Automatic Transaxle (A5HF1)

GENERAL

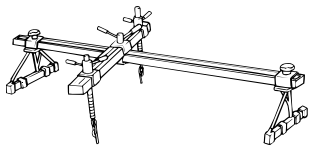
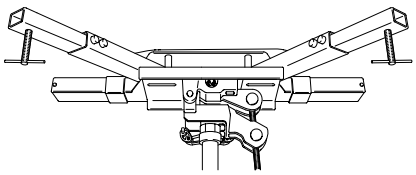
SPECIFICATIONS E6BFC05F

Engine type		λ -3.8
Transaxle type		A5HF1
Gear ratio	1ST	3.840
	2ND	2.092
	3RD	1.440
	4TH	1.048
	5TH	0.728
	REV.	3.859
Final gear ratio		3.333
T/M oil capacity(ℓ)		10.9

※ The quantity in the chart above is for the reference. The actual filling quantity of the automatic transaxle fluid must be set according to 'INSPECTION' or 'REPLACEMENT' process of the automatic transaxle fluid.

Recommended transaxle oil		Diamond ATF SP III or SK ATF SP III
Check & Replenishment		Every one year or every 15,000mile(24,000km)
Replacement	Private use	Every 100,000mile(160,000km)
	Business use	Every 30,000mile(48,000km)
		1. Driving on rough road(bumpy road, gravel road, snowy road, unpaved road etc.) 2. Driving on mountain road, ascent/descent 3. Repetition of short distance driving 4. More than 50% operation in heavy city traffic during hot weather above 32°C(89.6°F) 5. Police car, Taxi, Commercial type operation or trailer towing, etc.

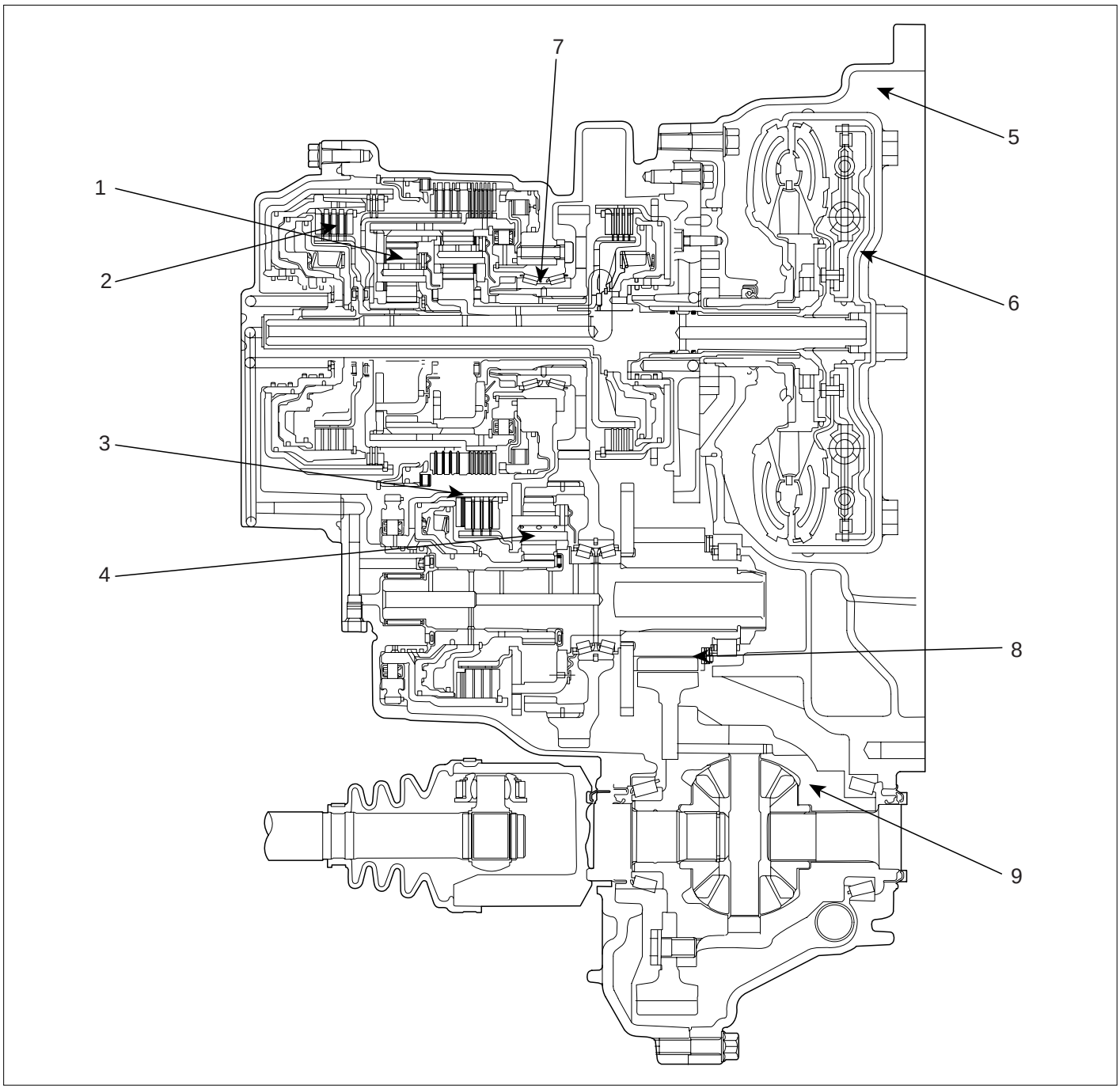
SPECIAL TOOLS EE7DCEB2

Tool (Number and name)	Illustration	Use
09200-38001 Engine support fixture	 KKBF030A	Removal and installation of transaxle
09624-38000 Crossmember supporter	 EKBF005A	Supporting of the crossmember

AUTOMATIC TRANSAXLE SYSTEM

DESCRIPTION E0F18099

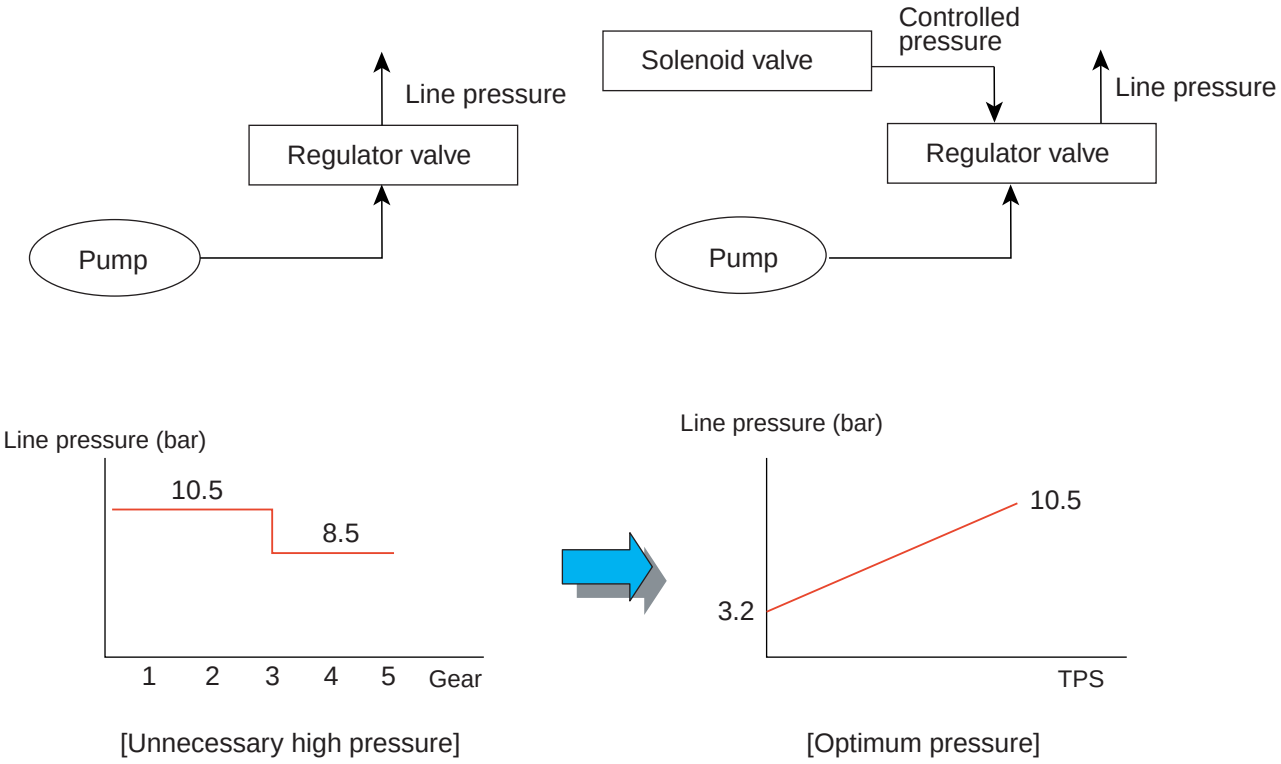
1. Structure & Technical highlights



1. Overdrive planetary gear (3→4 pinions)
2. SSP(Single sided plate)
   -Overdrive clutch
   -2ND brake
3. Reduction band (Piston increased)
4. Direct planetary gear (3→4 pinions)
5. Case/ Housing intensity reinforced & redesigned
6. High capacity torque converter
7. Bearing outer diameter increased (Φ5 mm)
8. Differential gear (Increased width by 2mm)
9. Differential capacity increased (6.1→7)

EKBF002A

2. Variable Line Pressure Control
   - Description
     - Form the most suitable line pressure according to the vehicle driving condition
   - Special Features
     - VFS (Variable Force Solenoid) valve (For varying line pressure)
     - Reducing valve added(Stabilize control pressure in shiftings)
   - Effects
     - Improved power transmission efficiency and fuel consumption



EKBF002B

3. Gear durability improvement and less-noisy gear development
   - Description
     - Optimal gear transmission ratio design from analyzing gears
   - Special Features
     - Apply High-strength gear material
     - Gear teeth width increased
     - Planetary gear (3 pinions → 4 pinions)
     - Less-noisy gear development
   - Effects
     - Durability improvement
     - Reduction of noise level

4. Case/Housing intensity reinforced
   - Description
     - Case/Housing intensity reinforced
   - Special Features
     - Converter housing intensity reinforced(Ribs added and thickness increased)
     - Most suitable stiff reinforcement through analyzing
   - Effects
     - Intensity increased and banding vibration decreased
     - NVH Performance improvement

5. New frictional material
   - Description
     - Apply new frictional material for capacity and durability improvement
   - Special Features
     - SSP (Single Sided Plate) applied only on overdrive clutch and 2nd brake
     - Apply the next generation frictional material(BWA 6100/D 0880-88)
   - Effects

- Thermal absorption capacity improvement
- Energy capacity and durability improvement

MECHANICAL SYSTEM EA257045

CLUTCHES AND BRAKES FOR EACH RANGE

		UD Clutch	OD Clutch	2ND Brake	LR Brake	REV Clutch	RED Brake	DIR Clutch	OWC 1	OWC 2
P		-	-	-	O	-	O	-	-	-
R		-	-	-	O	O	O	-	-	-
N		-	-	-	O	-	O	-	-	-
D	1st	O	-	-	O	-	O	-	●	●
	2nd	O	-	O	-	-	O	-	-	●
	3rd	O	O	-	-	-	O	-	-	●
	4th	-	O	O	-	-	O	-	-	●
	5th	-	O	O	-	-	-	O	-	-

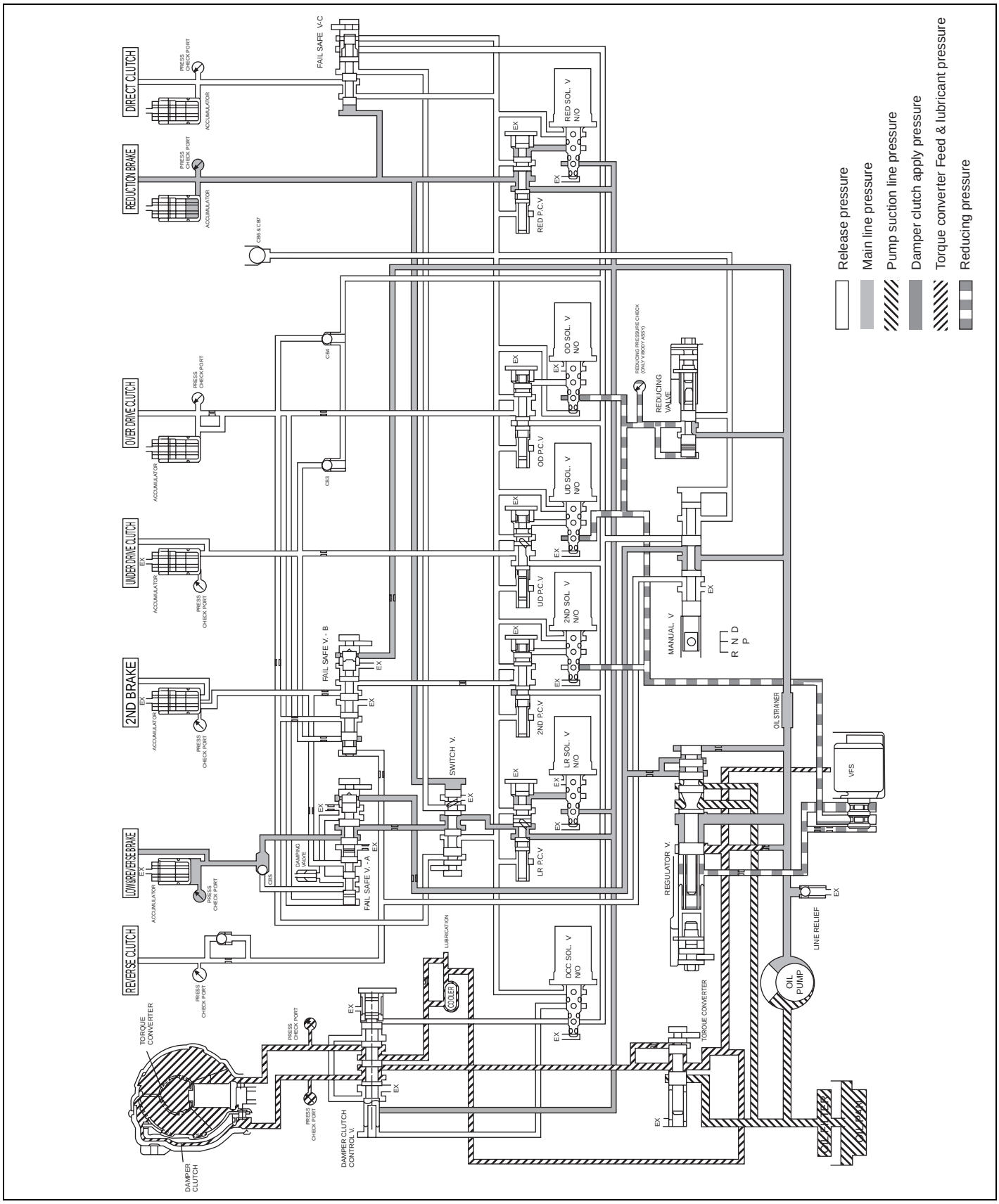
(● : Locked when driving)

FUNCTIONS OF CLUTCHES AND BRAKES

Element	Sign	Function
Underdrive clutch	UD	Connect the input shaft with the underdrive sun gear
Reverse clautch	REV	Connect the input shaft with the reverse sun gear
Overdrive clutch	OD	Connect the input shaft with the overdrive carrier
Direct clutch	DIR	Connect the direct sun gear with the direct carrier
Low & Reverse brake	LR	Fix the planetary gear and the overdrive carrier
2nd brake	2ND	Fix the reverse sun gear
Reduction brake	RED	Fix the direct sun gear
One way clutch 1	OWC 1	Control the rotational driection of the low & reverse ring gear
One way clutch 2	OWC 2	Control the rotational driection of the direct sun gear

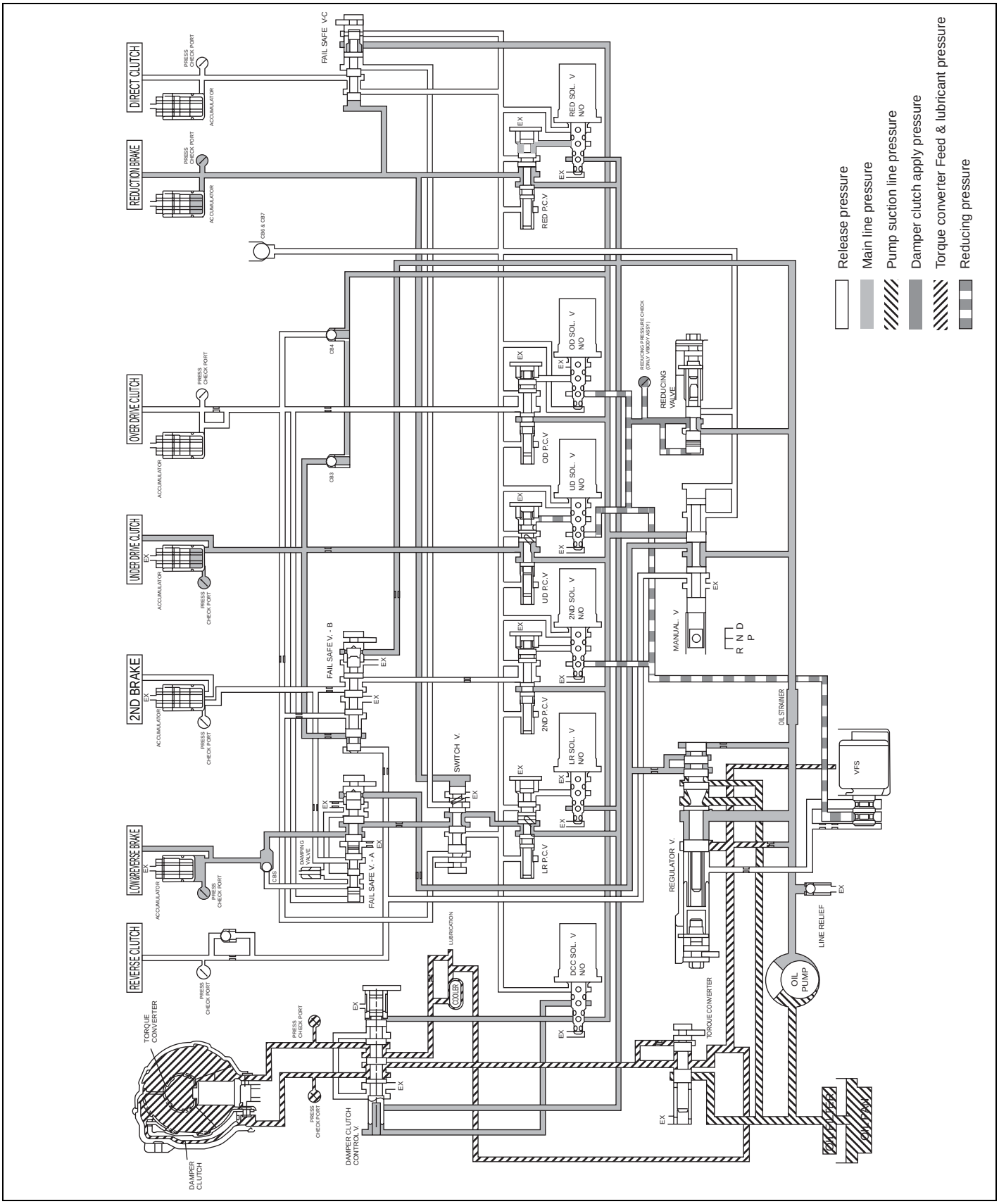
AUTOMATIC TRANSAXLE HYDRAULIC CIRCUIT

P/N



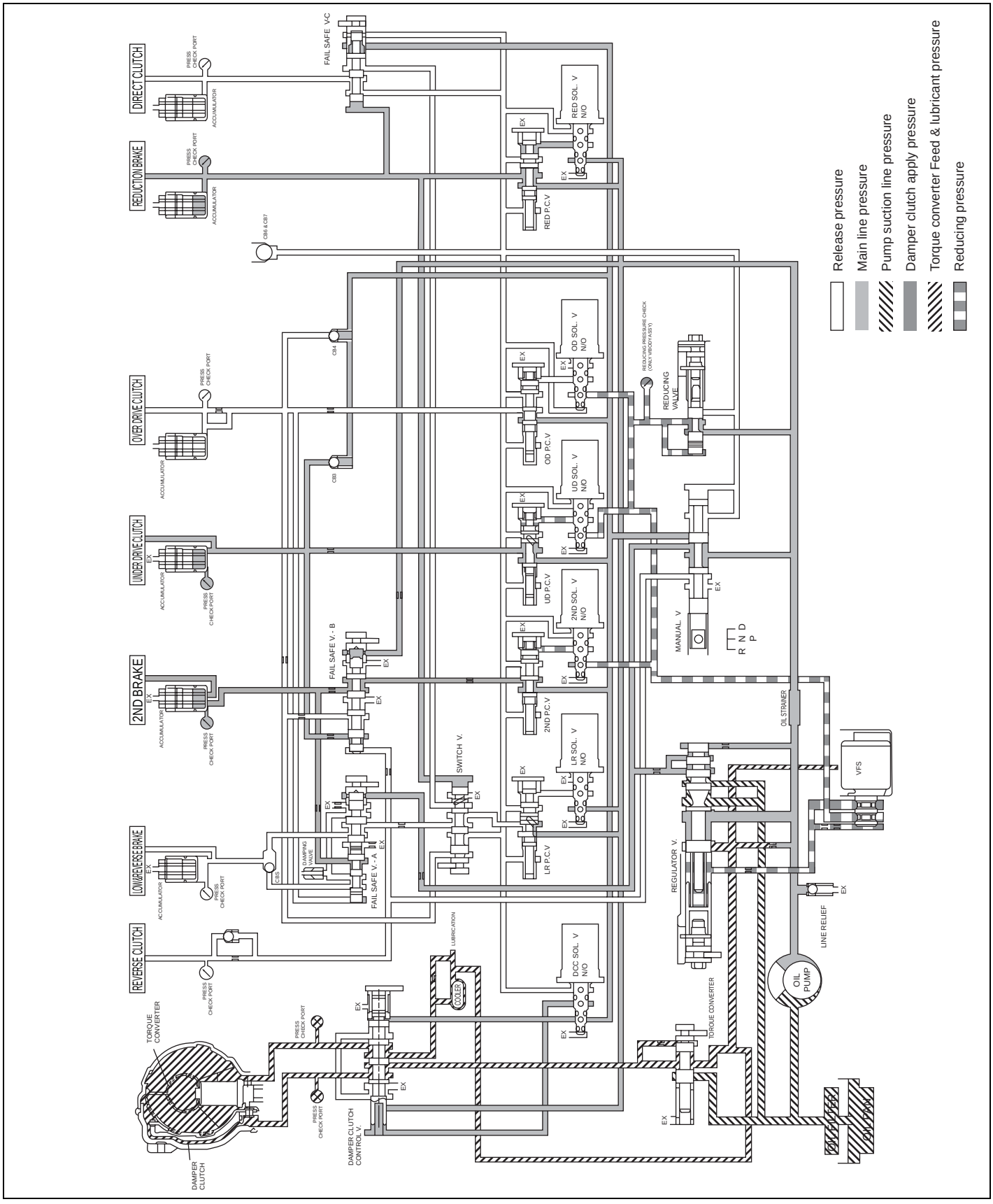
EKBF004A

D(1 RANGE)



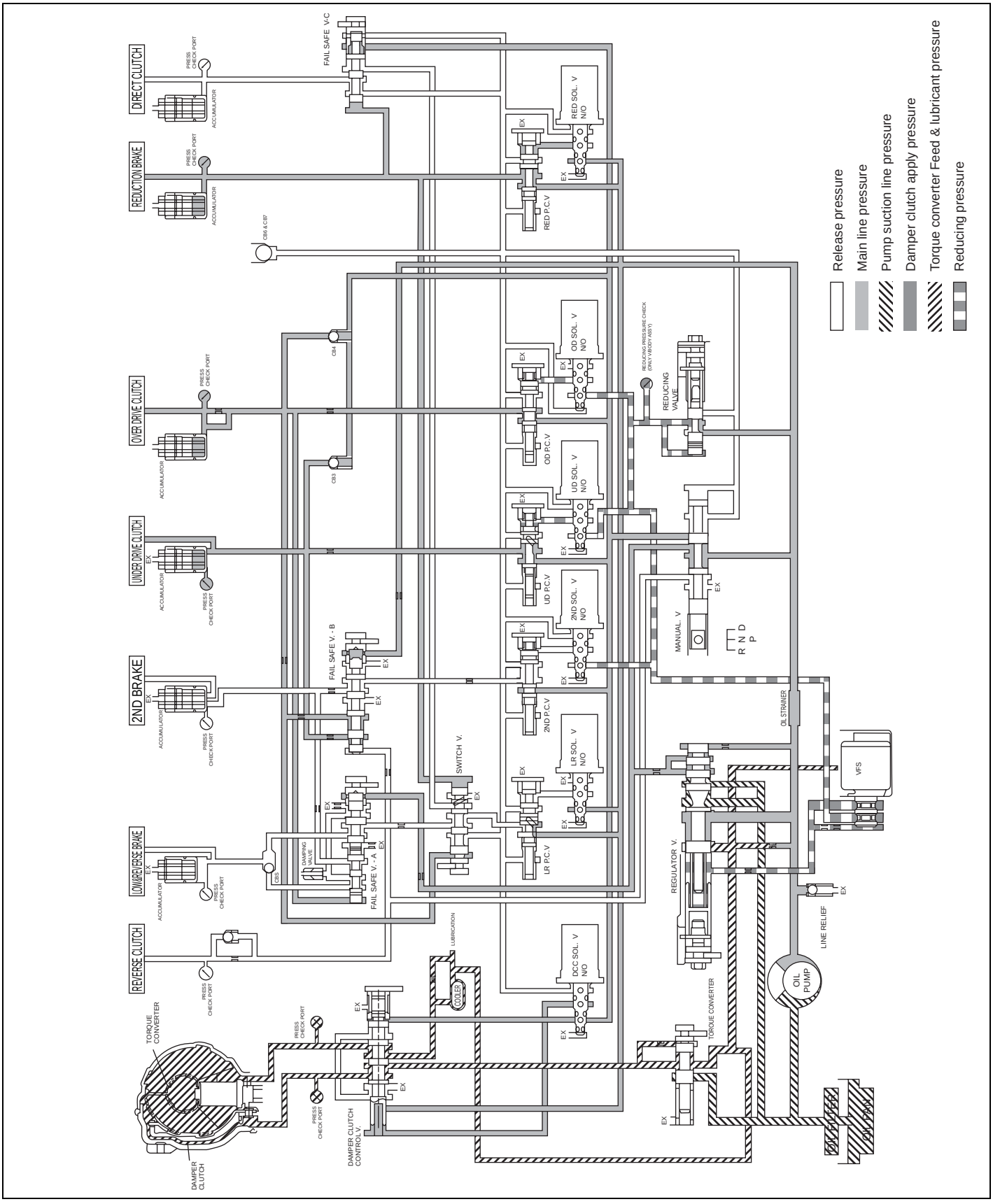
EKBF004B

D(2 RANGE)



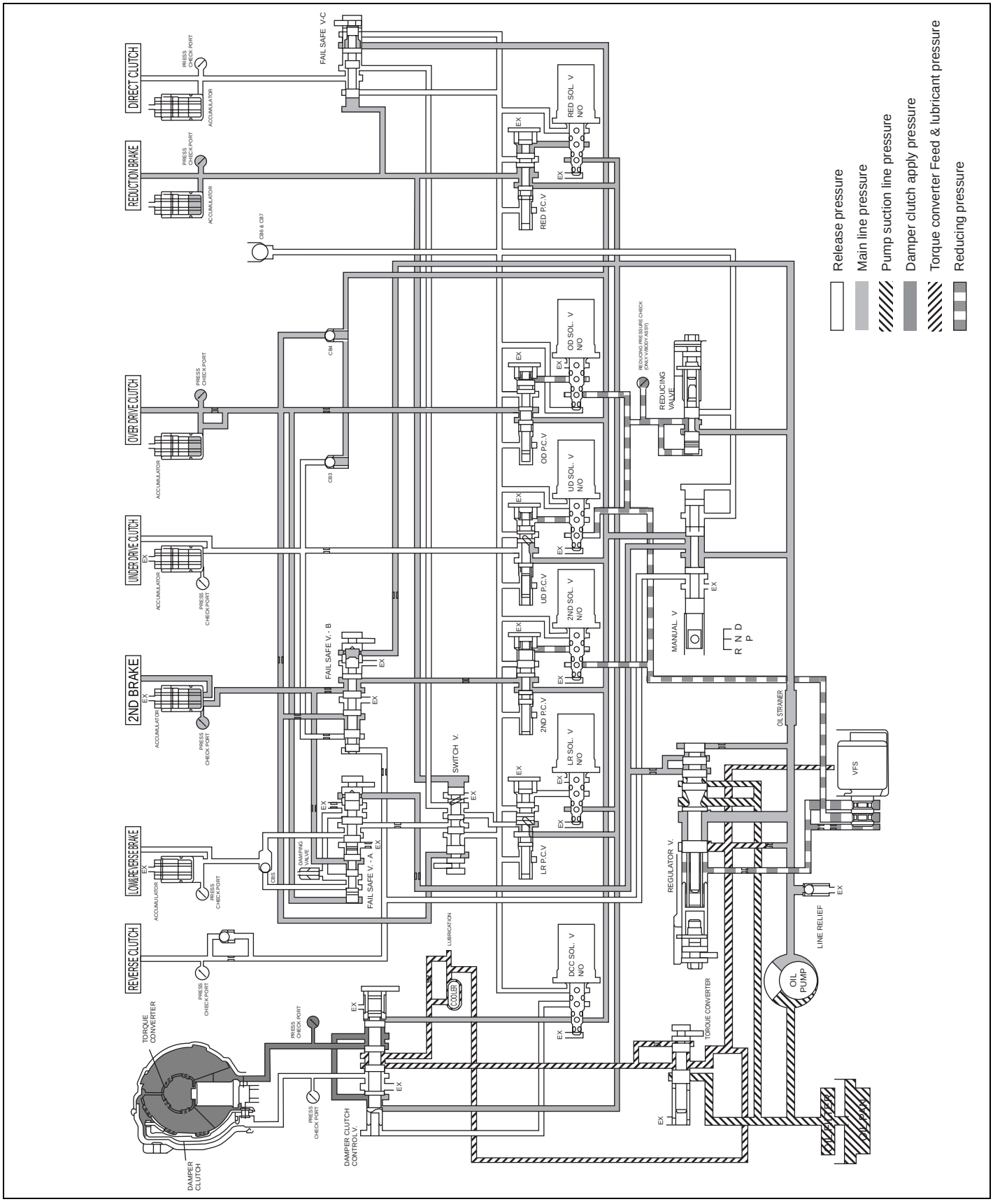
EKBF004C

D(3 RANGE)



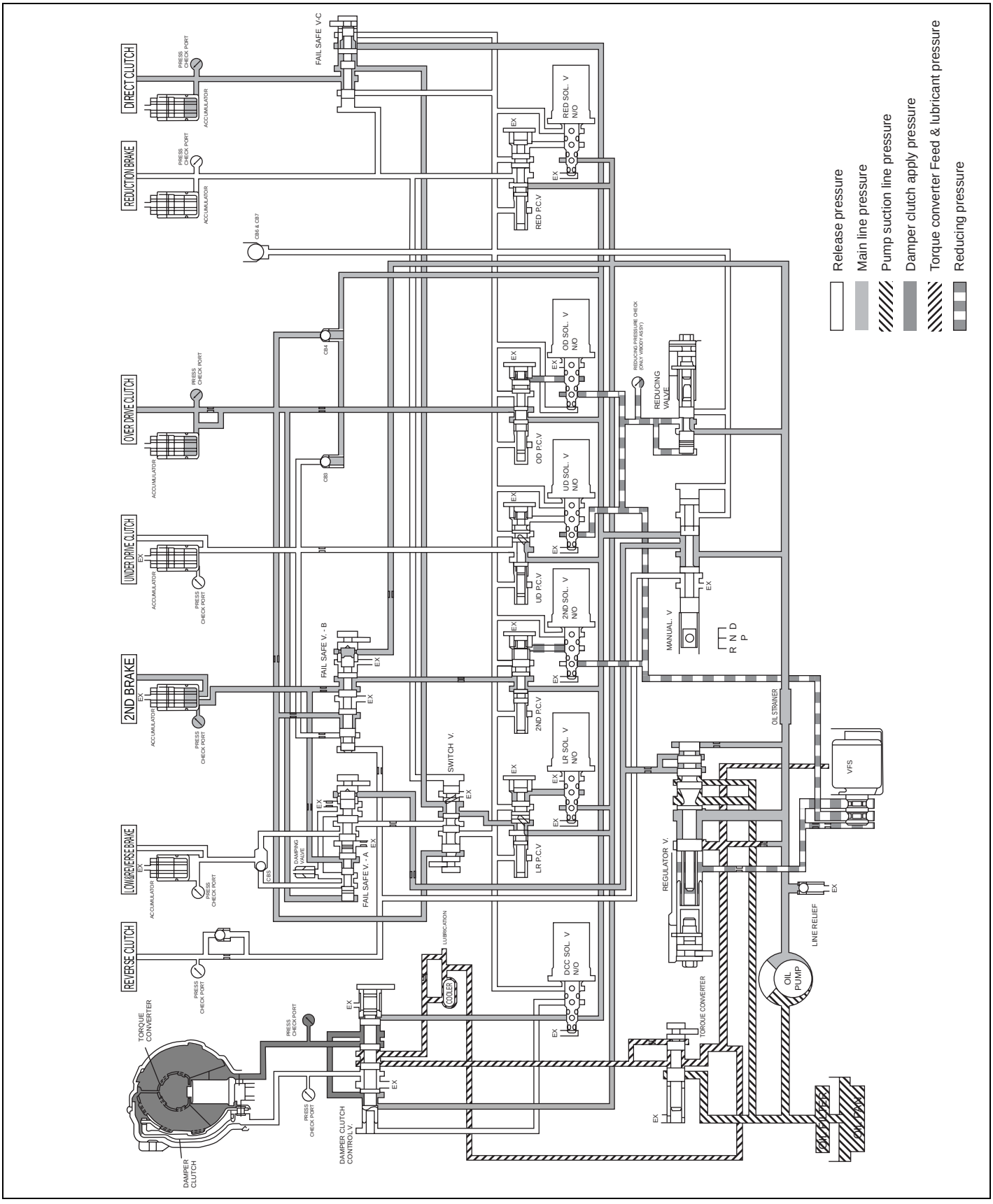
EKBF004D

D(4 RANGE)



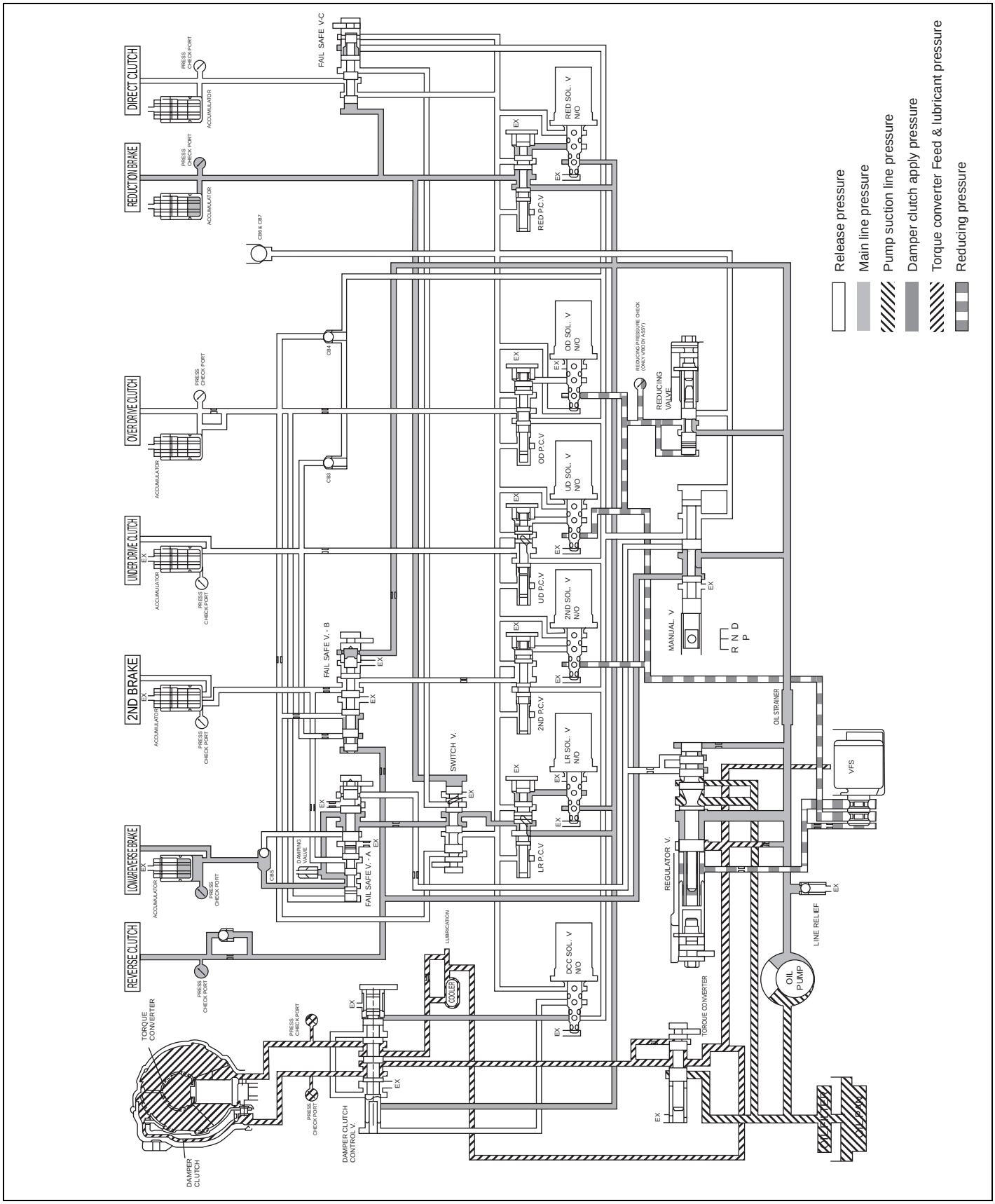
EKBF004E

D(5 RANGE)



EKBF004F

R RANGE



EKBF004G

SERVICE ADJUSTMENT PROCEDURE E15755FE

AUTOMATIC TRANSAXLE FLUID

INSPECTION

1. Drive the vehicle until the fluid reaches normal operating temperature [70~80°C(158~176°F)].
2. Place the vehicle on a level surface.
3. Move the selector lever through all gear positions. This will fill the torque converter and the hudraulic system with fluid and move the selector lever to the "N" (Neutral) or "P"(Park) position.
4. Before removing the oil level gauge, wipe all contaminants from around the oil level gauge. Then take out the oil level gauge and check the condition of the fluid.

NOTE

If the fluid smells as if it is burning, it means that the fluid has been contaminated by fine particles from the bushes and friction materials, a transaxle overhaul may be necessary.

5. Check that the fluid level is at the 75°C(167°F) mark on the oil level gauge. If the fluid level is low, add automatic transaxle fluid until the level reaches the 75°C(167°F) mark.

Auto transaxle fluid:
DIAMOND ATF SP-III, SK ATF SP-III
Quantity : 10.9ℓ (11.5 Us qt, 9.6lmp.qt)

NOTE

Low fluid level can cause a variety of a abnormal conditions because it allows the pump to take in air along with fluid. Air trapped in the hydraulic system forms bubbles, which are compressable. Therefore, pressures will be erratic, causing delayed shifting ,slipping clutches and brakes, etc. Improper filling can also raise fluid level too high. When the transaxle has too much fluid, gears churn up foam and acuise the same conditions which occur with low fluid level, resulting in accelerated deterioration of automatic transaxle fluid. In either case, air bubbles can cause overheating, and fluid oxidation, which can interfere with normal valve, clutch, and brake operation. Foaming can also result in fluid escaping from the transaxle vent where it may be mistaken for a leak.

6. Insert the oil level gauge securely.

NOTE

When new, automatic transmission fluid should be red. The red dye is added so the assembly plant can identify it as transmission fluid and distinguish it from engine oil or antifreeze. The red dye, which is not an indicator of fluid quality, is not permanent. As the vehicle is driven the transmission fluid will begin to look darker. The color may eventually appear light brown.

REPLACEMENT

If you have a fluid changer, use this changer to replace the fluid. If you do not, replace it using the following procedure.

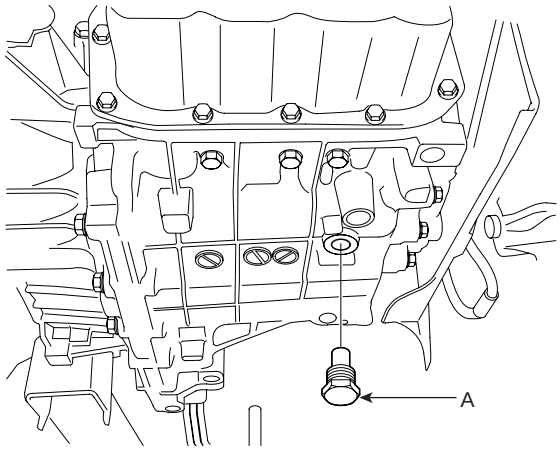
1. Disconnect the hose which connects the transmission and the oil cooler.
2. Start the engine and let the fluid drain out.

Running conditions : "N" range with engine idling.

CAUTION

The engine should be stopped within one minute after it is started. If the fluid has all drained out before then, the engine should be stopped at that point.

3. Romove the drain plug(A) from the bottom of the transmission case to drain the fluid.



KKRE004C

4. Install the drain plug via the gasket, and tighten it to the specified torque.

TORQUE :
40 ~ 50Nm (4 ~ 5 kgf.m, 29 ~ 36 lb-ft)

5. Pour the new fluid in through the oil filler tube.

CAUTION

Stop pouring if the full volume of fluid cannot be poured in.

6. Repeat the procedure in step (2).

NOTE

Check the old fluid for contamination. If it has been contaminated, repeat the steps (5) and (6).

7. Pour the new fluid in through the oil filler tube.

8. Reconnect the hose which was disconnected in step (1) above and firmly replace the oil level gauge.(In case of this "replace", this means after wiping off any dirt around the oil level gauge, insert it into the filler tube.)

9. Start the engine and run it at idle for 1~2 minutes.

10. Move the select lever through all positions, and then move it to the "N" position.

11. Drive the vehicle until the fluid temperature rises to the normal temperature [70~80°C(158~176°F)], and then check the fluid level again. The fluid level must be at the 75°C(167°F) mark.

12. Firmly insert the oil level gauge into the oil filler tube.

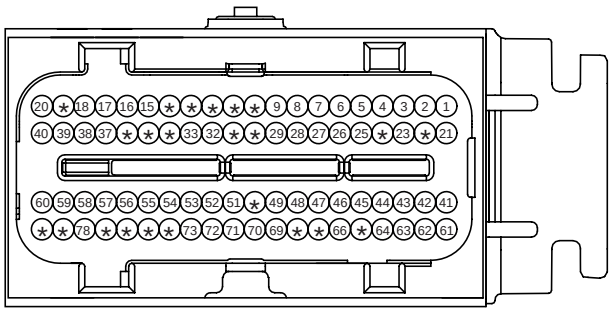
INSPECTION CHART FOR DIAGNOSIS

TROUBLE CODES (DTC) ED550A07

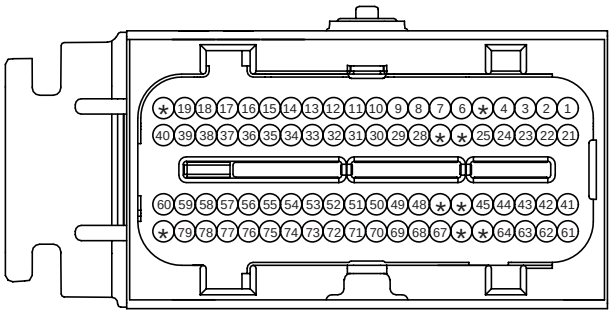
No.	Code	Item	MIL	Remark
1	P0707	TRANSAXLE RANGE SWITCH CIRCUIT LOW INPUT	ON	AT-20
2	P0708	TRANSAXLE RANGE SWITCH CIRCUIT HIGH INPUT	ON	AT-27
3	P0711	TRANSAXLE FLUID TEMPERATURE SENSOR RATIONALITY	ON	AT-30
4	P0712	TRANSAXLE FLUID TEMPERATURE SENSOR CIRCUIT LOW INPUT	ON	AT-36
5	P0713	TRANSAXLE FLUID TEMPERATURE SENSOR CIRCUIT HIGH INPUT	ON	AT-38
6	P0717	A/T INPUT SPEED SENSOR CIRCUIT - OPEN or SHORT(GND)	ON	AT-41
7	P0722	AT OUTPUT SPEED SENSOR CIRCUIT - OPEN or SHORT(GND)	ON	AT-48
8	P0731	GEAR 1 INCORRECT RATIO	ON	AT-54
9	P0732	GEAR 2 INCORRECT RATIO	ON	AT-60
10	P0733	GEAR 3 INCORRECT RATIO	ON	AT-65
11	P0734	GEAR 4 INCORRECT RATIO	ON	AT-70
12	P0735	GEAR 5 INCORRECT RATIO	ON	AT-74
13	P0741	TORQUE CONVERTER CLUTCH STUCK OFF	ON	AT-77
14	P0742	TORQUE CONVERTER CLUTCH STUCK ON	ON	AT-80
15	P0743	TORQUE CONVERTER CLUTCH CONTROL SOLENOID VALVE - OPEN or SHORT(GND)	ON	AT-83
16	P0748	VFS solenoid - OPEN or SHORT(GND)	OFF	AT-90
17	P0750	LOW and REVERSE SOLENOID VALVE CIRCUIT - OPEN or SHORT(GND)	ON	AT-97
18	P0755	UNDERDRIVE SOLENOID VALVE CIRCUIT - OPEN or SHORT(GND)	ON	AT-104
19	P0760	SECOND SOLENOID VALVE CIRCUIT - OPEN or SHORT(GND)	ON	AT-111
20	P0765	OVERDRIVE SOLENOID VALVE CIRCUIT - OPEN or SHORT(GND)	ON	AT-117
21	P0770	RED SOLENOID	ON	AT-123
22	P0885	A/T CONTROL RELAY - OPEN or SHORT(GND)	ON	AT-130
23	P0890	TCM power Relay sense circuit low	ON	AT-136
24	P0891	TCM power Relay sense circuit High	ON	AT-137

INPUT/OUTPUT SIGNAL VOLTAGE CHECK SHEET

C144-A



C144-B



SGHAT7021N

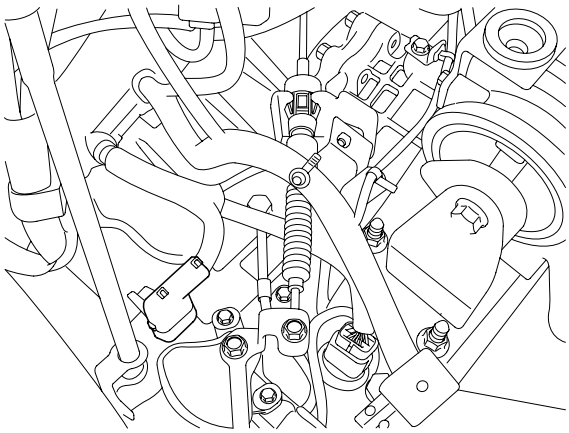
PIN No.	Check item	Condition	Input/Output value		Measurement Value	Remarks
			Type	Level		
A01	2nd CAN_HI	-	-	-	-	-
A02	2nd CAN_LO	-	-	-	-	-
A03	P Range Selection	P Position Otherwise	DC Voltage	V_BAT Max. 1.0V	12.9V 0V	
A04	R Range Selection	R Position Otherwise	DC Voltage	V_BAT Max. 1.0V	12.3V 0V	
A05	N Range Selection	N Position Otherwise	DC Voltage	V_BAT Max. 1.0V	13.2V 0V	
A06	D Range Selection	D Position Otherwise	DC Voltage	V_BAT Max. 1.0V	13.2V 0V	
A07	Select Position	Select Position Otherwise	DC Voltage	V_BAT Max. 1.0V	13.2V 0V	
A08	Up Position	Up Position Otherwise	DC Voltage	V_BAT Max. 1.0V	13.2V 0V	
A09	Down Position	Down Position Otherwise	DC Voltage	V_BAT Max. 1.0V	13.2V 0V	
A12	N.A	-	-	-	-	
A14	N.A	-	-	-	-	
A19	N.A	-	-	-	-	
A20	A/T Control Relay	Relay On Relay Off	DC Voltage	V_BAT Max. 1.0V Vpeak : Max. 70V Resistance : 680Ω	13.8V 0V -0.7V Resistance : 680Ω	
		W/H Open		DTC Spec : P0890	DTC : P0890	
A27	Diagnosis "K"	Communicated with GST	Pulse	At transmitting HI : V_BAT* 80%↑ LO : V_BAT∗20%↓ AT receiving HI : V_BAT* 70%↑ LO : V_BAT*30%↓	11.3V 0.14/ 0.32V	V_BAT : 13.2V
A31	N.A	-	-	-	-	

PIN No.	Check item	Condition	Input/Output value		Measurement Value	Remarks
			Type	Level		
A32	A/C Pressure Analog	-	-	-	-	-
A34	N.A	-	-	-	-	
A36	N.A	-	-	-	-	
A37	N.A	-	-	-	-	
A41	CAN_HI	Recessive Dominant	Pulse	2.0 ~ 3.0 V 2.75 ~ 4.5 V	3.85V 2.5V	
A42	CAN_LO	Recessive Dominant	Pulse	2.0 ~ 3.0 V 0.5 ~ 2.25 V	2.55V 1.34V	
A60	A/T PWR Source	IG Off IG On IG. Key On IG. Key Off Idle Key Off from Idle Fuse 1/2/3 Removal Condition	DC Voltage	Max. 0.5 V V_BAT MAX. +/- 75V (ECU GND) MAX. +/- 75V (ECU GND) MAX. +/- 75V (ECU GND) MAX. +/- 75V (ECU GND) MAX. +/- 75V (ECU GND)	0V 11.9V +30V / -10V or less ↑	
		W/H Open		DTC Spec : P0891	DTC : P0891	
A73	Shift Position Signal(To Cluster)	Running 1 gear 2 gear 3 gear 4 gear 5 gear	Pulse Duty ↑ ↑ ↑ ↑	HI : V_BAT LO : Max. 1.0V Freq.: 50±2Hz (Reference) 12.5±2% 27.5±2% 42.5±2% 57.5±2% 72.5±2%	N.A	Sports mode
B03	UD Solenoid	Shifting	Pulse	HI : V_BAT LO : Max. 1.0V Vpeak : Max. 70V	14.4V 0.35V 56.3V	
		W/H Open		DTC Spec : P0755	DTC : P0755	
B05	N.A	-	-	-	-	
B06	Oil temperature sensor_ATM	Idle	Analog	0.5V ~ 4.5V	4.4V 3.1V	16Hz
B09	Output speed sensor	30kph	Pulse	HI : Min. 4.0V LO : Max. 1.0V	5.08V 0.34V	
		W/H Open		DTC Spec : P0722	DTC : P0722	
B10	Input speed sensor	Idle	Pulse	HI : Min. 4.0V LO : Max. 1.0V	5.06V 0.35V	630Hz
		W/H Open		DTC Spec : P0717	DTC : P0717	
B20	N.A	-	-	-	-	
B22	LR Solenoid	Shifting	Pulse	HI : V_BAT LO : Max. 1.0V Vpeak : Max. 70V	13.9V 0.38V 56.1V	
		W/H Open		DTC Spec : P0750	DTC : P0750	

PIN No.	Check item	Condition	Input/Output value		Measurement Value	Remarks
			Type	Level		
B26	N.A	-	-	-	-	
B27	N.A	-	-	-	-	
B33	GND_Sensor	Idle	DC Voltage	Max. 50 mV	13mV	WTS & OTS_ATM
		W/H Open		DTC Spec : P0118/ 1115	DTC : P0118/ P1115	
B42	OD Solenoid	Shifting	Pulse	HI : V_BAT LO : Max. 1.0V Vpeak : Max. 70V	15.4V 0.45V 56.3V	
		W/H Open		DTC Spec : P0765	DTC : P0765	
B43	DCC solenoid	Lock_Up on	Pulse	HI : V_BAT LO : Max. 1.0V Vpeak : Max. 70V	15.4V 0.45V 56.3V	
		W/H Open		DTC Spec : P0743	DTC : P0743	
B44	RED Solenoid	Shifting	Pulse	HI : V_BAT LO : Max. 1.0V Vpeak : Max. 70V	15.4V 0.45V 56.3V	
		W/H Open		DTC Spec : P0770	DTC : P0770	
B45	2ND Solenoid	Shifting	Pulse	HI : V_BAT LO : Max. 1.0V Vpeak : Max. 70V	15.4V 0.45V 56.3V	
		W/H Open		DTC Spec : P0760	DTC : P0760	
B46	N.A	-	-	-	-	
B47	N.A	-	-	-	-	
B59	Variable Solenoid (-)	Idle	Pulse	HI : V_BAT LO : Max. 1.0V Vpeak : Max. 70V	1.8/1.2V - N range 0.03V(DC) - D range	600Hz
		W/H Open		DTC Spec : P0748	DTC : P0748	
B65	N.A	-	-	-	-	
B66	N.A	-	-	-	-	
B75	Variable Solenoid (+)	Idle	Pulse	HI : V_BAT LO : Max. 1.0V Vpeak : Max. 70V	13.1V -0.07V	
		W/H Open		DTC Spec : P0748	DTC : P0748	
B80	N.A	-	-	-	-	

DTC P0707 TRANSAXLE RANGE SWITCH - LOW INPUT

COMPONENT LOCATION EE4D3EED



AKKF102A

GENERAL DESCRIPTION ED2BF04B

The Transaxle Range Switch sends the shift lever position information to the TCM(PCM) using a 12V (battery voltage) signal. When the shift lever is in the D (Drive) position the output signal of Transaxle Range Switch is 12V and in all other positions the voltage is 0V. The TCM(PCM) judges the shift lever position by reading all signals, for the Transaxle Range Switch, simultaneously.

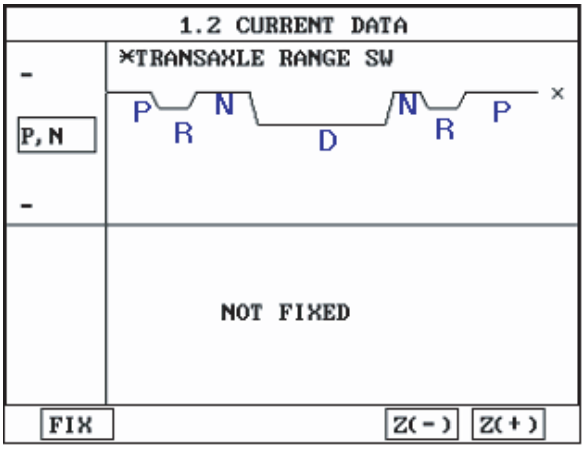
DTC DESCRIPTION EE756E84

The TCM(PCM) sets this code when the Transaxle Range Switch has no output signal for more than 30 seconds.

DTC DETECTING CONDITION E1F42537

Item	Detecting Condition	Possible cause
DTC Strategy	• Check for no signal	• Open or short in circuit • Faulty Shift cable adjustment • Faulty Inhibitor switch and Manual control lever position adjustment • Faulty TRANSAXLE RANGE SWITCH • Faulty TCM(PCM)
Enable Conditions	• Engine state = "RUN" • 11V ≤ Battery Voltage ≤ 16V • TPS ≥ 3%	
Threshold value	• No signal detected	
Diagnostic Time	• More than 30seconds	
Fail Safe	• Recognition as previous signal. - When P-D or R-D or D-R SHIFT is detected, it is regarded as N-D or N-R though "N" signal is not detected - When sports mode S/W is ON without P,R,N, D-RANGE signals, it is regarded sports mode. (DTC is not set)	

SIGNAL WAVEFORM E53BCE55



EKBF100A

MONITOR SCANTOOL DATA EC38DBFA

1. Connect scantool to data link connector(DLC).
2. Ignition "ON" & Engine "OFF".
3. Monitor the "TRANSAXLE RANGE SWITCH" parameter on the scantool.
4. Shift selector lever from "P" range to "D" range.

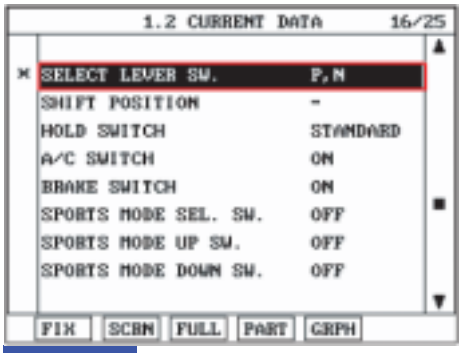


FIG.1)

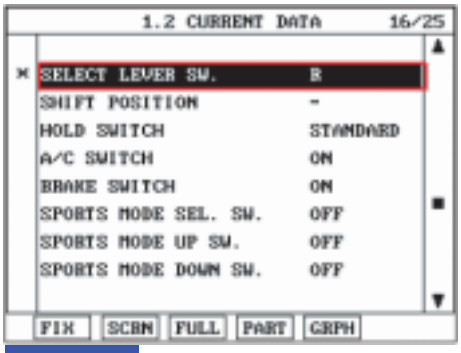


FIG.2)

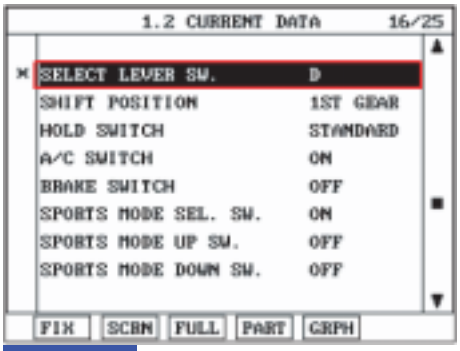


FIG.3)

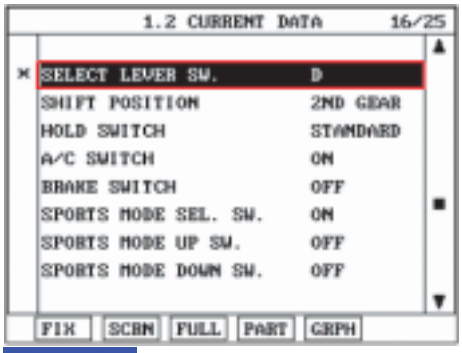


FIG.4)

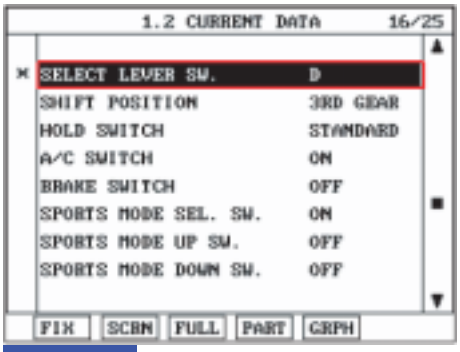


FIG.5)

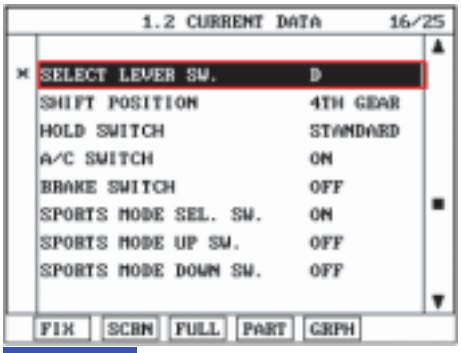


FIG.6)

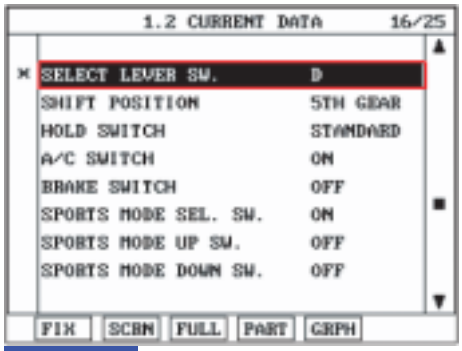


FIG.7)

FIG. 1) "P,N" Range
FIG. 2) "R" Range
FIG. 3) "D" Range 1st gear
FIG. 4) "D" Range 2nd gear
FIG. 5) "D" Range 3re gear
FIG. 6) "D" Range 4th gear
FIG. 7) "D" Range 5th gear

LLLG100A

5. Does "TRANSAXLE RANGE SWITCH" follow the reference data?

YES

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

NO

▶ Go to "Terminal & connector inspection" procedure.

※ Most of fault that happen about inhibitor switch, result from faulty shift cable adjustment or incorrect location of manual control lever and inhibitor switch. So, when DTC which related Inhibitor switch or engine start defectiveness at "P" range happen, After check the shift cable adjustment or location of manual control lever and inhibitor switch, repair or replace as necessary.

TERMINAL & CONNECTOR INSPECTION E27B0D0A

1. Many malfunctions in the electrical system are caused by poor harness and terminal condition. 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 supply circuit inspection" procedure.

POWER SUPPLY CIRCUIT INSPECTION EE009CEB

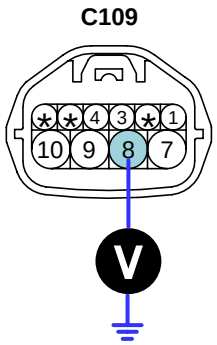
1. CHECK POWER TO RANGE SWITCH

   1) Disconnect "TRANSAXLE RANGE SWITCH" connector.

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

   3) Measure voltage between terminal "8" of the sensor harness connector and chassis ground.

Specification : approx. B+



1. D Range
3. P Range
4. N Range
7. R Range
8. Power supply IG1
9. Starting circuit
10. Starting circuit

SGHAT7100N

   4) Is voltage within specifications?

YES

▶ Go to "Signal circuit inspection" procedure.

NO

▶ Check that Fuse 10A is installed or not blown.
▶ Check for open in harness. Repair as necessary and go to "Verification of vehicle repair" procedure.

SIGNAL CIRCUIT INSPECTION E1FC0AA7

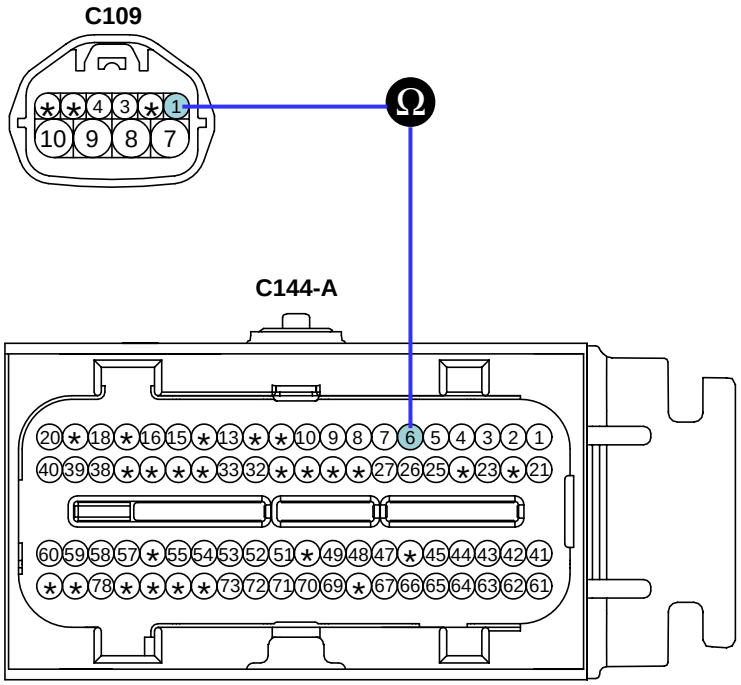
1. Ignition "OFF".

2. Disconnect "TRANSAXLE RANGE SWITCH" and "TCM(PCM)" connector.

3. Measure resistance between each terminal of the sensor harness connector and TCM(PCM) harness connector as below.

Specification :

Pin No of "TRANSAXLE RANGE SWITCH"	C109 No.1	C109 No.3	C109 No.4	C109 No.7
Pin No of "PCM" harness	C144-A No.6	C144-A No.3	C144-A No.5	C144-A No.4
Specification	0Ω	0Ω	0Ω	0Ω



1. D Range
2. P Range
4. N Range
7. R Range
8. Power supply IG1
9. Staring circuit
10. Starting circuit

3. P Range
4. R Range
5. N Range
6. D Range

SGHAT7101N

4. Is resistance within specifications?

YES

▶ Go to "Component inspection" procedure.

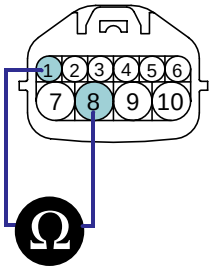
NO

▶ Check for Open in harness. Repair as necessary and Go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION E7FE177B

1. Ignition "OFF".
2. Remove "TRANSAXLE RANGE SWITCH".
3. Measure the resistance between each terminal of the sensor.

Specification : approx. 0 Ω



C109
Component side

1. D Range
3. P Range
4. N Range
7. R Range
8. Power supply IG1
9. Starting circuit
10. Starting circuit

Terminal \ Range	P	R	N	D	3	2	L
1				●			
2						●	
3	●						
4			●				
5					●		
6							●
7		●					
8	●	●	●	●	●	●	●
9	●		●				
10	●		●				

[RANGE SWITCH continuity check table (Case of SPORTS MODE vehicle has no 3,2,L range)]

SGHAT7102N

4. Is resistance within specifications?

YES

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

NO

▶ Replace "TRANSAXLE RANGE SWITCH" as necessary and Go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR EBDAA27F

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

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scantool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present?

YES

▶ Go to the applicable troubleshooting procedure.

NO

▶ System performing to specification at this time.

DTC P0708 TRANSAXLE RANGE SWITCH - HIGH INPUT

COMPONENT LOCATION ED85A23F

Refer to DTC P0707.

GENERAL DESCRIPTION E81531E6

Refer to DTC P0707.

DTC DESCRIPTION EAFEDA52

Refer to DTC P0707.

DTC DETECTING CONDITION E57893BF

Item	Detecting Condition	Possible cause
DTC Strategy	• Check for No signal	• Open or short in TRANSAXLE RANGE SWITCH • Faulty Shift cable adjustment • Faulty Inhibitor switch and Manual control lever position adjustment • Faulty TRANSAXLE RANGE SWITCH • Faulty PCM
Enable Conditions	• Engine state = "RUN" • 11V ≤ Battery Voltage ≤ 16V • TPS ≥ 3%	
Threshold value	• Multiple signal	
Diagnostic Time	• More than 30sec	
Fail Safe	• Recognition as previous signal - When signal is input "D" and "N" at the same time, TCM regards it as "N" RANGE - After PCM/TCM Reset, If the if the PCM/TCM detects multiple signal or no signal, then it holds the 3rd gear position	

SIGNAL WAVEFORM EDAD934C

Refer to DTC P0707.

MONITOR SCANTOOL DATA EFE346BF

Refer to DTC P0707.

TERMINAL & CONNECTOR INSPECTION EC716F3B

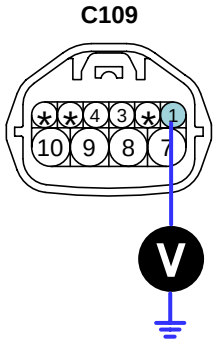
Refer to DTC P0707.

POWER SUPPLY CIRCUIT INSPECTION E2632C56

1. Disconnect "TRANSAXLE RANGE SWITCH" connector.
2. Ignition "ON" & Engine "OFF".
3. Measure voltage between each terminal of the sensor harness connector and chassis ground.

Specification :

TERMINAL (C109)	1	3	4	7	8	9	10
SPECIFICATION	0V	0V	0V	0V	0V	0V	0V



1. D Range
3. P Range
4. N Range
7. R Range
8. Power supply IG1
9. Starting circuit
10. Starting circuit

SGHAT7103N

4. Is voltage within specifications?

YES

▶ Go to "Signal circuit inspection" procedure.

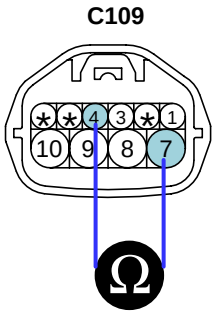
NO

▶ Check for Short in harness. Repair as necessary and Go to "Verification of Vehicle Repair" procedure.

SIGNAL CIRCUIT INSPECTION ECBCEA9E

1. Ignition "OFF".
2. Disconnect "TRANSAXLE RANGE SWITCH" and "TCM(PCM)" connector.
3. Measure resistance between each terminals of the sensor harness to check for Short.

Specification : Infinite



1. D Range
3. P Range
4. N Range
7. R Range
8. Power supply IG1
9. Starting circuit
10. Starting circuit

SGHAT7104N

4. Is resistance within specifications?

YES

▶ Go to "Component inspection" procedure.

NO

▶ Check for Short in harness. Repair as necessary and Go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION E0AABF6E

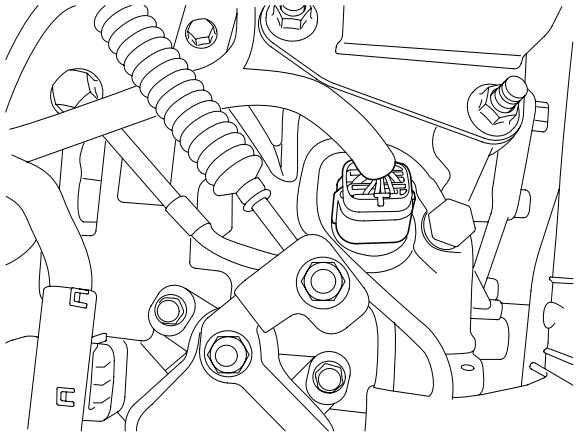
Refer to DTC P0707.

VERIFICATION OF VEHICLE REPAIR EDAAC2A6

Refer to DTC P0707.

DTC P0711 TRANSAXLE FLUID TEMPERATURE SENSOR RATIONALITY

COMPONENT LOCATION E03A1BA5



AKKF104A

GENERAL DESCRIPTION E43A4BD2

The automatic TRANSAXLE fluid(ATF) temperature sensor is installed in the Valve Body. This sensor uses a thermistor whose resistance changes according to the temperature changes. The TCM supplies a 5V reference voltage to the sensor, and the output voltage of the sensor changes when the ATF temperature varies. The automatic TRANSAXLE fluid(ATF) temperature provides very important data for the TCM's control of the Torque Converter Clutch, and is also used for many other purposes.

DTC DESCRIPTION ECF1EE4A

This DTC code is set when the ATF temperature output voltage is lower than a value generated by thermistor resistance, in a normal operating range, for approximately 1 second or longer. The TCM regards the ATF temperature as fixed at a value of 80°C(176°F).

DTC DETECTING CONDITION ED8929BD

Item	Detecting Condition	Possible cause
DTC Strategy	• Check rationality	• Sensor signal circuit is short to ground • Faulty sensor • Faulty PCM
Enable Conditions 1)	• Intake air temperature ≥ -25°C(-13°F) • Engine state = RUN • No error with relations other sensors • Engine be cooled sufficiently	
Enable Conditions 2)	• Engine state = RUN • Average start up temperature of TM stuck diagnostic ≤ 55°C(131°F)	
Threshold Value 1)	• ATF Temp - Coolant Temp ≥ 20°C(68°F)	
Threshold Value 2)	• ATF Temp - TM start up Temp ≤ 0.5°C(32.9°F)	
Diagnostic Time 1)	• more than 1 second	
Diagnostic Time 2)	• more than 900 seconds	
Fail Safe	• Learning control and Intelligent shift are inhibited • Fluid temperature is regarded as 80°C(176°F)	

SPECIFICATION EC92ACC5

TEMP.[°C(°F)]	Resistance(kΩ)	TEMP.[°C(°F)]	Resistance(kΩ)
-40(-40)	139.5	80(176)	1.08
-20(-4)	47.7	100(212)	0.63
0(32)	18.6	120(248)	0.38
20(68)	8.1	140(284)	0.25
40(104)	3.8	160(320)	0.16
60(140)	1.98		

MONITOR SCANTOOL DATA EAE303A4

1. Connect scantool to data link connector(DLC).
2. Engine "ON".
3. Monitor the "TRANSAXLE FLUID TEMPERATURE SENSOR" parameter on the scan tool.

Specification : Increasing Gradually

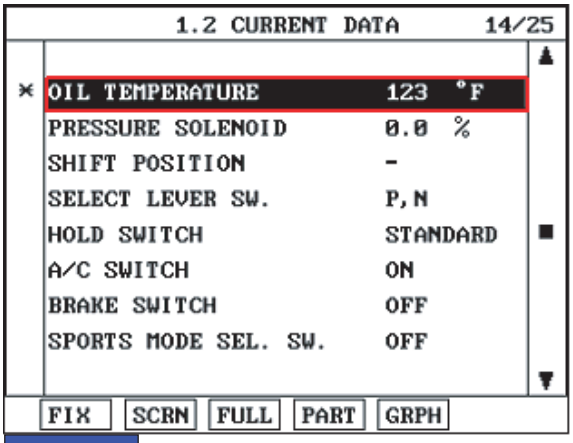


FIG.1)

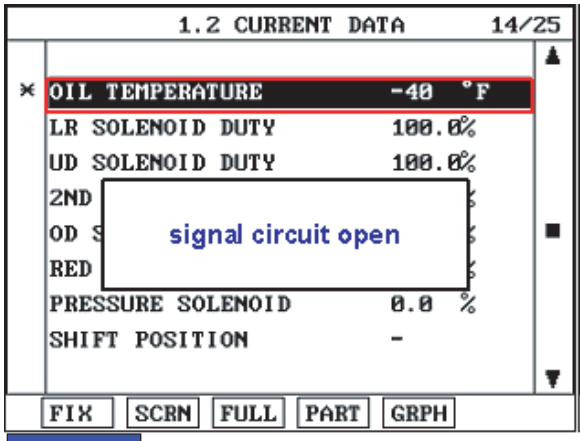


FIG.2)

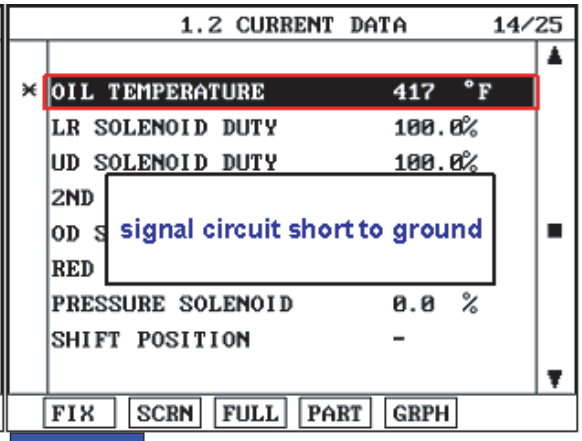


FIG.3)

FIG.1) Normal
FIG.2) Signal harness Open
FIG.3) Signal harness Short

SGHAT7160N

4. Does "TRANSAXLE FLUID TEMPERATURE SENSOR " follow the reference data?

YES

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

NO

▶ Go to "Terminal & connector inspection" procedure.

TERMINAL & CONNECTOR INSPECTION E97BC393

1. Many malfunctions in the electrical system are caused by poor harness and terminal condition. 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.

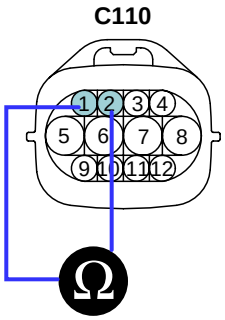
NO

▶ Go to "Component inspection" procedure.

COMPONENT INSPECTION EF3E03CC

1. CHECK "TRANSAXLE FLUID TEMPERATURE SENSOR"
   1) Ignition "OFF".
   2) Disconnect the "TRANSAXLE FLUID TEMPERATURE SENSOR" connector.
   3) Measure the resistance between terminals "1" and "2" of the "TRANSAXLE FLUID TEMPERATURE SENSOR".

Specification : Refer to "Reference data"



1.TRANSAXLE FLUID TEMPERATURE SENSOR
2.Sensor ground

SGHAT7106N

[REFERENCE DATA]

TEMP.[°C(°F)]	Resistance(kΩ)	TEMP.[°C(°F)]	Resistance(kΩ)
-40(-40)	139.5	80(176)	1.08
-20(-4)	47.7	100(212)	0.63
0(32)	18.6	120(248)	0.38
20(68)	8.1	140(284)	0.25
40(104)	3.8	160(320)	0.16
60(140)	1.98		

4) Is resistance within specifications?

YES

▶ Go to "CHECK PCM/TCM" as below.

NO

▶ Replace "TRANSAXLE FLUID TEMPERATURE SENSOR" as necessary and Go to "Verification of Vehicle Repair" procedure.

2. CHECK TCM

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

2) Connect "TRANSAXLE FLUID TEMPERATURE SENSOR" connector.

3) Install scan tool and select a SIMU-SCAN.

4) Simulate voltage (0→5V) to "TRANSAXLE FLUID TEMPERATURE SENSOR" signal circuit.

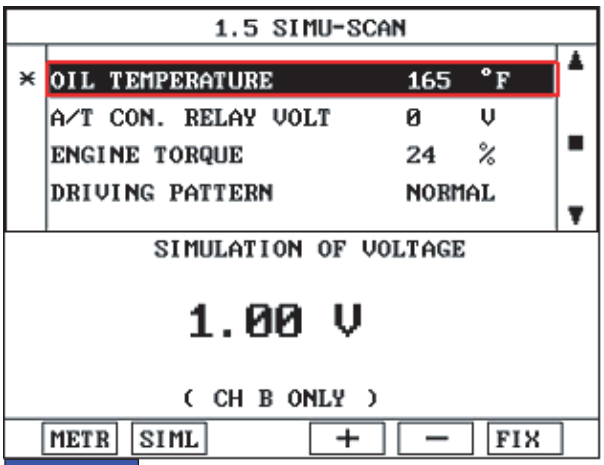


FIG.1)

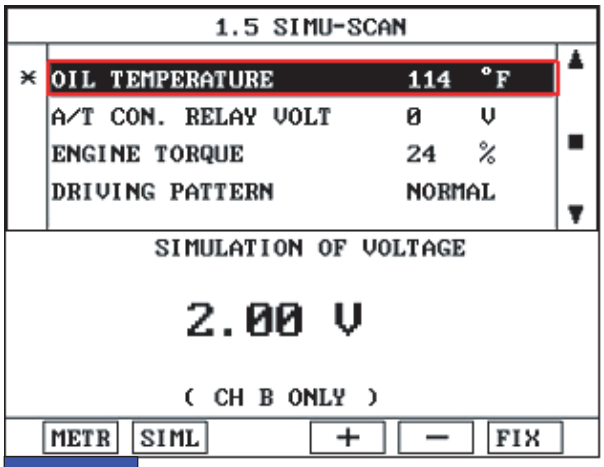


FIG.2)

FIG.1) INPUT 1.00V → 165˚F
FIG.2) INPUT 2.00V → 114˚F

※The values are subject to change according to vehicle model or conditions.

SGHAT7161N

5) Is FLUID TEMP. SENSOR signal value changed according to simulation voltage?

YES

▶ 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

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

VERIFICATION OF VEHICLE REPAIR EC5C60EF

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

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scantool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present?

YES

▶ Go to the applicable troubleshooting procedure.

NO

▶ System performing to specification at this time.

DTC P0712 FLUID(OIL) TEMPERATURE SENSOR CIRCUIT - LOW

COMPONENT LOCATION E4F151D4

Refer to DTC P0711.

GENERAL DESCRIPTION EDFD0B97

Refer to DTC P0711.

DTC DESCRIPTION EDC2AFD8

Refer to DTC P0711.

DTC DETECTING CONDITION EDC3D3F9

Item	Detecting Condition	Possible cause
DTC Strategy	• Check rationality	• Sensor signal circuit is short to ground • Faulty sensor • Faulty PCM
Enable Conditions	• Engine state = RUN	
Threshold Value	• voltage ＜0.07V	
Diagnostic Time	• more than 1sec	
Fail Safe	• Learning control and Intelligent shift are inhibited • Fluid temperature is regarded as 80°C(176°F)	

SPECIFICATION EDE9DF4E

Refer to DTC P0711.

MONITOR SCANTOOL DATA E3D8BA85

Refer to DTC P0711.

TERMINAL & CONNECTOR INSPECTION ECB87AAB

1. Many malfunctions in the electrical system are caused by poor harness and terminal condition. 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.

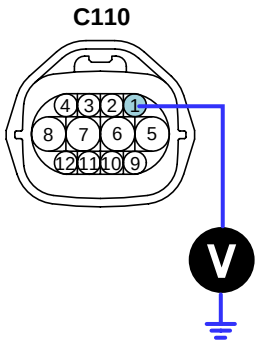
NO

▶ Go to "Signal circuit inspection" procedure.

SIGNAL CIRCUIT INSPECTION E3AFA11D

1. Ignition "ON" & Engine "OFF".
2. Disconnect the "TRANSAXLE FLUID TEMPERATURE SENSOR" connector.
3. Measure the voltage between terminal "1" of the "TRANSAXLE FLUID TEMPERATURE SENSOR" harness connector and chassis ground.

Specification : Approx. 5 V



1.TRANSAXLE FLUID TEMPERATURE SENSOR
2.Sensor ground

SGHAT7105N

4. Is voltage within specifications ?

YES

▶ Go to "Component Inspection" procedure.

NO

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

COMPONENT INSPECTION EB20B7F9

Refer to DTC P0711.

VERIFICATION OF VEHICLE REPAIR E599D2B6

Refer to DTC P0711.

DTC P0713 FLUID(OIL) TEMPERATURE SENSOR CIRCUIT - HIGH

COMPONENT LOCATION EB5F9840

Refer to DTC P0711.

GENERAL DESCRIPTION EEFCE099

Refer to DTC P0711.

DTC DESCRIPTION EE5CED1E

This DTC code is set when the ATF temperature output voltage is higher than a value generated by thermistor resistance, in a normal operating range, for an extended period of time. The TCM regards the ATF temperature as fixed at a value of 80°C(176°F).

DTC DETECTING CONDITION E6E033AC

Item	Detecting Condition	Possible cause
DTC Strategy	• Check for Voltage range	• Sensor signal circuit is short to ground • Faulty sensor • Faulty PCM
Enable Conditions	• Intake air temperature ≥ -23.5°C(-10.3°F) • Engine state = RUN	
Threshold Value	• voltage ≥4.9V	
Diagnostic Time	• more than 1sec	
Fail Safe	• Learning control and Intelligent shift are inhibited • Fluid temperature is regarded as 80°C(176°F)	

SPECIFICATION EE61CE8C

Refer to DTC P0711.

MONITOR SCANTOOL DATA EFC240FD

Refer to DTC P0711.

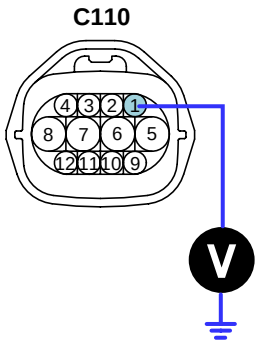
TERMINAL & CONNECTOR INSPECTION EE7F6E1A

Refer to DTC P0712.

SIGNAL CIRCUIT INSPECTION E2B37C23

1. Ignition "OFF".
2. Disconnect the "TRANSAXLE FLUID TEMPERATURE SENSOR" connector.
3. Measure the voltage between terminal "1" of the "TRANSAXLE FLUID TEMPERATURE SENSOR" harness connector and chassis ground.

Specification : Approx. 5 V



1.TRANSAXLE FLUID TEMPERATURE SENSOR
2.Sensor ground

SGHAT7105N

4. Is voltage within specifications ?

YES

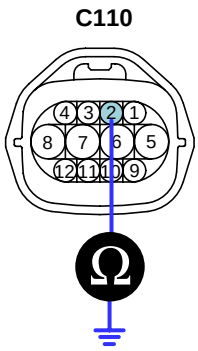
▶ Go to "Ground circuit inspection" procedure.

NO

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

GROUND CIRCUIT INSPECTION EEC8BF82

1. Ignition "OFF".
2. Disconnect the "TRANSAXLE FLUID TEMPERATURE SENSOR" connector.
3. Measure the resistance between terminal "2" of the "TRANSAXLE FLUID TEMPERATURE SENSOR" harness connector and chassis ground.



1.TRANSAXLE FLUID TEMPERATURE SENSOR
2.Sensor ground

SGHAT7107N

4. Is resistance within specifications ?

YES

▶ Go to "Component inspection" procedure.

NO

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

COMPONENT INSPECTION EE361EED

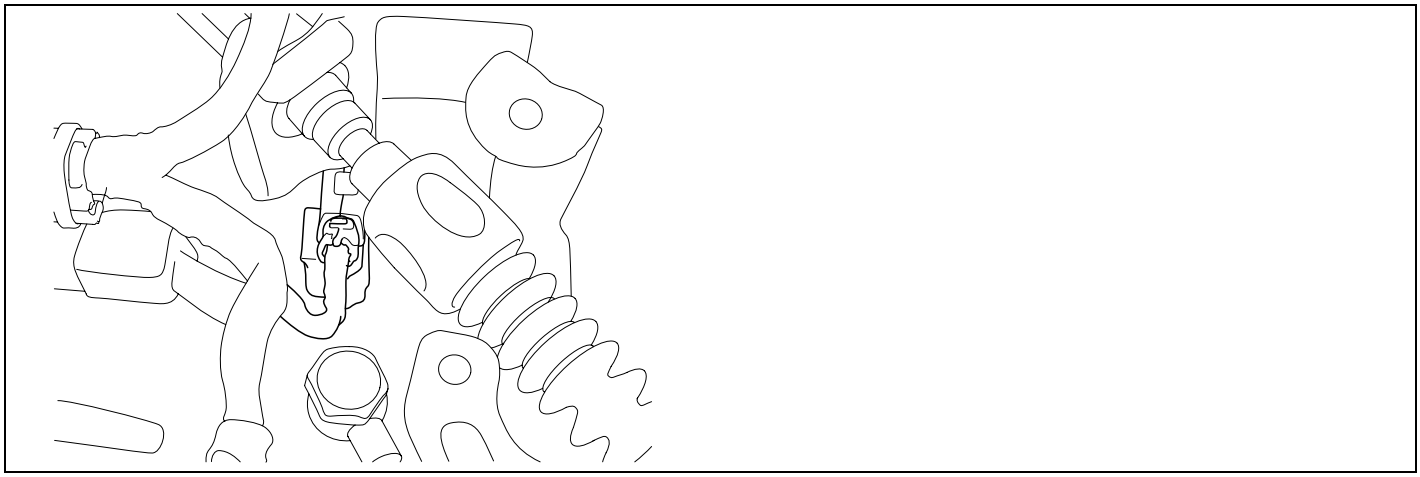
Refer to DTC P0711.

VERIFICATION OF VEHICLE REPAIR EF2754EA

Refer to DTC P0711.

DTC P0717 INPUT SPEED SENSOR CIRCUIT - NO SIGNAL

COMPONENT LOCATION EFFADF59



SCMAA6108N

GENERAL DESCRIPTION E88C21BD

The input(turbine) speed sensor outputs pulse-signals according to the revolutions of the input shaft of the transmission. The TCM determines the input shaft speed by counting the frequency of the pulses. This value is mainly used to control the optimum fluid pressure during shifting.

DTC DESCRIPTION E4DEAF05

The TCM sets this code if an output pulse-signal is not detected, from the input speed sensor, when the vehicle is running faster than 30 km/h. The Fail-Safe function will be set by the TCM if this code is detected.

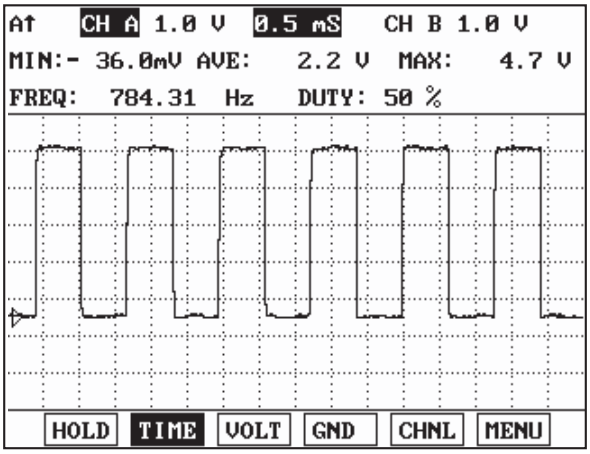
DTC DETECTING CONDITION E4C646CD

Item	Detecting Condition	Possible cause
DTC Strategy	• Speed rationality check	• Signal circuit is open or short. • Sensor power circuit is open • Sensor ground circuit is open • Faulty INPUT SPEED SENSOR • Faulty PCM/TCM
Enable Conditions	• Vehicle speed is over 19 Mile/h(30 Km/h) and Ne≥ 1000rpm in D,3,2,L(A/T range switch) and SP(SPORTS MODE) • 11V ≤ Battery Voltage ≤ 16V • TM oil temperature ≥ -23°C(-9.4°F)	
Threshold value	• No signal	
Diagnostic Time	• More than 1sec	
Fail Safe	• Locked into 3rd or 2nd gear • Manual shifting is possible(2nd → 3rd, 3rd → 2nd)	

SPECIFICATION E77FC675

Input shaft & Output shaft speed sensor
- Type : Hall sensor
- Current consumption : 22mA(MAX)
- Sensor body and sensor connector have been unified as one.

SIGNAL WAVEFORM E2FC1327



EKBF105A

MONITOR SCANTOOL DATA E035FD1E

1. Connect scan tool to data link connector(DLC).
2. Engine "ON".
3. Monitor the "INPUT SPEED SENSOR" parameter on the scantool.
4. Driving at speed of over 19 Mile/h(30 Km/h).

Specification : Increasing Gradually

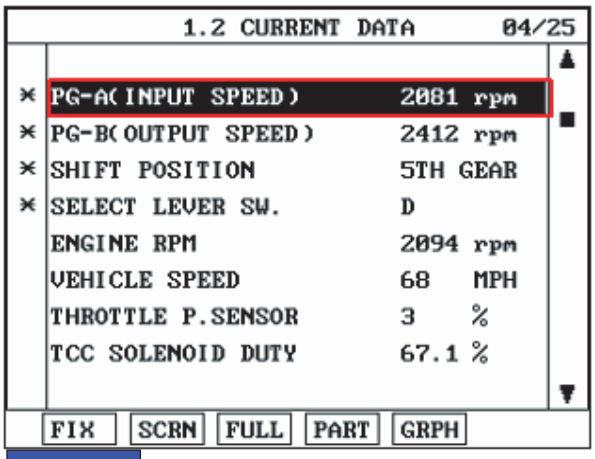


FIG.1)

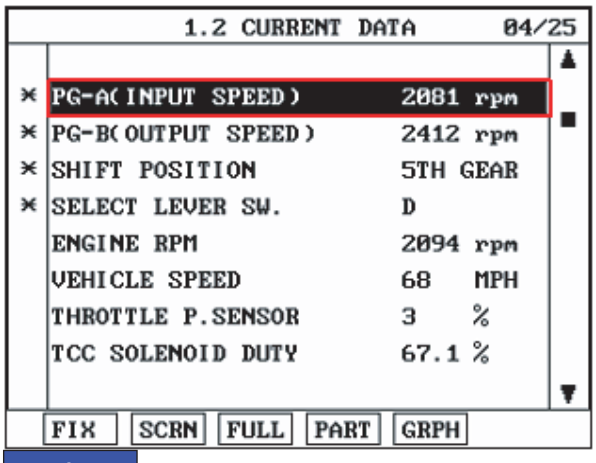


FIG.2)

FIG.1) Idling
FIG.2) Accelerating

SCMAT6331L

5. Does "Input speed sensor" follow the reference data?

YES

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

NO

▶ Go to "Terminal & connector inspection" procedure.

TERMINAL & CONNECTOR INSPECTION EA24F24B

1. Many malfunctions in the electrical system may be caused from poor harness and terminal condition. These faults can 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.

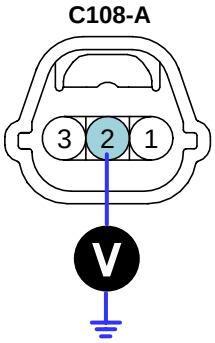
NO

▶ Go to "Signal circuit inspection" procedure.

SIGNAL CIRCUIT INSPECTION E8FFDD2C

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

Specification : approx. 5V



1. Sensor ground
2. **Input speed sensor**
3. Power supply IG1

SGHAT7110N

4. Is voltage within specification?

YES

▶ Go to "Power supply circuit Inspection" procedure.

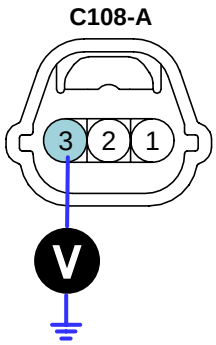
NO

▶ Check for open or short in harness. Repair as necessary and Go to "Verification of Vehicle Repair" procedure.
▶ If signal circuit in harness is OK, Go to "Check PCM/TCM" of the "Component Inspection" procedure.

POWER SUPPLY CIRCUIT INSPECTION E4AACB87

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

Specification : approx. B+



1. Sensor ground
2. Input speed sensor
3. Power supply IG1

SGHAT7111N

4. Is voltage within specification ?

YES

▶ Go to "Ground circuit inspection" procedure.

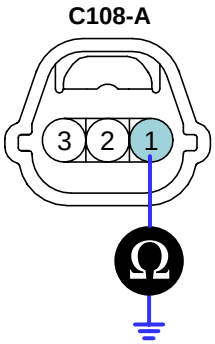
NO

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

GROUND CIRCUIT INSPECTION EF51CAB1

1. Ignition "ON" & Engine "OFF".
2. Disconnect the "INPUT SPEED SENSOR" connector.
3. Measure resistance between terminal "1" of the INPUT SPEED SENSOR harness connector and chassis ground.

Specification : approx. 0 Ω



1. Sensor ground
2. Input speed sensor
3. Power supply IG1

SGHAT7112N

4. Is resistance within specification ?

YES

▶ Go to "Component Inspection" procedure.

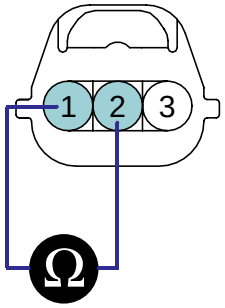
NO

▶ Check for open in harness. Repair as necessary and Go to "Verification of Vehicle Repair" procedure.
▶ If ground circuit in harness is OK, Go to "Check PCM/TCM" of the "Component Inspection" procedure.

COMPONENT INSPECTION EF4ED63C

1. Check "INPUT SPEED SENSOR"
   1) Ignition "OFF".
   2) Disconnect the "INPUT SPEED SENSOR" connector.
   3) Measure resistance between terminal "1","2" and "2","3" and "1","3" of the "INPUT SPEED SENSOR" connector.

Specification : Refer to "Reference data"



C108-A
Component side

1. Sensor ground
2. Input speed sensor
3. Power supply IG1

SGHAT7113N

4) Is resistance within specifications?

[REFERENCE DATA]

Data	Reference Data	
Current	22 mA	
Air Gap	Input sensor	1.3 mm
	Output sensor	0.85 mm
Resistance	Input sensor	Above 4 MΩ
	Output sensor	Above 4 MΩ
Voltage	High	4.8 ~ 5.2V
	Low	Below 0.8V

YES

▶ Go to "CHECK PCM/TCM" as below.

NO

▶ Replace "INPUT SPEED SENSOR" as necessary and Go to "Verification of Vehicle Repair" procedure.

2. CHECK PCM/TCM

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

2) Connect "INPUT SPEED SENSOR" connector.

3) Install scantool and select a SIMU-SCAN.

4) Simulate frequency to INPUT SPEED SENSOR signal circuit.

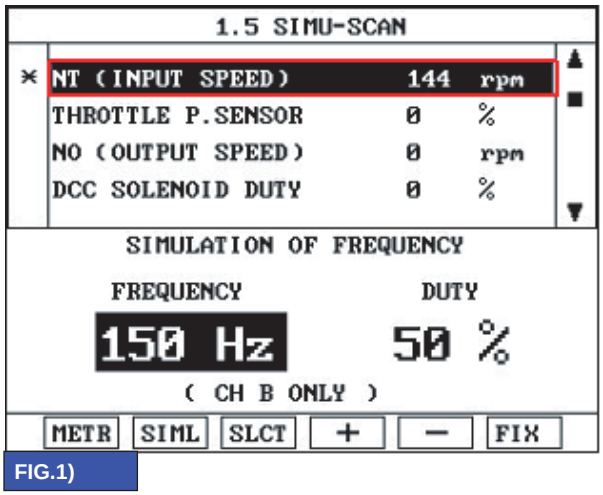


FIG.1)

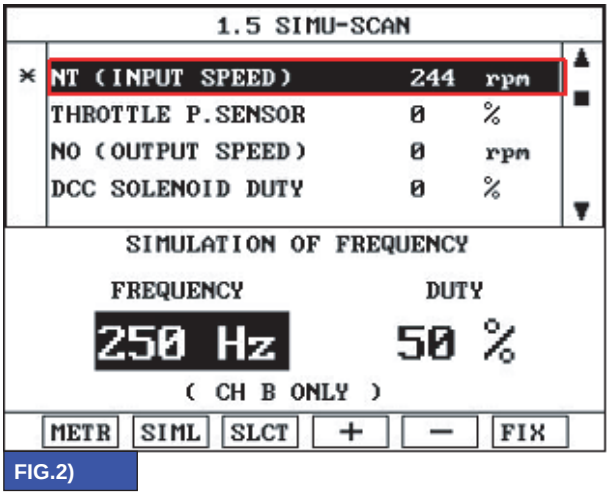


FIG.2)

FIG.1) INPUT 150Hz → 144rpm
FIG.2) INPUT 250Hz → 244rpm

※ The values are subject to change according to vehicle model or conditions

EKBF105G

5) Is "INPUT SPEED SENSOR" signal value changed according to simulation frequency?

YES

▶ 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

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

VERIFICATION OF VEHICLE REPAIR E062CC9A

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

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scan tool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present?

YES

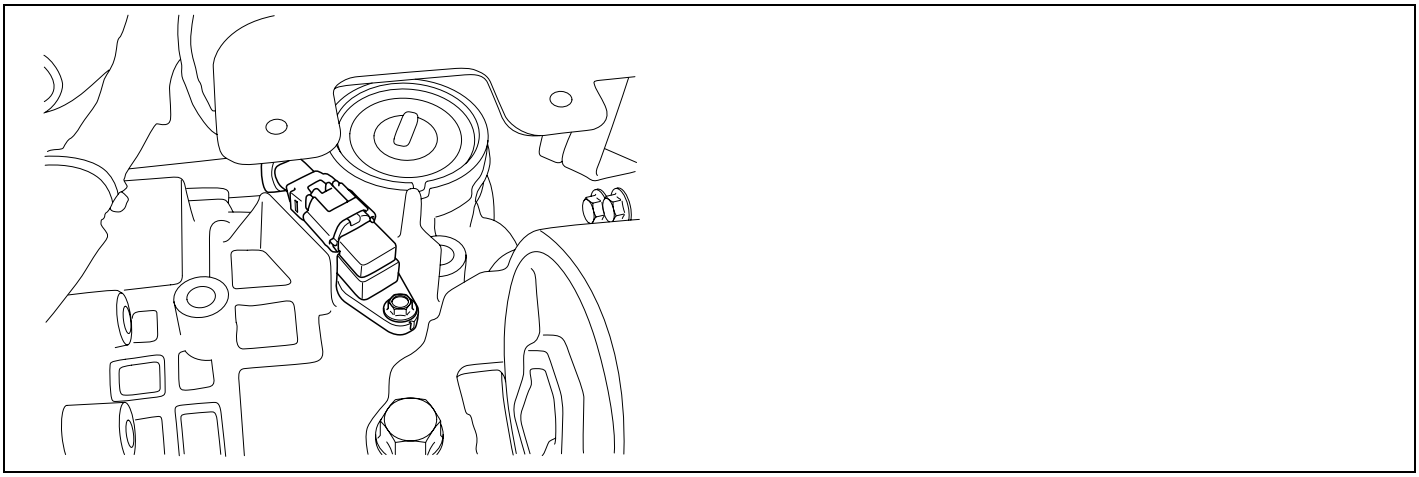
▶ Go to the applicable troubleshooting procedure.

NO

▶ System performing to specification at this time.

DTC P0722 OUTPUT SPEED SENSOR CIRCUIT - NO SIGNAL

COMPONENT LOCATION E6AB327E



SCMAA6109N

GENERAL DESCRIPTION ED92D4B7

The Output Speed Sensor outputs pulse-signals according to the revolutions of the output shaft of the transmission. The Output Speed Sensor is installed in front of the Transfer Drive Gear to determine the Transfer Drive Gear rpms by counting the frequency of the pulses. This value, together with the throttle position data, is mainly used to decide the optimum gear position.

DTC DESCRIPTION EA017D0A

The TCM sets this code if the calculated value of the pulse-signal is noticeably different from the value calculated, using the Vehicle Speed Sensor output, when the vehicle is running faster than 30 km/h. The TCM will initiate the fail safe function if this code is detected.

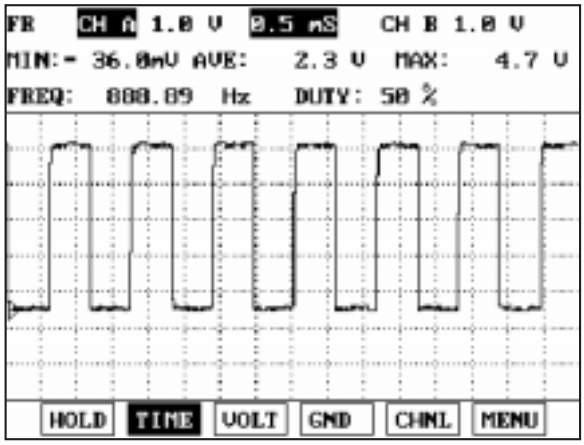
DTC DETECTING CONDITION E6ABF9EE

Item	Detecting Condition	Possible cause
DTC Strategy	• Speed rationality check	• Signal circuit is open or short • Sensor power circuit is open • Sensor ground circuit is open • Faulty OUTPUT SPEED SENSOR • Faulty PCM
Enable Conditions	• Vehicle speed is over 19 Mile/h(30 Km/h) and Ne≥ 1000rpm in D,3,2,L(A/T range switch) and SP(SPORTS MODE) • 11V ≤ Battery Voltage ≤ 16V • TM oil temperature ≥ -23°C(-9.4°F)	
Threshold value	• Vehicle speed calculated from output speed ≤ 10%(the vehicle speed from vehicle speed sensor)	
Diagnostic Time	• More than 1sec	
Fail Safe	• Locked into 3rd or 2nd gear. • Apply an electric current to solenoid valve • Manual shifting is possible(2 nd → 3 rd, 3 rd → 2 nd)	

SPECIFICATION E3EB8ECD

Refer to DTC P0717.

SIGNAL WAVEFORM EB42CF46



EKBF106A

MONITOR SCANTOOL DATA EBC1754F

1. Connect scantool to data link connector(DLC).
2. Engine "ON".
3. Monitor the "OUTPUT SPEED SENSOR" parameter on the scantool.
4. Driving at speed of over 30 Km/h(19 mph).

Specification : Increasing Gradually

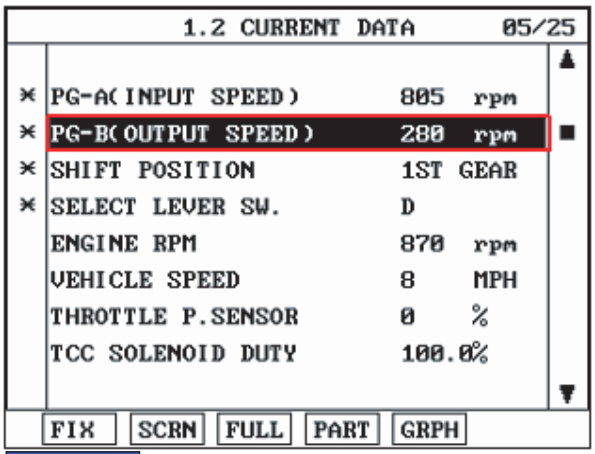


FIG.1)

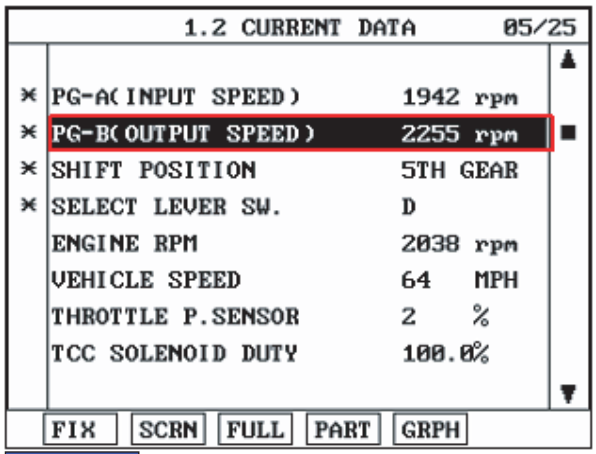


FIG.2)

FIG.1) Low-speed
FIG.2) High-speed

SCMAT6720L

5. Does "Output speed sensor" follow the reference data?

YES

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

NO

▶ Go to "Terminal & connector inspection" procedure.

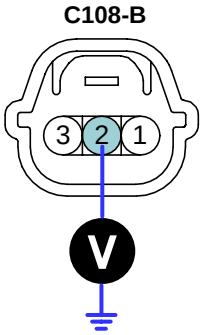
TERMINAL & CONNECTOR INSPECTION E74F0489

Refer to DTC P0717.

SIGNAL CIRCUIT INSPECTION E33F7306

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

Specification : approx. 5V



1. Sensor ground
2. **Output speed sensor**
3. Power supply IG1

SGHAT7115N

4. Is voltage within specification?

YES

▶ Go to "Power supply circuit Inspection" procedure.

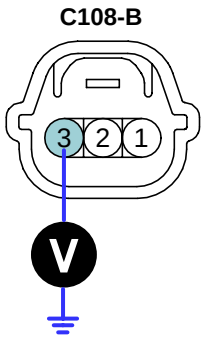
NO

▶ Check for open or short in harness. Repair as necessary and Go to "Verification of Vehicle Repair" procedure.
▶ If signal circuit in harness is OK, Go to "Check PCM/TCM" of the "Component Inspection" procedure.

POWER SUPPLY CIRCUIT INSPECTION E88C4D61

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

Specification : approx. B+



1. Sensor ground
2. Output speed sensor
3. Power supply IG1

SGHAT7116N

4. Is voltage within specification?

YES

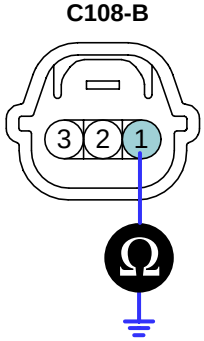
▶ Go to "Ground circuit inspection" procedure.

NO

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

GROUND CIRCUIT INSPECTION E0B92AD4

1. Ignition "ON" & Engine "OFF".
2. Disconnect the "OUTPUT SPEED SENSOR" connector.
3. Measure resistance between terminal "1" of the OUTPUT SPEED SENSOR harness connector and chassis ground.



1. Sensor ground
2. Output speed sensor
3. Power supply IG1

SGHAT7117N

4. Is resistance within specifications?

YES

▶ Go to "Component Inspection" procedure.

NO

▶ Check for open in harness. Repair as necessary and Go to "Verification of Vehicle Repair" procedure.
▶ If ground circuit is OK, Go to "Check PCM/TCM" of the "Component Inspection" procedure.

COMPONENT INSPECTION E1AE44CD

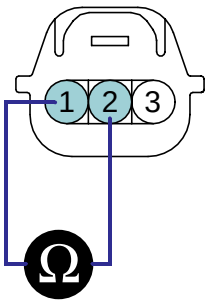
1. Check "OUTPUT SPEED SENSOR"

   1) Ignition "OFF".

   2) Disconnect the "OUTPUT SPEED SENSOR" connector.

   3) Measure resistance between terminal "1","2" and "2","3" and "1","3" of the "OUTPUT SPEED SENSOR" connector.

Specification : Refer to "Reference data"



C108-B
Component side

1. Sensor ground
2. Output speed sensor
3. Power supply IG1

SGHAT7118N

   4) Is resistance within specifications?

[REFERENCE DATA]

Data	Reference Data	
Current	22 mA	
Air Gap	Input sensor	1.3 mm
	Output sensor	0.85 mm
Resistance	Input sensor	Above 4 MΩ
	Output sensor	Above 4 MΩ
Voltage	High	4.8 ~ 5.2V
	Low	Below 0.8V

YES

▶ Go to "CHECK PCM/TCM " as below.

NO

▶ Replace "OUTPUT SPEED SENSOR" as necessary and Go to "Verification of Vehicle Repair" procedure.

2. CHECK PCM

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

2) Connect "OUTPUT SPEED SENSOR" connector.

3) Install scantool and select a SIMU-SCAN.

4) Simulate frequency to OUTPUT SPEED SENSOR signal circuit.

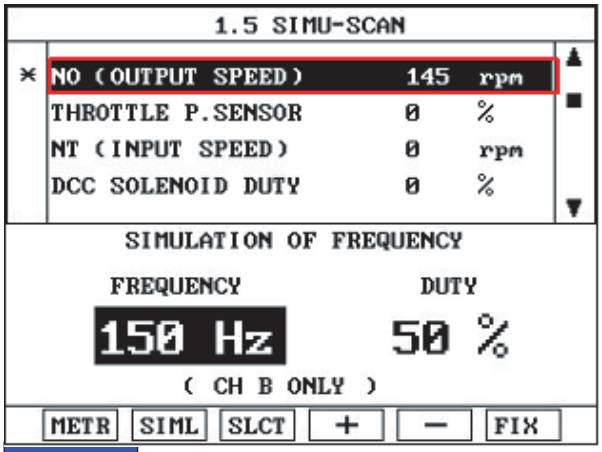


FIG.1)

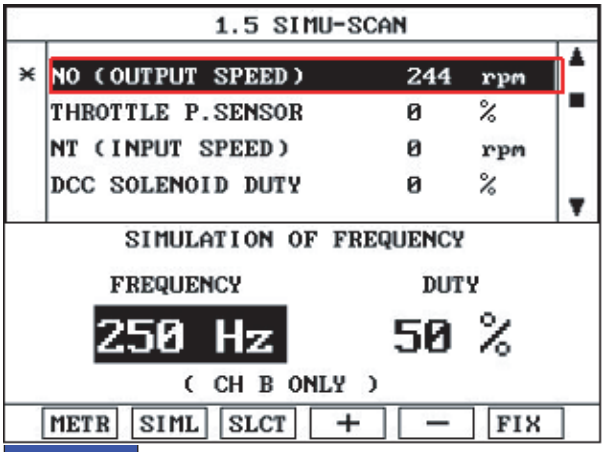


FIG.2)

FIG.1) OUTPUT 150Hz → 144rpm
FIG.2) OUTPUT 250Hz → 244rpm

※ The values are subject to change according to vehicle model or conditions

EKBF106G

5) Is "OUTPUT SPEED SENSOR" signal value changed according to simulation frequency?

YES

▶ 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

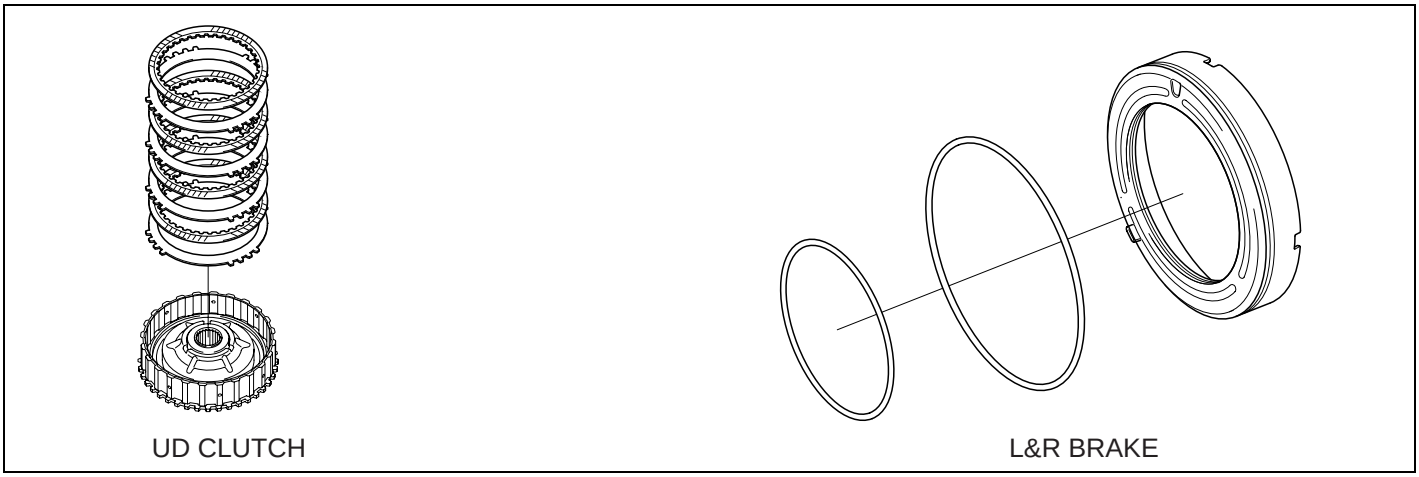
▶ Substitute with a known-good PCM/TCM and check for proper operation. If the problem is corrected, replace PCM/TCM as necessary and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR EA6D097D

Refer to DTC P0717.

DTC P0731 GEAR 1 INCORRECT RATIO

COMPONENT LOCATION EC6DCE5A



EKBF300A

GENERAL DESCRIPTION EEB7DFDB

The value of the input shaft speed should be equal to the value of the output shaft speed, when multiplied by the 1st gear ratio, while the transaxle is engaged in the 1st gear. For example, if the output speed is 1000 rpm and the 1st gear ratio is 4.497, then the input speed is 4,497 rpm.

DTC DESCRIPTION ECFAA9CE

This code is set if the value of input shaft speed is not equal to the value of the output shaft, when multiplied by the 1st gear ratio, while the transaxle is engaged in 1st gear. This malfunction is mainly caused by mechanical troubles such as control valve sticking or solenoid valve malfunctioning rather than an electrical issue.

DTC DETECTING CONDITION E45F8A25

Item	Detecting Condition	Possible cause
DTC Strategy	• 1st gear incorrect ratio	• Faulty Input speed sensor • Faulty output speed sensor • Faulty UD clutch or LR,RED brake or One way clutch1,2
Enable Conditions	• Engine speed ＞450rpm • Output speed ＞150rpm • Shift stage 1st. gear • Input speed ＞0rpm • A/T oil temp output ≥ -23°C(-9.4°F) • 11V ≤ Battery Voltage ≤16V • TRANSAXLE RANGE SWITCH is normal and after 2sec is passed from IG ON	
Threshold value	• ｜input speed/1st gear ratio - output speed｜≥200rpm	
Diagnostic Time	• more than 1sec	
Fail Safe	• Locked into 3rd gear. (If diagnosis code P0731 is output four times, the transaxle is locked into 3rd gear)	

SIGNAL WAVEFORM E22C888E

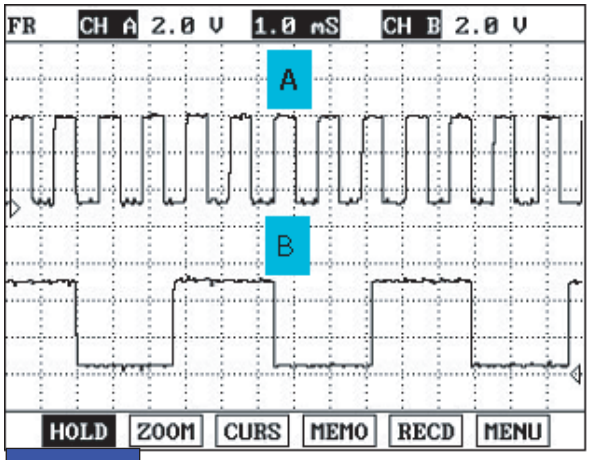


FIG.1)

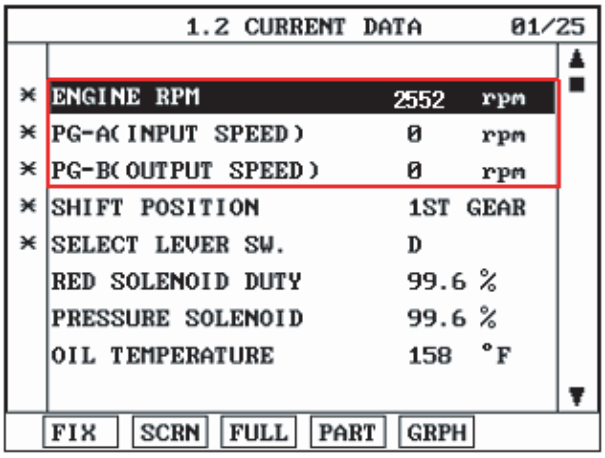
A : INPUT SPEED SENSOR
B : OUTPUT SPEED SENSOR

EKBF107A

MONITOR SCANTOOL DATA EB1ABCE7

1. Connect scan tool to data link connector(DLC).
2. Engine "ON".
3. Monitor the "ENGINE SPEED, INPUT SPEED SENSOR, OUTPUT SPEED SENSOR, GEAR POSITION" parameter on the scan tool.
4. Perform the "STALL TEST" with gear position "1"

Specification : 2100~2800 engine rpm



SCMAA6160N

OPERATING ELEMENT OF EACH SHIFTING RANGE

GEAR POSITION	ELEMENT								
	L/R BRAKE	2ND BRAKE	U/D CLUTCH	O/D CLUTCH	RED BRAKE	DIR CLUTCH	REV CLUTCH	OWC1	OWC2
1st	●		●		●			●	●
2nd		●	●		●				●
3rd			●	●	●				●
4th		●		●	●				●
5th		●		●		●			
REV	●				●		●		
N,P	●				●				

Low & Reverse Brake is released When the vehicle speed over the 5MPH(7km/h).

Stall test procedure in D1 and reason

Procedure

1. Warm up the engine.
2. After positioning the select lever in "D", depress the foot brake pedal fully after that, depress the accelerator pedal to the maximum.
   * The slippage of 1st gear operating parts can be detected by stall test in D

Reason for stall test

1. If there is no mechanical defaults in A/T, all slippages occurrs in torque converter.
2. Therefore, engine revolution is output, but input and output speed revolution must be "zero" due to wheel's lock.
3. If 1st gear operating part has faults, input speed revolution will be out of specification.
4. If output speed revolution is output. It means that the foot brake force is not applied fully. Remeasuring is required.

5. Is "STALL TEST " within specification?

YES

▶ Go to "Signal circuit inspection" procedure.

NO

▶ Go to "Component inspection" procedure.

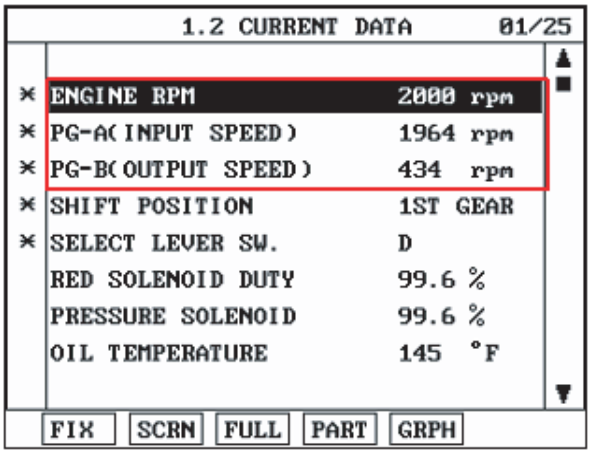
CAUTION

1. ***Do not let anybody stand in front of or behind the vehicle while this test is being carried out.***
2. ***Check the A/T fluid level and temperature and the engine coolant temperature.***
   - ***Fluid level : At the hot mark on the oil level gauge.***
   - ***Fluid temperature : 176 °F~ 212 °F (80~100 °C).***
   - ***Engine coolant temperature : 176 °F~ 212 °F (80~100 °C).***
3. ***Chock both rear wheel(left and right).***
4. ***Pull the parking brake lever on with the brake pedal fully depressed.***
5. ***The throttle should not be left fully open for more than eight second.***
6. ***If carrying out the stall test two or more time, move the select lever to the "N" position and run the engine at 1,000 rpm to let the A/T fluid cool down before carrying out subsequent.***

SIGNAL CIRCUIT INSPECTION ECB2EDEA

1. Connect Scan tool.
2. Engine "ON".
3. Monitor the "INPUT & OUTPUT SPEED SENSOR" parameter on the scan tool.
4. Accelerate the Engine speed until about 2000 rpm in the 1st gear.

Specification : INPUT SPEED - (OUTPUT SPEED × GEAR RATIO) ≤ 200 RPM



SCMAA6161N

5. Does "INPUT & OUTPUT SPEED SENSOR" within specifications?

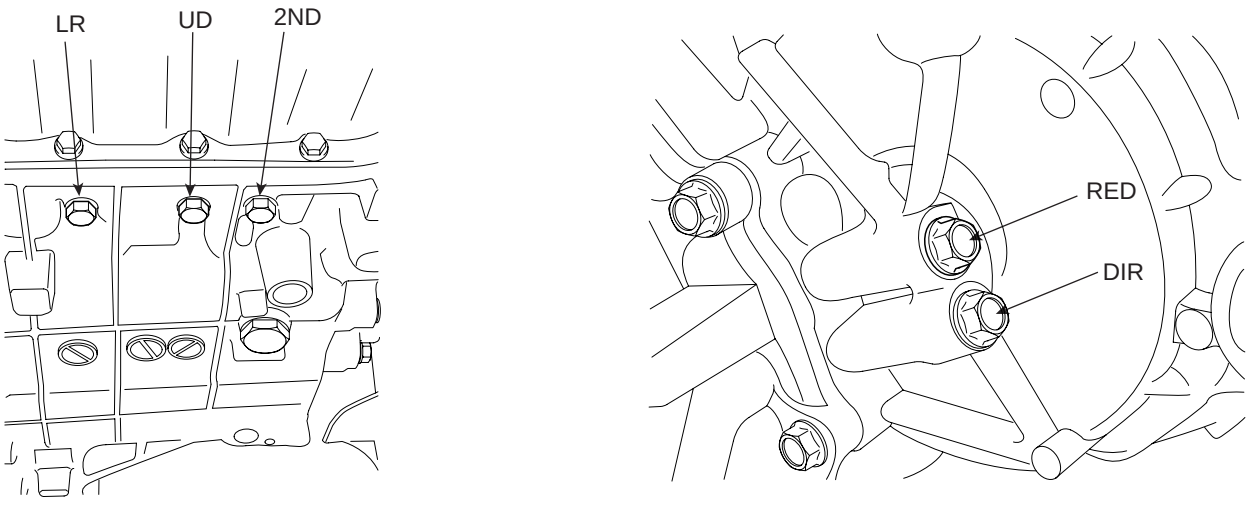
YES

▶ Go to "Component Inspection" procedure.

NO

▶ Check for electrical noise of circuit in INPUT &OUTPUT SPEED SENSOR or Replace INPUT & OUTPUT SPEED SENSOR. Repair as necessary and Go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION E0D81A75



SCMAA6162N

1. Connect oil pressure gauge to "UD" and "L/R" and "RED" port.
2. Engine "ON".
3. Drive a car with gear position 1 in "SPORTS MODE".
4. Compare it with reference data as below.

Specification : refer to Standard Oil Pressure Table as below

LEVER POSITION	INPUT SPEED	VFS CURRENT	SOLENOID VALVE DUTY (%)						ELEMENT	P(MPa)
			LR	DCC	2ND	UD	OD	RED*		
D	2500rpm	200mA	0	0	100	0	100	0	LR	1.03±0.02
↑	↑	↑	60	↑	↑	↑	↑	↑		0.52±0.04
↑	↑	↑	75	↑	↑	↑	↑	↑		0.23±0.04
↑	↑	↑	100	↑	↑	↑	↑	↑		0
↑	↑	↑	100	↑	0	0	100	0	2ND	1.03±0.02
↑	↑	↑	↑	↑	60	↑	↑	↑		0.55±0.04
↑	↑	↑	↑	↑	75	↑	↑	↑		0.22±0.04
↑	↑	↑	↑	↑	100	↑	↑	↑		0
↑	↑	↑	100	↑	100	0	0	0	OD	1.03±0.02
↑	↑	↑	↑	↑	↑	↑	60	↑		0.52±0.04
↑	↑	↑	↑	↑	↑	↑	75	↑		0.21±0.04
↑	↑	↑	↑	↑	↑	↑	100	↑		0
↑	↑	↑	100	↑	100	0	0	0	UD	1.03±0.02
↑	↑	↑	↑	↑	↑	60	↑	↑		0.47±0.04
↑	↑	↑	↑	↑	↑	75	↑	↑		0.17±0.04
↑	↑	↑	↑	↑	↑	100	↑	↑		0
↑	↑	↑	100	↑	0	100	0	0	RED*	1.03±0.02
↑	↑	↑	↑	↑	↑	↑	↑	60		0.54±0.04
↑	↑	↑	↑	↑	↑	↑	↑	75		0.27±0.04
↑	↑	↑	↑	↑	↑	↑	↑	100		0
↑	↑	↑	100	↑	0	100	0	100	DIR*	0
↑	↑	↑	75	↑	↑	↑	↑	↑		0.27±0.04
↑	↑	↑	60	↑	↑	↑	↑	↑		0.54±0.04
↑	↑	↑	0	↑	↑	↑	↑	↑		1.03±0.02
R	↑	250mA	0	↑	100	100	100	0	LR	1.55±0.25

※ The values are subject to change according to vehicle model or condition.

EKBF107E

5. Is oil pressure value within specifications?

YES

▶ Repair AUTO TRANSAXLE(Clutch or Brake) as necessary and Go to "Verification of Vehicle Repair" procedure.

NO

▶ Replace AUTO TRANSAXLE (BODY CONTROL VALVE faulty) as necessary and Go to "Verification of Vehicle Repair " procedure.

VERIFICATION OF VEHICLE REPAIR E1B4B265

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

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scantool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

YES

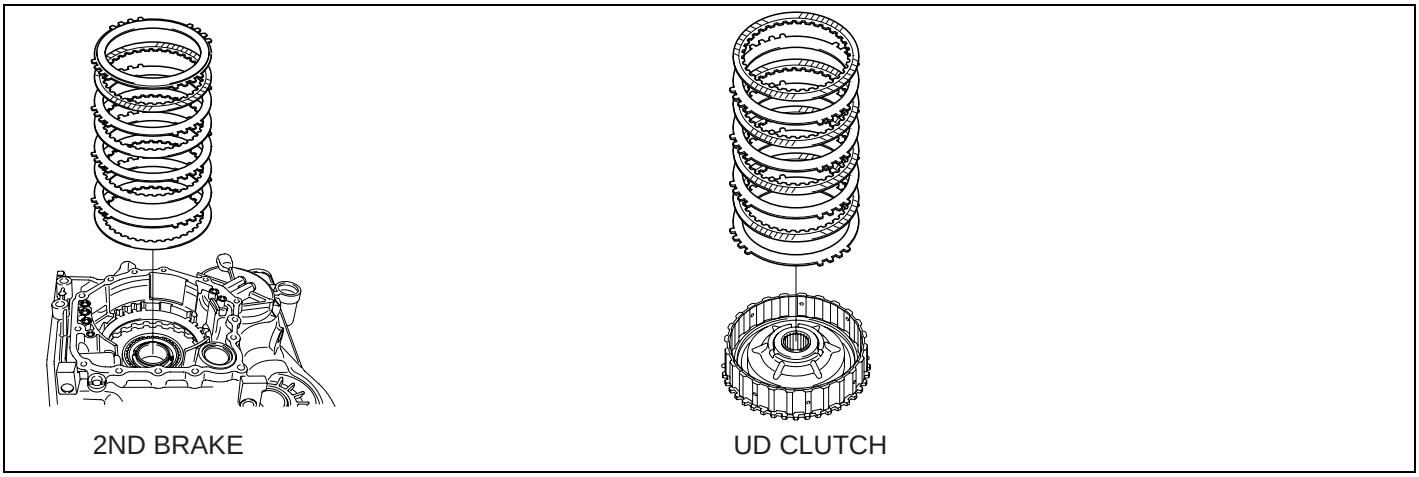
▶ Go to the applicable troubleshooting procedure.

NO

▶ System performing to specification at this time.

DTC P0732 GEAR 2 INCORRECT RATIO

COMPONENT LOCATION ECBED959



EKBF300B

GENERAL DESCRIPTION E5BD39C1

The value of the input shaft speed should be equal to the value of the output shaft speed, when multiplied by the 2nd gear ratio, while the transaxle is engaged in the 2nd gear. For example, if the output speed is 1000 rpm and the 2nd gear ratio is 2.442, then the input speed is 2,442 rpm.

DTC DESCRIPTION E2745552

This code is set if the value of input shaft speed is not equal to the value of the output shaft, when multiplied by the 2nd gear ratio, while the transaxle is engaged in 2nd gear. This malfunction is mainly caused by mechanical troubles such as control valve sticking or solenoid valve malfunctioning rather than an electrical issue.

DTC DETECTING CONDITION E9EBE27C

Item	Detecting Condition	Possible cause
DTC Strategy	• 2nd gear incorrect ratio	• Faulty Input speed sensor • Faulty output speed sensor • Faulty UD clutch or 2nd, RED brake or One way clutch 2
Enable Conditions	• Engine speed ＞450rpm • Output speed ＞300rpm • Shift stage 2nd. gear • Input speed ＞0rpm • A/T oil temp output ≥ -23°C(-9.4°F) • 11V ≤ Battery Voltage ≤16V • TRANSAXLE RANGE SWITCH is normal and after 2sec is passed from IG ON	
Threshold value	• | input speed/2nd gear ratio - output speed | ≥200rpm	
Diagnostic Time	• more than 1sec	
Fail Safe	• Locked into 3rd gear. (If diagnosis code P0732 is output four times, the transaxle is locked into 3rd gear)	

SIGNAL WAVEFORM E963DE6C

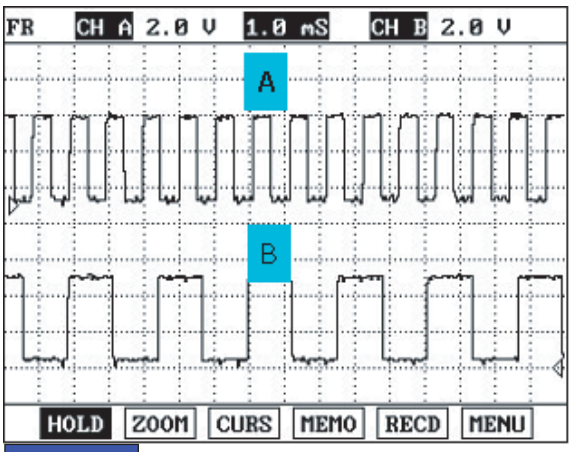


FIG.1)

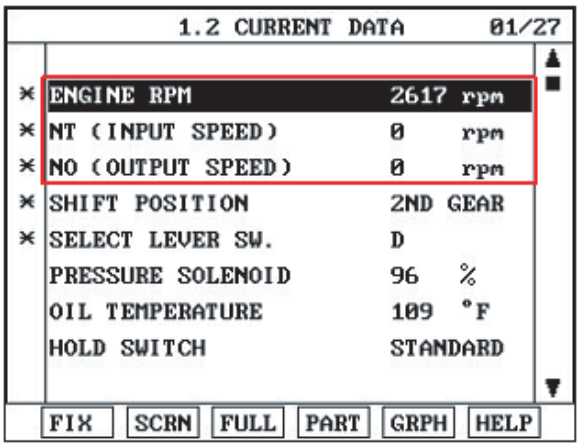
A : INPUT SPEED SENSOR
B : OUTPUT SPEED SENSOR

EKBF108A

MONITOR SCANTOOL DATA EC263E96

1. Connect scan tool to data link connector(DLC).
2. Engine "ON".
3. Monitor the "ENGINE SPEED, INPUT SPEED SENSOR, OUTPUT SPEED SENSOR, GEAR POSITION" parameter on the scan tool.
4. Perform the "STALL TEST" with gear position "2".

Specification : 2100~2800 engine rpm



SCMAA6163N

OPERATING ELEMENT OF EACH SHIFTING RANGE

GEAR POSITION	ELEMENT								
	L/R BRAKE	2ND BRAKE	U/D CLUTCH	O/D CLUTCH	RED BRAKE	DIR CLUTCH	REV CLUTCH	OWC1	OWC2
1st	●		●		●			●	●
2nd		●	●		●				●
3rd			●	●	●				●
4th		●		●	●				●
5th		●		●		●			
REV	●				●		●		
N,P	●				●				

Low & Reverse Brake is released When the vehicle speed over the 5MPH(7km/h)

Stall test procedure in D2 and reason

Procedure

1. Warm up the engine.
2. After positioning the select lever in "D" or "ON" of the HOLD SW (Operate UP SHIFT in case of "SPORTS MODE"),depress the foot brake pedal fully after that, depress the accelerator pedal to the maximum.
   * The slippage of 2nd gear operating parts can be detected by stall test in D2.

Reason for stall test

1. If there is no mechanical defaults in A/T, all slippages occurrs in torque converter.
2. Therefore, engine revolution is output, but input and output speed revolution must be "zero" due to wheel's lock.
3. If 2nd brake system(2nd gear operating part) has faults, input speed revolution will be out of specification.
4. If output speed revolution is output. It means that the foot brake force is not applied fully. Remeasuring is required.

5. Is "STALL TEST " within specification?

YES

▶ Go to "Signal circuit inspection" procedure.

NO

▶ Go to "Component inspection" procedure.

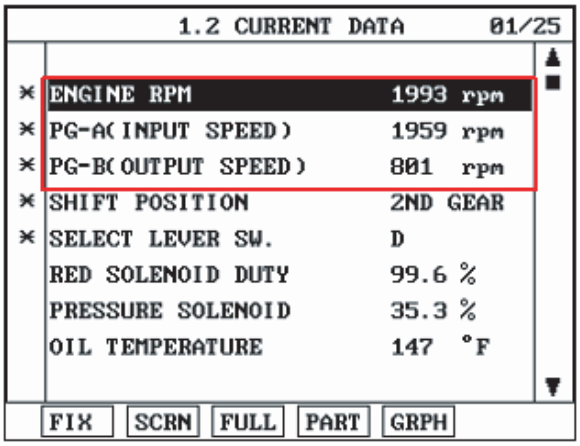
CAUTION

1. ***Do not let anybody stand in front of or behind the vehicle while this test is being carried out.***
2. ***Check the A/T fluid level and temperature and the engine coolant temperature.***
   - ***Fluid level : At the hot mark on the oil level gauge.***
   - ***Fluid temperature : 176 °F~ 212 °F (80~100 °C).***
   - ***Engine coolant temperature : 176 °F~ 212 °F (80~100 °C).***
3. ***Chock both rear wheel(left and right).***
4. ***Pull the parking brake lever on with the brake pedal fully depressed.***
5. ***The throttle should not be left fully open for more than eight second.***
6. ***If carrying out the stall test two or more time, move the select lever to the "N" position and run the engine at 1,000 rpm to let the A/T fluid cool down before carrying out subsequent.***

SIGNAL CIRCUIT INSPECTION EEDB11DA

1. Connect Scantool.
2. Engine "ON".
3. Monitor the "INPUT & OUTPUT SPEED SENSOR" parameter on the scantool.
4. Accelerate the Engine speed until about 2000 rpm in the 2nd gear.

Specification : INPUT SPEED - (OUTPUT SPEED × GEAR RATIO) ≤ 200 RPM



SCMAA6164N

5. Does "INPUT & OUTPUT SPEED SENSOR" within specifications?

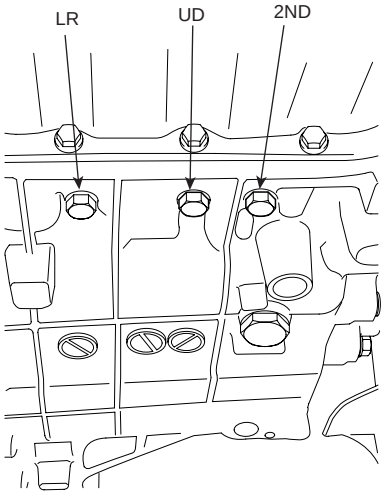
YES

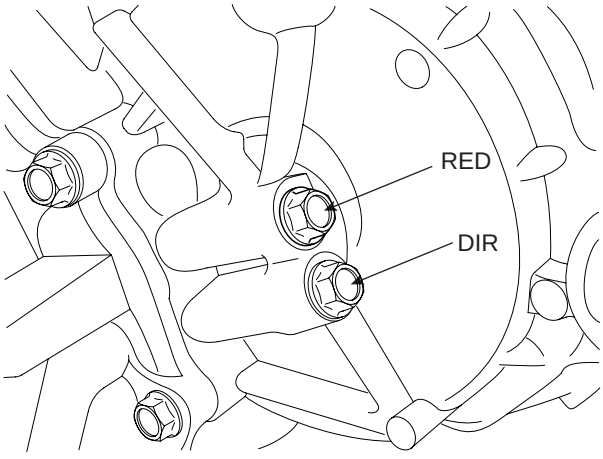
▶ Go to "Component Inspection" procedure.

NO

▶ Check for electrical noise of circuit in INPUT & OUTPUT SPEED SENSOR or Replace INPUT & OUTPUT SPEED SENSOR. Repair as necessary and Go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION E705F575





SCMAA6165N

1. Connect oil pressure gauge to "UD" and "2ND" and "RED" port.
2. Engine "ON".
3. Drive a car with gear position 2 in "SPORTS MODE".
4. Compare it with reference data as below.

Specification : refer to Standard Oil Pressure Table (Refer to DTC P0731)

5. Is oil pressure value within specifications?

YES

▶ Repair AUTO TRANSAXLE(Clutch or Brake) as necessary and Go to "Verification of Vehicle Repair" procedure.

NO

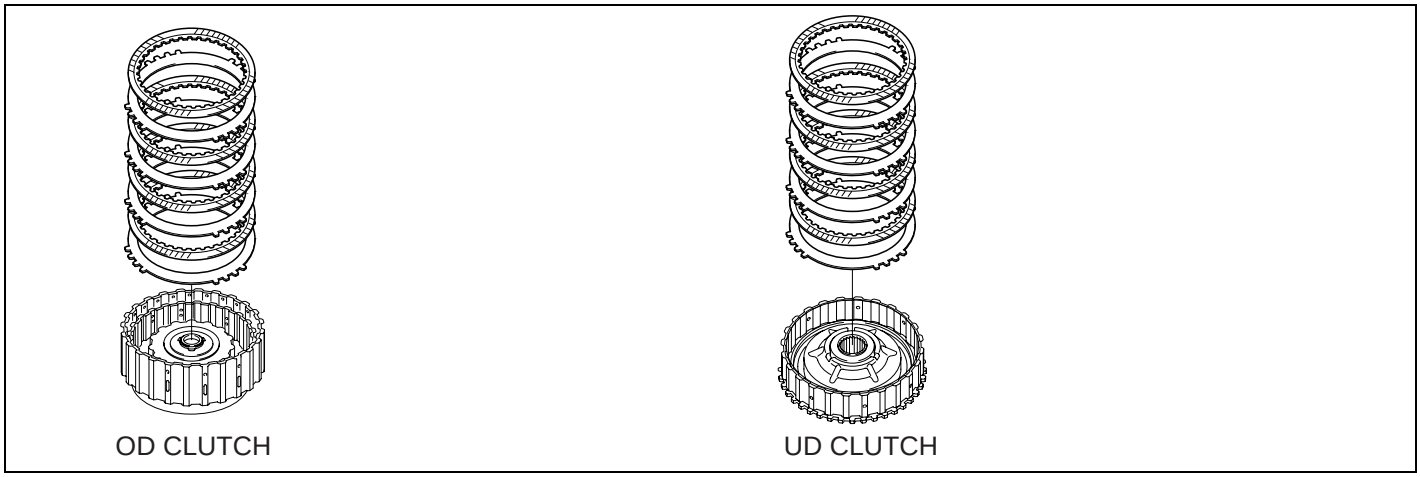
▶ Replace AUTO TRANSAXLE (BODY CONTROL VALVE faulty) as necessary and Go to "Verification of Vehicle Repair " procedure.

VERIFICATION OF VEHICLE REPAIR E88D2F67

Refer to DTC P0731.

DTC P0733 GEAR 3 INCORRECT RATIO

COMPONENT LOCATION E5412F08



EKBF300C

GENERAL DESCRIPTION E163F99F

The value of the input shaft speed should be equal to the value of the output shaft speed, when multiplied by the 3rd gear ratio, while the transaxle is engaged in the 3rd gear. For example, if the output speed is 1,000 rpm and the 3rd gear ratio is 1.686, then the input speed is 1,686 rpm.

DTC DESCRIPTION E9DC5BAA

This code is set if the value of input shaft speed is not equal to the value of the output shaft, when multiplied by the 3rd gear ratio, while the transaxle is engaged in 3rd gear. This malfunction is mainly caused by mechanical troubles such as control valve sticking or solenoid valve malfunctioning rather than an electrical issue.

DTC DETECTING CONDITION E6B52751

Item	Detecting Condition	Possible cause
DTC Strategy	• 3rd gear incorrect ratio	• Faulty Input speed sensor • Faulty output speed sensor • Faulty UD, OD clutch or RED brake or One way clutch 2
Enable Conditions	• Engine speed ＞450rpm • Output speed ＞300rpm • Shift stage 3rd. gear • Input speed ＞0rpm • A/T oil temp output ≥ -23°C(-9.4°F) • 11V ≤ Battery Voltage ≤16V • TRANSAXLE RANGE SWITCH is normal and after 2sec is passed from IG ON	
Threshold value	• | input speed/3rd gear ratio - output speed | ≥200rpm	
Diagnostic Time	• more than 1sec	
Fail Safe	• Locked into 3rd gear.(If diagnosis code P0733 is output four times, the transaxle is locked into 3rd gear)	

SIGNAL WAVEFORM E5460E02

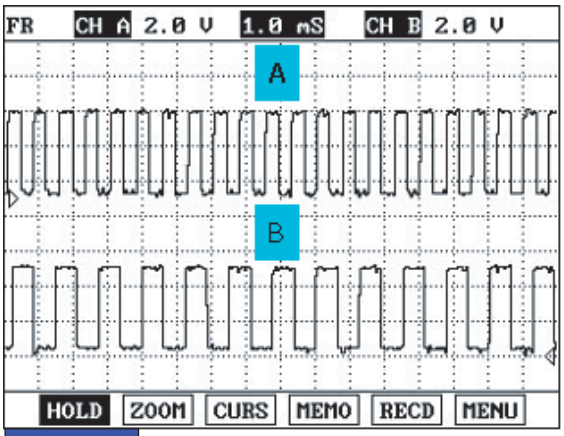


FIG.1)

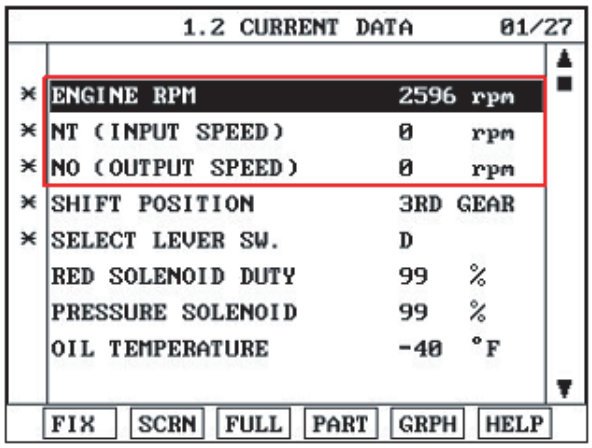
A : INPUT SPEED SENSOR
B : OUTPUT SPEED SENSOR

EKBF109A

MONITOR SCANTOOL DATA EFED6CEB

1. Connect scan tool to data link connector(DLC).
2. Engine "ON".
3. Monitor the "ENGINE SPEED, INPUT SPEED SENSOR, OUTPUT SPEED SENSOR, GEAR POSITION" parameter on the scan tool.
4. Disconnect the solenoid valve connector and perform the "STALL TEST".

Specification : 2100~2800 engine rpm



SCMAA6166N

OPERATING ELEMENT OF EACH SHIFTING RANGE

GEAR POSITION	ELEMENT								
	L/R BRAKE	2ND BRAKE	U/D CLUTCH	O/D CLUTCH	RED BRAKE	DIR CLUTCH	REV CLUTCH	OWC1	OWC2
1st	●		●		●			●	●
2nd		●	●		●				●
3rd			●	●	●				●
4th		●		●	●				●
5th		●		●		●			
REV	●				●		●		
N,P	●				●				

Low & Reverse Brake is released When the vehicle speed over the 5MPH(7km/h)

Stall test procedure in D3 and reason

Procedure

1. Warm up the engine.
2. After making 3rd gear hold by disconnecting the solenoid connector, and Then depress the foot brake pedal fully After that, step on the accelerator pedal to the maximum.
   * The slippage of 3rd gear operating parts can be detected by stall test in D3.

Reason for stall test

1. If there is no mechanical defaults in A/T, all slippages occurrs in torque converter.
2. Therefore, engine revolution is output, but input and output speed revolution must be "zero" due to wheel's lock.
3. If OD clutch system(3rd gear operating part) has faults, input speed revolution will be out of specification.
4. If output speed revolution is output. It means that the foot brake force is not applied fully. Remeasuring is required.

5. Is "STALL TEST " within specification?

YES

▶ Go to "Signal circuit inspection" procedure.

NO

▶ Go to "Component inspection" procedure.

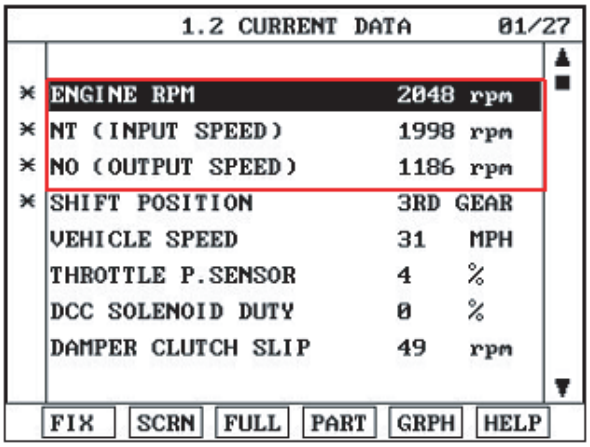
CAUTION

1. ***Do not let anybody stand in front of or behind the vehicle while this test is being carried out.***
2. ***Check the A/T fluid level and temperature and the engine coolant temperature.***
   - ***Fluid level : At the hot mark on the oil level gauge.***
   - ***Fluid temperature : 176 °F~ 212 °F (80~100 °C).***
   - ***Engine coolant temperature : 176 °F~ 212 °F (80~100 °C).***
3. ***Chock both rear wheel(left and right).***
4. ***Pull the parking brake lever on with the brake pedal fully depressed.***
5. ***The throttle should not be left fully open for more than eight second.***
6. ***If carrying out the stall test two or more time, move the select lever to the "N" position and run the engine at 1,000 rpm to let the A/T fluid cool down before carrying out subsequent.***

SIGNAL CIRCUIT INSPECTION EC239EC8

1. Connect Scantool.
2. Engine "ON".
3. Monitor the "INPUT & OUTPUT SPEED SENSOR" parameter on the scantool.
4. Accelerate the Engine speed until about 2000 rpm in the 3rd gear.

Specification : INPUT SPEED - (OUTPUT SPEED × GEAR RATIO) ≤ 200 RPM



SCMAA6167N

5. Is "INPUT & OUTPUT SPEED SENSOR" within specifications?

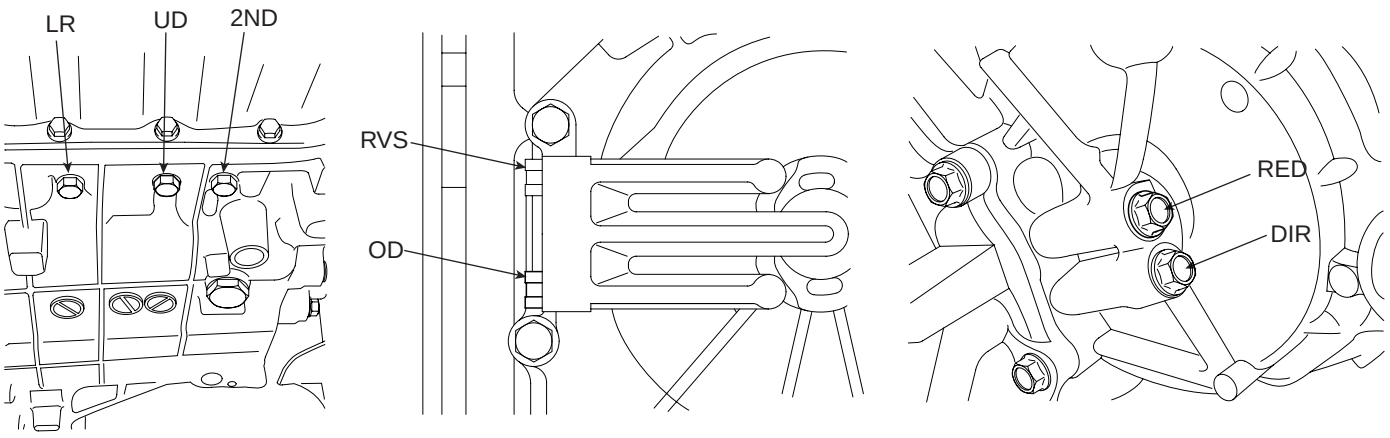
YES

▶ Go to "Component Inspection" procedure.

NO

▶ Check for electrical noise of circuit in INPUT & OUTPUT SPEED SENSOR or Replace INPUT & OUTPUT SPEED SENSOR. Repair as necessary and Go to "Verification of Vehicle Repair" procedure .

COMPONENT INSPECTION E09D6B58



SCMAA6168N

1. Connect oil pressure gauge to "UD" and "OD" and "RED" port.

2. Engine "ON".
3. Drive a car with gear position 3 in "SPORTS MODE".
4. Compare it with reference data as below.

Specification : refer to Standard Oil Pressure Table (Refer to DTC P0731)

5. Is oil pressure value within specifications?

YES

▶ Repair AUTO TRANSAXLE(Clutch or Brake) as necessary and Go to "Verification of Vehicle Repair" procedure.

NO

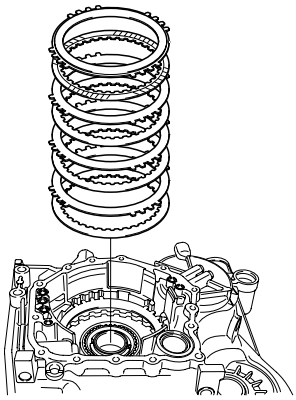
▶ Replace AUTO TRANSAXLE (BODY CONTROL VALVE faulty) as necessary and Go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR EBE4673F

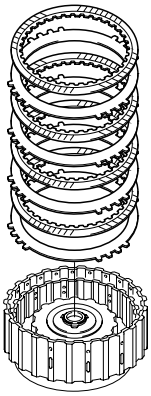
Refer to DTC P0731.

DTC P0734 GEAR 4 INCORRECT RATIO

COMPONENT LOCATION E7141536



2ND BRAKE



OD CLUTCH

EKBF300E

GENERAL DESCRIPTION EA028A3B

The value of the input shaft speed should be equal to the value of the output shaft speed, when multiplied by the 4th gear ratio, while the transaxle is engaged in the 4th gear. For example, if the output speed is 1,000 rpm and the 4th gear ratio is 1.233, then the input speed is 1,233 rpm.

DTC DESCRIPTION E95FC2FD

This code is set if the value of input shaft speed is not equal to the value of the output shaft, when multiplied by the 4th gear ratio, while the transaxle is engaged in 4th gear. This malfunction is mainly caused by mechanical troubles such as control valve sticking or solenoid valve malfunctioning rather than an electrical issue.

DTC DETECTING CONDITION E745BAA4

Item	Detecting Condition	Possible cause
DTC Strategy	• 4th gear incorrect ratio	• Faulty Input speed sensor • Faulty output speed sensor • Faulty OD clutch or 2nd brake
Enable Conditions	• Engine speed ＞450rpm • Output speed ＞300rpm • Shift stage 4th. gear • Input speed ＞0rpm • A/T oil temp output ≥ -23°C(-9.4°F) • 11V ≤ Battery Voltage ≤16V • TRANSAXLE RANGE SWITCH is normal and above 2sec is passed from IG ON	
Threshold value	• ｜input speed/4th gear ratio - output speed｜≥200rpm	
Diagnostic Time	• More than 1sec	
Fail Safe	• Locked into 3rd gear.(If diagnosis code P0734 is output four times, the transaxle is locked into 3rd gear)	

SIGNAL WAVEFORM E7A3A0A2

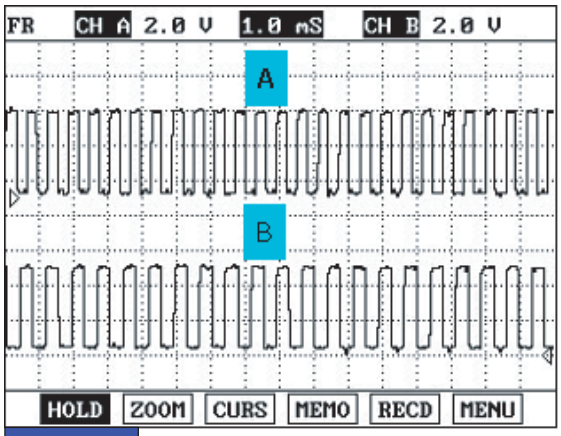


FIG.1)

A : INPUT SPEED SENSOR
B : OUTPUT SPEED SENSOR

EKBF110A

MONITOR SCANTOOL DATA EC6E9E5A

※ Go to "Signal circuit Inspection" procedure.

OPERATING ELEMENT OF EACH SHIFTING RANGE

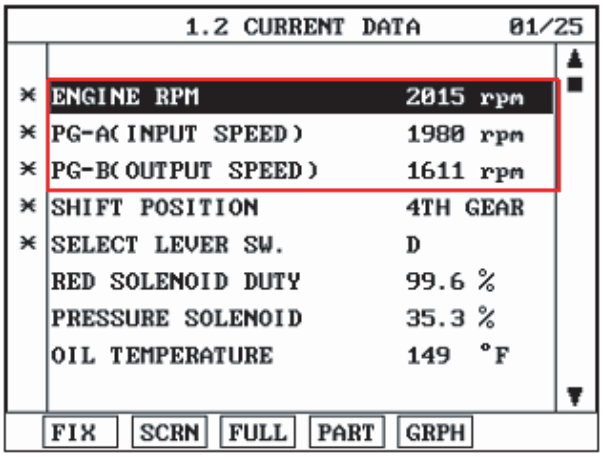
GEAR POSITION	ELEMENT								
	L/R BRAKE	2ND BRAKE	U/D CLUTCH	O/D CLUTCH	RED BRAKE	DIR CLUTCH	REV CLUTCH	OWC1	OWC2
1st	●		●		●			●	●
2nd		●	●		●				●
3rd			●	●	●				●
4th		●		●	●				●
5th		●		●		●			
REV	●				●		●		
N,P	●				●				

Low & Reverse Brake is released When the vehicle speed over the 5MPH(7km/h)

SIGNAL CIRCUIT INSPECTION EEDCF78B

1. Connect Scantool.
2. Engine "ON".
3. Monitor the "INPUT & OUTPUT SPEED SENSOR" parameter on the scantool.
4. Accelerate the Engine speed until about 2000 rpm in the 4th gear.

Specification : INPUT SPEED - (OUTPUT SPEED × GEAR RATIO) ≤ 200 RPM



SCMAA6170N

5. Is "INPUT & OUTPUT SPEED SENSOR" within specifications?

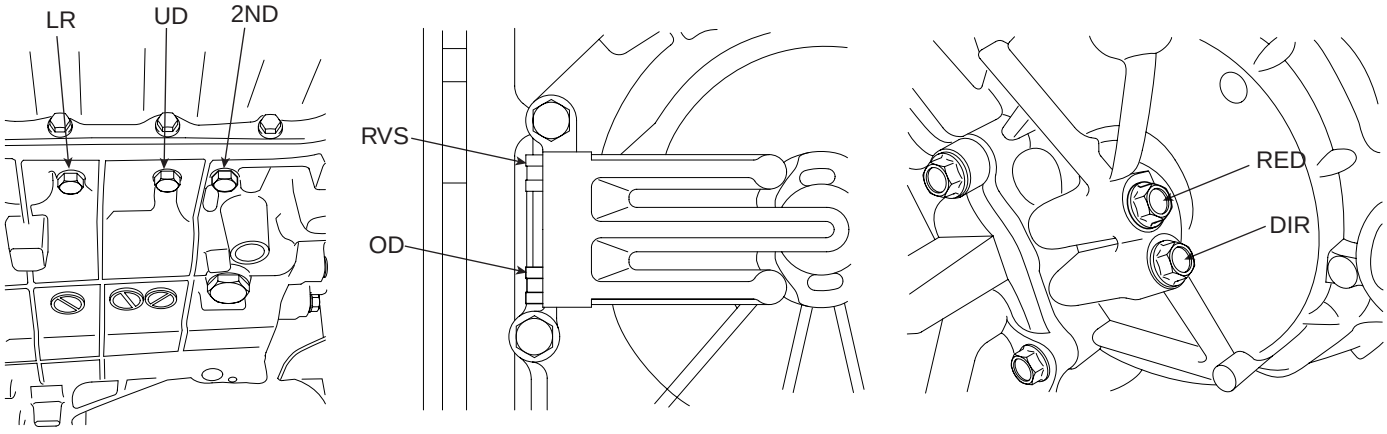
YES

▶ Go to "Component Inspection" procedure.

NO

▶ Check for electrical noise of circuit in INPUT & OUTPUT SPEED SENSOR or Replace INPUT & OUTPUT SPEED SENSOR. Repair as necessary and Go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION E3847BA2



SCMAA6171N

1. Connect oil pressure gauge to "2ND" and "OD" and "RED" port.
2. Engine "ON".
3. Drive a car with gear position 4 in "SPORTS MODE".
4. Compare it with reference data as below.

Specification : refer to Standard Oil Pressure Table (Refer to DTC P0731)

5. Is oil pressure value within specifications?

YES

▶ Repair AUTO TRANSAXLE(Clutch or Brake) as necessary and Go to "Verification of Vehicle Repair" procedure.

NO

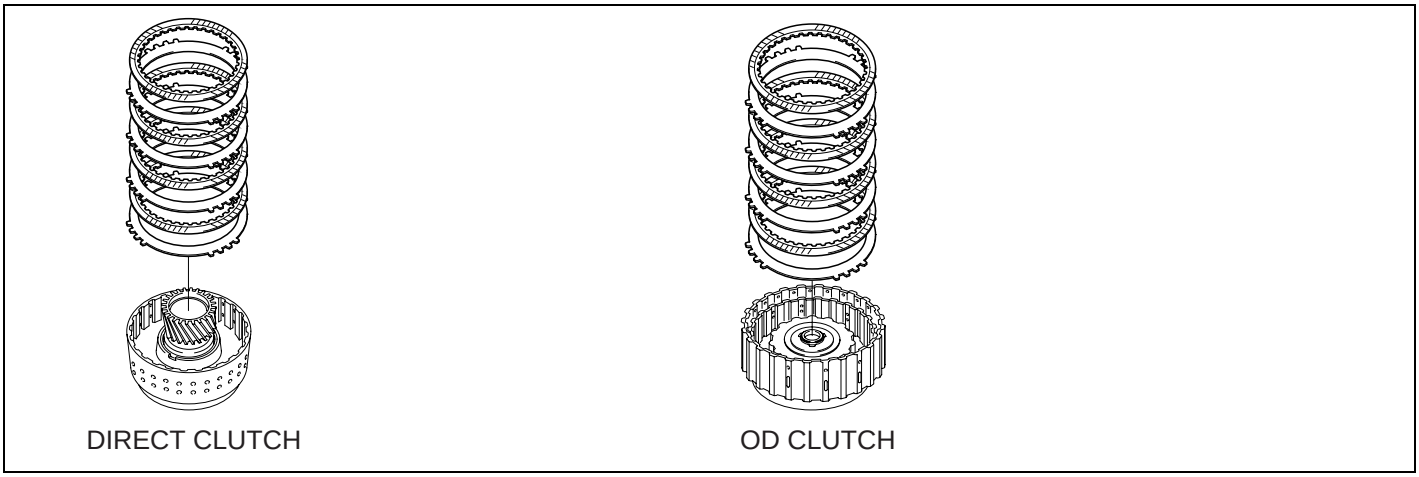
▶ Replace AUTO TRANSAXLE (BODY CONTROL VALVE faulty) as necessary and Go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR E5BFF520

Refer to DTC P0731.

DTC P0735 GEAR 5 INCORRECT RATIO

COMPONENT LOCATION E59ABD39



EKBF300D

GENERAL DESCRIPTION EAFBC2D0

The value of the input shaft speed should be equal to the value of the output shaft speed, when multiplied by the 5th gear ratio, while the transaxle is engaged in the 5th gear. For example, if the output speed is 1,000 rpm and the 5th gear ratio is 0.868, then the input speed is 868 rpm.

DTC DESCRIPTION EAB175ED

This code is set if the value of input shaft speed is not equal to the value of the output shaft, when multiplied by the 5th gear ratio, while the transaxle is engaged in 5th gear. This malfunction is mainly caused by mechanical troubles such as control valve sticking or solenoid valve malfunctioning rather than an electrical issue.

DTC DETECTING CONDITION E56AB31B

Item	Detecting Condition	Possible cause
DTC Strategy	• 5th gear incorrect ratio	• Faulty Input speed sensor • Faulty output speed sensor • Faulty OD, DIR clutch or 2nd brake
Enable Conditions	• Engine speed ＞450rpm • Output speed ＞300rpm • Shift stage 5th. gear • Input speed ＞0rpm • A/T oil temp output ≥ -23°C(-9.4°F) • 11V ≤ Battery Voltage ≤16V • TRANSAXLE RANGE SWITCH is normal	
Threshold value	• ｜input speed/5th gear ratio - output speed｜≥200rpm	
Diagnostic Time	• More than 1sec	
Fail Safe	• Locked into 3rd gear.(If diagnosis code P0734 is output four times, the transaxle is locked into 3rd gear)	

SIGNAL WAVEFORM EA8EA732

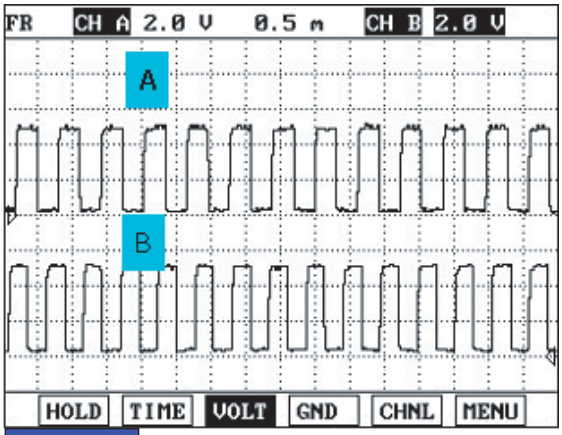


FIG.1)

A : INPUT SPEED SENSOR
B : OUTPUT SPEED SENSOR

EKBF111A

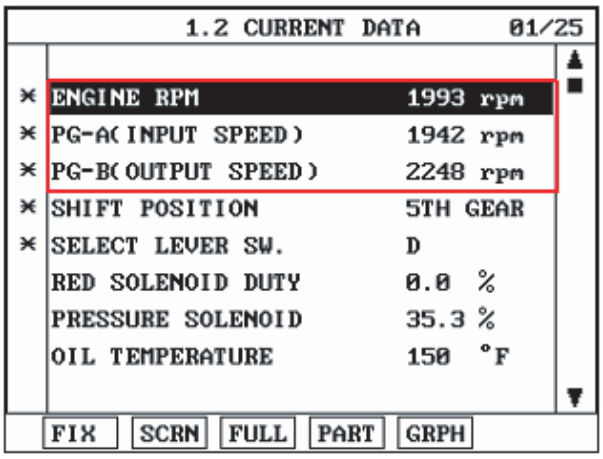
MONITOR SCANTOOL DATA ED53FDCB

Refer to DTC P0734.

SIGNAL CIRCUIT INSPECTION ECC6A99F

1. Connect Scan tool.
2. Engine "ON".
3. Monitor the "INPUT & OUTPUT SPEED SENSOR" parameter on the scan tool.
4. Accelerate the Engine speed until about 2000 rpm in the 5th gear.

Specification : INPUT SPEED - (OUTPUT SPEED × GEAR RATIO) ≤ 200 RPM



SCMAA6172N

5. Does "INPUT & OUTPUT SPEED SENSOR" follow the reference data?

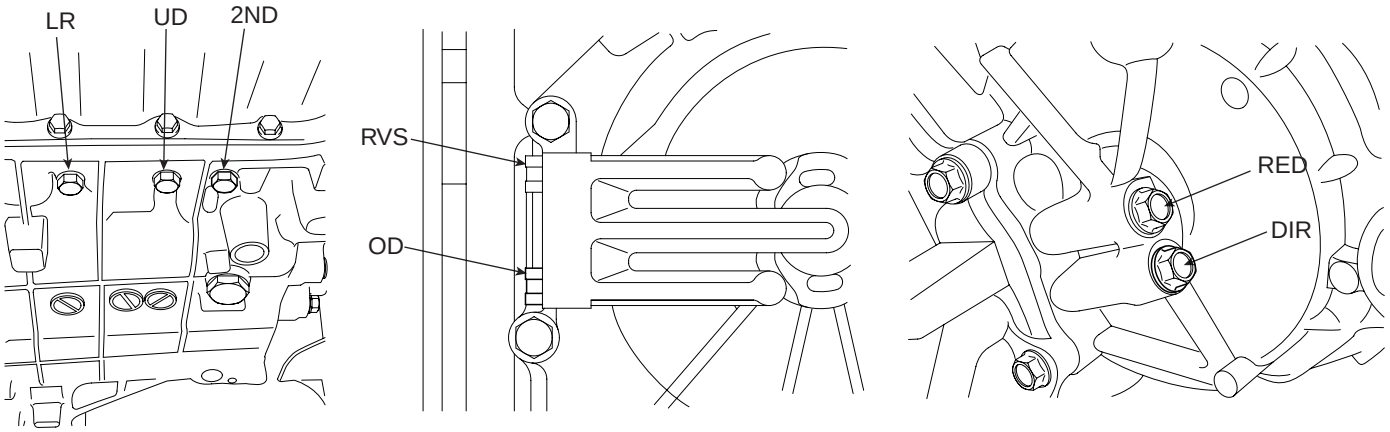
YES

▶ Go to "Component Inspection" procedure.

NO

▶ Check for electrical noise of circuit in INPUT & OUTPUT SPEED SENSOR or Replace INPUT & OUTPUT SPEED SENSOR. Repair as necessary and Go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION EFABD9E9



SCMAA6173N

1. Connect oil pressure gauge to "OD" and "2nd" and "DIR" port.
2. Engine "ON".
3. Drive a car with gear position "5".
4. Compare it with reference data as below.

Specification : refer to Standard Oil Pressure Table (Refer to DTC P0731)

5. Is oil pressure value within specification?

YES

▶ Repair AUTO TRANSAXLE(Clutch or Brake) as necessary and Go to "Verification of Vehicle Repair" procedure.

NO

▶ Replace AUTO TRANSAXLE (BODY CONTROL VALVE faulty) as necessary and Go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR EB3DA193

Refer to DTC P0731.

DTC P0741 TORQUE CONVERTER CLUTCH CIRCUIT - STUCK OFF

GENERAL DESCRIPTION EEFFE89A

The PCM/TCM controls the locking and unlocking of the Torque Converter Clutch (or Damper Clutch), to the input shaft of the transmission, by appling hydraulic pressure. The main purpose of T/C clutch control is to save fuel by decreasing the hydraulic load inside the T/C. The PCM/TCM outputs duty pulses to control the Damper Clutch Control Solenoid Valve(DCCSV) and hydraulic pressure is applied to the DC according to the DCC duty ratio value. When the duty ratio is high, high pressure is applied and the Damper Clutch is locked. The normal operating range of the Damper Clutch Control duty ratio value is from 30%(unlocked) to 85%(locked).

DTC DESCRIPTION EDD710E0

The PCM/TCM increases the duty ratio to engage the Damper Clutch by monitoring slip rpms (difference vlaue beteween engine speed and turbine speed). To decrease the slip of the Damper Clutch, the PCM/TCM increases the duty ratio by appling more hyraulic pressure. When slip rpm does not drop with 100% duty ratio, the PCM/TCM determines that the Torque Converter Clutch is stuck OFF and sets this code.

DTC DETECTING CONDITION EE98ED74

Item	Detecting Condition	Possible cause
DTC Strategy	• Stuck "OFF"	※ TORQUE CONVERTER(DAMPER) CLUTCH : TCC • Faulty TCC or oil pressure system • Faulty TCC solenoid valve • Faulty body control valve • Faulty PCM/TCM
Enable Conditions	• Always	
Threshold value	• TCC duty > 0% or TCC abnormal slip counter ≥ 4	
Diagnostic Time	• 1 second	
Fail Safe	• Damper clutch abnormal system (If diagnosis code P0741 is output four times, TORQUE CONVERTER(DAMPER) CLUTCH is not controlled by PCM/TCM)	

MONITOR SCANTOOL DATA EDEFDCA0

1. Connect scantool to data link connector(DLC).
2. Engine "ON".
3. Select "D RANGE" and drive vehicle.
4. Monitor the "TORQUE CONVERTER(DAMPER) CLUTCH" parameter on the scantool.

Specification : TCC SLIP＜160RPM(In condition that TCC SOL. DUTY ＞ 40%)

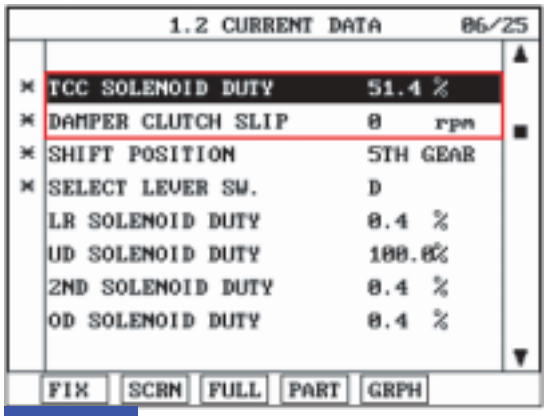


FIG.1)

FIG.1) : Normal status

LLLG112A

5. Are "TCC SOLENOID DUTY and TCC SLIP" within specifications?

YES

▶ Fault is intermittent caused by poor contact in the sensor's and/or TCM(PCM)'s connector or was repaired and TCM(PCM) memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage. Repair or replace as necessary and go to "Verification of vehicle repair" procedure.

NO

▶ Go to "Component inspection" procedure.

COMPONENT INSPECTION E304EBF0

1. CHECK TORQUE CONVERTER CLUTCH SOLENOID VALVE

   1) Connect scantool to data link connector(DLC).

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

   3) Select A/T solenoid valve actuator test and operate actuator test.

   4) Can you hear operating tone for using TCC SOLENOID VALVE actuator testing function?

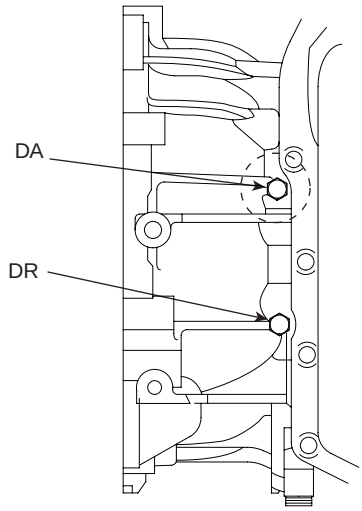
   YES

   ▶ Go to "CHECK OIL PRESSURE" as below.

   NO

   ▶ Replace "TCC SOLENOID VALVE" as necessary and go to "Verification of vehicle repair" procedure.

2. CHECK OIL PRESSURE



KKCF212B

1) Connect oil pressure gauge to "DA" ports.

2) Engine "ON".

3) After connecting Scantool and monitor the "TCC SOLENIOD VALVE DUTY" parameter on the scantool data list.

4) Operate vehicle with 3rd or 4th gear and operate the "TCC SOLENIOD VALVE DUTY" more than 85%.

5) Is oil pressure value within specification?

YES

▶ Repair TORQUE CONVERTER CLUTCH(REPLACE Torque Converter) as necessary and go to "Verification of vehicle repair" procedure.

NO

▶ Replace A/T assembly (or valve body assembly) as necessary and go to "Verification of vehicle repair" procedure.

VERIFICATION OF VEHICLE REPAIR E3FCCFBA

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

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scantool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

YES

▶ Go to the applicable troubleshooting procedure.

NO

▶ System performing to specification at this time.

DTC P0742 TORQUE CONVERTER CLUTCH CIRCUIT - STUCK ON

GENERAL DESCRIPTION EC6E31CC

Refer to DTC P0741.

DTC DESCRIPTION EAFE3C85

The TCM increases the duty ratio to engage the Damper Clutch by monitoring the slip rpms (difference vlaue beteween engine speed and turbine speed). If a very small amount of slip rpm is maintained though the TCM applies 0% duty ratio value, then the TCM determines that the Torque Converter Clutch is stuck ON and sets this code.

DTC DETECTING CONDITION E99A559C

Item	Detecting Condition	Possible cause
DTC Strategy	• Stuck "ON"	※ TORQUE CONVERTER(DAMPER) CLUTCH : TCC • Faulty TCC or oil pressure system • Faulty TCC solenoid valve • Faulty body control valve • Faulty TCM(PCM)
Enable Conditions	• Throttle position > 20% • Output speed > 500 rpm • Manifold air pressure >60 kPa • A/T range switch D,SP • TCC stuck on delay timer >5 secs	
Threshold value	• | Engine rpm - Input speed sensor rpm | ≤ 20 rpm	
Diagnostic Time	• More than 1sec	
Fail Safe	• Damper clutch abnormal system (If diagnosis code P0741 is output four times, TORQUE CONVERTER(DAMPER) CLUTCH is not controlled by PCM/TCM)	

MONITOR SCANTOOL DATA E90B8B2D

1. Connect scantool to data link connector(DLC).
2. Engine "ON".
3. Select "D RANGE" and drive vehicle.
4. Monitor the "TORQUE CONVERTER(DAMPER) CLUTCH" parameter on the scantool.

Specification : TCC SLIP>5RPM

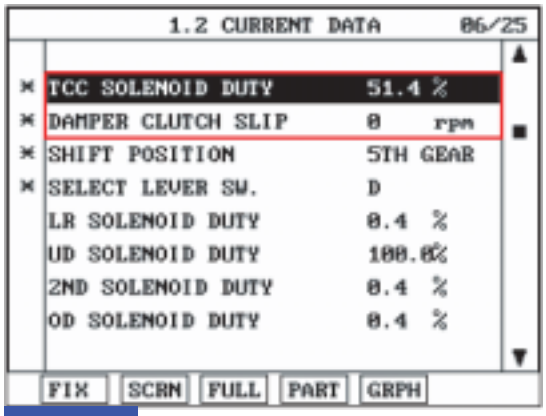


FIG.1)

FIG.1) : Normal status

LLLG112A

5. Is TCC SLIP" within specifications?

YES

▶ Fault is intermittent caused by poor contact in the sensor's and/or TCM(PCM)'s connector or was repaired and TCM(PCM) memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage. Repair or replace as necessary and go to "Verification of vehicle repair" procedure.

NO

▶ Go to "Component inspection" procedure.

COMPONENT INSPECTION ECD511FB

1. CHECK TORQUE CONVERTER CLUTCH SOLENOID VALVE

   1) Connect scantool to data link connector(DLC).

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

   3) Select A/T solenoid valve actuator test and operate actuator test.

   4) Can you hear operating sound for using TCC SOLENOID VALVE actuator testing function?

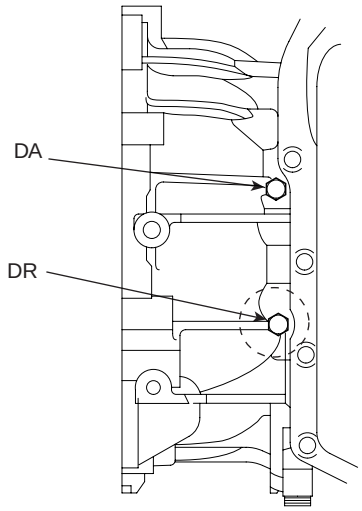
   YES

   ▶ Go to "CHECK OIL PRESSURE" as below.

   NO

   ▶ Repair or replace as necessary and then go to "Verification of vehicle repair" procedure.

2. CHECK OIL PRESSURE



SGHAT7162N

1) Connect oil pressure gauge to "DR" ports.

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

3) After connecting scantool and monitor the "TCC SOLENIOD VALVE DUTY" parameter on the scantool data list.

4) Select 1st gear and accelerate Engine speed to 2500 rpm.

5) Measure oil pressure.

Specification : approx. 598.2034KPa(6.1kg/cm²)

6) Is oil pressure value within specification?

YES

▶ Repair TORQUE CONVERTER CLUTCH(REPLACE Torque Converter) as necessary and go to "Verification of vehicle repair" procedure.

NO

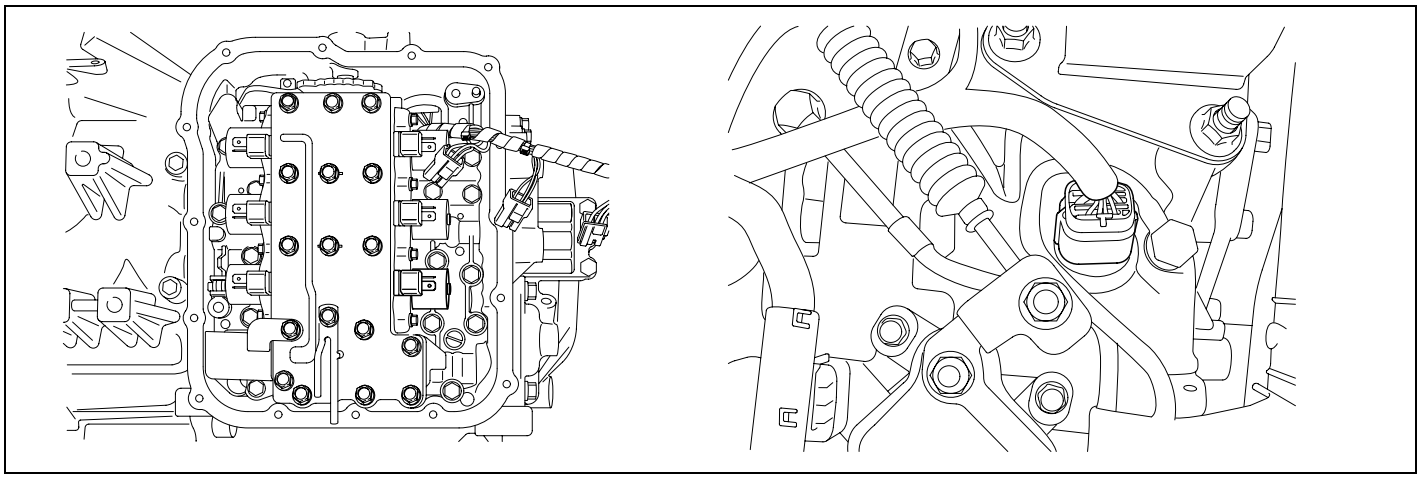
▶ Replace A/T assembly (possible to BODY CONTROL VALVE faulty) as necessary and Go to "Verification of vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR E77E9FD3

Refer to DTC P0741.

DTC P0743 TORQUE CONVERTER CLUTCH CIRCUIT - ELECTRICAL

COMPONENT LOCATION EDA1B370



AKKF116A

GENERAL DESCRIPTION EEB1CFA0

Refer to DTC P0741.

DTC DESCRIPTION EAD19ED0

The PCM/TCM checks the Damper Clutch Control Signal by monitoring the feedback signal from the solenoid valve drive circuit. If an unexpected signal is monitored (for example, high voltage is detected when low voltage is expected, or low voltage is detected when high voltage is expected) the PCM/TCM judges that DCCSV circuit is malfunctioning and sets this code.

DTC DETECTING CONDITION E6E12CEA

Item	Detecting Condition	Possible cause
DTC Strategy	• Check voltage range	※ TORQUE CONVERTER(DAMPER) CLUTCH : TCC • Open or short in circuit • Faulty TCC SOLENOID VALVE • Faulty PCM/TCM
Enable Conditions	• 16V > Voltage Battery >11V • In gear state(no gear shifting) 500msec is passed from turn on the relay • A/T Relay = ON • Engine state = RUN	
Threshold value	• Feedback voltage from DCC control solenoid> vb-2V and DCC control duty is 100% • Feedback voltage from DCC control solenoid≤ 5.5V and DCC control duty is 0%	
Diagnostic Time	• More than 5 seconds	
Fail Safe	• Locked in 3rd gear.(Control relay off)	

SPECIFICATION EADB3F61

Solenoid Valve for Pressure Control

- Sensor type : Normal open 3-way
- Operating temperature : -22~266°F(-30°C~130°C)
- Frequency :
  - LR, 2ND, UD, OD, RED : 61.27Hz (at the ATF temp. -20°C above)
  - DCC : 30.64Hz
    ※ KM series : 35Hz

- Internal resistance :
  - 2.7~3.4Ω (68°F or 20°C)

- Surge voltage : 56 V

SIGNAL WAVEFORM E78B62FB

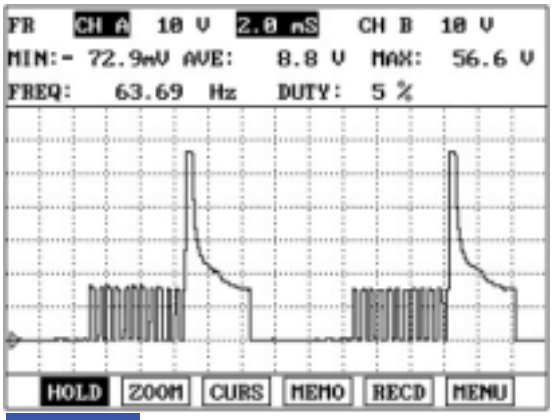


FIG.1)

FIG.1) : Operating of "DCCSV"

EKBF115A

MONITOR SCANTOOL DATA E34F06DD

1. Connect scantool to data link connector(DLC)
2. Engine "ON".
3. Monitor the "TCC SOL. VALVE" parameter on the scantool
4. Select "D RANGE" and Operate "TCC SOLENOID DUTY" more than 40%.

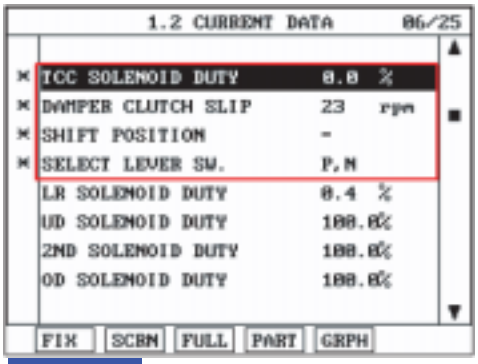


FIG.1)

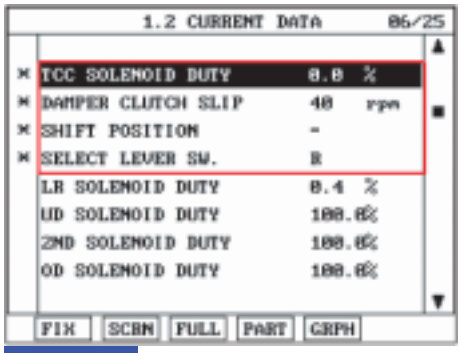


FIG.2)

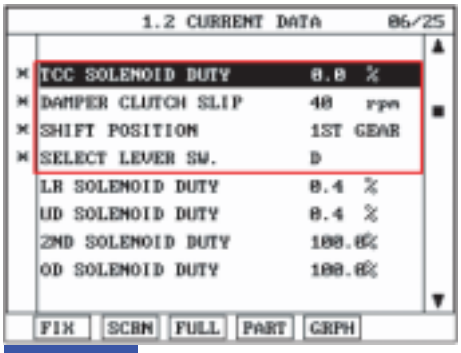


FIG.3)

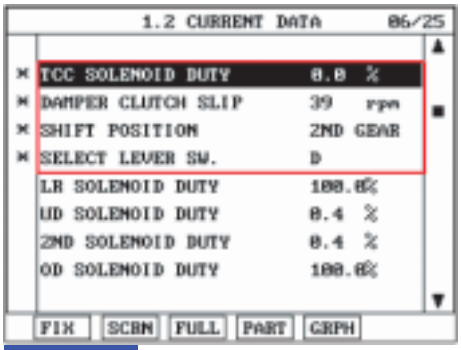


FIG.4)

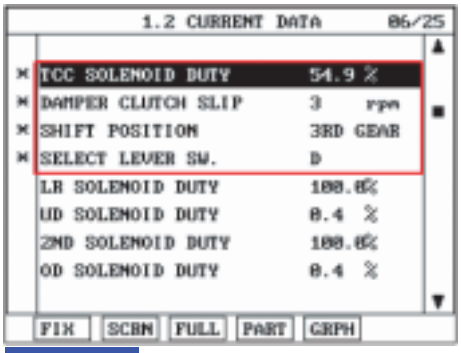


FIG.5)

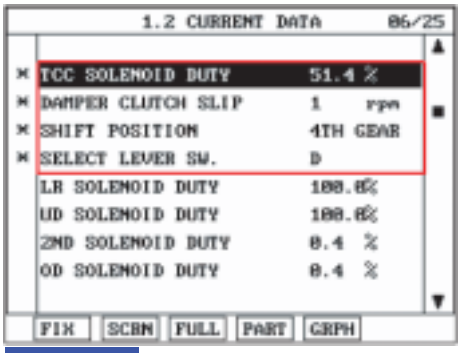


FIG.6)

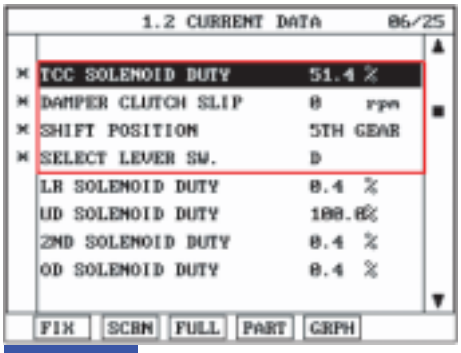


FIG.7)

FIG. 1) P,N
FIG. 2) "R"
FIG. 3) "D 1st" gear
FIG. 4) "2nd" gear
FIG. 5) "3rd" gear
FIG. 6) "4th" gear
FIG. 7) "5th" gear

LLLG114A

5. Does "TCC SOLENOID DUTY " follow the reference data?

YES

▶ Fault is intermittent caused by poor contact in the sensor's and/or TCM(PCM)'s connector or was repaired and TCM(PCM) memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage. Repair or replace as necessary and go to "Verification of vehicle repair" procedure.

NO

▶ Go to "Terminal & connector inspection " procedure.

TERMINAL & CONNECTOR INSPECTION ED85544C

1. Many malfunctions in the electrical system are caused by poor harness and terminal condition. 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 then go to "Verification of vehicle repair" procedure.

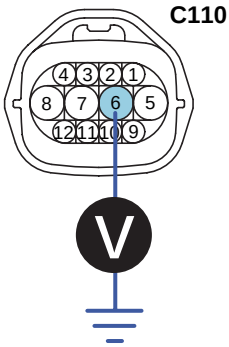
NO

▶ Go to "Power supply circuit inspection" procedure.

POWER SUPPLY CIRCUIT INSPECTION E7FFD8CF

1. Disconnect "A/T SOLENOID VALVE" connector.
2. Measure voltage between terminal "6" of the sensor harness connector and chassis ground.
3. Turn ignition switch OFF → ON

Specification: 12V is measured only for approx. 0.5sec



3. UD solenoid valve
4. 2ND solenoid valve
5. A/T battery
6. **A/T battery**
7. VF solenoid valve(+)
8. VF solenoid valve(-)
9. DCC solenoid valve
10. RED solenoid valve
11. LR solenoid valve
12. OD solenoid valve

SGHAT7120N

4. Is voltage within specifications?

YES

▶ Go to "Signal circuit inspection" procedure.

NO

▶ Check that A/T-20A fuse in engine room junction is installed or not blown.
▶ Check for open in harness. Repair as necessary and go to "Verification of vehicle repair" procedure.

SIGNAL CIRCUIT INSPECTION E5747F5D

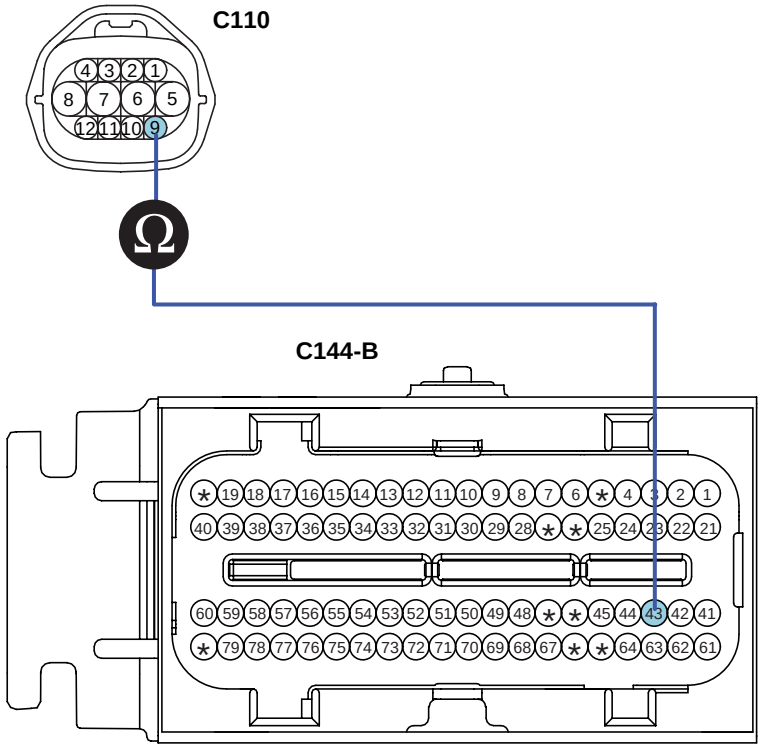
1. Check signal circuit open inspection.

   1) Ignition "OFF".

   2) Disconnect "A/T SOLENOID VALVE" connector and "PCM/TCM" connector.

   3) Measure resistance between terminal "9" of the ATM SOLENOID VALVE harness connector and terminal "43" of the TCM harness connector.

Specification: approx. 0 Ω



3. UD solenoid valve
4. 2ND solenoid valve
5. A/T battery
6. A/T battery
7. VF solenoid valve(+)
8. VF solenoid valve(-)
9. DCC solenoid valve
10.RED solenoid valve
11. LR solenoid valve
12. OD solenoid valve

42.OD solenoid valve control
45.2ND solenoid valve control
43.DCC solenoid valve control
44.RED solenoid valve
75.VF solenoid valve(+)
59.VF solenoid valve(-)
22.LR solenoid valve control
03.UD solenoid valve control

SGHAT7121N

4) Is resistance within specifications?

YES

▶ Go to "Check signal circuit short inspection" procedure.

NO

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

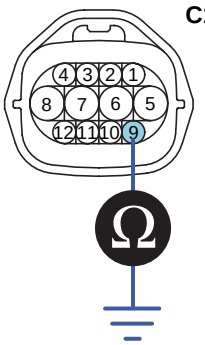
2. Check signal circuit short inspection

1) Ignition "OFF".

2) Disconnect "A/T SOLENOID VALVE" connector and "PCM/TCM" connector.

3) Measure resistance between terminal "9" of the ATM SOLENOID VALVE harness and chassis ground.

Specification: Infinite



3. UD solenoid valve
4. 2ND solenoid valve
5. A/T battery
6. A/T battery
7. VF solenoid valve(+)
8. VF solenoid valve(-)
9. DCC solenoid valve
10. RED solenoid valve
11. LR solenoid valve
12. OD solenoid valve

SGHAT7122N

4) Is resistance within specifications?

YES

▶ Go to "Component inspection" procedure.

NO

▶ Check for short to ground in harness. Repair as necessary and go to "Verification of vehicle repair" procedure.

COMPONENT INSPECTION E2EEB4D7

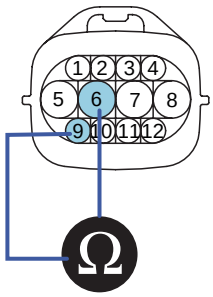
1. CHECK SOLENOID VALVE

1) Ignition "OFF".

2) Disconnect "A/T SOLENOID VALVE" connector.

3) Measure resistance between terminal "6" and terminal "9" of the ATM SOLENOID VALVE harness connector.

Specification: Approximately 2.7~3.4 Ω [20°C(68°F)]



C110

Component Side

3. UD solenoid valve
4. 2ND solenoid valve
5. A/T battery
6. A/T battery
7. VF solenoid valve(+)
8. VF solenoid valve(-)
9. DCC solenoid valve
10.RED solenoid valve
11. LR solenoid valve
12. OD solenoid valve

SGHAT7123N

4) Is resistance within specification?

YES

▶ Go to "CHECK PCM/TCM" as below.

NO

▶ Replace TCC SOLENOID VALVE as necessary and go to "Verification of vehicle repair" procedure.

2. CHECK PCM/TCM

1) Connect scantool to data link connector(DLC).

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

3) Select A/T solenoid valve actuator test and operate actuator test.

4) Can you hear operating sound for TCC SOLENOID VALVE actuator testing function?

YES

▶ Go to "Verification of vehicle repair" procedure.

NO

▶ Replace PCM/TCM as necessary and go to "Verification of vehicle repair" procedure.

ACTUATOR TEST CONDITION

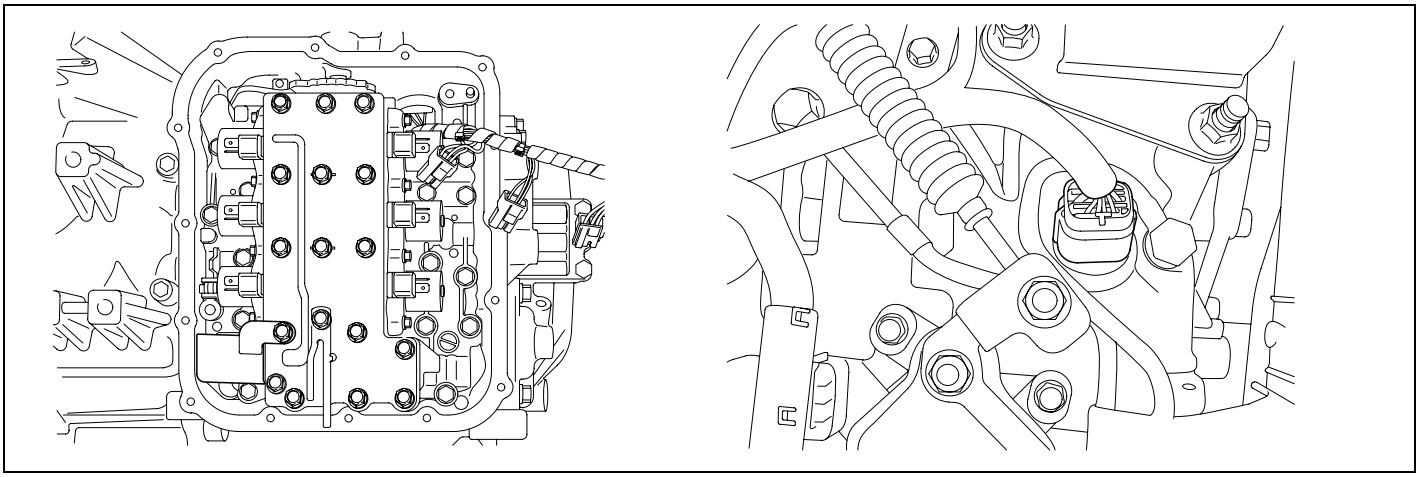
1. IG SWITCH ON
2. TRANSAXLE RANGE SWITCH is normal
3. P RANGE
4. Vehicle Speed 0mph(0km/h)
5. Throttle position sensor＜ 1V
6. IDLE SWITCH ON
7. ENGINE RPM 0

VERIFICATION OF VEHICLE REPAIR EDFD0B77

Refer to DTC P0741.

DTC P0748 PRESSURE CONTROL SOLENOID VALVE A - ELECTRICAL

COMPONENT LOCATION EA061308



AKKF116U

GENERAL DESCRIPTION E3BA73E4

Variable Force Solenoid (Linear Solenoid) : With the duty control which uses higher frequency(600Hz), instead of the existing PWM type which adapts low frequency(60Hz) to control, spool valve can be controlled precisely.
In PWM control, the amount of oil flow is determined by the duration of "ON"signal among continuously repeated ON/OFF signals.
In VFS, the amount is decided by the width of the oil passage.

DTC DESCRIPTION E2EEE170

The TCM checks the VFS Control Signal by monitoring the feedback signal from the solenoid valve drive circuit. If an unexpected signal is monitored (for example, high voltage is detected when low voltage is expected, or low voltage is detected when high voltage is expected), the TCM judges that the Low and Reverse control solenoid circuit is malfunctioning and sets this code.

DTC DETECTING CONDITION ED2E8E44

Item	Detecting Condition	Possible cause
DTC Strategy	• Check voltage range	• Open or short in circuit • Faulty VFS SOLENOID VALVE • Faulty PCM/TCM
Enable Conditions	• 16V > Voltage Battery >11V • In gear state(no gear shifting) 500msec is passed from turn on the relay • A/T Relay = ON • Engine state = RUN	
Threshold value	• Out of available voltage range	
Diagnostic Time	• More than 2 seconds	
Fail Safe	• Locked in 3rd gear (Control relay off)	

SPECIFICATION E61D8EF1

Refer to DTC P0743.

SIGNAL WAVEFORM E0CB5AE0

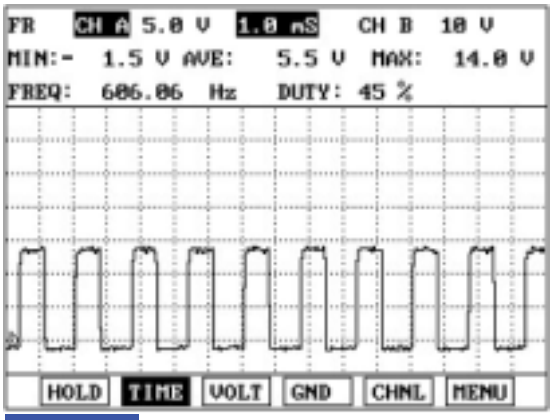


FIG.1)

FIG.1) : Wave form of "VFS"

EKBF116A

MONITOR SCANTOOL DATA EB937689

1. Connect scantool to data link connector(DLC).
2. Engine "ON".
3. Monitor the "PRESS CONTROL SOL. VALVE" parameter on the scantool.
4. Shift gear at each position.

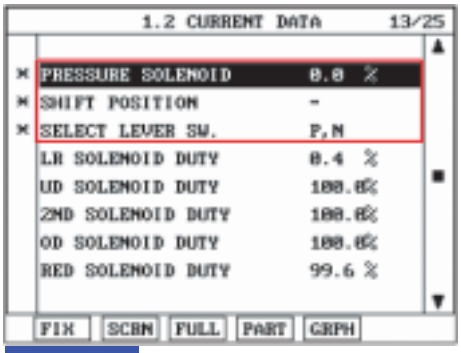


FIG.1)

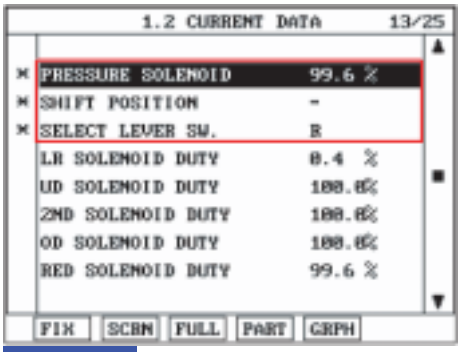


FIG.2)

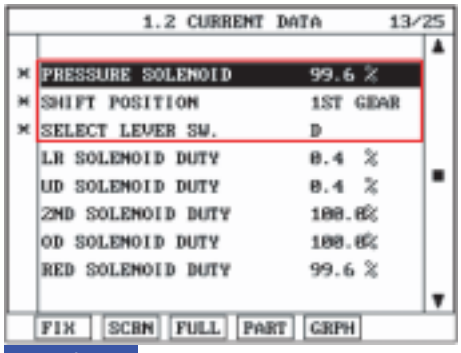


FIG.3)

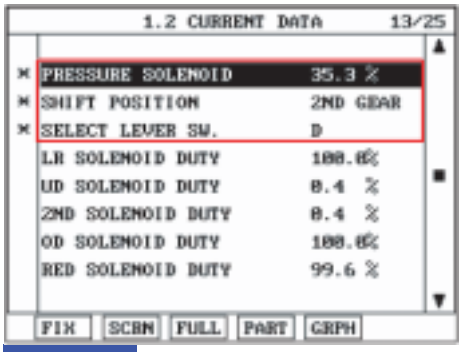


FIG.4)

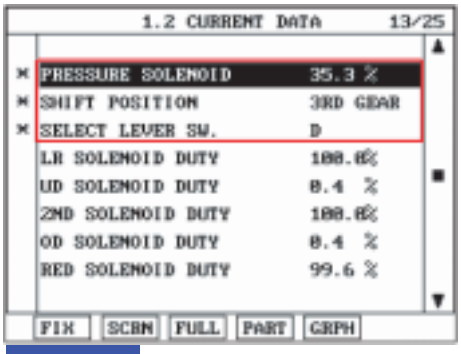


FIG.5)

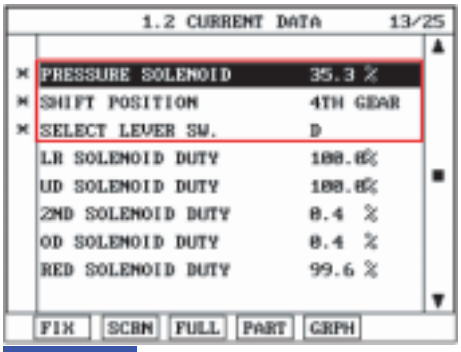


FIG.6)

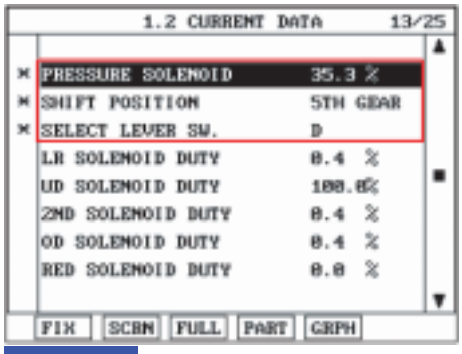


FIG.7)

FIG. 1) P,N
FIG. 2) "R"
FIG. 3) "D 1st" gear
FIG. 4) "2nd" gear
FIG. 5) "3rd" gear
FIG. 6) "4th" gear
FIG. 7) "5th" gear

SCMAT6736L

5. Does "PRESS CONTROL SOL DUTY " follow the reference data?

YES

▶ Fault is intermittent caused by poor contact in the sensor's and/or TCM(PCM)'s connector or was repaired and TCM(PCM) memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage. Repair or replace as necessary and go to "Verification of vehicle repair" procedure.

NO

▶ Go to "Terminal & connector inspection" procedure.

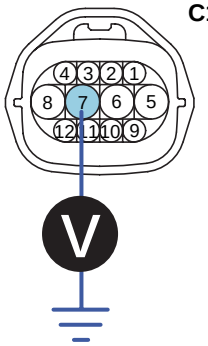
TERMINAL & CONNECTOR INSPECTION E38FABBE

Refer to DTC P0743.

POWER SUPPLY CIRCUIT INSPECTION E93E55CE

1. Disconnect "A/T SOLENOID VALVE" connector.
2. Measure voltage between terminal "7" of the sensor harness connector and chassis ground.
3. Measure voltage of VFS solenoid valve.

Specification: Approx.12V



3. UD solenoid valve
4. 2ND solenoid valve
5. A/T battery
6. A/T battery
7. VF solenoid valve(+)
8. VF solenoid valve(-)
9. DCC solenoid valve
10. RED solenoid valve
11. LR solenoid valve
12. OD solenoid valve

SGHAT7125N

4. Is voltage within specifications?

YES

▶ Go to "Signal circuit inspection" procedure.

NO

▶ Check that A/T-20A fuse in engine room junction is installed or not blown.
▶ Check for open in harness. Repair as necessary and go to "Verification of vehicle repair" procedure.

SIGNAL CIRCUIT INSPECTION ECABEE62

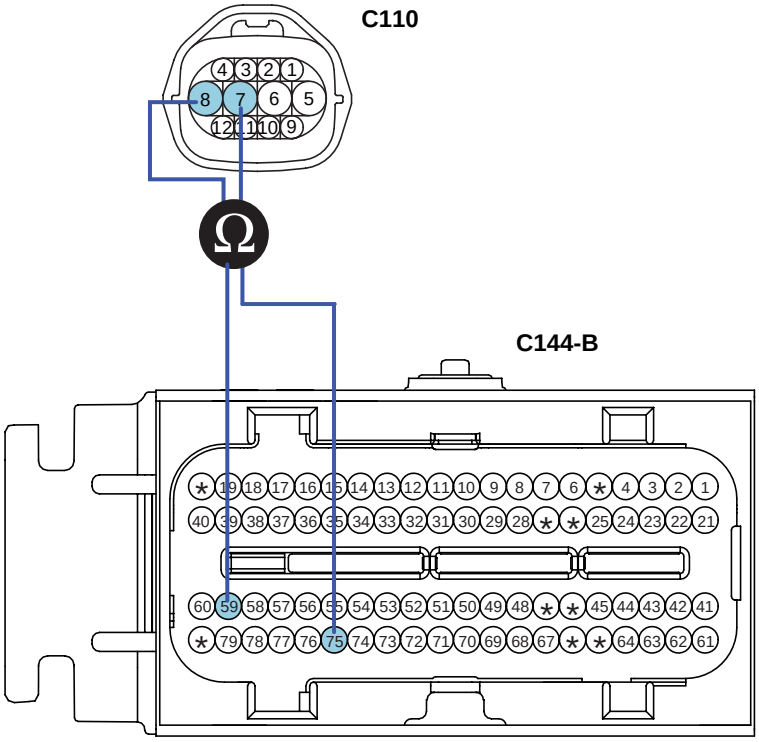
1. Check signal circuit open inspection.

   1) Ignition "OFF".

   2) Disconnect "A/T SOLENOID VALVE" connector and "PCM/TCM" connector.

   3) Measure resistance between terminal "7","8" of the ATM SOLENOID VALVE harness connector and terminal "75","59" of the PCM/TCM harness connector.

Specification: approx. 0 Ω



3. UD solenoid valve
4. 2ND solenoid valve
5. A/T battery
6. A/T battery
7. VF solenoid valve(+)
8. VF solenoid valve(-)
9. DCC solenoid valve
10.RED solenoid valve
11. LR solenoid valve
12. OD solenoid valve

42.OD solenoid valve control
45.2ND solenoid valve control
43.DCC solenoid valve control
44.RED solenoid valve
75.VF solenoid valve(+)
59.VF solenoid valve(-)
22.LR solenoid valve control
03.UD solenoid valve control

SGHAT7126N

   4) Is resistance within specifications?

YES

▶ Go to "Check signal circuit short inspection" procedure.

NO

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

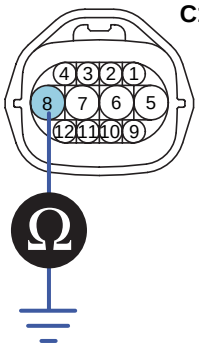
2. Check signal circuit short inspection

   1) Ignition "OFF".

   2) Disconnect "A/T SOLENOID VALVE" connector and "PCM/TCM" connector

   3) Measure resistance between terminal "8" of the ATM SOLENOID VALVE harness and chassis ground.

Specification: Infinite



3. UD solenoid valve
4. 2ND solenoid valve
5. A/T battery
6. A/T battery
7. VF solenoid valve(+)
8. VF solenoid valve(-)
9. DCC solenoid valve
10.RED solenoid valve
11. LR solenoid valve
12. OD solenoid valve

SGHAT7127N

4) Is resistance within specifications?

YES

▶ Go to "Component inspection" procedure.

NO

▶ Check for short to ground in harness. Repair as necessary and go to "Verification of vehicle repair" procedure.

COMPONENT INSPECTION E1D25DDF

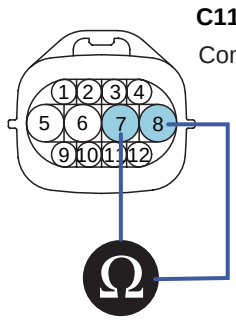
1. CHECK SOLENOID VALVE

1) Ignition "OFF".

2) Disconnect "A/T SOLENOID VALVE" connector.

3) Measure resistance between terminal "7" and terminal "8" of the ATM SOLENOID VALVE harness connector.

Specification: Approximately 4.35±0.35Ω [20°C(68°F)]



3. UD solenoid valve
4. 2ND solenoid valve
5. A/T battery
6. A/T battery
7. VF solenoid valve(+)
8. VF solenoid valve(-)
9. DCC solenoid valve
10.RED solenoid valve
11. LR solenoid valve
12. OD solenoid valve

SGHAT7128N

4) Is resistance within specification?

YES

▶ Go to "CHECK PCM/TCM" as below.

NO

▶ Replace "PRESS CONTROL SOL VALVE(VFS)" as necessary and go to "Verification of vehicle repair" procedure.

2. CHECK PCM/TCM

1) Connect scantool to data link connector(DLC).

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

3) Select A/T Solenoid valve Actuator test and Operate Actuator test.

4) Can you hear operating sound for "PRESS CONTROL SOL VALVE(VFS)" Actuator testing function?

YES

▶ Go to "Verification of vehicle repair" procedure.

NO

▶ Replace PCM/TCM as necessary and go to "Verification of vehicle repair" procedure.

ACTUATOR TEST CONDITION

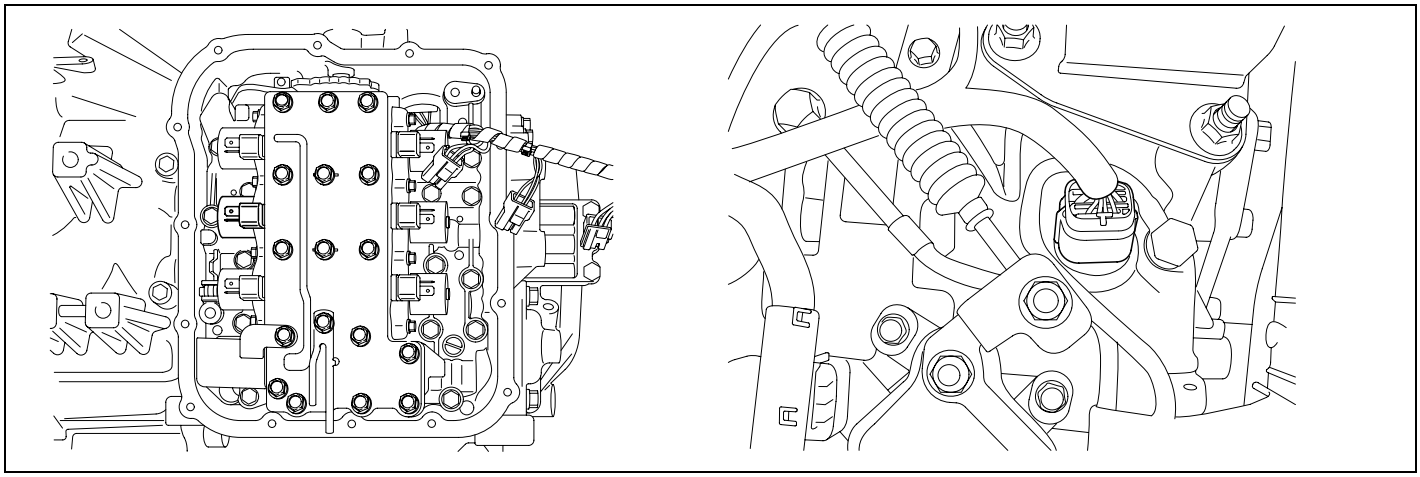
1. IG SWITCH ON
2. TRANSAXLE RANGE SWITCH is normal
3. P RANGE
4. Vehicle Speed 0mph(0km/h)
5. Throttle position sensor＜ 1V
6. IDLE SWITCH ON
7. ENGINE RPM 0

VERIFICATION OF VEHICLE REPAIR EC0F4FE9

Refer to DTC P0741.

DTC P0750 SHIFT CONTROL SOLENOID VALVE A CIRCUIT MALFUNCTION

COMPONENT LOCATION E4FB69CF



AKKF117G

GENERAL DESCRIPTION E7CFA9A5

The Automatic transmission changes the gear position of the transmission by utilizing a combination of clutches and brakes, which are controlled by solenoid valves. The HIVEC Automatic Transmission consists of a: LR (Low and Reverse Brake), 2ND (2nd Brake), UD (Under Drive Clutch), OD (Over Drive Clutch), REV (Reverse Clutch), and a RED (Reduction Brake, only for 5 speed transmissions). The LR Brake is engaged in the 1st gear and reverse gear positions.

DTC DESCRIPTION EFEFCDBA

The TCM checks the Low and Reverse Control Signal by monitoring the feedback signal from the solenoid valve drive circuit. If an unexpected signal is monitored (for example, high voltage is detected when low voltage is expected, or low voltage is detected when high voltage is expected), the TCM judges that the Low and Reverse control solenoid circuit is malfunctioning and sets this code.

DTC DETECTING CONDITION EBADA0DE

Item	Detecting Condition	Possible cause
DTC Strategy	• Check voltage range	• Open or short in circuit • Faulty LR SOLENOID VALVE • Faulty PCM/TCM
Enable Conditions	• 16V > Voltage Battery >11V • In gear state(no gear shifting) 500msec is passed from turn on the relay • A/T Relay = ON • Engine state = RUN	
Threshold value	• Out of available voltage range	
Diagnostic Time	• More than 5 seconds	
Fail Safe	• Locked in 3rd gear.(Control relay off)	

SPECIFICATION ECF2A431

Refer to DTC P0743.

SIGNAL WAVEFORM EDD5EFCC

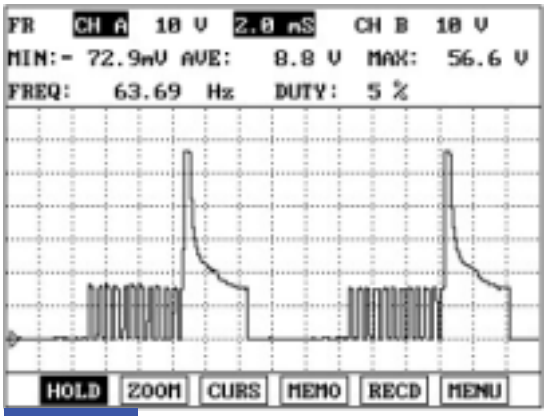


FIG.1)

FIG.1) : "2nd" gear → "1st" gear

EKBF117A

MONITOR SCANTOOL DATA E6EBB83C

1. Connect scantool to data link connector(DLC).
2. Engine "ON".
3. Monitor the "LR SOL. VALVE" parameter on the scantool.
4. Shift gear at each position.

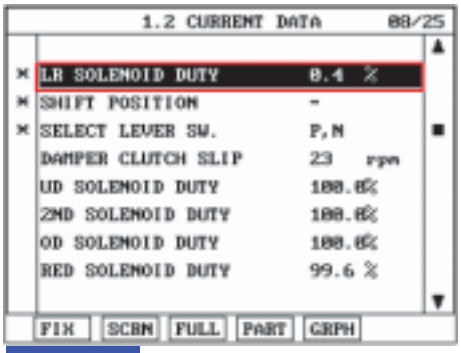


FIG.1)

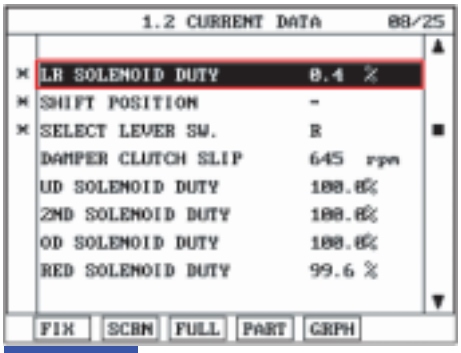


FIG.2)

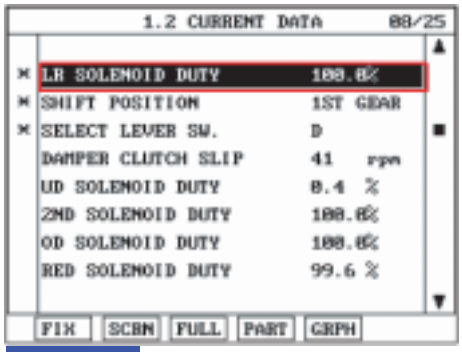


FIG.3)

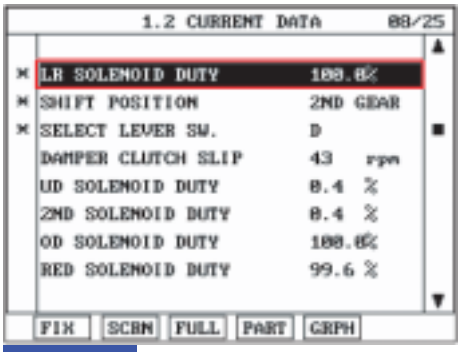


FIG.4)

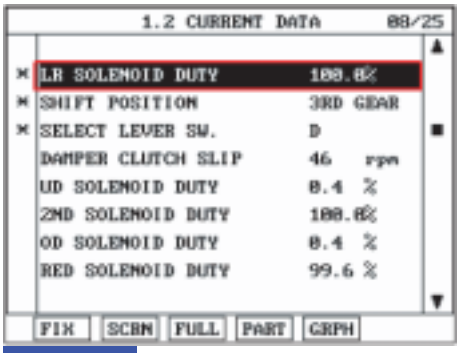


FIG.5)

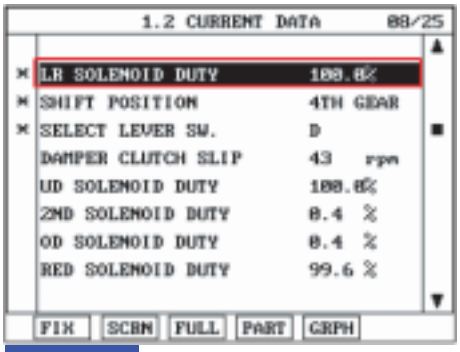


FIG.6)

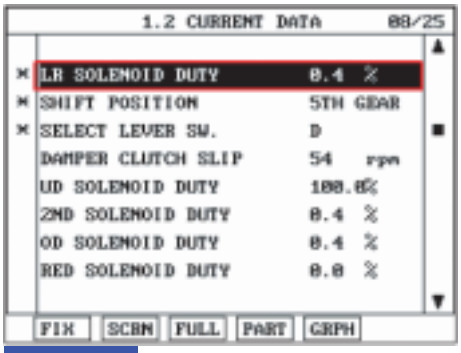


FIG.7)

FIG. 1) P,N
FIG. 2) "R"
FIG. 3) "D 1st" gear
FIG. 4) "2nd" gear
FIG. 5) "3rd" gear
FIG. 6) "4th" gear
FIG. 7) "5th" gear

SCMAT6741L

5. Does "LR SOLENOID DUTY " follow the reference data?

YES

▶ Fault is intermittent caused by poor contact in the sensor's and/or TCM(PCM)'s connector or was repaired and TCM(PCM) memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage. Repair or replace as necessary and go to "Verification of vehicle repair" procedure.

NO

▶ Go to "Terminal & connector inspection " procedure.

TERMINAL & CONNECTOR INSPECTION E7A3B6BE

Refer to DTC P0743.

POWER SUPPLY CIRCUIT INSPECTION E1DCF4DC

Refer to DTC P0743.

SIGNAL CIRCUIT INSPECTION EF5F119D

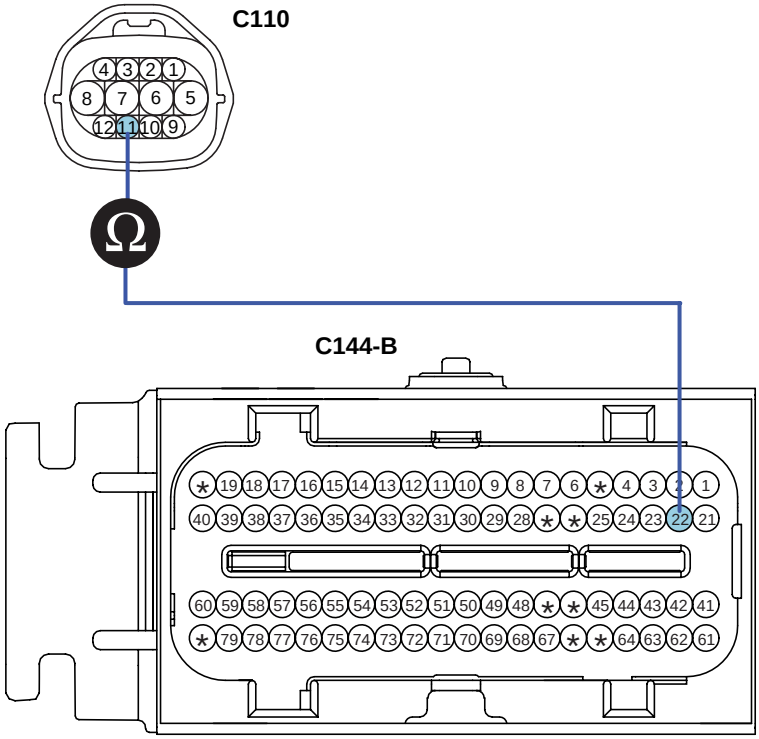
1. Check signal circuit open inspection

   1) Ignition "OFF".

   2) Disconnect "A/T SOLENOID VALVE" connector and "PCM/TCM" connector.

   3) Measure resistance between terminal "11" of the ATM SOLENOID VALVE harness connector and terminal "22" of the PCM/TCM harness connector.

Specification: approx. 0 Ω



3. UD solenoid valve
4. 2ND solenoid valve
5. A/T battery
6. A/T battery
7. VF solenoid valve(+)
8. VF solenoid valve(-)
9. DCC solenoid valve
10.RED solenoid valve
11. LR solenoid valve
12. OD solenoid valve

42.OD solenoid valve control
45.2ND solenoid valve control
43.DCC solenoid valve control
44.RED solenoid valve
75.VF solenoid valve(+)
59.VF solenoid valve(-)
22.LR solenoid valve control
03.UD solenoid valve control

SGHAT7130N

4) Is resistance within specifications?

YES

▶ Go to "Check signal circuit short inspection" procedure.

NO

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

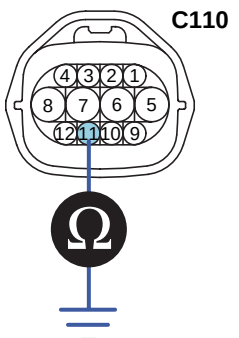
2. Check signal circuit short inspection

1) Ignition "OFF".

2) Disconnect "A/T SOLENOID VALVE" connector and "PCM/TCM" connector.

3) Measure resistance between terminal "11" of the ATM SOLENOID VALVE harness and chassis ground.

Specification: Infinite



3. UD solenoid valve
4. 2ND solenoid valve
5. A/T battery
6. A/T battery
7. VF solenoid valve(+)
8. VF solenoid valve(-)
9. DCC solenoid valve
10.RED solenoid valve
11. LR solenoid valve
12. OD solenoid valve

SGHAT7131N

4) Is resistance within specifications?

YES

▶ Go to "Component inspection" procedure.

NO

▶ Check for short to ground in harness. Repair as necessary and go to "Verification of vehicle repair" procedure.

COMPONENT INSPECTION E282C039

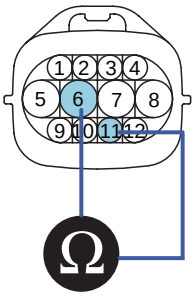
1. CHECK SOLENOID VALVE

1) Ignition "OFF".

2) Disconnect "A/T SOLENOID VALVE" connector.

3) Measure resistance between terminal "6" and terminal "11" of the ATM SOLENOID VALVE harness connector.

Specification: Approximately 2.7~3.4 Ω [20°C(68°F)]



C110
Component Side

3. UD solenoid valve
4. 2ND solenoid valve
5. A/T battery
6. A/T battery
7. VF solenoid valve(+)
8. VF solenoid valve(-)
9. DCC solenoid valve
10.RED solenoid valve
11. LR solenoid valve
12. OD solenoid valve

SGHAT7132N

4) Is resistance within specification?

YES

▶ Go to "CHECK PCM/TCM" as below.

NO

▶ Replace LR SOLENOID VALVE as necessary and go to "Verification of vehicle repair" procedure.

2. CHECK PCM/TCM

1) Connect scantool to data link connector(DLC).

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

3) Select A/T solenoid valve actuator test and operate actuator test.

4) Can you hear operating sound for LR SOLENOID VALVE actuator testing function?

YES

▶ Go to "Verification of vehicle repair" procedure.

NO

▶ Replace PCM/TCM as necessary and go to "Verification of vehicle repair" procedure.

ACTUATOR TEST CONDITION

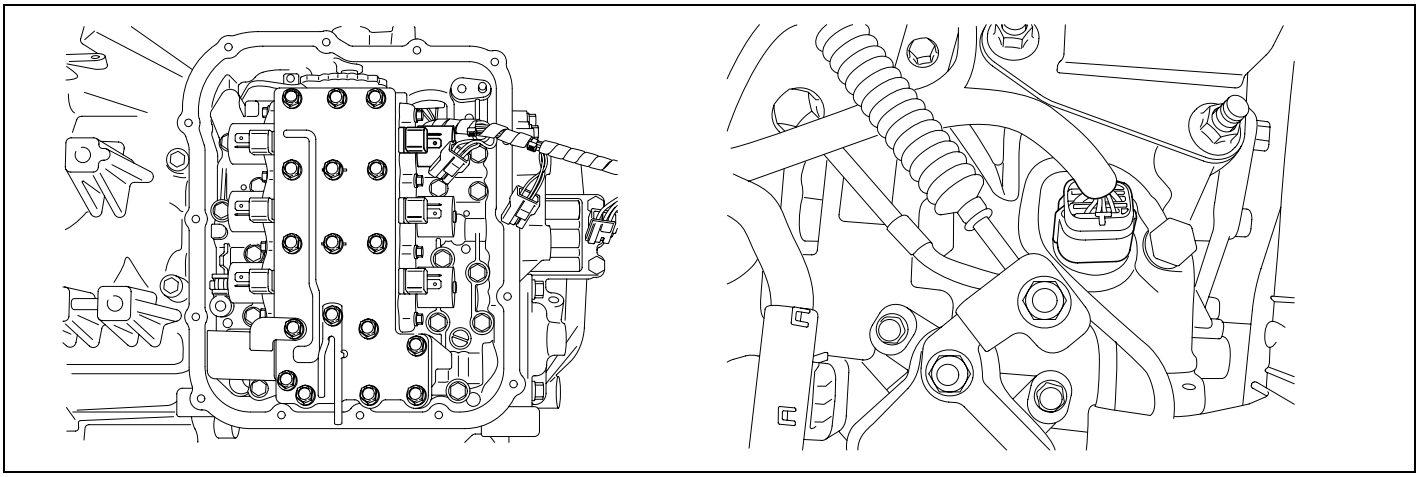
1. IG SWITCH ON
2. TRANSAXLE RANGE SWITCH is normal
3. P RANGE
4. Vehicle Speed 0mph(0km/h)
5. Throttle position sensor < 1V
6. IDLE SWITCH ON
7. ENGINE RPM 0

VERIFICATION OF VEHICLE REPAIR E6C58558

Refer to DTC P0741.

DTC P0755 SHIFT CONTROL SOLENOID VALVE B CIRCUIT MALFUNCTION

COMPONENT LOCATION EAEF3A58



AKKF118G

GENERAL DESCRIPTION EC181071

The Automatic transmission changes the gear position of the transmission by utilizing a combination of clutches and brakes, which are controlled by solenoid valves. The HIVEC Automatic Transmission consists of a: LR (Low and Reverse Brake), 2ND (2nd Brake), UD (Under Drive Clutch), OD (Over Drive Clutch), REV (Reverse Clutch), and a RED (Reduction Brake, only for 5 speed transmissions).
The UD Clutch is engaged in the 1st gear, 2nd gear and 3rd gear positions.

DTC DESCRIPTION EE7FD5B8

The TCM checks the Under Drive Clutch Control Signal by monitoring the feedback signal from the solenoid valve drive circuit. If an unexpected signal is monitored (for example, high voltage is detected when low voltage is expected, or low voltage is detected when high voltage is expected), the TCM judges that Under Drive control solenoid circuit is malfunctioning and sets this code.

DTC DETECTING CONDITION E8FAA0FD

Item	Detecting Condition	Possible cause
DTC Strategy	• Check voltage range	• Open or short in circuit • Faulty UD SOLENOID VALVE • Faulty PCM/TCM
Enable Conditions	• 16V > Voltage Battery >11V • In gear state(no gear shifting) 500msec is passed from turn on the relay • A/T Relay = ON • Engine state = RUN	
Threshold value	• Out of available voltage range	
Diagnostic Time	• More than 5 seconds	
Fail Safe	• Locked in 3rd gear.(Control relay off)	

SPECIFICATION EADB3611

Refer to DTC P0743.

SIGNAL WAVEFORM EAEC7109

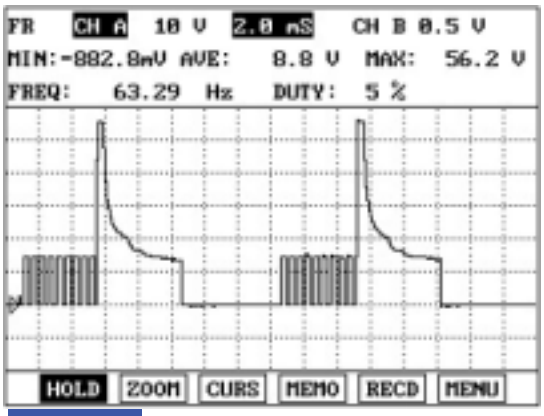


FIG.1)

FIG.1) : "N" → "D"

EKBF118A

MONITOR SCANTOOL DATA E6E9BD15

1. Connect scantool to data link connector(DLC)
2. Engine "ON".
3. Monitor the "UD SOL. VALVE" parameter on the scantool.
4. Shift gear at each position.

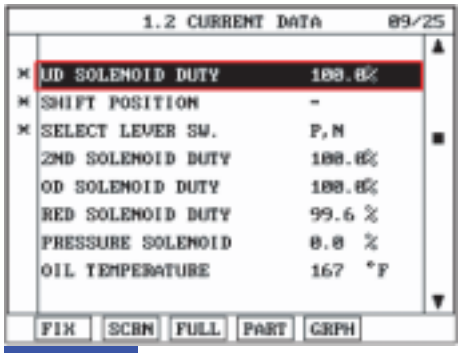


FIG.1)

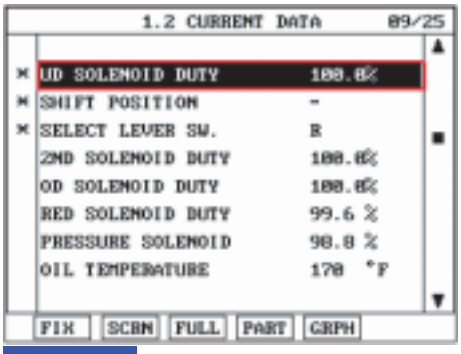


FIG.2)

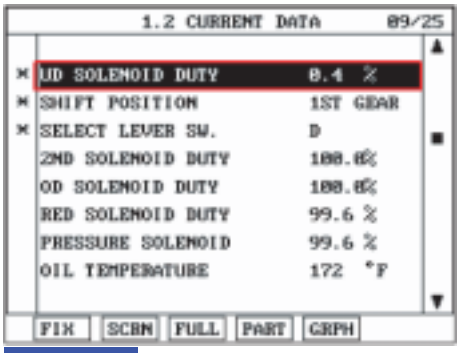


FIG.3)

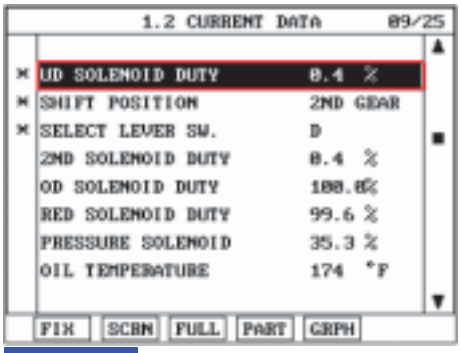


FIG.4)

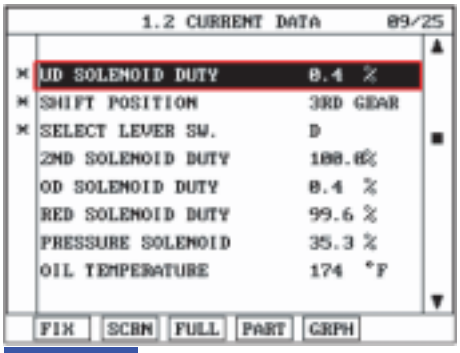


FIG.5)

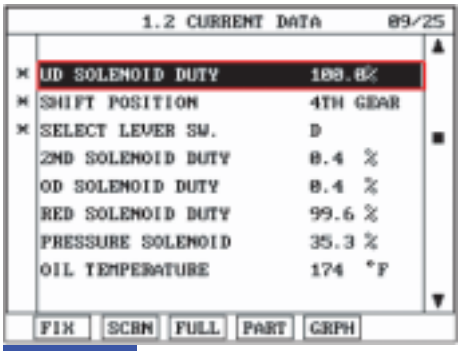


FIG.6)

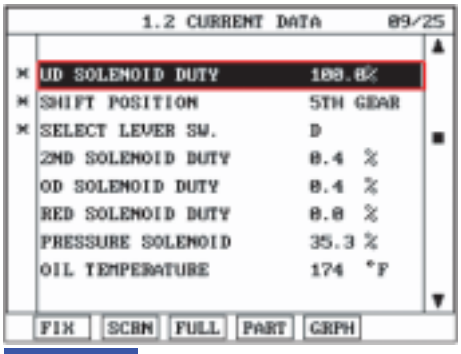


FIG.7)

FIG. 1) P,N
FIG. 2) "R"
FIG. 3) "D 1st" gear
FIG. 4) "2nd" gear
FIG. 5) "3rd" gear
FIG. 6) "4th" gear
FIG. 7) "5th" gear

SCMAT6745L

5. Does "UD SOLENOID DUTY " follow the reference data?

YES

▶ Fault is intermittent caused by poor contact in the sensor's and/or TCM(PCM)'s connector or was repaired and TCM(PCM) memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage. Repair or replace as necessary and go to "Verification of vehicle repair" procedure.

NO

▶ Go to "Terminal & connector inspection" procedure.

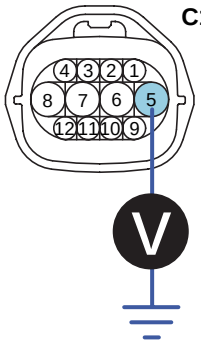
TERMINAL & CONNECTOR INSPECTION E5C34E5D

Refer to DTC P0743.

POWER SUPPLY CIRCUIT INSPECTION ED2F1CC4

1. Disconnect "A/T SOLENOID VALVE" connector.
2. Measure voltage between terminal "5" of the sensor harness connector and chassis ground.
3. Turn ignition switch OFF → ON.

Specification: 12V is measured only for approx. 0.5sec



3. UD solenoid valve
4. 2ND solenoid valve
5. A/T battery
6. A/T battery
7. VF solenoid valve(+)
8. VF solenoid valve(-)
9. DCC solenoid valve
10. RED solenoid valve
11. LR solenoid valve
12. OD solenoid valve

SGHAT7135N

4. Is voltage within specifications?

YES

▶ Go to "Signal circuit inspection" procedure.

NO

▶ Check that A/T-20A fuse in engine room junction is installed or not blown.
▶ Check for open in harness. Repair as necessary and go to "Verification of vehicle repair" procedure.

SIGNAL CIRCUIT INSPECTION ED28CBCF

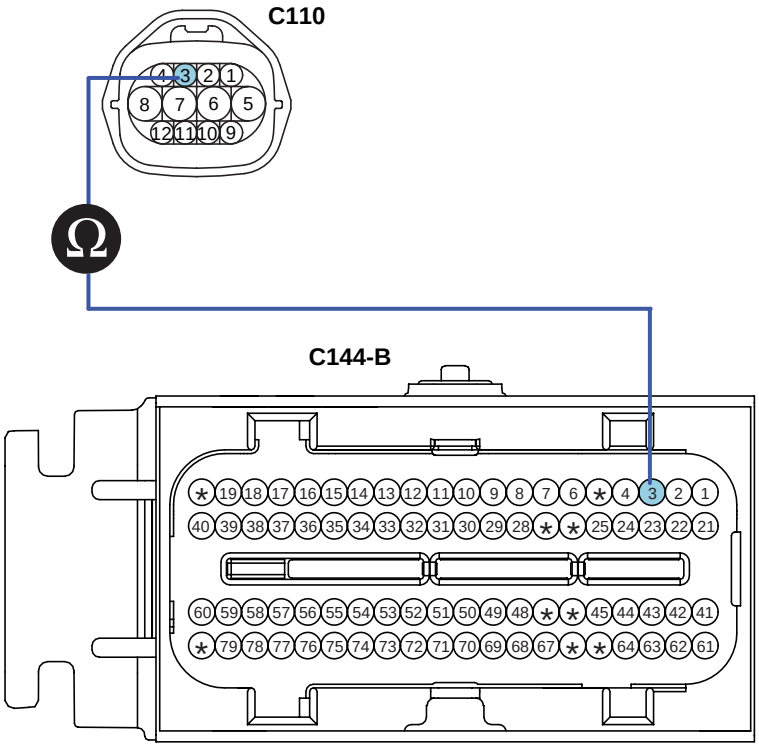
1. Check signal circuit open inspection

   1) Ignition "OFF".

   2) Disconnect "A/T SOLENOID VALVE" connector and "PCM/TCM" connector.

   3) Measure resistance between terminal "3" of the ATM SOLENOID VALVE harness connector and terminal "3" of the PCM/TCM harness connector.

Specification: approx. 0 Ω



3. UD solenoid valve
4. 2ND solenoid valve
5. A/T battery
6. A/T battery
7. VF solenoid valve(+)
8. VF solenoid valve(-)
9. DCC solenoid valve
10. RED solenoid valve
11. LR solenoid valve
12. OD solenoid valve

42. OD solenoid valve control
45. 2ND solenoid valve control
43. DCC solenoid valve control
44. RED solenoid valve
75. VF solenoid valve(+)
59. VF solenoid valve(-)
22. LR solenoid valve control
03. UD solenoid valve control

SGHAT7136N

   4) Is resistance within specifications?

YES

▶ Go to "Check signal circuit short inspection" procedure.

NO

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

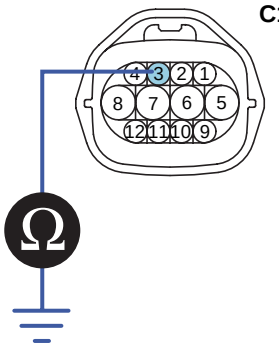
2. Check signal circuit short inspection

   1) Ignition "OFF".

   2) Disconnect "A/T SOLENOID VALVE" connector and "PCM/TCM" connector.

   3) Measure resistance between terminal "3" of the ATM SOLENOID VALVE harness and chassis ground.

Specification: Infinite



3. UD solenoid valve
4. 2ND solenoid valve
5. A/T battery
6. A/T battery
7. VF solenoid valve(+)
8. VF solenoid valve(-)
9. DCC solenoid valve
10.RED solenoid valve
11. LR solenoid valve
12. OD solenoid valve

SGHAT7137N

4) Is resistance within specifications?

YES

▶ Go to "Component inspection" procedure.

NO

▶ Check for short to ground in harness. Repair as necessary and go to "Verification of vehicle repair" procedure.

COMPONENT INSPECTION EC2184A2

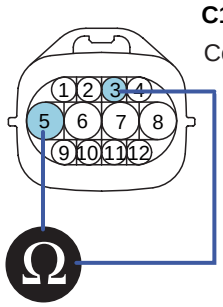
1. CHECK SOLENOID VALVE

1) Ignition "OFF".

2) Disconnect "A/T SOLENOID VALVE" connector.

3) Measure resistance between terminal "3" and terminal "5" of the ATM SOLENOID VALVE harness connector.

Specification: Approximately 2.7~3.4 Ω [20°C(68°F)]



3. UD solenoid valve
4. 2ND solenoid valve
5. A/T battery
6. A/T battery
7. VF solenoid valve(+)
8. VF solenoid valve(-)
9. DCC solenoid valve
10.RED solenoid valve
11. LR solenoid valve
12. OD solenoid valve

SGHAT7138N

4) Is resistance within specification?

YES

▶ Go to "CHECK PCM/TCM" as below.

NO

▶ Replace UD SOLENOID VALVE as necessary and go to "Verification of vehicle repair" procedure.

2. CHECK PCM/TCM

1) Connect scantool to data link connector(DLC).

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

3) Select A/T Solenoid valve Actuator test and Operate Actuator test.

4) Can you hear operating sound for UD SOLENOID VALVE actuator testing function?

YES

▶ Go to "Verification of vehicle repair" procedure.

NO

▶ Replace PCM/TCM as necessary and go to "Verification of vehicle repair" procedure.

ACTUATOR TEST CONDITION

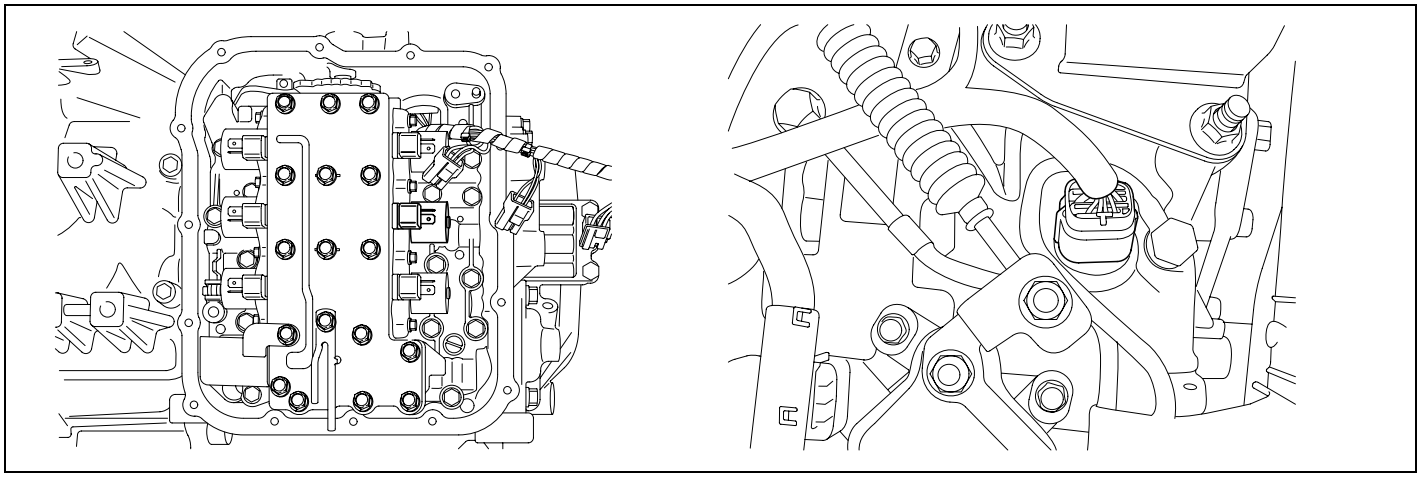
1. IG SWITCH ON
2. TRANSAXLE RANGE SWITCH is normal
3. P RANGE
4. Vehicle Speed 0mph(0km/h)
5. Throttle position sensor < 1V
6. IDLE SWITCH ON
7. ENGINE RPM 0

VERIFICATION OF VEHICLE REPAIR E7FCAF7B

Refer to DTC P0741.

DTC P0760 SHIFT CONTROL SOLENOID VALVE C CIRCUIT MALFUNCTION

COMPONENT LOCATION E2E86288



AKKF119F

GENERAL DESCRIPTION EECFD565

The Automatic transmission changes the gear position of the transmission by utilizing a combination of clutches and brakes, which are controlled by solenoid valves. The HIVEC Automatic Transmission consists of a: LR (Low and Reverse Brake), 2ND (2nd Brake), UD (Under Drive Clutch), OD (Over Drive Clutch), REV (Reverse Clutch), and a RED (Reduction Brake, only for 5 speed transmissions).
The 2ND Brake is engaged in the 2nd gear and 4th gear positions.

DTC DESCRIPTION E16B8FBB

The TCM checks the Under Drive Clutch Control Signal by monitoring the feedback signal from the solenoid valve drive circuit. If an unexpected signal is monitored, (For example, high voltage is detected when low voltage is expected or low voltage is detected when high voltage is expected) the TCM judges that 2nd Brake drive control solenoid circuit is malfunctioning and sets this code.

DTC DETECTING CONDITION EB9C7DDD

Item	Detecting Condition	Possible cause
DTC Strategy	• Check voltage range	• Open or short in circuit • Faulty 2ND SOLENOID VALVE • Faulty PCM/TCM
Enable Conditions	• 16V > Voltage Battery >11V • In gear state(no gear shifting) 500msec is passed from turn on the relay • A/T Relay = ON • Engine state = RUN	
Threshold value	• Out of available voltage range	
Diagnostic Time	• More than 5 seconds	
Fail Safe	• Locked in 3rd gear.(Control relay off)	

SPECIFICATION EACA7713

Refer to DTC P0743.

SIGNAL WAVEFORM E4D955C2

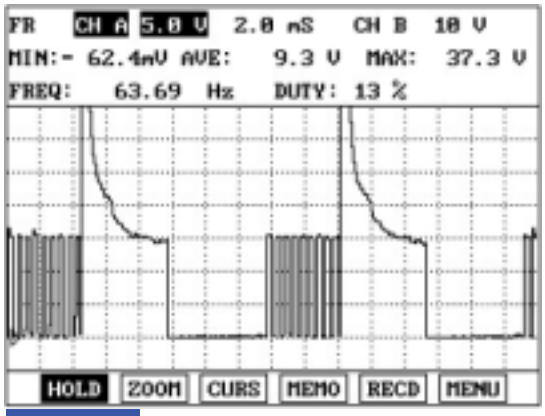


FIG.1)

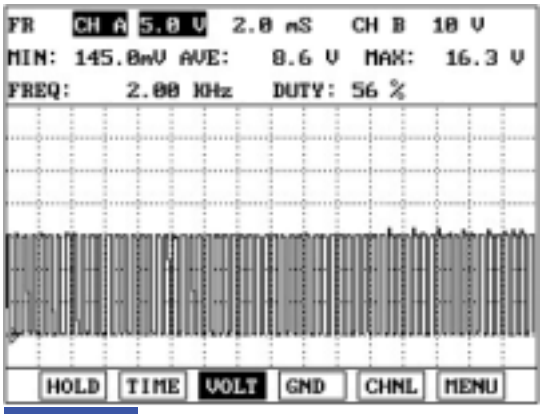


FIG.2)

FIG. 1) "2ND" gear → "1st" gear
FIG. 2) "P & N" Range

EKBF119A

MONITOR SCANTOOL DATA EC0D3536

1. Connect scantool to data link connector(DLC).
2. Engine "ON".
3. Monitor the "2nd SOL. VALVE" parameter on the scantool.
4. Shift gear at each position.

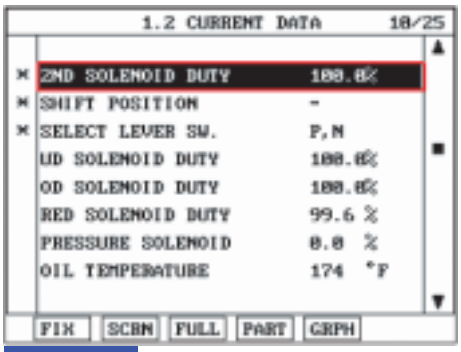


FIG.1)

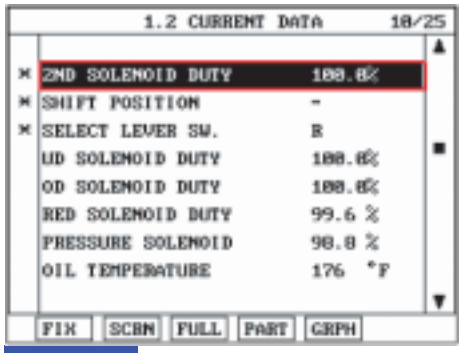


FIG.2)

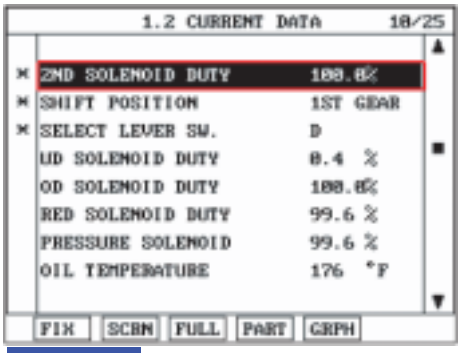


FIG.3)

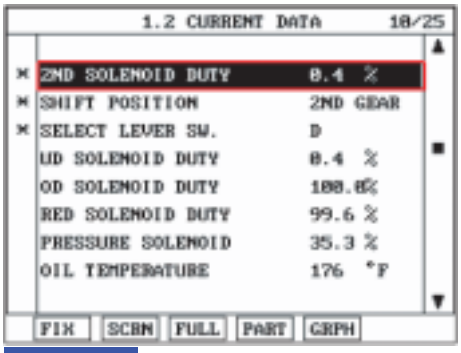


FIG.4)

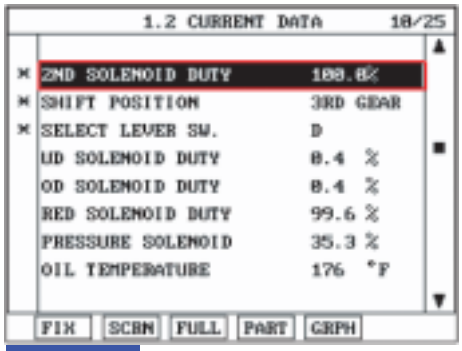


FIG.5)

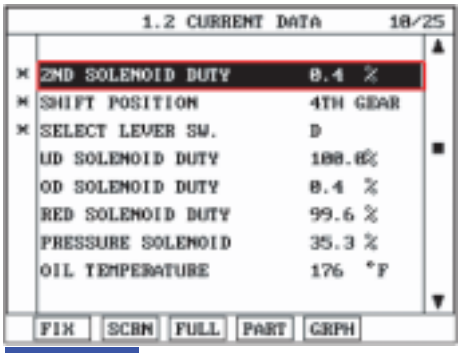


FIG.6)

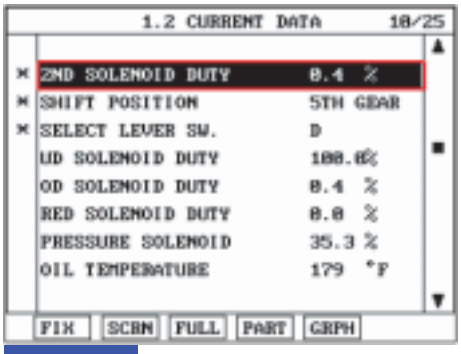


FIG.7)

FIG. 1) P,N
FIG. 2) "R"
FIG. 3) "D 1st" gear
FIG. 4) "2nd" gear
FIG. 5) "3rd" gear
FIG. 6) "4th" gear
FIG. 7) "5th" gear

SCMAT6750L

5. Does "2nd SOLENOID DUTY " follow the reference data?

YES

▶ Fault is intermittent caused by poor contact in the sensor's and/or TCM(PCM)'s connector or was repaired and TCM(PCM) memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage. Repair or replace as necessary and go to "Verification of vehicle repair" procedure.

NO

▶ Go to "Terminal & connector inspection " procedure.

TERMINAL & CONNECTOR INSPECTION EE1CB02F

Refer to DTC P0743.

POWER SUPPLY CIRCUIT INSPECTION E94ED2CE

Refer to DTC P0755.

SIGNAL CIRCUIT INSPECTION E7A9D5A8

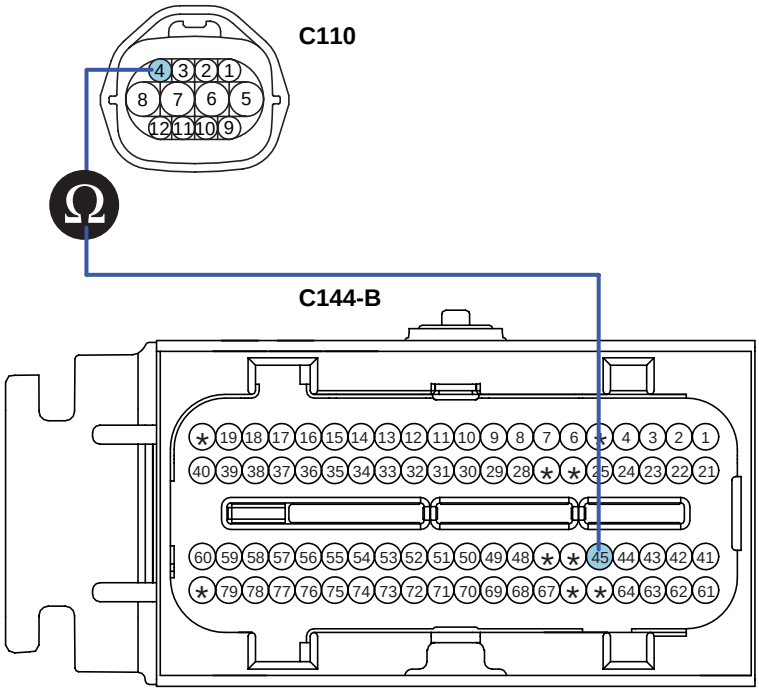
1. Check signal circuit open inspection

   1) Ignition "OFF".

   2) Disconnect "A/T SOLENOID VALVE" connector and "PCM" connector.

   3) Measure resistance between terminal "4" of the ATM SOLENOID VALVE harness connector and terminal "45" of the PCM/TCM harness connector.

Specification: approx. 0 Ω



3. UD solenoid valve
4. 2ND solenoid valve
5. A/T battery
6. A/T battery
7. VF solenoid valve(+)
8. VF solenoid valve(-)
9. DCC solenoid valve
10.RED solenoid valve
11. LR solenoid valve
12. OD solenoid valve

42.OD solenoid valve control
45.2ND solenoid valve control
43.DCC solenoid valve control
44.RED solenoid valve
75.VF solenoid valve(+)
59.VF solenoid valve(-)
22.LR solenoid valve control
03.UD solenoid valve control

SGHAT7140N

4) Is resistance within specifications?

YES

▶ Go to "Check signal circuit short inspection" procedure.

NO

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

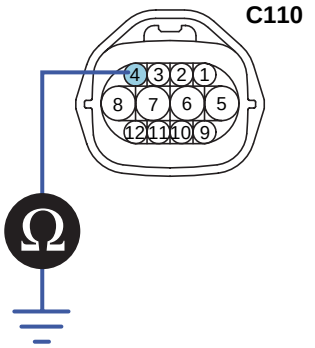
2. Check signal circuit short inspection

1) Ignition "OFF".

2) Disconnect "A/T SOLENOID VALVE" connector and "PCM/TCM" connector.

3) Measure resistance between terminal "4" of the ATM SOLENOID VALVE harness and chassis ground.

Specification: Infinite



3. UD solenoid valve
4. 2ND solenoid valve
5. A/T battery
6. A/T battery
7. VF solenoid valve(+)
8. VF solenoid valve(-)
9. DCC solenoid valve
10.RED solenoid valve
11. LR solenoid valve
12. OD solenoid valve

SGHAT7141N

4) Is resistance within specifications?

YES

▶ Go to "Component inspection" procedure.

NO

▶ Check for short to ground in harness. Repair as necessary and go to "Verification of vehicle repair" procedure.

COMPONENT INSPECTION E46CA3DA

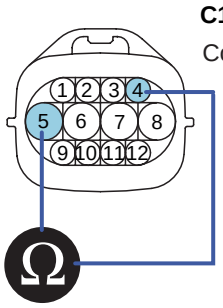
1. CHECK SOLENOID VALVE

1) Ignition "OFF".

2) Disconnect "A/T SOLENOID VALVE" connector.

3) Measure resistance between terminal "4" and terminal "5" of the ATM SOLENOID VALVE harness connector.

Specification: Approximately 2.7~3.4 Ω [20°C(68°F)]



3. UD solenoid valve
4. 2ND solenoid valve
5. A/T battery
6. A/T battery
7. VF solenoid valve(+)
8. VF solenoid valve(-)
9. DCC solenoid valve
10.RED solenoid valve
11. LR solenoid valve
12. OD solenoid valve

SGHAT7142N

4) Is resistance within specification?

YES

▶ Go to "CHECK PCM/TCM" as below.

NO

▶ Replace 2nd SOLENOID VALVE as necessary and go to "Verification of vehicle repair" procedure.

2. CHECK PCM/TCM

1) Connect scantool to data link connector(DLC).

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

3) Select A/T solenoid valve actuator test and operate actuator test.

4) Can you hear operating sound for 2nd SOLENOID VALVE actuator testing function?

YES

▶ Go to "Verification of vehicle repair" procedure.

NO

▶ Replace PCM/TCM as necessary and go to "Verification of vehicle repair" procedure.

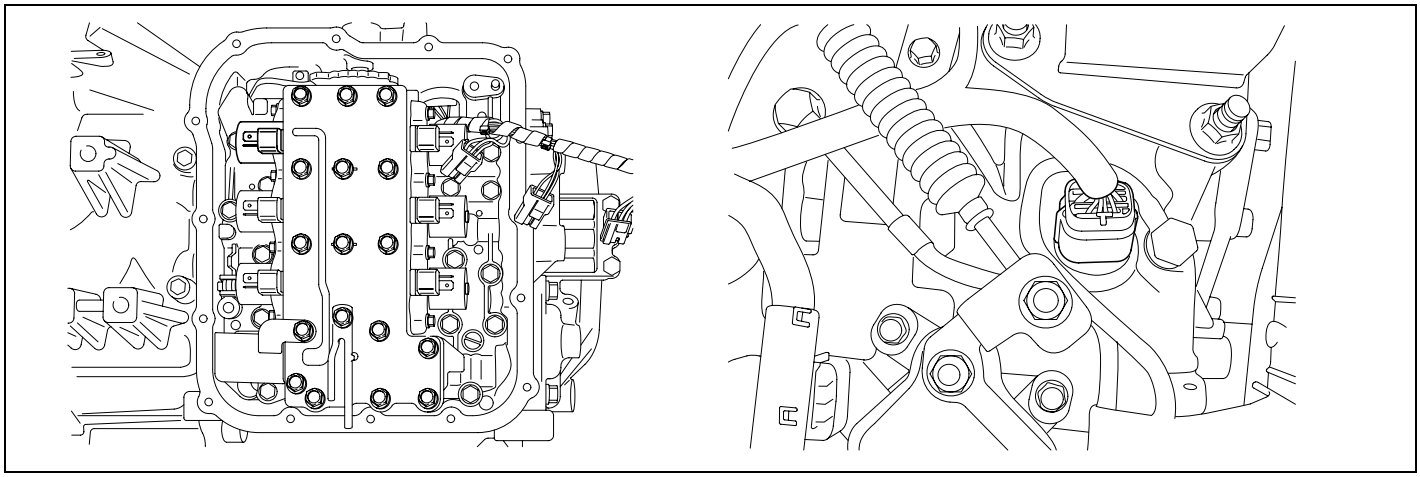
ACTUATOR TEST CONDITION
1. IG SWITCH ON
2. TRANSAXLE RANGE SWITCH is normal
3. P RANGE
4. Vehicle Speed 0mph(0km/h)
5. Throttle position sensor < 1V
6. IDLE SWITCH ON
7. ENGINE RPM 0

VERIFICATION OF VEHICLE REPAIR EE9DDC95

Refer to DTC P0741.

DTC P0765 SHIFT CONTROL SOLENOID VALVE D CIRCUIT MALFUNCTION

COMPONENT LOCATION E4AA2446



AKKF120Z

GENERAL DESCRIPTION ED5D5C6A

The Automatic transmission changes the gear position of the transmission by utilizing a combination of clutches and brakes, which are controlled by solenoid valves. The HIVEC Automatic Transmission consists of a: LR (Low and Reverse Brake), 2ND (2nd Brake), UD (Under Drive Clutch), OD (Over Drive Clutch), REV (Reverse Clutch), and a RED (Reduction Brake, only for 5 speed transmissions).
The OD Clutch is engaged in the 3rd gear and 4th gear positions.

DTC DESCRIPTION E42597F8

The TCM checks the Under Drive Clutch Control Signal by monitoring the feedback signal from the solenoid valve drive circuit. If an unexpected signal is monitored (for example, high voltage is detected when low voltage is expected or low voltage is detected when high voltage is expected), the TCM judges that the OVER DRIVE CLUTCH drive control solenoid circuit is malfunctioning and sets this code.

DTC DETECTING CONDITION E1C3504B

Item	Detecting Condition	Possible cause
DTC Strategy	• Check voltage range	• Open or short in circuit • Faulty OD SOLENOID VALVE • Faulty PCM/TCM
Enable Conditions	• 16V > Voltage Battery >11V • In gear state(no gear shifting) 500msec is passed from turn on the relay • A/T Relay = ON • Engine state = RUN	
Threshold value	• Out of available voltage range	
Diagnostic Time	• More than 5 seconds	
Fail Safe	• Locked in 3rd gear.(Control relay off)	

SPECIFICATION E4A6DEAA

Refer to DTC P0743.

SIGNAL WAVEFORM ECC6AB9C

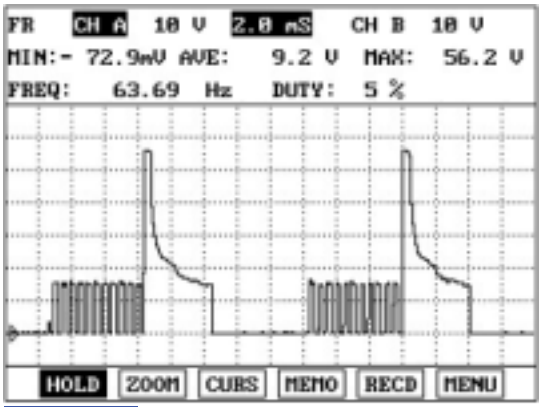


FIG.1)

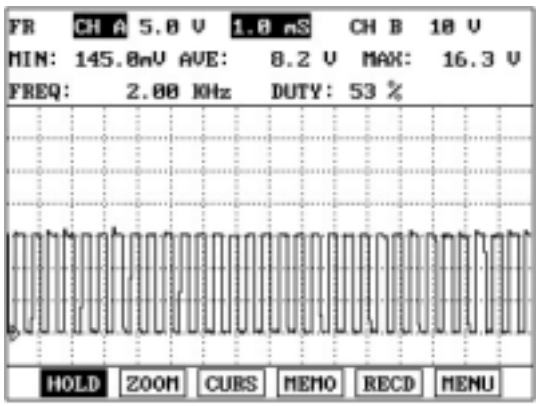


FIG.2)

FIG. 1) "3rd" gear → "2nd" gear
FIG. 2) "P & N" Range

EKBF120A

MONITOR SCANTOOL DATA EA84532D

1. Connect scantool to data link connector(DLC).
2. Engine "ON".
3. Monitor the "OD SOL. VALVE" parameter on the scantool.
4. Shift gear at each position.

Specification: 2nd gear → 0.0%, 3nd gear → 100%

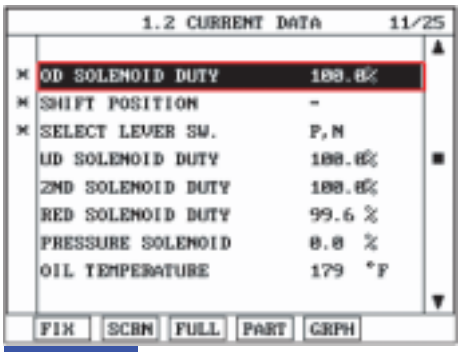


FIG.1)

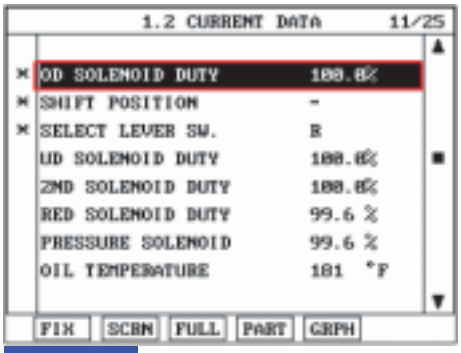


FIG.2)

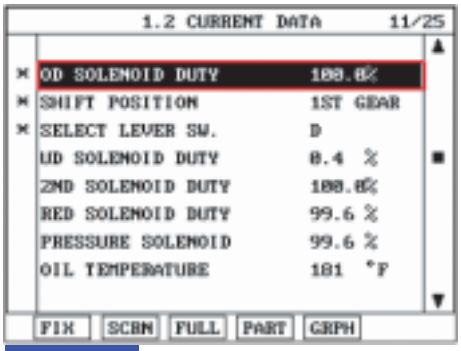


FIG.3)

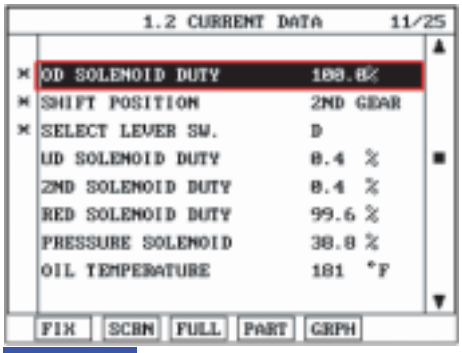


FIG.4)

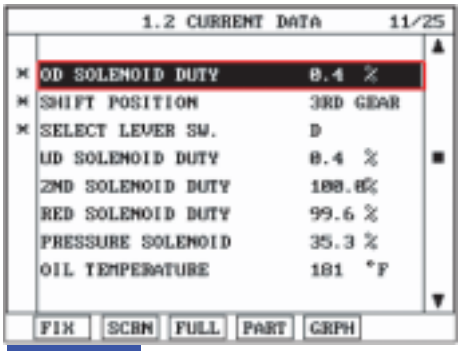


FIG.5)

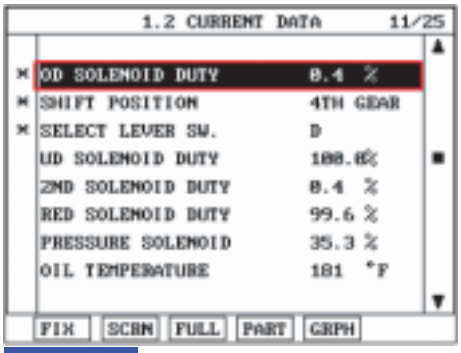


FIG.6)

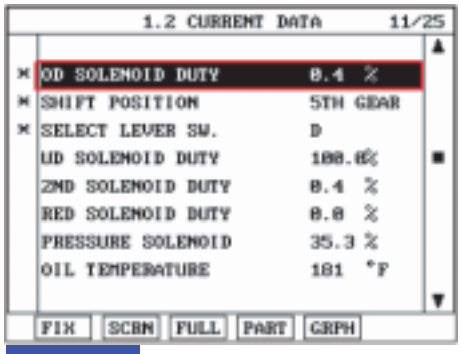


FIG.7)

FIG. 1) P,N
FIG. 2) "R"
FIG. 3) "D 1st" gear
FIG. 4) "2nd" gear
FIG. 5) "3rd" gear
FIG. 6) "4th" gear
FIG. 7) "5th" gear

SCMAT6755L

5. Does "OD SOLENOID DUTY " follow the reference data?

YES

▶ Fault is intermittent caused by poor contact in the sensor's and/or TCM(PCM)'s connector or was repaired and TCM(PCM) memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage. Repair or replace as necessary and go to "Verification of vehicle repair" procedure.

NO

▶ Go to "Terminal & connector inspection " procedure.

TERMINAL & CONNECTOR INSPECTION ECFACDA3

Refer to DTC P0743.

POWER SUPPLY CIRCUIT INSPECTION EE3DF9D6

Refer to DTC P0755.

SIGNAL CIRCUIT INSPECTION E76A9CFE

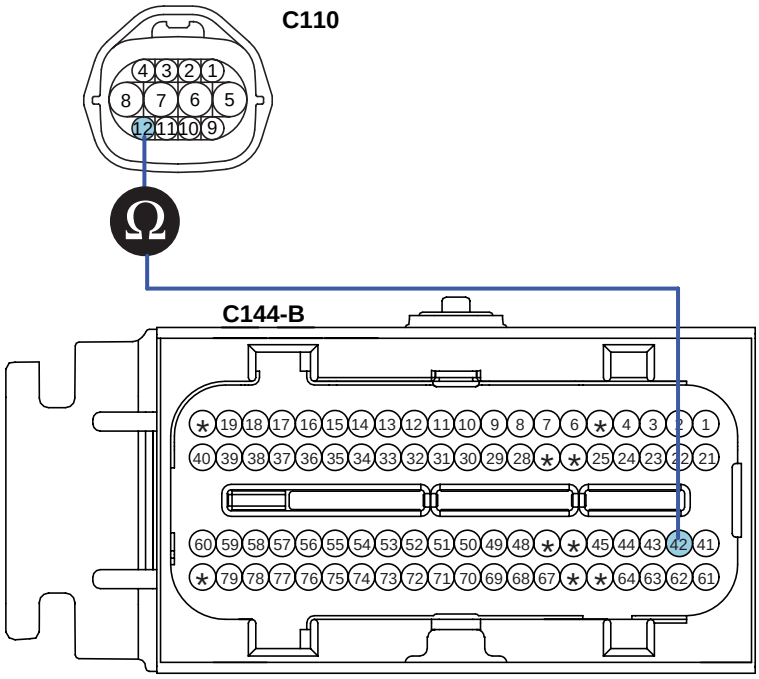
1. Check signal circuit open inspection

   1) Ignition "OFF".

   2) Disconnect "A/T SOLENOID VALVE" connector and "PCM/TCM" connector.

   3) Measure resistance between terminal "12" of the ATM SOLENOID VALVE harness connector and terminal "42" of the PCM/TCM harness connector.

Specification: approx. 0 Ω



3. UD solenoid valve
4. 2ND solenoid valve
5. A/T battery
6. A/T battery
7. VF solenoid valve(+)
8. VF solenoid valve(-)
9. DCC solenoid valve
10. RED solenoid valve
11. LR solenoid valve
12. OD solenoid valve

42. OD solenoid valve control
45. 2ND solenoid valve control
43. DCC solenoid valve control
44. RED solenoid valve
75. VF solenoid valve(+)
59. VF solenoid valve(-)
22. LR solenoid valve control
03. UD solenoid valve control

SGHAT7145N

4) Is resistance within specifications?

YES

▶ Go to "Check signal circuit short inspection" procedure.

NO

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

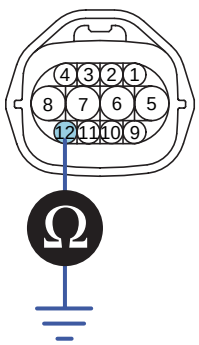
2. Check signal circuit short inspection

1) Ignition "OFF".

2) Disconnect "A/T SOLENOID VALVE" connector and "PCM/TCM" connector.

3) Measure resistance between terminal "12" of the ATM SOLENOID VALVE harness and chassis ground.

Specification: Infinite



3. UD solenoid valve
4. 2ND solenoid valve
5. A/T battery
6. A/T battery
7. VF solenoid valve(+)
8. VF solenoid valve(-)
9. DCC solenoid valve
10. RED solenoid valve
11. LR solenoid valve
12. OD solenoid valve

SGHAT7146N

4) Is resistance within specifications?

YES

▶ Go to "Component inspection" procedure.

NO

▶ Check for short to ground in harness. Repair as necessary and go to "Verification of vehicle repair" procedure.

COMPONENT INSPECTION EFAECF9C

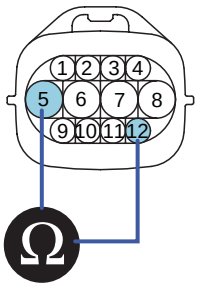
1. CHECK SOLENOID VALVE

1) Ignition "OFF".

2) Disconnect "A/T SOLENOID VALVE" connector.

3) Measure resistance between terminal "5" and terminal "12" of the ATM SOLENOID VALVE harness connector.

Specification: Approximately 2.7~3.4 Ω [20°C(68°F)]



C110

Component Side

3. UD solenoid valve
4. 2ND solenoid valve
5. A/T battery
6. A/T battery
7. VF solenoid valve(+)
8. VF solenoid valve(-)
9. DCC solenoid valve
10.RED solenoid valve
11. LR solenoid valve
12. OD solenoid valve

SGHAT7147N

4) Is resistance within specification?

YES

▶ Go to "CHECK PCM/TCM" as below.

NO

▶ Replace OD SOLENOID VALVE as necessary and go to "Verification of vehicle repair" procedure.

2. CHECK PCM/TCM

1) Connect scantool to data link connector(DLC).

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

3) Select A/T solenoid valve actuator test and operate actuator test.

4) Can you hear operating sound for OD SOLENOID VALVE actuator testing function?

YES

▶ Go to "Verification of vehicle repair" procedure.

NO

▶ Replace PCM/TCM and go to "Verification of vehicle repair" procedure.

ACTUATOR TEST CONDITION

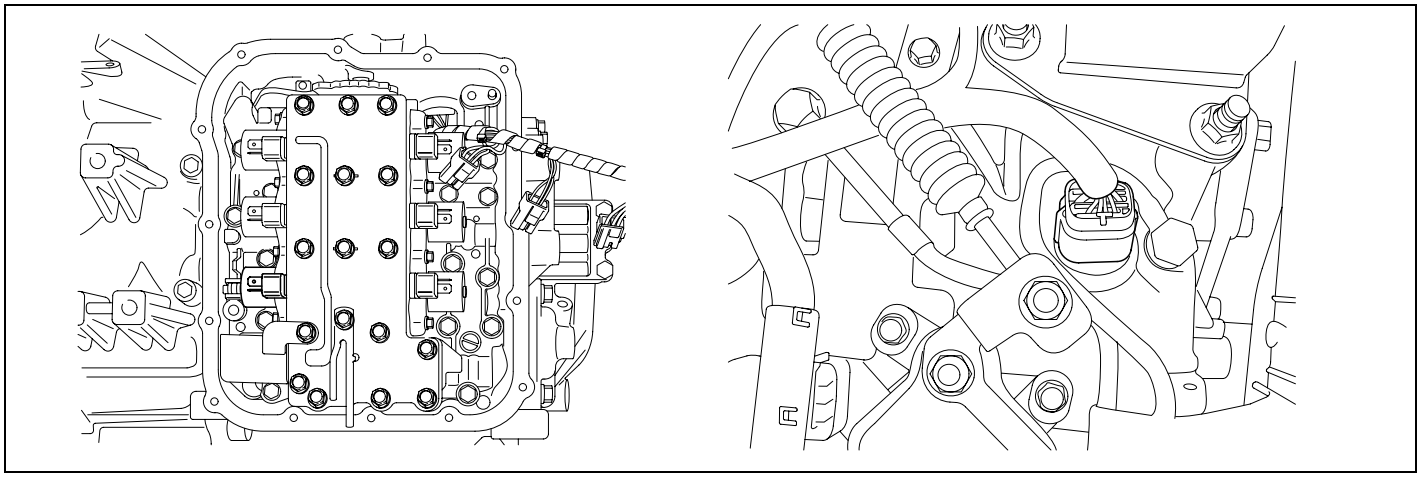
1. IG SWITCH ON
2. TRANSAXLE RANGE SWITCH is normal
3. P RANGE
4. Vehicle Speed 0mph(0km/h)
5. Throttle position sensor < 1V
6. IDLE SWITCH ON
7. ENGINE RPM 0

VERIFICATION OF VEHICLE REPAIR E99E7D3C

Refer to DTC P0741.

DTC P0770 SHIFT CONTROL SOLENOID VALVE E CIRCUIT MALFUNCTION

COMPONENT LOCATION EB1C09FC



AKKF120K

GENERAL DESCRIPTION E22992FC

The Automatic transmission changes the gear position of the transmission by utilizing a combination of clutches and brakes, which are controlled by solenoid valves. The HIVEC Automatic Transmission consists of a: LR (Low and Reverse Brake), 2ND (2nd Brake), UD (Under Drive Clutch), OD (Over Drive Clutch), REV (Reverse Clutch), and a RED (Reduction Brake, only for 5 speed transmissions).
The RED Brake is engaged in the 1st, 2nd, 3rd gear and reverse gear positions.

DTC DESCRIPTION E5F9DF11

The TCM checks the Reduction Control Signal by monitoring the feedback signal from the solenoid valve drive circuit. If an unexpected signal is monitored (for example, high voltage is detected when low voltage is expected, or low voltage is detected when high voltage is expected), the TCM judges that the Reduction control solenoid circuit is malfunctioning and sets this code.

DTC DETECTING CONDITION EEA2B10F

Item	Detecting Condition	Possible cause
DTC Strategy	• Check voltage range	• Open or short in circuit • Faulty RED SOLENOID VALVE • Faulty PCM/TCM
Enable Conditions	• 16V > Voltage Battery >11V • In gear state(no gear shifting) 500msec is passed from turn on the relay • A/T Relay = ON • Engine state = RUN	
Threshold value	• Out of available voltage range	
Diagnostic Time	• More than 5 seconds	
Fail Safe	• Locked in 3rd gear.(Control relay off)	

SPECIFICATION EF97EA2E

Refer to DTC P0743.

SIGNAL WAVEFORM E7364924

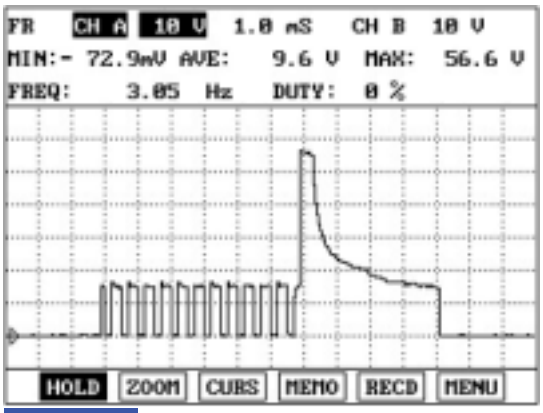


FIG.1)

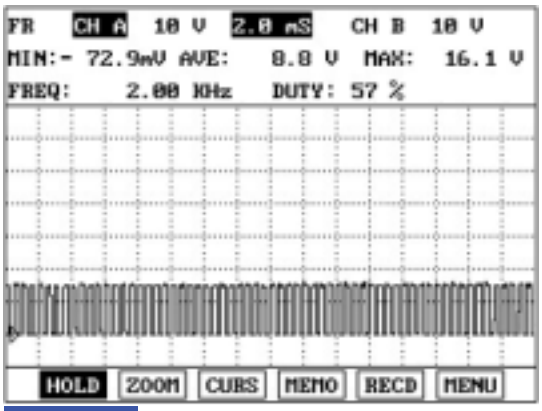


FIG.2)

FIG. 1) "5TH" gear → "4TH" gear
FIG. 2) "P & N" Range

EKBF121A

MONITOR SCANTOOL DATA EDEE5668

1. Connect scantool to data link connector(DLC).
2. Engine "ON".
3. Monitor the "RED SOL. VALVE" parameter on the scantool.
4. Shift gear at each position.

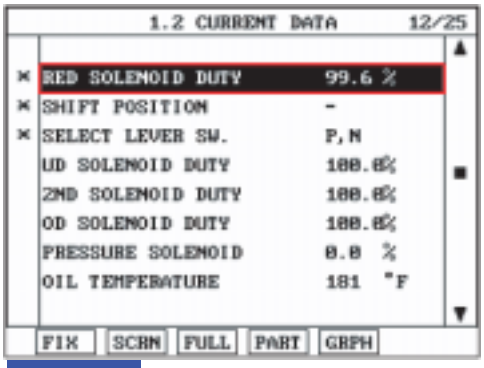


FIG.1)

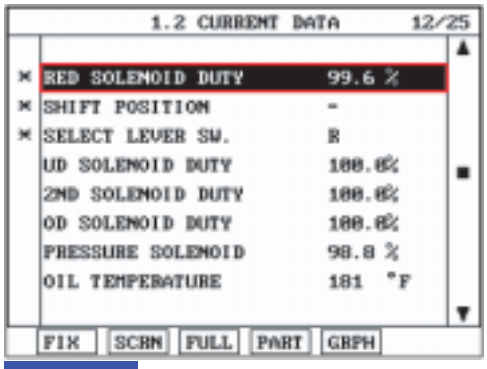


FIG.2)

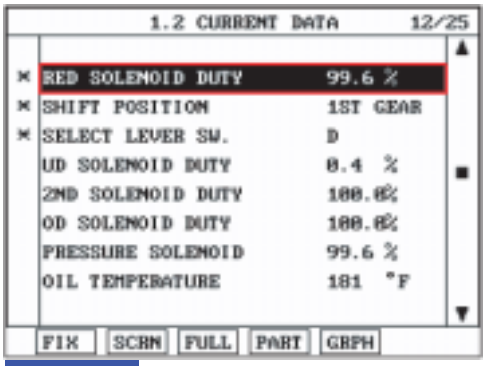


FIG.3)

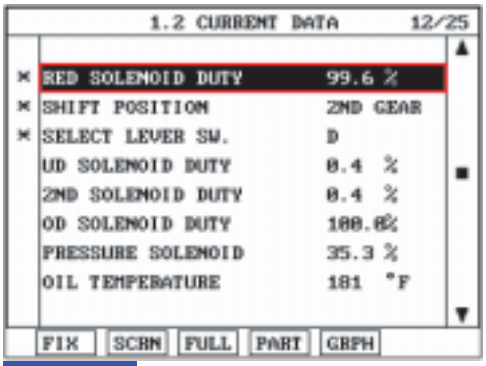


FIG.4)

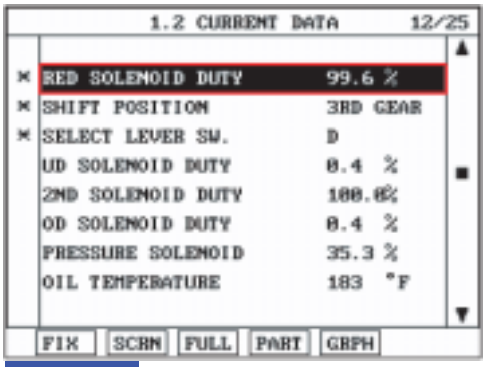


FIG.5)

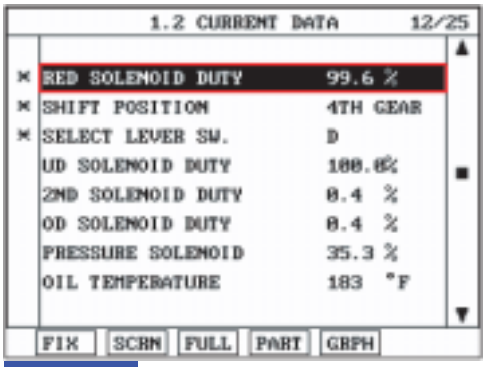


FIG.6)

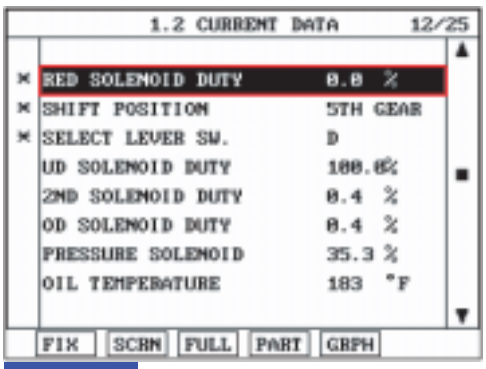


FIG.7)

FIG. 1) "R"
FIG. 2) P,N
FIG. 3) "D 1st" gear
FIG. 4) "2nd" gear
FIG. 5) "3rd" gear
FIG. 6) "4th" gear
FIG. 7) "5th" gear

SCMAA6175N

5. Is "RED SOLENOID DUTY" within specifications?

YES

▶ Fault is intermittent caused by poor contact in the sensor's and/or TCM(PCM)'s connector or was repaired and TCM(PCM) memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage. Repair or replace as necessary and go to "Verification of vehicle repair" procedure.

NO

▶ Go to "Terminal & connector inspection " procedure.

TERMINAL & CONNECTOR INSPECTION E9A652AC

Refer to DTC P0743.

POWER SUPPLY CIRCUIT INSPECTION EAA4E0CD

Refer to DTC P0743.

SIGNAL CIRCUIT INSPECTION E0CEFB94

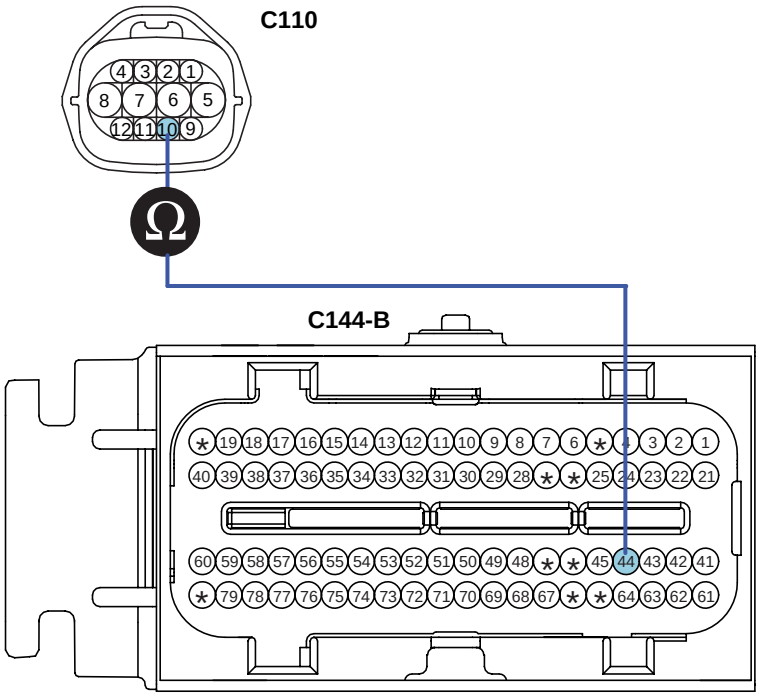
1. Check signal circuit open inspection

   1) Ignition "OFF".

   2) Disconnect "A/T SOLENOID VALVE" connector and "PCM/TCM" connector.

   3) Measure resistance between terminal "10" of the ATM SOLENOID VALVE harness connector and terminal "44" of the PCM/TCM harness connector.

Specification: approx. 0 Ω



3. UD solenoid valve
4. 2ND solenoid valve
5. A/T battery
6. A/T battery
7. VF solenoid valve(+)
8. VF solenoid valve(-)
9. DCC solenoid valve
10. RED solenoid valve
11. LR solenoid valve
12. OD solenoid valve

42.OD solenoid valve control
45.2ND solenoid valve control
43.DCC solenoid valve control
44. RED solenoid valve
75.VF solenoid valve(+)
59.VF solenoid valve(-)
22.LR solenoid valve control
03.UD solenoid valve control

SGHAT7150N

4) Is resistance within specifications?

YES

▶ Go to "Check signal circuit short inspection" procedure.

NO

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

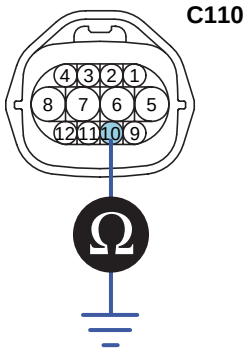
2. Check signal circuit short inspection

1) Ignition "OFF".

2) Disconnect "A/T SOLENOID VALVE" connector and "PCM/TCM" connector.

3) Measure resistance between terminal "10" of the ATM SOLENOID VALVE harness and chassis ground.

Specification: Infinite



3. UD solenoid valve
4. 2ND solenoid valve
5. A/T battery
6. A/T battery
7. VF solenoid valve(+)
8. VF solenoid valve(-)
9. DCC solenoid valve
10. RED solenoid valve
11. LR solenoid valve
12. OD solenoid valve

SGHAT7151N

4) Is resistance within specifications?

YES

▶ Go to "Component inspection" procedure.

NO

▶ Check for short to ground in harness. Repair as necessary and go to "Verification of vehicle repair" procedure.

COMPONENT INSPECTION E60D72BE

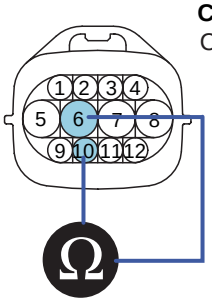
1. CHECK SOLENOID VALVE

1) Ignition "OFF".

2) Disconnect "A/T SOLENOID VALVE" connector.

3) Measure resistance between terminal "6" and terminal "10" of the ATM SOLENOID VALVE harness connector.

Specification: Approximately 2.7~3.4 Ω [20°C(68°F)]



C110
Component Side

3. UD solenoid valve
4. 2ND solenoid valve
5. A/T battery
6. A/T battery
7. VF solenoid valve(+)
8. VF solenoid valve(-)
9. DCC solenoid valve
10. RED solenoid valve
11. LR solenoid valve
12. OD solenoid valve

SGHAT7152N

4) Is resistance within specification?

YES

▶ Go to "CHECK PCM/TCM" as below.

NO

▶ Replace RED SOLENOID VALVE as necessary and go to "Verification of vehicle repair" procedure.

2. CHECK PCM/TCM

1) Connect scantool to data link connector(DLC).

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

3) Select A/T solenoid valve actuator test and operate actuator test.

4) Can you hear operating sound for RED SOLENOID VALVE actuator testing function?

YES

▶ Go to "Verification of vehicle repair" procedure.

NO

▶ Replace PCM/TCM as necessary and go to "Verification of vehicle repair" procedure.

ACTUATOR TEST CONDITION

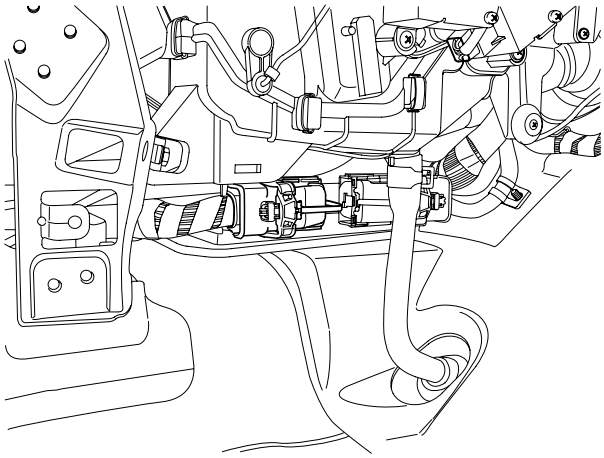
1. IG SWITCH ON
2. TRANSAXLE RANGE SWITCH is normal
3. P RANGE
4. Vehicle Speed 0mph(0km/h)
5. Throttle position sensor < 1V
6. IDLE SWITCH ON
7. ENGINE RPM 0

VERIFICATION OF VEHICLE REPAIR E98AE6FA

Refer to DTC P0741.

DTC P0885 A/T RELAY CIRCUIT MALFUNCTION

COMPONENT LOCATION E3ECAAB7



SGHAT6171D

GENERAL DESCRIPTION E68D6BBB

The HIVEC Automatic Transmission supplies the power to the solenoid valves by way of a control relay. When the TCM sets the relay to ON, the relay operates and the battery power is supplied to all the solenoid valves. When the TCM sets the relay to OFF, all solenoid valve power is shut off and the transmission is held in the 3rd gear position. (Fail Safe Mode).

DTC DESCRIPTION EB3DB549

The TCM checks the A/T control relay signal by monitoring the control signal. If, after the ignition key is turned on, a voltage value that is out of specification is detected the TCM sets this code.

DTC DETECTING CONDITION EA26B4B9

Item	Detecting Condition	Possible cause
DTC Strategy	• Check voltage range	• Open or short in circuit • Faulty A/T control relay • Faulty PCM/TCM
Enable Conditions	• 16V > Voltage Battery >11V • Time after TCM turns on >0.5sec	
Threshold value	• 16V > Voltage Battery >11V	
Diagnostic Time	• 2.375 seconds	
Fail Safe	• Locked in 3 rd gear.(control relay off)	

MONITOR SCANTOOL DATA E7BBF929

1. Connect scantool to data link connector(DLC).
2. Ignition "ON" & Engine "OFF".
3. Monitor the "A/T CON. RELAY VOLT" parameter on the scantool.

Specification : Approx. B+

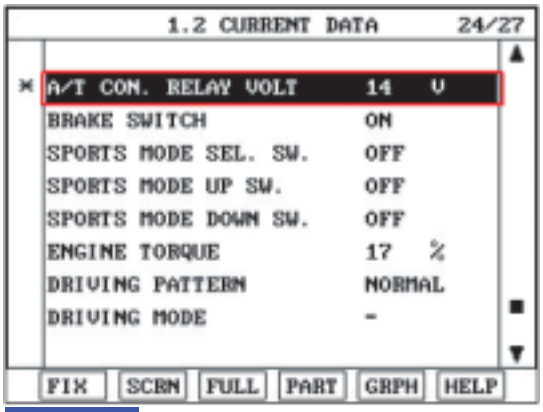


FIG.1)

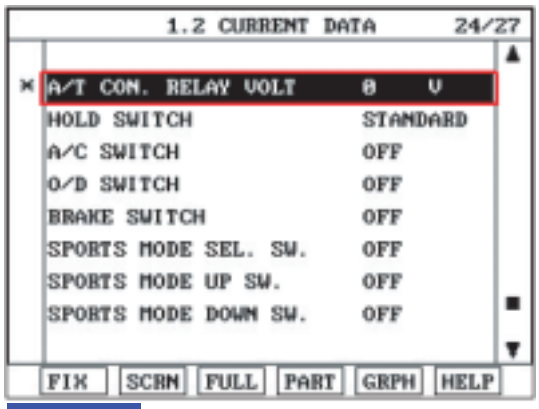


FIG.2)

FIG. 1) Normal status for "A/T RELAY"
FIG. 2) Open status for "A/T RELAY"

EKBF122A

4. Is A/T RELAY VOLT within specifications?

YES

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

NO

▶ Go to "Terminal & Connector Inspection" procedure.

TERMINAL & CONNECTOR INSPECTION E96AABF0

1. Many malfunctions in the electrical system are caused by poor harness and terminal condition. 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 then go to "Verification of Vehicle Repair" procedure.

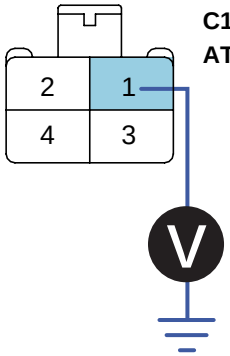
NO

▶ Go to "Power supply circuit inspection" procedure.

POWER SUPPLY CIRCUIT INSPECTION EEC9A7AB

1. Ignition "ON" & Engine "OFF".
2. Disconnect the "A/T CONTROL RELAY" connector.
3. Measure the voltage between terminal "1" of the "A/T CONTROL RELAY" harness connector and chassis ground.

Specification : Approx. B+



1.Battery
2.Ground
3.Battery Voltage
(Supplying Power to solenoid valve)
4.A/T control relay

SGHAT7156N

4. Is voltage within specifications?

YES

▶ Go to "Signal circuit inspection" procedure.

NO

▶ Check that A/T-20A Fuse in engine room junction is installed or not blown.
▶ Check for Open in harness. Repair as necessary and Go to "Verification of Vehicle Repair" procedure.

SIGNAL CIRCUIT INSPECTION EF3ACCEF

1. CHECK A/T control relay harness

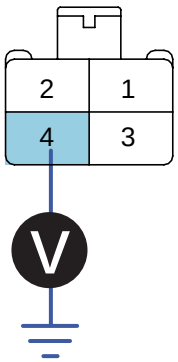
   1) Ignition "OFF".

   2) Disconnect the "A/T CONTROL RELAY" connector.

   3) Measure the voltage between terminal "4" of the "A/T CONTROL RELAY" harness connector and chassis ground.

   4) Engine OFF → ON.

Specification: 12V is measured only for approx. 0.5sec



C121
ATM Relay

1.Battery
2.Ground
3.Battery Voltage
(Supplying Power to solenoid valve)
4.A/T control relay

SGHAT7157N

   5) Is voltage within specifications?

YES

▶ Go to "Check Supplying Power to solenoid valve" procedure.

NO

▶ Check for open in harness. Repair as necessary and Go to "Verification of Vehicle Repair" procedure.
▶ If signal circuit is OK, Substitute with a known-good PCM/TCM and check for proper operation. If the problem is corrected, replace PCM/TCM and then go to "Verification of Vehicle Repair" procedure.

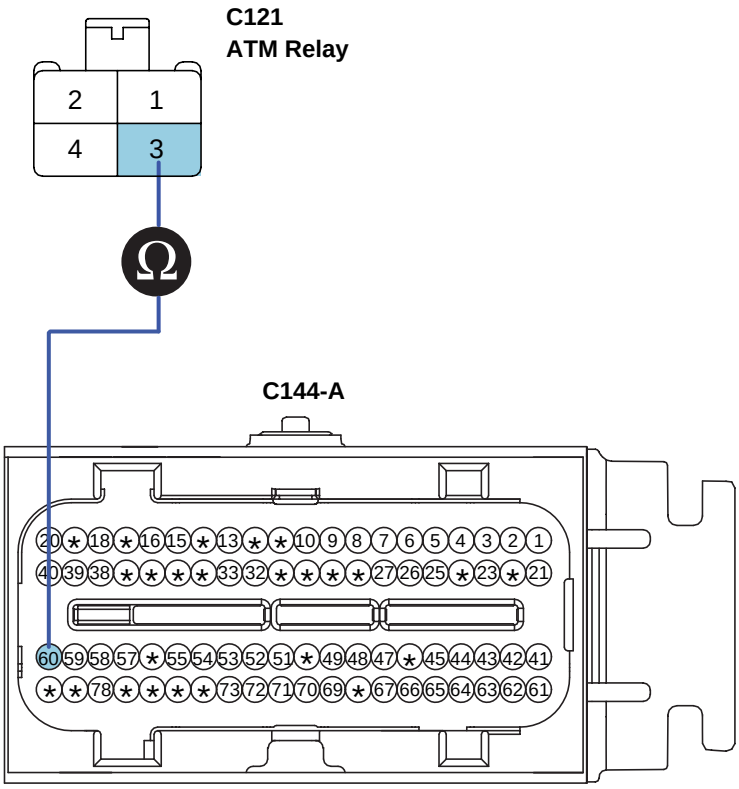
2. CHECK Supplying Power to solenoid valve harness

1) Ignition "OFF".

2) Disconnect the "A/T CONTROL RELAY" and PCM/TCM connector.

3) Measure the resistance between terminal "3" of the "A/T CONTROL RELAY" harness connector and terminal "60" of the PCM/TCM harness connector.

Specification : Approx. 0 Ω



1.Battery
2.Ground
3.Battery Voltage
(Supplying Power to solenoid valve)
4.A/T control relay

60. Battery Voltage
20.A/T control relay

SGHAT7155N

4) Is resistance within specifications?

YES

▶ Go to "Ground circuit inspection" procedure.

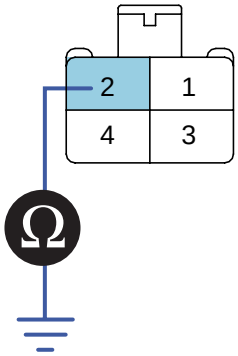
NO

▶ Check that A/T-20A Fuse in engine room junction is installed or not blown.
▶ Check for open in harness. Repair as necessary and Go to "Verification of Vehicle Repair" procedure.

GROUND CIRCUIT INSPECTION EF18A33E

1. Ignition "OFF".
2. Connect the "A/T CONTROL RELAY" connector.
3. Measure the resistance between terminal "2" of the "A/T CONTROL RELAY" harness connector and chassis ground.

Specification : Approx. 0 Ω



C121
ATM Relay

1.Battery
2.Ground
3.Battery Voltage
(Supplying Power to solenoid valve)
4.A/T control relay

SGHAT7158N

4. Is resistance within specifications?

YES

▶ 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

▶ Replace Front Area Module and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR E13B5F4D

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

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scantool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

YES

▶ Go to the applicable troubleshooting procedure.

NO

▶ System performing to specification at this time.

DTC P0890 AT RELAY - LOW CIRCUIT

COMPONENT LOCATION ED3F3F2F

Refer to DTC P0885.

GENERAL DESCRIPTION E3EFABAC

Refer to DTC P0885.

DTC DESCRIPTION E6F5D86C

The TCM checks the A/T control relay signal by monitoring the control signal. If, after the ignition key is turned on, an unexpected voltage value, which is quite a bit lower than battery voltage is detected, the TCM sets this code.

DTC DETECTING CONDITION E523EDE1

Item	Detecting Condition	Possible cause
DTC Strategy	• Check voltage range	• Open or short in circuit • Faulty A/T control relay • Faulty PCM/TCM
Enable Conditions	• 16V > Voltage Battery >11V • Time after TCM turns on >0.5sec	
Threshold value	• Feedback Voltage ≤ 0.5V	
Diagnostic Time	• 2 seconds	
Fail Safe	• Locked in 3 rd gear.(control relay off)	

MONITOR SCANTOOL DATA EA7E7DE8

Refer to DTC P0885.

TERMINAL & CONNECTOR INSPECTION ED44A4DC

Refer to DTC P0885.

POWER SUPPLY CIRCUIT INSPECTION EB80BF8B

Refer to DTC P0885.

SIGNAL CIRCUIT INSPECTION EDCF3CAF

Refer to DTC P0885.

GROUND CIRCUIT INSPECTION EABD2C8A

Refer to DTC P0885.

VERIFICATION OF VEHICLE REPAIR ED16FE28

Refer to DTC P0885.

DTC P0891 AT RELAY - OPEN CIRCUIT

COMPONENT LOCATION EA1E22F6

Refer to DTC P0885.

GENERAL DESCRIPTION ECBDED7E

Refer to DTC P0885.

DTC DESCRIPTION EFB6EF06

The TCM checks the A/T control relay signal by monitoring the control signal. If, after the ignition key is turned on, an unexpected voltage value, which is quite a bit lower than battery voltage is detected, the TCM sets this code.

DTC DETECTING CONDITION EFFF13B8

Item	Detecting Condition	Possible cause
DTC Strategy	• Check voltage range	• Open or short in circuit • Faulty A/T control relay • Faulty PCM/TCM
Enable Conditions	• 16V > Voltage Battery >11V • Time after TCM turns on >0.5sec	
Threshold value	• Feedback Voltage ≥ 20V	
Diagnostic Time	• 2 seconds	
Fail Safe	• Locked in 3 rd gear.(control relay off)	

MONITOR SCANTOOL DATA EEC6C40E

Refer to DTC P0885.

TERMINAL & CONNECTOR INSPECTION E1AF8D89

Refer to DTC P0885.

POWER SUPPLY CIRCUIT INSPECTION E305A5EB

Refer to DTC P0885.

SIGNAL CIRCUIT INSPECTION ECBEF1AC

Refer to DTC P0885.

GROUND CIRCUIT INSPECTION E0BB7C4B

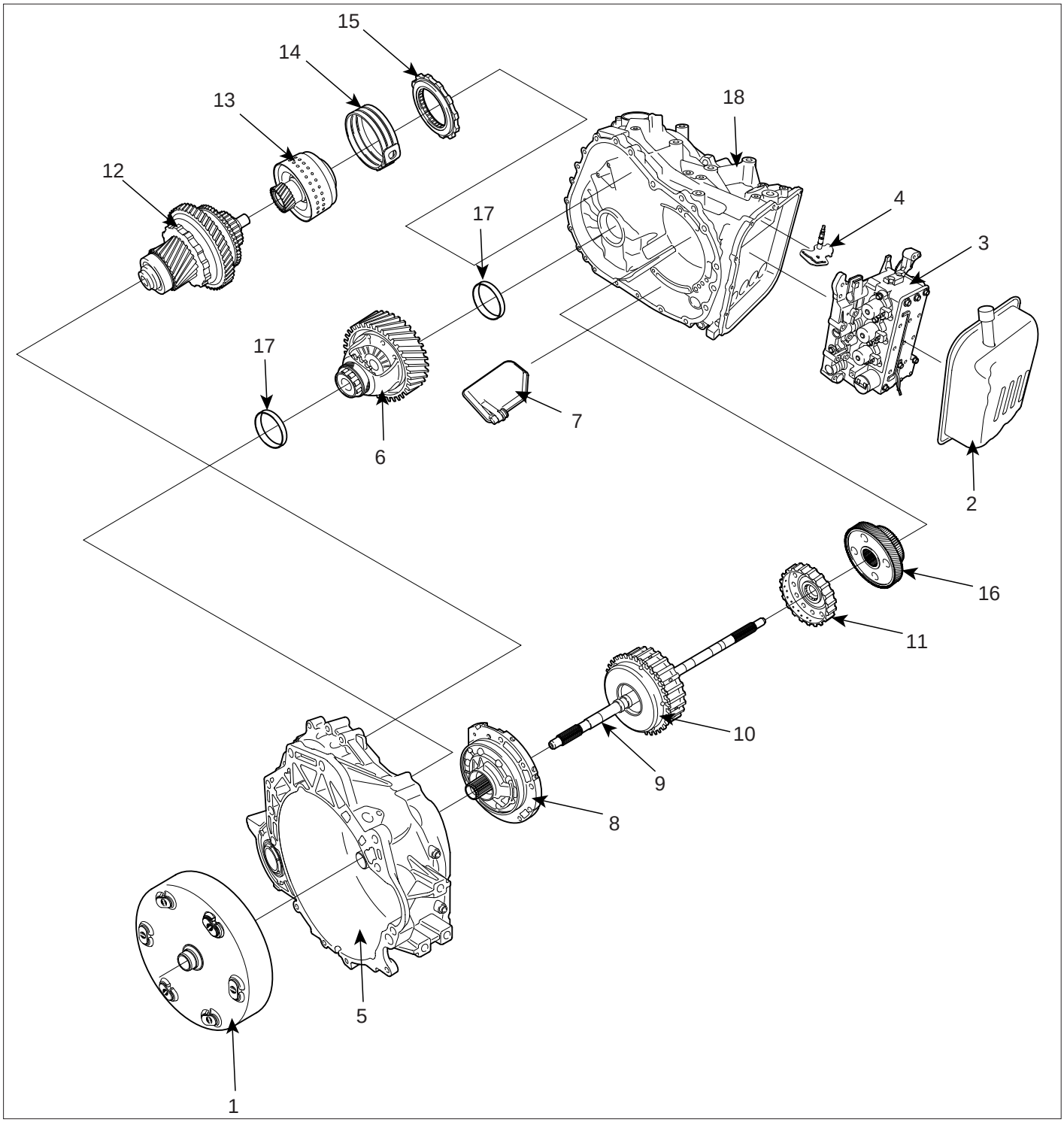
Refer to DTC P0885.

VERIFICATION OF VEHICLE REPAIR E86BF64A

Refer to DTC P0885.

AUTOMATIC TRANSAXLE

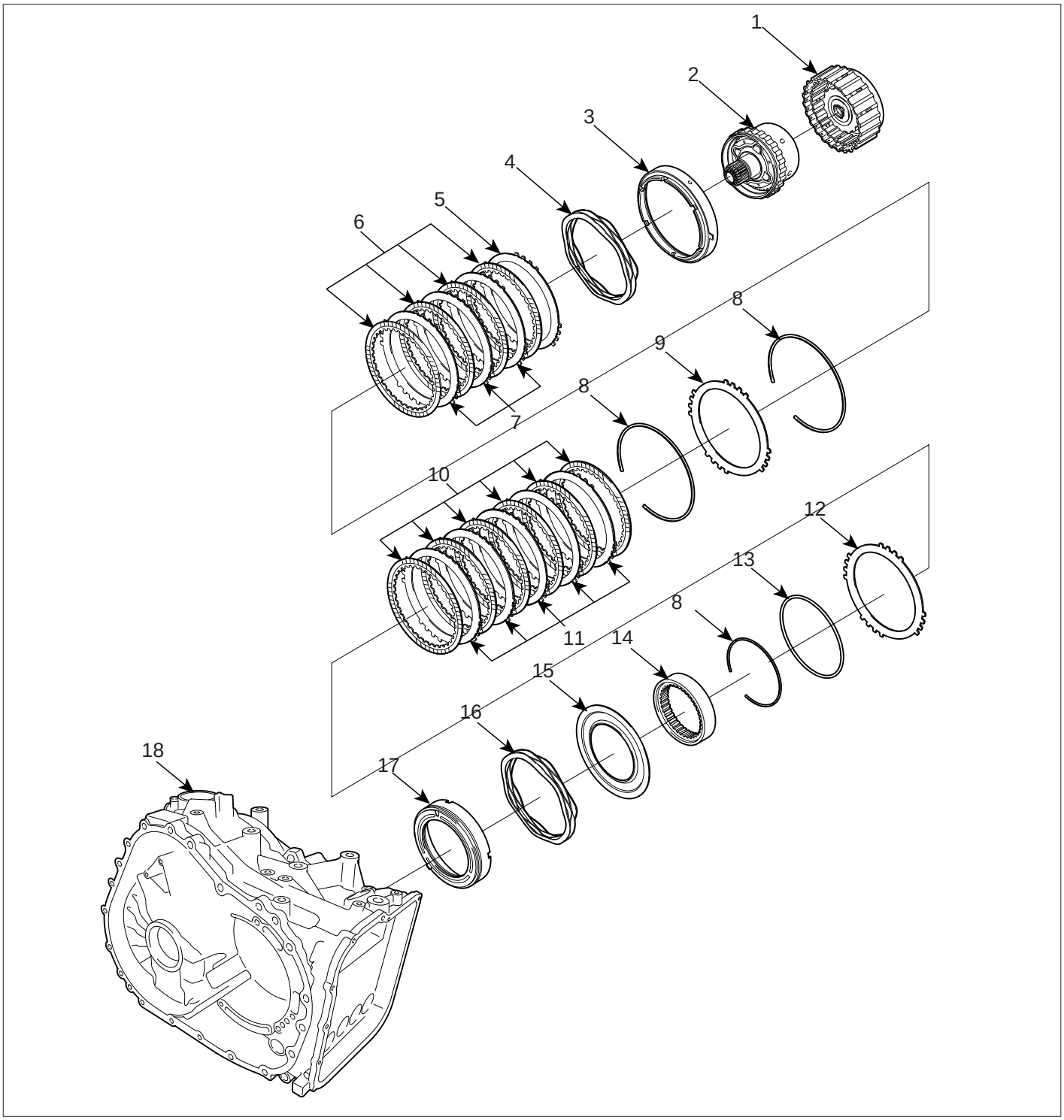
COMPONENTS (1) E8DDBB36



1. Torque converter
2. Valve body cover
3. Valve body assembly
4. Manual control shaft assembly
5. Converter housing
6. Differential assembly
7. Main oil filter
8. Oil pump
9. Input shaft
10. Underdrive clutch assembly
11. Underdrive clutch hub
12. Direct planetary carrier assembly
13. Direct clutch assembly
14. Reduction brake band
15. One way clutch
16. Transfer drive gear
17. Differential bearing case
18. Transaxle case

LKKG001A

COMPONENTS (2)



1. Reverse sun gear
2. Planetary gear assembly
3. 2nd brake retainer
4. 2nd brake return spring
5. 2nd brake pressure plate
6. 2nd brake discs
7. 2nd brake plates
8. Snap ring
9. Brake reaction plate
10. Brake discs
11. Brake plates
12. Low&Reverse brake pressure plate
13. Wave spring
14. Oneway clutch inner race
15. Brake spring retainer
16. Low&Reverse brake return spring
17. Low&Reverse brake piston
18. Transaxle case

LKKG001B

REMOVAL E3FC45EF

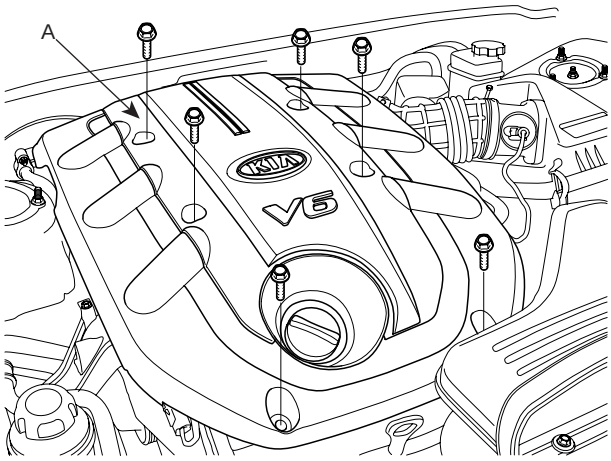
CAUTION

- ***Use fender covers to prevent vehicle damage.***
- ***Disconnect connectors carefully to avoid damage.***

NOTE

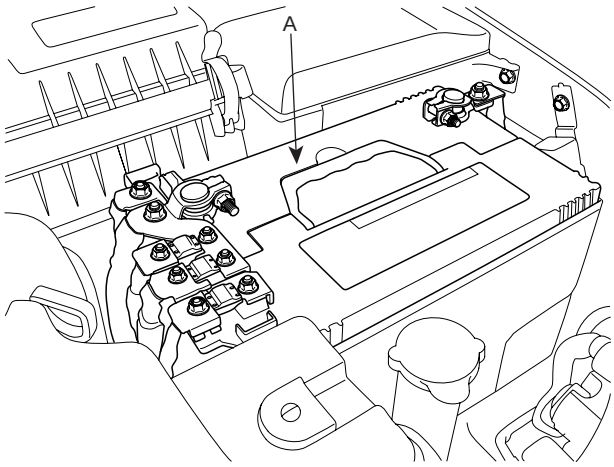
- *Mark wires or hoses for identification.*

1. Remove the engine cover (A).



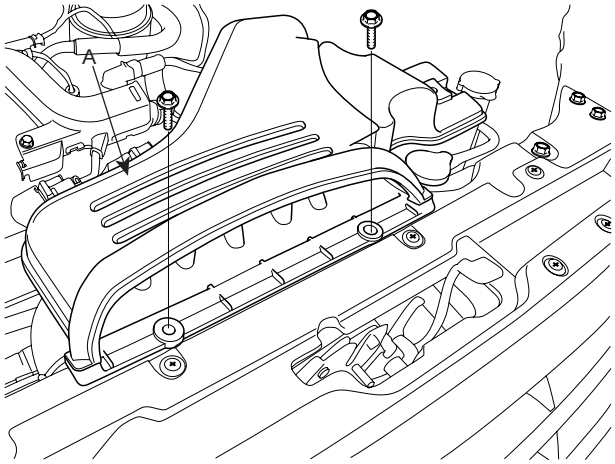
SGHAT7001N

2. Remove the battery (A).



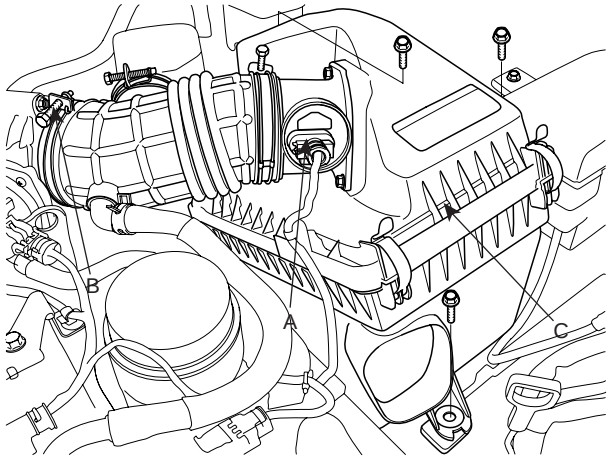
SGHAT7002N

3. Remove the air duct(A).



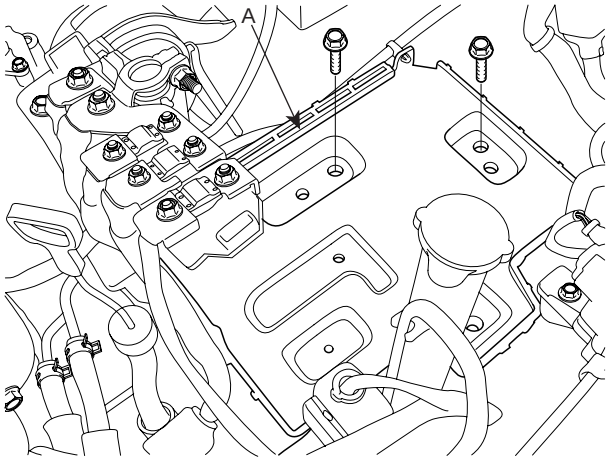
SGHAT7003N

4. Remove the air cleaner assembly (C) after disconnecting the air flow sensor connector (A) and loosening the clamp (B).



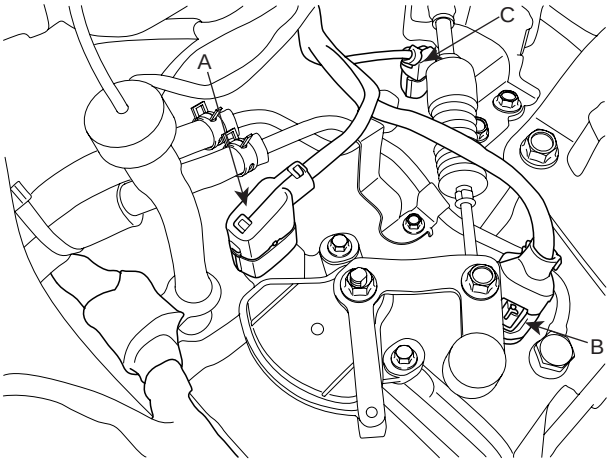
SGHAT7004N

5. Remove the battery tray (A).



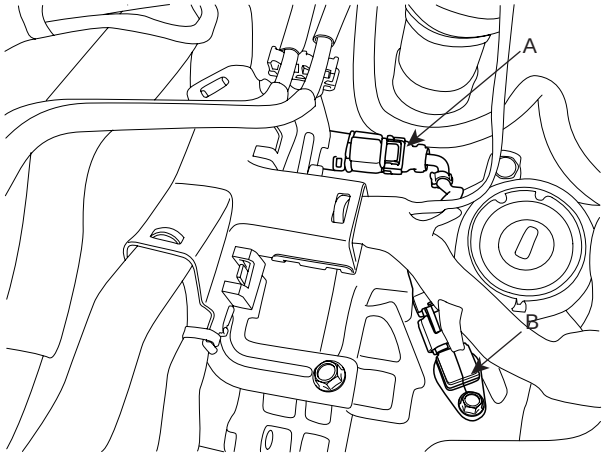
SGHAT7005N

6. Disconnect the inhibitor switch connector (A), the solenoid valve connector (B) and the input shaft speed sensor connector (C).



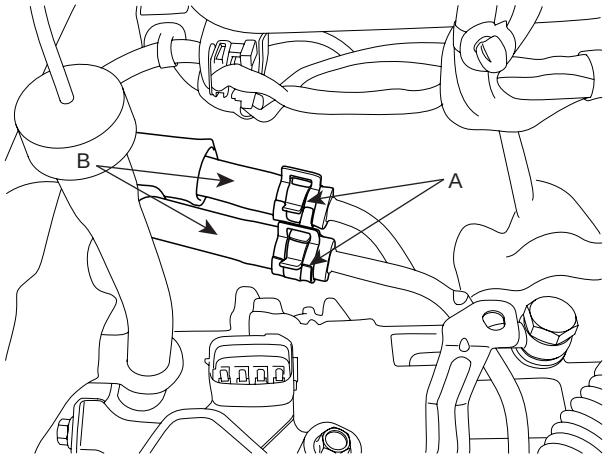
SGHAT7006N

7. Disconnect the vehicle speed sensor connector (A) and output shaft speed sensor connector (B).



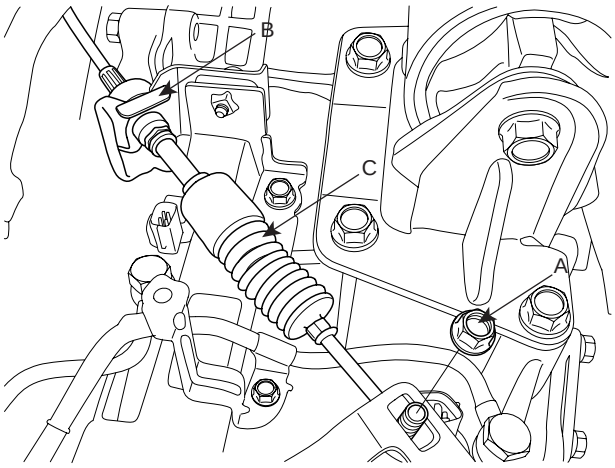
SGHAT7007N

8. Disconnect the transaxle oil cooler hoses (B) from the tubes by loosening the clamps (A).



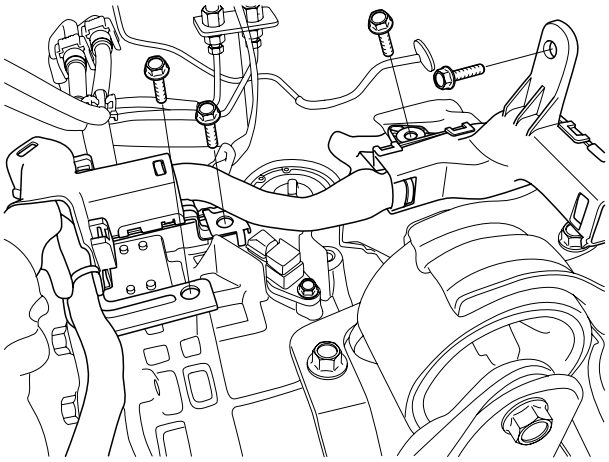
SGHAT7008N

9. Remove the shift cable assembly (C) by removing the nut (A) and clip (B).



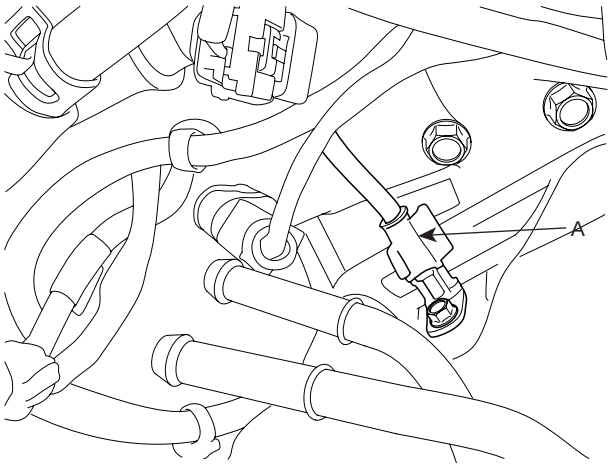
SGHAT7009N

10. Remove the wiring harness mounting bolts (4ea).



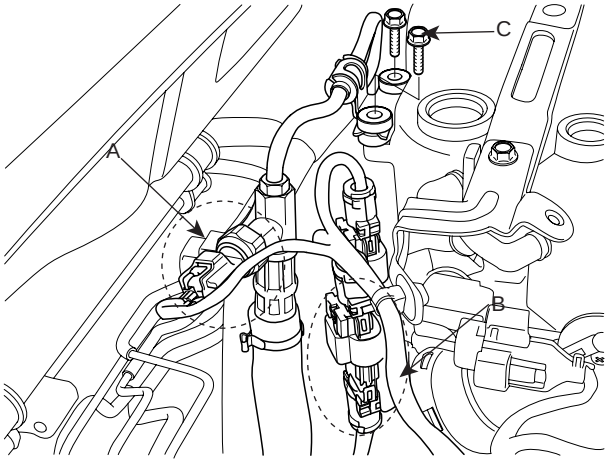
SGHAT7010N

11. Remove the CKP sensor connector (A).

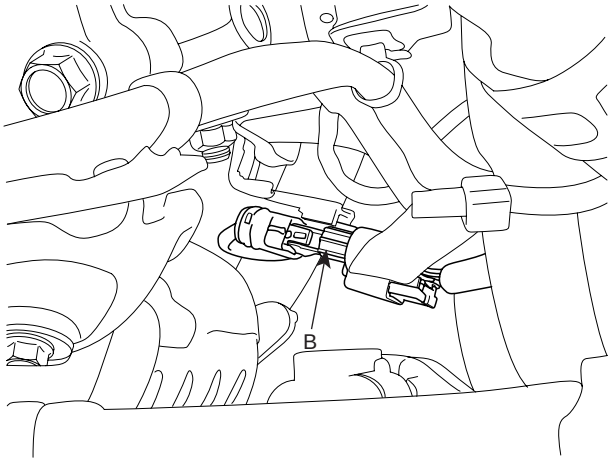


SGHAT7011N

12. Disconnect the oxygen sensor connectors (B-2ea) and the power steering pressure sensor connector (A) and remove the mounting bolts (C-2ea).

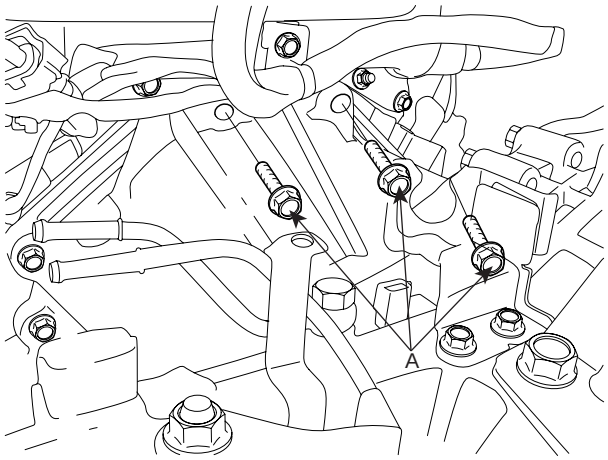


SGHAT7012N



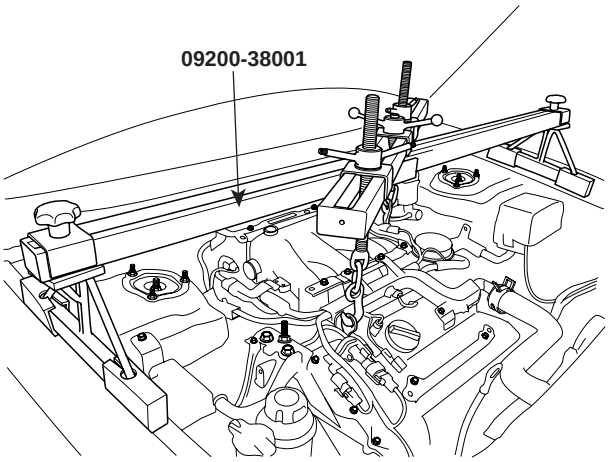
SGHAT7013N

13. Remove the transaxle mounting bolts (A-3ea).



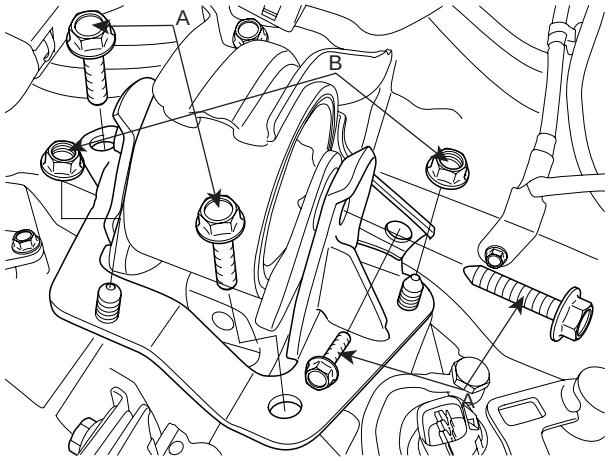
SGHAT7014N

14. Using the special tool(09200-38001), hold the engine and transaxle assembly safely.



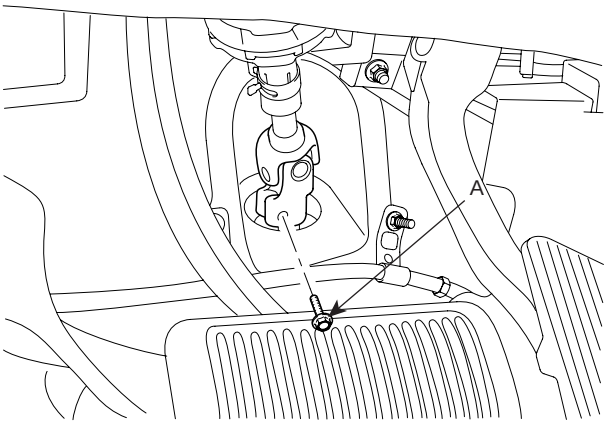
SGHAT7016N

15. Remove the transaxle support bracket bolts (A-4ea) and nuts (B-2ea).



SGHAT7015N

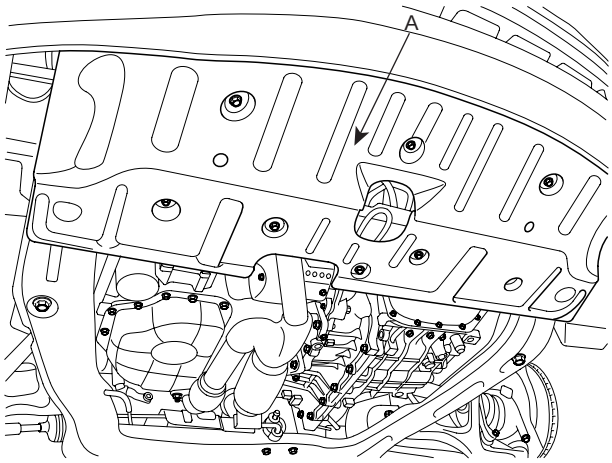
16. Remove the power steering column joint bolt (A).



SGHAT6018D

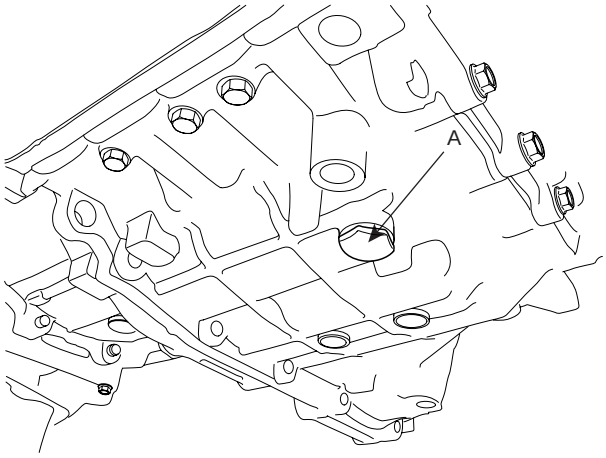
17. Remove the front wheels. (refer to Front suspension in SS group)

18. Remove the under cover (A).



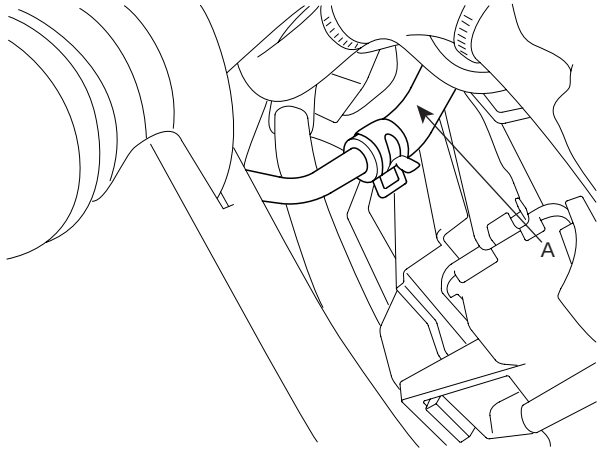
SGHAT6021D

19. Drain the transaxle fluid by removing the drain plug (A).



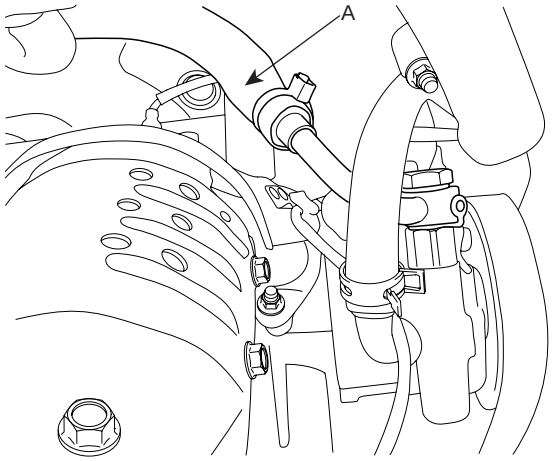
SCMAT6008N

20. Drain power steering fluid through the return tube(A).



SGHAT6022D

21. Disconnect the power steering pressure tube (A) from the power steering oil pump.

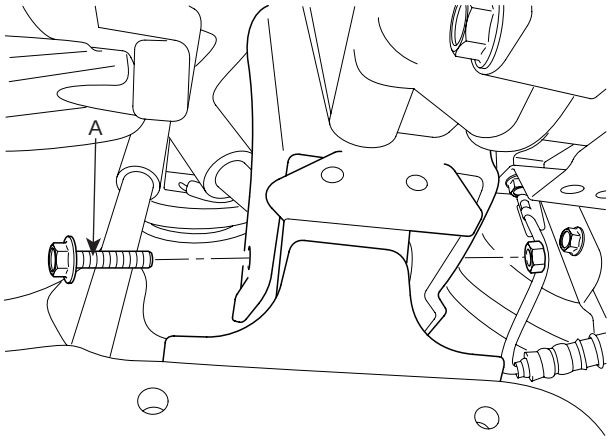


SCMAT6009N

22. Remove the fork from the front lower arm. (refer to Front suspension in SS group)

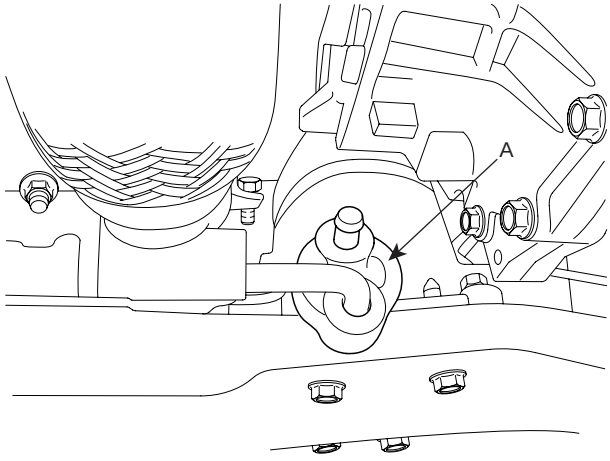
23. Disconnect the lower arm, the tie rod end ball joint, the stabilizer bar link from the front knuckle. (refer to Front suspension in SS group)

24. Remove the front roll stopper mounting bolt (A).



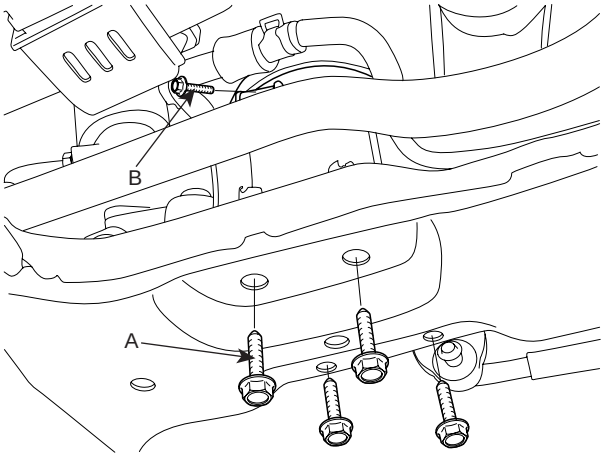
SGHAT6023D

25. Remove the muffler hanger rubber (A).



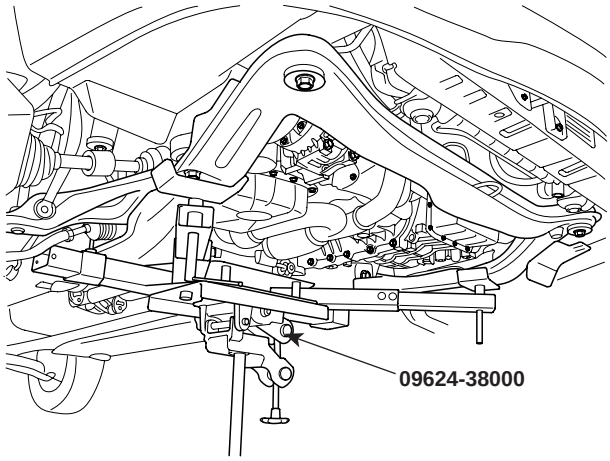
SGHAT6024D

26. Remove the rear roll stopper mounting bolts (A-4ea) and the power steering tube mounting bolt (B).



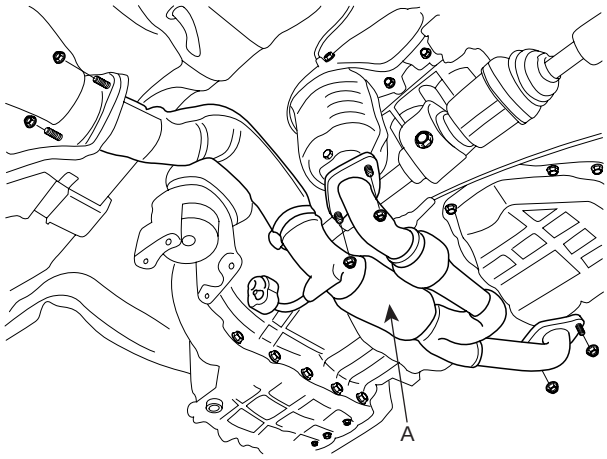
SGHAT7017N

27. Remove the mounting bolts from the sub frame by supporting the sub frame by using the special tool(09624-38000). (refer to Front suspension in SS group)



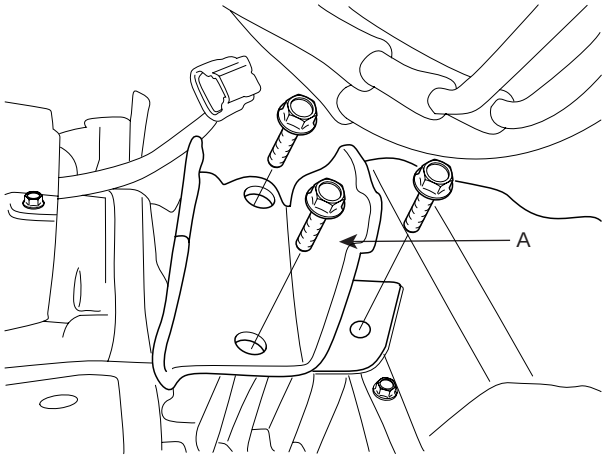
SGHAT6027D

28. Remove the front muffler assembly (A).



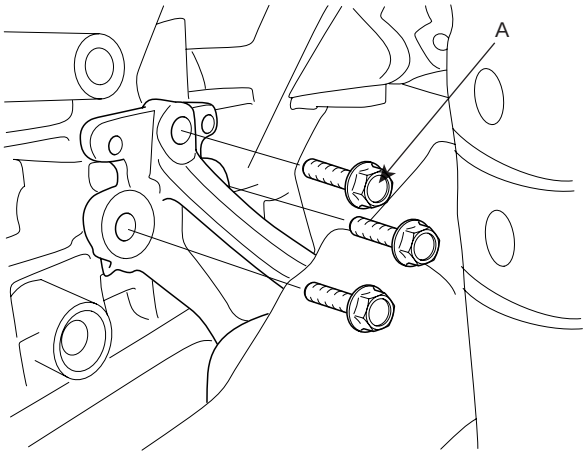
SGHAT7018N

29. Remove the front roll support (A) from the transaxle.



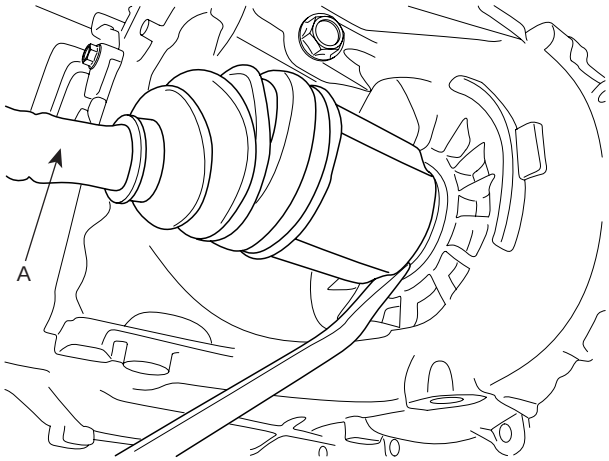
SGHAT7019N

30. Remove the inner shaft bracket bolts (A-3ea).

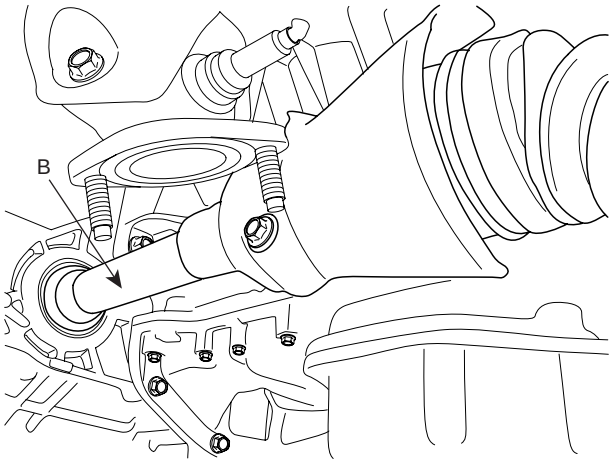


SCMAT6016N

31. Remove drive shaft (A, B) from transaxle.

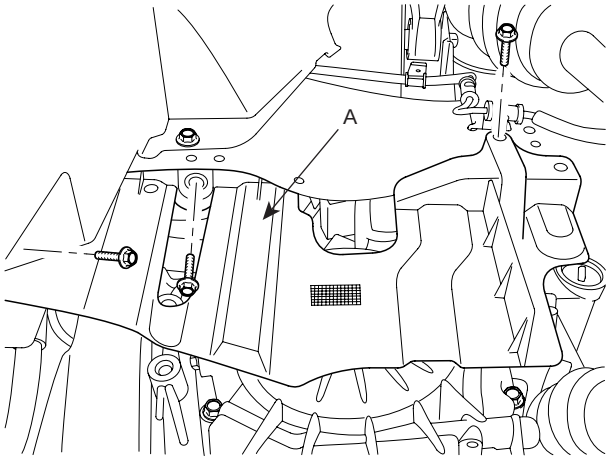


SCMAT6017N



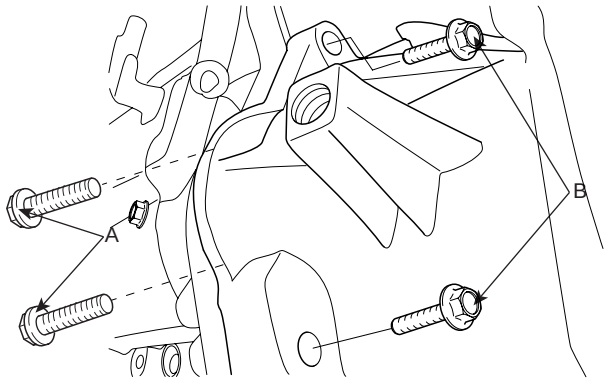
SCMAT6018N

32. Remove the left side cover (A).



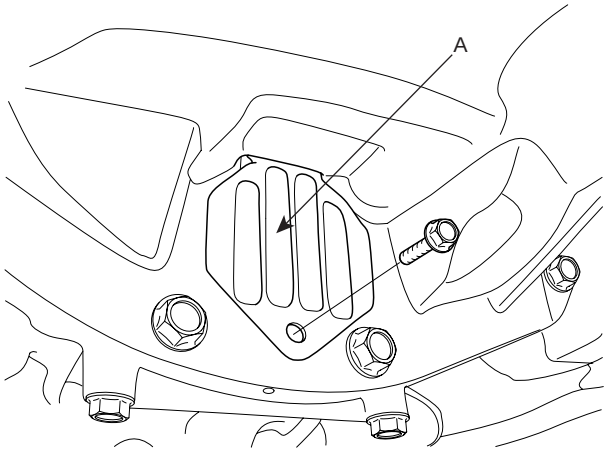
SGHAT6030D

33. Remove the starter motor mounting bolts (A) and the two bolts (B).



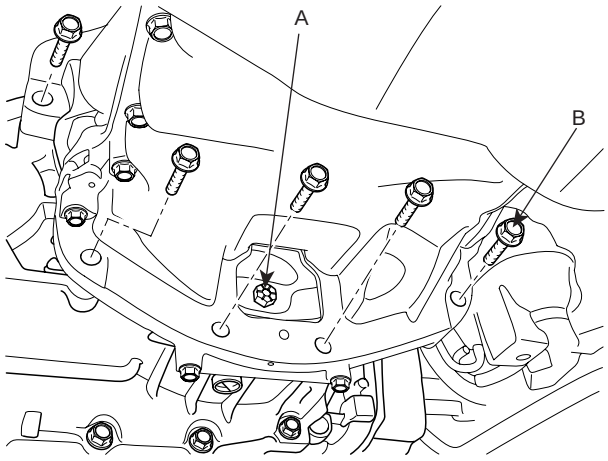
SCMAT6021N

34. Remove the cover (A).



SCMAT6022N

35. Remove the drive plate bolts (A) and the transaxle lower mounting bolts (B-6ea).



SCMAT6023N

36. Lifting the vehicle up and lowering the jack slowly, remove the transaxle assembly.

INSTALLATION E6BF54C7

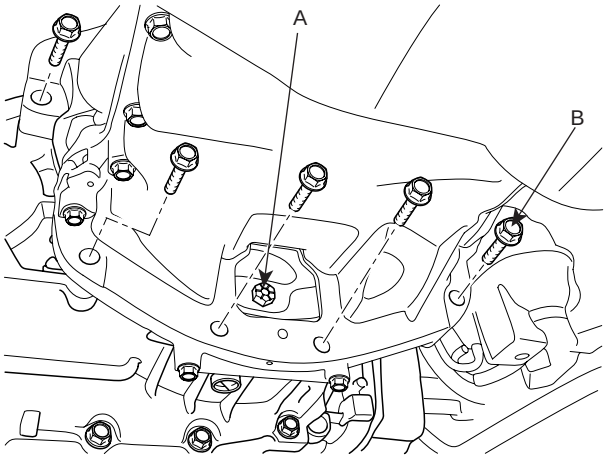
Installation is in the reverse order of removal.
Perform the following :

- Adjust the shift cable.
- Refill the transaxle with fluid.
- Refill the radiator with engine coolant.
- Bleed air from the cooling system with the heater valve open.
- Clean the battery posts and cable terminals with sandpaper, assemble them, and apply grease to prevent corrosion.

1. Using a transmission jack, install the transaxle assembly.

2. Tighten the transaxle lower mounting bolts (B-4ea, C-1ea).

TORQUE:
[B] 40~47 Nm(4.0~4.7 kgf.m, 28.9~34.0 lb-ft)
[C] 80~100 Nm(8~10 kgf.m, 57.9~72.3 lb-ft)

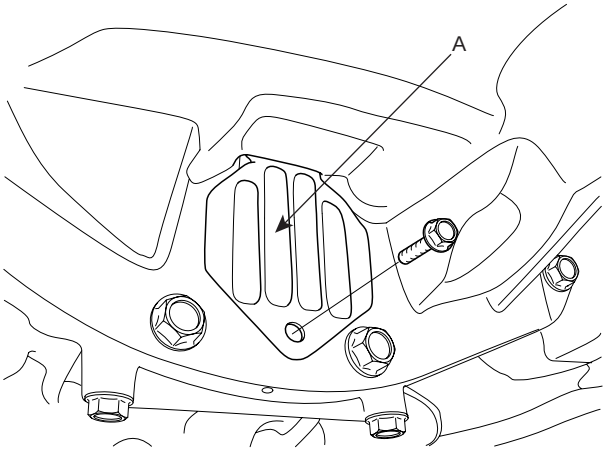


SCMAT6023N

3. Install the drive plate bolts (A) by turning the crankshaft.

TORQUE:
46~53 Nm(4.6~5.3 kgf.m, 33.3~38.3 lb-ft)

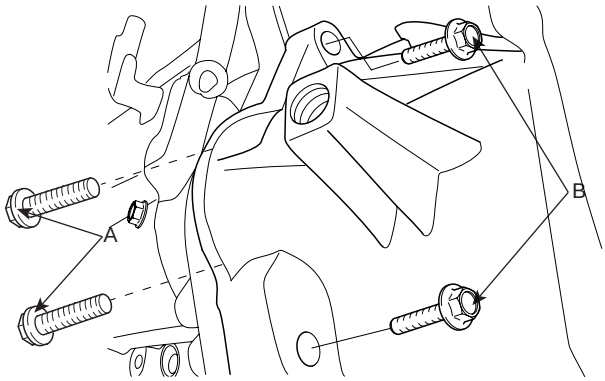
4. Install the cover (A).



SCMAT6022N

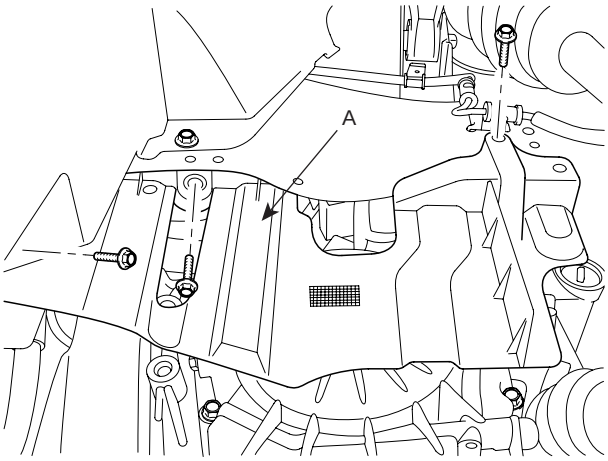
5. Install the starter motor mounting bolts (A) and the two bolts (B).

TORQUE:
[A] 43~55 Nm(4.3~5.5 kgf.m, 31.1~39.8 lb-ft)
[B] 33~50 Nm(3.3~5.0 kgf.m, 23.9~36.2 lb-ft)



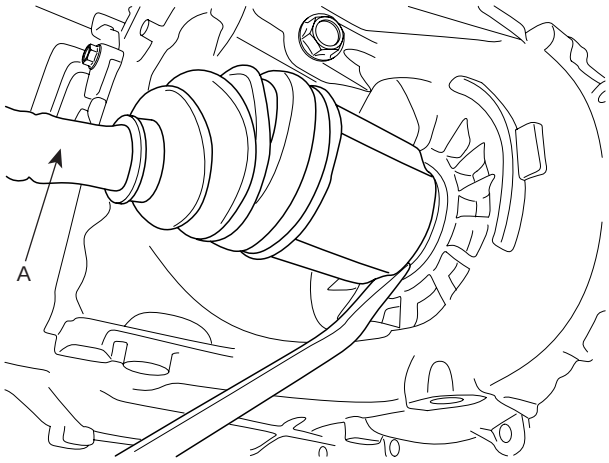
SCMAT6021N

6. Install the left side cover (A).

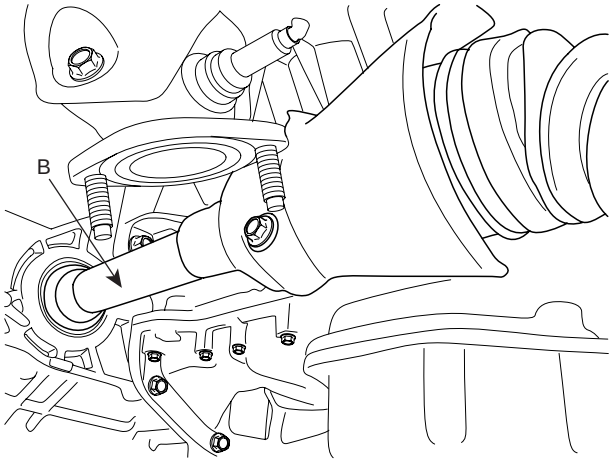


SGHAT6030D

7. After removing the jack, insert the drive shafts (A, B).

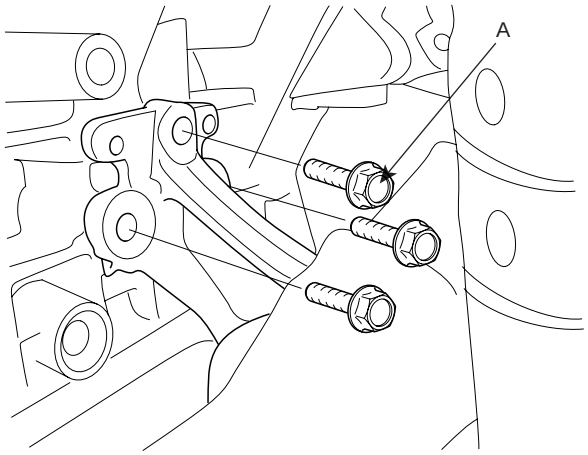


SCMAT6017N



SCMAT6018N

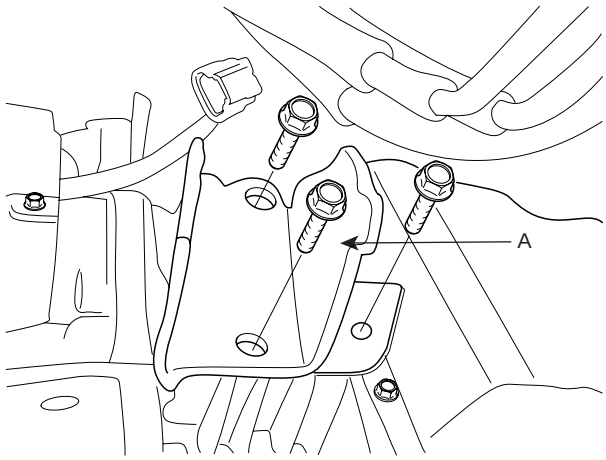
8. Install the inner shaft bracket bolts (A-3ea).



SCMAT6016N

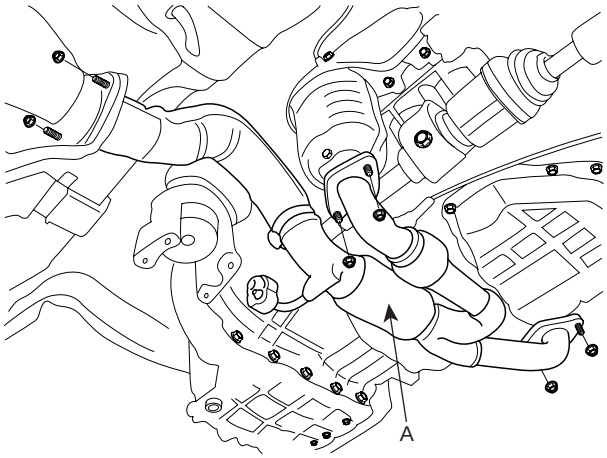
9. Install the front roll support (A) to the transaxle.

TORQUE:
60~80 Nm(6~8 kgf.m, 43.4~57.8 lb-ft)



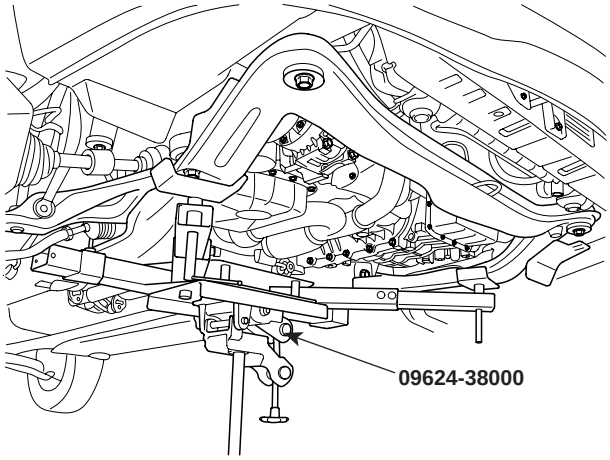
SGHAT7019N

10. Install the front muffler assembly (A).



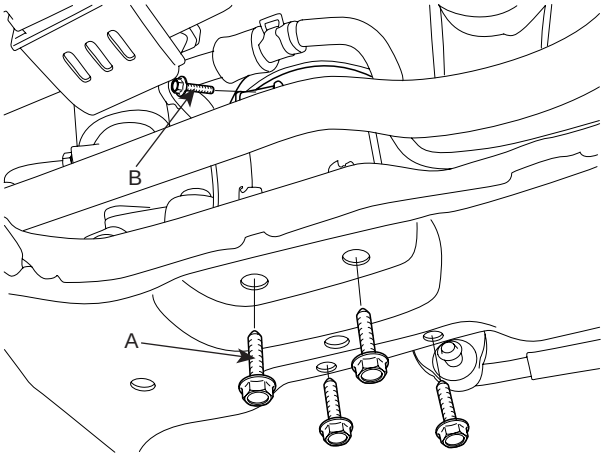
SGHAT7018N

11. Install the sub frame supported by the special tool(09624-38000). (refer to Front suspension in SS group)



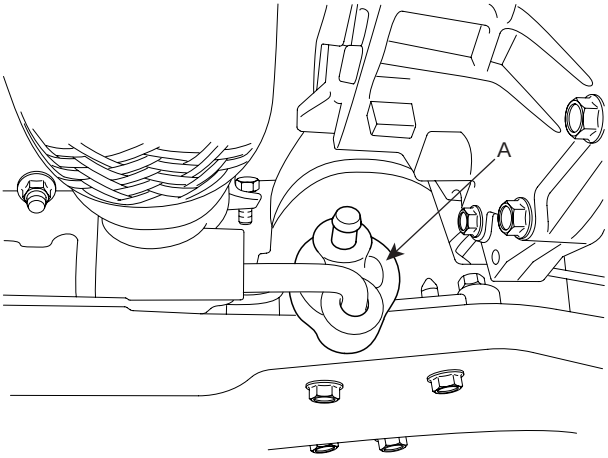
SGHAT6027D

12. Tighten the rear roll stopper mounting bolts (A-4ea) and the powersteering tube mounting bolt (B).



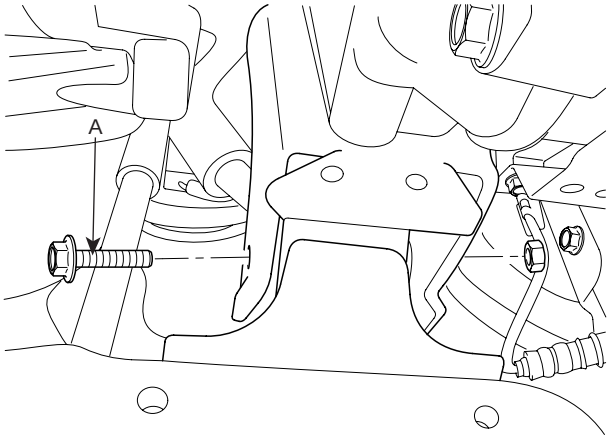
SGHAT7017N

13. Install the muffler hanger rubber (A).



SGHAT6024D

14. Tighten the front roll stopper mounting bolt (A).



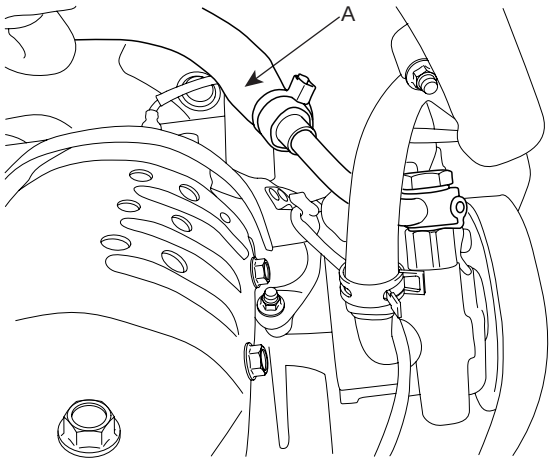
SGHAT6023D

15. Install the fork from the front lower arm. (refer to Front suspension in SS group).

16. Connect the lower arm, the tie rod end ball joint, the stabilizer bar link to the front knuckle. (refer to Front suspension in SS group)

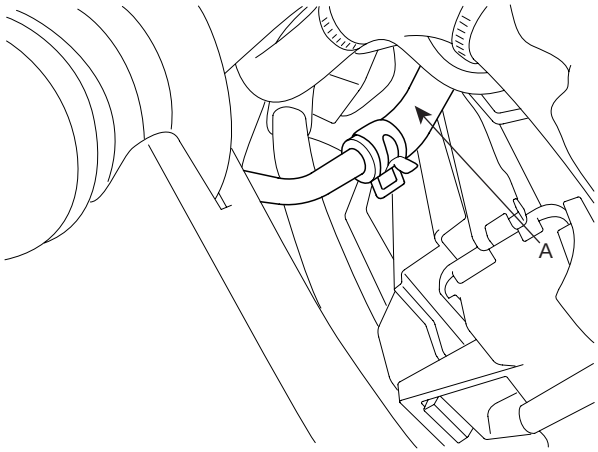
17. Connect the power steering pressure tube (A) to the power steering oil pump.

TORQUE:
55~65 Nm(5.5~6.5 kgf.m, 39.8~47.0 lb-ft)



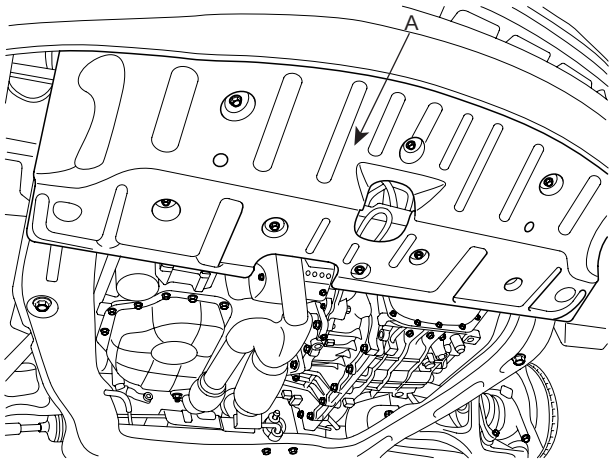
SCMAT6009N

18. Connect the return tube(A) with a clamp.



SGHAT6022D

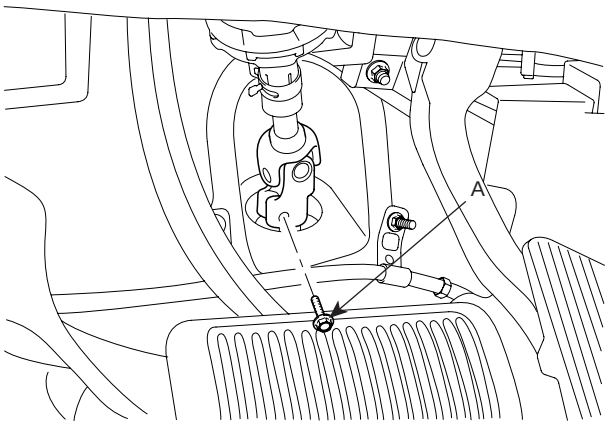
19. Install the under cover (A).



SGHAT6021D

20. Install the front wheels and tires. (refer to Front suspension in SS group)

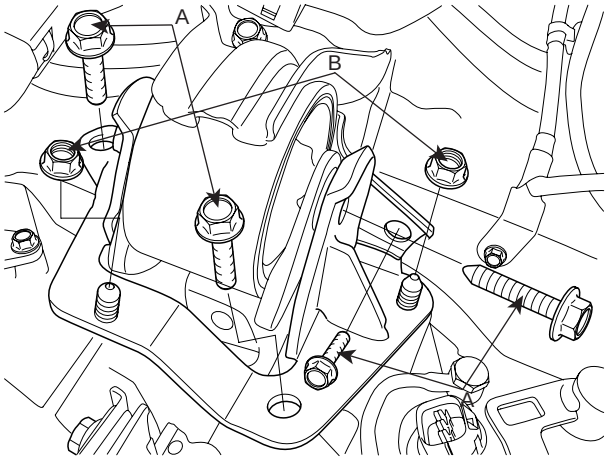
21. Install the steering column joint bolt.



SGHAT6018D

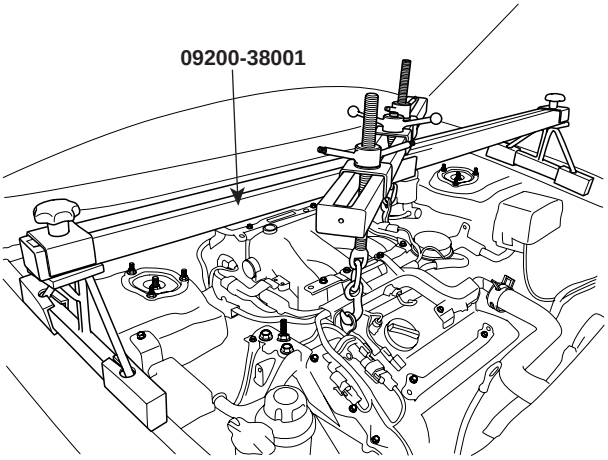
22. Tighten the transaxle insulator mounting bolt (A-4ea) and nuts (B-2ea).

TORQUE:
60~80 Nm(6~8 kgf.m, 43.4~57.8 lb-ft)



SGHAT7015N

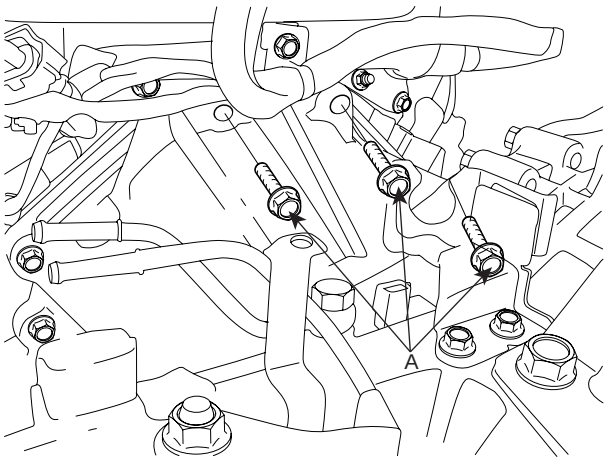
23. Remove the special tool (09200-38001) holding the engine and transaxle assembly.



SGHAT7016N

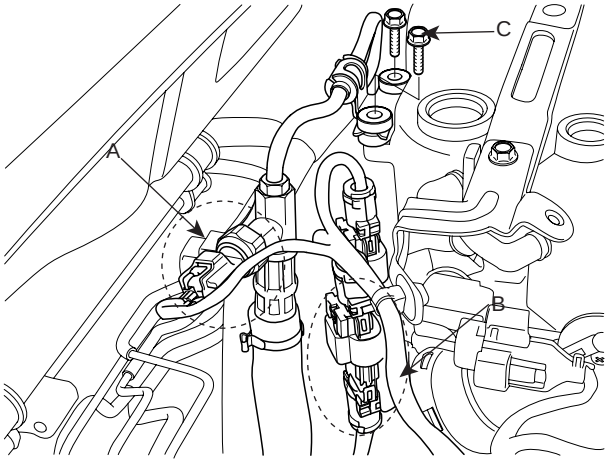
24. Tighten the transaxle mounting bolts (A-3ea).

TORQUE:
65~85 Nm(6.5~8.5 kgf.m, 47.0~61.5 lb-ft)

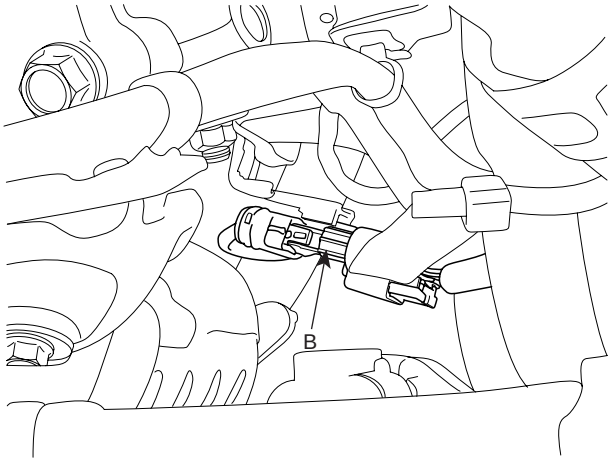


SGHAT7014N

25. Install the mounting bolts (C-2ea) and connect the oxygen sensor connectors (B-2ea) and the power steering pressure sensor connector (A).

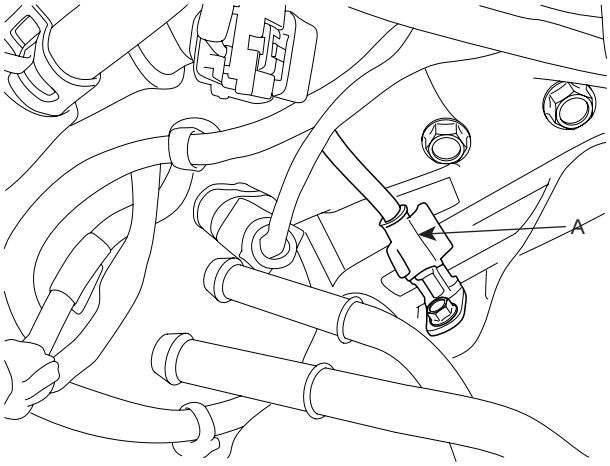


SGHAT7012N



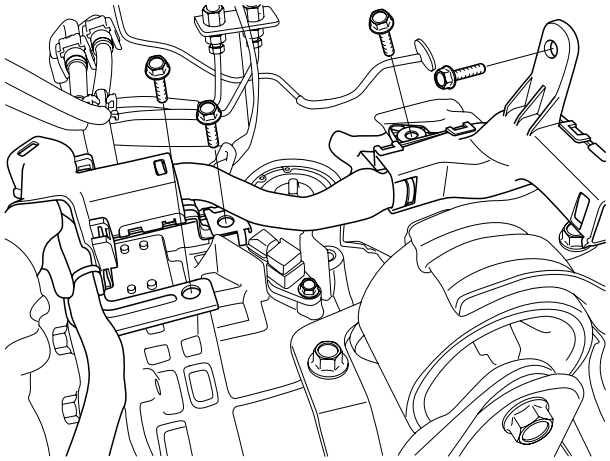
SGHAT7013N

26. Install the CKP sensor connector (A).



SGHAT7011N

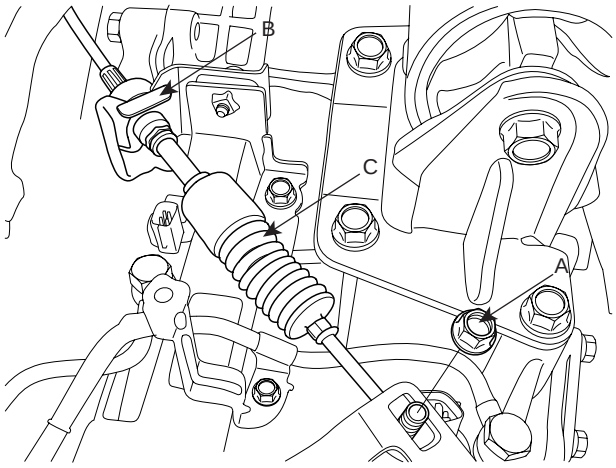
27. Install the wiring harness mounting bolts(4ea).



SGHAT7010N

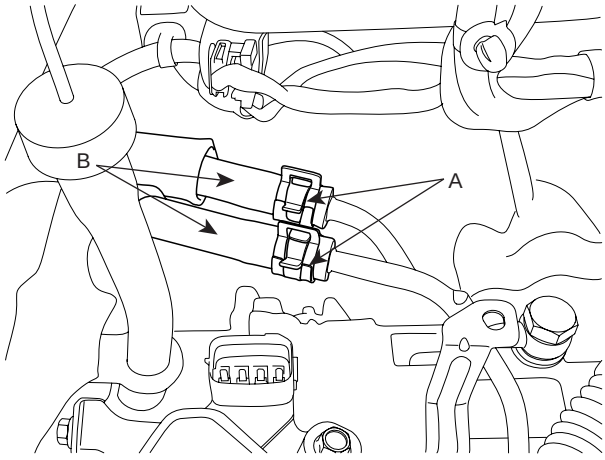
28. Install the shift cable assembly(C) by tightening the nut (A) and clip (B).

TORQUE:
8~12 Nm(0.8~1.2 kgf.m, 5.8~8.7 lb-ft)



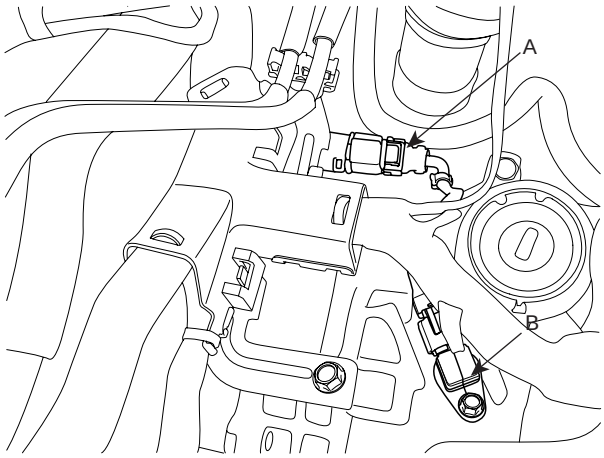
SGHAT7009N

29. Connect the transaxle oil cooler hoses (A) to the tubes by fastening the clamps (B).



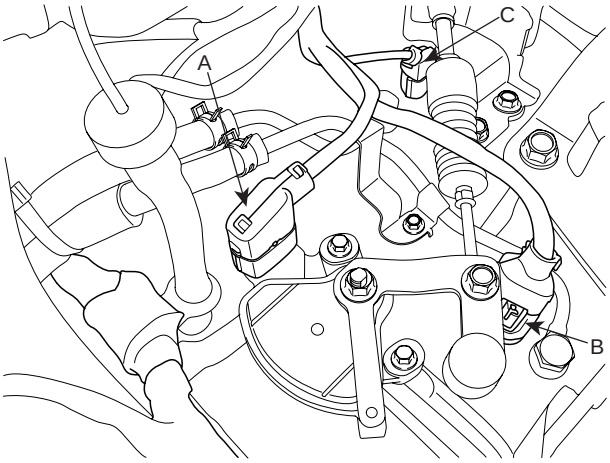
SGHAT7008N

30. Install the vehicle speed sensor connector (A) and output shaft speed sensor connector (B).



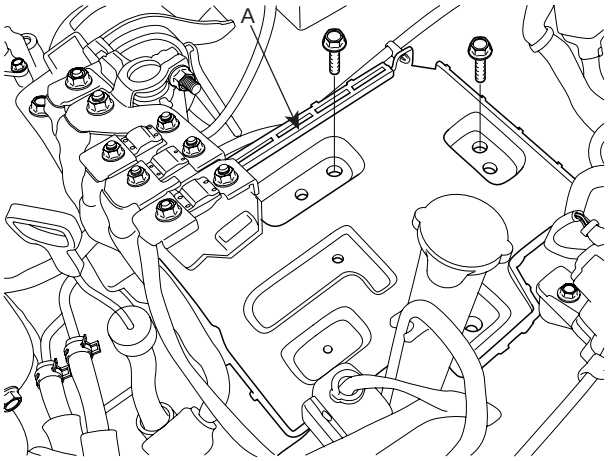
SGHAT7007N

31. Install the inhibitor switch connector (A), the solenoid valve connector (B) and the input shaft speed sensor connector (C).



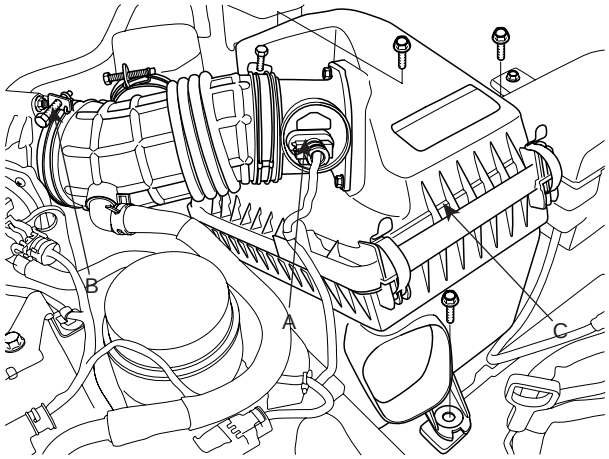
SGHAT7006N

32. Install the battery tray (A).



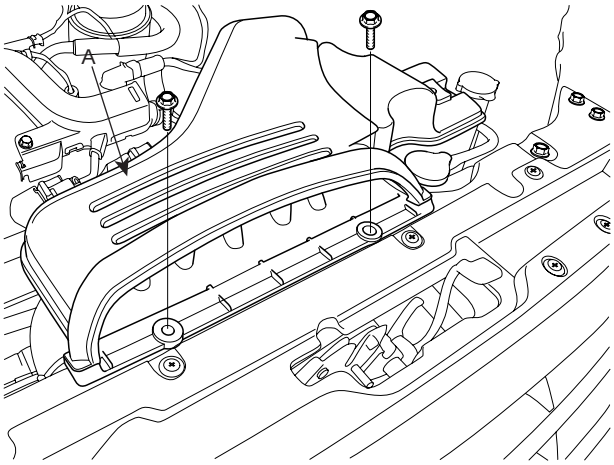
SGHAT7005N

33. Install the air cleaner assembly (C) and connect the air flow sensor connector (A) and tightening the clamp (B).



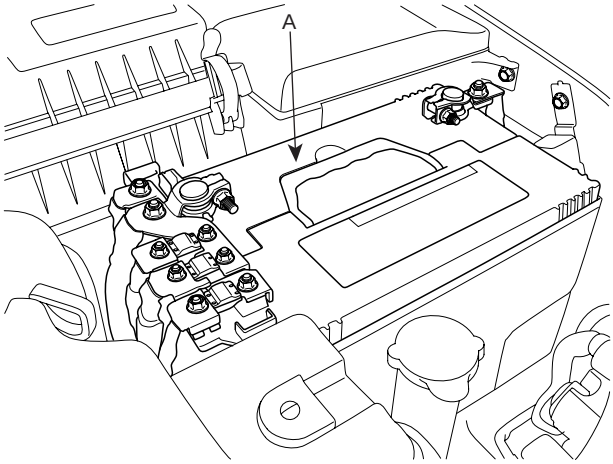
SGHAT7004N

34. Install the air duct(A).



SGHAT7003N

35. Install the battery (A).

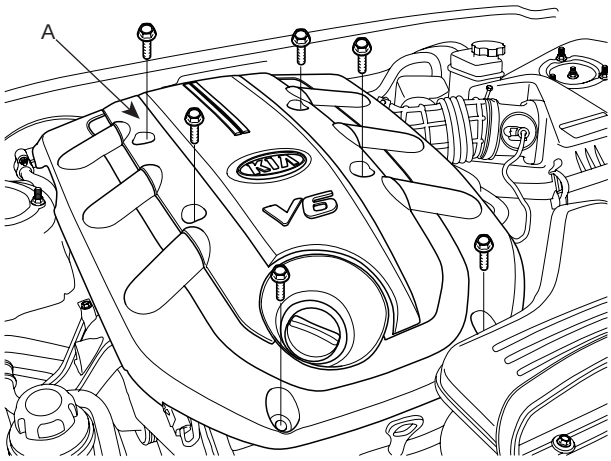


SGHAT7002N

36. Refill the transaxle fluid. (refer to 'Service adjustment procedure')

37. Refill the power steering fluid and bleed the air. (refer to 'Service adjustment procedure' in ST group)

38. Install the engine cover (A).



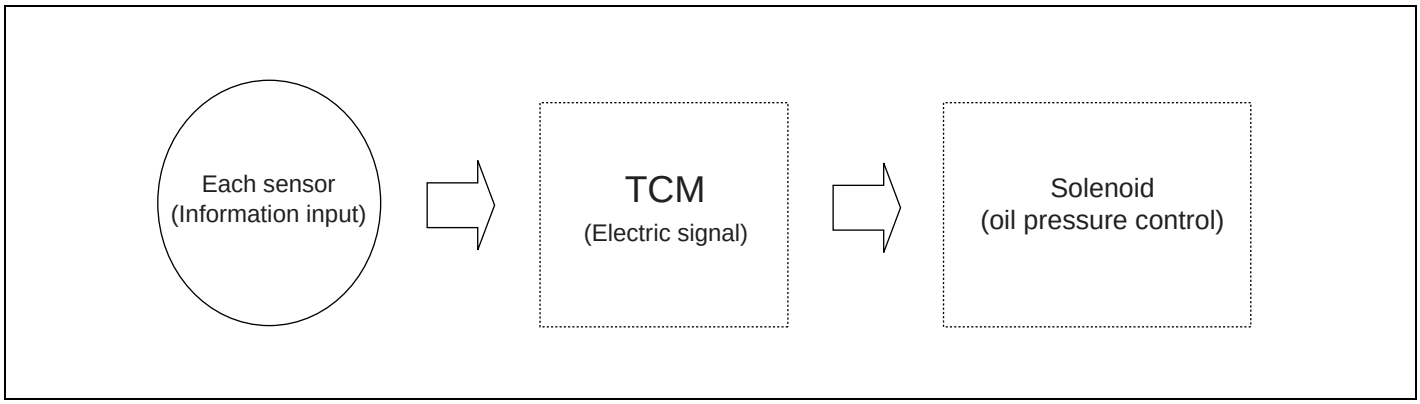
SGHAT7001N

AUTOMATIC TRANSAXLE CONTROL SYSTEM

SOLENOID VALVE

DESCRIPTION E2DBB4CE

TCM calculates the best condition using the information from all kinds of sensors. If the solenoid valve receives the information on the oil pressure, the solenoid valve actuates according to the driving signal. All kinds of regulators in the valve body are controlled to change the oil passage and also the line pressure is controlled by TCM.

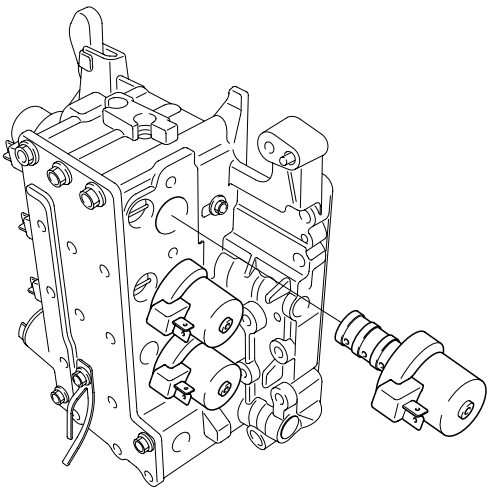


BKGF017A

● **PWM (Pulse Width Modulation) SOLENOID VALVE**

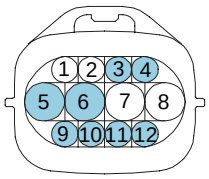
Structure and functions

PWM solenoid valve is composed of six solenoid valves and the oil capacity in the solenoid valve is changed by the electric duty value of TCM. The oil pressure of the valve body and the torque converter engages or disengages the damper clutch. The solenoid valves send the operating oil pressure to the clutches and brakes at the each range and also control the strength and weakness of oil pressure to reduce the shock when shifting the range.



<PWM Solenoid valve>

SCMAT6002L



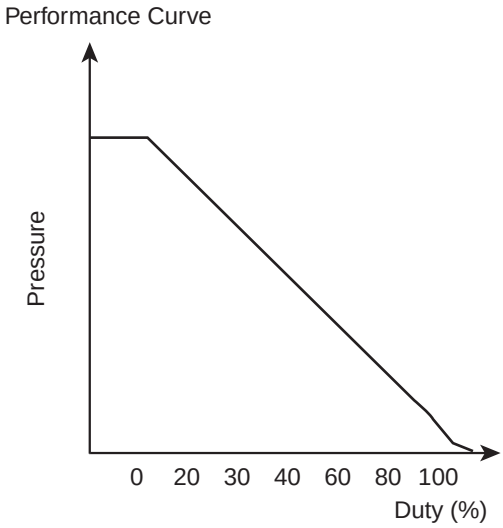
1.Fluid temperature sensor
2.Fluid temperature sensor ground
3.UD Solenoid valve
4.2ND Solenoid valve
5.A/T battery (UD, 2ND, OD)
6.A/T battery (LR/DIR, DC)
7.VFS Valve
8.VFS valve ground
9.DC Solenoid valve
10.RED Solenoid valve
11.LR Solenoid valve
12.OD Solenoid valve

SCMAA6002N

PWM (PULSE WIDTH MODULATION) SOLENOID

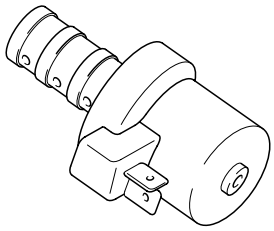
Range	PWM solenoid valve (0 : Duty 0%)				
	SCSV-A (LR)	SCSV-B (UD)	SCSV-C (2ND)	SCSV-D (OD)	SCSV-E (RED)
1st	O	O			O
2nd		O	O		O
3rd		O		O	O
4th			O	O	O
5th	O		O	O	
Reverse	O				O
N, P	O				O

PWM (PULSE WIDTH MODULATION) SOLENOID VALVE CONTROL FEATURE



<PWM Solenoid valve performance curve>

BKGF017D



<PWM Solenoid valve form>

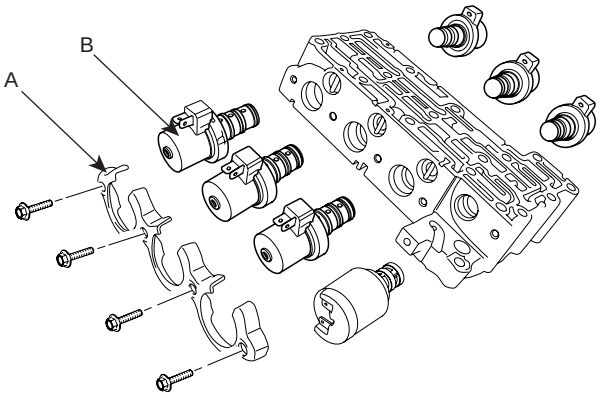
SCMAT6003L

PWM solenoid valve is controlled linearly according to the duty ratio.

Item	Specitication
Type	3way & Normal High
Supply voltage	12V
Coil resistance	2.6±0.2Ω
Control frequence	61.27Hz (30.64Hz of Temp.≤ -23°C)

REMOVAL E91C4C3C

1. Remove the battery terminal.
2. Lift the vehicle.
3. Remove the splash shield.
4. Loosen the drain plug and drain the transaxle oil.
5. Remove the oil pan. (Refer to automatic transaxle removal in A5HF1 overhaul manual)
6. Disconnect the solenoid valve connectors.
7. Remove the solenoid valve(B-6EA) by removing the supporting bracket(A).



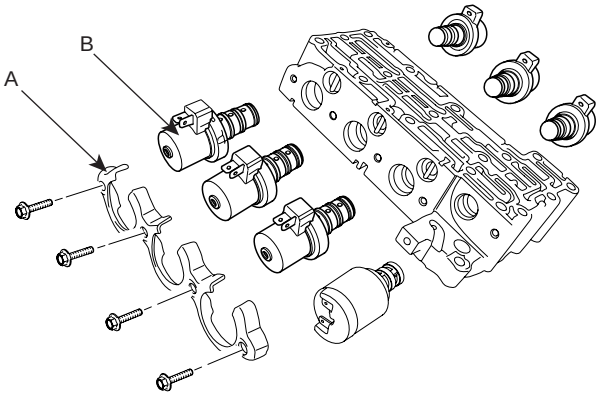
SCMAT6033D

INSTALLATION EFD8F825

1. Install the solenoid valve(B-6EA) and the supporting bracket(A).

CAUTION

Apply the ATF oil or White Vaseline to the O-ring not to be damaged.



SCMAT6033D

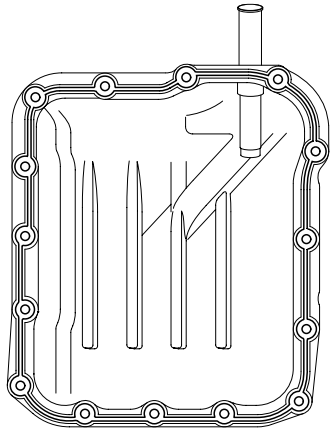
2. Connect the solenoid valve connector.

CAUTION

When connecting the solenoid valve connector, check the connector for rust, dirt, or oil, then re-connect it.

3. Continue to apply liquid gasket at application points at the oil pan with Ø2.5mm (0.098in) thickness.

Liquid gasket Part name : Threebond 1281B



SCMAT6052D

4. Tighten the mounting bolt with the specified torque after installing the oil pan.

TORQUE : 13~15Nm(1.3~1.5kgf.m, 9.4~10.8lb-ft)

5. Install the drain plug and refill the transaxle fluid.

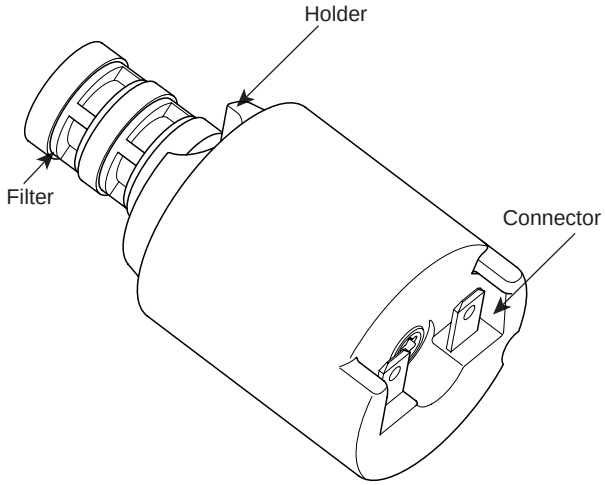
TORQUE : 40~50Nm(4.0~5.0kgf.m, 28.9~36.2lb-ft)

6. Install the splash shield.
7. Lower the vehicle and install the battery terminal.

VFS(VARIABLE FORCE SOLENOID) VALVE

DESCRIPTION E9FA1D98

VFS valve controls the regulator valve and varies the line pressure from 4.5bar to 10.5bar according to the throttle open angle and the shift range. The holder is installed on the upper side of the case and the filter is installed to the two places on the holder outside to prevent in the strange material from flowing in the VFS.

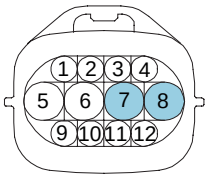


<VFS assembly >

SCMAT6011L

VFS valve is controlled linearly according to the current value.

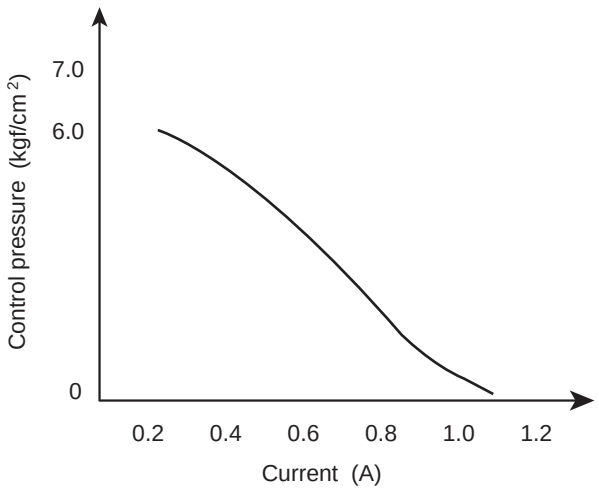
Item	Specification
type	3way & Normal High
Supply voltage	12V
Coil resistance	4.35 ± 0.35 Ω
Operating current	100 ~ 1100 mA
Control frequence	600Hz



1.Fluid temperature sensor
2.Fluid temperature sensor ground
3.UD Solenoid valve
4.2ND Solenoid valve
5.A/T battery (UD, 2ND, OD)
6.A/T battery (LR/DIR, DC)
7.VFS
8.VFS valve ground
9.DC Solenoid valve
10.RED Solenoid valve
11.LR Solenoid valve
12.OD Solenoid valve

SCMAA6003N

VFS (VARIABLE FORCE SOLENOID) VALVE CONTROL FEATURE

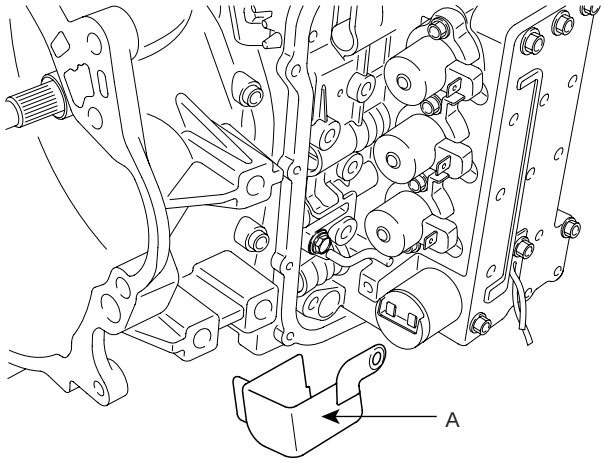


<VFS valve performance curve>

BKGF018B

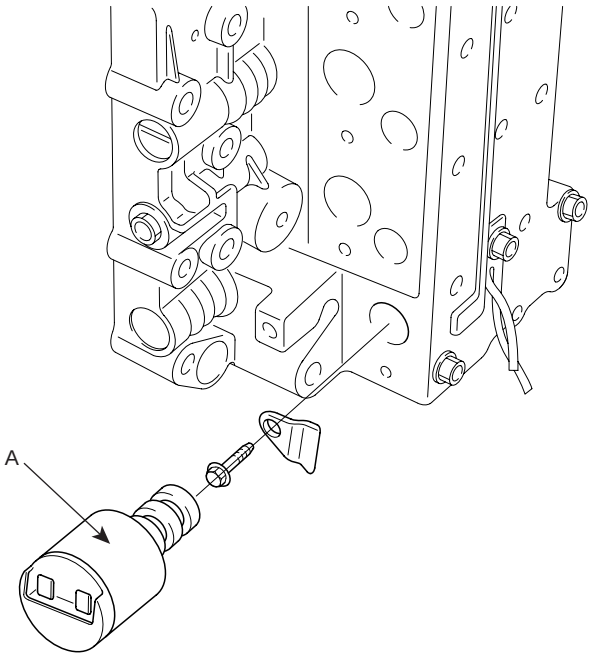
REMOVAL EEEA3EC8

1. Remove the battery terminal.
2. Lift the vehicle.
3. Remove the splash shield.
4. Loosen the drain plug and drain the transaxle oil.
5. Remove the oil pan. (Refer to automatic transaxle removal in A5HF1 overhaul manual)
6. Remove the VFS reservoir(A).



SCMAT6034D

7. Disconnect the VFS solenoid valve connector.
8. Remove the solenoid valve assembly(A).



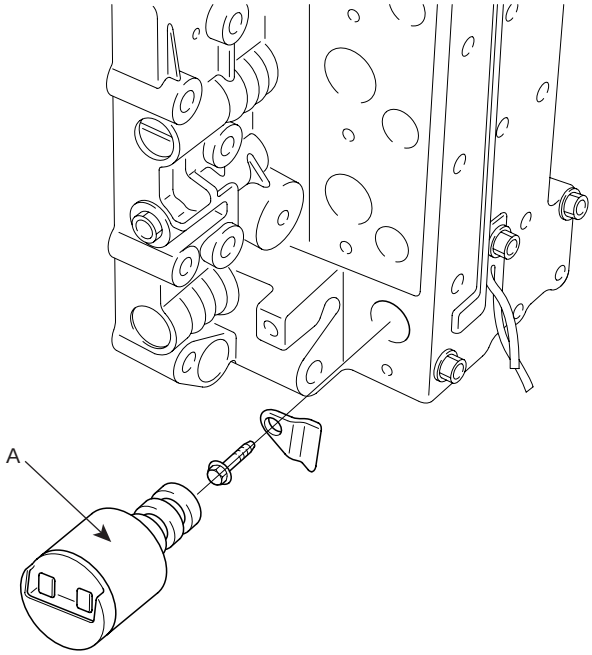
KKCF009D

INSTALLATION E31C8972

1. Install the solenoid valve(A).

CAUTION

Apply the ATF oil or White Vaseline to the O-ring not to be damaged.



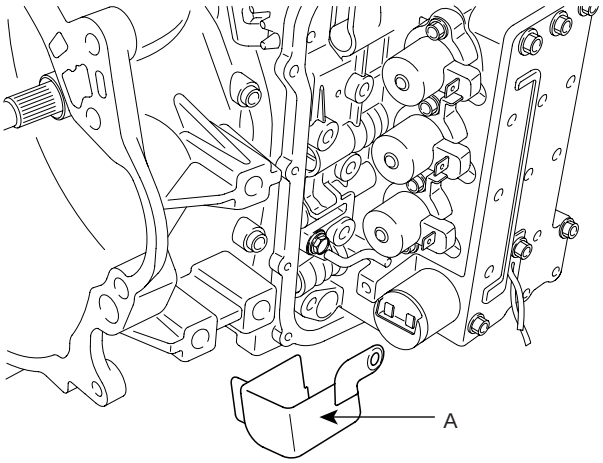
KKCF009D

2. Connect the solenoid valve connector to the valve body.

CAUTION

When connecting the solenoid valve connector, check the connector for rust, dirt, or oil, then re-connect it.

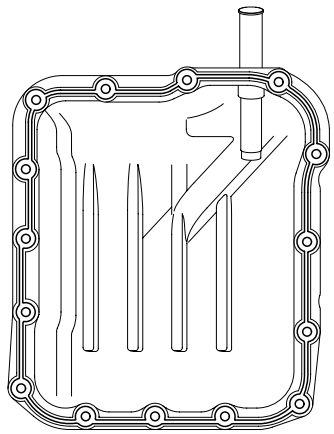
3. Install the VFS reservoir(A).



SCMAT6034D

4. Continue to apply liquid gasket at application points at the oil pan with Ø2.5mm (0.098in) thickness.

Liquid gasket Part name : Threebond 1281B



SCMAT6052D

5. Tighten the mounting bolt with the specified torque after installing the oil pan.

TORQUE : 13~15Nm(1.3~1.5kgf.m, 9.4~10.8lb-ft)

6. Install the drain plug and refill the transaxle fluid.

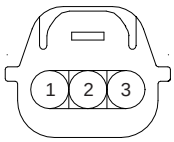
TORQUE : 40~50Nm(4.0~5.0kgf.m, 28.9~36.2lb-ft)

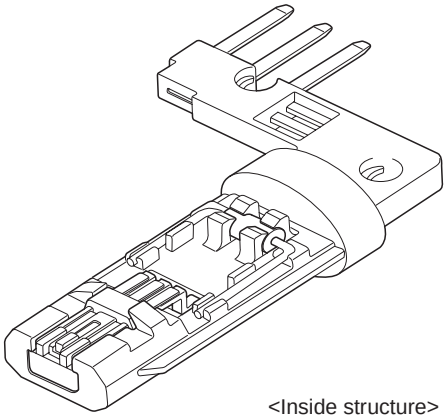
7. Install the splash shield.

8. Lower the vehicle and install the battery terminal.

INPUT SPEED SENSOR

DESCRIPTION EBD4BF9F

Sensor type	1. Type : HALL SENSOR 2. Operating voltage : DC 12V 3. Current consumption : 22mA (Max)
Function	1. Input shaft speed sensor: Detect the input shaft rotation at the OD & REV retainer side to control oil pressure when shifting. 2. Feedback control, clutch-clutch control, damper clutch control, shift range control, incorrect ratio control and sensor trouble detection signal.
Connector	 1. Ground 2. Input 3. Power source SCMAA6004N



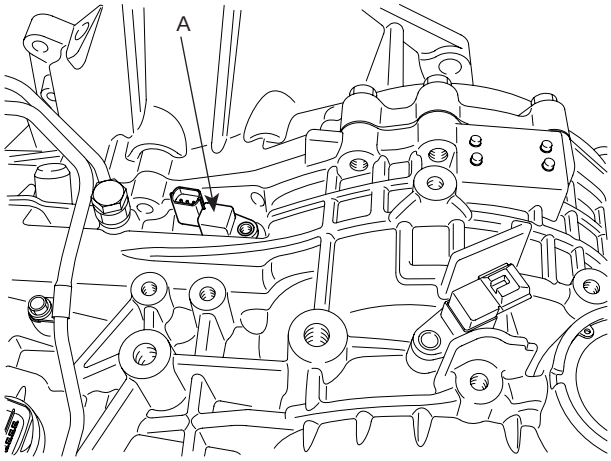
<Inside structure>

BKGF012B

Item	Inspection item	Standard value
Air gap	Input shaft speed sensor	0.05in(1.3mm)
Sensor resistance	Input shaft speed sensor	Over 1 MΩ
Output voltage	HIGH	Over 4.8V
	LOW	Below 0.8V

REMOVAL EED7E4CB

1. Remove the battery terminal.
2. Remove the battery and battery tray.
3. Remove the air cleaner assembly. (see the automatic transaxle-Removal/ installation procedures)
4. Remove the input shaft speed sensor connector.
5. Remove the input shaft speed sensor(A).



SCMAT6037D

INSTALLATION EE7CFF15

1. Install the new O-ring to the input shaft speed sensor.
2. Install the input shaft speed sensor.

TORQUE: 10~12Nm(1.0~1.2kgf.m, 7~8lb-ft)

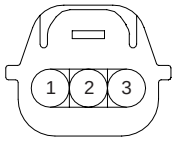
CAUTION

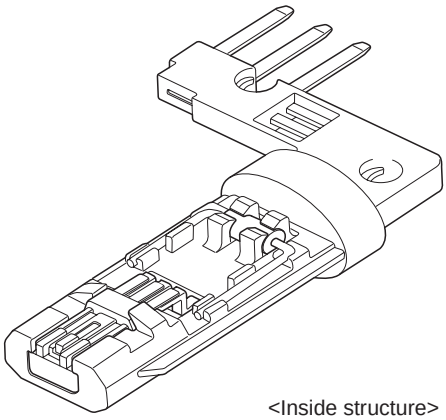
While installing the input shaft speed sensor, do not allow dust or other foreign particles to enter the transaxle.

3. Check the connector for dust, dirt, or oil, and then connect the connector securely.
4. Installation is the reverse of removal.

OUTPUT SPEED SENSOR

DESCRIPTION EE59F1CD

Sensor type	1. Type : HALL SENSOR 2. Output voltage : DC 12V 3. Current consumption : 22mA (Max)
Function	1. Output shaft speed sensor : Detect the output shaft rpm(T/F DRIVE GEAR RPM) at the T/F drive gear 2. Feedback control, clutch-clutch control, damper clutch control, shift range control, incorrect ratio control and sensor trouble detection signal.
Connector	 1. Ground 2. Input 3. Power source SCMAA6005N



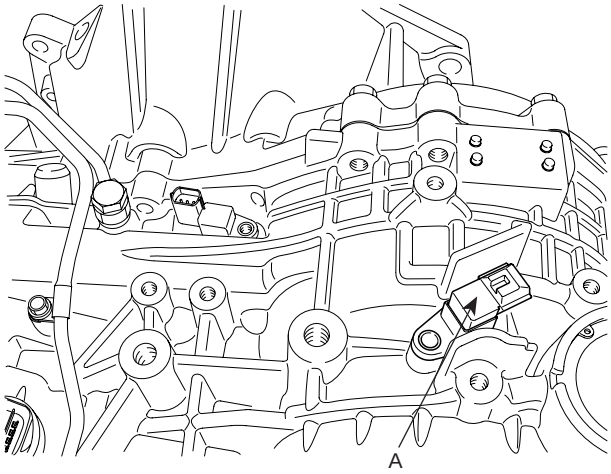
<Inside structure>

BKGF012B

Item	Inspection item	Standard value
Air gap	Output shaft speed sensor	0.0335in(0.85mm)
Sensor resistance	Output shaft speed sensor	Over 1 MΩ
Output voltage	HIGH	Over 4.8V
	LOW	Below 0.8V

REMOVAL E2D1DE7E

1. Remove the battery terminal.
2. Remove the battery and battery tray.
3. Remove the air cleaner assembly. (see the automatic transaxle- Removal/ installation procedures)
4. Remove the output shaft speed sensor connector.
5. Remove the output shaft speed sensor(A).



SCMAT6039D

INSTALLATION EDDDA414

1. Install the new O-ring to the output shaft speed sensor.
2. Remove the output shaft speed sensor.

TORQUE:
10~12Nm(1.0~1.2kgf.m, 7~8lb-ft)

CAUTION

While installing the output shaft speed sensor, do not allow dust or other foreign particles to enter the transaxle.

3. Check the connector for dust, dirt, or oil, then connect the connector securel.
4. Installation is the reverse of removal.

TRANSAXLE OIL TEMPERATURE SENSOR

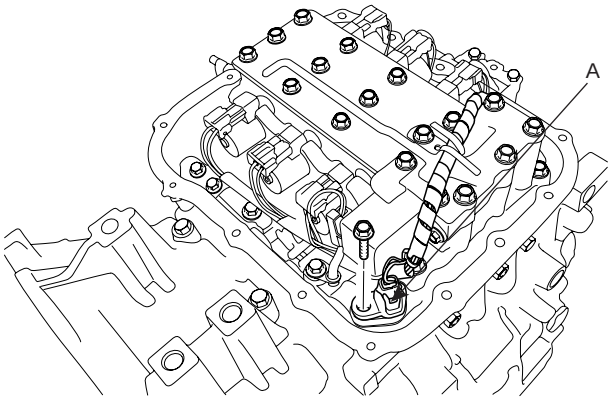
DESCRIPTION E7EEEEF5

Sensor type	1. Type : Thermister 2. Use available temperature :-40~160°C(-40~320°F)
Function and feature	1. Detect the temperature of ATF through the thermistor which is exposed outside. 2. When shifting the range, it is used as the oil pressure control information.
Connector	 **1.Fluid temperature sensor** **2.Fluid temperature sensor ground** 3.UD Solenoid valve 4.2ND Solenoid valve 5.A/T battery (UD, 2ND, OD) 6.A/T battery (LR/DIR, DC) 7.VFS 8.VFS valve ground 9.DC Solenoid valve 10.RED Solenoid valve 11.LR Solenoid valve 12.OD Solenoid valve SCMAA6006N

Temp.[°C(°F)]	Resistance (KΩ)	Temp.[°C(°F)]	Resistance (KΩ)
-40(-40)	139.5	80(176)	1.08
-20(-4)	47.7	100(212)	0.63±0.06
0(32)	18.6±1.86	120(248)	0.38
20(68)	8.1	140(284)	0.25
40(104)	3.8	160(320)	0.16
60(140)	1.98		

REMOVAL E7B2DE5B

1. Remove the battery terminal.
2. Lift the vehicle.
3. Remove the splash shield.
4. Loosen the drain plug and drain the transaxle oil.
5. Remove the oil pan. (Refer to automatic transaxle removal in A5HF1 overhaul manual)
6. Disconnect the oil temperature sensor connector and remove the sensor(A) from the valve body.



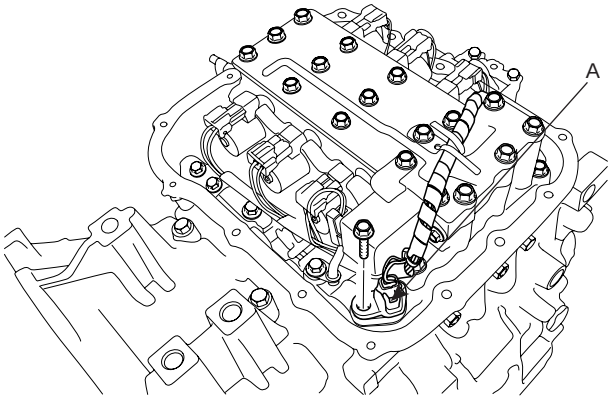
SCMAT6042D

INSTALLATION E8C2FBA3

1. Install the oil temperature sensor(A) and connect the sensor connector.

CAUTION

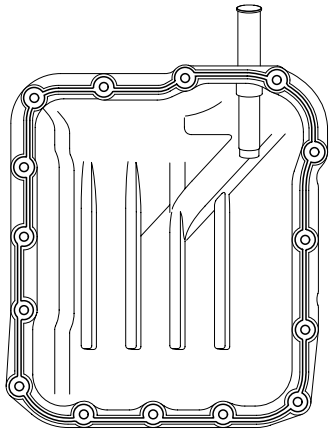
When connecting the oil temperature connector, check the connector for rust, dirt, or oil, then re-connect it.



SCMAT6042D

2. Continue to apply liquid gasket at application points at the oil pan with Ø0.098in(2.5mm) thickness.

Liquid gasket Part name : Threebond 1281B



SCMAT6052D

3. Tighten the mounting bolt with the specified torque after installing the oil pan.

TORQUE: 13~15Nm(1.3~1.5kgf.m, 9.4~10.8lb-ft)

4. Install the drain plug.

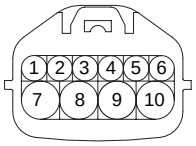
TORQUE : 40~50Nm(4.0~5.0kgf.m, 28.9~36.2lb-ft)

5. Installation is the reverse of the removal.

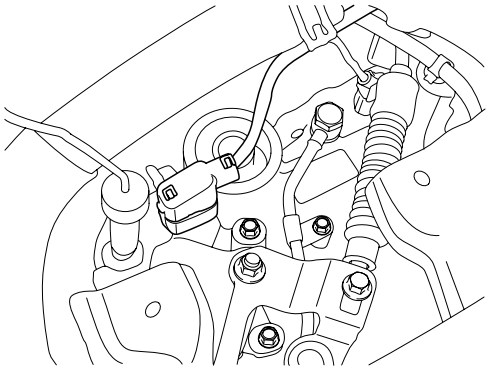
TRANSAXLE RANGE (TR) SWITCH

DESCRIPTION E3E6B37C

Sensor tyep	1. Type : ROTARY 2. Available temperature range : -40~150°C(-40~320°F) 3. TORQUE : 10~12Nm(1.0~1.2kgf.m, 7~8lb-ft)
Function	Detect the position of select lever through the contact switch. It makes starting possible in "P" and "N".



1. D range
3. P range
4. N range
7. R range
8. Power supply IG1
9. Start circuit
10. Start circuit



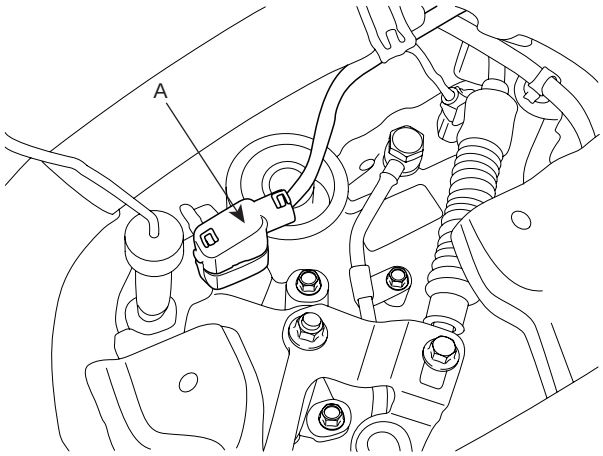
SCMAA6007N

Shift lever / Terminal No.	P	R	N	D
1				●
2				
3	●			
4			●	
5				
6				
7		●		
8	●	●	●	●
9	●		●	
10	●		●	

STGAT7002L

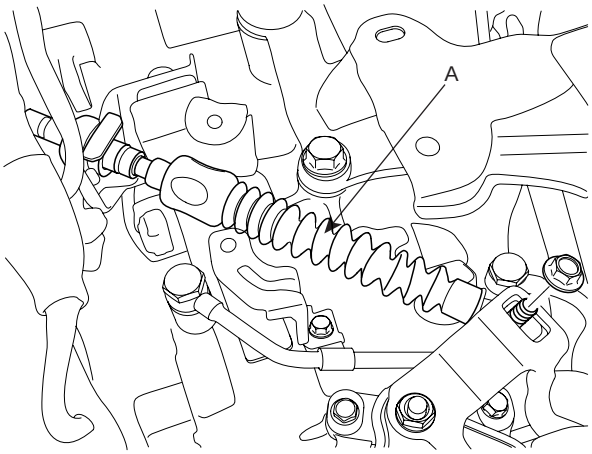
REMOVAL E0EF8ADF

1. Remove the battery terminal.
2. Remove the battery and battery tray.
3. Remove the air cleaner assembly(Refer to the automatic transaxle-Removal/installation procedures).
4. Disconnect the inhibitor switch connector(A).



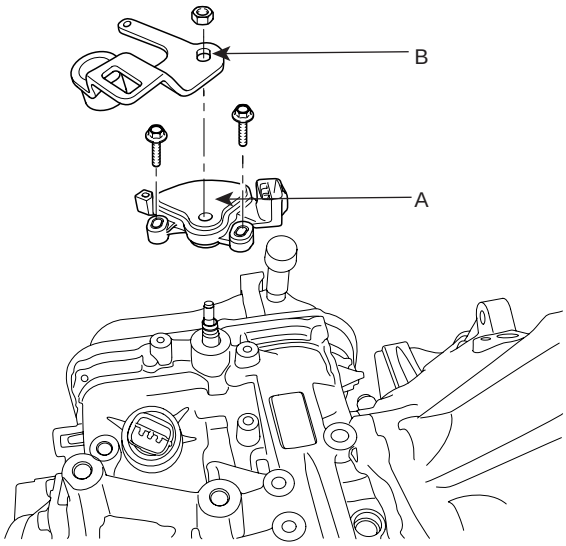
SCMAT6045D

5. Remove the control cable(A) from the manual control lever.



SCMAT6046D

6. Remove the inhibitor switch(A) and manual control lever(B).



SCMAT6047D

INSTALLATION E38D55AE

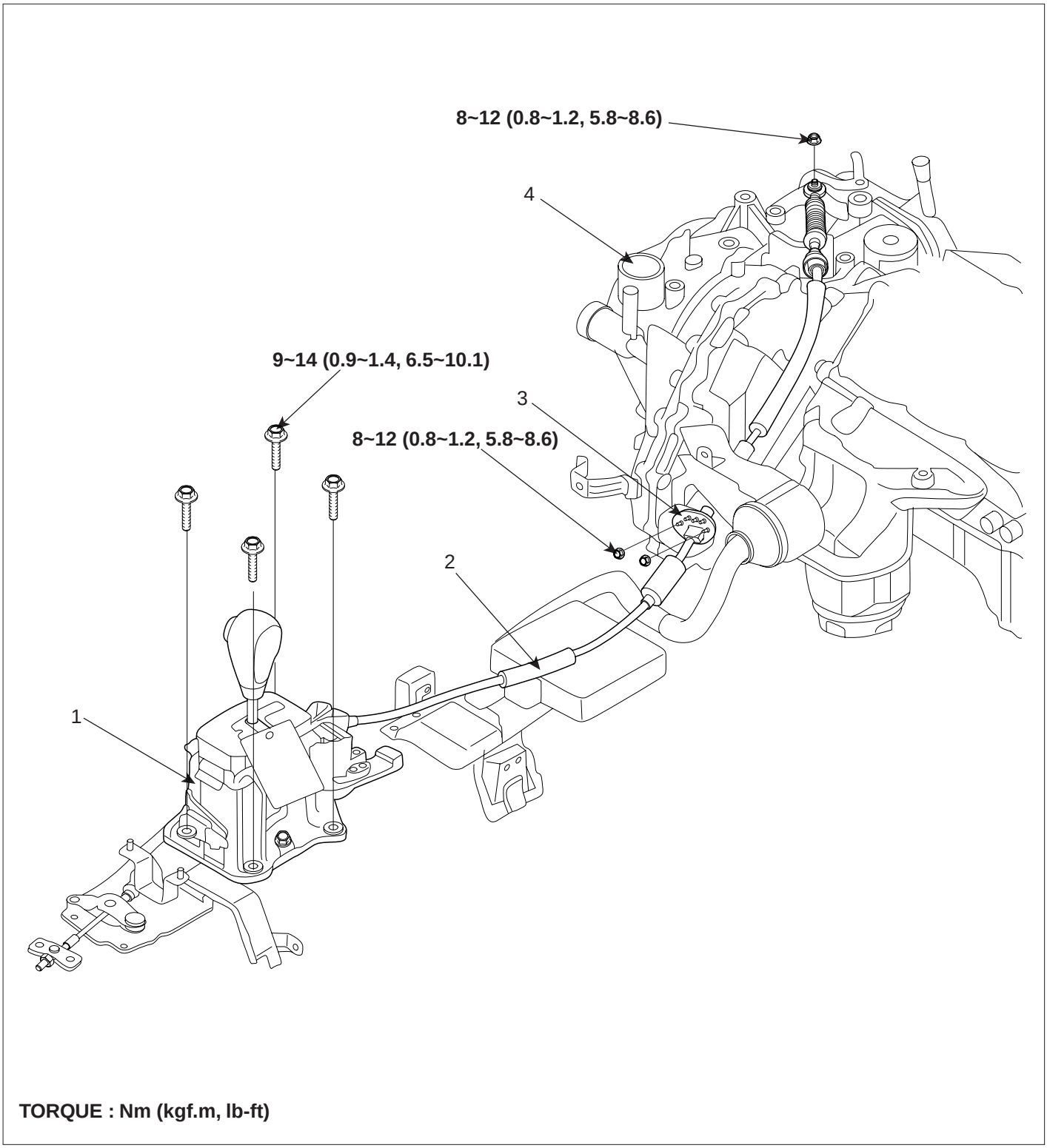
1. Set the inhibitor switch to the "N" position.
2. Set the inhibitor switch control shaft to the "N" position.
3. Install the inhibitor switch and manual control lever.

TORQUE
Shaft nut: 18~25Nm(1.8~2.5kgf.m, 13.0~18.1lb-ft)
Bolt(2EA): 10~12Nm(1.0~1.2kgf.m, 7~8lb-ft)

4. Install the control cable to the manual control lever.
5. Connect the inhibitor switch connector.
6. Installation is the reverse of the removal.
7. Turn the ignition switch ON after installation.
   Move the shift lever from "P" range to "L" range, and verify that the A/T gear position indicator follows the transaxle range switch.

SHIFT LEVER

COMPONENTS ECC569EC

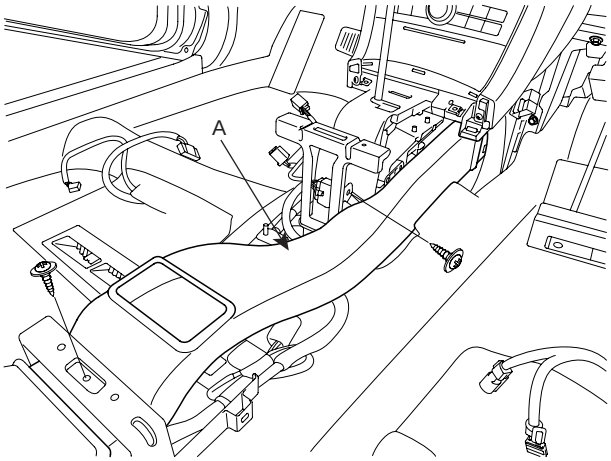


1. Shift lever assembly
2. Shift cable
3. Retainer
4. Transaxle assembly

SGHAT7020L

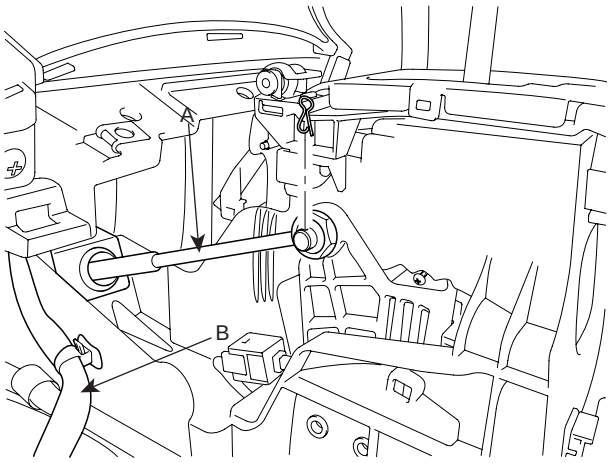
REMOVAL E09C492E

1. Remove the center console. (refer to Console in BD group)
2. Remove the air duct (A).



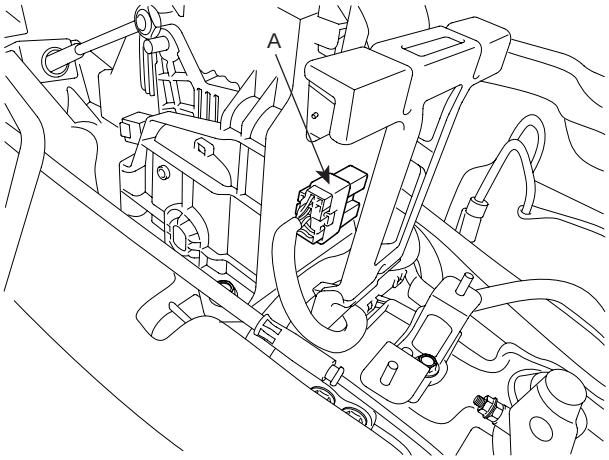
SGHAT6001D

3. Remove the shift cable (A) and wire (B) from the shift lever assembly.



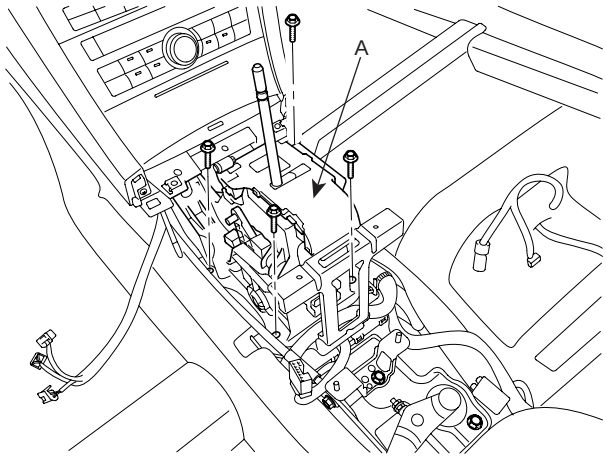
SGHAT6002D

4. Remove the sport mode connector (A).



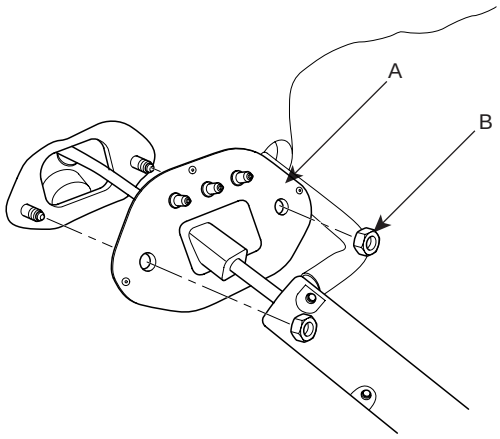
SGHAT6003D

5. Remove the shift lever assembly (A).



SGHAT6004D

6. Remove the retainer (A) and the nuts (B).



SHDAT6108D

NOTE

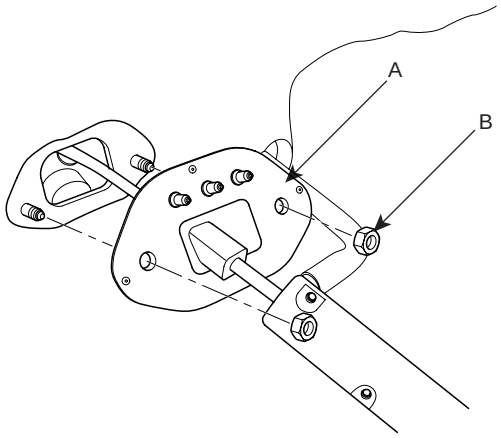
In case, remove the crush pad and cowl cross bar. (refer to Crush pad in BD group and Heater unit in HA group)

7. Remove the shift cable from the transaxle assembly. (refer to Automatic transaxle's Removal)

INSTALLATION ECB7BFC7

1. Install the retainer (A) and the nuts (B).

TORQUE : 8-12Nm(0.8-1.2kgf.m, 5.8-8.6lb-ft)



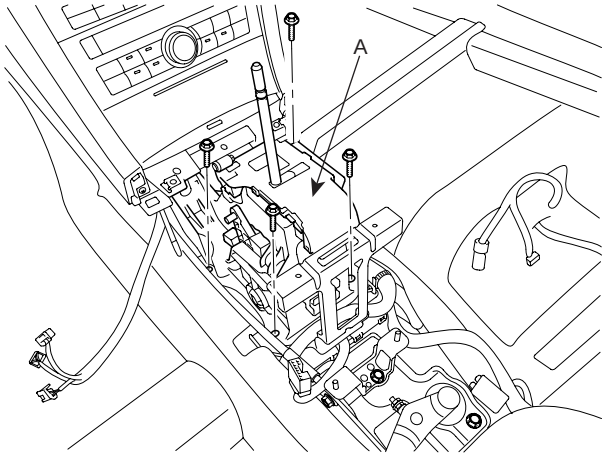
SHDAT6108D

NOTE

In case, install the crush pad and cowl cross bar. (refer to Crush pad in BD group and Heater unit in HA group)

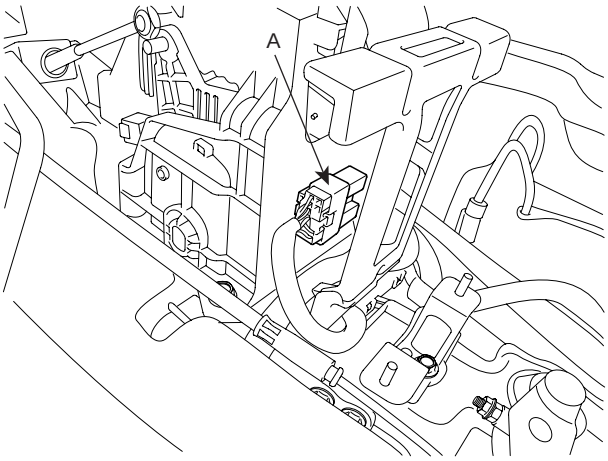
2. Install the shift lever assembly (A).

TORQUE: 9-14Nm(0.9-1.4kgf.m, 6.5-10.1lb-ft)



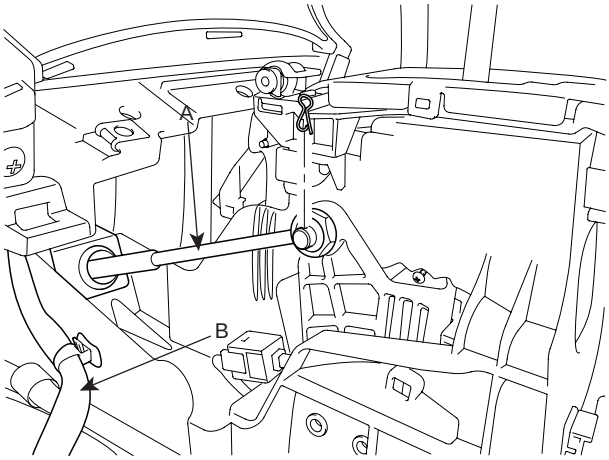
SGHAT6004D

3. Install the sport mode connector (A).



SGHAT6003D

4. Install the shift cable (A) and the wire (B) to the shift lever assembly.

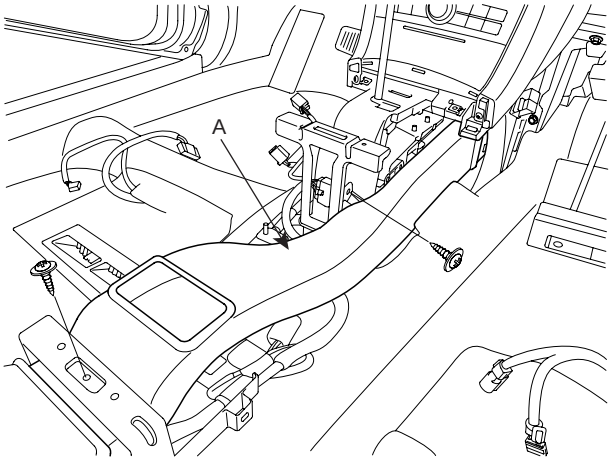


SGHAT6002D

CAUTION

Install the shift cable to the transaxle assembly before installing the shift cable to the shift lever assembly.

5. Install the air duct (A).



SGHAT6001D

6. Install the center console. (refer to Console in BD group)

7. Install the shift cable to the transaxle assembly. (refer to Automatic transaxle's Installation)

TORQUE : 8-12Nm(0.8-1.2kgf.m, 5.8-8.6lb-ft)