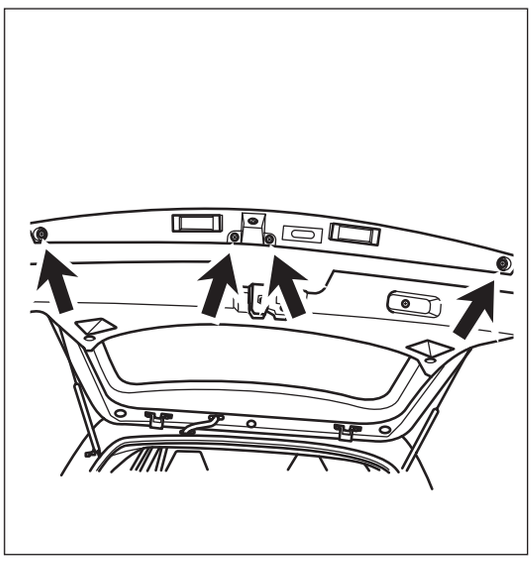
AutoLibrary

Replace the license plate light

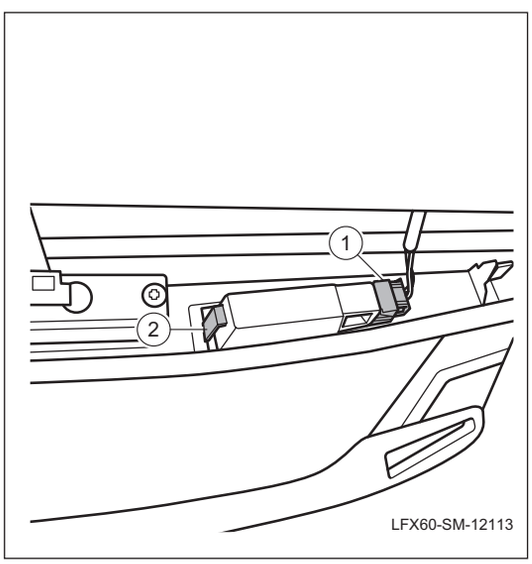
Removal

1. Disassemble the license plate light.

(a). Disconnect the battery negative connector.



(b). Disassemble fixing screws of the decorative bord of the rear license plate light.



(c). Disconnect the harness plug 1 of the license plate light.

(d). Disassemble the license plate light assembly 2 by using a proper tool.

Installation

1. Install the license plate light.

(a). The installation sequence is the reverse of the disassembly order.

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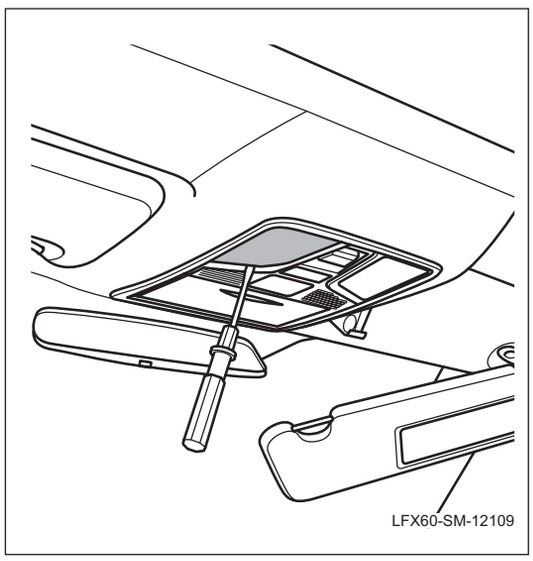
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Replace the front reading light.

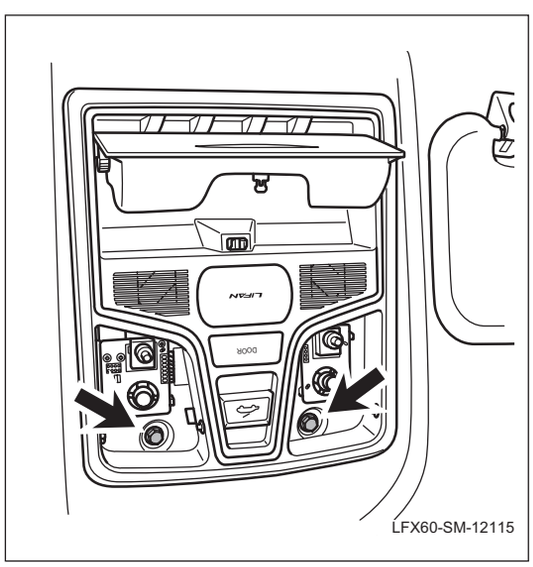
Removal

1. Disassemble the front reading light.

(a). Disconnect the battery negative connector.



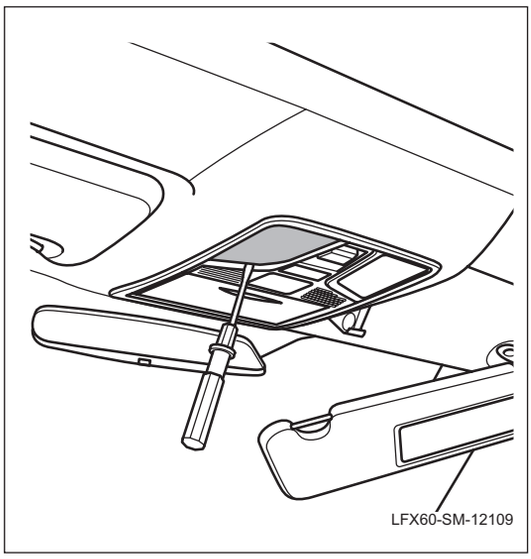
(b). Disassemble the lighting cover plate of the front reading light by using a proper tool.



(c). Disassemble the assembly bolts of the front reading light.

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(d). Disconnect the harness plug of the front reading light assembly and skylight switch.

(e). Remove the front reading light assembly.

Installation

1. Install the front reading light.

(a). The installation sequence is the reverse of the disassembly order.

Replace the luggage carrier light.

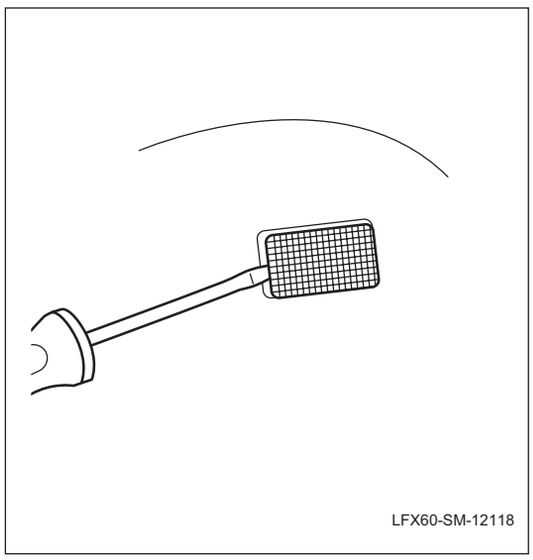
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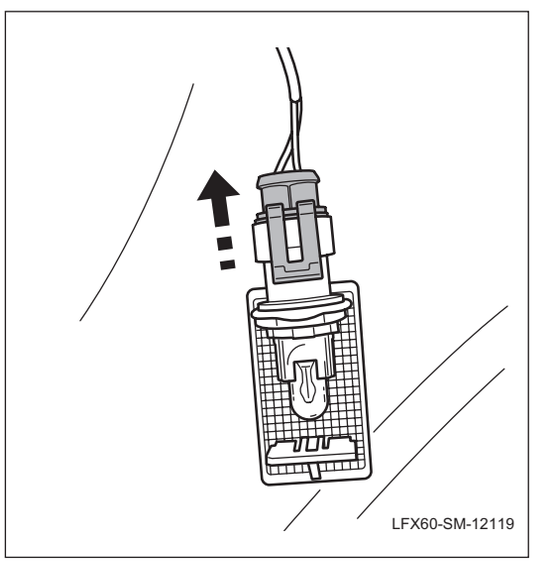
Removal

1. Disassemble the luggage carrier light.

(a). Disconnect the battery negative connector.



(b). Disassemble the luggage carrier light by using a proper tool.



(c). Disconnect the harness plug of the rear luggage carrier light.

(d). Remove the rear luggage carrier light.

Installation

1. Install the luggage carrier light.

(a). The installation sequence is the reverse of the disassembly order.

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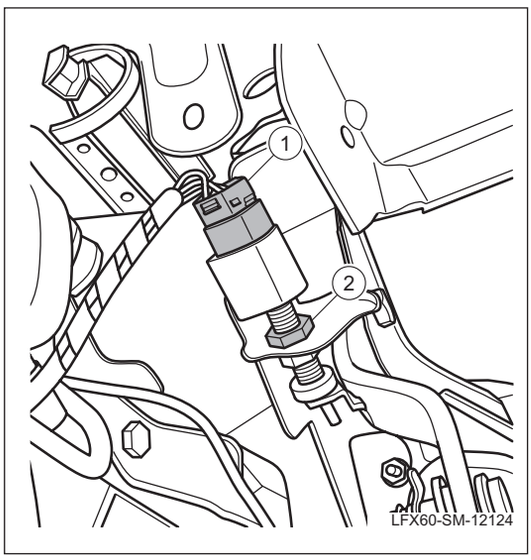
Replace the brake light switch.

Removal

1. Disassemble the brake light switch.

(a). Disconnect the battery negative connector.

(b). Remove the dashboard lower left panel assembly. Refer to the replacement of dashboard assembly.



(c). Disconnect the harness plug 1 of the brake light.

(d). Screw off the locking nut 2 of the brake light switch anticlockwise.

(e). Rotate anticlockwise again to reove the brake light switch.

Installation

1. Install the brake light switch.

(a). The installation sequence is the reverse of the disassembly order.

❶ Note:

Adjust the brake switch to a proper position in case of installation.

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12 - Electrical system

Wiper and scrubber..... 12-1583

Technical specifications 12-1583

Precautions..... 12-1584

Structure and installation location 12-1585

Operating Principle 12-1587

Diagnostic Information and Procedures 12-1588

Removal and Installation .. 12-1629

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Wiper and scrubber

Technical specifications

Torque Specifications

Name	Torque range	
	Nm	Lb -ft
Connect the rain wiper rod to the rain wiper arm	23	17
Connect the rear rain wiper motor to the rain wiper brush	23	17
Windscreen wahser fixed bolt	9	7
Connect the rain wiper motor to the vehicle body	9	7
Connect the rear rain wiper motor to the vehicle body	9	7

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Precautions

Precautions

1. Be sure to remove the battery cathode and wait for at least 1min before removing the system appliance wire, or it may cause personal injury.
2. If the wiper is blocked accidentally, the power should be cut timely for the prevention of burning the wiper motor. At this time, it is not enough to turn the rain wiper switch to OFF. It is necessary to quickly disconnect the battery cathode connector and remove the plug of the rain wiper motor from the socket of the combined switch.
3. The rain wiper brush should closely touch the vehicle window glass in use without a gap. Otherwise, the rain wiper can not clean well.
4. Forbid dry wiping in use to avoid damage to the rain wiper brush. If the rainn wiper switch is triggered accidentailly, it should be closed in time and the airwindow glass and the rain wiper should be cleaned and maintained to avoid accumulated dust.
5. After a rain wiper has been used for 1000h, the rain wiper motor should be disassembled for maintenance. The converter should be cleaned. The dual-zero paper is used to polish the electric brush trace on the converter's surface and the electric brush is replaced.
6. The washer cannot work for a long time and it cannot work for more than 5s every time. The break should not be less than 10s for each operation. The washer should not start without washing liquid.
7. The spray pipe must be fastened, it is prohibited to unplug the spray pipe casually. Do not spray the pipe interface for a long time when washing the car, so as to prevent it from corrosive aging.
8. For low temperature regions, be sure to add the cleaning solution meeting local temperature requirements.
9. Do not use the engine antifreeze or other substitutes to avoid damaging the window and paint.

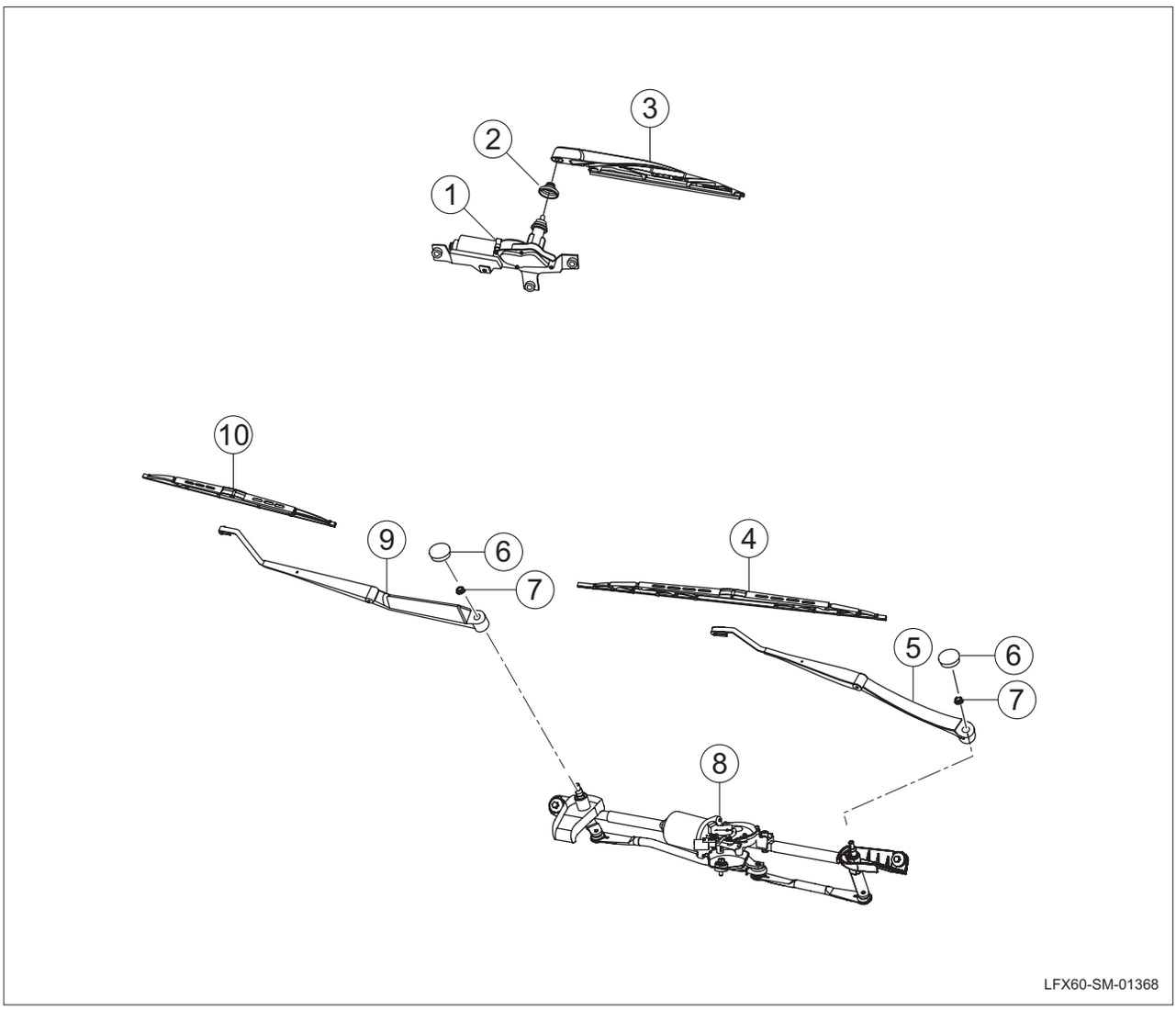
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Structure and installation location

Part exploded view

Wiper



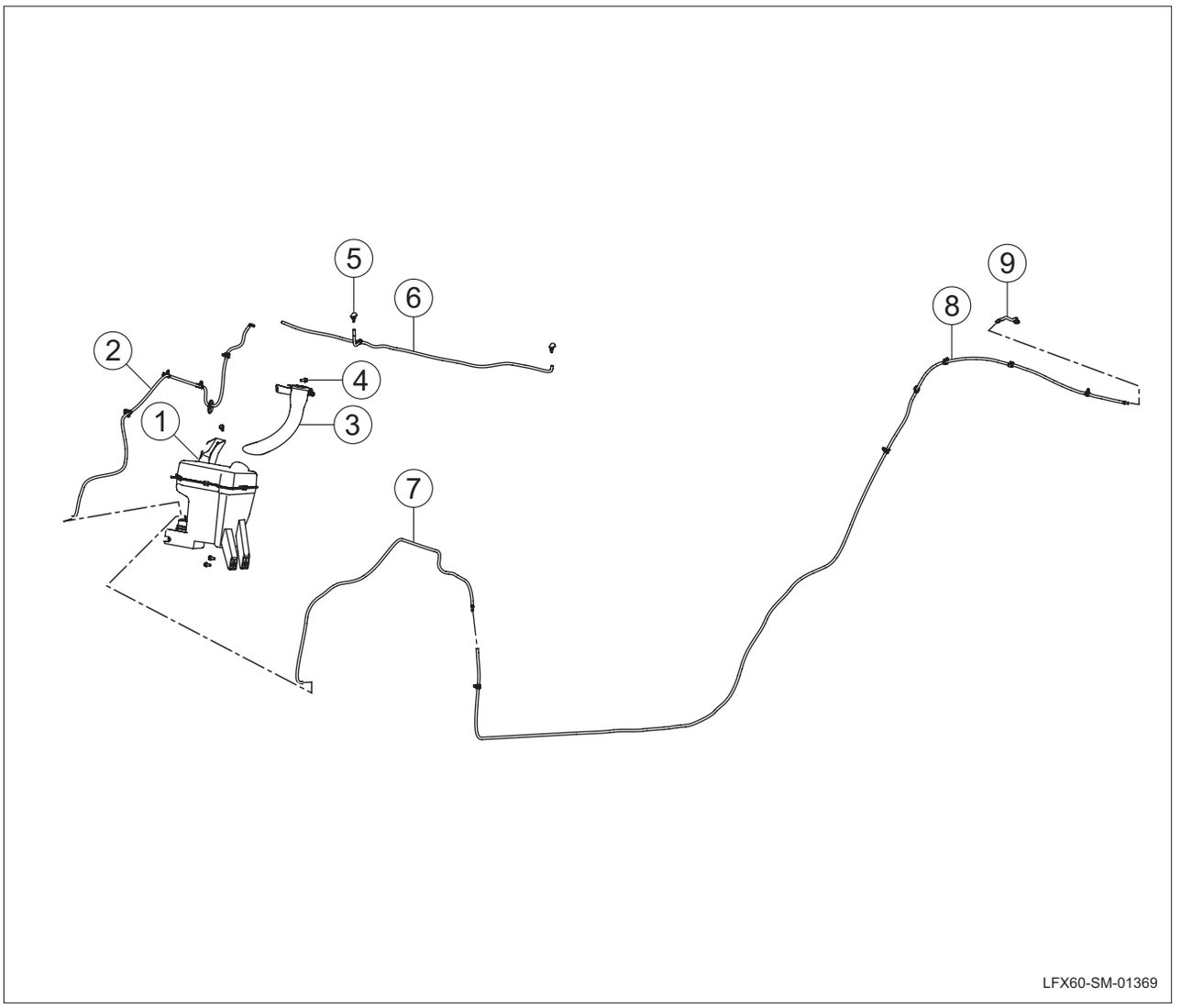
No.	Part name
1	Rear Wiper Motor Assembly
2	Motor rotating shaft jacket of rear rain wiper
3	Back door wiper assembly
4	Wiping brush component of left rain wiper
5	Wiping arm component of left rain wiper

No.	Part name
6	Wiper nut cap
7	Installation nut of rain wiper arm
8	Rain wiper connection rod and motor assembly
9	Wiping arm component of right rain wiper
10	Wiping brush component of right rain wiper

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Washing storage liquid pot and pipeline



No.	Part name
1	Washing pot body componennt
2	Front section components of front air window hose
3	Injection pipe component of washing pot
4	Hexagon flange bolt
5	Front windscreen nozzle assembly

No.	Part name
6	Rear section components of front air window hose
7	Front section components of rear air window hose
8	Rear section components of rear air window hose
9	Rear windscreen nozzle assembly

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Operating Principle

System description

Front Wiper System

The front rain wiper system is composed of the rain wiper/washer switch, front rain wiper and connection rod, front rain wiper arm and front rain wiper blades.

Front Windshield Washer System

The front air window glass washing system is composed of the glass cleaning agent, washing liquid storage tank and motor, front washer sprayer, washing hose and rain wiper/washing switch. The washing motor is fixed on the washing liquid storage tank. The washing motor transfers the washing liquid to the front and rear washing sprayer via the washing hose. The washer switch is one part of the rain wiper/washer switch.

Rear Wiper System

The rear rain wiper is composed of the rain wipe/washer switch, rear rain wipe motor, rear rain wiper ram and rear rain wiper blades. The rear rain wiper motor is installed under the inside of the back door and is directly connected to the rear rain wiper arm.

Rear Windshield Washer System

The rear air window glass washer is composed of the glass cleaning agent, rear rain wiper motor assembly, rear washer sprayer, washing hose and rain wiper/washing switch. The washing motor transfers the washing liquid to the rear rain wiper sprayer above the back door via the washing hose and uniformly sprays them on the rear air window glass via the rear rain wiper sprayer.

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Diagnostic Information and Procedures

Diagnosis Instructions

Before the rain wiping control system failure is diagnosed, please first read the system overview to know and familiarize the working principle of the rain wiping systen and then start system diagnosis. When a failure occurs, these knowledge can assist you to identify correct failure diagnosis steps. More importantly, these knowledge can assist you to check if conditions described by the customer are normal.

Any failure diagnisis of the rain wiping system should start with rain wiping system check. It can guide repairers to take enxt logic step and diagnose failures. Comprehend and correctly use the diagnostic flow chart to shorten the diagnosis time and avoid the misjudgment.

General equipment

Name
Diagnostic equipment of vehicle
Digital multimeter

Visual Inspection

1. Confirm the problem raised by the customer.
2. Check for the evident mechanical or electrical damage trace and collision deformation trace through the visual check.

Visual inspection table

Mechanical	Electrical
• Front windshield • Rear windshield • Sprayer • Washing liquid pipeline • Washing liquid water pot • Rain wiper • Rain wiping arm • Rain wiper transmission arm	• Fuse • Line • Wiper cluster switch • Front wiper motor • Rear wiper motor • Washer motor

3. Check the system lines easy to see or can be seen.
4. If the observed or raised problem is the evident and the cause has been found, ensure to fix this fault before proceeding with the next step.
5. If no problem is found through the visual check, confirm the fault and refer to the fault symptom list.

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List of fault symptoms

Symptom	Possible point of failure	Recommended Measures
The front rain wiper does not work	• Fuse • Front wiper mechanism not installed in position • Front wiper mechanism fault • Wiper cluster switch • Battery voltage low • Front wiper motor • Line fault	**Refer to: Diagnosis flow for non-operating front rain wiper**
The front rain wiper cannot stop	• Line fault • The rain wiper return signal failure • Wiper cluster switch • Front wiper motor	**Refer to: Diagnosis flow for non-stopping front rain wiper**
The front rain wiper does not operate at the low-rate gear	• Line fault • Low-rate signal failure • Wiper cluster switch • Front wiper motor	**Refer to: Diagnosis flow for non-operating front rain wiper at low rate gear**
The front rain wiper does not operate at the high-rate gear	• Line fault • High-rate signal failure • Wiper cluster switch • Front wiper motor	**Refer to: Diagnosis flow for non-operating front rain wiper at high rate gear**
The front rain wiper does not operate at the intermittent gear	• Line fault • Wiper cluster switch	**Refer to: Diagnosis flow for non-operating front rain wiper at intermittent gear**
The front rain wiper continuously operates under the intermittent mode	• Line fault • Intermittent signal failure of front rain wiper • Wiper cluster switch	**Refer to: Diagnosis flow for continuous operation of front rain wiper at low intermittent gear**
The rain wiper cannot wipe cleanly	• Washing solution unqualified • Battery voltage low • Wiper blade fault • Windshield scratch, fracture • Wiper mechanism fault • Front wiper motor	**Refer to: Diagnosis flow for unclean rain wiping**
Jitter in rain wiping	• The rain wiping mechanism is not installed in place • Washing solution unqualified • Battery voltage low • Wiper blade fault • Wiper mechanism fault • Windshield scratch, fracture • Front wiper motor	**Refer to: Diagnosis flow for jitter in rain wiping**
The front rain wiper cannot return to the initial position	• Front wiper mechanism not installed in position • Front wiper mechanism fault • Line fault • Wiper cluster switch • Return signal failure of the front rain wiper motor • Front wiper motor	**Refer to: Diagnosis flow for failed return to the initial position of the front rain wiper**
The rear rain wiper does not work	• Rear wiper mechanism not installed in position • Rear wiper mechanism fault • Wiper cluster switch • Battery voltage low • Line fault	**Refer to: Diagnosis flow for non-operating rear rain wiper**

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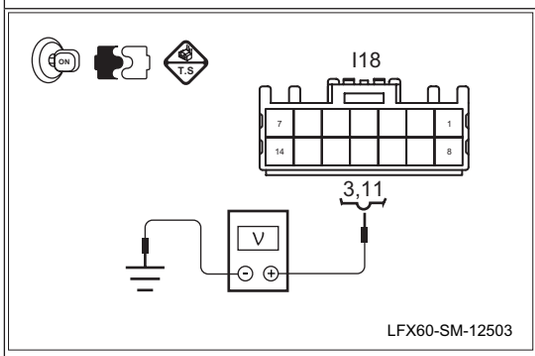
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Symptom	Possible point of failure	Recommended Measures
The rear rain wiper cannot return to the initial position.	• Rear wiper mechanism not installed in position • Rear wiper mechanism fault • Line fault • Wiper cluster switch • Return signal fialure of rear rain wiper motor • Rear wiper motor	**Refer to: Diagnosis flow for failed return to the initial position of rear rain wiper**
The front washer does not work	• Washing solution insufficient • Nozzle fault • Cleaning hose fault • Front washer switch • Line fault • Washer motor	**Refer to: Diagnosis flow for no operation of the front washer**
The rear washer does not work	• Washing solution insufficient • Nozzle fault • Cleaning hose fault • Rear washer switch • Line fault • Washer motor	**Refer to: Diagnosis flow for no operation of the rear washer**
Water is not sprayed in place	• Washing solution insufficient • Nozzle fault • Cleaning hose fault • Washer motor	**Refer to: Diagnosis flow for no spraying in place**
The front rain wiper cannot work at the one-time wiping gear	• Fuse • Line • Wiper cluster switch	**Refer to: Diagnosis flow for no operation of the front rain wiper at the one-tme rain wiping gear**

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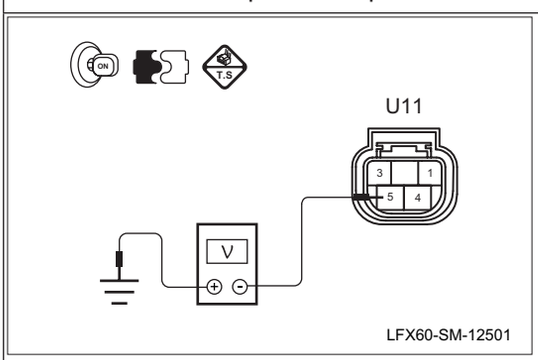
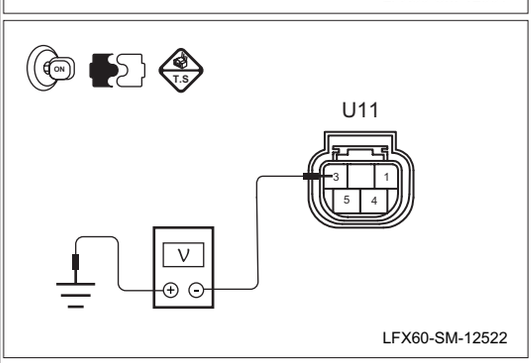
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Diagnosis flow for non-operating front rain wiper

Test condition	Details/results/measures
1. General inspection.	
	A. Check if the harness plug of the rain wiper switch and front rain mwiper motor are damaged, are aging and fall off. B. Check installation position and status of the front rain wiper. Is it OK after checking? →**Yes** To step 2. →**No** Repair or replace the damaged components.
2. Check the front wiper motor fuse.	
	A. Check the front wiper fuse FS25, FS26. **Fuse rated capacity: 20A** Is it OK after checking? →**Yes** To step 3. →**No** Replace the front wiper fuse.
3. Check the wiper cluster switch power line.	
	A. Operate the start switch to set the power mode to the “OFF” state. B. Disconnect the battery negative connector. C. Disconnect the wiper cluster switch harness plug I18. D. Connect the battery negative terminal. E. Operate the start switch to set the power mode to the “ON” state. F. Measure the voltage between the terminal 3 and 11 of the rain wiper combined switch harness plug I18 and the reliabile grounding point. **Standard value: 11 ~ 14 V** Is the voltage normal? →**Yes** To step 4. →**No** Repair the wiper cluster switch power line fault and replace the harness if necessary.

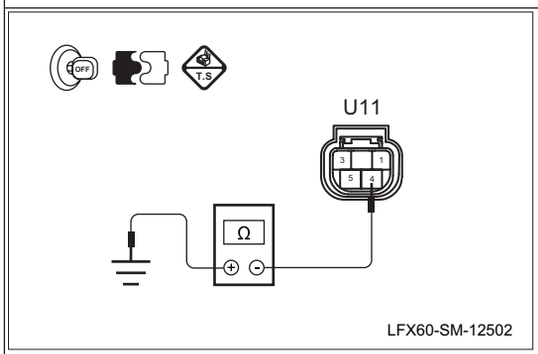
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Test condition	Details/results/measures
4. Check the wiper cluster switch.	
	A. Operate the start switch to set the power mode to the “OFF” state. B. Disconnect the battery negative connector. C. Disconnect the wiper cluster switch harness plug I18. D. Set the combined switch of the front rain wiper at the high-rate gear. E. Measure the resistance between the terminal 3 and 6 of the rain wipe combined switch. **Standard value: less than 1Ω** F. Set the combined switch of the front rain wiper at the low-rate gear. G. Measure the resistance between the terminal 3 and 10 of the rain wipe combined switch. **Standard value: less than 1Ω** Is the resistance normal? →**Yes** To step 5. →**No** Replace the wiper cluster switch. **Refer to: Replacement of wiper cluster switch.**
5. Check the front wiper motor power line.	
 LFX60-SM-12501  LFX60-SM-12522	A. Operate the start switch to set the power mode to the “OFF” state. B. Disconnect the battery negative connector. C. Disconnect the front wiper motor harness plug U11. D. Connect the battery negative terminal. E. Operate the start switch to set the power mode to the “ON” state. F. Set the combined switch of the front rain wiper at the high-rate gear. G. Measure the voltage between the terminal 5 of the rain wiper motor harness plug U11 and the reliabile grounding point. **Standard value: 11 ~ 14 V** H. Set the combined switch of the front rain wiper at the low-rate gear. I. Measure the voltage between the terminal 3 of the rain wiper motor harness plug U11 and the reliabile grounding point. **Standard value: 11 ~ 14 V** Is the voltage normal? →**Yes** To step 6. →**No** Repair the front wiper motor power line fault and replace the harness if necessary.

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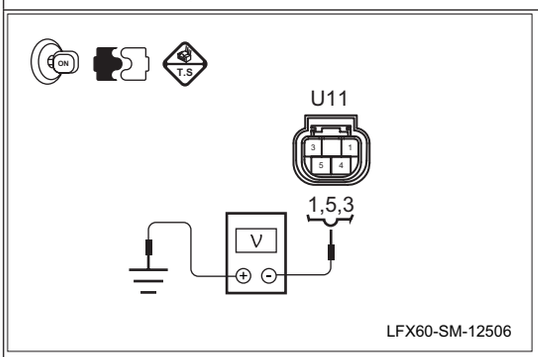
Test condition	Details/results/measures
6. Check the front wiper motor ground line.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the front wiper motor harness plug U11. D. Measure the resistance between the front wiper motor harness plug U11 terminal 4 and fixed ground point with the multimeter. **Standard value: less than 5Ω** Is the resistance normal? →**Yes** To step 7. →**No** Repair the front wiper motor ground line fault and replace the harness if necessary.
7. Replace the front wiper motor.	
	A. Replace the front wiper motor. **Refer to: Replace the front rain wiper motor** Confirm the system is normal.

12

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Diagnosis flow for non-stopping front rain wiper

Test condition	Details/results/measures
1. General inspection.	
	A. Check the front wiper harness plug and wiper cluster switch for breakage, aging, loose contact and looseness. Is it OK after checking? →**Yes** To step 2. →**No** Repair or replace the damaged components.
2. Check the wiper cluster switch.	
	A. Operate the start switch to set the power mode to the “OFF” state. B. Disconnect the battery negative connector. C. Disconnect the wiper cluster switch harness plug I18. D. Shift the combined switch of the front rain wiper to the Close status. E. Measure the resistance between the terminal 3 of the rain wipe combined switch and the terminal 6 of the power. F. Measure the resistance between the terminal 3 and 10 of the rain wipe combined switch. **Standard value: 10MΩ or higher** Is the resistance normal? →**Yes** To step 3. →**No** Replace the wiper cluster switch. **Refer to: Replacement of wiper cluster switch.**
3. Check the front wiper motor power line.	
	A. Operate the start switch to set the power mode to the “OFF” state. B. Disconnect the battery negative connector. C. Disconnect the front wiper motor harness plug U11. D. Shift the combined switch of the front rain wiper to “OFF” status. E. Connect the battery negative terminal. F. Operate the start switch to set the power mode to the “ON” state. G. Measure the voltage between the terminal 1, 5 and 3 of the rain wipe motor harness plug U11 and the reliabile grounding point. **Standard value: 0 V** Is the voltage normal? →**Yes** To step 4. →**No** Repair the front wiper motor power line fault and replace the harness if necessary.

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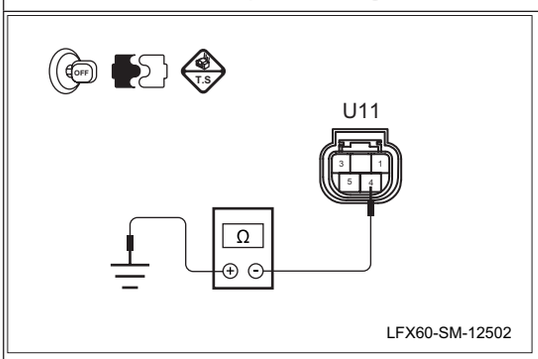
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4. Replace the front wiper motor.	
	A. Replace the front wiper motor. **Refer to: Replacement of front wiper motor and connecting rod assembly.** Confirm the system is normal.

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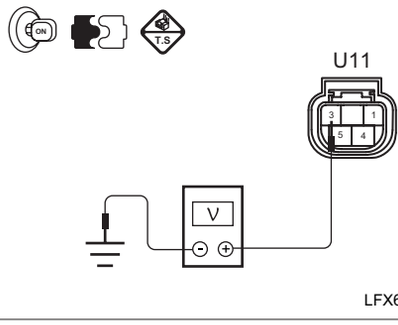
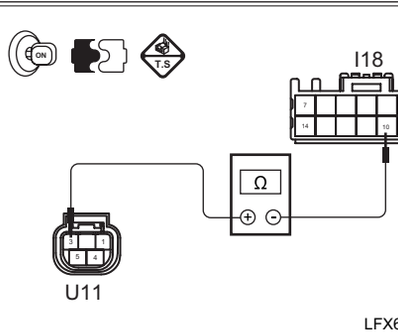
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Diagnosis flow for non-operating front rain wiper at low rate gear

Test condition	Details/results/measures
1. General inspection.	
	A. Check the front wiper harness plug and wiper cluster switch for breakage, aging, loose contact and looseness. Is it OK after checking? →**Yes** To step 2. →**No** Repair or replace the damaged components.
2. Check the front wiper motor fuse.	
	A. Check the front wiper fuse FS25, FS26. **Fuse rated capacity: 20A** Is it OK after checking? →**Yes** To step 3. →**No** Replace the front wiper fuse.
3. Check the front wiper motor ground line.	
	A. Operate the start switch to set the power mode to the “OFF” state. B. Disconnect the battery negative connector. C. Disconnect the front wiper motor harness plug U11. D. Measure the resistance between the front wiper motor harness plug U11 terminal 4 and fixed ground point with the multimeter. **Standard value: less than 5Ω** Is the resistance normal? →**Yes** To step 4. →**No** Repair the front wiper motor ground line fault and replace the harness if necessary.

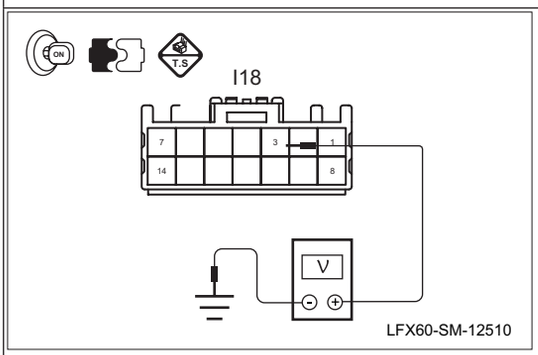
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Test condition	Details/results/measures
4. Check the voltage of the rain wiper motor at the low rate gear.	
	A. Operate the start switch to set the power mode to the “OFF” state. B. Disconnect the battery negative connector. C. Disconnect the front wiper motor harness plug U11. D. Connect the battery negative terminal. E. Operate the start switch to set the power mode to the “ON” state. F. Shift the combined switch of the rain wiper to the low rate position. G. Measure the voltage between the front wiper motor harness plug U11 terminal 3 and fixed ground point with the multimeter. **Standard value: 11 ~ 14 V** Is the voltage normal? →**Yes** Replace the front wiper motor. **Refer to: Replacement of front wiper motor and connecting rod assembly.** →**No** To step 5.
5. Check the power line of the front rain wiper motor at the low rate gear.	
	A. Operate the start switch to set the power mode to the “OFF” state. B. Disconnect the battery negative connector. C. Disconnect the front wiper motor harness plug U11. D. Disconnect the wiper cluster switch harness plug I18. E. Measure the resistance between the front wiper motor harness plug U11 terminal 3 and the wiper cluster switch I18 terminal 10. **Standard value: less than 5Ω** Is the resistance normal? →**Yes** To step 6. →**No** Repair the front wiper motor low gear power line fault and replace the harness if necessary.

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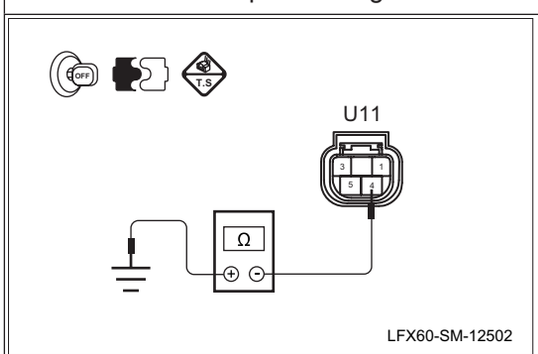
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Test condition	Details/results/measures
6. Check the power circuit of the combined switch of the front rain wiper at the low rate gear.	
	A. Operate the start switch to set the power mode to the “OFF” state. B. Disconnect the battery negative connector. C. Disconnect the wiper cluster switch harness plug I18. D. Operate the start switch to set the power mode to the “ON” state. E. Measure the voltage between the wiper cluster switch harness plug I18 terminal 3 and fixed ground point with the multimeter. **Standard value: 11 ~ 14 V** Is the voltage normal? →**Yes** To step 7. →**No** Repair the wiper cluster switch low speed power line fault and replace the harness if necessary.
7. Replace the wiper cluster switch.	
	A. Replace the wiper cluster switch. **Refer to: Replacement of wiper cluster switch.** Confirm the system is normal.

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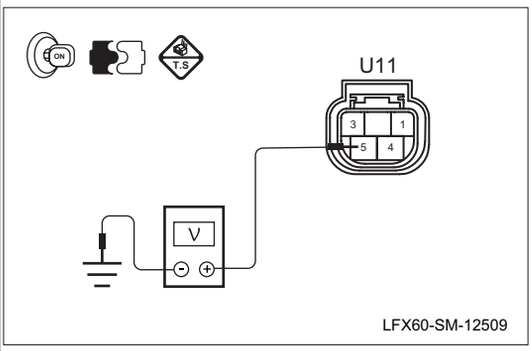
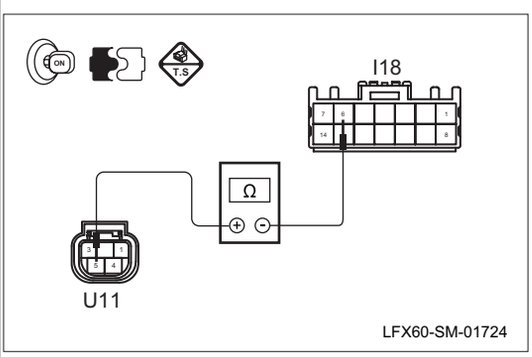
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Diagnosis flow for non-operating front rain wiper at high rate gear

Test condition	Details/results/measures
1. General inspection.	
	A. Check the front wiper harness plug and wiper cluster switch for breakage, aging, loose contact and looseness. Is it OK after checking? →**Yes** To step 2. →**No** Repair or replace the damaged components.
2. Check the front wiper motor fuse.	
	A. Check the front wiper fuse FS25, FS26. **Fuse rated capacity: 20A** Is it OK after checking? →**Yes** To step 3. →**No** Replace the front wiper fuse.
3. Check the front wiper motor ground line.	
	A. Operate the start switch to set the power mode to the “OFF” state. B. Disconnect the battery negative connector. C. Disconnect the front wiper motor harness plug U11. D. Measure the resistance between the front wiper motor harness plug U11 terminal 4 and fixed ground point with the multimeter. **Standard value: less than 5Ω** Is the resistance normal? →**Yes** To step 4. →**No** Repair the front wiper motor ground line fault and replace the harness if necessary.

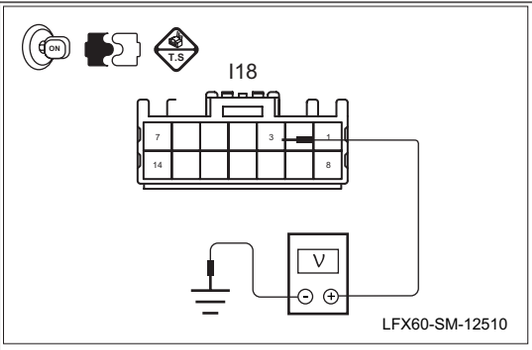
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Test condition	Details/results/measures
4. Check the voltage of the rain wiper motor at the high rate gear.	
	A. Operate the start switch to set the power mode to the “OFF” state. B. Disconnect the battery negative connector. C. Disconnect the front wiper motor harness plug U11. D. Connect the battery negative terminal. E. Operate the start switch to set the power mode to the “ON” state. F. Shift the combined switch of the rain wiper to the high rate position. G. Measure the voltage between the front wiper motor harness plug U11 terminal 5 and fixed ground point with the multimeter. **Standard value: 11 ~ 14 V** Is the voltage normal? →**Yes** Replace the front wiper motor. **Refer to: Replacement of front wiper motor and connecting rod assembly.** →**No** To step 5.
5. Check the power line of the front rain wiper motor at the high rate gear.	
	A. Operate the start switch to set the power mode to the “OFF” state. B. Disconnect the battery negative connector. C. Disconnect the front wiper motor harness plug U11. D. Disconnect the wiper cluster switch harness plug I18. E. Measure the resistance between the front wiper motor harness plug U11 terminal 5 and the wiper cluster switch I18 terminal 6. **Standard value: less than 5Ω** Is the resistance normal? →Yes To step 6. →**No** Repair the front wiper motor high gear power line fault and replace the harness if necessary.

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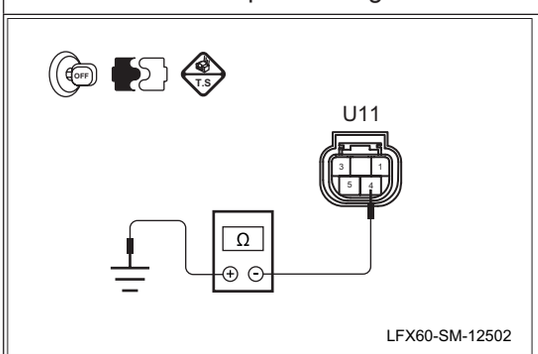
Test condition	Details/results/measures
6. Check the power circuit of the combined switch of the front rain wiper at the high rate gear.	
 LFX60-SM-12510	A. Operate the start switch to set the power mode to the “OFF” state. B. Disconnect the battery negative connector. C. Disconnect the wiper cluster switch harness plug I18. D. Operate the start switch to set the power mode to the “ON” state. E. Measure the voltage between the wiper cluster switch harness plug I18 terminal 3 and fixed ground point with the multimeter. **Standard value: 11 ~ 14 V** Is the voltage normal? →**Yes** To step 7. →**No** Repair the wiper cluster switch high speed power line fault and replace the harness if necessary.
7. Replace the wiper cluster switch.	
	A. Replace the wiper cluster switch. **Refer to: Replacement of wiper cluster switch.** Confirm the system is normal.

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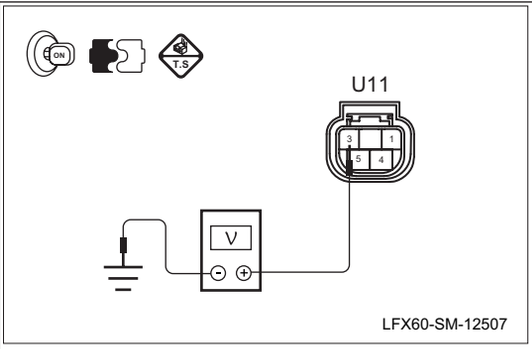
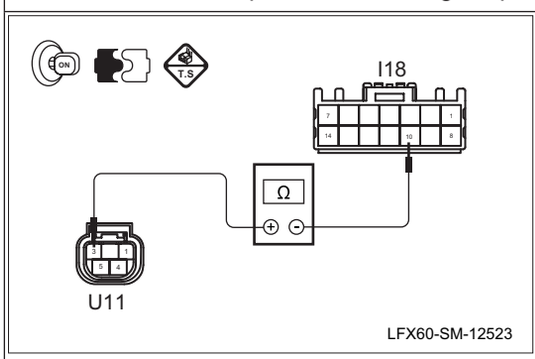
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Diagnosis flow for no operation of the front rain wiper at the one-tme rain wiping gear

Test condition	Details/results/measures
1. General inspection.	
	A. Check the front wiper harness plug and wiper cluster switch for breakage, aging, loose contact and looseness. Is it OK after checking? →**Yes** To step 2. →**No** Repair or replace the damaged components.
2. Check the front wiper motor fuse.	
	A. Check the front wiper fuse FS25, FS26. **Fuse rated capacity: 20A** Is it OK after checking? →**Yes** To step 3. →**No** Replace the front wiper fuse.
3. Check the front wiper motor ground line.	
	A. Operate the start switch to set the power mode to the “OFF” state. B. Disconnect the battery negative connector. C. Disconnect the front wiper motor harness plug U11. D. Measure the resistance between the front wiper motor harness plug U11 terminal 4 and fixed ground point with the multimeter. **Standard value: less than 5Ω** Is the resistance normal? →**Yes** To step 4. →**No** Repair the front wiper motor ground line fault and replace the harness if necessary.

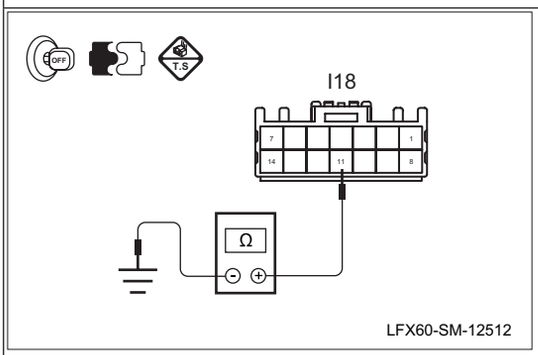
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Test condition	Details/results/measures
4. Check the voltage of the front rain wiper motor at “MIST” gear.	
	A. Operate the start switch to set the power mode to the “OFF” state. B. Disconnect the battery negative connector. C. Disconnect the front wiper motor harness plug U11. D. Connect the battery negative terminal. E. Operate the start switch to set the power mode to the “ON” state. F. Shift the combined switch of the rain wiper to “MIST” position under coordination of one person. G. Measure the voltage between the terminal 3 of the front rain wipe motor harness plug U11 and the reliabile grounding point (for test accuracy, measure multiple times under coordination of two persons). **Standard value: 11 ~ 14 V** Is the voltage normal? →Yes Replace the front wiper motor. **Refer to: Replacement of front wiper motor and connecting rod assembly.** **→No** To step 5.
5. Check the front wiper motor MIST gear power line.	
	A. Operate the start switch to set the power mode to the “OFF” state. B. Disconnect the battery negative connector. C. Disconnect the front wiper motor harness plug U11. D. Disconnect the wiper cluster switch harness plug I18. E. Measure the resistance between the terminal 3 of the front rain wipe motor harness plug U11 and the terminal 10 of the rain wipe combined switch I18. Standard value: less than 5Ω Is the resistance normal? **→Yes** To step 6. **→No** Repair the front wiper motor low gear power line fault and replace the harness if necessary.

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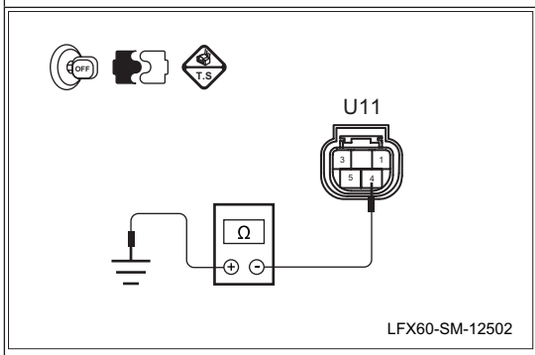
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Test condition	Details/results/measures
6. Check the power circuit of the combined switch of the front rain wiper at “MIST” gear.	
	A. Operate the start switch to set the power mode to the “OFF” state. B. Disconnect the battery negative connector. C. Disconnect the wiper cluster switch harness plug I18. D. Operate the start switch to set the power mode to the “ON” state. E. Measure the voltage between the wiper cluster switch harness plug I18 terminal 11 and fixed ground point with the multimeter. **Standard value: 11 ~ 14 V** Is the resistance normal? →**Yes** To step 7. →**No** Repair the wiper cluster switch low speed power line fault and replace the harness if necessary.
7. Replace the wiper cluster switch.	
	A. Replace the wiper cluster switch. **Refer to: Replacement of wiper cluster switch.** Confirm the system is normal.

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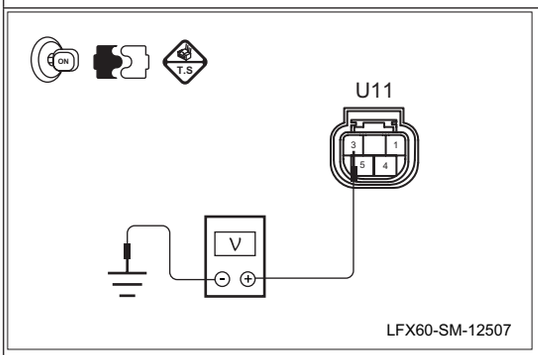
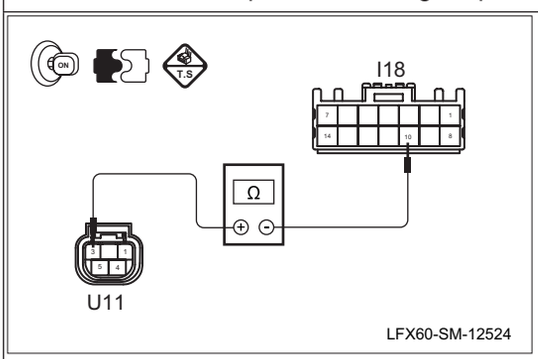
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Diagnosis flow for non-operating front rain wiper at intermittent gear

Test condition	Details/results/measures
1. General inspection.	
	A. Check the front wiper harness plug and wiper cluster switch for breakage, aging, loose contact and looseness. Is it OK after checking? →**Yes** To step 2. →**No** Repair or replace the damaged components.
2. Check the front wiper motor fuse.	
	A. Check the front wiper fuse FS25, FS26. **Fuse rated capacity: 20A** Is it OK after checking? →**Yes** To step 3. →**No** Replace the front wiper fuse.
3. Check the front wiper motor ground line.	
	A. Operate the start switch to set the power mode to the “OFF” state. B. Disconnect the battery negative connector. C. Disconnect the front wiper motor harness plug U11. D. Measure the resistance between the front wiper motor harness plug U11 terminal 4 and fixed ground point with the multimeter. **Standard value: less than 5Ω** Is the resistance normal? →**Yes** To step 4. →**No** Repair the front wiper motor ground line fault and replace the harness if necessary.

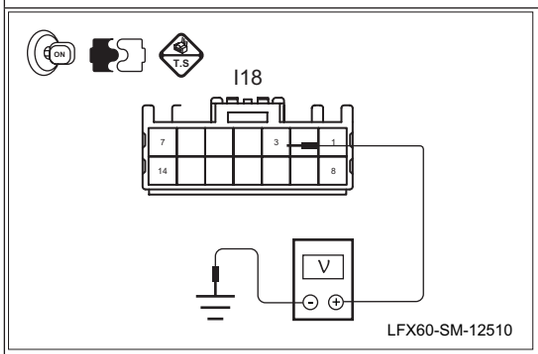
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Test condition	Details/results/measures
4. Check the voltage of the front rain wiper motor at “INT” gear.	
	A. Operate the start switch to set the power mode to the “OFF” state. B. Disconnect the battery negative connector. C. Disconnect the front wiper motor harness plug U11. D. Connect the battery negative terminal. E. Operate the start switch to set the power mode to the “ON” state. F. Shift the combined switch of the rain wiper to “INT” position. G. Measure the voltage between the front wiper motor harness plug U11 terminal 3 and fixed ground point with the multimeter. **Standard value: 11 ~ 14 V** Is the voltage normal? →**Yes** Replace the front wiper motor. **Refer to: Replacement of front wiper motor and connecting rod assembly.** →**No** To step 5.
5. Check the front wiper motor INT gear power line.	
	A. Operate the start switch to set the power mode to the “OFF” state. B. Disconnect the battery negative connector. C. Disconnect the front wiper motor harness plug U11. D. Disconnect the wiper cluster switch harness plug I18. E. Measure the resistance between the terminal 3 of the front rain wiper motor harness plug U11 and the terminal 10 of the rain wipe combined switch harness plug I18. **Standard value: less than 5Ω** Is the resistance normal? →**Yes** To step 6. →**No** Repair the front wiper motor INT gear power line fault and replace the harness if necessary.

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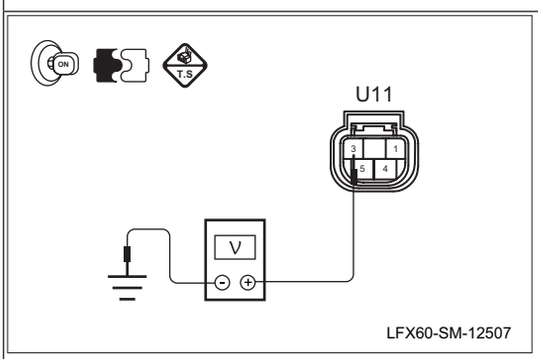
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Test condition	Details/results/measures
6. Check the power circuit of the combined switch of the front rain wiper at “INT” gear.	
	A. Operate the start switch to set the power mode to the “OFF” state. B. Disconnect the battery negative connector. C. Disconnect the wiper cluster switch harness plug I18. D. Connect the battery negative terminal. E. Operate the start switch to set the power mode to the “ON” state. F. Measure the voltage between the wiper cluster switch harness plug I18 terminal 3 and fixed ground point with the multimeter. **Standard value: 11 ~ 14 V** Is the voltage normal? →**Yes** To step 7. →**No** Repair the wiper cluster switch low speed power line fault and replace the harness if necessary.
7. Replace the wiper cluster switch.	
	A. Replace the wiper cluster switch. **Refer to: Replacement of wiper cluster switch.** Confirm the system is normal.

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Diagnosis flow for continuous operation of the front rain wiper under the intermittent mode

Test condition	Details/results/measures
1. General inspection.	
	A. Check the front wiper harness plug and wiper cluster switch for breakage, aging, loose contact and looseness. Is it OK after checking? →**Yes** To step 2. →**No** Repair or replace the damaged components.
2. Check the front wiper motor INT gear power line.	
	A. Operate the start switch to set the power mode to the “OFF” state. B. Disconnect the battery negative connector. C. Disconnect the front wiper motor harness plug U11. D. Disconnect the wiper cluster switch harness plug I18. E. Connect the battery negative terminal. F. Operate the start switch to set the power mode to the “ON” state. G. Check the voltage between the terminal 3 of the harness polug U11 of the front rain wiper motor and the reliable grounding point. **Standard value: 0 V** Is the voltage normal? →**Yes** To step 3. →**No** Repair the front wiper motor INT gear power line fault and replace the harness if necessary.
3. Replace the wiper cluster switch.	
	A. Replace the wiper cluster switch. **Refer to: Replacement of wiper cluster switch.** Confirm the system is normal.

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Diagnosis flow for unclean rain wiping

Test condition	Details/results/measures
1. General inspection.	
	A. Fill the genuine washing solution and operate the wiper. Is it OK after checking? →**Yes** Replace the genuine washing solution. →**No** To step 2.
2. Check the wiper blade.	
	A. Check the wiper blade cleaning condition. B. Check the wiper blade for aging, abrasion and breakage. Is it OK after checking? →**Yes** To step 3. →**No** Clean the wiper blade and replace it if necessary. **Refer to: Replacement of front wiper blade** **Refer to: Replacement of rear wiper blade**
3. Check the wiper arm.	
	A. Check the installation position of wiper arm. B. Check the elasticity of wiper arm. Is it OK after checking? →**Yes** To step 4. →**No** Adjust the wiper arm installation position and replace the wiper arm if necessary. **Refer to: Replacement of front wiper arm** **Refer to: Replacement of rear wiper arm**
4. Check the windshield.	
	A. Check the windshield cleaning condition. B. Check the windshield for scratch and breakage. Is it OK after checking? →**Yes** To step 5. →**No** Clean the windshield and replace it if necessary.

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Test condition	Details/results/measures
5. Replace the rain wiper connection rod.	
	A. Replace the rain wiper connection rod. **Refer to: Replacement of front wiper motor and connecting rod assembly.** **Refer to: Replacement of rear wiper motor and connecting rod assembly.** Confirm the system is normal.

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Diagnosis flow for jitter in rain wiping

Test condition	Details/results/measures
1. General inspection.	
	A. Fill the genuine washing solution and operate the wiper. Is it OK after checking? →**Yes** Replace the genuine washing solution. →**No** To step 2.
2. Check the wiper blade.	
	A. Check the wiper blade cleaning condition. B. Check the wiper blade for aging, abrasion and breakage. Is it OK after checking? →**Yes** To step 3. →**No** Clean the wiper blade and replace it if necessary. **Refer to: Replacement of front wiper blade** **Refer to: Replacement of rear wiper blade**
3. Check the wiper arm.	
	A. Check the installation position of wiper arm. B. Check the elasticity of wiper arm. Is it OK after checking? →Yes To step 4. →No Adjust the wiper arm installation position and replace the wiper arm if necessary. Refer to: Replacement of front wiper arm Refer to: Replacement of rear wiper arm
4. Check the windshield.	
	A. Check the windshield cleaning condition. B. Check the windshield for scratch and breakage. Is it OK after checking? →**Yes** To step 5. →**No** Clean the windshield and replace it if necessary.

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Test condition	Details/results/measures
5. Check the rain wiper connection rod.	
	A. Check the installation of wiper link mechanism. B. Check the wiper link mechanism for deformation and damage. Is it OK after checking? →**Yes** To step 6. →**No** Adjust the wiper link mechanism and replace it if necessary. **Refer to: Replacement of front wiper motor and connecting rod assembly.** **Refer to: Replacement of rear wiper motor and connecting rod assembly.**
6. Replace the wiper motor.	
	A. Replace the rain wiper motor. **Refer to: Replacement of front wiper motor and connecting rod assembly.** **Refer to: Replacement of rear wiper motor and connecting rod assembly.** Confirm the system is normal.

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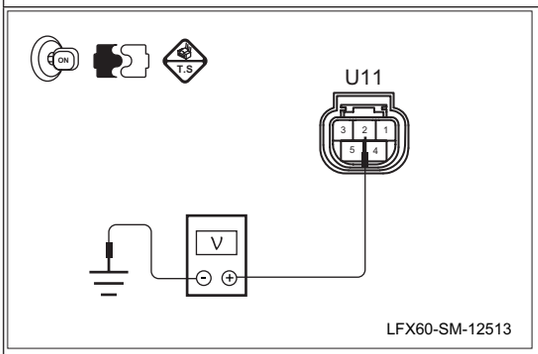
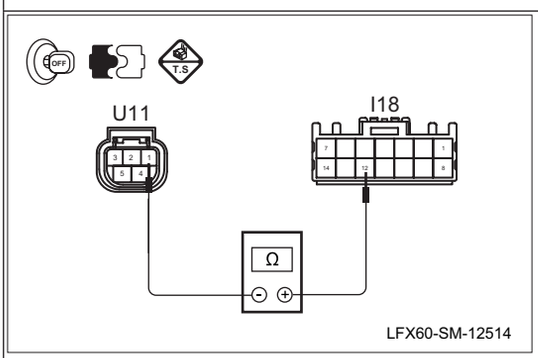
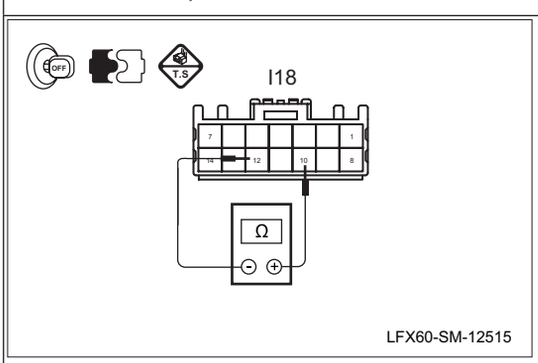
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Diagnosis flow for failed return to the initial position of the front rain wiper

Test condition	Details/results/measures
1. General inspection.	
	A. Check the front wiper harness plug and wiper cluster switch for breakage, aging, loose contact and looseness. Is it OK after checking? →**Yes** To step 2. →**No** Repair or replace the damaged components.
2. Check the front wiper arm.	
	A. Check the installation position of wiper arm. B. Check the elasticity of wiper arm. Is it OK after checking? →**Yes** To step 3. →**No** Adjust the installation position of the front rain wiper arm. If necessary, replace the front rain wiper arm. **Refer to: Replacement of front wiper arm**
3. Check the connection rod of the front rain wiper.	
	A. Check the installation of wiper link mechanism. B. Check the wiper link mechanism for deformation and damage. Is the system normal? →**Yes** To step 4. →**No** Adjust the connection rod of the front rain wiper. If necessary, replace the connection rod of the front rain wiper. **Refer to: Replacement of front wiper motor and connecting rod assembly.**
4. Check the wiper return fuse.	
	A. Check the wiper fuse FS26. **Fuse rated capacity: 20A** Is it OK after checking? →**Yes** To step 5. →**No** Replace the front wiper fuse.

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Test condition	Details/results/measures
5. Check the return power line of the front rain wiper motor.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the front wiper motor harness plug U11. D. Connect the battery negative terminal. E. Measure the voltage between the terminal 2 of the front rain wipe motor harness plug U11 and the reliabile grounding point. **Standard value: 11 ~ 14 V** Is it OK after checking? →**Yes** To step 6. →**No** Repair return power line failures of the front rain wiper. If necessary, replace the harness.
6. Check the return line of the front rain wiper.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the front wiper motor harness plug U11. D. Disconnect the harness connector I18 of the combined switch of the rain wiper. E. Measure the resistance between the terminal 1 of the front rain wiper motor harness plug U11 and the the terminal 12 of the rain wiper combined switch harness connector I18. **Standard value: less than 5Ω** Is the resistance normal? →**Yes** To step 7. →**No** Repair motor circuit harness failures of the front rain wiper. If necessary, replace the harness.
7. Check the wiper cluster switch.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the wiper cluster switch harness plug I18. D. Shift the combined switch of the rain wiper to "Off" position. E. Measure the resistance between the terminal 10 and 12 of the rain wiper combined switch harness connector I18. **Standard value: less than 1Ω** Is the resistance normal? →**Yes** To step 8. →**No** Replace the wiper cluster switch. **Refer to: Replacement of wiper cluster switch.**

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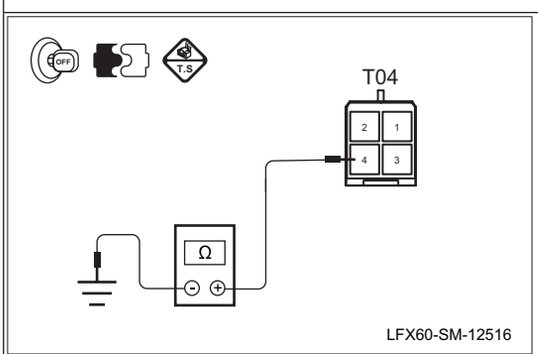
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Test condition	Details/results/measures
8. Check the motor of the front rain wiper.	
	A. Replace the front wiper motor. **Refer to: Replace the front rain wiper and connection rod assembly.** Confirm the system is normal.

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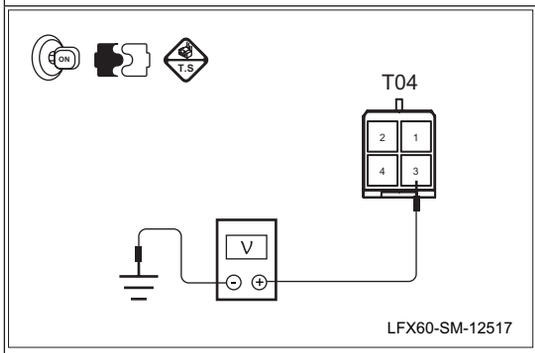
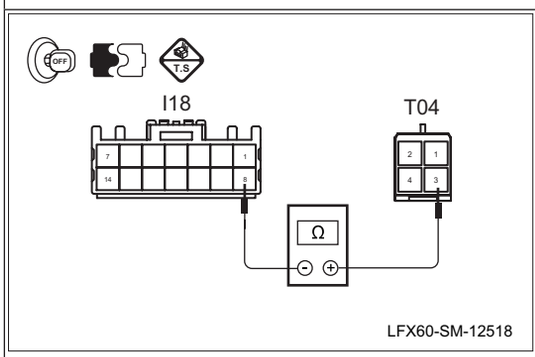
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Diagnosis flow for invalid rear rain wiper

Test condition	Details/results/measures
1. General inspection.	
	A. Check if the harness plug of the combined swtich of the rain wiper and rear rain wiper motor are damaged and aging and fall off. B. Check installation position and status of the rear rain wiper mechanism. Is it OK after checking? →**Yes** To step 2. →**No** Repair or replace the damaged components.
2. Check the fuse of the rear rain wiper.	
	A. Check the front wiper fuse FS25. **Fuse rated capacity: 20A** Is it OK after checking? →**Yes** To step 3. →**No** Replace the front wiper fuse.
3. Check the rear wiper motor ground line.	
	A. Operate the start switch to set the power mode to the “OFF” state. B. Disconnect the battery negative connector. C. Disconnect the rear wiper motor harness plug T04. D. Check the resistance between the terminal 4 of the harness plug T04 of the rear rain wiper motor and the reliable grounding point. **Standard value: less than 5Ω** Is the resistance normal? →**Yes** To step 4. →**No** Repair motor grounding line failures of the rear rain wiper. If necessary, replace the harness.

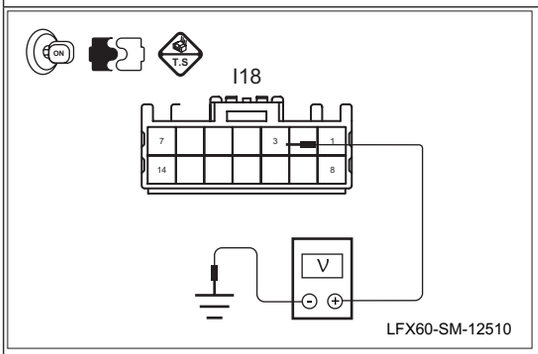
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Test condition	Details/results/measures
4. Check the input voltage of the rear rain wiper motor.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the rear wiper motor harness plug T04. D. Operate the start switch to set the power mode to the "ON" state. E. Shift the combined switch to the wiping gear of the rear rain wiper. F. Measure the voltage between the terminal 3 of the rear rain wiper harness plug T04 and the reliabile grounding point. **Standard value: 11 ~ 14V** Is the voltage normal? **→Yes** Replace rear wiper motor. **Refer to: Replacement of rear wiper motor and connecting rod assembly.** **→No** To step 5.
5. Check the input voltage line of the rear rain wiper motor.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the rear wiper motor harness plug T04. D. Disconnect the wiper cluster switch harness plug I18. E. Measure the resistance between the terminal 3 of the rear rain wiper harness plug T04 and the terminal 8 of the rain wiper combined switch harness plug I18. **Standard value: less than 5Ω** Is the resistance normal? **→Yes** To step 6. **→No** Repair motor input voltage line failures of the rear rain wiper. If necessary, replace the harness.

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Test condition	Details/results/measures
6. Check the power volage of the combined swtich of the rain wiper.	
	A. Operate the start switch to set the power mode to the “OFF” state. B. Disconnect the battery negative connector. C. Disconnect the wiper cluster switch harness plug I18. D. Operate the start switch to set the power mode to the “ON” state. E. Measure the voltage between the wiper cluster switch harness plug I18 terminal 3 and fixed ground point with the multimeter. **Standard value: 11 ~ 14 V** Is the voltage normal? →**Yes** To step 7. →**No** Repair the wiper cluster switch power line fault and replace the harness if necessary.
7. Replace the combined switch of the rain wiper.	
	A. Replace the wiper cluster switch. **Refer to: Replacement of cluster switch.** Confirm the system is normal.

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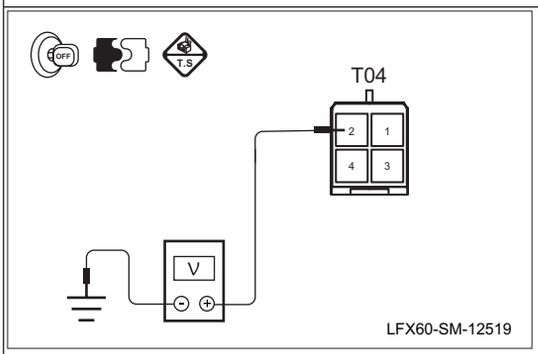
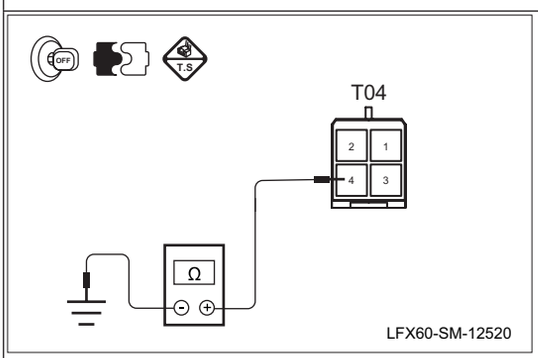
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Diagnosis flow for failed return to the initial position of rear rain wiper

Test condition	Details/results/measures
1. General inspection.	
	A. Check the rear wiper harness plug and wiper cluster switch for breakage, aging, loose contact and looseness. Is it OK after checking? →**Yes** To step 2. →**No** Repair or replace the damaged components.
2. Check the rear wiper arm.	
	A. Check the installation position of rear wiper arm. B. Check the elasticity of rear wiper arm. Is it OK after checking? →**Yes** To step 3. →**No** Adjust the installation position of the rear rain wiper arm. If necessary, replace the rear rain wiper arm. **Refer to: Replacement of rear wiper arm**
3. Check the connection rod of the rear rain wiper.	
	A. Check the installation of rear wiper link mechanism. B. Check the rear wiper link mechanism for deformation and damage. Is it OK after checking? →**Yes** To step 4. →**No** Adjust the wiper link mechanism and replace it if necessary. **Refer to: Replacement of rear wiper motor and connecting rod assembly.**
4. Check the wiper return fuse.	
	A. Check the wiper fuse FS26. **Fuse rated capacity: 20A** Is it OK after checking? →**Yes** To step 5. →**No** Replace the front wiper fuse.

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Test condition	Details/results/measures
5. Check the return power of the rear rain wiper motor.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the rear wiper motor harness plug T04. D. Connect the battery negative terminal. E. Measure the voltage between the terminal 2 of the front rain wipe motor harness plug T04 and the reliabile grounding point. **Standard value: 11 ~ 14V** Is the voltage normal? →**Yes** To step 6. →**No** Repair return power line failures of the REAR rain wiper. If necessary, replace the harness.
6. Check the rear wiper motor ground line.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the rear wiper motor harness plug T04. D. Measure the resistance between the terminal 4 of the rain wiper motor harness plug T04 and the reliabile grounding point. **Standard value: less than 5Ω** Is the resistance normal? →**Yes** To step 7. →**No** Repair rear rain wiper and grounding line failures. If necessary, replace the harness.
7. Replace the wiper motor.	
	A. Replace the rear wiper motor. **Refer to: Replacement of rear wiper motor and connecting rod assembly.** Confirm the system is normal.

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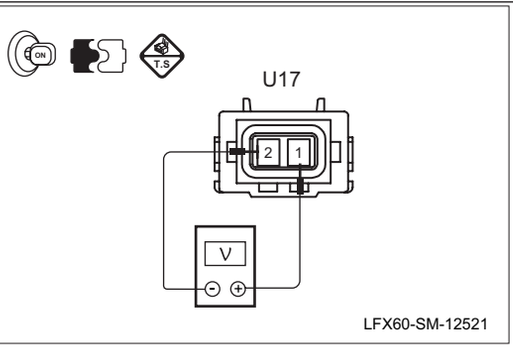
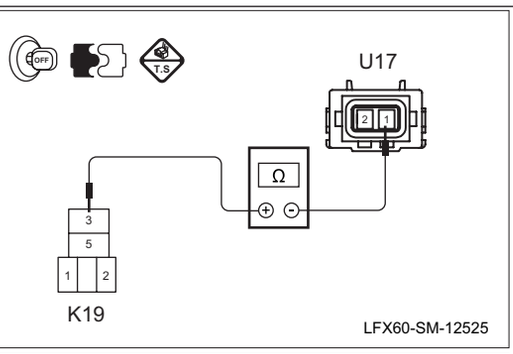
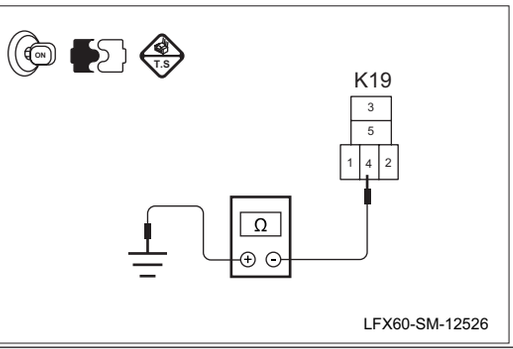
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Diagnosis flow for no operation of the front washer

Test condition	Details/results/measures
1. General inspection.	
	A. Check whether the washing solution is sufficient and the washing line is free of falling or damage. B. Check the washer harness plug and cluster switch for breakage, aging, loose contact and looseness. Is it OK after checking? →**Yes** To step 2. →**No** Repair or replace the abnormal components.
2. Check the fuse.	
	A. Check the fuse FS25. **Fuse rated capacity: 20A** Is it OK after checking? →**Yes** To step 3. →**No** Replace the fuse.
3. Check the washer motor relay.	
	A. Operate the start switch to set the power mode to the “OFF” state. B. Disconnect the battery negative connector. C. Remove the washer relay 1K18 and washer relay 2K19. D. Replace the washer relay K18 and K19 with the relay of same model and check whether the system is normal. Is it OK after checking? →**No** To step 4. →**Yes** Replace the K18 of the electric appliance of the washing relay and the electric appliance 2 K19 of the washing relay.

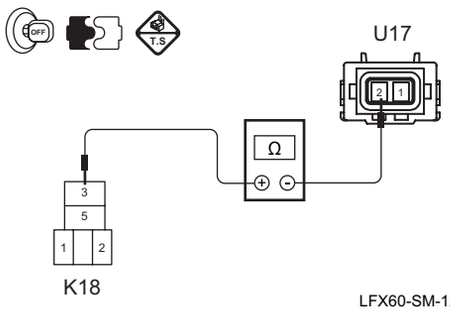
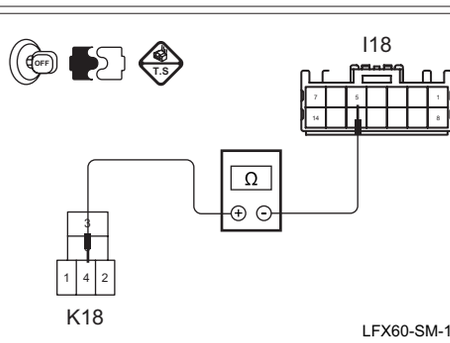
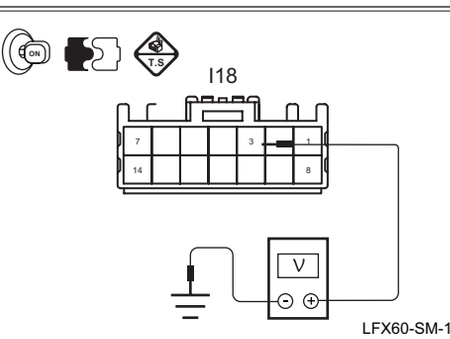
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Test condition	Details/results/measures
4. Check the washer motor power voltage.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the washer motor harness plug U17. D. Connect the battery negative terminal. E. Operate the start switch to shift the power mode to "ON" status and make the front rain wiper spray water. F. Measure the voltage between the washer motor harness plug U17 terminal 1 and terminal 2. **Standard value: 11 ~ 14 V** Is the voltage normal? →**No** To step 5. →**Yes** Replace the washer motor. **Refer to: Replacement of washer motor**
5. Check the washer motor ground line.	
 	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the washer motor harness plug U17. D. Remove the washer motor relay K19. E. Measure the resistance between the terminal 3 of the washer motor relay K19 and the terminal 1 of the washer motor harness plug U17. F. Measure the resistance between the washer motor relay K19 terminal 4 and fixed ground point. **Standard value: less than 5Ω** Is the resistance normal? →**Yes** To step 6. →**No** Repair the washer motor ground line fault and replace the harness if necessary.

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Test condition	Details/results/measures
6. Check the washer motor power line.	
 	A. Operate the start switch to set the power mode to the “OFF” state. B. Disconnect the battery negative connector. C. Disconnect the washer motor harness plug U17. D. Disconnect the combined switch I18. E. Remove the washer motor relay K18. F. Measure the resistance between the terminal 3 of the washer motor relay K18 and the terminal 2 of the washer motor harness plug U17. G. Measure the resistance between the terminal 5 of the rain wiper combined switch harness connector I18 and the terminal 4 of the washer motor relay K18. **Standard value: less than 5Ω** Is the resistance normal? →**Yes** To step 7. →**No** Repair the washer motor power line fault and replace the harness if necessary.
7. Check the wiper cluster switch power line.	
	A. Operate the start switch to set the power mode to the “OFF” state. B. Disconnect the battery negative connector. C. Disconnect the wiper cluster switch harness connector I18. D. Connect the battery negative terminal. E. Operate the start switch to set the power mode to the “ON” state. F. Measure the voltage between the wiper cluster switch harness connector I18 terminal 3 and fixed ground point. **Standard value: 11 ~ 14 V** Is the voltage normal? →**Yes** To step 8. →**No** Repair the wiper cluster switch power line fault and replace the harness if necessary.
8. Replace the wiper cluster switch.	
	A. Replace the wiper cluster switch. **Refer to: Replacement of wiper cluster switch.** Confirm the system is normal.

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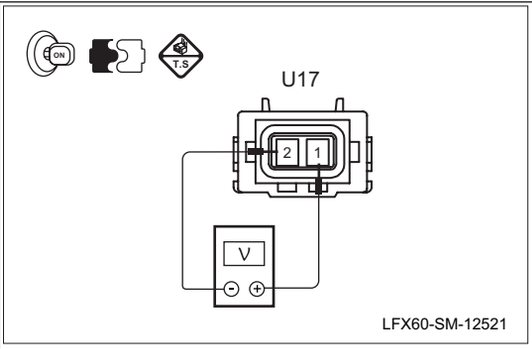
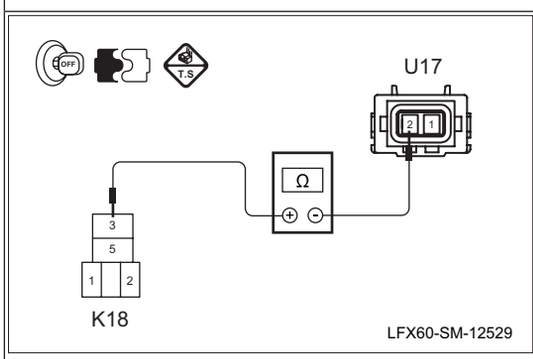
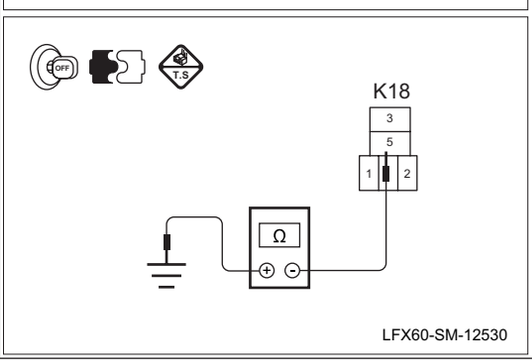
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Diagnosis flow for no operation of the rear washer

Test condition	Details/results/measures
1. General inspection.	
	A. Check whether the washing solution is sufficient and the washing line is free of falling or damage. B. Check the washer harness plug and cluster switch for breakage, aging, loose contact and looseness. Is it OK after checking? →**Yes** To step 2. →**No** Repair or replace the abnormal components.
2. Check the fuse.	
	A. Check the fuse FS25. **Fuse rated capacity: 20A** Is it OK after checking? →**Yes** To step 3. →**No** Replace the fuse.
3. Check the washer motor relay.	
	A. Operate the start switch to set the power mode to the “OFF” state. B. Disconnect the battery negative connector. C. Remove the washer relay 1K18 and washer relay 2K19. D. Replace the washer relay K18 and K19 with the relay of same model and check whether the system is normal. Is it OK after checking? →**No** To step 4. →**Yes** Replace the K18 of the electric appliance of the washing relay and the electric appliance 2 K19 of the washing relay.

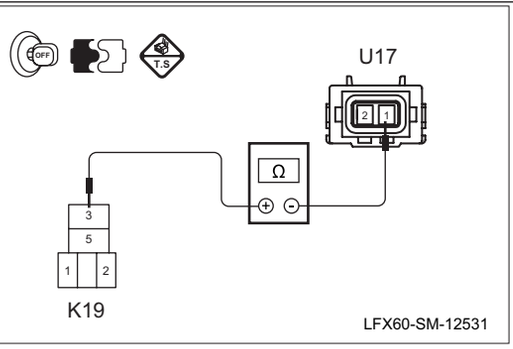
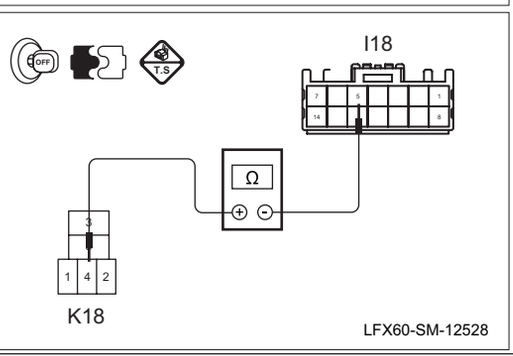
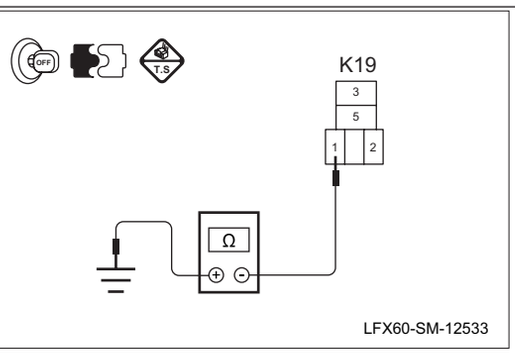
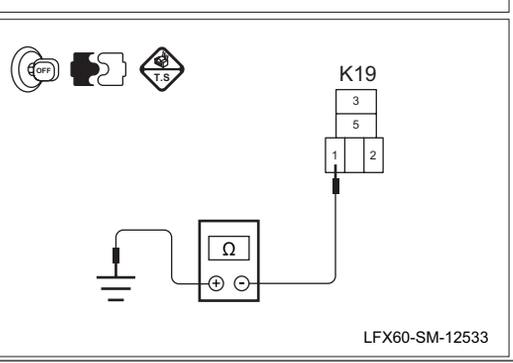
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Test condition	Details/results/measures
4. Check the washer motor power voltage.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the washer motor harness plug U17. D. Connect the battery negative terminal. E. Operate the start switch to shift the power mode to "ON" status and make the rear rain wiper spray water. F. Measure the voltage between the washer motor harness plug U17 terminal 1 and terminal 2. **Standard value: 11 ~ 14 V** Is it OK after checking? →**No** To step 5. →**Yes** Replace the washer motor. **Refer to: Replacement of washer motor**
5. Check the washer motor ground line.	
 	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the washer motor harness plug U17. D. Remove the washer motor relay K18. E. Measure the resistance between the terminal 3 of the washer motor relay K18 and the terminal 2 of the washer motor harness plug U17. F. Measure the resistance between the washer motor relay K18 terminal 5 and fixed ground point. **Standard value: less than 5Ω** Is it OK after checking? →**Yes** To step 6. →**No** Repair the washer motor ground line fault and replace the harness if necessary.

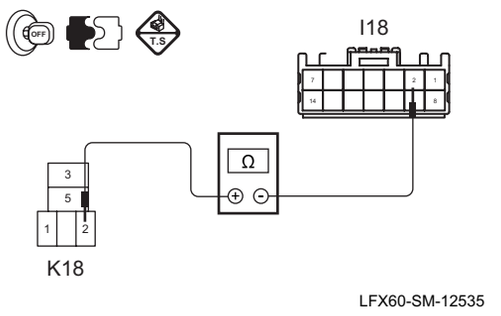
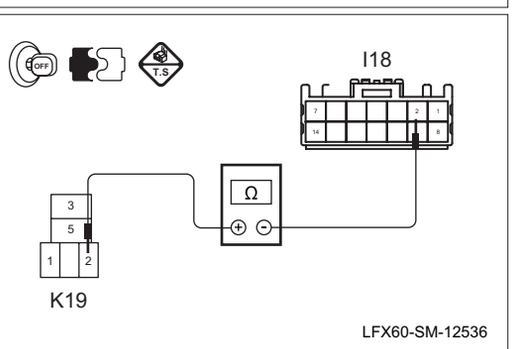
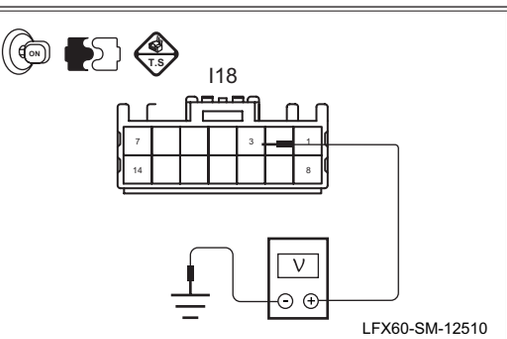
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Test condition	Details/results/measures
6. Check the washer motor power line.	
 	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the washer motor harness plug U17. D. Disconnect the wiper cluster switch harness plug I18. E. Remove the washer motor relay K19. F. Measure the resistance between the terminal 3 of the washer motor relay K19 and the terminal 1 of the washer motor harness plug U17. G. Measure the resistance between the terminal 5 of the washer motor relay K19 and the terminal 2 of the washer motor harness plug I18. **Standard value: less than 5Ω** Is it OK after checking? →**Yes** To step 7. →**No** Repair the washer motor power line fault and replace the harness if necessary.
7. Check the grounding line of the relay of the washer motor.	
 	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Remove the washer motor relay K18. D. Remove the washer motor relay K19. E. Measure the resistance between the terminal 1 of the washer motor relay K18 and the reliabile grounding point. F. Measure the resistance between the washer motor relay K19 terminal 1 and fixed ground point. **Standard value: less than 5Ω** Is it OK after checking? →**Yes** To step 8. →**No** Repair grounding failures of the washer motor relay. If necessary, replace the harness.

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Test condition	Details/results/measures
8. Check the power line of the relay of the washer motor.	
	A. Operate the start switch to set the power mode to the “OFF” state. B. Disconnect the battery negative connector. C. Disconnect the wiper cluster switch harness plug I18. D. Remove the washer motor relay K18. E. Remove the washer motor relay K19. F. Measure the resistance between the terminal 2 of the rain wiper combined harness plug I18 and the terminal 2 of the washer motor relay K18. G. Measure the resistance between the terminal 2 of the rain wiper combined switch harness plug B18 and the terminal 2 of the washer motor relay K10. **Standard value: less than 5Ω** Is it OK after checking? →**Yes** To step 9. →**No** Repair power line failures of the washer motor relay. If necessary, replace the harness.
	
9. Check the wiper cluster switch power line.	
	A. Operate the start switch to set the power mode to the “OFF” state. B. Disconnect the battery negative connector. C. Disconnect the wiper cluster switch harness connector I18. D. Connect the battery negative terminal. E. Operate the start switch to set the power mode to the “ON” state. F. Measure the voltage between the wiper cluster switch harness connector I18 terminal 3 and fixed ground point. **Standard value: 11 ~ 14 V** Is it OK after checking? →**Yes** To step 10. →**No** Repair power line failures of the rain wipe combined switch. If necessary, replace the harness.
10. Replace the wiper cluster switch.	
	A. Replace the wiper cluster switch. **Refer to: Replacement of wiper cluster switch.** Confirm the system is normal.

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Diagnosis flow for no spraying in place

Test condition	Details/results/measures
1. General inspection.	
	A. Check the capacity of the washingliquid. B. Check if the washing hose is distorted, bent and damage. Is it OK after checking? →**Yes** To step 2. →**No** Examine and repair the fault location.
2. Check the washer's sprayer.	
	A. Check the washer's sprayer. Is it OK after checking? →**No** Replace the washer's sprayer. →**Yes** To step 4.
3. Check washing conditions.	
	A. Wash and check the spraying angle and position of the washer's sprayer. Is it OK after checking? →**Yes** To step 4. →**No** Adjust the washer's sprayer.
4. Check the washer's motor.	
	A. Replace the washer's motor. **Refer to: Replacement of washer motor** Confirm the system is normal.

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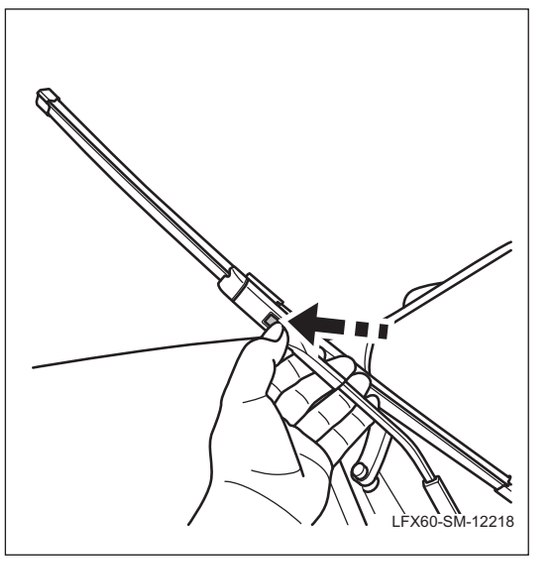
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Removal and Installation

Replace the blades of the rain wiper.

Removal

1. Disassemble the blades of the front rain wiper.



(a). Press the disassembly button of the rain wiper blade and pull out the rain wiper blades upward.

Note:

When the rain wiper blades are disassembled, rotate the key to (key switch is in OFF level) prevent the rain wiper from rotating in disassembling, affecting disassembly and damging the windshield.

Installation

1. Install the front rain wiper blades.

(a). The installation sequence is the reverse of the disassembly order.

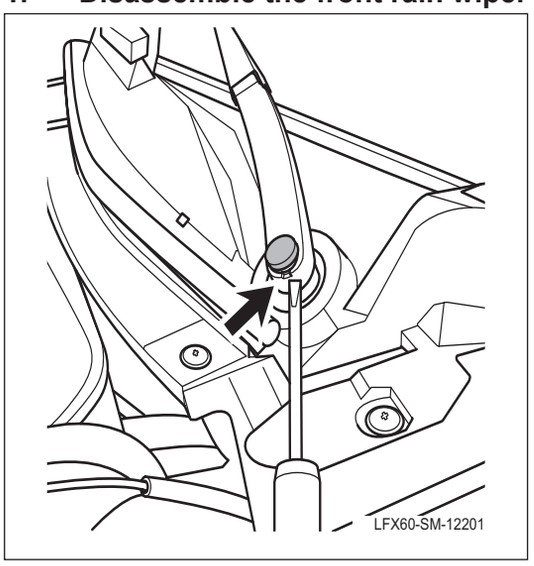
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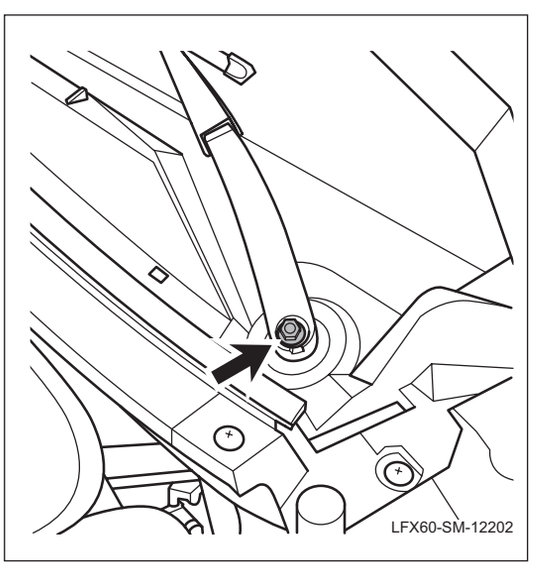
Replace the front wipe arm

Removal

1. Disassemble the front rain wiper arm.



(a). Open the front engine cover and tilt the protective cover of the rain wiper by using a screwdriver.



(b). Disassemble fixing bolts of the front rain wiper arm.

(c). Remove the front rain wiper arm.

(d). Disassemble the front rain wiper blades, **refer to: replacement of the front rain wiper blades**.

Installation

1. The installation sequence is reverse to the removal sequence.

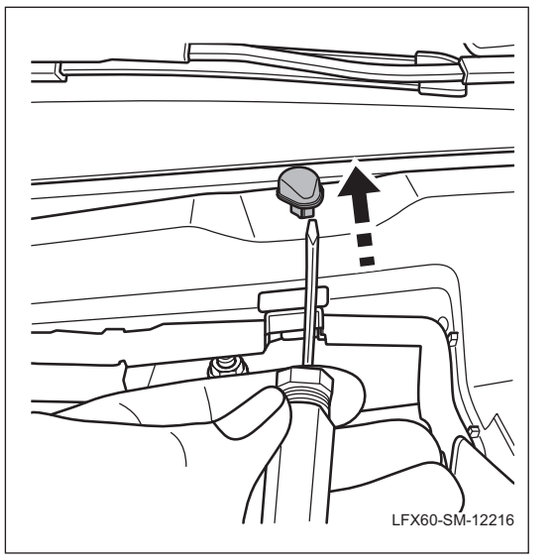
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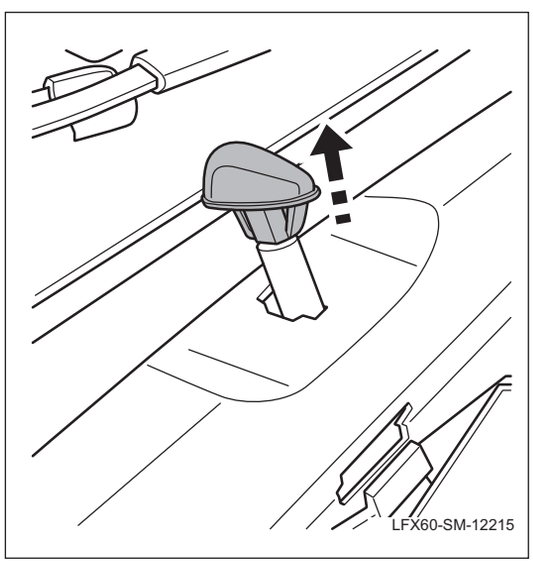
Replace the front washer sprayer

Removal

1. Disassemble the front washer sprayer.



(a). Open the front engine cover and disassemble the front washer sprayer by using a proper tool.



(b). Disconnec the washer sprayer hose.
(c). Remove the front washer sprayer.

Note:

The front washer sprayer is easy to brake in disassembly. It is recommended to heat it with the blow dryer and disassemble it in order to avoid break.

Installation

1. Install the front washer sprayer.

(a). The installation sequence is the reverse of the disassembly order.

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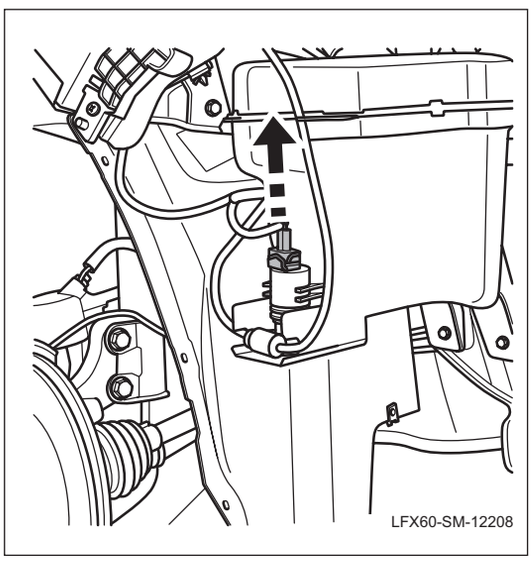
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Replace the storage tank motor of the washing liquid.

1. Disassemble the motor of the front and rear washing liquid storage tank.

(a). Disconnect the battery negative connector.

(b). Remove the front bumper assembly. **Refer to the replacement of front bumper assembly.**



(c). Disconnect the harness connector 1 of the front and rear washing liquid storage tank motor.

(d). Disasemble the hose 2 of the front and rear washing liquid storage tank motor.

(e). Remove the motor 3 of the front and rear washing liquid storage tank.

Installation

1. Install the motor of the front and rear washing liquid storage tank.

(a). The installation sequence is the reverse of the disassembly order.

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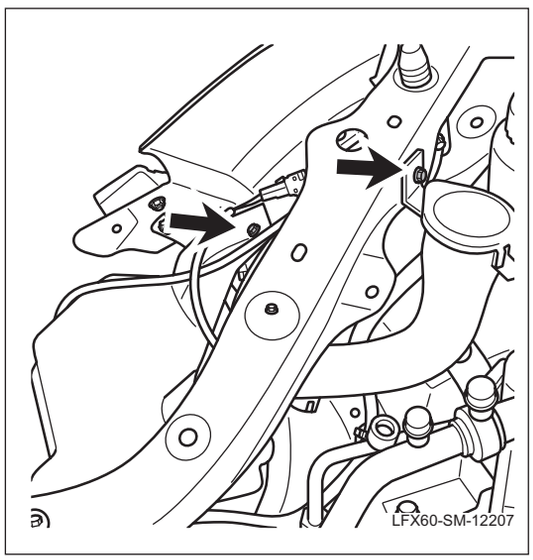
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Repalce the washing liquid storage tank

Removal

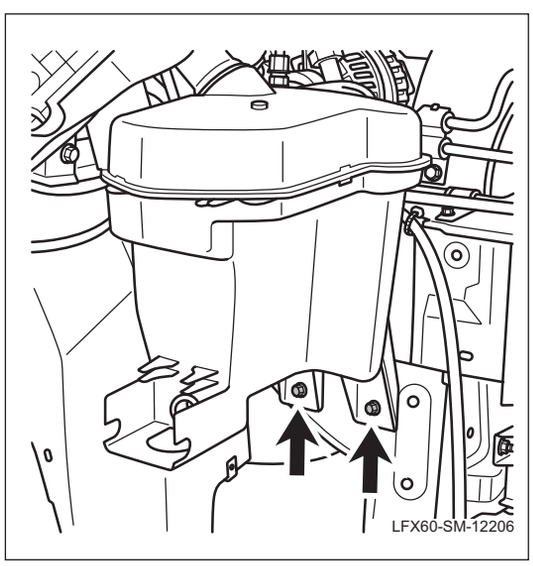
1. Disassemble the washing liquid storage tank.

(a). Disassemble the front bumper assembly, **refer to: replacement of the front bumper assembly.**



(b). Disassemble fixing bolts above the washing liquid storage tank.

(c). Disassemble the front and rear washing liquid storage tank motor by referring to replacement of the front and rear washing liquid storage tank motor.



(d). Disassemble the fixing bolts under the washing liquid storage tank.

(e). Remove the washing liquid storage tank.

Installation

1. Install the washing liquid storage tank.

(a). The installation sequence is the reverse of the disassembly order.

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Replace the front rain wiper motor and connection rod assembly

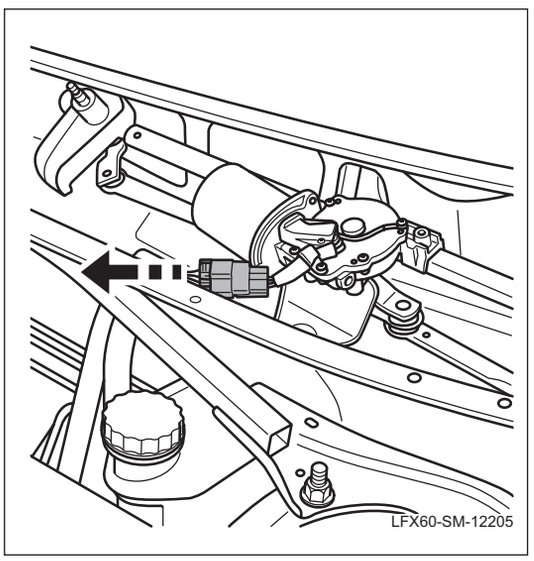
Removal

1. Disassemble the front rain wiper motor and connection rod assembly.

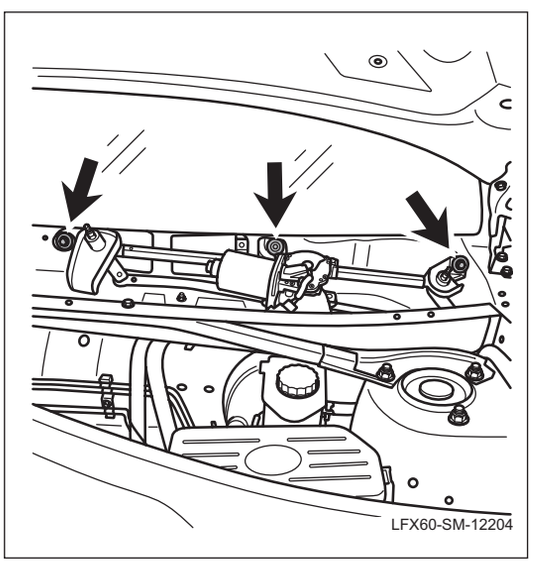
(a). Disconnect the battery negative connector.

(b). Disassemble the front rain wiper arm assembly, **refer to: replacement of the front rain wiper arm.**

(c). Disassemble the front ventilation cover plate, **referto: replacement of the front ventilation cover plate.**



(d). Disconnect the plug of the front rain wiper motor.



(e). Disassemble fixing bolts of the front rain wiper motor and connection rod assembly.

(f). Remove the front rain wiper motor and connection rod assembly.

Installation

1. Install the front rain wiper motor and connection rod assembly.

(a). The installation sequence is the reverse of the disassembly order.

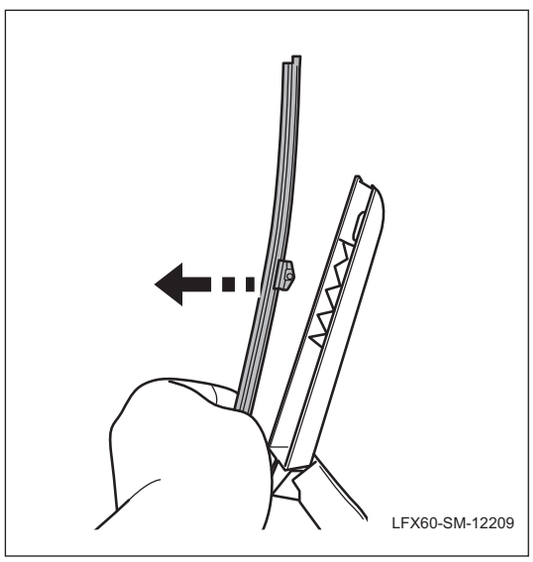
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Replace the rear rain wiper blades.

Removal

1. Disassemble the rear rain wiper blades.



(a). Separate the rain wiper arm from the rain wiper blades.

Installation

1. Install the rear rain wiper blades.

(a). The installation sequence is the reverse of the disassembly order.

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Replace the rear wipe arm

Removal

1. Disassemble the rear rain wiper arm.

(a). Disassemble the rear rain wiper blades, **refer to: replacement of the rear rain wiper blades.**



(b). Pull up the fixing nut cover 1 of the rear rain wipe arm.

(c). Disassemble fixing nut 2 of the rear rain wiper arm.

(d). Remove the rear rain wiper arm.

Note:

Rotate the key to (shift the key to OFF gear) in disassembly of the rain wiper to prevent rear rain wiper arm from swinging in disassembly and affecting disassembly or damaging the windshield.

Installation

1. Install the rear rain wiper arm.

(a). The installation sequence is the reverse of the disassembly order.

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Replace the rear washer sprayer

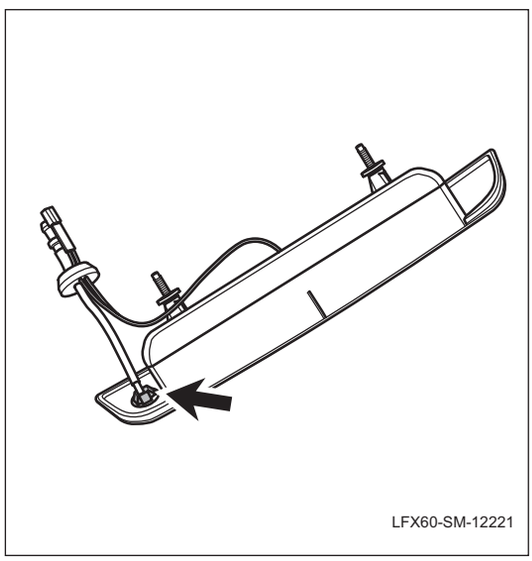
Removal

1. Disassemble the rear washer sprayer.

(a). Disconnect the battery negative connector.

(b). Disassemble the spoiler assembly, **refer to: replacement of the spoiler assembly.**

(c). Disassemble high brake light, **refer to: replacement of the high brake light assembly.**



(d). Remove the rear washer sprayer by using a proper tool.

Installation

1. Install the rear washer sprayer.

(a). The installation sequence is the reverse of the disassembly order.

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Replace the motor assembly of rear rain wiper

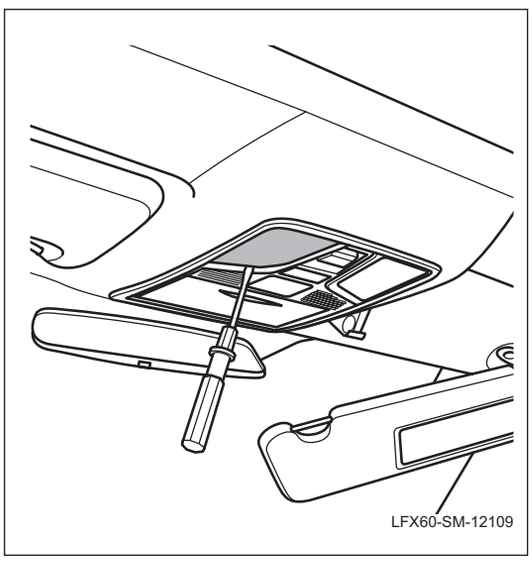
Removal

1. Disassemble the rear rain wiper motor assembly.

(a). Disconnect the battery negative connector.

(b). Disassemble the rear rain wiper arm, **refer to: replacement of the rear rain wiper arm.**

(c). Disassemble the internal protection plate of the rear back door, **refer to: Disassembly of the internal protection plate of the rear back door.**



(d). Disconnect the harness connector of the rear rain wiper motor assembly.



(e). Disassemble motor assembly of the fixing bolts of the rear rain wiper.

(f). Remove the motor assembly of the rear rain wiper

Installation

1. Install the rear rain wiper motor assembly.

(a). The installation sequence is the reverse of the disassembly order.

AutoLibrary

AutoLibrary

12 - Electrical system

Horn system..... 12-1641

Structure and installation location.. 12-1641

Operating Principle 12-1642

Diagnostic Information and Procedures 12-1643

Removal and Installation . 12-1650

AutoLibrary

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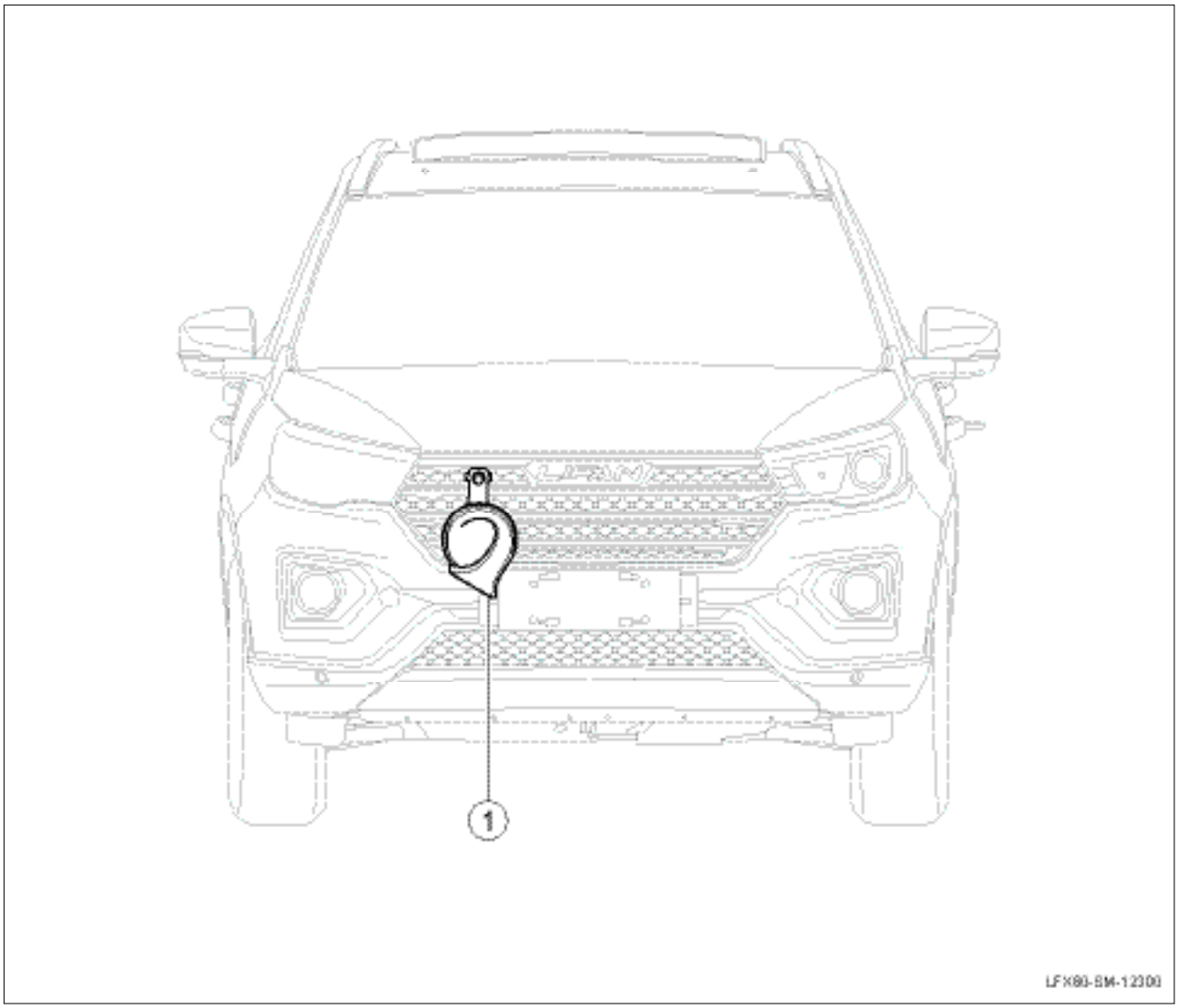
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Horn system

Structure and installation location

Component Location Plan



No.	Part name
1	Low pitched horn

No.	Part name

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Operating Principle

System description

⚠ Warning:

The vehicle is equipped with the airbag systems; any failure to follow the correct operating procedures will lead to the following cases:

- **The airbag system is opened due to an accident.**
- **The airbag system does not work if required.**

⚠ Warning:

Strictly observe the following rules to prevent the above conditions:

- **Before working, confirm whether you are working on the airbag system component, around the airbag or on the line.**
- **Remove the airbag system if you are carrying out maintenance operations on the airbag system components, around them, or on their lines.**

Horn

The horn is installed above the water tank crossbeam and is fixed at the front end of the front heat radiator of the vehicle. The horn is controlled in two manners. It can be controlled by the steering wheel horn switch. When the horn button of the steering wheel is pressued, the horn relay will control power supply of the horn line to make the horn give out sound. If the theft prevention information of the vehicle body requires horn ringing, the vehicle body control module can directly control ringing of the horn.

The horn line is connected to the power via the contact of the horn relay. The contact will generate magnetic field by electrifying the coil. Under the electromagnetic force of the magnetic field, the armature iron will be attracted to drive the diaphragm and sounding board to move downward. At same time, the armature iron will pull the lower contact arm downward, disconnect the up and down contacts, and cut off the circuit. After the coil is disconnected from the power, the electromagnetic force will disappear. The armature iron is released and the diaphragm and lower contact arm is reset. At this time, the up and down contact is closed. The power will electrify the coil via the contact to generate magnetic field. The above process is repeated. The vibration ssytem will reciprocate and vibrate the air to give out a sound.

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Diagnostic Information and Procedures

Diagnosis Instructions

Before the horn system failure is diagnosed, please first read the system overview to know and familiarize the working principle of the horn systen and then start horn system diagnosis. When a failure occurs, these knowledge can assist you to identify correct failure diagnosis steps. More importantly, these knowledge can assist you to check if conditions described by the customer are normal.

Any failure diagnisis of the horn system should start with horn system check. It can guide repairers to take enxt logic step and diagnose failures.

Comprehend and correctly use the diagnostic flow chart to shorten the diagnosis time and avoid the misjudgment.

General equipment

Name
Diagnostic equipment of vehicle
Digital multimeter

Note

Improper installation of the clock spring assembly will damage the clock spring's internal spiral coil, and may cause the coil failure to cause the airbag module to not work properly, resulting in personal injury.

Note

Disassemble the airbag module strictly according to the safe operation specification of the airbag system, referring to "Warning of airbag system".

Visual Inspection

1. Confirm the problem raised by the customer.
2. Check for evident mechanical and electrical faults.

Visual inspection table

Mechanical	Electrical
• Horn • Steering wheel	• Fuse • Line • Clock spring • Horn switch of steering wheel • Horn relay

3. Check the system lines easy to see or can be seen.
4. If the observed or raised problem is the evident and the cause has been found, ensure to fix this fault before proceeding with the next step.
5. If no problem is found through the visual check, confirm the fault and refer to the fault symptom list.

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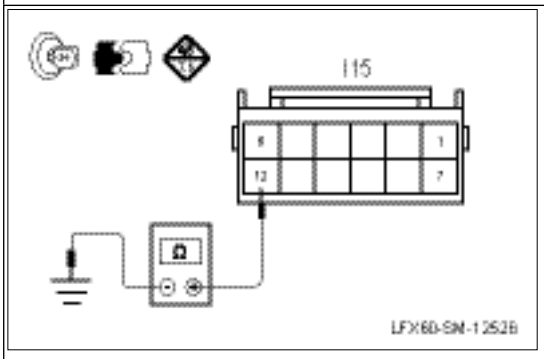
List of fault symptoms

Symptom	Possible point of failure	Recommended Measures
The speakers can not be turned off	• Relay	**Refer to: Diagnosis flow for constantly beeping horn**
	• Line	
	• Horn switch	
Horn Inoperative	• Fuse	**Refer to: Diagnosis flow for non-operating horn.**
	• Line	
	• Relay	
	• Horn	
	• Horn switch	
The speaker sound is abnormal	• Line	• Repair the line
	• Horn	• Replace the horn. **Refer to: Replacement of bass horn**

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Diagnosis flow for constantly beeping horn

Test condition	Details/results/measures
1. General inspection.	
	A. Check the clock spring and horn harness plug for breakage, loose contact, aging or looseness. Is it OK after checking? →**Yes** To step 2. →**No** Repair the fault position.
2. Check the horn power line.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disassemble the horn relay. C. Operate the ignition switch to turn the power to ON state. Does the horn sound? →**No** To step 3. →**Yes** Repair short circuit failures of horn power line. If necessary, replace the harness.
3. Check the horn relay.	
	A. Replace the new horn fuse of same model. Does the horn sound? →**Yes** To step 4. →**No** Replace the horn relay.
4. Check the horn relay control line.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the clock spring harness plug I15. D. Measure the resistance between the terminal 12 of the clock spring harness plug I15 and reliable grounding by using a multimeter. **Standard value: 10MΩ or higher** Is the resistance normal? →**Yes** To step 5. →**No** Repair line failures of the horn relay. If necessary, replace the harness.

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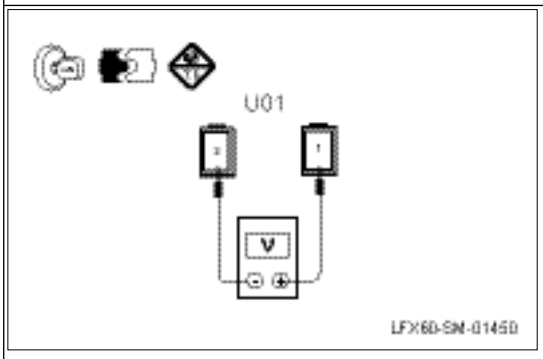
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Test condition	Details/results/measures
5. Check the horn switch.	
	A. Replace the horn switch. Confirm that the fault has been ruled out.

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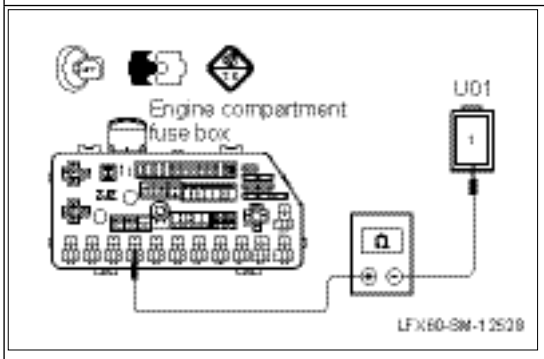
Diagnosis flow for non-operating horn.

Test condition	Details/results/measures
1. General inspection.	
	A. Check the clock spring and horn harness plug for breakage, loose contact, aging or looseness. Is it OK after checking? →**Yes** To step 2. →**No** Repair the fault position.
2. Check the horn fuse.	
	A. Check the horn fuse of the combined instrument FS04. **Fuse rated capacity: 15 A** Is it OK after checking? →**Yes** To step 3. →**No** Replace the fuse of same model.
3. Check the horn relay.	
	A. Replace the new horn fuse of same model. Is the system normal? →**No** To step 4. →**Yes** Replace the horn relay.
4. Check the horn power.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the horn harness plug U01. D. Connect the battery negative terminal. E. Press the horn switch and measure the resistance between the terminal 1 and 2 of the horn harness plug U01 by using a multimeter. **Standard value: 11 ~ 14 V** Is the voltage normal? →**Yes** To step 9. →**No** To step 5.

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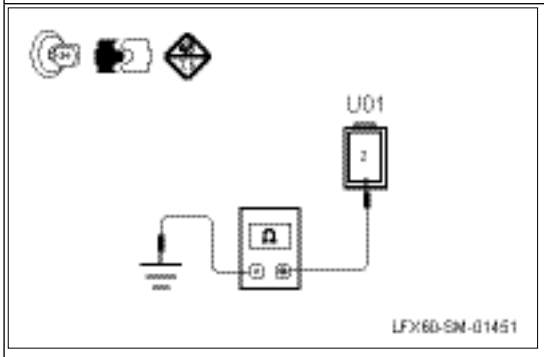
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5. Check the horn power line.



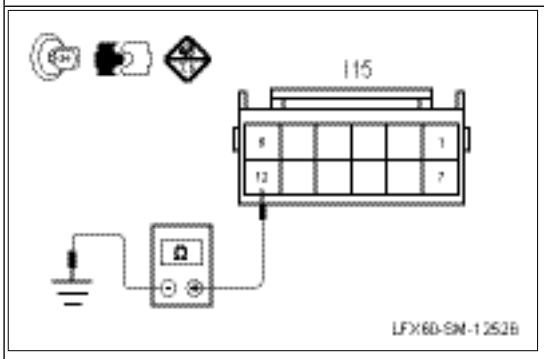
A. Operate the ignition switch to turn the power to OFF state.
B. Disconnect the battery negative connector.
C. Disconnect the horn harness plug U01.
D. Measure the resistance between the terminal 1 of the horn harness plug U01 and the terminal 5 of the horn relay by using a multimeter.
Standard value: Less than 5Ω
Is the resistance normal?
→**Yes**
To step 6.
→**No**
Repair power line break failures of the horn. If necessary, replace the harness.

6. Check the grounding line of the horn.



A. Operate the ignition switch to turn the power to OFF state.
B. Disconnect the battery negative connector.
C. Disconnect the horn harness plug U01.
D. Measure the resistance between the terminal 2 of the horn harness plug U01 and reliable grounding by using a multimeter.
Standard value: Less than 5Ω
Is the resistance normal?
→**Yes**
To step 7.
→**No**
Repair grounding line break failures of the horn. If necessary, replace the harness.

7. Check the horn relay control line.



A. Operate the ignition switch to turn the power to OFF state.
B. Disconnect the battery negative connector.
C. Disconnect the clock spring harness plug I15.
D. Connect the battery negative terminal.
E. Operate the ignition switch to turn the power to OFF state.
F. Measure the voltage between the terminal 12 of clock spring harness plug I15 and reliable grounding by using a multimeter.
Standard value: 11 ~ 14 V
Is the voltage normal?
→**Yes**
To step 8.
→**No**
Repair control line break failures of the horn relay. If necessary, replace the harness.

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8. Check the horn switch.	
	A. Replace the horn switch. Confirm that the fault has been ruled out.
9. Check the horn.	
	A. Replace the horn. **Refer to: Replacement of bass horn** Confirm that the fault has been ruled out.

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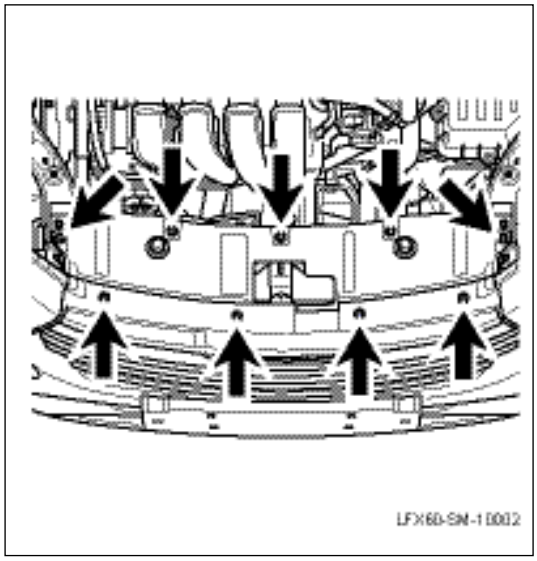
Removal and Installation

Replace the low pitch horn.

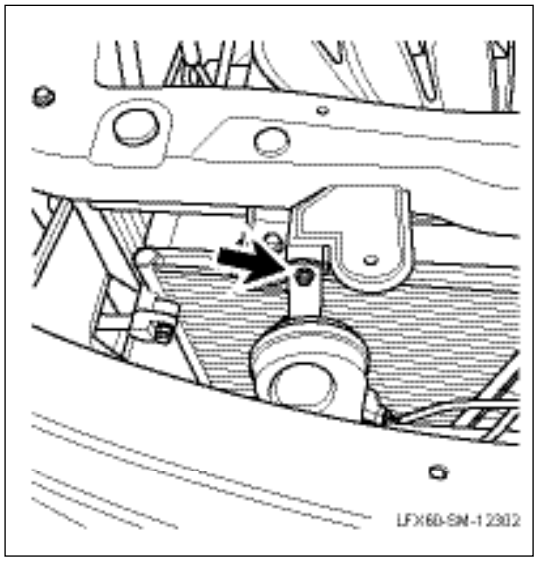
Removal

1. Disassemble the low-pitch horn.

(a). Disconnect the battery negative connector.



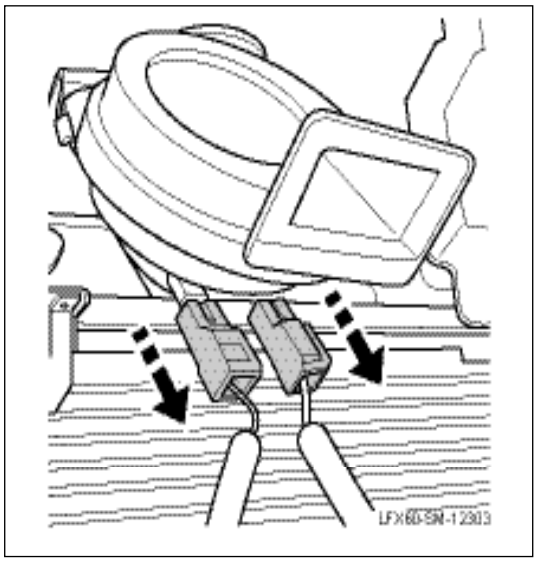
(b). Remove fixing bolts and screws above the front bumper.



(c). Disassemble fixing bolts of the horn.

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(d). Disconnect the horn harness plug.

(e). Remove the horn.

Installation

1. Install the low pitch horn.

(a). The installation sequence is the reverse of the disassembly order.

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12 - Electrical system

Instrument and display 12-1655

Technical specifications 12-1655

Structure and installation location 12-1656

Operating Principle 12-1657

Diagnostic Information and Procedures 12-1658

Removal and installation... 12-1718

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Instrument and display

Technical specifications

General specifications

Name	Rated voltage	Maximal current
Instrument cluster power supply	12V(DC)	-

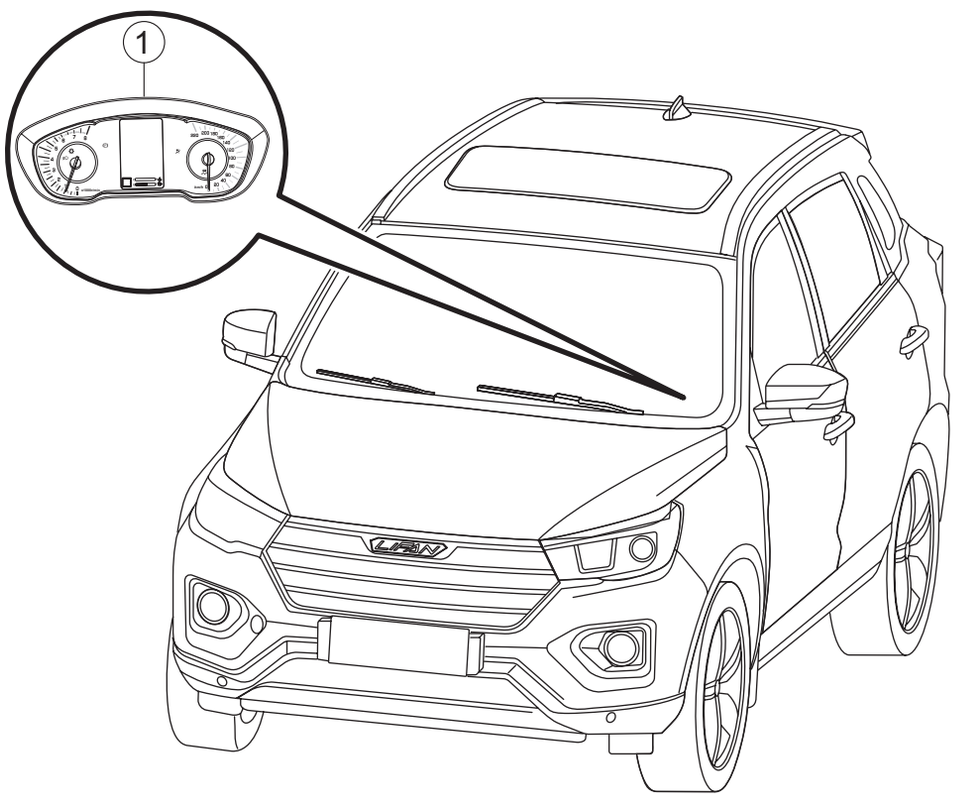
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Structure and installation location

Component Location Plan

Instrument cluster



LFX60-SM-01370

No.	Part name
1	Instrument cluster

No.	Part name

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Operating Principle

System description

The combined instrument is located on the left side the instrument board and different indicators of the combined instrument above the steering column provide vehicle performance information.

The combined instrument includes the thermometer, fuel gauge, speedometer, tachograph, different indicators and LCD (including odograph, hodometer, CVT gearbox position display, door status display and tyre pressure monitoring and display).

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Diagnostic Information and Procedures

Diagnosis Instructions

Before the instrument control system failure is diagnosed, please first read the system overview to know and familiarize the working principle of the instrument control systen and then start instrument control system system diagnosis. When a failure occurs, these knowledge can assist you to identify correct failure diagnosis steps. More importantly, these knowledge can assist you to check if conditions described by the customer are normal.

Any failure diagnisis of the instrument control system should start with the instrument control system check. It can guide repairers to take enxt logic step and diagnose failures.

Comprehend and correctly use the diagnostic flow chart to shorten the diagnosis time and avoid the misjudgment.

General equipment

Name
Diagnostic equipment of vehicle
Digital multimeter
Repair special tool

Visual Inspection

1. Confirm the problem raised by the customer.
2. Check for the evident mechanical or electrical damage trace and collision deformation trace through the visual check.

Visual inspection table

Mechanical	Electrical
• Dashboard • Instrument decorative board	• Fuse • Line • Harness plug • Control switch • Instrument cluster • BCM

3. Check the system lines easy to see or can be seen.
4. If the observed or raised problem is the evident and the cause has been found, ensure to fix this fault before proceeding with the next step.
5. If no problem is found through the visual check, confirm the fault and refer to the fault symptom list.

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List of fault symptoms

Symptom	Possible point of failure	Recommended Measures
The position light works normally and the lighting light of the dial plate is not on	• Fuse • Line fault • Instrument cluster	**Refer to: Diagnosis flow normal operation of the position light and no lighting of the lighting light of the dial plate**
The left steering signal indicator does not flicer in case of left steering	• Fuse • Line fault • Instrument cluster • CAN communication line • BCM lines	**Refer to: Diagnosis flow for non-flickering of left steering signal indicator in case of left steering**
Abnormal tachograph indication	• Fuse • Line fault • Instrument cluster • CAN communication line • ECM • ECM lines	**Refer to: Diagnosis flow for abnormal tachograph indication**
Abnormal speedometer indication	• Fuse • Line fault • Instrument cluster • CAN communication line • ABS control unit • ABS lines	**Refer to: Diagnosis flow for abnormal speedometer indication**
Abnormal water temperature gauge indication	• Fuse • Line fault • Instrument cluster • CAN communication line • ECM • ECM lines	**Refer to: Diagnosis flow for abnormal water temperature gauge indication**
Abnormal fuel gauge indication	• Fuse • Line fault • Instrument cluster • Fuel level sensor	**Refer to: Diagnosis flow for abnormal fuel gauge indication**
To operate the start switch and switch the power mode to “ON” status, the engine failure indicator is not on.	• Fuse • Line fault • Instrument cluster • CAN communication line • ECM lines • ECM	**Refer to: Diagnosis flow for off engine failure indicator when the ignition switch is in “ON” position**
To operate the start switch and switch the power mode to “ON” status, the engine oil pressure alarm indicator is not on.	• Fuse • Line fault • Instrument cluster • Oil pressure switch	**Refer to: Diagnosis flow for off engine oil pressure alarm indicator when the ignition switch is in “ON” position**
To operate the start switch and switch the power mode to “ON” status, the charging indicator is not on	• Fuse • Line fault • Instrument cluster • Voltage regulator • Generator	**Refer to: Diagnosis flow for off charging indicator when the ignition switch is in “ON” position**
The brake liquid level alarm indicator is not on	• Fuse • Line fault • Instrument cluster • Brake liquid level switch	**Refer to: Diagnosis flow for off alarm indicator when the brake liquid level is too low**

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Symptom	Possible point of failure	Recommended Measures
The parking brake indicator is not on	• Fuse • Line fault • Instrument cluster • Parking brake switch	**Refer to: Diagnosis flow for off indicator when the parking brake works**
To operate the start switch and switch the power mode to “ON” status, ABS failure indicator is not on	• Fuse • Line fault • Instrument cluster • CAN communication line • ABS control module • ABS module line	**Refer to: Diagnosis flow for off ABS failure indicator when the ignition switch is in “ON” position**
To operate the start switch and switch the power mode to “ON” status, non-fastened safety belt indicator is not on	• Fuse • Line fault • Instrument cluster • Safety belt switch	**Refer to: Diagnosis flow for off non-fastened safety belt indicator when the ignition switch is in “ON” position**
To operate the start switch and switch the power mode to “ON” status, ESP failure indicator is not on	• Fuse • Line fault • Instrument cluster • CAN communication line • ABS/ESP control module • ABS /ESP module line	**Refer to: Diagnosis flow for off ESP failure indicator when the ignition switch is in “ON” position**
To operate the start switch and switch the power mode to “ON” status, the airbag failure indicator is not on	• Fuse • Line fault • Instrument cluster • CAN communication line • Airbag controller • Airbag controller line	**Refer to: Diagnosis flow for off airbag failure indicator when the ignition switch is in “ON” position**

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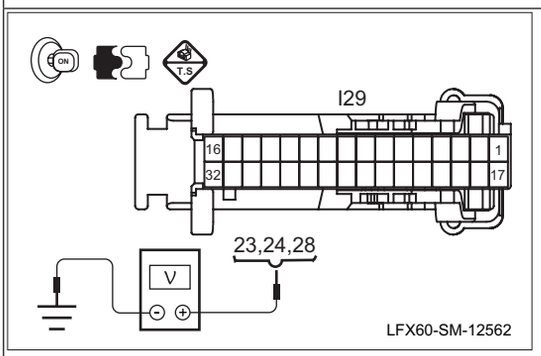
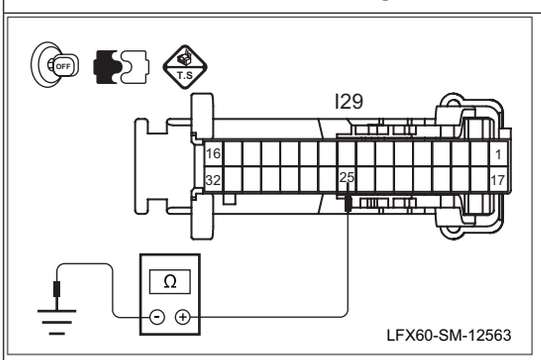
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Diagnosis flow when the position light works normally and the lighting light of the dashboard does not turn on

Test condition	Details/results/measures
1. Check the trouble code.	
	A. Connect the diagnostic equipment. B. Operate the start switch to set the power mode to the “ON” state. C. Enter the instrument system and read instrument system failure code. Is there a trouble code? →**Yes** To step 2. →**No** Repair or replace the damaged components.
2. General inspection.	
	A. Check the instrument cluster harness plug for breakage, loose contact, aging or looseness. Is it OK after checking? →**Yes** To step 3. →**No** Repair the abnormal part.
3. Check the fuse.	
	A. Check the fuse FS23, FS24, FS30. **The fuse rated capacity is 5A, 10 A, 25 A. Is the fuse normal?** →**Yes** To step 4. →**No** Repair the fuse line and replace the fuse of rated capacity.

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Test condition	Details/results/measures
4. Check the instrument cluster power line	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the instrument cluster harness plug I29. C. Connect the battery negative terminal and operate the start switch to turn the power to ON state. D. Measure the voltage between the instrument cluster harness plug I29 terminal 23, 24, 28 and the fixed ground point with the multimeter. **Standard value: 11 ~ 14 V** Is the voltage normal? →**Yes** To step 5. →**No** Repair the instrument cluster power line fault and replace the harness if necessary.
5. Check the instrument cluster ground line.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the instrument cluster harness plug I29. C. Measure the resistance between the instrument cluster harness plug I29 terminal 25 and the fixed ground point with the multimeter. **Standard value: less than 5Ω** Is the resistance normal? →**Yes** To step 6. →**No** Repair the instrument cluster ground line open circuit fault and replace the harness if necessary.
6. Replace the instrument cluster.	
	A. Replace the instrument cluster. **Refer to: Replacement of instrument cluster assembly** Confirm the system is normal.

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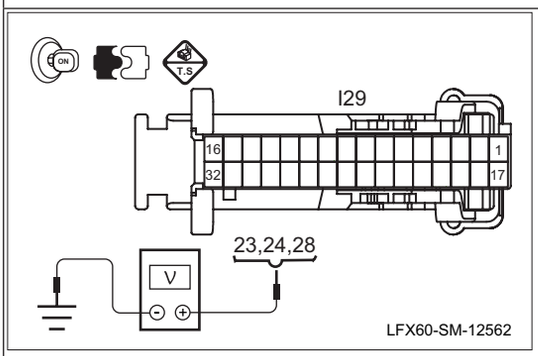
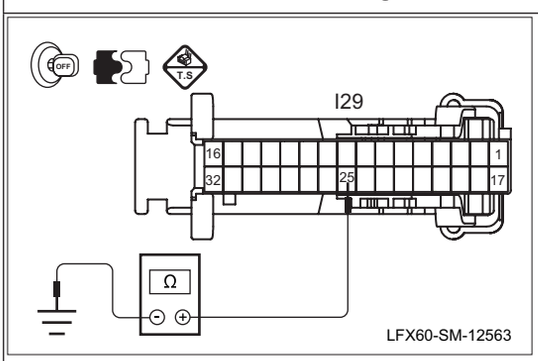
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Diagnosis flow for non-flickering of left steering signal indicator in case of left steering

Test condition	Details/results/measures
1. Check if the left steering light can work normally.	
	A. Turn on the left steering light and check if it can normally operate. Check whether it operates normally? →**Yes** To step 2. →**No** Repair failures of the left steering light.
2. General inspection.	
	A. Check the instrument cluster harness plug for breakage, loose contact, aging or looseness. Is it OK after checking? →**Yes** To step 3. →**No** Repair the abnormal part.
3. Check the trouble code.	
	A. Connect the diagnostic equipment. B. Operate the start switch to set the power mode to the “ON” state. C. Enter the instrument system and BCM and read the instrument system failure code. Is there a trouble code? →**Yes** To step 4. →**No** Repair related failures according to the failure code.
4. Check the fuse.	
	A. Check the fuse FS23, FS24, FS30. **The fuse rated capacity is 5A, 10 A, 25 A.** Is the fuse normal? →**Yes** To step 5. →**No** Repair the fuse line and replace the fuse of rated capacity.

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Test condition	Details/results/measures
5. Check the instrument cluster power line	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the instrument cluster harness plug I29. C. Connect the battery negative terminal and operate the start switch to turn the power to ON state. D. Measure the voltage between the instrument cluster harness plug I29 terminal 23, 24, 28 and the fixed ground point with the multimeter. **Standard value: 11 ~ 14 V** Is the measurement normal? →**Yes** To step 6. →**No** Repair the instrument cluster power line fault and replace the harness if necessary.
6. Check the instrument cluster ground line.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the instrument cluster harness plug I29. C. Measure the resistance between the instrument cluster harness plug I29 terminal 25 and the fixed ground point with the multimeter. **Standard value: less than 5Ω** Is the measurement normal? →**Yes** To step 7. →**No** Repair the instrument cluster ground line open circuit fault and replace the harness if necessary.
7. Check communication system between the combined instrument and BCM.	
	A. Check communication system between the combined instrument and BCM. Is the communication system normal? →**Yes** To step 8. →**No** Repair communication system failures between the combined instrument and BCM. If necessary, replace the harness.

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Test condition	Details/results/measures
8. Check the instrument cluster.	
	A. Replace the instrument cluster. **Refer to: Replacement of instrument cluster assembly** Is the system normal? →**Yes** Confirm that troubleshooting is completed. →**No** To step 9.
9. Replace BCM.	
	A. Replace BCM. **Refer to: Replacement of BCM.** Confirm the system is normal.

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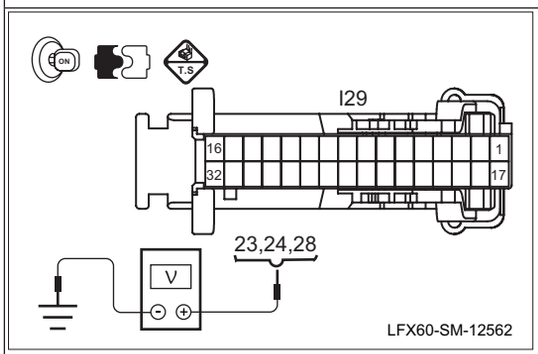
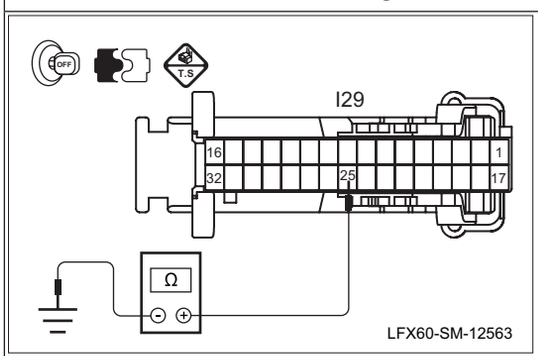
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Diagnosis flow for abnormal speedometer indication

Test condition	Details/results/measures
1. General inspection.	
	A. Check the instrument cluster harness plug for breakage, loose contact, aging or looseness. Is it OK after checking? →**Yes** To step 2. →**No** Repair the abnormal part.
2. Check the rotation rate data of the engine.	
	A. Connect the diagnostic equipment. B. Start the engine. C. Enter ECM and read rotation rate data of the engine. Check if the rotation rate data of the engine is normal. →**Yes** To step 3. →**No** Repair the rotation rate exception failure of the engine.
3. Check the trouble code.	
	A. Connect the diagnostic equipment. B. Operate the start switch to set the power mode to the “ON” state. C. Enter the instrument system and ECM and read failure code. Is there a trouble code? →**No** To step 4. →**Yes** Carry out the relevant fault diagnosis according to the DTCs.
4. Check the fuse.	
	A. Check the fuse FS23, FS24, FS30. **The fuse rated capacity is 5A, 10 A, 25 A.** Is the fuse normal? →**Yes** To step 5. →**No** Repair the fuse line and replace the fuse of rated capacity.

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Test condition	Details/results/measures
5. Check the instrument cluster power line	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the instrument cluster harness plug I29. C. Connect the battery negative terminal and operate the start switch to turn the power to ON state. D. Measure the voltage between the instrument cluster harness plug I29 terminal 23, 24, 28 and the fixed ground point with the multimeter. **Standard value: 11 ~ 14 V** Is the measurement normal? →**Yes** To step 6. →**No** Repair the instrument cluster power line fault and replace the harness if necessary.
6. Check the instrument cluster ground line.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the instrument cluster harness plug I29. C. Measure the resistance between the instrument cluster harness plug I29 terminal 25 and the fixed ground point with the multimeter. **Standard value: less than 5Ω** Is the resistance normal? →**Yes** To step 7. →**No** Repair the instrument cluster ground line open circuit fault and replace the harness if necessary.
7. Check the communication system between the instrument cluster and ECM.	
	A. Check the communication system between the instrument cluster and ECM. Is the communication system normal? →**Yes** To step 8. →**No** Repair the communication system fault between the instrument cluster and ECM and replace the harness if necessary.

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Test condition	Details/results/measures
8. Replace the instrument cluster.	
	A. Replace the instrument cluster. **Refer to: Replacement of the instrument cluster.** Is the system normal? →**Yes** Troubleshooting is completed. →**No** To step 9.
9. Replace ECM.	
	A. Replace ECM. **Refer to: Replacement ofECM** Confirm the system is normal.

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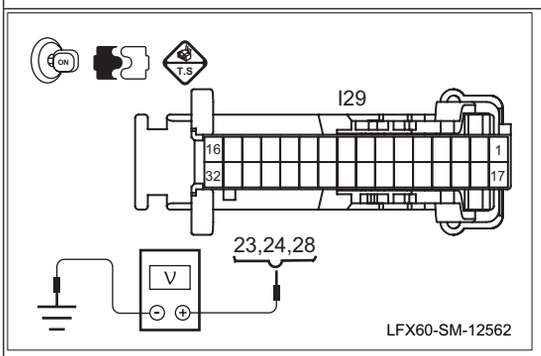
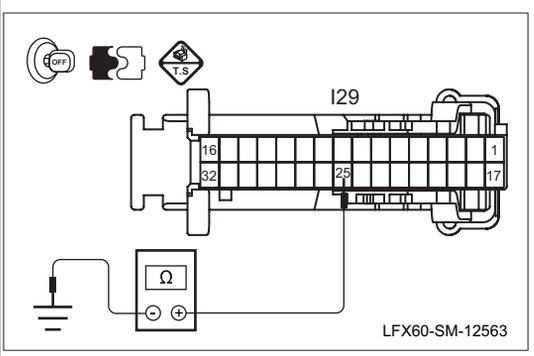
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Diagnosis flow for abnormal speedometer indication

Test condition	Details/results/measures
1. General inspection.	
	A. Check the instrument cluster harness plug for breakage, loose contact, aging or looseness. Is it OK after checking? →**Yes** To step 2. →**No** Repair the abnormal part.
2. Check vehicle rate data.	
	A. Lift the vehicle. B. Connect the diagnosis instrument and start the vehicle. C. Enter ABS system, shift the shift rod to the driving position and check the vehicle speed data. Check if the vehicle rate data is normal. →**Yes** To step 3. →**No** Repair the vehicle rate data exception failure.
3. Check the trouble code.	
	A. Connect the diagnostic equipment. B. Operate the start switch to set the power mode to the “ON” state. C. Enter the intrument system and ABS system and read the failure code. Is there a trouble code? →**No** To step 4. →**Yes** Carry out the relevant fault diagnosis according to the DTCs.
4. Check the fuse.	
	A. Check the fuse FS23, FS24, FS30. **The fuse rated capacity is 5A, 10 A, 25 A.** Is the fuse normal? →**Yes** To step 5. →**No** Repair the fuse line and replace the fuse of rated capacity.

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Test condition	Details/results/measures
5. Check the instrument cluster power line	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the instrument cluster harness plug I29. C. Connect the battery negative terminal and operate the start switch to turn the power to ON state. D. Measure the voltage between the instrument cluster harness plug I29 terminal 23, 24, 28 and the fixed ground point with the multimeter. **Standard value: 11 ~ 14 V** Is the measurement normal? →**Yes** To step 6. →**No** Repair the instrument cluster power line fault and replace the harness if necessary.
6. Check the instrument cluster ground line.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the instrument cluster harness plug I29. C. Measure the resistance between the instrument cluster harness plug I29 terminal 25 and the fixed ground point with the multimeter. **Standard value: less than 5Ω** Is the measurement normal? →**Yes** To step 7. →**No** Repair the instrument cluster ground line open circuit fault and replace the harness if necessary.
7. Check communication system between the combined instrument and ABS.	
	A. Check communication system between the combined instrument and ABS. Is the communication system normal? →**Yes** To step 8. →**No** Repair communication system failures between the combined instrument and ABS. If necessary, replace the harness.

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Test condition	Details/results/measures
8. Replace the instrument cluster.	
	A. Replace the instrument cluster. **Refer to: Replacement of the instrument cluster.** Is the system normal? →**Yes** Troubleshooting is completed. →**No** To step 9.
9. Replace ABS control module.	
	A. Replace the ABS control module. **Refer to: ABS Replace control module** Confirm the system is normal.

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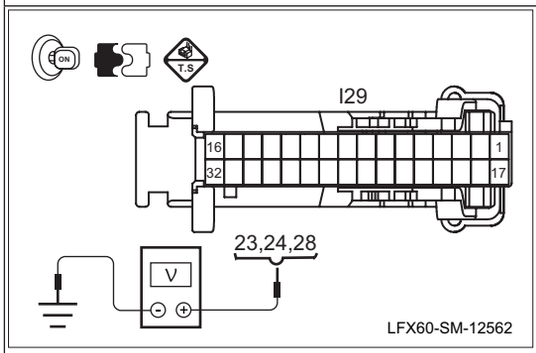
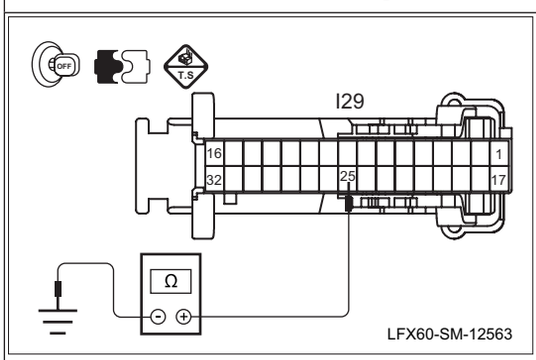
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Diagnosis flow for abnormal water temperature gauge indication

Test condition	Details/results/measures
1. General inspection.	
	A. Check the instrument cluster harness plug for breakage, loose contact, aging or looseness. Is it OK after checking? →**Yes** To step 2. →**No** Repair the abnormal part.
2. Check water temperature data of the engine.	
	A. Connect the diagnostic equipment. B. Start the engine. C. Etner ECM and read water temperature data of the engine. Check if the water temperature data of the engine is normal. →**Yes** To step 3. →**No** Repair water temperature exception failure of the engine.
3. Check the trouble code.	
	A. Connect the diagnostic equipment. B. Operate the start switch to set the power mode to the “ON” state. C. Enter the instrument system and read the failure codes. Is there a trouble code? →**No** To step 4. →**Yes** Carry out the relevant fault diagnosis according to the DTCs.
4. Check the fuse.	
	A. Check the fuse FS23, FS24, FS30. **The fuse rated capacity is 5A, 10 A, 25 A.** Is the fuse normal? →**Yes** To step 5. →**No** Repair the fuse line and replace the fuse of rated capacity.

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Test condition	Details/results/measures
5. Check the instrument cluster power line	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the instrument cluster harness plug I29. C. Connect the battery negative terminal and operate the start switch to turn the power to ON state. D. Measure the voltage between the instrument cluster harness plug I29 terminal 23, 24, 28 and the fixed ground point with the multimeter. **Standard value: 11 ~ 14 V** Is the measurement normal? →**Yes** To step 6. →**No** Repair the instrument cluster power line fault and replace the harness if necessary.
6. Check the instrument cluster ground line.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the instrument cluster harness plug I29. C. Measure the resistance between the instrument cluster harness plug I29 terminal 25 and the fixed ground point with the multimeter. **Standard value: less than 5Ω** Is the measurement normal? →**Yes** To step 7. →**No** Repair the instrument cluster ground line open circuit fault and replace the harness if necessary.
7. Check the communication system between the instrument cluster and ECM.	
	A. Check the communication system between the instrument cluster and ECM. Is the communication system normal? →**Yes** To step 8. →**No** Repair the communication system fault between the instrument cluster and ECM and replace the harness if necessary.

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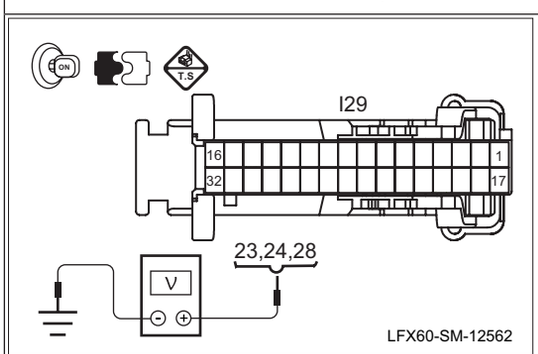
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Test condition	Details/results/measures
8. Replace the instrument cluster.	
	A. Replace the instrument cluster. **Refer to: Replacement of the instrument cluster.** Is the system normal? →**Yes** Troubleshooting is completed. →**No** To step 9.
9. Replace ECM.	
	A. Replace ECM. **Refer to: Replacement of ECM** Confirm the system is normal.

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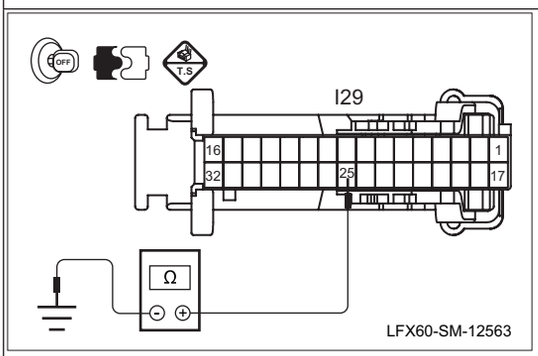
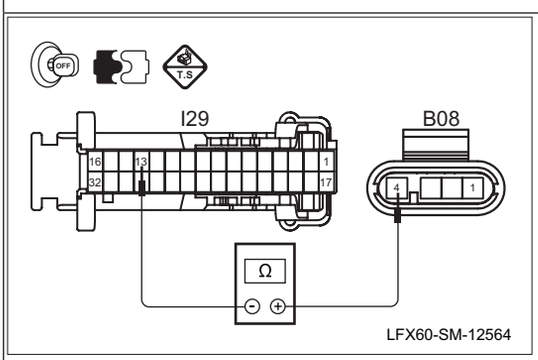
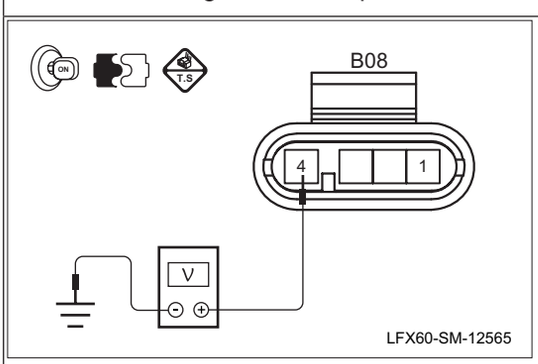
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Diagnosis flow for abnormal fuel gauge indication

Test condition	Details/results/measures
1. General inspection.	
	A. Check the harness plug of the combined instrument and ful pump are damaged, are in bad contact, are aging and fall off. Is it OK after checking? →**Yes** To step 2. →**No** Repair the abnormal part.
2. Check the fuse.	
	A. Check the fuse FS23, FS24, FS30. **The fuse rated capacity is 5A, 10 A, 25 A.** Is the fuse normal? →**Yes** To step 3. →**No** Repair the fuse line and replace the fuse of rated capacity.
3. Check the instrument cluster power line	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the instrument cluster harness plug I29. C. Connect the battery negative terminal and operate the start switch to turn the power to ON state. D. Measure the voltage between the instrument cluster harness plug I29 terminal 23, 24, 28 and the fixed ground point with the multimeter. **Standard value: 11 ~ 14 V** Is the measurement normal? →**Yes** To step 4. →**No** Repair the instrument cluster power line fault and replace the harness if necessary.

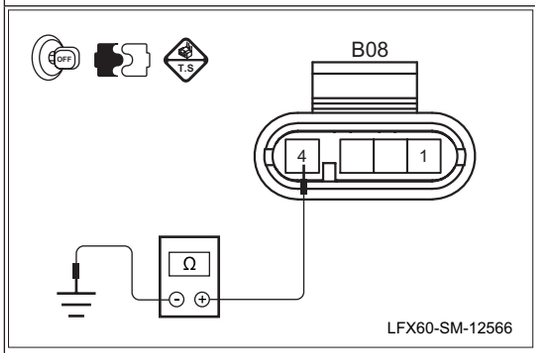
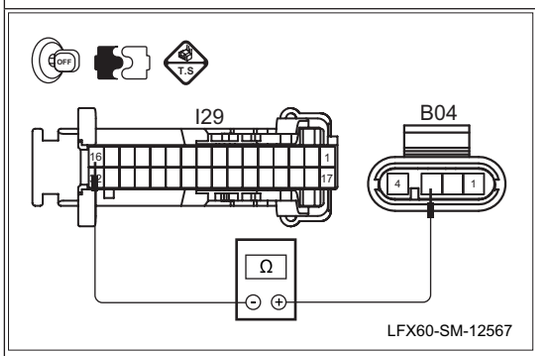
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Test condition	Details/results/measures
4. Check the instrument cluster ground line.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the instrument cluster harness plug I29. C. Measure the resistance between the instrument cluster harness plug I29 terminal 25 and the fixed ground point with the multimeter. **Standard value: less than 5Ω** Is the measurement normal? →**Yes** To step 5. →**No** Repair the instrument cluster ground line open circuit fault and replace the harness if necessary.
5. Check connectivity of the signal line of the fuel liquid level sensor.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the instrument cluster harness plug I29. C. Disconnect the fuel pump harness plug B08. D. Measure the resistance between the instrument cluster harness plug I29 terminal 13 and the fuel pump harness plug B08 terminal 4. **Standard value: less than 5Ω** Is the measurement normal? →**Yes** To step 6. →**No** Repair signal line break failures of the fuel level sensor. If necessary, replace the harness.
6. Check if the signal line and power of the fuel liquid level sensor are in short circuit.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the instrument cluster harness plug I29. C. Disconnect the fuel pump harness plug B08. D. Operate the start switch to turn the power to ON state and connect the battery negative terminal. E. Measure the voltage between the fuel pump harness plug B08 terminal 4 and the fixed ground point. **Standard value: 0 V** Is the measurement normal? →**Yes** To step 7. →**No** Repair signal line and power short-circuit failures of the fuel level sensor. If necessary, replace the harness.

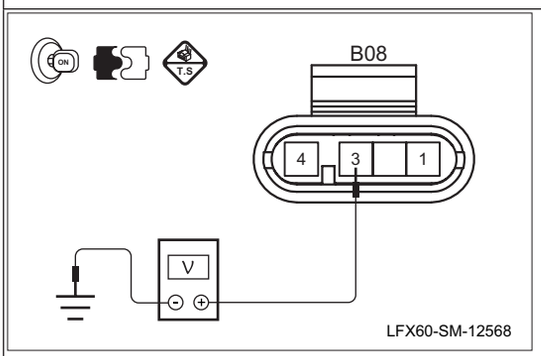
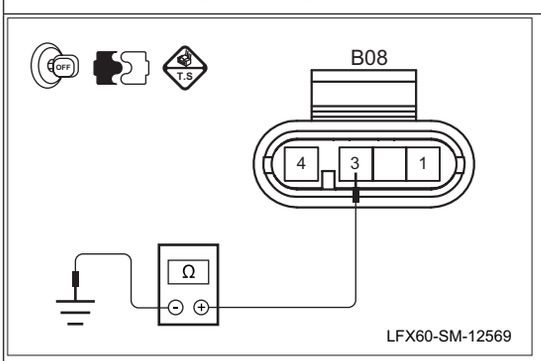
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Test condition	Details/results/measures
7. Check if the signal line and grounding of the fuel liquid level sensor are in short circuit.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the fuel pump harness plug B08. C. Disconnect the instrument cluster harness plug I29. D. Measure the resistance between the fuel pump harness plug B08 terminal 4 and the fixed ground point. **Standard value: 10MΩ or higher** Is the resistance normal? →**Yes** To step 8. →**No** Repair signal line and grounding short circuit failures of the fuel level sensor. If necessary, replace the harness.
8. Check connectivity of the grounding signal line of the fuel liquid level sensor.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the instrument cluster harness plug I29. C. Disconnect the fuel pump harness plug B08. D. Measure the resistance between the instrument cluster harness plug I29 terminal 16 and the fuel pump harness plug B08 terminal 3. **Standard value: less than 5Ω** Is the measurement normal? →**Yes** To step 9. →**No** Repair grounding line break failures of the fuel level sensor. If necessary, replace the harness.

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Test condition	Details/results/measures
9. Check if the grounding signal line of the fuel liquid level sensor and power are in short circuit.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the fuel pump harness plug B08. C. Disconnect the instrument cluster harness plug I29. D. Operate the start switch to turn the power to ON state and connect the battery negative terminal. E. Measure the voltage between the fuel pump harness plug B08 terminal 3 and the fixed ground point. **Standard value: 0 V** Is the measurement normal? →**Yes** To step 10. →**No** Repair grounding line and power short-circuit failures of the fuel level sensor. If necessary, replace the harness.
10. Check if the grounding line of the fuel liquid level sensor and grounding are in short circuit.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the fuel pump harness plug B08. C. Disconnect the instrument cluster harness plug I29. D. Measure the resistance between the fuel pump harness plug B08 terminal 3 and the fixed ground point. **Standard value: 10MΩ or higher** Is the measurement normal? →**Yes** To step 11. →**No** Repair grounding line and grounding short-circuit failures of the fuel level sensor. If necessary, replace the harness.
11. Replace the fuel liquid level sensor.	
	A. Replace the fuel liquid level sensor. **Refer to: Replacement of electric fuel pump** Is the system normal? →**Yes** Troubleshooting is completed. →**No** To step 12.

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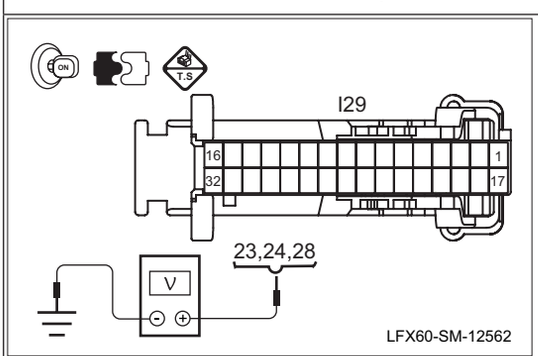
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Test condition	Details/results/measures
12. Replace the instrument cluster.	
	A. Replace the instrument cluster. **Refer to: Replacement of the instrument cluster.** Confirm the system is normal.

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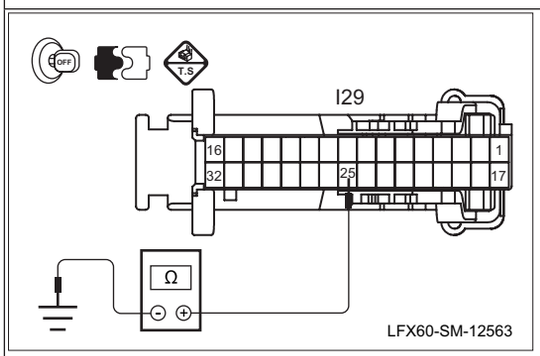
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Diagnosis flow for off engine failure indicator when the ignition switch is in “ON” position

Test condition	Details/results/measures
1. General inspection.	
	A. Check the instrument cluster harness plug for breakage, loose contact, aging or looseness. Is it OK after checking? →**Yes** To step 2. →**No** Repair the abnormal part.
2. Check the fuse.	
	A. Check the fuse FS23, FS24, FS30. **The fuse rated capacity is 5A, 10 A, 25 A.** Is the fuse normal? →**Yes** To step 3. →**No** Repair the fuse line and replace the fuse of rated capacity.
3. Check the instrument cluster power line	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the instrument cluster harness plug I29. C. Connect the battery negative terminal and operate the start switch to turn the power to ON state. D. Measure the voltage between the instrument cluster harness plug I29 terminal 23, 24, 28 and the fixed ground point with the multimeter. **Standard value: 11 ~ 14 V** Is the measurement normal? →**Yes** To step 4. →**No** Repair the instrument cluster power line fault and replace the harness if necessary.

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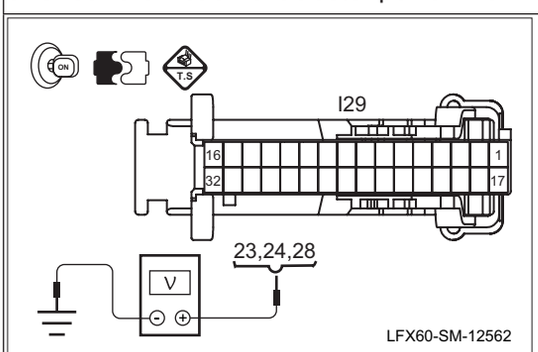
Test condition	Details/results/measures
4. Check the instrument cluster ground line.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the instrument cluster harness plug I29. C. Measure the resistance between the instrument cluster harness plug I29 terminal 25 and the fixed ground point with the multimeter. **Standard value: less than 5Ω** Is the measurement normal? →**Yes** To step 5. →**No** Repair the instrument cluster ground line open circuit fault and replace the harness if necessary.
5. Check the communication system between the instrument cluster and ECM.	
	A. Check the communication line between the combined instrument and engine control module ECM. Check if it is normal. →**Yes** To step 6. →**No** Repair CAN communication line exception failures between the combined instruction and motor control module ECM. If necessary, replace the harness.
6. Replace the instrument cluster.	
	A. Replace the instrument cluster. **Refer to: Replacement of the instrument cluster.** Is the system normal? →**Yes** Troubleshooting is completed. →**No** To step 8.
7. Replace ECM.	
	A. Replace ECM. **Refer to: Replacement of ECM.** Confirm the system is normal.

12

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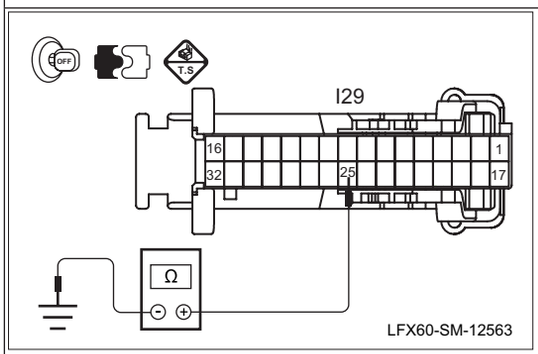
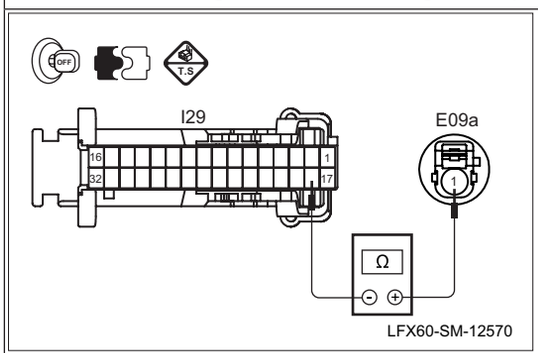
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Diagnosis flow for off engine oil pressure alarm indicator when the ignition switch is in "ON" position

Test condition	Details/results/measures
1. General inspection.	
	A. Check the harness plug of the combined instrument and engine oil pressure annunciator are damaged, are in bad contact, are aging and fall off. Is it OK after checking? →**Yes** To step 2. →**No** Repair the abnormal part.
2. Check the fuse.	
	A. Check the fuse FS23, FS24, FS30. **The fuse rated capacity is 5A, 10A, 25A.** Is the fuse normal? →**Yes** To step 3. →**No** Repair the fuse line and replace the fuse of rated capacity.
3. Check the instrument cluster power line.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the instrument cluster harness plug I29. C. Connect the battery negative terminal and operate the start switch to turn the power to ON state. D. Measure the voltage between the instrument cluster harness plug I29 terminal 23, 24, 28 and the fixed ground point with the multimeter. **Standard value: 11 ~ 14 V** Is the measurement normal? →**Yes** **To step 4.** →**No** Repair the instrument cluster power line fault and replace the harness if necessary.

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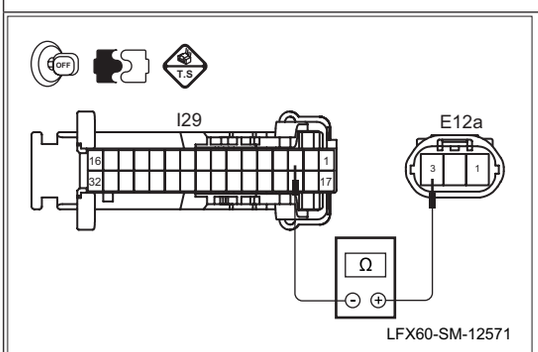
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Test condition	Details/results/measures
4. Check the instrument cluster ground line.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the instrument cluster harness plug I29. C. Measure the resistance between the instrument cluster harness plug I29 terminal 25 and the fixed ground point with the multimeter. Standard value: less than 5Ω Is the measurement normal? →**Yes** To step 5. →**No** Repair the instrument cluster ground line open circuit fault and replace the harness if necessary.
5. Check of the signal line of the engine oil pressure annunicator.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the instrument cluster harness plug I29. C. Disconnect the harness plug E09a of the engine oil pressure annunicator. D. Measure the resistance between the terminal 18 of the combined instrument harness plug I29 and the terminal 1 of the oil pressure annunciator harness plug E09a. **Standard value: less than 5Ω** Is the measurement normal? →**Yes** To step 6. →**No** Repair power line break failures of the oil pressure annunciator. If necessary, replace the harness.
6. Check the engine oile pressure switch.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative connector. B. Replace the engine oile pressure switch. Check if the engine oil pressure alarm indicator is normal. →**Yes** Confirm the repair is finished. →**No** Replace the instrument cluster. **Refer to: Replacement of the instrument cluster.** Confirm the system is normal.

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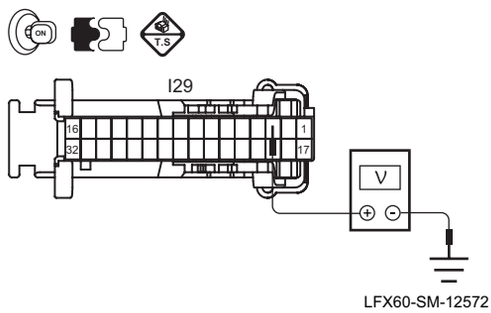
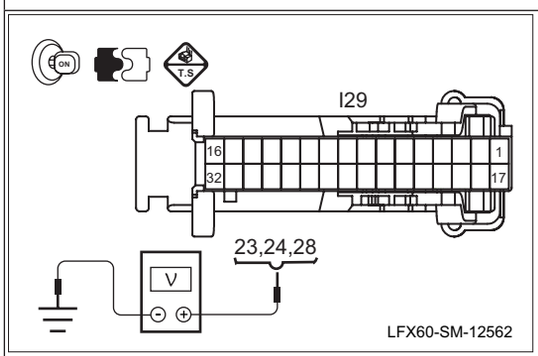
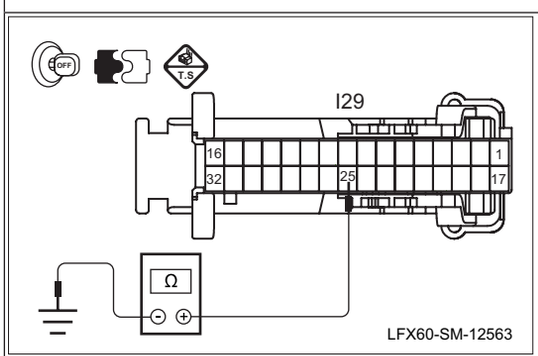
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Diagnosis flow for off charging indicator when the ignition switch is in “ON” position

Test condition	Details/results/measures
1. General inspection.	
	A. Check the harness plug of the combined instrument and the generator module are damaged, are in bad contact, are aging and fall off. Is it OK after checking? →**Yes** To step 2. →**No** Repair the abnormal part.
2. Check the fuse.	
	A. Check the fuse FS23, FS24, FS30. **The fuse rated capacity is 5A, 10 A, 25 A.** Is the fuse normal? →**Yes** To step 3. →**No** Repair the fuse line and replace the fuse of rated capacity.
3. Check connectivity of the charging indicator line between the motor and combined instrument.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the harness plug I29 of the combined instrument and the harness plug E12a of the generator regulator. C. Measure the resistance between the terminal 3 of the combined instrument harness plug I29 and the terminal 3 of the generator regulator harness plug E12a. **Standard value: less than 5Ω** Is the measurement normal? →**Yes** To step 4. →**No** Repair charging indicator line break failures between the motor and combined instrument. If necessary, replace the harness.

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Test condition	Details/results/measures
4. Check if the charging indicator line between the motor and combined instrument is in short circuit with the power.	
 LFX60-SM-12572	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the instrument cluster harness plug I29. C. Connect the battery negative terminal and operate the start switch to turn the power to ON state. D. Measure the voltage between the terminal 3 of the combined instrument harness plug I29 and the reliabile grounding point. **Standard value: 0V** Is the measurement normal? **→Yes** To step 5. **→No** Repair charging indicator line and power short-circuit failures between the motor and combined instrument. If necessary, replace the harness.
5. Check the instrument cluster power line.	
 LFX60-SM-12562	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the instrument cluster harness plug I29. C. Connect the battery negative terminal and operate the start switch to turn the power to ON state. D. Measure the voltage between the instrument cluster harness plug I29 terminal 23, 24, 28 and the fixed ground point with the multimeter. **Standard value: 11 ~ 14 V** Is the measurement normal? **→Yes** To step 6. **→No** Repair the instrument cluster power line fault and replace the harness if necessary.
6. Check the instrument cluster ground line.	
 LFX60-SM-12563	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the instrument cluster harness plug I29. C. Measure the resistance between the instrument cluster harness plug I29 terminal 25 and the fixed ground point with the multimeter. **Standard value: less than 5Ω** Is the measurement normal? **→Yes** To step 7. **→No** Repair the instrument cluster ground line open circuit fault and replace the harness if necessary.

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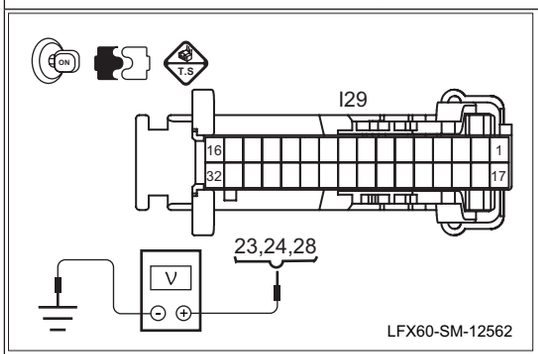
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Test condition	Details/results/measures
7. Replace alternator regulator.	
	A. Replace alternator regulator. **Refer to: Replacement of alternator** Is it normal? →**Yes** Troubleshooting is completed. →**No** To step 8.
8. Replace the instrument cluster.	
	A. Replace the instrument cluster. **Refer to: Replacement of the instrument cluster.** Confirm the system is normal.

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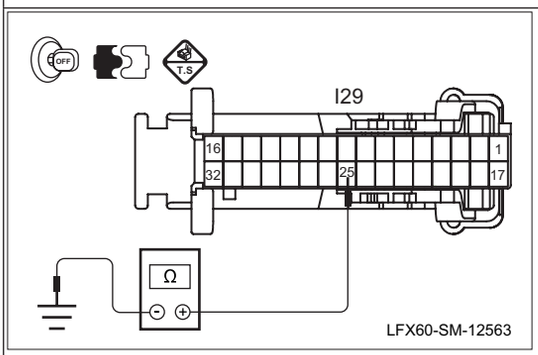
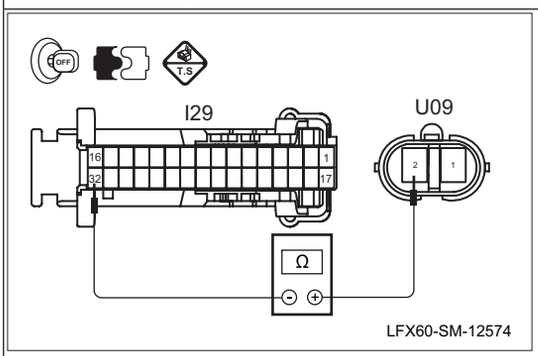
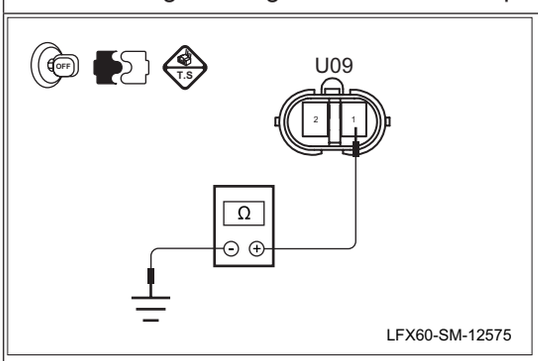
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Diagnosis flow for off alarm indicator when the brake liquid level is too low

Test condition	Details/results/measures
1. General inspection.	
	A. Check the instrument cluster harness plug and brake fluid level alarm harness plug for breakage, loose contact, aging or looseness. Is it OK after checking? →**Yes** To step 2. →**No** Repair the abnormal part.
2. Check the fuse.	
	A. Check the fuse FS23, FS24, FS30. **The fuse rated capacity is 5A, 10 A, 25 A.** Is the fuse normal? →**Yes** To step 3. →**No** Repair the fuse line and replace the fuse of rated capacity.
3. Check the instrument cluster power line.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the instrument cluster harness plug I29. C. Connect the battery negative terminal and operate the start switch to turn the power to ON state. D. Measure the voltage between the instrument cluster harness plug I29 terminal 23, 24, 28 and the fixed ground point with the multimeter. **Standard value: 11 ~ 14 V** Is the measurement normal? →**Yes** To step 4. →**No** Repair the instrument cluster power line fault and replace the harness if necessary.

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Test condition	Details/results/measures
4. Check the instrument cluster ground line.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the instrument cluster harness plug I29. C. Measure the resistance between the instrument cluster harness plug I29 terminal 25 and the fixed ground point with the multimeter. **Standard value: less than 5Ω** Is the measurement normal? →**Yes** To step 5. →**No** Repair the instrument cluster ground line open circuit fault and replace the harness if necessary.
5. Check the signal circuit of the brake liquid level switch.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the instrument cluster harness plug I29. C. Disconnect the harness plug U09 of the brake liquid level switch. D. Measure the resistance between the terminal 32 of the combined instrument harness plug I29 and the terminal 2 of the brake liquid level switch harness plug U09. **Standard value: less than 5Ω** Is the measurement normal? →**Yes** To step 6. →**No** Repair line break failures between the brake level switch and combined instrument. If necessary, replace the harness.
6. Check the grounding line of the brake liquid level switch.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the brake fluid level switch harness plug U09. C. Measure the resistance between the terminal 1 of the brake liquid level switch harness plug U09 and the reliabile grounding point. **Standard value: less than 5Ω** Is the measurement normal? →**Yes** To step 7. →**No** Repair grounding line break failures of the brake level switch. If necessary, replace the harness.

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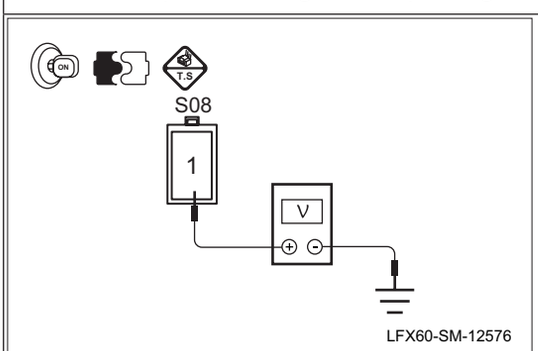
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Test condition	Details/results/measures
7. Replace the brake liquid level switch.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative connector. B. Replace the brake liquid level switch. Is the display normal? →**Yes** Confirm the repair is finished. →**No** Replace the instrument cluster. **Refer to: Replacement of the instrument cluster.** Confirm the system is normal.

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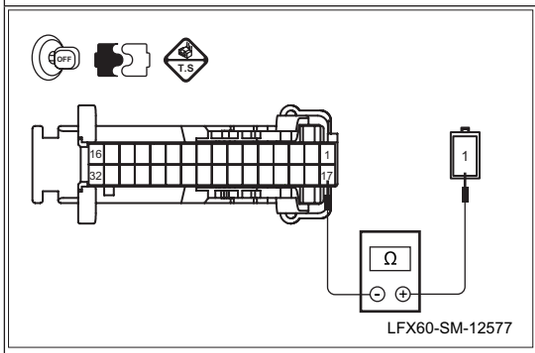
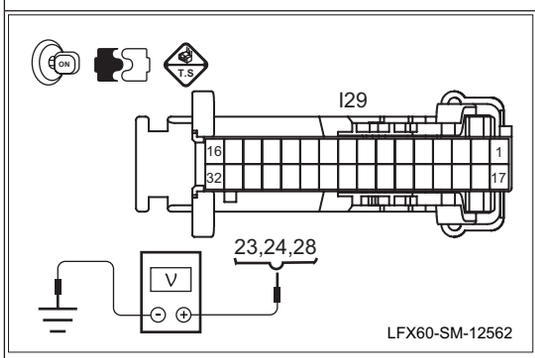
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Diagnosis flow for off indicator when the parking brake works

Test condition	Details/results/measures
1. General inspection.	
	A. Check the harness plug of the combined instrument and parking brake switch are damaged, are in bad contact, are aging and fall off. Is it OK after checking? →**Yes** To step 2. →**No** Repair the abnormal part.
2. Check the fuse.	
	A. Check the fuse FS23, FS24, FS30. **The fuse rated capacity is 5A, 10 A, 25 A.** Is the fuse normal? →**Yes** To step 3. →**No** Repair the fuse line and replace the fuse of rated capacity.
3. Check the power voltage of the parking brake switch.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the harness plug S08 of the parking brake switch. C. Connect the battery negative terminal and operate the start switch to turn the power to ON state. D. Measure the resistance between the terminal 1 of the parking brake switch harness plug S08 and the reliabile grounding point. **Standard value: 11 ~ 14 V** Is the measurement normal? →**No** To step 4. →**Yes** Replace the parking brake.

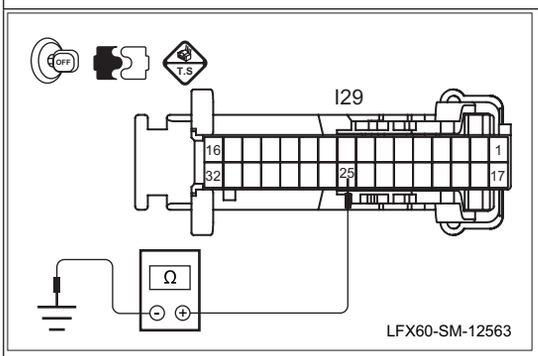
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Test condition	Details/results/measures
4. Check line connectivity of the parking brake switch and combined instrument.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the harness plug I29 of the combined instrument and harness plug S08 of the parking brake switch. C. Measure the resistance between the terminal 17 of the combined instrument harness plug I29 and the terminal 1 of the parking brake switch harness plug S08. **Standard value: less than 5Ω** Is the measurement normal? **→Yes** To step 5. **→No** Repair line break failures between the parking brake switch and combined instrument. If necessary, replace the harness.
5. Check the instrument cluster power line.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the instrument cluster harness plug I29. C. Connect the battery negative terminal and operate the start switch to turn the power to ON state. D. Measure the voltage between the instrument cluster harness plug I29 terminal 23, 24, 28 and the fixed ground point with the multimeter. **Standard value: 11 ~ 14 V** Is the measurement normal? **→Yes** To step 6. **→No** Repair the instrument cluster power line fault and replace the harness if necessary.

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Test condition	Details/results/measures
6. Check the instrument cluster ground line.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the instrument cluster harness plug I29. C. Measure the resistance between the instrument cluster harness plug I29 terminal 25 and the fixed ground point with the multimeter. **Standard value: less than 5Ω** Is the measurement normal? →**Yes** To step 7. →**No** Repair the instrument cluster ground line open circuit fault and replace the harness if necessary.
7. Replace the instrument cluster.	
	A. Replace the instrument cluster. **Refer to: Replacement of the instrument cluster.** Confirm the system is normal.

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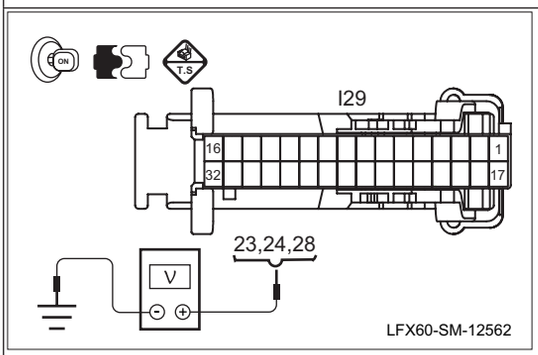
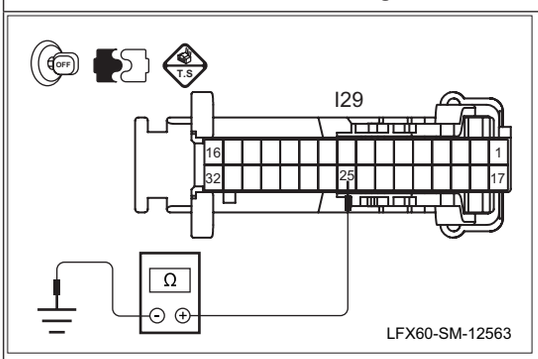
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Diagnosis flow for off ABS failure indicator when the ignition switch is in "ON" position

Test condition	Details/results/measures
1. General inspection.	
	A. Check the harness plug of the combined instrument and ABS are damaged, are in bad contact, are aging and fall off. Is it OK after checking? →**Yes** To step 2. →**No** Repair the abnormal part.
2. Check the trouble code.	
	A. Connect the diagnostic equipment. B. Operate the start switch to turn the power to ON state. C. Enter the instrument system and read the failure codes. Is there a trouble code? →**No** To step 3. →**Yes** Carry out the relevant fault diagnosis according to the DTCs.
3. Check the fuse.	
	A. Check the fuse FS23, FS24, FS30. **The fuse rated capacity is 5A, 10 A, 25 A.** Is the fuse normal? →**Yes** To step 4. →**No** Repair the fuse line and replace the fuse of rated capacity.

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Test condition	Details/results/measures
4. Check the instrument cluster power line	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the instrument cluster harness plug I29. C. Connect the battery negative terminal and operate the start switch to turn the power to ON state. D. Measure the voltage between the instrument cluster harness plug I29 terminal 23, 24, 28 and the fixed ground point with the multimeter. **Standard value: 11 ~ 14 V** Is the measurement normal? →**Yes** To step 5. →**No** Repair the instrument cluster power line fault and replace the harness if necessary.
5. Check the instrument cluster ground line.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the instrument cluster harness plug I29. C. Measure the resistance between the instrument cluster harness plug I29 terminal 25 and the fixed ground point with the multimeter. Standard value: less than 5Ω Is the measurement normal? →Yes To step 6. →**No** Repair the instrument cluster ground line open circuit fault and replace the harness if necessary.
6. Check communication system between the combined instrument and ABS.	
	A. Check communication system between the combined instrument and ABS. Is the communication network normal? →**Yes** To step 7. →**No** Repair communication system failures between the combined instrument and ABS. If necessary, replace the harness.

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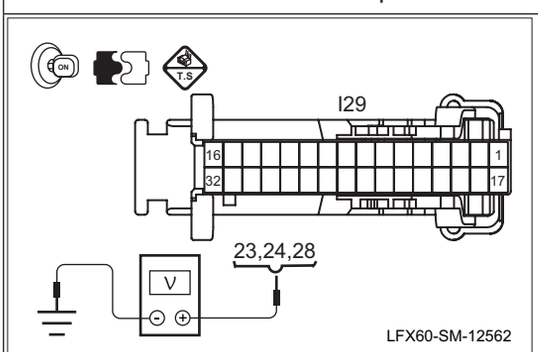
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Test condition	Details/results/measures
7. Replace the instrument cluster.	
	A. Replace the instrument cluster. **Refer to: Replacement of the instrument cluster.** Is the system normal? →**Yes** Troubleshooting is completed. →**No** To step 8.
8. Replace ABS pump.	
	A. Replace ABS pump. **Refer to: Replacement of the ABS pump.** Confirm the system is normal.

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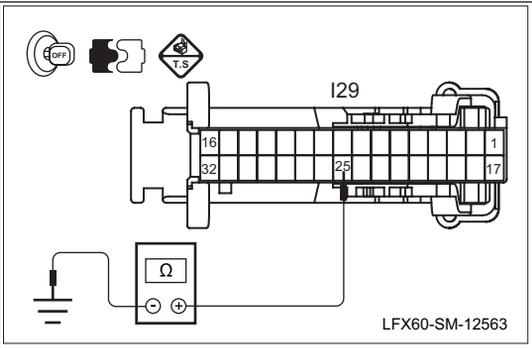
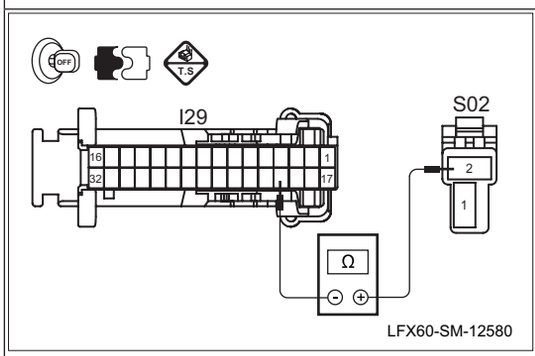
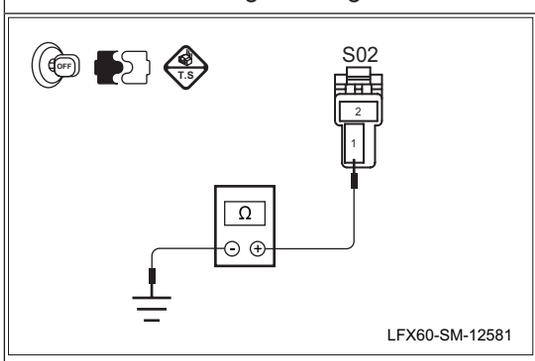
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Diagnosis flow for off non-fastened safety belt indicator when the ignition switch is in "ON" position

Test condition	Details/results/measures
1. General inspection.	
	A. Check the instrument cluster harness plug and brake fluid level alarm harness plug for breakage, loose contact, aging or looseness. Is it OK after checking? →**Yes** To step 2. →**No** Repair the abnormal part.
2. Check the fuse.	
	A. Check the fuse FS23, FS24, FS30. **The fuse rated capacity is 5A, 10 A, 25 A.** Is the fuse normal? →**Yes** To step 3. →**No** Repair the fuse line and replace the fuse of rated capacity.
3. Check the instrument cluster power line.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the instrument cluster harness plug I29. C. Connect the battery negative terminal and operate the start switch to turn the power to ON state. D. Measure the voltage between the instrument cluster harness plug I29 terminal 23, 24, 28 and the fixed ground point with the multimeter. **Standard value: 11 ~ 14 V** Is the measurement normal? →**Yes** To step 4. →**No** Repair the instrument cluster power line fault and replace the harness if necessary.

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Test condition	Details/results/measures
4. Check the instrument cluster ground line.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the instrument cluster harness plug I29. C. Measure the resistance between the instrument cluster harness plug I29 terminal 25 and the fixed ground point with the multimeter. **Standard value: less than 5Ω** Is the measurement normal? **→Yes** To step 5. **→No** Repair the instrument cluster ground line open circuit fault and replace the harness if necessary.
5. Check connectivity of the line between the driver's safety belt switch and combined instrument.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the instrument cluster harness plug I29. C. Disconnect the harness plug S02 of the driver safety belt switch. D. Measure the resistance between the terminal 20 of the combined instrument harness plug I29 and the terminal 2 of the driver safety belt switch harness plug S02. **Standard value: less than 5Ω** Is the measurement normal? **→Yes** To step 6. **→No** Repair line break failures between the driver safety belt switch and combined instrument. If necessary, replace the harness.
6. Check the switch grounding line of the driver's safety belt.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the brake fluid level switch harness plug U09. C. Measure the resistance between the terminal 1 of the driver safety belt harness plug S02 and the reliabile grounding point. **Standard value: less than 5Ω** Is the measurement normal? **→Yes** To step 7. **→No** Repair grounding line break failures of the driver safety belt switch. If necessary, replace the harness.

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Test condition	Details/results/measures
7. Driver's safety belt switch	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative connector. B. Replac the driver's safety belt switch Is the display normal? →**Yes** Confirm the repair is finished. →**No** Replace the instrument cluster. **Refer to: Replace the combined instruent assembly and confirm that the system is normal**

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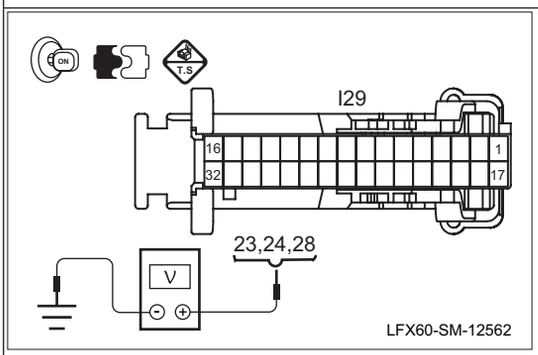
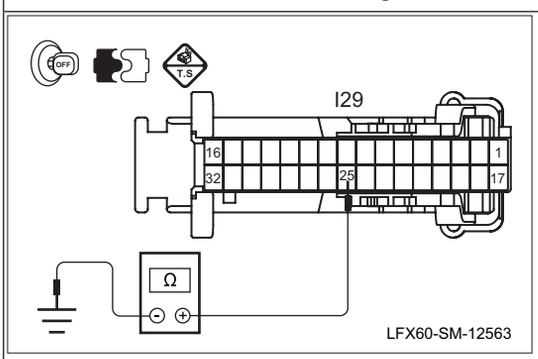
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Diagnosis flow for off ESP failure indicator when the ignition switch is in "ON" position

Test condition	Details/results/measures
1. General inspection.	
	A. Connect the diagnostic equipment. B. Operate the start switch to turn the power to ON state. C. Enter the instrument system and ESP system and check if the system includes a failure code. Is there a trouble code? →**No** To step 3. →**Yes** Carry out the relevant fault diagnosis according to the DTC.
2. Check the trouble code.	
	A. Check the fuse FS23, FS24, FS30. **The fuse rated capacity is 5A, 10 A, 25 A.** Is the fuse normal? →**Yes** To step 3. →**No** Repair the fuse line and replace the fuse of rated capacity.
3. Check the fuse.	
	A. Check the fuse FS23, FS24, FS30. **The fuse rated capacity is 5A, 10 A, 25 A.** Is the fuse normal? →**Yes** To step 4. →**No** Repair the fuse line and replace the fuse of rated capacity.

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Test condition	Details/results/measures
4. Check the instrument cluster power line.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the instrument cluster harness plug I29. C. Connect the battery negative terminal and operate the start switch to turn the power to ON state. D. Measure the voltage between the instrument cluster harness plug I29 terminal 23, 24, 28 and the fixed ground point with the multimeter. **Standard value: 11 ~ 14 V** Is the measurement normal? →**Yes** To step 5. →**No** Repair the instrument cluster power line fault and replace the harness if necessary.
5. Check the instrument cluster ground line.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the instrument cluster harness plug I29. C. Measure the resistance between the instrument cluster harness plug I29 terminal 25 and the fixed ground point with the multimeter. **Standard value: less than 5Ω** Is the measurement normal? →**Yes** To step 6. →**No** Repair the instrument cluster ground line open circuit fault and replace the harness if necessary.
6. Check the communication system between the combined instrument mand ESP	
	A. Check the communication system between the combined instrument mand ESP. Is the communication network normal? →**Yes** To step 7. →**No** Repair the communication failures between the combined instrument and ESP. If necessary, replace the harness.

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Test condition	Details/results/measures
7. Replace the instrument cluster.	
	A. Replace the instrument cluster. **Refer to: Replace the combined instrument and confirm if the system is normal.** →**Yes** Troubleshooting is completed. →**No** To step 8.
8. Replace ESP control unit.	
	A. Replace ESP control unit. **Refer to: Replacement of the ABS/ESP module** Confirm the system is normal.

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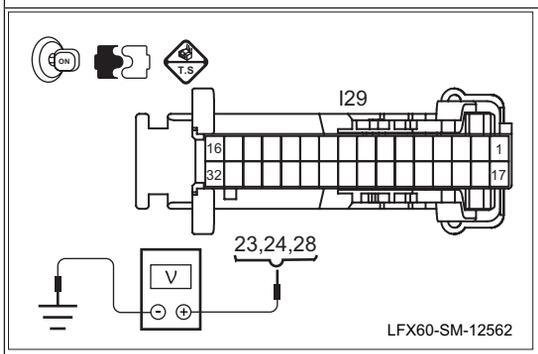
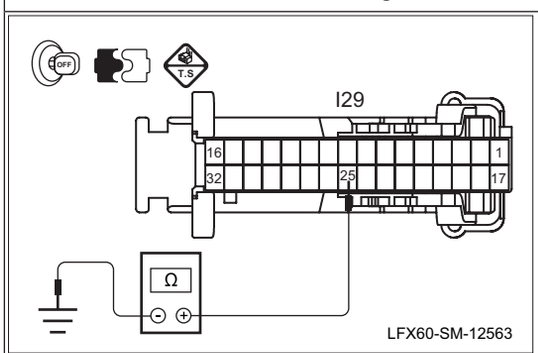
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Diagnosis flow for off airbag failure indicator when the ignition switch is in “ON” position

Test condition	Details/results/measures
1. General inspection.	
	A. Check the harness plug of the combined instrument and airbag module are damaged, are in bad contact, are aging and fall off. Is it OK after checking? →**Yes** To step 2. →**No** Repair the abnormal part.
2. Check the trouble code.	
	A. Connect the diagnostic equipment. B. Operate the start switch to turn the power to ON state. C. Access the instrument system and SRS system to check the system for DTC. Is there a trouble code? →**No** To step 3. →**Yes** Carry out the relevant fault diagnosis according to the DTC.
3. Check the fuse.	
	A. Check the fuse FS23, FS24, FS30. **The fuse rated capacity is 5A, 10 A, 25 A.** Is the fuse normal? →**Yes** To step 4. →**No** Repair the fuse line and replace the fuse of rated capacity.

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Test condition	Details/results/measures
4. Check the instrument cluster power line	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the instrument cluster harness plug I29. C. Connect the battery negative terminal and operate the start switch to turn the power to ON state. D. Measure the voltage between the instrument cluster harness plug I29 terminal 23, 24, 28 and the fixed ground point with the multimeter. **Standard value: 11 ~ 14 V** Is the measurement normal? →**Yes** To step 5. →**No** Repair the instrument cluster power line fault and replace the harness if necessary.
5. Check the instrument cluster ground line.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative terminal. B. Disconnect the instrument cluster harness plug I29. C. Measure the resistance between the instrument cluster harness plug I29 terminal 25 and the fixed ground point with the multimeter. **Standard value: less than 5Ω** Is the measurement normal? →**Yes** To step 6. →**No** Repair the instrument cluster ground line open circuit fault and replace the harness if necessary.
6. Check the communication system between the instrument cluster and SRS.	
	A. Check the communication system between the instrument cluster and SRS. Is the communication system normal? →**Yes** To step 7. →**No** Repair the communication system fault between the instrument cluster and SRS and replace the harness if necessary.

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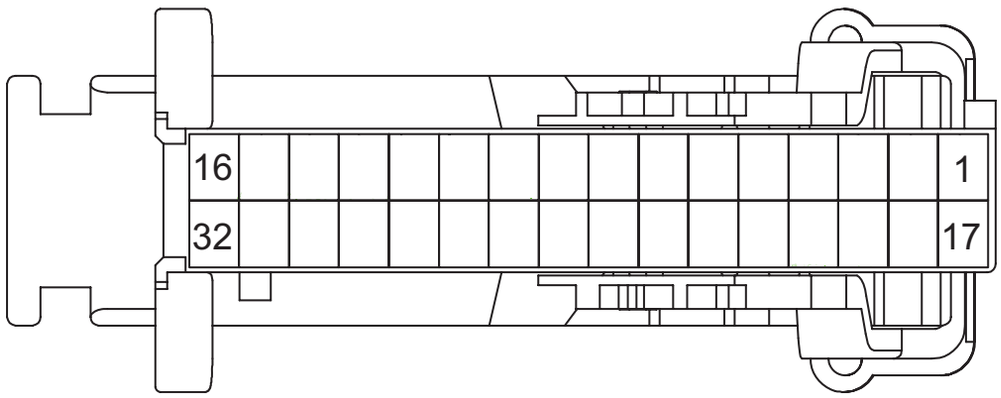
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Test condition	Details/results/measures
7. Replace the instrument cluster.	
	A. Replace the instrument cluster. **Refer to: Replacement of the instrument cluster.** Is the system normal? →**Yes** Troubleshooting is completed. →**No** To step 8.
8. Replace the airbag control unit.	
	A. Replace the airbag control unit. **Refer to: Replacement of the airbag control unit.** Confirm the system is normal.

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Control module terminal list



I29

LFX60-SM-12713

Terminal No.	Wire diameter/color	Terminal description
I29-01	0.30 G/B	Outside temperature sensor signal
I29-02	0.50 Y/B	Steering wheel switch +
I29-03	0.30 O/Bl	Charging indication signal
I29-04	0.30 O/Gr S	No fastened co-driver's safety belt indication signal
I29-05	-	-
I29-06	-	-
I29-07	-	-
I29-08	-	-
I29-09	-	-
I29-10	-	-
I29-11	-	-
I29-12	-	-
I29-13	0.30 Br/G	Fuel position indication signal
I29-14	0.30 Bl	Passenger detection signal
I29-15	0.50 Y	Steering wheel switch -
I29-16	0.30 B/Y	Fuel position signal ground
I29-17	0.30 G/B	Parking brake indication signal
I29-18	0.30 Y/B	Low engine oil pressure alarm signal
I29-19	0.50 W/O	Reverse sensor signal

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Terminal No.	Wire diameter/color	Terminal description
I29-20	0.30 O/W	No fastened driver's safety belt indication signal
I29-21	0.30 Bl/B	PCAN-H
I29-22	0.30 Bl/W	PCAN-L
I29-23	0.85 R/Bl	IG power supply
I29-24	0.50 R/W	Storage battery power supply
I29-25	0.50 B	Signal GND
I29-26	0.30 G	Speed signal output
I29-27	-	-
I29-28	0.30 R/V	ACC power supply
I29-29	-	-
I29-30	0.30 G/Br	Outside temperature sensor signal +
I29-31	0.30 G/W	Outside temperature sensor signal +
I29-32	0.30 Bl/R	Too low brake liquid level

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DTC list

DTC	DTC information
B180017	Battery voltage high
B180016	Battery voltage low
B182011	Fuel circuit short to ground
B182012	Fuel circuit short to power or open circuit
U002088	Instrument cluster CAN BUS off fault
U014087	Loss BCM CAN BUS information (0x4D4)
U014287	Loss BCM CAN BUS information (0x140)
U014187	Loss BCM CAN BUS information (0x2A4)
U021587	Loss BCM CAN BUS information (0x130)
U021487	Loss TPMS CAN BUS information (0x225)
U021687	Loss TPMS CAN BUS information (0x22A)
U012187	Loss ABS CAN BUS information (0x086)
U010087	Loss EMS CAN BUS information (0x082)
U010187	Loss EMS CAN BUS information (0x094)
U010287	Loss EMS CAN BUS information (0x288)
U010387	Loss EMS CAN BUS information (0x120)
U015187	Loss ACU CAN BUS information (0x268)
U013287	Loss TCU CAN BUS information (0x099)
U013187	Loss TCU CAN BUS information (0x099)
U013387	Loss TCU CAN BUS information (0x099)
U012086	ABS CAN bus information check error (0x068)
U013086	TCU CAN bus information check error (0x099)

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DTC diagnosis flow index

DTC	Description	Diagnostic process
B180017	Battery voltage high	**Refer to: DTC B180017, B180016**
B180016	Battery voltage low	
B182011	Fuel circuit short to ground	**Refer to: DTC B182011, B182012**
B182012	Fuel circuit short to power or open circuit	
U002088	Instrument cluster CAN BUS off fault	**Refer to: DTC U002088, U014087, U014287, U014187, U021587, U021487, U021687, U012187, U010087, U010187, U010287, U010387, U015187, U013287, U013187, U013387, U012086, U013086**
U014087	Loss BCM CAN BUS information (0x4D4)	
U014287	Loss BCM CAN BUS information (0x140)	
U014187	Loss BCM CAN BUS information (0x2A4)	
U021587	Loss BCM CAN BUS information (0x130)	
U021487	Loss TPMS CAN BUS information (0x225)	
U021687	Loss TPMS CAN BUS information (0x22A)	
U012187	Loss ABS CAN BUS information (0x086)	
U010087	Loss EMS CAN BUS information (0x082)	
U010187	Loss EMS CAN BUS information (0x094)	
U010287	Loss EMS CAN BUS information (0x288)	
U010387	Loss EMS CAN BUS information (0x120)	
U015187	Loss ACU CAN BUS information (0x268)	
U013287	Loss TCU CAN BUS information (0x099)	
U013187	Loss TCU CAN BUS information (0x099)	
U013387	Loss TCU CAN BUS information (0x099)	
U012086	ABS CAN bus information check error (0x068)	
U013086	TCU CAN bus information check error (0x099)	

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DTC B180017, B180016

DTC description

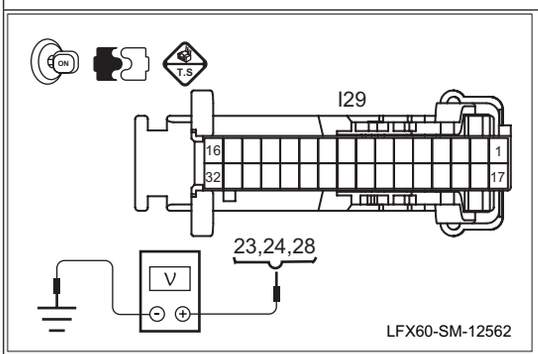
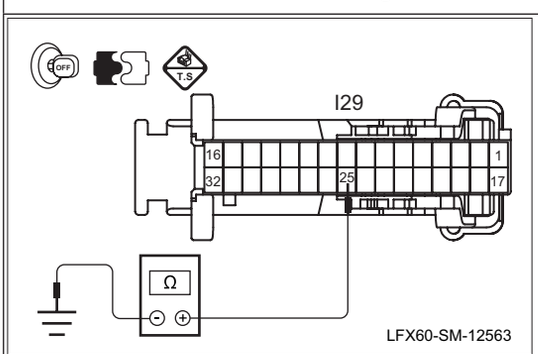
DTC	Description	Definition
B180017	Battery voltage high	The battery voltage keeps a value higher than 18V for 3s
B180016	Battery voltage low	The battery voltage keeps a value less than 9V for 3s

Diagnostic process

Test condition	Details/results/measures
1. General inspection.	
	A. Check the related harness plugs for breakage, loose contact, aging or looseness. Is it OK after checking? →**Yes** To step 2. →**No** Repair the fault position.
2. Read the DTC with the diagnostic meter.	
	A. Connect the diagnostic meter and check the system for the other relevant DTCs. Is it OK after checking? →**Yes** To step 3. →**No** Carry out the relevant fault diagnosis according to the DTCs.
3. Check whether the DTC can be cleared.	
	A. Connect the diagnostic meter and clear the instrument cluster DTC. B. Start the engine and check whether the DTC occurs again. Does DTC occur? →**Yes** To step 4. →**No** System normal.
4. Check the power supply system of vehicle.	
	A. Check whether the power supply system of vehicle is normal. Is it OK after checking? →**Yes** To step 5. →**No** Check the power supply system for fault.

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Test condition	Details/results/measures
5. Check the instrument cluster fuse.	
	A. Check the fuse FS23, FS24, FS30. **The rated capacity of the fuse is 5A, 10 A annd 25 A.** Is the fuse normal? →**Yes** To step 6. →**No** Repair the fuse line and replace the fuse of rated capacity.
6. Check the instrument cluster power line.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative connector. B. Disconnect the instrument cluster harness plug I29. C. Connect the battery negative terminal and operate the start switch to turn the power to ON state. D. Measure the voltage between the instrument cluster harness plug I29 terminal 23, 24, 28 and the fixed ground point with the multimeter. **Standard value: 11 ~ 14 V** Is it OK after checking? →**Yes** To step 7. →**No** Repair the instrument cluster power line open circuit fault and replace the harness if necessary.
7. Check the instrument cluster ground line.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative connector. B. Disconnect the instrument cluster harness plug I29. C. Measure the resistance between the instrument cluster harness plug I29 terminal 25 and the fixed ground point with the multimeter. **Standard value: less than 5Ω** Is it OK after checking? →**Yes** To step 8. →**No** Repair the instrument cluster ground line open circuit fault and replace the harness if necessary.
8. Check the instrument cluster.	
	A. Replace the instrument cluster. **Refer to: Replacement of instrument cluster assembly** Confirm the system is normal.

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DTC B182011, B182012

DTC description

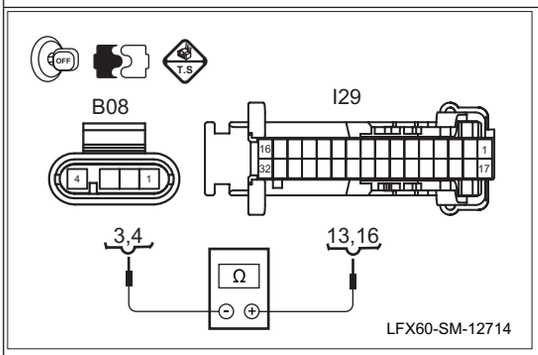
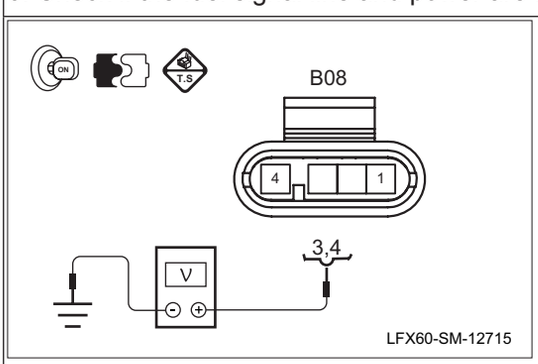
DTC	Description	Definition
B182011	Fuel circuit short to ground	Keep the fuel circuit be short circuit to the ground for 20s
B182012	Fuel circuit short to power or open circuit	Keep the fuel circuit be short circuit or open circuit to the power for 20s

Diagnostic process

Test condition	Details/results/measures
1. General inspection.	
	A. Check the related harness plugs for breakage, loose contact, aging or looseness. Is it OK after checking? →**Yes** To step 2. →**No** Repair the fault position.
2. Read the DTC with the diagnostic meter.	
	A. Connect the diagnostic meter and check the system for the other relevant DTCs. Is it OK after checking? →**Yes** To step 3. →**No** Carry out the relevant fault diagnosis according to the DTCs.
3. Check whether the DTC can be cleared.	
	A. Connect the diagnostic meter and clear the instrument cluster DTC. B. Start the engine and check whether the DTC occurs again. Does DTC occur? →**Yes** To step 4. →**No** System normal.

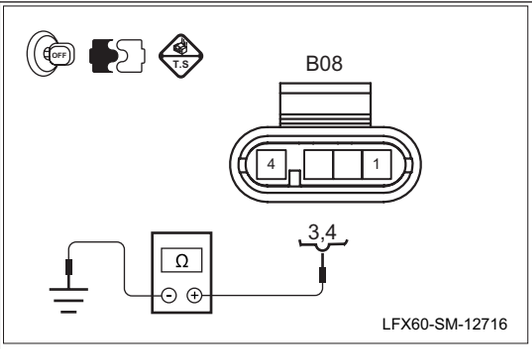
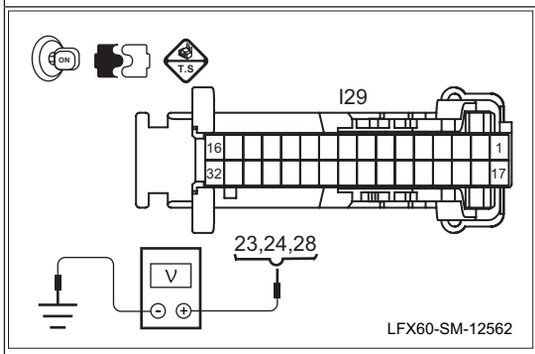
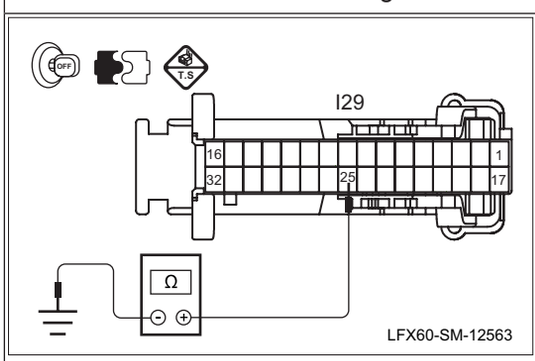
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Test condition	Details/results/measures
4. Check the power supply system of vehicle.	
	A. Check whether the power supply system of vehicle is normal. Is it OK after checking? →**Yes** To step 5. →**No** Check the power supply system for fault.
5. Check connectivity of the fuel signal line.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative connector. B. Disconnect the instrument cluster harness plug I29. C. Disconnect the harness plug B08 of the fuel pump. D. Measure the resistance between the terminal 13 of the combined instrument harness plug I29 and the terminal 4 of the fuel pump harness plug B08. Measure the resistance between the terminal 16 of the combined instrument harness plug I29 and the terminal 3 of the fuel pump harness plug B08. **Standard value: less than 5Ω** Is it OK after checking? →**Yes** To step 6. →**No** Repair fuel signal line failures. If necessary, replace the harness.
6. Check if the fuel signal line and power are in short circuit.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative connector. B. Disconnect the fuel pump harness plug B08. C. Disconnect the instrument cluster harness plug I29. D. Operate the start swithc and shift the power mode to “ON” status. E. Measure the voltage between the terminal 3 and 4 of the fuel pump harness plug B08 and reliable grounding by using a multimeter. **Standard value: 0 V** Is it OK after checking? →**Yes** To step 7. →**No** Repair fuel signal line and power short-circuit failures. If necessary, replace the harness.

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Test condition	Details/results/measures
7. Check if the fuel signal line and grounding are in short circuit.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative connector. B. Disconnect the instrument cluster harness plug I29. C. Disconnect the fuel pump harness plug B08. D. Measure the resistance between the terminal 3 and 4 of the fuel pump harness plug B08 and reliable grounding by using a multimeter. **Standard value: less than 5Ω** Is it OK after checking? **→Yes** To step 8. **→No** Repair fuel signal line and grounding short circuit failures. If necessary, replace the harness.
8. Check the instrument cluster power line.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative connector. B. Disconnect the instrument cluster harness plug I29. C. Connect the battery negative terminal and operate the start switch to turn the power to ON state. D. Measure the voltage between the instrument cluster harness plug I29 terminal 23, 24, 28 and the fixed ground point with the multimeter. **Standard value: 11 ~ 14 V** Is it OK after checking? **→Yes** To step 9. **→No** Repair the instrument cluster power line open circuit fault and replace the harness if necessary.
9. Check the instrument cluster ground line.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative connector. B. Disconnect the instrument cluster harness plug I29. C. Measure the resistance between the instrument cluster harness plug I29 terminal 25 and the fixed ground point with the multimeter. **Standard value: less than 5Ω** Is it OK after checking? **→Yes** To step 10. **→No** Repair the instrument cluster ground line open circuit fault and replace the harness if necessary.

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Test condition	Details/results/measures
10. Check the fuel position sensor.	
	A. Disassemble the fuel pump. B. Measure the resistance of the terminal 3 and 4 of the fuel pump at different positions (lift from the bottom of the fuel position sensor to the top end or measure multiple times in reverse direction in measurement). C. Check if the resistance of the fuel position sensor changes uniformly and stably and does not suddenly increase or decrease. Is it OK after checking? →**Yes** To step 11. →**No** If a fuel position sensor failure occurs, replace the fuel pump. **Refer to: Replacement of electric fuel pump**
11. Check the instrument cluster.	
	A. Replace the instrument cluster. **Refer to:Replacement of instrument cluster assembly** Confirm the system is normal.

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DTC U002088, U014087, U014287, U014187, U021587, U021487, U021687, U012187, U010087, U010187, U010287, U010387, U015187, U013287, U013187, U013387, U012086, U013086

DTC description

DTC	Description
U002088	Instrument cluster CAN BUS off fault
U014087	Loss BCM CAN BUS information (0x4D4)
U014287	Loss BCM CAN BUS information (0x140)
U014187	Loss BCM CAN BUS information (0x2A4)
U021587	Loss BCM CAN BUS information (0x130)
U021487	Loss TPMS CAN BUS information (0x225)
U021687	Loss TPMS CAN BUS information (0x22A)
U012187	Loss ABS CAN BUS information (0x086)
U010087	Loss EMS CAN BUS information (0x082)
U010187	Loss EMS CAN BUS information (0x094)
U010287	Loss EMS CAN BUS information (0x288)
U010387	Loss EMS CAN BUS information (0x120)
U015187	Loss ACU CAN BUS information (0x268)
U013287	Loss TCU CAN BUS information (0x099)
U013187	Loss TCU CAN BUS information (0x099)
U013387	Loss TCU CAN BUS information (0x099)
U012086	ABS CAN bus information check error (0x068)
U013086	TCU CAN bus information check error (0x099)

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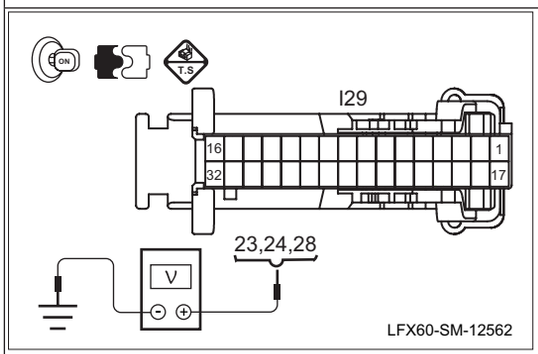
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Diagnostic process

Test condition	Details/results/measures
1. General inspection.	
	A. Check the related harness plugs for breakage, loose contact, aging or looseness. Is it OK after checking? →**Yes** To step 2. →**No** Repair the fault position.
2. Read the DTC with the diagnostic meter.	
	A. Connect the diagnostic meter and check the system for the other relevant DTCs. Is it OK after checking? →**Yes** To step 3. →**No** Carry out the relevant fault diagnosis according to the DTCs.
3. Check whether the DTC can be cleared.	
	A. Connect the diagnostic meter and clear the instrument cluster DTC. B. Start the engine and check whether the DTC occurs again. Does DTC occur? →**Yes** To step 4. →**No** System normal.
4. Check the CAN communication network.	
	A. Check whether the CAN communication network is normal. Is it OK after checking? →**Yes** To step 5. →**No** Repair the CAN communication network fault.

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Test condition	Details/results/measures
5. Check the instrument cluster power line.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative connector. B. Disconnect the instrument cluster harness plug I29. C. Connect the battery negative terminal and operate the start switch to turn the power to ON state. D. Measure the voltage between the instrument cluster harness plug I29 terminal 23, 24, 28 and the fixed ground point with the multimeter. **Standard value: 11 ~ 14 V** Is the voltage normal? →**Yes** To step 6. →**No** Repair the instrument cluster power line open circuit fault and replace the harness if necessary.
6. Check the instrument cluster ground line.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative connector. B. Disconnect the instrument cluster harness plug I29. C. Measure the resistance between the instrument cluster harness plug I29 terminal 25 and the fixed ground point with the multimeter. **Standard value: less than 5Ω** Is the resistance normal? →**Yes** To step 7. →**No** Repair the instrument cluster ground line open circuit fault and replace the harness if necessary.
7. Check the instrument cluster.	
	A. Replace the instrument cluster. **Refer to: Replacement of instrument cluster assembly** Is the system normal? →**Yes** The fault is solved and the system is normal. →No To step 8.
8. Replace the ECM (with ECM as example).	
	A. Replace ECM. **Refer to: Replacement of BCM** Confirm the system is normal.

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Removal and installation

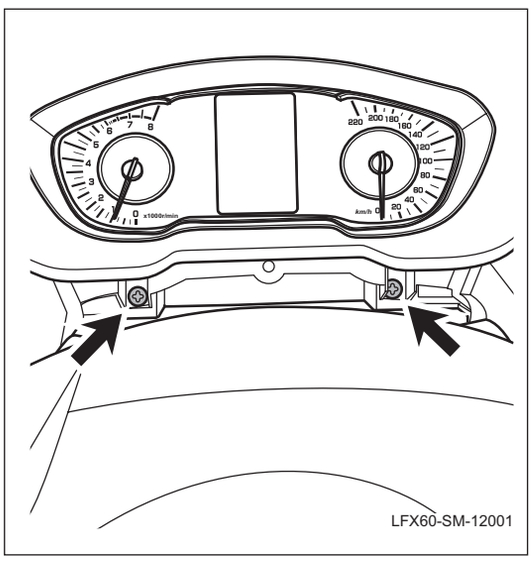
Replace combined instrument assembly

Removal

1. Replace combined instrument assembly

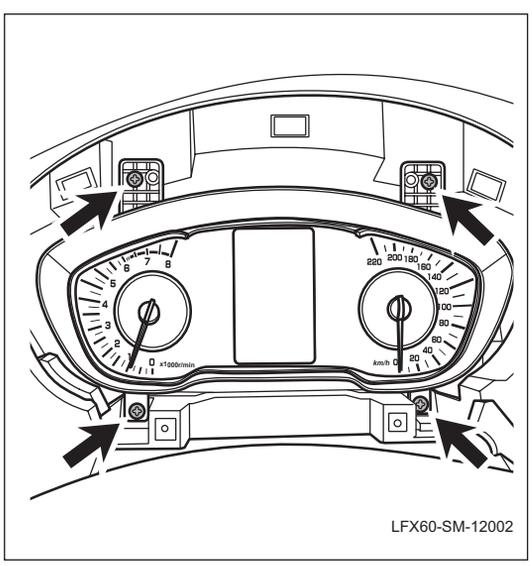
(a). Disconnect the battery negative connector.

(b). Remove the steering column cover by referring to replacement of steering column cover.



(c). Disassemble the decorative fixing screws of the combined instrument assembly.

(d). Remove the decorative cover of the combined instrument assembly.

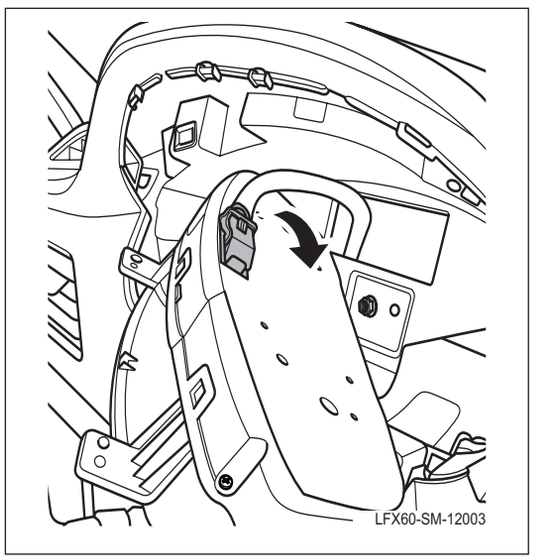


(e). Disassemble fixing screws of the combined instrument assembly.

(f). Remove the combined instrument assembly.

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(g). Disconnect the harness plug of the combined instrument assembly.
(h). Remove the combined instrument assembly.

Installation

1. Install the combined instrument assembly.
(a). The installation sequence is the reverse of the disassembly order.
(b). Install the steering column cover, **refer to: replacement of the steering column cover.**
(c). Connect the battery negative terminal.

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12 - Electrical system

Electric rearview mirror 12-1723

Precautions 12-1723

Structure and installation location 12-1724

Operating Principle 12-1725

Diagnostic Information and Procedures 12-1726

Removal and installation... 12-1736

AutoLibrary

AutoLibrary

AutoLibrary

AutoLibrary

Electric rearview mirror

Precautions

Precautions

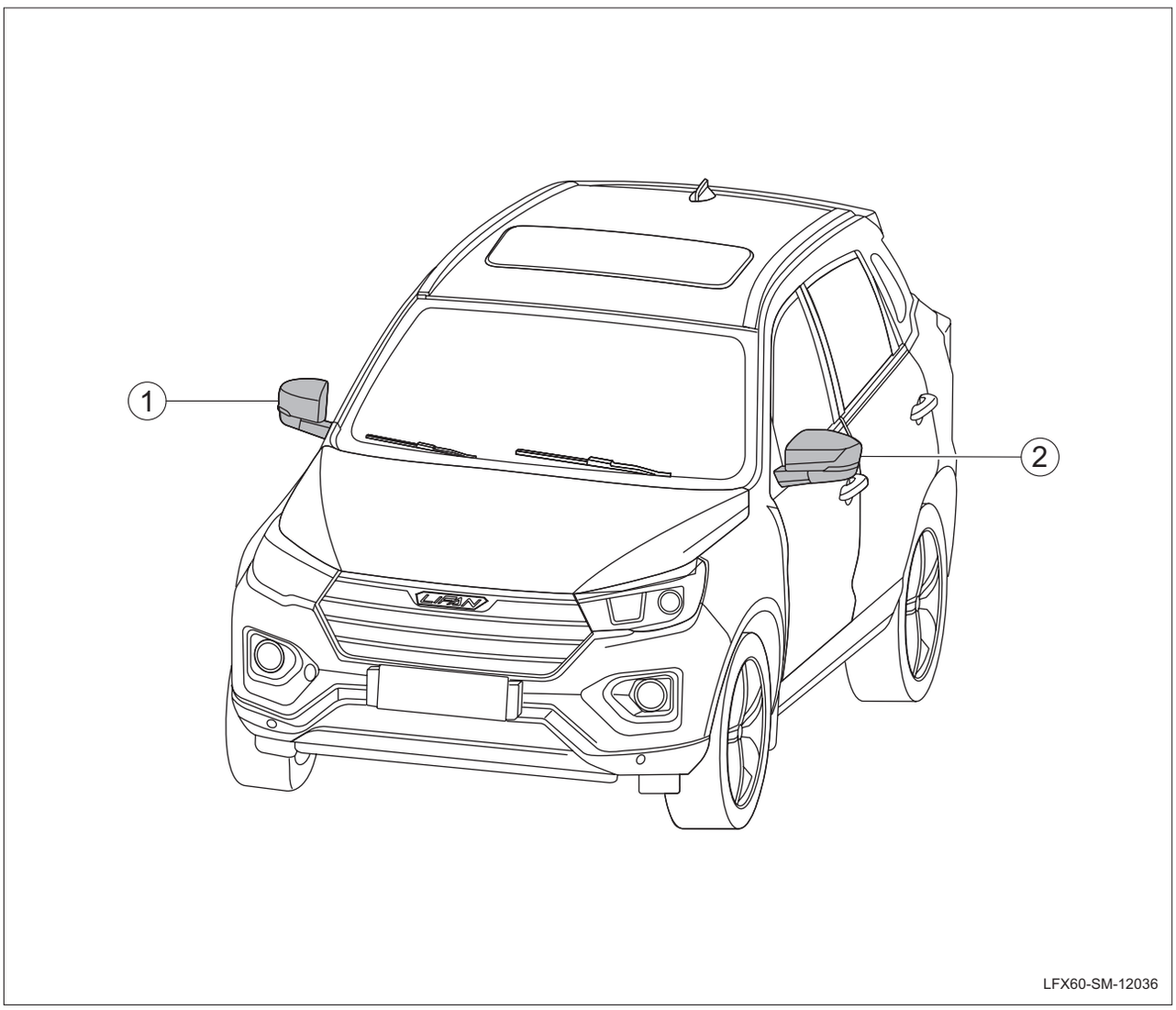
1. After the electric rearview mirrors are folded due to external force impact or manual folding, to reset the internal gearing, it should be electrified and reset.
2. When the electrice rearview mirrors are not used (namely in the initial position), do not electrify electric rear mirrrors. If it is electrified, the use life of the motor and line board will reduce.
3. When the product is electrified and folded to the internal folding position from the initial position and then is electrified and folded to the initial position from the internal folding position. After the product is folded in place, the electric rear mirrrors should power off as quickly as possible. The electric rearview mirrors shoud not be electrified for more than 30s, so it can protect the line board via two mechanisms.

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Structure and installation location

Component Location Plan



No.	Part name
1	Outer rear view mirror RH

No.	Part name
2	Outer rear view mirror LH

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Operating Principle

System description

1. The external rearview mirrors of this vehicle integrate electric regulation function, which are suitable for different configurations of this model.
2. The external rearview mirrors are the internally adjustable electric rearview mirrors and include build-in motor. The external rearview mirrors can be adjusted by operating the regulation switches of the external rearview mirrors on the driver's switch panel. When the exteranl rearview mirrors reach the maximal regulation angle, stop operation. When the motor's switch is pressed, it will continue oepration. The pressing duration should not exceed the necessary time. Otherwise, it will damage the motor.

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Diagnostic Information and Procedures

Diagnosis Instructions

Before the electric rearview mirror system failure is diagnosed, please first read the system overview to know and familiarize the working principle of the electric rearview mirror systen and then start electric rearview mirror system diagnosis. When a failure occurs, these knowledge can assist you to identify correct failure diagnosis steps. More importantly, these knowledge can assist you to check if conditions described by the customer are normal.

Any failure diagnisis of the electric rearview mirror system should start with electric rearview mirror system check. It can guide repairers to take enxt logic step and diagnose failures. Comprehend and correctly use the diagnostic flow chart to shorten the diagnosis time and avoid the misjudgement.

General equipment

Digital multimeter
Diagnostic equipment of vehicle

Visual Inspection

1. Confirm the problem of the customer.
2. Visually check whether there is any obvious mechanical or electrical damage sign.

Visual inspection table

Mechanical	Electrical
• Electric rearview mirror	• Fuse • Harness or plug • Dashboard switch • Electric rearview mirror • BCM

3. If the observed or raised problem is the evident and the cause has been found, ensure to fix this fault before proceeding with the next step.
4. If for the problem, there are no obvious findings, then confirm the fault and refer to the symptom table.

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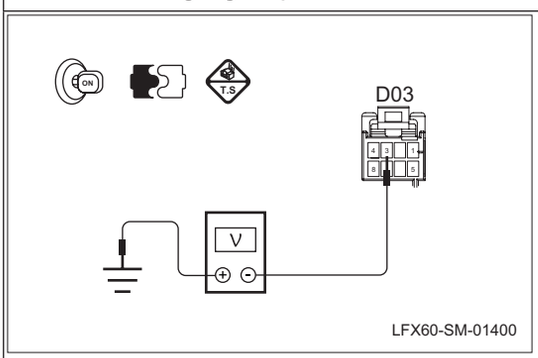
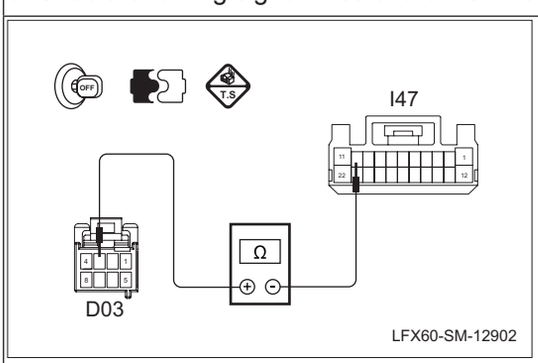
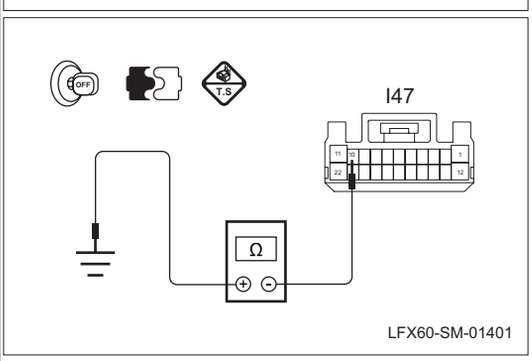
List of fault symptoms

Symptom	Possible point of failure	Recommended Measures
The rearview mirrors can not be folded	• Fuse	**Refer to: Diagnosis flow for no folding failure of rearview mirror**
	• Dashboard fuse box	
	• Harness or plug	
	• Dashboard switch	
	• Electric rearview mirror	
	• BCM	
All rearview mirrors cannot be adjusted	• Fuse	**Refer to: Diagnosis flow for no regulation failure of all rearview mirrors**
	• Harness or plug	
	• Dashboard fuse box	
	• Dashboard switch	
Single rearview mirror cannot be adjusted	• Harness or plug	**Refer to: Diagnosis flow for no regulation failure of single rearview mirrors**
	• Dashboard switch	
	• Electric rearview mirror	
No in-place regulation of rearview mirrors	• Mechanical failure of rearview mirrors	• Replace rearview mirrors **Refer to: Replacement of the rearview mirrors**

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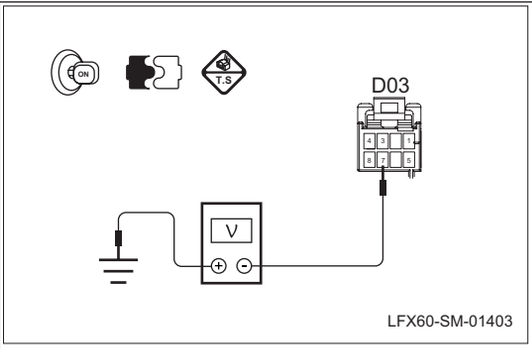
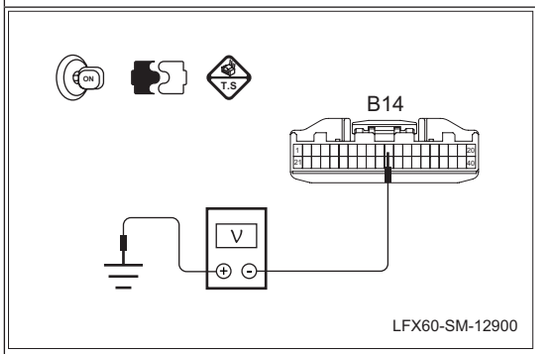
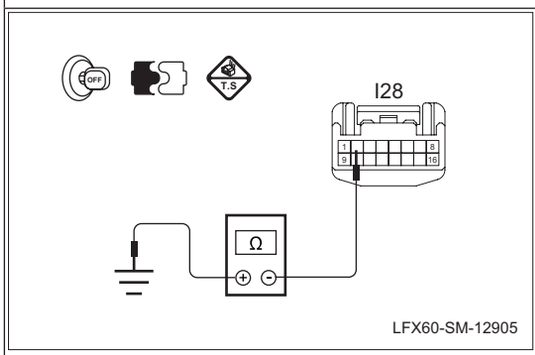
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Diagnosis flow for no folding failure of rearview mirror

Test condition	Details/results/measures
1. General inspection.	
	A. Check if the rearview mirror, BCM and dashboard switch harness plug are loose, aging and fall off. Is it OK after checking? →**Yes** To step 2. →**No** Repair the fault position.
2. Check folding signal power circuit of the rearview mirrors. (with left rearview mirrors as one example)	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the left exterior rearview mirror harness plug D03. D. Connect the battery negative terminal. E. Operate the ignition switch to turn the power to ON state. F. Operate switch folding function of the instrument board and measure the voltage between the terminal 3 of the left external rearview mirror harness plug D03 and reliable grounding by using a multimeter. **Standard value: 11 ~ 14 V** Is the voltage normal? →**Yes** To step 4. →**No** To step 3.
3. Chec the folding signal lines of the BCM rearview mirrors.	
 	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the BCM harness plug I47. D. Disconnect the left exterior rearview mirror harness plug D03. E. Measure the resistance between the BCM harness plug I47 terminal 10 and left exterior rearview mirror harness plug D03 terminal 3 with the multimeter. **Standard value: less than 5Ω** F. Measure the resistance between the BCM harness plug I47 terminal 10 and the fixed ground point with the multimeter. **Standard value: 10MΩ or higher** Is it OK after checking? →**Yes** To step 5. →**No** Repair folding output signal line failures of the BCM rearview mirror. If necessary, replace the harness.

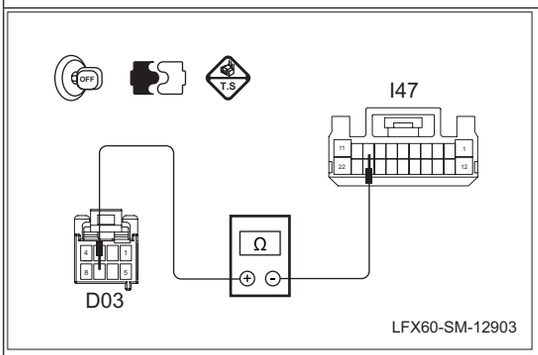
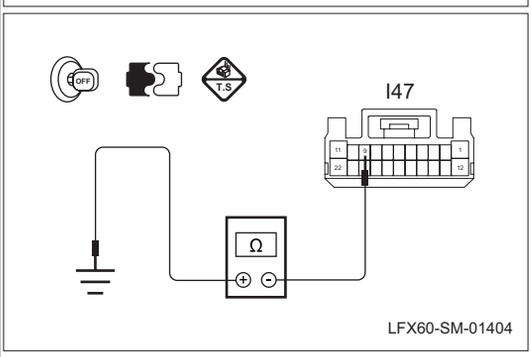
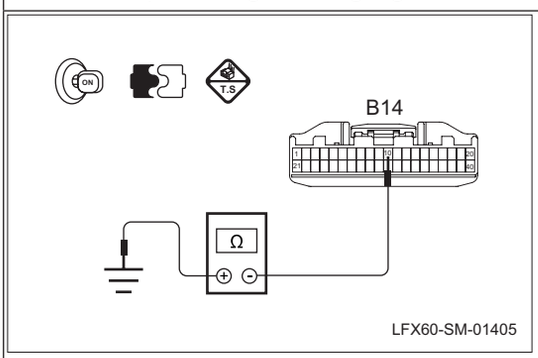
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Test condition	Details/results/measures
4. Check the BCM rearview mirror deployment output signal line.	
 LFX60-SM-01403	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the left exterior rearview mirror harness plug D03. D. Connect the battery negative terminal. E. Operate the ignition switch to turn the power to ON state. F. Operate the switch expansion function of the instrument board and measure the voltage between the terminal 7 of the left external rearview mirror harness plug D03 and reliable grounding by using a multimeter. **Standard value: 11 ~ 14 V** Is the voltage normal? →**Yes** To step 8. →**No** To step 7.
5. Check folding grounding signal circuit of the electric rearview mirrors.	
 LFX60-SM-12900	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the BCM harness plug B14. D. Operate switch folding function of the instrument board and measure the resistance between the terminal 11 of the BCM harness plug B14 and reliable grounding point by using a multimeter. **Standard value: less than 5Ω** Is the resistance normal? →**Yes** To step 6. →**No** Repair folding grounding signal circuit failures of the electric rearview mirror. If necessary, replace the harness.
6. Check the switch grounding line of the dashboard.	
 LFX60-SM-12905	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the switch harness plug I28 of the dashboard. C. Measure the resistance between the terminal 2 of the dashboard switch harness plug I28 and reliable grounding by using a multimeter. **Standard value: less than 5Ω** Is the resistance normal? →**Yes** Replace the dashboard switch. →**No** Repair switch grounding circuit failures of the instrument board. If necessary, replace the harness.

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Test condition	Details/results/measures
7. Check the BCM rearview mirror deployment output signal line.	
 LFX60-SM-12903  LFX60-SM-01404	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the BCM harness plug I47. D. Disconnect the left exterior rearview mirror harness plug D03. E. Measure the resistance between the BCM harness plug I47 terminal 9 and left exterior rearview mirror harness plug D03 terminal 7 with the multimeter. **Standard value: less than 5Ω** F. Measure the resistance between the BCM harness plug I47 terminal 9 and the fixed ground point with the multimeter. **Standard value: 10MΩ or higher** Is it OK after checking? →**Yes** To step 8. →**No** Repair expansion output signal line failures of the BCM rearview mirror. If necessary, replace the harness.
8. Check expansion grounding signal line of the electric rearview mirrors.	
 LFX60-SM-01405	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the BCM harness plug B14. D. Operate the switch expansion function of the dashboard and measure the resistance between the terminal 10 of the BCM harness plug B14 and reliable grounding by using a multimeter. **Standard value: less than 5Ω** Is the resistance normal? →**Yes** To step 9. →**No** Repair expansion grounding signal line failures of the electric rearview mirror. If necessary, replace the harness.
9. Check electric rearview mirrors.	
	A. Replace electric rearview mirrors. **Refer to: Replacement of the electric rearview mirrors.** Is the troubleshooting successful? →**Yes** Replace electric rearview mirrors. →**No** To step 10.

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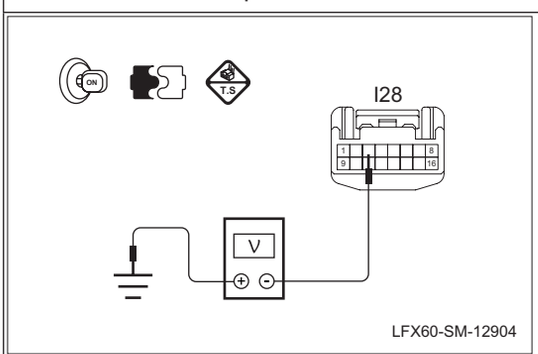
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Test condition	Details/results/measures
10. Check the BCM.	
	A. Replace BCM. **Refer to: Replacement of BCM.** Confirm that the fault has been ruled out.

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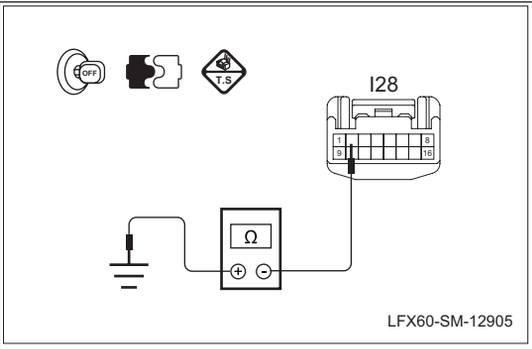
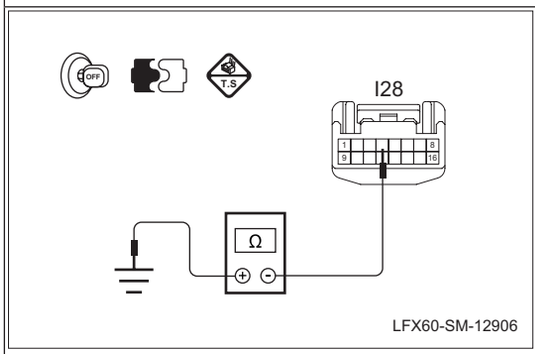
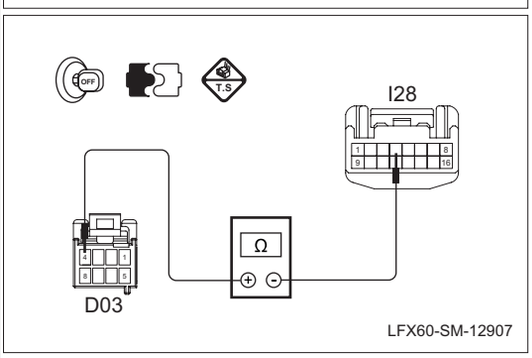
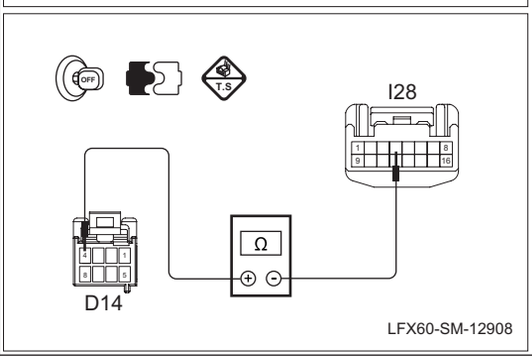
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Diagnosis flow for no regulation failure of all rearview mirrors

Test condition	Details/results/measures
1. General inspection.	
	A. Check the rearview mirror and dashboard switch harness plug for looseness, aging or falling. Is it OK after checking? →**Yes** To step 2. →**No** Repair the fault position.
2. Check the fuse.	
	A. Check the fuse FS29. **Fuse rated capacity: 15A** Is it OK after checking? →**Yes** To step 3. →**No** Replace the fuse.
3. Check the switch power line of the dashboard.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the switch harness plug I28 of the dashboard. D. Connect the battery negative terminal. E. Operate the ignition switch to turn the power to ON state. F. Measure the voltage between the terminal 3 of the dashboard switch harness plug I28 and reliable grounding by using a multimeter. **Standard value: 11 ~ 14 V** Is the voltage normal? →**Yes** To step 4. →**No** Repair the switch power line failures of the dashboard. If necessary, replace the electric appliance box of the dashboard.

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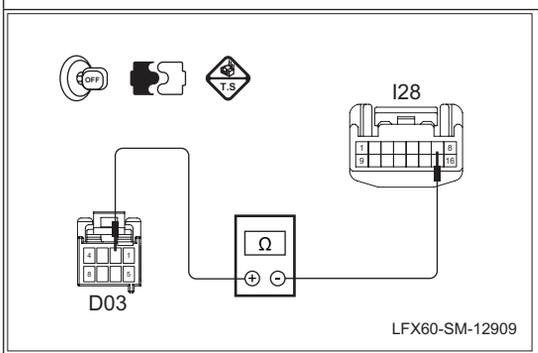
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Test condition	Details/results/measures
4. Check the dashboard switch ground line.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the switch harness plug I28 of the dashboard. D. Measure the resistance between the terminal 3 of the dashboard switch harness plug I28 and reliable grounding by using a multimeter. **Standard value: less than 5Ω** Is the resistance normal? →**Yes** To step 5. →**No** Repair switch electric grounding line failures of the instrument board. If necessary, replace the harness.
5. Check the rearview mirror common line.	
  	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the switch harness plug I28 of the dashboard. D. Disconnect the left exterior rearview mirror harness plug D03. E. Disconnect the right exterior rearview mirror harness plug D14. F. Measure the resistance between the dashboard switch harness plug I28 terminal 4 and fixed ground point with the multimeter. **Standard value: 10MΩ or higher** G. Measure the resistance between the dashboard switch harness plug I28 terminal 4 and left exterior rearview mirror harness plug D03 terminal 4 with the multimeter. **Standard value: less than 5Ω** H. Measure the resistance between the dashboard switch harness plug I28 terminal 4 and right exterior rearview mirror harness plug D14 terminal 4 with the multimeter. **Standard value: less than 5Ω** Is it OK after checking? →**Yes** To step 6. →**No** Repair switch electric public line failures of the instrument board. If necessary, replace the harness.
6. Check the dashboard switch.	
	A. Replace the dashboard switch. **Refer to: Replacement of the dashboard switch.** Confirm that the fault has been ruled out.

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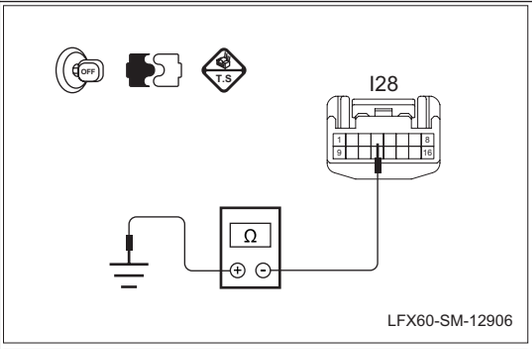
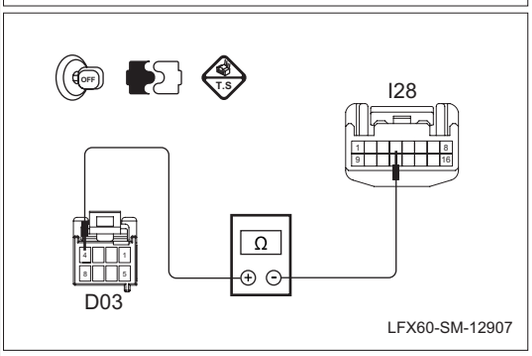
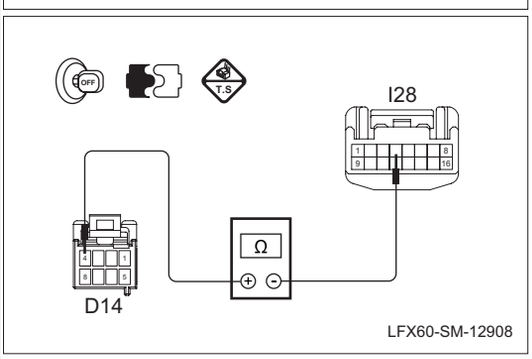
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Diagnosis flow for no regulation failure of single rearview mirrors

Test condition	Details/results/measures
1. General inspection.	
	A. Check the rearview mirror and dashboard switch harness plug for looseness, aging or falling. Is it OK after checking? →**Yes** To step 2. →**No** Repair the fault position.
2. Check up and down regulating motor line of the rearview mirrors. (with up and down regulation of left external rearview mirrors as one example).	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the left exterior rearview mirror harness plug D03. D. Disconnect the dashboard switch harness plug I28. E. Measure the resistance between the terminal 2 of the left external rearview mirror harness plug D03 and the terminal 7 of the dashboard switch harness plug I28 by using a multimeter. **Standard value: less than 5Ω** Is the resistance normal? →**Yes** To step 3. →**No** Repair up and down regulating motor line failures of the rearview mirror. If necessary, replace the harness.

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3. Check the rearview mirror common line.	
  	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the switch harness plug I28 of the dashboard. D. Disconnect the left exterior rearview mirror harness plug D03. E. Disconnect the right exterior rearview mirror harness plug D14. F. Measure the resistance between the dashboard switch harness plug I28 terminal 4 and fixed ground point with the multimeter. **Standard value: 10MΩ or higher** G. Measure the resistance between the dashboard switch harness plug I28 terminal 4 and left exterior rearview mirror harness plug D03 terminal 4 with the multimeter. **Standard value: less than 5Ω** H. Measure the resistance between the dashboard switch harness plug I28 terminal 4 and right exterior rearview mirror harness plug D14 terminal 4 with the multimeter. **Standard value: less than 5Ω** Is it OK after checking? →**Yes** To step 4. →**No** Repair public line failures of the rearview mirror. If necessary, replace the harness.
4. Check the dashboard switch.	
	A. Replace the dashboard switch. **Refer to: Replacement of the dashboard switch.** Is the troubleshooting successful? →**Yes** Replace the dashboard switch. →**No** To step 5.
5. Check rearview mirrors	
	A. Replace the rearview mirror. **Refer to: Replacement of the rearview mirror.** Confirm that the fault has been ruled out.

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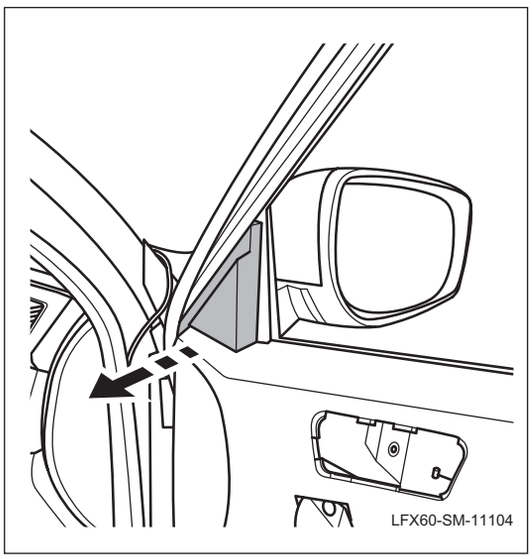
Removal and installation

Replace the electric rearview mirror

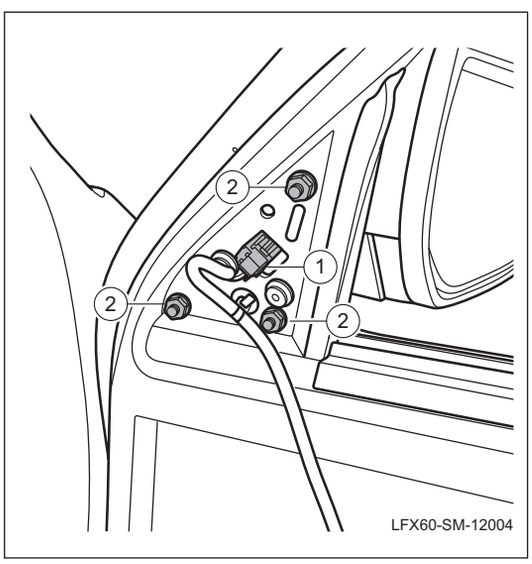
Removal

1. Disassemble electric rearview mirror.

(a). Disconnect the battery negative connector.



(b). Disassemble the front door triangular decorative board by using a proper tool.



(c). Disconnect the harness plug 1 of the electric rearview mirror.

(d). Disassemble the fixing nut 2 of the electric rearview mirror.

(e). Remove the electric rearview mirror.

Installation

1. Install the electric rearview mirror.

(a). The installation sequence is the reverse of the disassembly order.

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Replace electric rearview mirror lens

Removal

1. Disassemble electric rearview mirror lens.

(a). Disassemble electric rearview mirror lens by using a proper tool.

Note:

Electric rearview mirror lens are fragile. Wrap the disassemble end with soft cloth, carefully remove electric rearview mirror lens, properly handle and recycle them, and do not injure anyone.

Installation

1. Install the electric rearview mirror lens.

(a). The installation sequence is the reverse of the disassembly order.

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AutoLibrary

12 - Electrical system

Audio system 12-1741

Preparation 12-1741

Precautions 12-1742

Structure and installation location 12-1743

Diagnostic Information and Procedures 12-1744

Removal and installation .. 12-1752

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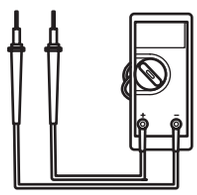
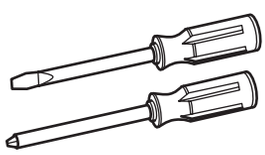
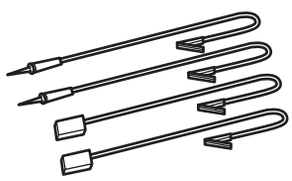
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Audio system

Preparation

General Maintenance Tools

No.	Tool name	Tool figure	Tool code	Remarks
1	Digital universal meter	 LFX60-SM-12128	-	Measure the voltage and resistance
2	Screw driver	 LFX60-SM-12129	-	For screw and panel removal
3	Conductor assembly	 LFX60-SM-12130	-	Testing circuit

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Precautions

Radio wave received by the antenna

1. Coverage area

Coverage range of AM broadcast is significantly large than that of FM broadcast system. High resolution AM broadcast can be received in areas where there is no FM signal. Beside smaller reception area, there always is squelch and other noise in stereo FM signal in some location.

2. Receiving problems

Besides squelch, the interference, multiplex transmission and attenuation exists too. This is due to problem of radio wave itself, that is irrelevant to electrical noise.

a. Disturbances

Besides squelch, the AM broadcast receives other type of noise, especially at night. This is due to reflection of AM radio wave by the Ionosphere. The reflected wave interferes with that the antenna received directly from the same signal source. This is known as Interference.

b. Multi-path transmission

The radio reflected by obstacles is known as multiplex transmission. When the radio signals from the broadcasting transmission antenna are reflected by high buildings or high moutains, the directly received signals will be disturbed and multi-path transmission occurs.

c. Attenuation

The FM wave is more likely be reflected by high buildings or mountain due to its higher frequency than AM wave. For this reason, always the FM is likely to disappear gradually, or can not be received due to blockage of vehicle by obstacles. This is known as attenuation.

3. Information of AM/FM broadcast channel will be eliminated when negative cable of battery disconnected. Before disconnect negative cable of battery, you can record channel informations for resetting after the cable would be connected.

4. Make sure the ground cable is fixed securely after removal and installation of the antenna assembly.

△ **Tips:**

Poor ground link of antenna may cause noise in broadcast signal reception. A new antenna can not even correct this problem

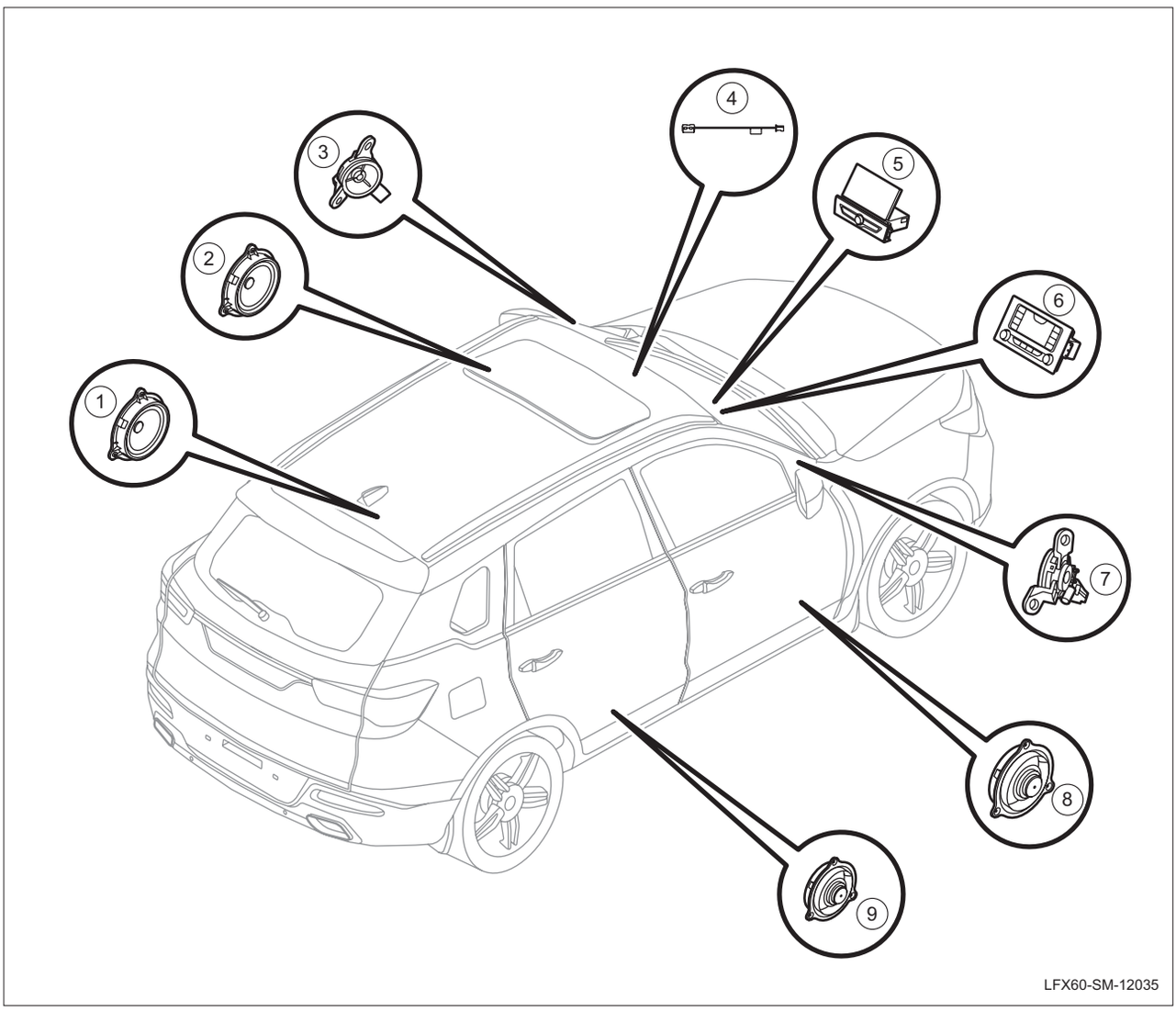
5. Don’t touch paper basin of the speaker.

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Structure and installation location

Component Location Plan



No.	Part name
1	Left rear door loadspeaker
2	Left front door loadspeaker
3	Left front high pitch horn
4	Microphone
5	Radio/MP5 player display screen

No.	Part name
6	Radio assembly
7	Right front high pitch horn
8	Right front door loadspeaker
9	Right rear door loadspeaker

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Diagnostic Information and Procedures

Diagnosis Instructions

Before the sound system failure is diagnosed, please first read the system overview to know and familiarize the working principle of the sound systen and then start the sound system diagnosis. When a failure occurs, these knowledge can assist you to identify correct failure diagnosis steps. More importantly, these knowledge can assist you to check if conditions described by the customer are normal.

Any failure diagnisis of the sound system should start with sound system check. It can guide repairers to take enxt logic step and diagnose failures. Comprehend and correctly use the diagnostic flow chart to shorten the diagnosis time and avoid the misjudgment.

General equipment

Digital multimeter

Visual Inspection

Note:

When the signal receiving or noise disturbance of the sound system is tested, the vehicle should be parked at a place which keeps away from buildings and power supply line and the engine hatch and all doors should be closed.

1. Confirm the problem of the customer.
2. Visually check whether there is any obvious mechanical or electrical damage sign.

Visual inspection table

Electrical
• Fuse • Harness or plug • Dashboard fuse box • Microphone • Antenna amplifier • Speaker • Radio assembly • Radio/MP5 player display

3. Check the system lines easy to see or can be seen.

Note:

The twisted pair cable can effectively shield sensitive electronic components and make them be free of electric appliance disturbances. If the shielding layer of the lead is destructed, it should be replaced.

4. If the observed or raised problem is the evident and the cause has been found, ensure to fix this fault before proceeding with the next step.
5. If for the problem, there are no obvious findings, then confirm the fault and refer to the symptom table.

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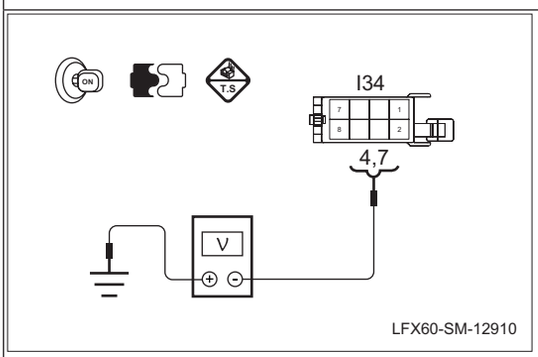
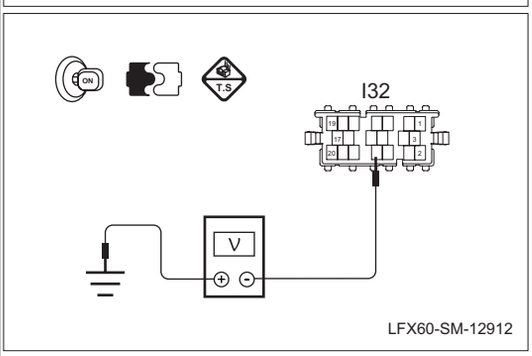
List of fault symptoms

Symptom	Possible point of failure	Recommended Measures
The power indicator is no on	• Fuse	• Replace the fuse.
	• Dashboard fuse box	• Repair the electric appliance box of the dashboard.
	• Harness or plug	• Repair or replace the harness
	• Radio/MP5 player display • Radio assembly	• Radio/MP5 player display **Refer to: Replace radio/MP5 player display**
Do not display, do not work and failed to power on	• Fuse	**Refer to: Diagnosis flow for no display, malfunction and booting failure**
	• Dashboard fuse box	
	• Harness or plug	
	• Radio/MP5 player display • Radio assembly	
The radio cannot lock a channel	• Radio assembly	• Replace the radio assembly **Refer to: Replacement of the radio assembly**
The radio signals cannot be received well or cannot be received	• Signal disturbance or shielding	**Refer to: Diagnosis flow for bad receiving or no receiving of radio signals**
	• Harness or plug	
	• Antennae	
	• Radio assembly • Radio/MP5 player display	
Unclear sound	• Line disturbance	• Repair system line
	• Antennae	• Replace the antenna
	• Speaker	• Replace a loadspeaker
	• Radio assembly	• Replace the radio assembly **Refer to: Replacement of the radio assembly**
Single loadspeaker does not work	• Harness or plug	**Refer to: Diagnosis flow for single failed loadspeaker**
	• Speaker	
	• Radio/MP5 player display • Radio assembly	
The microphone does not work	• Harness or plug	**Refer to: Diagnosis of failed microphone**
	• Microphone	
	• Radio/MP5 player display • Radio assembly	
The steering wheel switch does not work	• Harness or plug	• Repair or replace the harness
	• Steering wheel switch	• Replace the steering wheel switch
	• Clock spring	• Replace the clock spring. **Refer to: Replacement of the clock spring.**

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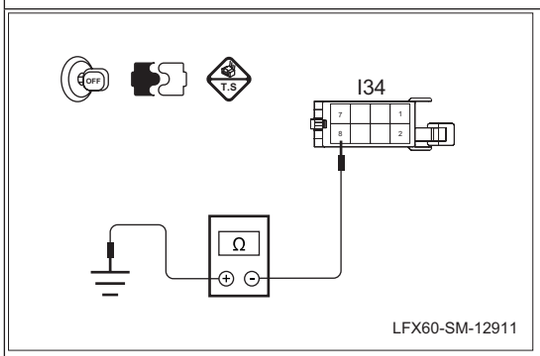
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Diagnosis flow for no display, malfunction and booting failure

Test condition	Details/results/measures
1. General inspection.	
	A. Check if the harness plug of the sound system display assembly are loose, aging and fall off. Is it OK after checking? →**Yes** To step 2. →**No** Repair the fault position.
2. Check the fuse.	
	A. Check the fuse FS30, FS31, FS24. **Fuse rated capacity: FS30(25 A), FS31(25 A), FS24(10 A)** Is it OK after checking? →**Yes** To step 3. →**No** Replace the fuse.
3. Check the power line of the sound system display assembly.	
 LFX60-SM-12910  LFX60-SM-12912	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the audio system display assembly harness plug I34. D. Disconnect the audio system display assembly harness plug I32. E. Connect the battery negative terminal. F. Operate the ignition switch to turn the power to ON state. G. Measure the voltage between the terminal 4 and 7 of the sound system display assembly harness plug I34 and reliable grounding by using a multimeter. **Standard value: 11 ~ 14 V** H. Measure the voltage between the terminal 11 of the sound system display assembly harness plug I32 and reliable grounding by using a multimeter. **Standard value: 11 ~ 14 V** Is the voltage normal? →**Yes** To step 4. →**No** Repair power line failures of the sound system display assembly. If necessary, replace the harness.

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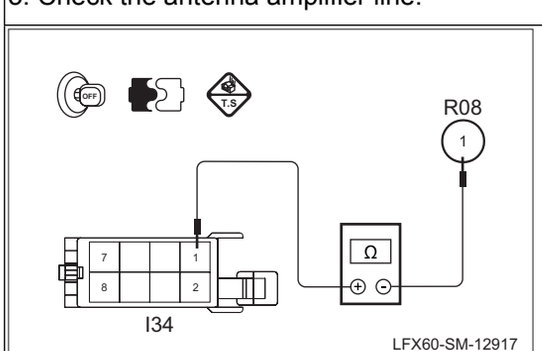
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Test condition	Details/results/measures
4. Check the grounding line of the sound sysem display assembly.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the audio system display assembly harness plug I34. D. Measure the resistance between the terminal 8 of the sound system display assembly harness plug I34 and reliable grounding by using a multimeter. **Standard value: less than 5Ω** Is the resistance normal? →**Yes** To step 5. →**No** Repair grounding line failures of the sound system display assembly. If necessary, replace the harness.
5. Check the audio system display assembly.	
	A. Replace the audio system display assembly. **Refer to: Replacement of radio/MP5 player display** Confirm that the fault has been ruled out.

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Diagnsis flow for bad receiving or no receiving of radio signals

Test condition	Details/results/measures
1. General inspection.	
	A. Check if the display assembly of the sound system and the harness plug of the antenna amplifier are loose, aging and fall off. Is it OK after checking? →**Yes** To step 2. →**No** Repair the fault position.
2. Check signal disturbances.	
	A. Move the vehicle to the open field without disturbances. B. Check if the radio can receive signals. Is it OK after checking? →**Yes** The system works normally under signal disturbance environment. →**No** To step 3.
3. Check the antenna amplifier line.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the audio system display assembly harness plug I34. D. Disconnect the harness plug R08 of the antenna amplifier. E. Measure the resistance between the terminal 1 of the sound system display assembly harness plug I34 and the terminal 4 of the antenna amplifier harness plug R08 by using a multimeter. **Standard value: less than 5Ω** Is the resistance normal? →**Yes** To step 3. →**No** Repair the antenna amplifier line failures. If necessary, replace the harness.
3. Check the antenna.	
	A. Replace the antenna. Is the troubleshooting successful? →**Yes** Replace the antenna. →**No** To step 4.

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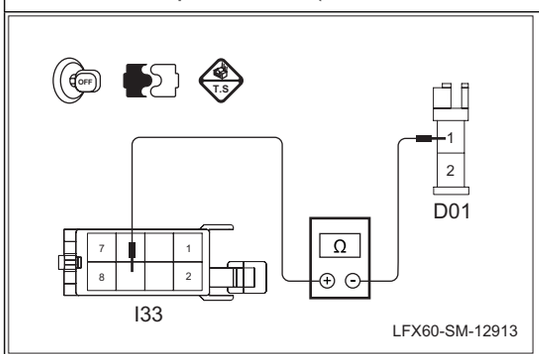
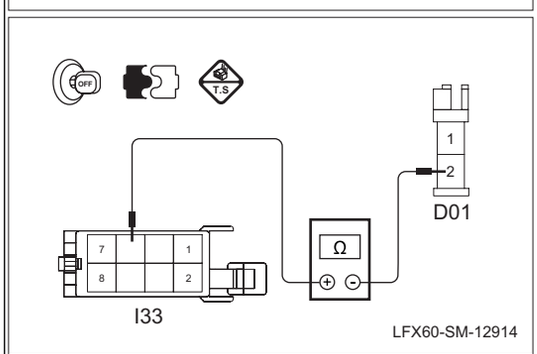
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Test condition	Details/results/measures
4. Check the audio system display assembly.	
	A. Replace the audio system display assembly. **Refer to: Replacement of radio/MP5 player display** **Refer to: Replacement of radio assembly** Confirm that the fault has been ruled out.

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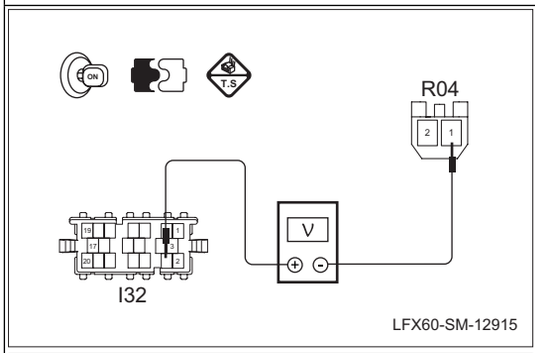
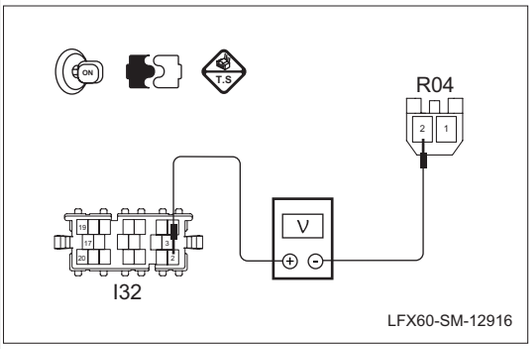
Diagnosis flow for single failed loadspeaker

Test condition	Details/results/measures
1. General inspection.	
	A. Check if the display assembly of the sound system and the harness plug of the loadspeaker are loose, aging and fall off. Is it OK after checking? →**Yes** To step 2. →**No** Repair the fault position.
2. Check the speaker line (with the left front door loadspeaker as one example)	
 	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the harness plug D01 of the left front door loadspeaker. D. Disconnect the harness plug I33 of the sound system display assembly. E. Measure the voltage between the terminal 1 of the left front door speaker harness plug D01 and the terminal 6 of the sound system display assembly harness plug I33 by using a multimeter. **Standard value: less than 5Ω** F. Measure the resistance between the terminal 2 of the left front door speaker harness plug D01 and the terminal 5 of the sound system display assembly harness plug I33 by using a multimeter. **Standard value: less than 5Ω** Is the resistance normal? →**Yes** To step 3. →**No** Repair the front left door speaker line fault and replace the harness if necessary.
3. Check the loadspeaker.	
	A. Replace the loadspeaker. **Refer to: Replace the front loadspeaker.** Is the troubleshooting successful? →**Yes** Replace the loadspeaker. →**No** To step 4.
4. Check the audio system display assembly.	
	A. Replace the audio system display assembly. **Refer to: Replacement of radio/MP5 player display** **Refer to: Replacement of radio assembly** Confirm that the fault has been ruled out.

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Diagnsis of failed microphone

Test condition	Details/results/measures
1. General inspection.	
	A. Check if the display assembly of the sound system and the harness plug of the microphone are looose, aging and fall off. Is it OK after checking? →**Yes** To step 2. →**No** Repair the fault position.
2. Check the microphone line.	
 	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnecdt the harness plug R04 of the microphone. D. Disconnect the audio system display assembly harness plug I32. E. Measure the resistance between the terminal 1 of the left front door speaker harness plug R04 and the terminal 5 of the sound system display assembly harness plug I32 by using a multimeter. **Standard value: less than 5Ω** F. Measure the resistance between the terminal 2 of the left front door speaker harness plug R04 and the terminal 2 of the sound system display assembly harness plug I32 by using a multimeter. **Standard value: less than 5Ω** Is the resistance normal? →Yes To step 3. →**No** Repair the front left door speaker line fault and replace the harness if necessary.
3. Check the micrphone.	
	A. Replace a microphone. Is the troubleshooting successful? →**Yes** Replace a microphone. →**No** To step 4.
4. Check the audio system display assembly.	
	A. Replace the audio system display assembly. **Refer to: Replacement of radio/MP5 player display** **Refer to: Replacement of radio assembly** Confirm that the fault has been ruled out.

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Removal and installation

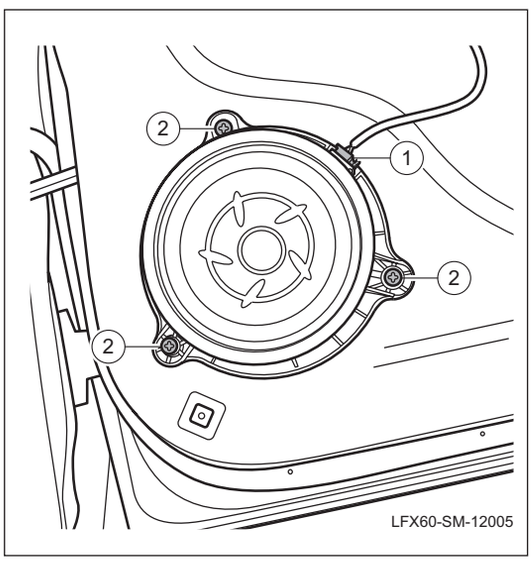
Replace the front low pitch loadspeaker

Removal

1. Disassemble front low pitch loadspeaker.

(a). Disconnect the battery negative connector.

(b). Remove the front door interior trim board. Refer to the replacement of front door interior trim board.



(c). Disconnect the harness plug 1 of the front low pitch loadspeaker.

(d). Disassemble the fixing screw 2 of the front low pitch loadspeaker.

(e). Remove the front low pitch loadspeaker.

Installation

1. Install front high pitch loadspeaker.

(a). The installation sequence is the reverse of the disassembly order.

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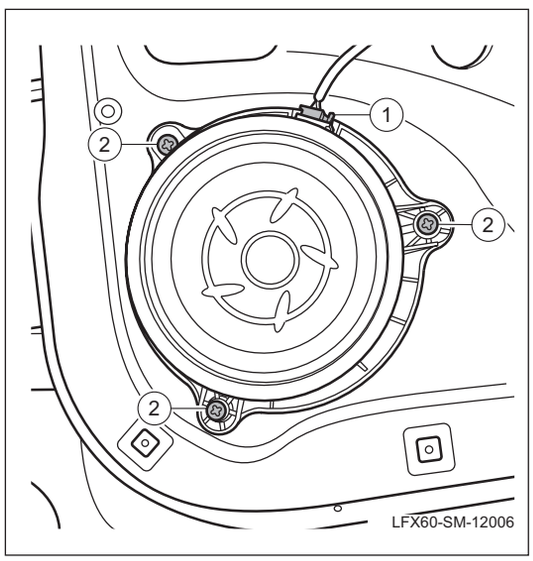
Replace the rear low pitch loadspeaker

Removal

1. Disassemble rear low pitch loadspeaker.

(a). Disconnect the battery negative connector.

(b). Remove the front door interior trim board. **Refer to the replacement of front door interior trim board.**



(c). Disconnect the harness plug 1 of the rear low pitch loadspeaker.

(d). Disassemble the fixing screw 2 of the rear low pitch loadspeaker.

(e). Remove the rear low pitch loadspeaker.

Installation

1. Install rear high pitch loadspeaker.

(a). The installation sequence is the reverse of the disassembly order.

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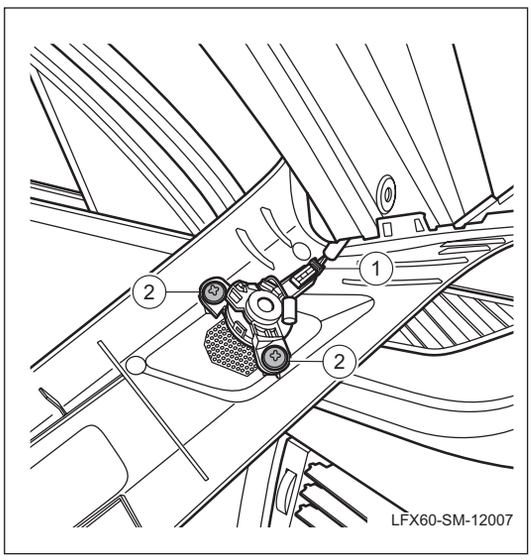
Replace the high pitch loadspeaker

Removal

1. Disassemble the front high pitch loadspeaker.

(a). Disconnect the battery negative connector.

(b). Remove the A pillar upper trim board. **Refer to the replacement of A pillar upper trim board.**



(c). Disconnect the harness plug 1 of the front high pitch loadspeaker.

(d). Disassemble fixing screw 2 of the front high pitch loadspeaker.

(e). Remove the front high pitch loadspeaker.

Installation

1. Install the front treble speaker.

(a). The installation sequence is the reverse of the disassembly order.

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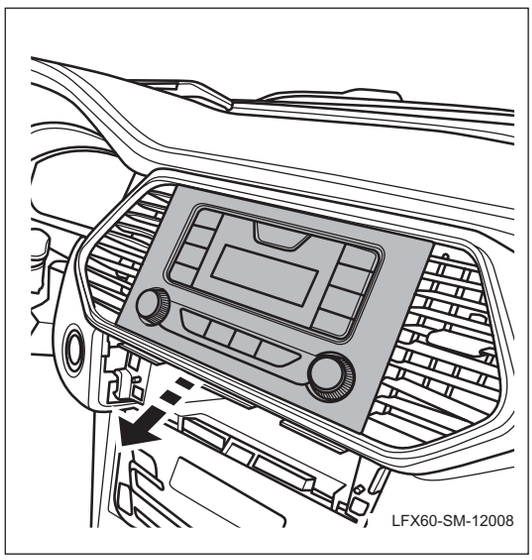
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Replace the radio assembly

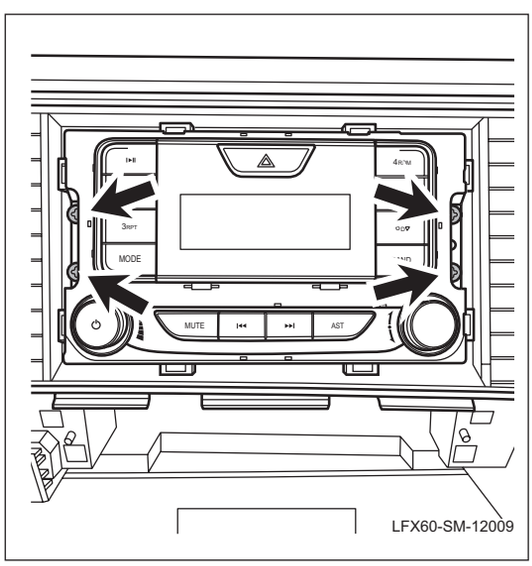
Removal

1. Disassemble the radio assembly.

(a). Disconnect the battery negative connector.



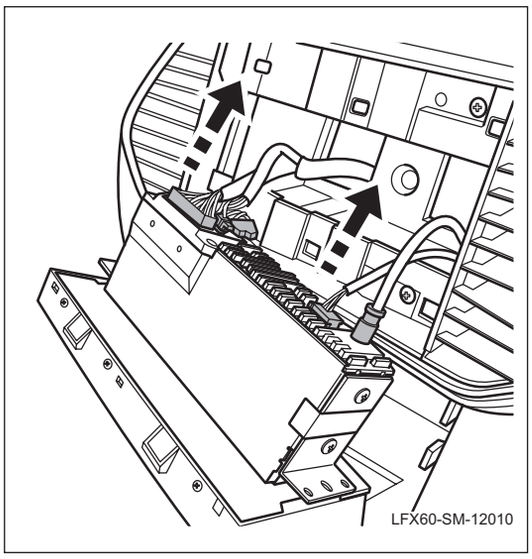
(b). Disassemble the decorative cover plate on the radio assembly.



(c). Disassemble fixing screws of the radio.

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(d). Disconnect the harness plug of the radio assembly.
(e). Remove the radio assembly.

Installation

1. Install the front treble speaker.

(a). The installation sequence is the reverse of the disassembly order.

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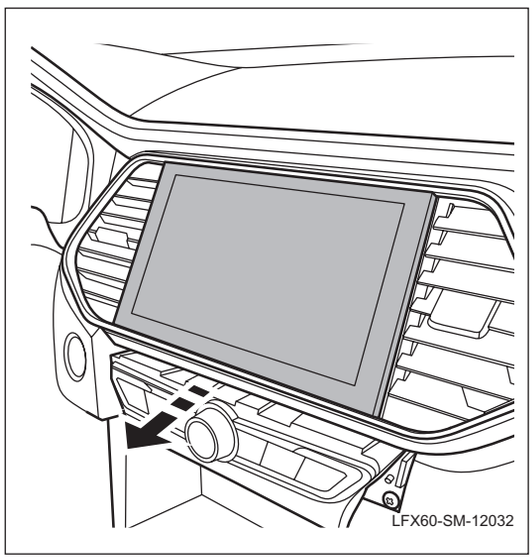
AutoLibrary

Replacement of radio/MP5 player display

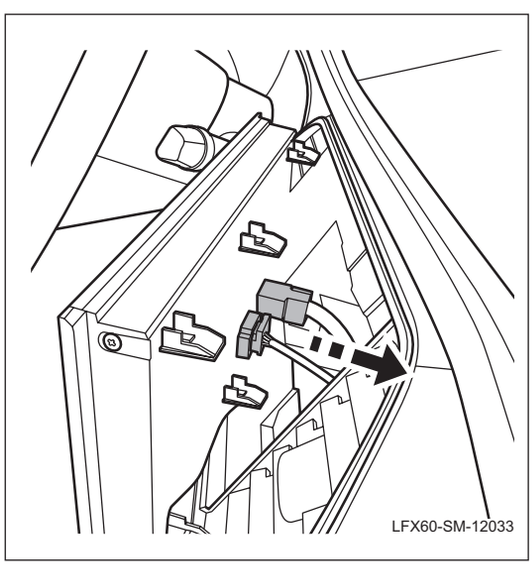
Removal

1. Disassemble the radio/MP5 player display screen.

(a). Disconnect the battery negative connector.



(b). Disassemble the radio/MP5 player display screen by using a proper tool.



(c). Disconnect the harness plug of the radio/MP5 player display screen.

(d). Remove the radio/MP5 player display screen.

12

Installation

1. Install radio/MP5 player display panel.

(a). The installation sequence is the reverse of the disassembly order.

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Replace radio/MP5 player key panel

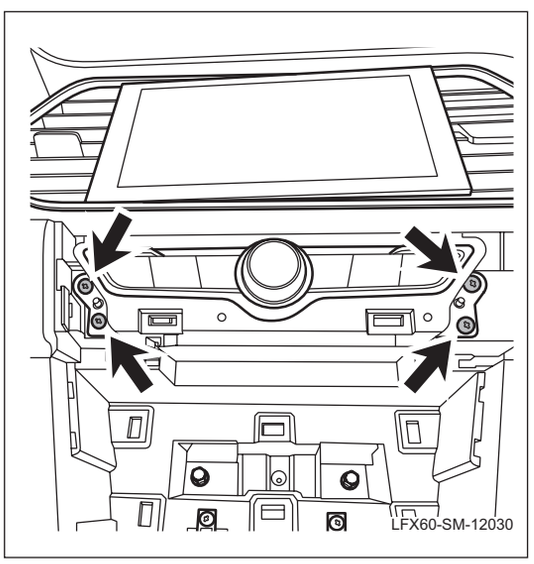
Removal

1. Disassemble the radio/MP5 player key panel.

(a). Disconnect the battery negative connector.



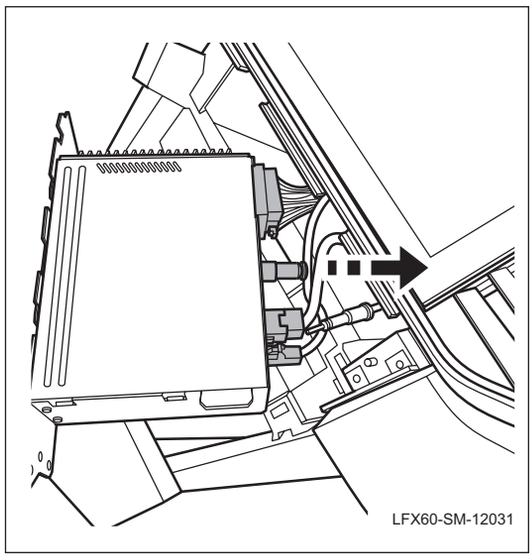
(b). Disassemble decorative cover plate of the radio/MP5 player key panel.



(c). Disassemble fixing screws of the radio/MP5 player key panel.

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(d). Disconnect the harness plug of the radio/MP5 player key panel.

(e). Remove the radio/MP5 player key panel.

Installation

1. Install a radio/MP5 player key panel

(a). The installation sequence is the reverse of the disassembly order.

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12 - Electrical system

PEPS system..... 12-1763

Technical specifications 12-1763

Structure and installation location 12-1766

General Inspection..... 12-1767

Operating Principle 12-1768

Diagnostic Information and Procedures 12-1771

Removal and installation... 12-1809

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PEPS system

Technical specifications

General specifications

Parameters of PEPS controller

Name	Specification
Rated voltage	12V
Operating voltage	(9 ~ 17) V
Storage temperature	(-40 ~ 95)℃
Protection level	IP52
Low frequency communication	134kHz±7kHz ASK
High frequency communication	The frequency hopping is used. The frequency points include 434.42 MHz ± 40 kHz and 433.42 MHz ± 40 kHz
High frequency receiving sensitiviltiy	-100 dbm (typical, direct injection method, BER = 10e-4,ASK, datarate4000bps)
Static sleeping current	≤3mA (testing static sleeping current of entire vehicle)
Service life	3 year or 60000km

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Parameters of smart key

Name	Specification
Rated voltage	3V
Operating voltage	(2.5 ~ 3.5) V
Operating temperature	(-40 ~ 85)℃
Storage temperature	(-40 ~ 95)℃
Operating temperature of battery	(-20 ~ 60) (Operating temperature requried to ensure capacity and use life when the battery is nude)
Static current	<5.5uA
Wave transmission frequency	The frequency hopping is used. The frequency points include 434.42 MHz ± 40 kHz and 433.42 MHz ± 40 kHz
Protection level	IP56 (The key can be controlled remotely after 5min when the key is immersed into 20cm deep water)
Low frequency communication	134kHz±7kHz ASK
High frequency communication	<10mW(e.r.p)
Modualtion mode	FSK
Induction distance	Within 1.5m
Remote control distance	≥ 45m (under open conditions)
Use life of remote controller	≥ 100000 times (one time indicates one cycle with 3 keys) (excluding the use life of the battery)

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Switch of start stop engine system

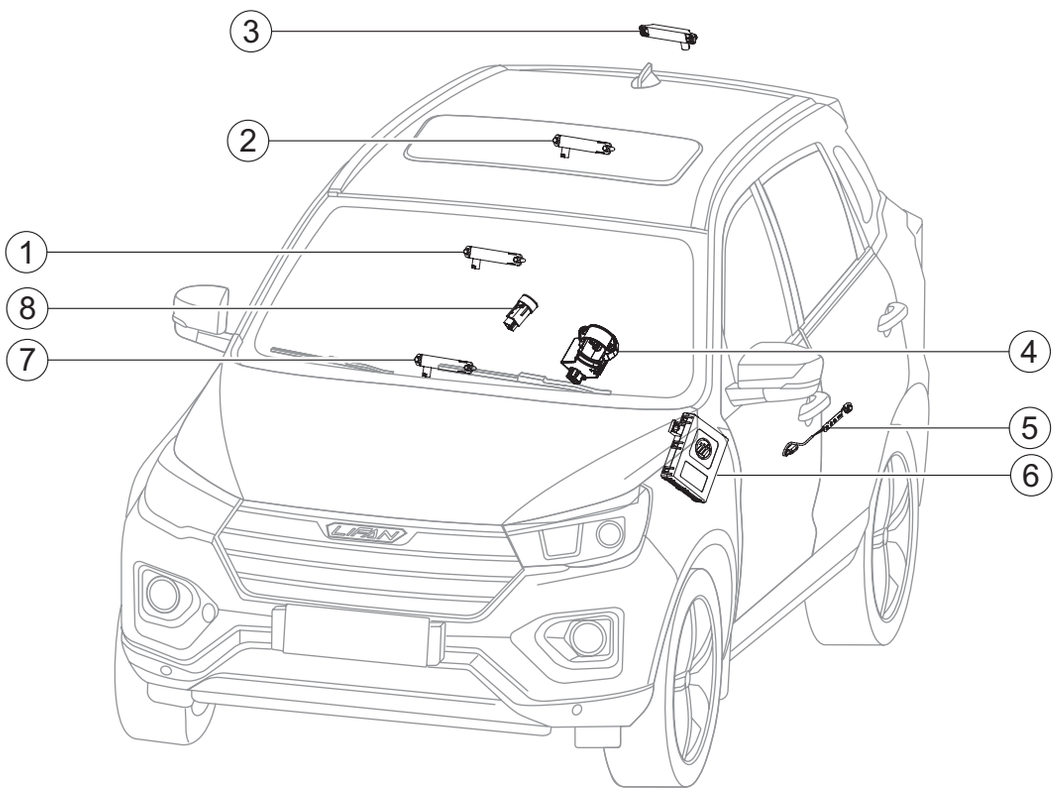
Name	Specification
Rated voltage	12V
Operating voltage	(9 ~ 17) V
Operating temperature	(-40 ~ 85)℃
Storage temperature	(-40 ~ 95)℃
Operating current	10mA
On resistance	<30ohm
Key operation force	(6.5±1) N
Key lift	100000 times
Backlight	Red backlight

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Structure and installation location

Part exploded view



LFX60-SM-01400

No.	Part name
1	Middle onboard antenna
2	Rear onboard antenna
3	External antennae
4	Steering column lock

No.	Part name
5	Door knob antennae
6	PEPScontrol module
7	Front onboard antenna
8	Start button assembly

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General Inspection

General equipment

Digital universal meter
Diagnostic equipment of vehicle

1. Check installed devices after-sales, which may affect theft prevention system of the engine.
2. Check system components, which are easy to touch or can be seen, to check if they are obviously damaged or include potential failures.
3. If the system displays that the engine is locked, check and confirm if the intelligent key has been learnt prior to failure check. Otherwise, the intelligent key learning program is performed.

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Operating Principle

System description

The one-key start system is the smart entry and start system, when the antenna in the vehicle detects the smart key, the control device in the vehicle will activate the vehicle power supply system. When the starting conditions are satisfied, the PEPS controller will control the electronic steering shaft unlocking and communicate with the ECM controller to start the engine together.

The intelligent entry and starting system not only can remotely control the wireless door lock and shut down the engine, but also realize the following functions with a carried key without the need of using the key or transmitter button (entry function and button starting function). This system is very convenient.

- The confirmation postion switch of the CVT gearbox in in P/N position. To push down the brake pedal and simply press the engine start button, the engine can start (button start function).
- To push down the clutch pedal of the MT gearbox and simply press the engine switch, the engien can start (button start function).
- Unlock/lock door (entry unlocking/entry locking function).
- Wireless door lock control

Functions of PEPS controller

The PEPS system can realize the low-frequency magnetic field positioning technology and divide the whole vehicle into the no-key entry area, no-key starting area and luggage carrier unlocking area via antennas at different positions on the vehicle. It will establish the corresponding magnetic fields in different areas of the whole vehicle. The intelligent key will confirm the areas via the magnetic field strengths.

Maximal coverage of PE starting area:

1. Extension from the vehicle window is within 50mm.
2. Extesnion from the front and rear air window glass of the vehicle is within 20mm.
3. Extension from the vehicle A/B/C column, metal ceiling shed, door and lower vehicle body is within 100mm.

PE unlocking (door) coverage

When the key is outside the vehicle and is within 20mm and 150cm area above the ground and 1m radius area, it can be correctly identified. Positions under the vehicle are excluded.

PE unlocking (luggage carrier door) coverage

The key is outside the vehicle and is within 1.5m area above the ground and 1.5 m radius area, it can be correctly identified.

PS key authentication

The PS key authentication includes intelligent key position authentication and spare IMMO authentication. If a key passes any authentication, it indicates successful PS key authentication.

The PEPS controller will first authenticate the position of the intelligent key by using the antenna inside the vehicle (intelligent starting area). if the intelligent starting area includes a legal intelligent key, it indicates successfully PS authentication.

If the antenna inside the vehicle fails to authenticate the intelligent key (e.g. insufficient power of intelligent key or intra-frequency disturbance), the IMMO authenntication function is enabled. If the key passes the spare IMMO authentication, it indicates successful PS key authentication. If the key fails to pass the spare IMMO authentication, it indicates failed PS key authentication.

Emergency starting flow:

1. Push down the brake (CVT)/clutch pedal (MT) and press one-push start switch.
2. When the instrument can not find a key, the indicator will flicker. Make the Lifan logo on the rear side of the intelligent key approximate to the start switch center and make the rear side of the intelligent key approximate to the one-push start buttong.
3. If the driving IMMO coil of the controller can not find an illegal key within 10s, the controller will stop finding the key and find the key when next emergency start flow is triggered.

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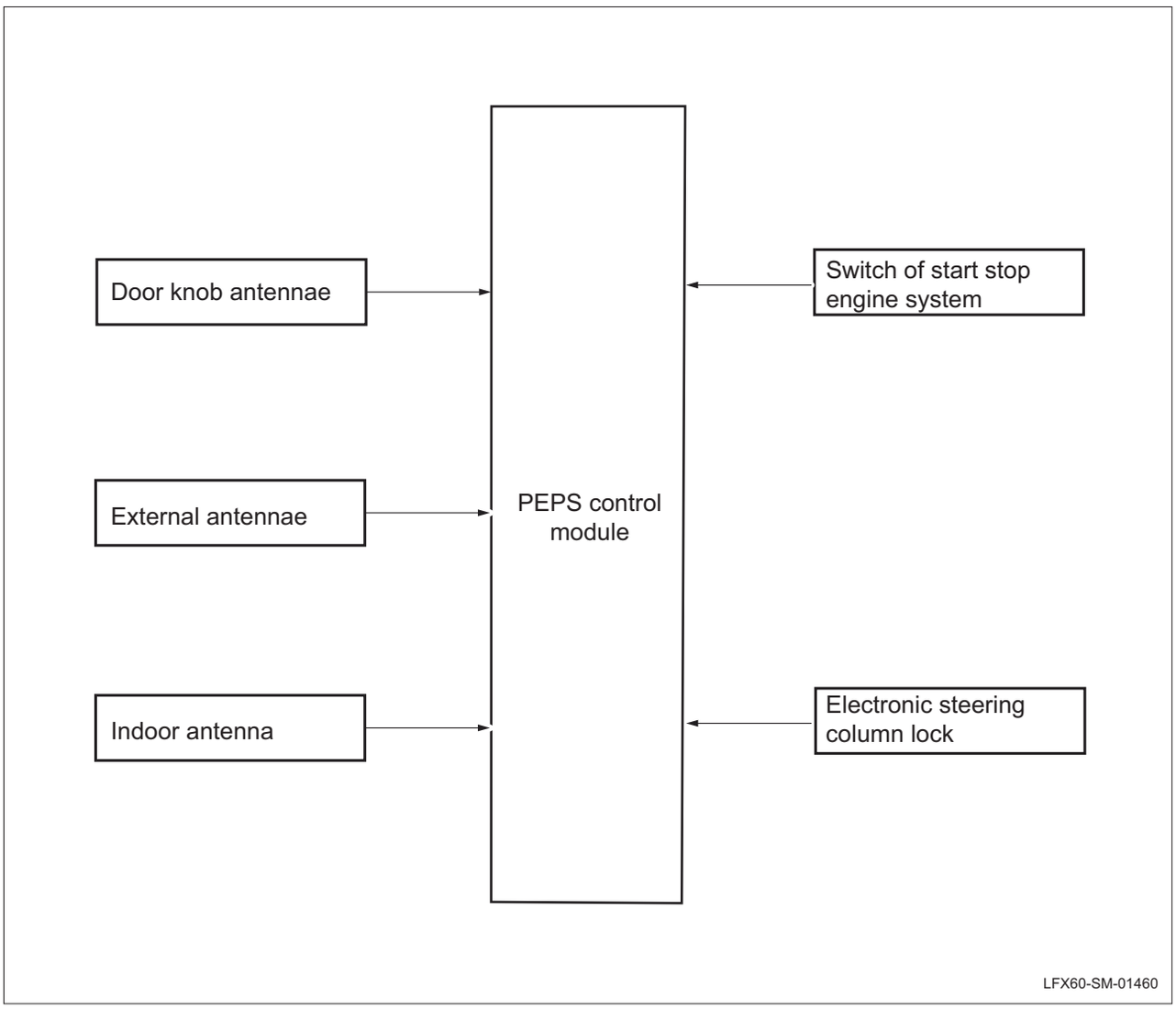
Function description

Function	Description
Indoor and outdoor lamplight control	Dipped headlight, front and rear position light, license plate light, (front, side and rear) steering light and laser light
Load of other electric appliances of vehicle body	Glass ascending/descending motor, door lock motor, luggage carrier lock motor and automatic folding motor of rearview mirror
PE (no key) entry function	PE unlocking (door lock) function
	PE locking (door lock) function
	PE unlocking (luggage carrier) function
PS Start function without a key	PS key authentication
	Power distribution function
	Intelligent start/stop function
	Emergency start function
	Emergency stop function
Engine theft prevention	EMS certification
ESCL	Unlock/lock
Hint function	Engine authentication failure hint
	Low power capacity hint of intelligent key
	Smart key leaving prompt function 1
	Smart key leaving prompt function 2
	No brake padel pressing hint
	No P/N position hint upon start
	No P/N position hint upon parking
	ESCL unlocking failure hint
	ESCL locking failure hint
	Start button failure hint
	No power OFF status hint upon intelligent locking
	Key in vehicle hint upon intelligent locking
	No intelligent key detected or illegal intelligent key alarm

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Electrical Schematic Diagram



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Diagnostic Information and Procedures

Diagnosis Instructions

Before the PEPS failure is diagnosed, please first read the system overview to know and familiarize the working principle of the PEPS systen and then start PEPS system diagnosis. When a failure occurs, these knowledge can assist you to identify correct failure diagnosis steps. More importantly, these knowledge can assist you to check if conditions described by the customer are normal.

Any failure diagnisis of the PEPS system should start with PEPS system check. It can guide repairers to take enxt logic step and diagnose failures. Understanding and using the diagnostic flowchart correctly reduces diagnostic time and avoids misjudgment of components.

General equipment

Name
Diagnostic equipment of vehicle
Digital multimeter

Visual Inspection

1. Confirm the problem raised by the customer.
2. Check for the evident mechanical or electrical damage trace and collision deformation trace through the visual check.

Visual inspection table

Mechanical	Electrical
• One-touch start switch • Antennae • PEPS module	• Fuse • Line

3. Solve the detected problems before the next step inspection.
4. If the observed or raised problem is the evident and the cause has been found, ensure to fix this fault before proceeding with the next step.
5. If no problem is found through the visual check, confirm the fault and refer to the fault symptom list.

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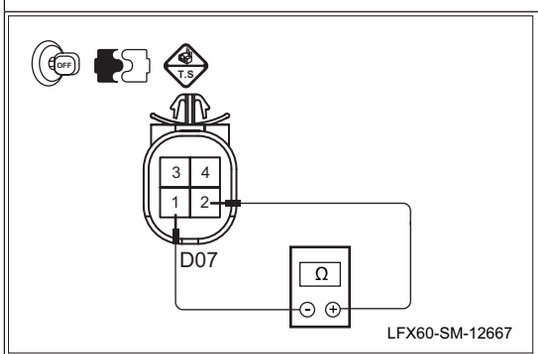
List of fault symptoms

Symptom	Possible point of failure	Recommended Measures
The door can not be locked by using a remote controller	• The remote controller is disturbed	• Keep away from the disturbance source.
	• The remote controller battery runs donw	• Replace the remote controller battery
	• The line from the controller to the door lock motor fails	**Refer to: Key locking/unlocking abnormal diagnosis flow**
	• The controller's door lock power has no input	
The door cannot be opened by PEPS (driver's side)	• Fuse • Harness • PEPS control module • Antennae	**Refer to: Failed to enter the system without a key and open the diagnosis current of the vehicle door (on the main driver side)**
Failed to start the vehicle	• Fuse	• Replace the damaged fuse
	• One-touch start switch	• Replace one-push start switch **Refer to: Replacement of one-touch start switch**
	• PEPS control module	• Check the PEPS control module line or replace the PEPS module
	• Engine system	• Check engine system failures

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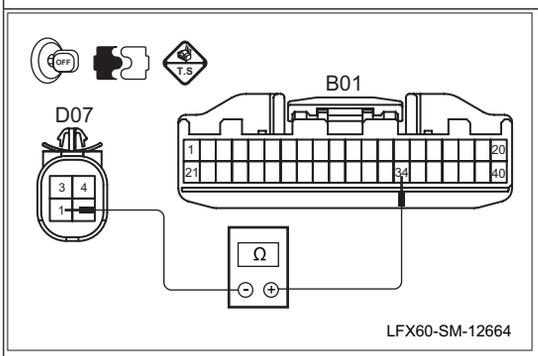
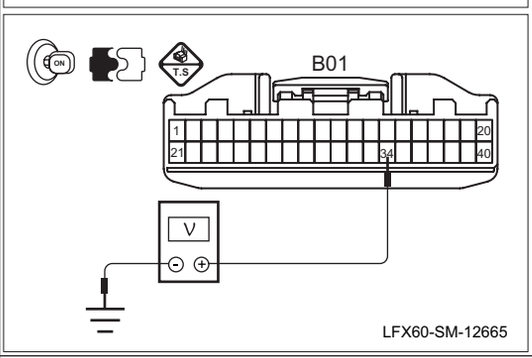
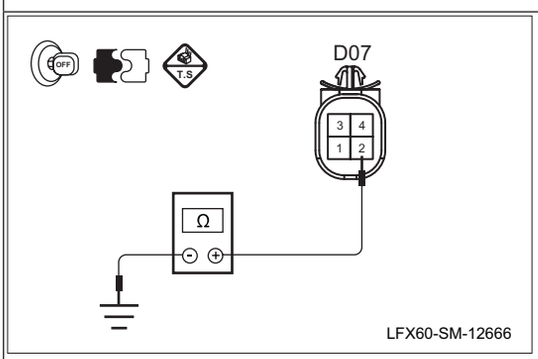
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The door cannot be opened by PEPS (driver's side)

Test condition	Details/results/measures
1. Check the key.	
	A. Check if the remote control key is disturbed. B. Check the remote control key battery. Is it OK after checking? →**Yes** To step 2. →**No** Keep away from the disturbance source and replace the remote control key battery.
2. Check the trouble code.	
	A. Connect the diagnostic equipment. B. Operate the start switch to turn the power to ON state. C. Check the failure code of the PEPS system. Check if the PEPS system failure code is avaialble. →**Yes** Make a diagnosis of the trouble code. **Refer to: DTC diagnosis flow index** →**No** Diagnosis flow index →**No** To step 3.
3. Check the left front door handle switch.	
	A. Operate the start switch to turn the power to ON state. B. Disconnect the battery negative connector. C. Disconnect the front left door pull antennae harness plug D07. D. Press the left front door handle switch and measure the resistance between the terminal 1 and 2 of the left front door handle by using a multimeter. Standard value: less than 1Ω Is the resistance normal? →**Yes** To step 4. →**No** Replace the left front door handle.

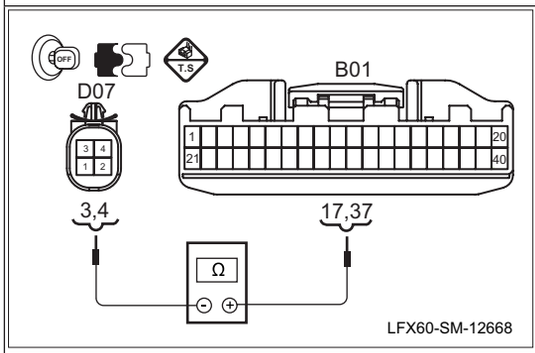
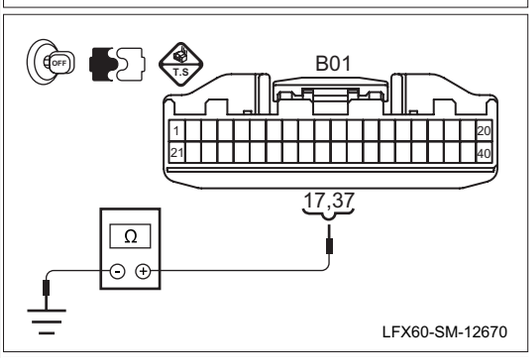
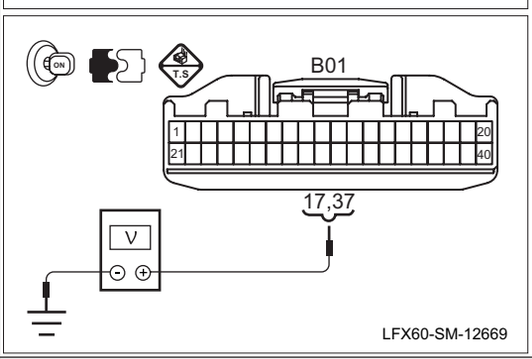
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Test condition	Details/results/measures
4. Check the switch signal line of the left front door handle.	
 LFX60-SM-12664  LFX60-SM-12665	A. Operate the start switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the front left door pull antennae harness plug D07. D. Disconnect the PEPS module harness plug B01. E. Measure the resistance between the terminal 1 of the left front door handle harness plug D07 and the terminal 34 of the PEPS module harness plug B01 by using a multimeter. **Standard value: less than 5Ω** F. Connect the battery negative terminal. G. Measure the voltage between the terminal 34 of the PEPE module harness plug B01 and reliable grounding point by using a multimeter. Is it OK after checking? →**Yes** To step 5. →**No** Repair signal line failures of the left front door handle. If necessary, replace the harness.
5. Check the switch grounding line of the left front door handle.	
 LFX60-SM-12666	A. Operate the start switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the front left door pull antennae harness plug D07. D. Measure the resistance between the terminal 2 of the left front door handle switch harness plug D07 and reliable grounding point by using a multimeter. **Standard value: less than 5Ω** Is the resistance normal? →**Yes** To step 6. →**No** Repair grounding line failures of the left front door handle. If necessary, replace the harness.

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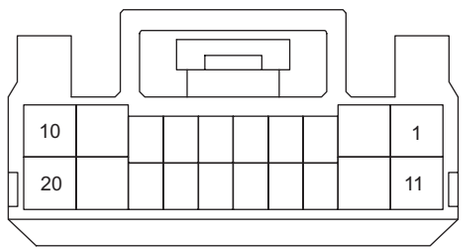
AutoLibrary

Test condition	Details/results/measures
6. Check antenna signal line of the left front door handle.	
	A. Operate the start switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the front left door pull antennae harness plug D07. D. Disconnect the PEPS module harness plug B01. E. Measure the resistance between the terminal 17 and 37 of the PEPS module harness plug B01 and the terminal 3 and 4 of the left front door handle harness plug D07 by using a multimeter. **Standard value: less than 5Ω** F. Measure the resistance between the terminal 17 and 37 of the PEPS ECU harness plug B01 and reliable grounding point by using a multimeter. **Standard value: 10MΩ or higher** G. Connect the battery negative terminal. H. Measure the voltage between the terminal 17 and 37 of the PEPS module harness plug B01 and reliable grounding point by using a multimeter. **Standard value: 0 V** Is it OK after checking? →**Yes** To step 7. →**No** Repair antenna signal line failures of the left front door handle. If necessary, replace the harness.
	
	
7. Replace the left front door handle antenna.	
	A. Replace the left front door handle antenna. **Refer to: Replacement of door handle antenna** Is the system normal? →**Yes** The system is normal and the fault is solved. →**No** To step 8.
8. Replace the PEPS module.	
	A. Replace the PEPS module. **Refer to: PEPS Replacement of control module** Confirm the system is normal.

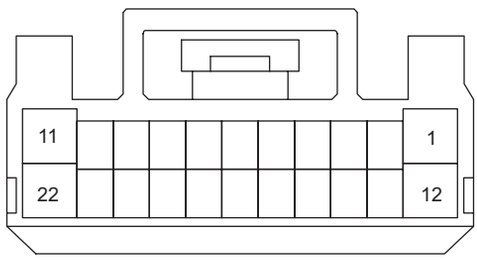
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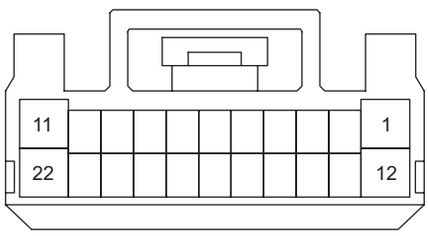
Control module terminal list



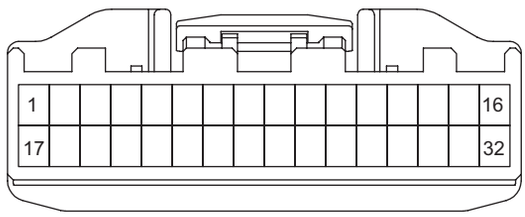
I23



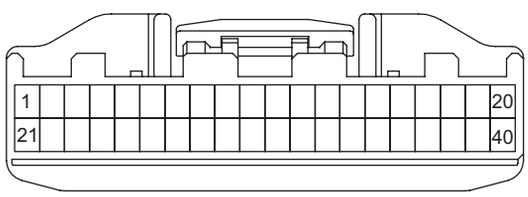
I24



I25



I26



B01

LFX60-SM-12676

Terminal No.	Wire diameter/color	Terminal description
I23-01	0.30Br/B	ESCL GND
I23-02	0.30 Br/W	ESCL power output
I23-03	0.30 G/Bl	Switching signal of right steering light
I23-04	0.30 G/W	Overtaking lamp switch signal
I23-05	0.30 G/Br	Low beam switch signal
I23-06	0.30 Bl	Simulation grounding
I23-07	0.50 Br/G	Hatch unlocking signal
I23-08	0.50 Br/R	Front left door unlocking
I23-09	0.50 Br/Bl	4-door locking
I23-10	0.50 Br/Y	3-door unlocking
I23-11	1.25 R/W	ESCL power supply
I23-12	-	-
I23-13	0.30 G/B	Distant light on/off signal

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Terminal No.	Wire diameter/color	Terminal description
I23-14	0.30 G	Small lamp switch signal
I23-15	-	-
I23-16	0.30 Br/O	Collision signal input
I23-17	-	-
I23-18	0.50 R/G	Energy-saving output
I23-19	0.85W	Lock power
I23-20	1.25 B	Central lock ground
I24-01	1.25 B	Front left window/ rear right window ground
I24-02	0.50 G/B	Rear right door glass lift motor down signal
I24-03	0.50 G	Rear right door glass lift motor up signal
I24-04	0.50 Y/W	Front left door glass lift motor up signal
I24-05	0.50 Y/R	Front left door glass lift motor down signal
I24-06	0.30 G/W	Skylight control signal
I24-07	0.50 Y/Bl	Front right door glass lift motor up signal
I24-08	0.50 Y/G	Front right door glass lift motor down signal
I24-09	0.50 Y/V	Rear left door glass lift motor down signal
I24-10	0.50 Y/Br	Rear left door glass lift motor up signal
I24-11	1.25 B	Front right window/ rear left window ground
I24-12	1.25 R/Y	Front left window/rear right window glass lift power
I24-13	0.30 Bl/W	High beam control signal
I24-14	0.30 Bl/Y	Low beam control signal
I24-15	0.30 Bl	Reverse lamp signal
I24-16	-	-
I24-17	0.30 Bl/R	AUTO lamp switch signal
I24-18	0.30 Bl/W	Rear fog lamp switch signal
I24-19	0.30 Bl/Gr	Front fog lamp switch signal
I24-20	0.30 Br/B	Hazard warning lamp switch signal
I24-21	0.30 Br/W	Left turn lamp switch signal
I24-22	1.25 G/Y	Front right window/rear left window glass lift power
I25-01	0.50 R/G	Controller power

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Terminal No.	Wire diameter/color	Terminal description
I25-02	0.30 BI/B	PCAN-H
I25-03	-	-
I25-04	0.30 Br/Y	Immobilizer indicator lamp power
I25-05	0.30 G/BI	Dome lamp drive output
I25-06	-	-
I25-07	0.30 BI/G	Front right turn lamp power
I25-08	0.30 G/Y	Front left turn lamp power
I25-09	0.30 Y/G	Exterior rearview mirror deployment signal output
I25-10	0.30 Y/Br	Folding signal output of external rearview mirror
I25-11	0.50 Y/W	Outside lamp power
I25-12	0.85 B	Controller grounding
I25-13	0.30 BI/W	PCAN-L
I25-14	-	-
I25-15	0.30 Y/B	Position light driving signal of right front door
I25-16	0.30 G/W	Position light driving signal of left front door
I25-17	0.30 G	Daytime light driving signal of right front door
I25-18	0.30 G/O	Daytime light driving signal of left front door
I25-19	0.30 Br/R	Sensor power supply
I25-20	0.30 Y	Rear fog lamp drive output
I25-21	0.30 BI/B	Front fog lamp control signal
I25-22	0.30 P/B	Electric horn driving output
I26-01	0.30 Br	IMMO antenna +
I26-02	0.30 Br/Y	Inside front antennae signal
I26-03	0.30 Br/R	ESCL LIN
I26-04	0.50 Br/G	Clutch TDC signal
I26-05	0.30W	Start switch signal 1
I26-06	0.30 Br/R	ESCL feedback
I26-07	0.30 R/BI	IG1 signal feedback
I26-08	0.30 BI/W	Brake signal input
I26-09	0.30 B/Y	Start signal feedback
I26-10	0.30 W/O	Start switch LED1

AutoLibrary

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Terminal No.	Wire diameter/color	Terminal description
I26-11	0.30 Bl/R	IG1 power driving output
I26-12	0.30 Bl/Y	IG2 power driving output
I26-13	0.30 V	ACC power driving output
I26-14	0.30 B/O	Driving power output of starting power
I26-15	0.30 B/W	ESCL enable
I26-16	-	-
I26-17	0.30 Br/B	IMMO antenna -
I26-18	0.30 Br/W	Inside front antennae signal
I26-19	0.30 P/G	Wheel rate signal input
I26-20	0.30 W/B	P/N switch signal
I26-21	0.30 W/R	Start switch signal 2
I26-22	0.30 V/W	ACC signal feedback
I26-23	0.30 R/Y	IG2 signal feedback
I26-24	0.50 Y	Clutch LDC signal
I26-25	0.50 G/O	Glass lift working indicator lamp
I26-26	0.30 W/G	Start switch LED2
I26-27	0.30 W/Bl	Background indicator of start switch
I26-28	0.30 B/G	Start switch grounding
I26-29	-	-
I26-30	-	-
I26-31	-	-
I26-32	-	
B01-01	0.30 G/Y	Backlight power supply
B01-02	-	-
B01-03	0.50 Y/Gr	Central switch unlocking signal
B01-04	0.50 Y/Bl	Driver control – left front door glass ascending/descending signal
B01-05	0.50 Y/Br	Driver control – left rear door glass ascending/descending signal
B01-06	0.50 Y/R	Front right door glass lift signal
B01-07	0.30 G/O	Sensor analog signal
B01-08	0.30 Y/B	Trunk status signal
B01-09	0.30 Br	Key locking/locking signal
B01-10	0.30 G/W	Exterior rearview mirror deployment signal input

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Terminal No.	Wire diameter/color	Terminal description
B01-11	0.30 G/B	Exterior rearview mirror folding signal input
B01-12	0.30 B/W	Front left door status signal
B01-13	0.30 B/R	Rear left door status signal
B01-14	0.50 Y	Window locking signal
B01-15	-	-
B01-16	-	-
B01-17	0.30 V/W	Left front door handle antenna signal +
B01-18	0.30 Br/R	Luggage carrier antenna signal +
B01-19	0.30 Br/Y	Indoor middle antenna signal +
B01-20	0.30 Br	Indoor rear antenna signal +
B01-21	0.30 Bl/R	Rear left turn lamp power
B01-22	0.30 Bl/Y	Rear right turn lamp power
B01-23	-	-
B01-24	0.50 Y/G	Driver control-Front right door glass lift signal
B01-25	0.50 Y/O	Driver control-Rear right door glass lift signal
B01-26	0.50 Y/W	Rear left door glass lift signal
B01-27	0.50 Y/V	Rear right door glass lift signal
B01-28	0.30 G/Bl	Hatch inching switch status signal
B01-29	Y/P	Central switch locking signal
B01-30	B/Bl	Left front door lock status signal
B01-31	-	-
B01-32	0.30 B/O	Front right door status signal
B01-33	0.30 B/G	Rear right door status signal
B01-34	0.30 G	Left front door handle switch signal
B01-35	0.50 B/Y	Window simulation ground
B01-36	-	-
B01-37	0.30 V/G	Front left door pull antennae signals -
B01-38	0.30 Br/O	Luggage carrier antenna signals
B01-39	0.30 Br/B	Indoor middle antenna signal -
B01-40	0.30 Br/W	Indoor rear antenna signal -

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DTC list

DTC	DTC information
B12E3	EMS key error
B12E4	Immobilizer coil fault
B1020	Central lock state fault
B1021	Front left turn lamp open circuit fault
B1022	Front left turn lamp short circuit fault
B1023	Front right turn lamp open circuit fault
B1024	Front right turn lamp short circuit fault
B1025	Rear left turn lamp open circuit fault
B1026	Rear left turn lamp short circuit fault
B1027	Rear right turn lamp open circuit fault
B1028	Rear right turn lamp short circuit fault
B1029	Front left door pull antennae fault
B1030	Inside front antennae fault
B1031	Inside middle antennae fault
B1032	Inside rear antennae fault
B1033	Trunk exterior antennae fault
B1034	ACC relay short to ground/relay open circuit
B1035	IG1 relay short to ground/relay open circuit
B1036	IG2 relay short to ground/relay open circuit
B1037	ESCL power supply failure
B1038	ESCL power supply failure
B1039	ESCL internal fault
B1040	ESCL and PEPS communication line fault
B1041	Operating voltage exceeding limit or abnormal
B1042	RKE synchronous code fault
B1043	Start switch fault
U2503	EMS not initiate authentication request
U0073	CAN BUSOFF fault

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U0121	EMS_082 node missing fault
U0122	EMS_28A node missing fault
U0124	EMS_094 node missing fault
U0125	EMS_120 node missing fault
U0126	ABS node missing fault
U0127	TCU node missing fault
U0128	IC node missing fault

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DTC diagnosis flow index

DTC	Description	Diagnostic process
B1021	Front left turn lamp open circuit fault	**Refer to: DTC B1021, B1022, B1023, B1024, B1025, B1026, B1027, B1028**
B1022	Front left turn lamp short circuit fault	
B1023	Front right turn lamp open circuit fault	
B1024	Front right turn lamp short circuit fault	
B1025	Rear left turn lamp open circuit fault	
B1026	Rear left turn lamp short circuit fault	
B1027	Rear right turn lamp open circuit fault	
B1028	Rear right turn lamp short circuit fault	
B1029	Front left door pull antennae fault	**Refer to: DTC B1029, B1030, B1031, B1032, B1033**
B1030	Inside front antennae fault	
B1031	Inside middle antennae fault	
B1032	Inside rear antennae fault	
B1033	Trunk exterior antennae fault	
B1034	ACC relay short to ground/relay open circuit	**Refer to: DTC B1034**
B1035	IG1 relay short to ground/relay open circuit	**Refer to: DTC B1035**
B1036	IG2 relay short to ground/relay open circuit	**Refer to: DTC B1036**
B1037	ESCL power supply failure	**Refer to: DTC B1037, B1038, B1039, B1040, B1041, B1042, B1043**
B1038	ESCL power supply failure	
B1039	ESCL internal fault	
B1040	ESCL and PEPS communication line fault	
B1041	Operating voltage exceeding limit or abnormal	
B1042	RKE synchronous code fault	
B1043	Start switch fault	

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B12E3	EMS key error	**Refer to: DTC B12E3, B12E4, B1020, U2503, U0073, U0121, U0122, U0123, U0124, U0125, U0126, U0127, U0128**
B12E4	Immobilizer coil fault	
B1020	Central lock state fault	
U2503	EMS not initiate authentication request	
U0073	CAN BUSOFF fault	
U0121	EMS_082 node missing fault	
U0122	EMS_28A node missing fault	
U0123	EMS_094 node missing fault	
U0124	EMS_120 node missing fault	
U0125	EMS not initiate authentication request	
U0126	ABS node missing fault	
U0127	TCU node missing fault	
U0128	IC node missing fault	

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DTC B1021, B1022, B1023, B1024, B1025, B1026, B1027, B1028

Trouble code description

DTC	Description
B1021	Front left turn lamp open circuit fault
B1022	Front left turn lamp short circuit fault
B1023	Front right turn lamp open circuit fault
B1024	Front right turn lamp short circuit fault
B1025	Rear left turn lamp open circuit fault
B1026	Rear left turn lamp short circuit fault
B1027	Rear right turn lamp open circuit fault
B1028	Rear right turn lamp short circuit fault

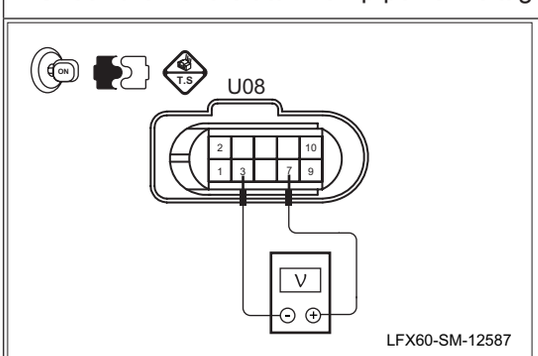
DTC conditions

DTC	DTC activation conditions	DTC clear conditions
B1021	The left front steering light flickers continuously 10 times in cycle and the open circuit failure is detected	No open circuit detected within 10 times blinking of left turn lamp continuously
B1022	The left front steering light turns off/on continuously 3 times and the open circuit failure is detected	Short circuit not detected within 3 times of switching on of left turn lamp continuously
B1023	The right front steering light flickers continuously 10 times in cycle and the open circuit failure is detected	No open circuit detected within 10 times blinking of right turn lamp continuously
B1024	The right front steering light turns off/on continuously 3 times and the open circuit failure is detected	Short circuit not detected within 3 times of switching on of right turn lamp continuously
B1025	The left rear steering light flickers continuously 10 times in cycle and the open circuit failure is detected	No open circuit detected within 10 times blinking of left turn lamp continuously
B1026	The left rear steering light turns off/on continuously 3 times and the open circuit failure is detected	Short circuit not detected within 3 times of switching on of left turn lamp continuously
B1027	The right rear steering light flickers continuously 10 times in cycle and the open circuit failure is detected	No open circuit detected within 10 times blinking of right turn lamp continuously
B1028	The right rear steering light turns off/on continuously 3 times and the open circuit failure is detected	Short circuit not detected within 3 times of switching on of right turn lamp continuously

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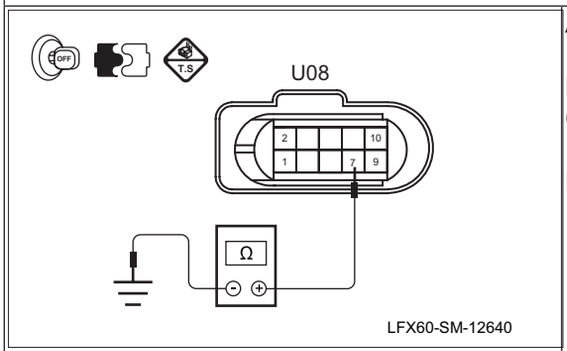
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Diagnostic process

Test condition	Details/results/measures
1. General inspection.	
	A. Check the related harness plugs for breakage, loose contact, aging or looseness. Is it OK after checking? →**Yes** To step 2. →**No** Repair the fault position.
2. Read the DTC with the diagnostic meter.	
	A. Connect the diagnostic meter and check the system for the other relevant DTCs. Is it OK after checking? →**Yes** To step 3. →**No** Carry out the relevant fault diagnosis according to the DTCs.
3. Check whether the DTC can be cleared.	
	A. Connect the diagnostic meter and access the PEPS system to clear DTC. B. Start the engine and check whether the DTC occurs again. Does DTC occur? →**Yes** To step 4. →**No** System normal.
4. Check the front left turn lamp power voltage (with this lamp as example).	
	A. Operate the start switch to set the power mode to the “OFF” state. B. Disconnect the battery negative connector. C. Disconnect the front left combination lamp harness plug U08. D. Connect the battery negative terminal. E. Start the switch to turn the power to ON mode. F. Turn on the left front steering light and measure the voltage between the terminal 3 and 7 of the left front combined light harness plug U08 by using a multimeter. **Standard value: 11 ~ 14 V** Is the voltage normal? →**No** To step 5. →**Yes** Replace the front left turn lamp bulb. **Refer to: Replace the bulb of the left steering light**

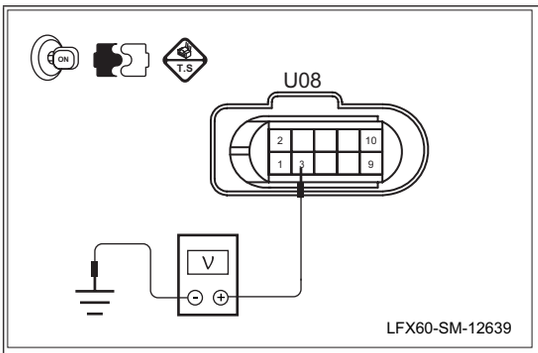
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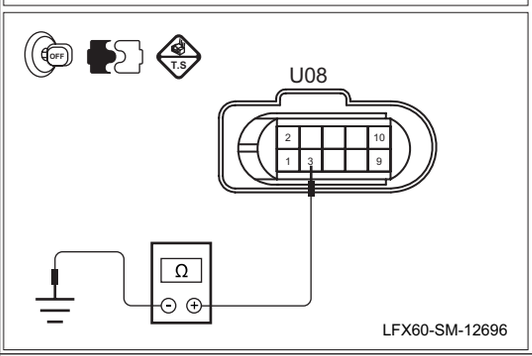
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5. Check the front left turn lamp ground line.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the front left combination lamp harness plug U08. D. Measure the resistance between the terminal 7 of the left front combined light harness plug U08 and reliable grounding point by using a multimeter. **Standard value: less than 5Ω** Is the resistance normal? →**Yes** To step 6. →**No** Repair grounding line failures of the left front steering light. If necessary, replace the harness.
6. Check the power line of the left front steering light.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the front left combination lamp harness plug U08. D. Disconnect the harness plug I25 of the PEPS module E. Measure the resistance between the terminal 3 of the left front combined harness plug U08 and the terminal 8 of the PEPS module harness plug I25 by using a multimeter. **Standard value: less than 5Ω** F. Connect the battery negative terminal. G. Measure the voltage between the terminal 1 of the PEPS harness plug I25 and the reliabile grounding point. **Standard value: 0 V** Is it OK after checking? →**Yes** To step 7. →**No** Repair the front left turn lamp power line fault and replace the harness if necessary.
6. Check the power line voltage of the left front steering light.	

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<table>
<tr>
<td> 


</td>
<td>A. Operate the Enable switch and shift the power mode to “OFF” status.
B. Disconnect the battery negative connector.
C. Disconnect the front left combination lamp harness plug U08.
D. Connect the battery negative terminal.
E. Start the switch to turn the power to ON mode.
F. Turn on the left front steering light and measure the resistance between the terminal 3 of the left front combined light harness plug U08 and reliable grounding point by using a multimeter.
Standard value: 11 ~ 14 V
Is the voltage normal?
→Yes
To step 7.
→No
Repair the front left turn lamp power line fault and replace the harness if necessary.</td>
</tr>
<tr>
<td colspan="2">7. Replace the PEPS control module.</td>
</tr>
<tr>
<td></td>
<td>A. Replace the PEPS.
Refer to: Replacement of the PEPS control unit.
Confirm the system is normal.</td>
</tr>
</table>

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DTC B1029, B1030, B1031, B1032, B1033

DTC description

DTC	Description
B1029	Front left door pull antennae fault
B1030	Inside front antennae fault
B1031	Inside middle antennae fault
B1032	Inside rear antennae fault
B1033	Trunk exterior antennae fault

DTC conditions

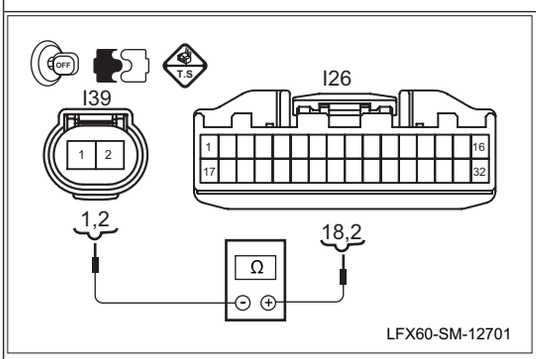
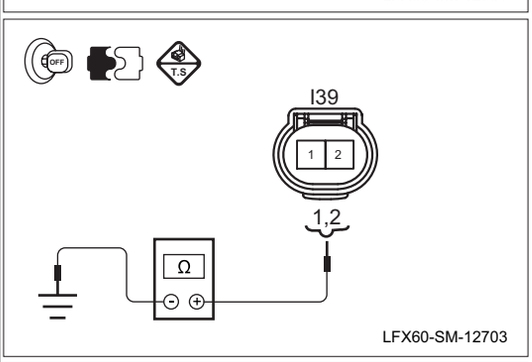
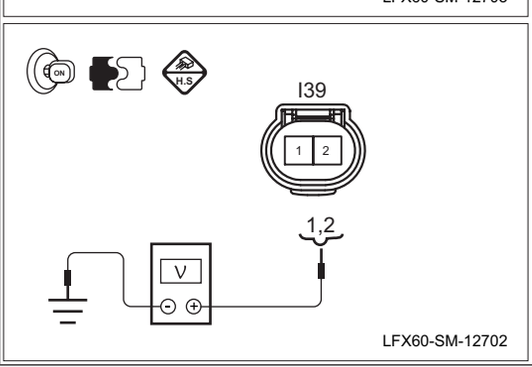
DTC	DTC activation conditions	DTC clear conditions
B1029	PEPS detects antennae transmitter current error when executing PE/PS emitting low frequency data	PEPS detects antennae transmitter current correct when executing PE/PS emitting low frequency data
B1030	PEPS detects antennae transmitter current error when executing PE/PS emitting low frequency data	PEPS detects antennae transmitter current correct when executing PE/PS emitting low frequency data
B1031	PEPS detects antennae transmitter current error when executing PE/PS emitting low frequency data	PEPS detects antennae transmitter current correct when executing PE/PS emitting low frequency data
B1032	PEPS detects antennae transmitter current error when executing PE/PS emitting low frequency data	PEPS detects antennae transmitter current correct when executing PE/PS emitting low frequency data
B1033	PEPS detects antennae transmitter current error when executing PE/PS emitting low frequency data	PEPS detects antennae transmitter current correct when executing PE/PS emitting low frequency data

Diagnostic process

Test condition	Details/results/measures
1. General inspection.	
	A. Check the related harness plugs for breakage, loose contact, aging or looseness. Is it OK after checking? →**Yes** To step 2. →**No** Repair the fault position.
2. Read the DTC with the diagnostic meter.	
	A. Connect the diagnostic meter and check the system for the other relevant DTCs. Is it OK after checking? →**Yes** To step 3. →**No** Carry out the relevant fault diagnosis according to the DTCs.

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Test condition	Details/results/measures
3. Check whether the DTC can be cleared.	
	A. Connect the diagnostic meter and access the PEPS system to clear DTC. B. Start the engine and check whether the DTC occurs again. Does DTC occur? →**Yes** To step 4. →**No** System normal.
4. Check the indoor front antenna signal line (with the indoor front antenna as one example)	
  	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the indoor front antenna harness plug I39. D. Disconnect the PEPS harness plug I39. E. Measure the resistance between the terminal 1 and 2 of the indoor front antenna harness plug I39 and the terminal 18 and 2 of the PEPS harness plug I26 by using a multimeter **Standard value: less than 5Ω** F. Measure the resistance between the terminal 1 and 2 of the indoor front antenna harness plug I39 and the reliabile grounding point by using a multimeter. **Standard value: 10MΩ or higher** G. Connect the battery negative terminal. H. Measure the voltage between the terminal 1 and 2 of the indoor front antenna harness plug I39 and the reliabile grounding point by using a multimeter. **Standard value: 0 V** Is it OK after checking? →**Yes** To step 5. →**No** Repair signal line failures of the indoor front antenna. If necessary, replace the harness.

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Test condition	Details/results/measures
5. Replace indoor front antenna.	
	A. Replace indoor front antenna. Check whether the system is normal. →**Yes** The fault is solved and the system is normal. →**No** To step 6.
6. Replace the PEPS control unit.	
	A. Replace the PEPS. **Refer to: Replacement of the PEPS control unit.** Confirm the system is normal.

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DTC B1034

DTC description

DTC	Description
B1034	ACC relay short to ground/relay open circuit

DTC conditions

DTC	DTC activation conditions	DTC clear conditions
B1034	PEPS detects that the ACC driving circuit feedback is different from output in the power ACC position.	PEPS detects that the ACC driving circuit feedback is same as output in the power ACC position.

Diagnostic process

Test condition	Details/results/measures
1. General inspection.	
	A. Check the related harness plugs for breakage, loose contact, aging or looseness. Is it OK after checking? →**Yes** To step 2. →**No** Repair the fault position.
2. Read the DTC with the diagnostic meter.	
	A. Connect the diagnostic meter and check the system for the other relevant DTCs. Is it OK after checking? →**Yes** To step 3. →**No** Carry out the relevant fault diagnosis according to the DTCs.
3. Check whether the DTC can be cleared.	
	A. Connect the diagnostic meter and access the PEPS system to clear DTC. B. Start the engine and check whether the DTC occurs again. Does DTC occur? →**Yes** To step 4. →**No** System normal.

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Test condition	Details/results/measures
4. Check ACC relay.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disassemble the ACC relay K02. C. Replace the K02 with the ACC relay of same model. Is it OK after checking? →**Yes** To step 5. →**No** Replace the ACC relay K02.
5. Check the control grounding line of the ACC relay.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Remove the ACC relay K02. D. Measure the resistance between the terminal 1 of the ACC relay K02 and reliable grounding point by using a multimeter. **Standard value: less than 5Ω** Is the resistance normal? →**Yes** To step 6. →**No** Repair control grounding line failures of the ACC relay. If necessary, replace the harness.
6. Check ACC driving output line.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Remove the ACC relay K02. D. Disconnect the PEPS module harness plug. E. Measure the resistance between the terminal 2 of the ACC relay K02 and the terminal 13 of the PEPS module harness plug I26 by using a multimeter. **Standard value: less than 5Ω** F. Measure the resistance between the PEPS harness plug I26 terminal 13 and the fixed ground point. **Standard value: 10MΩ or higher** Is the resistance normal? →**Yes** To step 7. →**No** Repair driving output line failures of the ACC. If necessary, replace the harness.

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Test condition	Details/results/measures
7. Check the K02 power line of the ACC relay.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Remove the ACC relay K02. D. Connect the battery negative terminal. E. Start the switch to turn the power to ON mode. F. Measure the voltage between the terminal 3 of the ACC relay K02 and reliable grounding. **Standard value: 11 ~ 14 V** Is the voltage normal? →**Yes** To step 8. →**No** Repair the K02 power line failure of the ACC relay. If necessary, replace the harness.
8. Check the ACC signal feedbac line.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Disconnect the battery negative connector. C. Disconnect the PEPS harness plug I26. D. Disconnect the ACC relay K02. E. Measure the resistance between the terminal 22 of the PEPS harness plug I26 and terminal 5 of the ACC relay K02. **Standard value: less than 5Ω** Is the resistance normal? →**Yes** To step 9. →**No** Repair the feedback line failure of the ACC signals. If necesasry, replace the harness.
9. Replace the PEPS control unit.	
	A. Replace the PEPS control unit. **Refer to: Replacement of the PEPS control unit.** Confirm the system is normal.

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DTC B1035

DTC description

DTC	Description
B1035	IG1 relay short to ground/relay open circuit

DTC conditions

DTC	DTC activation conditions	DTC clear conditions
B1035	The power is in ON/START position and PEPS detects that the IG1 driving circuit feedback is not consistent with output.	The power is in ON/START position and PEPS detects that the IG1 driving circuit feedback is not consistent with output.

Diagnostic process

Test condition	Details/results/measures
1. General inspection.	
	A. Check the related harness plugs for breakage, loose contact, aging or looseness. Is it OK after checking? →**Yes** To step 2. →**No** Repair the fault position.
2. Read the DTC with the diagnostic meter.	
	A. Connect the diagnostic meter and check the system for the other relevant DTCs. Is it OK after checking? →**Yes** To step 3. →**No** Carry out the relevant fault diagnosis according to the DTCs.
3. Check whether the DTC can be cleared.	
	A. Connect the diagnostic meter and access the PEPS system to clear DTC. B. Start the engine and check whether the DTC occurs again. Does DTC occur? →**Yes** To step 4. →**No** System normal.

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Test condition	Details/results/measures
4. Check the IG1 relay.	
	A. Operate the start switch to set the power mode to the "OFF" state. B. Remove the IG1 relay K03. C. Replace K03 with the IG1 relay of same model. Is it OK after checking? →**Yes** To step 5. →**No** Replace the IG1 relay K03.
5. Check control grounding line of the IG1 relay.	
	A. Operate the start switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Remove the IG1 relay K03. D. Measure the resistance between the terminal 1 of the IG1 relay K03 and reliable grounding by using a multimeter. **Standard value: less than 5Ω** Is the resistance normal? →**Yes** To step 6. →**No** Check the control grounding failure of the IG1 relay, if necessary, replace the harness.
6. Check the IG1 driving output line.	
	A. Operate the start switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Remove the IG1 relay K03. D. Disconnect the PEPS module harness plug. E. Measure the resistance between the terminal 2 of the IG1 relay K03 and No. 11 of the PEPS module harness plug I26 by using a multimeter. **Standard value: less than 5Ω** F. Measure the resistance between the PEPS harness plug I26 terminal 11 and the fixed ground point. **Standard value: 10MΩ or higher** Is the resistance normal? →**Yes** To step 7. →**No** Check if the IG1 driving output line fail. If necessary, replace the harness.

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Test condition	Details/results/measures
7. Check the IG1 relay K03 power line.	
	A. Operate the start switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Remove the IG1 relay K03. D. Connect the battery negative terminal. E. Start switch to turn the power to ON state. F. Measure the voltage between the IG1 relay K03 terminal 3 and the fixed ground point. **Standard value: 11 ~ 14 V** Is the voltage is OK? →**Yes** To step 8. →**No** Repair the IG1 relay K03 power line fault and replace the harness if necessary.
8. Check the IG1 signal feedback line.	
	A. Operate the start switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the PEPS harness plug I26. D. K03Remove the IG1 relay E. Measure the resistance between PEPS harness plug I26 terminal 7 and IG1 relay K03 terminal 5. **Standard value: Less than 5Ω** Is the resistance normal? →**Yes** To step 9. →**No** Repair IG1 signal feedback line fault and replace the harness if necessary.
9. Replace the PEPS control unit.	
	A. Replace the PEPS control unit. **Refer to: Replacement of PEPS control unit** Confirm the system is normal.

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DTC B1036

DTC description

DTC	Description
B1036	IG2 relay short to ground/relay open circuit

DTC conditions

DTC	DTC activation conditions	DTC clear conditions
B1036	The power is in ON/START position and PEPS detects that the IG2 driving circuit feedback is not consistent with output.	The power is in ON/START position and PEPS detects that the IG2 driving circuit feedback is not consistent with output.

Diagnostic process

Test condition	Details/results/measures
1. General inspection.	
	A. Check the related harness plugs for breakage, loose contact, aging or looseness. Is it OK after checking? →**Yes** To step 2. →**No** Repair the fault position.
2. Read the DTC with the diagnostic meter.	
	A. Connect the diagnostic meter and check the system for the other relevant DTCs. Is it OK after checking? →**Yes** To step 3. →**No** Carry out the relevant fault diagnosis according to the DTCs.
3. Check whether the DTC can be cleared.	
	A. Connect the diagnostic meter and access the PEPS system to clear DTC. B. Start the engine and check whether the DTC occurs again. Does DTC occur? →**Yes** To step 4. →**No** System normal.

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Test condition	Details/results/measures
4. Check the IG2 relay.	
	A. Operate the start switch to turn the power to OFF state. B. Remove the IG2 relay K04. C. Replace K04 with the IG2 relay of same model. Is it OK after checking? →**Yes** To step 5. →**No** Replace the IG1 relay K03.
5. Check the IG2 relay control grounding line.	
	A. Operate the start switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Remove the IG2 relay K04. D. Measure the resistance between the IG2 relay K04 terminal 1 and the fixed ground point with the multimeter. **Standard value: Less than 5Ω** Is the resistance normal? →**Yes** To step 6. →**No** Repair IG2 relay control grounding fault and replace the harness if necessary.
6. Check the IG2 drive output line.	
	A. Operate the start switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Remove the IG2 relay K04. D. Disconnect the PEPS module harness plug. E. Measure the resistance between the IG2 relay K04 terminal 2 and PEPS module harness plug I26 terminal 12 with the multimeter. **Standard value: Less than 5Ω** F. Measure the resistance between the PEPS harness plug I26 terminal 12 and the fixed ground point. **Standard value: 10MΩ or higher** Is the resistance normal? →**Yes** To step 7. →**No** Repair IG2 drive output line fault and replace the harness if necessary.

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Test condition	Details/results/measures
7. Check the IG2 relay K04 power line.	
	A. Operate the start switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Remove the IG2 relay K04. D. Connect the battery negative terminal. E. Start switch to turn the power to ON state. F. Measure the voltage between the IG2 relay K04 terminal 3 and the fixed ground point. **Standard value: 11 ~ 14 V** Is the voltage is OK? →**Yes** To step 8. →**No** Repair IG2 relay K04 power line fault and replace the harness if necessary.
8. Check the IG2 signal feedback line.	
	A. Operate the start switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the PEPS harness plug I26. D. Remove the IG2 relay K04. E. Measure the resistance between the PEPS harness plug I26 terminal 23 and IG2 relay K04 terminal 5. **Standard value: Less than 5Ω** Is the resistance normal? →**Yes** To step 9. →**No** Repair IG2 signal feedback line fault and replace the harness if necessary.
9. Replace the PEPS control unit.	
	A. Replace the PEPS control unit. **Refer to: Replacement of PEPS control unit** Confirm the system is normal.

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DTC B1037, B1038, B1039, B1040, B1041, B1042, B1043

DTC description

DTC	Description
B1037	ESCL power supply failure
B1038	ESCL power supply failure
B1039	ESCL internal fault
B1040	ESCL and PEPS communication line fault
B1041	Operating voltage exceeding limit or abnormal
B1042	RKE synchronous code fault
B1043	Start switch fault

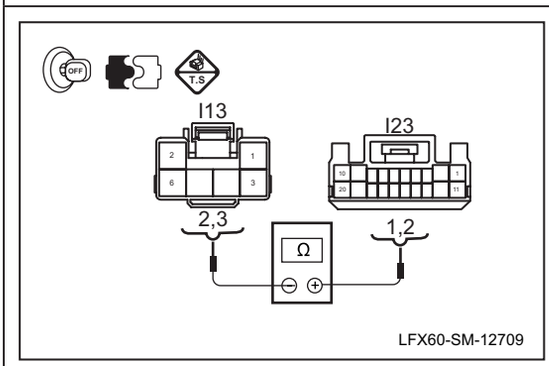
DTC conditions

DTC	DTC activation conditions	DTC clear conditions
B1037	Delect the power supply feedback abnormity when performing ESCL actions	Delect the power supply feedback normal when performing ESCL actions
B1038	Delect the power supply feedback abnormity when performing ESCL actions	Delect the power supply grounding feedback normal when performing ESCL actions
B1039	ESCL feedbacks its internal fault status information when performing ESCL actions	ESCL feedbacks its internal normal status information when performing ESCL actions
B1040	Do not receive the message data from ESCL after ESCL is powered on by PEPS.	PEPS receives the response or status byte data of ESCL
B1041	The voltage is less than 9V or greater than 16V within continuous 2s	The voltage is greater than or equal to 9V or less than or equal to 16V whtin continuous 2s
B1042	In RKE data frame received by PEPS, KEY ID meets the requirements, but FOB roll code has error	-
B1043	Start a contact for continuous valid for more than 1min or only one contact is valid within continuous 5 times	-

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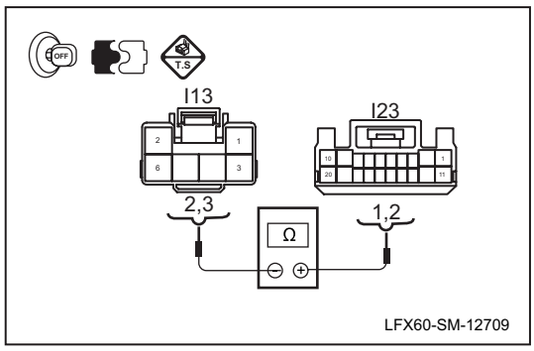
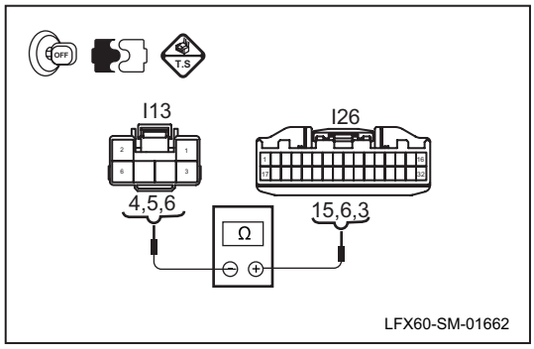
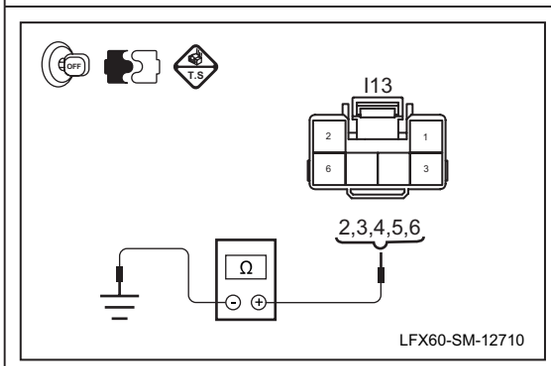
AutoLibrary

Diagnostic process

Test condition	Details/results/measures
1. General inspection.	
	A. Check the related harness plugs for breakage, loose contact, aging or looseness. Is it OK after checking? →**Yes** To step 2. →**No** Repair the fault position.
2. Read the DTC with the diagnostic meter.	
	A. Connect the diagnostic meter and check the system for the other relevant DTCs. Is it OK after checking? →**Yes** To step 3. →**No** Carry out the relevant fault diagnosis according to the DTCs.
3. Check whether the DTC can be cleared.	
	A. Connect the diagnostic meter and access the PEPS system to clear DTC. B. Start the engine and check whether the DTC occurs again. Does DTC occur? →**Yes** To step 4. →**No** System normal.
4. Inspect ESCL power line in PEPS module.	
	A. Operate the start switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the PEPS harness plug I23. D. Measure the voltage between Terminal 11 of PEPS wiring harness connector I23 and the reliable ground ling with a multimeter. **Standard value: 11 ~ 14V** Is the voltage is OK? →**Yes** To step 5. →**No** Inspect and repair ESCL power line fault in PEPS module; if necessary, replace the wiring harness.

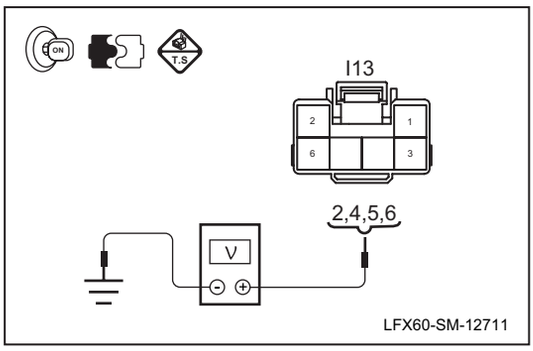
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Test condition	Details/results/measures
5. Inspect the line continuity between PEPS and ESCL.	
 	A. Operate the start switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the PEPS harness plug I23, I26. D. Disconnect the ESCL harness plug I13. E. Measure the resistance between Terminals 1 and 2 of PEPS wiring harness connector I23 and Terminals 2 and 3 of ESCL wiring harness connector I13 with a multimeter seperately. F. Measure the resistance between Terminals 15, 6 and 3 of PEPS wiring harness connector I26 and Tterminals 4, 5 and 6 of ESCL wiring harness connector I13 with a multimeter seperately. **Standard value: Less than 5Ω** Is the resistance normal? →**Yes** To step 6. →**No** Inspect and repair the open circuit fault between PEPS and ESCL; if necessary, replace the wiring harness.
6. Inspect the line between PEPS or ESCL and the grounding point for shor circit.	
	A. Operate the start switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the ESCL harness plug I13. D. Disconnect the PEPS harness plug I23 and I26. E. Measure the resistance between Terminals 2, 3, 4, 5, and 6 of ESCL wiring harness connector I13 and the reliable grounding point with a multimeter seperately. **Standard value: 10MΩ or higher** Is the resistance normal? →**Yes** To step 7. →**No** Inspect and repair the line short circuit fault between PEPS or ESCL and the grounding point; if necessary, replace the wiring harness.

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Test condition	Details/results/measures
7. Inspect whether the line between PEPS and ESCL and the power supply for short circuit.	
	A. Operate the start switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the ESCL harness plug I13. D. Disconnect the PEPS harness plug I23 and I26. E. Connect the negative battery terminal. F. Measure the voltage between Terminals 2, 4, 5, 6 of ESCL wiring harness connector I13 and the reliable grounding point with a multimeter. **Standard value: 0 V** Is the voltage is OK? →**Yes** To step 8. →**No** Inpspect and repair the short circuit fault betweem PEPS or ESCL and the power supply; if necessary, replace the wiring harness.
8. Replace the ESCL.	
	A. Replace ESCL steering column lock. Inspect whether the system is normal. →**Yes** The system is normal and the fault is solved. →**No** To step 8.
9. Replace the PEPS.	
	A. Replace the PEPS. **Refer to: Replacement of PEPS control unit** Confirm the system is normal.

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DTC B12E3, B12E4, B1020, U2503, U0073, U0121, U0122, U0123, U0124, U0125, U0126, U0127, U0128

DTC description

DTC	Description
B12E3	EMS key error
B12E4	Anti-theft coil fault
B1020	Central lock state fault
U2503	EMS not initiate authentication request
U0073	CAN BUSOFF fault
U0121	EMS_082 node missing fault
U0122	EMS_28A node missing fault
U0123	EMS_094 node missing fault
U0124	EMS_288 node missing fault
U0125	EMS_120 node missing fault
U0126	ABS node missing fault
U0127	TCU node missing fault
U0128	IC node missing fault

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DTC conditions

DTC	DTC activation conditions	DTC clear conditions
B12E3	EMS encryption results received within a ignition cycle are error	EMS encryption results received within a ignition cycle are correct
B12E4	The coil operation monitored within a ignition cycle is error	The coil operation monitored within a ignition cycle is correct
B1020	The central lock status monitored within consecutive 10 times is inconsistant with the expected status	The central lock status monitored within consecutive 10 times is consistant with the expected status
U2503	EMS certification request is not received during a ignition cycle	EMS certification request is received during a ignition cycle
U0073	After 2s since the ignition switch is turned on and BUS OFF appears, continuous 2 times of BUS OFF reset operations are not successful	BUS OFF does not appear within consecutive 10 ignition cycles
U0121	After IGON2S, no message is received within 4 cycles (50ms) continuous	Message EMS_EngineStatus of 10 cycles (0x120) is received continuously
U0122	After IGON2S, no message is received within 4 cycles (500ms) continuous	Message EMS_EngineStatus of 10 cycles (0x120) is received continuously
U0123	After IGON2S, no message is received within 4 cycles (50ms) continuousEMS_EngineRPM	Message EMS_EngineStatus of 10 cycles (0x120) is received continuously
U0124	After IGON 2S, no message is received within 4 cycles (500ms) continuous	Message EMS_EngineStatus of 10 cycles (0x120) is received continuously
U0125	After IGON 2S, no message is received within 4 cycles (500ms) continuous	Message EMS_EngineStatus of 10 cycles (0x120) is received continuously
U0126	After IGON2S, no message is received within 5 cycles (100ms) continuous	Receive continuously 10 cycles of messages ABS_ VehicleSpeedAndStatus (0x068)
U0127	After IGON2S, no message is received within 4 cycles (50ms) continuous	Message TCU_TorqueStatus of 10 cycles (0x097) is received continuously
U0128	After IGON2S, no message is received within 5 cycles (100ms) continuous	Message IC_VehicleSpeedAndSeatbeltStatus of 10 cycles (0x210) is received continuously

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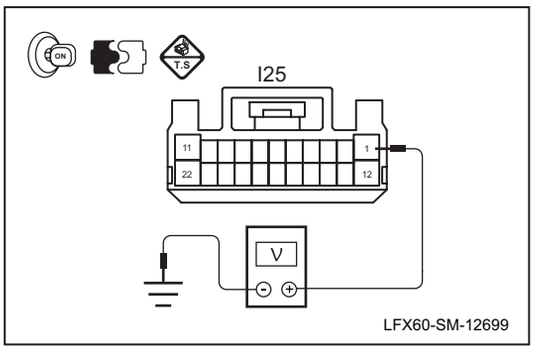
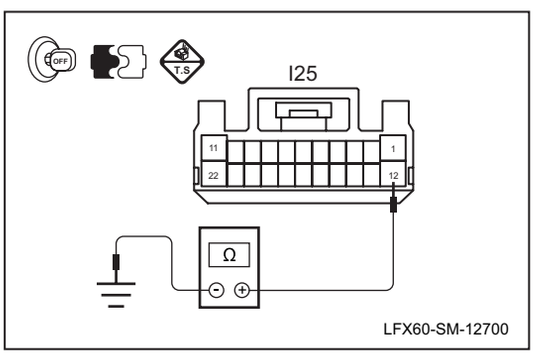
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Diagnostic process

Test condition	Details/results/measures
1. General inspection.	
	A. Check the related harness plugs for breakage, loose contact, aging or looseness. Is it OK after checking? →**Yes** To step 2. →**No** Repair the fault position.
2. Read the DTC with the diagnostic meter.	
	A. Connect the diagnostic meter and check the system for the other relevant DTCs. Is it OK after checking? →**Yes** To step 3. →**No** Carry out the relevant fault diagnosis according to the DTCs.
3. Check whether the DTC can be cleared.	
	A. Connect the diagnostic meter and access the PEPS system to clear DTC. B. Start the engine and check whether the DTC occurs again. Does DTC occur? →**Yes** To step 4. →**No** System normal.
4. Check the CAN communication network.	
	A. Check whether the CAN communication network is normal. Is it OK after checking? →**Yes** To step 5. →**No** Repair the CAN communication network fault.

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Test condition	Details/results/measures
5. Inspect PEPS power line.	
	A. Operate the start switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the PEPS harness plug I25. D. Connect the battery negative terminal. E. Start switch to turn the power to ON state. F. Measure the voltage between Terminal 1 of PEPS wiring harness connector I25 and the reliable grounding point with a multimeter. **Standard value: 11 ~ 14 V** Is the voltage is OK? →**Yes** To step 6. →**No** Inspect and repair PEPS power line fault; if necessary, replace the wiring harness.
6. Check the PEPS control module ground line.	
	A. Operate the start switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the PEPS harness plug I25. D. Measure the resistance between Terminal 12 of PEPS wiring harness connector I25 and the reliable grounding point with a multimeter. **Standard value: Less than 5Ω** Is the resistance normal? →**Yes** To step 7. →**No** Inspect and repair PEPS grounding point fault; if necessary, replace the wiring harness.
7. Replace the PEPS control unit.	
	A. Replace the PEPS control unit. **Refer to: Replacement of PEPS control unit** Is the system normal? →**Yes** The fault is solved and the system is normal. →**No** To step 8.
8. Replace the ECM (with ECM as example).	
	A. Replace ECM. **Refer to: Replacement of ECM control unit** Confirm the system is normal.

AutoLibrary

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Removal and installation

Replacement of the one button start switch

Removal

1. Remove the one button start switch.

(a). Remove the one button start switch; **refer to: Dashboard Assembly Replacement.**

Installation

1. Install the one button start switch.

(a). Install the one button start switch; **refer to: Dashboard Assembly Replacement.**

AutoLibrary

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Replacement of the steering column anti-theft lock

Removal

1. Remove the steering column anti-theft lock.

(a). Disconnect the battery negative connector.

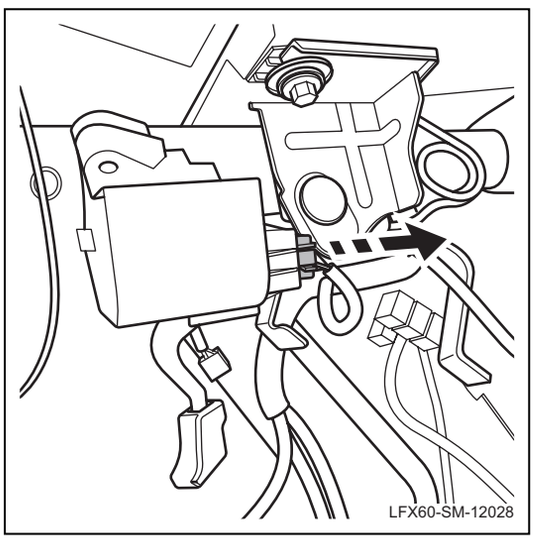
(b). Remove the driver's airbag. **Refer to the replacement of driver's airbag.**

(c). Remove the steering wheel, **refer to: Steering Wheel Replacement.**

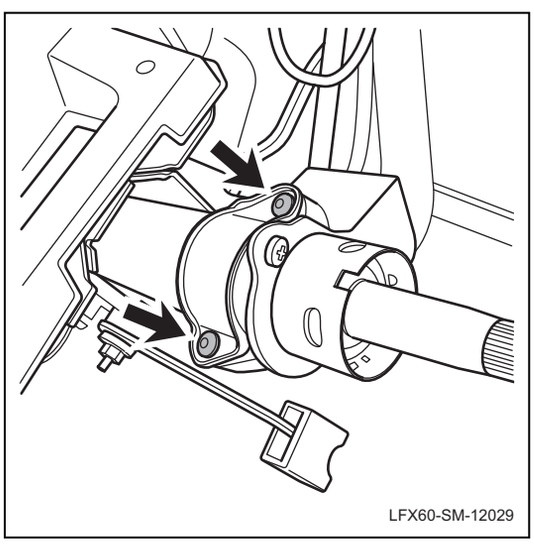
(d). Remove the upper and lower covers on the steering column; **refer to: Replacement of Upper and Lower Covers on Steering Column.**

(e). Remove the combination switch, **refer to: Combination Switch Replacement.**

(f). Remove the clock spring. **Refer to the replacement of clock spring.**



(g). Disconnect the steering column anti-theft lock wiring harness connector.



(h). Temove the riveted bolt with the appropriate tool.

(i). Remove the steering column anti-theft lock.

Installation

1. Install the steering column anti-theft lock.

(a). The installation sequence is the reverse of the disassembly order.

AutoLibrary

AutoLibrary

Replacement of the door handle antenna

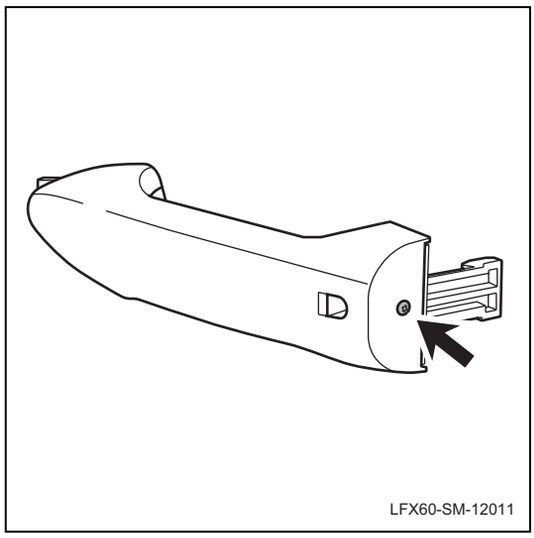
Removal

1. Remove the door handle antenna.

(a). Disconnect the battery negative connector.

(b). Remove the front door lock barrel. **Refer to the replacement of front door lock barrel.**

(c). Remove the front door outer handle, **refer to: Front Door Outer Handle Replacement.**



(d). Remove the outer handle housing fixing screw.

(e). Remove the front door outer handle trim cover.

(f). Remove the door handle antenna.

Installation

1. Install the door handle antenna wiring harness.

(a). The installation sequence is the reverse of the disassembly order.

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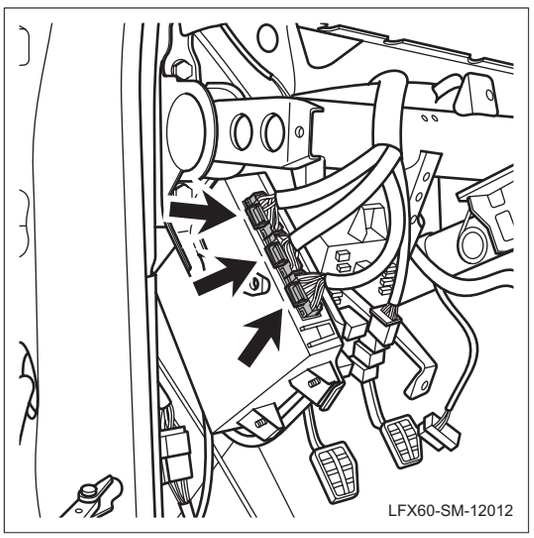
Replacement of the PEPS control module

Removal

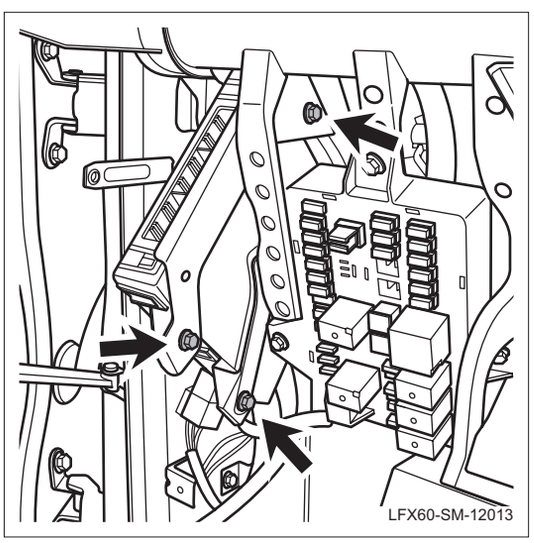
1. Remove PEPS control module.

(a). Disconnect the battery negative connector.

(b). Remove the dashboard. **Refer to the replacement of dashboard assembly.**



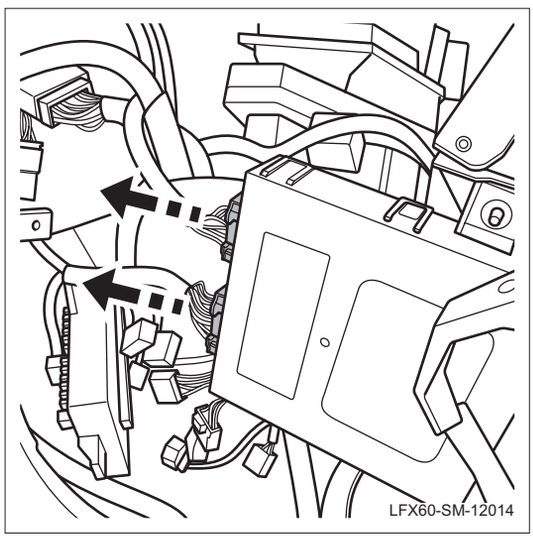
(c). Disconnect PEPS control module wiring harness connector.



(d). Remove PEPS control module fixing bolt.

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(e). Disconnect the wiring harness connector in PEB control module.
(f). Remove PEPS control module.

Installation

1. Install PEPS control module.

(a). The installation sequence is the reverse of the disassembly order.

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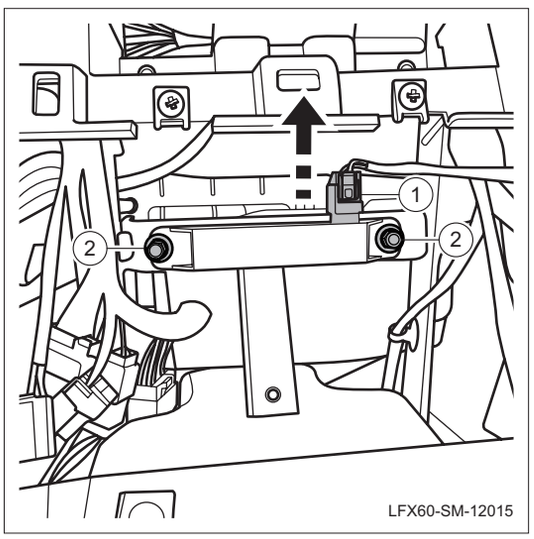
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Replacement of the inner antenna

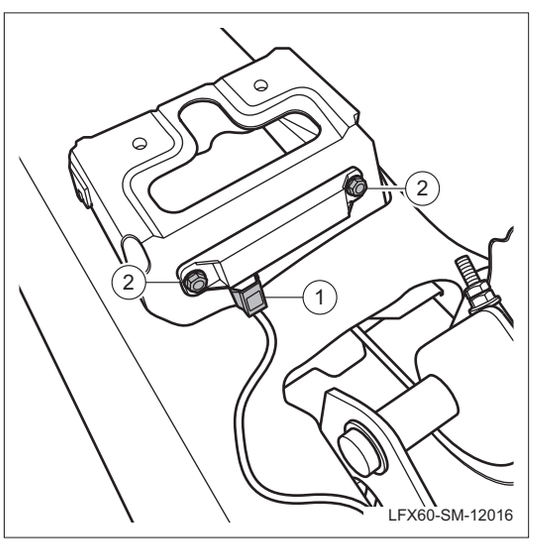
Removal

1. Replace the inner antenna

(a). Disconnect the battery negative connector.



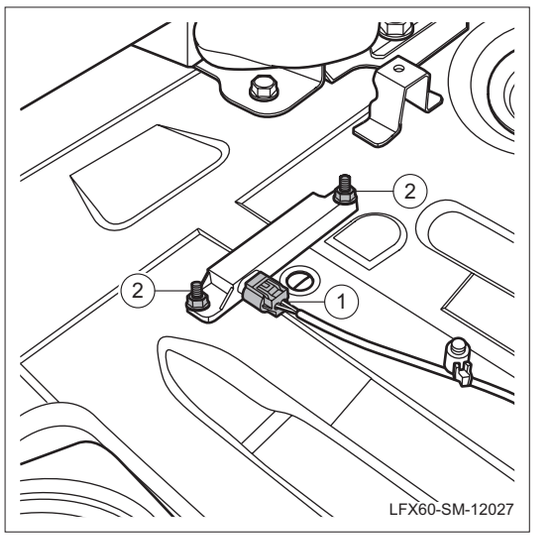
(b). Remove the dashboard. **Refer to the replacement of dashboard assembly.**
(c). Disconnect the front inner antenna wiring harness connector 1.
(d). Remove the front inner antenna fixing bolt 2.
(e). Remove the front inner antenna.



(f). Remove the center console; **refer to: Center Console Assembly Replacement.**
(g). Disconnect the middle inner antenna wiring harness connector 1.
(h). Remove the middle inner antenna fixing bolt 2.
(i). Remove the middle inner antenna.

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(j). Open the rear seat back.
(k). Remove the trim panel under C pillar; **refer to: Replacement of Trim Panel under C Pillar.**
(l). Open the floor carpet.
(m). Disconnect the rear innner antenna wiring harness connector 1.
(n). Remove the rear inner antenna fixing nut 2.
(o). Remove the rear inner antenna.

Installation

1. Install the inner antenna.

(a). The installation sequence is the reverse of the disassembly order.

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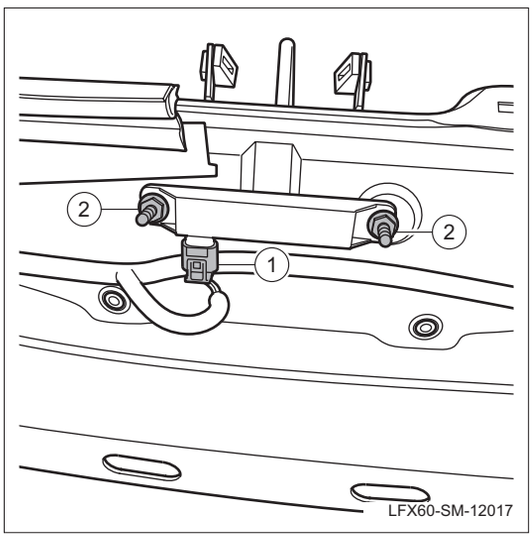
Replacement of the outer antenna

Removal

1. Remove the outer antenna.

(a). Disconnect the battery negative connector.

(b). Remove the rear bumper. **Refer to: Replacement of the rear bumper.**



(c). Disconnect the outer antenna wiring harness connector 1.

(d). Remove the outer antenna fixing bolt 2.

(e). Remove the outer antenna.

Installation

1. Install the outer antenna.

(a). The installation sequence is the reverse of the disassembly order.

AutoLibrary

AutoLibrary

12- Electrical system

Central lock system..... 12-1819

Precautions 12-1819

Preparation 12-1820

Structure and installation location 12-1821

Operating Principle 12-1822

Diagnosis Information and Procedures 12-1825

Removal and Installation . 12-1835

AutoLibrary

AutoLibrary

AutoLibrary

AutoLibrary

Central lock system

Precautions

Precautions

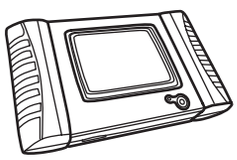
1. Regardless of the engine operation, do not plug any component in the system, such as, any battery cable, system part connector, and etc., as long as the power is in the non-OFF status.
2. Before removing or installing any electrical installation, and when the tool or equipment is easily accessible to any exposed electrical terminal, must disconnect the negtive battery terminal, to prevent person injury or vehicle damage.
3. Do not pull the harness while disconnecting the system component plug so as to prevent damaging the harness.

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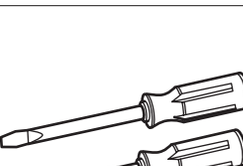
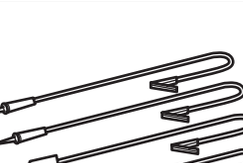
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Preparation

Special maintenance tools

No.	Tool name	Tool figure	Tool code	Remarks
1	Diagnostic equipment of vehicle	 LFX60-SM-02802	-	System fault diagnosis

General maintenance tools

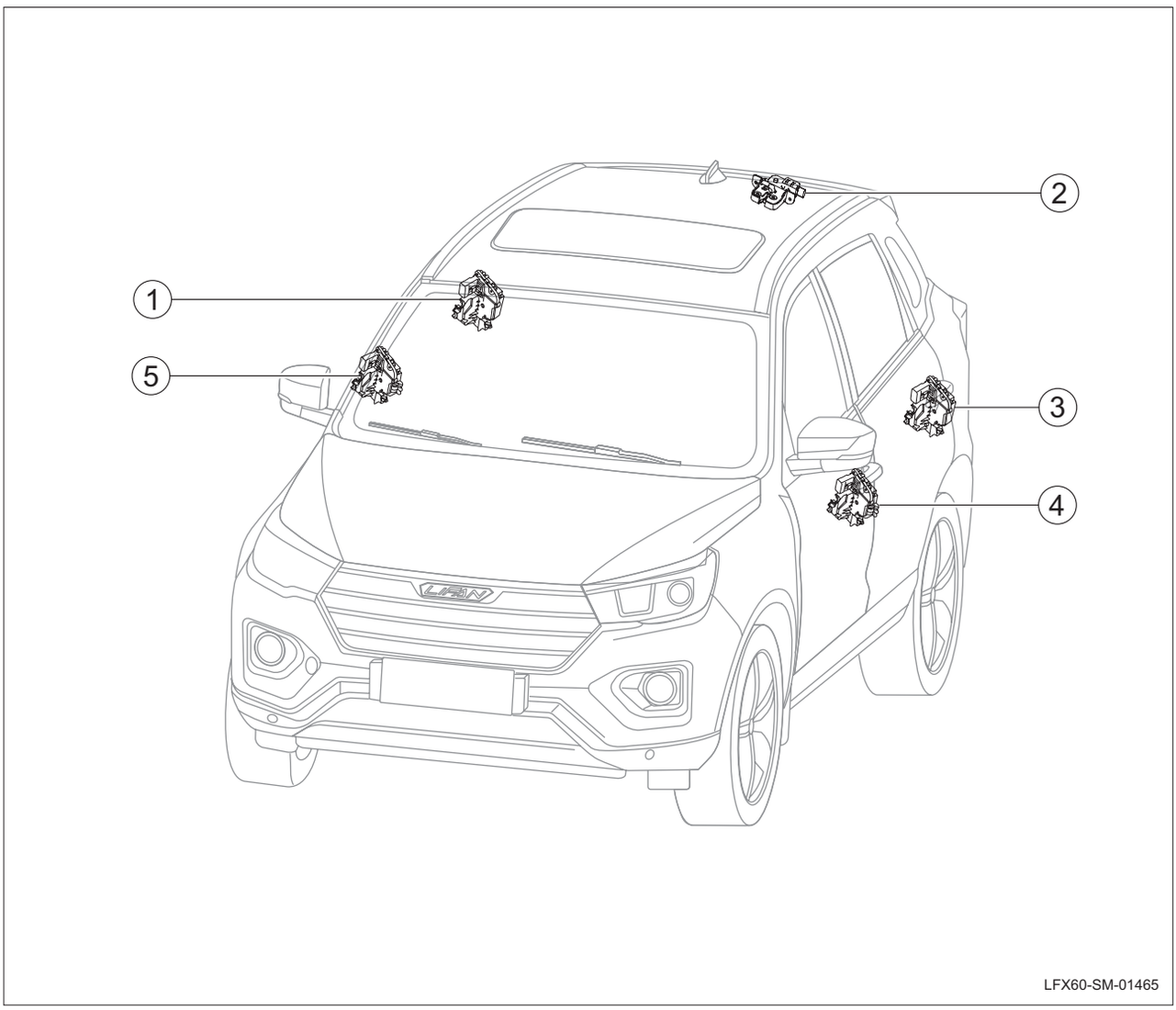
No.	Tool name	Tool figure	Tool code	Remarks
1	Digital multimeter	 LFX60-SM-12128	-	Test the voltage, resistance
2	Screwdriver	 LFX60-SM-12129	-	Remove the screw and panel
3	Wiring group	 LFX60-SM-12130	-	Check the line

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Structure and installation location

Component Location Plan



No.	Part name
1	Right rear door lock body
2	Back door lock body
3	Left rear door lock body

No.	Part name
4	Left front door lock body
5	Lock body of door (FR, RH)

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Operating Principle

Door unlocking function

Remote control unlocking function

In the remote control range, when the remote control unlock button matched with the vehicle is pressed and the high-frequency signal sent by the remote control key is received by BCM controller, if all the remote unlock conditions are met, BCM controller will unlock the door.

Remote unlock conditions (and):

1. The ignition switch is in OFF position
2. The remote unlock (door) signal is received.
3. Remote key ID is legal.
4. The key insertion signal is withdraw.

Remote unlock actions:

Unlock the door and the danger warning indicator flashes 2 times.

Unlock mode switching:

When pressing the unlock button and the lock button for more than 4s at the same time, the turn signal will flash twice to remind the unlock mode switching. In this mode, if pressing the unlock button firstly, only the driver's door can be unlocked, if pressing the unlock button secondly, other doors can be unlocked. In this mode, if repeating the operation, the four doors can be unlocked (in default mode).

Mechanical key unlocking function

When the ignition switch is OFF position, the mechanical key unlocking signal will be at low level and the four doors will be simultaneously unlocked.

Power door lock switch unlocking function

The power door lock switch unlocking function includes "Level I Unlock" and "Level II Unlock" modes.

- Level I unlock: Under any power status and at any speed, the central control switch unlocking signal will be at low level and the four doors will be simultaneously unlocked (factory default configuration).
- Level II unlock: Under any power status and at any speed, the central switch unlocking signal will be at low level and only the left front door will be unlocked; when the unlocking signal is at the low level again, the remaining three doors will be unlocked.

Electric door lock switch unlock mode switching:

- When the power supply is in ON position and the vehicle speed is less than 3km/h, if BCM receives "Unlock mode configuration signal = 1" signal sent from the instrument, the unlock mode will be set as "Level I Unlock" and "BCM/PEPS_ unlock vehicle configuration description = 0" will be set;
- When the power supply is in ON position and the vehicle speed is less than 3km/h, if BCM receives "Unlock mode configuration signal = 2" signal sent from the instrument, the unlock mode will be set as "Level II Unlock" and "BCM/PEPS_ unlock vehicle configuration description = 1" will be set;

Power-off the auto-unlocking function

If all power-off auto-unlocking function conditions are met, the controller will unlock the four doors

Power-off auto-unlocking function conditions (and):

1. The speed is ≤ 3km/h.
2. The ignition switch is switched from IG ON to OFF.
3. The left front door lock status signal is locked (in vain).

Collision unlocking function

Collision unlock: When the ignition switch is in ON position and the airbag controller outputs a collision signal, the four doors will be unlocked 3 times (with the interval of 500 ms) simultaneously, and the danger warning indicator will flash until the power supply is turned off (ie, the ignition switch is in OFF position).

Gear interlinking unlocking function

- Unlock at Gear P: For CVT model, when the engine is running, the gear is switched from any Gear non-P to Gear P and the left front door lock is locked, the four doors will be unlocked automatically.
- Lock at Gear Non-P: For CVT models, when the engine is running, the gear is switched from Gear P to any Gear non-P and the left front door lock is unlocked, the four doors will be locked automatically.

Door locking function

Remote locking function

When the remote lock button matched with the vehicle is pressed and BCM controller receives the high-frequency signal sent from the remote control key, if all remote control lock conditions are met, BCM controller will lock the doors.

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a. Remote locking function conditions (and):
1. The ignition switch is in OFF position;
2. The remote control locking signal is received;
3. The remote control key ID is legal;
4. The key insertion signal is withdraw;
5. The four doors, engine hood and trunk door are closed (in vain).

The remote control locking function executes the action:

The doors will be locked and the danger warning indicator will flash once.

b. Remote locking function conditions (and):
1. The ignition switch is in OFF position;
2. The remote control locking signal is received;
3. The remote control key ID is legal;
4. The key insertion signal is withdraw;
5. Any one of four doors, engine hood and trunk door is opened (at low level).

The remote control locking function executes the action:

The door will be locked, the danger warning indicator will flash 10 times and the speaker will sound 5 times to remind that the door is not closed (with the sound time of 50ms and the interval of 950 ms).

ⓘ Note:

When the door is locked, if the signal that the doors are not closed is trigged, it will stop when the last door is closed.

Mechanical key locking function

When the ignition switch is in OFF position and the mechanical key unlocking signal is in vain, the four doors will be locked simultaneously.

Electric door lock switch locking function

Under any power status and at any speed, when the central control switch locking signal is at low level, the four doors will be locked simultaneously.

Secondary locking function

When the vehicle is under the waring status, if the doors are not opened after pressing the remote control, the four doors will be locked automatically again after 30s and the danger warning indicator will flash once; if the doors are opened or the central lock or the ignition switch is switched within 30s, the function will exit.

Speed sensing self-locking function

When the vehicle starts and the speed is up to 20km/h, the four doors are closed, and the left front door lock is unlocked, the four doors will be locked simultaneously; during driving process, if the middle door is opened or the four doors are unlocked and the speed is less than 20km/h and then higher than 20km/h, the four doors will be locked automatically again (after the doors are locked, if the left front door lock is still unlocked, it should be under the fault status and can not be locked automatically again).

Trunk unlocking function

Remote control unlocking function

When the remote control trunk button on the remote control key matched with the vehicle is pressed for more than 1s and BCM controller receives the high-frequency signal from the remote control key, if all remote control unlocking (trunk lock) functions are met, BCM controller will unlock the trunk lock.

Remote unlocking (trunk lock) conditions (and):
1. The ignition switch is in OFF position;
2. The left front door locking signal is in vain (locking);
3. Receive the remote control trunk unlocking signal within continuous 1s and above;
4. The remote control key ID is legal;
5. The key insertion signal is withdraw;
6. Within 30s after the conditions (3) are met, the micro switch signal is switched from the invalid status to the valid status.

ⓘ Note:

- After the remote trunk unlocking signal is continuously received for 1s and above, the danger warning indicator will flash twice to indicate that the trunk door can be unlocked.
- Once the trunk door is switched from the closing status to the opening status and then to the vain status (closing), the trunk door will be automatically locked again (ie, if the remote control trunk unlocking function is operated once, the trunk door will be opened only once).
- If the trunk micro switch signal is switched from the invalid status to the valid status, the trunk lock motor will be continuously powered within the holding time of 500 ms.

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Trunk unlocking function

Five-door unlock (trunk lock) function conditions (and):

1. The ignition switch is in any positon and the speed is ≤ 3km/h;
2. The left front door locking signal is at low level (unlocking);
3. The trunk micro switch signal is switched from the invalid status to the valid status.

ⓘ Note:

If the trunk micro switch signal is switched from the invalid status to the valid status, the trunk lock motor will be continuously powered within the holding time of 500 ms.

Remote control searching function logic descriptions

Searching function: Under the warning status, if 2 consecutive remote control lock (door) signals are received within 2s, BCM will enter the searching prompt status, and the searching status will be ended after 15s; if the remote unlocking (door) signal or remote control locking signal is received within 15s of the search period, the searching function will stop and the corresponding unlocking and locking operations will be performed.

Remote searching function conditions (and):

1. The ignition switch is in OFF position;
2. Two remote control locking signals are received within 2s;
3. The remote control key ID is legal;
4. The key insertion signal is withdraw.

Remote searching stop conditions (or):

1. During searching process, receive the remote control unlocking (door) signal;
2. During searching process, receive the remote control locking signal;
3. During searching process, the ignition switch is in non-OFF position;
4. During searching process, any door status is switched;
5. The searching time is more than 15s.

Remote searching stop actions:

The danger warning indicator does not flash, the speaker does not sound and the doors are unlocked or locked.

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Diagnosis Information and Procedures

Diagnosis Instructions

Before the central lock system troubleshooting, must understand and familiarize its working principle, and then perform its diagnosis, so as to determine the correct fault diagnosis procedure in case of fault, and more importantly, to determine whether the situations described by the user are normal.

For any central lock system fault diagnosis, must inspect it firstly, and then guide the maintenance staff to take the next logical steps for fault diagnosis. Comprehend and correctly use the diagnostic flow chart to shorten the diagnosis time and avoid the misjudgement.

General equipment

Digital multimeter
Diagnostic equipment of vehicle

Visual inspection

1. Confirm the problem raised by the customer.
2. Check for the evident mechanical or electrical damage trace.

Visual inspection table

Mechanical	Electrical
• Door dislocation • Door lock buckle • Door lock cylinder • Lock cylinder connection rod	• Fuse • Harness or plug • Dashboard fuse box • Central lock switch • Trunk inching switch • Door lock actuator • BCM

3. Check the system lines easy to see or can be seen.
4. If the observed or raised problem is the evident and the cause has been found, ensure to fix this fault before proceeding with the next step.
5. If for the problem, there are no obvious findings, then confirm the fault and refer to the symptom table.

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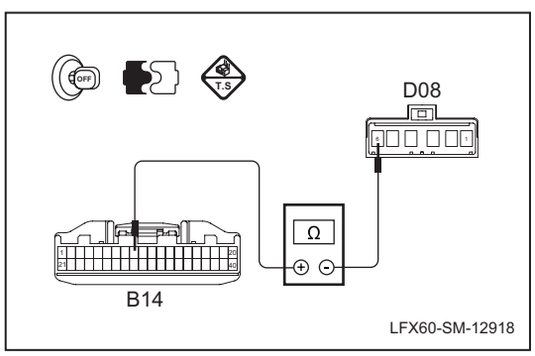
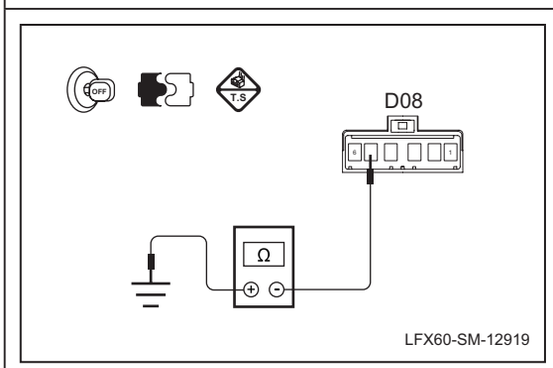
Fault symptoms table

Symptom	Possible Cause	Recommended measure
Remote control locking/unlocking abnormalities	• There is no on-board matched remote control	• Re-match the key
	• The remote control distance is too far or there is a strong interference source nearby (mobile phone, transmitter, etc.)	• Operate the remote control near the vehicle, to inspect whether the function is normal and confirm whether there is interference source nearby
	• The key voltage is too low	• Replace the remote controller battery
	• The remote control is in poor contact with the battery	• Reinstall the battery
	• Battery voltage low	• Inspect and repair the charging system
	• The remote control is damaged	• Replace the remote control and match it again
All the locks do not work	• Harness or plug	• Repair or replace the harness connection
	• BCM	• Replace the BCM **Refer to: Replacement of BCM**
Key locking/ unlocking abnormalities	• Harness or plug	**Refer to: Key locking/unlocking abnormal diagnosis flow**
	• Left front door lock cylinder connecting rod	
	• BCM	
Central switch locking/unlocking abnormalities	• Harness or plug	• Repair or replace the harness connection
	• Central lock switch	• Replace the central lock switch
	• BCM	• Replace BCM; **Refer to: BCM Replacement**
Left front door locking/unlocking abnormalities	• Harness or connector	**Refer to: Left front door locking/ unlocking abnormality Diagnosis procedure**
	• Left front door actuator	
	• BCM	
Right front door locking/unlocking abnormalities	• Harness or connector	**Refer to: Right front door locking/ unlocking abnormality Diagnosis procedure**
	• Right front door actuator	
	• BCM	
Trunk micro switch unlocking abnormalities	• Harness or connector	**Refer to: Back door locking/unlocking Diagnosis procedure**
	• Trunk inching switch	
	• BCM	

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Key locking/unlocking abnormal diagnosis flow

Test condition	Details/results/measures
1. General inspection.	
	A. Inspect the left front door lock cylinder connecting rod for shedding. B. Inspect the left front door actuator wiring harness connector for loosening, aging, shedding or other abnormalities. Is it OK after checking? →**Yes** To step 2. →**No** Repair the fault position.
2. Inspect the key unlocking/locking signal line.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the front left door actuator harness plug D08. D. Disconnect the BCM harness plug B14. E. Measure the resistance between Terminal 6 of the left front door actuator wiring harness connector D08 and Terminal 9 of BCM wiring harness connector B14 with a multimeter. **Standard value: Less than 5Ω** Is the resistance normal? →**Yes** To step 3. →**No** Inspect and repair the key unlocking/locking signal line fault; if necessary, replace the wiring harness.
3. Inspect the key unlocking/locking signal grounding point.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the front left door actuator harness plug D08. D. Measure the resistance between Terminal 5 of the left front door actuator wiring harness connector D08 and the reliable grounding point with a multimeter. **Standard value: Less than 5Ω** Is the resistance normal? →**Yes** To step 4. →**No** Inspect and repair the key unlocking/locking signal grounding point fault; if necessary, replace the wiring harness.

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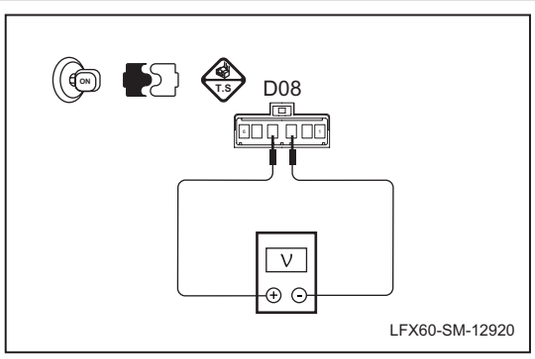
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Test condition	Details/results/measures
4. Inspect the left front door lock assembly.	
	A. Replace the left front door lock assembly. **Refer to: Replacement of front door lock body assembly** Is the troubleshooting successful? →**Yes** Replace the left front door lock assembly. →**No** To step 5.
5. Check the BCM.	
	A. Replace the BCM. **Refer to: Replacement of BCM** Confirm that troubleshooting is completed.

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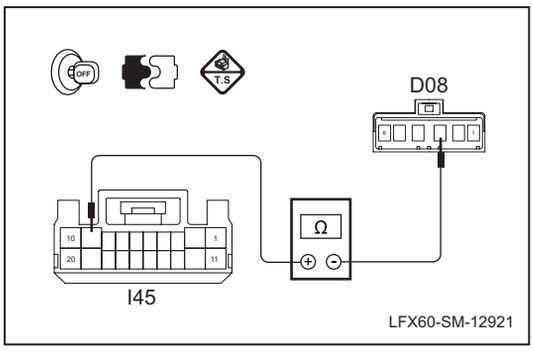
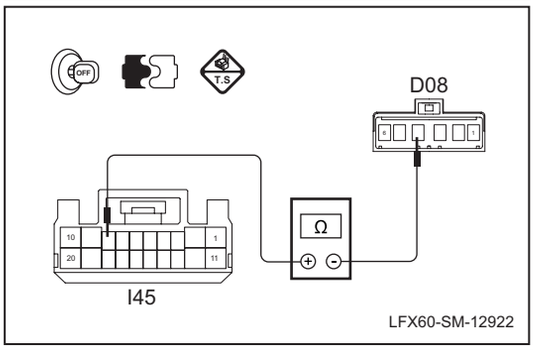
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Left front door locking/unlocking abnormality diagnosis procedure

Test condition	Details/results/measures
1. General inspection.	
	A. Inspect the left front door lock fasteners for loosening. B. Inspect the left front door lock for mechanical fault. C. Inspect the left front door lock bucket for normal operation. D. Is it OK after checking? →**Yes** To step 2. →**No** Repair the fault parts or replace the faulty components
2. Inspect the left front door actuator operating voltage.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the front left door actuator harness plug D08. D. Connect the battery negative terminal. E. Operate the ignition switch to turn the power to ON state. F. Perform the left front door locking/unlocking actions and measure the voltage between Terminals 3 and 4 of the left front door actuator wiring harness connector D08 with a multimeter. **Standard value: 11 ~ 14 V** Is the voltage is OK? →**No** To step 3. →**Yes** To step 4.

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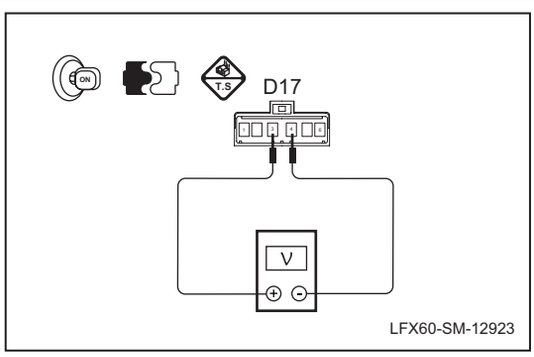
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Test condition	Details/results/measures
3. Inspect the left front door actuator line.	
 LFX60-SM-12921  LFX60-SM-12922	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the front left door actuator harness plug D08. D. Disconnect the BCM harness plug I45. E. Measure the resistance between Terminal 3 of the left front door actuator wiring harness connector D08 and Terminal 9 of BCM wiring harness connector I45 with a multimeter. **Standard value: Less than 5Ω** F. Measure the resistance between the front left door actuator harness plug D08 terminal 4 and BCM harness plug I45 terminal 8 with the multimeter. **Standard value: Less than 5Ω** Is the resistance normal? →**Yes** To step 5. →**No** Inspect and repair the left front door actuator line fault; if necessary, replace the wiring harness.
4. Inspect the left front door actuator.	
	A. Replace the left front door actuator. **Refer to: Replacement of front door lock body assembly** Confirm that troubleshooting is completed.
5. Check the BCM.	
	A. Replace BCM. **Refer to: Replacement of BCM** Confirm that troubleshooting is completed.

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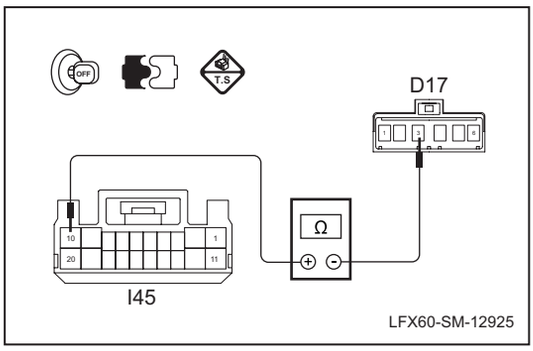
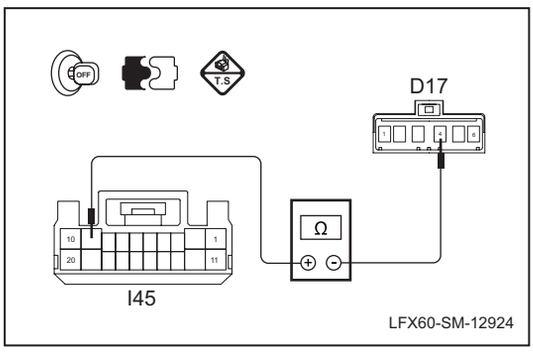
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Right front door locking/unlocking abnormality diagnosis procedure

Test condition	Details/results/measures
1. General inspection.	
	A. Check the front right door fasteners for looseness. B. Check the front right door for mechanical fault. C. Check whether the front right door is normal. Is it OK after checking? →**Yes** To step 2. →**No** Repair the fault parts or replace the faulty components.
2. Check the front right door actuator operating voltage.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the front right door actuator harness plug D17. D. Connect the battery negative terminal. E. Operate the ignition switch to turn the power to ON state. F. Perform the right front door locking/unlocking actions, while measure the voltage between Terminals 3 and 4 of the front door actuator wiring harness connector D17 with a multimeter. **Standard value: 11 ~ 14 V** Is the voltage is OK? →**No** To step 3. →**Yes** To step 4.

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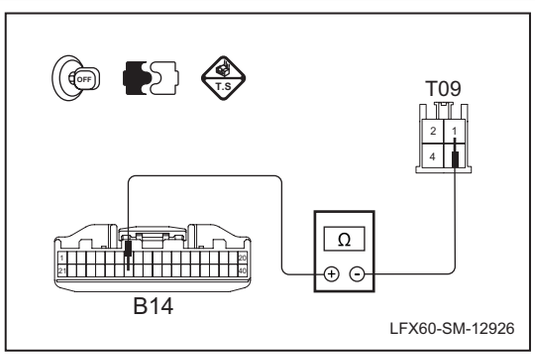
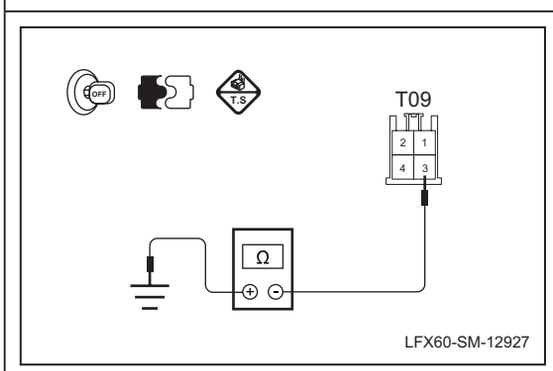
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Test condition	Details/results/measures
3. Check the front right door actuator line.	
 LFX60-SM-12925  LFX60-SM-12924	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the front right door actuator harness plug D17. D. Disconnect the BCM harness plug I45. E. Measure the resistance between the front right door actuator harness plug D17 terminal 4 and BCM harness plug I45 terminal 10 with the multimeter. **Standard value: Less than 5Ω** F. Measure the resistance between the front right door actuator harness plug D17 terminal 3 and BCM harness plug I45 terminal 9 with the multimeter. **Standard value: Less than 5Ω** Is the resistance normal? →**Yes** To step 5. →**No** Repair the front right door actuator line fault and replace the harness if necessary.
4. Check the front right door actuator.	
	A. Replace the front right door actuator. Confirm that troubleshooting is completed.
5. Check the BCM.	
	A. Replace BCM. **Refer to: Replacement of BCM** Confirm that troubleshooting is completed.

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Trunk micro switch unlocking fault diagnosis procedure

Test condition	Details/results/measures
1. General inspection.	
	A. Inspect the trunk micro switch wiring harness plug for loosening, aging, shedding and other abnormities. Is it OK after checking? →**Yes** To step 2. →**No** Repair the fault position.
2. Inspect the trunk micro switch signal line.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the trunk inching switch harness plug T09. D. Disconnect the BCM harness plug B14. E. Measure the resistance between Terminal 1 of the trunk micro switch wiring harness connector T09 and Terminal 28 of BCM wiring harness connector B14 with a multimeter. **Standard value: Less than 5Ω** Is the resistance normal? →**Yes** To step 3. →**No** Inspect and repair the trunk micro switch signal line fault; if necessary, replace the wiring harness.
3. Inspect the trunk micro switch grounding point.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the trunk inching switch harness plug T09. D. Measure the resistance between Terminal 3 of the trunk micro switch wiring harness connector T09 and the reliable grounding point with a multimeter. **Standard value: Less than 5Ω** Is the resistance normal? →**Yes** To step 4. →**No** Inspect and repair the trunk micro switch grounding point fault; if necessary, replace the wiring harness.

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Test condition	Details/results/measures
4. Inspect the trunk micro switch.	
	A. Replace the trunk micro switch. Is the troubleshooting successful? →**Yes** Replace the trunk micro switch. →**No** To step 5.
5. Check the BCM.	
	A. Replace BCM. **Refer to: Replacement of BCM** Confirm that troubleshooting is completed.

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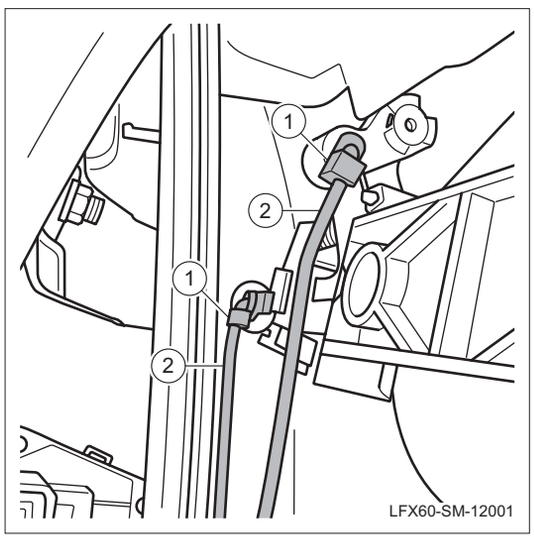
Removal and Installation

Replacement of the front door lock body assembly

Removal

1. Remove the front door lock body assembly.

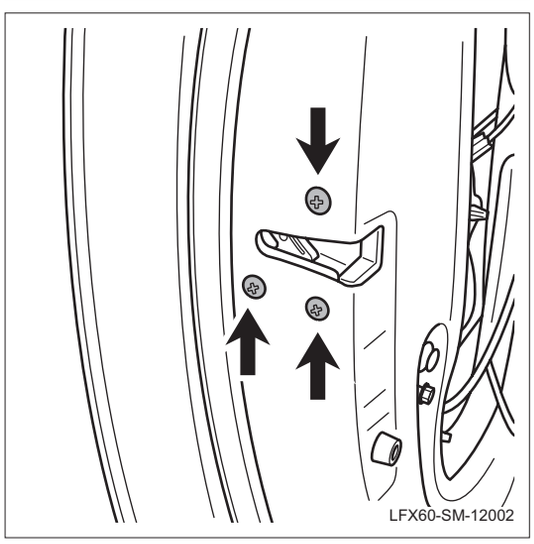
(a). Remove the front door interior trim board. **Refer to the replacement of front door interior trim board.**



(b). Remove the front door water-proof membrane.

(c). Remove the outer door opening lever buckle 1 from the front door lock body assembly.

(d). Remove the door lock cylinder pull rod 2 from the front door lock body assembly.



(e). Remove the front door lock body assembly fixing bolt.

(f). Disconnect the front door lock wiring harness connector.

(g). Remove the front door lock body and pull rod assembly.

(h). Disconnect the two pull rods of the outer handle from the front door lock body.

Installation

1. Install the front door lock body assembly.

(a). The installation sequence is the reverse of the disassembly order.

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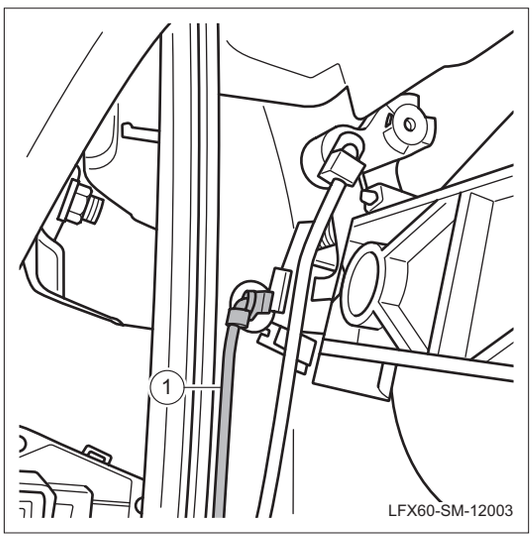
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Replacement of the front door lock cylinder

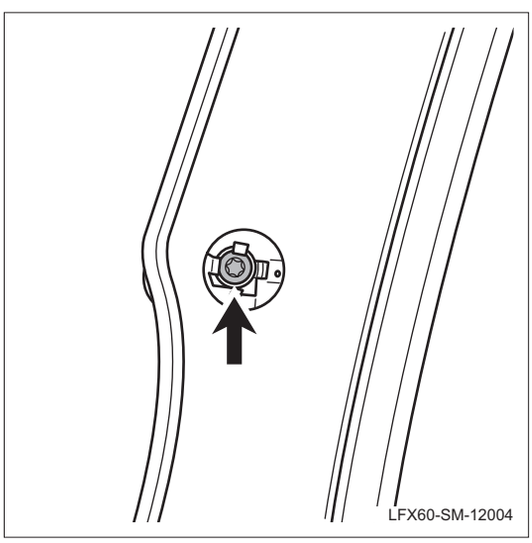
Removal

1. Remove the front door lock cylinder.

(a). Remove the front door interior trim board. **Refer to the replacement of front door interior trim board.**



(b). Remove the front door water-proof membrane.
(c). Remove the front door lock cylinder pull rod 1.



(d). Remove the front door lock cylinder fixing screw trim cap.
(e). Remove the front door lock cylinder fixing bolt.
(f). Remove the front door lock cylinder and trim cap assembly.
(g). Remove the front door lock cylinder.

Installation

1. Install the front door lock cylinder.

(a). The installation sequence is the reverse of the disassembly order.

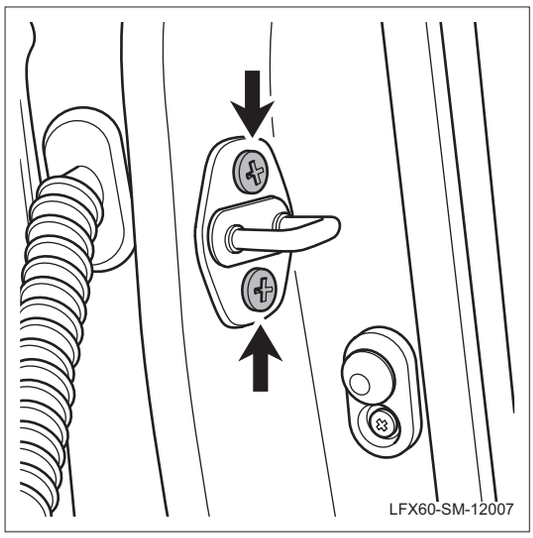
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Replacement of front door lock bucket

Removal

1. Remove the front door lock bucket.



(b). Remove the front door lock bucket fixing bolt.

ⓘ Note:

Before removal, make assembly mark for proper re-installaiton.

(c). Remove the front door lock bucket.

Installation

1. Install the front door lock bucket.

(a). The installation sequence is the reverse of the disassembly order.

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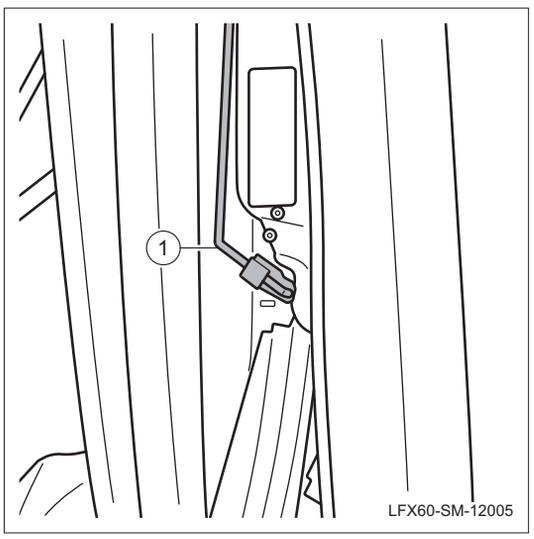
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Replacement of rear door lock body assembly

Removal

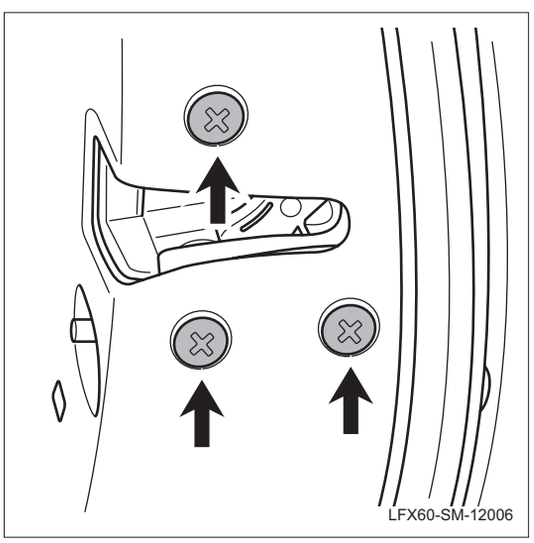
1. Remove the rear door lock body assembly.

(a). Remove the rear door interior trim board. **Refer to the replacement of rear door interior trim board.**



(b). Remove the rear door water-proof membrane.

(c). Remove the outer door opening lever buckle 1 from the rear door lock body assembly.



(d). Remove the rear door lock body assembly fixing bolt.

(e). Remove the rear door lock body assembly.

Installation

1. Install the rear door lock body assembly.

(a). The installation sequence is the reverse of the disassembly order.

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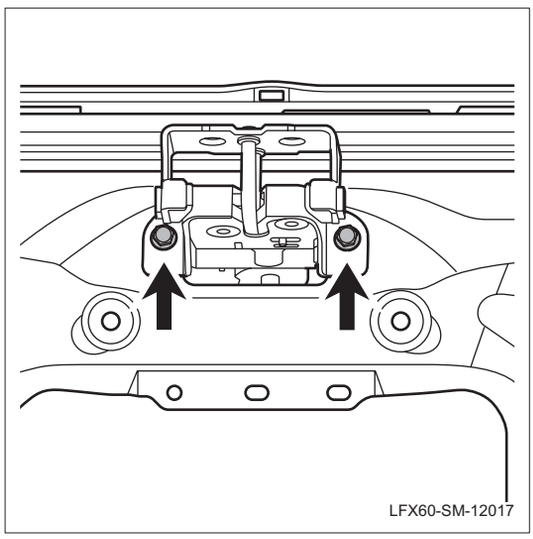
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Replacement of the back door lock body assembly

Removal

1. Remove the back door lock body assembly.

(a). Remove the back door inner shield panel; **refer to: Replacement of Back Door Inner Shield Panel.**



(b). Disconnect the back door lock body assembly wiring harness connector.

(c). Remove the back door lock body assembly fixing bolt and remove the back door lock body assembly.

Installation

1. Install the back door lock body assembly.

(a). The installation sequence is the reverse of the disassembly order.

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12- Electrical system

Roof 12-1843

Technical specifications ... 12-1843

Operating Principle 12-1844

Diagnosis Information and Procedures 12-1845

Removal and Installation . 12-1851

AutoLibrary

AutoLibrary

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Roof

Technical specifications

General specifications

Name	Specification	
Normal operating voltage	12V	13V
Operating voltage range	9~16V	9~15V
Operating environment temperature	-30 °C ~ 85 °C	-30 °C ~ 90 °C

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Operating Principle

System overview

If your vehicle is equipped with a sunroof, you can open, close, or tilt the sunroof with the sunroof control switch on the roof. The sunroof can only be operated when the ignition switch is in “ON” position.

⚠ Warning:

Do not operate the sunroof during driving process, otherwise the vehicle may be loss of control due to driver attention transfer, resulting in traffic accidents, with property damage or persion injury or even death.

The sunroof system consists of the following components:

- Skylight switch
- Skylight motor
- Sunroof frame assembly

Power window function logic description

Remote control window closing function

When BCM/PEPS controller receives the remote control locking high-requency signal for more than 2s sent from the remote control key, if all remote control window closing conditions are met, BCM/PEPS controller will perform the window and sunroof closing function. (all configurations are provided with the sunroof closing function, without need of diagnosisi opening function.)

Remote control window closing function conditions (and):

1. The ignition switch is in OFF position;
2. The remote control key ID is legal;
3. The key insertion signal is withdraw;
4. Receive the remote control locking signal for more than 2s.

Remote window closing operation stop conditions (or):

1. During closing process, receive a remote control locking signal;
2. During closing process, receive a remote control unlocking (door) signal;
3. During closing process, receive a remote control trunk unlocking signal;
4. During closing process, the left front door lock status signal is switched from vain to the low level (unlocking);
5. During closing process, the ignition switch is in non-OFF position.

The remote control window close stop function executes the action:

Do not perform the corresponding unlocking and locking function, perform the window closing stop function; the sunroof will be closed continuously.

During the remote control window closing process, PEPS will outputs the high level signal (continuous 2s) to the sunroof controller.

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Diagnosis Information and Procedures

Diagnosis Instructions

Before the sunroof system troubleshooting, must familiarize and understand its working principle, and then perform its diagnosis, which helps to determine the correct troubleshooting steps in case of a fault, and more importantly, to determine whether the situation descrived by the user is normal.

In any sunroof system fault diagnosis, must first inspect it, and guide the maintenance staff to take the next logical steps for fault diagnosis. Comprehend and correctly use the diagnostic flow chart to shorten the diagnosis time and avoid the misjudgement.

General equipment

Digital multimeter
Diagnostic equipment of vehicle

Visual inspection

1. Confirm the problem raised by the customer.
2. Check for the evident mechanical or electrical damage trace.

Visual inspection table

Electrical
• Fuse • Harness or plug • Dashboard fuse box • Skylight switch • Skylight motor • PEPS ECU/BCM

3. Check the system lines easy to see or can be seen.
4. If the observed or raised problem is the evident and the cause has been found, ensure to fix this fault before proceeding with the next step.
5. If for the problem, there are no obvious findings, then confirm the fault and refer to the symptom table.

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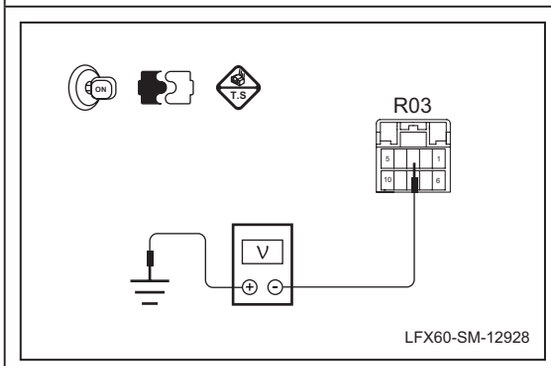
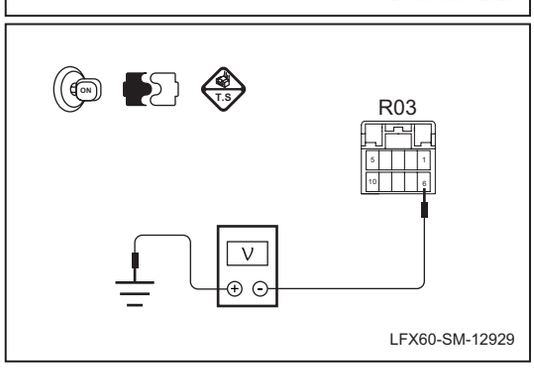
Fault symptoms table

Symptom	Possible cause	Recommended measure
The sunroof can not be opened	• Skylight mechanical seizing	**Refer to: Diagnosis procedure about that the sunroof can not be opened**
	• Fuse	
	• Harness or plug	
	• Dashboard fuse box	
	• Skylight switch	
	• Skylight motor	
	• PEPS ECU/BCM	
The opened sunroof can not be closed	• Skylight mechanical seizing	**Refer to: Diagnosis procedure about that the opened sunroof can not be closed**
	• Skylight switch	
	• Skylight motor	
The sunroof is leaked	• Seal strips	• Repair or replace the seal strips
	• The drain tube is disconnected	• Reinstall the sunroof drain tube
	• The sunroof is stuck and can not be closed completely	• Inspect and repair the sunroof
The sunroof sends an abnormal sound	• There is a foreign matter in the sunroof chute	• Clean up the foreign matter and lubricate the chute
	• Skylight motor	• Replace the sunroof motor **Refer to: Replacement of skylight motor**

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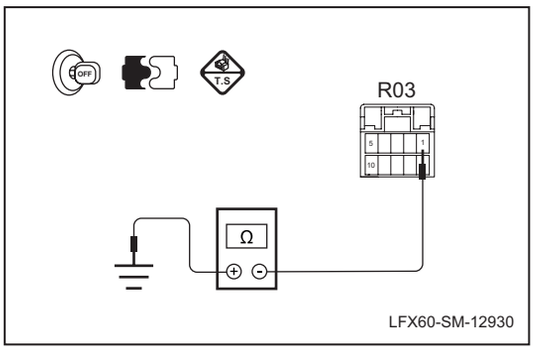
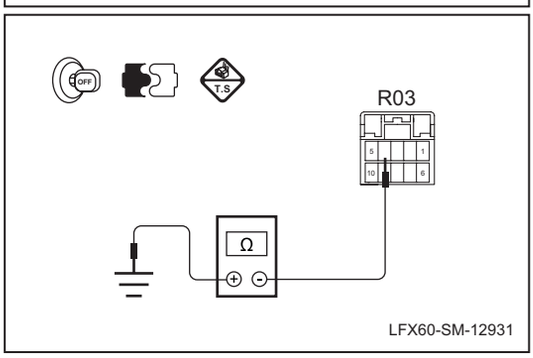
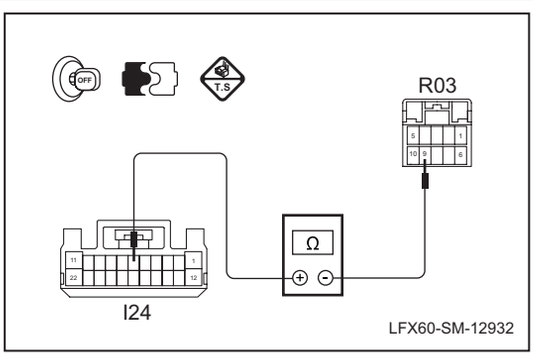
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Diagnosis procedure about the skylight can not be opened

Test condition	Details/results/measures
1. General inspection.	
	A. Inspect whether the sunroof is installed properly and whether there is mechanical jam. B. Inspect the sunroof motor and sunroof switch wiring harness connector for loosening, aging, falling off and other abnormities. Is it OK after checking? →**Yes** To step 2. →**No** Repair the fault position.
2. Check the fuse.	
	A. Inspect the sunroof motor fuses FS10 and FS29. **Fuse rated capacity: FS10 (10A), FS29 (15 A)** Is it OK after checking? →**Yes** To step 3. →**No** Replace the fuse.
3. Inspect the sunroof motor power supply.	
 LFX60-SM-12928  LFX60-SM-12929	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the skylight motor harness plug R03. D. Connect the battery negative terminal. E. Operate the ignition switch to turn the power to ON state. F. Measure the voltage between Terminal 3 of the sunroof motor wiring harness connector R03 and the reliable grounding point with a multimeter. **Standard value: 11 ~ 14 V** G. Measure the voltage between skylight motor harnmess plug R03 terminal 6 and fixed ground point with the multimeter. **Standard value: 11 ~ 14 V** Is the voltage is OK? →**Yes** To step 4. →**No** Inspect and repair the sunroof motor power line fault; if necessary, replace the dashboard wiring box.

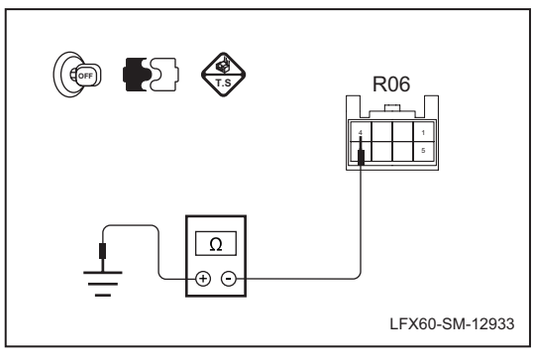
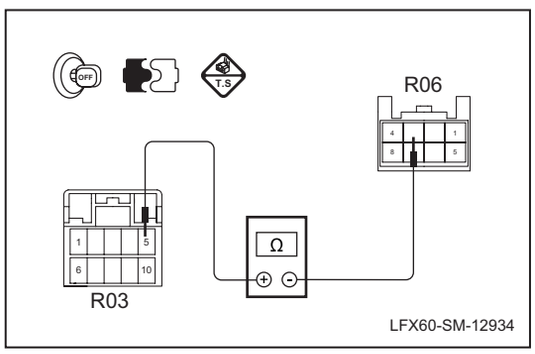
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Test condition	Details/results/measures
4. Inspect the sunroof motor grounding point.	
 LFX60-SM-12930  LFX60-SM-12931	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the skylight motor harness plug R03. D. Measure the resistance between Terminal 1 of the sunroof motor wiring harness connector R03 and the reliable grounding point with a multimeter. **Standard value: Less than 5Ω** E. Measure the voltage between skylight motor harnmess plug R03 terminal 2 and fixed ground point with the multimeter. **Standard value: Less than 5Ω** Is the resistance normal? **→Yes** To step 5. **→No** Inspect and repair the sunroof motor grounding point fault; if necessary, replace the wiring harness.
5. Inspect the sunroof control signal line.	
 LFX60-SM-12932	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the skylight motor harness plug R03. D. Disconnect the PEPS ECU harness plug I24. E. Measure the resistance between Terminal 9 of the sunroof motor wiring harness connector R03 and Terminal 6 of PEPS ECU wiring harness connector I24 with a multimeter. **Standard value: Less than 5Ω** Is the resistance normal? **→Yes** To step 6. **→No** Inspect and repair the sunroof control signal line fault; if necessary, replace the wiring harness.

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Test condition	Details/results/measures
6. Inspect the sunroof switch control grounding point.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the front dome lamp harness plug R06. D. Measure the resistance between Terminal 4 of the front dome lamp wiring harness connector R06 and the reliable grounding point with a multimeter. **Standard value: Less than 5Ω** Is the resistance normal? **→Yes** To step 7. **→No** Inspect and repait the sunroof switch control grounding point fault; if necessary, replace the wiring harness.
7. Inspect the sunroof opening signal line.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the front dome lamp harness plug R06. D. Disconnect the sunroof motor wiring harness connector R03. E. Measure the resistance between Terminal 3 of the front dome lamp wiring harness connector R06 and Terminal 5 of the sunroof motor wiring harness connector R03 with a multimeter. **Standard value: Less than 5Ω** Is the resistance normal? **→Yes** To step 8. **→No** Inspect and repair the sunroof opening signal line fault; if necessary, replace the wiring harness.
8. Check the skylight switch.	
	A. Replace the sunroof switch. **Refer to: Replacement of Sunroof Switch** Is the troubleshooting successful? **→Yes** Replace the sunroof switch. **→No** To step 9.

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Test condition	Details/results/measures
9. Inspect the sunroof motor.	
	A. Replace the sunroof motor. **Refer to: Replace the sunroof motor.** Is the troubleshooting successful? →**Yes** Replace the sunroof motor. →**No** To step 10.
10. Inspect PEPS control unit.	
	A. Replace the PEPS control unit. **Refer to: Replacement of PEPS control unit** Confirm that troubleshooting is completed.

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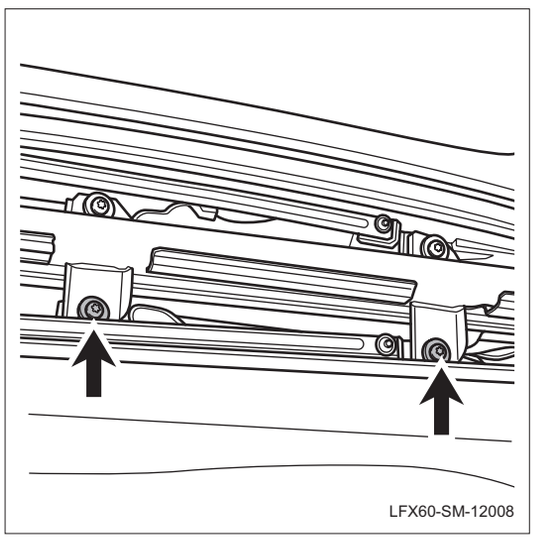
Removal and Installation

Replacement of the sunroof glass assembly

Removal

1. Remove the sunroof glass assembly.

(a). Open the sunvisor.



(b). Remove the sunroof glass assembly fixing bolts.

△ **Tips:**

The fixing bolts on both sides can be removed with the same method.

(c). Remove the sunroof glass assembly.

Installation

1. Install the sunroof glass assembly.

(a). The installation sequence is the reverse of the disassembly order.

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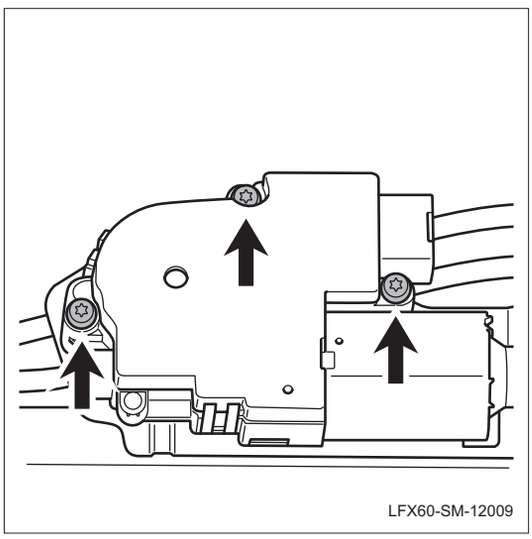
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Replacement of the sunroof motor

Removal

1. Remove the sunroof motor.

(a). Remove the top cover trim; **refer to: Replacement of Top Cover Trim.**



(b). Disconnect the sunroof motor wiring harness connector.

(c). Remove the sunroof motor fixing bolts.

(d). Remove the sunroof motor.

Installation

1. Install the sunroof motor.

(a). The installation sequence is the reverse of the disassembly order.

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12- Electrical system

Power window..... 12-1857

Technical specifications ... 12-1857

Precautions..... 12-1858

Preparation 12-1859

Operating Principle 12-1860

Structure and installation location.. 12-1862

Diagnosis information and procedures..... 12-1863

Removal and Installation . 12-1875

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Power window

Technical specifications

General specifications

Name	Specification
Door glass lifter motor	Operating voltage: 12V

Torque Specifications

Name	Torque range	
	Metric (Nm)	British (lb-ft)
Connecting bolt between the glass and the lifter	9	7
Connecting bolt between the movable rail and the body	9	7

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Precautions

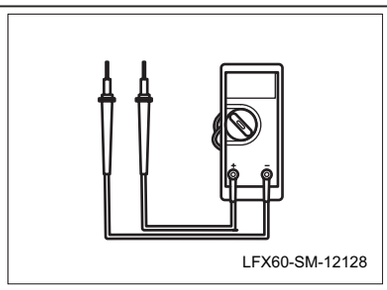
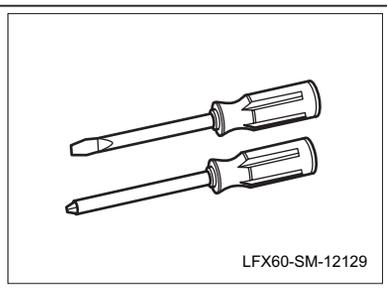
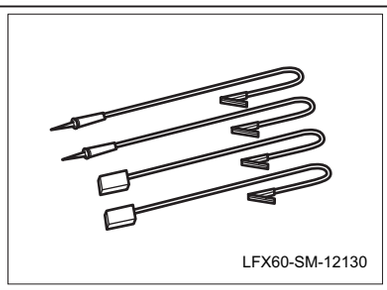
1. If any circuit is required for removal and repair in the repair process, the negative battery connector must be first disconnected.
2. In the maintenance, if the door needs to be opened for removal, the door should be supported with a rod.
3. Do not remove the trim panels and other wearing parts with a sharp tool.

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Preparation

General maintenance tools

No.	Tool name	Tool figure	Tool code	Remarks
1	Digital multimeter	 LFX60-SM-12128	-	Test the voltage, resistance
2	Screwdriver	 LFX60-SM-12129	-	Remove the screw and panel
3	Wiring group	 LFX60-SM-12130	-	Check the line

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Operating Principle

Remote window opening function

When PEPS controller receives the remote control unlocking high frequency signal sent from the smart key for more than 2s, if all remote control window opening function conditions are met, PEPS controller will perform the window opening function and send the remote window opening message via CAN bus. All configurations are provided with this function by default, without need of the diagnosiss opening function.

Remote window opening function conditions (and):

1. The vehicle power supply is in OFF position;
2. The smart key ID is legal;
3. Received the remote unlocking signal for more than 2s.

Remote window opening stop conditions (or):

1. During the window opening process, receive a remote locking signal;
2. During the window opening process, receive a remote unlocking (door) signal;
3. During the window opening process, receive a remote unlocking (trunk) signal;
4. During the window opening process, the vehicle power supply is in non-OFF position.

The remote control window close stop function executes the action:

During the window opening process, if receiving the remote control unlocking or remote control locking or remote control trunk unlocking signal, the window opening stop function will be performed, and the door unlocking, locking and trunk unlocking functions will not be performed.

Power window switch closing and opening functions

Power window rise function

Power window rise function conditions (and):

1. The entire vehicle power is in ON gear;
2. The resistance between the power window signal input pins is 2940Ω ≤ R ≤ 3060Ω;

Actions: the corresponding window will perform the rise function.

Power window rise function stop conditions (or):

1. The power window rise signal will be in vain;
2. Detect the locking current (12A for individual window);
3. The glass lift single output time exceeds 8s.

Actions: the corresponding window will perfomr the rise stop function.

Power window automatic rise function

Power window automatic rise function conditions (and):

1. The entire vehicle power is in ON gear;
2. The resistance between the power window signal signal input pinns is 980Ω ≤ R ≤ 1020Ω.

Actions: the corresponding window will perform the automatic rise function.

Power window automatic rise function stop conditions:

1. Detect the locking current (12A for individual window);
2. The glass lift single output time exceeds 8s;
3. Detect the electric window switch up or down signal.

Actions: the corresponding window will perform the automatic rise stop function

Power window drop function

Power window drop function conditions (and):

1. The entire vehicle power is in ON gear;
2. The resistance btween the power window signal input pins is 325.36Ω ≤ R ≤ 343.64Ω.

Perfrom the actions: the corresponding window will perform the drop function.

Power window drop function stop conditions (or):

1. The power window drop signal is in vain;
2. Detect the locking current (12A for individual window);
3. The glass lift single output time exceeds 8s.

Perfrom the actions: the corresponding window will perform the drop stop function.

Power window automatic drop function

Power window automatic drop function conditions (and):

1. The entire vehicle power is in ON gear;
2. The resistance between the power window input signal pins is R ≤ 5Ω.

Actions: the corresponding window will perform the automatic drop function.

Power window automatic drop stop conditions:

1. Detect the locking current (12A for individual window);
2. The glass lift single output time exceeds 8s;

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3. Detect the electric window switch up or down signal.

Actions: the corresponding window will perform the automatic drop stop function.

Power window locking function

Power door locking function opening conditions (and):

1. The entire vehicle power is in ON gear;
2. The power window locking function is under OFF status;
3. Detect the electric window locking input signal changes to low level from suspending (the locking switch is hold-to-run type).

Actions: Turn on the window lock switch operating indicator; monitor that the corresponding window action is performed via the driver armrest board switch signal and the window actions are not performed via other three armrest board signals.

Power window locking function closing conditions (and):

1. The entire vehicle power is in ON gear;
2. The power window locking function is in ON positon;
3. Detect the electric window locking input signal changes to low level from suspending (the locking switch is hold-to-run type).

Actions: Turn off the window lock switch operating indicator;

Monitor that the corresponding operations are performed via the driver armrest board switch signal and other three armrest board signals.

ⓘ Note:

- **The default configuration is that the power window locking function is turned off.**
- **The controller is prvided with the memory function.**
- **When the power window locking function is under ON status, the power window lock operating indicator will be turned off after locking with remote control, PE, key and the second locking, and will be turned on after unlocking with remote control, PE and key.**
- **When the power supply is in OFF position and the power window locking function is under ON status, the operating indicator will be turned off after 8 min, for energy saving.**

Electric window operation delay function

Within a period of time since the vehicle power supply is switched from ON to ACC or OFF position, the power window switch can be operated to open or close the window.

Electric window operation delay function conditions (and)

1. Afer 60s since the vehicle power supply is switched from ON to ACC or OFF position;
2. The left front door and the right front door are under closed (vain) status.

Power window operation delay function stop conditions (or):

1. Afer 60s since the vehicle power supply is switched from ON to ACC or OFF position;
2. Within 60s after the vehicle power supply is switched from ON to ACC or OFF position and the left front door or right front door is swithced from OFF (vain) to ON (low level) status.

ⓘ Note:

The power window lifter switch on the driver side must prevail.

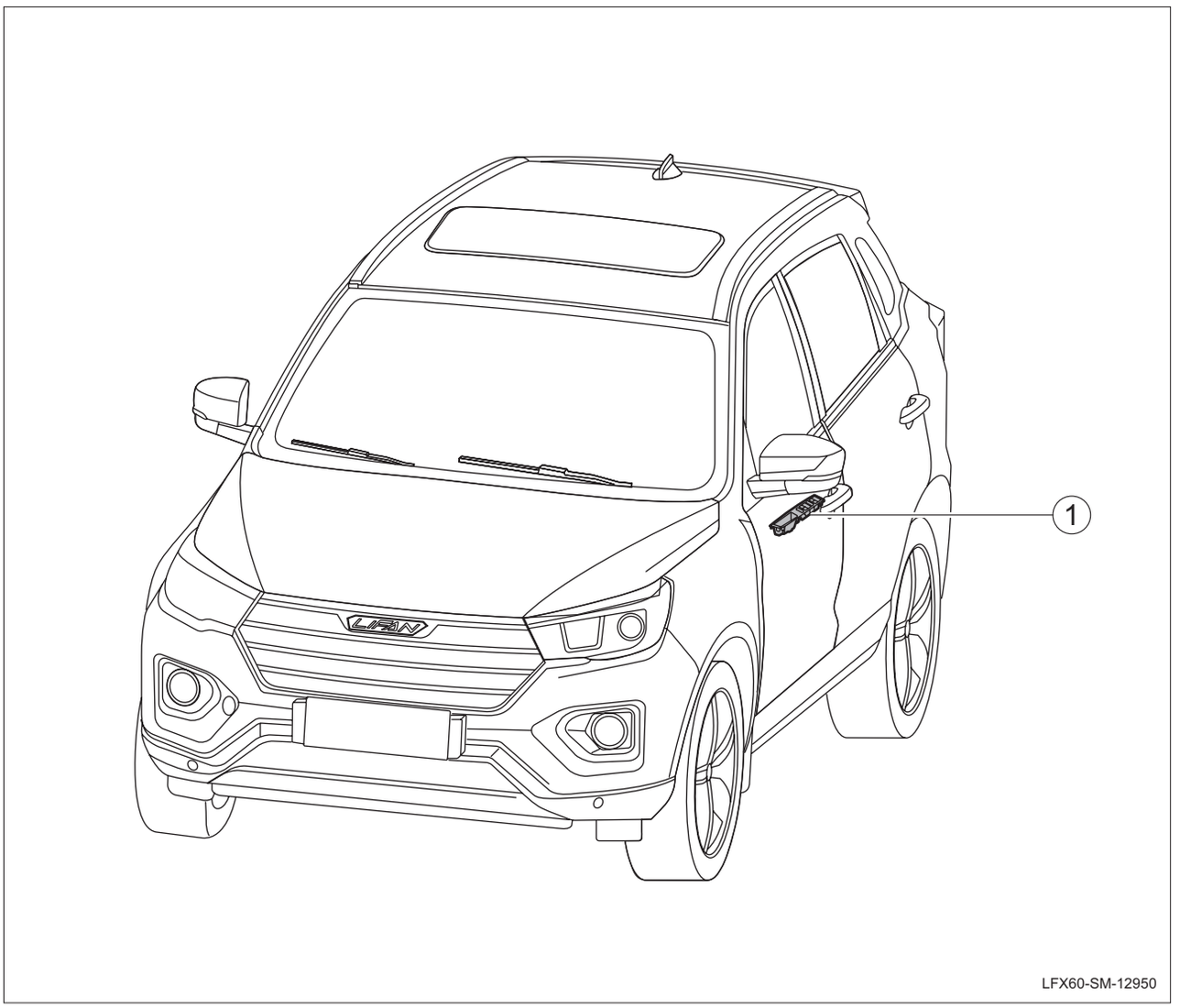
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Structure and installation location

Component Location Plan

Front left door window switch assembly



No.	Part name
1	Front left door window switch assembly

No.	Part name

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Diagnosis information and procedures

Diagnosis instructions

Before the power window troubleshooting, must familiarize and understand its working principle, and then perform its diagnosis, which helps to determine the correct troubleshooting steps in case of a fault, and more importantly, to determine whether the situation descrived by the user is normal.

In any power window fault diagnosis, must first inspect it, and guide the maintenance staff to take the next logical steps for fault diagnosis. Comprehend and correctly use the diagnostic flow chart to shorten the diagnosis time and avoid the misjudgement.

General equipment

Digital multimeter
Diagnostic equipment of vehicle

Visual Inspection

1. Confirm the problem raised by the customer.
2. Check for the evident mechanical or electrical damage trace.

Visual inspection table

Electrical
• Fuse • Harness or plug • Dashboard fuse box • Window switch • Glass lifter motor • BCM

3. Check the system lines easy to see or can be seen.
4. If the observed or raised problem is the evident and the cause has been found, ensure to fix this fault before proceeding with the next step.
5. If for the problem, there are no obvious findings, then confirm the fault and refer to the symptom table.

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Fault symptoms table

Symptom	Possible Cause	Recommended measure
All power windows are not working	• Fuse	**Refer to: No electric window working diagnosis flow**
	• Harness or plug	
	• Dashboard fuse box	
	• Window switch	
	• BCM/PEPS ECU	
The power window on the driver side is not operated	• Fuse	**Refer to: Driver's side electric window not working diagnosis flow**
	• Harness or plug	
	• Dashboard fuse box	
	• Window switch	
	• Glass lift motor	
	• BCM/PEPS ECU	
The power windows on the passenger side is not operated	• Harness or plug	**Refer to: Passenger's side electric window not working diagnosis flow**
	• Window switch	
	• Glass lift motor	
	• BCM/PEPS ECU	
One button window drop function is faulty	• Harness or plug	• Repair or replace the harness plug
	• Window switch	• Replace the window switch
	• BCM/PEPS ECU	• Replace the BCM **Refer to: Replacement of BCM**
The window locking function is faulty	• Harness or plug	• Repair or replace the harness plug
	• Window switch	• Replace the window switch **Refer to: Replacement of driver's side glass lift switch**
	• BCM/PEPS ECU	• Replace the BCM **Refer to: Replacement of BCM**
The window switch backlight lamp is not turned on	• Harness or plug	• Repair or replace the harness plug
	• Window switch	• Replace the window switch
	• BCM	• Replace the BCM **Refer to: Replacement of BCM**

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The window glass is operated slowly	• Battery voltage low	• Inspect and repair the charging system or replace the battery
	• Glass guide rail	• Repair or replace the glass guide rail
	• Glass chute	• Repair or replace the glass chute
	• Door	• Repair or replace the door
	• Glass lifter	• Repair or replace the glass lifter assembly

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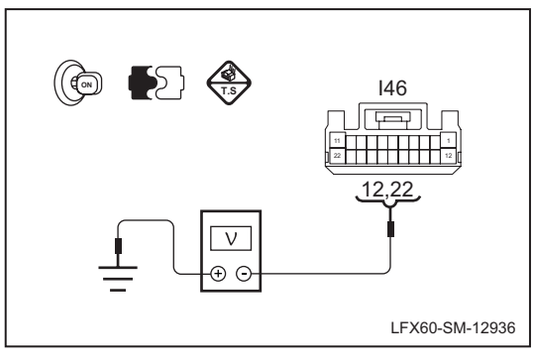
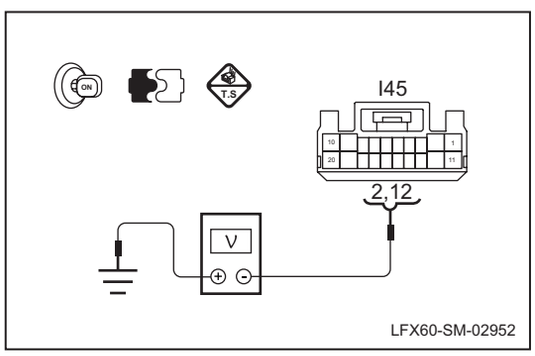
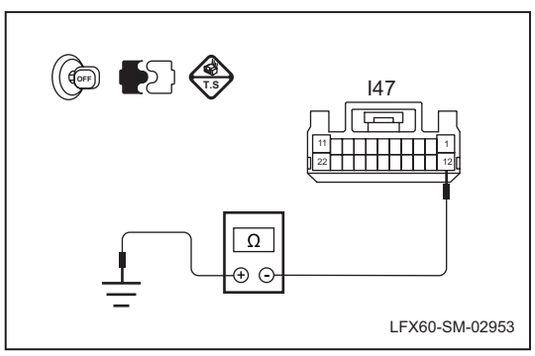
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No electric window working diagnosis flow

Test condition	Details/results/measures
1. General inspection.	
	A. Check the window switch and glass lift harness plug for looseness, aging or falling. Is it OK after checking? →**Yes** To step 2. →**No** Repair the fault position.
2. Inspect the glass lifter fuse.	
	A. Checkthe glass lifter fuse SB04. **Fuse rated capacity: 30 A** Is it OK after checking? →**Yes** To step 3. →**No** Replace the fuse.
3. Check the battery voltage.	
	A. Measure the battery voltage with a multimeter. **Standard value: 11 ~ 14 V** Is the voltage is OK? →**Yes** To step 4. →**No** Inspect and repair the charging system or replace the battery.

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Test condition	Details/results/measures
4. Inspect BCM window glass lifter power supply.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the BCM harness plug I46. D. Connect the battery negative terminal. E. Operate the ignition switch to turn the power to ON state. F. Measure the voltage between Terminals 12 and 22 of BCM wiring harness connector I46 and the reliable grounding point with a multimeter. **Standard value: 11 ~ 14 V** Is the voltage is OK? →**Yes** To step 5. →**No** Inspect and repair BCM window glass lifter power supply line fault; if necessary, replace the dashboard wiring box.
5. Check the BCM power line.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the BCM harness plug I45. D. Connect the battery negative terminal. E. Operate the ignition switch to turn the power to ON state. F. Measure the voltage between the BCM harness plug I45 terminal 2, 12 and fixed ground point with the multimeter. **Standard value: 11 ~ 14 V** Is the voltage is OK? →**Yes** To step 6. →**No** Inspect and repair BCM power supply line fault; if necessary, replace the dashboard wiring box.
6. Check the BCM ground line.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the BCM harness plug I47. D. Measure the resistance between Terminal 12 of BCM wiring harness connector I47 and the grounding point with a multimeter. **Standard value: Less than 5Ω** Is the resistance normal? →**Yes** To step 7. →**No** Repair the BCM ground line fault and replace the harness if necessary.

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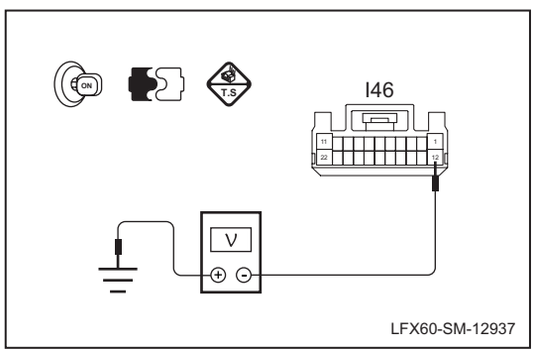
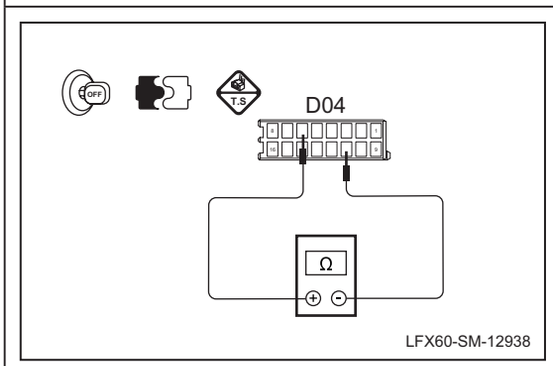
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Test condition	Details/results/measures
7. Check the BCM.	
	A. Replace BCM. **Refer to: Replacement of BCM** Confirm that troubleshooting is completed.

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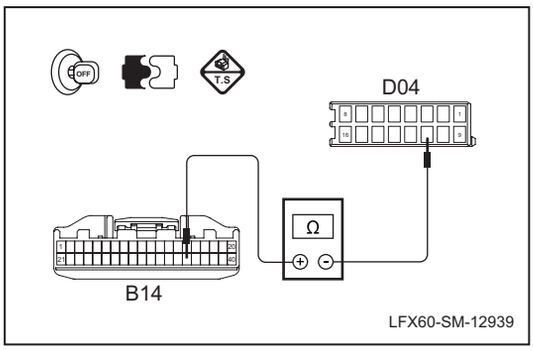
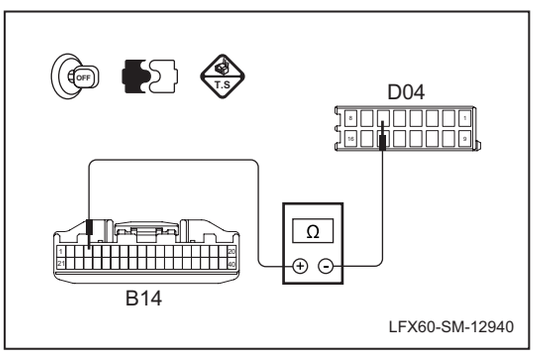
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Driver's side electric window not working diagnosis flow

Test condition	Details/results/measures
1. General inspection.	
	A. Check the window switch and glass lift harness plug for looseness, aging or falling. Is it OK after checking? →**Yes** To step 2. →**No** Repair the fault position.
2. Inspect BCM left front window lifter power supply.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the BCM harness plug I46. D. Connect the battery negative terminal. E. Operate the ignition switch to turn the power to ON state. F. Measure the voltage between Terminal 12 of BCM wiring harness connector I46 and the reliable grounding point with a multimeter. **Standard value: 11 ~ 14 V** Is the voltage is OK? →**Yes** To step 3. →**No** Inspect and repair BCM left front window lifter power line fault; if necessary, replace the wiring harness.
3. Inspect the glass lifter switch on the driver side.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the driver's side glass lift switch harness plug D04. D. Operate glass lifter switch on the driver side up and down, and measure the resistance between Terminals 6 and 11 of the glass lifter switch on the driver side with a multimeter. **Standard value:** **Up: 3 KΩ** **Down: 332Ω** Is the resistance normal? →**Yes** To step 4. →**No** Replace the glass lifter switch on the driver side. **Refer to: Replacement of driver's side glass lift switch**

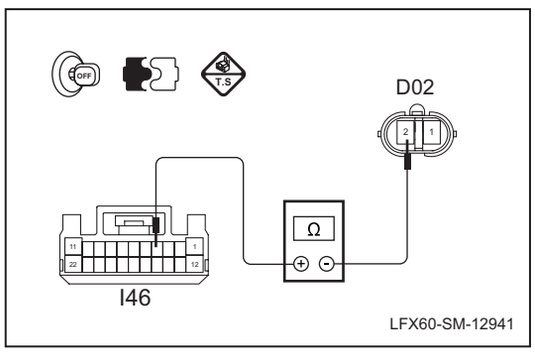
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Test condition	Details/results/measures
4. Inspect the left front door analog grounding point.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the driver's side glass lift switch harness plug D04. D. Disconnect the BCM harness plug B14. E. Measure the resistance between the driver's side glass lift switch harness plug D04 terminal 11 and BCM harness plug B14 terminal 35 with the multimeter. **Standard value: Less than 5Ω** Is the resistance normal? →**Yes** To step 5. →**No** Inspect and repair the left front door analog grounding point fault; if necessary, replace the wiring harness.
5. Inspect the left front door glass lifter signal line.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the driver's side glass lift switch harness plug D04. D. Disconnect the BCM harness plug B14. E. Measure the resistance between the driver's side glass lift switch harness plug D04 terminal 6 and BCM harness plug B14 terminal 4 with the multimeter. **Standard value: Less than 5Ω** Is the resistance normal? →**Yes** To step 6. →**No** Inspect and repair the left front door glass lifter signal line fault; if necessary, replace the wiring harness.

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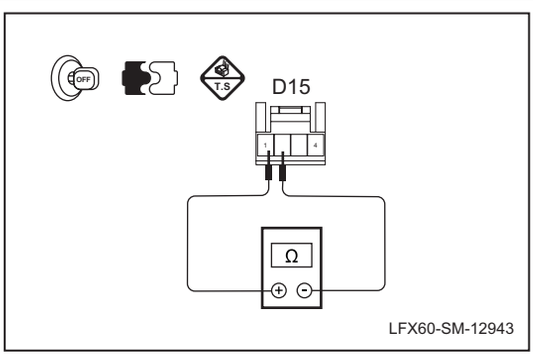
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Test condition	Details/results/measures
6. Inspect the left front door glass lifter motor line.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the left front door glass lifter motor wiring harness connector D02. D. Disconnect the BCM harness plug I46. E. Measure the resistance between Terminal 2 of the left front door glass lifter motor wiring harness connector D02 and Terminal 4 of BCM wiring harness connector I46 with a multimeter. **Standard value: Less than 5Ω** F. Measure the resistance between Terminal 1 of the left front door glass lifter motor wiring harness connector D02 and Terminal 5 of BCM wiring harness connector I46 with a multimeter. **Standard value: Less than 5Ω** Is the resistance normal? →**Yes** To step 7. →**No** Inspect and repair the left front door glass lifter motor line fault; if necessary, replace the wiring harness.
7. Inspect the left front door glass lifter motor.	
	A. Replace the left front door glass lifter motor. **Refer to: Replacement of front door electric lift** Is the troubleshooting successful? →**Yes** Replace the front left door glass lift. →**No** To step 8.
8. Check the BCM.	
	A. Replace BCM. **Refer to: Replacement of BCM** Confirm that troubleshooting is completed.

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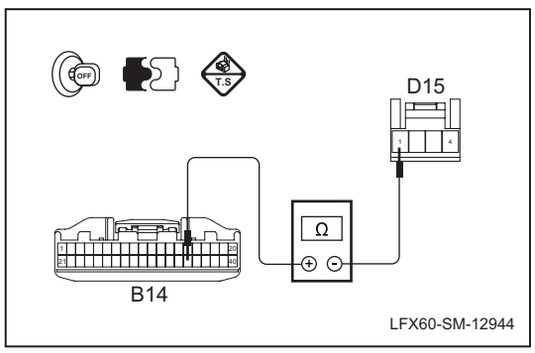
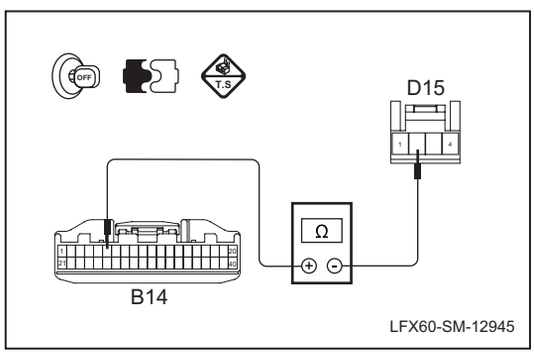
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Diagnosis procedure about that the power window on the passenger side is not operated (with the right front door as an example)

Test condition	Details/results/measures
1. General inspection.	
	A. Check the window switch and glass lift harness plug for looseness, aging or falling. Is it OK after checking? →**Yes** To step 2. →**No** Repair the fault position.
2. Inspect the front door glass lifter switch.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the front right door glass lift switch harness plug D15. D. Operate the right front door glass lifter switch up and down, and measure the resistance between Terminals 1 and 2 of the front door glass lifter switch D15 with a multimeter. **Standard value:** **Up: 3 KΩ** **Down: 332Ω** Is the resistance normal? →**Yes** To step 3. →**No** Replace the front door glass lifter switch.
3. Inspect the window glass locking switch on the driver side.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the driver's side glass lift switch harness plug D04. D. Connect the battery negative terminal. E. Operate the ignition switch to turn the power to ON state. F. Operate the right front door glass lifter switch, and inspect whether the glass operating function is normal. Is it OK after checking? →**Yes** Replace the window glass locking switch on the driver side. **Refer to: Replacement of driver's side glass lift switch** →**No** To step 4.

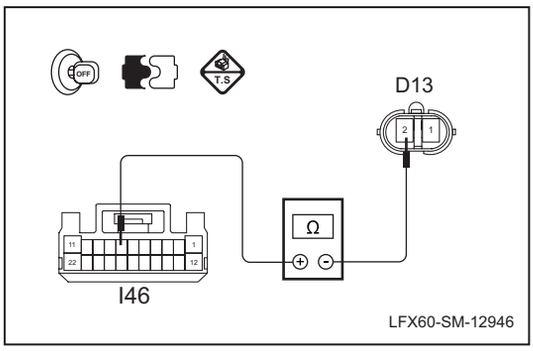
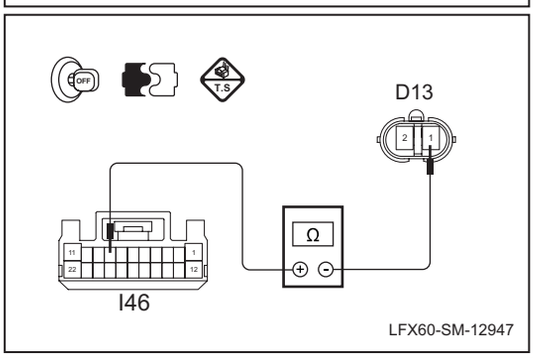
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Test condition	Details/results/measures
4. Inspect the window analog grounding point.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the front right door glass lift switch harness plug D15. D. Disconnect the BCM harness plug B14. E. Measure the resistance between Terminal 1 of the glass lifter switch wiring harness connector D15 on the driver side and Terminal 35 of BCM wiring harness connector B14 with a multimeter. **Standard value: Less than 5Ω** Is the resistance normal? →**Yes** To step 5. →**No** Inspect and repair the window analog grounding point fault; if necessary, replace the wiring harness.
5. Inspect the right front door glass lifter signal line.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the front right door glass lift switch harness plug D15. D. Disconnect the BCM harness plug B14. E. Measure the resistance between Terminal 2 of the front door glass lifter switch wiring harness connector D15 and Terminal 6 of BCM wiring harness connector B14 with a multimeter. **Standard value: Less than 5Ω** Is the resistance normal? →**Yes** To step 6. →**No** Inspect and repair the left front door glass lifter line fault; if necessary, replace the wiring harness.

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Test condition	Details/results/measures
6. Inspect the right front door glass lifter motor line.	
 LFX60-SM-12946  LFX60-SM-12947	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the right front door glass lifter motor harness plug D13. D. Disconnect the BCM harness plug I146. E. Measure the resistance between right front door glass lifter motor harness plug D13 terminal 2 and BCM harness plug I46 terminal 7 with the multimeter. **Standard value: Less than 5Ω** F. Measure the resistance between right front door glass lifter motor harness plug D13 terminal 1 and BCM harness plug I46 terminal 8 with the multimeter. **Standard value: Less than 5Ω** Is the resistance normal? →**Yes** To step 7. →**No** Repair the right front door glass lifter motor line fault and replace the harness if necessary.
7. Inspect the right front door glass lifter motor.	
	A. Replace the right front door glass lifter motor. **Refer to: Replacement of front door electric lift** Is the troubleshooting successful? →**Yes** Replace the front left door glass lift. →**No** To step 8.
8 Inspect the BCM	
	A. Replace BCM. **Refer to: Replacement of BCM** Confirm that troubleshooting is completed.

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Removal and Installation

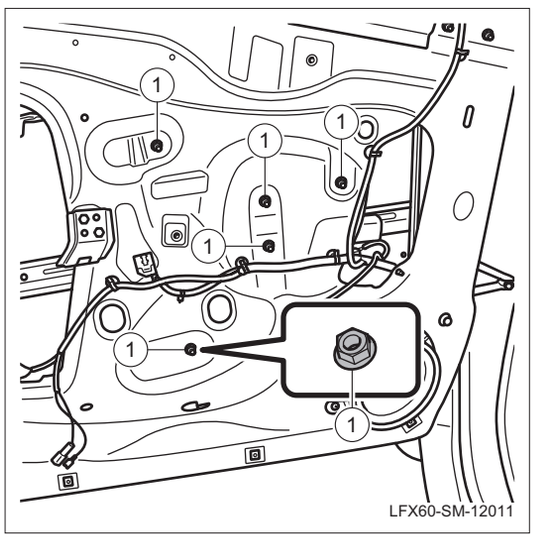
Replacement of front door power lifter

Removal

1. Remove the front door power lifter.

(a). Disconnect the battery negative connector.

(b). Remove the front door glass; **refer to: Replacement of Front Door Glass.**



(c). Disconnect the front door power lifter wiring harness connector.

(d). Remove the front door power lifter fixing nut 1.

(e). Remove the front door power lifter.

Installation

1. Install the front door power lifter.

(a). The installation sequence is the reverse of the disassembly order.

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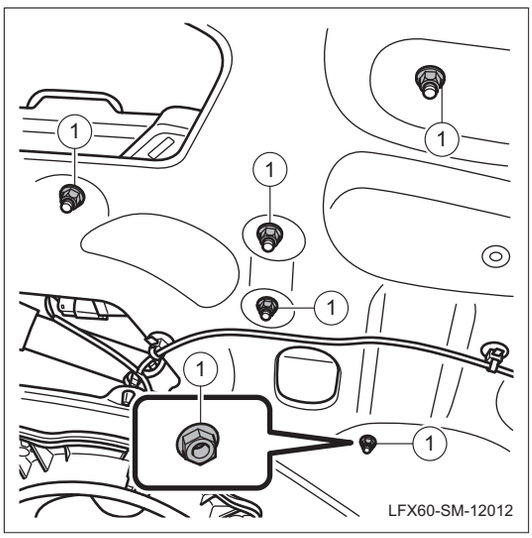
Replacement of rear door power lifter

Removal

1. Remove the rear door power lifter.

(a). Disconnect the battery negative connector.

(b). Remove the rear door glass; **refer to: Replacement of Rear Door Glass.**



(c). Disconnect the rear door power lifter wiring harness connector.

(d). Remove the rear door power lifter fixing nut 1.

(e). Remove the rear door power lifter.

Installation

1. Install the rear door power lifter.

(a). The installation sequence is the reverse of the disassembly order.

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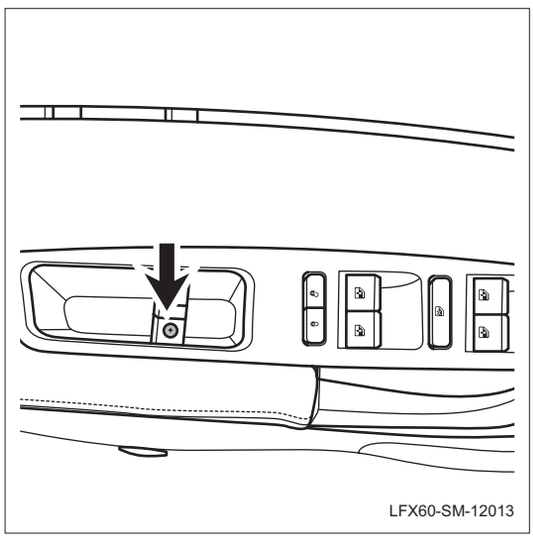
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Replacement of driver's side glass lift switch

Removal

1. Remove the glass lifter switch on the driver side.

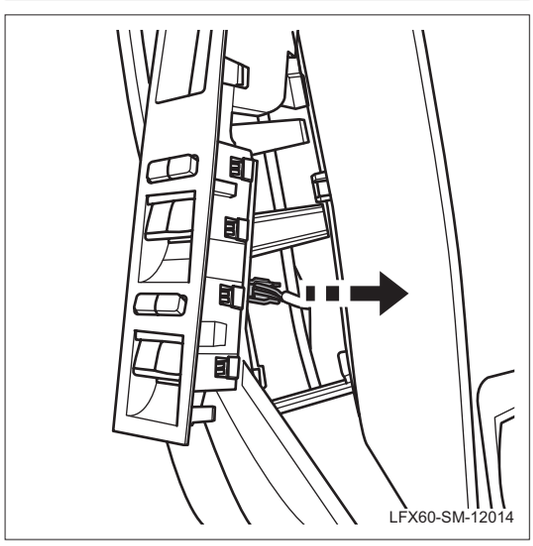
(a). Disconnect the battery negative connector.



(b). Remove the glass lifter switch fixing bolt trim pad on the driver side.

(c). Remove the glass lifter switch fixing bolt on the driver side.

(d). Remove the glass lifter switch on the driver side.



(e). Disconnect the glass lifter switch wiring harness connector on the driver side.

(f). Remove the glass lifter switch on the driver side.

Installation

1. Install the glass lifter switch on the driver side.

(a). The installation sequence is the reverse of the disassembly order.

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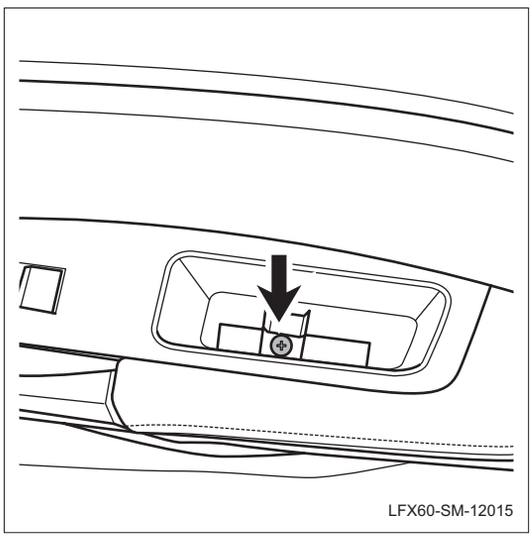
Replacement of the glass lifter switch on the passenger side

Removal

1. Remove the glass lifter switch on the passenger side.

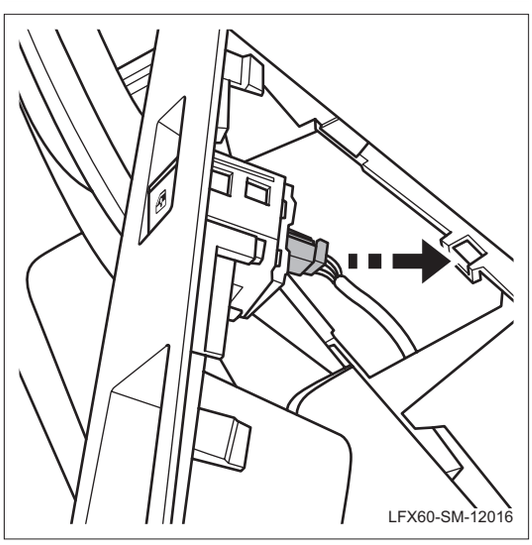
(a). Disconnect the battery negative connector.

(b). Remove the glass lifter switch fixing bolt trim pad on the passenger side.



(c). Remove theglass lifter switch fixing bolt on the passenger side.

(d). Remove the glass lifter switch on the passenger side.



(e). Disconnect the glass lifter switch wiring harness connector on the passenger side.

(f). Remove the glass lifter switch on the passenger side.

Installation

1. Install the glass lifter switch on the passenger side.

(a). The installation sequence is the reverse of the disassembly order.

AutoLibrary

AutoLibrary

12- Electrical system

Rear reversing radar 12-1881

Precautions 12-1881

Preparation 12-1882

Structure and installation location 12-1883

Diagnosis Information and Procedures 12-1885

Removal and Installation . 12-1891

AutoLibrary

AutoLibrary

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Rear reversing radar

Precautions

Precautions

The monitorion function may be abnormal under the following conditions:

1. The reversing radar sensor is covered with mud, snow and other impurities (the monitorion function will be returned to normal after the sensor is cleaned).
2. The reversing radar sensor is frozen (the monitorion function will be returned to normal after the sensor temperature is increased).
3. The reversing radar sensor is covered.
4. In case of a fault in cold weather, the reversing radar sensor may not monitor any obstacle.

The monitorion range is affected by the following conditions:

1. The reverse radar sensor is covered by the mud or snow.
2. The vehicle is in extremely hot or cold area.

A monitorion error may occur under the following conditions:

1. The vehicle is driven on a rugged road, unpaved road or the road with high grass.
2. There is a speaker sound from another vehicle, the sound from a motorbike engine, the sound from a big air brake or the ultrasound from another sonar in the vicinity of the vehicle.
3. The vehicle is driven in heavy rain or the sensor is in contact with water (splashed with water).
4. The vehicle is tilted considerably.
5. The vehicle is equipped with the optional protection rod or wireless antenna.
6. The reverse radar sensor is covered by the mud or snow.
7. The vehicle is moving toward the high curbs or the corners of protruding objects.

The reversing radar sensor can not monitor the objects as follows:

1. Wire, rope and other fine objects.
2. Cotton, snow and other materials that may absorb ultrasonic waves.
3. Objects with sharp edges.
4. Short objects.
5. Highly suspended objects.

Other precautions

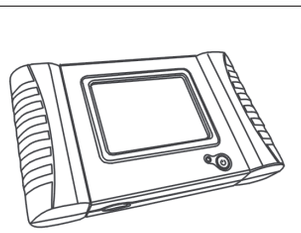
1. The reversing radar sensor can not monitor any object under the bumper. (The reverse radar sensor may detect lower items and thin bars and then lost tracking.)
2. The reversing radar sensor may not monitor any obstacle that are too close to it.
3. The reversing radar sensor may not monitor any obstacle when it falls or is violently bumped.

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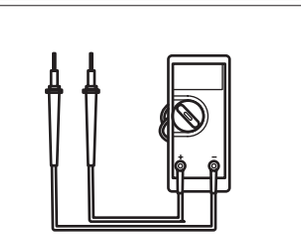
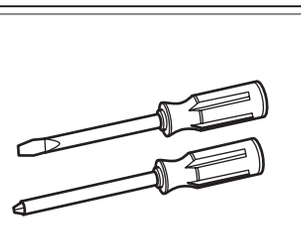
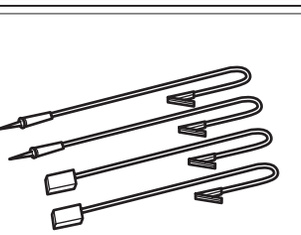
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Preparation

Special maintenance tools

No.	Tool name	Tool figure	Tool code	Remarks
1	Diagnostic equipment of vehicle	 LFX60-SM-12127	-	System fault diagnosis

General maintenance tools

No.	Tool name	Tool figure	Tool code	Remarks
1	Digital multimeter	 LFX60-SM-12128	-	Test the voltage, resistance
2	Screwdriver	 LFX60-SM-12129	-	Remove the screw and panel
3	Wiring group	 LFX60-SM-12130	-	Check the line

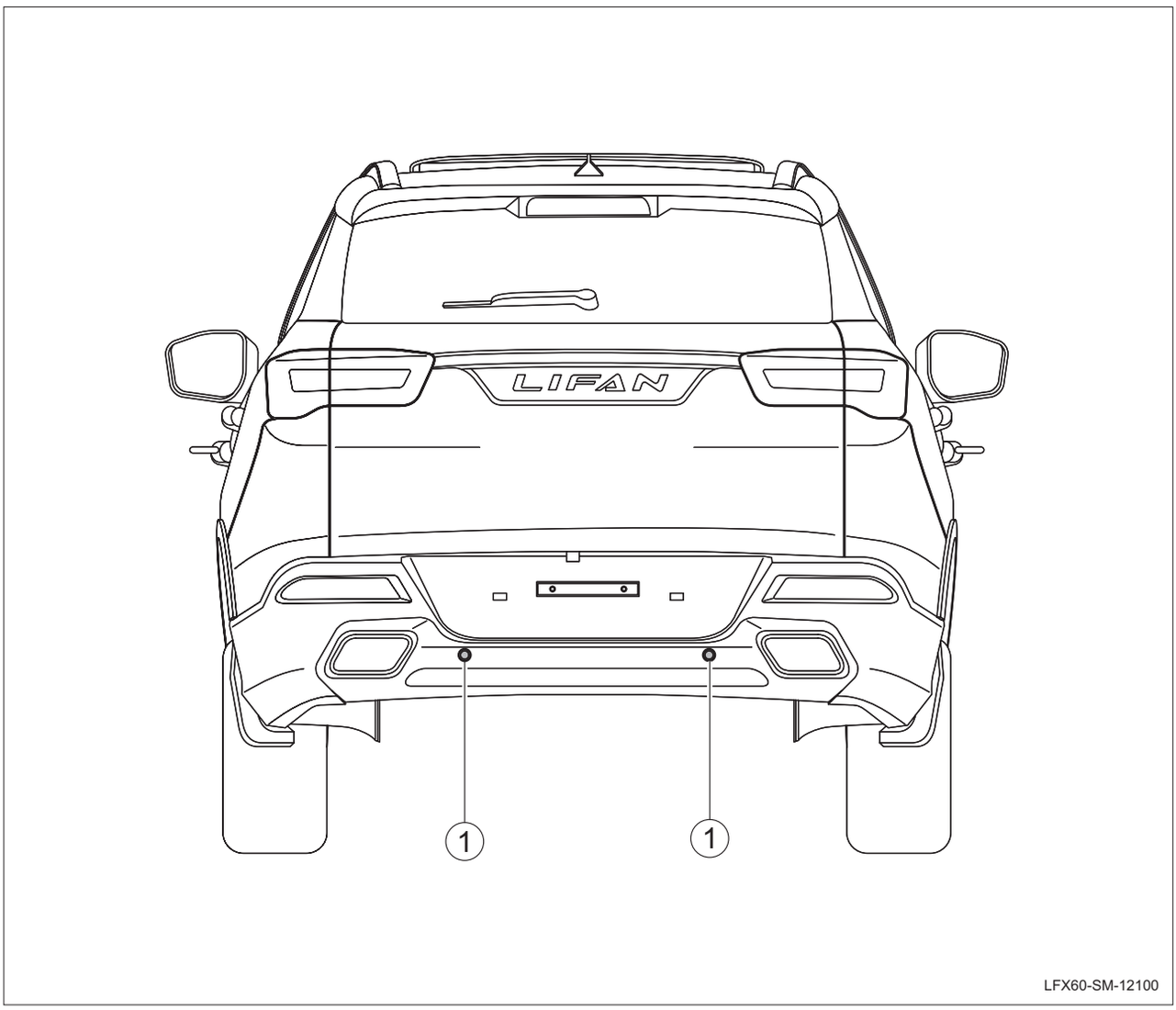
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Structure and installation location

Component Location Plan

Rear anti-collision radar sensor



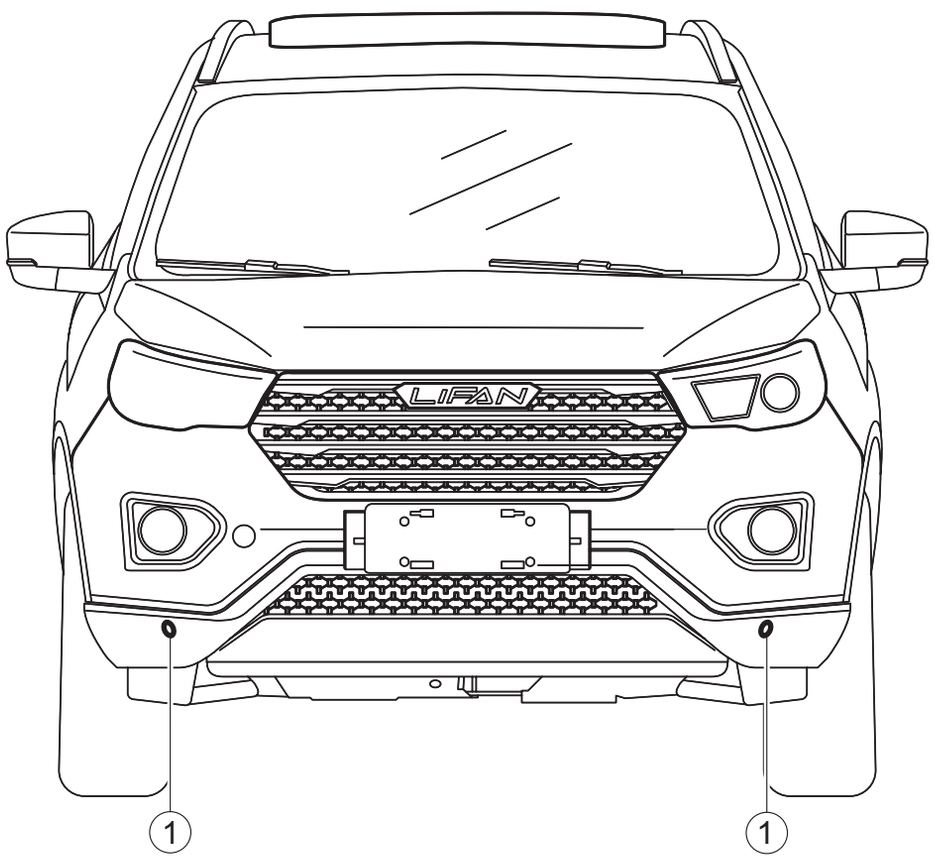
No.	Part name
1	Rear anti-collision radar probe

No.	Part name

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Front anti-collision radar sensor



LFX60-SM-12101

No.	Part name
1	Front anti-collision radar probe

No.	Part name

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Diagnosis Information and Procedures

Diagnosis Instructions

Before the reversing radar system troubleshooting, must familiarize and understand its working principle, and then perform its diagnosis, which helps to determine the correct troubleshooting steps in case of a fault, and more importantly, to determine whether the situation descrived by the user is normal.

In any reversing radar system fault diagnosis, must first inspect it, and guide the maintenance staff to take the next logical steps for fault diagnosis. Comprehend and correctly use the diagnostic flow chart to shorten the diagnosis time and avoid the misjudgement.

General equipment

Name
Diagnostic equipment of vehicle
Digital multimeter

Visual Inspection

1. Confirm the problem raised by the customer.
2. Check for the evident mechanical or electrical damage trace.

Visual inspection table

Electrical
• Fuse • Line • Harness plug • Rear radar sensor • Front radar sensor

3. If the observed or raised problem is the evident and the cause has been found, ensure to fix this fault before proceeding with the next step.
4. If no problem is found through the visual check, confirm the fault and refer to the fault symptom list.

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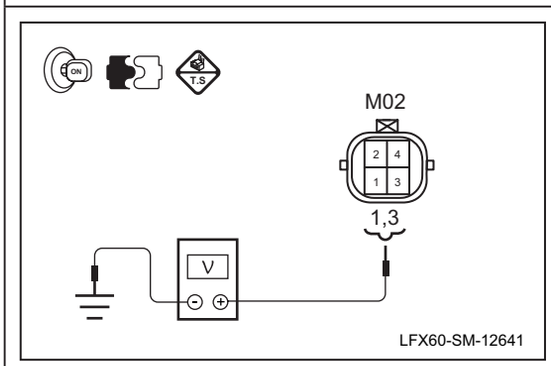
Fault symptoms table

Symptom	Possible Cause	Recommended measure
All anti-corrosion radars can not alarm	• Fuse	**Refer to: All anti-corrosion radars can not alarm**
	• The system voltage is too low	
	• Line fault	
	• Anti-collision radar	
	• Instrument cluster	
The front anti-collision radar does not alarm	• Line fault	**Refer to: The front anti-collision radar does not alarm**
	• Anti-collision radar	
The alarm distance is inaccurate in case of any obstacle	• The obstacle is sound-absorbing material, such as: sponge, foam, and etc.	• It is a collision radar characteristic, and there is no return sound
	• The obstacle is too small	• The anti-collision radar can not monitor it
	• There is dirt or foreign matter on the anti-collision radar surface	• Inspect the anti-corrosion radar connector
	• The anti-collision radar connector has poor contact	• Keep anti-collision radar surface clean and clean the dirt on the surface
	• Anti-collision radar	• Replace the anti-collision radar

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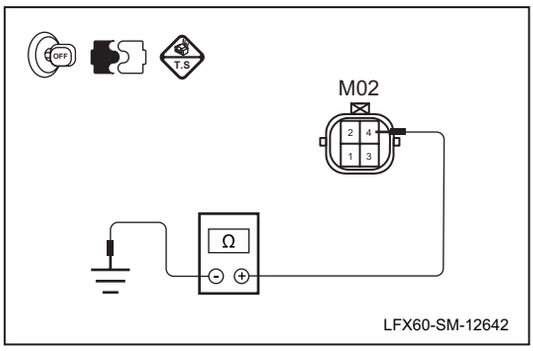
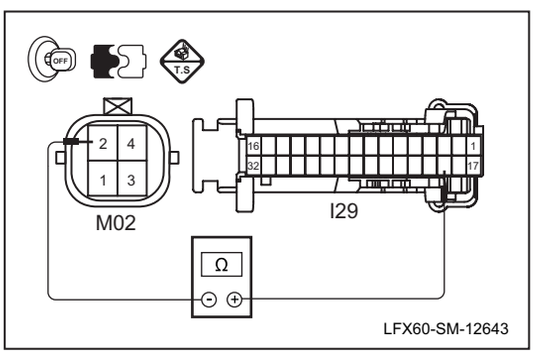
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Diagnosis procedure about that all radar do not alarm

Test condition	Details/results/measures
1. General inspection.	
	A. Inspect the wiring harness connectors of the anti-collision radar and the instrument cluster for damage, poor contact, aging, loosening or other signs. B. Inspect the anti-collision radar surface for any foreign body. Is it OK after checking? →**Yes** To step 2. →**No** Repair the fault position.
2. Inspect the anti-corrision radar fuse.	
	A. Inspect the reversing radar fuse FS11. **Fuse rated capacity: 15 A** Is it OK after checking? →**Yes** To step 3. →**No** Replace the fuse.
3. Inspect the anti-collision radar power line (with the left rear anti-collision radar as an example).	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative cable. C. Disconnect the rear left anti-collision radar harness plug M02. D. Connect the battery negative terminal. E. Measure the voltage between Terminals 1 and 3 of the left rear anti-collision radar witing harness connector M02 and the reliable grounding point with a multimeter. **Standard value: 11 ~ 14 V** Is the voltage is OK? →**Yes** To step 4. →**No** Inspect and repair the left rear anti-collision radar power line fault; if necessary, replace the wiring harness.

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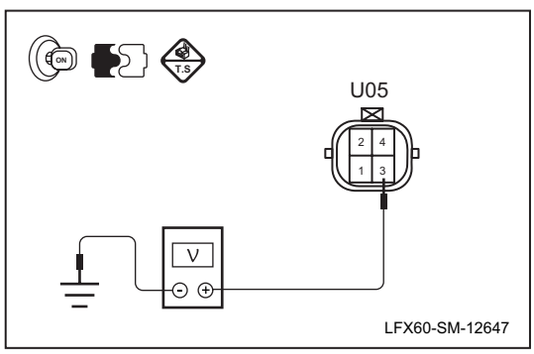
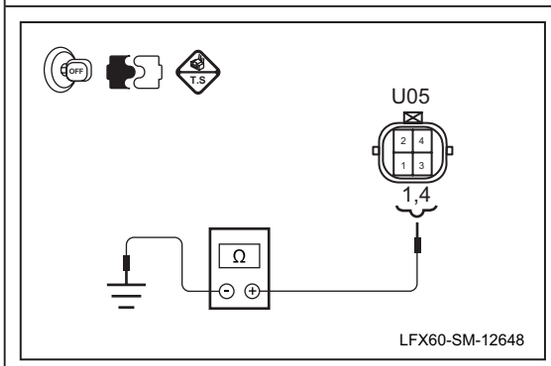
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Test condition	Details/results/measures
4. Inspect the left rear anti-collision radar grounding point.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the rear left anti-collision radar harness plug M02. D. Measure the resistance between Terminal 4 of the left rear anti-collision radar wiring harness connector M02 and the reliable grounding point with a multimeter. **Standard value: Less than 5Ω** Is the resistance normal? →**Yes** To step 5. →**No** Inspect and repair the left rear anti-collision radar grounding point fault; if necessary, replace the wiring harness.
5. Inspect the left rear anti-collision radar signal line.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the rear left anti-collision radar harness plug M02. D. Disconnect the instrument cluster harness plug I29. E. Measure the resistance between Terminal 2 of the left rear anti-collision radar wiring harness connector M02 and Terminal 19 of the instrument cluster wiring harness connector I29 with a multimeter. **Standard value: Less than 5Ω** Is the resistance normal? →**Yes** To step 6. →**No** Inspect and repair the left rear anti-collision radar signal line fault; if necessary, replace the wiring harness.
6. Inspect the left rear anti-collision radar.	
	A. Replace left rear radar. **Refer to: Replacement of Rear Anti-collision Radar Sensor** Is the system normal? →**Yes** Replace the left rear anti-collision radar. →**No** To step 7.
7. Check the instrument cluster.	
	A. Replace the instrument cluster. **Refer to: Replacement of instrument cluster assembly** Confirm that troubleshooting is completed.

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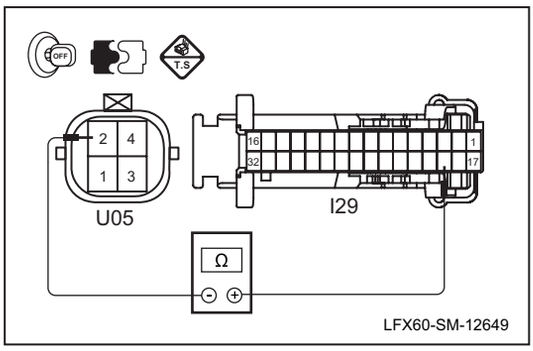
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Diagnosis procedure about that the front anti-collision radar does not alarm

Test condition	Details/results/measures
1. General inspection.	
	A. Inspect the anti-collision radar wiring harness connector for damage, poor contact, aging, loosening or other signs. B. Inspect the front collision radar sensor surface for any foreign matter. Is it OK after checking? →**Yes** To step 2. →**No** Repair the fault position.
2. Inspect the front anti-corrosion radar power line (with the left front anti-collision radar as an example).	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the front left anti-collision radar harness plug U05. D. Connect the battery negative terminal. E. Operate the ignition switch to turn the power to ON state. F. Measure the voltage between Terminal 3 of the left front anti-collision radar wiring harness connector U05 terminal and the reliable grounding point with a multimeter. **Standard value: 11 ~ 14 V** Is the voltage is OK? →**Yes** To step 3. →**No** Inspect and repair the reversing radar power line open circuit fault; if necessary, replace the wiring harness.
3. Inspect the left front anti-collision radar grounding point.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the front left anti-collision radar harness plug U05. D. Measure the resistance between Terminals 1 and 4 of the left rear reversing radar witing harness connector U05 and the reliable grounding point with a multimeter. **Standard value: Less than 5Ω** Is the resistance normal? →**Yes** To step 4. →**No** Inspect and repair the left front anti-collision radar grounding point fault; if necessary, replace the wiring harness.

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Test condition	Details/results/measures
4. Inspect the left front anti-collision radar signal line.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative cable. C. Disconnect the front left anti-collision radar harness plug U05. D. Disconnect the instrument cluster harness plug I29. E. Measure the resistance between Terminal 2 of the left front anti-collision radar wiring harness connector U05 and Terminal 19 of the instrument cluster wiring harness connector I29 with a multimeter. **Standard value: Less than 5Ω** Is the resistance normal? →**Yes** To step 5. →**No** Inspect and repair the reversing radar signal line fault; if necessary, replace the wiring harness.
5. Inspect the left front anti-collision radar.	
	A. Replace the left front anti-collision radar. **Refer to: Replacement of Front Anti-collision Radar Sensor** Confirm that troubleshooting is completed.

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Removal and Installation

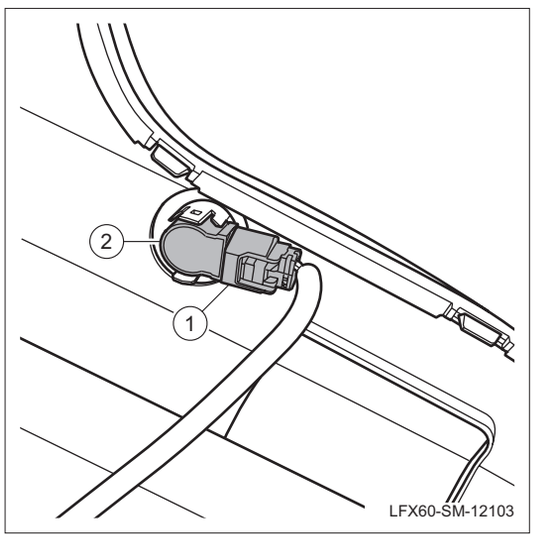
Replacement of Rear Anti-collision Radar Sensor

Removal

1. Remove the rear anti-collision radar sensor.

(a). Disconnect the battery negative connector.

(b). Remove the rear bumper assembly; **refer to: Replacement of Rear Bumper Assembly.**



(c). Disconnect the rear anti-collision radar sensor wiring harness connector 1.

(d). Remove the rear anti-collision radar sensor 2.

Installation

1. Install the rear anti-collision radar sensor.

(a). The installation sequence is the reverse of the disassembly order.

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Replacement of Front Anti-collision Radar Sensor

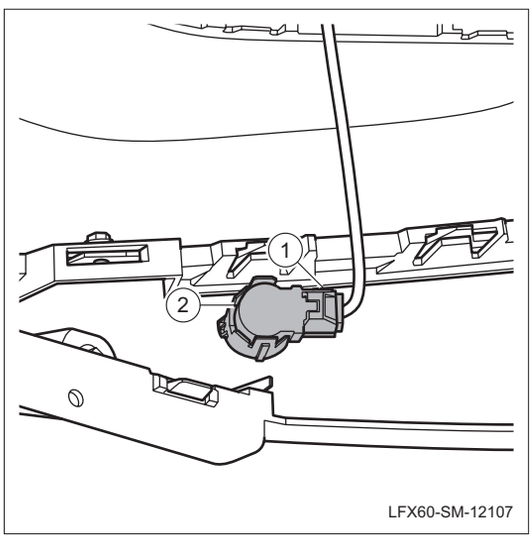
Removal

1. Remove the front anti-collision radar sensor.

(a). Disconnect the battery negative connector.

(b). Lift the vehicle. **Refer to the vehicle lift and support.**

(c). Remove the lower engine guard panel; **refer to: Replacement of Lower Engine Guard Panel.**



(d). Disconnect the front anti-collision radar sensor wiring harness connector 1.

(e). Remove the front anti-collision radar sensor 2.

Installation

1. Install the front anti-collision radar sensor.

(a). The installation sequence is the reverse of the disassembly order.

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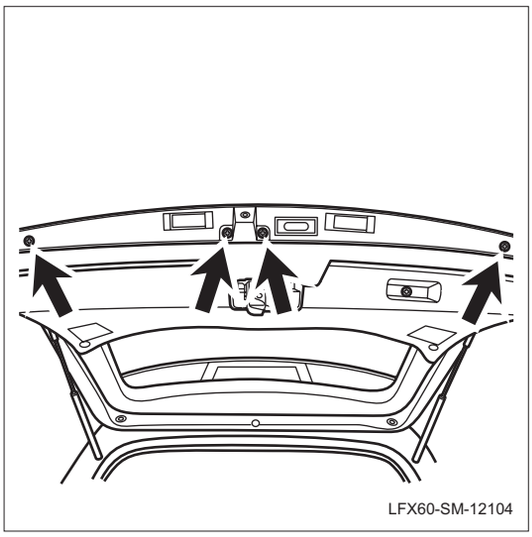
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Replacement of Reversing Monitoring Camera

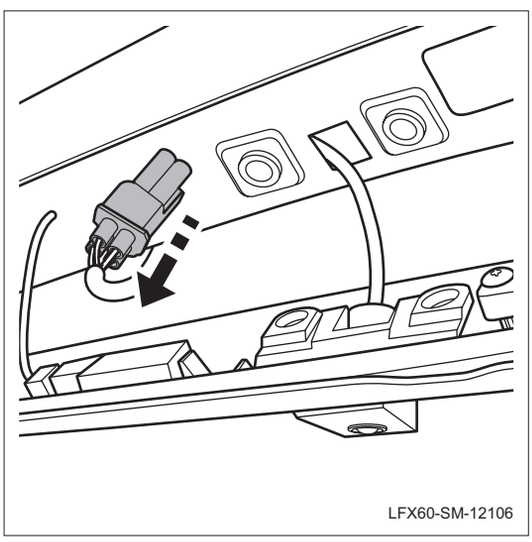
Removal

1. Remove the reversing monitoring camera.

(a). Disconnect the battery negative connector.


LFX60-SM-12104

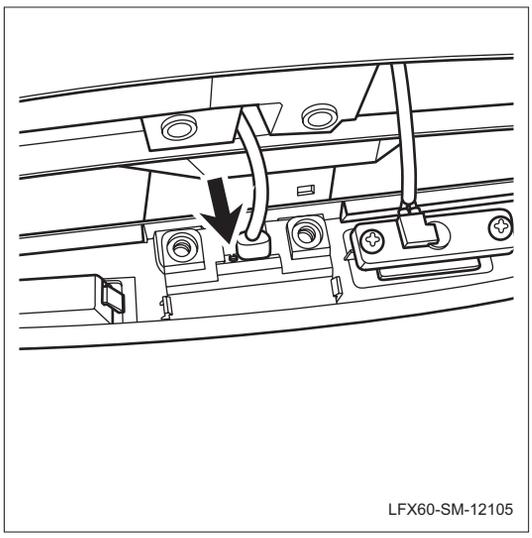
(b). Remove the license plate lamp cover fixing screws and remove the license plate lamp cover.


LFX60-SM-12106

(c). Disconnect the rear reversing monitoring camera wiring harness connector.

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(d). Remove the reversing monitoring camera fixing screws and remove the reversing monitoring camera.

Installation

1. Install the reversing monitoring camera.

(a). The installation sequence is the reverse of the disassembly order.

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12- Electrical system

Constant speed cruise 12-1897

Precautions 12-1897

Preparation 12-1898

Structure and installation location 12-1899

Operating Principle 12-1900

Diagnosis Information and Procedures 12-1901

Removal and Installation . 12-1909

AutoLibrary

AutoLibrary

AutoLibrary

AutoLibrary

Constant speed cruise

Precautions

Precautions

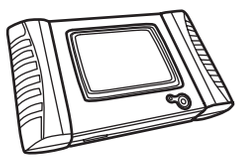
1. Do not see the constant speed cruise control button during the operation process and pay attention to driving safety; it is recommended to familiarize the opening process after parking.

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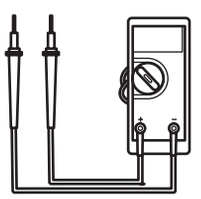
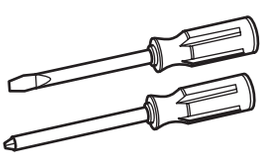
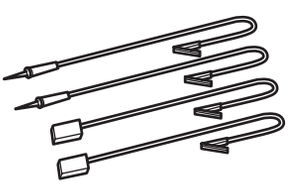
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Preparation

Special maintenance tools

No.	Tool name	Tool figure	Tool code	Remarks
1	Diagnosis equipment	 LFX60-SM-02802	-	System fault diagnosis

General maintenance tools

No.	Tool name	Tool figure	Tool code	Remarks
1	Digital multimeter	 LFX60-SM-12128	-	Test the voltage, resistance
2	Screwdriver	 LFX60-SM-12129	-	Remove the screw and panel
3	Wiring group	 LFX60-SM-12130	-	Check the line

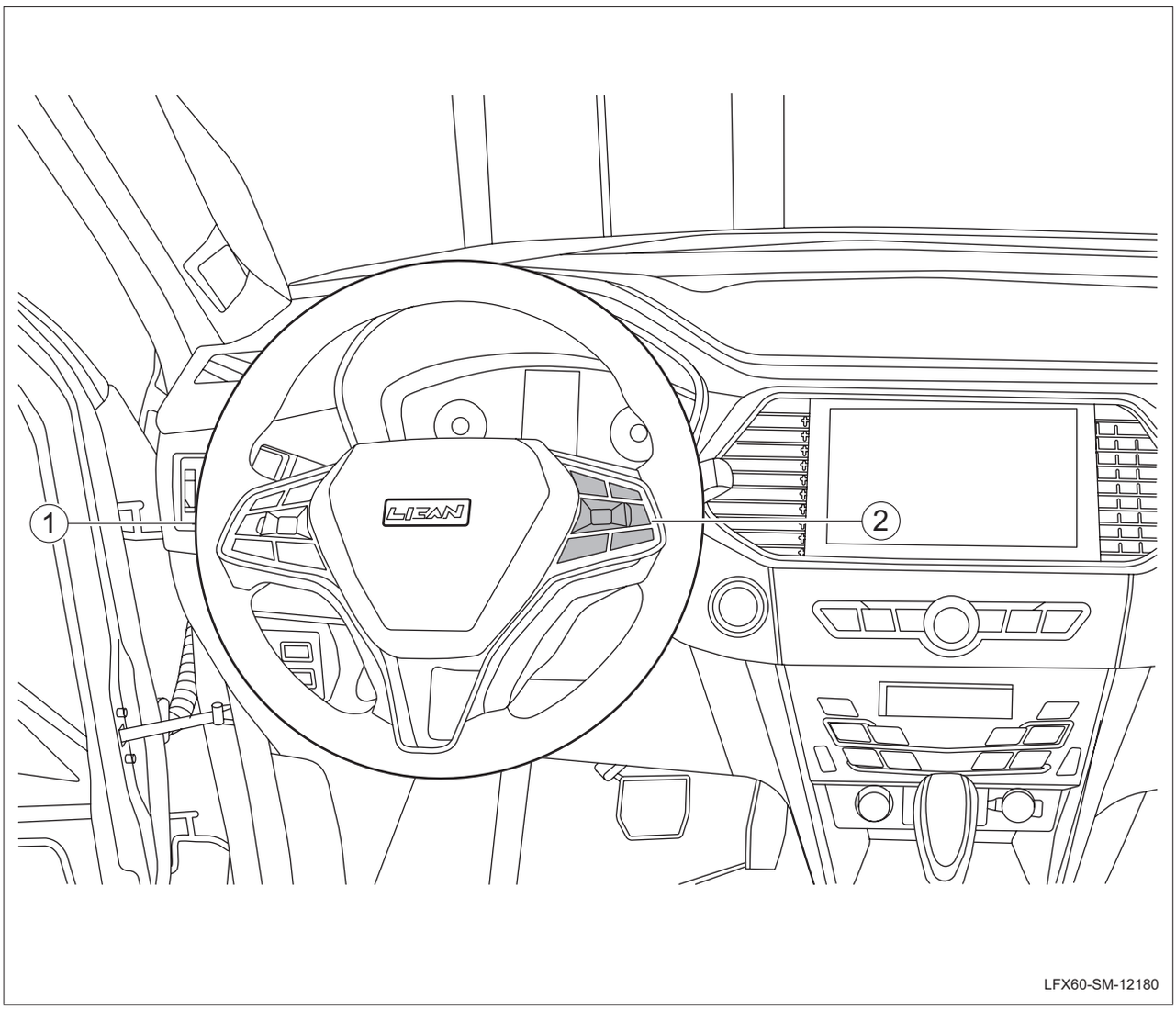
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Structure and installation location

Component Location Plan

Constant speed cruise switch



No.	Part name
1	Steering wheel

No.	Part name
6	Constant speed cruise control button

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Operating Principle

System overview

Turn on the cruise control

When the main switch is pressed to turn on the cruise system, the cruise indicator on the dashboard will be turned on. At the speed of above 38km/h (can be calibrated) and below 180km/h (can be calibrated), (Set) button is short pressed to set the cruise speed, the vehicle will enter the cruise at the constant speed (without depressing the throttle, the vehicle can enter the cruise at the set speed).

When the main switch is in OFF status, the cruise function does not action in any case.

Acceleration cruise

Under the constant speed cruise status, short press RES button to increase the cruise speed by 2km (can be calibrated).

Under the constant speed cruise status, long press RES button to automatically and slowly increse the speed until the appropriate speed is achieved before releasing the button.

Deceleration cruise

Under the constant speed cruise status, short press Set button to decrease the cruise speed by 2km (can be calibrated).

Under the constant speed cruise status,, long press Set button to automatically and slowly decrease the cruise speed until the appropriate speed is achieved before releasing the button.

Constant speed cruise release

Under the cruise status, press Cancel button to release the constant speed cruise.

Constant speed cruise restore

After releasing the constant speed cruise, short press RES button and do not depress the accelerator, the speed can be automatically restored to the cruise speed before release.

Under the constant speed cruise status, directly depress the accelerator to increase the speed; but after releasing the accelerator, the speed will be slowly restored to the previously set cruising speed.

LIM actively adjustable speed switch

The adjustable speed limit function allows the driver to set the maximum speed of the vehicle with the adjustable speed limit control switch. After the actively adjustable speed limit function is activated, the vehicle speed will not exceed the maximum speed set by the driver, to ensure that the speed can not exceed the maximum speed, and improve the driving safety.

Speed limit opening

After pressing LIM button, at any speed of above 30km/h (can be calibrated) and below 180km/h (can be calibrated), short press (Set +/-) button to activate the adjustable speed limit function, to set the initial target speed limit as the current speed.

Speed limit target value adjustment

When the adjustable speed limit is activated, short press (RES +) button, to increase the target speed limit value by 1km (can be calibrated).

When the adjustable speed limit is activated, long press (RES +) button to continuously increase the target speed limit at the calibration rate to the desired value before releasing the button.

When the adjustable speed limit is activated, short press (Set -) button, to decrease the target speed limit value by 1km (can be calibrated).

When the adjustable speed limit is activated, long press (Set -) button, to continuoulsy decrease the target speed limit at the calibration rate to the desired value before releasing the button.

Speed limit function release

When the adjustable speed limit is activated, press LIM button, to release the current speed limit activation status and then enter the normal driving status.

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Diagnosis Information and Procedures

Diagnosis Instructions

Before the cruise system troubleshooting, must understand and familiarize the working principle of the speaker system system, and then perform its diagnosis, so as to determine the correct fault diagnosis procedure in case of fault, and more importantly, determine whether the situations described by the user are normal.

For any fault diagnosis of the cruise system, must inspect it firstly, and then guide the maintenance staff to take the next logical steps for fault diagnosis. Comprehend and correctly use the diagnostic flow chart to shorten the diagnosis time and avoid the misjudgement.

General equipment

Name
Diagnostic equipment of vehicle
Digital multimeter

Visual Inspection

1. Confirm the problem raised by the customer.
2. Check for evident mechanical and electrical faults.

Visual inspection table

Mechanical	Electrical
• Brake pedal	• Line • Brake switch • Cruise control switch • Cruise setting switch

3. Check the system lines easy to see or can be seen.
4. If the observed or raised problem is the evident and the cause has been found, ensure to fix this fault before proceeding with the next step.
5. If no problem is found through the visual check, confirm the fault and refer to the fault symptom list.

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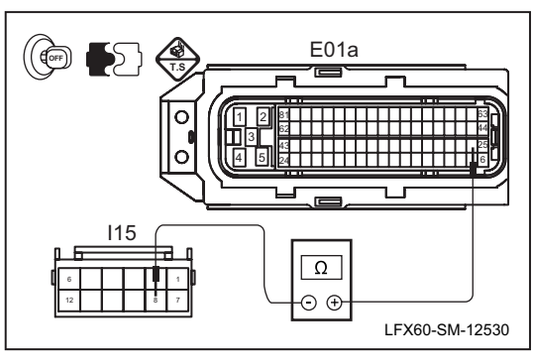
Fault symptoms table

Symptom	Possible point of failure	Recommended measure
The cruise function does not action/fault	• Line • Cruise control switch • Cruise setting switch • Brake switch • ECM	**Refer to: The cruise function does not action/ fault diagnosis flow**

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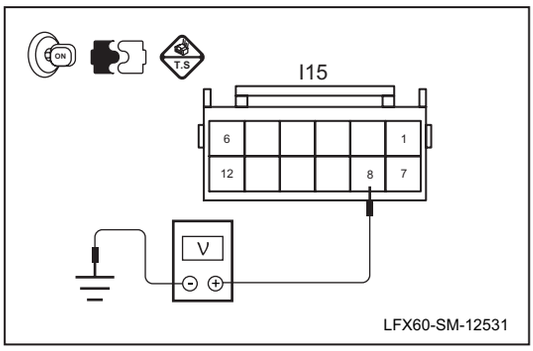
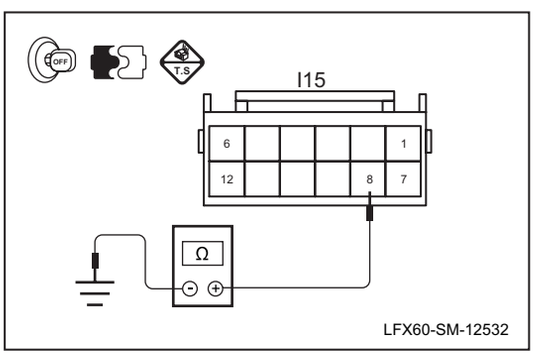
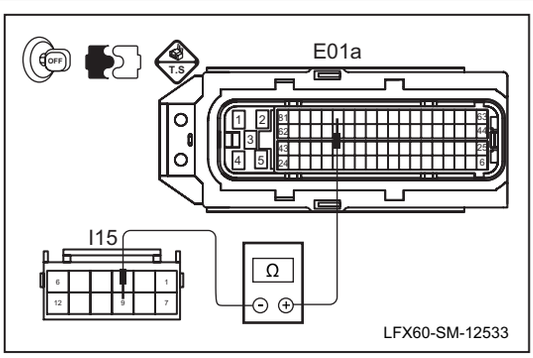
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Diagnosis procedure about that the cruise function does not action/fault (Delphi)

Test condition	Details/results/measures
1. General inspection.	
	A. Check the cruise control switch, stop lamp switch and ECM harness plug for breakage, loose contact, aging or looseness. Is it OK after checking? →**Yes** To step 2. →**No** Repair the fault position.
2. Check the auxiliary safety system.	
	A. Check the auxiliary safety system for fault related to the clock spring. Is it OK after checking? →**Yes** To step 3. →**No** Repair the auxiliary safety system.
3. Check the cruise control signal line for open circuit.	
	A. Operate the start switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the clock spring harness plug I15. D. Disconnect the ECM harness plug E01a. E. Measure the resistance between the clock spring harness plug I15 terminal 8 and ECM harness plug E01a terminal 26. **Standard value: Less than 5Ω** Is the measurement normal? →**Yes** To step 4. →**No** Repair the cruise control switch signal line open circuit fault and replace the harness if necessary.

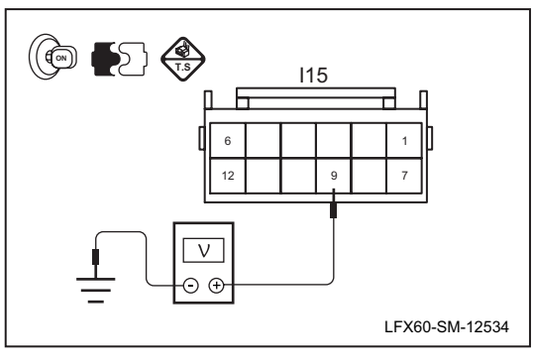
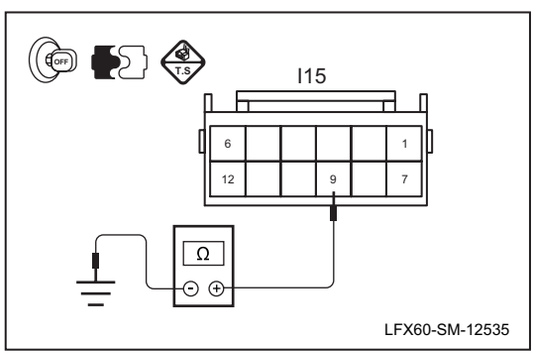
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Test condition	Details/results/measures
4. Check the cruise control switch signal line for short circuit to the power.	
	A. Operate the start switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the clock spring harness plug I15 and operate the start switch to turn the power to ON state. D. Measure the voltage between the clock spring harness plug I15 terminal 8 and the fixed ground point. **Standard value: 0V** Is the measurement normal? →**Yes** To step 5. →**No** Repair the cruise control switch signal line and power short circuit fault and replace the harness if necessary.
5. Check the cruise control switch signal line for short circuit to the ground.	
	A. Operate the start switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the clock spring harness plug I15. D. Measure the resistance between the clock spring harness plug I15 terminal 8 and the fixed ground point. **Standard value: 10MΩ or higher** Is the measurement normal? →**Yes** To step 6. →**No** Repair the cruise control switch signal line and ground short circuit fault and replace the harness if necessary.
6. Check the cruise control switch ground line for open circuit.	
	A. Operate the start switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the clock spring harness plug I15. D. Disconnect the ECM harness plug E01a. E. Measure the resistance between the clock spring harness plug I15 terminal 9 and ECM harness plug E01a terminal 76. **Standard value: Less than 5Ω** Is the measurement normal? →**Yes** To step 7. →**No** Repair the cruise control switch ground line open circuit fault and replace the harness if necessary.

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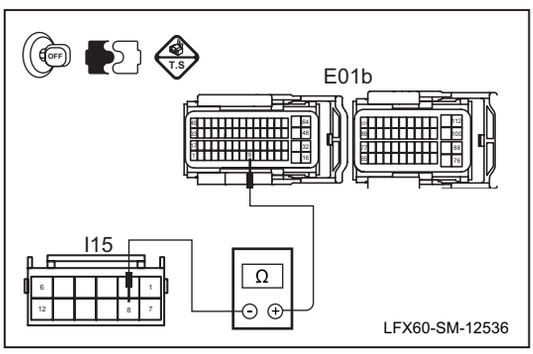
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Test condition	Details/results/measures
7. Check the cruise control switch ground line for short circuit to the power.	
 LFX60-SM-12534	A. Operate the start switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the clock spring harness plug I15 and operate the start switch to turn the power to ON state. D. Measure the voltage between the clock spring harness plug I15 terminal 9 and the fixed ground point. **Standard value: 0 V** Is the measurement normal? **→Yes** To step 8. **→No** Repair the cruise control switch ground line and power short circuit fault and replace the harness if necessary.
8. Check the cruise control switch signal line for short circuit to the power negative pole.	
 LFX60-SM-12535	A. Operate the start switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the clock spring harness plug I15. D. Measure the resistance between the clock spring harness plug I15 terminal 9 and the fixed ground point. **Standard value: 10MΩ or higher** Is the measurement normal? **→Yes** To step 9. **→No** Repair the cruise control switch ground line and power negative pole short circuit fault and replace the harness if necessary.
9. Replace the cruise control switch.	
	A. Replace the cruise control switch. B. Replacement of cruise control switch. Is the system normal? **→Yes** Troubleshooting is completed. **→No** To step 10.
10. Replace ECM.	
	A. Replace ECM. **Refer to: Replacement of ECM.** Confirm the system is normal.

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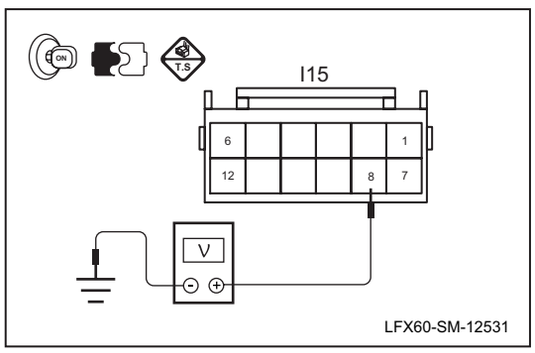
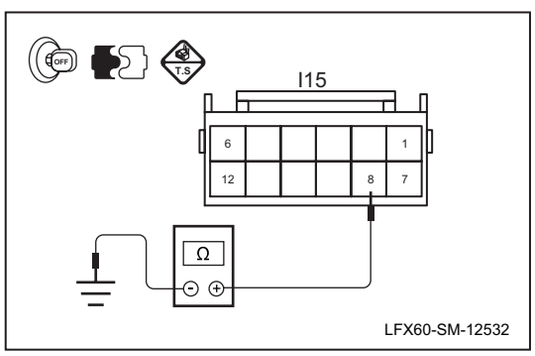
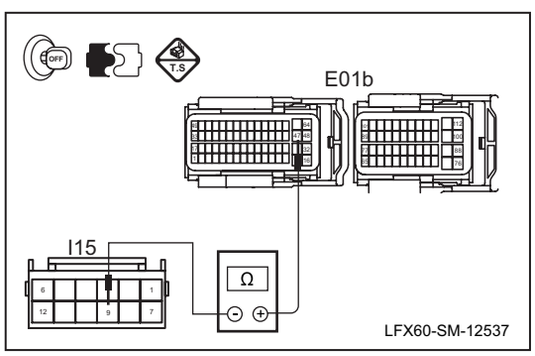
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The cruise function does not action/ fault diagnosis flow (Connect the power supply)

Test condition	Details/results/measures
1. General inspection.	
	A. Check the cruise control switch, stop lamp switch and ECM harness plug for breakage, loose contact, aging or looseness. Is it OK after checking? →**Yes** To step 2. →**No** Repair the fault position.
2. Check the auxiliary safety system.	
	A. Check the auxiliary safety system for fault related to the clock spring. Is it OK after checking? →**Yes** To step 3. →**No** Repair the auxiliary safety system.
3. Check the cruise control signal line for open circuit.	
	A. Operate the start switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the clock spring wiring harness connector I15 and ECM wiring harness connector E01b. D. Measure the resistance between Terminal 8 of the clock spring wiring harness connector I15 and Terminal 9 of ECM wiring harness connector E01b. **Standard value: Less than 5Ω** Is the measurement normal? →**Yes** To step 4. →**No** Repair the cruise control switch signal line open circuit fault and replace the harness if necessary.

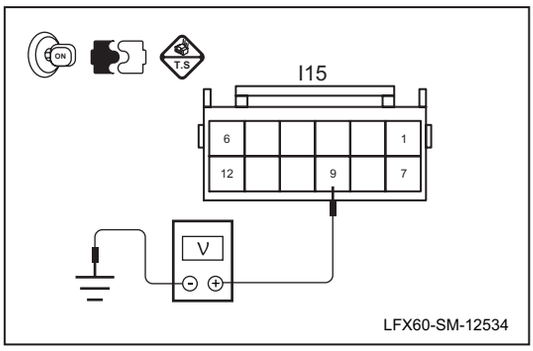
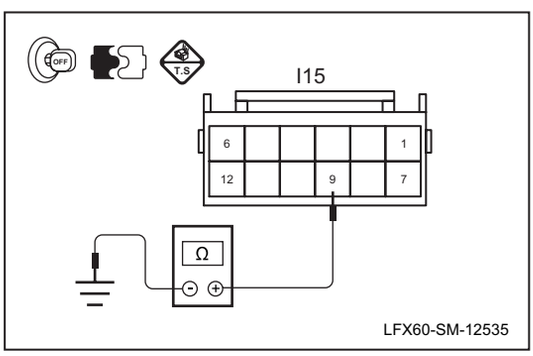
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Test condition	Details/results/measures
4. Check the cruise control switch signal line for short circuit to the power.	
	A. Operate the start switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the clock spring harness plug I15 and operate the start switch to turn the power to ON state. D. Measure the voltage between the clock spring harness plug I15 terminal 8 and the fixed ground point. **Standard value: 0 V** Is the measurement normal? →**Yes** To step 5. →**No** Repair the cruise control switch signal line and power short circuit fault and replace the harness if necessary.
5. Check the cruise control switch signal line for short circuit to the ground.	
	A. Operate the start switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the clock spring harness plug I15. D. Measure the resistance between the clock spring harness plug I15 terminal 8 and the fixed ground point. **Standard value: 10MΩ or higher** Is the measurement normal? →**Yes** To step 6. →**No** Repair the cruise control switch signal line and ground short circuit fault and replace the harness if necessary.
6. Check the cruise control switch ground line for open circuit.	
	A. Operate the start switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the clock spring harness plug I15. D. Disconnect the ECM harness connector E01b. E. Measure the resistance between Terminal 9 of the clock spring wiring harness connector I15 and Terminal 47 of ECM wiring harness connector E01b. **Standard value: Less than 5Ω** Is the measurement normal? →**Yes** To step 7. →**No** Repair the cruise control switch ground line open circuit fault and replace the harness if necessary.

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Test condition	Details/results/measures
7. Check the cruise control switch ground line for short circuit to the power.	
	A. Operate the start switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the clock spring harness plug I15 and operate the start switch to turn the power to ON state. D. Measure the voltage between the clock spring harness plug I15 terminal 9 and the fixed ground point. **Standard value: 0 V** Is the measurement normal? →**Yes** To step 8. →**No** Repair the cruise control switch ground line and power short circuit fault and replace the harness if necessary.
8. Check the cruise control switch signal line for short circuit to the power negative pole.	
	A. Operate the start switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the clock spring harness plug I15. D. Measure the resistance between the clock spring harness plug I15 terminal 9 and the fixed ground point. **Standard value: 10MΩ or higher** Is the measurement normal? →**Yes** To step 9. →**No** Repair the cruise control switch ground line and power negative pole short circuit fault and replace the harness if necessary.
9. Replace the cruise control switch.	
	A. Replace the cruise control switch. Replacement of cruise control switch. Is the system normal? →**Yes** Troubleshooting is completed. →**No** To step 10.
10. Replace ECM.	
	A. Replace ECM. **Refer to: Replacement of ECM.** Confirm the system is normal.

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Removal and Installation

Replacement of Cruise Switch

Removal

1. Remove the cruise switch.

(a). Disconnect the battery negative connector.
(b). Remove the driver airbag; **refer to: Replacement of Driver Airbag.**
(c). Remove the steering wheel. **Refer to the replacement of steering wheel.**
(d). Disconnect the steering wheel multi-function switch wiring harness connector.
(e). Remove the cruise switch.

Installation

1. Install the cruise switch.

(a). The installation sequence is the reverse of the disassembly order.

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12- Electrical system

Communication system 12-1913

Operating principle..... 12-1913

Diagnosis information and procedures..... 12-1914

AutoLibrary

AutoLibrary

AutoLibrary

AutoLibrary

Communication system

Operating principle

System overview

The vehicle is equipped with two data communication modes of CAN and LIN.

Description of CAN Bus

CAN bus communication medium is a twisted pair; the vehicle is equipped with high-speed CAN bus, with the communication rate of 500kbps. 120Ω termination resistors in CAN network are located in the engine control system (EMS) and the instrument clusteration (IC).

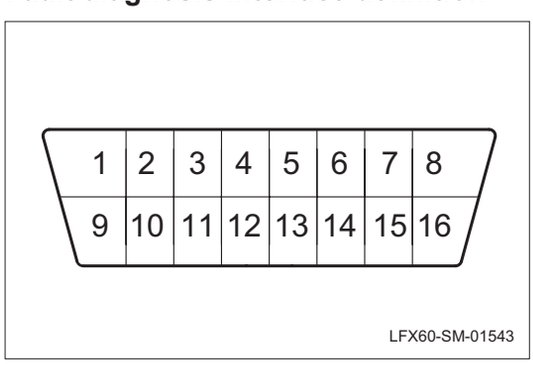
CAN network has the diagnosis function nodes, including:

- Engine control system (ECM)
- Transmission control system (TCM)
- Anti-lock braking system/electronic stability system (ABS/ESP)
- Instrument clusteration (IC)
- Body control system (BCM)
- Anti-theft system (PEPS)
- Tire pressure monitoring system (TPMS)
- Airbag system (ACU)

LIN bus description

LIN bus is a low cost serial communication system for automotive distributed electronic control system. LIN communication mode is used between ESCL and PEPS.

Fault diagnosis interface definition

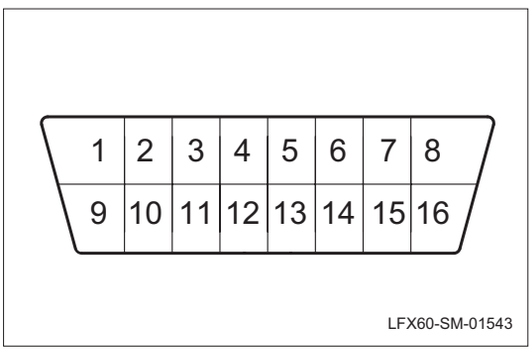


PIN	Definition	PIN	Definition
1		9	
2		10	
3		11	
4	GND	12	
5	GND	13	
6	CANH	14	CANL
7		15	
8		16	BAT

CAN bus integrity inspection

1. Operate the start switch to set the power mode under OFF status.
2. Disconnect the negative battery connector.
3. Measure the resistance between Terminals 6 and 14 of DLC diagnosis interface.

Standard value: 55~63Ω



4. If the displayed resistance value is 110 ~ 125Ω or the line is disconnected, it will indicate CAN bus fault, must inspect the wiring harness connectors of ECM and the instrument cluster; if there is open circuit, poor connection and other abnormities, must repair it.

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Diagnosis information and procedures

Diagnosis Instructions

Before the on-board network troubleshooting, must understand and familiarize its working principle, and then perform its diagnosis, so as to determine the correct fault diagnosis procedure in case of fault, and more importantly, to determine whether the situations described by the user are normal.

For any on-board network fault diagnosis, must inspect it firstly, and then guide the maintenance staff to take the next logical steps for fault diagnosis. Comprehend and correctly use the diagnostic flow chart to shorten the diagnosis time and avoid the misjudgement.

General equipment

Name
Diagnostic equipment of vehicle
Digital multimeter

Visual Inspection

1. Confirm the problem raised by the customer.
2. Check for evident mechanical and electrical faults.

Visual inspection table

Electrical
• Battery • Fuse • Loosening or aging of wiring harness connector • Harness

3. Check the system lines easy to see or can be seen.
4. If the observed or raised problem is the evident and the cause has been found, ensure to fix this fault before proceeding with the next step.
5. If no problem is found through the visual check, confirm the fault and refer to the fault symptom list.

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Fault symptoms table

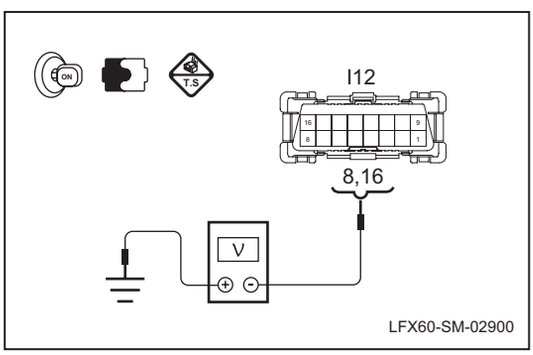
If there is a fault but the fault diagnosis code (DTC) is not stored in the control module and the fault causes can not be confirmed in the basic inspection, must perfrom the fault diagnosis and troubleshooting with the steps listed in the table below.

Symptom	Possible point of failure	Recommended measure
The diagnosiss instrument can not perform CAN communication with ECM	• Diagnostic meter • Line • ECM module	**Refer to: Diagnosis procedure about the diagnosiss instrument can not perform CAN communication with ECM**
The diagnosiss instrument can not perform CAN communication with TCM	• Diagnostic meter • Line • TCM module	• The fault diagnosis flow is similar to that of ECM **Refer to: The diagnostic meter unable to communicate CAN diagnosis flow with ECM**
The diagnosiss instrument can not perform CAN communication with ABS/ ESP	• Line • Instrument cluster • ABS/ESP module	• The fault diagnosis flow is similar to that of ECM **Refer to: The diagnostic meter unable to communicate CAN diagnosis flow with ECM**
The diagnosiss instrument can not perform CAN communication with BCM	• Diagnostic meter • Line • BCM module	• The fault diagnosis flow is similar to that of ECM **Refer to: The diagnostic meter unable to communicate CAN diagnosis flow with ECM**
The diagnosiss instrument can not perform CAN communication with PEPS	• Diagnostic meter • Line • PEPS module	• The fault diagnosis flow is similar to that of ECM **Refer to: The diagnostic meter unable to communicate CAN diagnosis flow with ECM**
The diagnosis instrument can not perfrom CAN communication with the instrument cluster	• Diagnostic meter • Line • Instrument cluster	• The fault diagnosis flow is similar to that of ECM **Refer to: The diagnostic meter unable to communicate CAN diagnosis flow with ECM**
The diagnosiss instrument can not perform CAN communication with TPMS	• Diagnosis equipment • Line • TPMS	• The fault diagnosis flow is similar to that of ECM **Refer to: The diagnostic meter unable to communicate CAN diagnosis flow with ECM**
The diagnosis instrument can not perform CAN communication with the airbag module	• Diagnostic meter • Line • Airbag module	• The fault diagnosis flow is similar to that of ECM **Refer to: The diagnostic meter unable to communicate CAN diagnosis flow with ECM**

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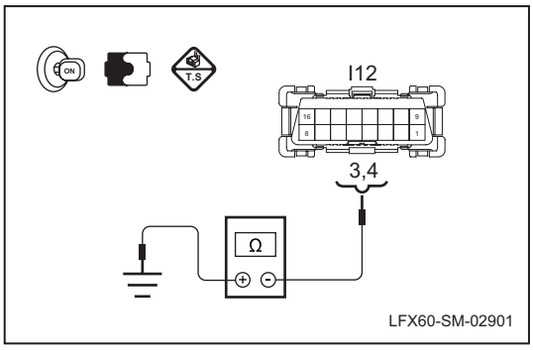
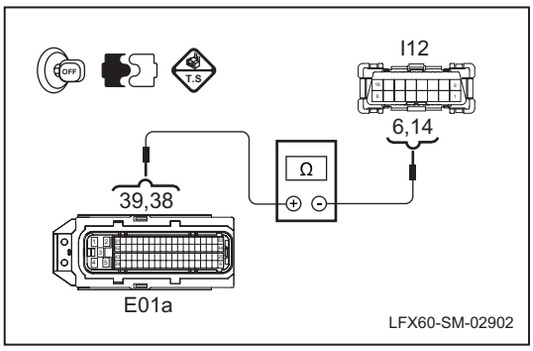
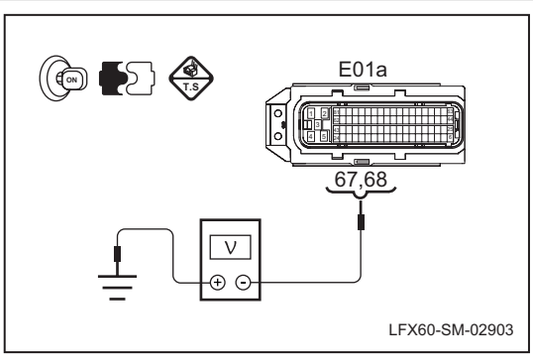
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The diagnostic meter unable to communicate CAN diagnosis flow with ECM (Delphi)

Test condition	Details/results/measures
1. Check the engine data.	
	A. Operate the ignition switch to turn the power to OFF and connect the diagnostic meter. B. Operate the ignition switch to turn the power to ON state. Turn on the diagnostic meter - use the latest software version. C. Read the engine data display in the diagnostic meter. D. Can the diagnostic meter access to the ECM to read the data stream? →**Yes** There is intermittent fault and check the fault. →**No** To step 2.
2. Check the other module data.	
	A. Read the airbag and ABS/ESP system data. B. Can the diagnostic meter access to the airbag system or ABS system to read the data stream? →**Yes** To step 5. →**No** To step 3.
3. Check the diagnostic interface power line.	
	A. Operate the ignition switch to turn the power to ON state. B. Measure the voltage between the terminal 8 and 16 of the diagnostic interface I12 and fixed ground point with the multimeter. **Standard value: 11 ~ 14 V** Is the voltage is OK? →**No** Repair the diagnostic interface power line fault and replace the harness if necessary. →**Yes** To step 4.

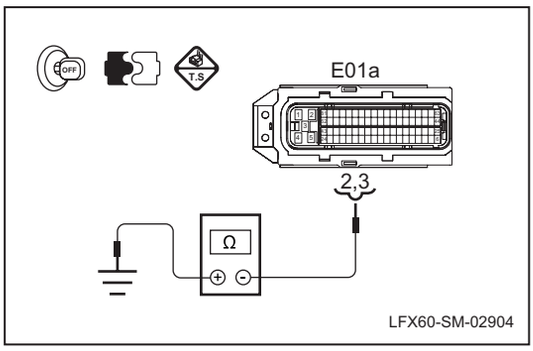
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Test condition	Details/results/measures
4. Check the diagnostic interface ground circuit.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Measure the resistance between the terminal 3 and 4 of the diagnostic interface I12 and fixed ground point with the multimeter. **Standard value: Less than 5Ω** Is the resistance normal? →**Yes** To step 5. →**No** Repair the diagnostic interface ground circuit fault and replace the harness if necessary.
5. Check the ECM communication line.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the ECM harness plug E01a. D. Measure the resistance between the terminal 38, 39 of E01a and the terminal 14 and 6 of diagnostic interface I12 with the multimeter. **Standard value: Less than 5Ω** Is the resistance normal? →**Yes** To step 6. →**No** Repair the communication line fault between the ECM and diagnostic interface and replace the harness if necessary.
6. Check the ECM power.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the ECM harness plug E01a. D. Connect the battery negative terminal. E. Operate the ignition switch to turn the power to ON state. F. Measure the voltage between the terminal 67, 68 of E01a plug and the fixed ground point with the multimeter. **Standard value: 11 ~ 14 V** Is the voltage is OK? →**Yes** To step 7. →**No** Repair the ECM power line fault and replace the harness if necessary.

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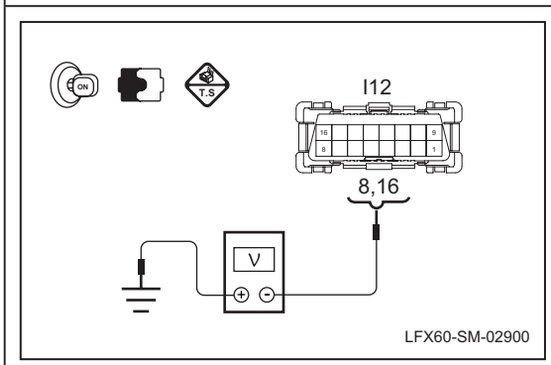
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Test condition	Details/results/measures
7. Check the ECM grounding line.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Measure the resistance between the terminal 2, 3 of E01a plug and the fixed ground point with the multimeter. **Standard value: Less than 5Ω** Is the resistance normal? →**Yes** To step 8. →**No** Repair the ECM ground circuit fault and replace the harness if necessary.
8. Check ECM.	
	A. Replace ECM. **Refer to: ECM** Confirm that troubleshooting is completed.

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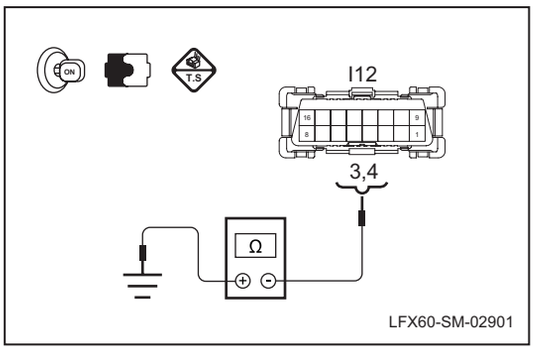
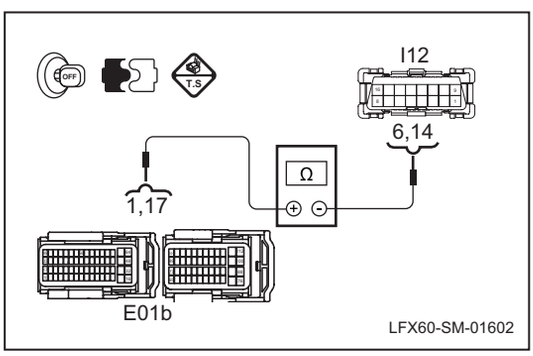
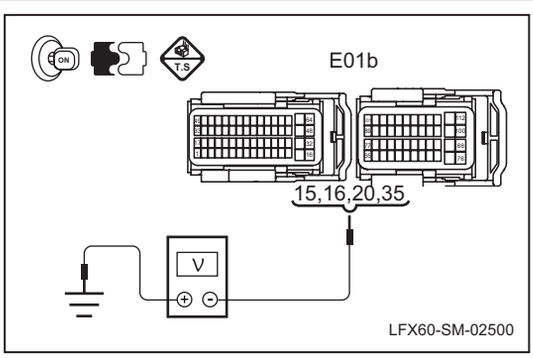
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The diagnostic meter unable to communicate CAN diagnosis flow with ECM (UMC)

Test condition	Details/results/measures
1. Check the engine data.	
	A. Operate the ignition switch to turn the power to OFF and connect the diagnostic meter. B. Operate the ignition switch to turn the power to ON state. Turn on the diagnostic meter - use the latest software version. C. Read the engine data display in the diagnostic meter. Can the diagnostic meter access to the ECM to read the data stream? →**Yes** There is intermittent fault and check the fault. →**No** To step 2.
2. Check the other module data.	
	A. Read the airbag and ABS/ESP system data. Can the diagnostic meter access to the airbag system or ABS system to read the data stream? →**Yes** To step 5. →**No** To step 3.
3. Check the diagnostic interface power line.	
	A. Operate the ignition switch to turn the power to ON state. B. Measure the voltage between the terminal 8 and 16 of the diagnostic interface I12 and fixed ground point with the multimeter. **Standard value: 11 ~ 14 V** Is the voltage is OK? →**No** Repair the diagnostic interface power line fault and replace the harness if necessary. →**Yes** To step 4.

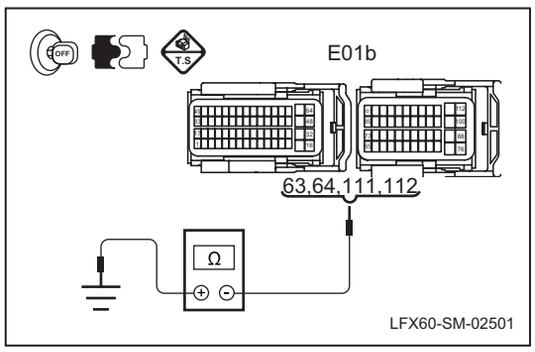
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Test condition	Details/results/measures
4. Check the diagnostic interface ground circuit.	
	A. Operate the ignition switch to turn the power to OFF state. B.VDisconnect the battery negative connector. Measure the resistance between the terminal 3 and 4 of the diagnostic interface I12 and fixed ground point with the multimeter. **Standard value: Less than 5Ω** Is the resistance normal? →**Yes** To step 5. →**No** Repair the diagnostic interface ground circuit fault and replace the harness if necessary.
5. Check the ECM communication line.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the ECM harness plug E01a. D. Measure the resistance between Terminals 1 and 17 of E01b and Terminals 6 and 14 of the diagnosis interface I12 with a multimeter seperately. **Standard value: Less than 5Ω** Is the resistance normal? →**Yes** To step 6. →**No** Repair the communication line fault between the ECM and diagnostic interface and replace the harness if necessary.
6. Check the ECM power supply line.	
	A. Operate the start switch to turn the power to ON state. B. Measure the voltage between terminals 15, 16, 20, 35 of the ECM harness connector E01b and the reliable ground point, respectively, with a multimeter. **Standard value: 11 ~ 14V** Is the voltage is OK? →**Yes** To step 7. →**No** Troubleshoot the ECM power supply line and replace the harness if necessary.
7. Check the ECM grounding line.	

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Test condition	Details/results/measures
	A. Operate the start switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the ECM harness connector E01b. D. Measure the resistance between the terminals 63, 64, 111, 112 of the ECM harness connector E01b and the reliable ground point with a multimeter. **Standard value: Less than 5Ω** Is the resistance normal? →**Yes** To step 8. →**No** Troubleshoot the ECM grounding line and replace the harness if necessary.
8. Check ECM.	
	A. Replacement of the engine control module. **Refer to: Replacement of the engine control module (ECM)** Confirm that troubleshooting is completed.

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12- Electrical system

Body controller (BCM) 12-1925

Technical specifications ... 12-1925

Structure and installation location 12-1926

Operating principle..... 12-1927

Diagnosis information and procedures..... 12-1928

Removal and installation.. 12-1965

AutoLibrary

AutoLibrary

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Body controller (BCM)

Technical specifications

General specifications

Body controller

Name	Torque range
Rated voltage	12V
Operating voltage	(9 ~ 16) V
Operating temperature	(-40 ~ 85) °C
Storage temperature	(-40 ~ 95) °C
Protection level	IP52
HF communication	Frequency hopping technology, with the frequency of 434.42 MHz ± 40 kHz or 433.42 MHz ± 40 kHz
Static sleeping current	≤3mA (testing static sleeping current of entire vehicle)
Service life	3 year or 60000km

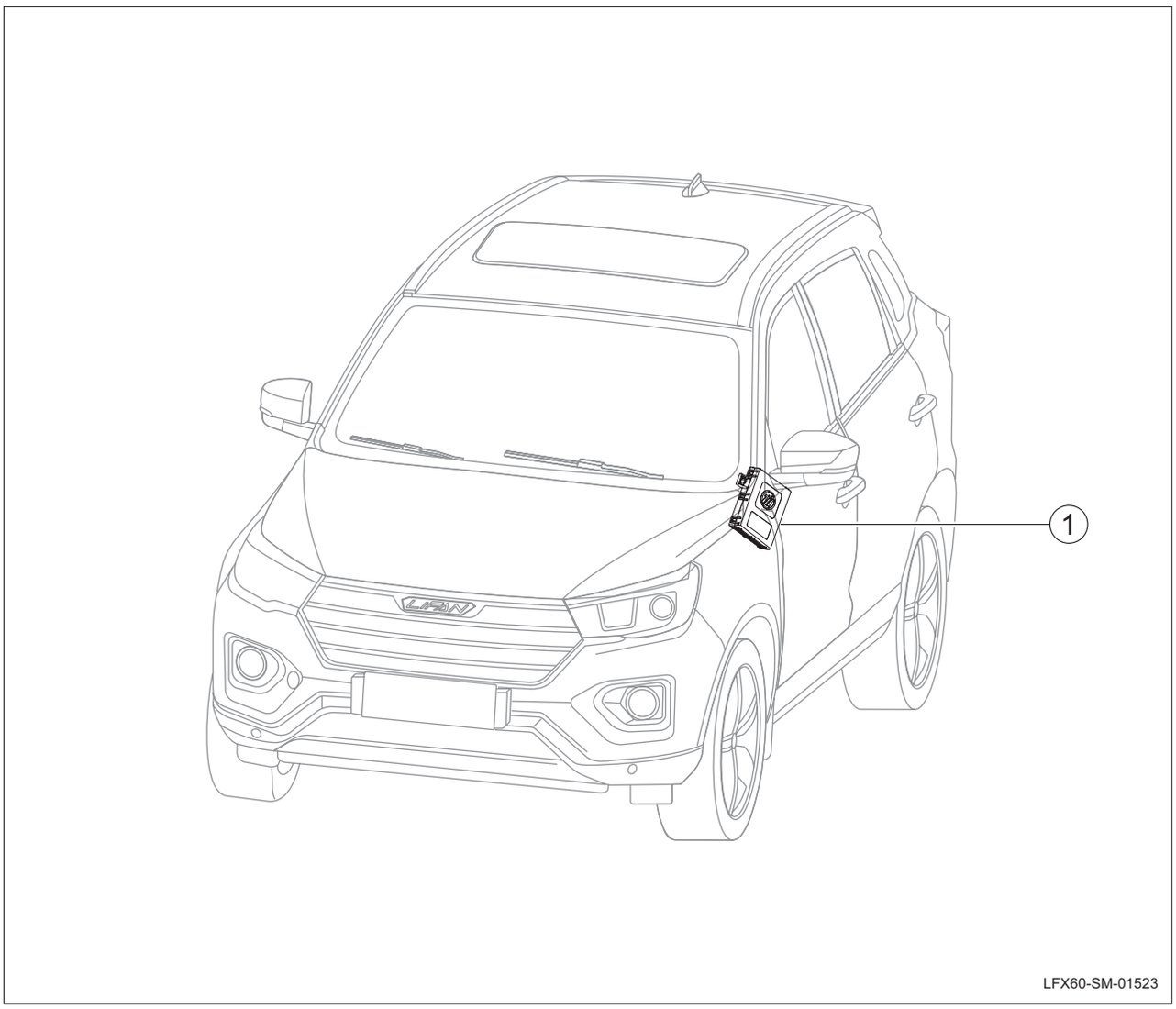
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Structure and installation location

Component Location Plan

Body controller



No.	Part name
1	Body controller (BCM)

No.	Part name

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Operating principle

System overview

The body control system consists of body control module, body remote control key, power windows, left and right turn signals, headlights, four door lock motors, back door lock motor, indoor lights, combination switch, danger alarm switch and other components.

In order to reduce the fault rate of the vehicle and implement more effective control, all electrical applications are equipped with a centralized control mode (BCM) with a radio frequency receiver.

The main functions of the body control system:

- Central door lock control
- Trunk unlocking
- Remote search function
- Body anti-theft system
- Power window control
- Automatically folding of rearview mirrors
- Light function control
- Prompt function logic
- Locking prompt
- BCM controller sleep
- BCM controller waking up
- Communication and diagnosis functions

For the functional description of each system, please refer to the system overview of each system.

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Diagnosis information and procedures

Diagnosis Instructions

Before BCM system troubleshooting, must understand and familiarize its working principle, and then perform its diagnosis, so as to determine the correct fault diagnosis procedure in case of fault, and more importantly, to determine whether the situations described by the user are normal.

For any BCM system fault diagnosis, must inspect it firstly, and then guide the maintenance staff to take the next logical steps for fault diagnosis. Comprehend and correctly use the diagnostic flow chart to shorten the diagnosis time and avoid the misjudgement.

General equipment

Name
Diagnostic equipment of vehicle
Digital multimeter

Visual inspection

1. Confirm the problem raised by the customer.
2. Check for the evident mechanical or electrical damage trace and collision deformation trace through the visual check.

Visual inspection table

Electrical
• Fuse • Line • Battery • Loosening or corrosion of the wiring harness connector

3. Check the system lines easy to see or can be seen.
4. If there is any significant smell or overheated part during the inspection process, must determine whether the part is damaged.
5. If the observed or raised problem is the evident and the cause has been found, ensure to fix this fault before proceeding with the next step.
6. If no problem is found through the visual check, confirm the fault and refer to the fault symptom list.

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Fault symptoms table

Symptom	Possible cause	Recommended measure
Position light malfunction	• Is the fuse blown? • Are the fuse and connector contact pins bent? • Is the battery voltage between 11 ~ 14V? • Input signal invalid • Eliminate the fault and repair	• Inspect whether the position light switch can be turned on • Check whether the connector contact pins are reliable • Connect the diagnostic meter and check the input by reading the data stream • Connect the diagnostic meter and read the DTC to check for short circuit or open circuit • Connect the diagnosis instrument, perform the action test and inspect the connectors
Front fog lamp malfunction	• The fuse is blown • Are the fuse and connector contact pins bent? • Is the battery voltage between 11 ~ 14V? • Input signal invalid • Eliminate the fault and repair	• Inspect whether the front fog lamp switch can be turned on • Check whether the connector contact pins are reliable • Check whether the exterior relay and fuse are normal • Connect the diagnostic meter and check the input signal by reading the data stream • Connect the diagnostic meter and read the DTC to check for short circuit or open circuit
High beam malfunction	• Is the fuse blown? • The fuse and connector pins are bent • There is a relay load • The battery voltage is out of the range of 11 ~ 14V • Input signal invalid • Eliminate the fault and repair	• Inspect whether the headlamp switch can be turned on • Inspect whether the high beam switch can be turned on • Check whether the connector contact pins are reliable • Check whether the exterior relay and fuse are normal • Connect the diagnostic meter and check the input signal by reading the data stream • Connect the diagnostic meter and read the DTC to check for short circuit or open circuit
Rear fog lamp malfunction	• Is the fuse blown? • The fuse and connector pins are bent • There is a relay load • Is the battery voltage between 11 ~ 14V? • The start input signal is invalid • Eliminate the fault and repair	• Inspect whether the rear fog lamp switch can be turned on • Check whether the connector contact pins are reliable • Check whether the exterior relay and fuse are normal • Connect the diagnostic meter and check the input signal by reading the data stream • Connect the diagnostic meter and read the DTC to check for short circuit or open circuit
Left turn signal malfunction	• Is the fuse blown? • Are the fuse and connector contact pins bent? • Is the battery voltage between 11 ~ 14V? • Input signal invalid • Eliminate the fault and repair	• Inspect whether the left turn signal switch can be turned on • Check whether the connector contact pins are reliable • Connect the diagnostic meter and check the input by reading the data stream • Connect the diagnostic meter and read the DTC to check for short circuit or open circuit • Connect the diagnosis instrument, perform the action test, and inspect the connectors
Right turn signal malfunction	• Is the fuse blown? • The fuse and the connector pins are bent • The battery voltage is out of the range of 11 ~ 14V • Input signal invalid • Eliminate the fault and repair	• Inspect whether the right turn signal switch can be turned on • Check whether the connector contact pins are reliable • Connect the diagnostic meter and check the input by reading the data stream • Connect the diagnostic meter and read the DTC to check for short circuit or open circuit

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Symptom	Possible cause	Recommended measure
Danger alarm light malfunction	• Is the fuse blown? • Are the fuse and connector contact pins bent? • Is the battery voltage between 11 ~ 14V? • Input signal invalid • Eliminate the fault and repair	• Inspect whether the danger alarm light switch can be turned on • Check whether the connector contact pins are reliable • Connect the diagnostic meter and check the input signal by reading the data stream • Connect the diagnostic meter and read the DTC to check for short circuit or open circuit
Indoor light malfunction	• Is the fuse blown? • Are the fuse and connector contact pins bent? • Is the battery voltage between 11 ~ 14V? • Input signal invalid • Eliminate the fault and repair	• Inspect whether the indoor light is turned to “Door” position • Connect the diagnostic meter and read the DTC to check for short circuit or open circuit
Brake light malfunction	• Is the fuse blown? • The fuse and connector pins are bent • The brake light switch is faulty • Is the battery voltage between 11 ~ 14V? • Input signal invalid • Eliminate the fault and repair	• Inspect whether the brake light switch can be turned on • Check whether the connector contact pins are reliable • Connect the diagnostic meter and check the input signal by reading the data stream • Connect the diagnostic meter and read the DTC to check for short circuit or open circuit
Anti-theft indicator malfunction	• Is the fuse blown? • The fuse and connector pins are bent • The battery voltage is out of the range of 9 ~ 16V • Input signal invalid • Eliminate the fault and repair	• Inspect whether the power supply is in ACC position • Inspect the door status data
Driver door unlocking malfunction	• Is the fuse blown? • Are the fuse and connector contact pins bent? • Is the battery voltage between 11 ~ 14V? • Input signal invalid • Eliminate the fault and repair	• Inspect whehter the fuse is blown or loosened • Inspect whether the central unlock switch can be turned on • Check whether the connector contact pins are reliable • Connect the diagnostic meter and check the input signal by reading the data stream
Driver door locking malfunction	• Is the fuse blown? • Are the fuse and connector contact pins bent? • Is the battery voltage between 11 ~ 14V? • Input signal invalid • Eliminate the fault and repair	• Inspect whether BCM fuse is blown or loosened • Inspect whether the central lock switch can be turned on • Check whether the connector contact pins are reliable • Connect the diagnostic meter and check the input signal by reading the data stream
Back door unlocking malfunction	• Is the fuse blown? • Are the fuse and connector contact pins bent? • Is the battery voltage between 11 ~ 14V? • Input signal invalid • Eliminate the fault and repair	• Check the BCM fuse for blowing or looseness • Inspect whether the trunk microswitch can be turned on • Inspect whether the connector pins are insered reliably • Connect the diagnostic meter and check the input by reading the data stream

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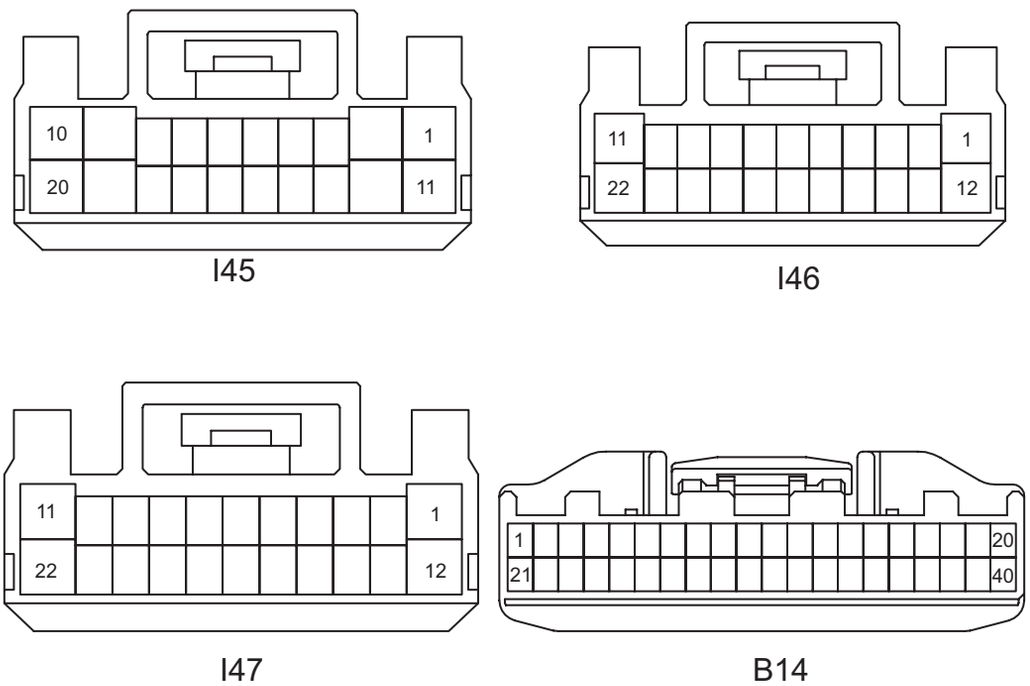
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Alarm speaker malfunction	• Is the fuse blown? • Are the fuse and connector contact pins bent? • Is the battery voltage between 11 ~ 14V? • Input signal invalid • Eliminate the fault and repair	• Check the BCM fuse for blowing or looseness • Inspect the speaker for any abnormity • Inspect and repair the correspinding line fault
Remote control malfunction	• Is the fuse blown? • Are the fuse and connector contact pins bent? • Is the battery voltage between 11 ~ 14V? • Input signal invalid • Eliminate the fault and repair	• Connect the diagnostic meter and check the remote control key request signal • Inspect whether the central control button and the trunk button can be locked or unlocked, or inspect the central lock • Connect the diagnosis instrument, inspect whether the power supply is in ACC position and whether there is IGN signal input by reading the data flow
Remote window opening/ closing malfunction	• Is the fuse blown? • Are the fuse and connector contact pins bent? • Is the battery voltage between 11 ~ 14V? • Input signal invalid • Repair the malfunction	• Connect the diagnostic meter and check the remote control key request signal • Inspect whether the window is normal
Other BCM input malfunction	• Is the fuse blown? • Are the fuse and connector contact pins bent? • Is the battery voltage between 11 ~ 14V? • Input signal invalid • Eliminate the fault and repair	• Inspect whether the corresponding input switch can be turned on • Inspect whether the corresponding connector pins are reliable • Connect the diagnostic meter and check the input signal by reading the data stream
ACC relay malfunction	• Is the fuse blown? • The fuse and connector pins are bent • Is the battery voltage between 11 ~ 14V? • Input signal invalid • Eliminate the fault and repair	• Inspect whther the relay is normal • Inspect whther the control line is normal

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List of control module (BCM) terminals



LFX60-SM-12678

Terminal No.	Wire diameter/color	Terminal description
I45-01	0.30 Br/W	Anti-theft identification coil backlight signal
I45-02	0.30 V	ACC signal feedback
I45-03	0.30 G/Bl	Right turn signal
I45-04	0.30 G/W	Overtaking lamp switch signal
I45-05	0.30 G/Br	Low beam switch signal
I45-06	0.30 Bl	Sensor analog grounding
I45-07	0.50 Br/G	Hatch unlocking signal
I45-08	0.50 Br/R	Front left door unlocking
I45-09	0.50 Br/Bl	4-door locking
I45-10	0.50 Br/Y	3-door unlocking
I45-11	0.30 Br/B	Key insertion signal
I45-12	0.30 R/Bl	IG1 signal feedback
I45-13	0.30 G/B	High beam switch signal
I45-14	0.30 G	Small lamp switch signal
I45-15	-	-

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Terminal No.	Wire diameter/color	Terminal description
I45-16	0.30 Br/O	Collision signal input
I45-17	0.30 W/B	P/N switch signal
I45-18	0.50 R/G	Energy-saving output
I45-19	0.85W	Lock power
I45-20	1.25 B	Central lock ground
I46-01	1.25 B	Front left window/ rear right window ground
I46-02	0.50 G/B	Rear right door glass lift motor down signal
I46-03	0.50 G	Rear right door glass lift motor up signal
I46-04	0.50 Y/W	Front left door glass lift motor up signal
I46-05	0.50 Y/R	Front left door glass lift motor down signal
I46-06	0.30 G/W	Skylight control signal
I46-07	0.50 Y/Bl	Front right door glass lift motor up signal
I46-08	0.50 Y/G	Front right door glass lift motor down signal
I46-09	0.50 Y/V	Rear left door glass lift motor down signal
I46-10	0.50 Y/Br	Rear left door glass lift motor up signal
I46-11	1.25 B	Front right window/ rear left window ground
I46-12	1.25 R/Y	Front left window/rear right window glass lift power
I46-13	0.30 Bl/W	High beam control signal
I46-14	0.30 Bl/Y	Low beam control signal
I46-15	0.30 Bl	Reverse lamp signal
I46-16	-	-
I46-17	0.30 Bl/R	AUTO lamp switch signal
I46-18	0.30 Bl/W	Rear fog lamp switch signal
I46-19	0.30 Bl/B	Front fog lamp switch signal
I46-20	0.30 Br/W	Hazard warning lamp switch signal
I46-21	0.30 G/Y	Left turn lamp switch signal
I46-22	1.25 R/Y	Front right window/rear left window glass lift power
I47-01	0.50 R/G	Controller power
I47-02	0.30 Bl/B	PCAN-H
I47-03	0.30 Br	Anti-theft identification coil signal +
I47-04	0.30 Br/Y	Immobilizer indicator lamp power
I47-05	0.30 G/Bl	Dome lamp drive output
I47-06	0.30 G/Y	Backlight power supply
I47-07	0.30 Bl/G	Front right turn lamp power

AutoLibrary

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Terminal No.	Wire diameter/color	Terminal description
I47-08	0.30 BI/P	Front left turn lamp power
I47-09	0.30 Y/G	Exterior rearview mirror deployment signal output
I47-10	0.30 Y/Br	Exterior rearview mirror extending/folding signal output
I47-11	0.50 Y/W	Outside lamp power
I47-12	0.85 B	BCM grounding
I47-13	0.30 BI/W	PCAN-L
I47-14	0.30 Br/B	Anti-theft identification coil signal -
I47-15	0.30 Y/B	Right front position light actived signal
I47-16	0.30 G/W	Left front position light actived signal
I47-17	0.30 G	Right front daytime lamp actived signal
I47-18	0.30 G/O	Left front daytime lamp actived signal
I47-19	0.30 Br/R	Sensor power supply
I47-20	0.30 Y	Rear fog lamp drive output
I47-21	0.30 BI/Gr	Front fog lamp control signal
I47-22	0.30 P/B	Speaker actived output
B14-01	0.30 G/Y	-
B14-02	-	-
B14-03	0.50 Y/Gr	Central switch unlocking signal
B14-04	0.50 Y/Bl	Front left door glass lift signal
B14-05	0.50 Y/Br	Rear left door glass lift signal
B14-06	0.50 Y/R	Front right door glass lift signal
B14-07	0.30 G/O	Ambient light sensor analog signal
B14-08	0.30 Y/B	Trunk status signal
B14-09	0.30 Br	Key locking/locking signal
B14-10	0.30 G/W	Exterior rearview mirror deployment signal input
B14-11	0.30 G/B	Exterior rearview mirror folding signal input
B14-12	0.30 B/W	Front left door status signal
B14-13	0.30 B/P	Rear left door status signal
B14-14	0.50 Y	Window locking signal
B14-15	-	-
B14-16	-	-
B14-17	0.30 V/W	-
B14-18	0.30 Br/R	-
B14-19	0.30 Br/Y	-

AutoLibrary

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Terminal No.	Wire diameter/color	Terminal description
B14-20	0.30 Br	-
B14-21	0.30 Bl/R	Rear left turn lamp power
B14-22	0.30 Bl/Y	Rear right turn lamp power
B14-23	0.30 G/O	Glass lift working indicator lamp
B14-24	0.50 Y/G	Front right door glass lift signal
B14-25	0.50 Y/O	Rear right door glass lift signal
B14-26	0.50 Y/W	Rear left door glass lift signal
B14-27	0.50 Y/V	Rear right door glass lift signal
B14-28	0.30 G/Bl	Hatch inching switch status signal
B14-29	0.50Y/P	Central switch locking signal
B14-30	0.30 Br	-
B14-31	-	-
B14-32	0.30 B/O	Front right door status signal
B14-33	0.30 B/G	Rear right door status signal
B14-34	0.30 G	-
B14-35	0.50B/Y	Window simulation ground
B14-36	-	-
B14-37	0.30 V/G	-
B14-38	0.30 Br/O	-
B14-39	0.30 Br/B	-
B14-40	0.30 Br/W	-

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DTC list

DTC	DTC information
B100016	The voltage is too low
B100017	The voltage is too high
B102015	Front left turn lamp open circuit
B102011	Front left turn lamp short circuit
B102115	Front right turn lamp open circuit
B102111	Front right turn lamp short circuit
B102215	Rear left turn lamp open circuit
B102211	Rear left turn lamp short circuit
B102315	Rear right turn lamp open circuit
B102311	Rear right turn lamp short circuit
B102415	Front left clearance lamp open circuit
B102411	Front left clearance lamp short circuit
B102515	Front right clearance lamp open circuit
B102511	Front right clearance lamp short circuit
B102615	Rear clearance lamp open circuit
B102611	Rear clearance lamp short circuit
B102715	Left daytime running lamp open circuit
B102711	Left daytime running lamp short circuit
B102815	Right daytime running lamp open circuit
B102811	Right daytime running lamp short circuit
B104011	Front left door window motor short circuit
B104015	Front left door window motor open circuit
B104111	Front right door window motor short circuit
B104115	Front right door window motor open circuit
B104211	Rear left door window motor short circuit
B104215	Rear left door window motor open circuit
B104311	Rear right door window motor short circuit
B104315	Rear right door window motor open circuit
B105015	Immobilizer coil open circuit
B103A96	Immobilizer coil short to the ground
U016403	Engine immobilizer authentication fail

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DTC diagnosis flow index

DTC	Description	Diagnostic process
B100016	The voltage is too low	**Refer to: DTC B100016, B100017**
B100017	The voltage is too high	
B102015	Front left turn lamp open circuit	**Refer to: DTC B102015, B102011, B102115, B102111, B102215, B102211, B102315, B102311**
B102011	Front left turn lamp short circuit	
B102115	Front right turn lamp open circuit	
B102111	Front right turn lamp short circuit	
B102215	Rear left turn lamp open circuit	
B102211	Rear left turn lamp short circuit	
B102315	Rear right turn lamp open circuit	
B102311	Rear right turn lamp short circuit	
B102415	Front left clearance lamp open circuit	**Refer to: DTC B102415, B102411, B102515, B102511, B102615, B102611**
B102411	Front left clearance lamp short circuit	
B102515	Front right clearance lamp open circuit	
B102511	Front right clearance lamp short circuit	
B102615	Rear clearance lamp open circuit	
B102611	Rear clearance lamp short circuit	
B102715	Left daytime running lamp open circuit	**Refer to: DTC B102715, B102711, B102815, B102811**
B102711	Left daytime running lamp short circuit	
B102815	Right daytime running lamp open circuit	
B102811	Right daytime running lamp short circuit	
B104011	Front left door window motor short circuit	**Refer to: DTC B104011, B104015, B104111, B104115, B104211, B104215, B104311, B104315**
B104015	Front left door window motor open circuit	
B104111	Front right door window motor short circuit	
B104115	Front right door window motor open circuit	
B104211	Rear left door window motor short circuit	
B104215	Rear left door window motor open circuit	
B104311	Rear right door window motor short circuit	
B104315	Rear right door window motor open circuit	
B105015	Immobilizer coil open circuit	**Refer to: DTC U016403, B105015, B103A96**
B103A96	Immobilizer coil short to the ground	
U016403	Engine immobilizer authentication fail	

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DTC	Description	Diagnostic process
U002088	CAN bus OFF	**Refer to: DTC U002088, U016487, U015187, U015587**
U016487	Unable to communicate with EMS	
U015187	Unable to communicate with SDM	
U015587	Unable to communicate with IC	

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DTC B100016, B100017

DTC description

DTC	Description	Definition
B100016	The voltage is too low	BCM control unit monitors the system operating voltage abnormity
B100017	The voltage is too high	

Possible reasons

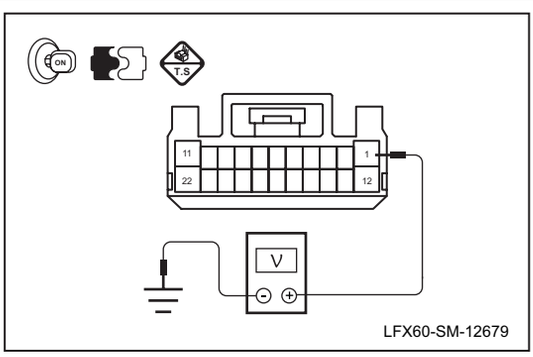
DTC	Check the strategy	Set the condition (control strategy)	Define the fault location
B100016	Check the hardware and line	Voltage exceeds 18 V and maintains 10s	• Charging system • BCM control unit or its line fault
B100017		Voltage is less than 9V and maintains 10s	

Diagnostic process

Test condition	Details/results/measures
1. General inspection.	
	A. Check the related harness plugs for breakage, loose contact, aging or looseness. Is it OK after checking? →**Yes** To step 2. →**No** Repair the fault position.
2. Read the DTC with the diagnostic meter.	
	A. Connect the diagnostic meter and check the system for the other relevant DTCs. Is it OK after checking? →**Yes** To step 3. →**No** Carry out the relevant fault diagnosis according to the DTCs.
3. Check whether the DTC can be cleared.	
	A. Connect the diagnostic meter and clear BCM DTC. B. Start the engine and check whether the DTC occurs again. Does DTC occur? →**Yes** To step 4. →**No** System normal.

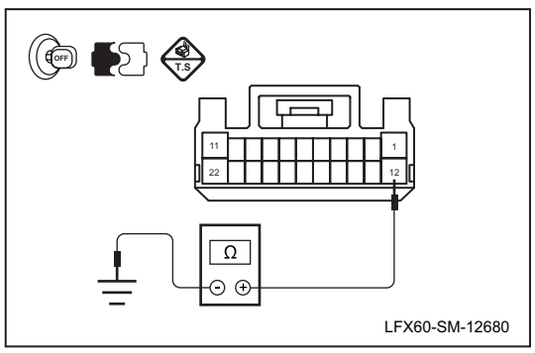
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Test condition	Details/results/measures
4. Check the power supply system of vehicle.	
	A. Check whether the power supply system of vehicle is normal. Is it OK after checking? →**Yes** To step 5. →**No** Check the power supply system for fault.
5. Inspect BCM fuse.	
	A. Inspect the fuse FS23. **Rated fuse capacity is 5A.** Is the fuse normal? →**Yes** To step 6. →**No** Repair the fuse line and replace the fuse of rated capacity.
6. Check the BCM power line.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative connector. B. Disconnect the BCM harness plug I47. C. Connect the battery negative terminal and operate the start switch to turn the power to ON state. D. Measure the voltage between the BCM harness plug I47 terminal 1 and the fixed ground point. **Standard value: 11 ~ 14 V** Is it OK after checking? →**Yes** To step 7. →**No** Repair the BCM power line open circuit fault and replace the harness if necessary.

AutoLibrary

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Test condition	Details/results/measures
7. Check the BCM control module ground line.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative connector. B. Disconnect the BCM harness plug I47. C. Measure the resistance between the BCM harness plug I47 terminal 12 and the fixed ground point. **Standard value: Less than 5Ω** Is it OK after checking? →**Yes** To step 8. →**No** Repair the BCM ground line open circuit fault and replace the harness if necessary.
8. Replace the BCM.	
	A. Replace BCM. **Refer to: Replacement of BCM** Confirm the system is normal.

AutoLibrary

AutoLibrary

DTC B102015, B102011, B102115, B102111, B102215, B102211, B102315, B102311

DTC description

DTC	Description
B102015	Front left turn lamp open circuit
B102011	Front left turn lamp short circuit
B102115	Front right turn lamp open circuit
B102111	Front right turn lamp short circuit
B102215	Rear left turn lamp open circuit
B102211	Rear left turn lamp short circuit
B102315	Rear right turn lamp open circuit
B102311	Rear right turn lamp short circuit

Possible reasons

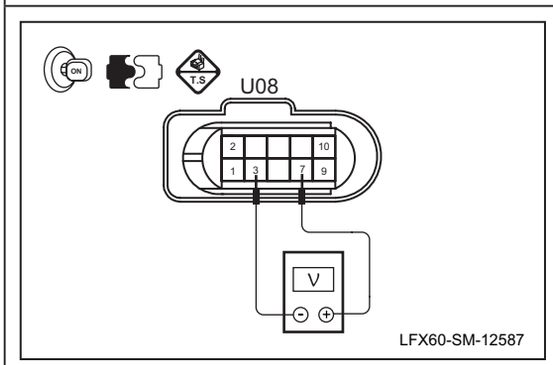
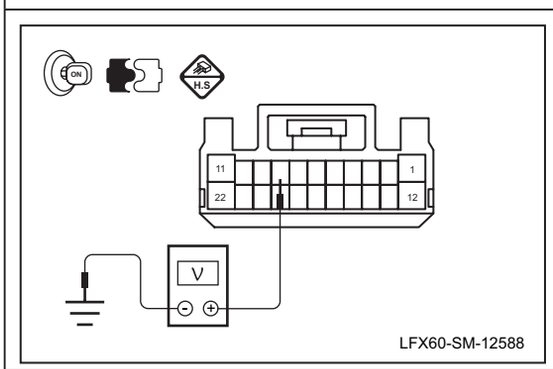
DTC	Check the strategy	Set the condition (control strategy)	Define the fault location
B102015	Check the hardware and line	Left front turn signal open circuit load	• Left front marker light • Harness line fault • BCM module power and ground • BCM
B102011		Left front turn signal short circuit load	
B102115		Right front turn signal open circuit load	
B102111		Right front turn signal short circuit load	
B102215		Left rear turn signal open circuit load	
B102211		Left rear turn signal short circuit load	
B102315		Right rear turn signal open circuit load	
B102311		Right rear turn signal short circuit load	

Diagnostic process

Test condition	Details/results/measures
1. General inspection.	
	A. Check the related harness plugs for breakage, loose contact, aging or looseness. Is it OK after checking? →**Yes** To step 2. →**No** Repair the fault position.

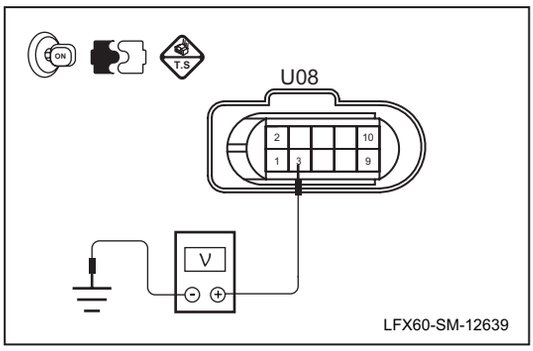
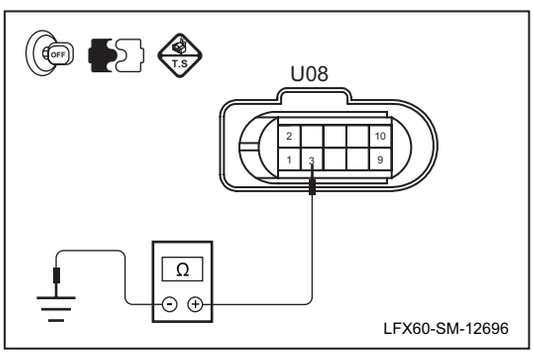
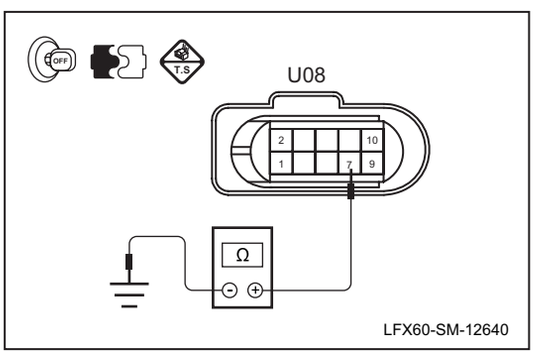
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Test condition	Details/results/measures
2. Read the DTC with the diagnostic meter.	
	A. Connect the diagnostic meter and check the system for the other relevant DTCs. Is it OK after checking? →**Yes** To step 3. →**No** Carry out the relevant fault diagnosis according to the DTCs.
3. Check whether the DTC can be cleared.	
	A. Connect the diagnostic meter and access the BCM to clear DTC. B. Start the engine and check whether the DTC occurs again. Does DTC occur? →**Yes** To step 4. →**No** System normal.
4. Check the front left turn lamp power voltage (with this lamp as example).	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative connector. B. Disconnect the front left combination lamp harness plug U08. C. Connect the battery negative terminal and operate the start switch to turn the power to ON state. D. Turn on the left front turn signal and measure the voltage between Terminals 3 and 7 of the left front combination light wiring harness connector U08. **Standard value: 11 ~ 14 V** Is it OK after checking? →**No** To step 5. →**Yes** Replace the front left turn lamp bulb.
5. Check the output voltage of BCM terminal 8.	
	A. Operate the start switch to turn the power to ON state. B. Turn on the left front turn signal and measure the voltage between Terminal 8 of BCM wiring harness connector I47 and the reliable grounding point. **Standard value: 11 ~ 14 V** Is it OK after checking? →**Yes** To step 6. →**No** To step 9.

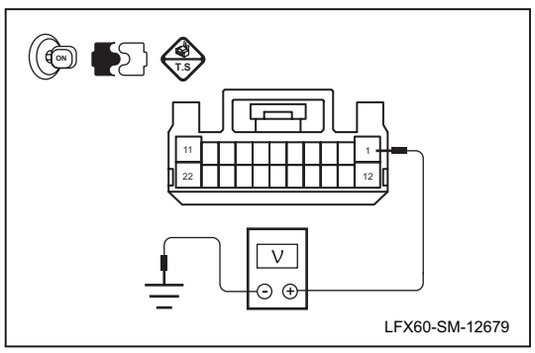
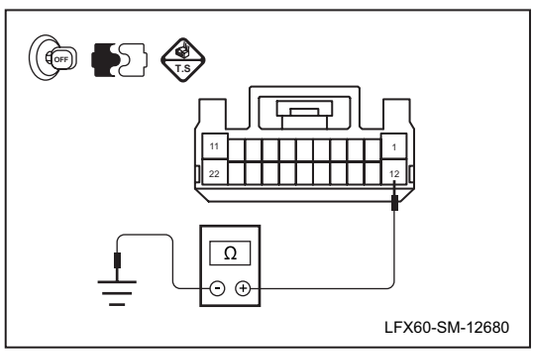
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Test condition	Details/results/measures
6. Inspect the left front turn signal operating voltage.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative connector. B. Disconnect the front left combination lamp harness plug U08. C. Connect the battery negative terminal and operate the start switch to turn the power to ON state. D. Turn on the left front turn signal and measure the voltage between Terminal 3 of the left front combination light wiring harness connector U08 and the reliable grounding point. **Standard value: 11 ~ 14 V** Is it OK after checking? →**Yes** To step 7. →**No** Inspect and repair the left front turn signal power line fault; if necessary, replace the wiring harness.
7. Inspect the left front turn signal power line for short circuit to the grounding point.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative connector. B. Disconnect the front left combination lamp harness plug U08. C. Measure the resistance between the front left combination lamp harness plug U08 terminal 3 and the fixed ground point. **Standard value: 10MΩ or higher** Is it OK after checking? →**Yes** To step 8. →**No** Inspect and repair the left front turn signal power line short circuit fault; if necessary, replace the wiring harness.
8. Check the front left turn lamp ground line.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative connector. B. Disconnect the front left combination lamp harness plug U08. C. Measure the resistance between the front left combination lamp harness plug U08 terminal 7 and the fixed ground point. **Standard value: Less than 5Ω** Is it OK after checking? →**Yes** To step 9. →**No** Inspect and repair the left front turn signal grounding point open circuit fault; if necessary, replace the wiring harness.

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Test condition	Details/results/measures
9. Check the BCM power line.	
 LFX60-SM-12679	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative connector. B. Disconnect the BCM harness plug I47. C. Connect the battery negative terminal and operate the start switch to turn the power to ON state. D. Measure the voltage between the BCM harness plug I47 terminal 1 and the fixed ground point. **Standard value: 11 ~ 14 V** Is it OK after checking? →**Yes** To step 10. →**No** Repair the BCM power line open circuit fault and replace the harness if necessary.
10. Check the BCM control module ground line.	
 LFX60-SM-12680	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative connector. B. Disconnect the BCM harness plug I47. C. Measure the resistance between the BCM harness plug I47 terminal 12 and the fixed ground point. **Standard value: Less than 5Ω** Is it OK after checking? →**Yes** To step 11. →**No** Repair the BCM ground line open circuit fault and replace the harness if necessary.
11. Replace the BCM.	
	A. Replace BCM. **Refer to: Replacement of BCM** Confirm the system is normal.

AutoLibrary

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DTC B102415, B102411, B102515, B102511, B102615, B102611

DTC description

DTC	Description
B102415	Front left clearance lamp open circuit
B102411	Front left clearance lamp short circuit
B102515	Front right clearance lamp open circuit
B102511	Front right clearance lamp short circuit
B102615	Rear clearance lamp open circuit
B102611	Rear clearance lamp short circuit

Possible reasons

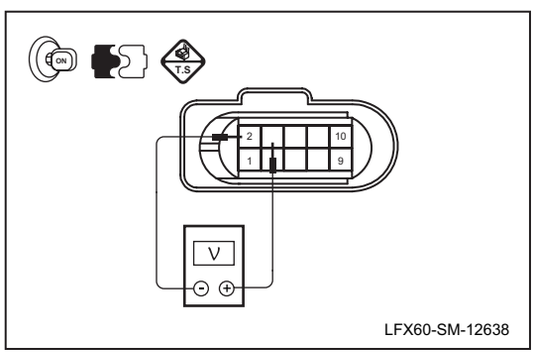
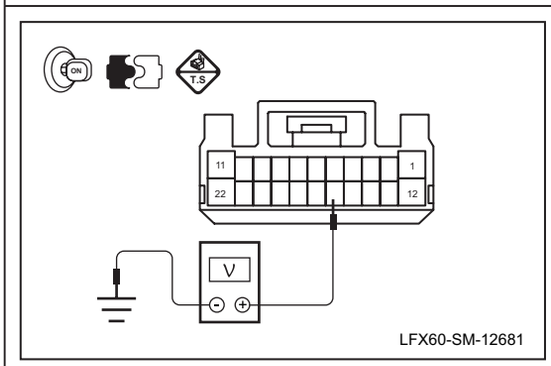
DTC	Check the strategy	Set the condition (control strategy)	Define the fault location
B102415	Check the hardware and line	Left front marker light open circuit load	• Left front marker light • Harness line fault • BCM module power and ground • BCM
B102411		Left front marker light short circuit load	
B102515		Front right clearance lamp open circuit load	
B102511		Front right clearance lamp short circuit load	
B102615		Rear clearance lamp open circuit load	
B102611		Rear clearance lamp short circuit load	

Diagnostic process

Test condition	Details/results/measures
1. General inspection.	
	A. Check the related harness plugs for breakage, loose contact, aging or looseness. Is it OK after checking? →**Yes** To step 2. →**No** Repair the fault position.
2. Read the DTC with the diagnostic meter.	
	A. Connect the diagnostic meter and check the system for the other relevant DTCs. Is it OK after checking? →**Yes** To step 3. →**No** Carry out the relevant fault diagnosis according to the DTCs.

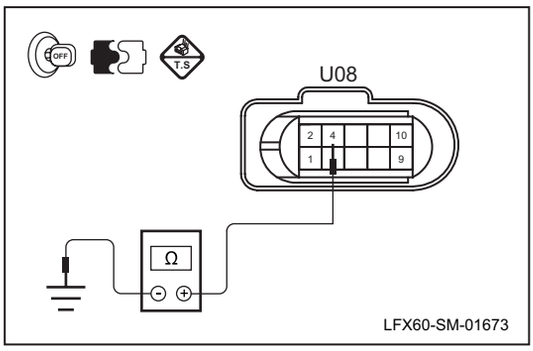
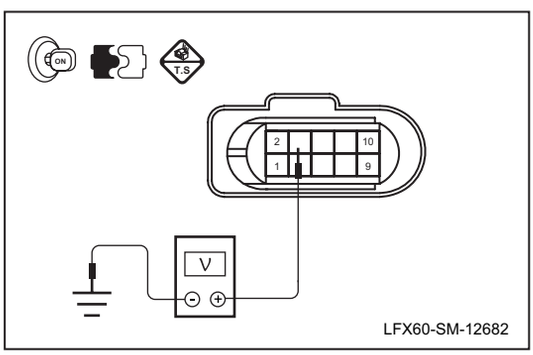
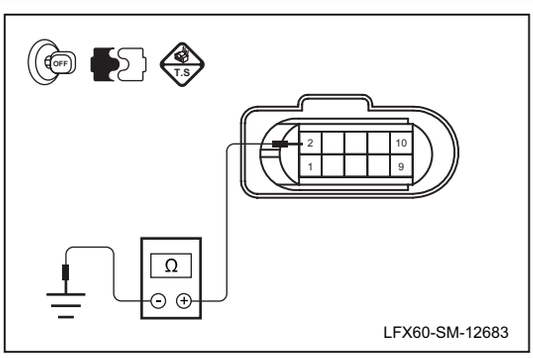
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Test condition	Details/results/measures
3. Check whether the DTC can be cleared.	
	A. Connect the diagnostic meter and access the BCM to clear DTC. B. Start the engine and check whether the DTC occurs again. Does DTC occur? →**Yes** To step 4. →**No** Confirm the system is normal.
4. Inspect the voltage between the two terminals of the left front marker light (with the left front marker light as an example).	
 LFX60-SM-12638	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative connector. B. Disconnect the front left combination lamp harness plug U08. C. Connect the battery negative terminal and operate the start switch to turn the power to ON state. D. Turn on the position light and measure the voltage between Terminals 2 and 4 of the left front combination light wiring harness connector U08. **Standard value: 11 ~ 14 V** Is it OK after checking? →**No** To step 5. →**Yes** Replace the left front marker light. **Refer to: Replacement of front combination lamp**
5. Check the output voltage of BCM terminal 16.	
 LFX60-SM-12681	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative connector. B. Disconnect the BCM harness plug I47. C. Connect the battery negative terminal and operate the start switch to turn the power to ON state. D. Turn on the position light and measure the voltage between Terminal 16 of BCM wiring harness connector I47 and the reliable grounding point. **Standard value: 11 ~ 14 V** Is it OK after checking? →**Yes** To step 6. →**No** To step 9.

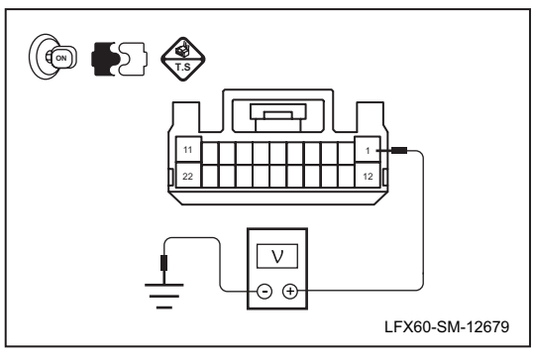
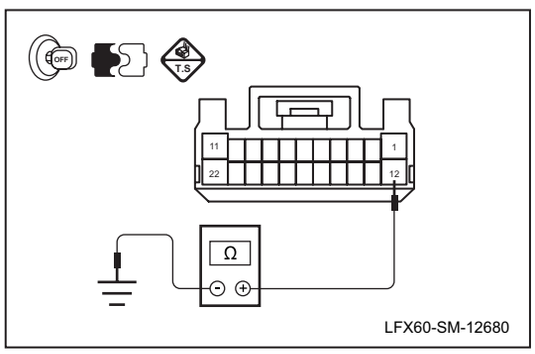
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Test condition	Details/results/measures
6. Inspect the left front marker light power line for short circuit to the grounding point.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative connector. B. Disconnect the left front marker light wiring harness connector U08. C. Measure the resistance between Terminal 4 of the left front marker light wiring harness connector U08 and the reliable grounding point. **Standard value: 10MΩ or higher** Is it OK after checking? →**Yes** To step 7. →**No** Inspect nad repair the left front marker light power line short circuit fault; if necessary, replace the wiring harness.
7. Inspect the left front marker light operating voltage.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative connector. B. Disconnect the front left combination lamp harness plug U08. C. Connect the battery negative terminal and operate the start switch to turn the power to ON state. D. Turn on the position light and measure the voltage between Terminal 4 of the left front combination light wiring harness connector U08 and the reliable grounding point. **Standard value: 11 ~ 14 V** Is it OK after checking? →**Yes** To step 8. →**No** Inspect and repair the left front marker light power line open circuit fault; if necessary, replace the wiring harness.
8. Inspect the left front marker light grounding point.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative connector. B. Disconnect the front left combination lamp harness plug U08. C. Measure the resistance between the front left combination lamp harness plug U08 terminal 2 and the fixed ground point. **Standard value: Less than 5Ω** Is it OK after checking? →**Yes** To step 9. →**No** Inspect and repair the left front marker light grounding point open circuit fault; if necessary, replace the wiring harness.

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Test condition	Details/results/measures
9. Check the BCM power line.	
 LFX60-SM-12679	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative connector. B. Disconnect the BCM harness plug I47. C. Connect the battery negative terminal and operate the start switch to turn the power to ON state. D. Measure the voltage between the BCM harness plug I47 terminal 1 and the fixed ground point. **Standard value: 11 ~ 14 V** Is it OK after checking? →**Yes** To step 10. →**No** Repair the BCM power line open circuit fault and replace the harness if necessary.
10. Check the BCM control module ground line.	
 LFX60-SM-12680	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative connector. B. Disconnect the BCM harness plug I47. C. Measure the resistance between the BCM harness plug I47 terminal 12 and the fixed ground point. **Standard value: Less than 1Ω** Is it OK after checking? →**Yes** To step 11. →**No** Repair the BCM ground line open circuit fault and replace the harness if necessary.
11. Replace the BCM.	
	A. Replace BCM. **Refer to: Replacement of BCM** Confirm the system is normal.

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DTC B102715, B102711, B102815, B102811

DTC description

DTC	Description
B102715	Left daytime running lamp open circuit
B102711	Left daytime running lamp short circuit
B102815	Right daytime running lamp open circuit
B102811	Right daytime running lamp short circuit

Possible reasons

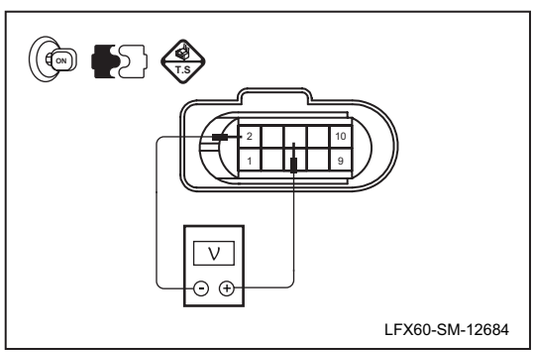
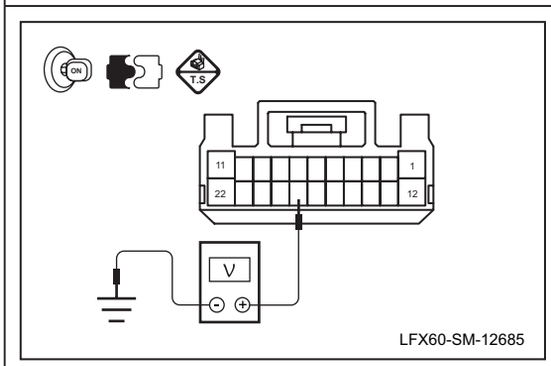
DTC	Check the strategy	Set the condition (control strategy)	Define the fault location
B102715	Check the hardware and line	Left daytime running light open circuit load	• Daytime running light • Harness line fault • BCM module power supply and grounding point • BCM
B102711		Left daytime running light short circuit load	
B102815		Right daytime running light open circuit load	
B102811		Right daytime running light short circuit load	

Diagnostic process

Test condition	Details/results/measures
1. General inspection.	
	A. Check the related harness plugs for breakage, loose contact, aging or looseness. Is it OK after checking? →**Yes** To step 2. →**No** Repair the fault position.
2. Read the DTC with the diagnostic meter.	
	A. Connect the diagnostic meter and check the system for the other relevant DTCs. Is it OK after checking? →**Yes** To step 3. →**No** Carry out the relevant fault diagnosis according to the DTCs.

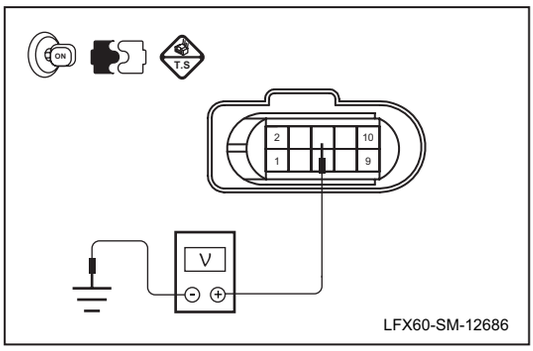
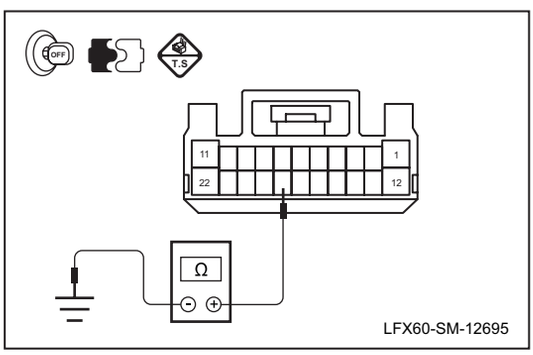
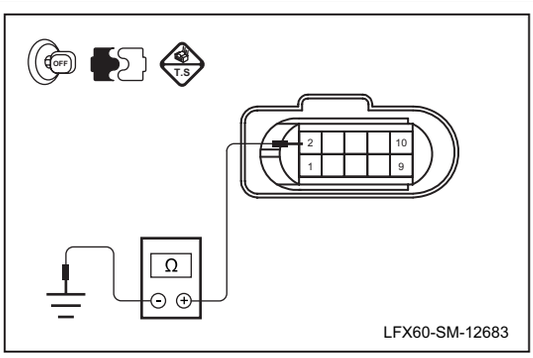
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Test condition	Details/results/measures
3. Check whether the DTC can be cleared.	
	A. Connect the diagnostic meter and access the BCM to clear DTC. B. Start the engine and check whether the DTC occurs again. Does DTC occur? →**Yes** To step 4. →**No** Confirm the system is normal.
4. Inspect the voltage between the two terminals of the left daytime running light (with the lefr daytime running light as an example).	
 LFX60-SM-12684	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative connector. B. Disconnect the front left combination lamp harness plug U08. C. Connect the battery negative terminal and operate the start switch to turn the power to ON state. D. Measure the voltage between Terminals 2 and 6 of the left front combination light wiring harness connector U08. **Standard value: 11 ~ 14 V** Is it OK after checking? →**No** To step 5. →**Yes** Replace the left daytime running light. **Refer to: Replacement of front combination lamp**
5. Check the output voltage of BCM terminal 18.	
 LFX60-SM-12685	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative connector. B. Disconnect the BCM harness plug I47. C. Connect the battery negative terminal and operate the start switch to turn the power to ON state. D. Measure the voltage between the BCM harness plug I47 terminal 18 and the fixed ground point. **Standard value: 11 ~ 14 V** Is it OK after checking? →**Yes** To step 6. →**No** To step 9.

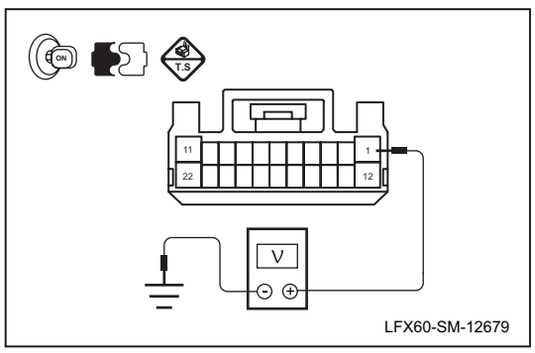
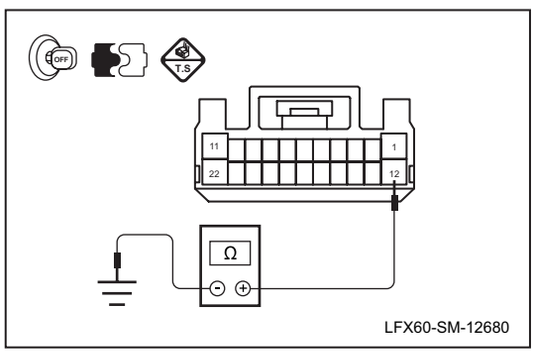
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Test condition	Details/results/measures
6. Inspect the left daytime running light operating voltag.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative connector. B. Disconnect the front left combination lamp harness plug U08. C. Connect the battery negative terminal and operate the start switch to turn the power to ON state. D. Measure the voltage between Terminal 6 of the left front combination light wiring harness connector U08 and the reliable grounding point. **Standard value: 11 ~ 14 V** Is it OK after checking? →**Yes** To step 7. →**No** Inspect and repair the lefr front daytime running light power line open circuit fault; if necessary, replace the wiring harness.
7. Inspect the left front daytime running light power line for short circuit to the grounding point.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative connector. B. Disconnect the BCM harness plug I47. C. Measure the resistance between the BCM harness plug I47 terminal 18 and the fixed ground point. **Standard value: 10MΩ or higher** Is it OK after checking? →**Yes** To step 8. →**No** Inspect and repair the left front daytime running light power line short circuit fault; if necessary, replace the wiring harness.
8. Inspect the left front daytime running light grounding point.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative connector. B. Disconnect the front left combination lamp harness plug U08. C. Measure the resistance between the front left combination lamp harness plug U08 terminal 2 and the fixed ground point. **Standard value: Less than 5Ω** Is it OK after checking? →**Yes** To step 9. →**No** Inspect and repair the left front daytime running light grounding point open circuit fault; if necessary, replace the wiring harness.

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Test condition	Details/results/measures
9. Check the BCM power line.	
 LFX60-SM-12679	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative connector. B. Disconnect the BCM harness plug I47. C. Connect the battery negative terminal and operate the start switch to turn the power to ON state. D. Measure the voltage between the BCM harness plug I47 terminal 1 and the fixed ground point. **Standard value: 11 ~ 14 V** Is it OK after checking? **→Yes** To step 10. **→No** Repair the BCM power line open circuit fault and replace the harness if necessary.
10. Check the BCM control module ground line.	
 LFX60-SM-12680	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative connector. B. Disconnect the BCM harness plug I47. C. Measure the resistance between the BCM harness plug I47 terminal 12 and the fixed ground point. **Standard value: Less than 5Ω** Is it OK after checking? **→Yes** To step 11. **→No** Repair the BCM ground line open circuit fault and replace the harness if necessary.
11. Replace BCM	
	A. Replace BCM. **Refer to: Replacement of BCM** Confirm the system is normal.

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DTC B104011, B104015, B104111, B104115, B104211, B104215, B104311, B104315

DTC description

DTC	Description
B104011	Front left door window motor short circuit
B104015	Front left door window motor open circuit
B104111	Front right door window motor short circuit
B104115	Front right door window motor open circuit
B104211	Rear left door window motor short circuit
B104215	Rear left door window motor open circuit
B104311	Rear right door window motor short circuit
B104315	Rear right door window motor open circuit

Possible reasons

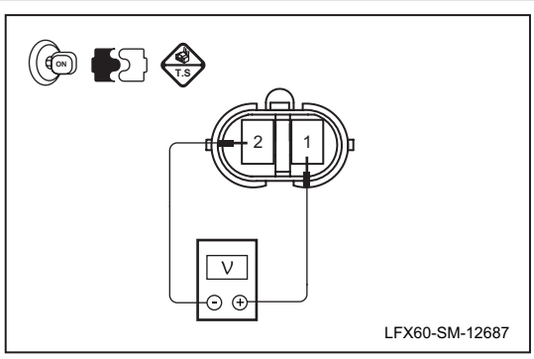
DTC	Check the strategy	Set the condition (control strategy)	Define the fault location
B104011	Check the hardware and line	Front left windows motor short circuit load	• Window motor • Wiring harness fault • BCM module power supply and grounding point • BCM
B104015		Front left windows motor open circuit load	
B104111		Front right door window motor short circuit load	
B104115		Front right door window motor open circuit load	
B104211		Rear left windows motor short circuit load	
B104215		Rear left windows motor open circuit load	
B104311		Rear right windows motor short circuit load	
B104315		Front right door window motor open circuit load	

Diagnostic process

Test condition	Details/results/measures
1. General inspection.	
	A. Check the related harness plugs for breakage, loose contact, aging or looseness. Is it OK after checking? →**Yes** To step 2. →**No** Repair the fault position.

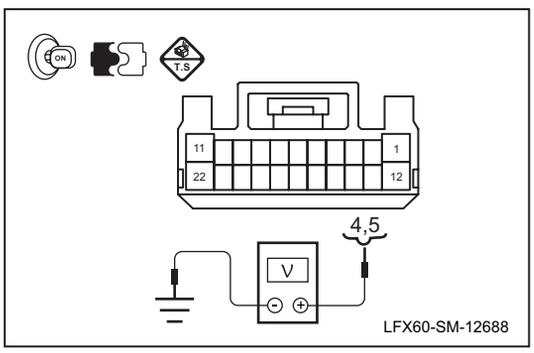
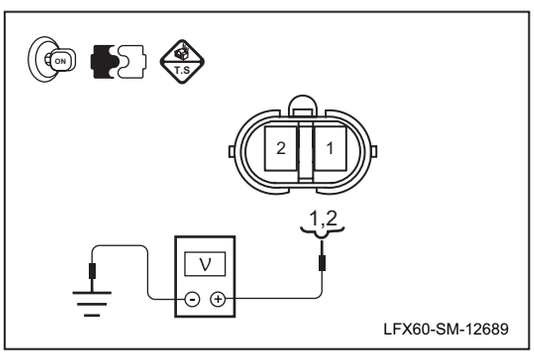
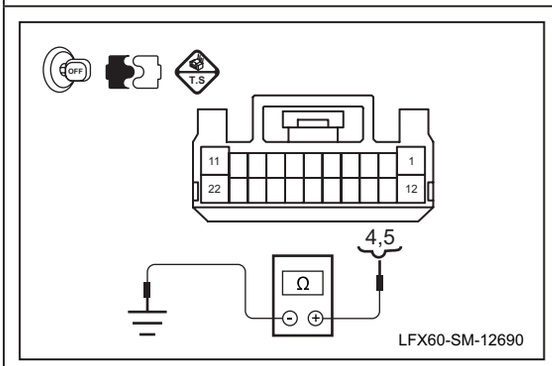
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Test condition	Details/results/measures
2. Read the DTC with the diagnostic meter.	
	A. Connect the diagnostic meter and check the system for the other relevant DTCs. Is it OK after checking? →**Yes** To step 3. →**No** Carry out the relevant fault diagnosis according to the DTCs.
3. Check whether the DTC can be cleared.	
	A. Connect the diagnostic meter and access the BCM to clear DTC. B. Start the engine and check whether the DTC occurs again. Does DTC occur? →**Yes** To step 4. →**No** System normal.
4. Inspect the voltage between the two terminals of the left front window motor (with the left front door as an example).	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative connector. B. Disconnect the front left door harness plug D02. C. Connect the battery negative terminal and operate the start switch to turn the power to ON state. D. Operate the glass lifter switch and measure the voltage between Terminals 1 and 2 of the left front window motor wiring harness connector D02. **Standard value: 11 ~ 14 V** Is it OK after checking? →**No** To step 5. →**Yes** Replace left front window motor.

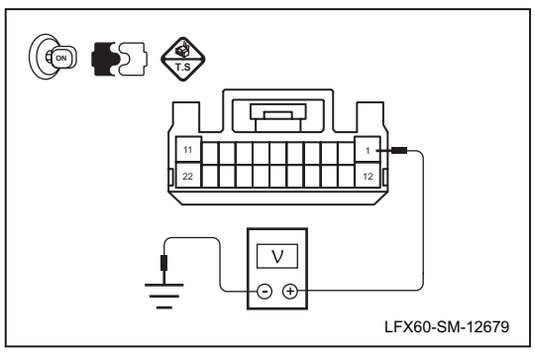
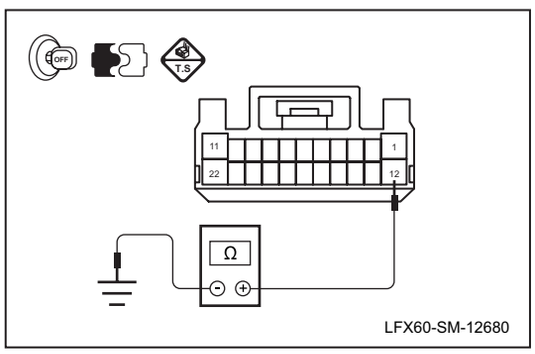
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Test condition	Details/results/measures
5. Inspect the output voltage between Terminals 4 and 5 of BCM.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative connector. B. Disconnect the BCM harness plug I46. C. Connect the battery negative terminal and operate the start switch to turn the power to ON state. D. Operate the left front glass lifter switch to raise or drop the glass and measure the voltage between Terminals 4 and 5 of BCM wiring harness connector I46 and the reliable grounding point. **Standard value: 11 ~ 14 V** Is it OK after checking? →**Yes** To step 6. →**No** To step 8.
6. Inspect the left front window motor operating voltage.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative connector. B. Disconnect the front left door harness plug D02. C. Connect the battery negative terminal and operate the start switch to turn the power to ON state. D. Operate the glass lifter switch to raise or drop the glass, and measure the voltage between Terminals 1 and 2 of the left front window motor wiring harness connector D02 and the reliable grounding point. **Standard value: 11 ~ 14 V** Is it OK after checking? →**Yes** To step 7. →**No** Inspect and repair the left front window motor line open circuit fault; if necessary, replace the wiring harness.
7. Inspect the left front window motor line for short circuit to the grounding point.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative connector. B. Disconnect the BCM harness plug I46. C. Measure the resistance between Terminals 4 and 5 of BCM wiring harness connector I46 and the reliable grounding point. **Standard value: 10MΩ or higher** Is it OK after checking? →**Yes** To step8. →**No** Repair the BCM power line open circuit fault and replace the harness if necessary.

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Test condition	Details/results/measures
8. Check the BCM power line.	
 LFX60-SM-12679	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative connector. B. Disconnect the BCM harness plug I47. C. Connect the battery negative terminal and operate the start switch to turn the power to ON state. D. Measure the voltage between the BCM harness plug I47 terminal 1 and the fixed ground point. **Standard value: 11 ~ 14 V** Is it OK after checking? →**Yes** To step 9. →**No** Repair the BCM power line open circuit fault and replace the harness if necessary.
9. Check the BCM control module ground line.	
 LFX60-SM-12680	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative connector. B. Disconnect the BCM harness plug I47. C. Measure the resistance between the BCM harness plug I47 terminal 12 and the fixed ground point. **Standard value: Less than 5Ω** Is it OK after checking? →**Yes** To step 10. →**No** Repair the BCM ground line open circuit fault and replace the harness if necessary.
10. Replace BCM	
	A. Replace BCM. **Refer to: Replacement of BCM** Confirm the system is normal.

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DTC B105015, B103A96, U016403

DTC description

DTC	Description
B105015	Immobilizer coil open circuit
B103A96	Immobilizer coil short to the ground
U016403	Engine immobilizer authentication fail

Possible reasons

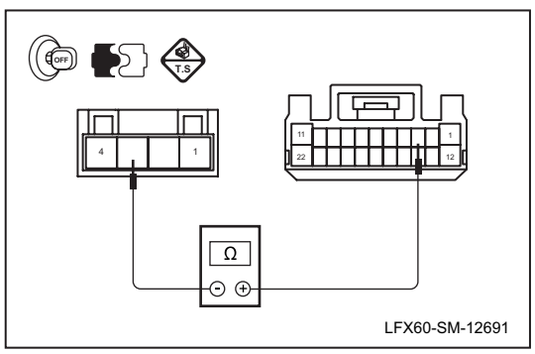
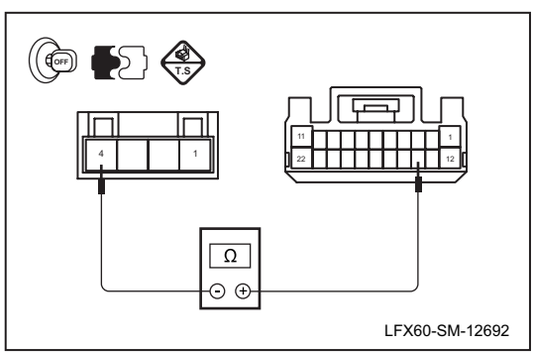
DTC	Check the strategy	Set the condition (control strategy)	Define the fault location
B105015	Check the hardware and line	Immobilizer coil open circuit	• Anti-theft coil • BCM
B103A96		Immobilizer coil short to the ground	
U016403		Engine immobilizer authentication fail	

Diagnostic process

Test condition	Details/results/measures
1. General inspection.	
	A. Check the related harness plugs for breakage, loose contact, aging or looseness. Is it OK after checking? →**Yes** To step 2. →**No** Repair the fault position.
2. Read the DTC with the diagnostic meter.	
	A. Connect the diagnostic meter and check the system for the other relevant DTCs. Is it OK after checking? →**Yes** To step 3. →**No** Carry out the relevant fault diagnosis according to the DTCs.

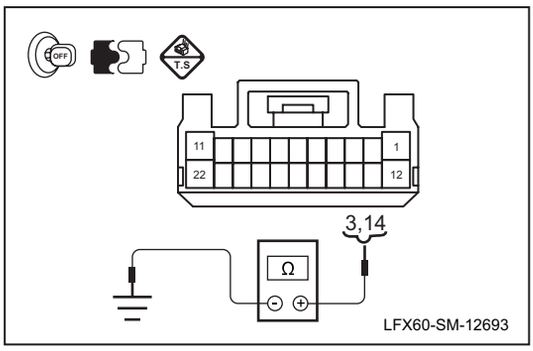
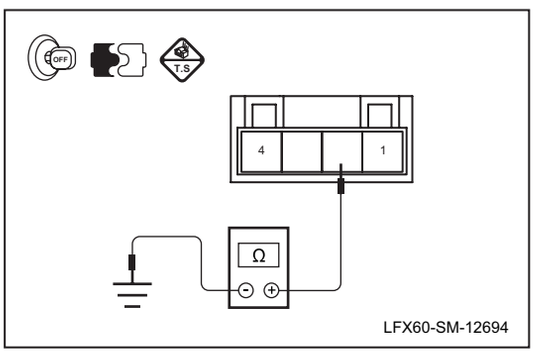
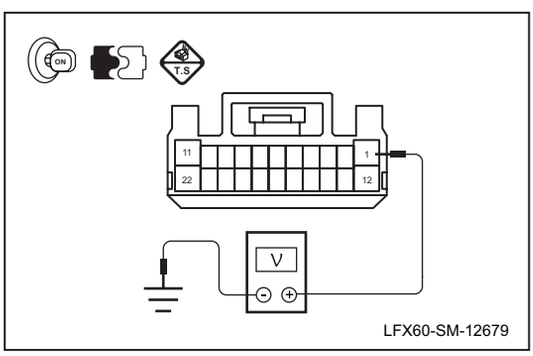
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Test condition	Details/results/measures
3. Check whether the DTC can be cleared.	
	A. Connect the diagnostic meter and access the BCM to clear DTC. B. Start the engine and check whether the DTC occurs again. Does DTC occur? →**Yes** To step 4. →**No** System normal.
4. Inspect the anti-theft identification coil “signal +” continuity.	
 LFX60-SM-12691	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative connector. B. Disconnect the BCM harness plug I47. C. Disconnect the anti-theft identification coil harness plug I20. D. Measure the resistance between the BCM harness plug I47 terminal 3 and immobilizer identification coil harness plug I20 terminal 3. **Standard value: Less than 5Ω** Is it OK after checking? →**Yes** To step 5. →**No** Inspect and repair the anti-theft identification coil “signal +” open circuit fault; if necessary, replace the wiring harness.
5. Inspect the anti-theft identification coil “signal -” continuity.	
 LFX60-SM-12692	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative connector. B. Disconnect the BCM harness plug I47. C. Disconnect the anti-theft identification coil harness plug I20. D. Measure the resistance between the BCM harness plug I47 terminal 14 and immobilizer identification coil harness plug I20 terminal 4. **Standard value: Less than 5Ω** Is it OK after checking? →**Yes** To step 6. →**No** Inspect and repair the anti-theft identification coil “signal +” short circuit fault; if necessary, replace the wiring harness.

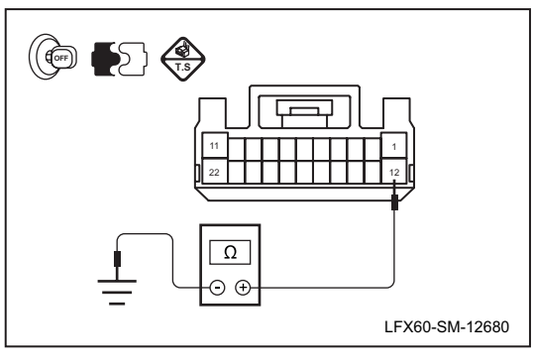
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Test condition	Details/results/measures
6. Inspect the anti-theft identification coil for short circuit to the grounding point.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative connector. B. Disconnect the BCM harness plug I47. C. Measure the resistance between Terminals 3 and 14 of BCM wiring harness connector I47 and the reliable grounding point seperately. **Standard value: 10MΩ or higher** Is it OK after checking? →**Yes** To step 7. →**No** Inspect and repair the anti-theft identification coil signal line short circuit fault; if necessary, replace the wiring harness.
7. Inspect the anti-theft identification coil grounding point.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative connector. B. Disconnect the anti-theft identification coil wiring harness connector I20. C. Measure the resistance between Terminal 2 of the anti-theft identification coil wiring harness connector I20 and the reliable grounding point. **Standard value: Less than 5Ω** Is it OK after checking? →**Yes** To step 8. →**No** Inspect and repair the anti-theft identification coil grounding point open circuit fault; if necessary, replace the wiring harness.
8. Check the BCM power line.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative connector. B. Disconnect the BCM harness plug I47. C. Connect the battery negative terminal and operate the start switch to turn the power to ON state. D. Measure the voltage between the BCM harness plug I47 terminal 1 and the fixed ground point. **Standard value: 11 ~ 14 V** Is it OK after checking? →**Yes** To step 9. →**No** Repair the BCM power line open circuit fault and replace the harness if necessary.

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Test condition	Details/results/measures
9. Check the BCM control module ground line.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative connector. B. Disconnect the BCM harness plug I47. C. Measure the resistance between the BCM harness plug I47 terminal 12 and the fixed ground point. **Standard value: Less than 5Ω** Is it OK after checking? →**Yes** To step 10. →**No** Repair the BCM ground line open circuit fault and replace the harness if necessary.
10. Replace the anti-theft identification coil.	
	A. Replace the immobilizer identification coil. Is the system normal? →**Yes** The fault is solved and the system is normal. →**No** To step 11.
11. Replace the BCM.	
	A. Replace BCM. **Refer to: Replacement of BCM** Confirm the system is normal.

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DTC U002088, U016487, U015187, U015587

DTC description

DTC	Description
U002088	CAN bus OFF
U016487	Unable to communicate with EMS
U015187	Unable to communicate with SDM
U015587	Unable to communicate with IC

Possible reasons

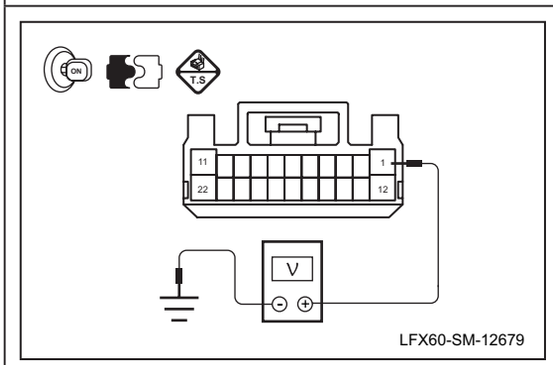
DTC	Check the strategy	Set the condition (control strategy)	Define the fault location
U002088	Check the hardware and line	CAN bus closure in 2 consecutive times	• CAN communication fault • Module fault
U016487		No EMS information (within the period of more than 4.5 cycles)	
U015187		No SDM information (within the period of more than 4.5 cycles)	
U015587		No receive IC information (within the period of more than 4.5 cycles)	

Diagnostic process

Test condition	Details/results/measures
1. General inspection.	
	A. Check the related harness plugs for breakage, loose contact, aging or looseness. Is it OK after checking? →**Yes** To step 2. →**No** Repair the fault position.
2. Read the DTC with the diagnostic meter.	
	A. Connect the diagnostic meter and check the system for the other relevant DTCs. Is it OK after checking? →**Yes** To step 3. →**No** Carry out the relevant fault diagnosis according to the DTCs.

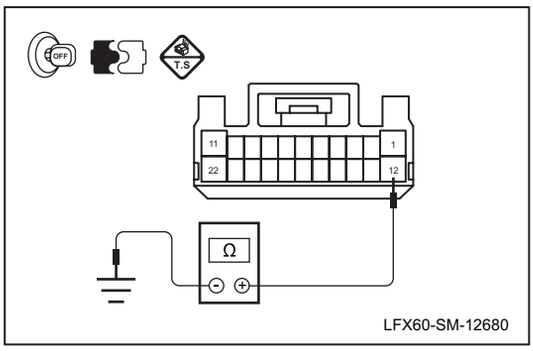
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Test condition	Details/results/measures
3. Check whether the DTC can be cleared.	
	A. Connect the diagnostic meter and access the BCM to clear DTC. B. Start the engine and check whether the DTC occurs again. Does DTC occur? →**Yes** To step 4. →**No** System normal.
4. Check the CAN communication network.	
	A. Check whether the CAN communication network is normal. **Refer to: CAN Bus Integrity Inspection** Is it OK after checking? →**Yes** To step 5. →**No** Repair the CAN communication network fault.
5. Check the BCM power line.	
 LFX60-SM-12679	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative connector. B. Disconnect the BCM harness plug I47. C. Connect the battery negative terminal and operate the start switch to turn the power to ON state. D. Measure the voltage between the BCM harness plug I47 terminal 1 and the fixed ground point. **Standard value: 11 ~ 14 V** Is it OK after checking? →**Yes** To step 6. →**No** Repair the BCM power line open circuit fault and replace the harness if necessary.

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Test condition	Details/results/measures
6. Check the BCM control module ground line.	
 LFX60-SM-12680	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative connector. B. Disconnect the BCM harness plug I47. C. Measure the resistance between the BCM harness plug I47 terminal 12 and the fixed ground point. **Standard value: Less than 5Ω** Is it OK after checking? →**Yes** To step 7. →**No** Repair the BCM ground line open circuit fault and replace the harness if necessary.
7. Replace the BCM.	
	A. Replace BCM. **Refer to: Replacement of BCM** Is the system normal? →**Yes** The fault is solved and the system is normal. →**No** To step 8.
8. Replace the ECM (with ECM as example).	
	A. Replace ECM. **Refer to: Replacement of BCM** Confirm the system is normal.

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Removal and installation

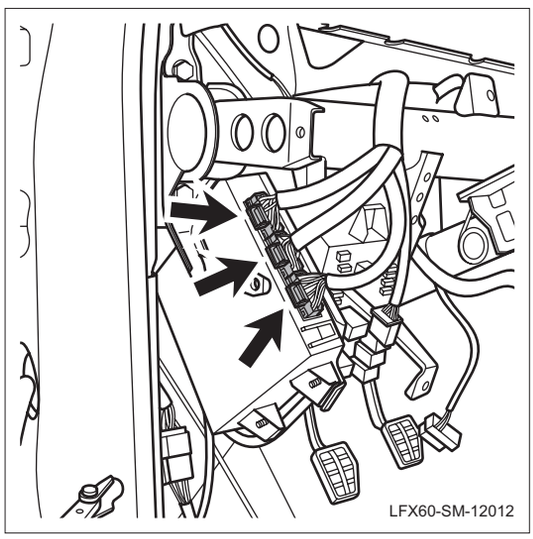
Replacement of Body Controller (BCM)

Removal

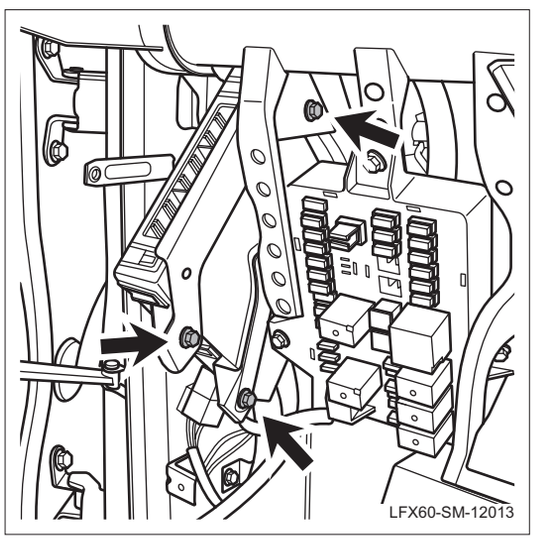
1. Remove the body controller (BCM).

(a). Disconnect the battery negative connector.

(b). Remove the dashboard. **Refer to the replacement of dashboard assembly.**



(c). Disconnect the body controller (BCM) wiring harness connector.

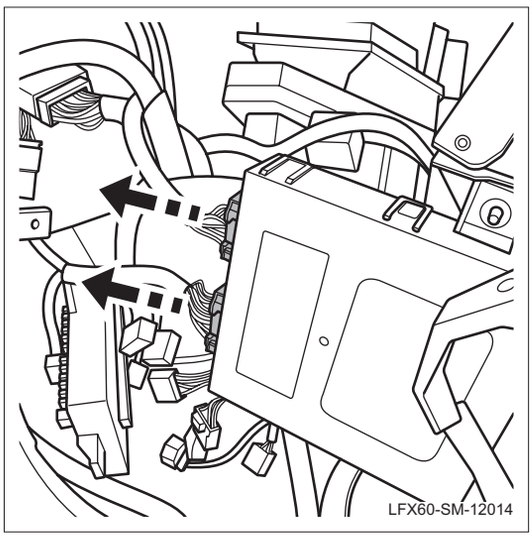


(d). Remove the body controller (BCM) fixing bracket bolts.

(e). Remove the body controller (BCM).

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(f). Remove the body controller (BCM) inner wiring harness connector.
(g). Remove the body controller (BCM).

Installation

1. Install the body controller (BCM).
(a). The installation sequence is the reverse of the disassembly order.

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12- Electrical system

Defrosting..... 12-1969

Structure and installation location.. 12-1969

Diagnosis information and procedures..... 12-1970

Removal and installation.. 12-1978

AutoLibrary

AutoLibrary

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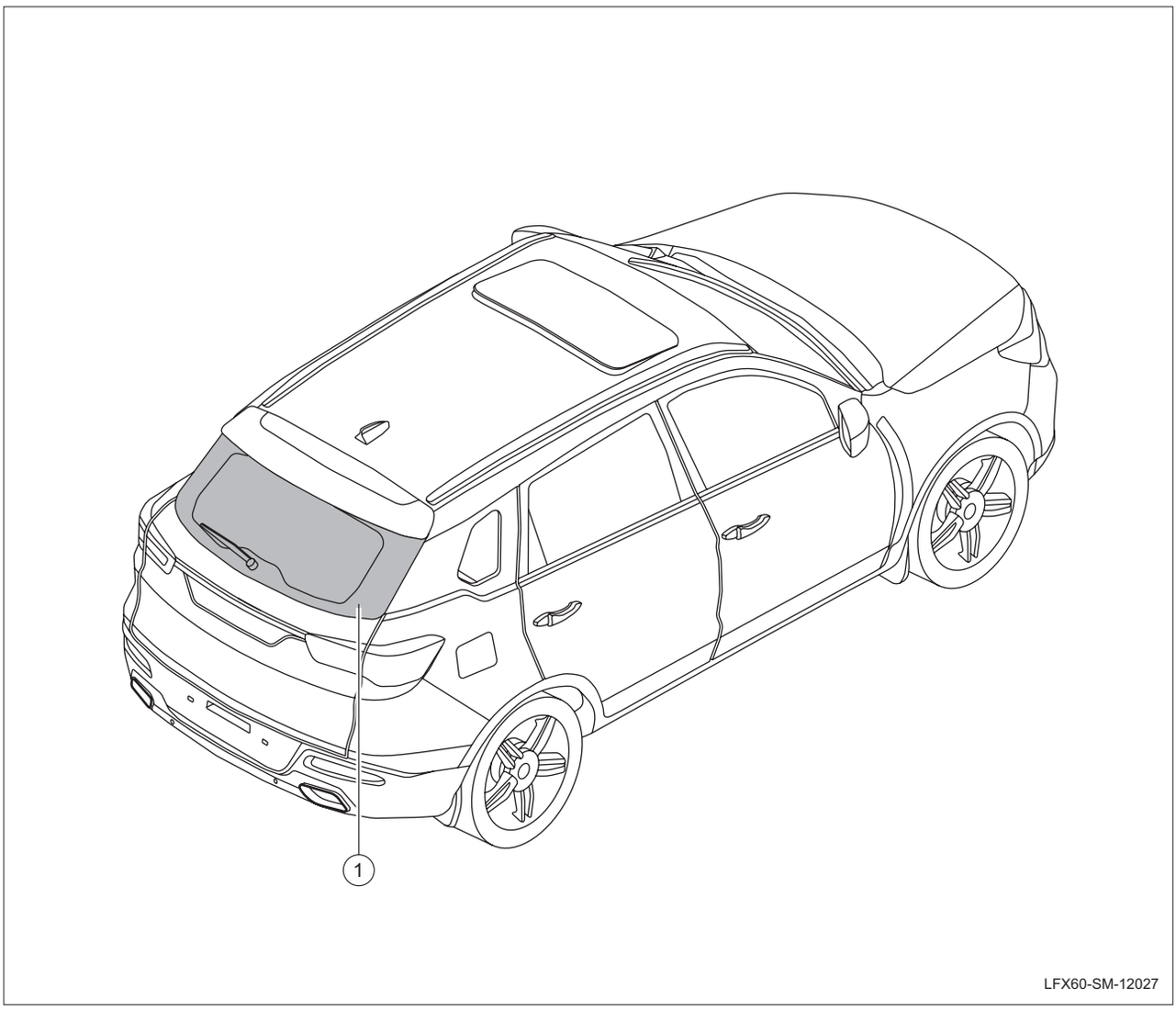
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Defrosting

Structure and installation location

Component location plan

Rear windshield defroster



No.	Part name
1	Rear windshield defroster

No.	Part name

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Diagnosis information and procedures

Diagnosis Instructions

Before the rear windshield defroster troubleshooting, must understand and familiarize its working principle, and then perform its diagnosis, so as to determine the correct fault diagnosis procedure in case of fault, and more importantly, to determine whether the situations described by the user are normal.

For any rear windshield defroster fault diagnosis, must inspect it firstly, and then guide the maintenance staff to take the next logical steps for fault diagnosis. Comprehend and correctly use the diagnostic flow chart to shorten the diagnosis time and avoid the misjudgement.

General equipment

Name
Diagnostic equipment of vehicle
Digital multimeter

Visual Inspection

ⓘ Note:

Clean the windshield glass along the heating wire with a soft and dry cloth, to prevent damage to the heating wire.

ⓘ Note:

Do not use detergent or glass cleaner with abrasive ingredients.

1. Confirm the problem raised by the customer.
2. Inspect whether there is any post installation that may affect the back door windshield defroster operation.
3. Check for the evident mechanical or electrical damage trace and collision deformation trace through the visual check.

Visual inspection table

Mechanical section	Electrical section
• Rear windshield • Rearview mirror	• Fuse • Rear defroster relay • Line • Rear windshield defroster • A/C control panel

4. Check the system lines easy to see or can be seen.
5. If the observed or raised problem is the evident and the cause has been found, ensure to fix this fault before proceeding with the next step.
6. If no problem is found through the visual check, confirm the fault and refer to the fault symptom list.

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Fault symptoms table

If there is a fault but the fault diagnosis code (DTC) is not stored in the control module and the fault causes can not be confirmed in the basic inspection, the fault diagnosis and troubleshooting should be performed according to the steps listed in the table below.

Symptom	Possible point of failure	Recommended measure
The rear windshield defroster is not operated	• Battery voltage low • Fuse • Relay • Line fault • A/C control panel • Rear windshield defroster fault	**Refer to: Rear windshield defroster out of operation diagnosis flow**
The power rearview mirror heating wire is not operated	• Battery voltage low • Fuse • Relay • Line fault • A/C control panel • Power rearview mirror assembly fault	**Refer to: Electric rearview mirror no heating diagnosis flow**
The rear windshield defroster is not operated	• Rear windshield defroster fault	• Inspect and repair the rear windshield defroster or replace the rear windshield **Refer to: Replacement of Back Door Windshield**

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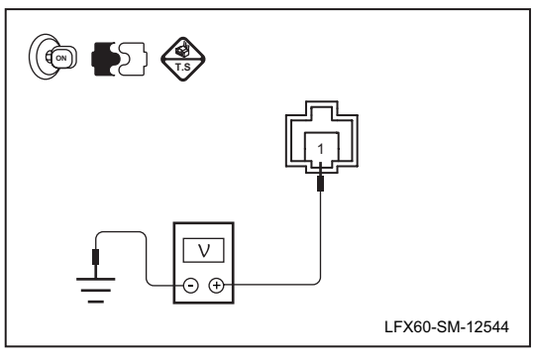
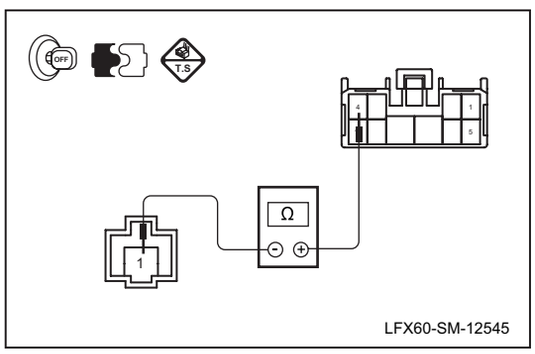
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Rear windshield defroster out of operation diagnosis flow

Test condition	Details/results/measures
1. General inspection.	
	A. Check the harness plug for breakage, loose contact, aging or looseness. B. Inspect the rear defroster heating wire for any fault. C. Inspect the air conditioning system for any fault. Is it OK after checking? →**Yes** To step 2. →**No** Repair the fault position.
2. Inspect the rear defroster fuse.	
	A. Check the rear defroster fuse FS25, FS32. **Fuse rated capacity: 20A, 30A** Inspect whether it is normal? →**Yes** To step 3. →**No** Rear defroster fuse.
3. Inspect the rear defroster relay.	
	A. Replace the rear defroster relay with the same type and inspect whether the defroster function is normal. Is the defroster function normal? →**No** To step 4. →**Yes** Replace the rear defroster relay.

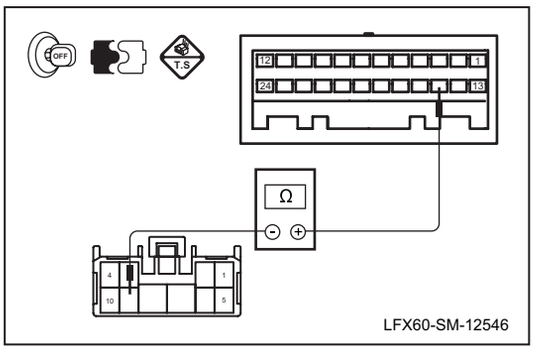
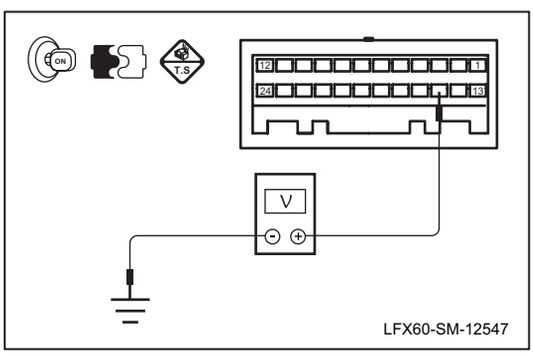
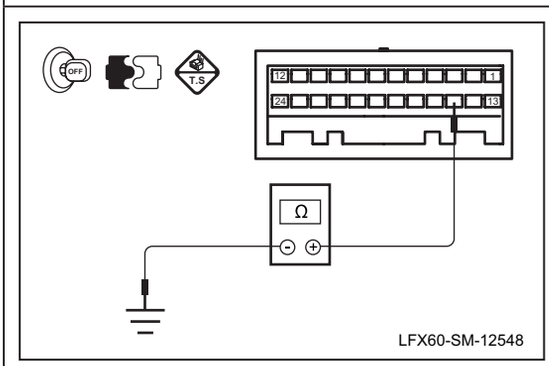
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Test condition	Details/results/measures
4. Inspect the rear defroster power supply voltage.	
 LFX60-SM-12544	A. Operate the start switch to turn the power to OFF state. B. Disconnect the rear defroster harness connector T02. C. Connect the negative battery cable and operate the start switch to place the power mode under ON status. D. Press the rear defroster switch and measure the voltage between Terminal 1 of the rear defroster wiring harness connector T02 and the reliable grounding point. **Standard value: 11 ~ 14 V** Is the measurement normal? **→Yes** To step 5. **→No** To step 6.
5. Inspect the rear defender grounding point.	
	A. Inspect whether the rear defroster grounding point is normal. B. Confirm whether the rear defroster grounding point is normal? **→Yes** To step 6. **→No** Inspect and repair the rear defroster grounding point fault.
6. Inspect the rear defroster power line.	
 LFX60-SM-12545	A. Operate the start switch to turn the power to OFF state. B. Disconnect the rear defroster harness connector T02. C. Disconnect the wiring harness connector I06 from the dashboard wiring box. D. Measure the resistance between Terminal 1 of the rear defroster wiring harness connector T02 and Terminal 4 of the wiring harness connector I06 in the dashboard wiring box. **Standard value: Less than 5Ω** Is the measurement normal? **→Yes** To step 7. **→No** Inspect and repair the rear defroster power line open circuit fault; if necessary, replace the wiring harness.

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Test condition	Details/results/measures
7. Inspect the rear defroster controller line continuity.	
 LFX60-SM-12546	A. Operate the start switch to turn the power to OFF state. B. Disconnect the air conditioning control panel wiring harness connector A07 and dashboard wiring box wiring harness connector I06. C. Measure the resistance between Terminal 15 of the air conditioning control panel wiring harness connector A07 and Terminal 9 of the dashboard wiring box wiring harness connector I06. **Standard value: Less than 5Ω** Is the measurement normal? **→Yes** To step 8. **→No** Inspect and repair the rear defroster control line open circuit fault; if necessary, replace the wiring harness.
8. Inspect the rear defroster control line for short circuit to the power supply.	
 LFX60-SM-12547	A. Operate the start switch to turn the power to OFF state. B. Disconnect the A/C control panel harness plug A07. C. Connect the negative battery cable and operate the start switch to place the power mode under ON status. D. Measure the voltage betweenTerminal 15 of the air conditioning control panel wiring harness connector A07 and the reliable grounding point. **Standard value: 11 ~ 14 V** Is the measurement normal? **→Yes** To step 9. **→No** Inspect and repair the short circuit fault between the rear defroster control line and the power supply; if necessary, replace the wiring harness.
9. Inspect the rear defroster control line for short circuit to the grounding point.	
 LFX60-SM-12548	A. Operate the start switch to turn the power to OFF state. B. Disconnect the A/C control panel harness plug A07. C. Measure the resistance between the A/C control panel harness connector A07 terminal 15 and the fixed ground point. **Standard value: 10MΩ or higher** Is the measurement normal? **→Yes** To step 10. **→No** Inspect and repair the short circuit fault between the rear defroster control line and the grounding point; if necessary, replace the wiring harness.

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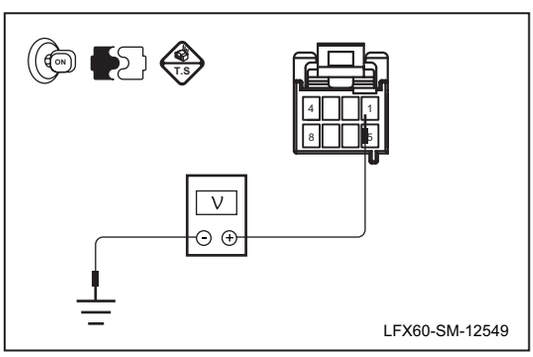
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Test condition	Details/results/measures
10. Replace the A/C contriol panel.	
	A. Replace the A/C control panel. **Refer to: Replacement of Air Conditioning Control Panel.** Confirm the system is normal.

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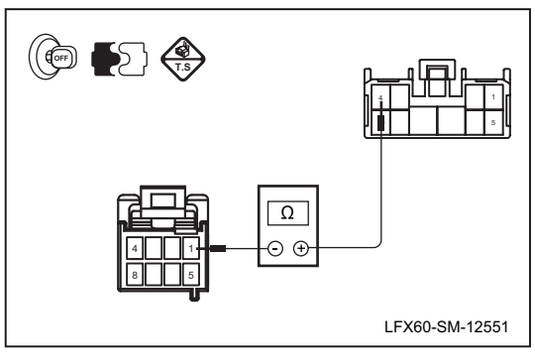
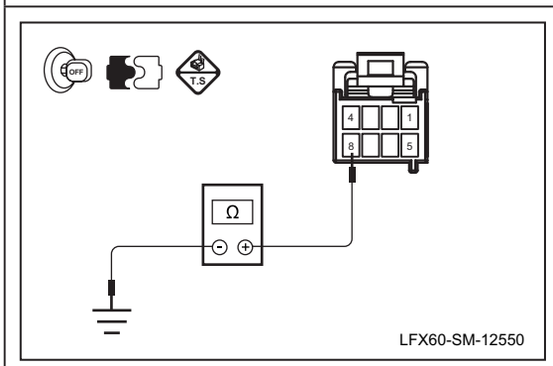
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Electric rearview mirror no heating diagnosis flow

Test condition	Details/results/measures
1. General inspection.	
	A. Inspect the defroster wiring harness connector for damage, poor contact, aging, loosening or other signs. Is it OK after checking? →**Yes** To step 2. →**No** Repair the fault position.
2. Inspect whether the rear windshield defroster is normal.	
	A. Inspect whether the rear windshield defroster is normal. Is it normal? →**Yes** To step 3. →**No** Inspect and repair the rear windshield defroster. **Refer to: Diagnosis procedure about that the rear windshield defroster is not operated.**
3. Inspect the rearview mirror defroster power supply voltage (with the left outer rearview mirror as an example).	
	A. Operate the start switch to turn the power to OFF state. B. Disconnect the rearview mirror harness connector D03. C. Connect the negative battery cable and operate the start switch to place the power mode under ON status. D. Press the rear defroster switch and measure the voltage between Terminal 1 of the rearview mirror wiring harness connector D03 and the reliable grounding point. **Standard value: 11 ~ 14 V** Is the measurement normal? →**No** To step 4. →**Yes** To step 5.

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Test condition	Details/results/measures
4. Inspect the rear view mirror defroster power line continuity.	
	A. Operate the start switch to turn the power to OFF state. B. Disconnect the rearview mirror wiring harness connector D03 and the dashboard wiring box wiring harness connector I06. C. Measure the resistance between Terminal 1 of the rearview mirror wiring harness connector D03 and Terminal 4 of the dashboard wiring box wiring harness connector I06. **Standard value: Less than 5Ω** Is the measurement normal? →**Yes** To step 5. →**No** Inspect and repair the reaview mirror defroster power line open circuit fault; if necessary, replace the wiring harness.
5. Inspect the reaview mirror defroster grounding point.	
	A. Operate the start switch to turn the power to OFF state. B. Disconnect the rearview mirror harness connector D03. C. Measure the resistance between Terminal 8 of the rearview mirror wiring harness connector D03 and the reliable grounding point. **Standard value: Less than 5Ω** Is the measurement normal? →**Yes** To step 6. →**No** Inspect and repair the rearview mirror defroster ground line open circuit fault; if necessary, replace the wiring harness.
6. Replace the rearview mirror.	
	A. Replace the rearview mirror. **Refer to: Replacement of Power Rearview Mirror.** Confirm the system is normal.

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Removal and installation

Replacement of Rear Windshield Grille.

Removal

1. Remove the rear windshield grille.

(a). Disconnect the battery negative connector.

(b). Remove the rear windshield grille; **refer to: Replacement of Back Door Glass.**

Installation

1. Install the rear windshield grille.

(a). The installation sequence is the reverse of the disassembly order.

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Replacement of Rear Windshield Defroster Switch

Removal

1. Remove the rear windshield defroster switch.

(a). Disconnect the battery negative connector.

(b). Remove the rear windshield defroster switch; **refer to: Replacement of Air Conditioning Control Panel.**

Installation

1. Install the rear windshield defroster switch.

(a). The installation sequence is the reverse of the disassembly order.

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12- Electrical system

Cigarette lighter 12-1983

Operating Principle 12-1983

Diagnosis information and procedures 12-1984

Removal and installation.. 12-1990

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Cigarette lighter

Operating Principle

System overview

The cigarette lighter is installed in the dashboard assembly; if its button is pressed, the cigarette lighter components will be automatically heated and popped up, and then pulled out for use.

Note:

The cigarette lighter temperature is high in the use; must prevent burns.

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Diagnosis information and procedures

Diagnosis Instructions

Before the cigarette lighter troubleshooting, must understand and familiarize its working principle, and then perform its diagnosis, so as to determine the correct fault diagnosis procedure in case of fault, and more importantly, to determine whether the situations described by the user are normal.

For any cigarette lighter fault diagnosis, must inspect it firstly, and then guide the maintenance staff to take the next logical steps for fault diagnosis. Comprehend and correctly use the diagnostic flow chart to shorten the diagnosis time and avoid the misjudgement.

General equipment

Name
Diagnostic equipment of vehicle
Digital multimeter

Visual Inspection

1. Confirm the problem raised by the customer.
2. Check for evident mechanical and electrical faults.

Visual inspection table

Mechanical	Electrical
• Cigarette lighter • USB socket • Standby power supply	• Fuse • Line • Cigarette lighter • USB socket

3. Check the system lines easy to see or can be seen.
4. If the observed or raised problem is the evident and the cause has been found, ensure to fix this fault before proceeding with the next step.
5. If no problem is found through the visual check, confirm the fault and refer to the fault symptom list.

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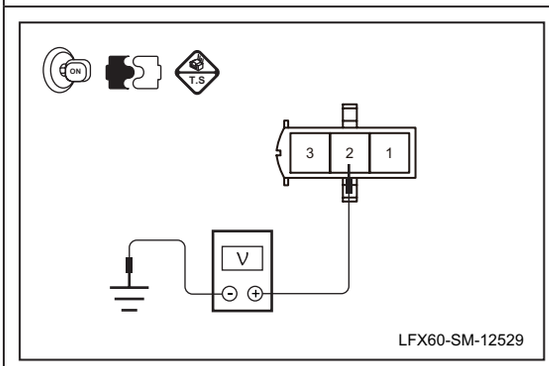
Fault symptoms table

Symptom	Possible point of failure	Recommended measure
Cigarette lighter inoperative	• Fuse • Line • Cigarette lighter	**Refer to: Diagnosis procedure about the cigarette lighter is not operated**
The cigarette lighter can not be automatically popped up	• Cigarette lighter	• Replace the cigarette lighter

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Diagnosis procedure about the cigarette lighter is not operated

Test condition	Details/results/measures
1. General inspection.	
	A. Inspect the cigarette lighter and its wiring harness connector for damage, poor contact, aging, loosening or other signs. Is it OK after checking? →**Yes** To step 2. →**No** Repair the fault position.
2. Inspect the cigarette lighter fuse.	
	A. Check the cigarette lighter fuse FS30. **Fuse rated capacity: 25A** Is it OK after checking? →**Yes** To step 3. →**No** Replace the fuse of same model.
3. Inspect the cigarette lighter.	
	A. Replace it with a new cigarette lighter with the same type. Inspect whether it is normal? →**No** To step 4. →**Yes** Replace cigarette lighter. **Refer to: Replacement of Cigarette Lighter.**
4. Inspect the cigarette lighter power line.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative cable. B. Disconnect the cigarette lighter harness plug I31. C. Connect the negative battery cable and operate the start switch to place the power mode under ON status. D. Inspect the voltage between Terminal 2 of the cigarette lighter wiring harness connector I31 and the reliable grounding point. **Standard value: 11 ~ 14 V** Is it OK after checking? →**Yes** To step 5. →**No** Inspect and repair the cigarette lighter power line open circuit fault; if necessary, replace the wiring harness.

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Test condition	Details/results/measures
5. Inspect the cigarette lighter grounding point.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative cable. B. Disconnect the cigarette lighter harness plug I31. C. Measure the resistance between Terminal 3 of the cigarette lighter wiring harness connector I31 and the reliable grounding point. **Standard value: Less than 5Ω** Is the measurement normal? →**Yes** Confirm the system is normal. →**No** Inspect and repair the cigarette lighter grounding point open circuit fault; if necessary, replace the wiring harness.

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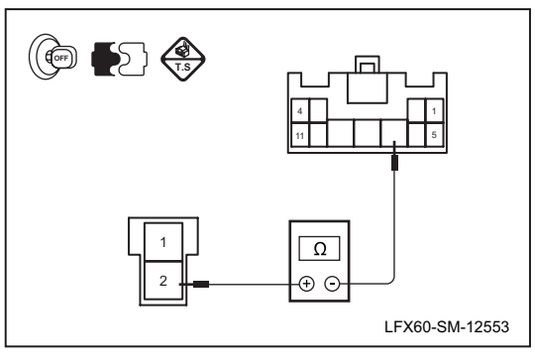
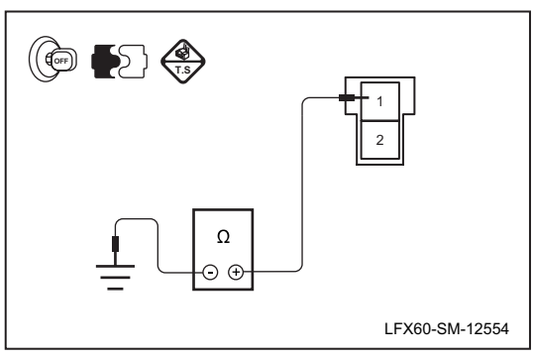
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Diagnosis procedure about that the standby power outlet is not operated

Test condition	Details/results/measures
1. General inspection.	
	A. Inspect the power outlet and its wiring harness connectors for damage, poor contact, aging, loosening or other signs. Is it OK after checking? →**Yes** To step 2. →**No** Repair the fault position.
2. Check the fuse.	
	A. Check the fuse FS30. **Fuse rated capacity: 25A** Is it OK after checking? →**Yes** To step 3. →**No** Replace the fuse of same model.
3. Inspect the standby power supply voltage.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative cable. B. Disconnect the standby power supply harness plug I40. C. Connect the negative battery cable and operate the start switch to place the power mode under ON status. D. Measure the voltage between Terminals 1 and 2 of the standby power supply wiring harness connector I40. **Standard value: 11 ~ 14 V** Is the measurement normal? →**Yes** System normal. →**No** To step 4.

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Test condition	Details/results/measures
4. Inspect the standby power supply line continuity.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative cable. B. Disconnect the standby power supply wiring harness connector I40 and the dashboard wiring box wiring harness connector I04. C. Measure the resistance between Terminal 2 of the standby power supply wiring harness connector I40 and Terminal 7 of the dashboard wiring box wiring harness connector I04. **Standard value: Less than 5Ω** Is the measurement normal? →**Yes** To step 5. →**No** Inspect and repair the standby power supply line open circuit fault; if necessary, replace the wiring harness.
5. Inspect the standby power grounding point continuity.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative cable. B. Disconnect the standby power supply harness plug I40. C. Measure the resistance between Terminal 1 of the standby power supply wiring harness connector I40 and the reliable grounding point. **Standard value: Less than 5Ω** Is the measurement normal? →**Yes** Confirm the system is normal. →**No** Inspect and repair the standby power supply ground line open cirucuit fault; if necessary, replace the wiring harness.
6. The system is normal.	

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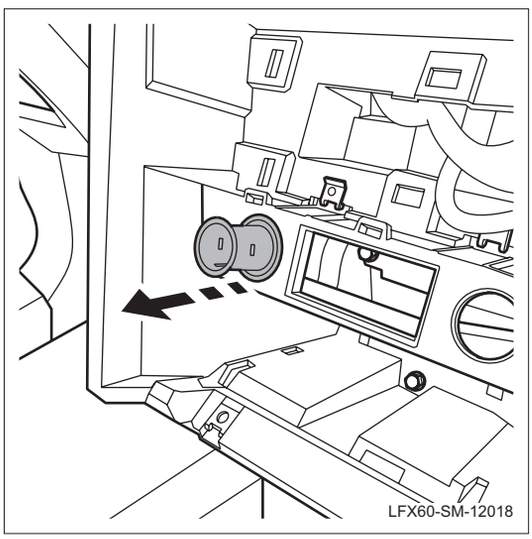
Removal and installation

Replacement of cigarette lighter

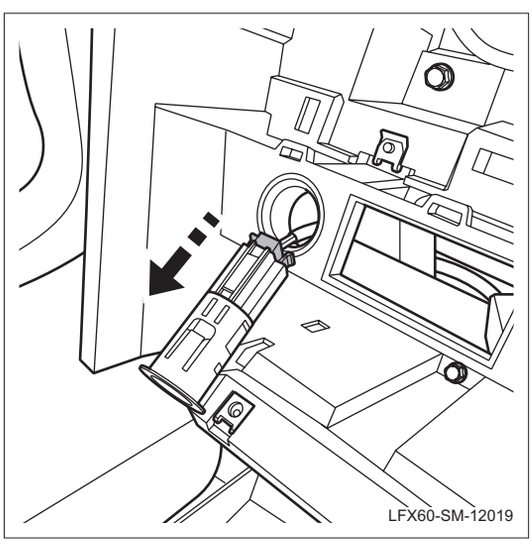
Removal

1. Remove the cigarette lighter.

(a). Disconnect the battery negative connector.



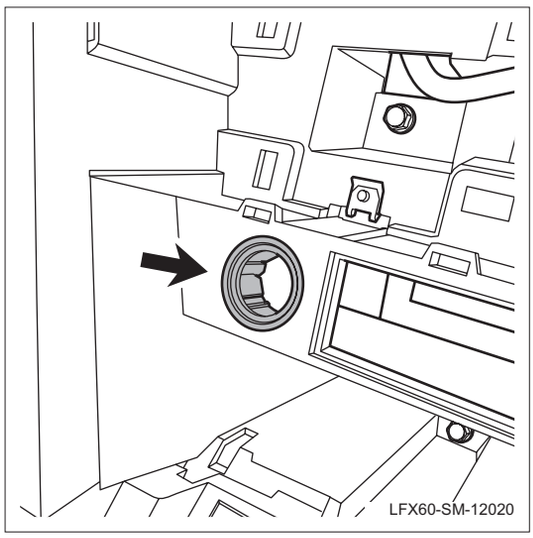
(b). Remove the cigarette lighter holder with an appropriate tool.



(c). Disconnect the cigarette lighter wiring harness connector.

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(d). Remove the cigarette lighter holder.

Installation

1. Install the cigarette lighter.

(a). The installation sequence is the reverse of the disassembly order.

(b). Connect the battery negative terminal.

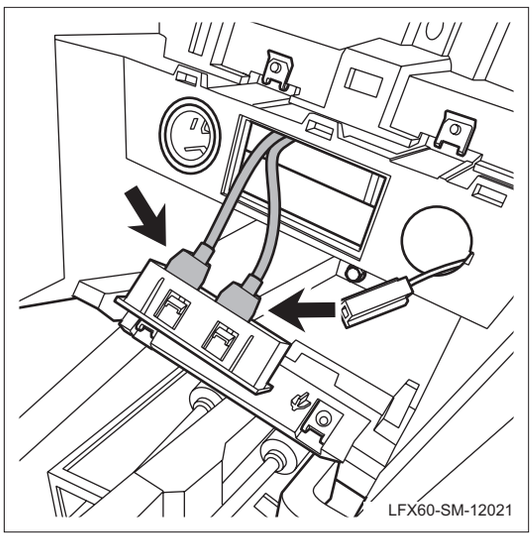
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Replacement of USB Socket

Removal

1. Remove USB socket.



(a). Remove USB socket with an appropriate tool.
(b). Disconnect USB socket wiring harness connector.
(c). Remove USB socket.

Installation

1. Install USB socket.

(a). The installation sequence is the reverse of the disassembly order.

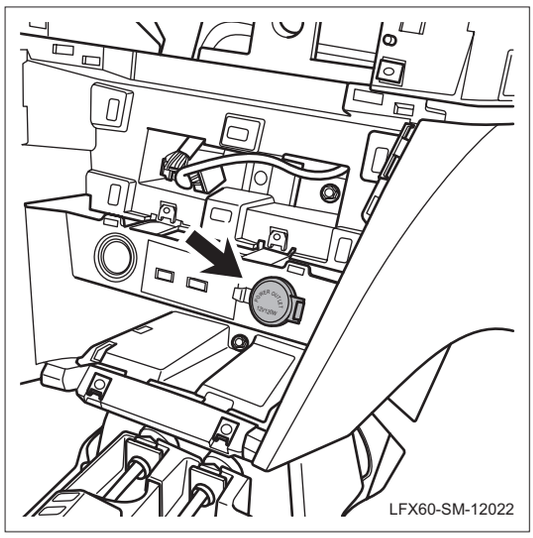
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Replacement of Standby Power Outlet

Removal

1. Remove the standby power outlet.



(a). Remove the standby power outlet with an appropriate tool.
(b). Disconnect the standby power outlet wiring harness connector.
(c). Remove the standby power outlet.

Installation

1. Install the standby power outlet.

(a). The installation sequence is the reverse of the disassembly order.

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12- Electrical system

TPMS (tire pressure monitoring system) 12-1997

Technical specifications ... 12-1997

Structure and installation location 12-1999

Electrical Schematic Diagram 12-2000

General Inspection 12-2001

Operating Principle 12-2002

Diagnosis information and procedures 12-2003

Removal and installation .. 12-2021

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TPMS (tire pressure monitoring system)

Technical specifications

General specifications

Tire pressure receiver

Name	Specification
Rated voltage	12V
Operating voltage	(7.8 ~ 16)V
Receiving frequency	433.92Mhz±60khz
Receiver sensitivity	> -105 dBm
Operating current	≤50mA
Quiescent current	≤ 50μA
Operating temperature	(-40 ~ 85) °C
Storage temperature	(-40 ~ 90) °C

Tire pressure monitoring sensor

Transmission	Frequency	433.92MHz±40KHz
	Baud rate	(4800±48) bps
	Modulation mode	FSK
Receiving	Frequency	125kHz ± 5kHz
	Baud rate	3900 bps
	Modulation mode	ASK
Transmission power		(4 ~ 6 dBm)
Operating voltage		2.1V ~ 3.6V, Lithium manganese battery power supply
RF transmission current		≤14mA
Quiescent current		≤ 2.5μA
Pressure measurement range		(100 ~ 450) kPa (absolute pressure)
Pressure error (with the battery voltage of 2.1V ~ 3.6V)		±17.5kPa (-40 °C ~ 0 °C) ±7kPa (0 °C ~ 50 °C) ±9kPa (50 °C ~ 70 °C) ±17.5kPa (70 °C ~ 125 °C)
Temperature measurement range		(-40 ~ 125) °C
Temperature error (Battery voltage is 2.1V ~ 3.6V)		±5 °C, (-40 ~ -20) °C ±3 °C, (-20 ~ 70) °C ±5 °C, (70 ~ 125) °C

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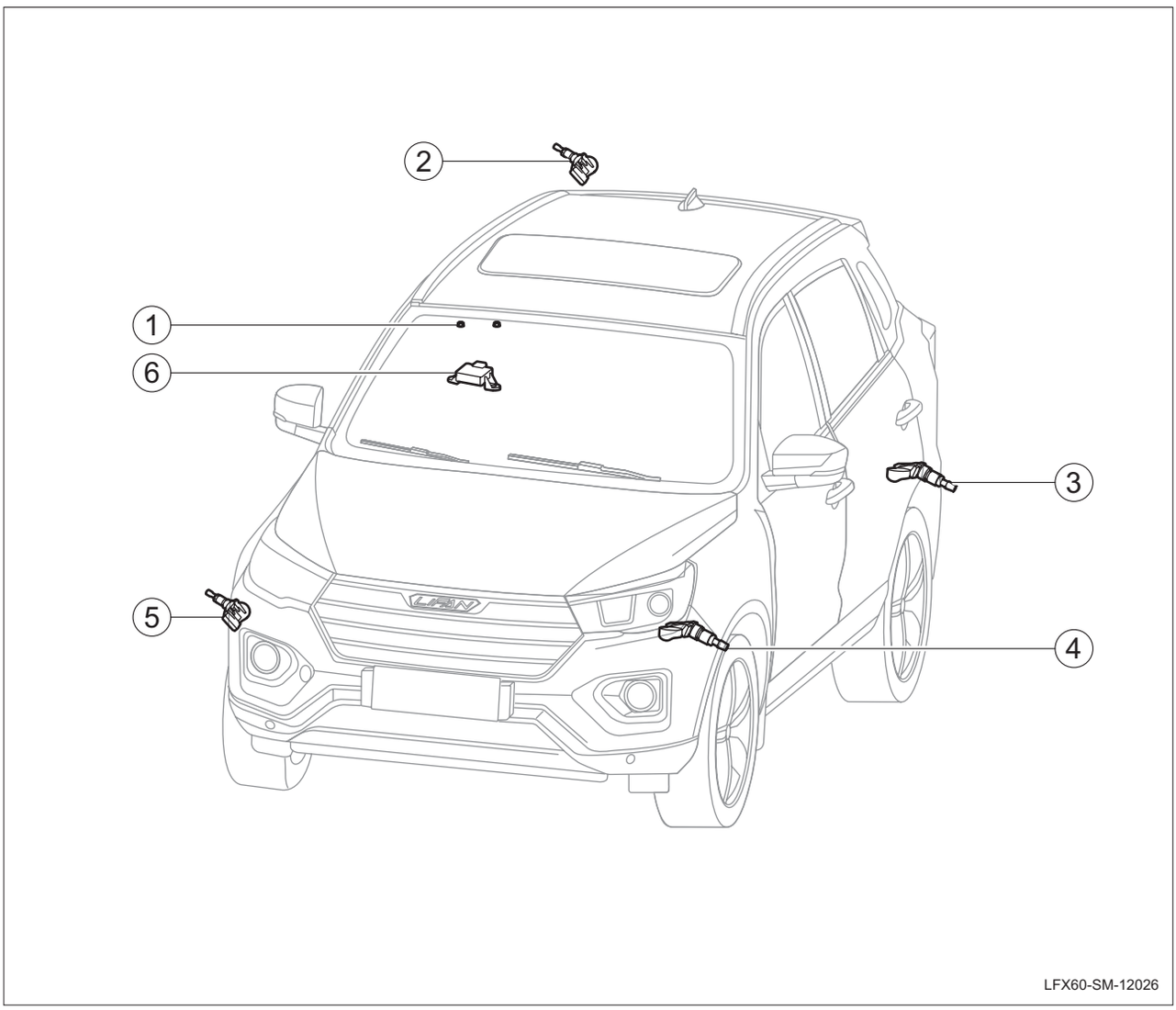
High pressure alarm	≥ P_Max
Low pressure alarm	≤ P_Min
Air keakage alarm	Measure the pressure once every 4s; if the the measured pressure is decreased in continuous 5 times and the cumulative decreased value exceeds 30kPa, the air leakage alarm will be sent.
High temperature alarm	≥ 75 °C
Operating temperature	-40 ~ 105 °C
Storage temperature	-40 ~ 125 °C
Operating humidity	(0 ~ 90)%
Battery service life	≥ 9 years or 100,000 km
Battery voltage measurement range	2.1V ~ 3.6V
Battery voltage measurement accuracy	±0.1V
Weight	≤35g

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Structure and installation location

Component Location Plan



No.	Part name
1	Tire pressure receiver fixing nut
2	Right rear TPMS
3	Left rear TPMS

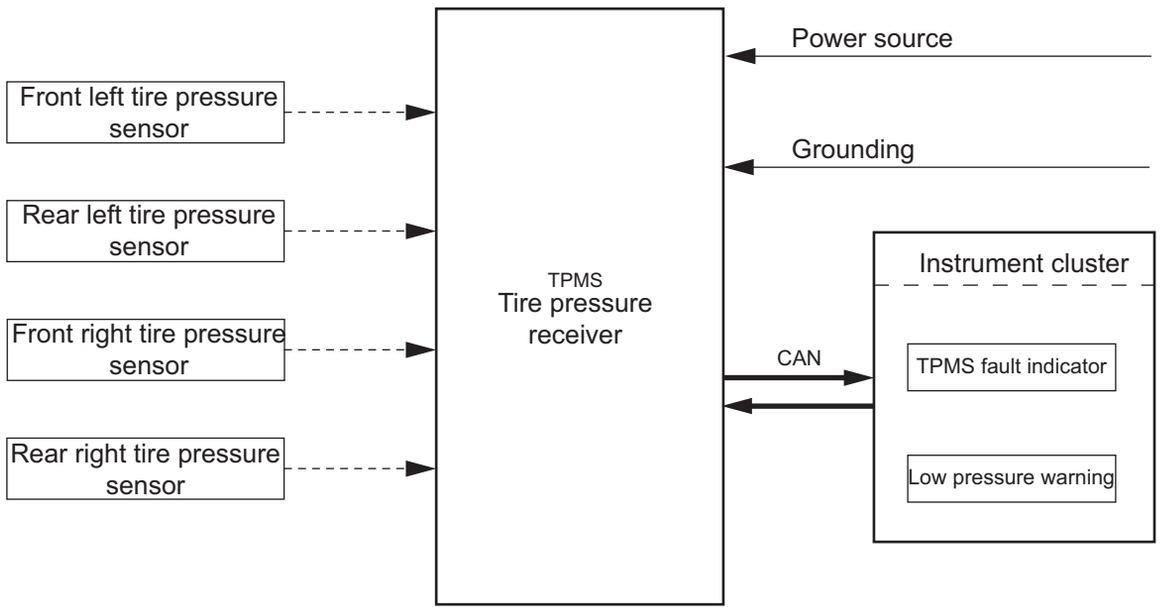
No.	Part name
4	Left front TPMS
5	Right front TPMS
6	Tire pressure receiver

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Electrical Schematic Diagram

Electrical Schematic Diagram



LFX60-SM-12025

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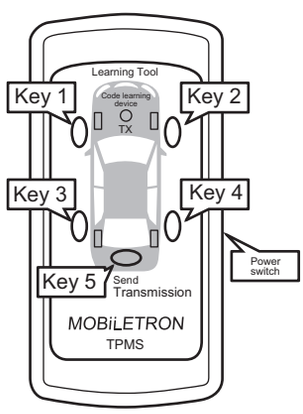
General Inspection

Code learning/ tire pressure matching

Matching instructions

After the ignition switch is turned on or the engine is running (at the speed of less than 3km/h), when the tire pressure receiver receives the tire pressure matching indication signal “IC_TPMS MatchIndication = 1” via CAN bus, it will enter the matching mode. After completion of the matching, the tire pressure receiver will exit the matching mode and enter the operating mode. The matching process will be completed within 5min. If the power switch is switched to ACC/OFF status or the matching is not completed within 5min, the tire pressure receiver will exit the matching mode and return to the status before the matching.

Code learning steps



LFX60-SM-12024

Key 1: Learn the front left tire transmission module
Key 2: Learn the front right tire transmission module
Key 3: Learn the rear left tire transmission module
Key 4: Learn the rear right tire transmission module
Key 5: Send each tire sensor ID code after completion 4 times of the code learning

Step 1: Place the code learning device on the position within about 10cm near the tire valve, press the corresponding tire position button; during the trigging process, circular LED will flash continuously.

Step 2: That the square LED near the button is turned on indicates that the tire is received, otherwies it indicates that the tire is not reception is not received; when the circular LED is turned off, repeat Step 1.

Step 3: Repeat Steps 1 and 2, until the square LEDs near the buttons 1 ~ 4 are all turned on, which indicates that the sensor data are received.

Step 4: Set the receiver under the code learning mode, and place it on the position within 20cm near the tire pressure receiver, press the button 5 to send the data, the square LED will flash continuously, and the data will be sent completely after 15s; the code learning process is completed.

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Operating Principle

System overview

Tire pressure receiver

The tire pressure receiver may receive the high frequency signals transmitted periodically from TPMS, which contains the pressure, temperature and acceleration information of the tire at which TPMS is installed. after receiving and processing the high-frequency signals, the tire pressure receiver can send information to the instrument via CAN bus for display.

The tire pressure receiver shall have a power-off memory function for the tire pressure information, that is, when it is switched from IG OFF to IG ON, if it does not receive data from TPMS, it should send the tire pressure data before power-off, until it can normally receive the latest data transmitted from TPMS.

If the tire pressure or temperature information received by the tire pressure receiver is abnormal or TPMS fails, it should send the corresponding alarm message to the instrument via CAN bus for display. When there is a tire pressure alarm, the icon on the instrument corresponding to the tire will be turned on, when there is a fault alarm, the yellow tire pressure fault alarm indicator will be turned on.

Alarm priority level settings: Sensor fault> Tire pressure alarm; when the both alarms occur at the same time, the latter can be processed after the sensor fault is repaired.

Component description

TPMS status description

The sensor has a 24h continuous monitoring function, mainly including driving mode, parking mode, alarm mode, low speed driving mode, code learning mode (matching)/low frequency trigging mode.

Mode storage:

When the battery is powered on, the sensor will be initialized immediately and enter into this mode, waiting for installing into the tire and receiving the pressure; when the monitoring pressure is ≥ 35kPa, the sensor will enter the parking mode.

Parking mode:

When the sensor monitors that the vehicle is parked for more than 15min, it will enter the parking mode.

Driving mode:

When sensor monitors the vehicle under the running status (with the speed of ≥ 20km/h), it will enter the driving mode.

Low speed driving mode:

Under driving mode, when it monitors that the speed is ≤ 20km/h after parking, it will enter the low speed driving mode.

If it monitors that the vehicle is in the running status again within 15min, it will immediately return to the driving mode.

If it monitors that the vehicle is parked after 15min, it will enter the parking mode.

If only it returns to the driving mode and enters the low speed driving mode, it will count again for 15 min.

Alarm mode:

The sensor monitors the abnormalities, such as, pressure, temperature, low voltage, and sensor faults.

Matching mode:

Trig the sensor with a code learning trigger, to allow the receiver to learn the sensor information or status.

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Diagnosis information and procedures

Diagnosis Instructions

Before TPMS system troubleshooting, must understand and familiarize its working principle, and then perform its diagnosis, so as to determine the correct fault diagnosis procedure in case of fault, and more importantly, to determine whether the situations described by the user are normal.

For any TPMS system fault diagnosis, must inspect it firstly, and then guide the maintenance staff to take the next logical steps for fault diagnosis. Comprehend and correctly use the diagnostic flow chart to shorten the diagnosis time and avoid the misjudgement.

General equipment

Name
Diagnostic equipment of vehicle
Digital multimeter

Visual Inspection

1. Confirm the problem raised by the customer.
2. Check for the evident mechanical or electrical damage trace and collision deformation trace through the visual check.

Visual inspection table

Mechanical	Electrical
• TPMS	• Fuse • Line and wiring harness connectors • TPMS control unit

3. Solve the detected problems before the next step inspection.
4. If the observed or raised problem is the evident and the cause has been found, ensure to fix this fault before proceeding with the next step.
5. If no problem is found through the visual check, confirm the fault and refer to the fault symptom list.

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Fault symptoms table

Symptom	Possible Cause	Recommended measure
Intermittent fault	• Clear DTC • Carry out the simulation test • Check and shake the harness, joint and terminal	**Refer to: Intermittent fault diagnostic flow**
The tire pressure monitoring system (TPMS) indicator can not be turned off	• Instrument cluster • TPMS control unit • TPMS has a fault code	**Refer to: Diagnosis procedure about the tire pressure monitoring system (TPMS) indicator can not be turned off**
The tire pressure monitoring system (TPMS) indicator can not be turned on when the tire pressure is too low	• Instrument cluster • TPMS control unit	**Refer to: Diagnosis flow for tire pressure severely insufficient and tire pressure monitoring system instrument cluster (TPMS) indicator lamp not on**

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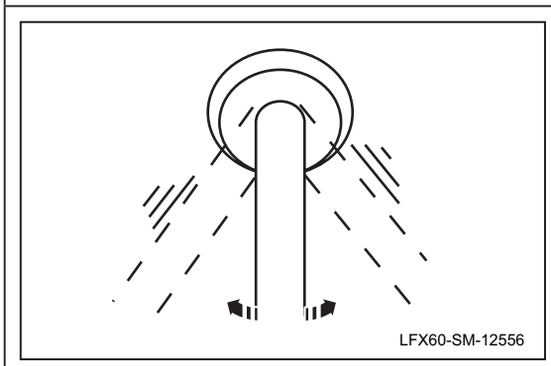
Intermittent fault diagnostic flow

ⓘ Note:

- **Clear DTC.**
- **Carry out the simulation test.**
- **Inspect and shake the wiring harness, connectors and terminals.**

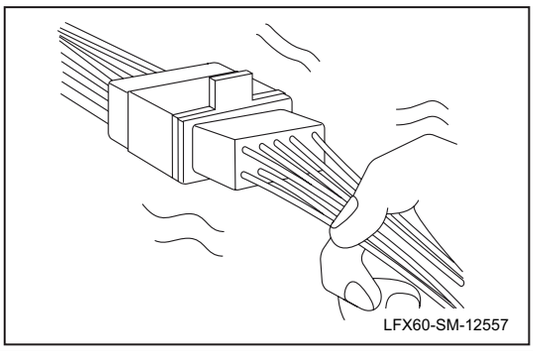
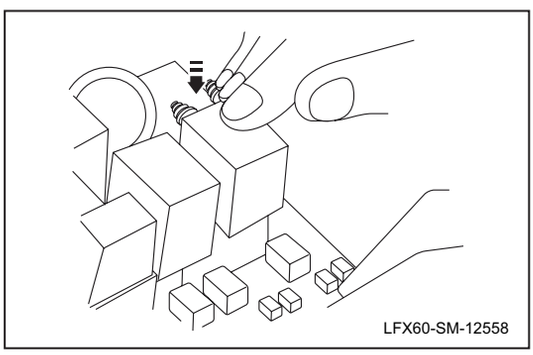
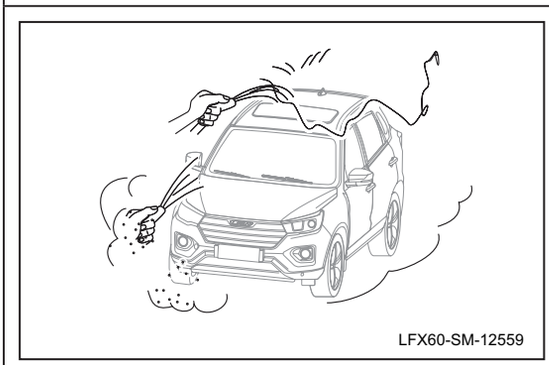
Fault definition: There is no the fault at present, but the history fault diagnosis code indicates that the fault has occurred. Or the customer reports this fault while the fault does not relate to the DTC and the fault symptom cannot be reproduced currently.

When the fault can not be confirmed in DTC check, the fault may occur in use occasionally. At this point, check all the lines and parts which may cause the fault. In many cases, the faults, especially for bad wiring harness contact, can be quickly and effectively monitored with the basic inspection shown in the following flowchart.

Test condition	Details/results/measures
1. General inspection.	
	A. If the fault occurs or the fault is more severe or the engine vibration occurs when the vehicle is running on the rough road, go to Step 2. **ⓘ Note:** **There are several reasons that may cause electrical faults due to vibrations of the vehicle or engine.** **Check the following:** 1.The plug is not inserted in position. 2.There is no sufficient gap for the harness. 3.The harness layout passes across the bracket or moving parts. 4.The harness is arranged too near to the high temperature parts. 5.The wiring is incorrect, not clamped or the loose harness causes the wiring pinched between parts. 6.The plug joints, vibration parts and the harness passing positions should be checked as the key points. For example, the harness passing through the fire wall and bodywork plate.
2. Wiring harness connector inspection method.	
 LFX60-SM-12556	A. Connect the diagnostic meter to the diagnostic interface (DLC). B. Operate the start switch to turn the power to ON state (shut down the engine). C. Access the data flow of the switch you are checking. D. While monitoring the data stream, gently shake each plug or harness horizontally and horizontally. E. If the data stream value is instable, check whether the contact is loose.

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Test condition	Details/results/measures
3. Check the wiper cluster switch power line.	
 LFX60-SM-12557	A. Connect the diagnostic meter to the diagnostic interface (DLC). B. Operate the start switch to set the power mode under ON status (do not start the engine). **Note:** **If the engine is started, perform the following steps during its operation in idling mode.** C. Access the data flow of the switch you are checking. D. While monitoring the data stream, gently shake each plug or harness horizontally and horizontally. If the data flow is not stable, check whether the connection is bad.
4. Method of checking the actuator or relay.	
 LFX60-SM-12558	A. Connect the diagnostic meter to the diagnostic interface (DLC). B. Operate the start switch to set the power mode under ON status (do not start the engine). **Note:** **If the engine is started, perform the following steps during its operation in idling mode.** C. Prepare the output status control function well for the actuator or relay you are checking. D. After the output status control function is activated, use a finger to vibrate the actuator or relay 3s. E. If you hear an unstable “click” sound, check for any improper connection or improper installation of the actuator and/or relay. **Note:** **A strongly vibrating relay may cause the relay to be disconnected.**
5. Sprinkling method	
 LFX60-SM-12559	If the fault occurs only at high humidity or rainy/snowy weather, the following procedure should be performed: The temperature and humidity are changed indirectly by water spray on the front of the radiator. If the vehicle is likely to leak, this may damage the control module. In a leakage inspection in a vehicel, must take special protective measures. A. If the sensor or switch is inspected, connect the diagnosis instrument to the diagnosis interface DLC. B. Operate the start switch to set the power mode under ON status (do not start the engine). **Note:** **If the engine is started, perform the following steps during its operation in idling mode.** C. If you want to check the sensor or switch, access the sensor or switch data stream. D. If you want to check the switch, manually turn it on. E. Spray water on the car, or drive the car through the car wash. F. If the data flow is unstable or malfunctioning, repair or replace parts if necessary.

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Diagnosis procedure about the tire pressure monitoring system (TPMS) indicator can not be turned off

Test condition	Details/results/measures
1. Read the TPMS DTC.	
	A. Connect the diagnostic equipment. B. Operate the start switch to turn the power to ON state. C. Read TPMS system fault code on the diagnosis instrument. Is there TPMS DTC? →**Yes** Carry out the relevant fault diagnosis according to the DTCs. →**No** To step 2.
2. Test the instrument cluster TPMS indicator lamp.	
	A. Connect the diagnostic equipment. B. Operate the start switch to turn the power to ON state. C. Read the combination instrument on the instrument cluster and perform the self-test operation. Is the TPMS indicator lamp normal? →**Yes** To step 3. →**No** Replace the instrument cluster. **Refer to: Replacement of instrument cluster assembly**
3. Replace the TPMS control unit.	
	A. Replace the TPMS control unit. **Refer to: Replacement of TPMS control unit** Confirm the system is normal.

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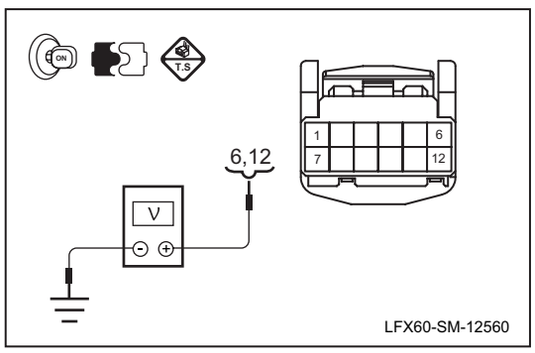
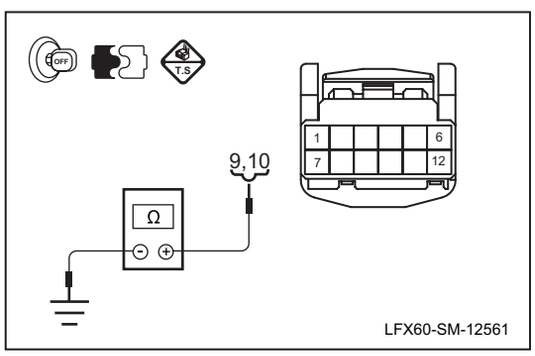
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Diagnosis flow for tire pressure severely insufficient and tire pressure monitoring system instrument cluster (TPMS) indicator lamp not on

Test condition	Details/results/measures
1. Inspect TPMS system fuse.	
	A. Check the TPMS fuse FS23, FS24. **The fuse rated capacity is 5 A and 10A respectively** Is it OK after checking? →**Yes** To step 2. →**No** Replace the TPMS system fuse.
2. Read the TPMS DTC.	
	A. Connect the diagnostic equipment. B. Operate the start switch to turn the power to ON state. C. Read TPMS system fault code. Is there TPMS DTC? →**Yes** Carry out the relevant fault diagnosis according to the DTCs. →**No** To step 3.
3. Test the instrument cluster TPMS indicator lamp.	
	A. Connect the diagnostic equipment. B. Operate the start switch to turn the power to ON state. C. Perform the self-test operation on the instrument cluster. Is the TPMS indicator lamp normal? →**Yes** To step 4. →**No** Replace the instrument cluster. **Refer to: Replacement of instrument cluster assembly**

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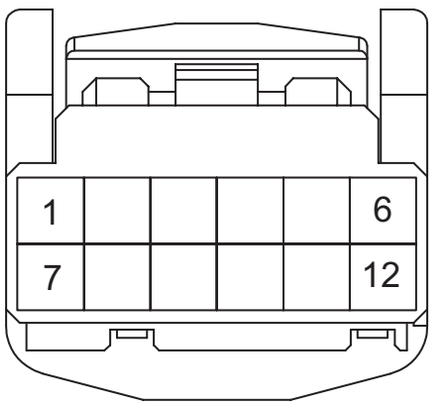
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Test condition	Details/results/measures
4. Inspect TPMS control unit power line.	
	A. Operate the start switch to set the power mode under ON status (do not start the engine) and disconnect the negative battery cable. B. Disconnect the TPMS harness plug S12. C. Measure the voltage between Terminals 12 and 6 of TPMS wiring harness connector S12 and the reliable grounding point. **Standard value: 11 ~ 14 V** Is the measurement normal? →**Yes** To step 5. →**No** Inspect and repair TPMS control unit power line open circuit fault; if necessary, replace the wiring harness.
5. Inspect TPMS control unit grounding line.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative cable. B. Disconnect the TPMS harness plug. C. Measure the resistance between Terminals 9 and 10 of TPMS wiring harness connector S12 and the reliable grounding point. **Standard value: Less than 5Ω** Is the measurement normal? →**Yes** To step 6. →**No** Inspect and repair TPMS control unit open circuit fault; if necessary, replace the wiring harness.
6. Replace the TPMS control unit.	
	A. Replace the TPMS control unit. **Refer to: Replacement of TPMS control unit** Confirm the system is normal.

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Control module terminal list



S12

LFX60-SM-12675

Terminal No.	Wire diameter/color	Terminal description
S01-01	0.30 Bl/B	PCAN-H
S01-02	0.30Bl/W	PCAN-L
S01-03		
S01-04		
S01-05		
S01-06	0.30 R/Bl	IG power supply
S01-07	-	-
S01-08	-	-
S01-09	0.30 B	Signal GND
S01-10	0.30 B	Power ground
S01-11	-	-
S01-12	0.30 R/W	Battery power supply

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DTC list

DTC	DTC information
B12DF	The voltage is too high
B12E0	The voltage is too low
B12EC	Front left tire pressure information update fail
B12EC	Front left tire pressure sensor fault
B12ED	Front right tire pressure information update fail
B12ED	Front right tire pressure sensor fault
B12EE	Rear left tire pressure information update fail
B12EE	Rear left tire pressure sensor fault
B12EF	Rear right tire pressure information update fail
B12EF	Rear right tire pressure sensor fault
U0027	Instrument vehicle speed message loss
U0028	Bus disconnection fault

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DTC diagnosis flow index

DTC	Description	Diagnostic process
B12DF	The voltage is too high	**Refer to: DTC B12DF, B12E0**
B12E0	The voltage is too low	
B12EC	Front left tire pressure information update fail	**Refer to: DTC B12DF, B12E0, B12EC, B12EC, B12ED, B12ED, B12EE, B12EE, B12EF, B12EF**
B12ED	Front right tire pressure information update fail	
B12EE	Rear left tire pressure information update fail	
B12EF	Rear right tire pressure information update fail	
B12EC	Front left tire pressure sensor fault	
B12ED	Front right tire pressure sensor fault	
B12EE	Rear left tire pressure sensor fault	
B12EF	Rear right tire pressure sensor fault	
U0027	Instrument vehicle speed message loss	**Refer to: DTC U0027, U0028**
U0028	Bus disconnection fault	

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DTC B111717, B111716

DTC description

DTC	Description	Definition
B12DF	The voltage is too high	TPMS control unit monitors the system operating voltage abnormality
B12E0	The voltage is too low	

Possible reasons

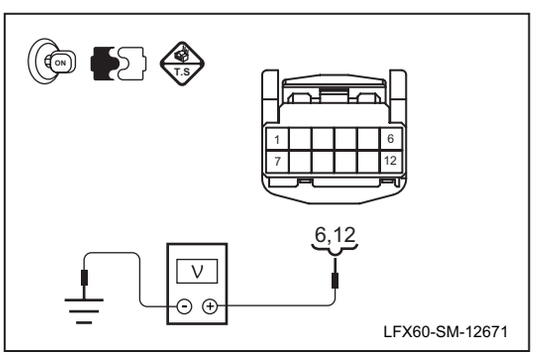
DTC	Check the strategy	Set the condition (control strategy)	Define the fault location
B12DF	Check the hardware and line	Voltage > 17 V within continuous 10s	• Charging system • TPMS control unit and line fault
B12E0		Voltage < 9 V within continuous 10s	

Diagnostic process

Test condition	Details/results/measures
1. General inspection.	
	A. Check the related harness plugs for breakage, loose contact, aging or looseness. Is it OK after checking? →**Yes** To step 2. →**No** Repair the fault position.
2. Read the DTC with the diagnostic meter.	
	A. Connect the diagnostic meter and check the system for the other relevant DTCs. Is it OK after checking? →**Yes** To step 3. →**No** Carry out the relevant fault diagnosis according to the DTCs.
3. Check whether the DTC can be cleared.	
	A. Connect the diagnostic meter and access the TPMS to clear DTC. B. Start the engine and check whether the DTC occurs again. Does DTC occur? →**Yes** To step 4. →**No** System normal.

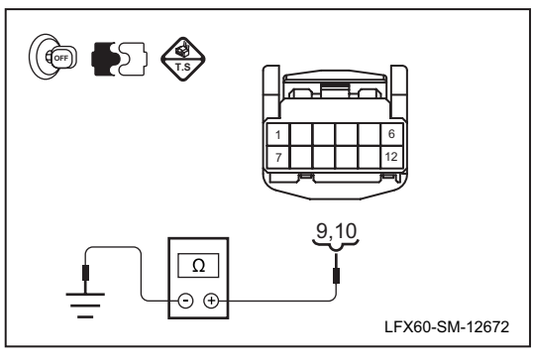
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Test condition	Details/results/measures
4. Check the power supply system of vehicle.	
	A. Check whether the power supply system of vehicle is normal. Is it OK after checking? →**Yes** To step 5. →**No** Check the power supply system for fault.
5. Check the TPMS fuse.	
	A. Check the TPMS fuse FS23, FS24. **The fuse rated capacity is 5 A and 10A respectively** Is it OK after checking? →**Yes** To step 6. →**No** Replace the TPMS system fuse.
6. Check the TPMS power line.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative cable. B. Disconnect the TPMS harness plug S12. C. Connect the negative battery cable and operate the start switch to set the power mode under ON status. D. Measure the voltage between the TPMS control module harness plug S12 terminal 6, 12 and the fixed ground point. **Standard value: 11 ~ 14 V** Is it OK after checking? →**Yes** To step 7. →**No** Repair the TPMS control module power line open circuit fault and replace the harness if necessary.

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Test condition	Details/results/measures
7. Check the TPMS control module ground line.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative cable. B. Disconnect the TPMS control module harness plug S12. C. Measure the resistance between the TPMS control module harness plug S12 terminal 9, 10 and the fixed ground point. **Standard value: Less than 5Ω** Is it OK after checking? →**Yes** To step 8. →**No** Repair the TPMS control module ground line open circuit fault and replace the harness if necessary.
8. Replace the TPMS control unit.	
	A. Replace the TPMS control unit. **Refer to: Replacement of TPMS control unit** Confirm the system is normal.

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DTC B12DF, B12E0, B12EC, B12EC, B12ED, B12ED, B12EE, B12EE, B12EF, B12EF

DTC description

DTC	Description	Definition
B12EC	Front left tire pressure information update fail	• The tire pressure information update fails • TPMS monitors that the pressure sensor has failed more than 15 times
B12ED	Front right tire pressure information update fail	
B12EE	Rear left tire pressure information update fail	
B12EF	Rear right tire pressure information update fail	
B12EC	Front left tire pressure sensor fault	
B12ED	Front right tire pressure sensor fault	
B12EE	Rear left tire pressure sensor fault	
B12EF	Rear right tire pressure sensor fault	

Possible reasons

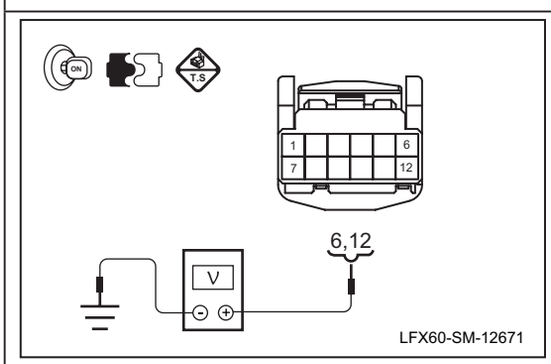
DTC	Check the strategy	Set the condition (control strategy)	Define the fault location
B12EC	Hadware inspection	TPMS does not receive TPMS feedback signal within 10min	• TPMS • TPMS control unit
B12ED			
B12EE			
B12EF			
B12EC		TPMS monitors that TPMS has failed more than 15 times	
B12ED			
B12EE			
B12EF			

Diagnostic process

Test condition	Details/results/measures
1. General inspection.	
	A. Check the related harness plugs for breakage, loose contact, aging or looseness. Is it OK after checking? →**Yes** To step 2. →**No** Repair the fault position.
2. Read the DTC with the diagnostic meter.	

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Test condition	Details/results/measures
	A. Connect the diagnostic meter and check the system for the other relevant DTCs. Is it OK after checking? →**Yes** To step 3. →**No** Carry out the relevant fault diagnosis according to the DTCs.
3. Check whether the DTC can be cleared.	
	A. Connect the diagnostic meter and access the TPMS to clear DTC. B. Start the engine and check whether the DTC occurs again. Does DTC occur? →**Yes** To step 4. →**No** System normal.
4. Check the fuse.	
	A. Check the fuse: FS23, FS24. **The fuse rated capacity is 5A, 10A.** Is the fuse normal? →**Yes** To step 5. →**No** Repair the fuse line and replace the fuse of rated capacity.
5. Check the TPMS power line.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative cable. B. Disconnect the TPMS harness plug S12. C. Connect the battery negative cable and operate the start switch to turn the power to ON state. D. Measure the voltage between the TPMS control module harness plug S12 terminal 6, 12 and the fixed ground point. **Standard value: 11 ~ 14 V** Is it OK after checking? →**Yes** To step 6. →**No** Repair the TPMS control module power line open circuit fault and replace the harness if necessary.
6. Check the TPMS control module ground line.	

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Test condition	Details/results/measures
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative cable. B. Disconnect the TPMS control module harness plug S12. C. Measure the resistance between the TPMS control module harness plug S12 terminal 9, 10 and the fixed ground point. **Standard value: Less than 5Ω** Is it OK after checking? →**Yes** To step 7. →**No** Repair the TPMS control module ground line open circuit fault and replace the harness if necessary.
7. Replace TPMS.	
	A. Replace TPMS. **Refer to: Replacement of TPMS Sensor** Inspect whether it is normal? →**Yes** The fault is solved and the system is normal. →**No** To step 8.
8. Replace the TPMS control unit.	
	A. Replace the TPMS control unit. **Refer to: Replacement of TPMS control unit** Confirm the system is normal.

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DTC U0027, U0028

DTC description

DTC	Description	Definition
U0027	Instrument vehicle speed message loss	• Network transmission abnormity
U0028	Bus disconnection fault	

Possible reasons

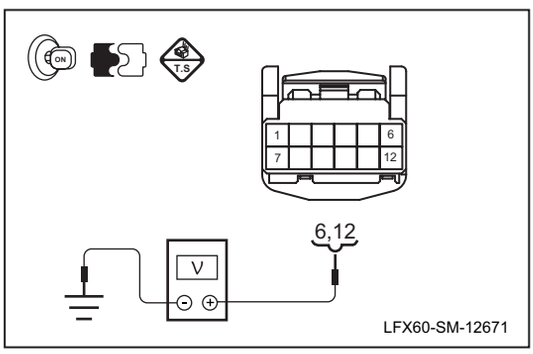
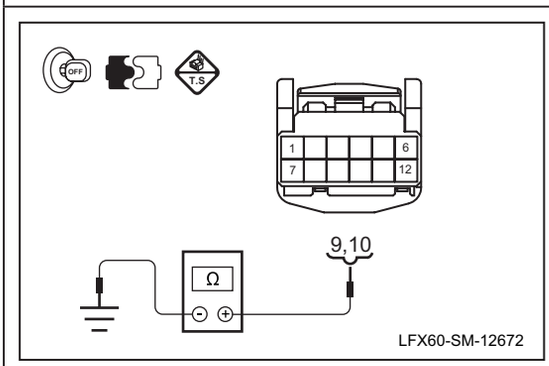
DTC	Check the strategy	Set the condition (control strategy)	Define the fault location
B12DF	Check the hardware and line	The speed signal has been lost more than 50 times	• CAN bus fault • TPMS control unit and line fault
B12E0		The bus is off more than 3 times	

Diagnostic process

Test condition	Details/results/measures
1. General inspection.	
	A. Check the related harness plugs for breakage, loose contact, aging or looseness. Is it OK after checking? →**Yes** To step 2. →**No** Repair the fault position.
2. Read the DTC with the diagnostic meter.	
	A. Connect the diagnostic meter and check the system for the other relevant DTCs. Is it OK after checking? →**Yes** To step 3. →**No** Carry out the relevant fault diagnosis according to the DTCs.
3. Check whether the DTC can be cleared.	
	A. Connect the diagnostic meter and access the TPMS to clear DTC. B. Start the engine and check whether the DTC occurs again. Does DTC occur? →**Yes** To step 4. →**No** System normal.

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Test condition	Details/results/measures
4. Check whether the vehicle communication system is normal.	
	A. Check whether the vehicle communication system is normal. **Refer to: CAN Network Integrity Inspection** Is it OK after checking? →**Yes** To step 5. Check the communication system for fault.
5. Check the TPMS power line.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative cable. B. Disconnect the TPMS harness plug S12. C. Connect the battery negative cable and operate the start switch to turn the power to ON state. D. Measure the voltage between the TPMS control module harness plug S12 terminal 6, 12 and the fixed ground point. **Standard value: 11 ~ 14 V** Is it OK after checking? →**Yes** To step 6. →**No** Repair the TPMS control module power line open circuit fault and replace the harness if necessary.
6. Check the TPMS control module ground line.	
	A. Operate the start switch to turn the power to OFF state and disconnect the battery negative cable. B. Disconnect the TPMS control module harness plug S12. C. Measure the resistance between the TPMS control module harness plug S12 terminal 9, 10 and the fixed ground point. **Standard value: Less than 5Ω** Is it OK after checking? →**Yes** To step 7. →**No** Repair the TPMS control module ground line open circuit fault and replace the harness if necessary.
7. Replace the TPMS control unit.	
	A. Replace the TPMS control unit. **Refer to: Replacement of TPMS control unit** Confirm the system is normal.

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Removal and installation

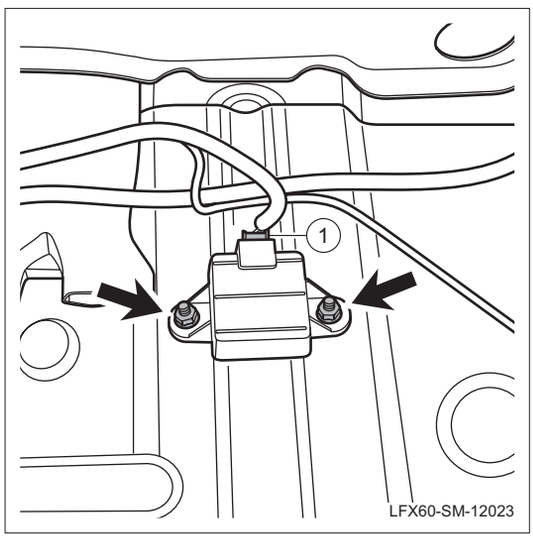
Replacement of TPMS control unit

Removal

1. Remove TPMS control unit.

(a). Disconnect the battery negative connector.

(b). Remove the passenger seat; **refer to: Replacement of Front Seats.**



(c). Partially open the floor carpet.

(d). Disconnect TPMS control unit wiring harness connector 1.

(e). Remove TPMS control unit fixing nut 2.

(f). Remove TPMS control unit.

Installation

1. Install TPMS control unit.

(a). The installation sequence is the reverse of the disassembly order.

(a). Connect the battery negative terminal.

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Replacement of TPMS

Removal

1. Remove TPMS.

(a). Disconnect the battery negative connector.

(b). Remove the wheel. Refer to the replacement of tire.

(c). Remove TPMS.

Installation

1. Install TPMS.

(a). The installation sequence is the reverse of the disassembly order.

(b). Connect the battery negative terminal.

(c). Tire pressure monitoring sensor ID learning.

ⓘ Note:

To ensure that the sensor seal rubber and rim installation, must ensure the tire seal.

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