Automatic Transaxle (A5HF1)

GENERAL

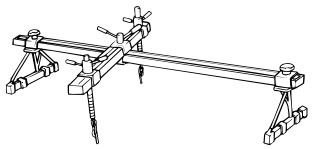
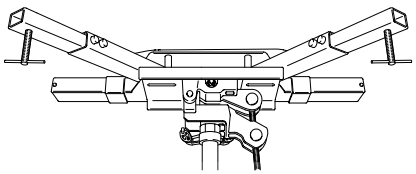
SPECIFICATIONS E3EDBAF9

Engine type		λ -3.3	λ -3.8
Transaxle type		A5HF1	A5HF1-2
Gear ratio	1ST	4.497	←
	2ND	2.442	←
	3RD	1.686	←
	4TH	1.233	←
	5TH	0.868	←
	REV.	4.586	←
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' procesure of the automatic transaxle fluid.

Recommended transaxle oil		Diamond ATF SP Ⅲ or SK ATF SP Ⅲ
Check & Replenishment		Every one year or every 20,000km Every one year or every 15,000km only for European contries
Replacement	Private use	No service required Every 100,000km only for Australia Every 90,000km only for European contries
	Business use	Every 40,000km Every 45,000km only for European contries
		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.

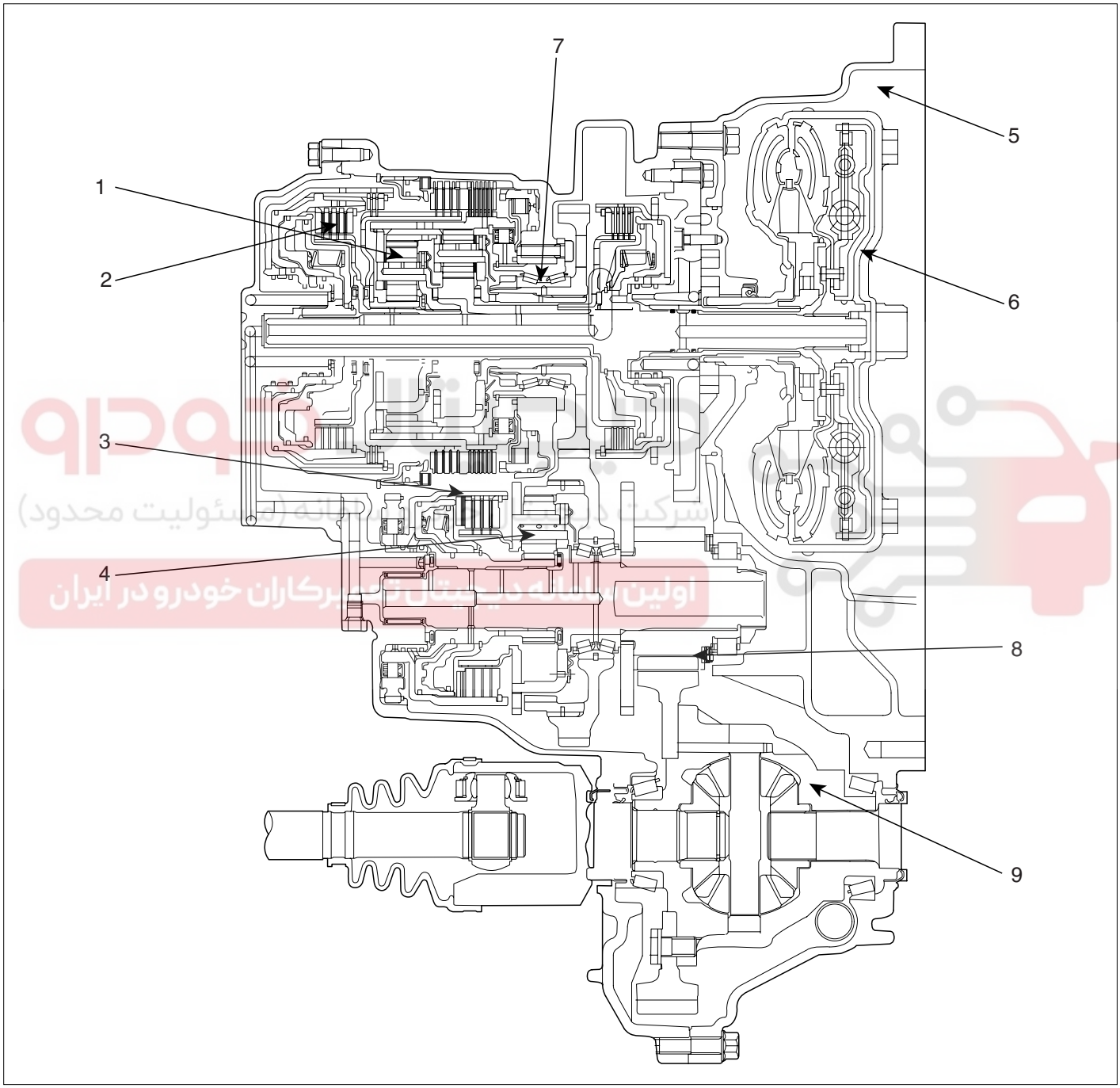
SPECIAL TOOLS EDFDFB60

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 E619A8DF

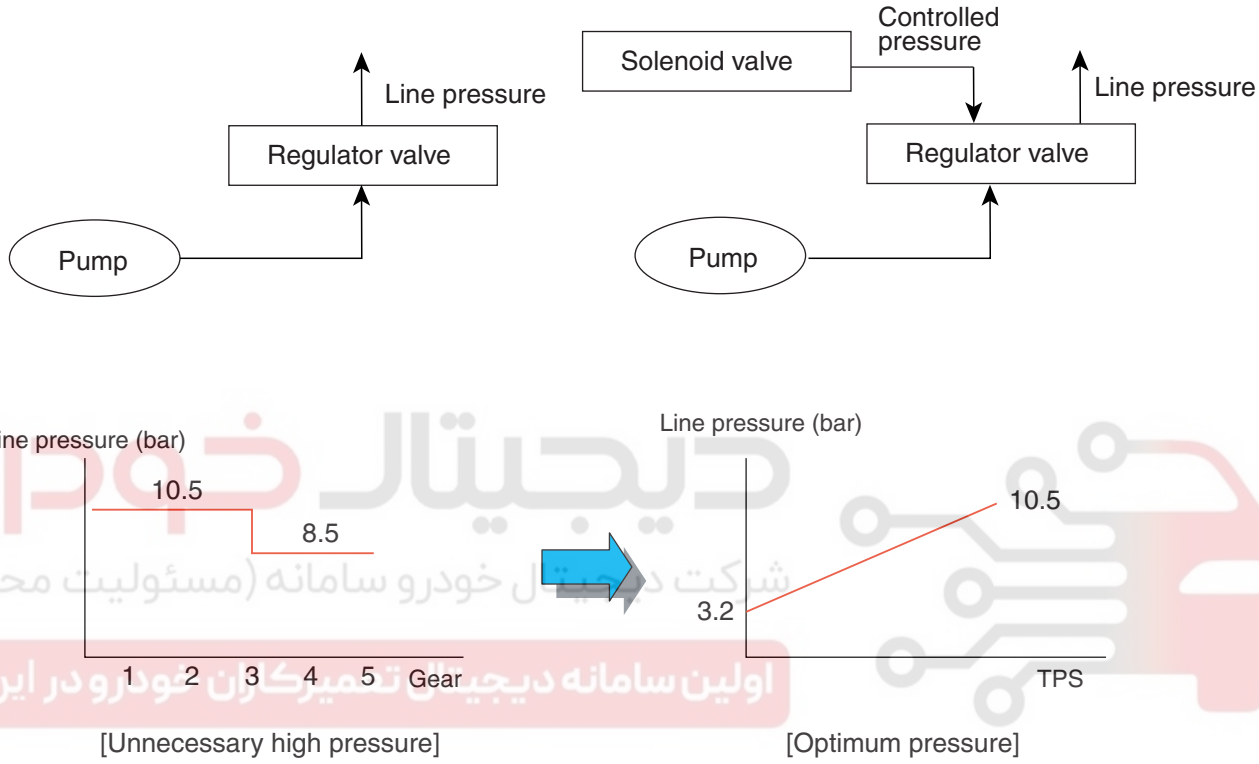
1. Structure & Technical highlights



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



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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 hosing 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 EAEAADAD

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	-	-

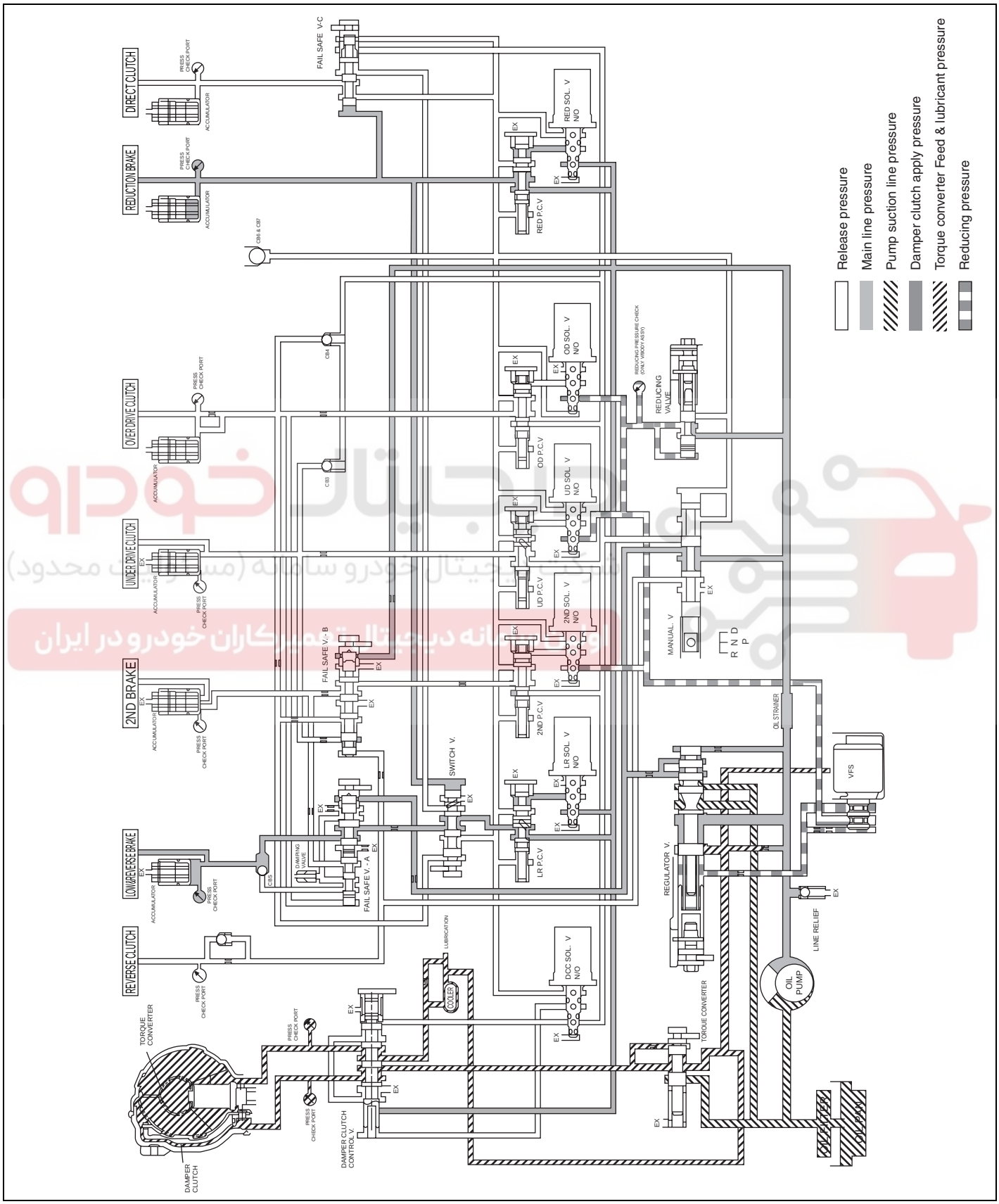
(● : Locked when driving)

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



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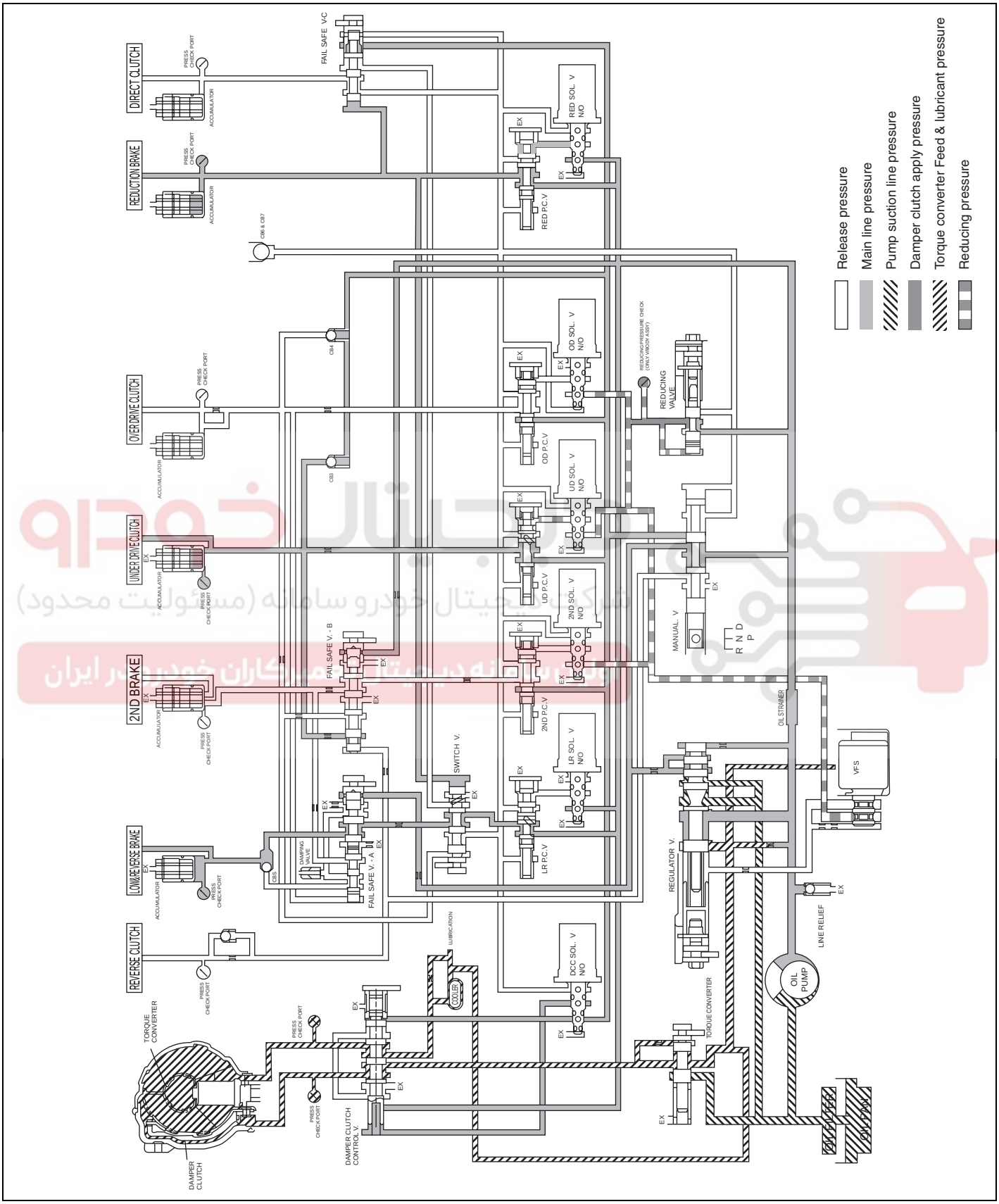
D(1 RANGE)



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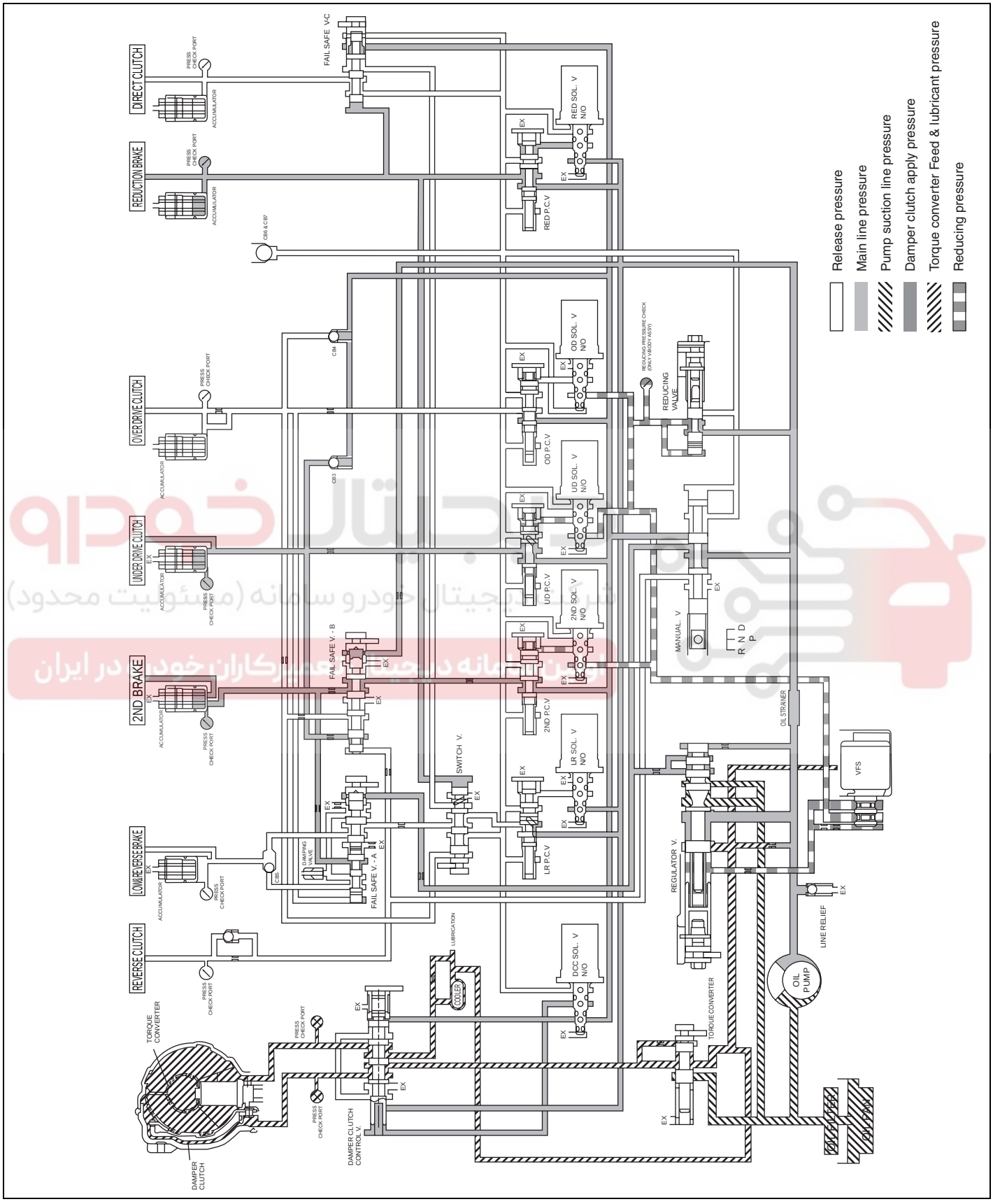
D(2 RANGE)



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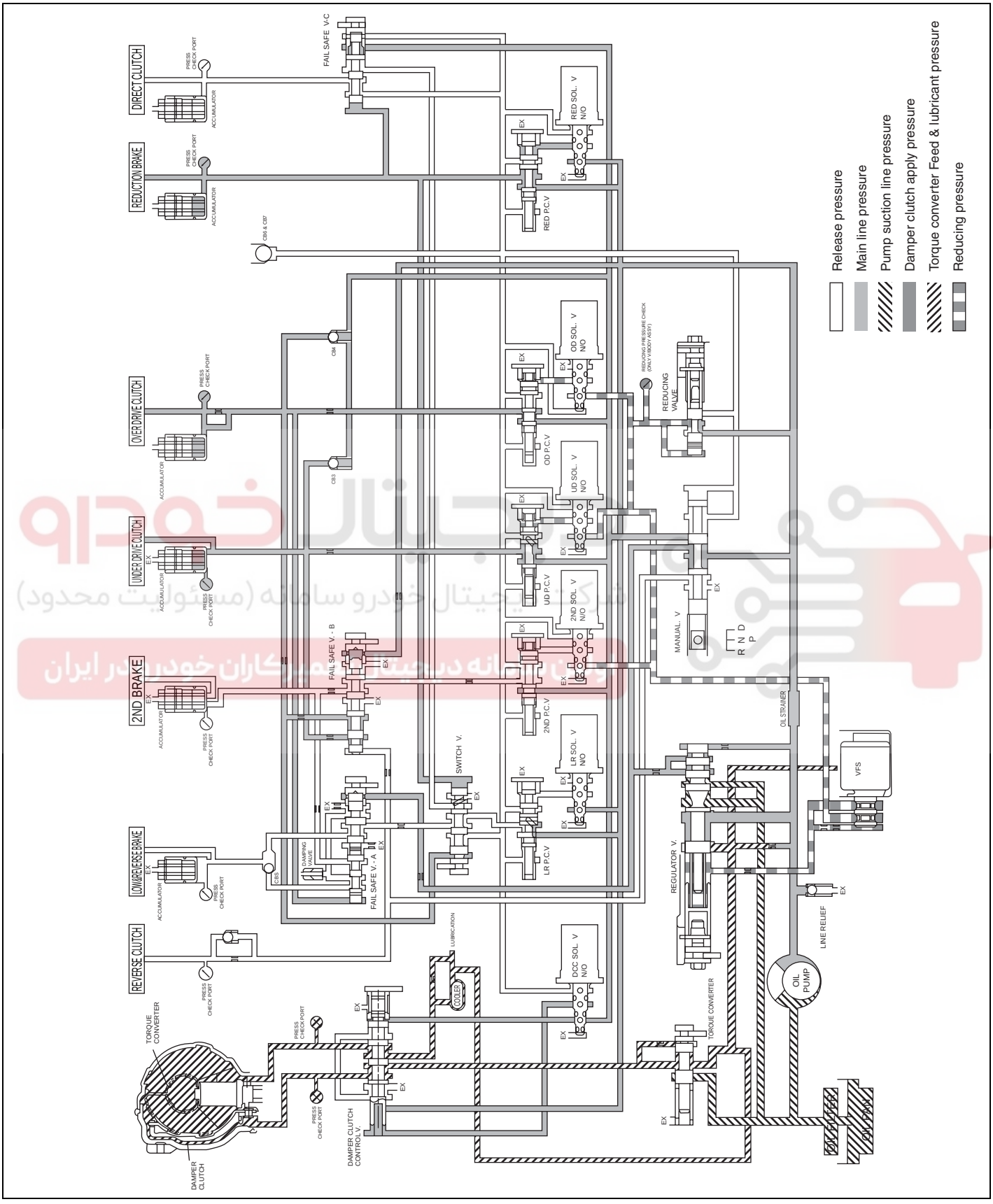
D(3 RANGE)



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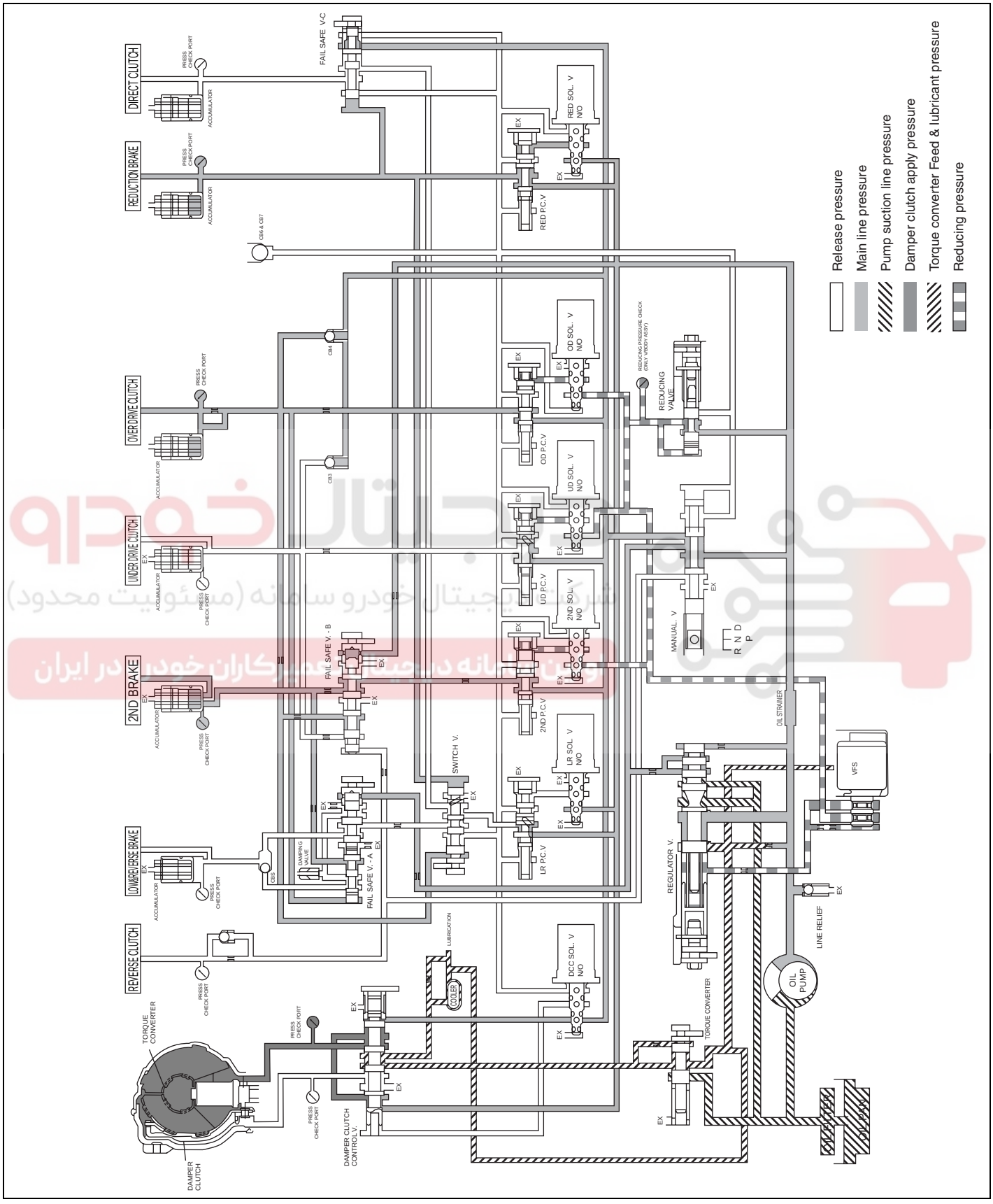
D(4 RANGE)



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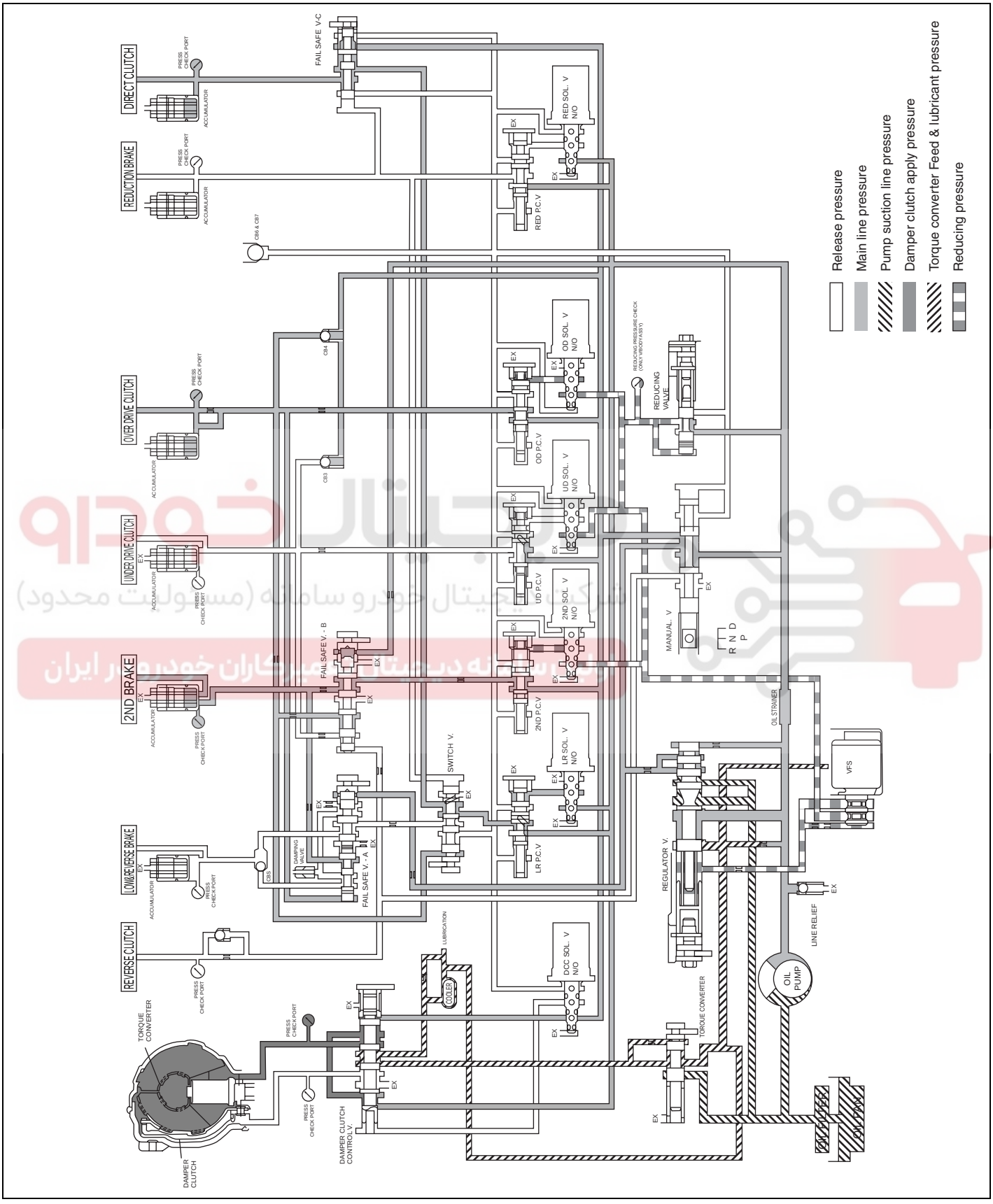
D(5 RANGE)



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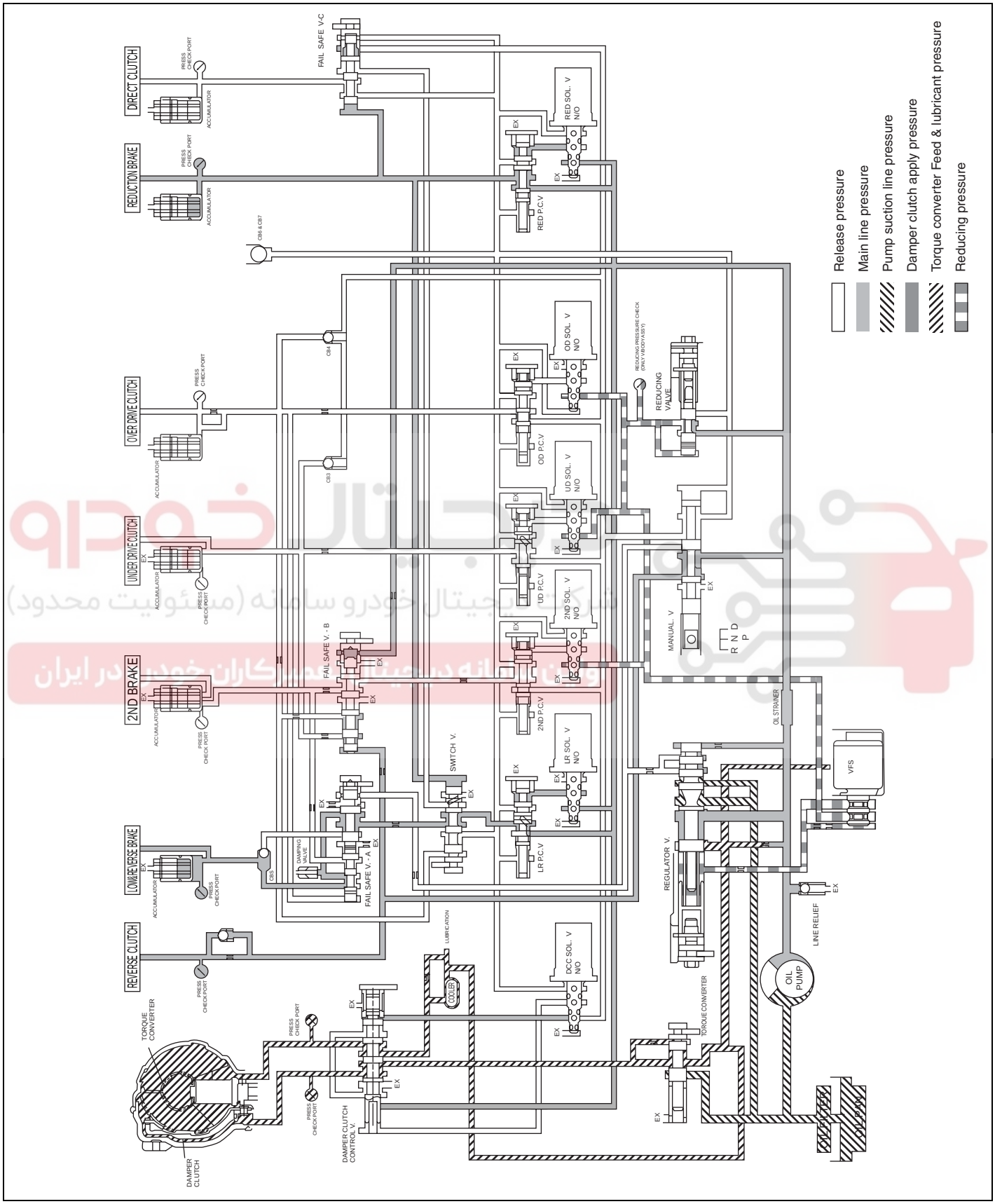
R RANGE



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INSPECTION CHART FOR DIAGNOSIS

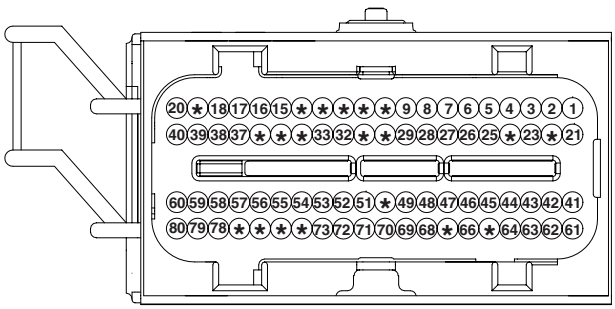
TROUBLE CODES (DTC) E2A08E40

No.	Code	Item	MIL	Remark
1	P0707	TRANSAXLE RANGE SWITCH CIRCUIT LOW INPUT	OFF	AT-20
2	P0708	TRANSAXLE RANGE SWITCH CIRCUIT HIGH INPUT	OFF	AT-26
3	P0712	TRANSAXLE FLUID TEMPERATURE SENSOR CIRCUIT LOW INPUT	OFF	AT-29
4	P0713	TRANSAXLE FLUID TEMPERATURE SENSOR CIRCUIT HIGH INPUT	OFF	AT-36
5	P0717	A/T INPUT SPEED SENSOR CIRCUIT - OPEN or SHORT(GND)	OFF	AT-39
6	P0722	AT OUTPUT SPEED SENSOR CIRCUIT - OPEN or SHORT(GND)	OFF	AT-47
7	P0731	GEAR 1 INCORRECT RATIO	OFF	AT-54
8	P0732	GEAR 2 INCORRECT RATIO	OFF	AT-60
9	P0733	GEAR 3 INCORRECT RATIO	OFF	AT-66
10	P0734	GEAR 4 INCORRECT RATIO	OFF	AT-72
11	P0735	GEAR 5 INCORRECT RATIO	OFF	AT-76
12	P0741	TORQUE CONVERTER CLUTCH STUCK OFF	OFF	AT-80
13	P0742	TORQUE CONVERTER CLUTCH STUCK ON	OFF	AT-84
14	P0743	TORQUE CONVERTER CLUTCH CONTROL SOLENOID VALVE - OPEN or SHORT(GND)	OFF	AT-87
15	P0748	VFS solenoid - OPEN or SHORT(GND)	OFF	AT-95
16	P0750	LOW and REVERSE SOLENOID VALVE CIRCUIT - OPEN or SHORT(GND)	OFF	AT-102
17	P0755	UNDERDRIVE SOLENOID VALVE CIRCUIT - OPEN or SHORT(GND)	OFF	AT-112
18	P0760	SECOND SOLENOID VALVE CIRCUIT - OPEN or SHORT(GND)	OFF	AT-119
19	P0765	OVERDRIVE SOLENOID VALVE CIRCUIT - OPEN or SHORT(GND)	OFF	AT-125
20	P0770	RED SOLENOID	OFF	AT-131
21	P0885	A/T CONTROL RELAY - OPEN or SHORT(GND)	OFF	AT-137
22	P0890	TCM power Relay sense circuit low	OFF	AT-144
23	P0891	TCM power Relay sense circuit High	OFF	AT-146

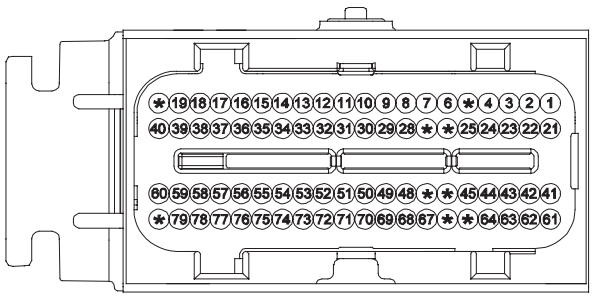
※ The DTC(P0736) about a reverse incorrect gear ratio is eliminated.
If the vehicle which hardly backs up is entered shed, it will be taken a stall test in 'R' range.

INPUT/OUTPUT SIGNAL VOLTAGE CHECK SHEET

C144-A



C144-B



KKBF112A

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	-	DC Voltage	V_BAT Max. 1.0V	13.2V 0V	
A08	Up Position	-	DC Voltage	V_BAT Max. 1.0V	13.2V 0V	
A09	Down Position	-	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 : P0888	DTC : P0888	
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	-	-	-	-	

SERVICE ADJUSTMENT PROCEDURE E2CF8FF9

AUTOMATIC TRANSAXLE FLUID

INSPECTION

1. Drive the vehicle until the fluid reaches normal operating temperature [70~80°C].
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 HOT mark on the oil level gauge. If the fluid level is low, add automatic transaxle fluid until the level reaches the "HOT" mark.

Auto transaxle fluid:
DIAMOND ATF SP-III, SK ATF SP-III
Quantity : 10.9ℓ

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.

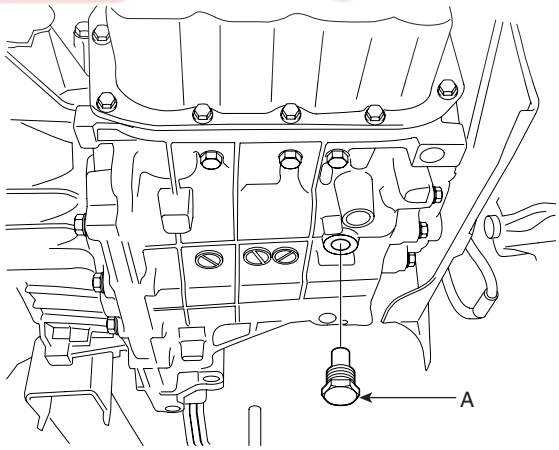
1. Disconnect the hose which connects the transmission and the oil cooler.
2. Start the engine and let the fluid drain out.

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 (400 ~ 500 kgf.cm, 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).

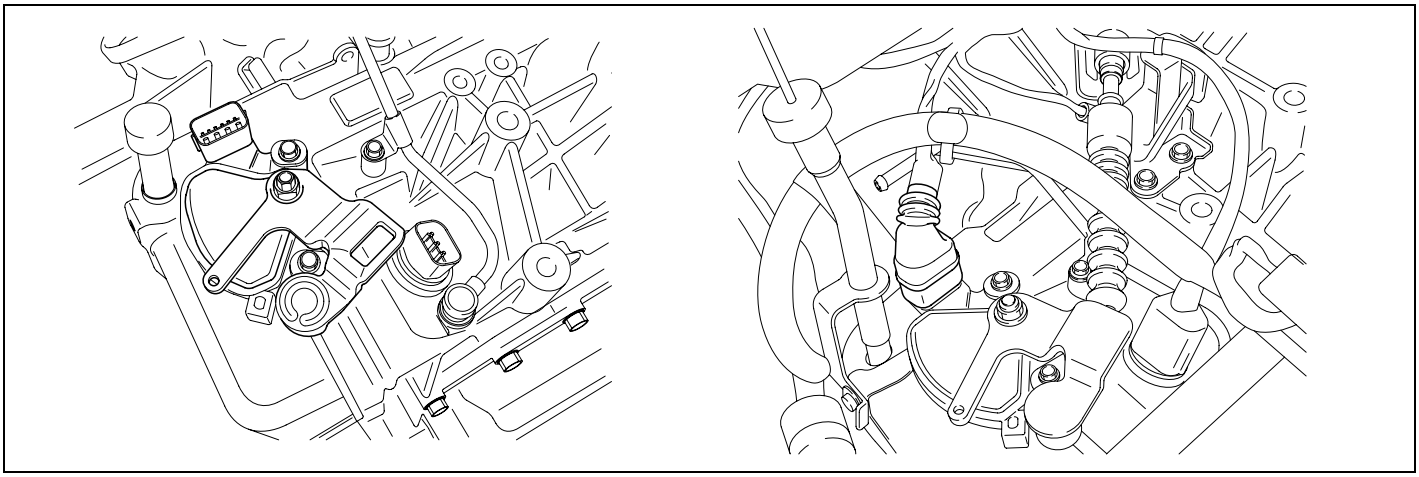
NOTE

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), and then check the fluid level again. The fluid level must be at the HOT mark.
12. Firmly insert the oil level gauge into the oil filler tube.

DTC P0707 TRANSAXLE RANGE SWITCH - LOW INPUT

COMPONENT LOCATION E22B0DAE



KKCF200A

GENERAL DESCRIPTION EB6844DC

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.

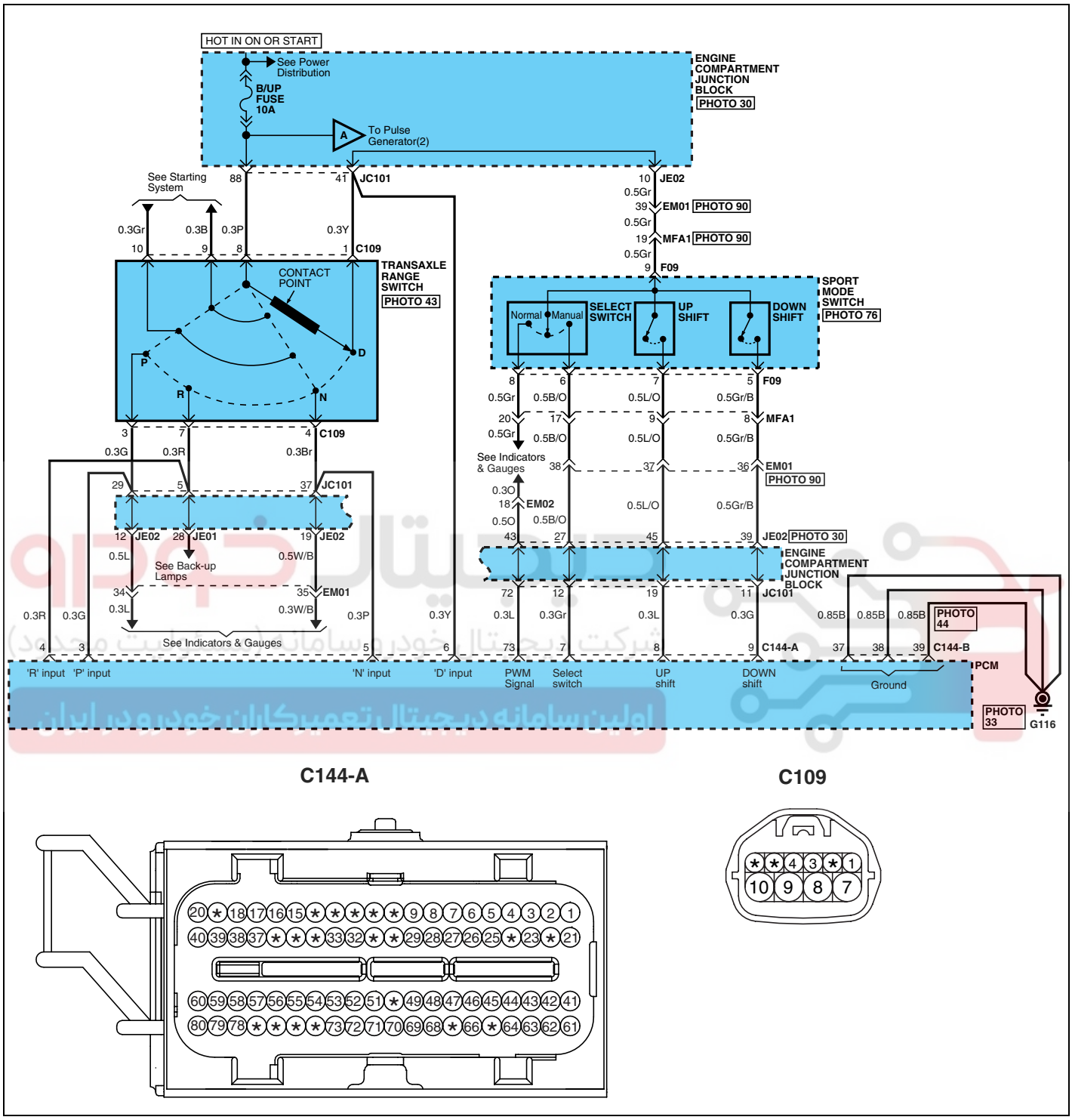
DTC DESCRIPTION E8A71213

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

DTC DETECTING CONDITION EBDF582B

Item	Detecting Condition	Possible cause
DTC Strategy	• Check for no signal	• Open or short in circuit • 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)	

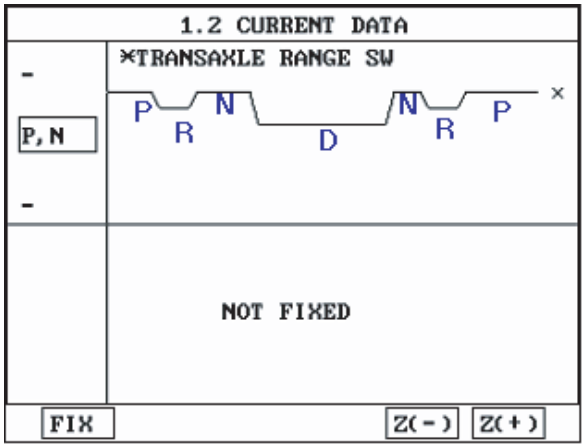
SCHEMATIC DIAGRAM EEFFA80B



EKBF100E

MONITOR SCANTOOL DATA E2EE2BBA

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 other range.



EKBF100A

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.

TERMINAL & CONNECTOR INSPECTION ED0017DE

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

YES

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

NO

▶ Go to "Power circuit inspection" procedure.

POWER SUPPLY CIRCUIT INSPECTION E7FFA1E6

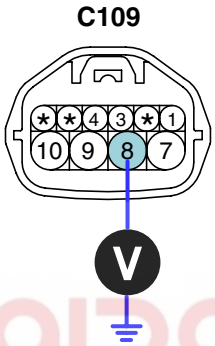
1. CHECK POWER TO RANGE SWITCH

   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

EKBF100B

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 ECD825F0

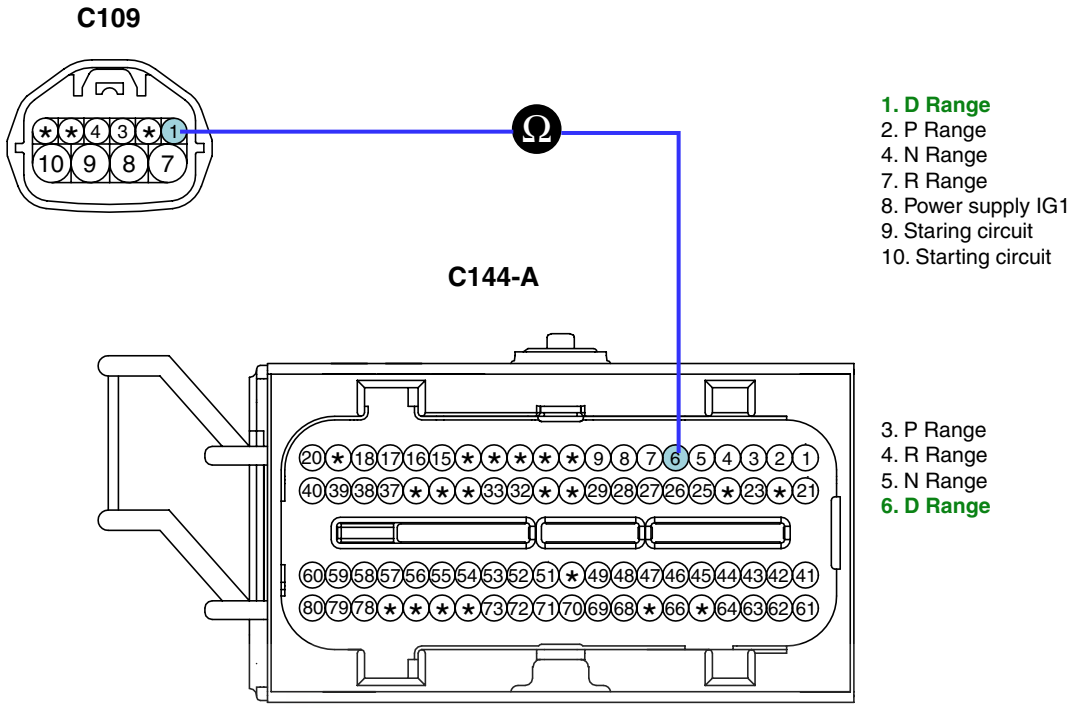
1. Ignition "OFF".

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



4. Is resistance within specifications?

YES

▶ Go to "Component inspection" procedure.

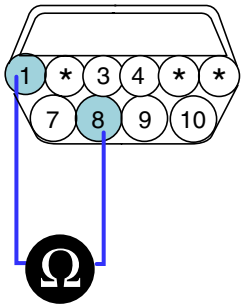
NO

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

COMPONENT INSPECTION ED8F53B6

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)]

EKBF100D

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 ECFA3CFA

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 E750C73A

Refer to DTC P0707.

GENERAL DESCRIPTION E2908417

Refer to DTC P0707.

DTC DESCRIPTION E652DD0C

The TCM sets this code when the Transaxle Range Switch outputs multiple signals for more than 30 seconds.

DTC DETECTING CONDITION EEE0EE8D

Item	Detecting Condition	Possible cause
DTC Strategy	• Check for No signal	• Open or short in TRANSAXLE RANGE SWITCH • 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	

SCHEMATIC DIAGRAM E296E10A

Refer to DTC P0707.

MONITOR SCANTOOL DATA EB2F2A4A

Refer to DTC P0707.

TERMINAL & CONNECTOR INSPECTION E0ACBCDA

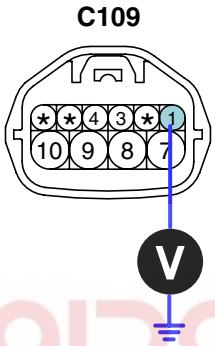
Refer to DTC P0707.

POWER SUPPLY CIRCUIT INSPECTION E05CA599

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

EKBF101A

4. Is voltage within specifications?

YES

▶ Go to "Signal circuit inspection" procedure.

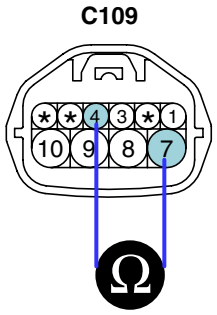
NO

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

SIGNAL CIRCUIT INSPECTION E2B61FE6

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

EKBF101B

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 EEAD34BC

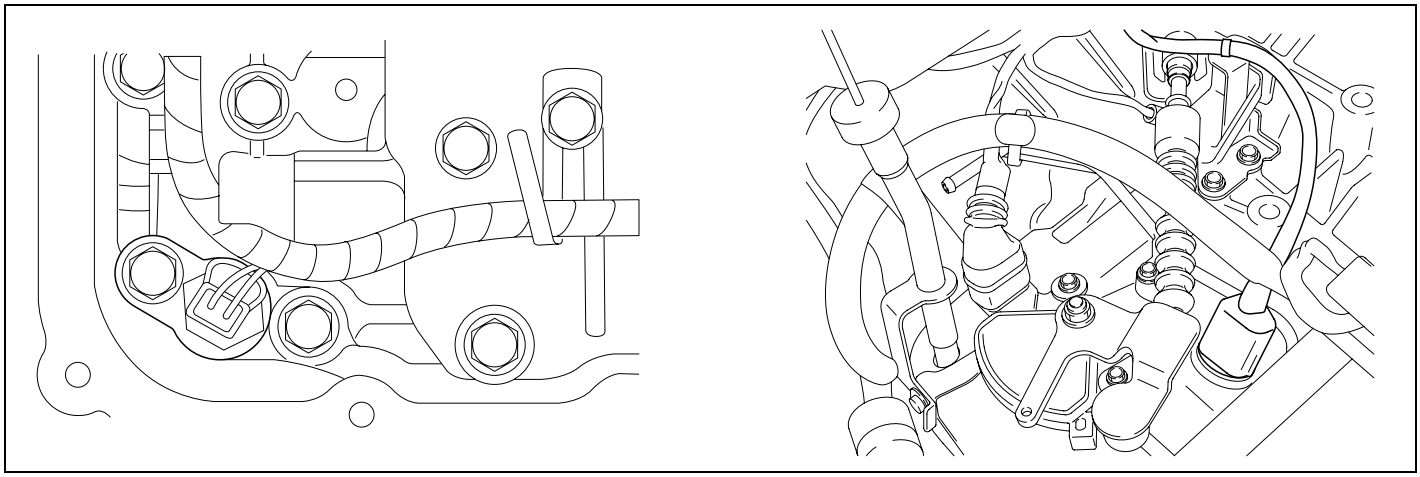
Refer to DTC P0707.

VERIFICATION OF VEHICLE REPAIR E0DDA7AA

Refer to DTC P0707.

DTC P0712 FLUID(OIL) TEMPERATURE SENSOR CIRCUIT - LOW

COMPONENT LOCATION E95DF764



KKCF202A

GENERAL DESCRIPTION E48F18D5

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 E19EE8EE

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).

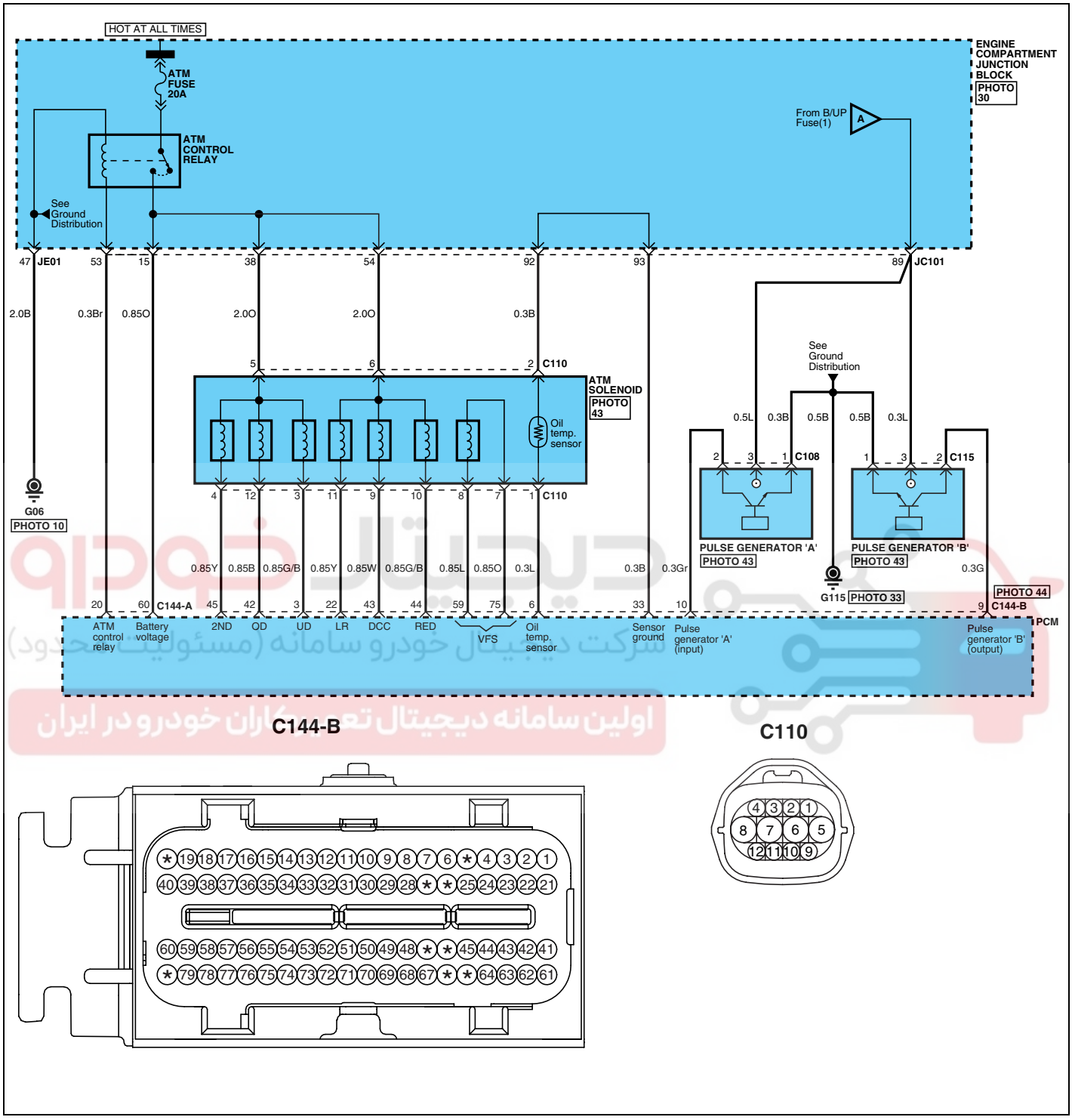
DTC DETECTING CONDITION EC59F682

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 10sec	
Fail Safe	• Learning control and Intelligent shift are inhibited • Fluid temperature is regarded as 80°C(176°F)	

SPECIFICATION E2BB0288

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		

SCHEMATIC DIAGRAM E5E741BD



EKBF100F

MONITOR SCANTOOL DATA EA1AAF5B

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

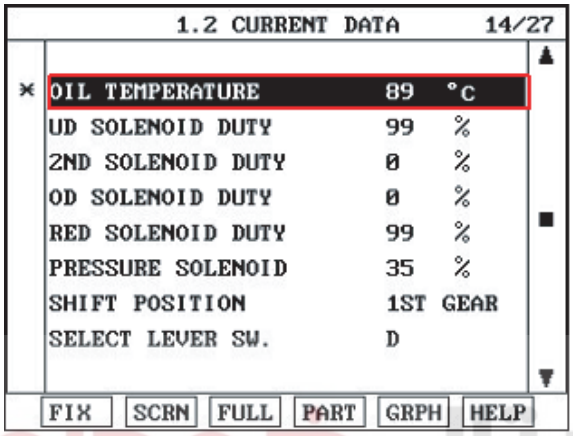


FIG.1)

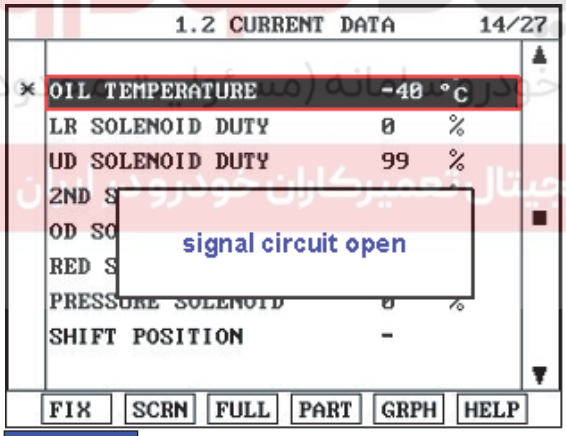


FIG.2)

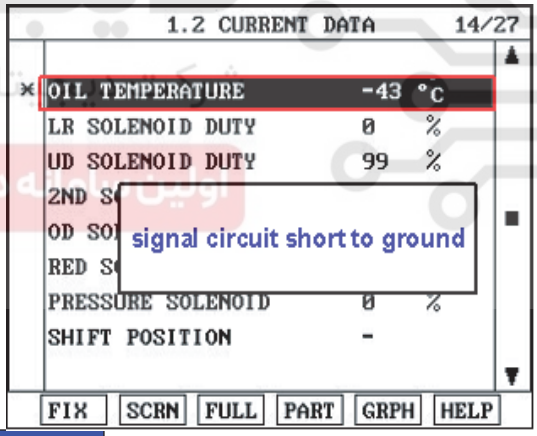


FIG.3)

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

EKBF102A

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 EDE005EC

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

YES

▶ Repair as necessary and go to "Verification of vehicle Repair" procedure.

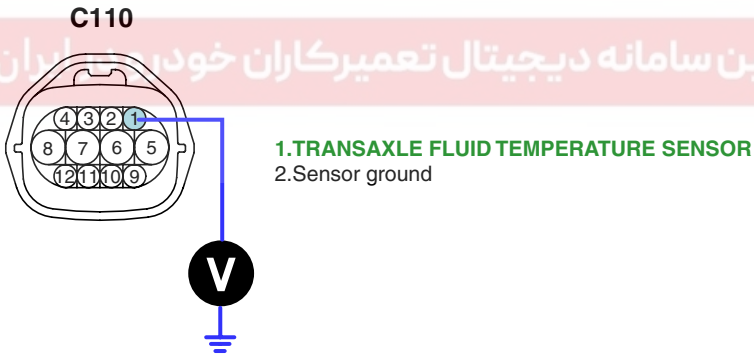
NO

▶ Go to "Component inspection" procedure.

SIGNAL CIRCUIT INSPECTION EFEA8F49

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



EKBF103A

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 E569B1C8

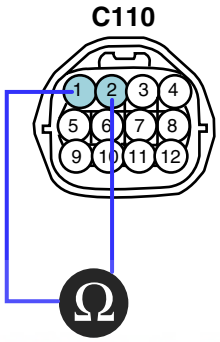
1. CHECK "TRANSAXLE FLUID TEMPERATURE SENSOR"

   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

EKBF102B

[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 PCM

   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.

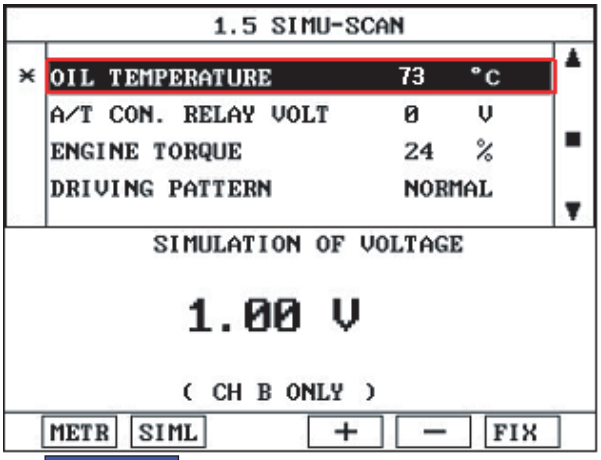


FIG.1)

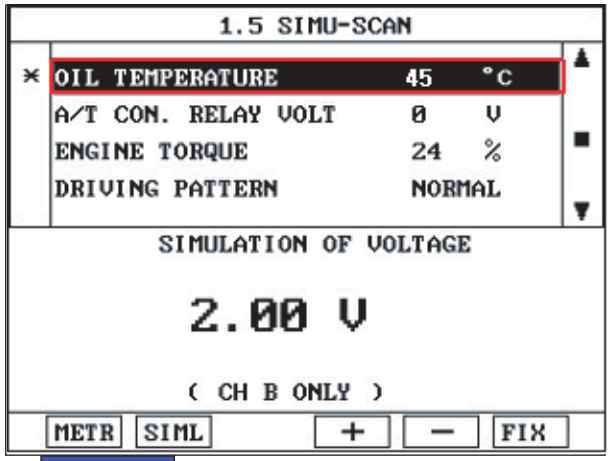


FIG.2)

FIG.1) INPUT 1.00V → 73˚C
FIG.3) INPUT 2.00V → 45˚C

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

EKBF102C

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 E5F5DBD5

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 P0713 FLUID(OIL) TEMPERATURE SENSOR CIRCUIT - HIGH

COMPONENT LOCATION E9ACA032

Refer to DTC P0712.

GENERAL DESCRIPTION ECC6D19A

Refer to DTC P0712.

DTC DESCRIPTION E0ECCC29

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 ECD8E3C5

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 • Engine state = RUN • Warm up driving time > 287.5 sec	
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 EB6E4E4C

Refer to DTC P0712.

SCHEMATIC DIAGRAM EEACD805

Refer to DTC P0712.

MONITOR SCANTOOL DATA EDFAA8AD

Refer to DTC P0712.

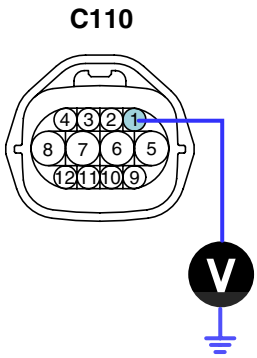
TERMINAL & CONNECTOR INSPECTION E4F4DEB9

Refer to DTC P0712.

SIGNAL CIRCUIT INSPECTION E579CEEE

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



EKBF103A

4. Is voltage within specifications ?

YES

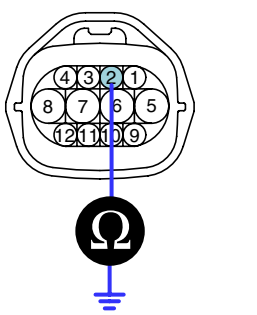
▶ Go to "Ground circuit inspection" procedure.

NO

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

GROUND CIRCUIT INSPECTION ECB921D9

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.



EKBF104A

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 ECD1015F

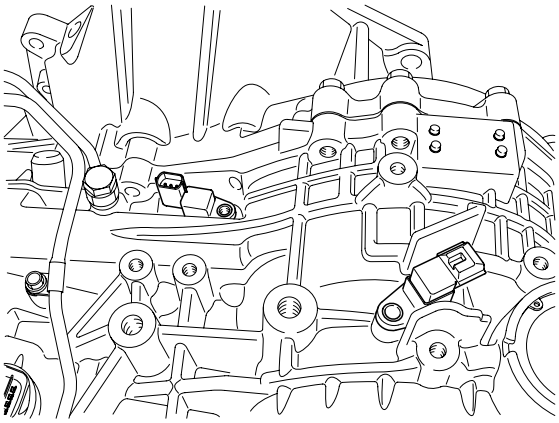
Refer to DTC P0712.

VERIFICATION OF VEHICLE REPAIR E0A7E805

Refer to DTC P0712.

DTC P0717 INPUT SPEED SENSOR CIRCUIT - NO SIGNAL

COMPONENT LOCATION EE6BD76C



KKCF204A

GENERAL DESCRIPTION E11CFCCC

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 E6DF4A5E

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.

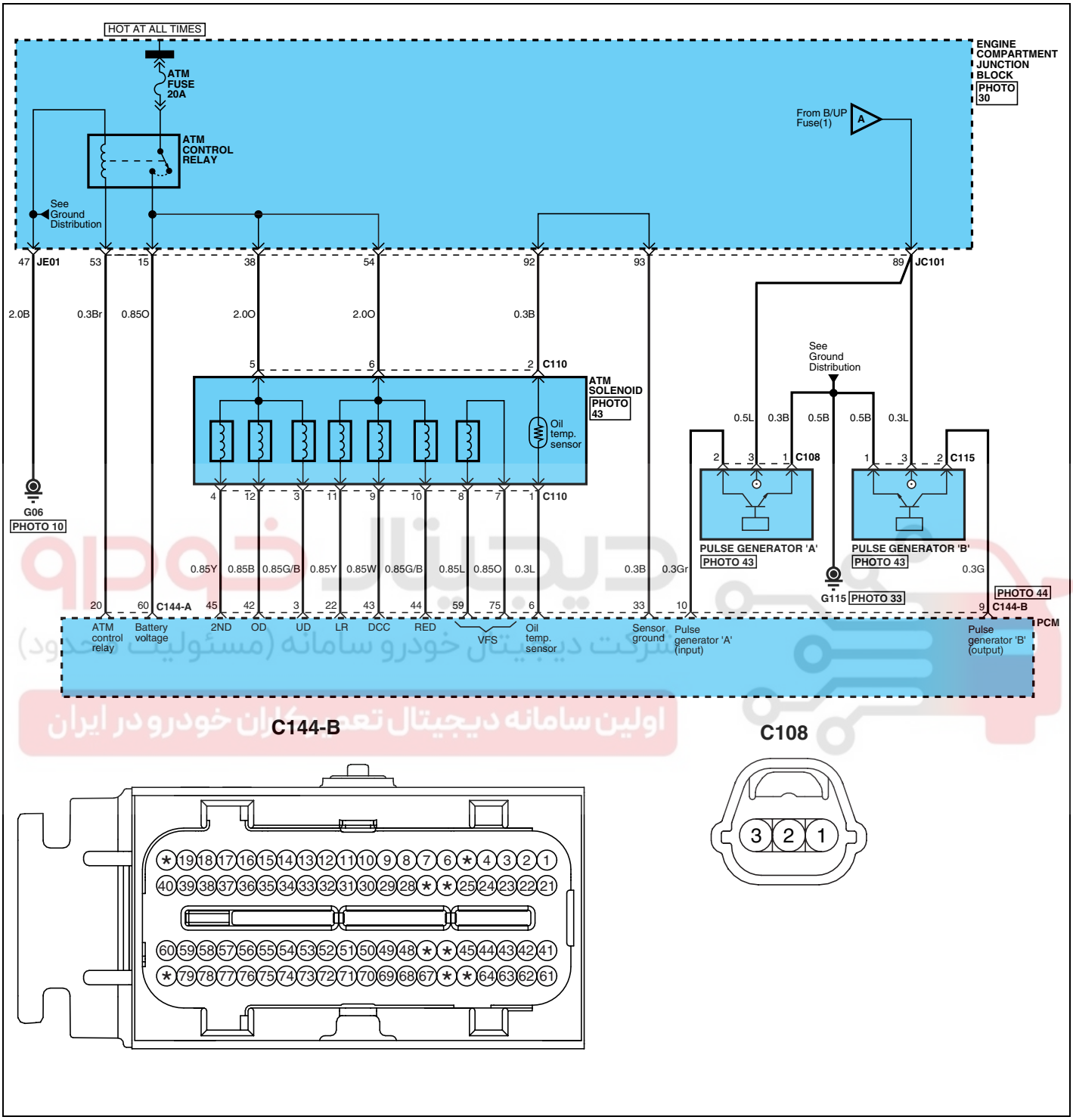
DTC DETECTING CONDITION E66C92E4

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) • Ne > 1000 rpm (only at 1st or 2nd gear) • 11V ≤ Battery Voltage ≤ 16V • TM oil temperature ≥ -23°C	
Threshold value	• No signal	
Diagnostic Time	• More than 1sec	
Fail Safe	• Locked into 3rd or 2nd gear • Manual shifting is possible(2 nd → 3 rd, 3 rd → 2 nd)	

SPECIFICATION E2829417

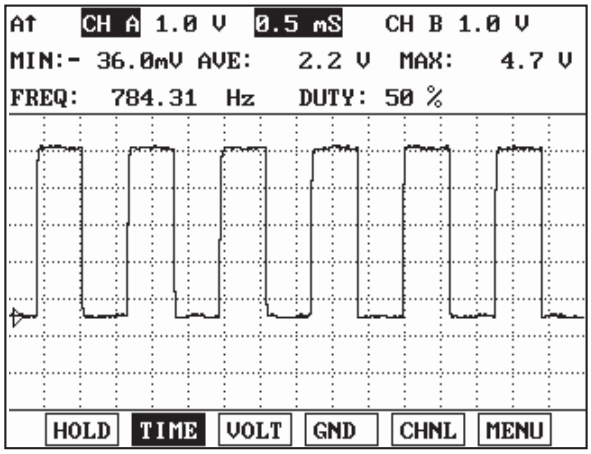
Input shaft & Output shaft speed sensor
- Type : Hall sensor
- Current consumption : 22mA(MAX)
- Sensor body and sensor connector have been unified as one.

SCHEMATIC DIAGRAM E00B2127



EKBF100G

SIGNAL WAVEFORM E2E6C382



EKBF105A

MONITOR SCANTOOL DATA EF3D2DAB

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

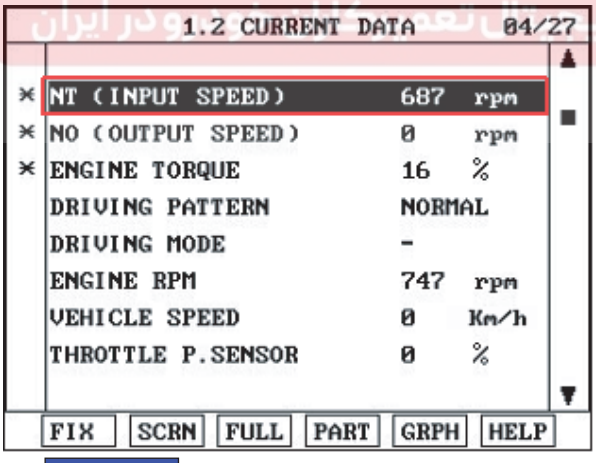


FIG.1)

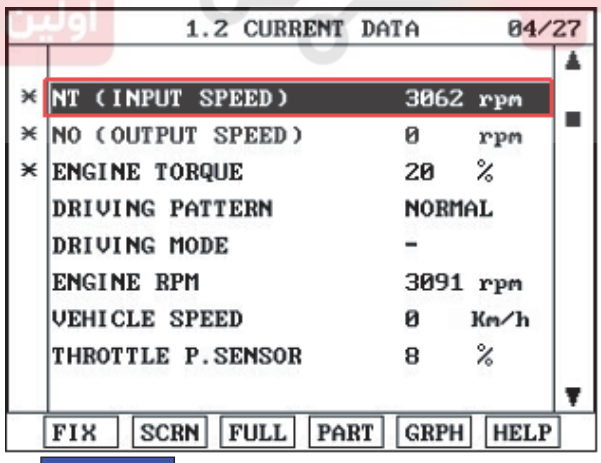


FIG.2)

FIG.1) Idling

FIG.2) Accelerating

EKBF105B

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 EC27D7F2

1. Many malfunctions in the electrical system may be caused from poor harness and terminals. 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.

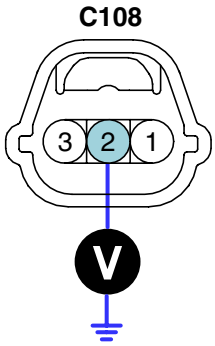
NO

▶ Go to "Signal circuit inspection" procedure.

SIGNAL CIRCUIT INSPECTION E07F27BB

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

EKBF105C

4. Is voltage within specification?

YES

▶ Go to "Power 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 EDD1DEEB

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+

EKBF105D

4. Is voltage within specification ?

YES

▶ Go to "Ground circuit inspection" procedure.

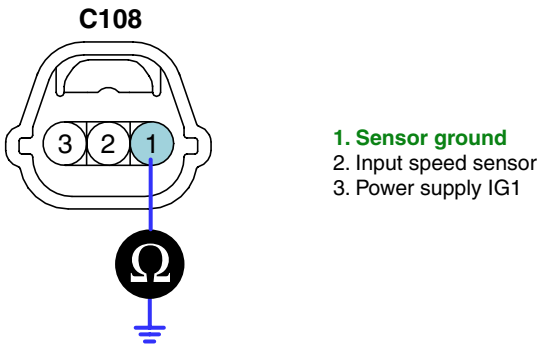
NO

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

GROUND CIRCUIT INSPECTION EE08F3CC

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

EKBF105E

4. Is resistance within specification ?

YES

▶ Go to "Component Inspection" procedure.

NO

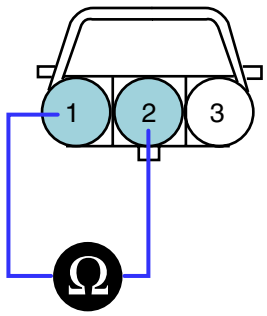
▶ Check for open in harness. Repair as necessary and Go to "Verification of Vehicle Repair" procedure.
▶ If ground circuit in harness is OK, Go to "Check PCM/TCM" of the "Component Inspection" procedure.

COMPONENT INSPECTION E63E3D3C

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 Component side



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

EKBF105F

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" as below.

NO

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

2. CHECK PCM

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.

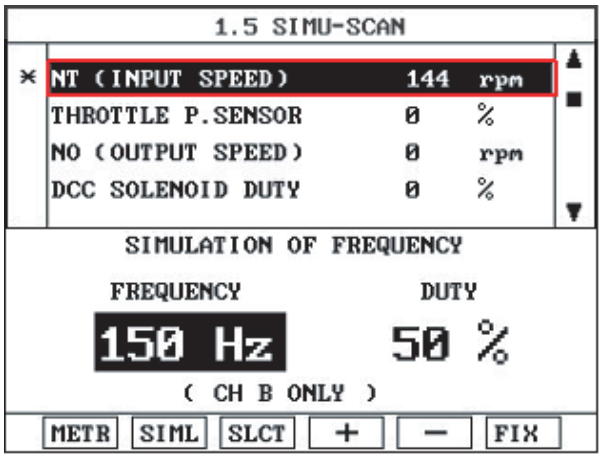


FIG.1)

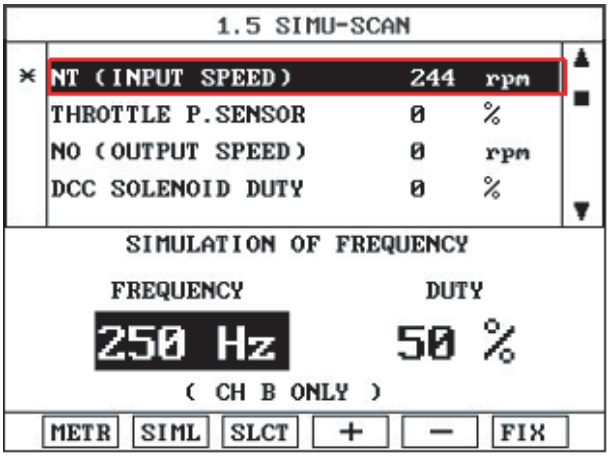


FIG.2)

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 EFDC6AAD

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. Is resistance within specification ?

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 EF01D33C

Refer to DTC P0717.

GENERAL DESCRIPTION EE3ADC65

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 E3B0D82D

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.

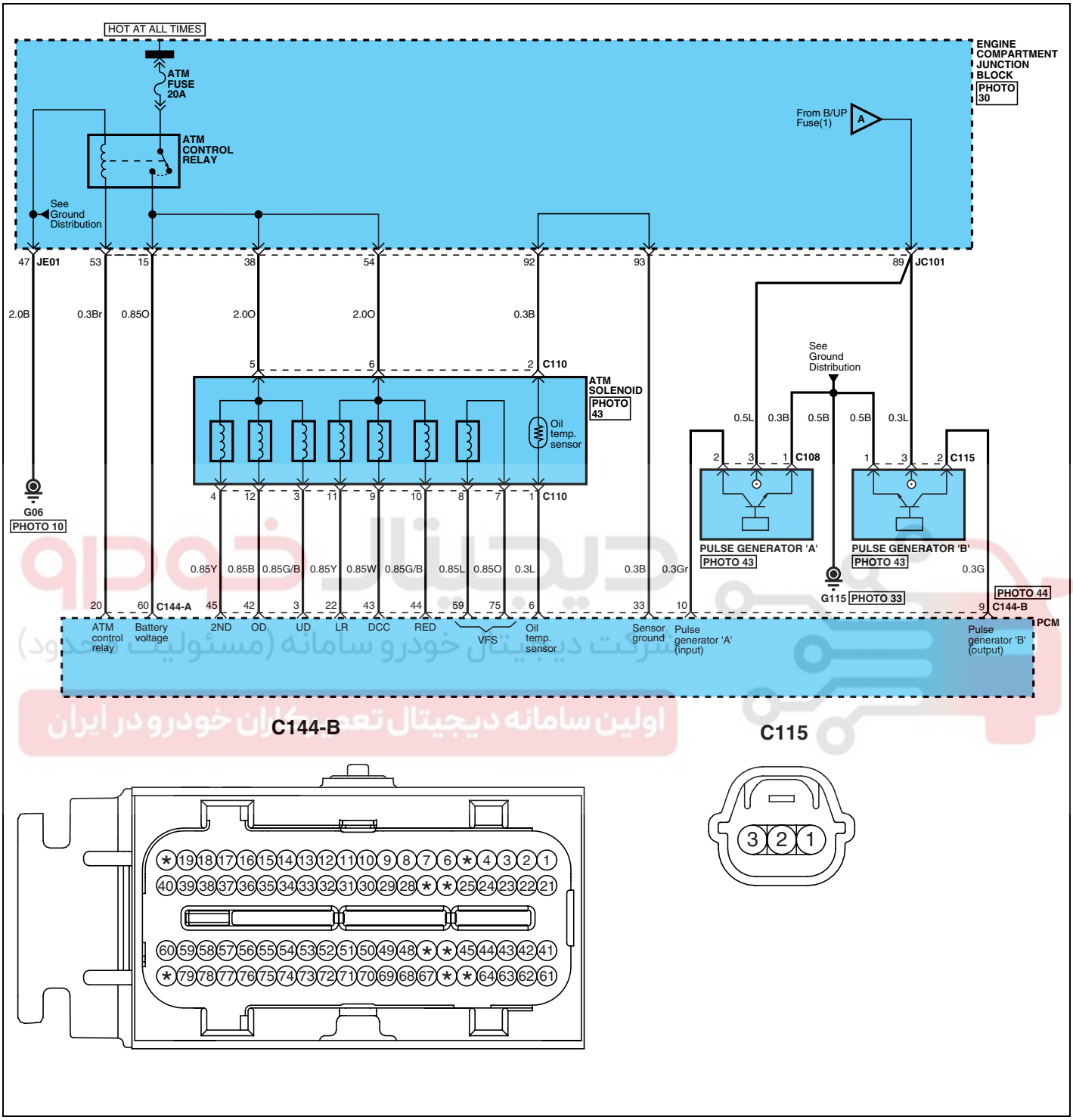
DTC DETECTING CONDITION EA48536A

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) • Ne≥ 1000rpm (only at 1st or 2nd gear) • 11V ≤ Battery Voltage ≤ 16V • TM oil temperature ≥ -23°C	
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 E4BC465E

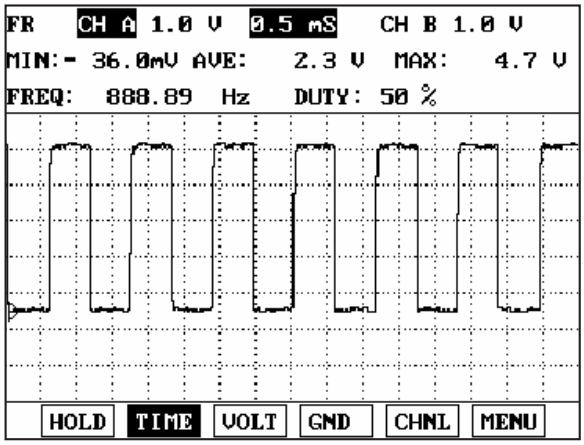
Refer to DTC P0717.

SCHEMATIC DIAGRAM EC3BBC9E



EKBF100H

SIGNAL WAVEFORM ED4F143E



EKBF106A

MONITOR SCANTOOL DATA EDBFAAE9

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

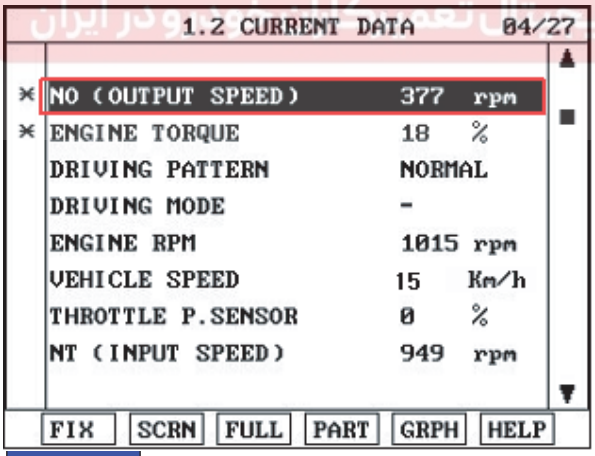


FIG.1)

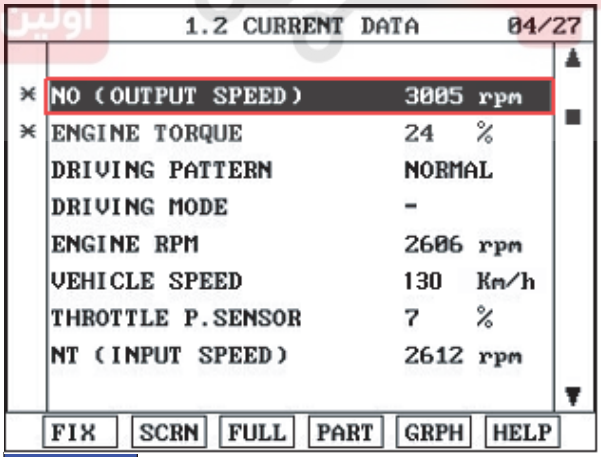


FIG.2)

FIG.1) Low-speed

FIG.2) High-speed

EKBF106B

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.

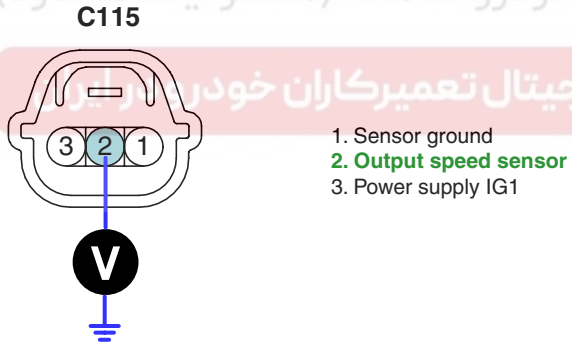
TERMINAL & CONNECTOR INSPECTION EBE4DAC6

Refer to DTC P0717.

SIGNAL CIRCUIT INSPECTION EDBFEF0F

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

EKBF106C

4. Is voltage within specification?

YES

▶ Go to "Power circuit Inspection" procedure.

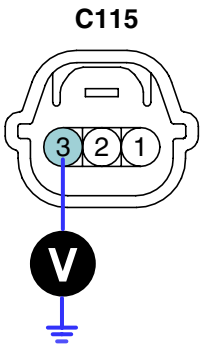
NO

▶ 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 E8BC75CB

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

EKBF106D

4. Is voltage within specification?

YES

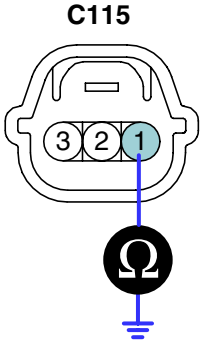
▶ Go to "Ground circuit inspection" procedure.

NO

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

GROUND CIRCUIT INSPECTION E109F3E4

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

EKBF106E

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 EFDFCD32

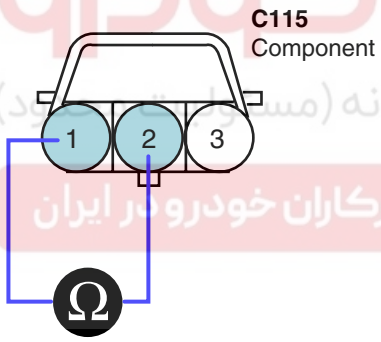
1. Check "OUTPUT SPEED SENSOR"

   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"



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

EKBF106F

   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.

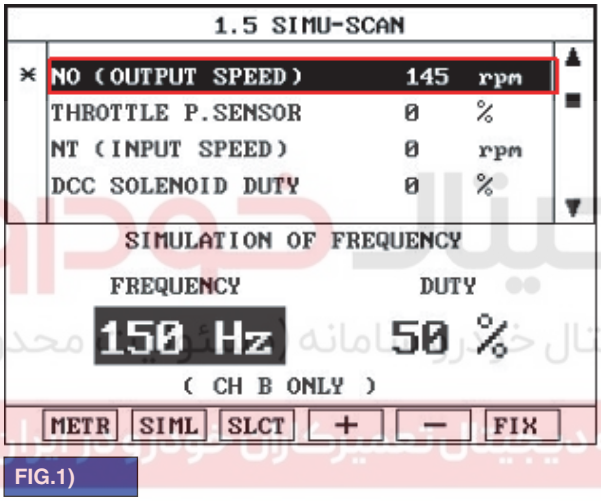


FIG.1)

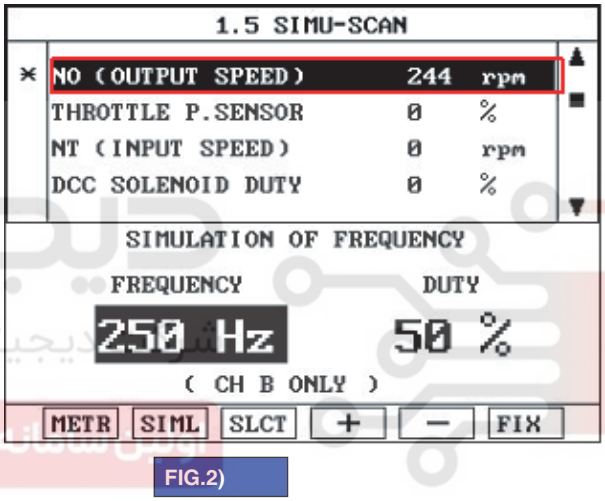


FIG.2)

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

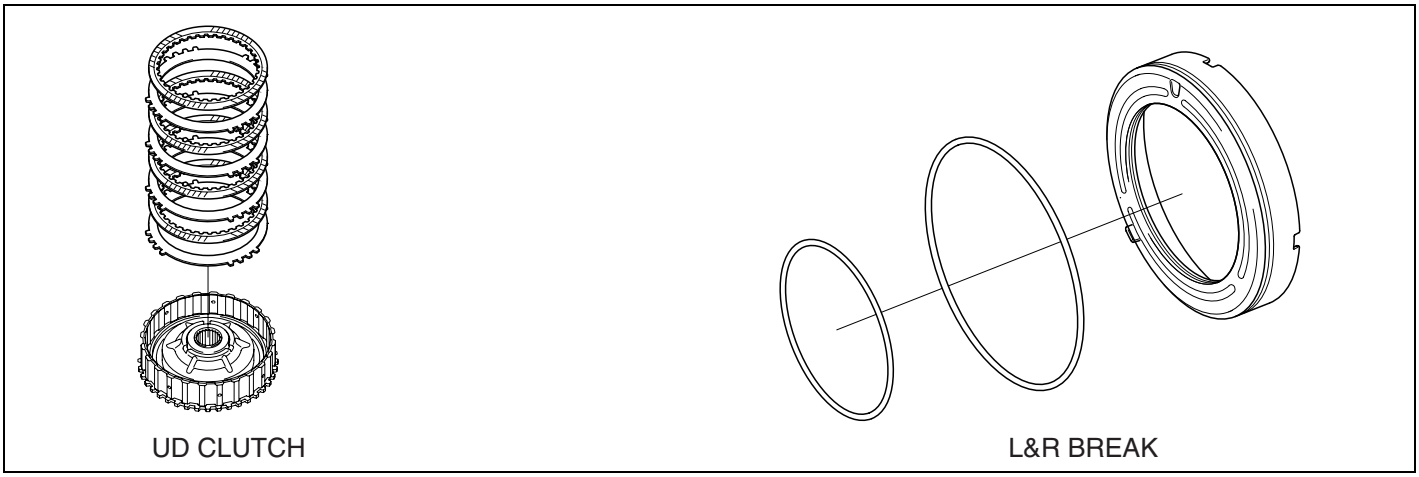
▶ Substitute with a known-good PCM/TCM and check for proper operation. If the problem is corrected, replace PCM/TCM as necessary and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR EEBC615E

Refer to DTC P0717.

DTC P0731 GEAR 1 INCORRECT RATIO

COMPONENT LOCATION EAB41CD0



EKBF300A

GENERAL DESCRIPTION EDD6EEB5

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 ECFBF2BF

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 E54625BC

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 normaland after 2sec is passed from IG ON	
Threshold value	• ｜input speed - output speed ×1st gear ratio｜≥200rpm	
Diagnostic Time	• more than 4sec	
Fail Safe	• Locked into 3 rd gear	

SIGNAL WAVEFORM EE5C7D3B

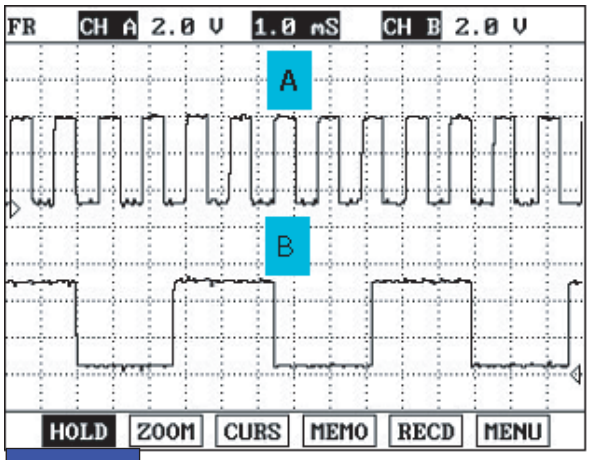


FIG.1)

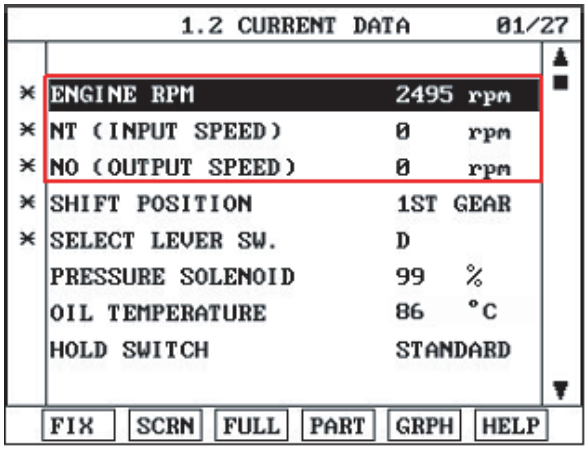
A : INPUT SPEED SENSOR
B : OUTPUT SPEED SENSOR

EKBF107A

MONITOR SCANTOOL DATA EB8540D5

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



EKBF107B

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	O		O		O			●	●
2nd		O	O		O				●
3rd			O	O	O				●
4th		O		O	O				●
5th		O		O		O			
REV	O				O		O		
N,P	O				O				

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, every slippage occur 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.
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.

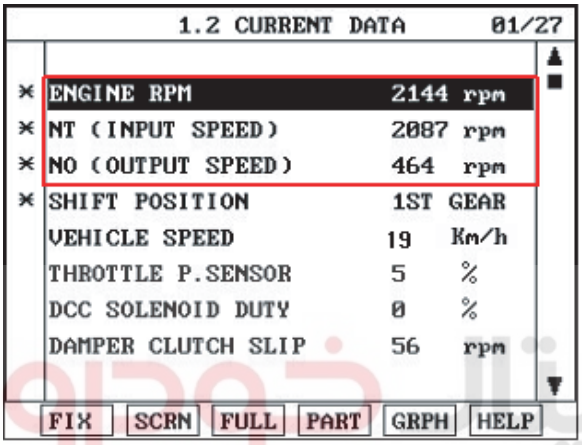
⚠ ***CAUTION***

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 E98947AA

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



EKBF107C

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

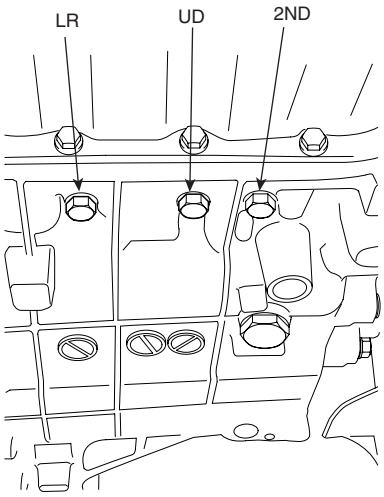
YES

▶ 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 EE37E851



EKBF107D

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	SOLENOIDE 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 E0F76326

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

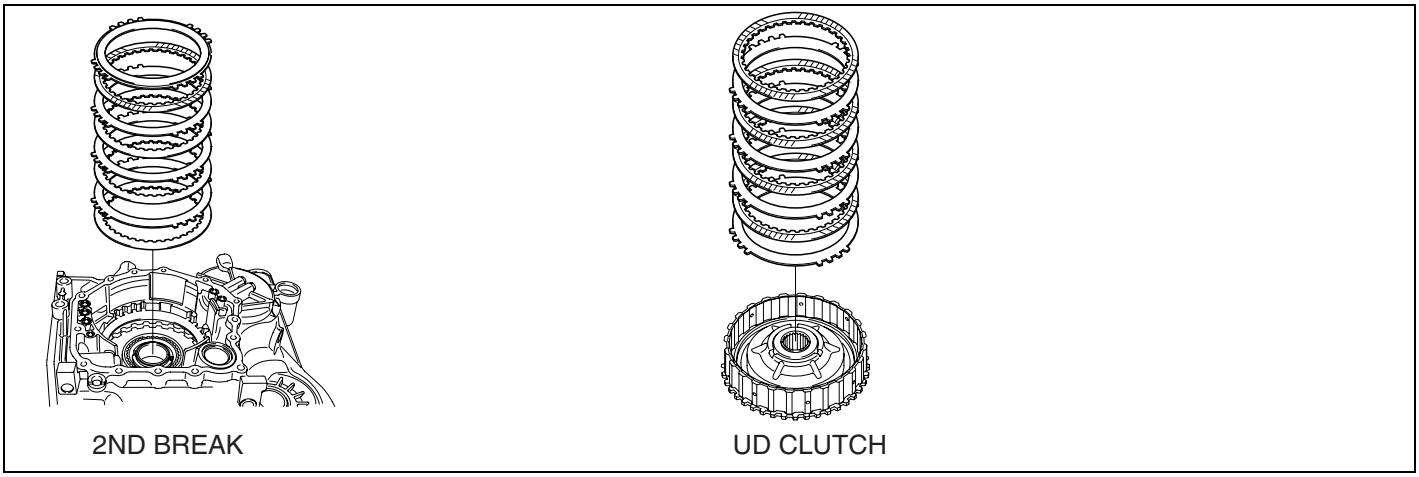
▶ Go to the applicable troubleshooting procedure.

NO

▶ System performing to specification at this time.

DTC P0732 GEAR 2 INCORRECT RATIO

COMPONENT LOCATION. EEEB7A69



EKBF300B

GENERAL DESCRIPTION EB79A773

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 EA7DD79C

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 E61BC502

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 normaland after 2sec is passed from IG ON	
Threshold value	• | input speed - output speed × 2nd gear ratio | ≥ 200rpm	
Diagnostic Time	• more than 4sec	
Fail Safe	• Locked into 3 rd gear	

SIGNAL WAVEFORM EE6089B8

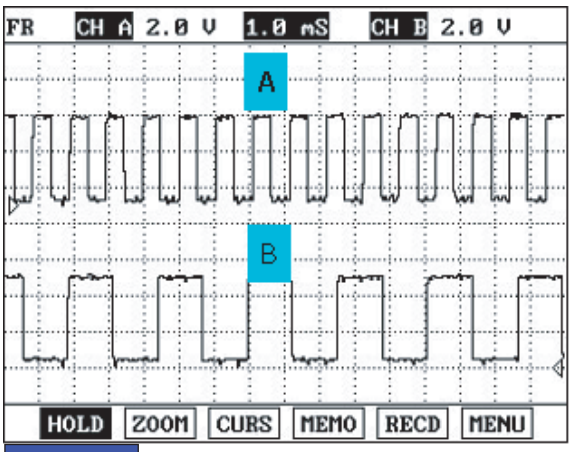


FIG.1)

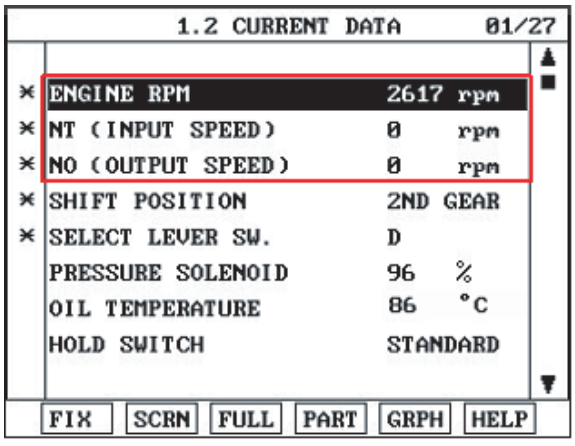
A : INPUT SPEED SENSOR
B : OUTPUT SPEED SENSOR

EKBF108A

MONITOR SCANTOOL DATA EF05A9FF

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



EKBF108B

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	O		O		O			●	●
2nd		O	O		O				●
3rd			O	O	O				●
4th		O		O	O				●
5th		O		O		O			
REV	O				O		O		
N,P	O				O				

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, every slippage occur 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.
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.

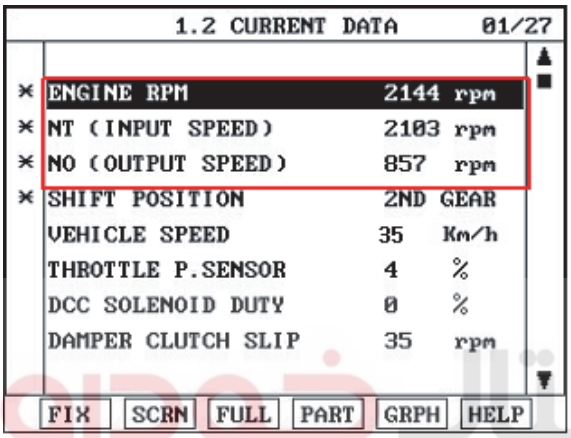
CAUTION

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 E848CBFF

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



EKBF108C

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

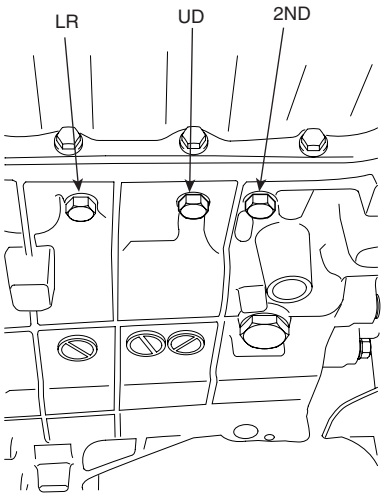
YES

▶ 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 E7AFEB2F



EKBF108D

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 as below

LEVER POSITION	INPUT SPEED	VFS CURRENT	SOLENOIDE 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

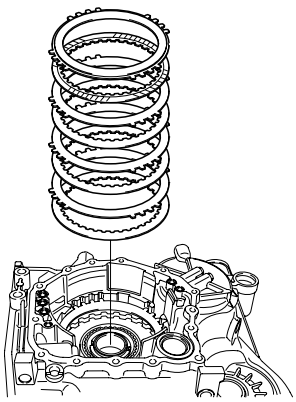
▶ Replace AUTO TRANSAXLE (BODY CONTROL VALVE faulty) as necessary and Go to "Verification of Vehicle Repair " procedure.

VERIFICATION OF VEHICLE REPAIR EACAF3EE

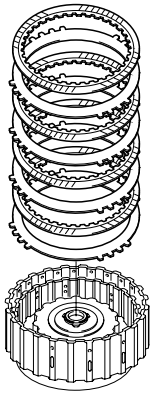
Refer to DTC P0731.

DTC P0733 GEAR 3 INCORRECT RATIO

COMPONENT LOCATION E0D3762F



2ND BREAK



OD CLUTCH

EKBF300E

GENERAL DESCRIPTION EE7CAF4D

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 E45ABD73

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 EC41DC85

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 brakeor 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 normaland after 2sec is passed from IG ON	
Threshold value	• | input speed - output speed × 3rd gear ratio | ≥ 200rpm	
Diagnostic Time	• more than 4sec	
Fail Safe	• Locked into 3 rd gear	

SIGNAL WAVEFORM E2B69981

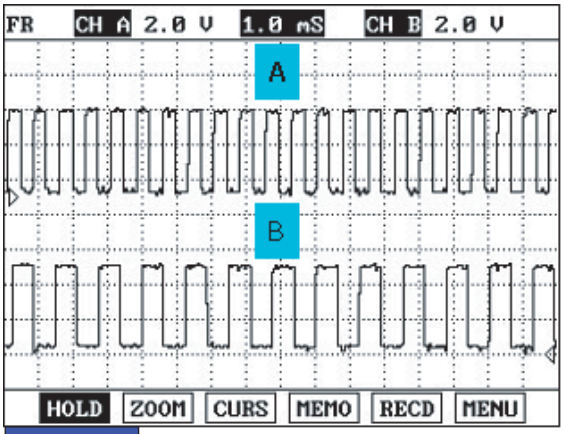


FIG.1)

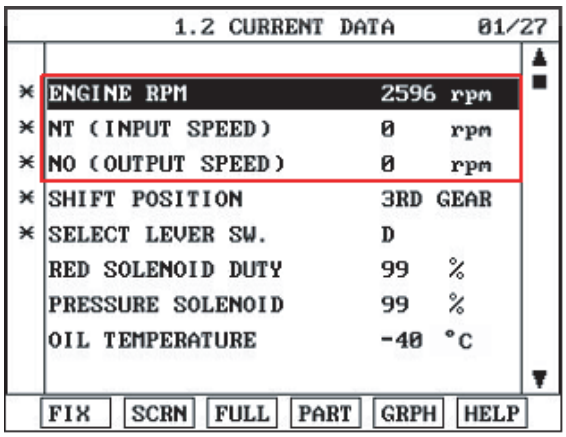
A : INPUT SPEED SENSOR
B : OUTPUT SPEED SENSOR

EKBF109A

MONITOR SCANTOOL DATA E3BEC72E

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



EKBF109B

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	O		O		O			●	●
2nd		O	O		O				●
3rd			O	O	O				●
4th		O		O	O				●
5th		O		O		O			
REV	O				O		O		
N,P	O				O				

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, every slippage occur 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 output.
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.

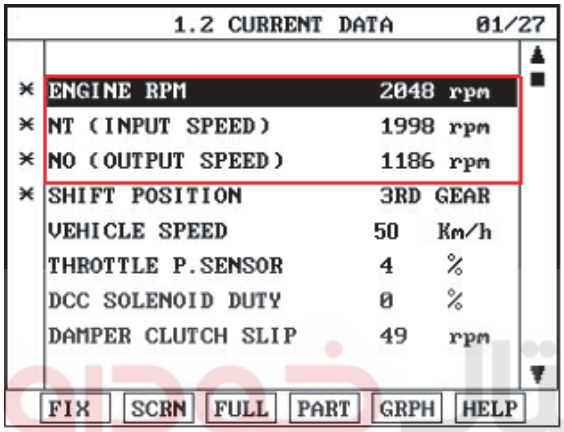
CAUTION

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 EF7DD66B

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



EKBF109C

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

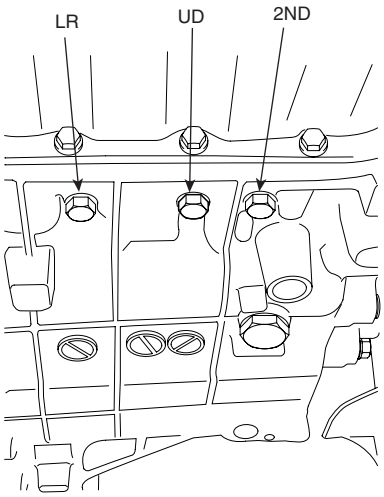
YES

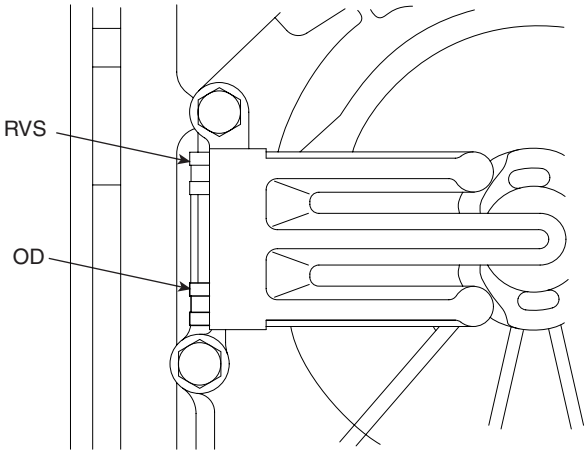
▶ Go to "Component Inspection" procedure.

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 E7C57FB8





EKBF109D

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 as below

LEVER POSITION	INPUT SPEED	VFS CURRENT	SOLENOIDE 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 EAA9E7FA

Refer to DTC P0731.

DTC P0734 GEAR 4 INCORRECT RATIO

COMPONENT LOCATION E1CF3ED7

EKBF300D

GENERAL DESCRIPTION EDFE1A32

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 EEECDCA7

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 E6AE2A9A

Item	Detecting Condition	Possible cause
DTC Strategy	• 4th gear incorrect ratio	• Faulty Input speed sensor • Faulty output speed sensor • Faulty UD 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 - output speed × 4th gear ratio | ≥ 200rpm	
Diagnostic Time	• More than 4sec	
Fail Safe	• Locked into 3 rd gear	

SIGNAL WAVEFORM E7EB4CC6

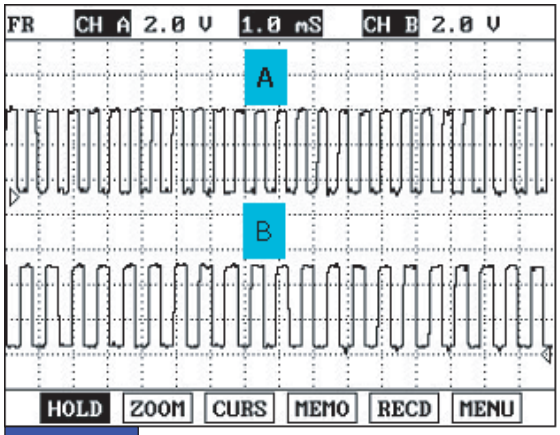


FIG.1)

A : INPUT SPEED SENSOR
B : OUTPUT SPEED SENSOR

EKBF110A

MONITOR SCANTOOL DATA E6C31FC0

※ It is difficult to "STALL TEST" in 4th gear, therefore Go to "Signal circuit Inspection" procedure.

OPERATING ELEMENT OF EACH SHIFTING RANGE

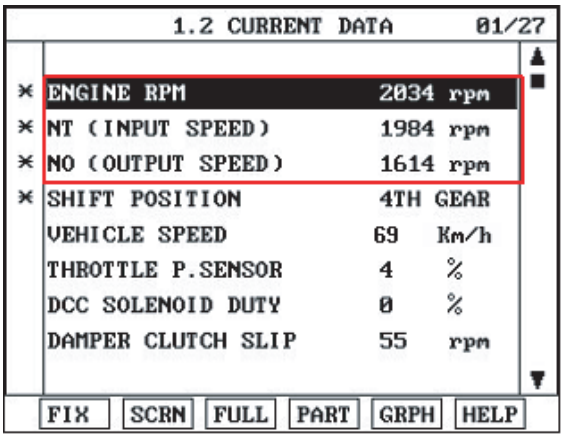
GEAR POSITION	ELEMENT								
	L/R BRAKE	2ND BRAKE	U/D CLUTCH	O/D CLUTCH	RED BRAKE	DIR CLUTCH	REV CLUTCH	OWC1	OWC2
1st	O		O		O			●	●
2nd		O	O		O				●
3rd			O	O	O				●
4th		O		O	O				●
5th		O		O		O			
REV	O				O		O		
N,P	O				O				

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

SIGNAL CIRCUIT INSPECTION E7FB47FC

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



EKBF110B

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

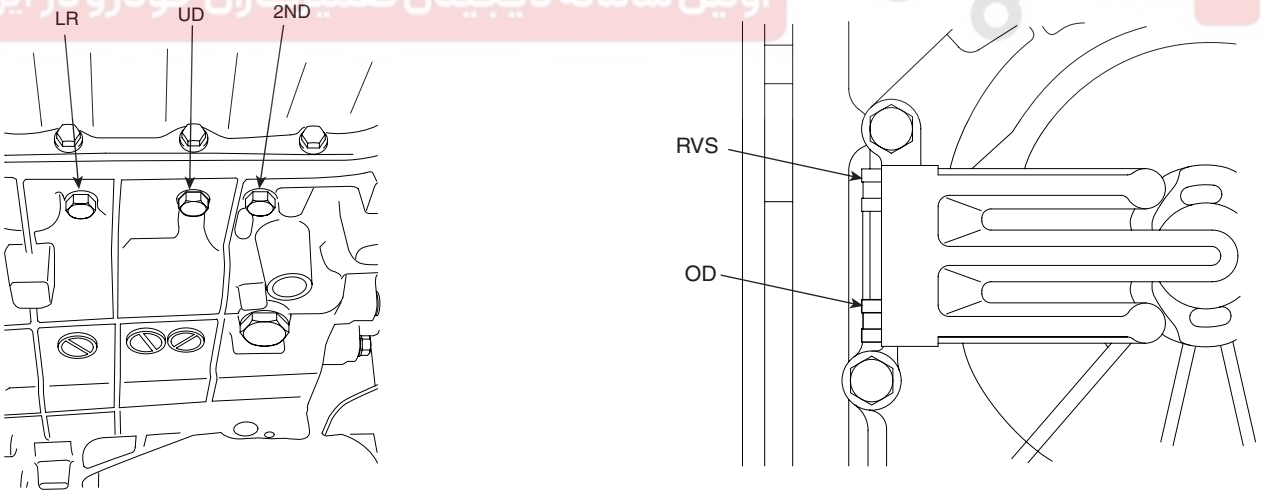
YES

▶ 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 E2A6D98A



EKBF110C

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 as below

LEVER POSITION	INPUT SPEED	VFS CURRENT	SOLENOIDE 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

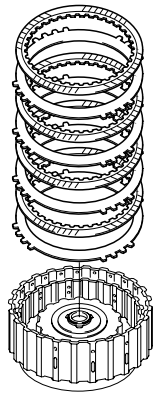
▶ Replace AUTO TRANSAXLE (BODY CONTROL VALVE faulty) as necessary and Go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR EACACBBF

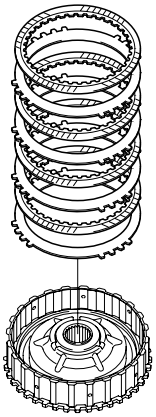
Refer to DTC P0731.

DTC P0735 GEAR 5 INCORRECT RATIO

COMPONENT LOCATION E9CAEDE0



OD CLUTCH



UD CLUTCH

EKBF300C

GENERAL DESCRIPTION EEF015F6

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 E7718B7E

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 EEC8D007

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 - output speed × 5th gear ratio | ≥ 200rpm	
Diagnostic Time	• More than 4sec	
Fail Safe	• Locked into 3 rd gear	

SIGNAL WAVEFORM EB4CC661

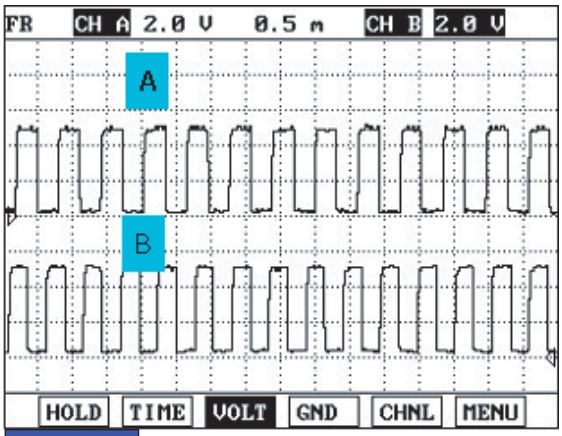


FIG.1)

A : INPUT SPEED SENSOR
B : OUTPUT SPEED SENSOR

EKBF111A

MONITOR SCANTOOL DATA EB490813

※ It is difficult to "STALL TEST" in 5th gear, so that Go to "Signal circuit Inspection" procedure

OPERATING ELEMENT OF EACH SHIFTING RANGE

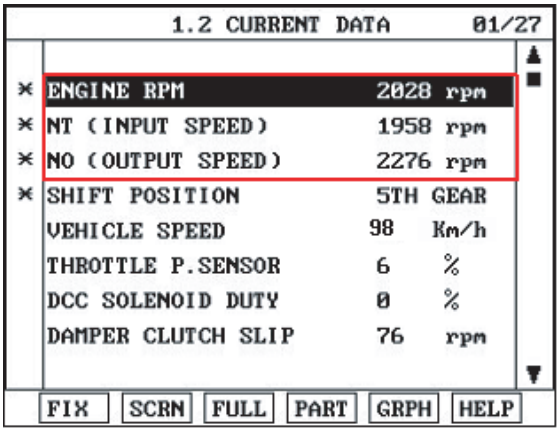
GEAR POSITION	ELEMENT								
	L/R BRAKE	2ND BRAKE	U/D CLUTCH	O/D CLUTCH	RED BRAKE	DIR CLUTCH	REV CLUTCH	OWC1	OWC2
1st	O		O		O			●	●
2nd		O	O		O				●
3rd			O	O	O				●
4th		O		O	O				●
5th		O		O		O			
REV	O				O		O		
N,P	O				O				

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

SIGNAL CIRCUIT INSPECTION EAD21165

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



EKBF111B

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

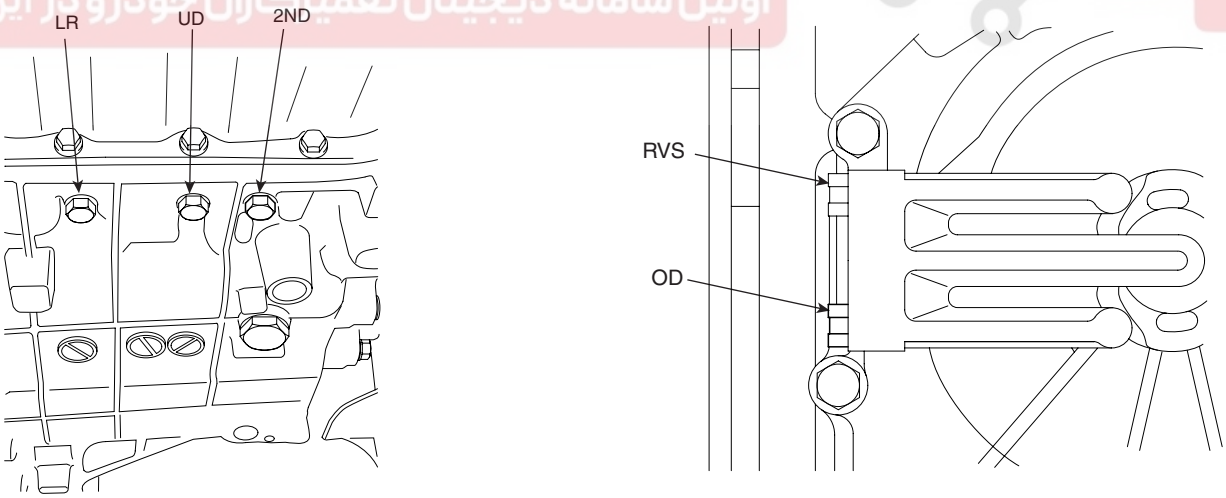
YES

▶ 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 E7525B6C



EKBF111C

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 as below

LEVER POSITION	INPUT SPEED	VFS CURRENT	SOLENOIDE 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 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 E8E2EF7D

Refer to DTC P0731.

DTC P0741 TORQUE CONVERTER CLUTCH CIRCUIT - STUCK OFF

GENERAL DESCRIPTION EA6CACC6

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 EA742AC9

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 under some value with 100% duty ratio, the PCM/TCM determines that the Torque Converter Clutch is stuck OFF and sets this code.

DTC DETECTING CONDITION E7F14DFD

Item	Detecting Condition	Possible cause
DTC Strategy	• Stuck "OFF"	※ TORQUE CON-VERTER(DAMPER) CLUTCH : TCC • Faulty TCC or oil pressure system • Faulty TCC solenoid valve • Faulty body control valve • Faulty PCM/TCM
Enable Conditions	• Always (in TCC apply mode)	
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 EEEC3F92

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 > 80%)

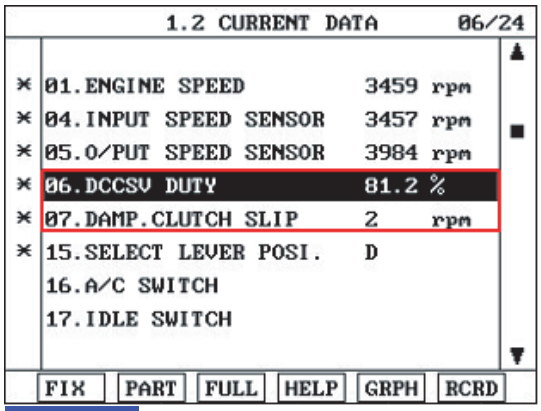


FIG.1)

FIG.1) : Normal status

EKBF113A

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 E6606F3A

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?

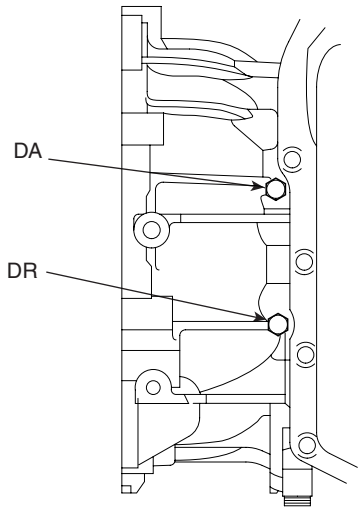
   YES

   ▶ 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%.

Specification :
Oil pressure gauge approx 735.4960KPa(7.5kg/㎠)-(In condition that TCC SOL. DUTY > 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 EDCF45C0

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 EC42CBA3

Refer to DTC P0741.

DTC DESCRIPTION E5E64A5F

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 E30AEDC7

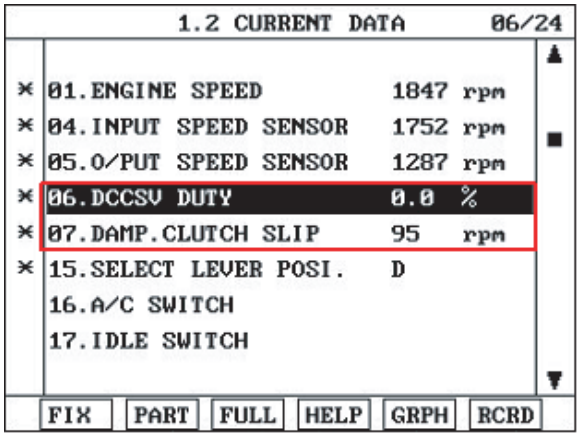
Item	Detecting Condition	Possible cause
DTC Strategy	• Stuck "ON"	※ TORQUE CON-VERTER(DAMPER) CLUTCH : TCC • Faulty TCC or oil pressure system • Faulty TCC solenoid valve • Faulty body control valve • Faulty TCM(PCM)
Enable Conditions	• Throttle position > 20% • Output speed > 500 rpm • Manifold air 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 E6DC021A

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



EKBF114A

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 EB7DC782

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?

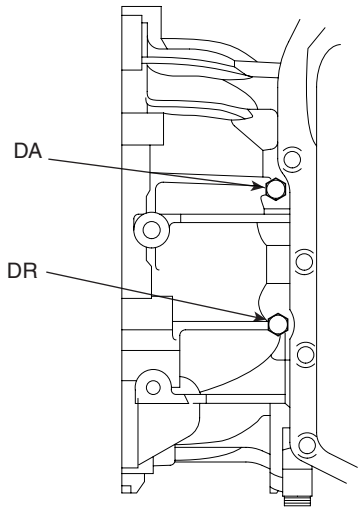
      YES

      ▶ 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



KKCF212B

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

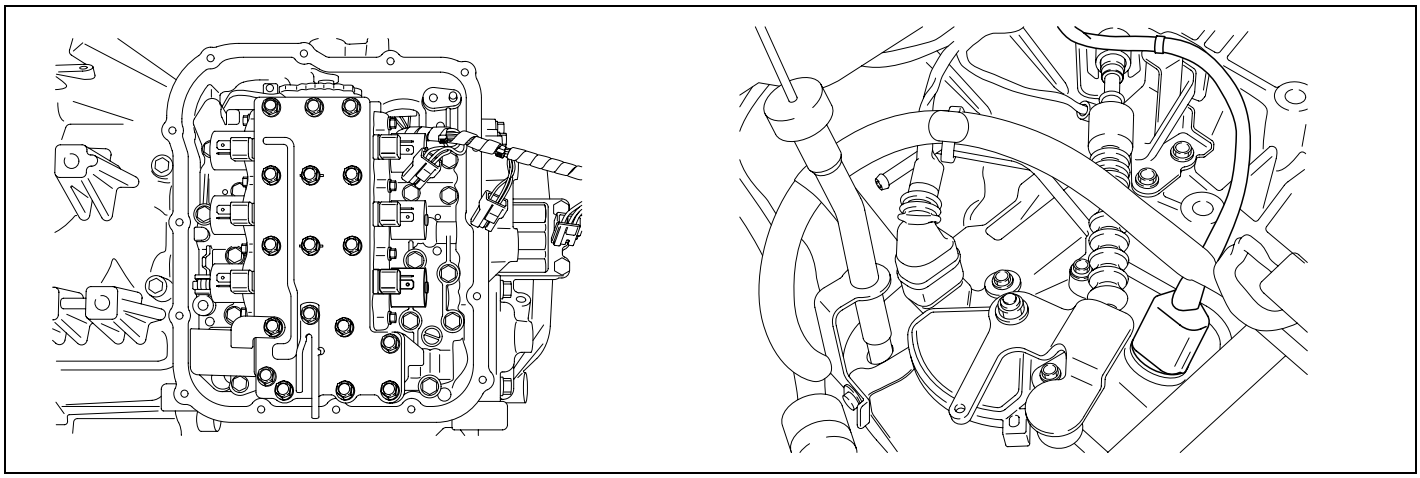
▶ Replace A/T assembly (possible to BODY CONTROL VALVE faulty) as necessary and Go to "Verification of vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR E5B063EF

Refer to DTC P0741.

DTC P0743 TORQUE CONVERTER CLUTCH CIRCUIT - ELECTRICAL

COMPONENT LOCATION EC7BFD36



KKCF213A

GENERAL DESCRIPTION EAC2F141

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 EC8D126C

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 EB7D115A

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 E63DA3C7

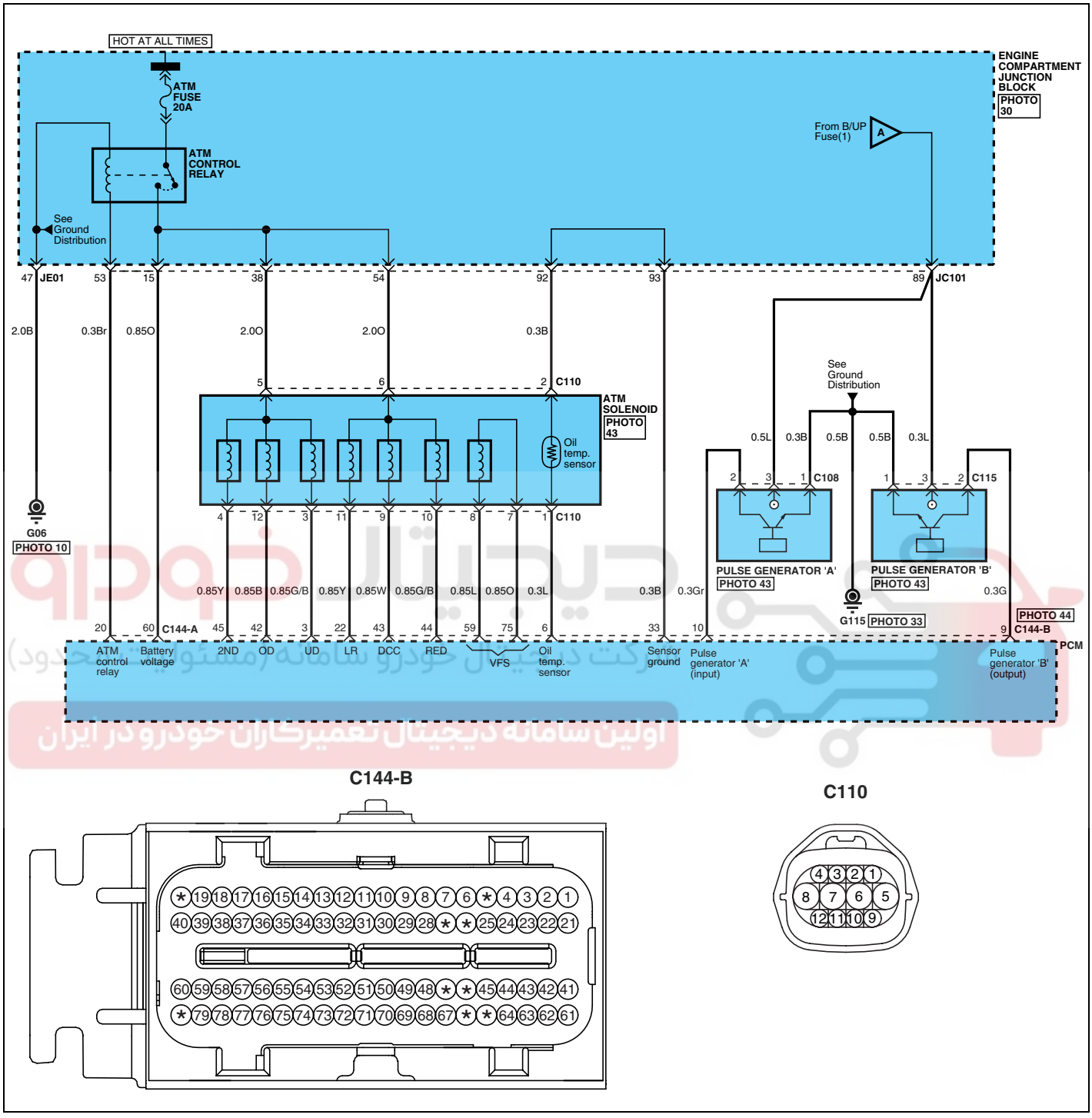
Solenoid Valve for Pressure Control

- 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
  - VFS : 600 ± 20Hzs

- Internal resistance :
  - 2.7~3.4Ω (68°F or 20°C) - LR, 2ND, UD, OD, RED, DCC
  - 4.35±0.35Ω (68°F or 20°C) - VFS

- Surge voltage : 56 V(except VFS)

SCHEMATIC DIAGRAM EEE47CC0



C144-B

C110

EKBF115G

SIGNAL WAVEFORM EDD3FDBC

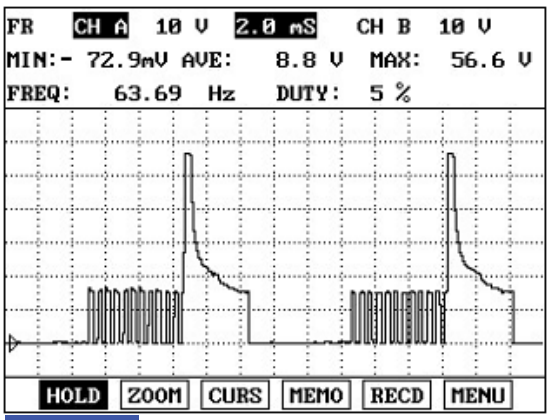


FIG.1)

FIG.1) : Operating of "DCCSV"

EKBF115A

MONITOR SCANTOOL DATA EE316D0A

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 80%.

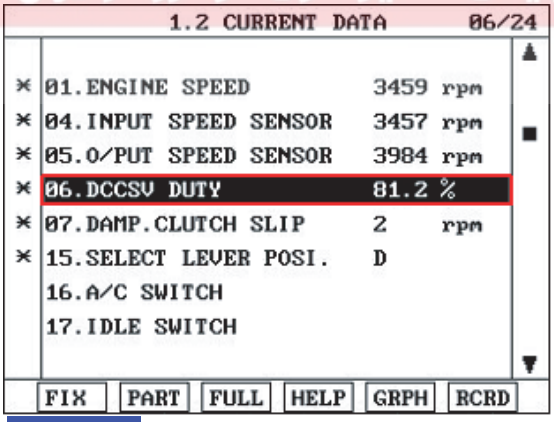


FIG.1)

FIG.1) : Normal status

EKBF115B

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 E221AD4A

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

YES

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

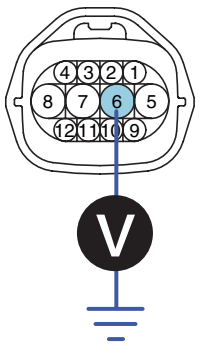
NO

▶ Go to "Power supply circuit inspection" procedure.

POWER SUPPLY CIRCUIT INSPECTION EDABE012

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 solenoide valve

EKBF115C

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 E1C21EA1

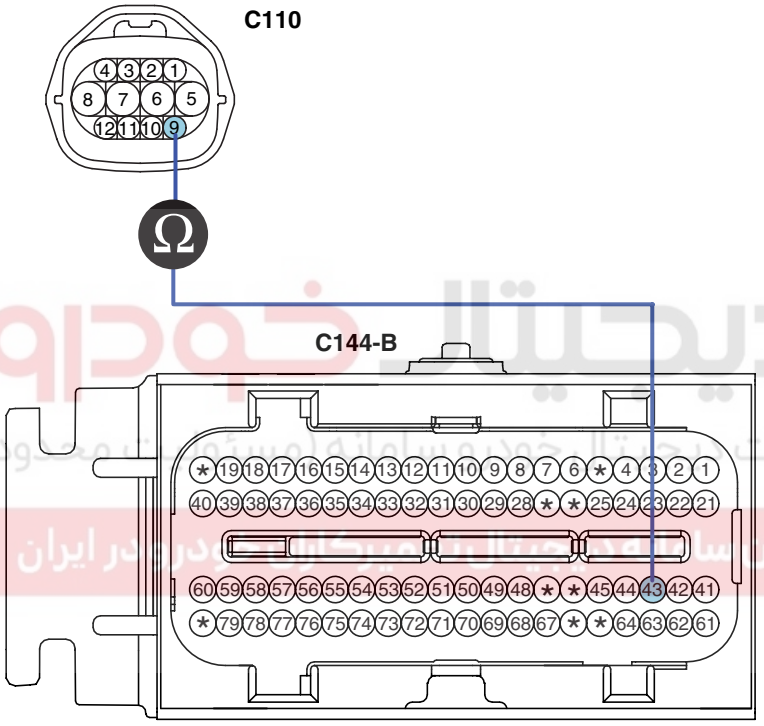
1. Check signal circuit open inspection.

   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 solenoide 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

EKBF115D

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.

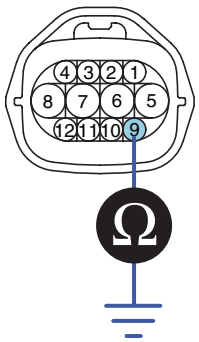
2. Check signal circuit short inspection

   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 solenoide valve

EKBF115E

4) Is resistance within specifications?

YES

▶ Go to "Component inspection" procedure.

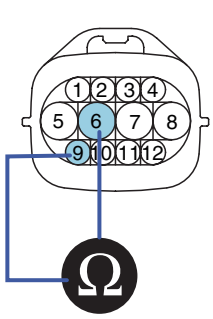
NO

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

COMPONENT INSPECTION E26D790D

1. CHECK SOLENOID VELVE
   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)]



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 solenoide valve

EKBF115F

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

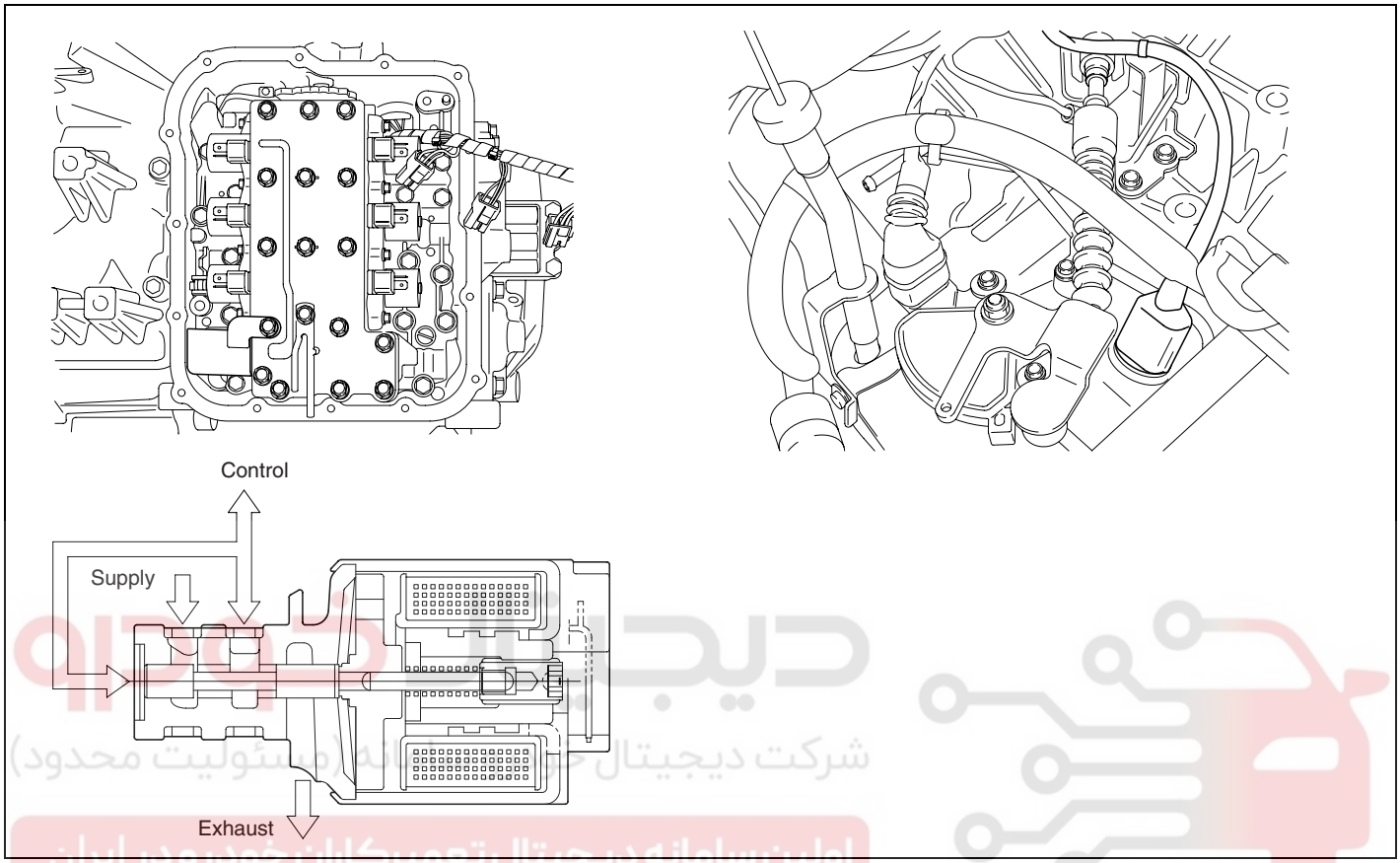
1. IG SWITCH ON
2. TRANSAXLE RANGE SWITCH is normal
3. P RANGE
4. Vehicle Speed 0mph(0km/h)
5. Throttle position sensor < 1V
6. IDLE SWITCH ON
7. ENGINE RPM 0

VERIFICATION OF VEHICLE REPAIR EAECDD57

Refer to DTC P0741.

DTC P0748 PRESSURE CONTROL SOLENOID VALVE A - ELECTRICAL

COMPONENT LOCATION EAF256ED



EKBF116G

GENERAL DESCRIPTION EF2EB9BC

Variable Faced 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 how widely spool valve open the passage of going through.

DTC DESCRIPTION E1A73781

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 EE6D88FD

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 5seconds	
Fail Safe	• Locked in 3rd gear (Control relay off)	

SPECIFICATION E6083248

Refer to DTC P0743.

SCHEMATIC DIAGRAM EE20D3D5

Refer to DTC P0743.

SIGNAL WAVEFORM E88EDA9F

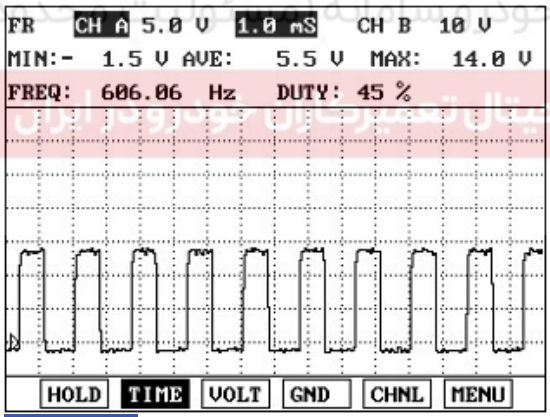


FIG.1)

FIG.1) : Wave form of "VFS"

EKBF116A

MONITOR SCANTOOL DATA E35A66F5

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.

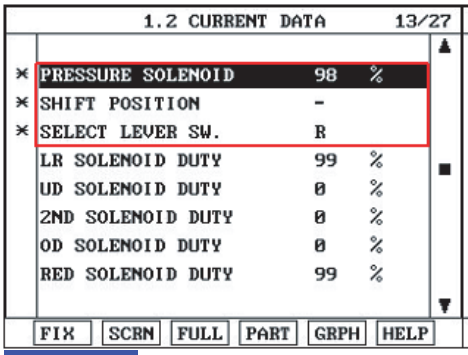


FIG.1)

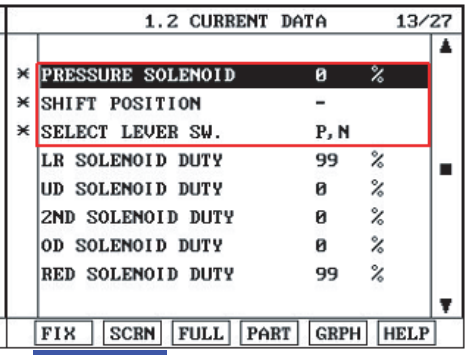


FIG.2)

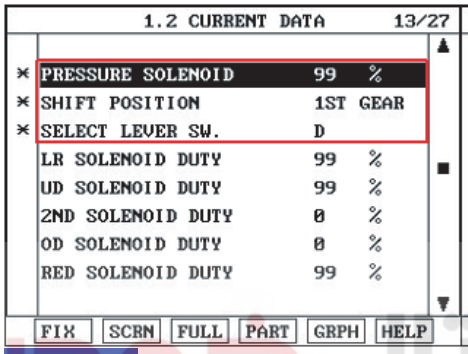


FIG.3)

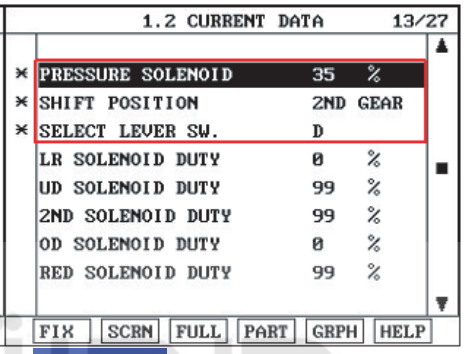


FIG.4)

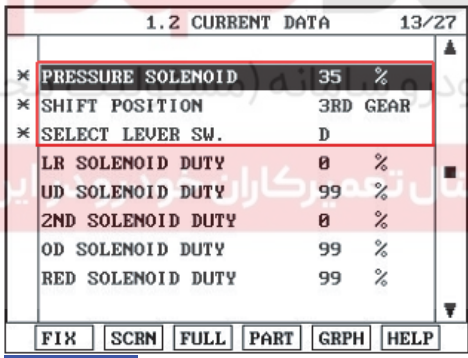


FIG.5)

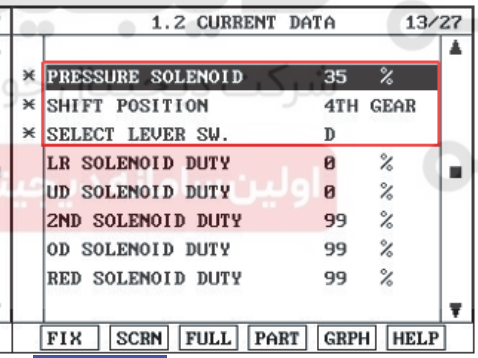


FIG.6)

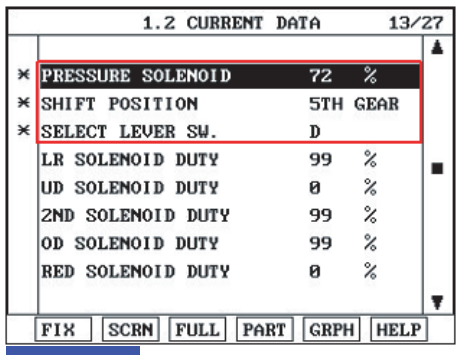


FIG.7)

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

EKBF116B

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.

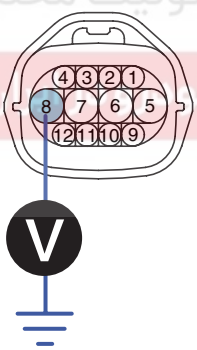
TERMINAL & CONNECTOR INSPECTION EEFA09EC

Refer to DTC P0743.

POWER SUPPLY CIRCUIT INSPECTION E9CBBAD0

1. Disconnect "A/T SOLENOID VALVE" connector.
2. Measure voltage between terminal "8" 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 solenoide valve

EKBF116C

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 EBEEDDEB

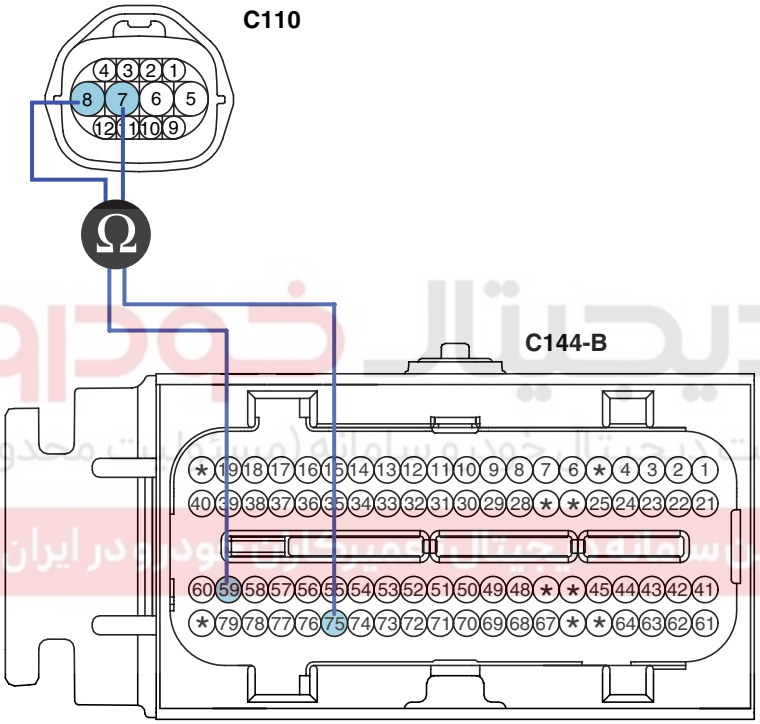
1. Check signal circuit open inspection.

   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 solenoide 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

EKBF116D

   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.

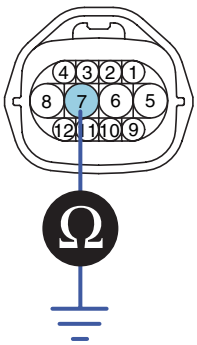
2. Check signal circuit short inspection

   1) Ignition "OFF".

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

   3) Measure resistance between terminal "7" 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 solenoide valve

EKBF116E

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 E3F0A134

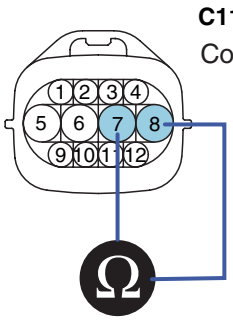
1. CHECK SOLENOID VELVE

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 solenoide valve

EKBF116F

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

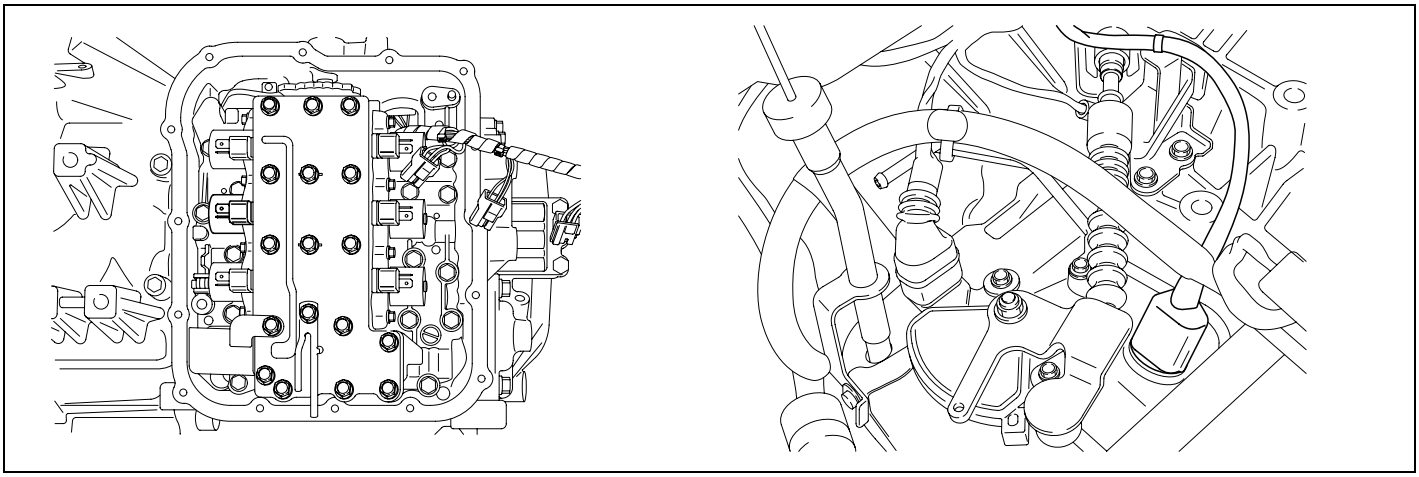
1. IG SWITCH ON
2. TRANSAXLE RANGE SWITCH is normal
3. P RANGE
4. Vehicle Speed 0mph(0km/h)
5. Throttle position sensor < 1V
6. IDLE SWITCH ON
7. ENGINE RPM 0

VERIFICATION OF VEHICLE REPAIR EE939592

Refer to DTC P0741.

DTC P0750 SHIFT CONTROL SOLENOID VALVE A CIRCUIT MALFUNCTION

COMPONENT LOCATION E94BBEA5



KKCF213G

GENERAL DESCRIPTION E0A345E9

The Automatic transmission changes the gear position of the transmission by utilizing a combination of clutches and brakes, which are controlled by solenoid valves. This 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 E874D569

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 EC82B06F

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 E2A271EA

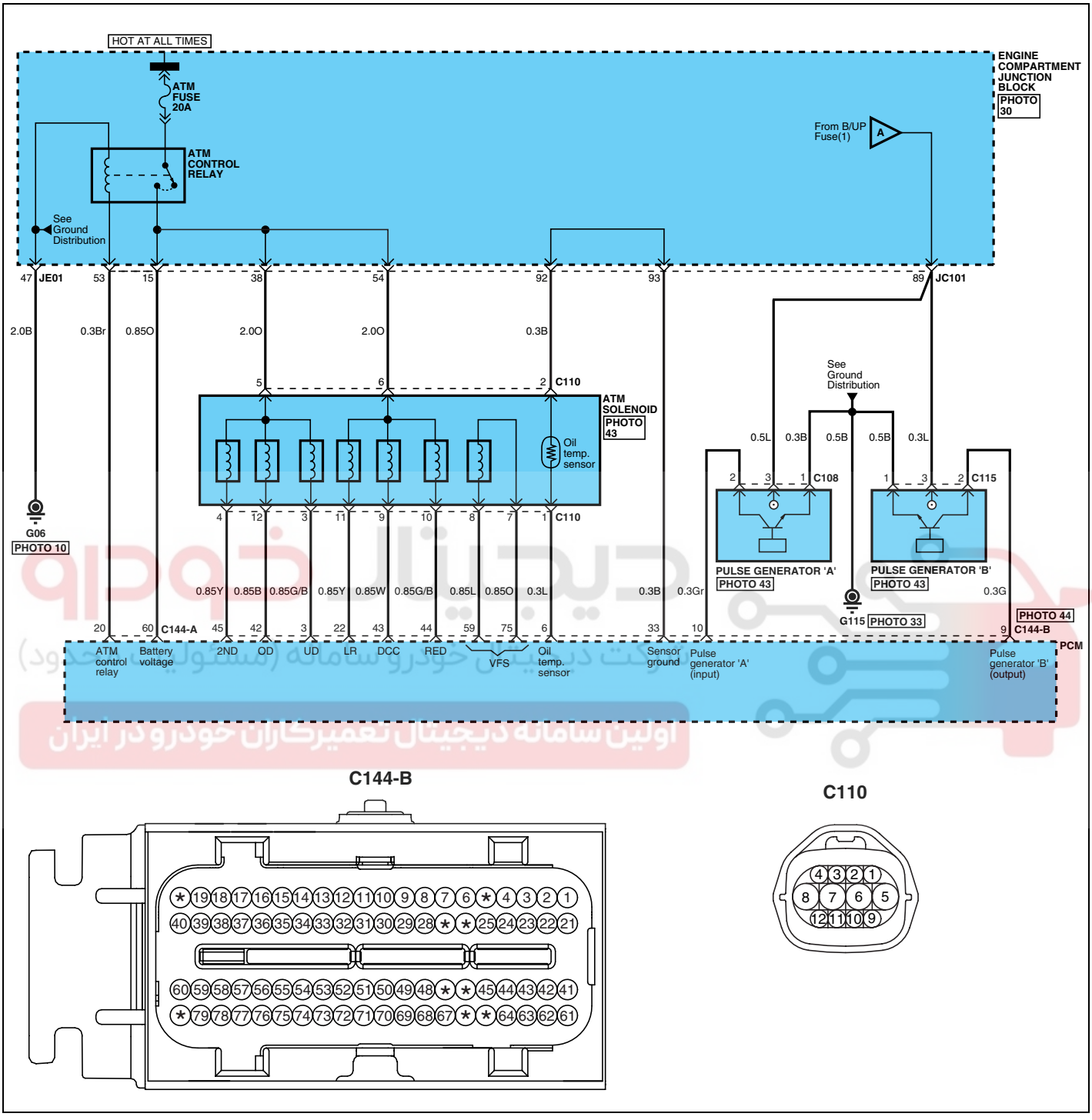
Solenoid Valve for Pressure Control

- 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
  - VFS : 600 ± 20Hzs

- Internal resistance :
  - 2.7~3.4Ω (68°F or 20°C) - LR, 2ND, UD, OD, RED, DCC
  - 4.35±0.35Ω (68°F or 20°C) - VFS

- Surge voltage : 56 V(except VFS)

SCHEMATIC DIAGRAM EB0ACD11



C144-B

C110

EKBF115G

SIGNAL WAVEFORM E3BF464C

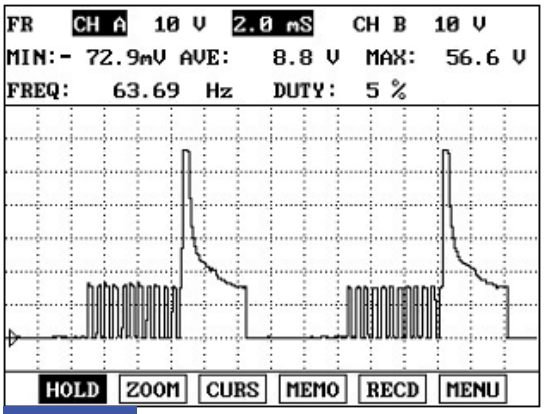


FIG.1)

FIG.1) : "2nd" gear → "1st" gear

EKBF117A

MONITOR SCANTOOL DATA E7F9007B

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.

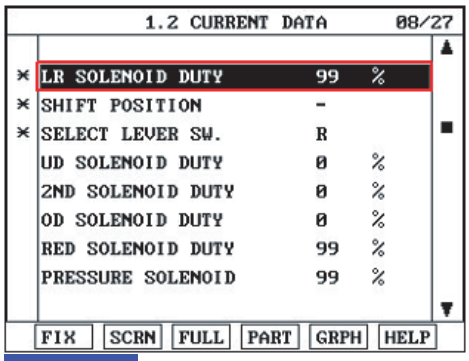


FIG.1)

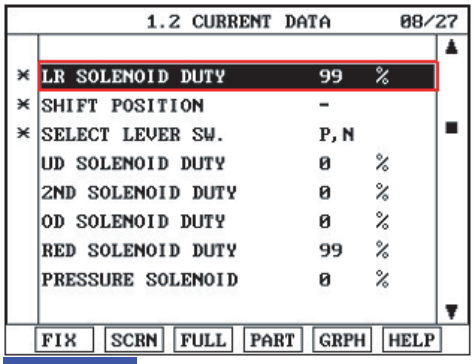


FIG.2)

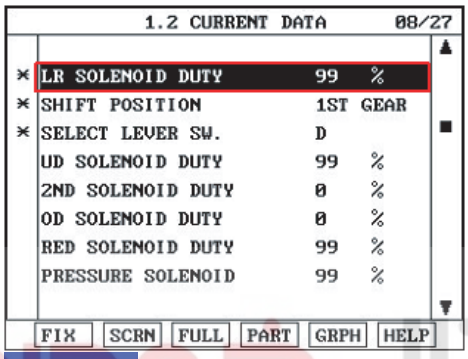


FIG.3)

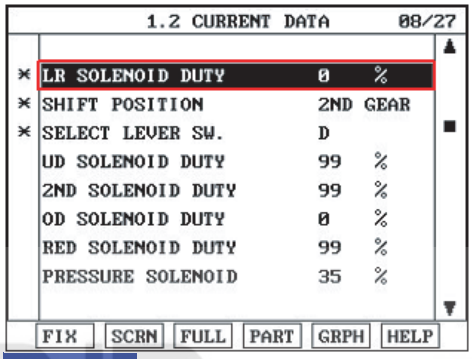


FIG.4)

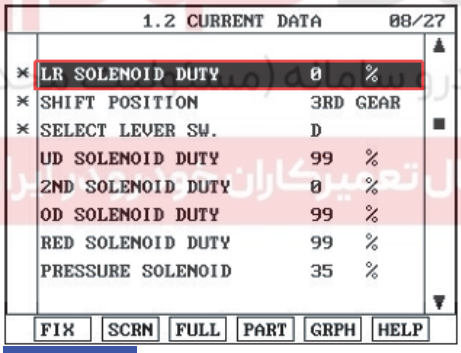


FIG.5)

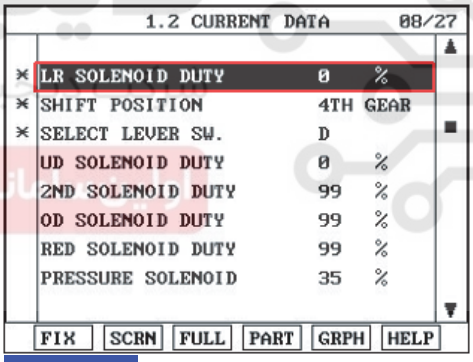


FIG.6)

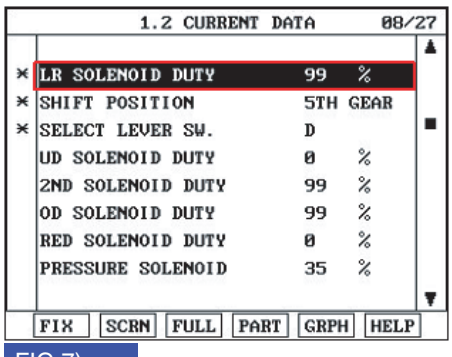


FIG.7)

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

EKBF117B

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 E0FFC404

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

YES

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

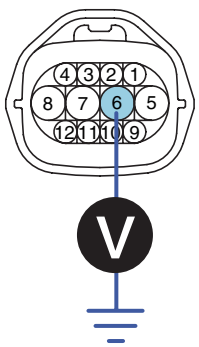
NO

▶ Go to "Power supply circuit inspection" procedure.

POWER SUPPLY CIRCUIT INSPECTION ED06AB6A

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 solenoide valve

EKBF115C

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 EA51E6BF

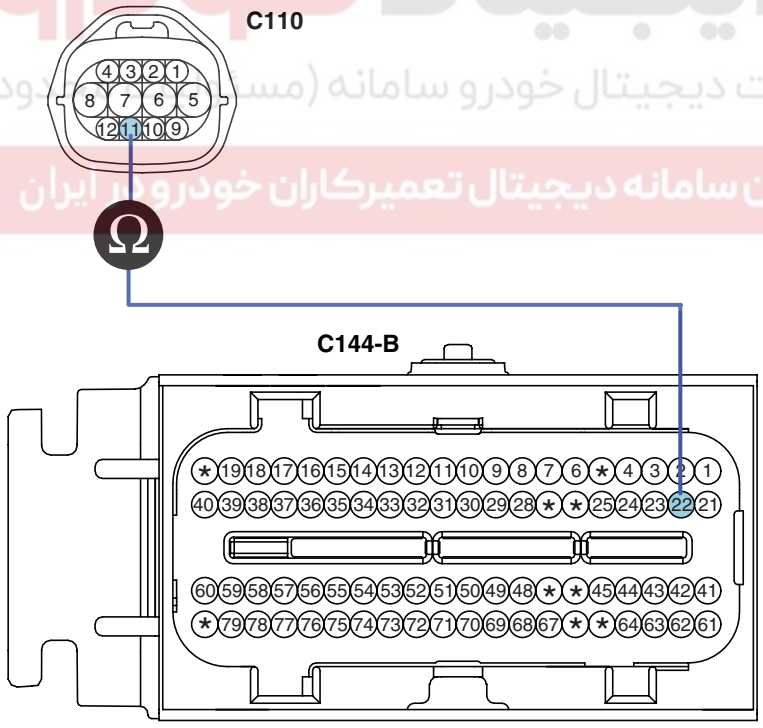
1. Check signal circuit open inspection

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 solenoide 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

EKBF117C

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.

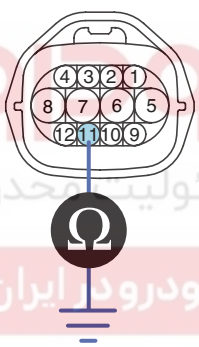
2. Check signal circuit short inspection

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 solenoide valve

EKBF117D

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 EEF95CFB

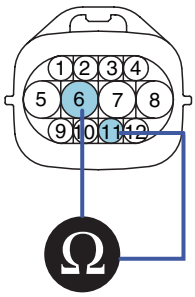
1. CHECK SOLENOID VELVE

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 solenoide valve

EKBF117E

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 E1BC5FAF

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

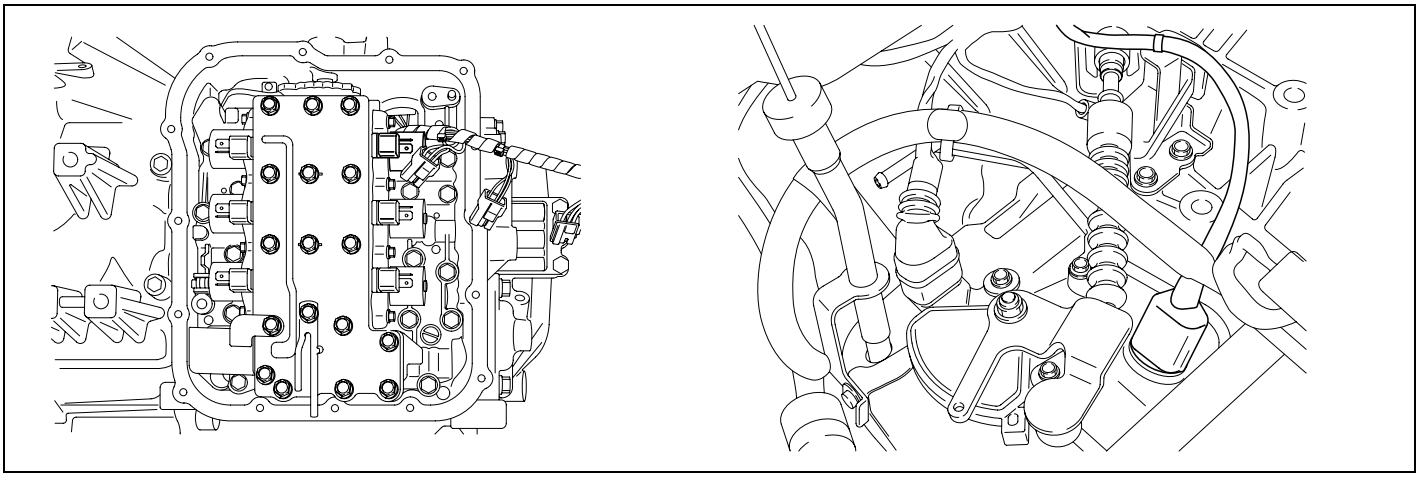
▶ Go to the applicable troubleshooting procedure.

NO

▶ System performing to specification at this time.

DTC P0755 SHIFT CONTROL SOLENOID VALVE B CIRCUIT MALFUNCTION

COMPONENT LOCATION EE4FA6CB



KKCF213H

GENERAL DESCRIPTION E14C119C

The Automatic transmission changes the gear position of the transmission by utilizing a combination of clutches and brakes, which are controlled by solenoid valves. This 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 EAF88B5C

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 ED12EDF5

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 EBEA94FC

Refer to DTC P0750.

SCHEMATIC DIAGRAM EBDCCEC6

Refer to DTC P0750.

SIGNAL WAVEFORM E37D2BB7

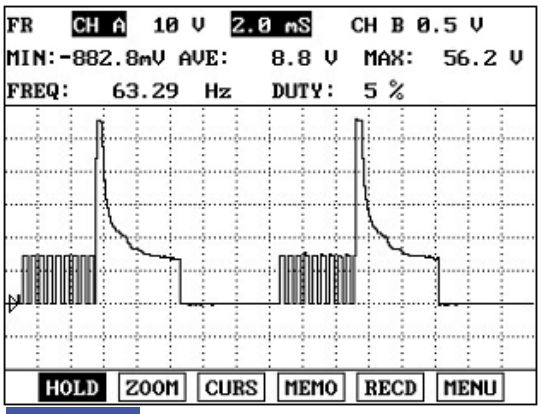


FIG.1)

FIG.1) : "N" → "D"

EKBF118A

MONITOR SCANTOOL DATA EB8F93CB

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.

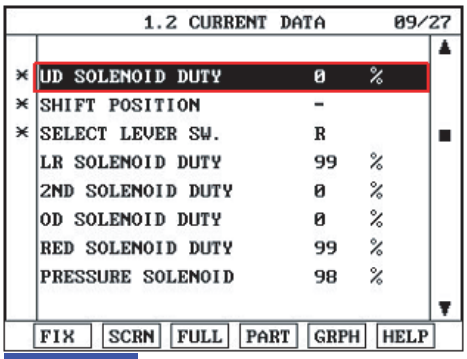


FIG.1)

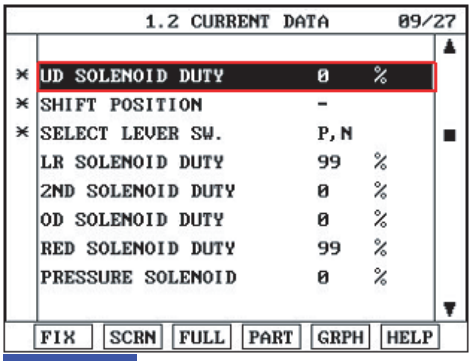


FIG.2)

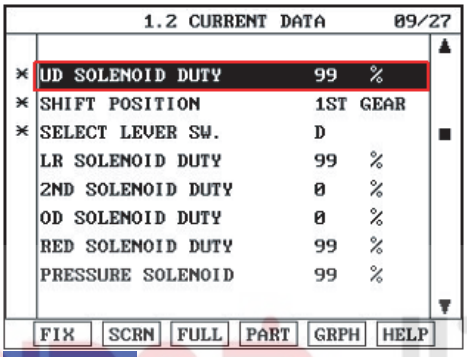


FIG.3)

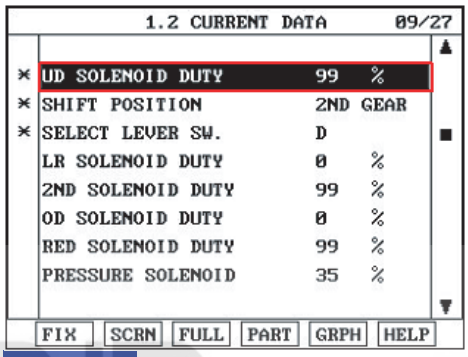


FIG.4)

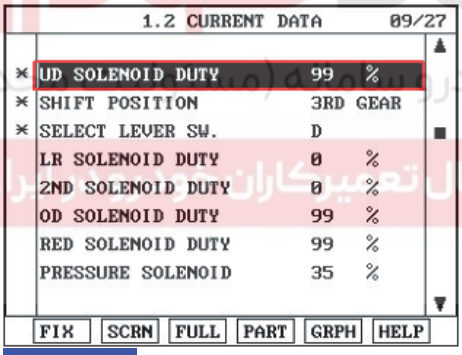


FIG.5)

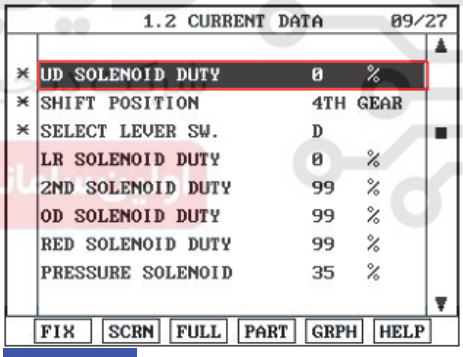


FIG.6)

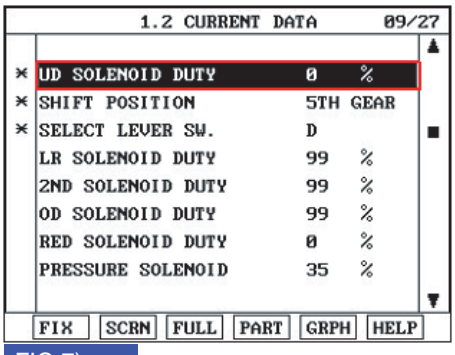


FIG.7)

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

EKBF118B

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.

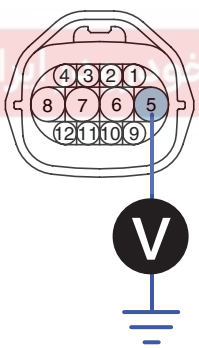
TERMINAL & CONNECTOR INSPECTION E09A8F36

Refer to DTC P0750.

POWER SUPPLY CIRCUIT INSPECTION E4E5D250

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 solenoide valve

EKBF118C

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 E03B554A

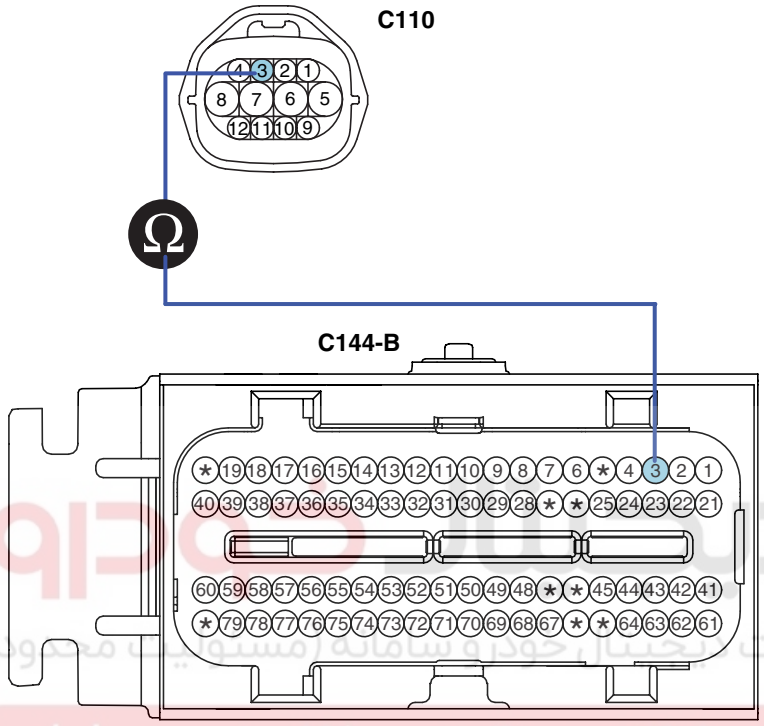
1. Check signal circuit open inspection

   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 solenoide 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

EKBF118D

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.

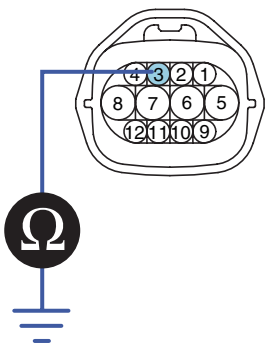
2. Check signal circuit short inspection

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 solenoide valve

EKBF118E

4) Is resistance within specifications?

YES

▶ Go to "Component inspection" procedure.

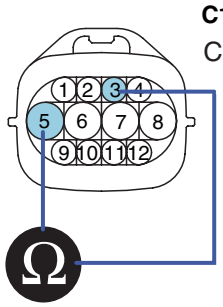
NO

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

COMPONENT INSPECTION E9EFD89F

1. CHECK SOLENOID VELVE
   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 solenoide valve

EKBF118F

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 ATM 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

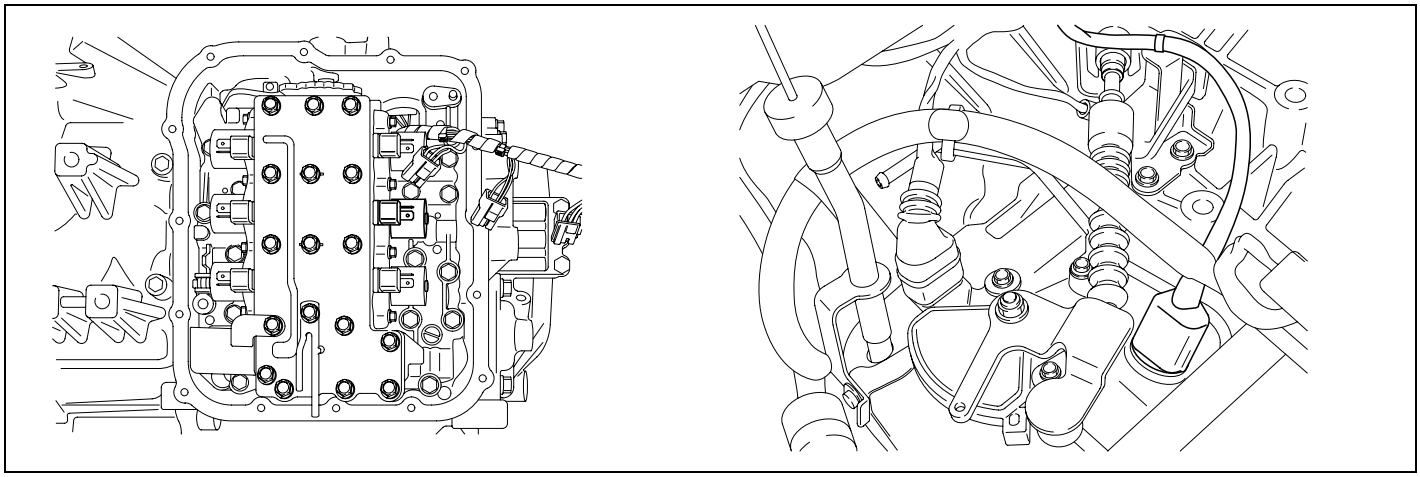
1. IG SWITCH ON
2. TRANSAXLE RANGE SWITCH is normal
3. P RANGE
4. Vehicle Speed 0mph(0km/h)
5. Throttle position sensor < 1V
6. IDLE SWITCH ON
7. ENGINE RPM 0

VERIFICATION OF VEHICLE REPAIR ECC222BB

Refer to DTC P0750.

DTC P0760 SHIFT CONTROL SOLENOID VALVE C CIRCUIT MALFUNCTION

COMPONENT LOCATION E8BA7135



KKCF213I

GENERAL DESCRIPTION EB2A0F60

The Automatic transmission changes the gear position of the transmission by utilizing a combination of clutches and brakes, which are controlled by solenoid valves. This 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 ED1923DD

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 E4DD9DA6

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 E8D6793F

Refer to DTC P0750.

SCHEMATIC DIAGRAM E6BDB954

Refer to DTC P0750.

SIGNAL WAVEFORM EDA0F351

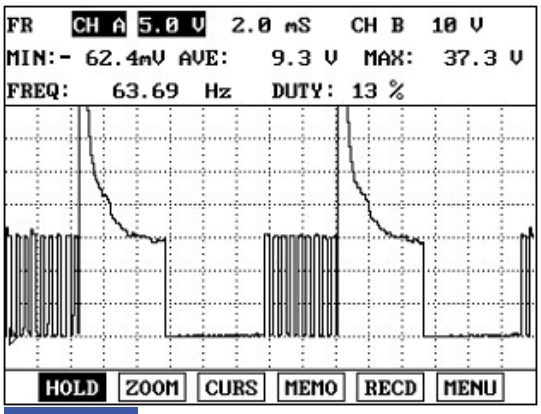


FIG.1)

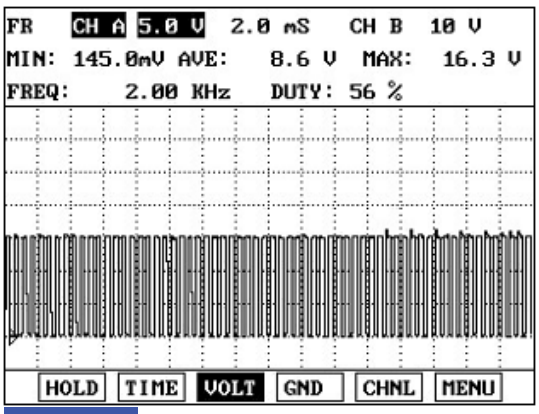


FIG.2)

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

EKBF119A

MONITOR SCANTOOL DATA E4D3BECD

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.

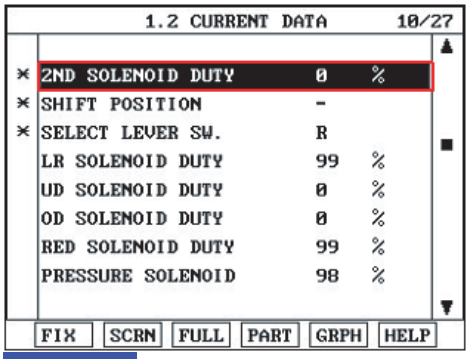


FIG.1)

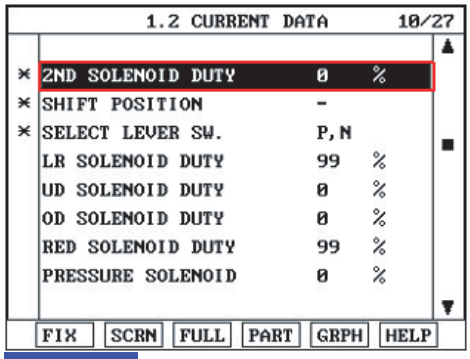


FIG.2)

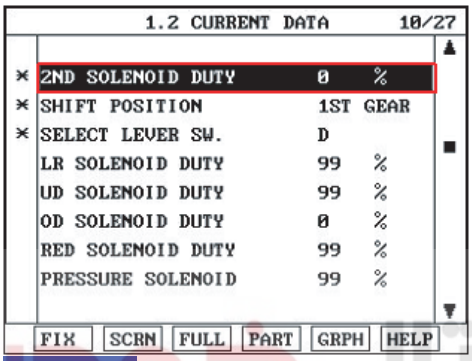


FIG.3)

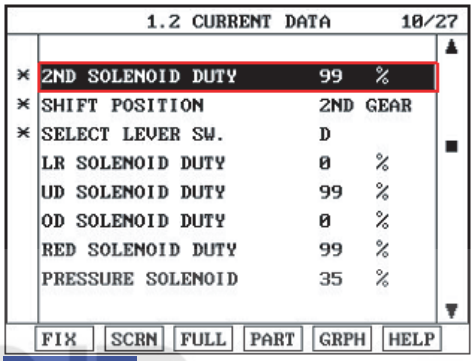


FIG.4)

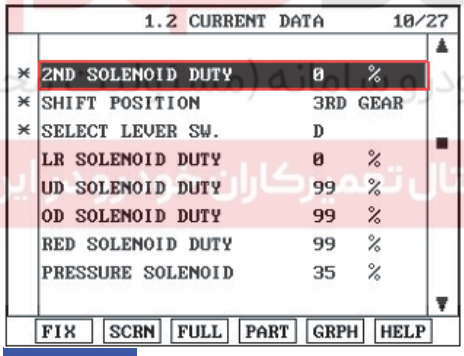


FIG.5)

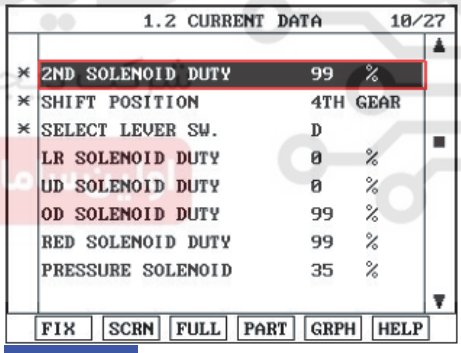


FIG.6)

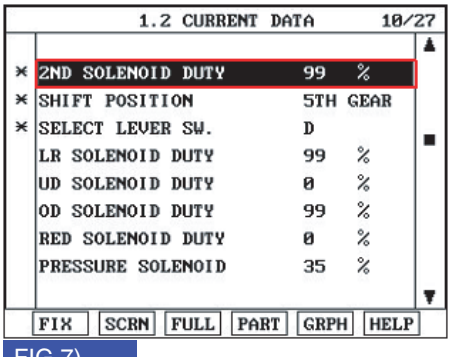


FIG.7)

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

EKBF119B

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 E492A31E

Refer to DTC P0750.

POWER SUPPLY CIRCUIT INSPECTION EE69BC6B

Refer to DTC P0755.

SIGNAL CIRCUIT INSPECTION E2D2182F

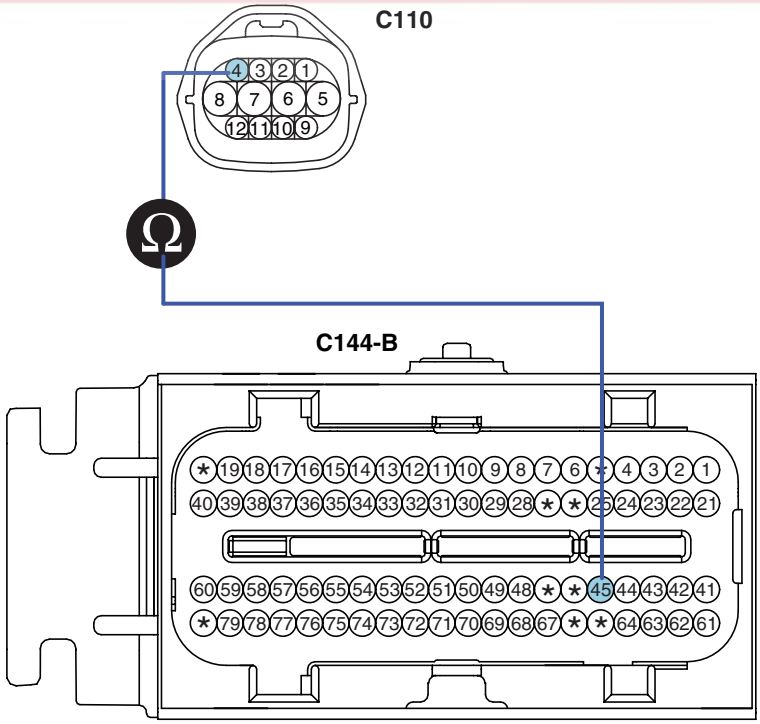
1. Check signal circuit open inspection

   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



EKBF119C

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 solenoide valve

EKBF119D

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 EE69ADBE

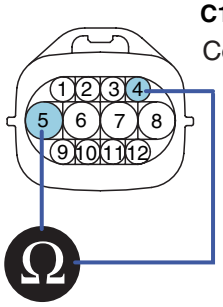
1. CHECK SOLENOID VELVE

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 solenoide valve

EKBF119E

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

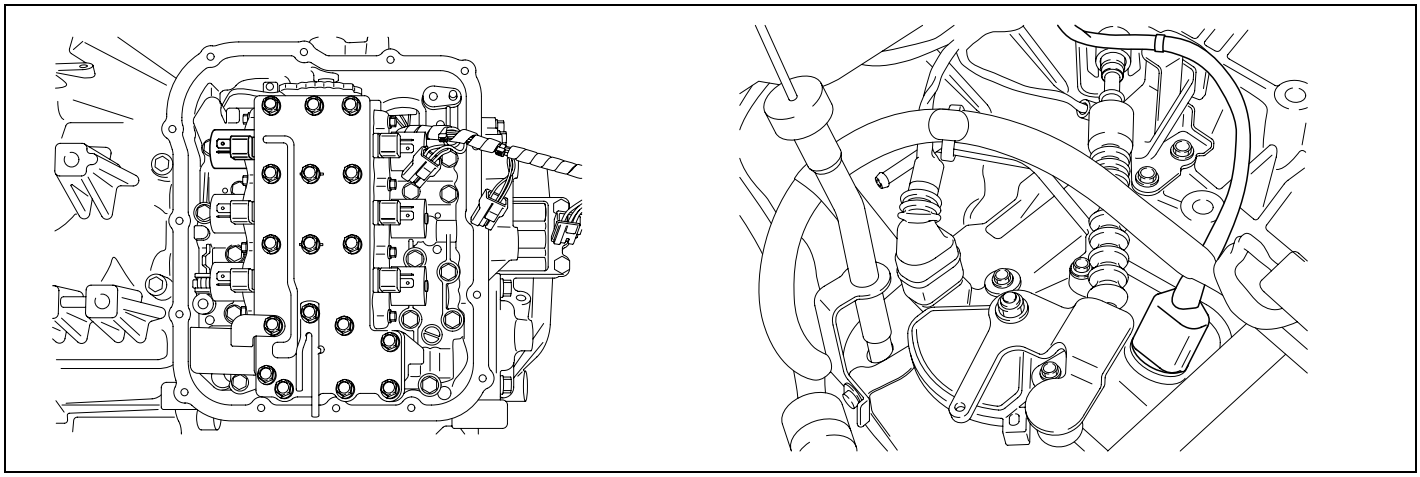
1. IG SWITCH ON
2. TRANSAXLE RANGE SWITCH is normal
3. P RANGE
4. Vehicle Speed 0mph(0km/h)
5. Throttle position sensor < 1V
6. IDLE SWITCH ON
7. ENGINE RPM 0

VERIFICATION OF VEHICLE REPAIR E2AAC8CC

Refer to DTC P0750.

DTC P0765 SHIFT CONTROL SOLENOID VALVE D CIRCUIT MALFUNCTION

COMPONENT LOCATION E777E04B



KKCF213J

GENERAL DESCRIPTION E174B1E9

The Automatic transmission changes the gear position of the transmission by utilizing a combination of clutches and brakes, which are controlled by solenoid valves. This 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 ED21F62B

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 E5CB7B4E

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 E55F4B0A

Refer to DTC P0750.

SCHEMATIC DIAGRAM E1C21A70

Refer to DTC P0750.

SIGNAL WAVEFORM E464E8D4

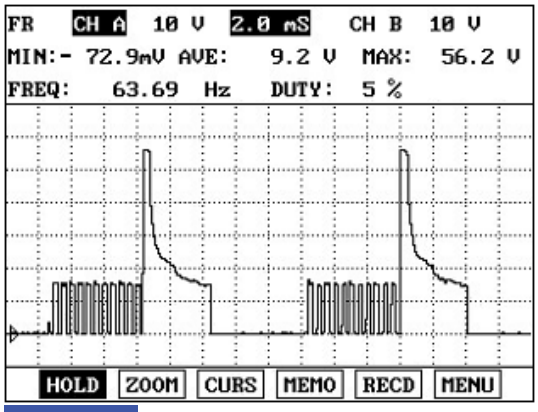


FIG.1)

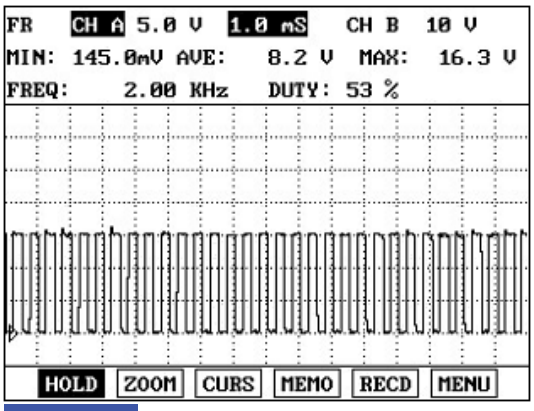


FIG.2)

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

EKBF120A

MONITOR SCANTOOL DATA EDDBC31F

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.

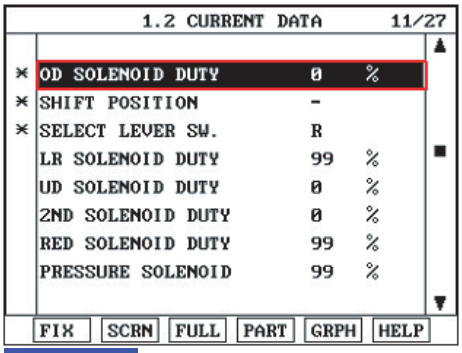


FIG.1)

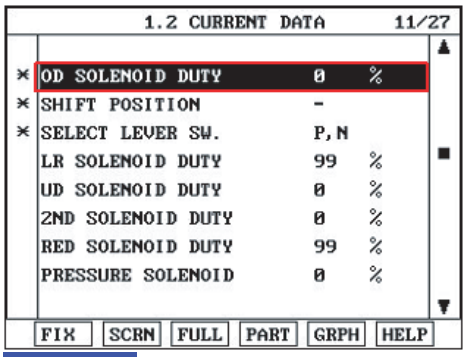


FIG.2)

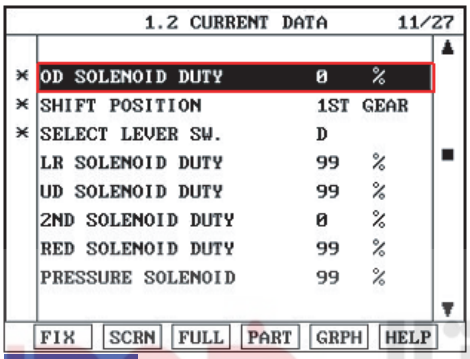


FIG.3)

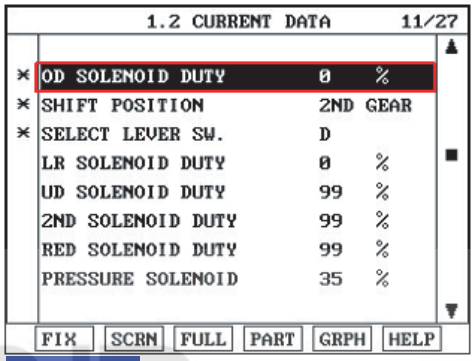


FIG.4)

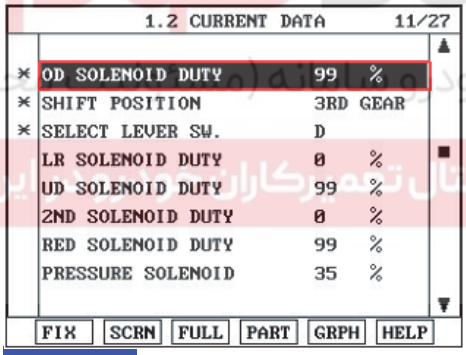


FIG.5)

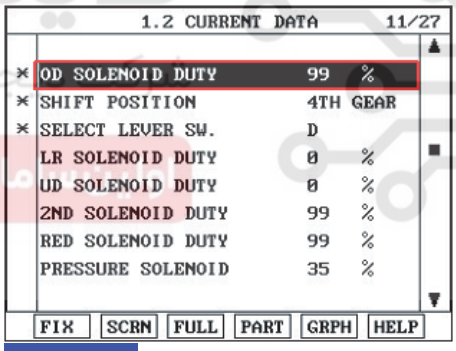


FIG.6)

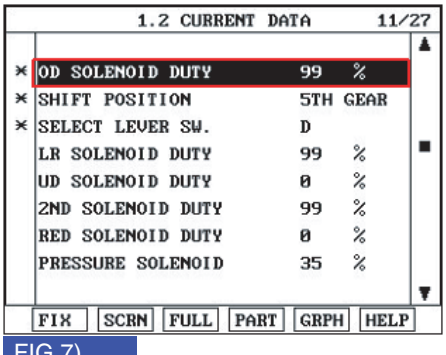


FIG.7)

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

EKBF120B

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 E1A166A1

Refer to DTC P0750.

POWER SUPPLY CIRCUIT INSPECTION E03562BB

Refer to DTC P0755.

SIGNAL CIRCUIT INSPECTION E520A8AB

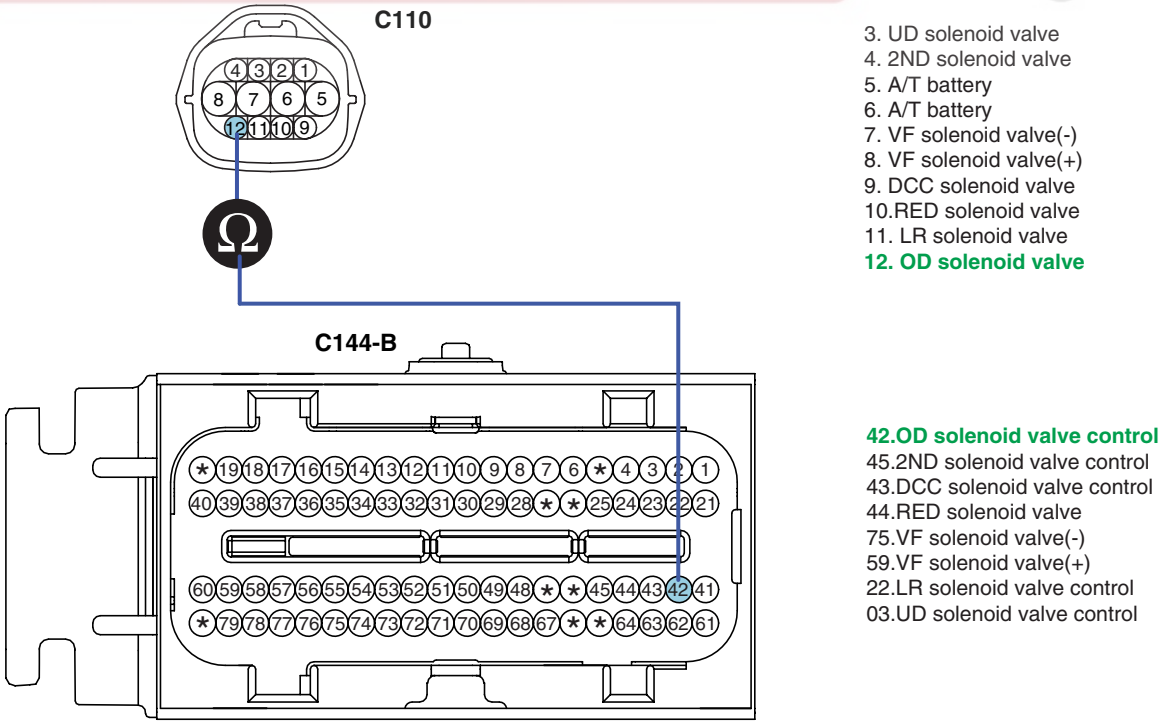
1. Check signal circuit open inspection

   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

EKBF120C

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.

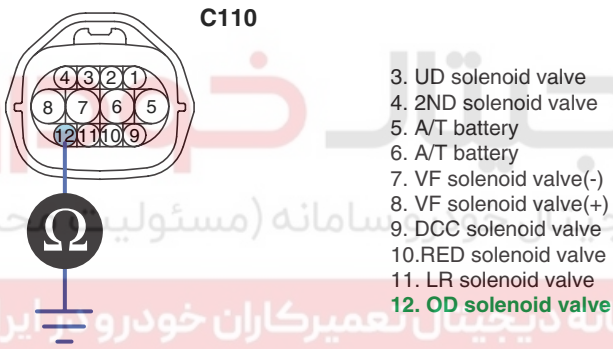
2. Check signal circuit short inspection

1) Ignition "OFF" & Engine "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

EKBF120D

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 EEBBEAC5

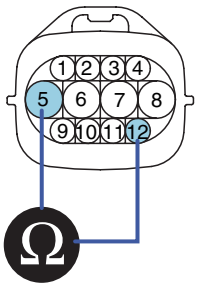
1. CHECK SOLENOID VELVE

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

EKBF120E

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.

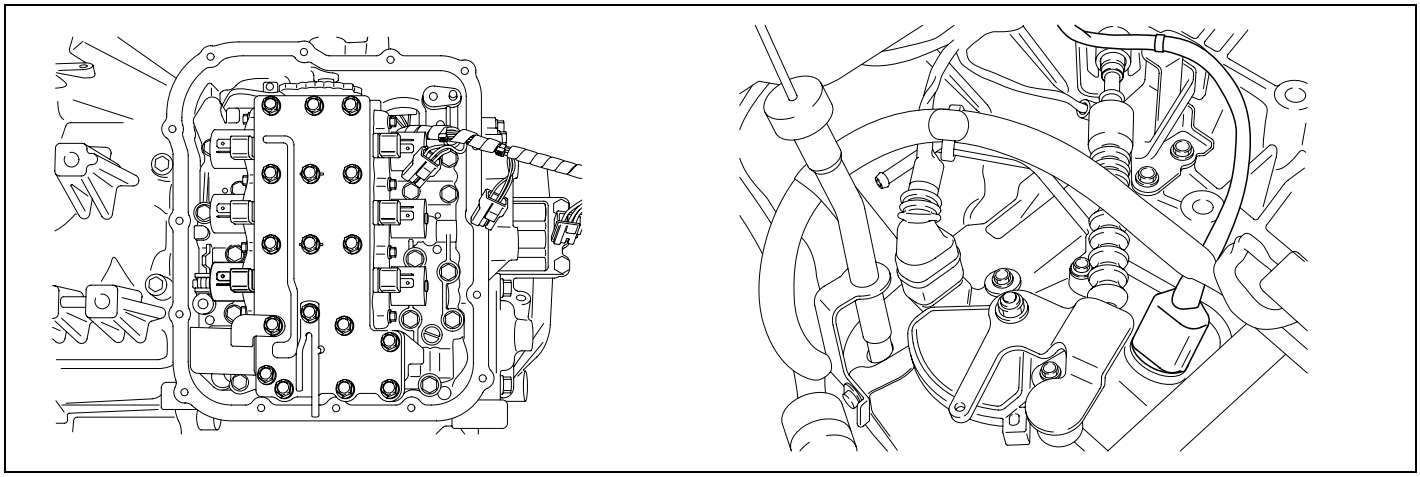
ACTUATOR TEST CONDITION
1. IG SWITCH ON
2. TRANSAXLE RANGE SWITCH is normal
3. P RANGE
4. Vehicle Speed 0mph(0km/h)
5. Throttle position sensor < 1V
6. IDLE SWITCH ON
7. ENGINE RPM 0

VERIFICATION OF VEHICLE REPAIR E323F2CD

Refer to DTC P0750.

DTC P0770 SHIFT CONTROL SOLENOID VALVE E CIRCUIT MALFUNCTION

COMPONENT LOCATION ED6567DF



KKCF213K

GENERAL DESCRIPTION EC5C1EEF

The Automatic transmission changes the gear position of the transmission by utilizing a combination of clutches and brakes, which are controlled by solenoid valves. This 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 E05D226B

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 E69CBF2C

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 EE2FA0DF

Refer to DTC P0750.

SCHEMATIC DIAGRAM E68FE3DD

Refer to DTC P0750.

SIGNAL WAVEFORM E9094571

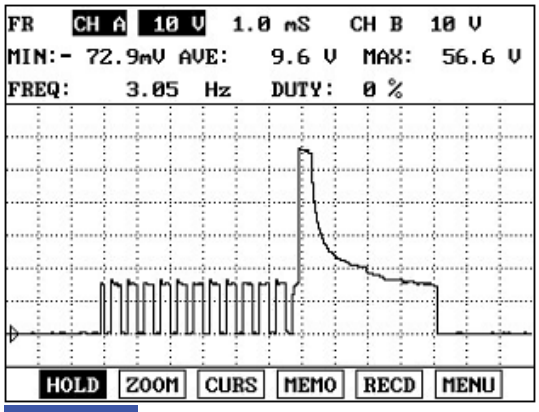


FIG.1)

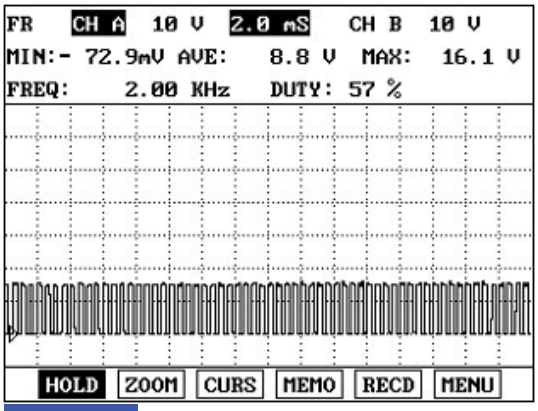


FIG.2)

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

EKBF121A

MONITOR SCANTOOL DATA E7DEA5C4

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.

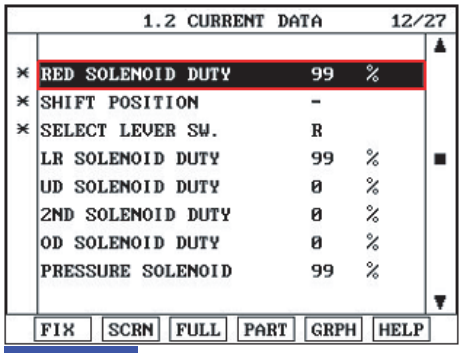


FIG.1)

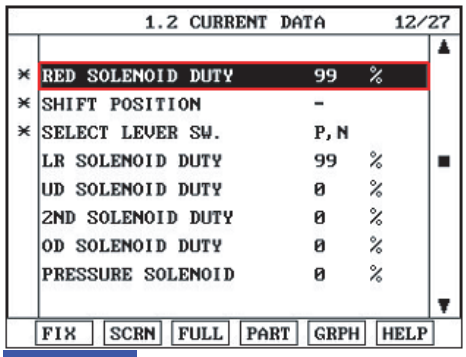


FIG.2)

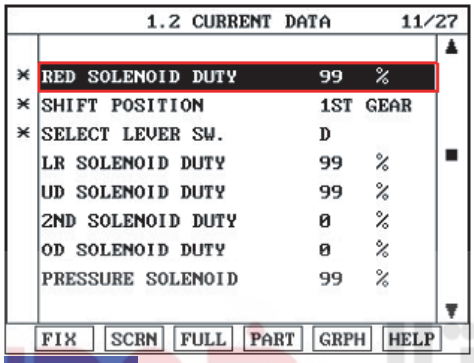


FIG.3)

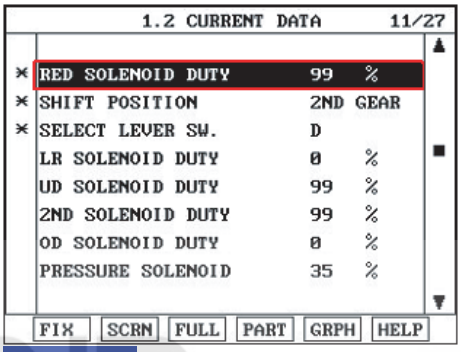


FIG.4)

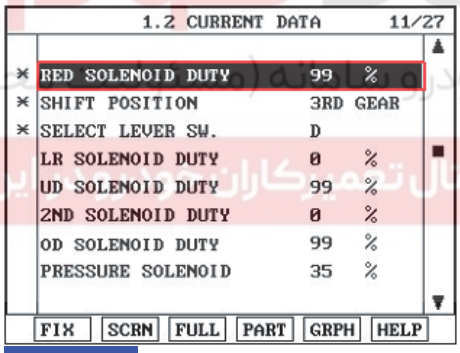


FIG.5)

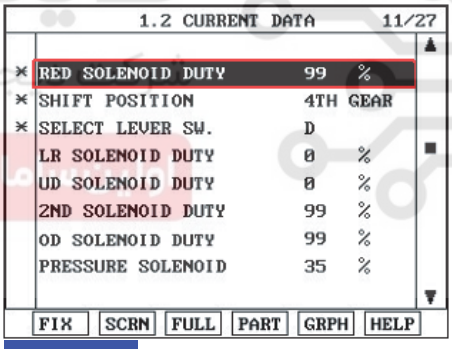


FIG.6)

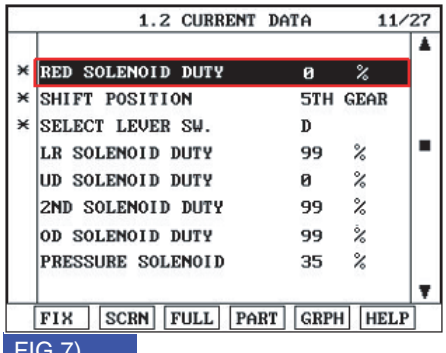


FIG.7)

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

EKBF121B

5. Does "RED 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 EC5BEB58

Refer to DTC P0750.

POWER SUPPLY CIRCUIT INSPECTION EC0FA1D1

Refer to DTC P0750.

SIGNAL CIRCUIT INSPECTION E3D2DC7D

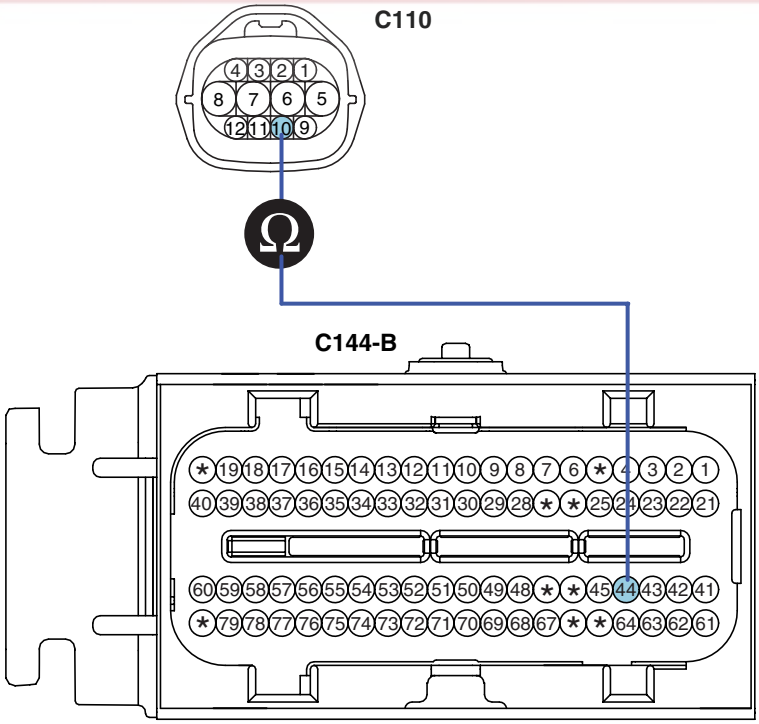
1. Check signal circuit open inspection

   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 solenoide 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

EKBF121D

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 solenoide valve

EKBF121E

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 E0D683DD

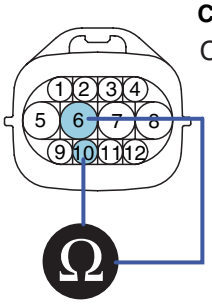
1. CHECK SOLENOID VELVE

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)]



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 solenoide valve

EKBF121F

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

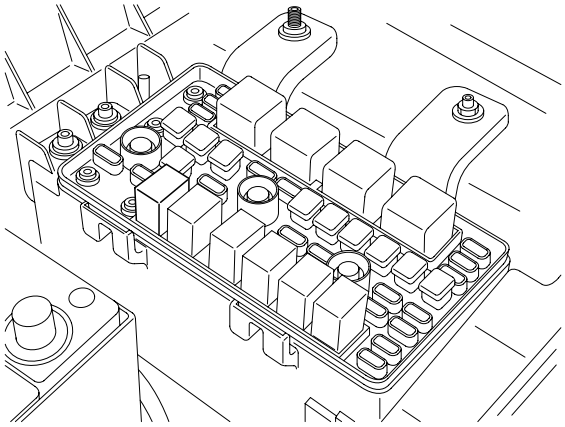
1. IG SWITCH ON
2. TRANSAXLE RANGE SWITCH is normal
3. P RANGE
4. Vehicle Speed 0mph(0km/h)
5. Throttle position sensor < 1V
6. IDLE SWITCH ON
7. ENGINE RPM 0

VERIFICATION OF VEHICLE REPAIR E8B41863

Refer to DTC P0750.

DTC P0885 A/T RELAY CIRCUIT MALFUNCTION

COMPONENT LOCATION ECFDD7B2



KKBF110A

GENERAL DESCRIPTION EECD1B8C

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).

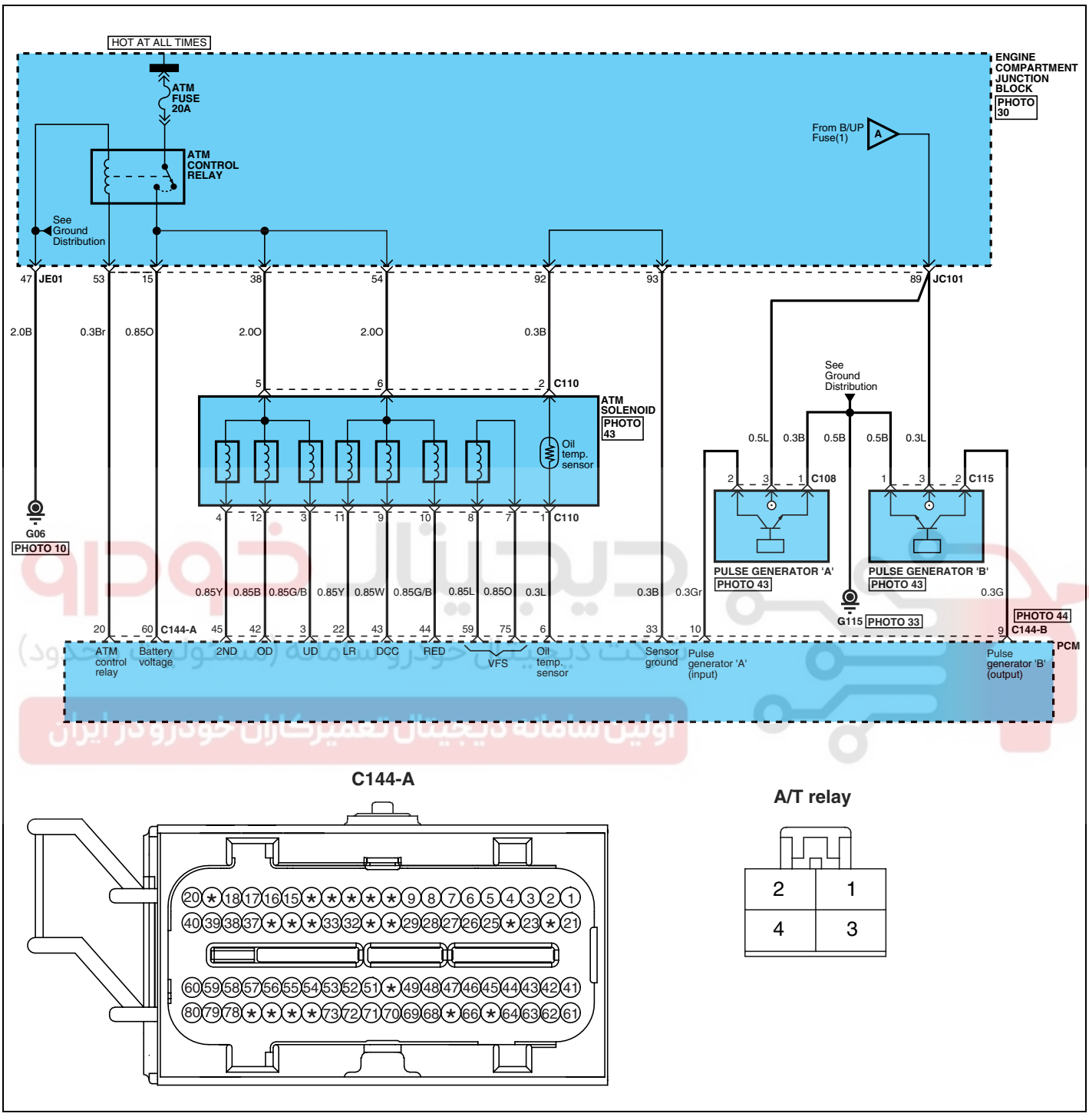
DTC DESCRIPTION EFE587C4

The TCM checks the A/T control relay signal by monitoring the contol 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 EFD23799

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 • In gear state(no gear shifting) 500msec is passed from turn on the relay • A/T Relay = ON • Engine state = RUN	
Threshold value	• 16V > Voltage Battery > 11V	
Diagnostic Time	• 1 second	
Fail Safe	• Locked in 3 rd gear.(control relay off)	

SCHEMATIC DIAGRAM EAC5E729



EKBF122G

MONITOR SCANTOOL DATA EE7BFEB9

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+

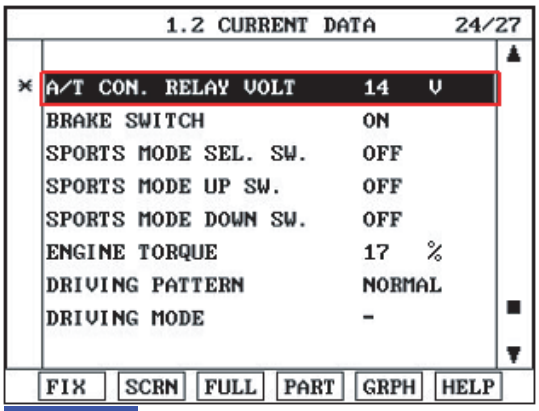


FIG.1)

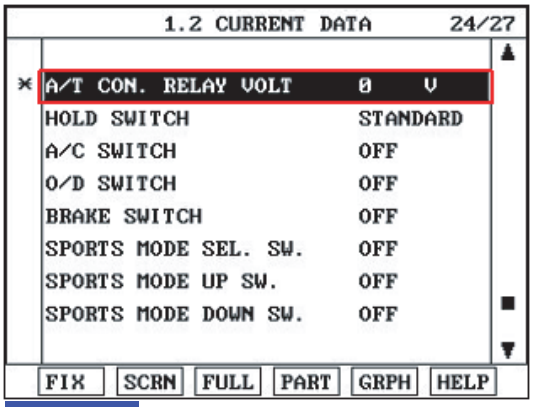


FIG.2)

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

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 E5F89AAB

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

YES

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

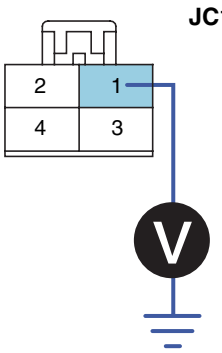
NO

▶ Go to "Power circuit inspection" procedure.

POWER SUPPLY CIRCUIT INSPECTION EBC4B32F

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(JC101) connector and chassis ground.

Specification : Approx. B+



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

EKBF122B

4. Is voltage within specifications?

YES

▶ Go to "Signal circuit inspection" procedure.

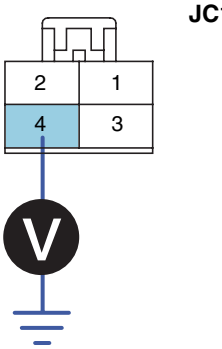
NO

▶ 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 E404FC17

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) Turn ignition switch OFF → ON

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



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

EKBF122C

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.

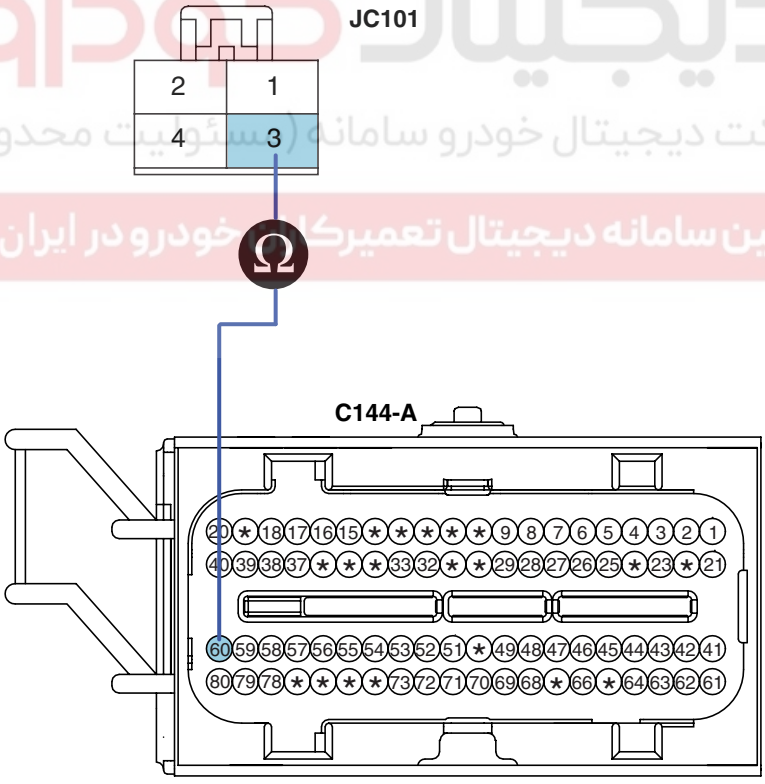
2. CHECK Supplying Power to solenoid valve harness

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



EKBF122D

4) Is resistance within specifications?

YES

▶ Go to "Ground circuit inspection" procedure.

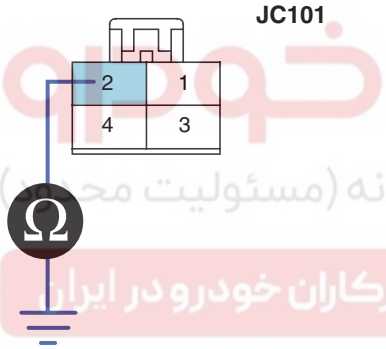
NO

▶ 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 ECC722C2

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



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

EKBF122E

4. Is resistance within specifications?

YES

▶ Go to "Component inspection" procedure.

NO

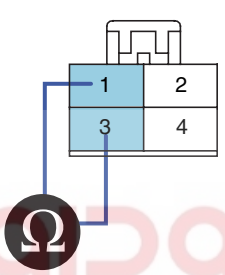
▶ Check for open in harness. Repair as necessary and Go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION E7EEAC3A

1. Ignition "OFF".
2. Remove "A/T CONTROL RELAY".
3. Measure the resistance between each terminal of the sensor.

Specification:

Item	Terminal No	
Resistance	1(red) - 3(black)	INFINITE
	2(black) - 4(red)	
supply(B+) to number 4 and supply (B-) to number 2	1(red) - 3(black)	0Ω



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

EKBF122F

4. Is resistance with in 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 ATM CONTROL RELAY and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR EF7A4A24

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 EAC2BBAF

Refer to DTC P0885.

GENERAL DESCRIPTION E4333EB6

Refer to DTC P0885.

DTC DESCRIPTION EA3A0DCC

Refer to DTC P0885.

DTC DETECTING CONDITION EEEE0EE7

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 • A/T Relay = ON	
Threshold value	• Feedback Voltage ≤ 0.5V	
Diagnostic Time	• 1 second	
Fail Safe	• Locked in 3 rd gear.(control relay off)	

SCHEMATIC DIAGRAM E722262C

Refer to DTC P0885.

MONITOR SCANTOOL DATA E5946DF5

Refer to DTC P0885.

TERMINAL & CONNECTOR INSPECTION EF3A356A

Refer to DTC P0885.

POWER SUPPLY CIRCUIT INSPECTION E71A37B0

Refer to DTC P0885.

SIGNAL CIRCUIT INSPECTION E5C4BFE9

Refer to DTC P0885.

GROUND CIRCUIT INSPECTION EF7AB8FD

Refer to DTC P0885.

COMPONENT INSPECTION ED16A7EE

Refer to DTC P0885.

VERIFICATION OF VEHICLE REPAIR E38EEA10

Refer to DTC P0885.

DTC P0891 AT RELAY - OPEN CIRCUIT

COMPONENT LOCATION EEDEAECF

Refer to DTC P0885.

GENERAL DESCRIPTION E2ECBF54

<Refer to DTC P0885.

DTC DESCRIPTION EEF19096

Refer to DTC P0885.

DTC DETECTING CONDITION E5CE3C04

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 • A/T Relay = ON	
Threshold value	• Feedback Voltage ≥ 20V	
Diagnostic Time	• 1 second	
Fail Safe	• Locked in 3 rd gear.(control relay off)	

SCHEMATIC DIAGRAM EFB78254

Refer to DTC P0885.

MONITOR SCANTOOL DATA EEDBDC4A

<Refer to DTC P0885.

TERMINAL & CONNECTOR INSPECTION EEDFDC3D

Refer to DTC P0885.

POWER SUPPLY CIRCUIT INSPECTION E577B6CC

Refer to DTC P0885.

SIGNAL CIRCUIT INSPECTION EC8DDDEC

Refer to DTC P0885.

GROUND CIRCUIT INSPECTION EFAD4D35

Refer to DTC P0885.

COMPONENT INSPECTION EBAA0CFE

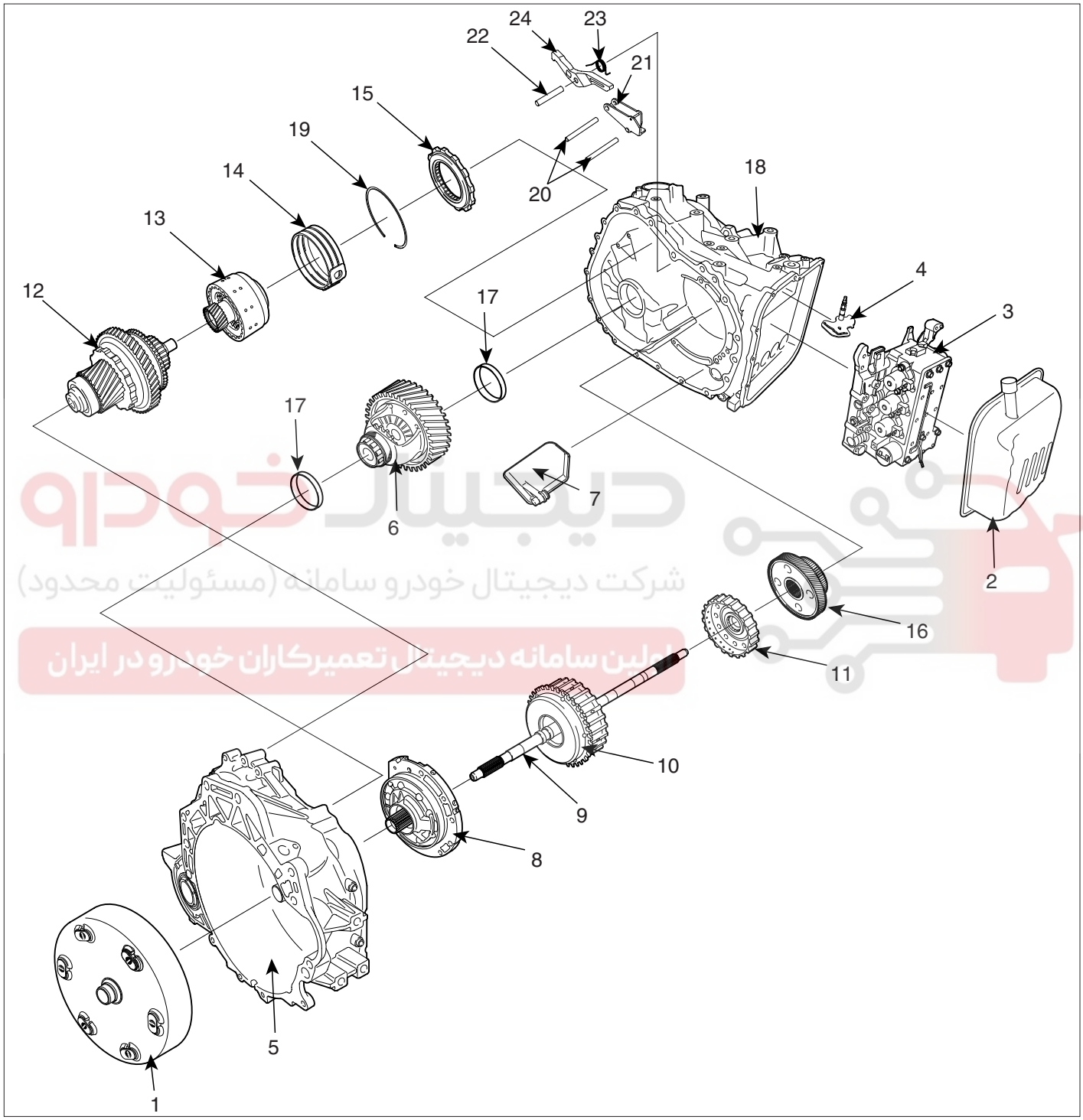
Refer to DTC P0885.

VERIFICATION OF VEHICLE REPAIR ED534128

Refer to DTC P0885.

AUTOMATIC TRANSAXLE

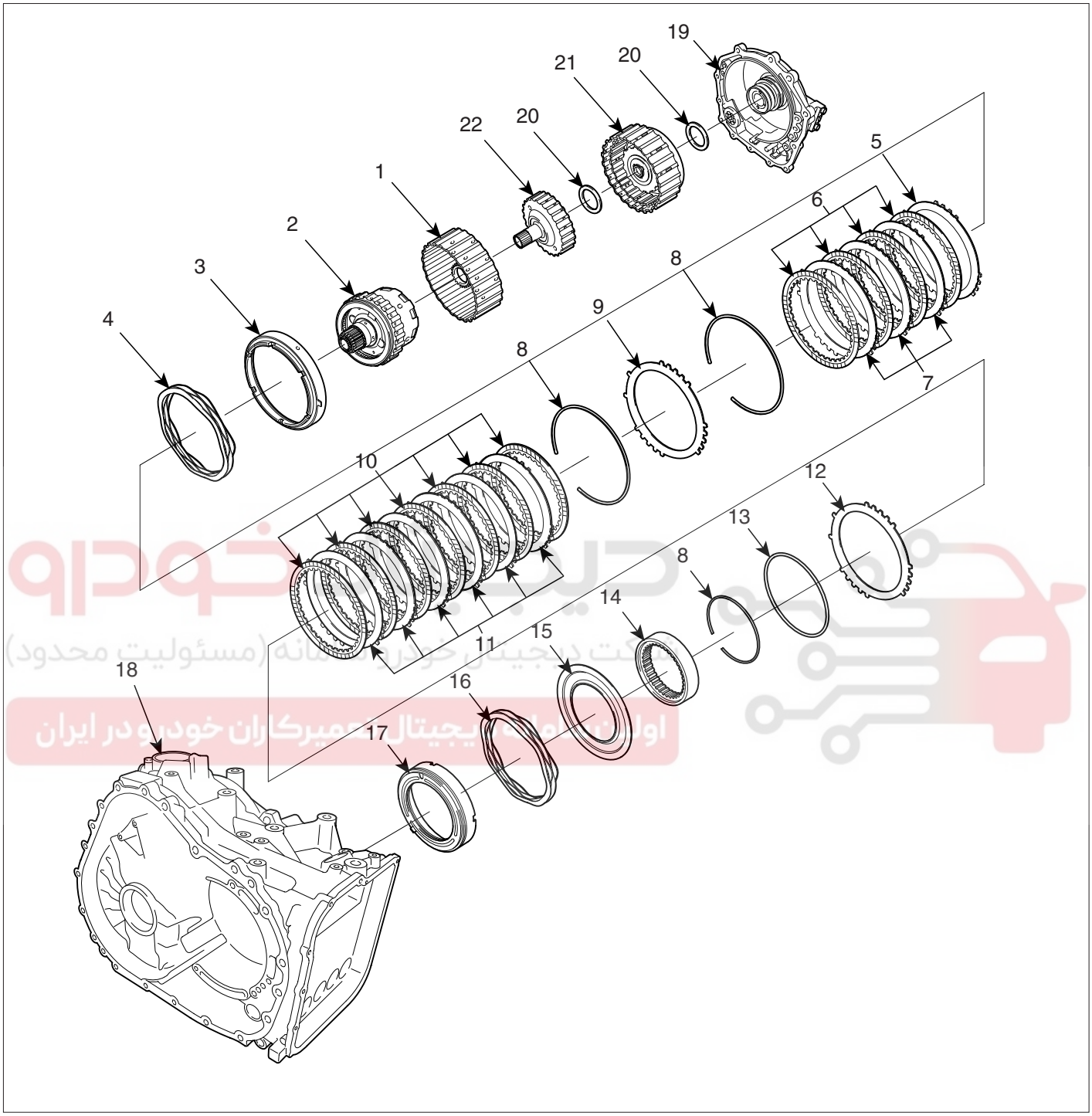
COMPONENTS (1) EABC42F5



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
19. Snap ring
20. Parking rollar support shaft
21. Parking rollar support
22. Parking sprag shaft
23. Parking sprag spring
24. Parking sprag

EKBF001A

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
19. Rear cover
20. Thrust bearing
21. Reverse & Overdrive clutch
22. Overdrive clutch hub

EKBF001B

REMOVAL E1A4B0CC

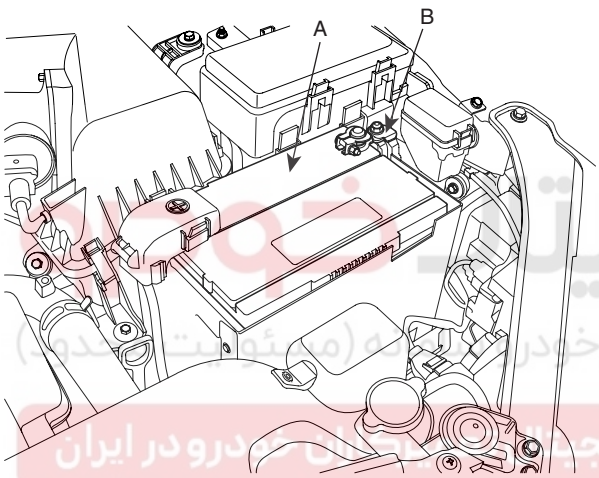
CAUTION

- ***Use a cover not to damage the vehicle surface.***
- ***Disconnect connectors carefully not to be damaged.***

NOTE

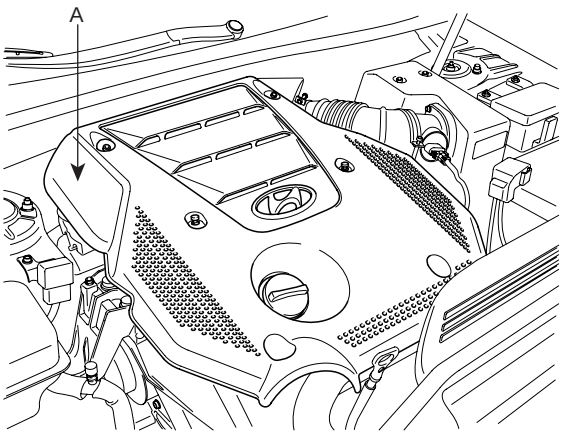
- *Mark wires or hoses for identification not to be confused.*

1. Disconnect the negative terminal(B) from the battery(A).



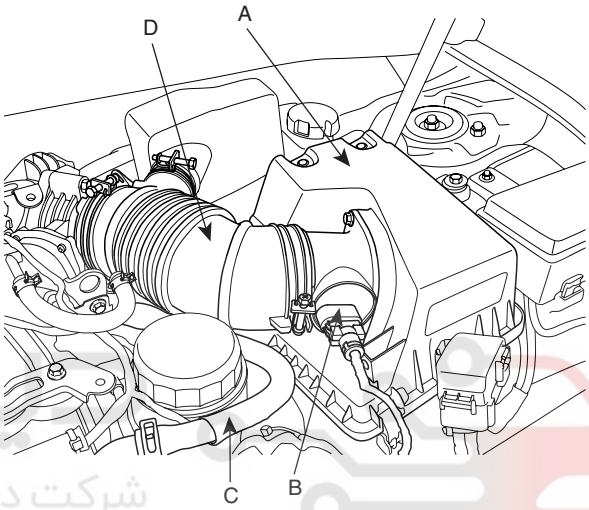
KKBF001A

2. Remove the engine cover(A).



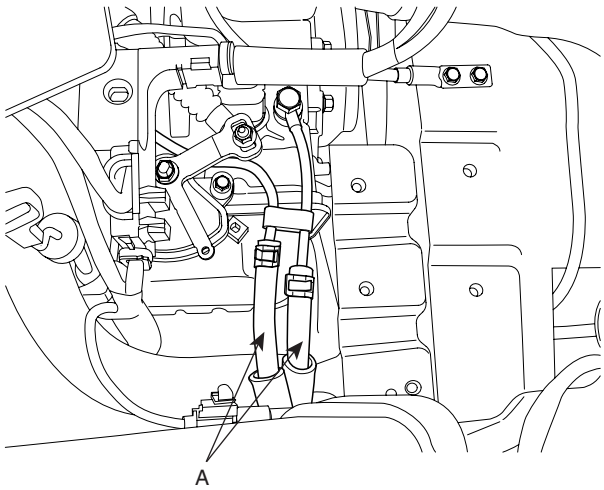
KKBF040A

3. Remove the intake air hose(D) and the air cleaner assembly(A).
   1) Disconnect the AFS connector(B).
   2) Disconnect the breather hose(C) from air cleaner hose(D).
   3) Disconnect the PCM connectors. (See FL group)
   4) Remove the intake air hose(D) and air cleaner (A).



KKBF040I

4. After disconnecting the positive terminal from the battery, remove the battery.
5. Remove the transaxle oil cooler hoses(A).

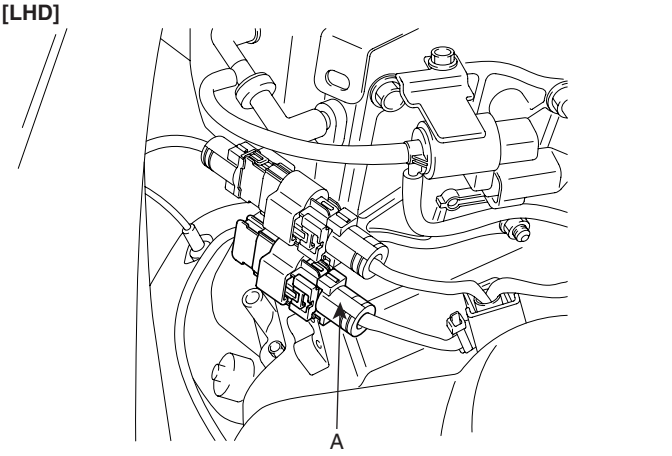


KKBF004A

6. Remove engine wiring.

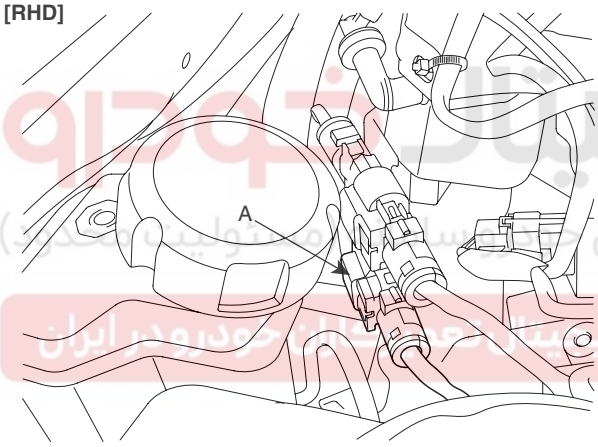
   1) Disconnect the RH rear oxygen sensor connector(A).

[LHD]



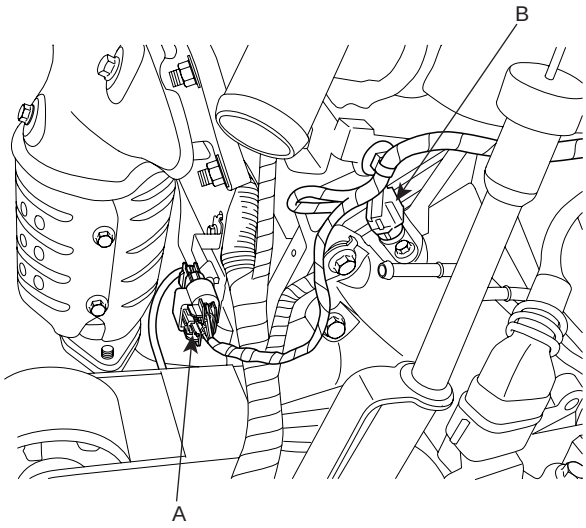
EKBF006A

[RHD]



EKBF006B

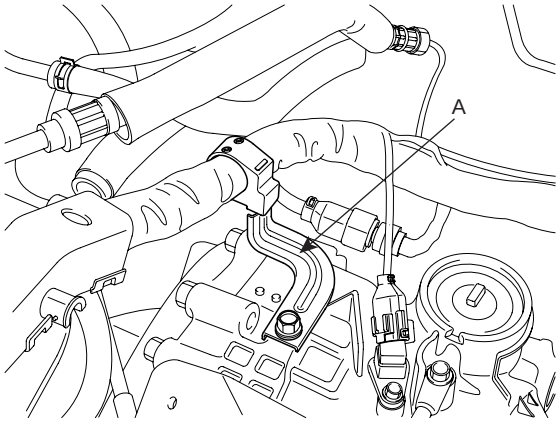
   2) Disconnect the LH rear oxygen sensor connector(A) and the CPS connector(B).



KKCF014Y

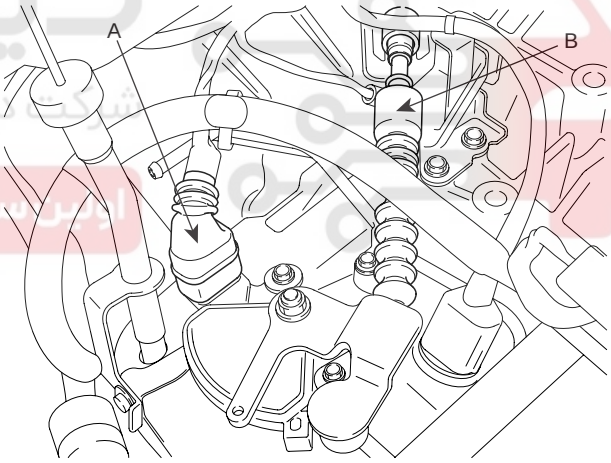
7. Disconnect the transaxle wire harness connector and remove transaxle control cable.

   1) Remove the wiring brackets(A).



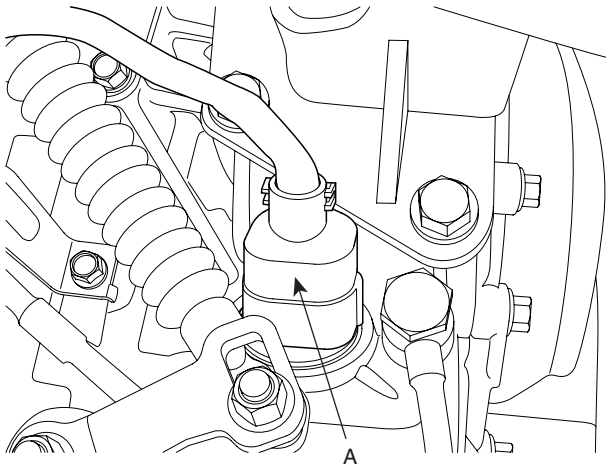
KKBF040C

   2) After removing a transaxle bracket, remove the inhibiter switch connector(A) and shift cable(B).



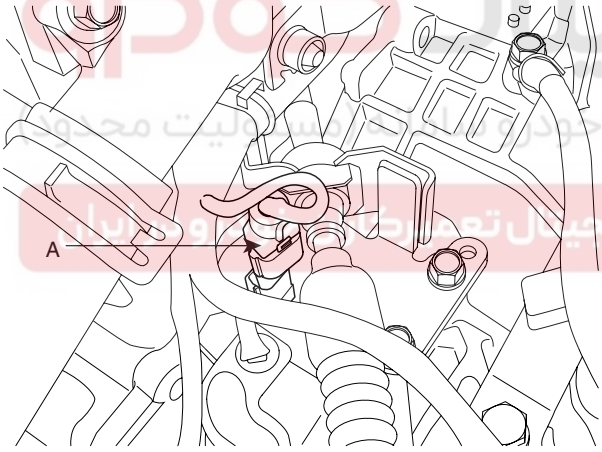
KKCF015B

3) Remove the solenoid valve connector(A).

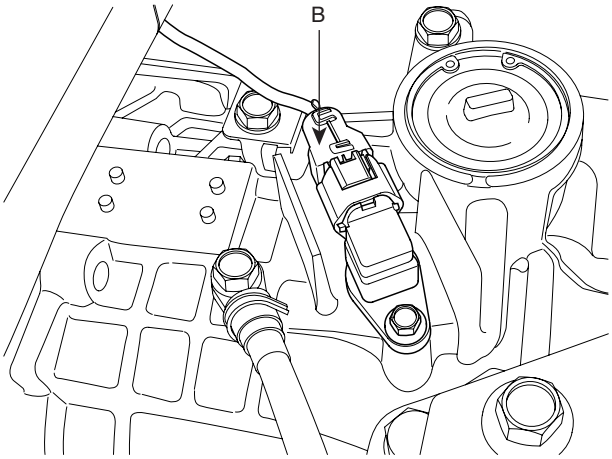


KKBF014A

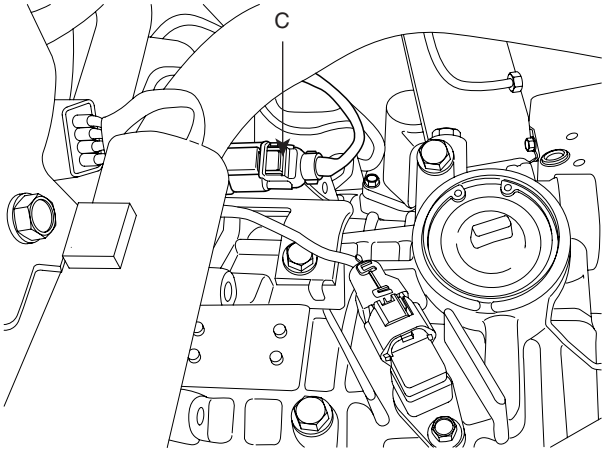
4) Remove the input speed sensor, output speed sensor(A, B) and vehicle speed sensor connector(C).



KKBF012A

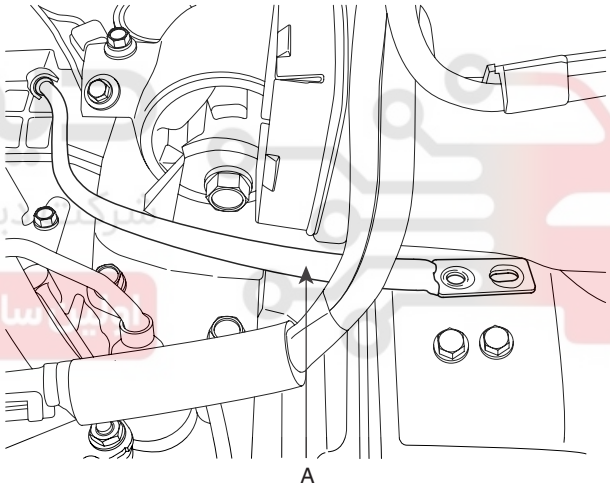


KKBF040J



KKBF040K

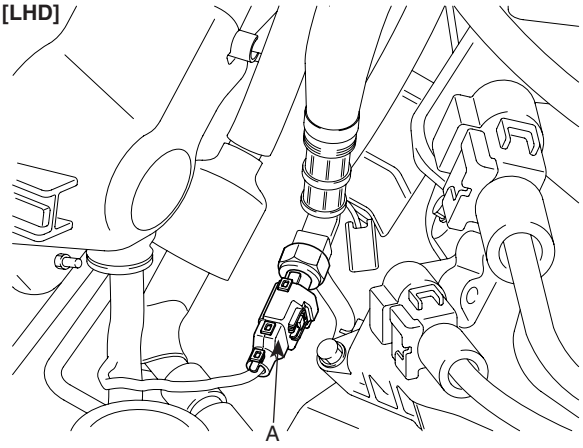
5) Disconnect the ground wire(A).



KKBF016A

8. Disconnect the power steering pressure sensor connector(A).

[LHD]

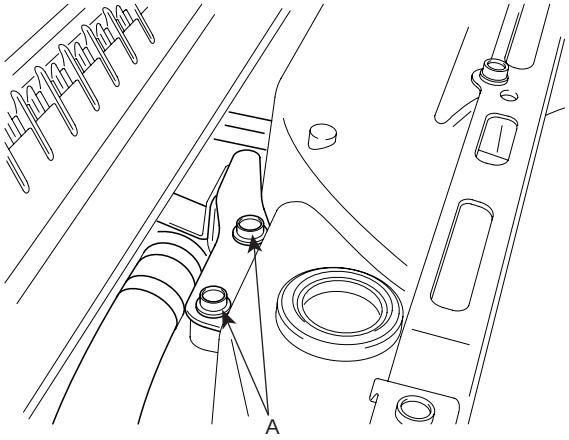


EKBF006C

[RHD]

EKBF006D

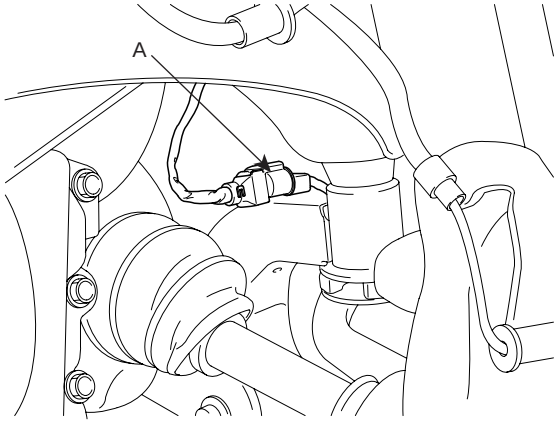
9. Remove the power steering hose mounting bolts(A-2EA).



KKBF040E

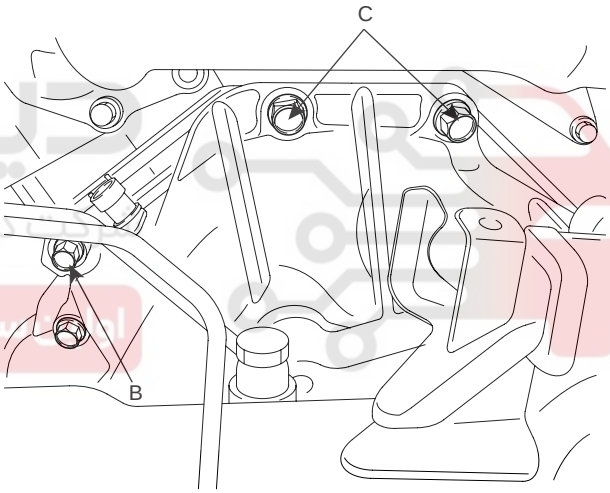
10. Remove the front wheels.

11. Disconnect the EPS connector(A) around the left hand side front wheel.



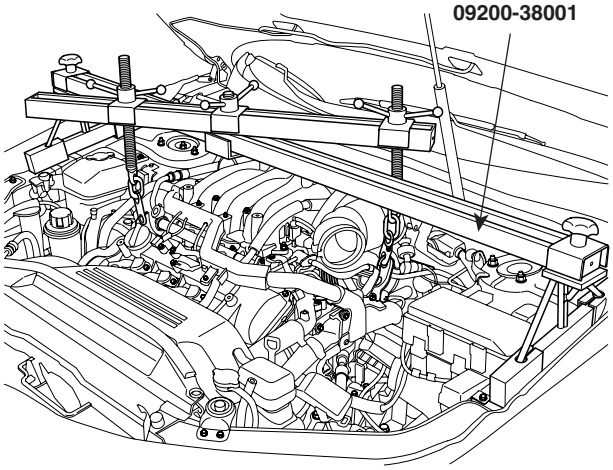
KKBF040F

12. Remove the transaxle mounting bolts(B, C).



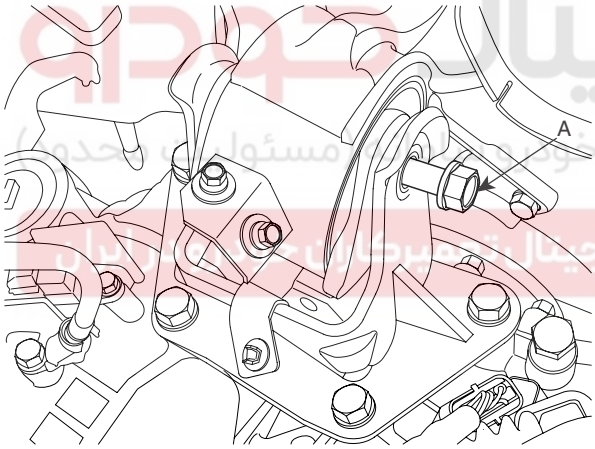
KKCF015L

13. Using the SST(09200-38001), hold the enigne and transaxle assembly safely.



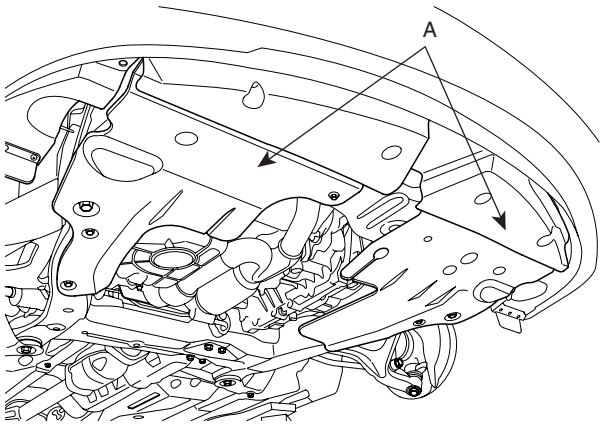
KKBF006A

14. Remove the transaxle insulator mounting bolt(A).



KKBF010A

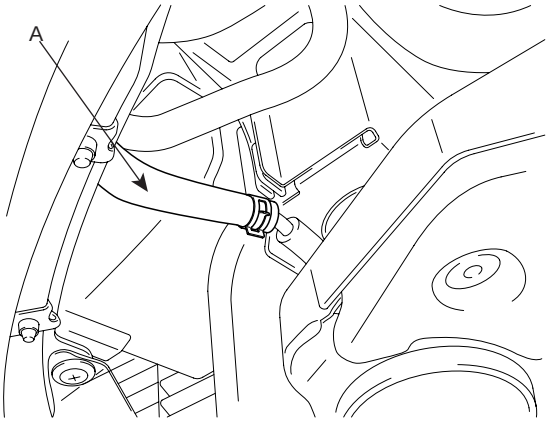
15. After lifting up the vehicle, remove the under cover(A).



KKBF005A

16. Drain transaxle oil.

17. Disconnect the power steering pump hose(A).



KKBF040G

18. Disconnect the lower arm assembly from the knuckle. (see DS group)

19. Disconnect the tie rod end ball joint from the knuckle after removing the split pin. (see DS group)

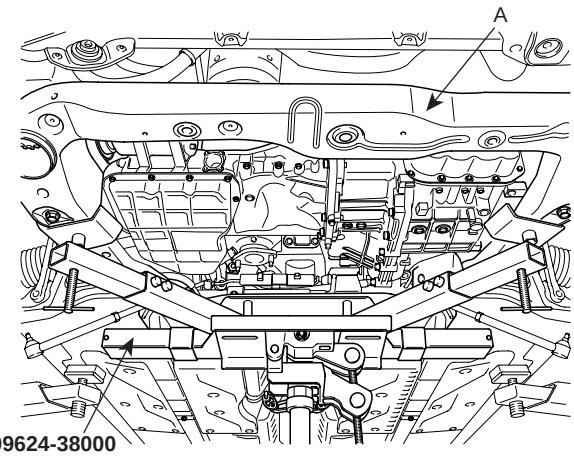
20. Disconnect the stabilizer bar link. (see SS group)

21. Remove the front roll stopper mounting bolt. (see ST group)

22. Remove the front exhaust pipe. (see EM group)

23. Remove the rear roll stopper mounting bolt. (see ST group)

24. Using the SST(09624-38000) and holding the cross member(A) with a jack, remvoe the steering bolt.



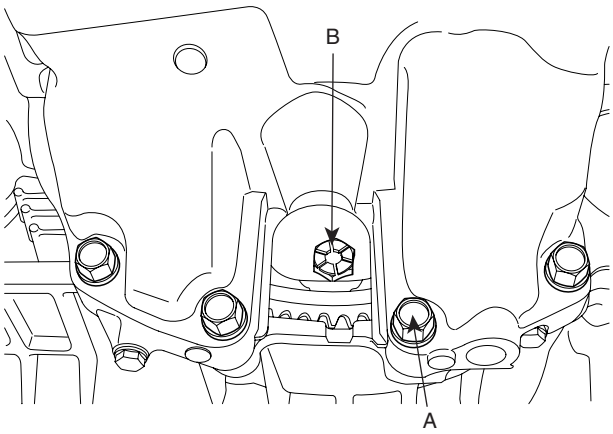
KKBF040H

25. Remove the cross member.

26. Remove drive shaft from transaxle. (See 'DS' group)

27. Install a jack for supporting the transaxle assembly.

28. Remove the transaxle under mounting bolts(A) and the drive plate bolts(B).



KKBF009A

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

INSTALLATION E0D7FB67

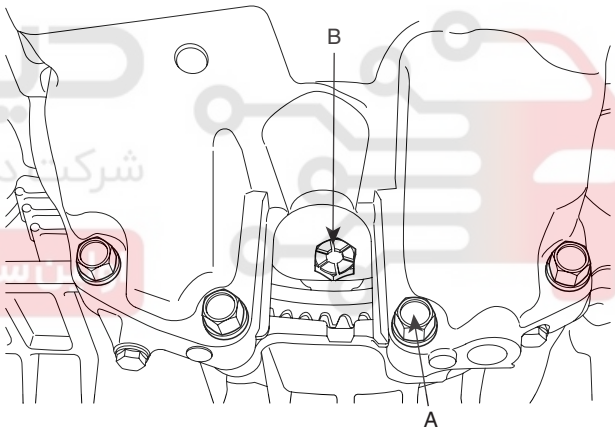
Installation is in the reverse order of removal.
Perform the following :

- 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. Lowering the vehicle or lifting up a jack, install the transaxle assembly.

2. Tighten the transaxle under mounting bolts(A, B).

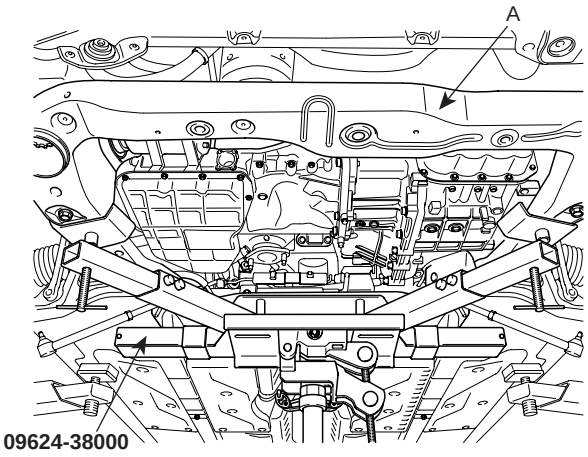
TORQUE:
34.3~41.2 Nm(350~420 Kgf.cm, 25.3~30.4 lb.ft) - A
45.1~52.0 Nm(460~530 Kgf.cm, 33.3~38.3 lb.ft) - B



KKBF009A

3. After removing a jack, insert the drive shafts. (see DS group)

4. Supporting the cross member with the SST(09624-38000), tighten the steering column bolt and the cross member mounting bolts. (see ST group)



KKBF040H

5. Tighten the rear roll stopper mounting bolt. (see ST group)

TORQUE:
49.0~63.7 Nm(500~650 Kgf.cm, 36.2~47.0 lb.ft)

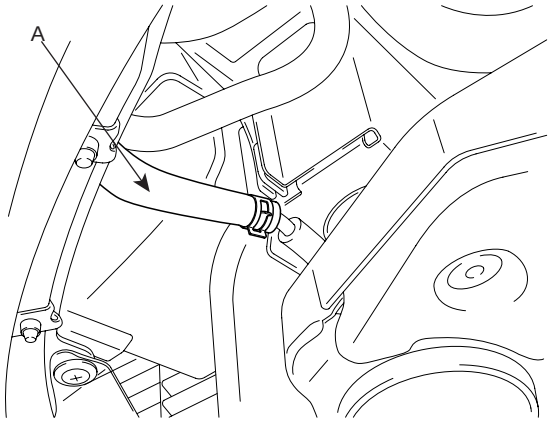
6. Install the front exhaust pipe. (see EM group)

7. Tighten the front roll stopper mounting bolt. (see ST group)

TORQUE:
49.0~63.7 Nm(500~650 Kgf.cm, 36.2~47.0 lb.ft)

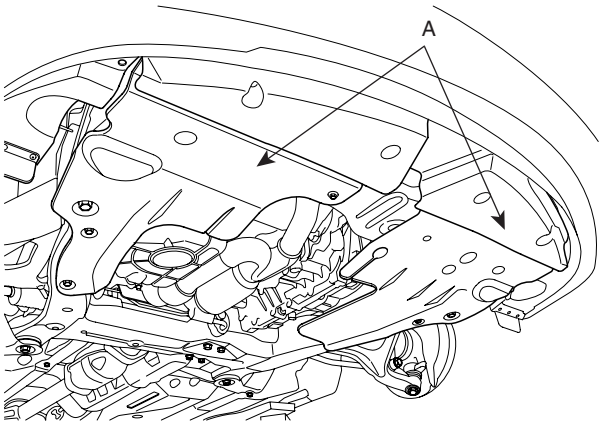
8. Install the steering bar tie rod, the stabilizer bar link and the lower arm assembly. (see ST group)

9. Clamp the power steering pump hose(A).



KKBF040G

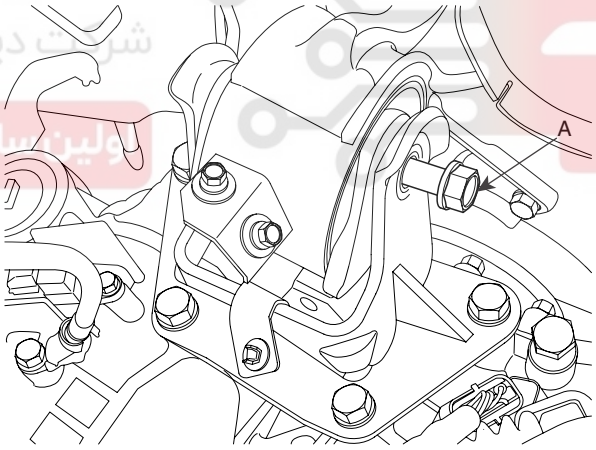
10. Install the under cover(A).



KKBF005A

11. After lowering the vehicle, tighten the transaxle insulator mounting bolt(A).

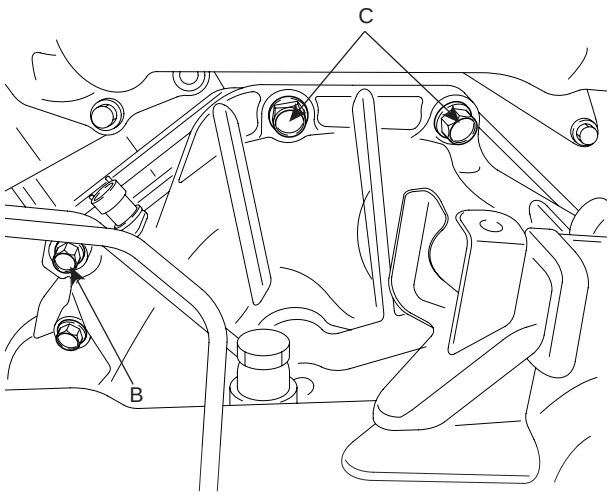
TORQUE:
63.7~83.4 Nm(650~850 Kgf.cm, 47.0~61.5 lb.ft)



KKBF010A

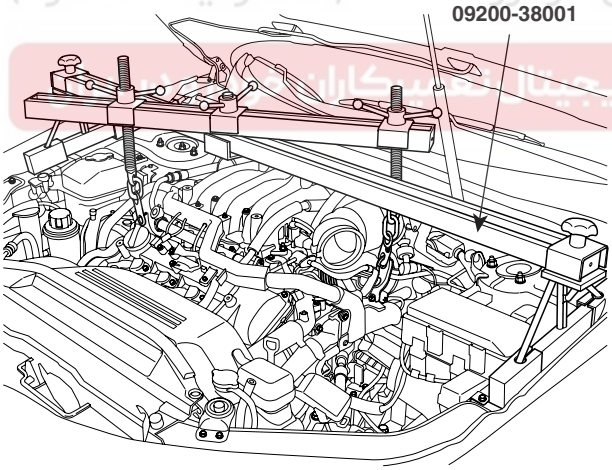
12. Tighten the transaxle mounting bolts(B, C).

TORQUE:
32.4~49.0 Nm(350~420 Kgf.cm, 23.9~36.2 lb.ft) - A
63.7~83.4 Nm(650~850 Kgf.cm, 47.0~61.5 lb.ft) - B



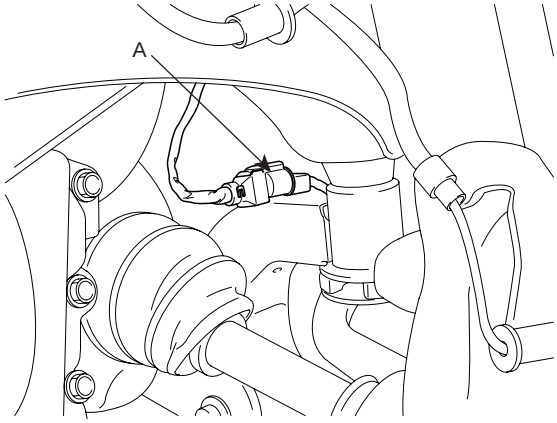
KKCF015L

13. Remove the SST(09200-38001) holding the engine and transaxle assembly.



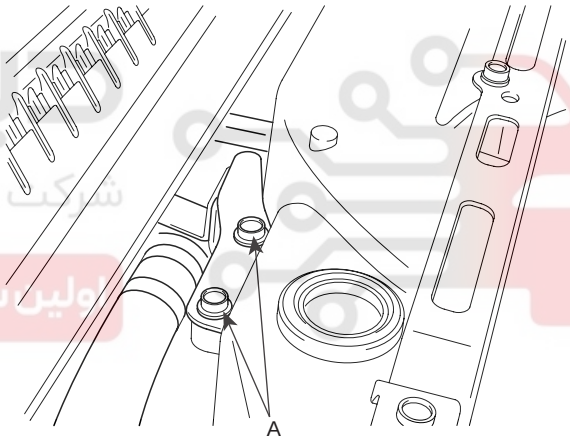
KKBF006A

14. Connect the EPS connector(A) and install the front wheels and tires.



KKBF040F

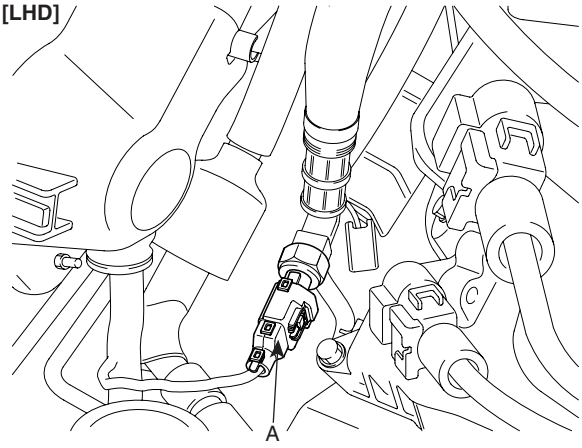
15. Install the power steering hose mounting bolts(A-2EA).



KKBF040E

16. Connect the power steering pressure sensor connector(A).

[LHD]



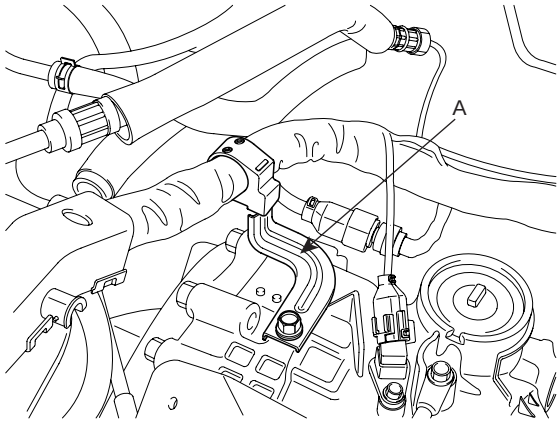
EKBF006C

[RHD]

EKBF006D

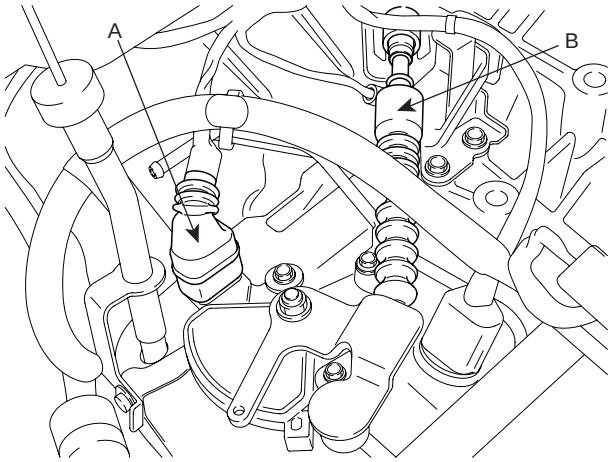
17. Connect the transaxle wire harness connector and the control cable.

1) Install the wiring brackets(A).



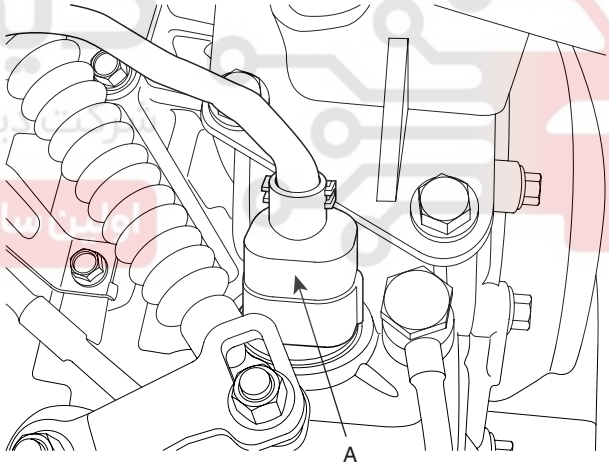
KKBF040C

2) Connect the inhibitor switch connector(A) and the shift cable(B) and install the transaxle bracket.



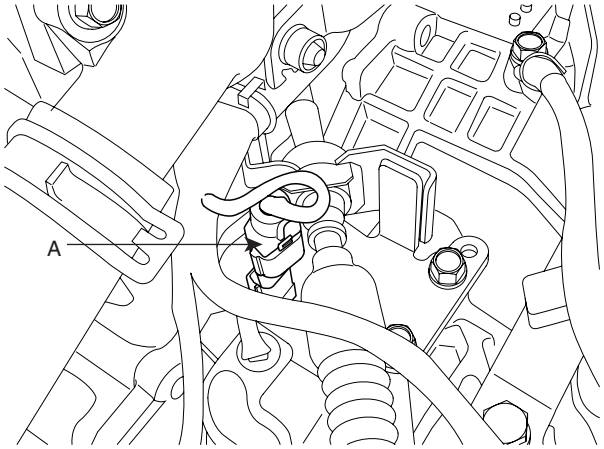
KKCF015B

3) Connect the solenoid valve connector(A).

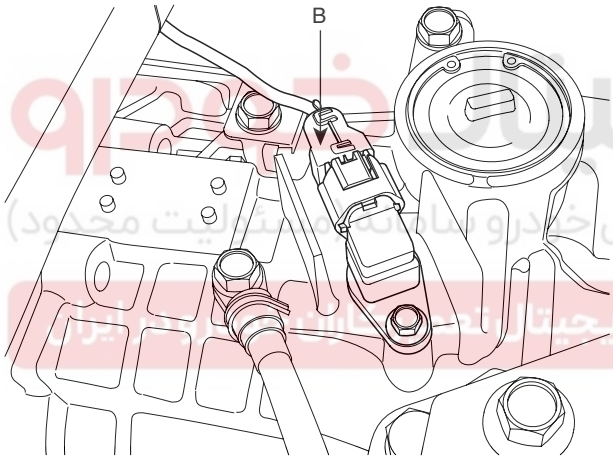


KKBF014A

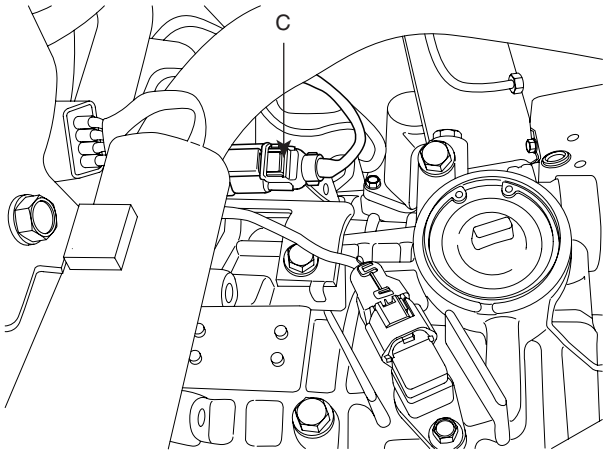
4) Connect the input/output speed sensor connectors(A, B) and vehicle speed sensor connector(C).



KKBF012A

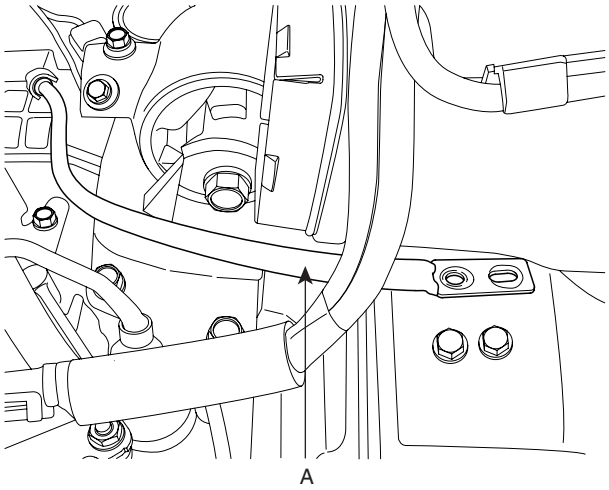


KKBF040J



KKBF040K

5) Connect the ground wire(A).

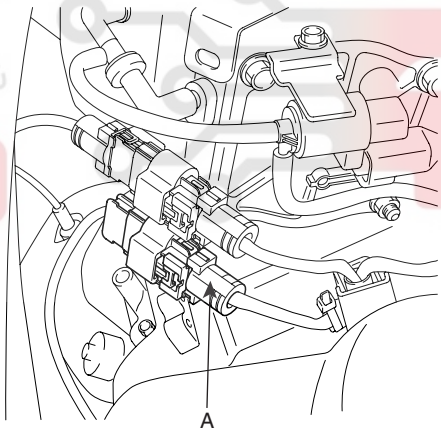


KKBF016A

18. Connect engine wiring.

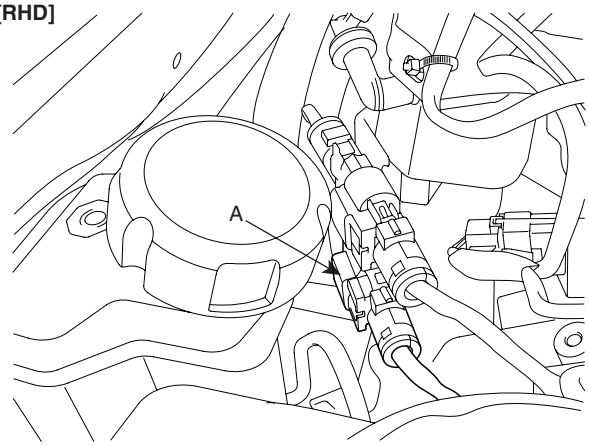
1) Connect the RH rear oxygen sensor connector(A).

[LHD]



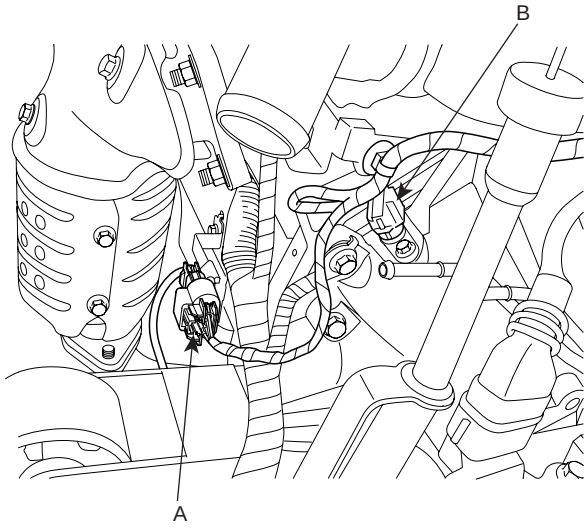
EKBF006A

[RHD]



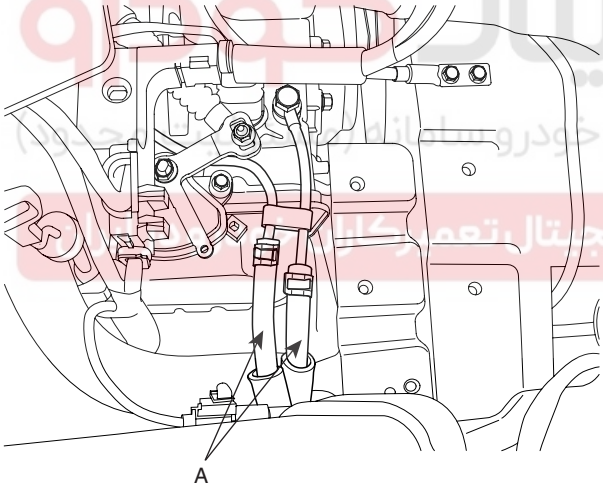
EKBF006B

2) Connect the LH rear oxygen sensor connector(A) and the CPS connector(B).



KKCF014Y

19. Clamp the transaxle oil cooler hoses(A).



KKBF004A

20. After disconnecting the positive terminal from the battery, remove the battery.

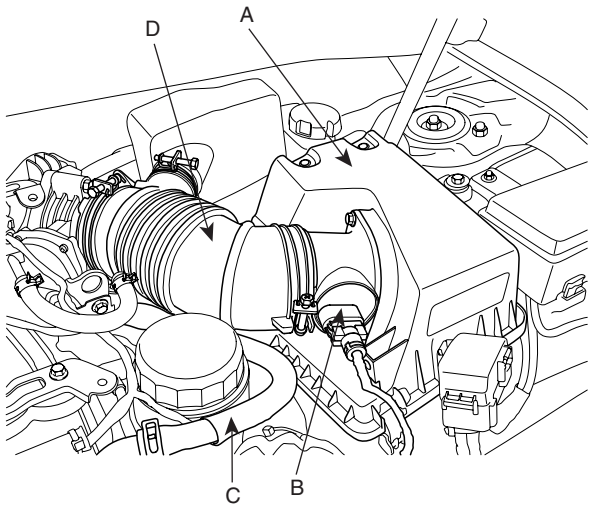
21. Install the intake air hose(D) and the air cleaner assembly(A).

1) Connect the AFS connector(B).

2) Clamp the breather hose(C) from the air cleaner hose(D).

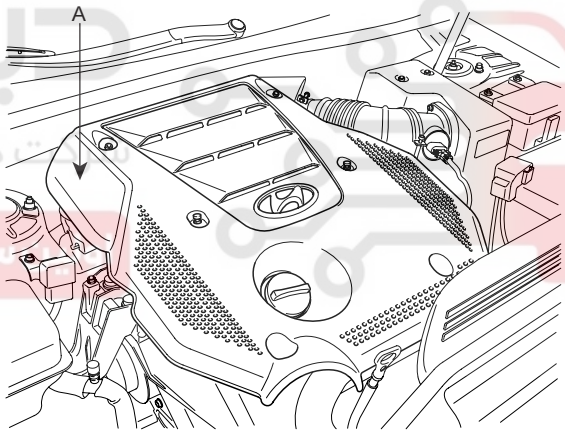
3) Connect the PCM connectors. (See FL group)

4) Install the intake air hose(D) and the air cleaner assembly(A).



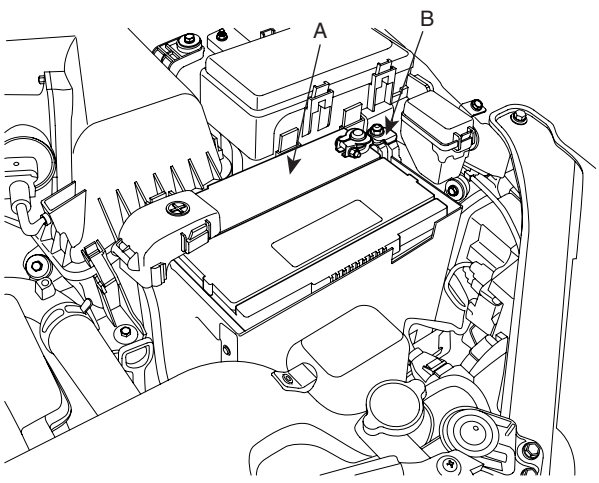
KKBF040I

22. Install the engine cover(A).



KKBF040A

23. Connect the negative terminal(B) from the battery(A).



KKBF001A