Body Electrical System

AUDIO SYSTEM
AUDIO UNIT
AUX(AUXILIARY)

KEYLESS ENTRY AND BURGLAR ALARM

ETACS (ELECTRONIC TIME AND ALARM CONTROL SYSTEM)
BODY CONTROL MODULE

INDICATORS AND GAUGES
INSTRUMENT CLUSTER
SPEEDOMETER

SUNROOF
SUNROOF MOTOR

LIGHTING SYSTEM
HEAD LAMPS

IMMOBILIZER CONTROL SYSTEM

AUDIO SYSTEM

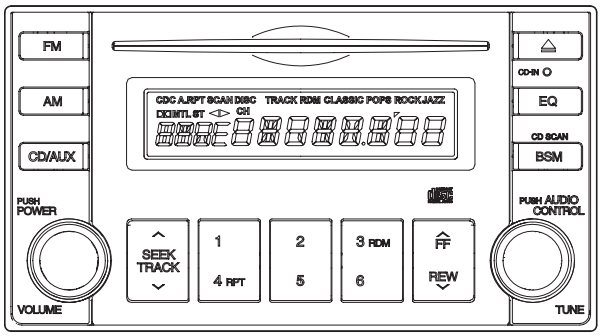
SPECIFICATION E4DDAAEE

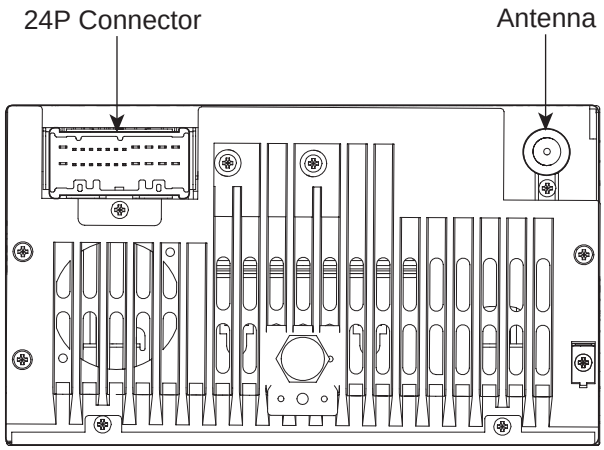
Item		Specification		
Model		AM/FM/CD	AM/FM/CD/MP3	AM/FM/6CDC/MP3
Power supply		DC 14.4V		
Rated output		Max 43W x 4		
Antenna		4Ω x 4		
Antenna		80PF 75Ω		
Tuning type		PLL synthesized type		
Frequency range / Channel space	FM	87.5 ~ 108.0 MHz/100 KHz (General)		
	AM	531 ~ 1602 KHz/9 KHz (General)		
	FM	87.5 ~ 108.0 MHz/50 KHz (Europe)		
	MW	522 ~ 1620 KHz/9 KHz (Europe)		
	LW	153 ~ 279 KHz/1 KHz (Europe)		

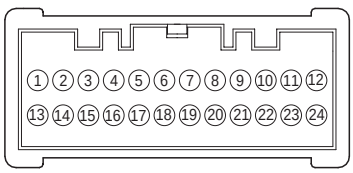
AUDIO UNIT

COMPONENT LOCATION E51CD74A

[AM/FM/CD]

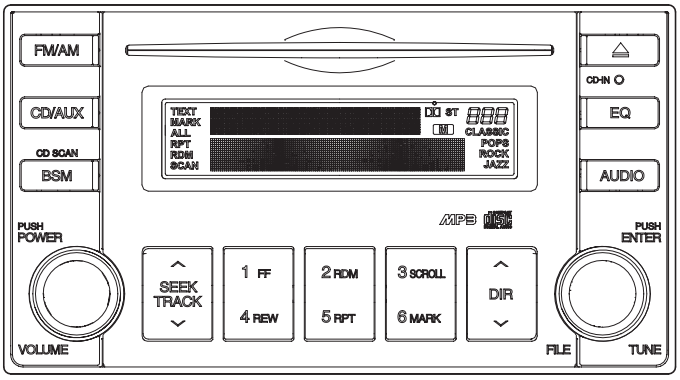


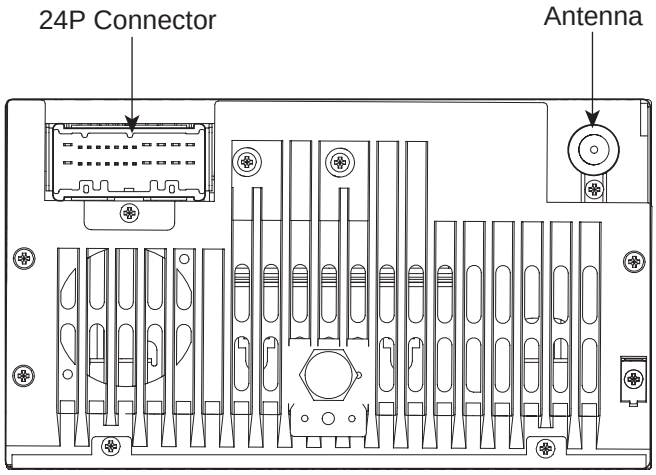


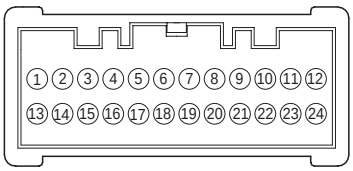
24P Connector	Pin	Description	Pin	Description
	1	Front left speaker(+)	13	Front left speaker(-)
	2	Front right speaker(+)	14	Front right speaker(-)
	3	Rear right speaker(+)	15	Rear right speaker(-)
	4	Rear left speaker(+)	16	Rear left speaker(-)
	5	Illumination(+)	17	Illumination(-)
	6	Steering remote control	18	Remote control ground
	7	-	19	MUTE
	8	AUX GND	20	AUX Detect
	9	AUX IN(L)	21	AUX IN(R)
	10	-	22	-
	11	ACC	23	Antenna B+
	12	B+	24	Ground

SLDBE7001L

[AM/FM/MP3/CD]





24P Connector	Pin	Description	Pin	Description
	1	Front left speaker(+)	13	Front left speaker(-)
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	3	Rear right speaker(+)	15	Rear right speaker(-)
	4	Rear left speaker(+)	16	Rear left speaker(-)
	5	Illumination(+)	17	Illumination(-)
	6	Steering remote control	18	Remote control ground
	7	-	19	MUTE
	8	AUX GND	20	AUX Detect
	9	AUX IN(L)	21	AUX IN(R)
	10	-	22	-
	11	ACC	23	Antenna B+
	12	B+	24	Ground

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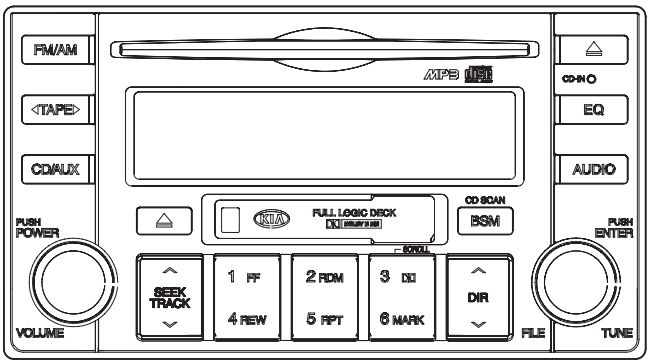
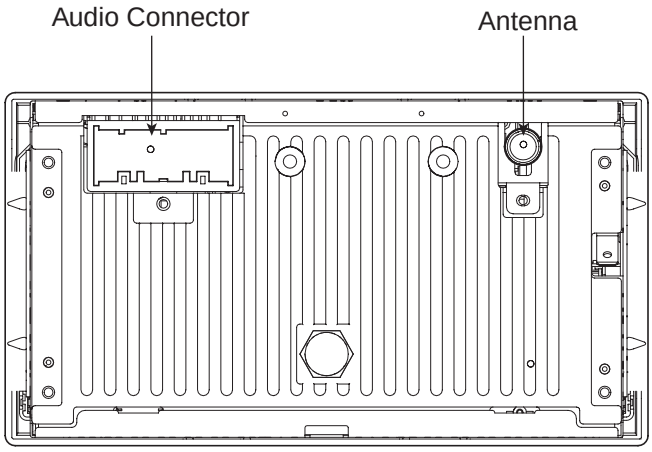
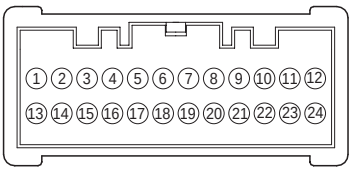
[AM/FM/MP3/6CDC]





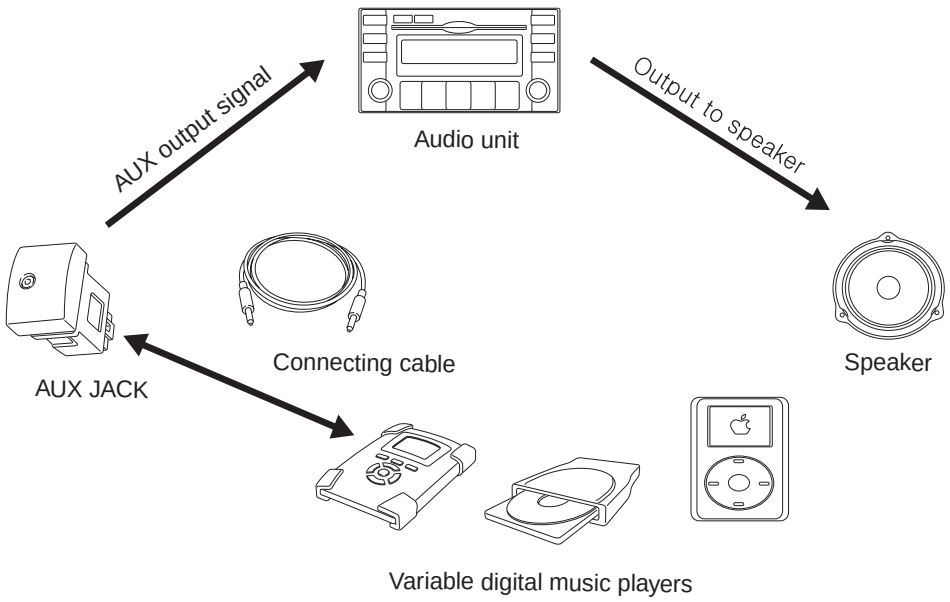
24P Connector	Pin	Description	Pin	Description
	1	Front left speaker(+)	13	Front left speaker(-)
	2	Front right speaker(+)	14	Front right speaker(-)
	3	Rear right speaker(+)	15	Rear right speaker(-)
	4	Rear left speaker(+)	16	Rear left speaker(-)
	5	Illumination(+)	17	Illumination(-)
	6	Steering remote control	18	Remote control ground
	7	-	19	MUTE
	8	AUX GND	20	AUX Detect
	9	AUX IN(L)	21	AUX IN(R)
	10	Amp remote control	22	SPEED
	11	ACC	23	Antenna B+
	12	B+	24	Ground

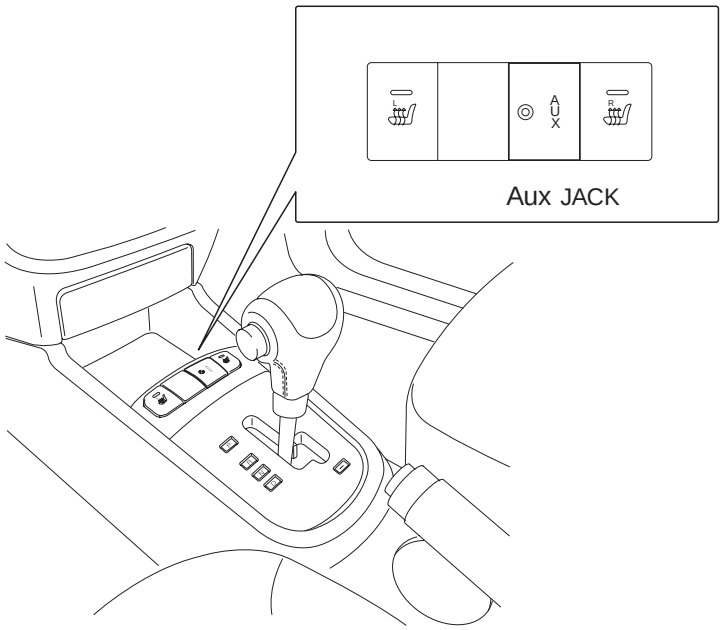
SLDBE7009L

AUX(AUXILIARY)

DESCRIPTION E1EBFED6

When the portable music player (MP3, iPOD and etc.) is linked to the audio unit through the aux jack on the center console, the customer can listen to the music sound of external music player equipment in the car.
Therefore, the customer needs for listening to variable music have been satisfied by the interface between the portable music player and the car audio.





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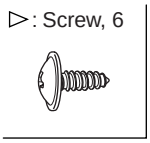
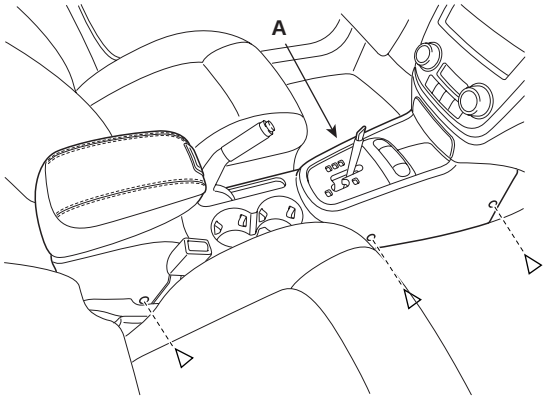
REMOVAL E4E2ECAB

1. Remove the center console(A). (Refer to Body Gr. - Center console)

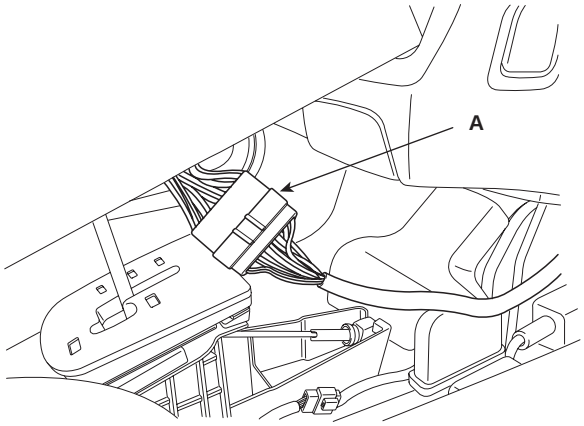
▷: Screw, 6





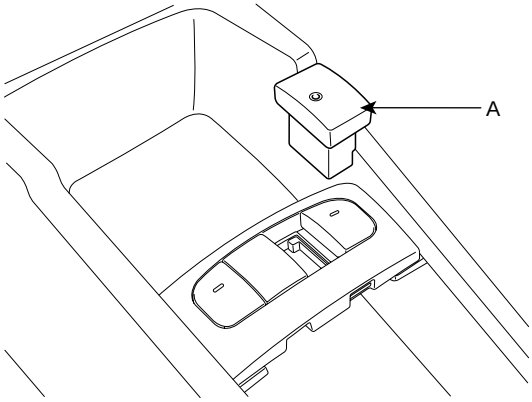
SLDBE7002L

2. Disconnect the center console connector(A).



SLDBE6003D

3. Remove the AUX jack(A) after disconnecting the jack connector.



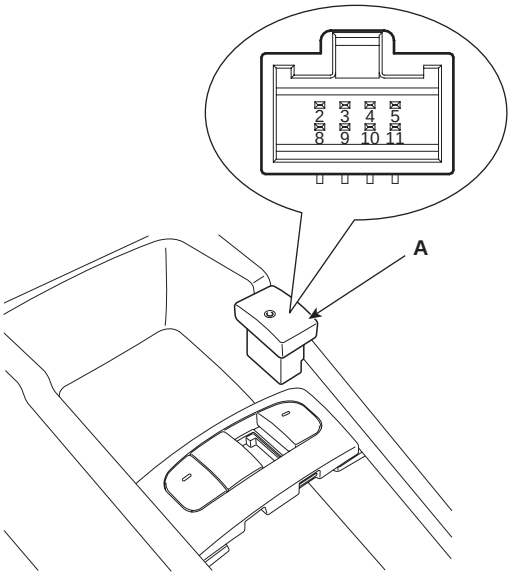
SLDBE6004D

INSTALLATION EAEF7280

1. Install the AUX jack.
2. Connect the AUX jack connector.
3. Install the center console.

INSPECTION EBB281FC

1. Disconnect the negative(-) battery terminal.
2. Disconnect the AUX jack(A) after removing the center console.



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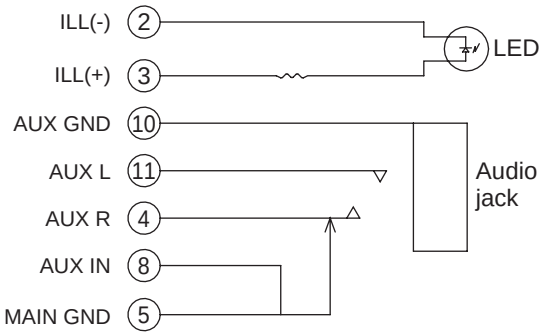
3. Using an ohmmeter, check for continuity between the terminals of AUX jack connector.



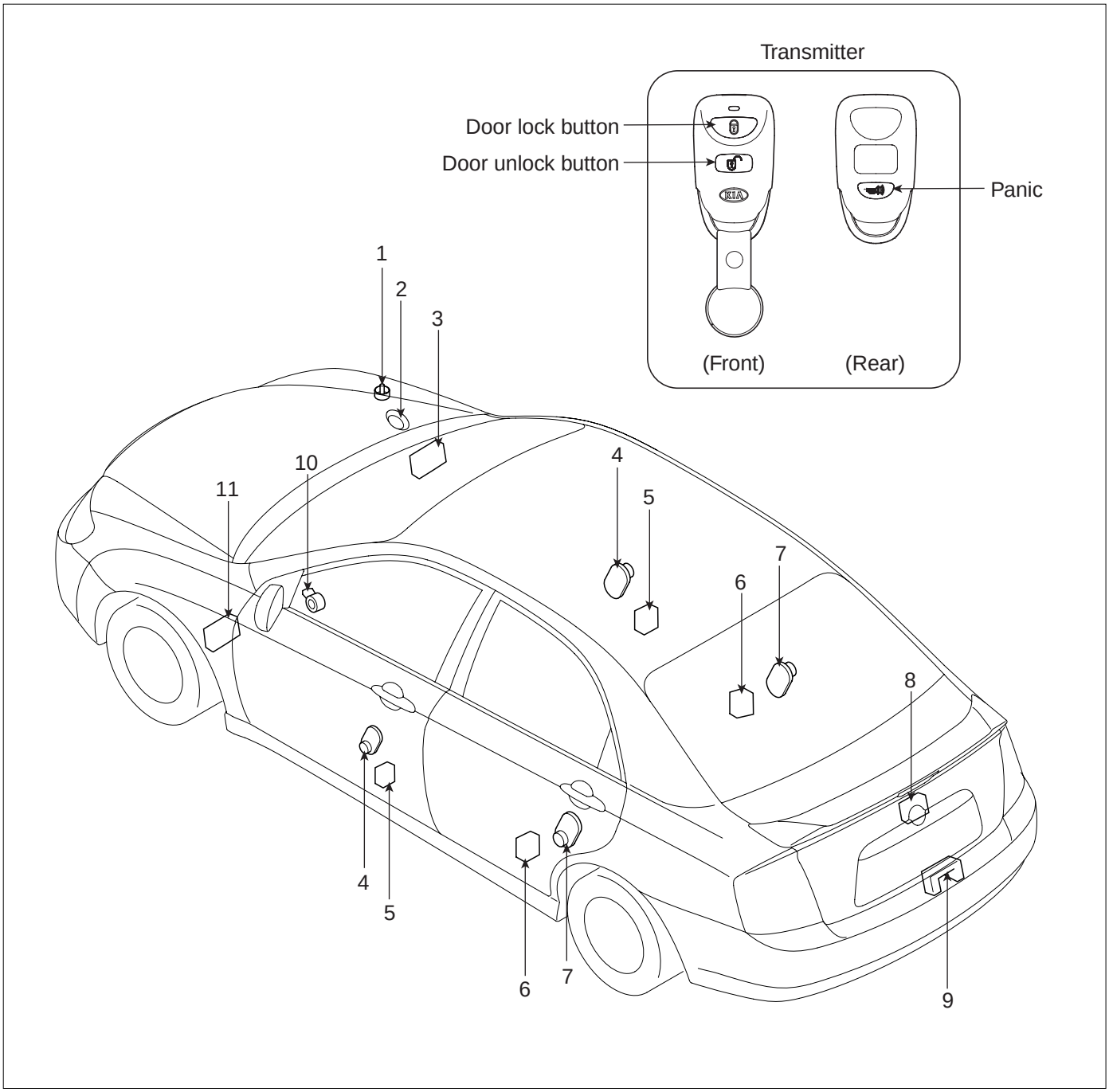
SLDBE7006L

KEYLESS ENTRY AND BURGLAR ALARM

SPECIFICATION E7C479C1

Items	Specifications
Keyless entry transmitter Power source	Lithium 3V battery (1EA)
Transmissible distance	30m or more
Life of battery	2 years or more (at 10 times per day)
Button	4 Door : 4 (Door lock, Door unlock, Trunk open, Panic) 5 Door : 3 (Door lock, Door unlock, Panic)
Transmission frequency	433.92 MHz

COMPONENT LOCATION E64EFED6



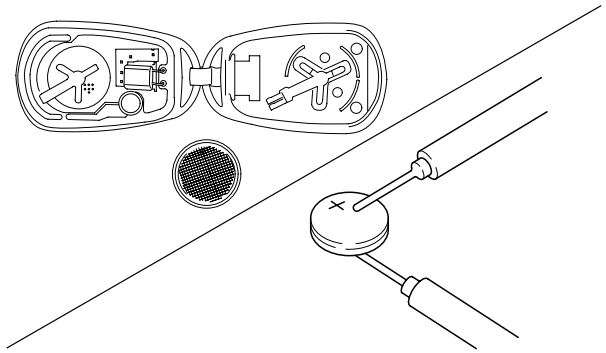
1. Hood switch
2. Burglar horn
3. Receiver
4. Front door switch
5. Front door lock actuator & switch
6. Rear door lock actuator & switch
7. Rear door switch
8. Tailgate lock actuator & switch (5 doors)
9. Tailgate switch (5 doors) / Trunk lid switch (4 doors)
10. Door warning switch
11. Body control module (BCM)

SLDBE7010L

INSPECTION E01F3BBF

1. Check that the red light flickers when the door lock or unlock button is pressed on the transmitter.
2. Remove the battery and check voltage if the red light doesn't flicker.

Standard voltage : 3V

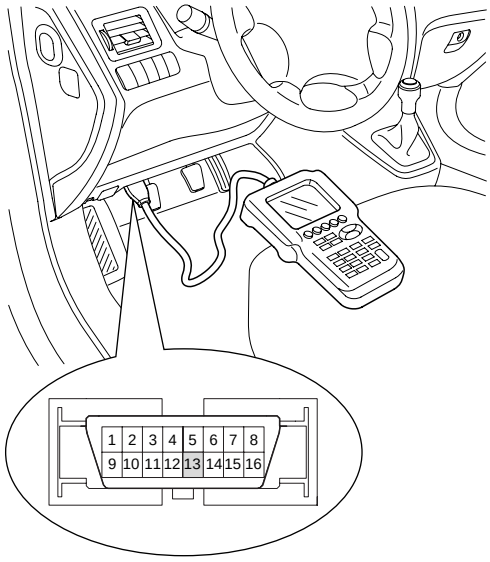


KTKD029A

3. Replace the transmitter battery with a new one, if voltage is below 3V then try to lock and unlock the doors with the transmitter by pressing the lock or unlock button five or six times.
4. If the doors lock and unlock, the transmitter is O.K, but if the doors don't lock and unlock, register the transmitter code, then try to lock and unlock the doors.
5. If the transmitter is fails, replace only the transmitter (A).

TRANSMITTER CODE REGISTRATION EBE0F3DE

1. Connect the DLC cable of scan tool to the data link connector (16 pins) in driver side crash pad lower panel, turn the power on scan tool.



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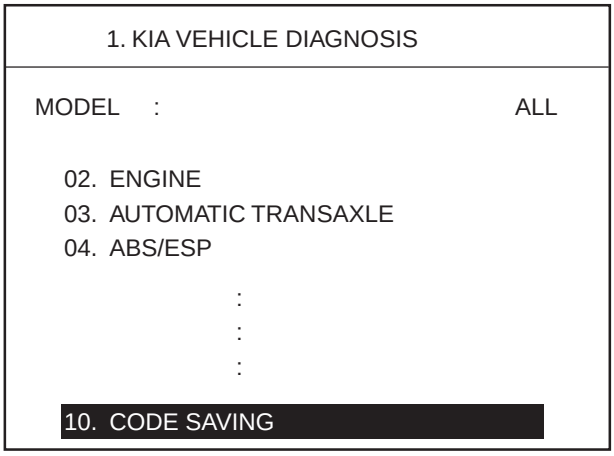
2. Select the vehicle model and then do "CODE SAVING".



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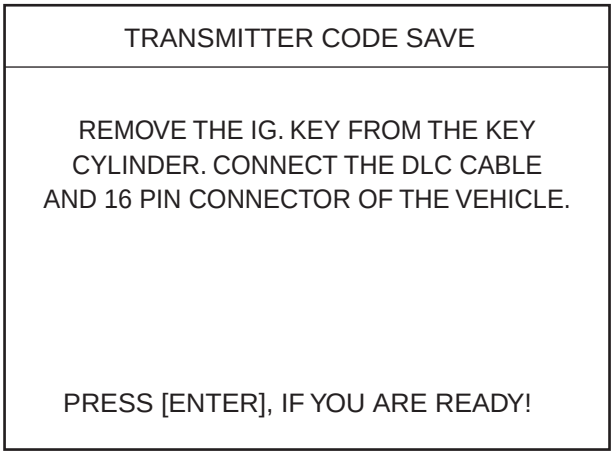
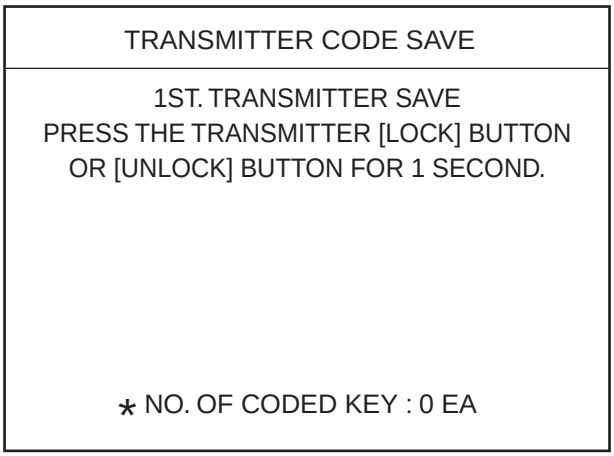
3. After selecting "CODE SAVING" menu, push "ENTER" key, then the screen will be shown as below.

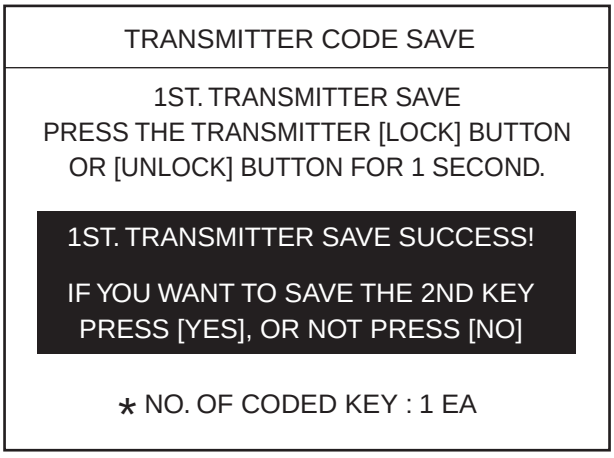


ETRF065M

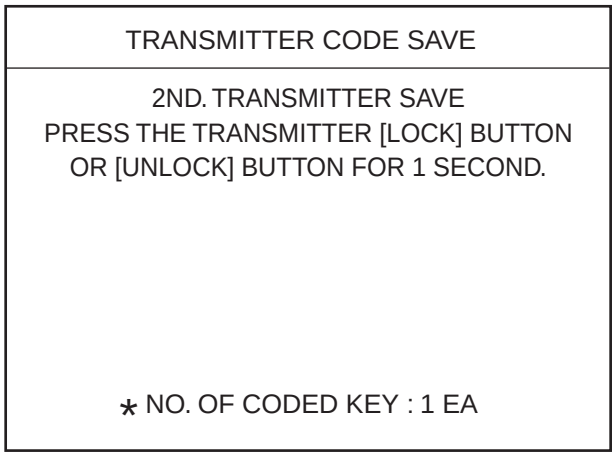
4. After removing the ignition key from key cylinder, push "ENTER" key to proceed to the next mode for code saving. Follow steps 1 to 4 and then code saving is completed.



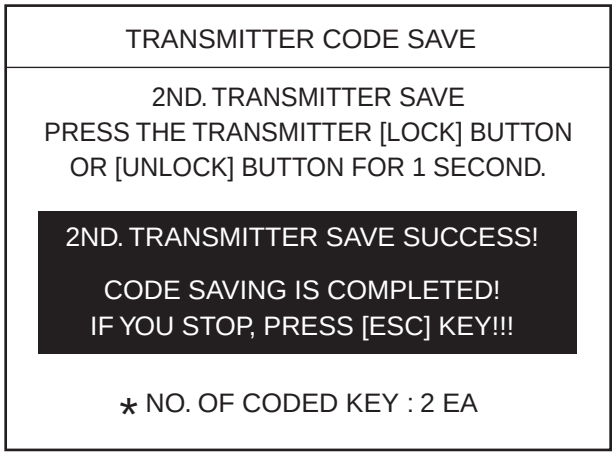
ETRF065N



ETRF065O



ETRF065P



ETRF065Q

ETACS (ELECTRONIC TIME AND ALARM CONTROL SYSTEM)

BODY CONTROL MODULE

SPECIFICATIONS E783CBF2

Item	Requirements	Note
Rated Load	DC 12V	Should be operated normally between two ranges.
Operating Voltage	DC 9V ~ 16V	
Operating Temperature	-30°C ~ +80°C	
Storage Temperature	-40°C ~ +85°C	
Insulation Resistance	Should have no heating or burning due to the leakage current (100 MΩ)	Measure with 500V Megger Measure CASE on TML (Except for Earth)

Item	Rated Load
Tail lamp relay	DC 12V , 200 mA (Induced Load)
RFT fog lamp relay	DC 12V , 200 mA (Induced Load)
RR fog lamp relay	DC 12V , 200 mA (Induced Load)
Key hole illumination lamp	DC 12V , 2W (LAMP Load)
Room lamp	DC 12V , 10W (LAMP Load)
Central door actuatior	DC 12V , MAX 25A (ACTUATOR Load) : 5 EA
Burglar horn	DC 12V , 3.5A (Induced Load)
Burglar relay	DC 12V , 200 mA (Induced Load)
Seat belt lamp	DC 12V , 1.4W (LAMP Load)
RR defogger relay	DC 12V , 200 mA (Induced Load)
P/WDW timer relay	DC 12V , 200 mA (Induced Load)
INT wiper relay	DC 12V , 200 mA (Induced Load)
RR wiper relay	DC 12V , 200 mA (Induced Load)
Trunk relay	DC 12V , 200 mA (Induced Load)
DRL relay	DC 12V , 200 mA (Induced Load)
Flasher lamp	TURN SIGNAL : DC 12V, 21WX2+5W+1.4W (LAMP Load) HAZARD : DC 12V, (21WX2+5W+1.4W)X2 (LAMP Load)
Side repeater	DC 12V, 5WX2 (LAMP load)

FUNCTION E4A596A0

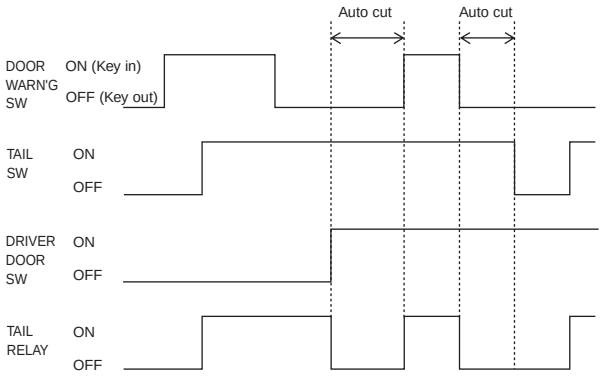
1. TAIL LAMP AUTO CUT

   1) After DOOR WARNING SW is ON (KEY on), Off the DOOR WARNING SW in case TAIL SW is ON.
   When the KEY is off and Diver side door is opened, TAIL LAMP turns automatically off.

   2) Also, in case the Diver's seat door opened and DOOR WARNING SW is off, the TAIL LAMP turns automatically off.

   3) After turned automatically off, TAIL LAMP turns on and AUTO CUT function cancels in case TAIL LAMP SW is ON after OFF.

   4) If the KEY is ON after the automatic turn-off, TAIL LAMP turns on and AUTO CUT function is canceled.



LTGE141A

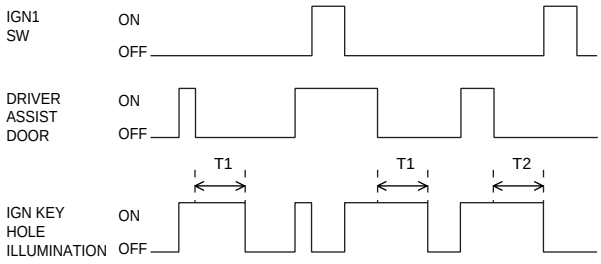
2. IGN KEY HOLE Lighting

   1) When the driver's door is opened, IGN KEY HOLE light should be turned on.
   On 1), when the driver's door is closed, IGN KEY HOLE lights should be turned on for 30 seconds before turning it off.

   2) When the assistant's door is opened, IGN KEY HOLE light should be turned on.
   On 3), when the assistant' s door is closed, IGN KEY HOLE lights should be turned on for 30 seconds before turning it off.

   3) 1) and 3) has the priorities.

   4) While operating the actions of 1) through 4), as soon as IGN 1 SW is on, IGN KEY HOLE lighting should be off immediately.
   (However, when the ARM MODE started, IGN KEY HOLE lighting should be off.)



LTGE141B

T1 : 30 ± 1.0 sec., T2 : 0 ~ 30 sec.

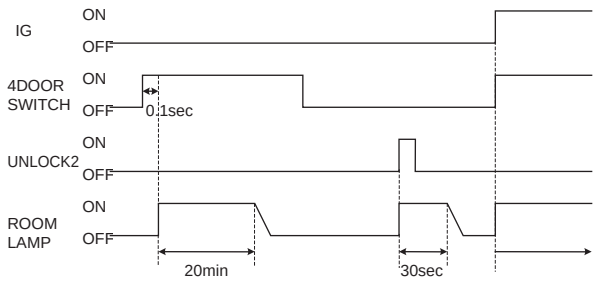
3. DECAYED ROOM LAMP

ROOM LAMP OFF STATE

State	Description
First condition	Room lamp OFF & IGN1 off & 4Door SW off
Event	IGN1 off & (4Door SW off → on for 100ms)
Action	Change ROOM LAMP ON for 20 min state. Output RoomLamp for 20 +/-1 minute.

State	Description
First condition	Room lamp OFF & IGN1 off & 4Door SW off
Event	UNLOCK2
Action	Change ROOM LAMP ON for 30s state Output Room Lamp for 30sec.

State	Description
First condition	Room Lamp OFF & IGN1 off & 4Door SW off
Event	IGN1 ON & 4DRSW on
Action	Change ROOM LAMP ON state Output Room Lamp (No limit time)



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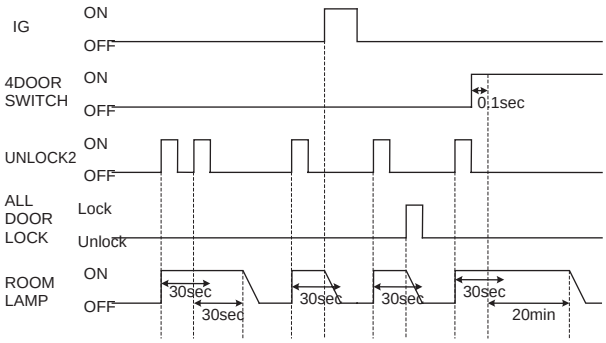
ROOM LAMP ON FOR 30S STATE

State	Description
First condition	Room lamp ON for 30s & IGN1 OFF
Event	4Door SW off → on for 100ms
Action	Change ROOM LAMP ON for 20 min state. Output Room Lamp for 20 ± 1 minute.

State	Description
First condition	Room lamp ON for 30s & IGN1 OFF
Event	UNLOCK2
Action	Change ROOM LAMP ON for 30s state. Output Room Lamp for 30 sec.

State	Description
First condition	Room Lamp ON for 30s & IGN1 OFF
Event	IGN1 ON Or 30s timer elapsed Or ALL DOOR LOCK
Action	Change ROOM LAMP DECAYING state Decaying Room Lamp output for 2 ± 0.2 sec off



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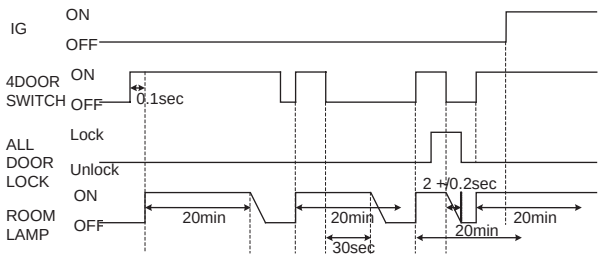
ROOM LAMP ON FOR 20MIN STATE

State	Description
First condition	ROOM LAMP ON for 20min & IGN1 OFF
Event	IGN1 ON
Action	Change ROOM LAMP ON state. Output Room Lamp (no limit time).

State	Description
First condition	ROOM LAMP ON for 20min & IGN1 OFF
Event	4Door SW off
Action	Change ROOM LAMP ON for 30s state. Output Room Lamp for 30 sec.

State	Description
First condition	ROOM LAMP ON for 20min & IGN1 OFF
Event	(4Door SW off & ALL DOOR LOCK) Or 20min timer elapsed
Action	Change ROOM LAMP DECAYING state. Decaying Room Lamp output for 2 ± 0.2 sec off.



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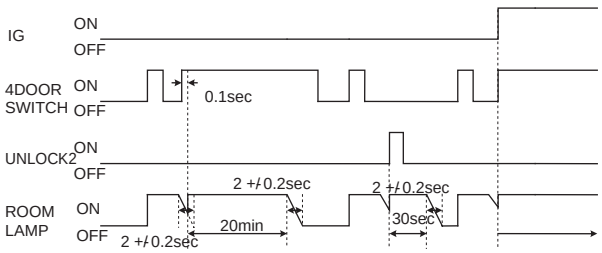
ROOM LAMP DECAYING STATE

State	Description
First condition	ROOM LAMP DECAYING & IGN1 OFF
Event	4Door SW off → on for 100ms
Action	Change ROOM LAMP ON for 20 min state. Output Room Lamp for 20 ± 1minute.

State	Description
First condition	ROOM LAMP DECAYING & IGN1 OFF & 4Door SW off
Event	UNLOCK2
Action	Change ROOM LAMP ON for 30sec state. Output Room Lamp for 30 sec.

State	Description
First condition	ROOM LAMP DECAYING
Event	Room lamp decaying completed
Action	Change ROOM LAMP OFF state. STOP Room Lamp output.

State	Description
First condition	ROOM LAMP DECAYING
Event	IGN1 ON & 4Door SW ON
Action	Change ROOM LAMP ON state. Output Room Lamp (no limit time).



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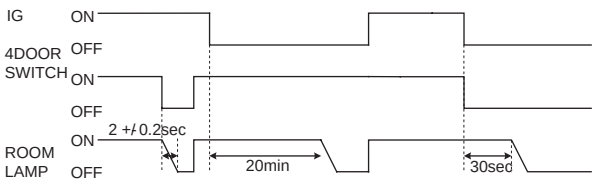
ROOM LAMP ON STATE

State	Description
First condition	ROOM LAMP ON & IGN1 ON & 4Door SW on
Event	4Door SW off
Action	Change ROOM LAMP DECAYING state. Decaying Room Lamp output for 2 ± 0.2 sec off.

State	Description
First condition	ROOM LAMP ON & IGN1 ON & 4Door SW on
Event	IGN1 off.
Action	Change ROOM LAMP ON for 20min state. Output Room Lamp for 20 ± 1minute.

State	Description
First condition	ROOM LAMP ON & IGN1 ON & 4Door SW on
Event	4Door SW off & IGN1 OFF
Action	Change ROOM LAMP ON for 30s state. Output Room Lamp for 30 sec.



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NOTE

1. *The flickering of lamp is not allowed even though IGN1 ON.*
2. *The resolution of DECAYED ROOM LAMP must be more then 32 steps.*

4. CENTRAL DOOR LOCK / UNLOCK

1) Central Door Lock Auto Logic

OPTION		Central DR Lock	RKE
DR KEY UNLOCK	Driver's seat	-	All unlock
	Assistant's seat	-	All unlock
RKE Fob	Lock	-	All lock
	Unlock	-	All unlock
Driver's seat KNOB	Lock	All lock	All lock
	Unlock	All unlock	DR Seat unlock
Assistant's seat KNOB	Lock	All lock	All lock
	Unlock	All unlock	Asst. unlock
Main Door Lock SW	Lock	All lock	All lock
	Unlock	All unlock	All unlock

2) There should be no error when the battery is connected (When KNOB is LOCKed or UNLOCKed, there should be no LOCK output when the battery's connected).

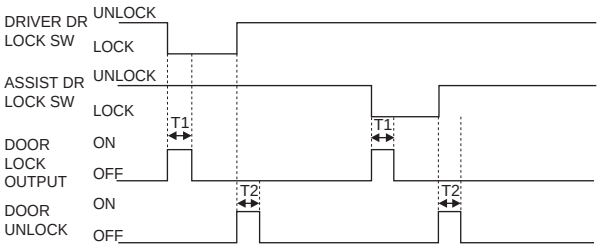
3) Ignore the signal under 60msec.

4) When UNLOCK is input while outputting LOCK, immediately stop outputting LOCK or output UNLOCK after 100ms pause (and vice versa).

5) When RKE LOCK signal is received, output LOCK for 0.5 seconds.

6) When RKE UNLOCK signal is received, output UNLOCK for 0.5 seconds.

7) When RKE LOCK signal is received, output LOCK ON irrespective of ALL DOOR state.



SLDBE7018L

T1, T2 : 0.5 ± 0.1 sec.

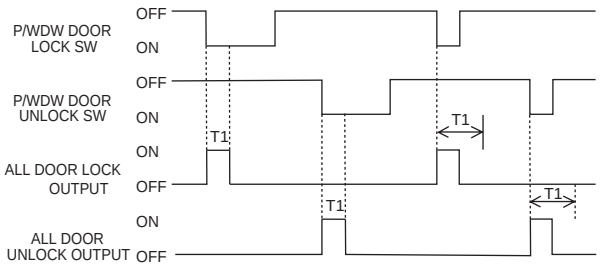
5. POWER WINDOW MAIN DOOR SW LOCK / UNLOCK

1) When P/WDW MAIN DOOR SW LOCK is ON, all Door LOCK outputs for max. 0.5 seconds. (However, RELAY output should be OFF immediately while MAIN SW LOCK is OFF within 0.5 sec.)

2) When P/WDW MAIN DOOR SW UNLOCK is ON, all Door UNLOCK outputs for max. 0.5 seconds. (However, RELAY output should be OFF immediately while MAIN SW UNLOCK is OFF within 0.5 sec.)

3) Ignore the signal under 60msec.

4) When UNLOCK is input while LOCK signal is outputting, stop outputting LOCK signal and output UNLOCK after 100ms pause (vice versa).



LTGE141E

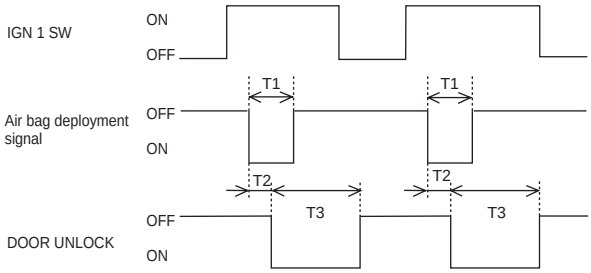
T1 : 0.5 ± 0.1 sec.

6. CRASH DOOR UNLOCK

1) In case CRASH UNLOCK is inputting on IGN SW ON state, all the doors should be unlocked.

2) This function is prior to all the door lock functions (when Crash Unlock is operating, Door Lock function is disable).

3) After operating Crash Unlock function, if DRIVER or ASSIST or REAR(RKE only) door is locked, all the doors unlocked for T3 seconds.



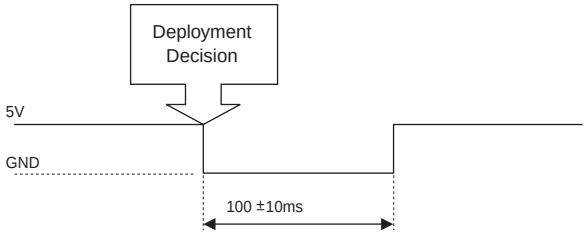
LTGE141F

T1 : 100 ± 10ms, T2 : 40ms,
T3 : 5 ± 0.5 sec.

4) If re-input the Airbag signal, always output Unlock T3 time.
(If maintain Airbag signal ON, NO re-output The Crash unlock)

5) Ignore the Crash unlock, if IGN ON while IGN SW OFF & Airbag signal ON.

6) If Reset function CRASH UNLOCK after IGN 1 SW OFF, normal active central DOOR LOCK.



SLDBE7020L

7. IGN KEY REMINDER

1) Insert IGN KEY to the KEY CYLINDER, open the driver's seat door and assistant's seat door and press DOOR LOCK KNOB to lock the door. After outputting UNLOCK signal for 1 second, confirm its reaction. IF it's locked, output the UNLOCK signal for three times for 0.5 seconds. (However, if the door warning switching is off before 0.5 seconds passed after door lock switch is pressed, Key reminder function will be cancelled and the central door lock signal will be output.)

2) Confirming its ACT while three times of outputting, the following output will be stopped.

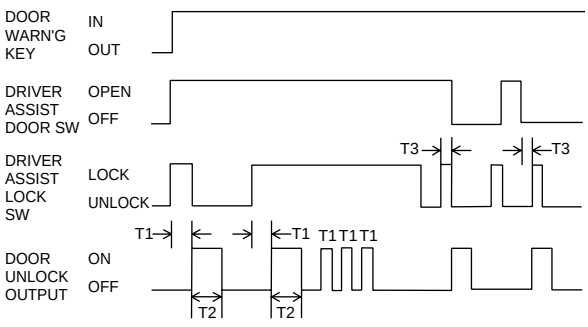
3) When the door closed or key is off while three times of outputting, the following output will be stopped.

4) Confirming its ACT while three times of outputting, if it's locked, maintain its state.
If there's any changes of DOOR WARNING SW, driver's/assistant's seat DOOR SW, or DR/AS DOOR LOCK SW, RESET(UNLOCK) it.

5) When the door is opened and key inserted when it is on the LOCK state, UNLOCK should be output.
(However, there's no output when the key is inserted after unlocked the driver's seat on 2 TURN UNLOCK vehicle.)

6) If In side 0.5 sec DOOR LOCK SW became LOCK form DOOR(DR or ASSIST) Open → Close at IGN KEY IN state, output UNLOCK for 1sec.

7) When P/WDW MAIN DOOR SW is LOCKed, lock it for 0.5 seconds and output UNLOCK signal immediately.
(DOOR WARN'G SW = KEYLESS SW)



LTGE141G

T1 : 0.5sec, T2 : 1sec,
T3 : 0 sec < T3 < 0.5sec.

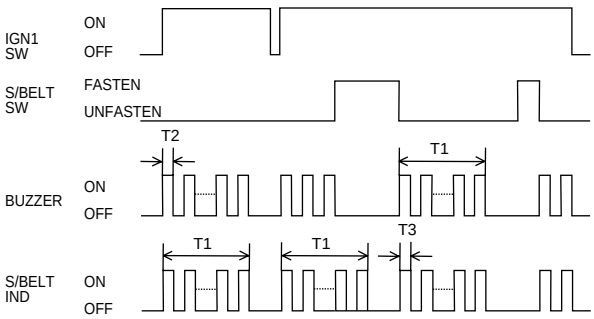
8. SEAT BELT WARNING TIMER (General/Middle East)

1) From the time of IGN1 SW is ON, SEAT BELT WARNING IND outputs for 0.6 cycle, BUZZER for 1 sec cycle, and reduce sound for 6 sec.

2) When IGN1 SW is OFF while outputting, SEAT BELT WARNING IND and BUZZER immediately stop outputting.

3) If the SEAT BELT is ON while the assigned time (SW OFF), BUZZER immediately stops outputting, but SEAT BELT WARNING IND will output remained time.

4) After fastening the seat belt(SW OFF) on the IGN1 SW is ON and then, SW ON, SEAT BELT WARNING IND and BUZZER again outputs for 6 seconds.

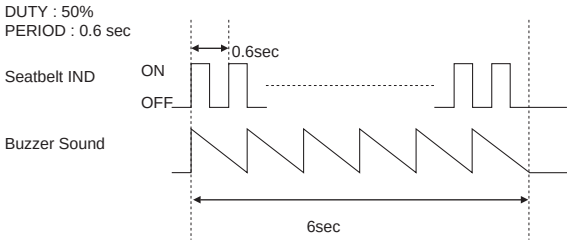


LTGE141H

T1 : 6 ± 1sec, T2 : 0.5 ± 0.1sec (ON, OFF TIME), T3 : 0.3 ± 0.1sec (ON, OFF TIME).

9. SEAT BELT REMINDER

1) SEAT BELT WARNING LAMP DRIVING CONDITION

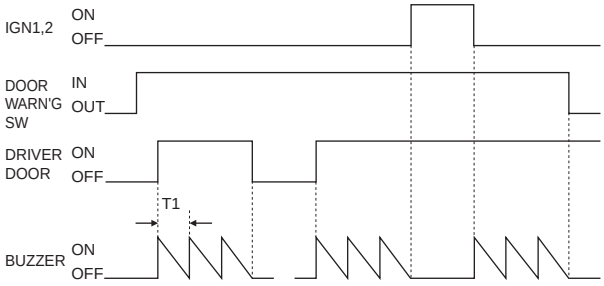


SLDBE7022L

10. KEY OPERATED WARNING (BUZZER applying specification)

1) When the driver's door is opened with IGN OFF and IGN KEY inserted in KEY CYLINDER (DOOR WARNING SW ON), BUZZER output occurs as 0.7 seconds cycle DUTY 50%.

2) If IGN KEY pulled out from KEY CYLINDER or the driver's door closed, the output immediately is stopped.

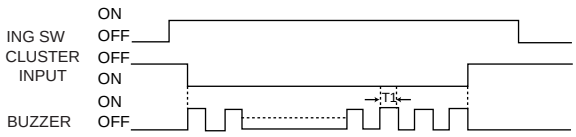


SLDBE7021L

T1 : 0.7sec.

11. OVER SPEED WARNING(For Middle East ONLY)

1) When IGN SW is ON and CLUSTER GND is input, BUZZER is on as 1 second cycle.



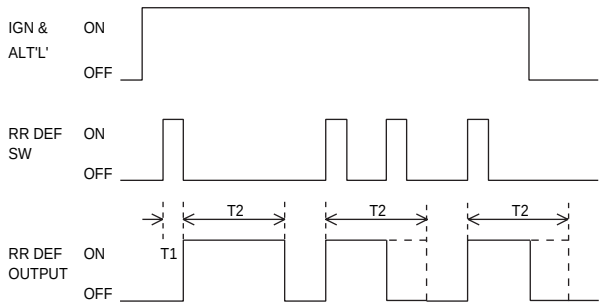
LTGE141T

T1 : 0.5 ± 0.1sec.

12. REAR DEFOGGER TIMER

1) Rear Defogger Timer
   a. On the ALT "L" ON state, switch on the DEFOG SW to output DEFOG for 20 minutes.
   b. While outputting DEFOG, off the switch if DEFOG SW is ON again.
   c. While outputting DEFOG, off the output if ALT "L" terminal is OFF.

2) Front Deicer Timer
   a. On the ALT "L" ON state, switch on the Deicer to output Deicer Relay for 20 minutes.
   b. While outputting Deicer, off the switch if Deicer SW is ON again.
   c. While outputting Deicer, off the output if ALT "L" terminal is OFF.
   d. Deicer Relay output terminal and Deicer SW input terminal are operating by using RR FOG LAMP SW and RELAY terminal.
   e. Refer to the TIME CHART below for the detailed operation logic.



LTGE141J

T1 : 60±10ms, T2 : 20±1min.

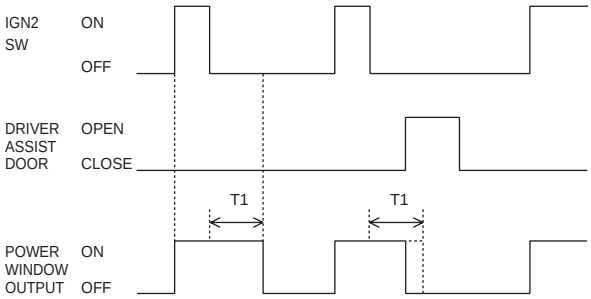
13. POWER WINDOW TIMER

1) When the IGN2 switch is ON, turn on the POWER WINDOW output.

2) When IGN2 SW is OFF, maintain the output for 30 seconds, then off the switch.

3) During 2), as soon as opening the driver's or assistant's door within 30 seconds, the output will be stopped at once.

4) When the driver's/assistant's seat door open and IGN is off, POWER WINDOW output will be stopped at once.



LTGE141K

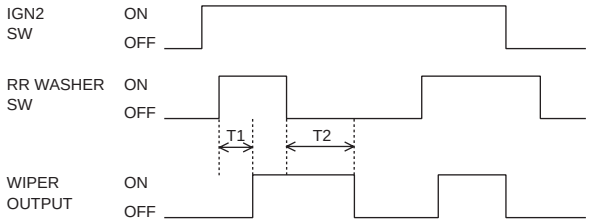
T1 : 30 ± 3sec.

14. REAR WIPER & WASHER Control

1) When IGN2 SW is ON, switch on the RR WASHER to output REAR WIPER after 0.3 seconds.

2) After WASHER SW is OFF, output the REAR WIPER during the T2.
(WIPER 2~3 times operation time).

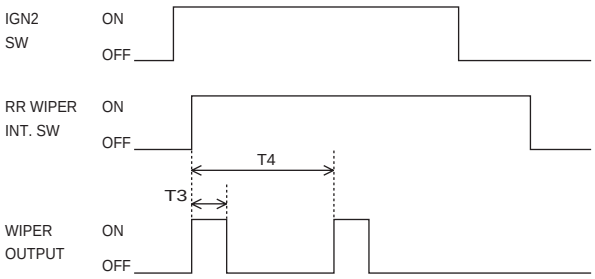
3) When the WASHER SW is off within T1, output WIPER for T2 time at T1.



LTGE141L

T1 : 0.3±0.1sec., T2 : 2.5~3.8sec.

4) On the state of IGN2 SW ON, turn on the RR WIPER output for T3 when RR WIPER INT SW is ON.



LTGE141M

T3 : 0.7±0.1sec., T4 : 5±0.5sec.

5) Ignore the signal under 60msec.

15. FRONT WASHER GEARED WIPER

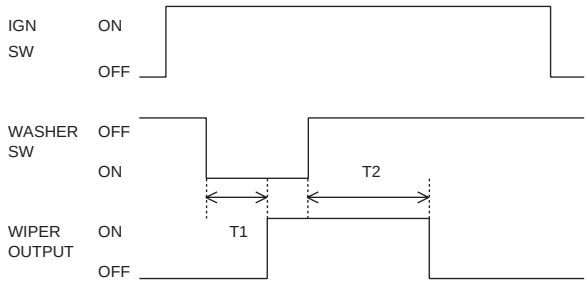
1) Switch on the WASHER when IGN switch is ON, start and stop outputting WIPER after T2 sec (2.5-3.8sec) and stop outputting WIPER.

2) WAHER GEARED WIPER operation is priority while operating INT WIPER.

3) Ignore the WASHER SW input when IGN1 is ON and IGN2 is OFF.

4) Even if the WASHER SW is OFF within T1, output WIPER at T1 for T2.

5) Ignore the signal under 60msec.



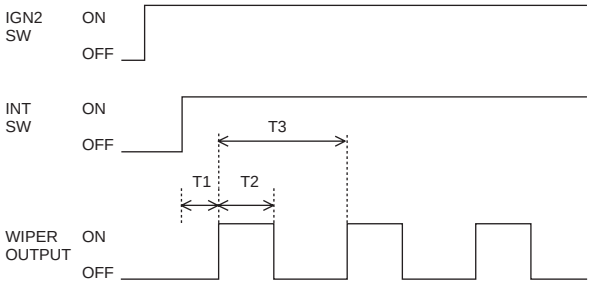
LTGE141N

T1 : 0.3±0.1sec., T2 : 2.5~3.8sec.

16. VARIABLE INTERMITTENT WIPER

1) If INT SW is on when IGN2 SW is ON, INT WIPER is occasionally operating by the set value of INT VOLUME.

2) If the INT SW is ON, WIPER output should be ON when IGN is ON.



LTGE141O

T1 : MAX 0.3 sec., T2 : 0.7 ± 0.1 sec.,
T3 : 2.2 ± 0.2 sec. (at VR=0 kΩ)
10.0 ± 1.0 sec. (at VR=50 kΩ)

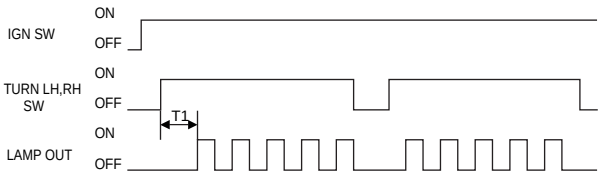
INT VOL	INT VOL LEVEL (DEG)	0 (FAST)	0.25	0.5	0.75	1 (SLOW)
	VOL-UME (kohm)	0	10.9 ± 20%	25 ± 20%	39 ± 20%	50 ± 20%

17. FLASHER UNIT

1) On the IGN1 SW ON state, switch on the TURN Signal LH (or RH) to flicker the LH (or RH) LAMP 85 times per minute.

2) Switch on the HAZARD on the B+ state, flicker the LAMP 85 times per minute.

3) When the LAMP1 is disconnected on the TURN state, flicker 120 times per minute.



LTGE141P

T1 : MAX 0.1sec., T/SIG : 85±10 C/M, HAZARD : 85±10 C/M

18. REAR FOG LAMP CONTROL

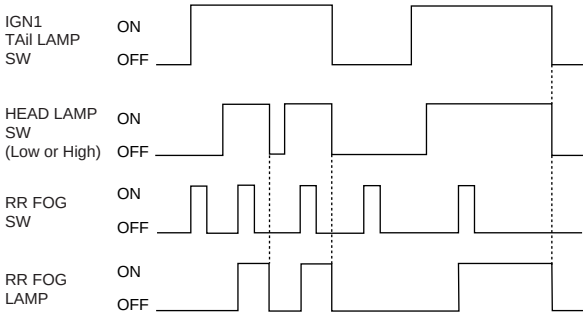
1) In case of switching on the HEAD LAMP (low or high) and inputting RR FOG SW on IGN1 ON state, output RR FOG LAMP RELAY.

2) REAR FOG LAMP SW is SELF RETURN TYPE.

3) If HEAD LAMP SW or FRONT FOG LAMP SW is turned-on on IGN2 ON state, press REAR FOG LAMP SW to output REAR FOG LAMP.

4) Press REAR FOG LAMP SW again or OFF any conditions above while outputting REAR FOG LAMP, immediately off the output of REAR FOG LAMP.

5) Press RR FOG SW while operating DRL, AUTO-LIGHT to output LAMP.

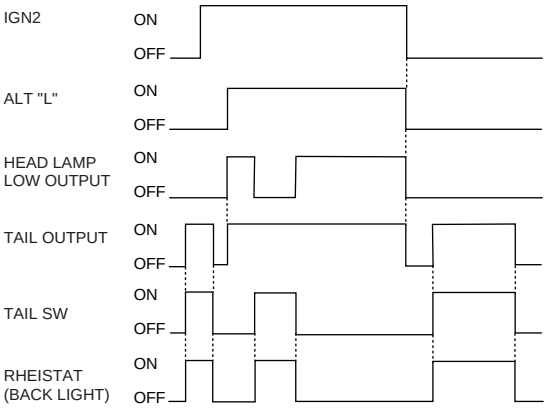


LTGE141S

19. DAYTIME RUNNING LAMPS CONTROL

1) If the vehicle is on ALT "L" ON state, output HEAD LAMP LOW and TAIL RELAY.

2) If the TAIL Switch is ON, turn on the BACK LIGHT RELAY, and off the HEAD LAMP LOW output.



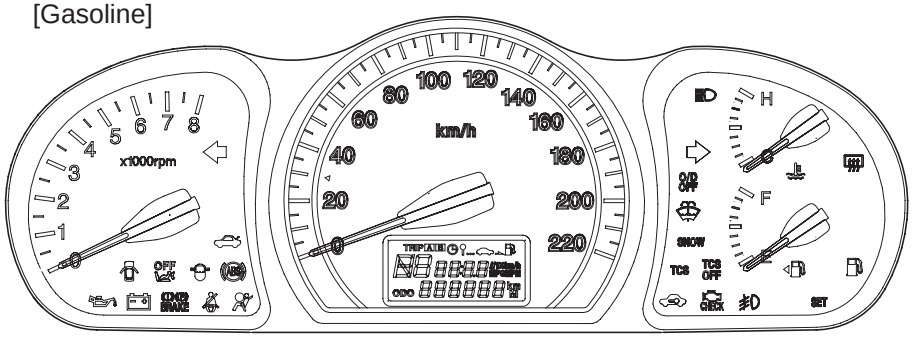
LTGE141R

INDICATORS AND GAUGES

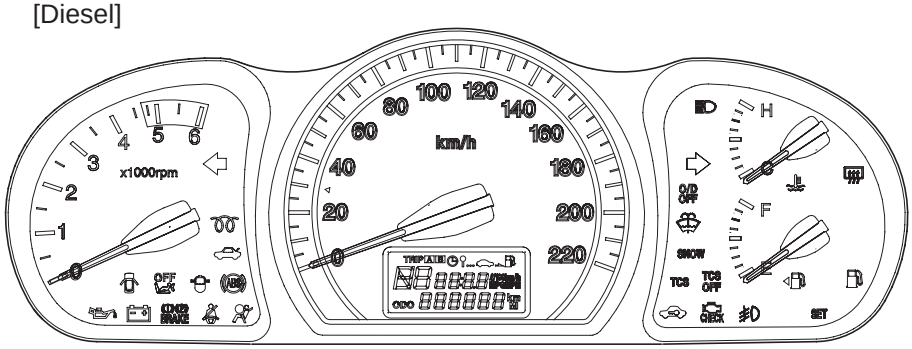
INSTRUMENT CLUSTER

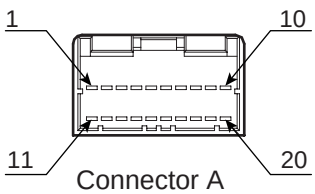
COMPONENTS E791FB0A

[Gasoline]

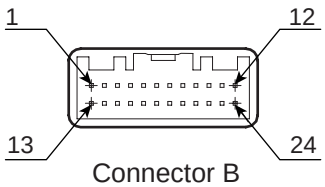


[Diesel]

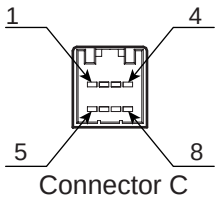




Connector A



Connector B



Connector C

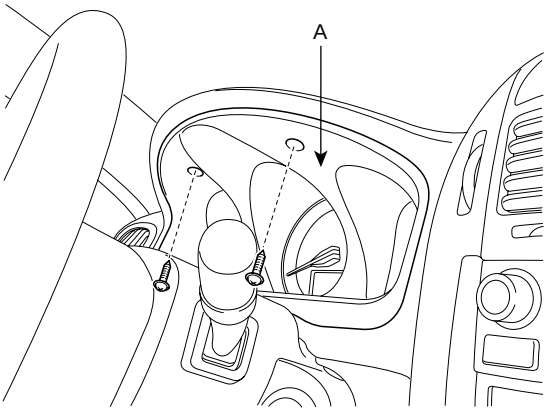
SLDBE7221L

CONNECTOR PIN INFORMATION

NO.	Connector A	Connector B	Connector C
1	Turn left	Passenger air bag OFF(+)	P
2	-	Turn right	R
3	-	Temp. Input	N
4	Passenger air bag OFF(-)	Fuel GND	D
5	Tachometer Input	Washer	PWM signal
6	ILL(-)	Immobilizer	O/D OFF
7	ILL(+)	TCS	SNOW
8	Oil pressure	TCS OFF	-
9	Water seperator	Rear Defogger	
10	IG+	4P OUT	
11	Air Bag +	Injection Signal	
12	Air Bag -	GND	
13	ABS/EBD	-	
14	Charge	Fuel Input	
15	B(+)	Trip Comp. GND	
16	Trunk Lid Open	Engine check	
17	Door	Front Fog	
18	GND(P)	Head lamp (H/Beam) -	
19	Brake	Head lamp (H/Beam) +	
20	Seat belt	-	
21		SET	
22		Trip Comp. SW	
23		Chime	
24		Speed Input	

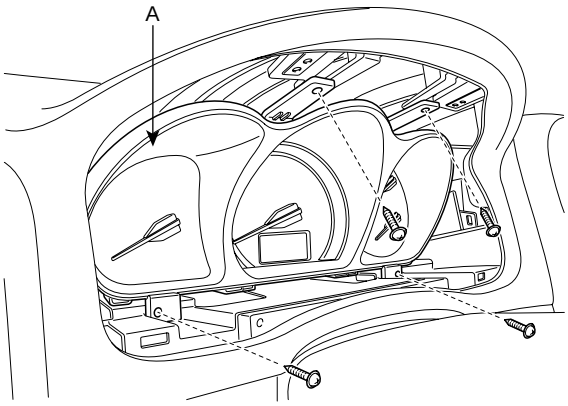
REMOVAL EBB4A76B

1. Disconnect the negative (-) battery terminal.
2. Remove the cluster facia panel (A) after loosening 2 screws.



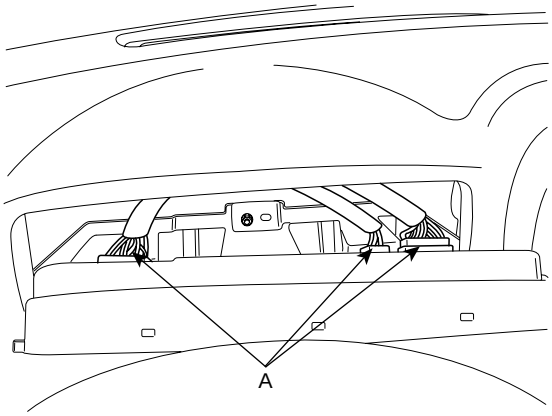
SLDBE6222D

3. Pull out the cluster (A) from the housing after removing 4 screws.



SLDBE6223D

4. Disconnect the cluster connecters and then remove the cluster.



SLDBE6224D

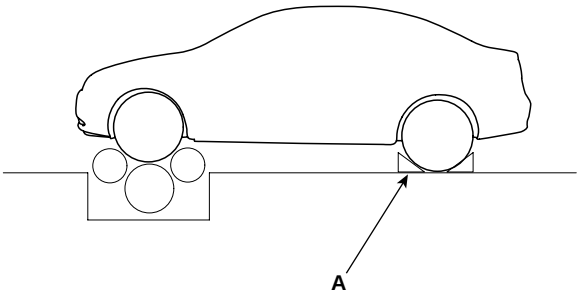
INSTALLATION E16FEECC

1. Connect the cluster connector.
2. Install the cluster assembly.
3. Install the cluster facia panel.

SPEEDOMETER

INSPECTION EDFE0693

1. Adjust the pressure of the tires to the specified level.
2. Drive the vehicle onto a speedometer tester. Use wheel chocks(A) as appropriate.



SHDBE6204L

3. Check if the speedometer indicator range is within the standard values.

CAUTION

Do not operate the clutch suddenly or increase/ decrease speed rapidly while testing.

NOTE

Tire wear and tire over or under inflation will increase the indication error.

[KM/H]

Velocity (km/h)	20	40	60	80	100	120
Tolerance (km/h)	+4.0 +1.0	+5.5 +1.5	+7.0 +3.0	+9.0 +4.0	+10.0 +5.0	+12.0 +6.0
Velocity (km/h)	140	160	180	200	220	-
Tolerance (km/h)	+14.0 +7.0	+16.0 +8.5	+17.0 +9.0	+18.0 +9.5	+19.0 +10.0	-

[MPH]

Velocity (MPH)	10	20	40	60
Tolerance (MPH)	+2.5 +0.2	+3.2 +0.8	+4.5 +1.5	+5.7 +2.0
Velocity (MPH)	80	100	120	140
Tolerance (MPH)	+7.0 +3.0	+8.0 +4.0	+9.5 +5.0	+10.5 +6.0

TACHOMETER

1. Connect the scan tool to the diagnostic link connector or install a tachometer.
2. With the engine started, compare the readings of the tester with that of the tachometer. Replace the tachometer if the tolerance is exceeded.

CAUTION

a. Reversing the connections of the tachometer will damage the transistor and diodes inside.

b. When removing or installing the tachometer, be careful not to drop it or subject it to severe shock.

Revolution (rpm)	1,000	2,000	3,000	4,000	Remark
Tolerance (rpm)	±100	±125	±150	±170	Gasoline
Tolerance (rpm)	±100	±125	±150	±170	Diesel
Revolution (rpm)	5,000	6,000	7,000	-	Remark
Tolerance (rpm)	±200	±240	±260	-	Gasoline
Tolerance (rpm)	±200	-	-	-	Diesel

SUNROOF

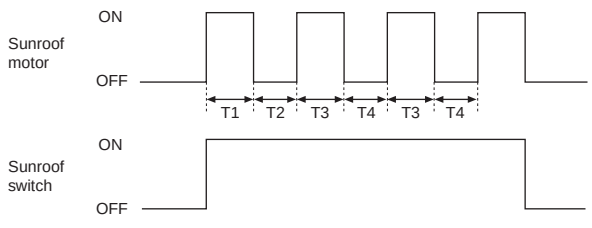
SUNROOF MOTOR

INSPECTION EB2F802B

PROTECTING THE OVERHEATED MOTOR

In order to protect the overheated sunroof motor by continuous motor operation, the sunroof ECU controls the Run-time and Cool-time of motor as followings;

1. The Sunroof ECU detects the Run- time of motor
2. Motor can be operated continuously for the 1st Run-time(120 ± 10sec.).
3. The continuously operated motor stops operating after the 1st Run-time(120 ± 10sec.).
4. And then Motor is not operated for the 1st Cool-time(18 ± 2sec.).
5. Motor is operated for the 2nd Run-time(10 ± 2sec.) at the continued motor operation after 1st Cool-time(18 ± 2sec.)
6. The continuously operated motor stops operating after the 2st Run-time(120 ± 10sec.)
7. Motor is not operated for the 2st Cool-time(18 ± 2sec.).
8. Motor repeats the 2nd Run-time and 2nd Cool-time at the continued motor operation.
   - In case that motor is not operated continuously, the Run-time which is limited for protecting the overheated motor is increased.
   - The Run-Time of motor is initialized to "0" if the battery or fuse is reconnected after being disconnected, discharged or blown.



SHDBE6476L

T1 : 120 ± 10 sec., T2 : 18 ± 2 sec.,
T3 : 10 ± 2 sec., T4 : 18 ± 2 sec.

LIGHTING SYSTEM

SPECIFICATION E25E09EA

Items	Bulb Wattage (W)
Head lamp (High)	60
Head lamp (Low)	55
Front turn signal lamp	21
Front fog lamp	27
Rear stop/tail lamp (Outside)	21/5
Back up lamp	16
Rear turn signal lamp	21
Rear fog lamp - Europe	21
License plate lamp	5
Side repeater	5
Room lamp	10
Overhead console lamp	10 x 2
Glove box lamp	5

HEAD LAMPS

ADJUSTMENT E2D06955

HEAD LAMP AIMING INSTRUCTIONS

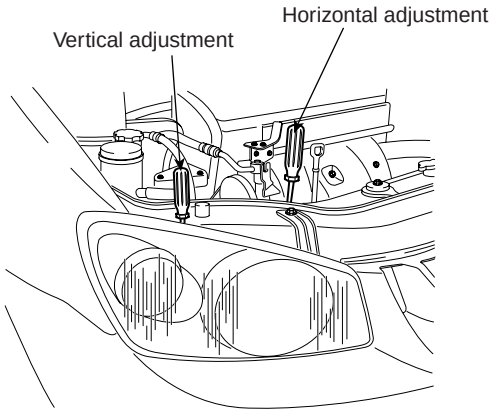
The head lamps should be aimed with the proper beam-setting equipment, and in accordance with the equipment manufacturer's instructions.

NOTE

If there are any regulations pertinent to the aiming of head lamps in the area where the vehicle is to be used, adjust so as to meet those requirements.

Alternately turn the adjusting gear to adjust the head lamp aiming. If beam-setting equipment is not available, proceed as follows :

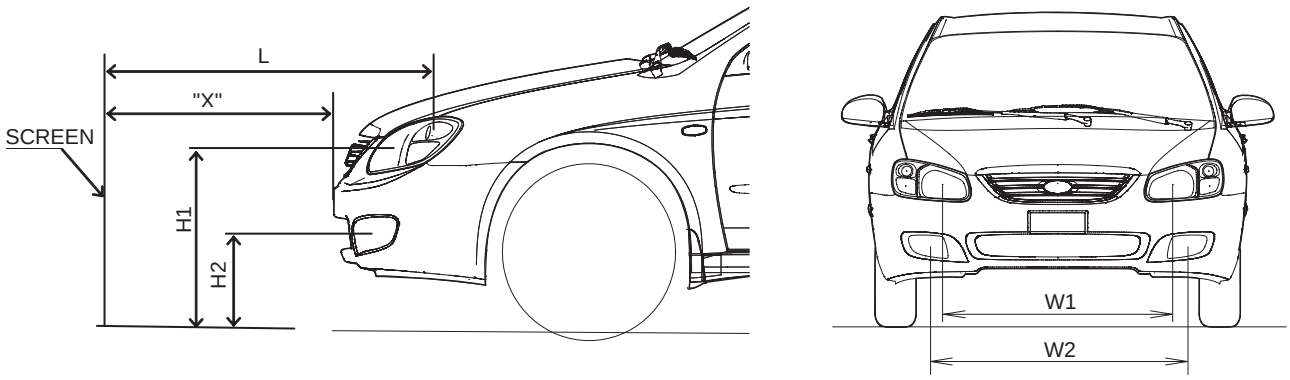
1. Inflate the tires to the specified pressure and remove any loads from the vehicle except the driver, spare tire, and tools.
2. The vehicle should be placed on a flat floor.
3. Draw vertical lines (Vertical lines passing through respective head lamp centers) and a horizontal line (Horizontal line passing through center of head lamps) on the screen.
4. With the head lamp and battery in normal condition, aim the head lamps so the brightest portion falls on the horizontal and vertical lines.
   Make vertical and horizontal adjustments to the lower beam using the adjusting wheel.



LTGE491B

FRONT FOG LAMP AIMING

The front fog lamps should be aimed as the same manner of the head lamps aiming.
With the front fog lamps and battery normal condition, aim the front fog lamps by turning the adjusting gear.



H1 : Height between the head lamp bulb center and ground (high/low beam)
H2 : Height between the fog lamp bulb center and ground

W1 : Distance between the two head lamp bulb's center (high/low beam)
W2 : Distance between the two fog lamp bulb's center

L : Distance between the head lamp bulb center and screen.

SLDBE7491L

HEAD LAMP AND FOG LAMP AIMING POINT

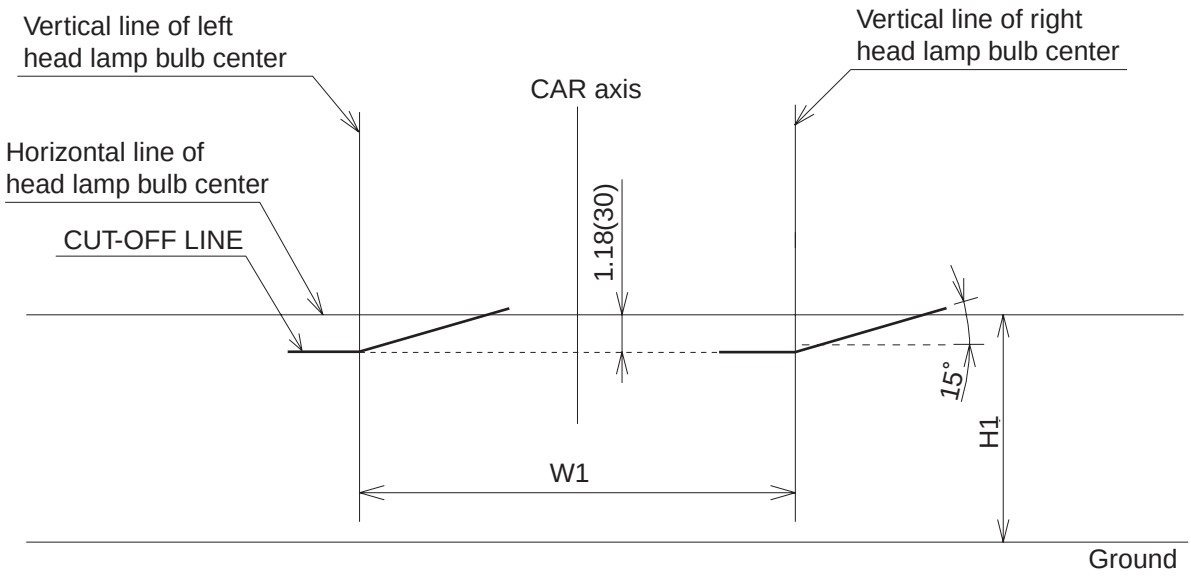
Unit : in.(mm)

Vehicle condition	H1	H2	W1	W2	L
Without driver	25.5(647.6)	13.9(353)	42.1(1,070)	54.8(1,392)	118.1(3,000)
With driver	25.1(637.6)	13.5(343)			

SLDBE7492L

1. Turn the low beam on without the driver aboard.
   The cut-off line should be projected in the allowable range (shaded region).

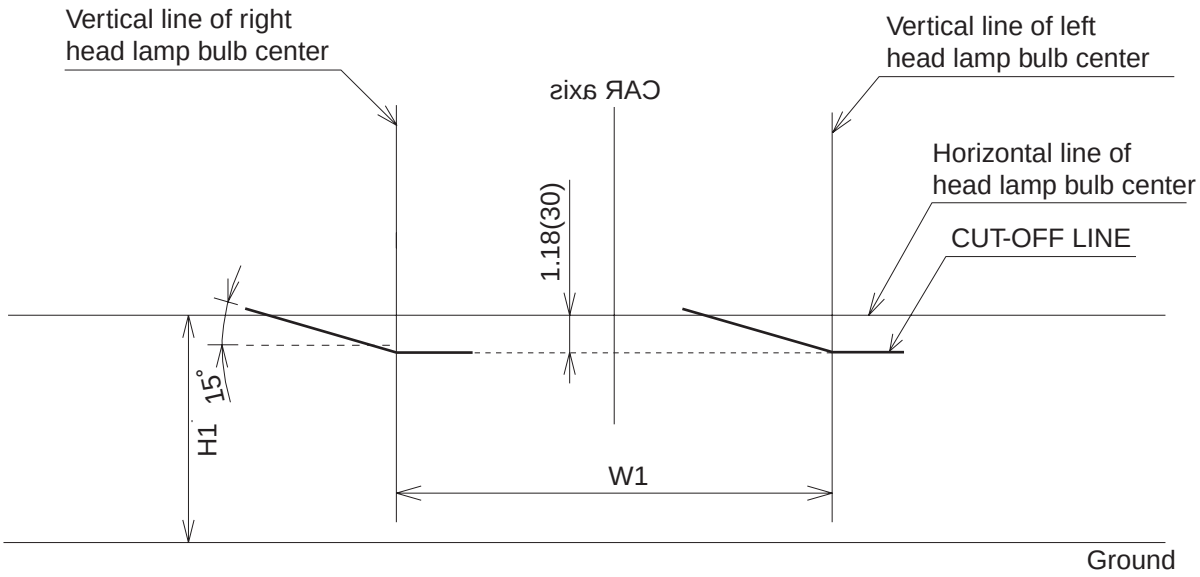
[LHD]



Unit : in.(mm)

SLDBE7493L

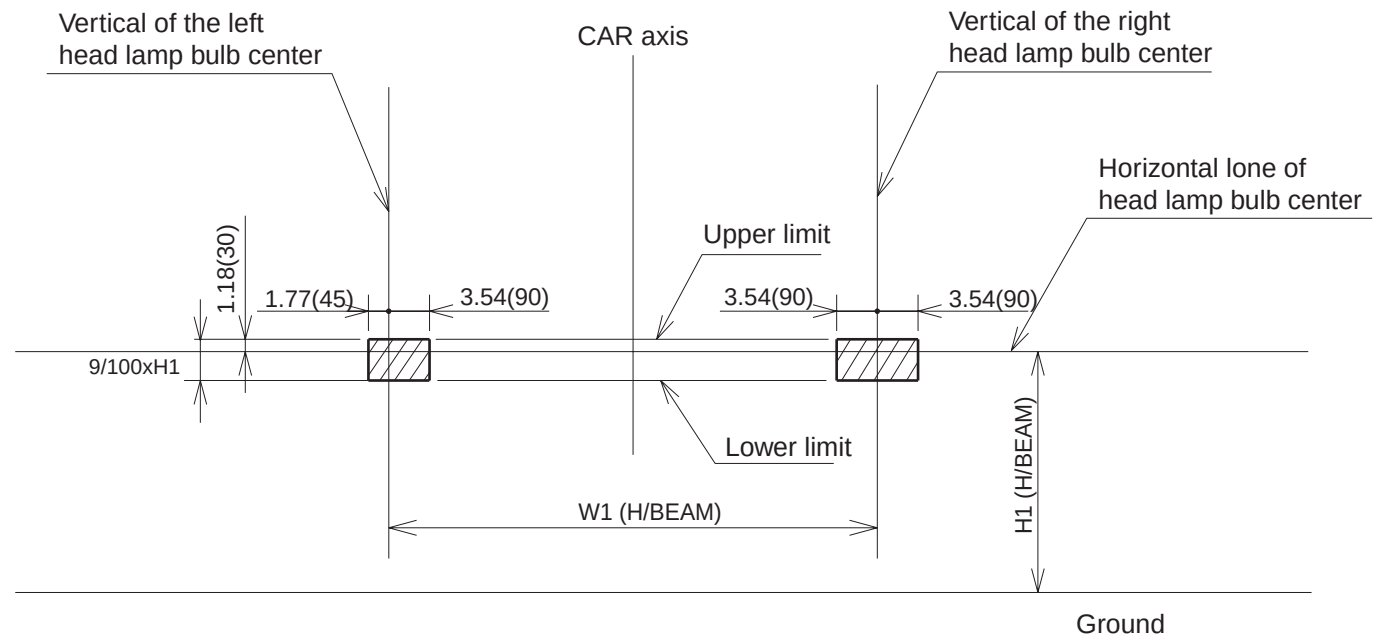
[RHD]



Unit : in.(mm)

SLDBE7494L

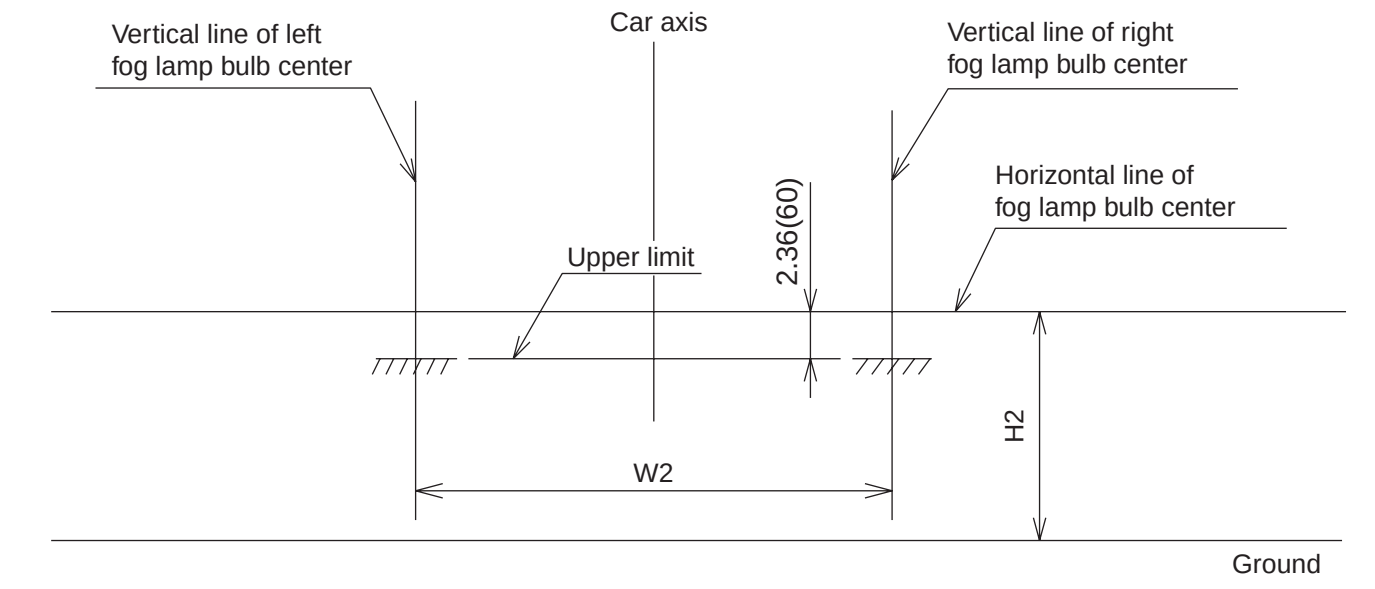
2. Turn the high beam on without the driver aboard.
   The hot point should be projected in the allowable range (shaded region).



Unit : in.(mm)

SHDBE6446L

3. Turn the front fog lamp on without the driver aboard.
   The cut-off line should be projected in the allowable range (shaded region)



Unit : in.(mm)

BTGE491G

IMMOBILIZER CONTROL SYSTEM

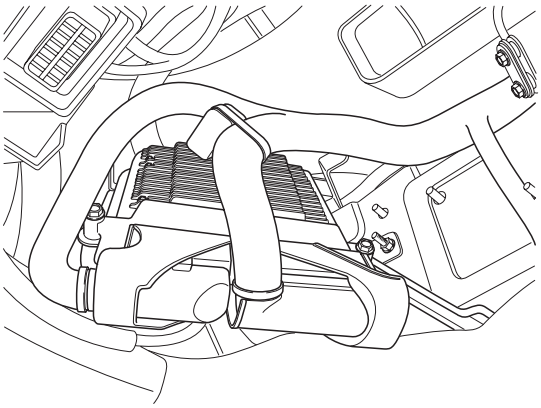
IMMOBILIZER (SMARTRA) DTC LIST E3071D3E

No.	Fault code	Monitor strategy description	Relevant page
1	P1610	Non-Immobilizer-EMS connected to an Immobilizer	BE - 37
2	P1674	Transponder status error	BE - 39
3	P1675	Transponder programming error	BE - 42
4	P1676	SMARTRA message error	BE - 45
5	P1690	SMARTRA no response	BE - 48
6	P1691	Antenna coil error	BE - 55
7	P1693	Transponder no response error / Invalid response	BE - 63
8	P1694	EMS message error	BE - 64
9	P1695	EMS memory error	BE - 67
10	P1696	Authentication fail	BE - 68
11	P1697	Hi-sacn message error	BE - 70
12	P1699	Twice overtrial	BE - 72

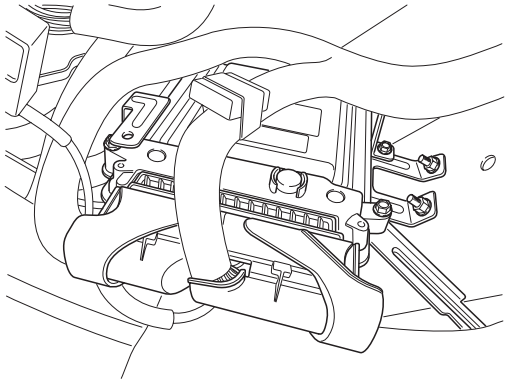
DTC P1610 NON-IMMOBILIZER-EMS CONNECTED TO AN IMMOBILIZER

COMPONENT LOCATION ECD3AF7B

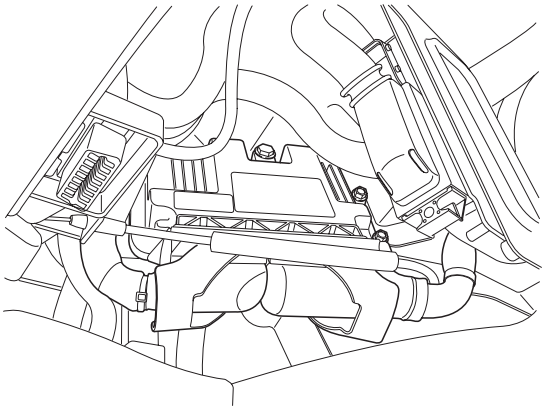
Gasoline 2.0



Gasoline 1.6



Diesel 1.6



SLDBE7740L

GENERAL DESCRIPTION EDEDE09D

Immobilizer is device that prevents car from being thieved by reproduced key. Major components of immobilizer are ECM(Engine Control Module) and SMARTRA. Besides them, Immobilizer has transponder and coil antenna in it. If driver inserts key into key hole, SMARTRA gets tansponder signal by wireless communications via coil antenna and delivers it to ECM through K-line communication line. then ECM deciphers code in it. If inserted key has invalid transponder with incorrect code or doesn't have transponder in it, ECM judges that inserted key is reproduced key and prohibits engine starting.

DTC DESCRIPTION EE62CA96

The ECM sets DTC P1610 if Non Immobilizer EMS is installed on vehicle equipped with Immobilizer.

DTC DETECTING CONDITION E4C34E53

Item	Detecting Condition	Possible Cause
DTC Strategy		• Invalid ECM
Enable Conditions	• IG ON	
Threshold value		
Detecting time		
FAIL SAFE		

MONITOR DTC STATUS EEED2A7C

1. Connect scantool to Data Link Connector(DLC)
2. Ignition "ON" & engine "OFF"
3. Selet "Diagnostic Trouble Codes(DTCs)"mode and monitor "DTC Status" parameter
4. Is the DTC B1610 present?

YES

Substitute with a known-good ECM with immobilizer and check for proper operation.If the problem is corrected, replace ECU and then go to "Verification of Vehicle Repair" procedure.

NO

Fault is intermittent caused by poor contact in SMARTRA's and/or ECM's connector or was repaired and ECM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR EDF8B4FE

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and selet "Diagnostic Trouble Codes(DTCs)" mode and then clear DTC.
2. Operate the vehicle and monitor the DTC on the scantool.
3. Are any DTCs present?

YES

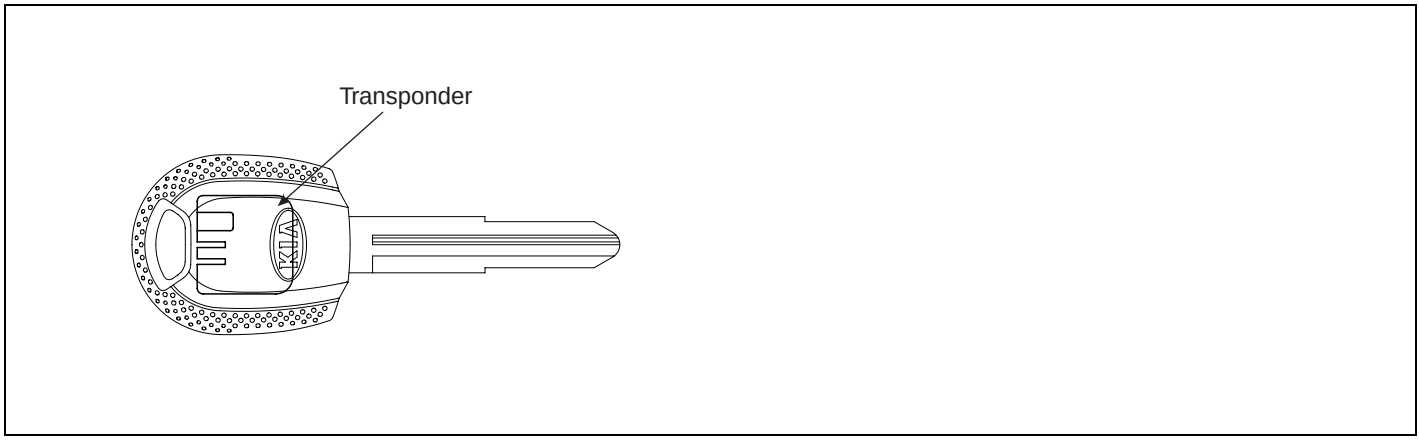
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

DTC P1674 TRANSPONDER STATUS ERROR

COMPONENT LOCATION E43ACD0A



SLDBE7744L

GENERAL DESCRIPTION E5A1FD2B

During the key teaching procedure the transponder will be programmed with vehicle specific data. The vehicle specific data are written into the transponder memory. The write procedure is unique; therefore the content of transponder can never be modified or changed. The data are a string of 9 bytes defined by vehicle manufacturer.The transponder memory is split into two strings called authenticator and key password After this programming the transponder memory is locked and the data(PIN code) cannot be read or changed respectively. The transponder status changes from "virgin" to "learnt". Additionally every transponder includes a unique IDE (Identifier number) of 32 bit. Unique means that the IDE of all transponder is different from each other. The IDE is programmed by the transponder manufacturer and is a read-only value. The authenticator and the key password are not transferred from ECM to transponder or vice versa. Only the results from the encryption algorithm are transferred. It is almost impossible to calculate the vehicle specific data from the encryption result.
For teaching of keys and special purposes the ECM is connected to the tester device.

When IG is ON, the coil supplies energy to the transponder which in turn accumulates energy in the condenser.Once the energy supply from the coil has stopped, using the stored energy in the condenser, the transponder transmits the ID CODE (stored within the ASIC).

DTC DESCRIPTION E5BFDFDF

The ECM sets DTC P1674 if transponder key that can't be register(TP not in the password mode or whose transport data has been changed) is inserted for registration procedure.

DTC DETECTING CONDITION E03391CD

Item	Detecting Condition	Possible Cause
DTC Strategy		• Invalid transponder. ※ Key not in 'VIRGIN' Status or with invalid ID code
Enable Conditions	• IG ON (On Registering TP Procedure)	
Threshold value		
Detecting time		
FAIL SAFE		

MONITOR DTC STATUS E5A171CD

1. Connect scantool to Data Link Connector(DLC)
2. Ignition "ON" & engine "OFF"
3. Selet "Diagnostic Trouble Codes(DTCs)" mode and monitor "DTC Status" parameter
4. Is the DTC B1674 present?

YES

Go to "Inspection & Repair" procedure.

NO

Fault is intermittent caused by poor contact in SMARTRA's and/or ECM's connector or was repaired and ECM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION ECD361D6

1. Check transponder status
   1) IGN "ON" & Engine "OFF" with key intended to register.
   2) Monitor the "KEY STATUS" Parameter on the Scantool.

■ Specification : 'VIRGIN' or 'LEARNT'

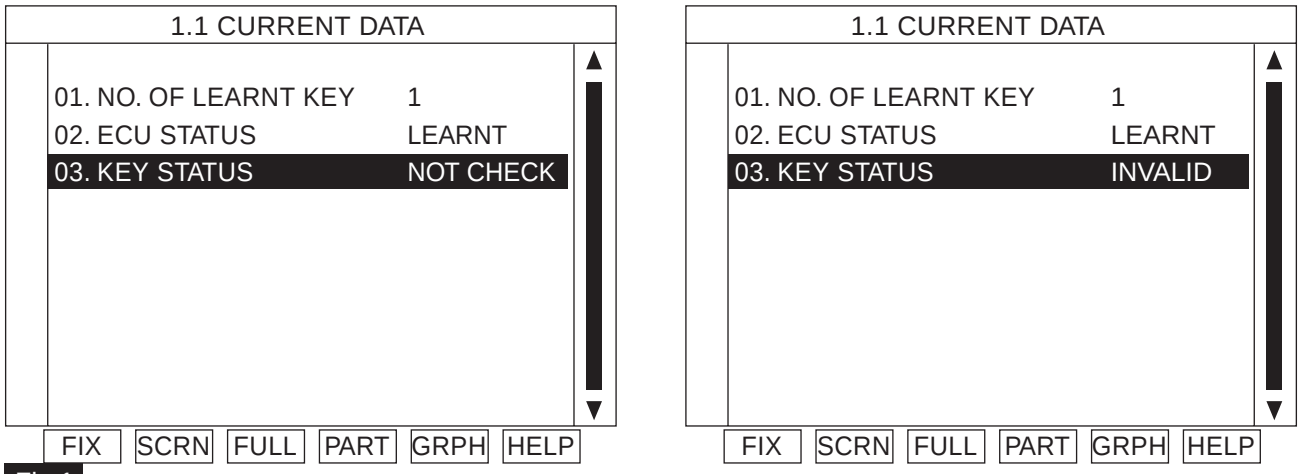


Fig 1

Fig 1) The current data in abnormal state

LTKG742C

3) Is the measured voltage within specifications?

YES

Check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good transponder and check for proper operation.
If the problem is corrected, replace transponder and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR E0DA80D8

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and selet "Diagnostic Trouble Codes(DTCs)" mode and then clear DTC.
2. Operate the vehicle and monitor the DTC on the scantool.
3. Are any DTCs present?

YES

Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

DTC P1675 TRANSPONDER PROGRAMMING ERROR

COMPONENT LOCATION ED4316EB

Refer to the DTC P1674.

GENERAL DESCRIPTION EBBC644D

Refer to the DTC P1674.

DTC DESCRIPTION E3ACB588

The ECM sets DTC P1675 if characteristic data of transponder doesn't coincide with that of ECM owing to transponder programming error.

DTC DETECTING CONDITION E79CF1FB

Item	Detecting Condition	Possible Cause
DTC Strategy		• Invalid transponder. ※ Invalid characteristic data ※ No transponder or more than two transponder is detected by coil antenna
Enable Conditions	• IG ON	
Threshold value		
Detecting time		
FAIL SAFE		

MONITOR DTC STATUS E718DF0F

1. Connect scantool to Data Link Connector(DLC)
2. Ignition "ON" & engine "OFF"
3. Selet "Diagnostic Trouble Codes(DTCs)" mode and monitor "DTC Status" parameter
4. Is the DTC B1675 present?

YES

Go to "Inspection & Repair" procedure.

NO

Fault is intermittent caused by poor contact in SMARTRA's and/or ECM's connector or was repaired and ECM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION EA0A2D3E

1. Check transponder and ECU status

   1) IGN "ON" & Engine "OFF" with key intended to register.

   2) Monitor the "KEY STATUS" and "ECU STATUS' Parameter on the Scantool.

■ Specification : 'LEARNT'

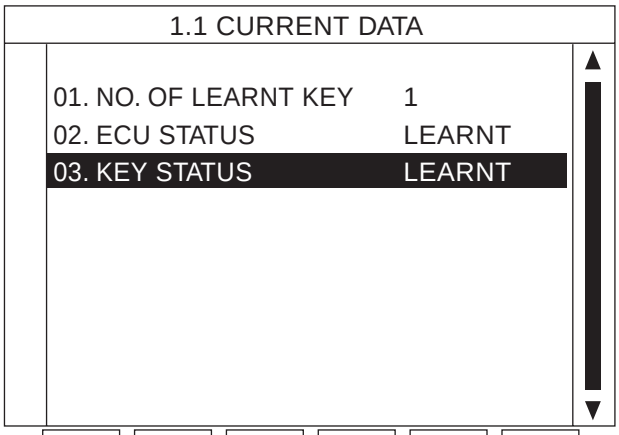


Fig 1

Fig 1) The current data in abnormal state

SCMBE6752L

   3) Is the measured voltage within specifications?

YES

Check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "Check transponder" procedure.

2. Check transponder

   1) IGN "ON" & Engine "OFF".

   2) Neutralize ECM and Register transponder key by scantool.

   NOTE

   Pin code is requied to Neutralize ECM and to Register transponder key

   3) Are Neutralizing and Registering completed normally?

      YES

      Check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
      Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

      NO

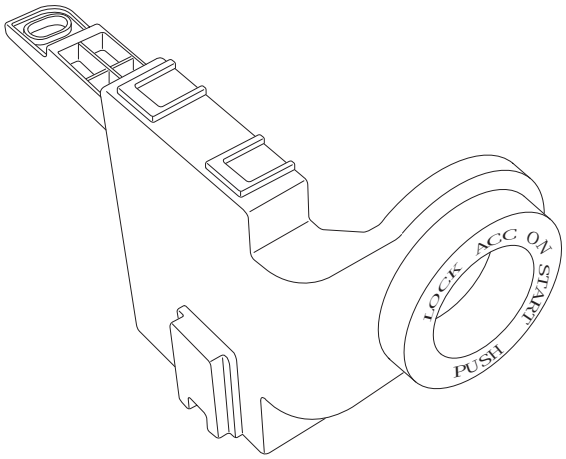
      Substitute with a known-good transponder and check for proper operation.
      If the problem is corrected, replace transponder and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR E38F84A6

Refer to the DTC P1674.

DTC P1676 SMARTRA MESSAGE ERROR

COMPONENT LOCATION EAACE1FD



SLDBE6751D

GENERAL DESCRIPTION EABE3198

The SMARTRA carries out communication with the built-in transponder of the ignition key. This wireless communication runs on RF (Radio frequency of 125 kHz). The SMARTRA is mounted at the ignition lock close to the antenna coil for RF transmission and receiving. The RF signal from the transponder received by the antenna coil is converted into messages for serial communication by the SMARTRA device. And the received messages from the ECM are converted into an RF signal, which is transmitted to the transponder by the antenna. The SMARTRA does not carry out the validity check of transponder or the calculation of encryption algorithm. This device is only an advanced interface, which converts the RF data flow of the transponder into serial communication to ECM and vice versa.

* SMARTRA : SMARt TRansponder Antenna

DTC DESCRIPTION EC56BEC6

The ECM sets DTC P1676 if there's any fault in message from SMARTRA to ECU.

DTC DETECTING CONDITION E776ECAF

Item	Detecting Condition	Possible Cause
DTC Strategy		• Faulty SMARTRA
Enable Conditions	• IG ON	
Threshold value		
Detecting time		
FAIL SAFE		

MONITOR DTC STATUS E12CD3B8

1. Connect scantool to Data Link Connector(DLC)
2. Ignition "ON" & engine "OFF"
3. Selet "Diagnostic Trouble Codes(DTCs)" mode and monitor "DTC Status" parameter
4. Is the DTC B1676 present?

YES

Go to "Inspection & Repair" procedure.

NO

Fault is intermittent caused by poor contact in SMARTRA's and/or ECM's connector or was repaired and ECM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION EF303A42

1. Check transponder and ECU status
   1) IGN "ON" & Engine "OFF" with key intended to register.
   2) Monitor the "KEY STATUS" and "ECU STATUS' Parameter on the Scantool.

■ Specification : 'LEARNT'

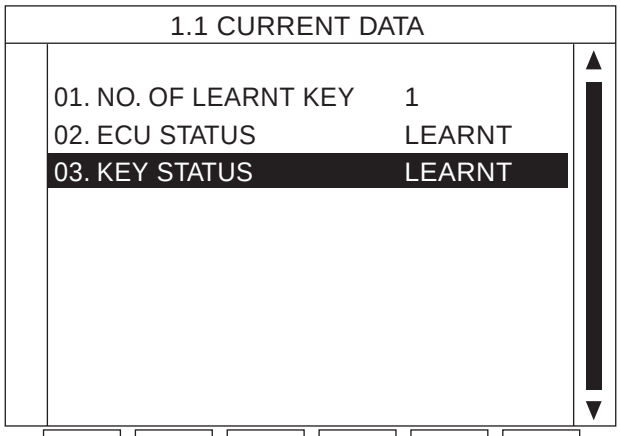


Fig 1

Fig 1) The current data in abnormal state

SCMBE6752L

3) Are "KEY STATUS" and "ECU STATUS' Parameter within specifications?

YES

Check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "Check SMARTRA" procedure.

2. Check SMARTRA

1) IGN "ON" & Engine "OFF".

2) Neutralize ECM and Register transponder key by scantool.

NOTE

Pin code is requied to Neutralize ECM and to Register transponder key

3) Are Neutralizing and Registering completed normally?

YES

Check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good transponder and check for proper operation.
If the problem is corrected, replace transponder and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR E60592CE

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and selet "Diagnostic Trouble Codes(DTCs)" mode and then clear DTC.
2. Operate the vehicle and monitor the DTC on the scantool.
3. Are any DTCs present?

YES

Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

DTC P1690 SMARTRA NO RESPONSE

COMPONENT LOCATION EBABE83F

Refer to the DTC P1676.

GENERAL DESCRIPTION EF385E60

Refer to the DTC P1676.

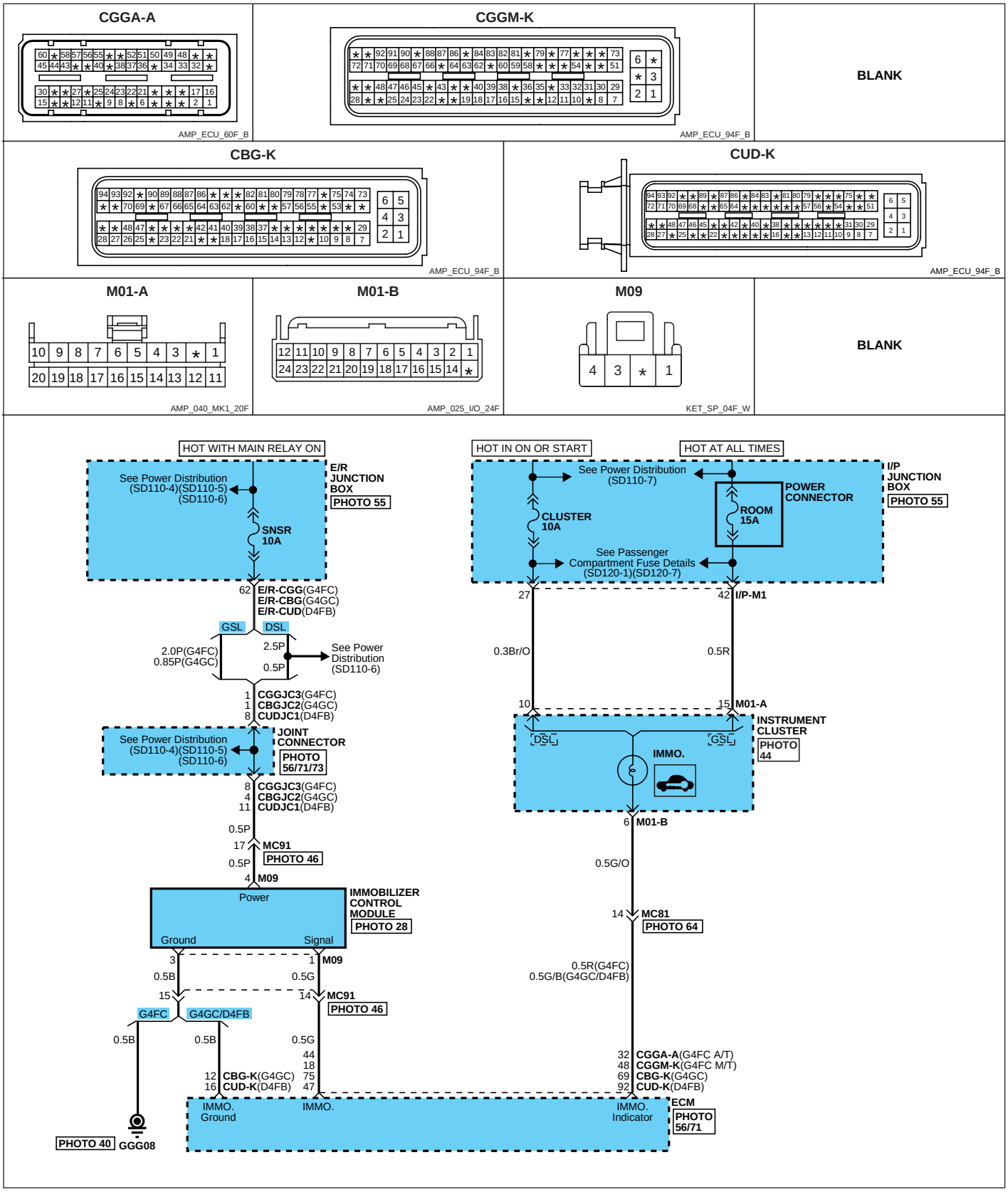
DTC DESCRIPTION EAADC7CE

The ECM sets DTC P1690 if there's No Response from SMARTRA.

DTC DETECTING CONDITION E49C1110

Item	Detecting Condition	Possible Cause
DTC Strategy		• Open Circuit in signal harness • Short Circuit in signal harness • Faulty SMARTRA
Enable Conditions	• IG ON	
Threshold value		
Detecting time		
FAIL SAFE		

SCHEMATIC DIAGRAM EF3EFCF9



SLDBE7743L

MONITOR SCANTOOL DATA EAEE1AAD

1. Connect scantool to Data Link Connector(DLC).
2. IGN "ON" & Engine "OFF".
3. Monitor the "KEY STATUS" and "ECU STATUS' Parameter on the Scantool.

■ Specification : 'LEARNT'

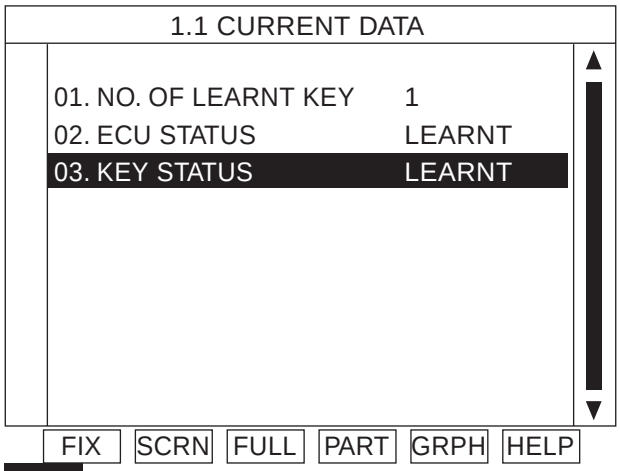


Fig 1

Fig 1) The current data in abnormal state

SCMBE6752L

4. Are "KEY STATUS" and "ECU STATUS' Parameter within specifications?

YES

Check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "Inspection & Repair" procedure.

TERMINAL AND CONNECTOR INSPECTION E104D2AC

1. Many malfunctions in the electrical system are caused by poor harness and terminals.
   Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification Vehicle Repair" procedure.

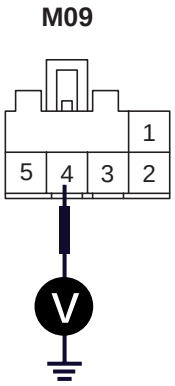
NO

Go to "W/Harness Inspection" procedure .

POWER SUPPLY CIRCUIT INSPECTION E6AF9BDE

1. Check for open in harness
   1) Ignition "OFF".
   2) Disconnect SMARTRA.
   3) Ignition "ON" & Engine "OFF".
   4) Measure voltage value between terminal "4" of SMARTRA and chassis ground.

■ Specification : 9~16V



1. Coil antenna
3. Ground
4. Power

SLDBE7753L

5) Is the measured voltage within specifications?

YES

Go to "Signal circuit Inspection" procedure.

NO

Check for open or short in harness. Repair as necessary and go to "Verification of Vehicle Repair" procedure.

SIGNAL CIRCUIT INSPECTION EE90ECDC

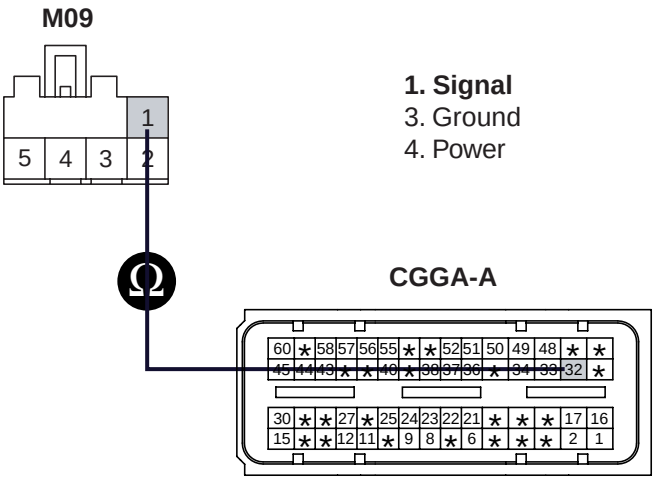
1. Check for open in harness

1) Ignition "OFF".

2) Disconnect SMARTRA.

3) Measure resistance between terminal "1" of SMARTRA and terminal "32" of ECM.

■ Specification : 1 Ω or less



SLDBE7754L

4) Is the measured resistance within specifications?

YES

Go to "Check for short in harness" procedure.

NO

Check for open in harness. Repair as necessary and go to "Verification of Vehicle Repair" procedure.

2. Check for short in harness

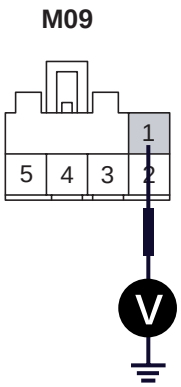
1) Ignition "OFF".

2) Disconnect SMARTRA.

3) Ignition "ON" & Engine "OFF".

4) Measure voltage value between terminal "1" of SMARTRA and chassis ground.

■ Specification :Approx. 5.48V



1. **Signal**
3. Ground
4. Power

SLDBE7756L

5) Is the measured voltage within specifications?

YES

Go to "Signal circuit Inspection" procedure

NO

Check for short in harness. Repair as necessary and go to "Verification of Vehicle Repair" procedure.

GROUND CIRCUIT INSPECTION ECEEB85F

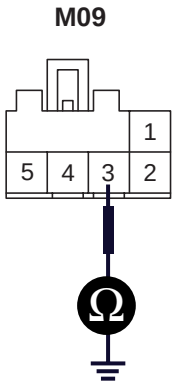
1. Check for open in ground harness

   1) Ignition "OFF".

   2) Disconnect SMARTRA.

   3) Measure resistance between terminal "3" of SMARTRA and chassis ground.

■ Specification : 1 Ω or less



1. Coil antenna
3. Ground
4. Power

SLDBE7757L

   4) Is the measured resistance within specifications?

YES

Check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

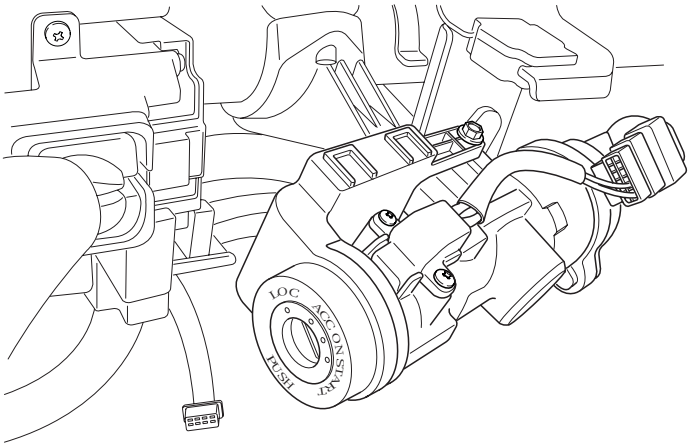
Check for open in harness. Repair as necessary and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR EDE8D660

Refer to the DTC P1676.

DTC P1691 ANTENNA COIL ERROR

COMPONENT LOCATION E712FA35



SLDBE6752D

GENERAL DESCRIPTION E21C3DE5

This wireless communication runs on RF. The SMARTRA is mounted at the ignition lock for RF transmission and receiving. The RF signal from the transponder received by the antenna coil is converted into messages for serial communication by the SMARTRA device. And the received messages from the EMS are converted into an RF signal,which is transmitted, to the transponder by the antenna.

DTC DESCRIPTION E712E1ED

This DTC is defined as Antenna coil open or short circuit.

DTC DETECTING CONDITION EF864F0B

Item	Detecting Condition	Possible Cause
Enable Conditions	• IG ON	• Open or short in coil circuit • Faulty Antenna Coil • Faulty SMARTRA • Faulty ECM
Detecting factors	• Antenna signal error	
Detecting window	• Before transponder communications	
Detecting criteria	• Antenna open/short circuit	

SCHEMATIC DIAGRAM EF5C56D9

Refer to the DTC P1690.

SIGNAL WAVEFORM E11FF73D

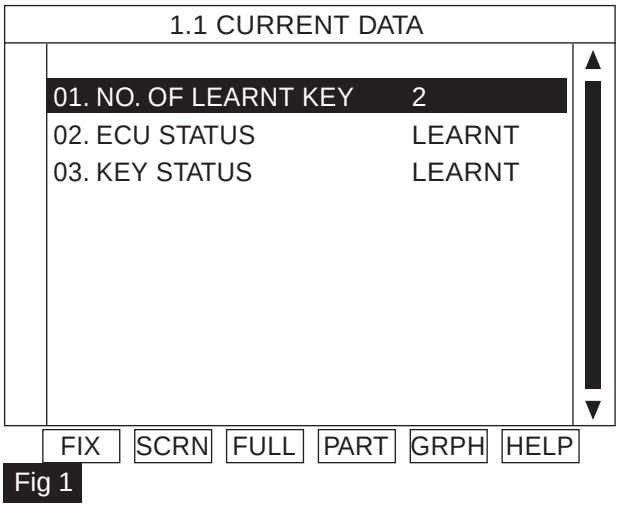


Fig 1

EMS Status	Engine start with valid key	Engine start by limp home	Teaching of key	Teaching or changing of user password	Twice ignition of function
Not yet checked	No	No	No	No	No
Virgin	No	No	Yes	No	Yes, with virgin key
Learnt	Yes	Yes, with learnt user password	Yes	Yes	No
Neutral	No	No	Yes	No	No
Locked by timer	No	No	No	No	No

Fig 2

SLDBE7745L

MONITOR SCANTOOL DATA E5E591D4

1. Ignition "ON" & Engine "OFF".
2. Connect Scan tool and cleare the DTCs
3. If the DTCs are retrived again, monitor "CURRENT DATA" to check No. of Learnt key, ECM and KEY status.

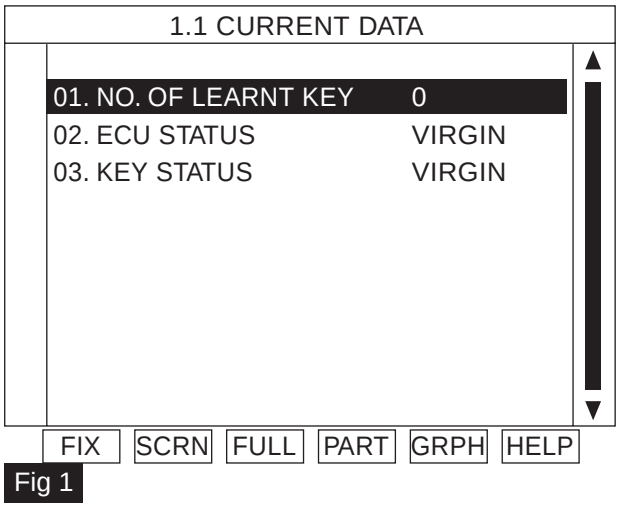


Fig 1

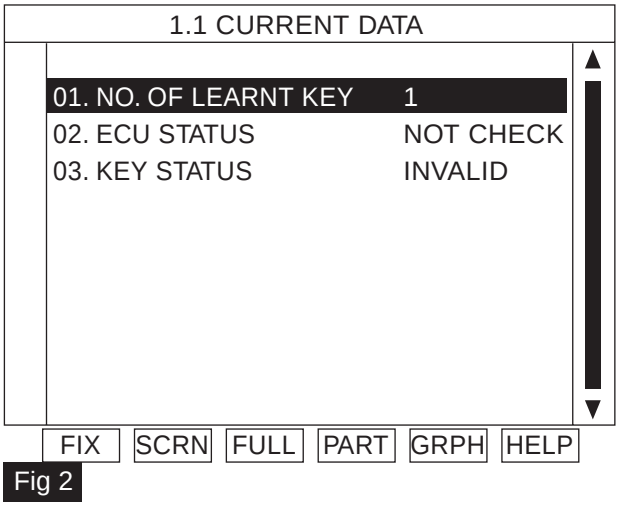


Fig 2

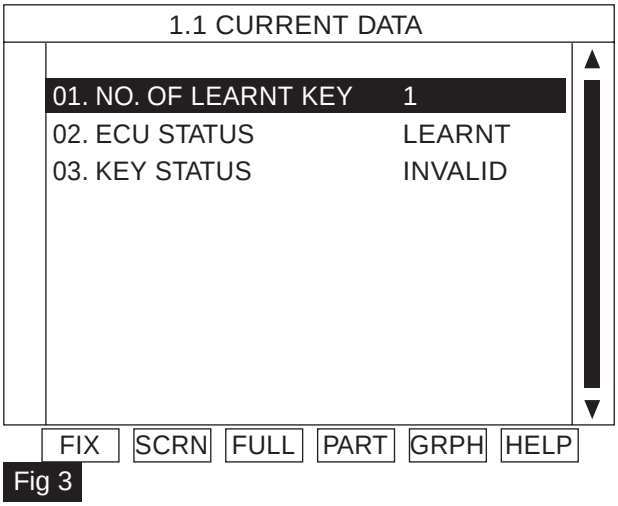


Fig 3

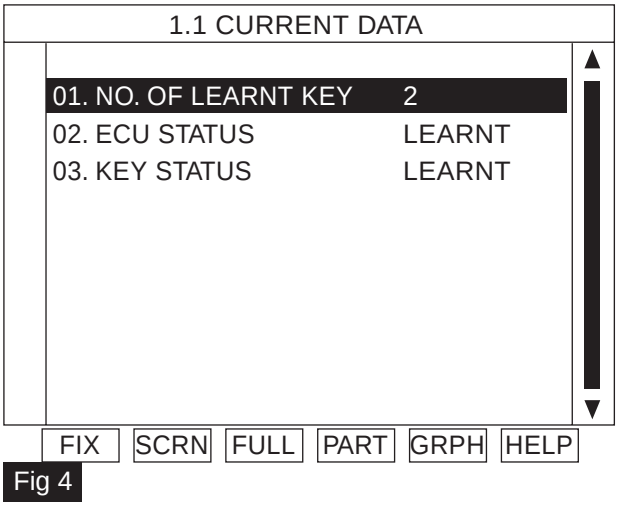


Fig 4

Fig. 1 : ECM has not matched with any Key yet.
Fig. 2 : ECM Internal Failure.
Fig. 3 : IG On with unmatched key.
Fig. 4 : 2(two) Keys have been matched with ECM.

SLDBE7746L

4. Are both Key and ECM status learnt?

YES

Fault is intermittent caused by poor contact in the SMARTRA's and/or ECM's connector or was repaired and ECM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "W/Harness Inspection" procedure.

TERMINAL AND CONNECTOR INSPECTION E4452DAB

1. Many malfunctions in the electrical system are caused by poor harness and terminals.
   Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of Vehicle Repair" procedure.

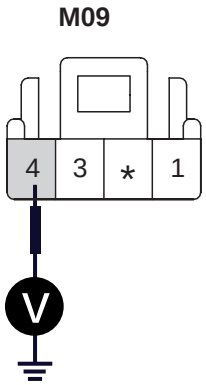
NO

Go to " Power Circuit Inspection " procedure.

POWER SUPPLY CIRCUIT INSPECTION E9BB24FC

1. Ignition "OFF"
2. Disconnect SMARTRA connector.
3. Ignition "ON" & Engine "OFF".
4. Measure voltage between terminal "4" of the SMARTRA harness connector and chassis ground.

■ Specification : B+



1. Signal
2. -
3. Ground
4. Power

SLDBE7747L

5. Is the measured voltage within specifications?

YES

Go to "Signal Circuit Inspection" procedure.

NO

Check open or short in power harness
Check that sensor fuse 10A located between Control relay and Smartra is open or blown off
Repair as necessary and go to "Verification of Vehicle repair" procedure.

SIGNAL CIRCUIT INSPECTION E05EE2F5

1. Check for short in harness

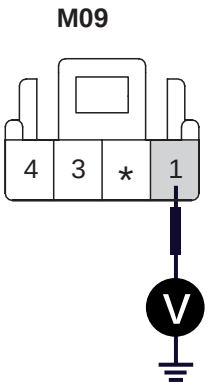
   1) Ignition "OFF"

   2) Disconnect SMARTRA connector

   3) Ignition "ON" & Engine "OFF"

   4) Measure voltage between terminal "1"of the SMARTRA harness connector and chassis ground.

■ Specification : Approx. 6.0V



1. Signal
2. -
3. Ground
4. Power

SLDBE7748L

   5) Is the measured voltage within specifications?

YES

Go to "Check for open in harness" as below

NO

Check short in signal harness
Repair as necessary and go to "Verification of Vehicle repair" procedure.

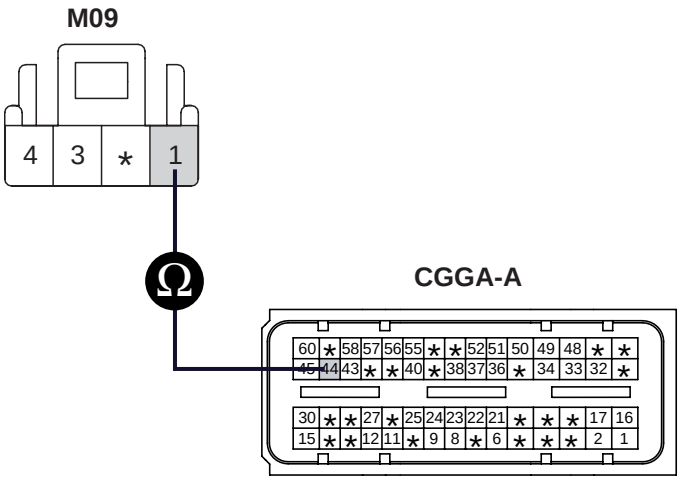
2. Check for open in harness

   1) Ignition "OFF"

   2) Disconnect SMARTRA connector.

   3) Measure resistance between terminal "1" of the SMARTRA harness connector and terminal "44" of ECM harness connector.

■ Specification : Approx. below 1Ω



SLDBE7749L

   4) Is the measured resistance within specifications?

YES

Go to "Ground Circuit Inspection" procedure

NO

Check for open in signal harness
Repair as necessary and go to "Verification of Vehicle repair" procedure.

GROUND CIRCUIT INSPECTION EC46DFE7

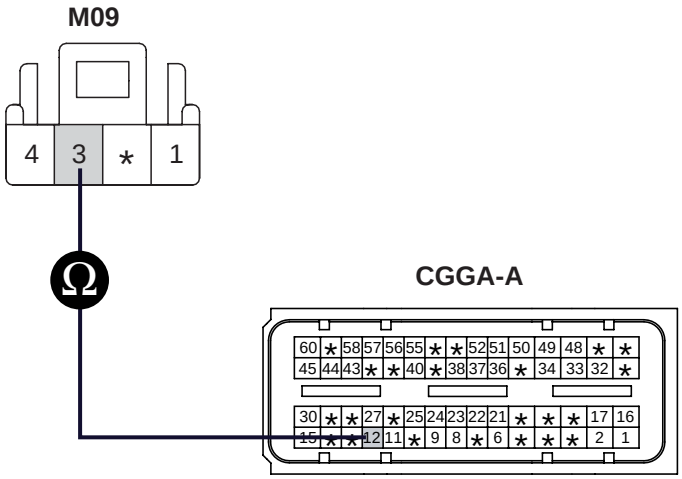
1. Check for open in harness between SMARTRA and ECM

   1) Ignition "OFF"

   2) Disconnect SMARTRA connector

   3) Measure resistance between terminal "3" of the SMARTRA harness connector and terminal "12" of ECM harness connector.

■ Specification : Approx. below 1Ω



SLDBE7750L

   4) Is the measured resistance within specifications?

   YES

   Go to "Check for open in harness between ECM and Chassis ground" as below

   NO

   Check for open in ground harness
   Repair as necessary and go to "Verification of Vehicle repair" procedure.

2. Check for open in harness between ECM and Chassis ground

   1) Ignition "OFF"

   2) Disconnect SMARTRA connector

   3) Measure resistance between terminal 61 of ECM harness connector and chassis ground(G19)

■ Specification : Approx. below 1Ω

COMPONENT INSPECTION E050452C

1. Check SMARTRA

   1) Ignition "ON" & Engine "OFF"

   2) Perform neutral mode, key teaching/changing and password teaching according to description in "System inspection" procedure.

   NOTE

   Be sure that PIN code is prepared before performing neutral mode.

   3) Is Key teaching completed?

      YES

      Go to "Check ECM" as below

      NO

      Substitute with a known-good SMARTRA and check for proper operation. If the problem is corrected, replace SMARTRA and Go to "Verification of Vehicle Repair" procedure.

   NOTE

   In case of faulty SMARTRA, there are no special procedures required. A new SMARTRA device simply replaces the old one. (There are no transponder-related data stored in this device.)

2. Check ECM

   1) Ignition "ON" & Engine "OFF"

   2) Perform Key teaching/changing mode again

   3) Is the Key teaching completed?

      YES

      Go to "Verification of Vehicle Repair" procedure.

      NO

      Substitute with a known-good ECM and check for proper operation. If the problem is corrected, replace ECM and then go to "Verification of Vehicle repair" procedure.

   NOTE

   1. *Don't forget to prepare for the PIN of the vehicle before removing ECM from the vehicle.*
   2. *Remember that substituting with a known-good ECM should be followed "The things to remember before repair(1)" in "System Inspection" procedure. (In case of faulty ECM, it has to be replaced with "VIRGIN" or "NEUTRAL" ECM.)*
   3. *Strongly recommend to register PIN which is given by HMC or the regional office when replacing a new ECM.*

VERIFICATION OF VEHICLE REPAIR EFD94473

Refer to the DTC P1610.

DTC P1693 TRANSPONDER NO RESPONSE ERROR / INVALID RESPONSE

COMPONENT LOCATION E725C131

Refer to the DTC P1674.

GENERAL DESCRIPTION E926FD39

Refer to the DTC P1674.

DTC DESCRIPTION ED2C154B

The ECM sets DTC P1693 if there's abnormal response from transponder.

DTC DETECTING CONDITION ED05DAF8

Item	Detecting Condition	Possible Cause
DTC Strategy		• Corrupted data from Transponder • More than one TP in the magnetic field • No TP(Key without TP) in the magnetic field
Enable Conditions	• IG ON (On Registering TP Procedure)	
Threshold value		
Detecting time		
FAIL SAFE		

COMPONENT INSPECTION ECA67F88

Refer to the DTC P1675.

VERIFICATION OF VEHICLE REPAIR E192DC3E

Refer to the DTC P1674.

DTC P1694 EMS MESSAGE ERROR

COMPONENT LOCATION ED1ED2DB

Refer to the DTC P1610.

GENERAL DESCRIPTION EF1C69A7

The ECM and the SMARTRA communicate by dedicated line. During this communication of ECM and SMARTRA the K line of ECM cannot be used for communication. The ECM controls the communication either to SMARTRA or to other devices(e.g. scanner) on K line by switching of a multiplexer and specific communication procedures. The multiplexer is a part of ECM H/W.

DTC DESCRIPTION EF1AEBBD

The ECM sets DTC P1694 if Request from EMS is invalid.

DTC DETECTING CONDITION E4CDD774

Item	Detecting Condition	Possible Cause
DTC Strategy		• Faulty EMS ※ Protocol layer violation - Invalid request - Check sum error
Enable Conditions	• IG ON (On Registering TP Procedure)	
Threshold value		
Detecting time		
FAIL SAFE		

COMPONENT INSPECTION EBF3E8DF

1. Check transponder and ECU status

   1) IGN "ON" & Engine "OFF".

   2) Monitor the "KEY STATUS" and "ECU STATUS' Parameter on the Scantool.

■ Specification : 'LEARNT'

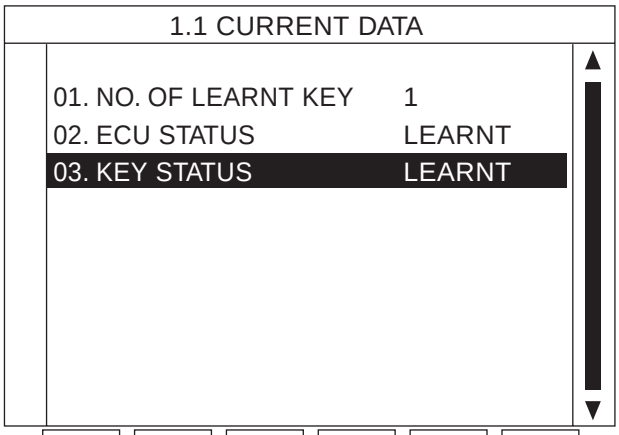


Fig 1

Fig 1) The current data in abnormal state

SCMBE6752L

   3) Are "KEY STATUS" and "ECU STATUS' Parameter within specifications?

YES

Check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "Check transponder" procedure.

2. Check ECM

   1) IGN "ON" & Engine "OFF".

   2) Neutralize ECM and Register transponder key by scantool.

   NOTE

   Pin code is requied to Neutralize ECM and to Register transponder key

   3) Are Neutralizing and Registering completed normally?

      YES

      Check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

      NO

      Substitute with a known-good transponder and check for proper operation.
      If the problem is corrected, replace transponder and then go to "Verification of Vehicle Repair" procedure.

   NOTE

   ECM substitued for old one must be in "Virgin" or "Neutral" status and Pin code is requied to Neutralize ECM and to Register transponder key.

VERIFICATION OF VEHICLE REPAIR E6EDF41C

Refer to the DTC P1610.

DTC P1695 EMS MEMORY ERROR

COMPONENT LOCATION EDD06C5D

Refer to the DTC P1610.

GENERAL DESCRIPTION EE9CDABD

The relevant data for the immobilizer function are stored at permanent memory (EEPROM or Flash etc.).
The immobilizer data are stored by three independent entries.
The data from EEPROM are evaluated by "2 of 3 decision". That means all three entries are read and the content is compared before authentication process.
If the contents of all entries are equal, the authentication will run without additional measures.
If only the contents of two entries are equal, the authentication will run and fault code "EEPROM defective" is stored at ECM.
If the contents of all three entries are different from each other, no authentication will be possible and the fault code "EEPROM defective" will be stored. The limp home function cannot be activated. The ECM shall be replaced if the EEPROM related fault occurs again after new teaching of all keys.

DTC DESCRIPTION EAD2516C

The ECM sets DTC P1694 if there's any fault in EMS internal permanent memory(EEPROM or Flash etc.).

DTC DETECTING CONDITION E3E0B2CF

Item	Detecting Condition	Possible Cause
DTC Strategy		• Faulty EMS
Enable Conditions	• IG ON	
Threshold value		
Detecting time		
FAIL SAFE		

COMPONENT INSPECTION E2C1FA73

Refer to the DTC P1694.

VERIFICATION OF VEHICLE REPAIR E3B35277

Refer to the DTC P1610.

DTC P1696 AUTHENTICATION FAIL

COMPONENT LOCATION EF8F5BE0

Refer to the DTC P1674.

GENERAL DESCRIPTION E0CFB46F

Refer to the DTC P1674.

DTC DESCRIPTION ECF7E7E8

The ECM sets DTC P1696 if invaild key is inserted into key hole for Authentication.

DTC DETECTING CONDITION ECD4ED24

Item	Detecting Condition	Possible Cause
DTC Strategy		• Virgin TP at EMS status "Learnt". • Learnt(Invalid) TP at EMS status "Learnt".
Enable Conditions	• IG ON	
Threshold value		
Detecting time		
FAIL SAFE		

COMPONENT INSPECTION EC9F5866

1. Check transponder and ECU status

   1) IGN "ON" & Engine "OFF".

   2) Monitor the "KEY STATUS" and "ECU STATUS' Parameter on the Scantool.

■ Specification : LEARNT'

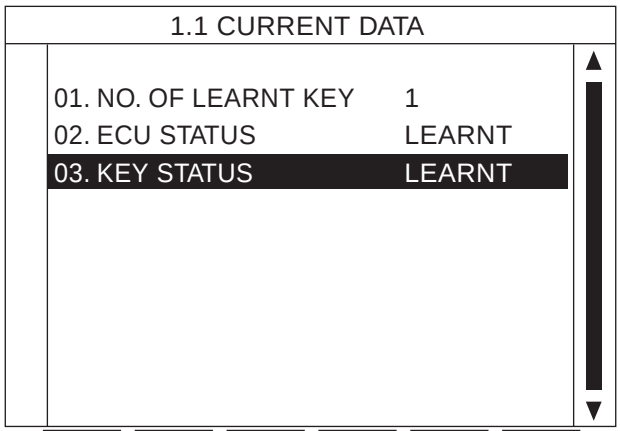


Fig 1

Fig 1) The current data in abnormal state

SCMBE6752L

3) Are "KEY STATUS" and "ECU STATUS" Parameter within specifications?

YES

Check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Register as necessary and then go to "Verification of Vehicle Repair" procedure.
CASE 1. KEY STATUS "VIRGIN" : Register transponder key now inserted
CASE 2. KEY STATUS "INVAILD" : Register all transponder key

VERIFICATION OF VEHICLE REPAIR E6FC5E75

Refer to the DTC P1674.

DTC P1697 HI-SCAN MESSAGE ERROR

COMPONENT LOCATION E0D4D0DA

Refer to the DTC P1610.

GENERAL DESCRIPTION E44F4142

In immobilizer system, scantool is mainly used for diagnosis. besides this, registration of key and neutralization of ECM is executed by scantool. For ECM communicate with other components such as SMARTRA and scantool by changing type of communication through just one line, K-line communication between scantool and ECM is unavalible while communication between ECM and SMARTRA is in progress.

DTC DESCRIPTION E8F8EFED

The ECM sets DTC P1696 if Request from Tester is Invalid.

DTC DETECTING CONDITION E31C7C4C

Item	Detecting Condition	Possible Cause
DTC Strategy		• Invalid request. - Protocol layer violation - Check sum error
Enable Conditions	• IG ON (On Registering TP Procedure)	
Threshold value		
Detecting time		
FAIL SAFE		

MONITOR DTC STATUS E3274A79

1. Connect scantool to Data Link Connector(DLC)
2. Ignition "ON" & engine "OFF"
3. Selet "Diagnostic Trouble Codes(DTCs)" mode and monitor "DTC Status" parameter
4. Is the DTC B1697 present?

YES

Go to "Inspection & Repair" procedure.

NO

Fault is intermittent caused by poor contact in SMARTRA's and/or ECM's connector or was repaired and ECM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION E4E368B1

1. Check communication between ECM and scantool

   1) IGN "ON" & Engine "OFF".

   2) Connect scantool to Data Link Connector(DLC).

   3) Erase the DTC and Monitor Parameter of immobilizer on the Scantool.
      ※ Try one more time from "select car model " even if "Communication error" is present on the scantool

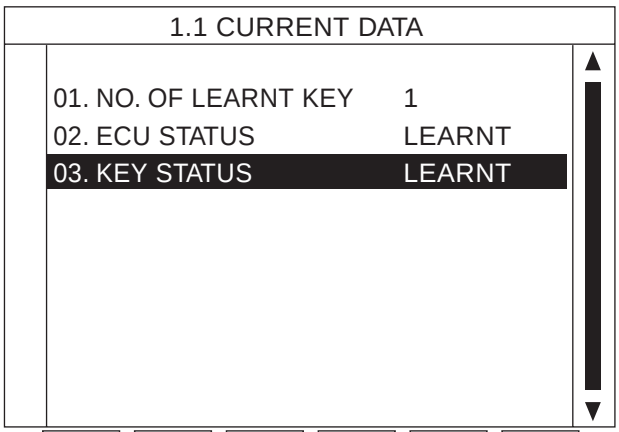


Fig 1

Fig 1) The current data in abnormal state

SCMBE6752L

   4) Is the communication between ECM and scantool normal?

      YES

      If ECM is in "Locked by Timer" status. Keep "KEY ON" status for 1 hours to withdraw "Locked by Timer" status. Then repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.

      NO

      Substitute with a known-good scantool and check for proper operation.
      If the problem is corrected, Go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR EFB64CA1

Refer to the DTC P1610.

DTC P1699 TWICE OVERTRIAL

COMPONENT LOCATION E3C3872E

Refer to the DTC P1610.

GENERAL DESCRIPTION E0FAB6F2

This is a special function for engine start by vehicle manufacturer. The engine can be started for moving from the production line to an area where the key teaching is proceeded.

DTC DESCRIPTION E12BAD8C

The ECM sets DTC P1697 if the maximum limit of Twice IGN is Exceeded.

DTC DETECTING CONDITION EBAC40E5

Item	Detecting Condition	Possible Cause
DTC Strategy		• Twice IGN ≥ 32 times.
Enable Conditions	• IG ON	
Threshold value		
Detecting time		
FAIL SAFE		

MONITOR DTC STATUS E080FAFD

1. Connect scantool to Data Link Connector(DLC)
2. Ignition "ON" & engine "OFF"
3. Selet "Diagnostic Trouble Codes(DTCs)" mode and monitor "DTC Status" parameter
4. Is the DTC B1699 present?

YES

Go to "Inspection & Repair" procedure.

NO

Fault is intermittent caused by poor contact in SMARTRA's and/or ECM's connector or was repaired and ECM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION E8D39BEB

1. Check transponder and ECU status

   1) IGN "ON" & Engine "OFF".

   2) Connect scantool to Data Link Connector(DLC).

   3) Erase the DTC and Monitor the "ECU STATUS' Parameter on the Scantool.

■ Specification : 'LEARNT'

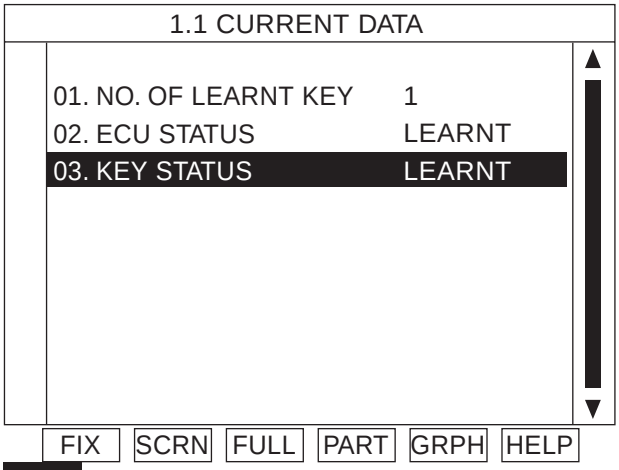


Fig 1

Fig 1) The current data in abnormal state

SCMBE6752L

   4) Is "ECU STATUS' Parameter "Locked"?

   YES

   Keep "KEY ON" status for 1 hours to withdraw "Locked by Timer" status. Then register transponder and go to "Verification of Vehicle Repair" procedure.

   NO

   Check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR E73A1D1E

Refer to the DTC P1610.