

2006 TRANSMISSION**Automatic Transaxle (A5HF1) - Azera****GENERAL****SPECIFICATIONS****GENERAL SPECIFICATION**

Engine type		3.8 L
Transaxle type		A5HF1-2
Gear ratio	1ST	3.840
	2ND	2.092
	3RD	1.440
	4TH	1.048
	5TH	0.728
	REV.	3.859
Final gear ratio		3.333
T/M oil capacity(l) ⁽¹⁾		10.9
(1) 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' procedure of the automatic transaxle fluid.		

GENERAL SPECIFICATION

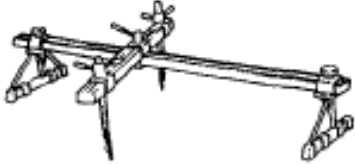
Recommended transaxle oil			Diamond ATF SP III or SK ATF SP III
Check & Replenishment			Every one year or every 24,000km
Replacement	Private use	Normal use	No service required
		Severe use ⁽¹⁾	Every 48,000km
	Business use		

(1) Severe use(marked '*) is defined as:

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**SPECIAL TOOLS SPECIFICATION**

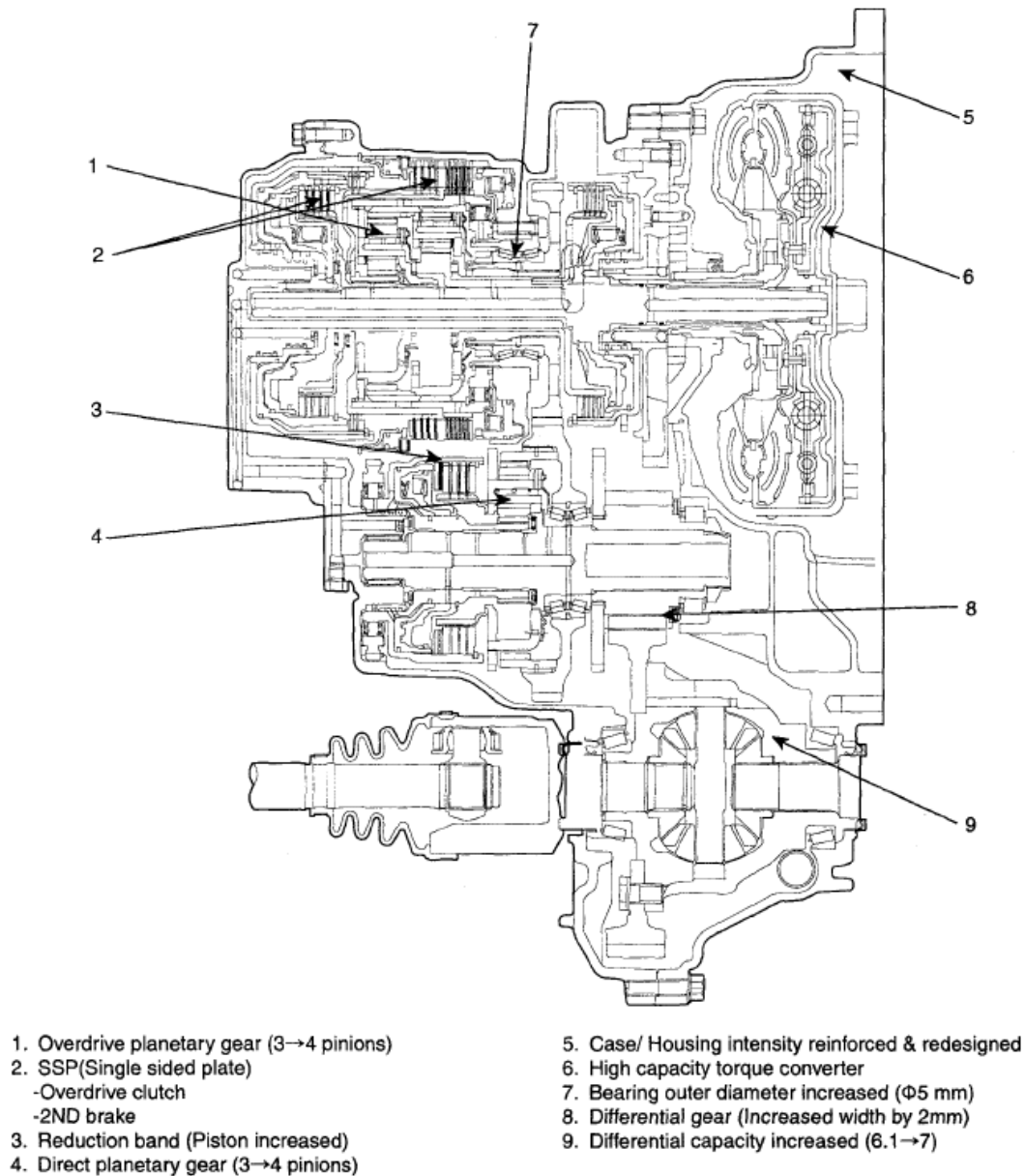
Tool (Number and name)	Illustration	Use

09200-38001 Engine support fixture	 KKBFD030A	○ Removal and installation of transaxle
09624-38000 Crossmember supporter	 EKBF005A	○ Supporting of the crossmember

AUTOMATIC TRANSAXLE SYSTEM

DESCRIPTION

1. Structure & Technical highlights



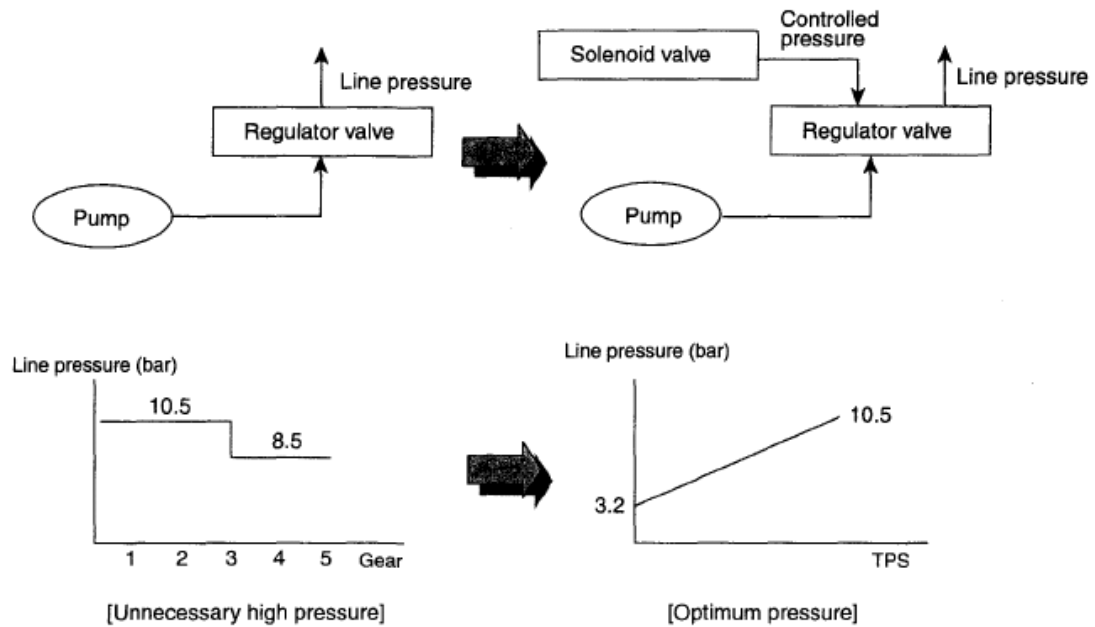
EKBF002A

Fig. 1: Cross Sectional View Of Automatic Transaxle System
 Courtesy of HYUNDAI MOTOR CO.

2. Variable Line Pressure Control

- Description
 - Form the most suitable line pressure according to the vehicle driving condition
- Special Features
 - VFS (Variable Force Solenoid) valve (For varying line pressure)
 - Reducing valve added (Stabilize control pressure in shiftings)
- Effects

- Improved power transmission efficiency and fuel consumption



EKBF002B

Fig. 2: Variable Line Pressure Control Chart
Courtesy of HYUNDAI MOTOR CO.

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

CLUTCHES AND BRAKES FOR EACH RANG

CLUTCHES AND BRAKES FOR RANG

	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	-	(1)	(1)
	2nd	o	-	o	-	o	-	-	(1)
	3rd	o	o	-	-	o	-	-	(1)
	4th	-	o	o	-	o	-	-	(1)
	5th	-	o	o	-	-	o	-	-

(1) (: Locked when driving)

FUNCTIONS OF CLUTCHES AND BRAKE

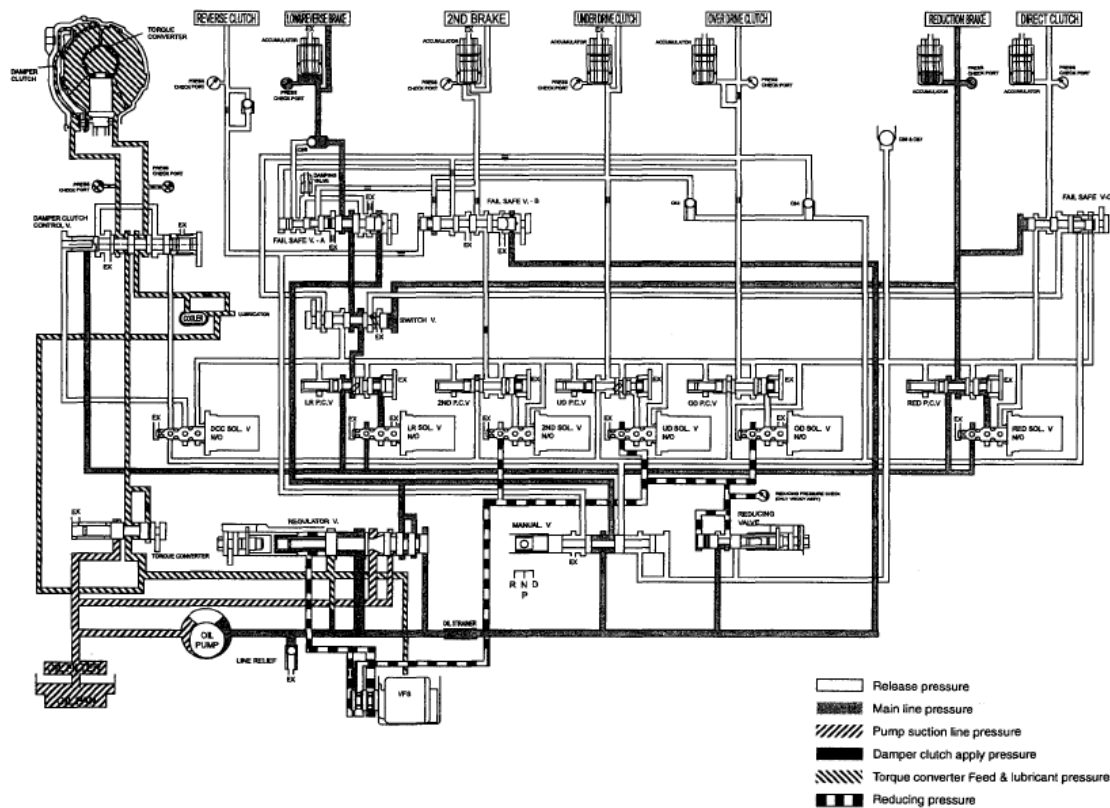
CLUTCHES AND BRAKE FUNCTIONS

Element	Sign	Function
Underdrive clutch	UD	Connect the input shaft with the underdrive sun gear
Reverse clutch	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 direction of the low & reverse ring gear
One way clutch 2	OWC 2	Control the rotational direction of the direct sun gear

AUTOMATIC TRANSAXLE HYDRAULIC CIRCUIT

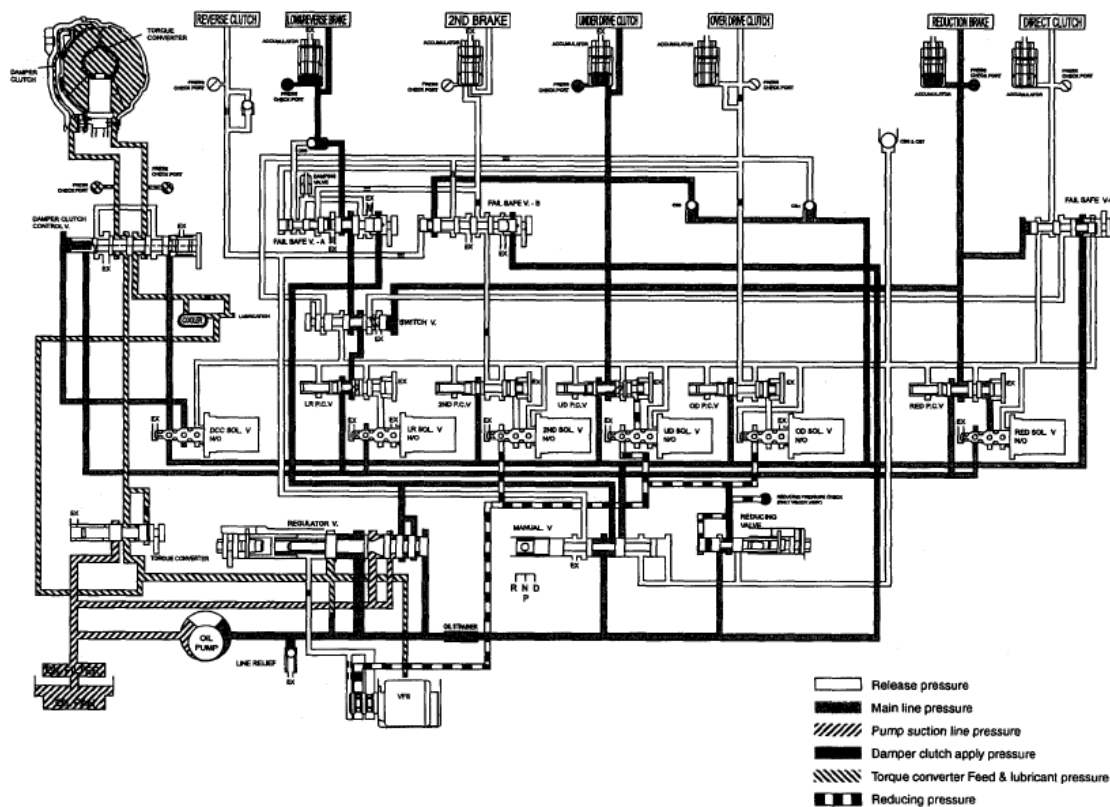
P/N



EKBF004A

Fig. 3: Automatic Transaxle Hydraulic Circuit Diagram - P/N
 Courtesy of HYUNDAI MOTOR CO.

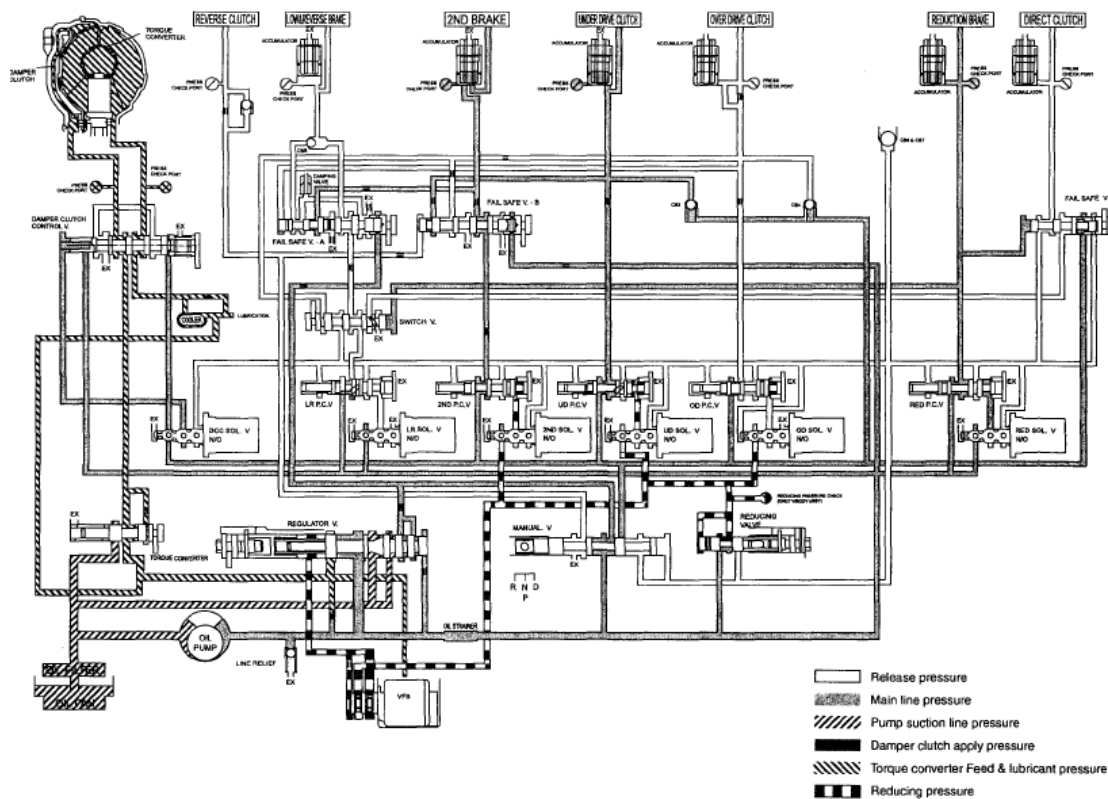
D (1 RANGE)



EKB004B

Fig. 4: Automatic Transaxle Hydraulic Circuit Diagram - D (1 Range)
 Courtesy of HYUNDAI MOTOR CO.

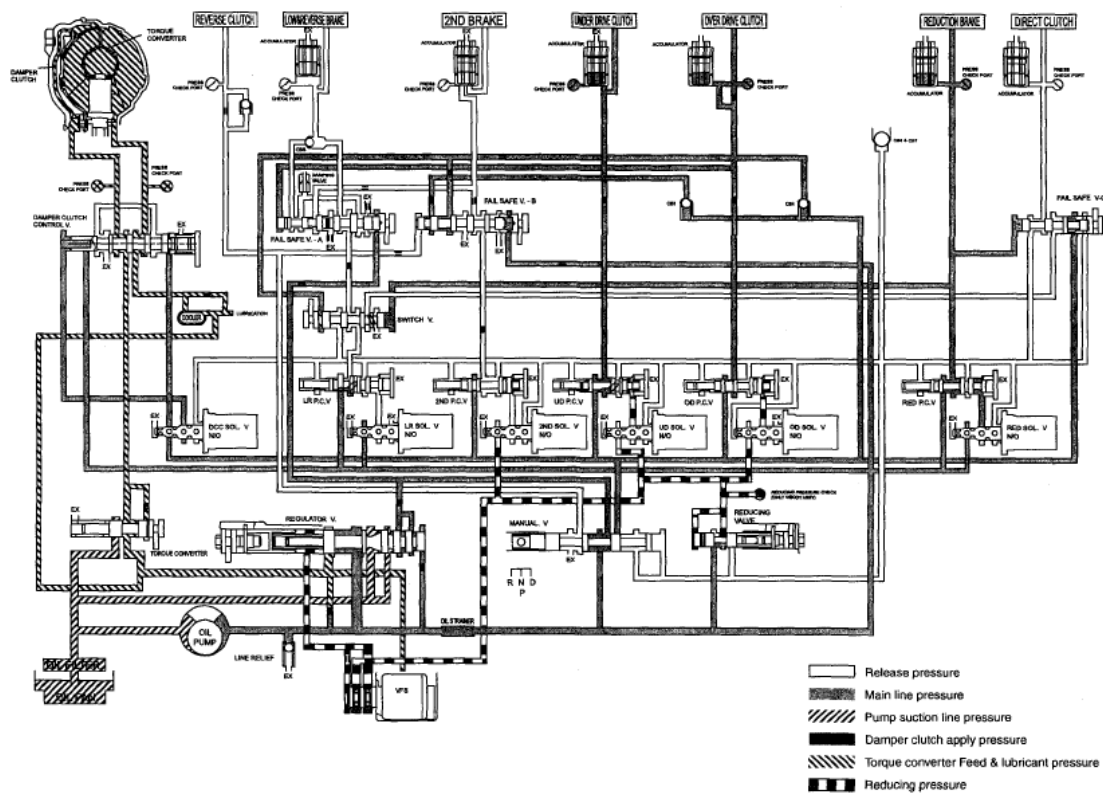
D (2 RANGE)



EKBFD04C

Fig. 5: Automatic Transaxle Hydraulic Circuit Diagram - D (2 Range)
 Courtesy of HYUNDAI MOTOR CO.

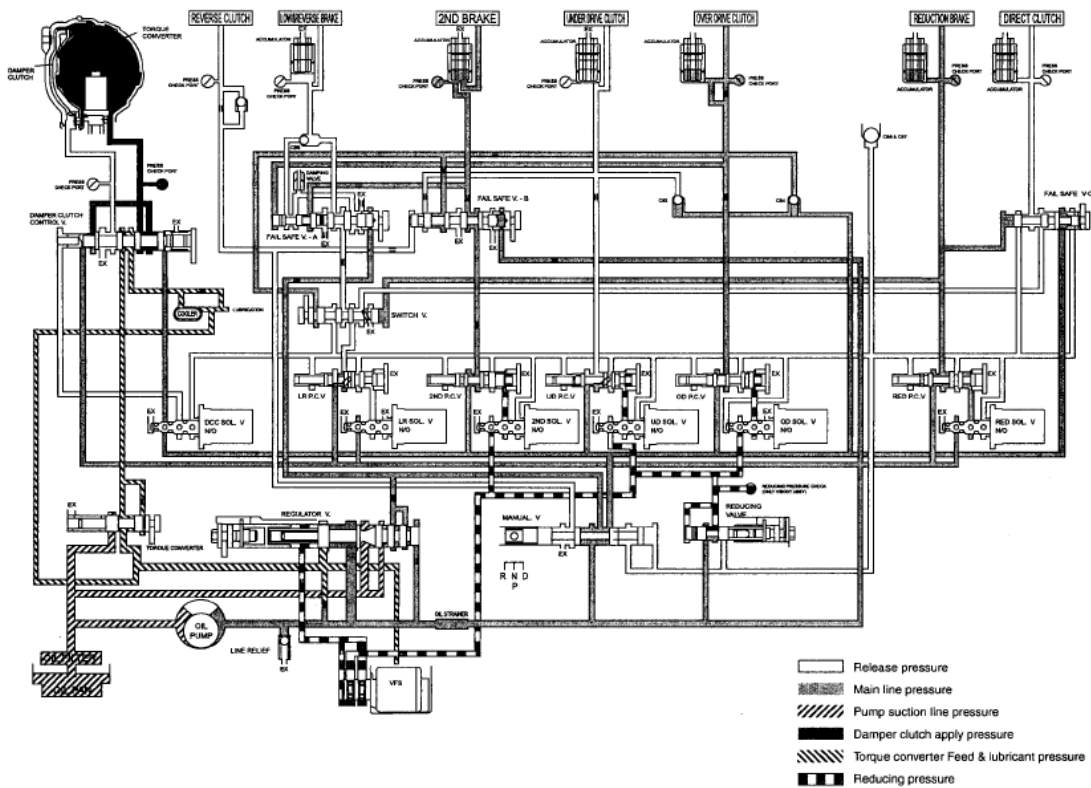
D (3 RANGE)



EKB004D

Fig. 6: Automatic Transaxle Hydraulic Circuit Diagram - D (3 Range)
 Courtesy of HYUNDAI MOTOR CO.

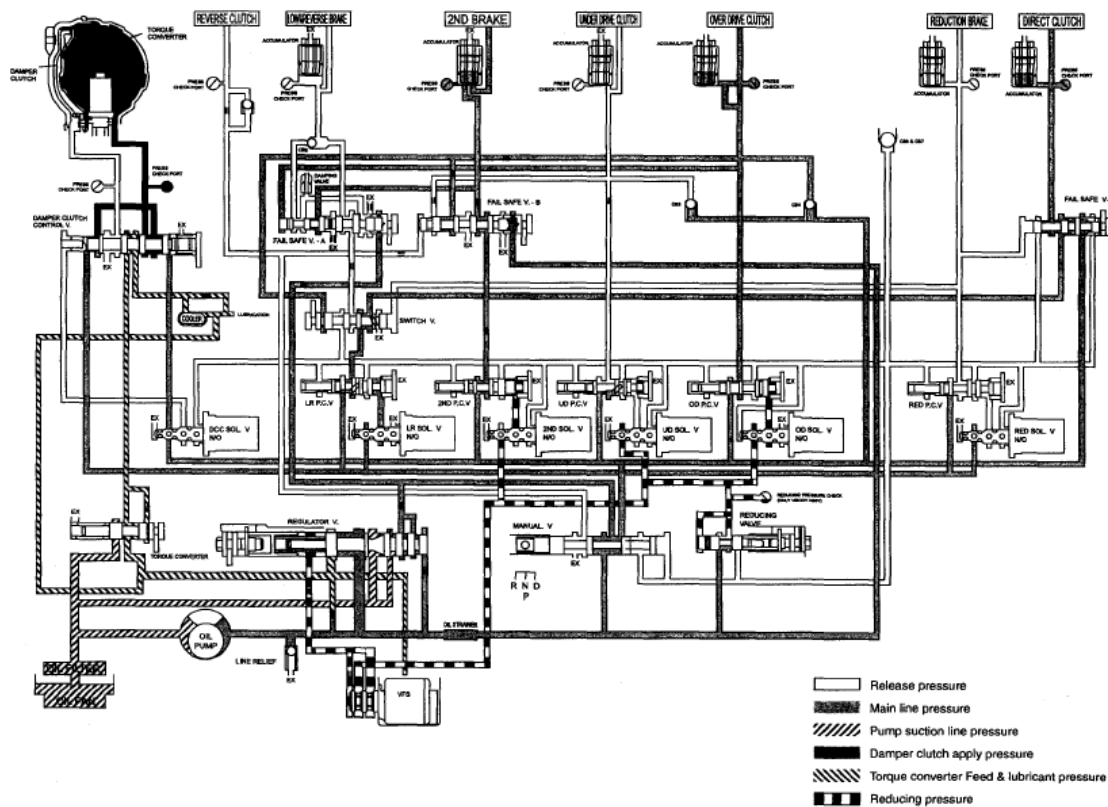
D (4 RANGE)



EKBF004E

Fig. 7: Automatic Transaxle Hydraulic Circuit Diagram - D (4 Range)
 Courtesy of HYUNDAI MOTOR CO.

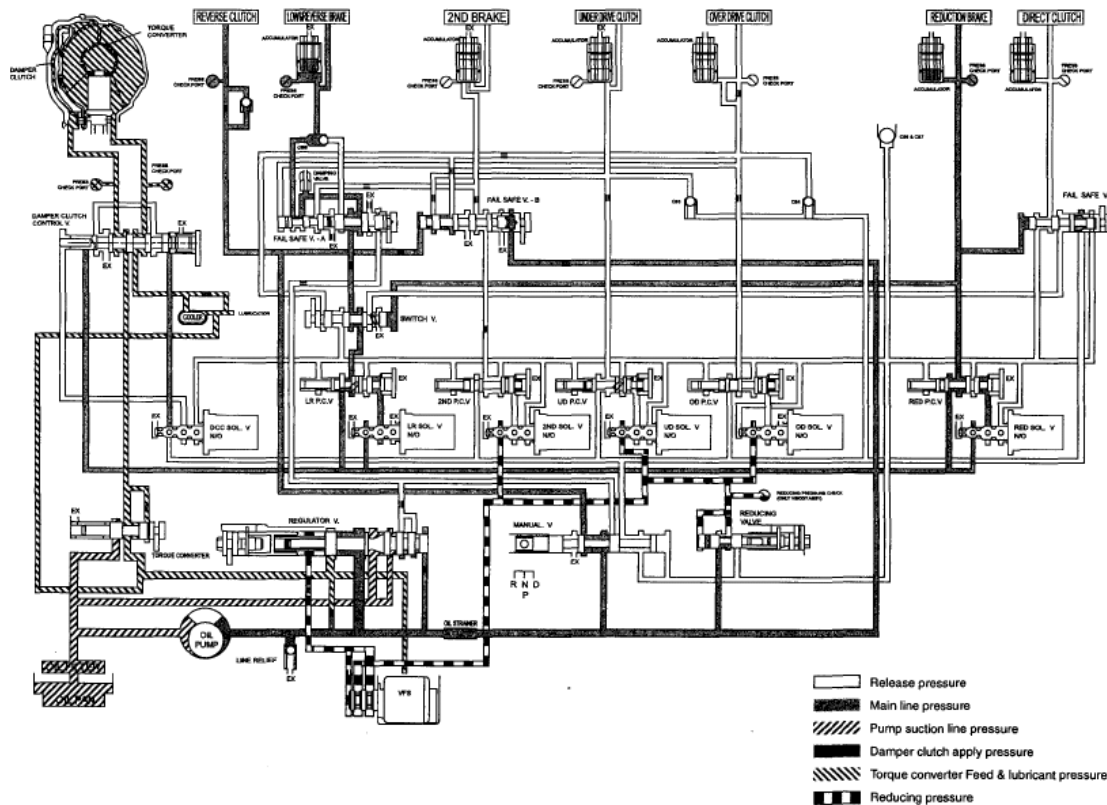
D (5 RANGE)



EKBF004F

Fig. 8: Automatic Transaxle Hydraulic Circuit Diagram - D (5 Range)
 Courtesy of HYUNDAI MOTOR CO.

R RANGE



EKBFO04G

Fig. 9: Automatic Transaxle Hydraulic Circuit Diagram - R Range
Courtesy of HYUNDAI MOTOR CO.

INSPECTION CHART FOR DIAGNOSIS TROUBLE CODES (DTC)

DIAGNOSIS TROUBLE CODES CHART

No.	Code	Item	MIL
1	P0707	TRANSAXLE RANGE SWITCH CIRCUIT LOW INPUT	ON
2	P0708	TRANSAXLE RANGE SWITCH CIRCUIT HIGH INPUT	ON
3	P0712	TRANSAXLE FLUID TEMPERATURE SENSOR CIRCUIT LOW INPUT	ON
4	P0713	TRANSAXLE FLUID TEMPERATURE SENSOR CIRCUIT HIGH INPUT	ON
5	P0717	A/T INPUT SPEED SENSOR CIRCUIT - OPEN or SHORT(GND)	ON
6	P0722	AT OUTPUT SPEED SENSOR CIRCUIT - OPEN or SHORT(GND)	ON
7	P0731	GEAR 1 INCORRECT RATIO	ON
8	P0732	GEAR 2 INCORRECT RATIO	ON
9	P0733	GEAR 3 INCORRECT RATIO	ON
10	P0734	GEAR 4 INCORRECT RATIO	ON
11	P0735	GEAR 5 INCORRECT RATIO	ON
12	P0741	TORQUE CONVERTER CLUTCH STUCK OFF	ON

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13	P0742	TORQUE CONVERTER CLUTCH STUCK ON	ON
14	P0743	TORQUE CONVERTER CLUTCH CONTROL SOLENOID VALVE - OPEN or SHORT(GND)	ON
15	P0748	VFS solenoid - OPEN or SHORT(GND)	OFF
16	P0750	LOW and REVERSE SOLENOID VALVE CIRCUIT - OPEN or SHORT(GND)	ON
17	P0755	UNDERDRIVE SOLENOID VALVE CIRCUIT - OPEN or SHORT (GND)	ON
18	P0760	SECOND SOLENOID VALVE CIRCUIT - OPEN or SHORT(GND)	ON
19	P0765	OVERDRIVE SOLENOID VALVE CIRCUIT - OPEN or SHORT (GND)	ON
20	P0770	RED SOLENOID	ON
21	P0885	A/T CONTROL RELAY - OPEN or SHORT(GND)	ON
22	P0890	TCM power Relay sense circuit low	ON
23	P0891	TCM power Relay sense circuit High	ON

* 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

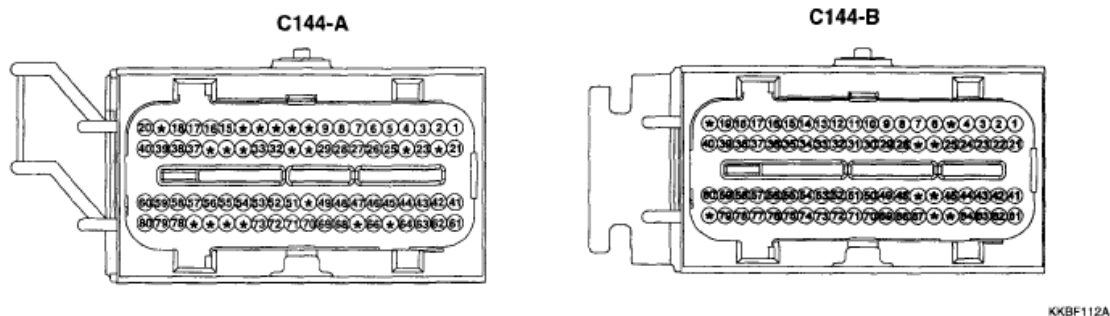


Fig. 10: Identifying C-144-A And C-144-B Connector Terminals
Courtesy of HYUNDAI MOTOR CO.

CONNECTOR TERMINALS REFERENCE CHART

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 OV	
A04	R Range Selection	R Position Otherwise	DC Voltage	V_BAT Max. 1.0V	12.3V OV	
A05	N Range Selection	N Position Otherwise	DC Voltage	V_BAT Max. 1.0V	13.2V OV	

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A06	D Range Selection	D Position Otherwise	DC Voltage	V_BAT Max. 1.0V	13.2V OV	
A07	Select Position	-	DC Voltage	V_BAT Max. 1.0V	13.2V OV	
A08	Up Position	-	DC Voltage	V_BAT Max. 1.0V	13.2V OV	
A09	Down Position	-	DC Voltage	V_BAT Max. 1.0V	13.2V OV	
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 V_peak: Max. 70V Resistance: 680ohms	13.8V OV-0.7V Resistance: 680ohms	
		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	-	-	-	-	
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)	OV 11.9V +30V / - 10V or less ?	

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		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	3.9V 0.38V 56.1V	
		W/H Open		DTC Spec: P0750	DTC: P0750	
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	

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		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

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 hydraulic 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 abnormal conditions because it allows the pump to take in air along with fluid. Air trapped in the hydraulic system forms bubbles, which are compressible. 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 cause 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

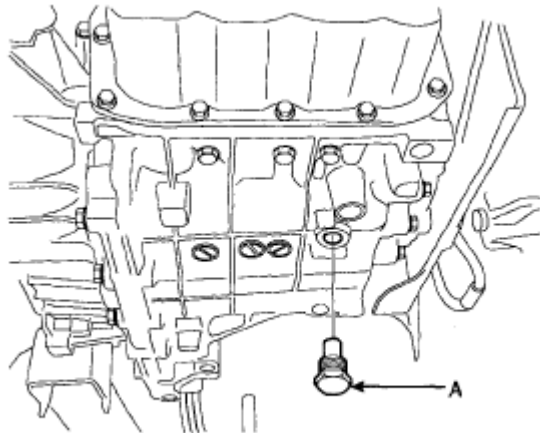
If you have a fluid changer, use this changer to replace the fluid. If you do not, replace it using the following procedure.

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



KKRE004C

Fig. 11: Identifying Drain Plug
Courtesy of HYUNDAI MOTOR CO.

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.

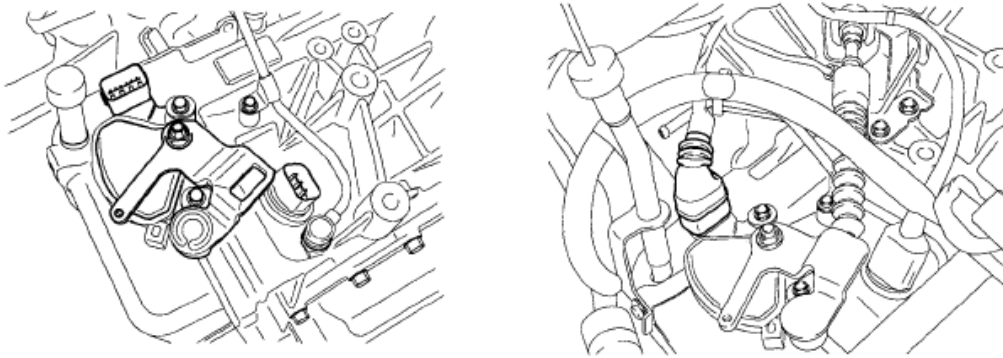
6. Repeat the procedure in step (2).

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



KKCF200A

Fig. 12: Identifying Transaxle Range Switch Component Location
 Courtesy of HYUNDAI MOTOR CO.

GENERAL DESCRIPTION

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

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

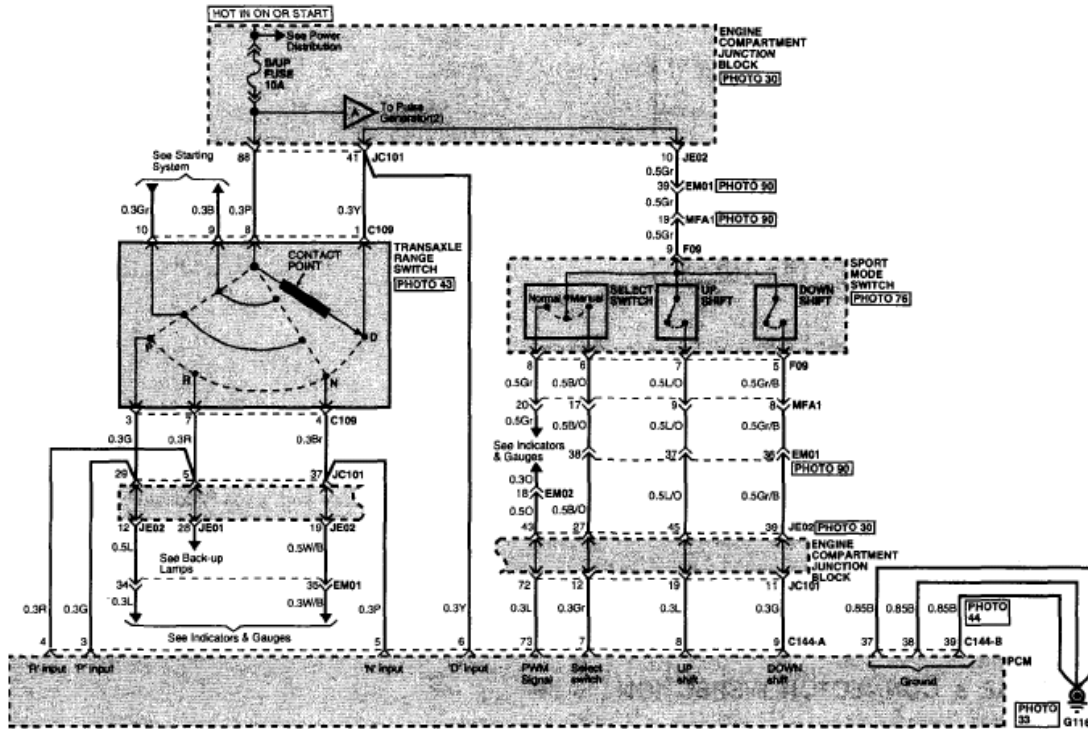
DTC DETECTING CONDITION

DTC DETECTING CONDITION

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 < or = Battery Voltage < or = 16V - TPS > or = 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	

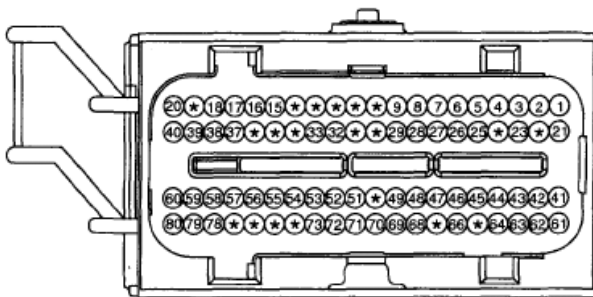
mode. (DTC is not set)

SCHEMATIC DIAGRAM



C144-A

C109



EKB100E

Fig. 13: Schematic Diagram - Transaxle Range Switch
Courtesy of HYUNDAI MOTOR CO.

MONITOR SCANTOOL DATA

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.

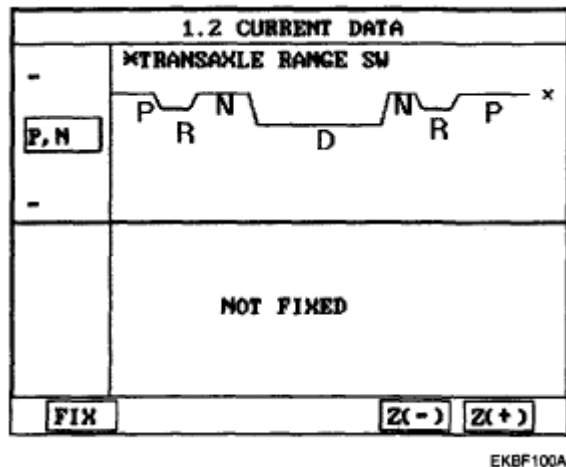


Fig. 14: Scan Tool Display - Transaxle Range Switch
 Courtesy of HYUNDAI MOTOR CO.

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

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 SUPPLY CIRCUIT INSPECTION"** procedure.

POWER SUPPLY CIRCUIT INSPECTION

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.

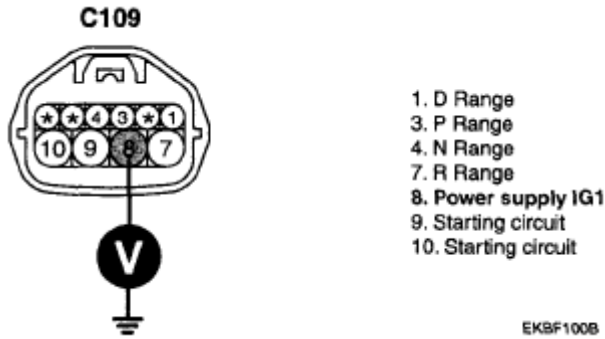


Fig. 15: Measuring Voltage Between Terminal 8 Of Sensor Harness Connector And Chassis Ground

Courtesy of HYUNDAI MOTOR CO.

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

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:

TERMINALS RESISTANCE CHART

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	0ohms	0ohms	0ohms	0ohms

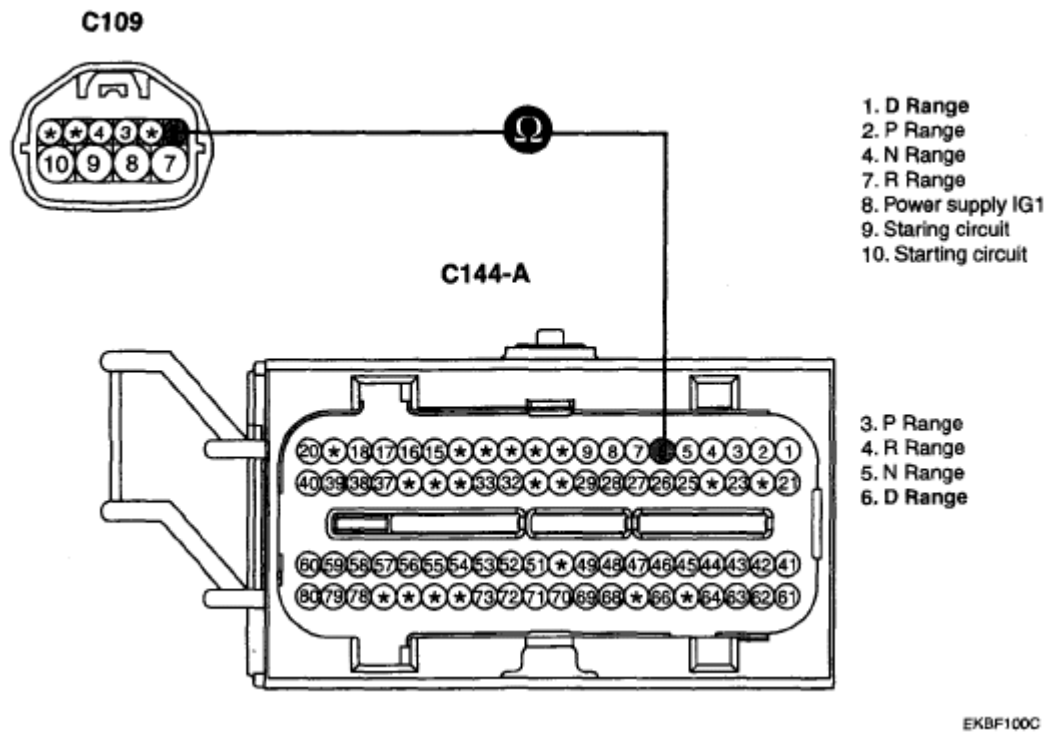


Fig. 16: Measuring Resistance Between Terminal Of Sensor Harness Connector And TCM (PCM) Harness Connector
Courtesy of HYUNDAI MOTOR CO.

4. Is resistance within specifications?

YES

- Go to "**COMPONENT INSPECTION**" procedure.

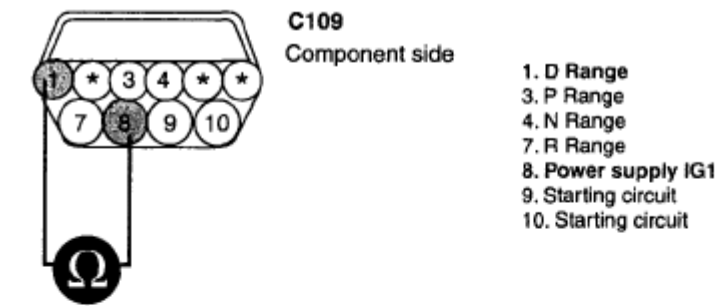
NO

- Check for Open in harness. Repair as necessary and Go to "**VERIFICATION OF VEHICLE REPAIR**" procedure.

COMPONENT INSPECTION

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

Specification: approx. 0 ohms



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

Fig. 17: Measuring Resistance Between Terminal Of Sensor
Courtesy of HYUNDAI MOTOR CO.

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

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

- Connect scantool and select "Diagnostic Trouble Codes (DTCs)" mode.
- Using a scantool, Clear DTC.
- 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

Refer to **DTC P0707**.

GENERAL DESCRIPTION

Refer to **DTC P0707**.

DTC DESCRIPTION

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

DTC DETECTING CONDITION

DTC DETECTING CONDITION

Item	Detecting Condition	Possible cause
DTC Strategy	• Check for multiple signal	• Open or short in TRANSAXLE RANGE SWITCH • Faulty TRANSAXLE RANGE SWITCH • Faulty PCM
Enable Conditions	• Engine state = "RUN" • 11V < or = Battery Voltage < or = 16V • TPS > or = 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 PCM/TCM detects multiple signal or no signal, then it holds the 3rd gear position	

SCHEMATIC DIAGRAM

Refer to **DTC P0707**.

MONITOR SCANTOOL DATA

Refer to **DTC P0707**.

TERMINAL & CONNECTOR INSPECTION

Refer to **DTC P0707**.

POWER SUPPLY CIRCUIT INSPECTION

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:

TERMINALS VOLTAGE CHART

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

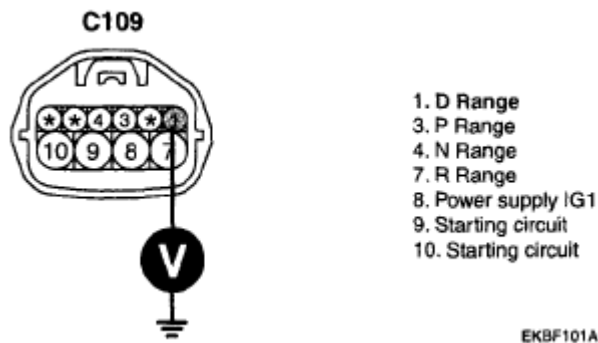


Fig. 18: Measuring Voltage Between Terminal Of Sensor Harness Connector And Chassis Ground
Courtesy of HYUNDAI MOTOR CO.

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

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

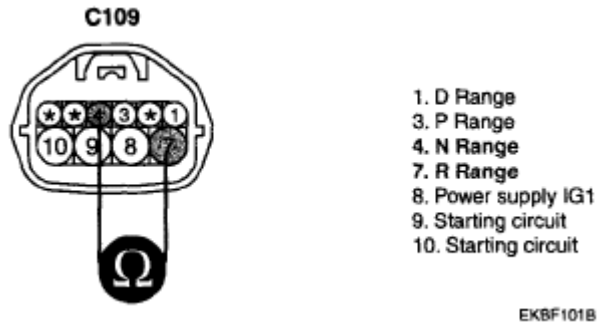


Fig. 19: Measuring Resistance Between Terminals Of Sensor Harness
 Courtesy of HYUNDAI MOTOR CO.

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

Refer to **DTC P0707**.

VERIFICATION OF VEHICLE REPAIR

Refer to **DTC P0707**.

DTC P0712 FLUID (OIL) TEMPERATURE SENSOR CIRCUIT - LOW

COMPONENT LOCATION

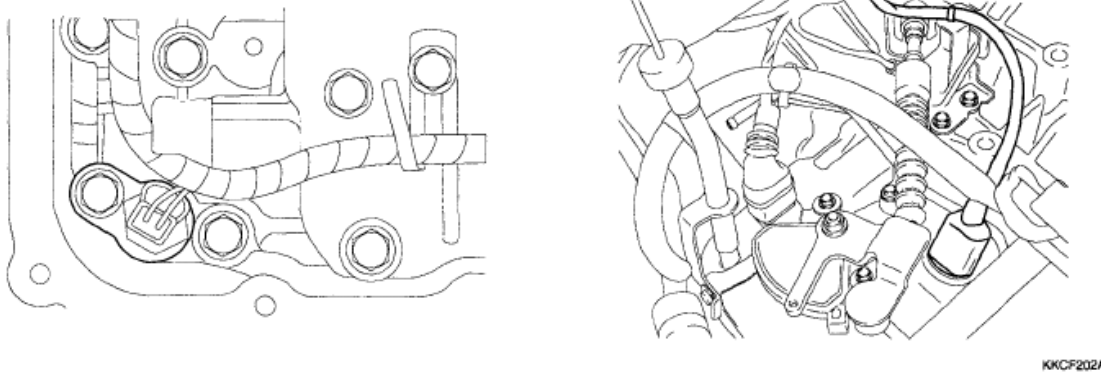


Fig. 20: Identifying Fluid (Oil) Temperature Sensor Component Location
 Courtesy of HYUNDAI MOTOR CO.

GENERAL DESCRIPTION

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

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

DTC DETECTING CONDITION

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)	

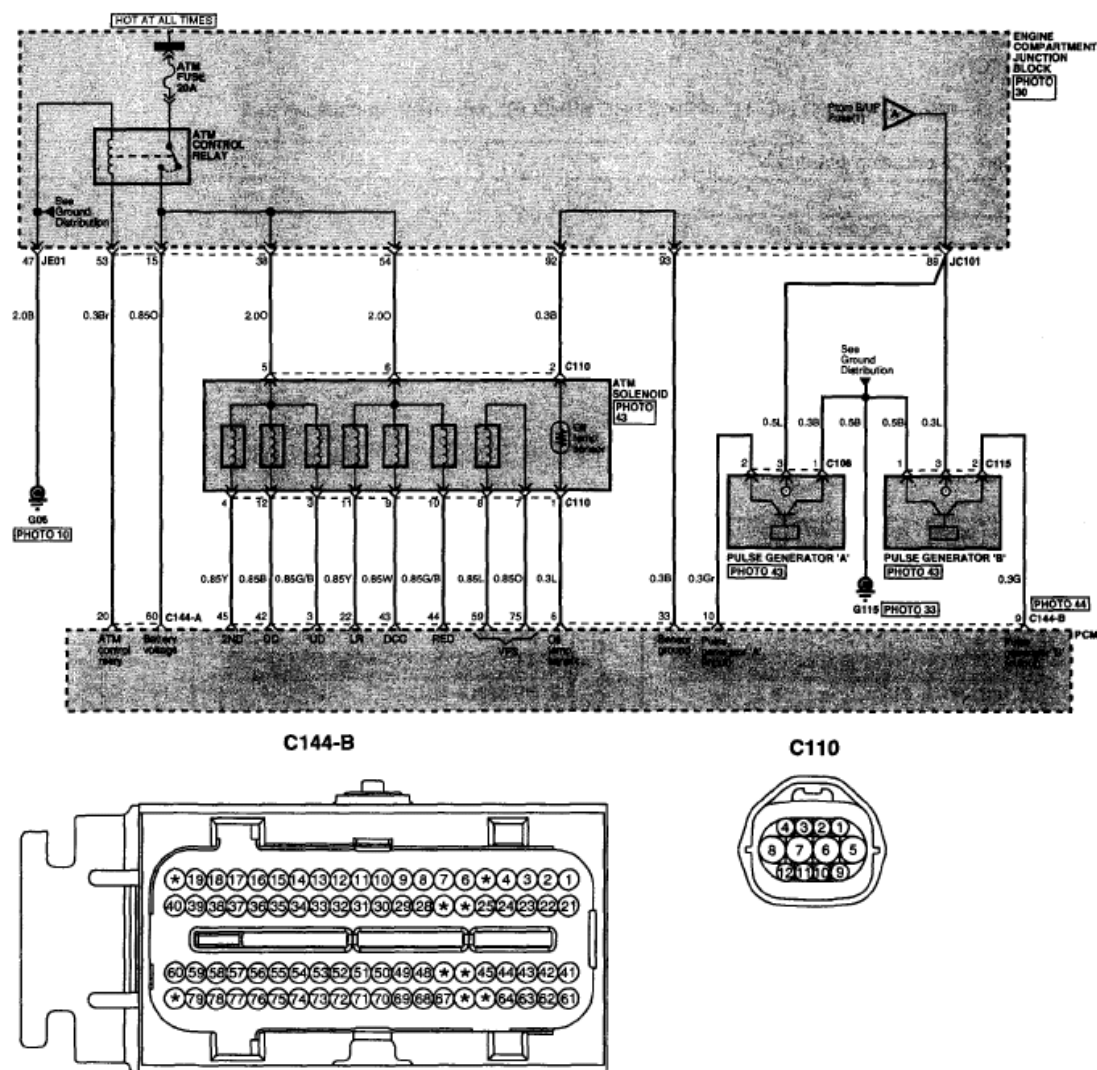
SPECIFICATION

TEMPERATURE AND RESISTANCE SPECIFICATION

--	--	--	--

TEMP.[°C(°F)]	Resistance(kohms)	TEMP.[°C(°F)]	Resistance(kohms)
-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



EKBF100F

Fig. 21: Schematic Diagram - Fluid (Oil) Temperature Sensor
Courtesy of HYUNDAI MOTOR CO.

MONITOR SCANTOOL DATA

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

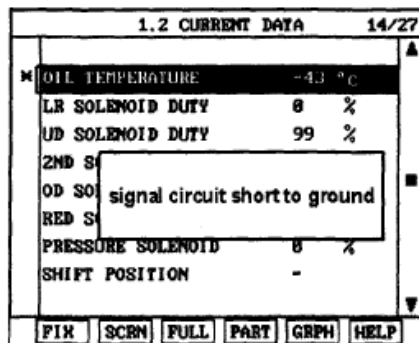
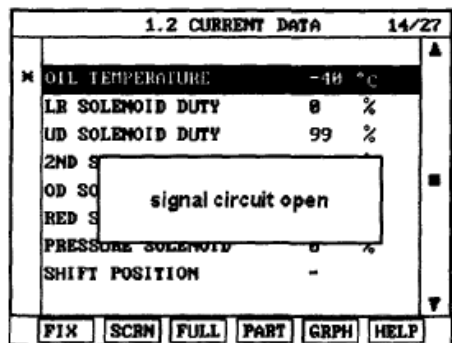
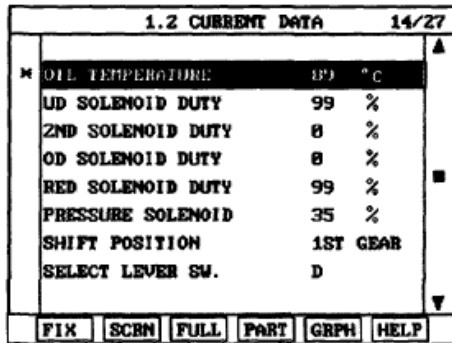


FIG.1) Normal
 FIG.2) Signal harness Open
 FIG.3) Signal harness Short

EKBF102A

Fig. 22: Scan Tool Display - Transaxle Fluid Temperature Sensor Parameter
 Courtesy of HYUNDAI MOTOR CO.

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

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

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

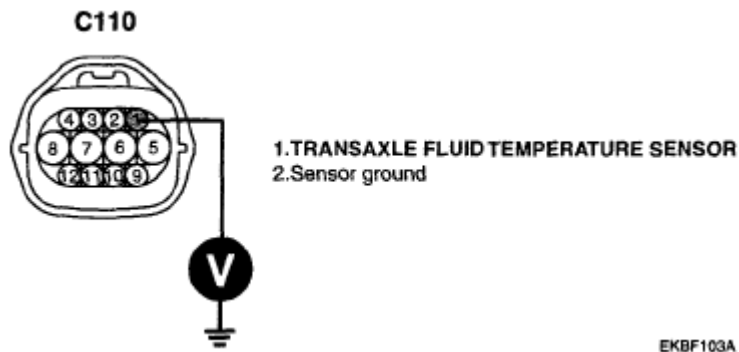


Fig. 23: Measuring Voltage Between Terminal 1 Of Transaxle Fluid Temperature Sensor Connector And Chassis Ground
Courtesy of HYUNDAI MOTOR CO.

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

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**"

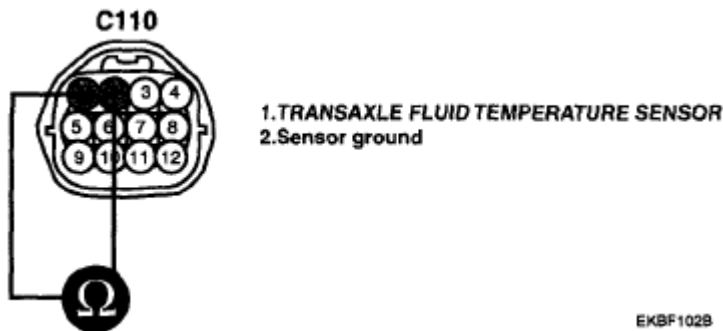


Fig. 24: Measuring Resistance Between Terminals 1 And 2 Of Transaxle Fluid Temperature Sensor

Courtesy of HYUNDAI MOTOR CO.

TRANSAXLE FLUID TEMPERATURE SENSOR CHECK

TEMP.[°C(°F)]	Resistance(kohms)	TEMP.[°C(°F)]	Resistance(kohms)
-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 2 "CHECK PCM/TCM" as below.

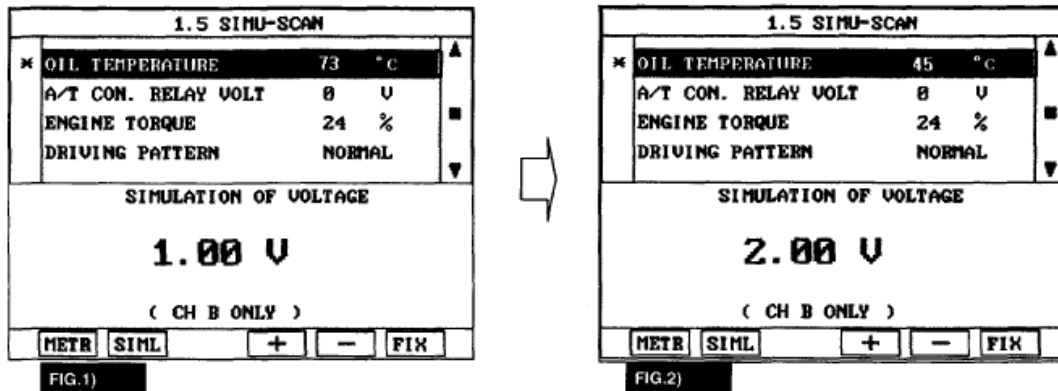
NO

- 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.



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

EKBF102C

Fig. 25: Scan Tool Display - Transaxle Fluid Temperature Sensor
Courtesy of HYUNDAI MOTOR CO.

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

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

Refer to **DTC P0712**.

GENERAL DESCRIPTION

Refer to **DTC P0712**.

DTC DESCRIPTION

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

DTC DETECTING CONDITION

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 > or = -23.5°C • Engine state = RUN • Warm up driving time > 287.5 sec	
Threshold Value	• voltage > or = 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

Refer to **DTC P0712**.

SCHEMATIC DIAGRAM

Refer to **DTC P0712**.

MONITOR SCANTOOL DATA

Refer to **DTC P0712**.

TERMINAL & CONNECTOR INSPECTION

Refer to **DTC P0712**.

SIGNAL CIRCUIT INSPECTION

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

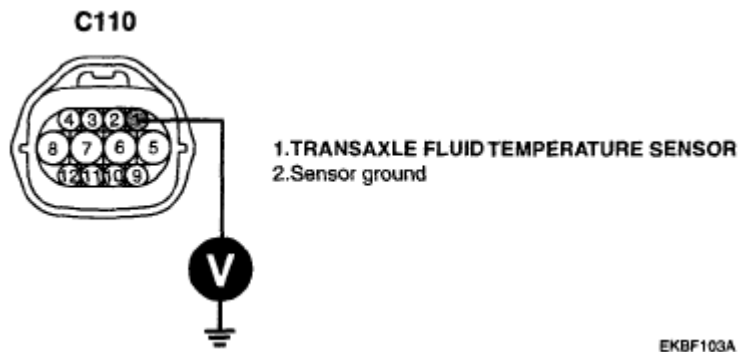


Fig. 26: Measuring Voltage Between Terminal 1 Of Transaxle Fluid Temperature Sensor Connector And Chassis Ground

Courtesy of HYUNDAI MOTOR CO.

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

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.

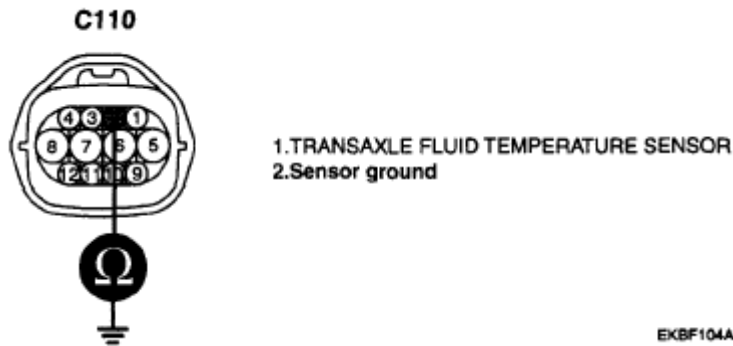


Fig. 27: Measuring Resistance Between Terminal 2 Of Transaxle Fluid Temperature Sensor Connector And Chassis Ground
 Courtesy of HYUNDAI MOTOR CO.

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

Refer to **DTC P0712**.

VERIFICATION OF VEHICLE REPAIR

Refer to **DTC P0712**.

DTC P0717 INPUT SPEED SENSOR CIRCUIT - NO SIGNAL

COMPONENT LOCATION

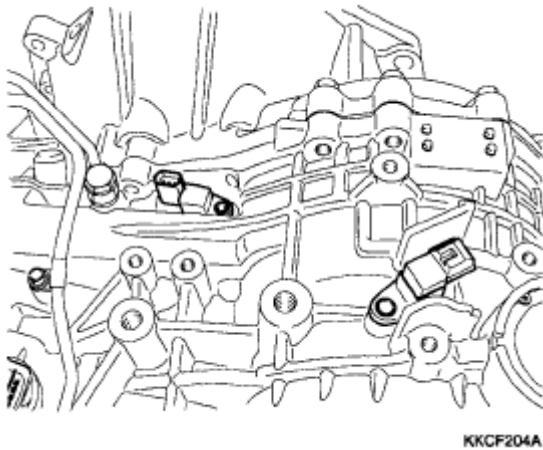


Fig. 28: Identifying Input Speed Sensor Location
 Courtesy of HYUNDAI MOTOR CO.

GENERAL DESCRIPTION

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

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

DTC DETECTING CONDITION

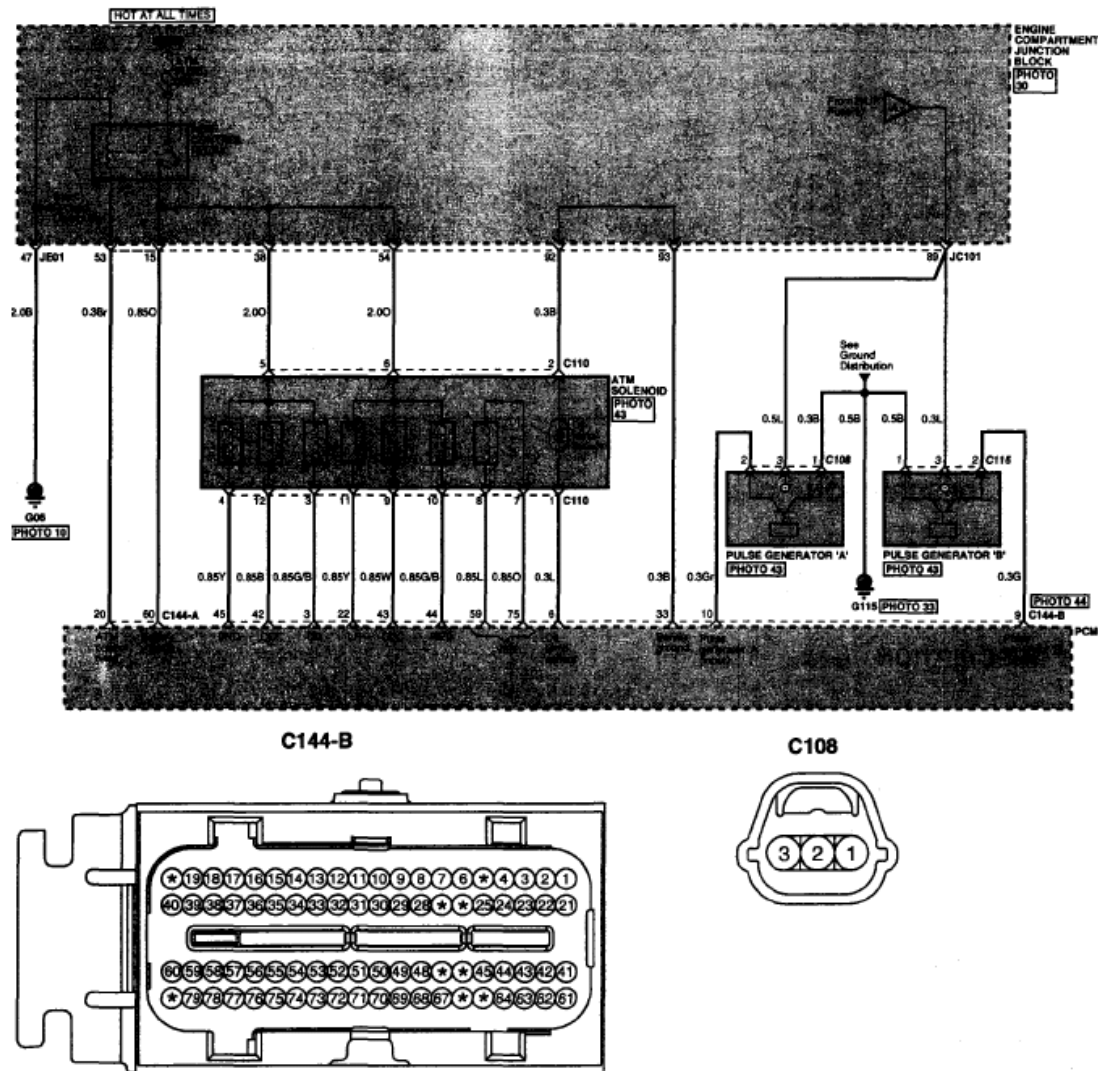
Item	Detecting Condition	Possible cause
DTC Strategy	Speed rationality check	- Signal circuit is open or short. - Sensor power circuit is open - Sensor ground circuit is open - Faulty INPUT SPEED SENSOR - Faulty PCM/TCM
Enable Conditions	- Vehicle speed is over 19 Mile/h(30 Km/h) - Ne > 1000 rpm (only at 1st or 2nd gear) 11V < or = Battery Voltage < or = 16V - TM oil temperature > or = -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

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



EKB100G

Fig. 29: Schematic Diagram - Input Speed Sensor
 Courtesy of HYUNDAI MOTOR CO.

SIGNAL WAVEFORM

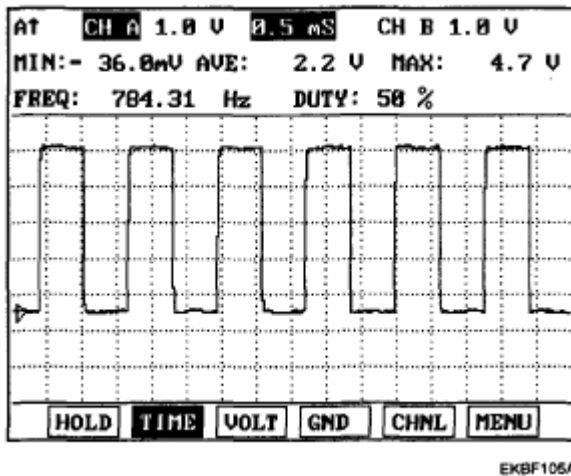


Fig. 30: Identifying Signal Waveform
Courtesy of HYUNDAI MOTOR CO.

MONITOR SCANTOOL DATA

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

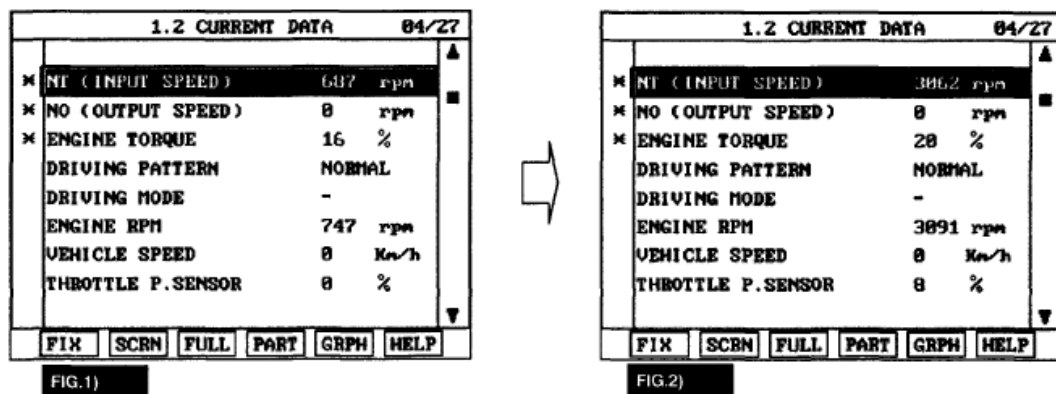


Fig. 31: Scan Tool Display - Input Speed Sensor Parameter
Courtesy of HYUNDAI MOTOR CO.

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

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

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

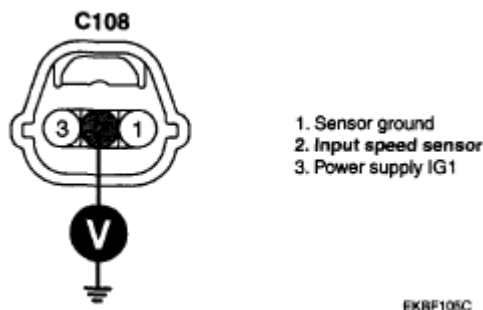


Fig. 32: Measuring Voltage Between Terminal 2 Of Input Speed Sensor Harness Connector And Chassis Ground
Courtesy of HYUNDAI MOTOR CO.

4. Is voltage within specification?

YES

- Go to "**POWER SUPPLY CIRCUIT INSPECTION**" procedure.

NO

- Check for open or short in harness. Repair as necessary and Go to "**VERIFICATION OF VEHICLE REPAIR**" procedure.
- If signal circuit in harness is OK, Go to 2 "Check PCM/TCM" of the "Component Inspection" procedure.

POWER SUPPLY CIRCUIT INSPECTION

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+

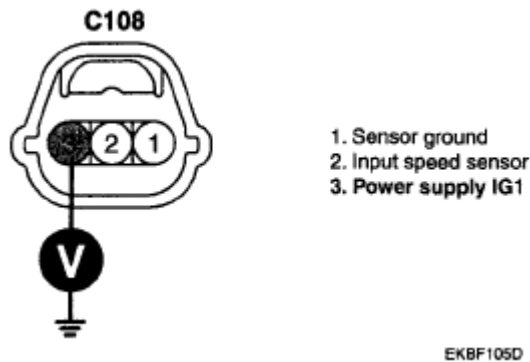


Fig. 33: Measuring Voltage Between Terminal 3 Of Input Speed Sensor Harness Connector And Chassis Ground

Courtesy of HYUNDAI MOTOR CO.

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

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 ohms

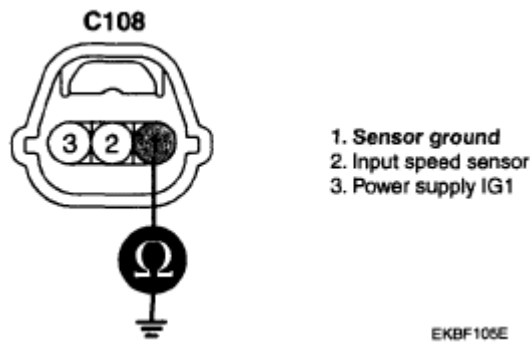


Fig. 34: Measuring Resistance Between Terminal 1 Of Input Speed Sensor Harness Connector And Chassis Ground

Courtesy of HYUNDAI MOTOR CO.

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 2 "Check PCM/TCM" of the "Component Inspection" procedure.

COMPONENT INSPECTION

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**"

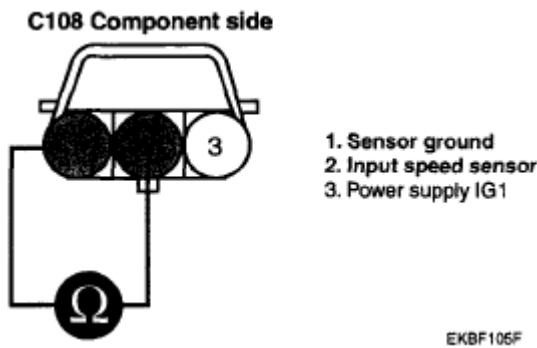


Fig. 35: Measuring Resistance Between Terminal Of Input Speed Sensor Connector
Courtesy of HYUNDAI MOTOR CO.

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 Mohms
	Output sensor	Above 4 Mohms
Voltage	High	4.8 ~ 5.2V
	Low	Below 0.8V

YES

- Go to 2 "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.

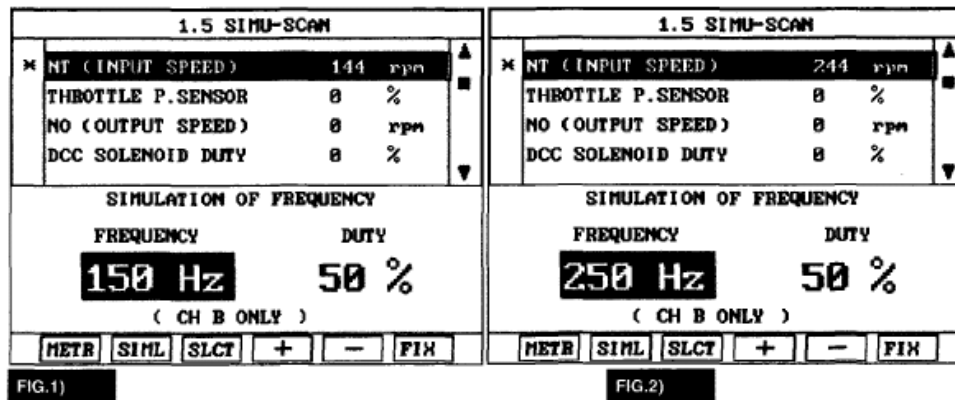


FIG.1) INPUT 150Hz → 144rpm

FIG.2) INPUT 250Hz → 244rpm

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

EKBF106G

Fig. 36: Scan Tool Display - Input Speed Sensor Parameter
 Courtesy of HYUNDAI MOTOR CO.

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

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

Refer to **DTC P0717**.

GENERAL DESCRIPTION

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

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

DTC DETECTING CONDITION

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 > or = "1000rpm (only at 1st or 2nd gear) • 11V < or = Battery Voltage < or = 16V • TM oil temperature > or = -23°C	
Threshold value	• Vehicle speed calculated from output speed < or = 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)	

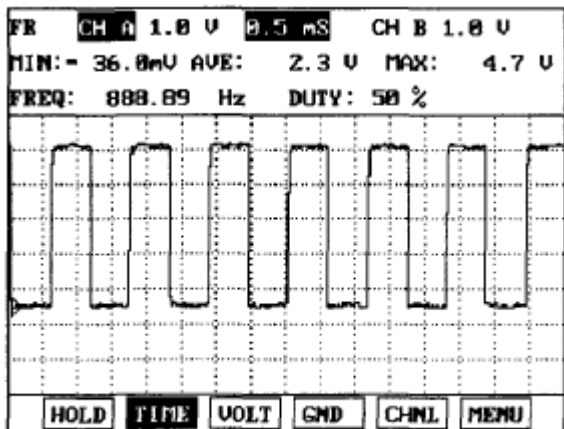
SPECIFICATION

Refer to **DTC P0717**.

SCHEMATIC DIAGRAM



SIGNAL WAVEFORM



EKB106A

Fig. 38: Identifying Signal Waveform
Courtesy of HYUNDAI MOTOR CO.

MONITOR SCANTOOL DATA

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

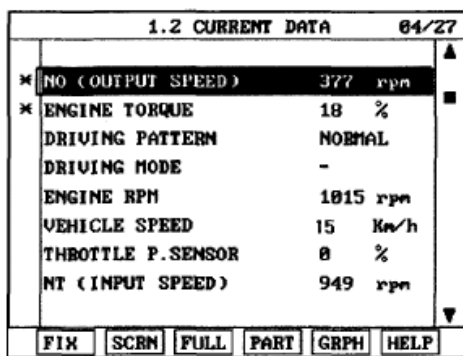


FIG.1)

FIG.1) Low-speed

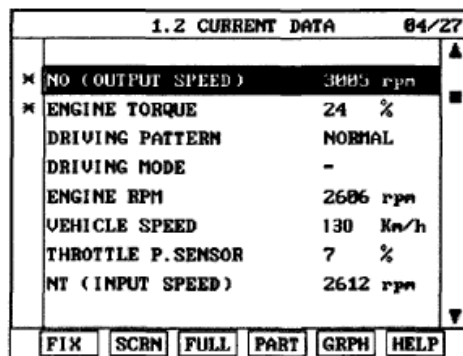


FIG.2)

FIG.2) High-speed

EKB106B

Fig. 39: Scan Tool Display - Output Speed Sensor Parameter
Courtesy of HYUNDAI MOTOR CO.

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

Refer to **DTC P0717**.

SIGNAL CIRCUIT INSPECTION

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

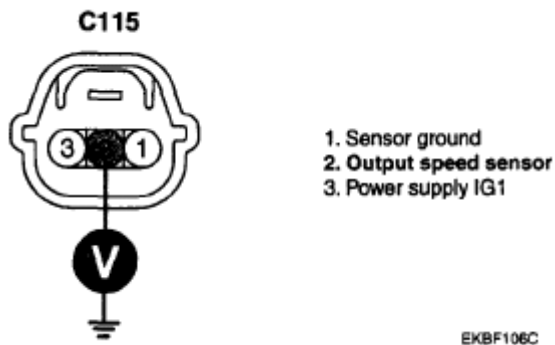


Fig. 40: Measuring Voltage Between Terminal 2 Of Output Speed Sensor Harness Connector And Chassis Ground

Courtesy of HYUNDAI MOTOR CO.

4. Is voltage within specification?

YES

- Go to "**POWER SUPPLY CIRCUIT INSPECTION**" procedure.

NO

- Check for open or short in harness. Repair as necessary and Go to "**VERIFICATION OF VEHICLE REPAIR**" procedure.

- If signal circuit in harness is OK, Go to 2 "Check PCM/TCM" of the "Component Inspection" procedure.

POWER SUPPLY CIRCUIT INSPECTION

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+

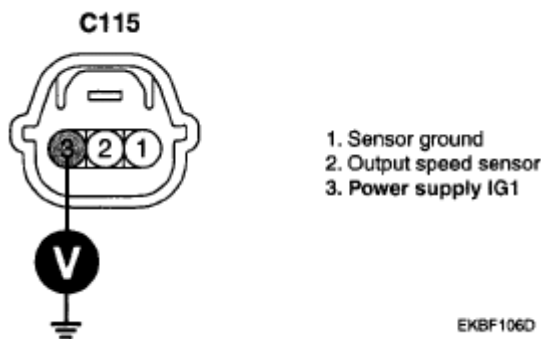


Fig. 41: Measuring Voltage Between Terminal 3 Of Output Speed Sensor Connector And Chassis Ground

Courtesy of HYUNDAI MOTOR CO.

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

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.

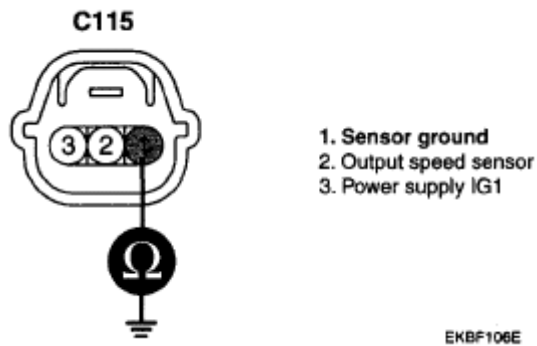


Fig. 42: Measuring Resistance Between Terminal 1 Of Output Speed Sensor Connector And Chassis Ground
Courtesy of HYUNDAI MOTOR CO.

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 2"Check PCM/TCM" of the "Component Inspection" procedure.

COMPONENT INSPECTION

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**"

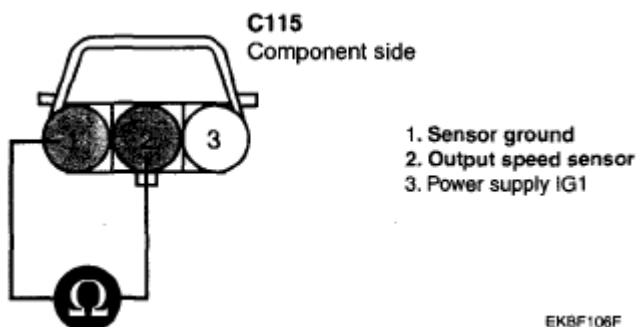


Fig. 43: Measuring Resistance Between Terminal Of Output Speed Sensor Connector
Courtesy of HYUNDAI MOTOR CO.

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 Mohms
	Output sensor	Above 4 Mohms
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

- Ignition "ON" & Engine "OFF".
- Connect "OUTPUT SPEED SENSOR" connector.
- Install scantool and select a SIMU-SCAN.
- Simulate frequency to OUTPUT SPEED SENSOR signal circuit.

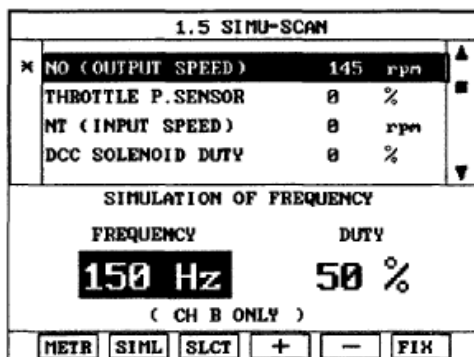


FIG.1)

FIG.1) INPUT 150Hz → 144rpm

FIG.2) INPUT 250Hz → 244rpm

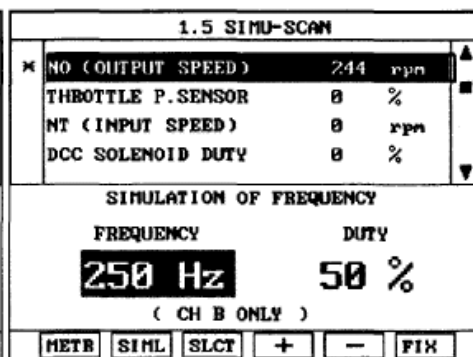


FIG.2)

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

EKBF106G

Fig. 44: Scan Tool Display - Output Speed Sensor Parameter
Courtesy of HYUNDAI MOTOR CO.

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

Refer to **DTC P0717**.

DTC P0731 GEAR 1 INCORRECT RATIO

COMPONENT LOCATION

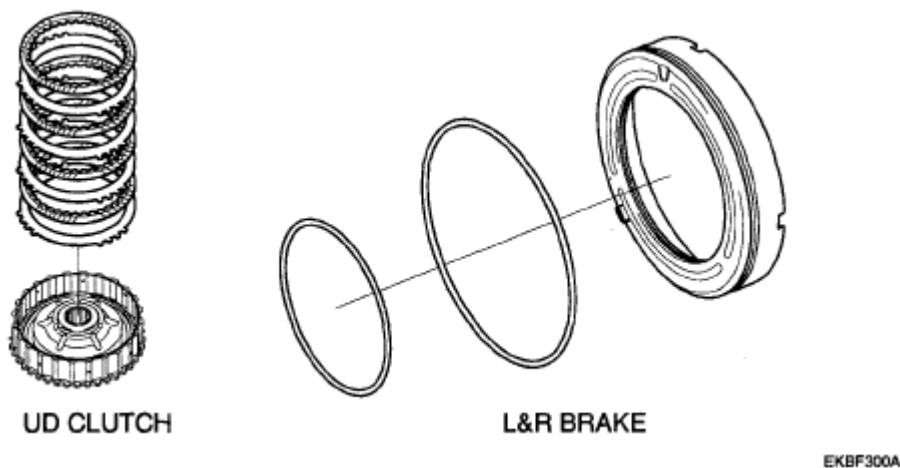


Fig. 45: Identifying UD Clutch And L & R Brake Component Location
Courtesy of HYUNDAI MOTOR CO.

GENERAL DESCRIPTION

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 3.840, then the input speed is 3,840 RPM.

DTC DESCRIPTION

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**DTC DETECTING CONDITION**

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 clutch 1,2
Enable Conditions	- Engine speed > 450rpm - Output speed > 150rpm - Shift stage 1st. gear - Input speed > Orpm - A/T oil temp output > or = -23°C(-9.4°F) 11V < or = Battery Voltage < or = 16V - TRANSAXLE RANGE SWITCH is normaland after 2sec is passed from IG ON	
Threshold value	input speed - output speed x 1st gear ratio > or = 200rpm	
Diagnostic Time	more than 4sec	
Fail Safe	Locked into 3 rd gear	

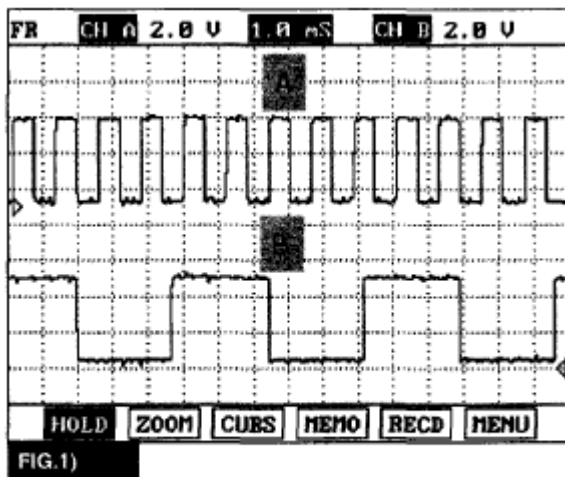
SIGNAL WAVEFORM

FIG. 1)
A : INPUT SPEED SENSOR
B : OUTPUT SPEED SENSOR

EKBF107A

Fig. 46: Identifying Signal Waveform

Courtesy of HYUNDAI MOTOR CO.

MONITOR SCANTOOL DATA

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

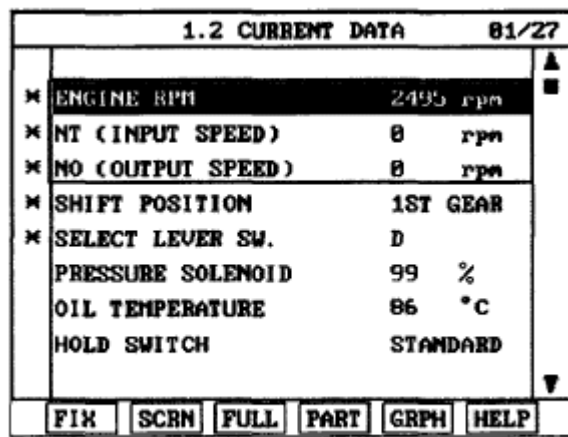


Fig. 47: Scan Tool Display - Engine RPM
Courtesy of HYUNDAI MOTOR CO.

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

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 x GEAR RATIO) < or = 200 RPM

1.2 CURRENT DATA		01/27
× ENGINE RPM	2144 rpm	
× INT (INPUT SPEED)	2087 rpm	
× NO (OUTPUT SPEED)	464 rpm	
× SHIFT POSITION	1ST GEAR	
VEHICLE SPEED	19 Km/h	
THROTTLE P.SENSOR	5 %	
DCC SOLENOID DUTY	0 %	
DAMPER CLUTCH SLIP	56 rpm	
FIX		SCRN
FULL		PART
GRPH		HELP

EKBF107C

Fig. 48: Scan Tool Display - Engine RPM
Courtesy of HYUNDAI MOTOR CO.

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

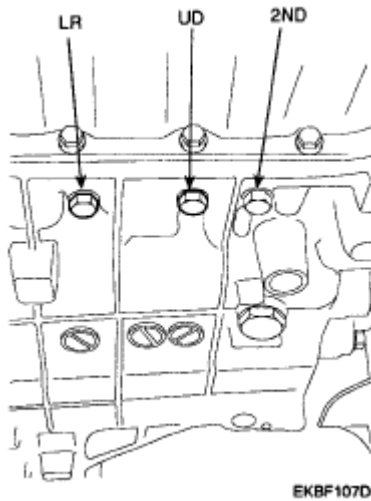


Fig. 49: Identifying LR, UD And 2ND Port
Courtesy of HYUNDAI MOTOR CO.

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

OIL PRESSURE SPECIFICATION

LEVER POSITION	INPUT SPEED	VFS CURRENT	SOLENOID VALVE DUTY (%)						ELEMENT	P(MPa)
			LR	DCC	2ND	UD	OD	RED (1)		
D	2500rpm	200mA	0	0	100	0	100	0	LR	1.03±0.02
?	?	?	60	?	?	?	?	?		0.45±0.04
?	?	?	75	?	?	?	?	?		0.19±0.04
?	?	?	100	?	?	?	?	?		0
?	?	?	100	?	0	0	100	0	2ND	1.03±0.02
?	?	?	?	?	60	?	?	?		0.50±0.05
?	?	?	?	?	75	?	?	?		0.20±0.05
?	?	?	?	?	100	?	?	?		0
?	?	?	100	?	100	0	0	0	OD	1.02±0.02
?	?	?	?	?	?	?	60	?		0.46±0.04
?	?	?	?	?	?	?	75	?		0.19±0.04
?	?	?	?	?	?	?	100	?		0
?	?	?	100	?	100	0	0	0	UD	1.03±0.02
?	?	?	?	?	?	60	?	?		0.44±0.05

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?	?	?	?	?	?	75	?	?		0.18±0.04
?	?	?	?	?	?	100	?	?		0
?	?	?	100	?	0	100	0	0	RED ⁽¹⁾	1.03±0.02
?	?	?	?	?	?	?	?	60		0.49±0.04
?	?	?	?	?	?	?	?	75		0.24±0.04
?	?	?	?	?	?	?	?	100		0
?	?	?	100	?	0	100	0	100	DIR ⁽¹⁾	0
?	?	?	75	?	?	?	?	?		0.25±0.04
?	?	?	60	?	?	?	?	?		0.51±0.04
?	?	?	0	?	?	?	?	?		1.03±0.02
R	?	250mA	0	?	100	100	100	0	LR	1.55±0.25

(1) The values are subject to change according to vehicle model or condition.

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

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

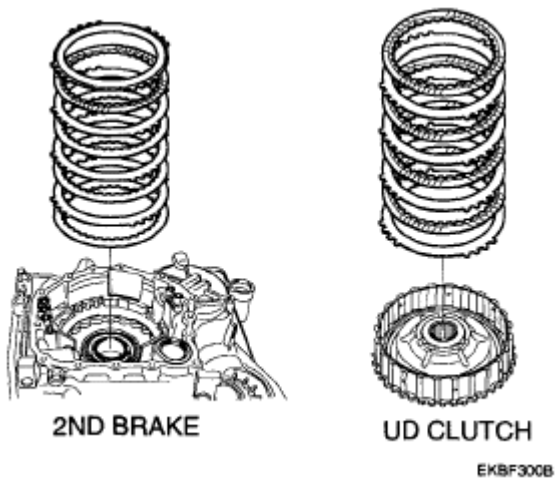


Fig. 50: Identifying 2ND Brake And UD Clutch Component
 Courtesy of HYUNDAI MOTOR CO.

GENERAL DESCRIPTION

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 2.092, then the input speed is 2,092 RPM.

DTC DESCRIPTION

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.

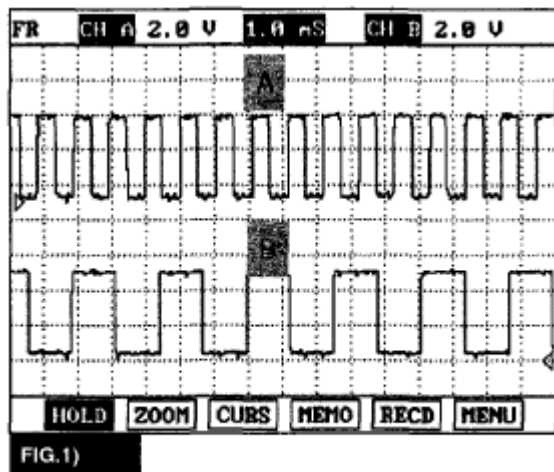
DTC DETECTING CONDITION

DTC DETECTING CONDITION

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 > Orpm - A/T oil temp output > or = -23°C(-9.4°F) 11V < or = Battery Voltage < or = 16V - TRANSAXLE RANGE SWITCH is normaland after 2sec is passed from IG ON	
Threshold	input speed - output speed x 2nd gear ratio	

value	> or =200rpm	
Diagnostic Time	more than 4sec	
Fail Safe	Locked into 3 rd gear	

SIGNAL WAVEFORM



A : INPUT SPEED SENSOR
B : OUTPUT SPEED SENSOR

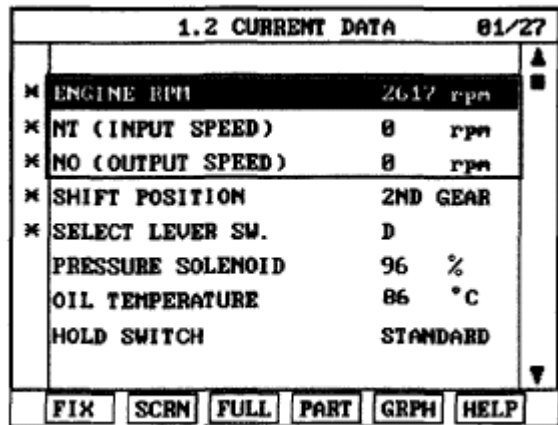
EKBF108A

Fig. 51: Identifying Signal Waveform
Courtesy of HYUNDAI MOTOR CO.

MONITOR SCANTOOL DATA

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

Fig. 52: Scan Tool Display - Engine RPM
Courtesy of HYUNDAI MOTOR CO.

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

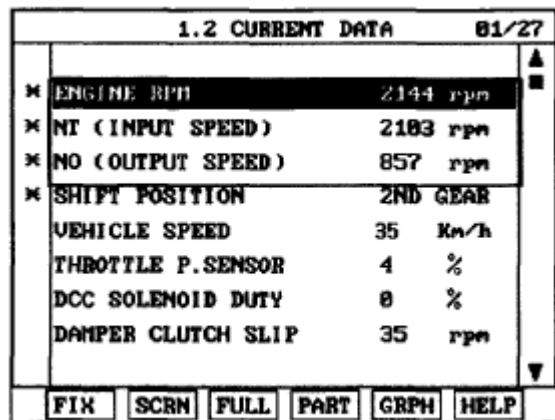
- Go to "**COMPONENT INSPECTION**" procedure.

- 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

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: $\text{INPUT SPEED} - (\text{OUTPUT SPEED} \times \text{GEAR RATIO}) < \text{or} = 200 \text{ RPM}$



EKBF108C

Fig. 53: Scan Tool Display - Engine RPM
Courtesy of HYUNDAI MOTOR CO.

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

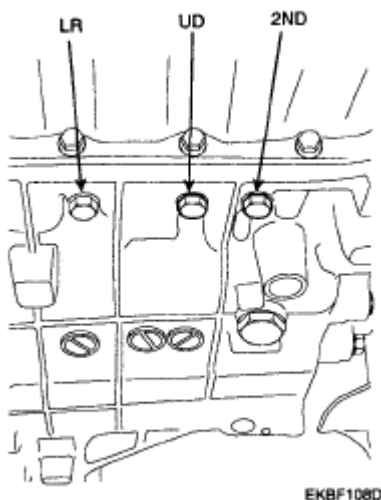
YES

- 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



EKBF108D

Fig. 54: Identifying LR, UD And 2ND Port
Courtesy of HYUNDAI MOTOR CO.

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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

OIL PRESSURE SPECIFICATION

LEVER POSITION	INPUT SPEED	VFS CURRENT	SOLENOID VALVE DUTY (%)						ELEMENT	P(MPa)
			LR	DCC	2ND	UD	OD	RED (1)		
D	2500rpm	200mA	0	0	100	0	100	0	LR	1.03±0.02
?	?	?	60	?	?	?	?	?		0.45±0.04
?	?	?	75	?	?	?	?	?		0.19±0.04
?	?	?	100	?	?	?	?	?		0
?	?	?	100	?	0	0	100	0	2ND	1.03±0.02
?	?	?	?	?	60	?	?	?		0.50±0.05
?	?	?	?	?	75	?	?	?		0.20±0.05
?	?	?	?	?	100	?	?	?		0
?	?	?	100	?	100	0	0	0	OD	1.02±0.02
?	?	?	?	?	?	?	60	?		0.46±0.04
?	?	?	?	?	?	?	75	?		0.19±0.04
?	?	?	?	?	?	?	100	?		0
?	?	?	100	?	100	0	0	0	UD	1.03±0.02
?	?	?	?	?	?	60	?	?		0.44±0.05
?	?	?	?	?	?	75	?	?		0.18±0.04
?	?	?	?	?	?	100	?	?		0
?	?	?	100	?	0	100	0	0	RED ⁽¹⁾	1.03±0.02
?	?	?	?	?	?	?	?	60		0.49±0.04
?	?	?	?	?	?	?	?	75		0.24±0.04
?	?	?	?	?	?	?	?	100		0
?	?	?	100	?	0	100	0	100	DIR ⁽¹⁾	0
?	?	?	75	?	?	?	?	?		0.25±0.04
?	?	?	60	?	?	?	?	?		0.51±0.04
?	?	?	0	?	?	?	?	?		1.03±0.02
R	?	250mA	0	?	100	100	100	0	LR	1.55±0.25

(1) The values are subject to change according to vehicle model or condition.

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

Refer to **DTC P0731**.

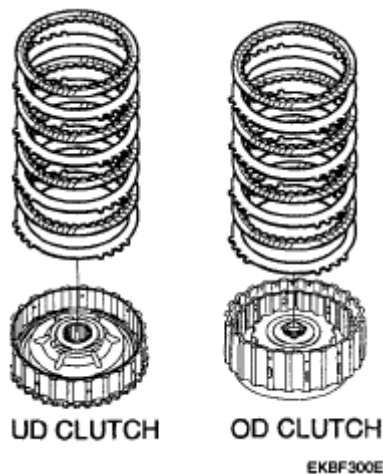
DTC P0733 GEAR 3 INCORRECT RATIO**COMPONENT LOCATION**

Fig. 55: Identifying UD Clutch And CD Clutch Component
 Courtesy of HYUNDAI MOTOR CO.

GENERAL DESCRIPTION

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 1.440, then the input speed is 1,440 RPM.

DTC DESCRIPTION

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

DTC DETECTING CONDITION

Item	Detecting Condition	Possible cause
DTC Strategy	3rd gear incorrect ratio	- Faulty Input speed sensor - Faulty output speed sensor - Faulty UD, OD clutch or RED brake or One way clutch 2
Enable Conditions	- Engine speed > 450rpm - Output speed > 300rpm - Shift stage 3rd. gear - Input speed > Orpm - A/T oil temp output > or = -23°C(-9.4°F) 11V < or = Battery Voltage < or = 16V - TRANSAXLE RANGE SWITCH is normal and after 2sec is passed from IG ON	
Threshold value	input speed - output speed x 3rd gear ratio > or = 200rpm	
Diagnostic Time	more than 4sec	
Fail Safe	Locked into 3 rd gear	

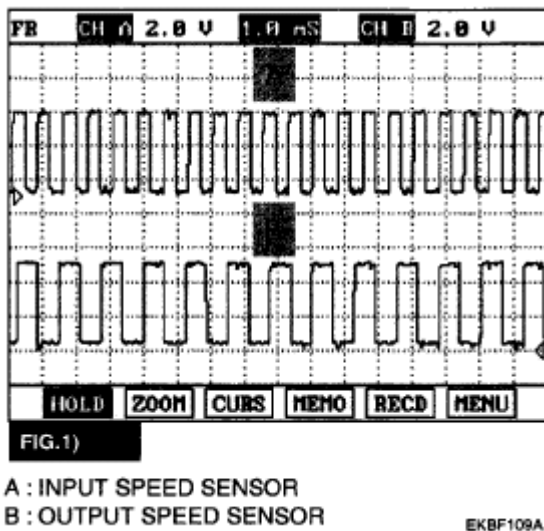
SIGNAL WAVEFORM

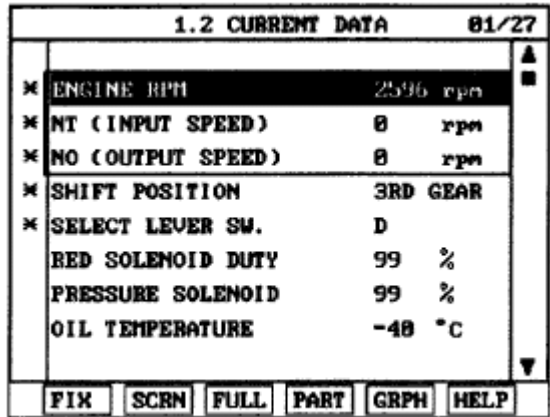
Fig. 56: Identifying Signal Waveform
Courtesy of HYUNDAI MOTOR CO.

MONITOR SCANTOOL DATA

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

Fig. 57: Scan Tool Display - Engine RPM
Courtesy of HYUNDAI MOTOR CO.

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

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 x GEAR RATIO) < or = 200 RPM

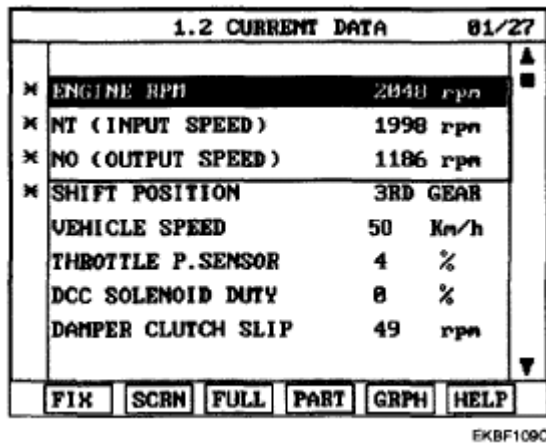


Fig. 58: Scan Tool Display - Engine RPM
Courtesy of HYUNDAI MOTOR CO.

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

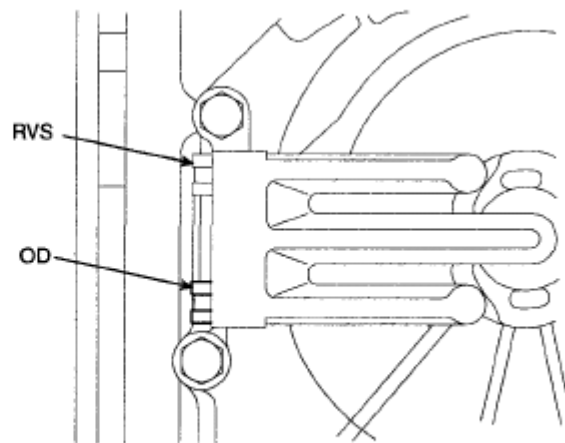
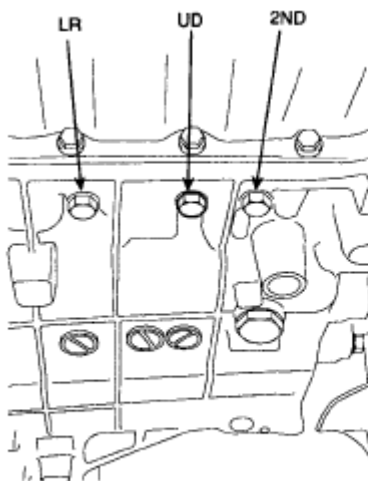
YES

- 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



EKB109D

Fig. 59: Identifying LR, UD And 2ND Port

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Courtesy of HYUNDAI MOTOR CO.

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

OIL PRESSURE SPECIFICATION

LEVER POSITION	INPUT SPEED	VFS CURRENT	SOLENOID VALVE DUTY (%)						ELEMENT	P(MPa)
			LR	DCC	2ND	UD	OD	RED (1)		
D	2500rpm	200mA	0	0	100	0	100	0	LR	1.03±0.02
?	?	?	60	?	?	?	?	?		0.45±0.04
?	?	?	75	?	?	?	?	?		0.19±0.04
?	?	?	100	?	?	?	?	?		0
?	?	?	100	?	0	0	100	0	2ND	1.03±0.02
?	?	?	?	?	60	?	?	?		0.50±0.05
?	?	?	?	?	75	?	?	?		0.20±0.05
?	?	?	?	?	100	?	?	?		0
?	?	?	100	?	100	0	0	0	OD	1.02±0.02
?	?	?	?	?	?	?	60	?		0.46±0.04
?	?	?	?	?	?	?	75	?		0.19±0.04
?	?	?	?	?	?	?	100	?		0
?	?	?	100	?	100	0	0	0	UD	1.03±0.02
?	?	?	?	?	?	60	?	?		0.44±0.05
?	?	?	?	?	?	75	?	?		0.18±0.04
?	?	?	?	?	?	100	?	?		0
?	?	?	100	?	0	100	0	0	RED ⁽¹⁾	1.03±0.02
?	?	?	?	?	?	?	?	60		0.49±0.04
?	?	?	?	?	?	?	?	75		0.24±0.04
?	?	?	?	?	?	?	?	100		0
?	?	?	100	?	0	100	0	100	DIR ⁽¹⁾	0
?	?	?	75	?	?	?	?	?		0.25±0.04
?	?	?	60	?	?	?	?	?		0.51±0.04
?	?	?	0	?	?	?	?	?		1.03±0.02
R	?	250mA	0	?	100	100	100	0	LR	1.55±0.25

(1) The values are subject to change according to vehicle model or condition.

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

Refer to **DTC P0731**.

DTC P0734 GEAR 4 INCORRECT RATIO

COMPONENT LOCATION

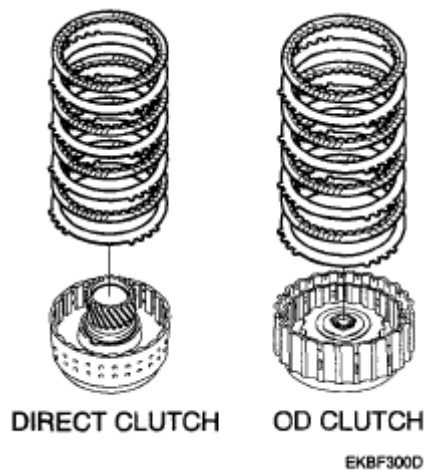


Fig. 60: Identifying Direct Clutch And OD Clutch Component
Courtesy of HYUNDAI MOTOR CO.

GENERAL DESCRIPTION

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 1.048, then the input speed is 1,048 RPM.

DTC DESCRIPTION

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

DTC DETECTING CONDITION

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 > Orpm - A/T oil temp output > or = -23°C(-9.4°F) 11V < or = Battery Voltage < or = 16V - TRANSAXLE RANGE SWITCH is normal and above 2sec is passed from IG ON	
Threshold value	input speed - output speed x 4th gear ratio > or = 200rpm	
Diagnostic Time	More than 4sec	
Fail Safe	Locked into 3 rd gear	

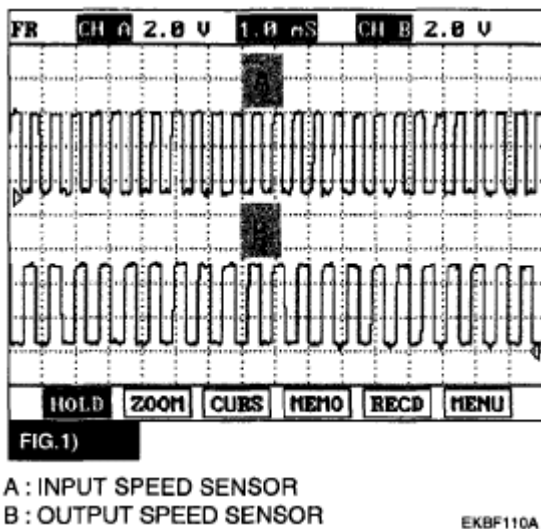
SIGNAL WAVEFORM

Fig. 61: Identifying Signal Waveform
Courtesy of HYUNDAI MOTOR CO.

MONITOR SCANTOOL DATA

* 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

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 x GEAR RATIO) < or = 200 RPM

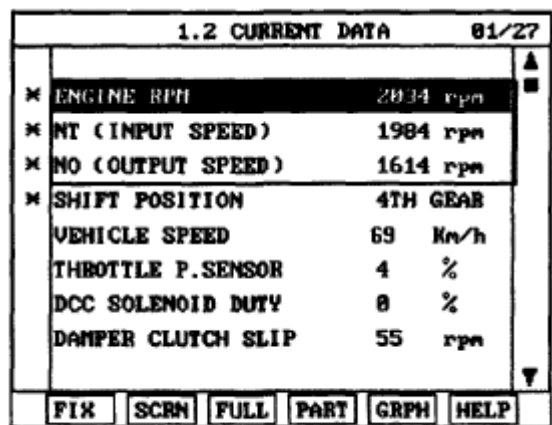


Fig. 62: Scan Tool Display - Engine RPM
Courtesy of HYUNDAI MOTOR CO.

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.

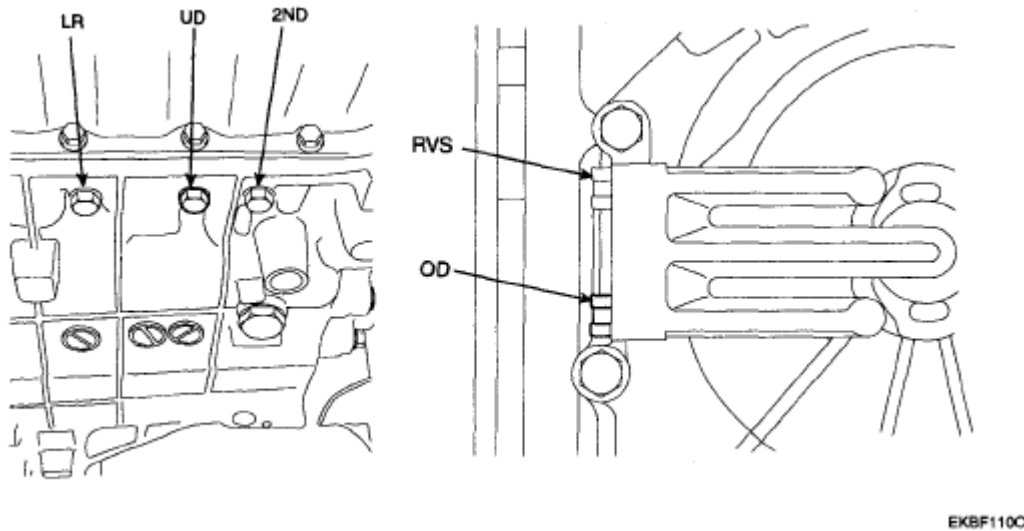
COMPONENT INSPECTION

Fig. 63: Identifying LR, UD And 2ND Port
 Courtesy of HYUNDAI MOTOR CO.

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

OIL PRESSURE SPECIFICATION

LEVER POSITION	INPUT SPEED	VFS CURRENT	SOLENOID VALVE DUTY (%)						ELEMENT	P(MPa)
			LR	DCC	2ND	UD	OD	RED (1)		
D	2500rpm	200mA	0	0	100	0	100	0	LR	1.03±0.02
?	?	?	60	?	?	?	?	?		0.45±0.04
?	?	?	75	?	?	?	?	?		0.19±0.04
?	?	?	100	?	?	?	?	?		0
?	?	?	100	?	0	0	100	0	2ND	1.03±0.02
?	?	?	?	?	60	?	?	?		0.50±0.05

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?	?	?	?	?	75	?	?	?		0.20±0.05
?	?	?	?	?	100	?	?	?		0
?	?	?	100	?	100	0	0	0	OD	1.02±0.02
?	?	?	?	?	?	?	60	?		0.46±0.04
?	?	?	?	?	?	?	75	?		0.19±0.04
?	?	?	?	?	?	?	100	?		0
?	?	?	100	?	100	0	0	0	UD	1.03±0.02
?	?	?	?	?	?	60	?	?		0.44±0.05
?	?	?	?	?	?	75	?	?		0.18±0.04
?	?	?	?	?	?	100	?	?		0
?	?	?	100	?	0	100	0	0	RED ⁽¹⁾	1.03±0.02
?	?	?	?	?	?	?	?	60		0.49±0.04
?	?	?	?	?	?	?	?	75		0.24±0.04
?	?	?	?	?	?	?	?	100		0
?	?	?	100	?	0	100	0	100	DIR ⁽¹⁾	0
?	?	?	75	?	?	?	?	?		0.25±0.04
?	?	?	60	?	?	?	?	?		0.51±0.04
?	?	?	0	?	?	?	?	?		1.03±0.02
R	?	250mA	0	?	100	100	100	0	LR	1.55±0.025

(1) The values are subject to change according to vehicle model or condition.

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

Refer to **DTC P0731**.

DTC P0735 GEAR 5 INCORRECT RATIO

COMPONENT LOCATION

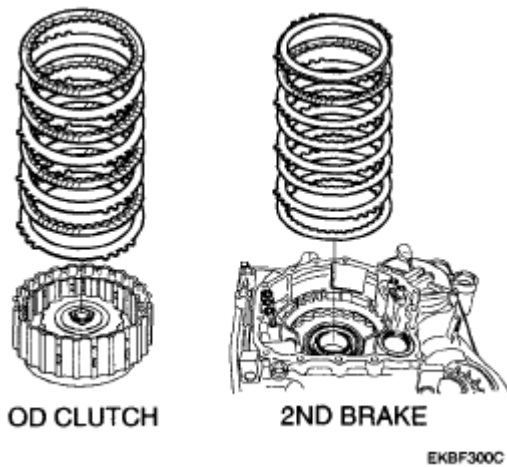


Fig. 64: Identifying OD Clutch And 2ND Brake Component
 Courtesy of HYUNDAI MOTOR CO.

GENERAL DESCRIPTION

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 0.728, then the input speed is 728 RPM.

DTC DESCRIPTION

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

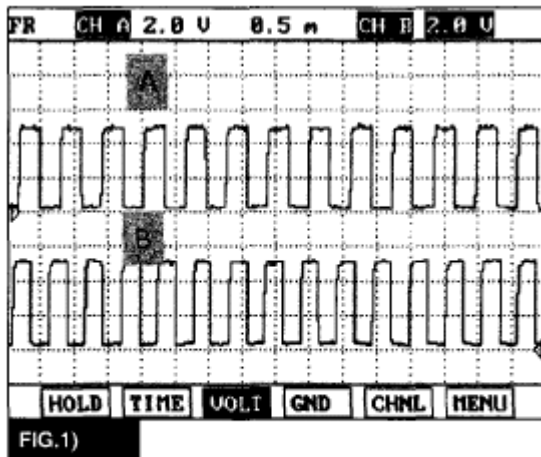
DTC DETECTING CONDITION

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 > Orpm - A/T oil temp output > or = -23°C(-9.4°F) 11V < or = Battery Voltage < or = 16V - TRANSAXLE RANGE SWITCH is normal	
Threshold value	input speed - output speed x 5th gear ratio > or = 200rpm	
Diagnostic Time	More than 4sec	

Fail Safe

- Locked into 3 rd gear

SIGNAL WAVEFORM



A : INPUT SPEED SENSOR
B : OUTPUT SPEED SENSOR

EKBF111A

Fig. 65: Identifying Signal Waveform
Courtesy of HYUNDAI MOTOR CO.

MONITOR SCANTOOL DATA

* 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

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 x GEAR RATIO) < or = 200 RPM

1.2 CURRENT DATA		01/27
✖ ENGINE RPM	2028 rpm	▲
✖ IN (INPUT SPEED)	1958 rpm	■
✖ NO (OUTPUT SPEED)	2276 rpm	
✖ SHIFT POSITION	5TH GEAR	
VEHICLE SPEED	98 Km/h	
THROTTLE P.SENSOR	6 %	
DCC SOLENOID DUTY	8 %	
DAMPER CLUTCH SLIP	76 rpm	▼
FIX	SCRN	FULL
PART	GRPH	HELP

EKBFI111B

Fig. 66: Scan Tool Display - Engine RPM
Courtesy of HYUNDAI MOTOR CO.

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

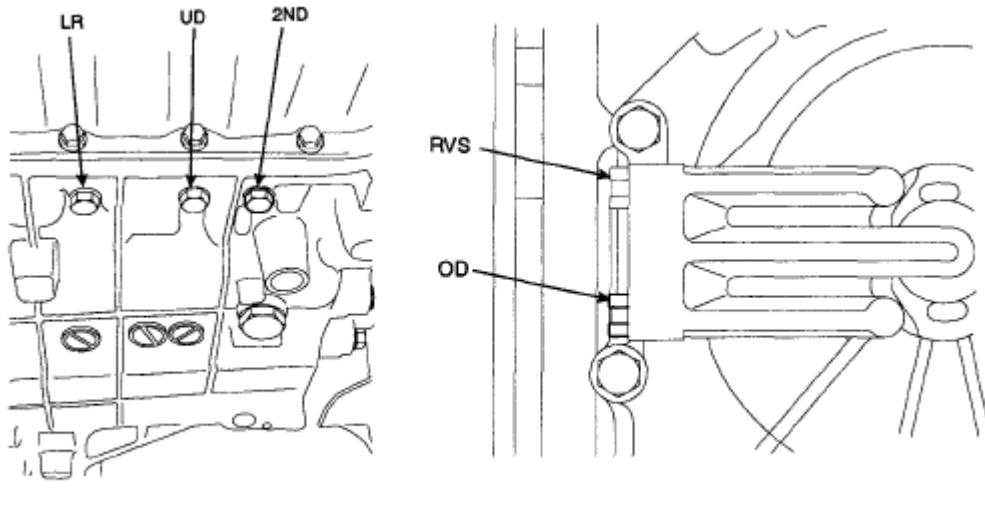


Fig. 67: Identifying LR, UD And 2ND Port
Courtesy of HYUNDAI MOTOR CO.

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

OIL PRESSURE SPECIFICATION

LEVER POSITION	INPUT SPEED	VFS CURRENT	SOLENOID VALVE DUTY (%)						ELEMENT	P(MPa)
			LR	DCC	2ND	UD	OD	RED (1)		
D	2500rpm	200mA	0	0	100	0	100	0	LR	1.03±0.02
?	?	?	60	?	?	?	?	?		0.45±0.04
?	?	?	75	?	?	?	?	?		0.19±0.04
?	?	?	100	?	?	?	?	?		0
?	?	?	100	?	0	0	100	0	2ND	1.03±0.02
?	?	?	?	?	60	?	?	?		0.50±0.05
?	?	?	?	?	75	?	?	?		0.20±0.05
?	?	?	?	?	100	?	?	?		0
?	?	?	100	?	100	0	0	0	OD	1.02±0.02
?	?	?	?	?	?	?	60	?		0.46±0.04
?	?	?	?	?	?	?	75	?		0.19±0.04
?	?	?	?	?	?	?	100	?		0
?	?	?	100	?	100	0	0	0		1.03±0.02

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?	?	?	?	?	?	60	?	?	UD	0.44±0.05
?	?	?	?	?	?	75	?	?		0.18±0.04
?	?	?	?	?	?	100	?	?		0
?	?	?	100	?	0	100	0	0	RED ⁽¹⁾	1.03±0.02
?	?	?	?	?	?	?	?	60		0.49±0.04
?	?	?	?	?	?	?	?	75		0.24±0.04
?	?	?	?	?	?	?	?	100		0
?	?	?	100	?	0	100	0	100	DIR ⁽¹⁾	0
?	?	?	75	?	?	?	?	?		0.25±0.04
?	?	?	60	?	?	?	?	?		0.51±0.04
?	?	?	0	?	?	?	?	?		1.03±0.02
R	?	250mA	0	?	100	100	100	0	LR	1.55±0.25

(1) The values are subject to change according to vehicle model or condition.

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

Refer to **DTC P0731**.

DTC P0741 TORQUE CONVERTER CLUTCH CIRCUIT - STUCK OFF

GENERAL DESCRIPTION

The PCM/TCM controls the locking and unlocking of the Torque Converter Clutch (or Damper Clutch), to the input shaft of the transmission, by applying 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

The PCM/TCM increases the duty ratio to engage the Damper Clutch by monitoring slip RPMs (difference

value between engine speed and turbine speed). To decrease the slip of the Damper Clutch, the PCM/TCM increases the duty ratio by applying more hydraulic 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

DTC DETECTING CONDITION

Item	Detecting Condition	Possible cause
DTC Strategy	Stuck "OFF"	* TORQUE CONVERTER (DAMPER) CLUTCH: TCC - Faulty TCC or oil pressure system - Faulty TCC solenoid valve - Faulty body control valve - Faulty PCM/TCM
Enable Conditions	Always (in TCC apply mode)	
Threshold value	TCC duty > 0% or TCC abnormal slip counter > or = 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

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%)

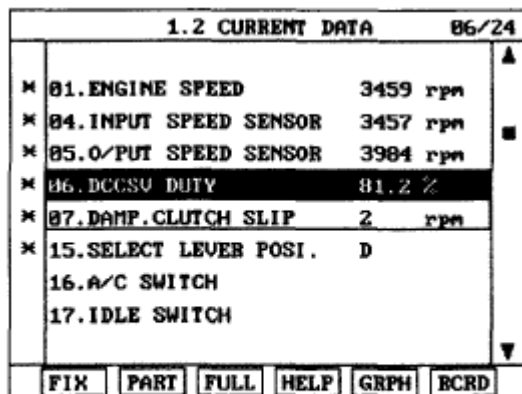


FIG.1)

FIG.1) : Normal status

EKBF113A

Fig. 68: Scan Tool Display - Torque Converter (Damper) Clutch Parameter

Courtesy of HYUNDAI MOTOR CO.

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**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 2 "CHECK OIL PRESSURE" as below.

NO

- Replace "TCC SOLENOID VALVE" as necessary and go to "**VERIFICATION OF VEHICLE REPAIR**" procedure.

2. CHECK OIL PRESSURE

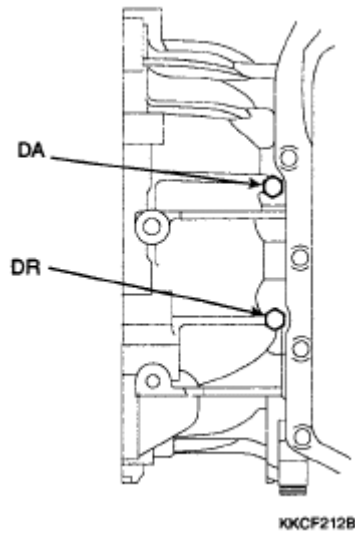


Fig. 69: Identifying DA And DR Port
Courtesy of HYUNDAI MOTOR CO.

1. Connect oil pressure gauge to "DA" ports.
2. Engine "ON".
3. After connecting Scantool and monitor the "TCC SOLENOID VALVE DUTY" parameter on the scantool data list.
4. Operate vehicle with 3rd or 4th gear and operate the "TCC SOLENOID VALVE DUTY" more than 85%.

Specification: Oil pressure gauge approx 735.4960KPa (7.5kg/cm*)- (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

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

Refer to **DTC P0741**.

DTC DESCRIPTION

The TCM increases the duty ratio to engage the Damper Clutch by monitoring the slip RPMs (difference value between 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

DTC DETECTING CONDITION

Item	Detecting Condition	Possible cause
DTC Strategy	• Stuck "ON"	* TORQUE CONVERTER(DAMPER) CLUTCH: TCC • Faulty TCC or oil pressure system • Faulty TCC solenoid valve • Faulty body control valve • Faulty TCM(PCM)
Enable Conditions	• Throttle position > 20% • Output speed > 500 rpm • Manifold air pressure > 60 kPa • A/T range switch D, SP • TCC stuck on delay timer > 5 sees	
Threshold value	• Engine rpm - Input speed sensor rpm < or = 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

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

2. Engine "ON".
3. Select "D RANGE" and drive vehicle.
4. Monitor the "TORQUE CONVERTER (DAMPER) CLUTCH" parameter on the scantool.

Specification: TCC SLIP > 5RPM

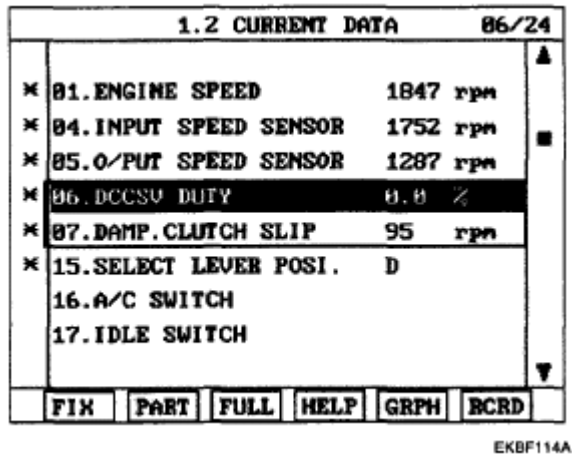


Fig. 70: Scan Tool Display - Torque Converter (Damper) Clutch Parameter
Courtesy of HYUNDAI MOTOR CO.

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

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 2 "CHECK OIL PRESSURE" as below.

NO

- Repair or replace as necessary and then go to "**VERIFICATION OF VEHICLE REPAIR**" procedure.

2. CHECK OIL PRESSURE

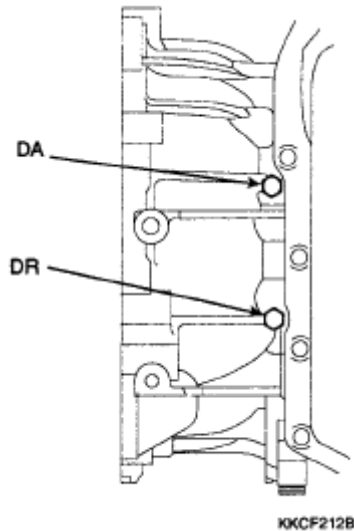


Fig. 71: Identifying DA And DR Port
Courtesy of HYUNDAI MOTOR CO.

1. Connect oil pressure gauge to "DR" ports.
2. Ignition "ON" & Engine "OFF".
3. After connecting scantool and monitor the "TCC SOLENOID 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 (6.1 kg/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

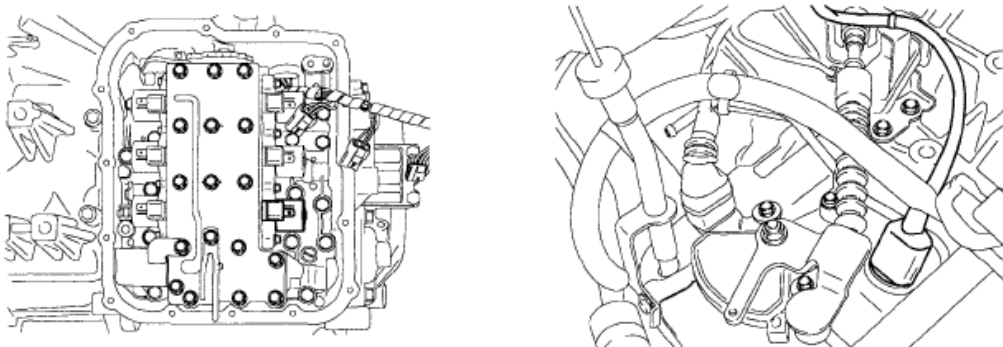
to **"VERIFICATION OF VEHICLE REPAIR"** procedure.

VERIFICATION OF VEHICLE REPAIR

Refer to **DTC P0741**.

DTC P0743 TORQUE CONVERTER CLUTCH CIRCUIT - ELECTRICAL

COMPONENT LOCATION



KKCF213A

Fig. 72: Identifying Torque Converter Clutch Component Location

Courtesy of HYUNDAI MOTOR CO.

GENERAL DESCRIPTION

The PCM/TCM controls the locking and unlocking of the Torque Converter Clutch (or Damper Clutch), to the input shaft of the transmission, by applying 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

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

DTC DETECTING CONDITION

Item	Detecting Condition	Possible cause
DTC Strategy	• Check voltage range	
	• 16V > Voltage Battery > 11V	

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2006 TRANSMISSION Automatic Transaxle (A5HF1) - Azera

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

SPECIFICATION**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:
 - 2.7-3.4Q (68°F or 20°C) - LR, 2ND, UD, OD, RED, DCC
 - 4.35±0.35ohms (68°F or 20°C) - VFS
- Surge voltage: 56 V (except VFS)

SCHEMATIC DIAGRAM

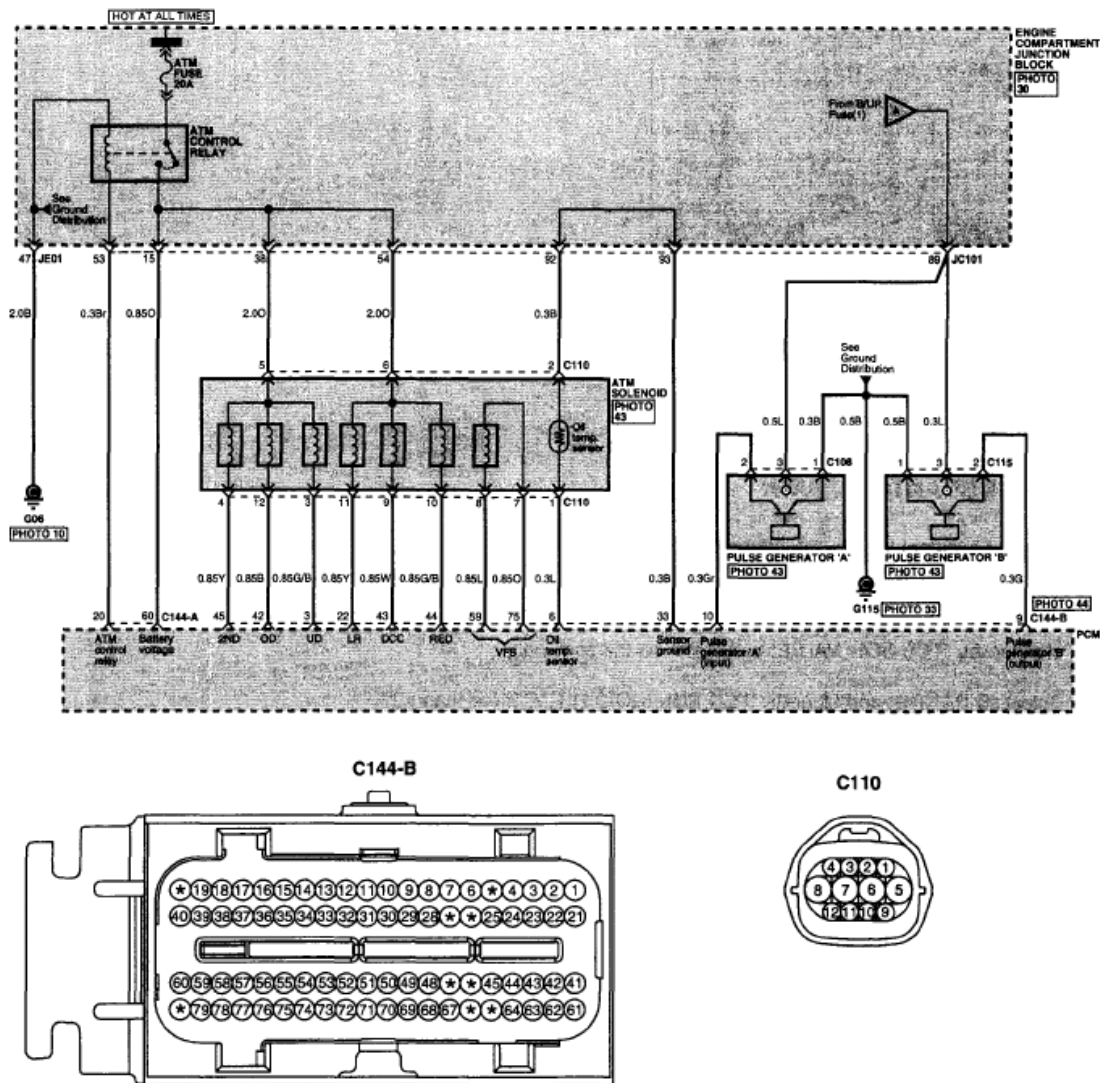


Fig. 73: Schematic Diagram - Torque Converter Clutch
 Courtesy of HYUNDAI MOTOR CO.

SIGNAL WAVEFORM

EKBF115G

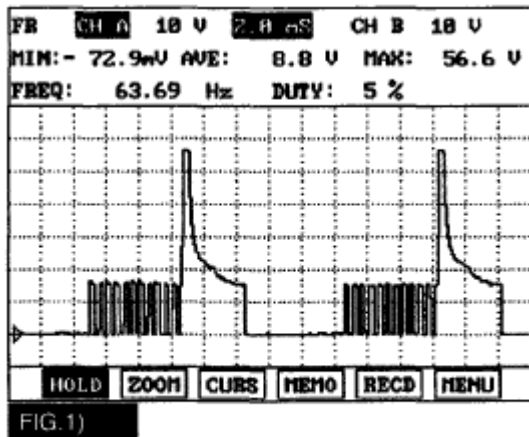


FIG.1) : Operating of "DCCSV"

EKBF115A

Fig. 74: Identifying Signal Waveform
 Courtesy of HYUNDAI MOTOR CO.

MONITOR SCANTOOL DATA

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%.

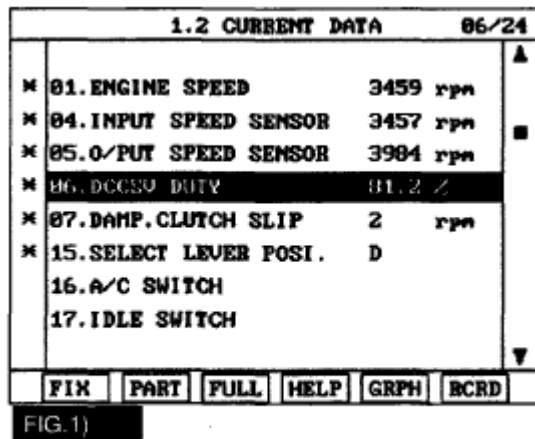


FIG.1) : Normal status

EKBF115B

Fig. 75: Scan Tool Display - TCC SOL. VALVE Parameter
 Courtesy of HYUNDAI MOTOR CO.

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

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

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

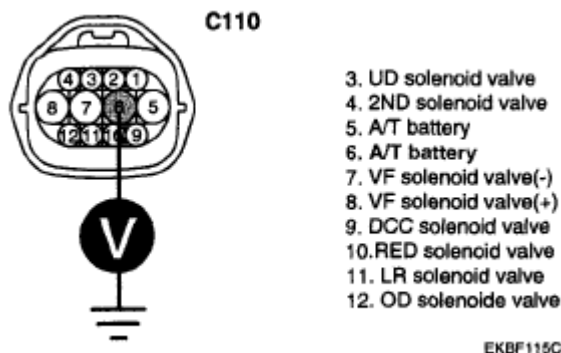


Fig. 76: Measuring Voltage Between Terminal 6 Of Sensor Harness Connector And Chassis Ground

Courtesy of HYUNDAI MOTOR CO.

4. Is voltage within specifications?

YES

- Go to "**SIGNAL CIRCUIT INSPECTION**" procedure.

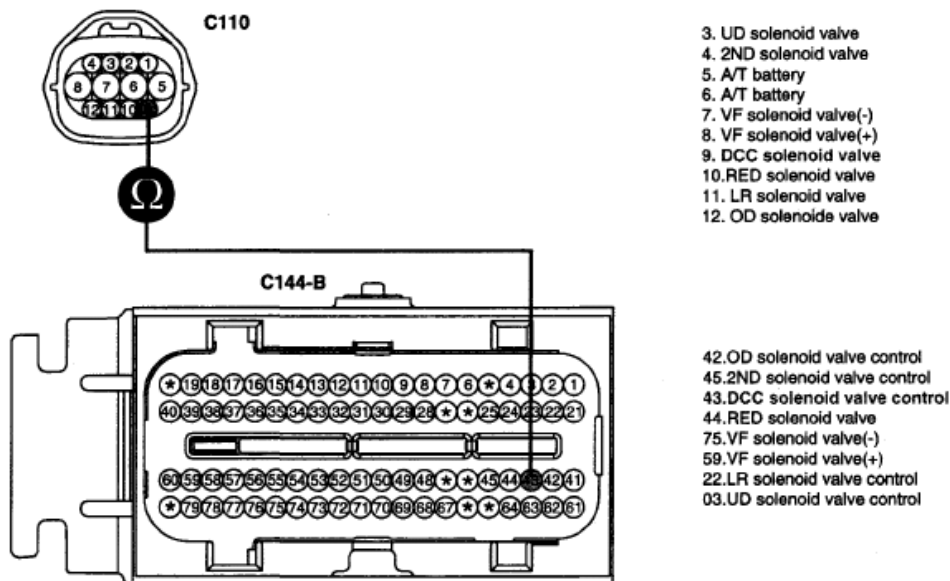
NO

- 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

- Check signal circuit open inspection.
 - Ignition "OFF".
 - Disconnect "A/T SOLENOID VALVE" connector and "PCM/TCM" connector.
 - Measure resistance between terminal "9" of the ATM SOLENOID VALVE harness connector and terminal "43" of the TCM harness connector.

Specification: approx. 0 ohms



EKBF115D

Fig. 77: Measuring Resistance Between Terminal 9 Of ATM Solenoid Valve Connector And Terminal 43 Of TCM Connector
 Courtesy of HYUNDAI MOTOR CO.

4. Is resistance within specifications?

YES

- Go to 2 "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

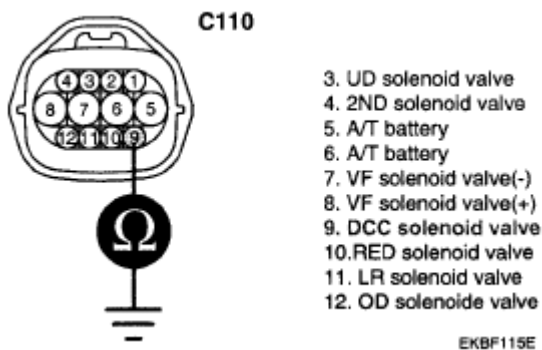


Fig. 78: Measuring Resistance Between Terminal 9 Of ATM Solenoid Valve And Chassis Ground

Courtesy of HYUNDAI MOTOR CO.

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

1. CHECK SOLENOID VALVE

1. Ignition "OFF".
2. Disconnect "A/T SOLENOID VALVE" connector.
3. Measure resistance between terminal "6" and terminal "9" of the ATM SOLENOID VALVE harness connector.

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

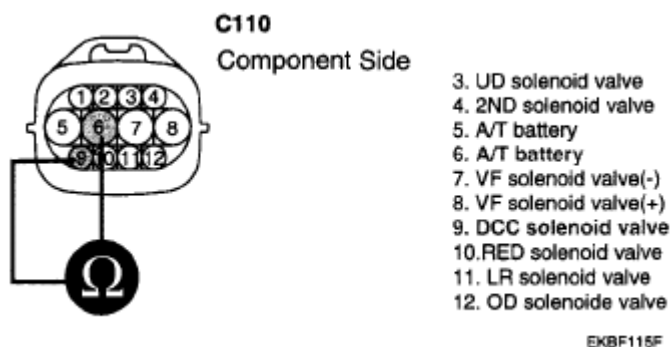


Fig. 79: Measuring Resistance Between Terminal 6 And Terminal 9 Of ATM Solenoid Valve Connector
Courtesy of HYUNDAI MOTOR CO.

4. Is resistance within specification?

YES

- Go to 2"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

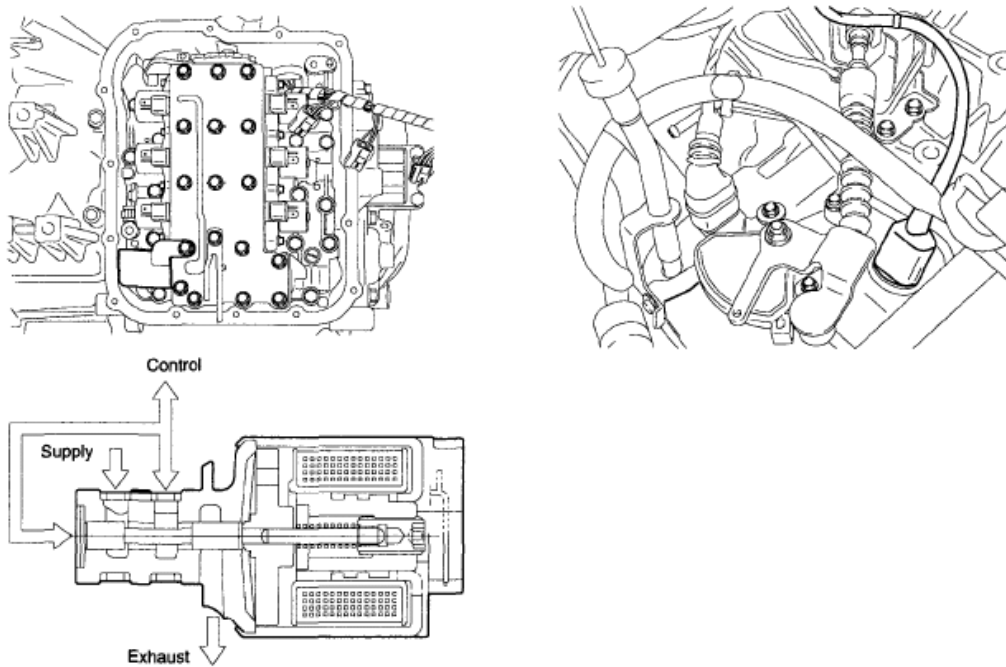
- Replace PCM/TCM as necessary and go to "**VERIFICATION OF VEHICLE REPAIR**" procedure.

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

Refer to **DTC P0741**.

DTC P0748 PRESSURE CONTROL SOLENOID VALVE A - ELECTRICAL**COMPONENT LOCATION**

EKBF116G

Fig. 80: Identifying Pressure Control Solenoid Valve A Component Location
Courtesy of HYUNDAI MOTOR CO.

GENERAL DESCRIPTION

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

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

DTC DETECTING CONDITION

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

Refer to **DTC P0743**.

SCHEMATIC DIAGRAM

Refer to **DTC P0743**.

SIGNAL WAVEFORM

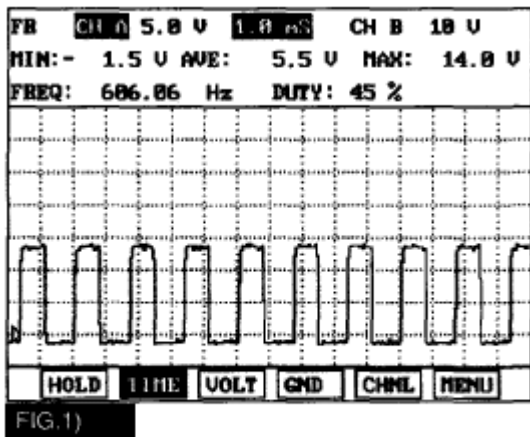


FIG.1) : Wave form of "VFS"

EKBF116A

Fig. 81: Identifying Signal Waveform
Courtesy of HYUNDAI MOTOR CO.

MONITOR SCANTOOL DATA

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.

1.2 CURRENT DATA 13/27		1.2 CURRENT DATA 13/27	
× PRESSURE SOLENOID	98 %	× PRESSURE SOLENOID	H %
× SHIFT POSITION	-	× SHIFT POSITION	-
× SELECT LEVER SW.	R	× SELECT LEVER SW.	P,N
LR SOLENOID DUTY	99 %	LR SOLENOID DUTY	99 %
UD SOLENOID DUTY	8 %	UD SOLENOID DUTY	8 %
2ND SOLENOID DUTY	8 %	2ND SOLENOID DUTY	8 %
OD SOLENOID DUTY	8 %	OD SOLENOID DUTY	8 %
RED SOLENOID DUTY	99 %	RED SOLENOID DUTY	99 %
FIX	SCRN	FULL	PART
GRPH	HELP	GRPH	HELP

FIG.1)

FIG.2)

1.2 CURRENT DATA 13/27		1.2 CURRENT DATA 13/27	
× PRESSURE SOLENOID	99 %	× PRESSURE SOLENOID	35 %
× SHIFT POSITION	1ST GEAR	× SHIFT POSITION	2ND GEAR
× SELECT LEVER SW.	D	× SELECT LEVER SW.	D
LR SOLENOID DUTY	99 %	LR SOLENOID DUTY	8 %
UD SOLENOID DUTY	99 %	UD SOLENOID DUTY	99 %
2ND SOLENOID DUTY	8 %	2ND SOLENOID DUTY	99 %
OD SOLENOID DUTY	8 %	OD SOLENOID DUTY	8 %
RED SOLENOID DUTY	99 %	RED SOLENOID DUTY	99 %
FIX	SCRN	FULL	PART
GRPH	HELP	GRPH	HELP

FIG.3)

FIG.4)

1.2 CURRENT DATA 13/27		1.2 CURRENT DATA 13/27	
× PRESSURE SOLENOID	35 %	× PRESSURE SOLENOID	35 %
× SHIFT POSITION	3RD GEAR	× SHIFT POSITION	4TH GEAR
× SELECT LEVER SW.	D	× SELECT LEVER SW.	D
LR SOLENOID DUTY	8 %	LR SOLENOID DUTY	8 %
UD SOLENOID DUTY	99 %	UD SOLENOID DUTY	8 %
2ND SOLENOID DUTY	8 %	2ND SOLENOID DUTY	99 %
OD SOLENOID DUTY	99 %	OD SOLENOID DUTY	99 %
RED SOLENOID DUTY	99 %	RED SOLENOID DUTY	99 %
FIX	SCRN	FULL	PART
GRPH	HELP	GRPH	HELP

FIG.5)

FIG.6)

1.2 CURRENT DATA 13/27	
× PRESSURE SOLENOID	72 %
× SHIFT POSITION	5TH GEAR
× SELECT LEVER SW.	D
LR SOLENOID DUTY	99 %
UD SOLENOID DUTY	8 %
2ND SOLENOID DUTY	99 %
OD SOLENOID DUTY	99 %
RED SOLENOID DUTY	8 %
FIX	SCRN
FULL	PART
GRPH	HELP

FIG.7)

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

EKBFI168

Fig. 82: Scan Tool Display - Press Control Sol. Valve Parameter
Courtesy of HYUNDAI MOTOR CO.

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

Refer to **DTC P0743**.

POWER SUPPLY CIRCUIT INSPECTION

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

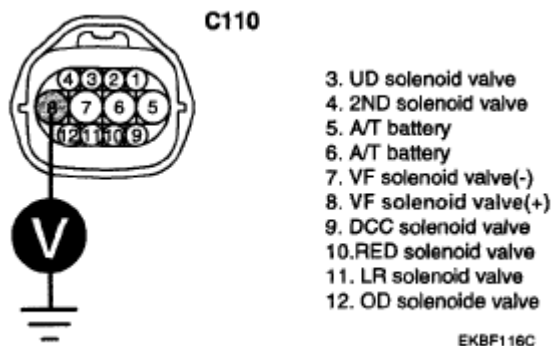


Fig. 83: Measuring Voltage Between Terminal 8 Of Sensor Connector And Chassis Ground
Courtesy of HYUNDAI MOTOR CO.

4. Is voltage within specifications?

YES

- Go to "**SIGNAL CIRCUIT INSPECTION**" procedure.

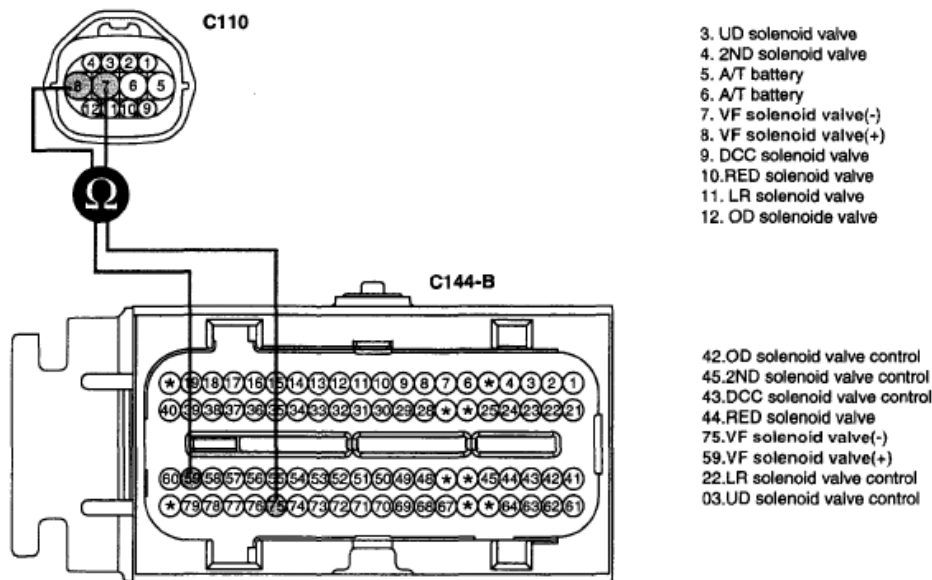
NO

- 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

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 ohms



EKBF116D

Fig. 84: Measuring Resistance Between Terminal 7, 8 Of ATM Solenoid Valve Connector And Terminal 75, 59 Of PCM/TCM Connector
Courtesy of HYUNDAI MOTOR CO.

4. Is resistance within specifications?

YES

- Go to 2 "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

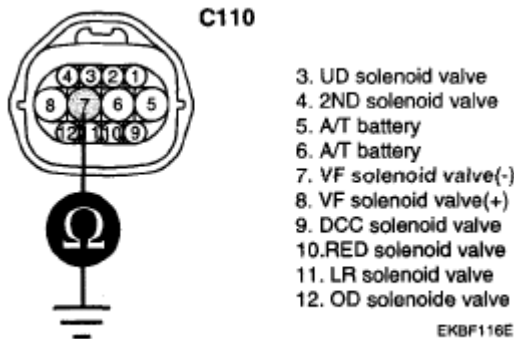


Fig. 85: Measuring Resistance Between Terminal 7 Of ATM Solenoid Valve And Chassis Ground

Courtesy of HYUNDAI MOTOR CO.

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

1. CHECK SOLENOID VALVE

1. Ignition "OFF".
2. Disconnect "A/T SOLENOID VALVE" connector.
3. Measure resistance between terminal "7" and terminal "8" of the ATM SOLENOID VALVE harness connector.

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

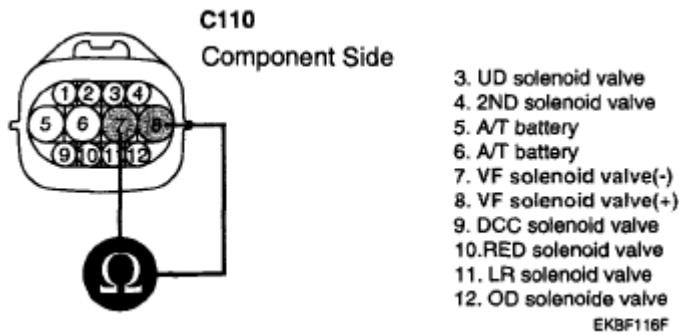


Fig. 86: Measuring Resistance Between Terminal 7 And Terminal 8 Of ATM Solenoid Valve Harness Connector
Courtesy of HYUNDAI MOTOR CO.

4. Is resistance within specification?

YES

- Go to 2 "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

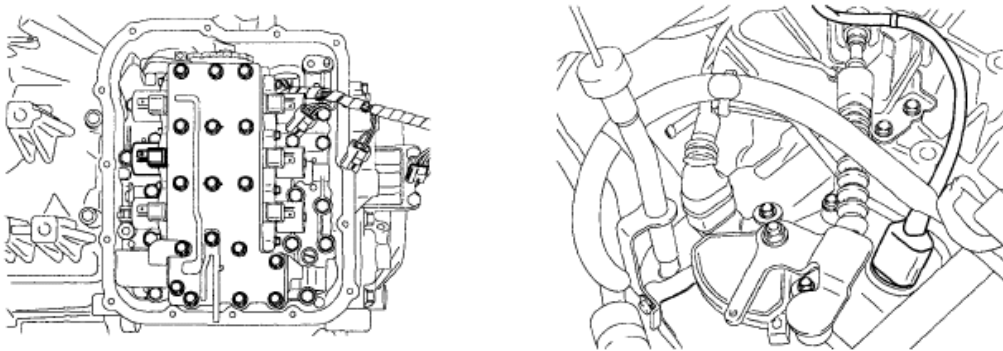
4. Vehicle Speed 0mph (0km/h)
5. Throttle position sensor < 1V
6. IDLE SWITCH ON
7. ENGINE RPM 0

VERIFICATION OF VEHICLE REPAIR

Refer to **DTC P0741**.

DTC P0750 SHIFT CONTROL SOLENOID VALVE A CIRCUIT MALFUNCTION

COMPONENT LOCATION



KKCF213G

Fig. 87: Identifying Shift Control Solenoid Valve A Component Location
Courtesy of HYUNDAI MOTOR CO.

GENERAL DESCRIPTION

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

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

DTC DETECTING CONDITION

Item	Detecting Condition	Possible cause

2006 Hyundai Azera Limited

2006 TRANSMISSION Automatic Transaxle (A5HF1) - Azera

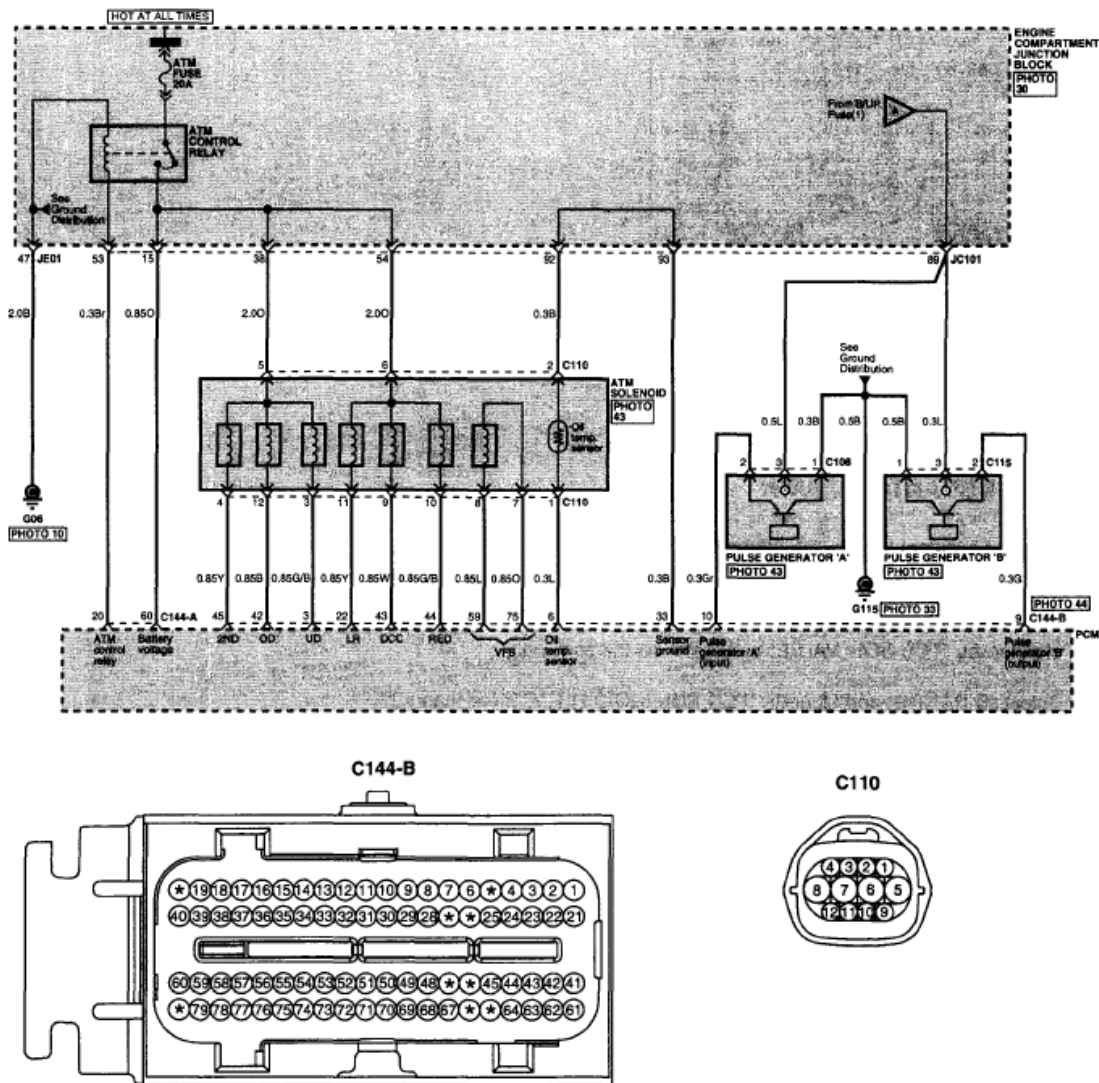
DTC Strategy	• Check voltage range	• Open or short in circuit • Faulty LR SOLENOID VALVE • Faulty PCM/TCM
Enable Conditions	• 16V > Voltage Battery > 11V • In gear state(no gear shifting) 500msec is passed from turn on the relay • A/T Relay = ON • Engine state = RUN	
Threshold value	• Out of available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

SPECIFICATION

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:
 - 2.7-3.4ohms (68°F or 20°C) - LR, 2ND, UD, OD, RED, DCC
 - 4.35±0.35ohms (68°F or 20°C) - VFS
- Surge voltage: 56 V (except VFS)

SCHEMATIC DIAGRAM



EKBF115G

Fig. 88: Schematic Diagram - Torque Converter Clutch
Courtesy of HYUNDAI MOTOR CO.

SIGNAL WAVEFORM

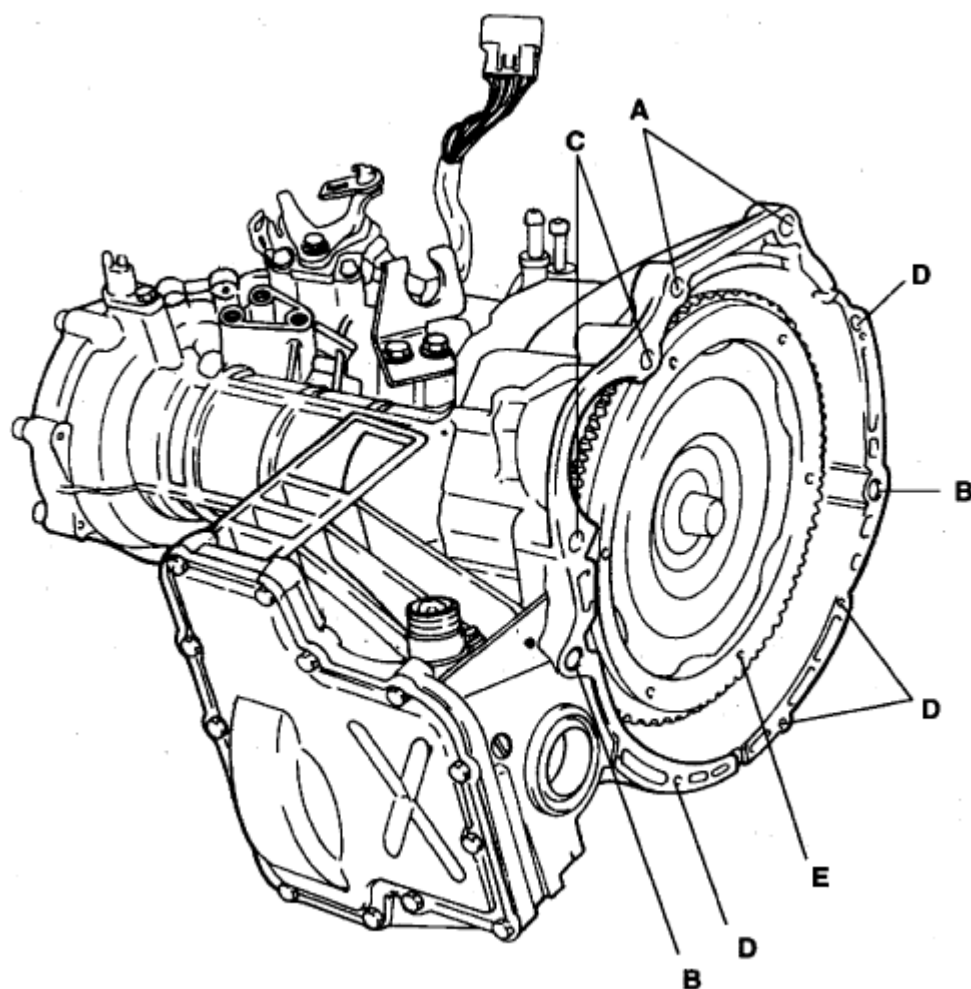


Fig. 89: Identifying Signal Waveform
Courtesy of HYUNDAI MOTOR CO.

MONITOR SCANTOOL DATA

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.

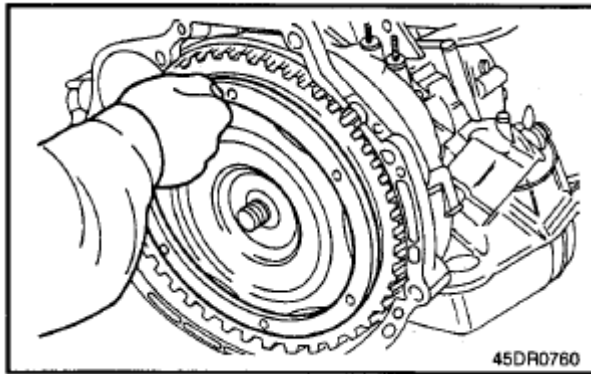


Fig. 90: Scan Tool Display - LR SOL. Valve Parameter
Courtesy of HYUNDAI MOTOR CO.

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

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

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

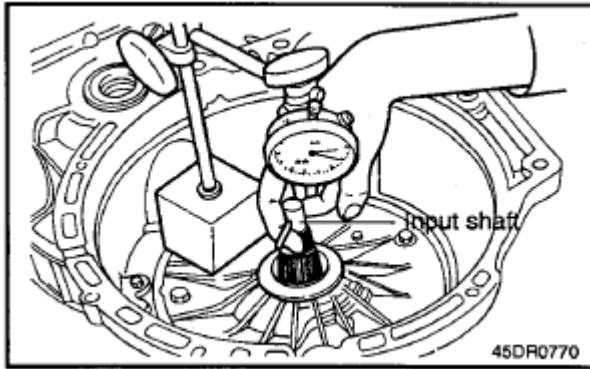


Fig. 91: Measuring Voltage Between Terminal 6 Of Sensor Harness Connector And Chassis Ground

Courtesy of HYUNDAI MOTOR CO.

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

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 ohms

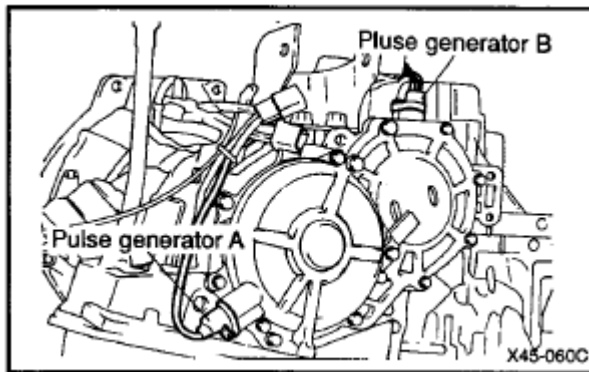


Fig. 92: Measuring Resistance Between Terminal 11 Of ATM Solenoid Valve Connector And Terminal 22 Of PCM/TCM Connector
 Courtesy of HYUNDAI MOTOR CO.

4. Is resistance within specifications?

YES

- Go to 2 "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

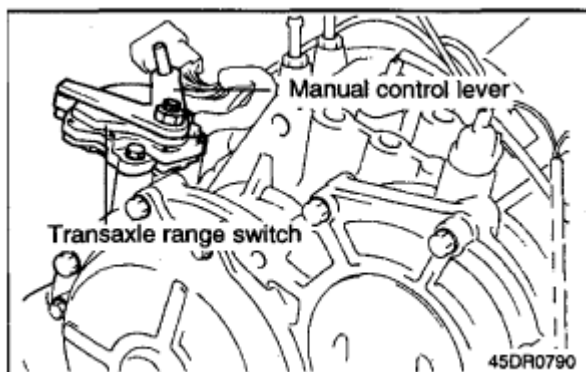


Fig. 93: Measuring Resistance Between Terminal 11 Of ATM Solenoid Valve And Chassis

Ground

Courtesy of HYUNDAI MOTOR CO.

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

1. CHECK SOLENOID VALVE

1. Ignition "OFF".
2. Disconnect "A/T SOLENOID VALVE" connector.
3. Measure resistance between terminal "6" and terminal "11" of the ATM SOLENOID VALVE harness connector.

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

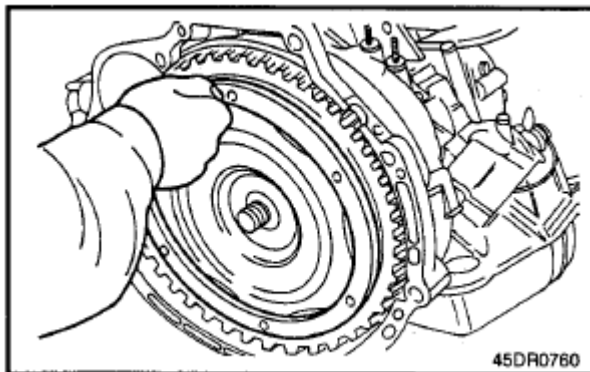


Fig. 94: Measuring Resistance Between Terminal 6 And Terminal 11 Of ATM Solenoid Valve Connector

Courtesy of HYUNDAI MOTOR CO.

4. Is resistance within specification?

YES

- Go to 2 "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 < IV
6. IDLE SWITCH ON
7. ENGINE RPM 0

VERIFICATION OF VEHICLE REPAIR

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.

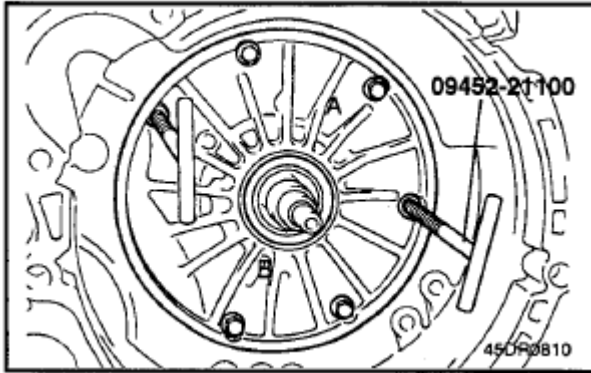
DTC P0755 SHIFT CONTROL SOLENOID VALVE B CIRCUIT MALFUNCTION**COMPONENT LOCATION**

Fig. 95: Identifying Shift Control Solenoid Valve B Component Location
 Courtesy of HYUNDAI MOTOR CO.

GENERAL DESCRIPTION

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

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**DTC DETECTING CONDITION**

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

Refer to **DTC P0750**.

SCHEMATIC DIAGRAM

Refer to **DTC P0750**.

SIGNAL WAVEFORM

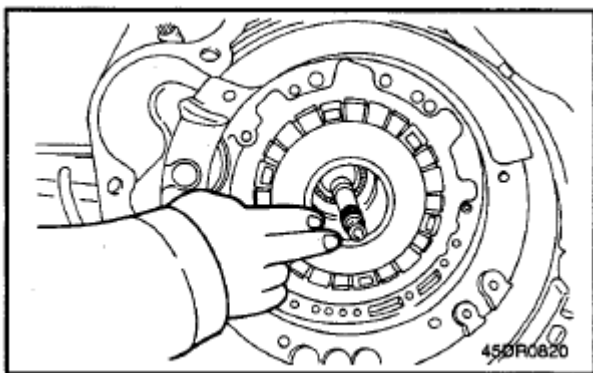


Fig. 96: Identifying Signal Waveform
Courtesy of HYUNDAI MOTOR CO.

MONITOR SCANTOOL DATA

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.

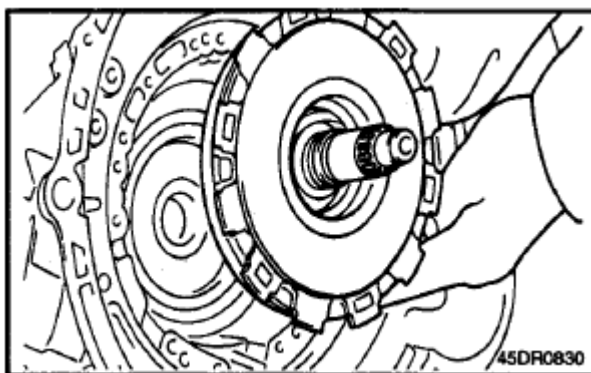


Fig. 97: Scan Tool Display - UD SOL. Valve Parameter
Courtesy of HYUNDAI MOTOR CO.

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

Refer to **DTC P0750**.

POWER SUPPLY CIRCUIT INSPECTION

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

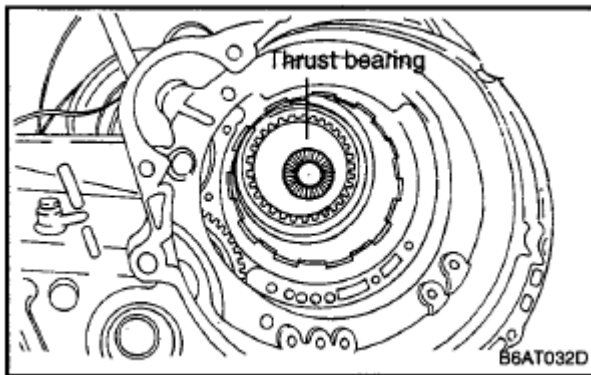


Fig. 98: Measuring Voltage Between Terminal 5 Of Sensor Connector And Chassis Ground
Courtesy of HYUNDAI MOTOR CO.

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

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 ohms

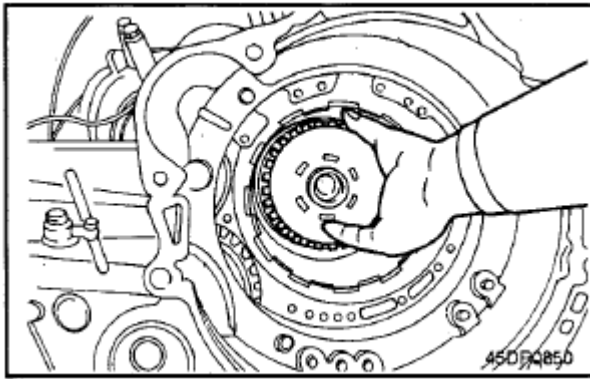


Fig. 99: Measuring Resistance Between Terminal 3 Of ATM Solenoid Valve Connector And Terminal 3 Of PCM/TCM Connector
Courtesy of HYUNDAI MOTOR CO.

4. Is resistance within specifications?

YES

- Go to 2 "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

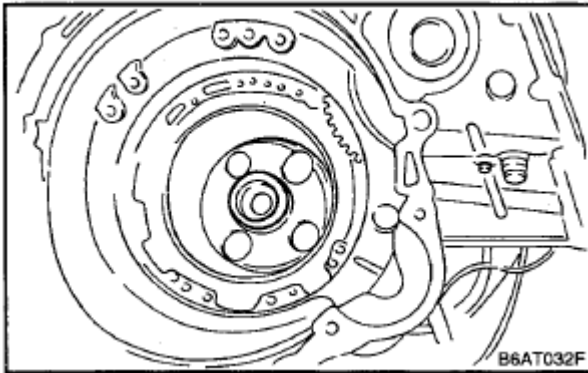


Fig. 100: Measuring Resistance Between Terminal 3 Of ATM Solenoid Valve And Chassis Ground

Courtesy of HYUNDAI MOTOR CO.

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

1. CHECK SOLENOID VALVE

1. Ignition "OFF".
2. Disconnect "A/T SOLENOID VALVE" connector.
3. Measure resistance between terminal "3" and terminal "5" of the ATM SOLENOID VALVE harness connector.

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

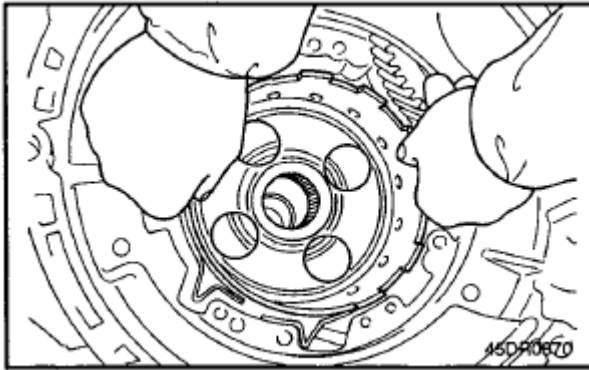


Fig. 101: Measuring Resistance Between Terminal 3 And Terminal 5 Of ATM Solenoid Valve Connector

Courtesy of HYUNDAI MOTOR CO.

4. Is resistance within specification?

YES

- Go to 2 "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

Refer to **DTC P0750**.

DTC P0760 SHIFT CONTROL SOLENOID VALVE C CIRCUIT MALFUNCTION

COMPONENT LOCATION

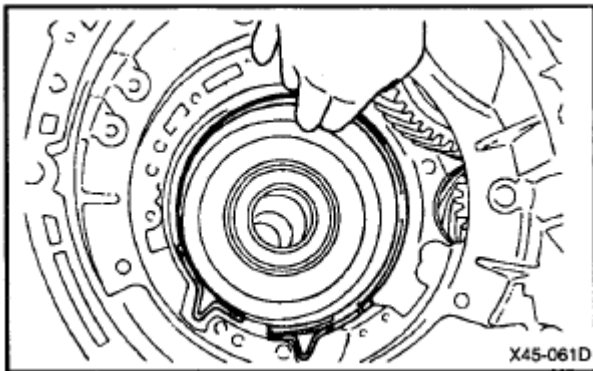


Fig. 102: Identifying Shift Control Solenoid Valve C Component Location
Courtesy of HYUNDAI MOTOR CO.

GENERAL DESCRIPTION

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

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

DTC DETECTING CONDITION

Item	Detecting Condition	Possible cause

DTC Strategy	• Check voltage range	
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	• Open or short in circuit • Faulty 2ND SOLENOID VALVE • Faulty PCM/TCM
Threshold value	• Out of available voltage range	
Diagnostic Time	• More than 5 seconds	
Fail Safe	• Locked in 3rd gear.(Control relay off)	

SPECIFICATION

Refer to **DTC P0750**.

SCHEMATIC DIAGRAM

Refer to **DTC P0750**.

SIGNAL WAVEFORM

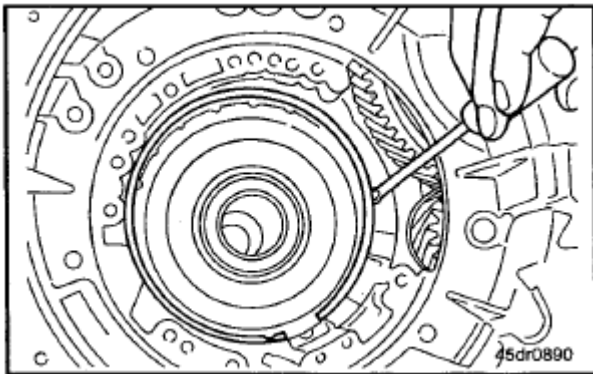


Fig. 103: Identifying Signal Waveform
Courtesy of HYUNDAI MOTOR CO.

MONITOR SCANTOOL DATA

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.

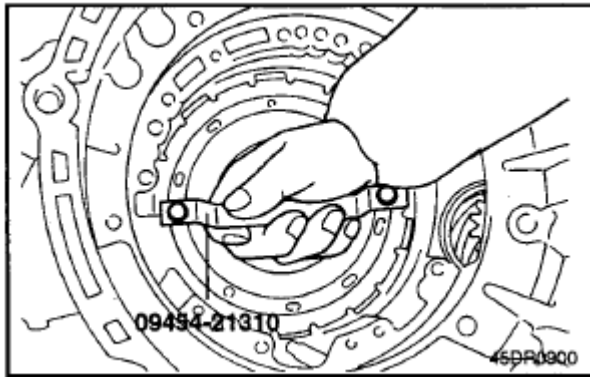


Fig. 104: Scan Tool Display - 2nd SOL. Valve Parameter
Courtesy of HYUNDAI MOTOR CO.

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

Refer to **DTC P0750**.

POWER SUPPLY CIRCUIT INSPECTION

Refer to **DTC P0755**.

SIGNAL CIRCUIT INSPECTION

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 ohms

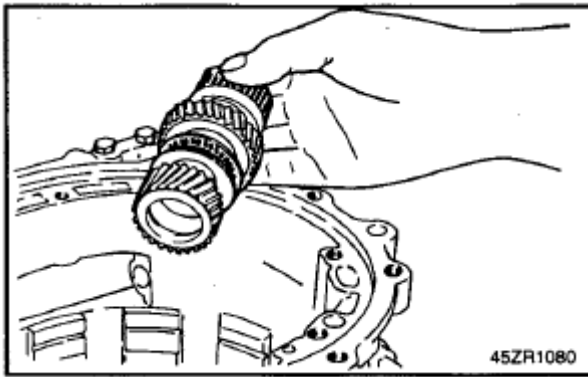


Fig. 105: Measuring Resistance Between Terminal 4 Of ATM Solenoid Valve Connector And Terminal 45 Of PCM/TCM Connector
Courtesy of HYUNDAI MOTOR CO.

4. Is resistance within specifications?

YES

- Go to 2 "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

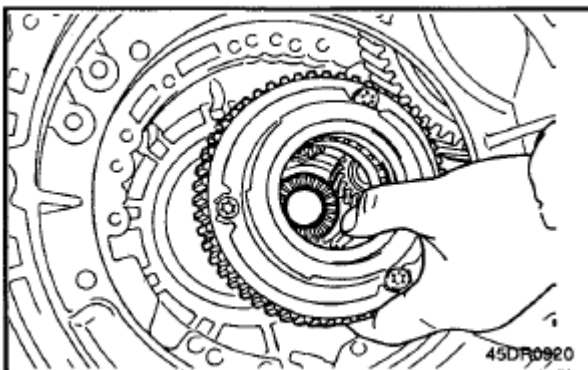


Fig. 106: Measuring Resistance Between Terminal 4 Of ATM Solenoid Valve And Chassis

Ground

Courtesy of HYUNDAI MOTOR CO.

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

1. CHECK SOLENOID VALVE

1. Ignition "OFF".
2. Disconnect "A/T SOLENOID VALVE" connector.
3. Measure resistance between terminal "4" and terminal "5" of the ATM SOLENOID VALVE harness connector.

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

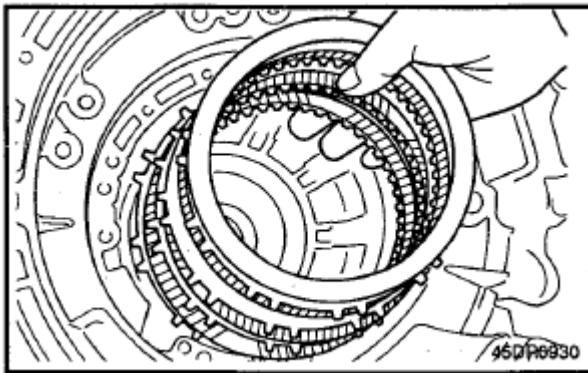


Fig. 107: Measuring Resistance Between Terminal 4 And Terminal 5 Of ATM Solenoid Valve Harness Connector

Courtesy of HYUNDAI MOTOR CO.

4. Is resistance within specification?

YES

- Go to 2 "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

Refer to **DTC P0750**.

DTC P0765 SHIFT CONTROL SOLENOID VALVE D CIRCUIT MALFUNCTION**COMPONENT LOCATION**

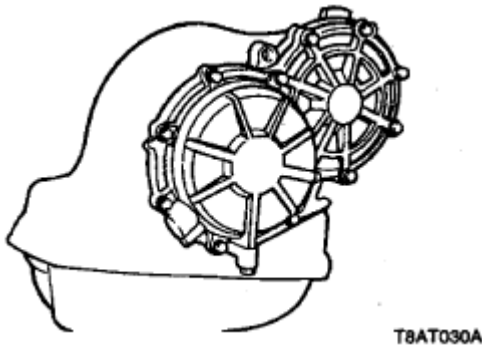


Fig. 108: Identifying Shift Control Solenoid Valve D Component Location
 Courtesy of HYUNDAI MOTOR CO.

GENERAL DESCRIPTION

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

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

DTC DETECTING CONDITION

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

Refer to **DTC P0750**.

SCHEMATIC DIAGRAM

Refer to **DTC P0750**.

SIGNAL WAVEFORM

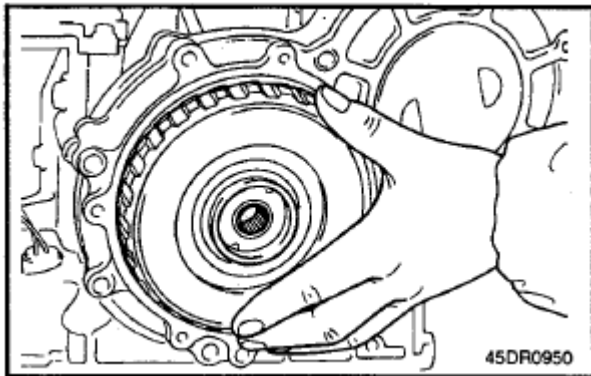


Fig. 109: Identifying Signal Waveform
Courtesy of HYUNDAI MOTOR CO.

MONITOR SCANTOOL DATA

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.

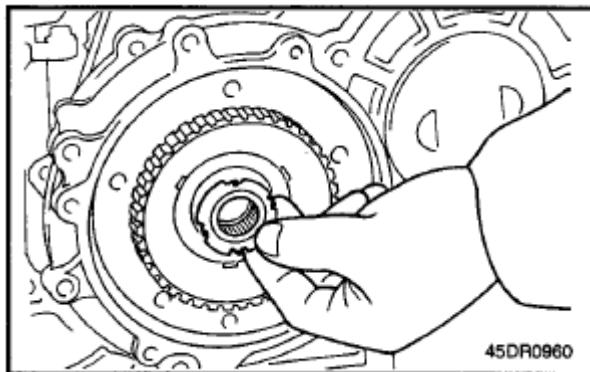


Fig. 110: Scan Tool Display - OD SOL. Valve Parameter
Courtesy of HYUNDAI MOTOR CO.

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

Refer to **DTC P0750**.

POWER SUPPLY CIRCUIT INSPECTION

Refer to **DTC P0755**.

SIGNAL CIRCUIT INSPECTION

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 ohms

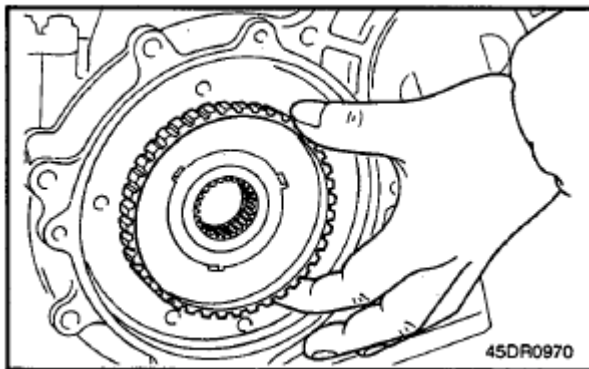


Fig. 111: Measuring Resistance Between Terminal 12 Of ATM Solenoid Valve Connector And Terminal 42 Of PCM/TCM Connector
Courtesy of HYUNDAI MOTOR CO.

4. Is resistance within specifications?

YES

- Go to 2 "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

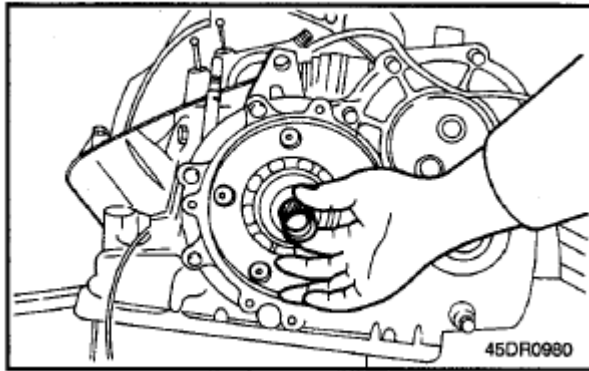


Fig. 112: Measuring Resistance Between Terminal 12 Of ATM Solenoid Valve Harness And Chassis Ground
Courtesy of HYUNDAI MOTOR CO.

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

1. CHECK SOLENOID VALVE

1. Ignition "OFF".
2. Disconnect "A/T SOLENOID VALVE" connector.

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

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

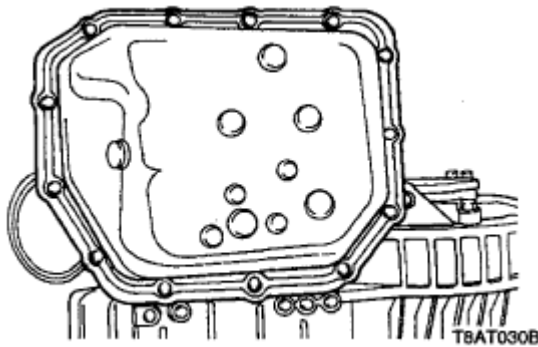


Fig. 113: Measuring Resistance Between Terminal 5 And Terminal 12 Of ATM Solenoid Valve Connector
 Courtesy of HYUNDAI MOTOR CO.

4. Is resistance within specification?

YES

- Go to 2 "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

Refer to **DTC P0750**.

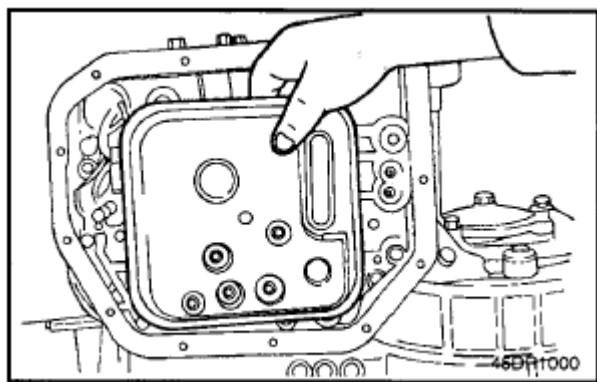
DTC P0770 SHIFT CONTROL SOLENOID VALVE E CIRCUIT MALFUNCTION**COMPONENT LOCATION**

Fig. 114: Identifying Shift Control Solenoid Valve E Component Location
Courtesy of HYUNDAI MOTOR CO.

GENERAL DESCRIPTION

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

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

DTC DETECTING CONDITION

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

Refer to **DTC P0750**.

SCHEMATIC DIAGRAM

Refer to **DTC P0750**.

SIGNAL WAVEFORM

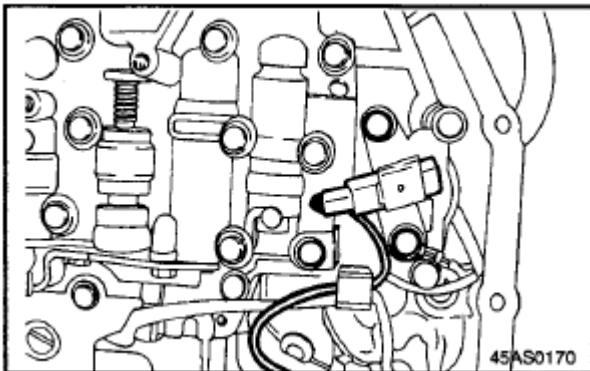


Fig. 115: Identifying Signal Waveform
Courtesy of HYUNDAI MOTOR CO.

MONITOR SCANTOOL DATA

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.

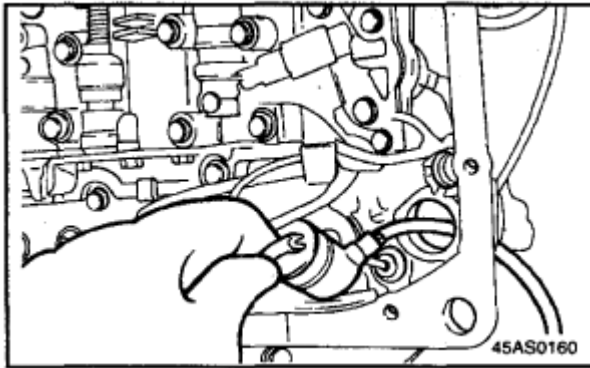


Fig. 116: Scan Tool Display - RED SOL. Valve Parameter
Courtesy of HYUNDAI MOTOR CO.

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

Refer to **DTC P0750**.

POWER SUPPLY CIRCUIT INSPECTION

Refer to **DTC P0750**.

SIGNAL CIRCUIT INSPECTION

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 ohms

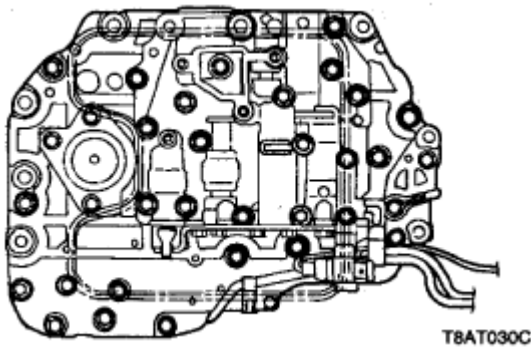


Fig. 117: Measuring Resistance Between Terminal 10 Of ATM Solenoid Valve Connector And Terminal 44 Of PCM/TCM Connector
Courtesy of HYUNDAI MOTOR CO.

4. Is resistance within specifications?

YES

- Go to 2 "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

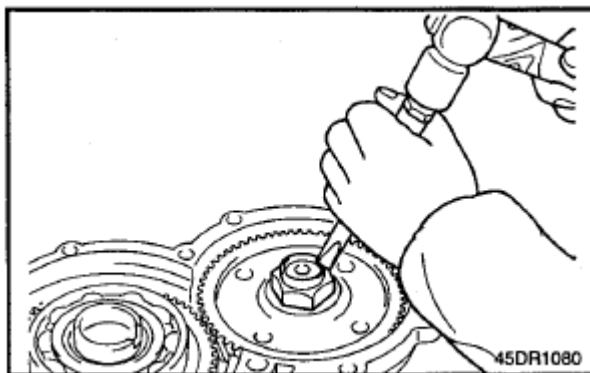


Fig. 118: Measuring Resistance Between Terminal 10 Of ATM Solenoid Valve And Chassis Ground

Courtesy of HYUNDAI MOTOR CO.

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

1. CHECK SOLENOID VALVE

1. Ignition "OFF".
2. Disconnect "A/T SOLENOID VALVE" connector.
3. Measure resistance between terminal "6" and terminal "10" of the ATM SOLENOID VALVE harness connector.

Specification: Approximately 2.7-3.4 ohms [20°C (68°F)]

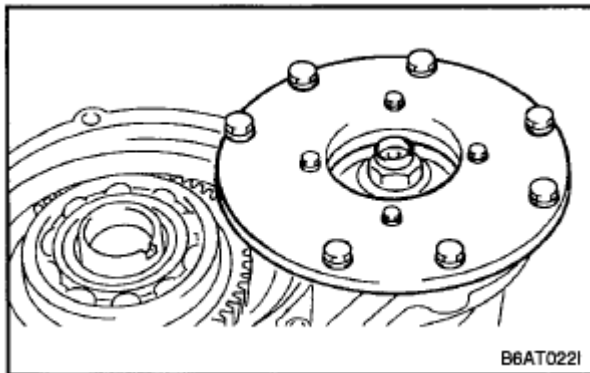


Fig. 119: Measuring Resistance Between Terminal 6 And Terminal 10 Of ATM Solenoid Valve Connector

Courtesy of HYUNDAI MOTOR CO.

4. Is resistance within specification?

YES

- Go to 2 "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

Refer to **DTC P0750**.

DTC P0885 A/T RELAY CIRCUIT MALFUNCTION**COMPONENT LOCATION**

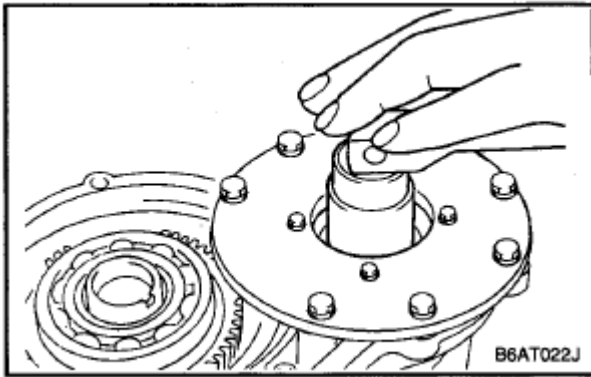


Fig. 120: Identifying A/T Relay
Courtesy of HYUNDAI MOTOR CO.

GENERAL DESCRIPTION

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

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

DTC DETECTING CONDITION

DTC DETECTING CONDITION

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 shirting) 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

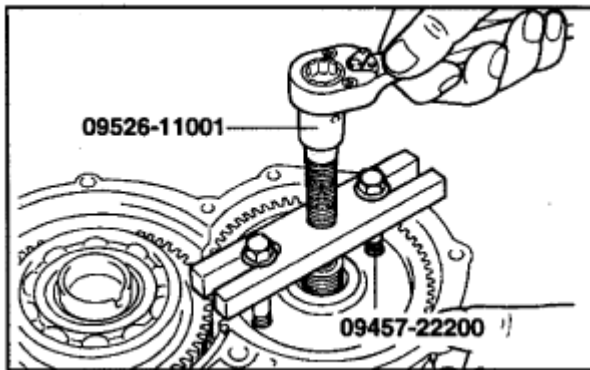


Fig. 121: Schematic Diagram - A/T Relay
Courtesy of HYUNDAI MOTOR CO.

MONITOR SCANTOOL DATA

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+

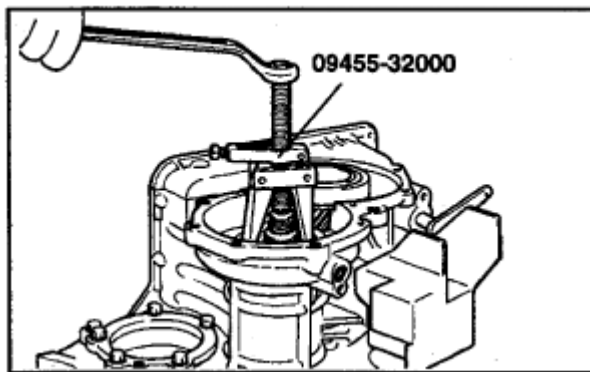


Fig. 122: Scan Tool Display - A/T Con. Relay Volt Parameter
Courtesy of HYUNDAI MOTOR CO.

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

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

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+

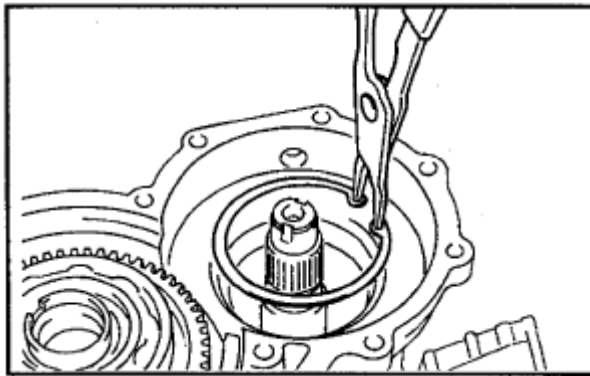


Fig. 123: Measuring Voltage Between Terminal 1 Of A/T Control Relay (Jc101) Connector And Chassis Ground

Courtesy of HYUNDAI MOTOR CO.

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

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

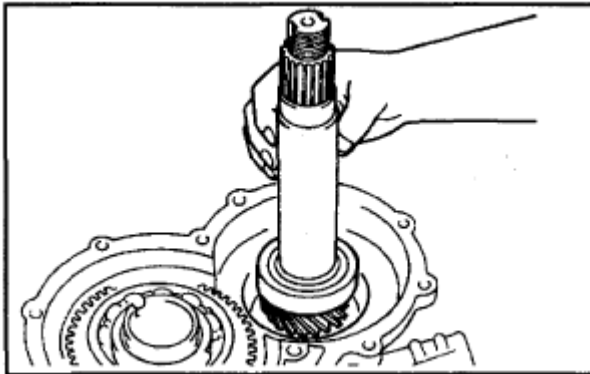


Fig. 124: Measuring Voltage Between Terminal 4 Of A/T Control Relay Connector And Chassis Ground

Courtesy of HYUNDAI MOTOR CO.

5. Is voltage within specifications?

YES

- Go to 2"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 ohms

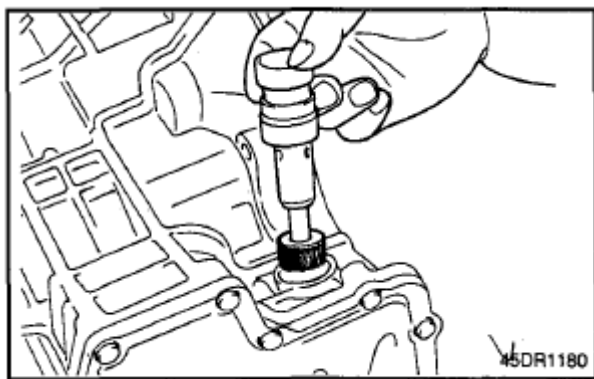


Fig. 125: Measuring Resistance Between Terminal 3 Of A/T Control Relay Connector And Terminal 60 Of PCM/TCM Connector
Courtesy of HYUNDAI MOTOR CO.

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

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 ohms

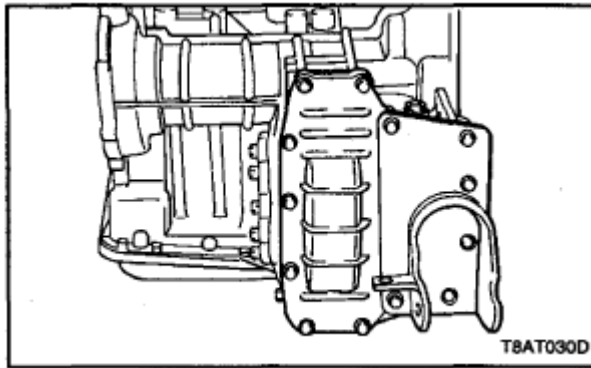


Fig. 126: Measuring Resistance Between Terminal 2 Of A/T Control Relay Connector And Chassis Ground

Courtesy of HYUNDAI MOTOR CO.

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

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

Specification:

TERMINALS RESISTANCE CHART

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)	Oohms

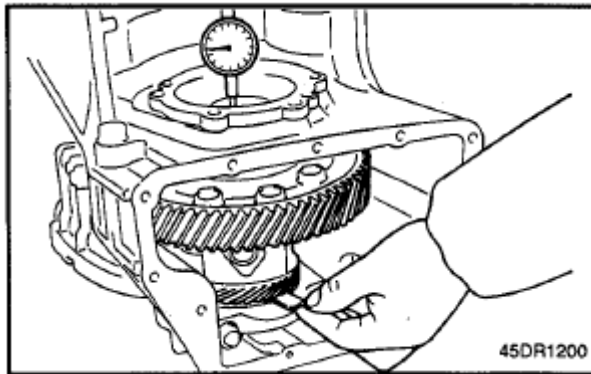


Fig. 127: Measuring Resistance Between Terminal Of Sensor
Courtesy of HYUNDAI MOTOR CO.

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

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

Refer to **DTC P0885**.

GENERAL DESCRIPTION

Refer to **DTC P0885**.

DTC DESCRIPTION

Refer to **DTC P0885**.

DTC DETECTING CONDITION**DTC DETECTING CONDITION**

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 < or = 0.5V	
Diagnostic Time	• 1 second	
Fail Safe	• Locked in 3 rd gear.(control relay off)	

SCHEMATIC DIAGRAM

Refer to **DTC P0885**.

MONITOR SCANTOOL DATA

Refer to **DTC P0885**.

TERMINAL & CONNECTOR INSPECTION

Refer to **DTC P0885**.

POWER SUPPLY CIRCUIT INSPECTION

Refer to **DTC P0885**.

SIGNAL CIRCUIT INSPECTION

Refer to **DTC P0885**.

GROUND CIRCUIT INSPECTION

Refer to **DTC P0885**.

COMPONENT INSPECTION

Refer to **DTC P0885**.

VERIFICATION OF VEHICLE REPAIR

Refer to **DTC P0885**.

DTC P0891 AT RELAY - OPEN CIRCUIT

COMPONENT LOCATION

Refer to **DTC P0885**.

GENERAL DESCRIPTION

Refer to **DTC P0885**.

DTC DESCRIPTION

Refer to **DTC P0885**.

DTC DETECTING CONDITION

DTC DETECTING CONDITION

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 > or = 20V	
Diagnostic Time	• 1 second	
Fail Safe	• Locked in 3 rd gear, (control relay off)	

SCHEMATIC DIAGRAM

Refer to **DTC P0885**.

MONITOR SCANTOOL DATA

Refer to **DTC P0885**.

TERMINAL & CONNECTOR INSPECTION

Refer to **DTC P0885**.

POWER SUPPLY CIRCUIT INSPECTION

Refer to **DTC P0885**.

SIGNAL CIRCUIT INSPECTION

Refer to **DTC P0885**.

GROUND CIRCUIT INSPECTION

Refer to **DTC P0885**.

COMPONENT INSPECTION

Refer to **DTC P0885**.

VERIFICATION OF VEHICLE REPAIR

Refer to **DTC P0885**.

AUTOMATIC TRANSAXLE

COMPONENTS

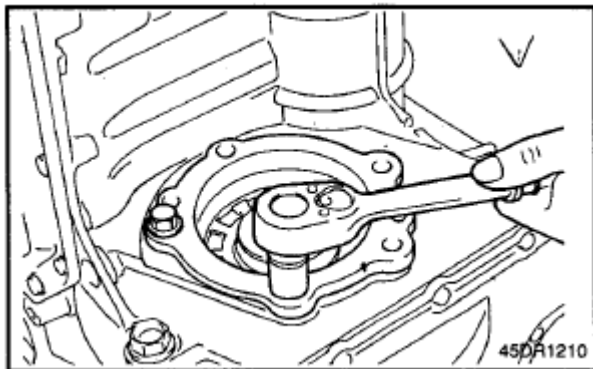


Fig. 128: Identifying Automatic Transaxle Components (1 Of 2)
Courtesy of HYUNDAI MOTOR CO.

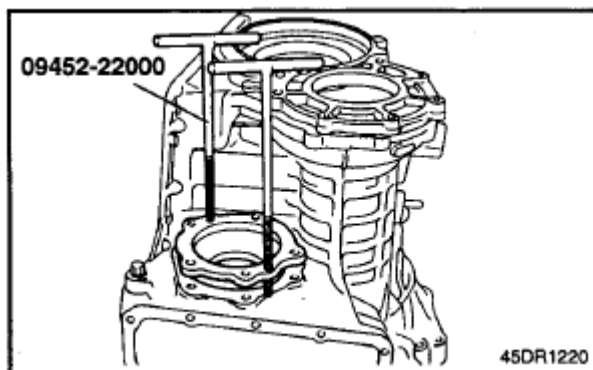


Fig. 129: Identifying Automatic Transaxle Components (2 Of 2)

Courtesy of HYUNDAI MOTOR CO.

REMOVAL

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).

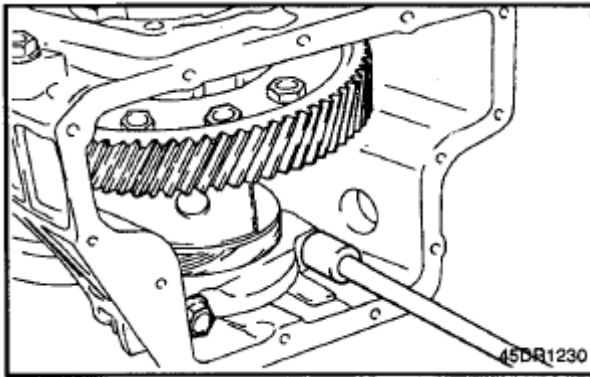


Fig. 130: Identifying Battery Negative Terminal

Courtesy of HYUNDAI MOTOR CO.

2. Remove the engine cover (A).

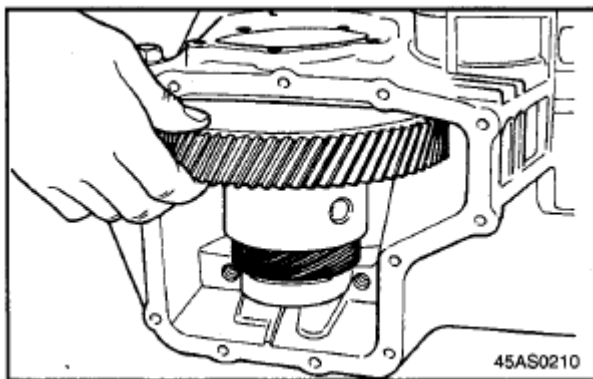


Fig. 131: Identifying Engine Cover

Courtesy of HYUNDAI MOTOR CO.

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 **POWERTRAIN CONTROL MODULE (PCM)**)
4. Remove the intake air hose (D) and air cleaner (A).

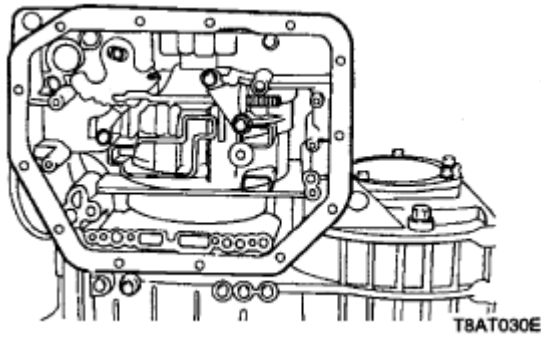


Fig. 132: Identifying AFS Connector, Intake Air Hose And Air Cleaner
 Courtesy of HYUNDAI MOTOR CO.

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

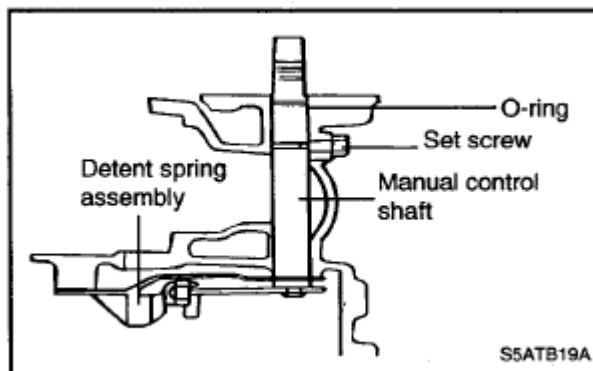


Fig. 133: Identifying Transaxle Oil Cooler Hoses
 Courtesy of HYUNDAI MOTOR CO.

6. Remove engine wiring.
 1. Disconnect the RH rear oxygen sensor connector).

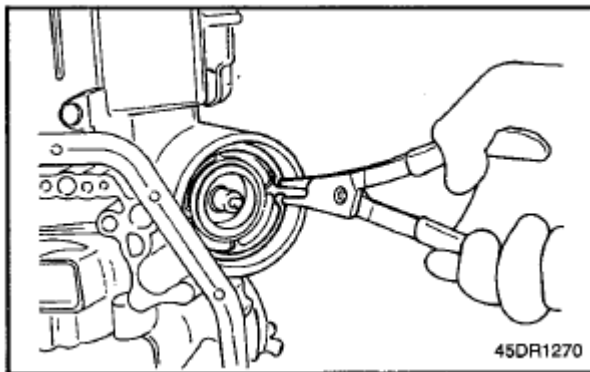


Fig. 134: Identifying RH Rear Oxygen Sensor Connector
Courtesy of HYUNDAI MOTOR CO.

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

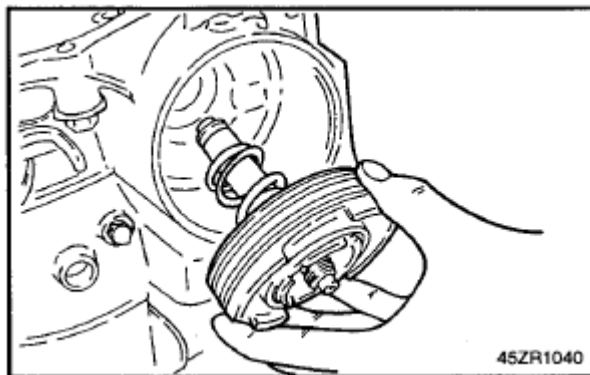


Fig. 135: Identifying LH Rear Oxygen Sensor Connector And CPS Connector
Courtesy of HYUNDAI MOTOR CO.

7. Disconnect the transaxle wire harness connector and remove transaxle control cable.
 1. Remove the wiring brackets (A).

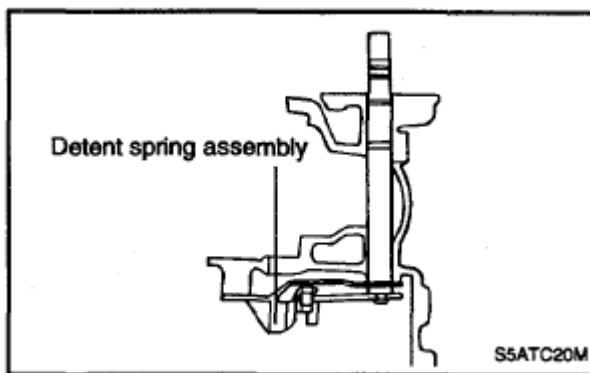


Fig. 136: Identifying Wiring Brackets
Courtesy of HYUNDAI MOTOR CO.

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

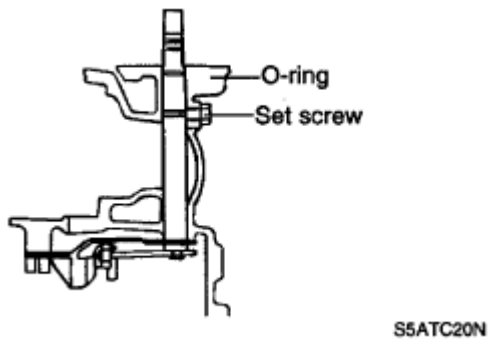


Fig. 137: Identifying Inhibiter Switch Connector And Shift Cable
Courtesy of HYUNDAI MOTOR CO.

3. Remove the solenoid valve connector (A).

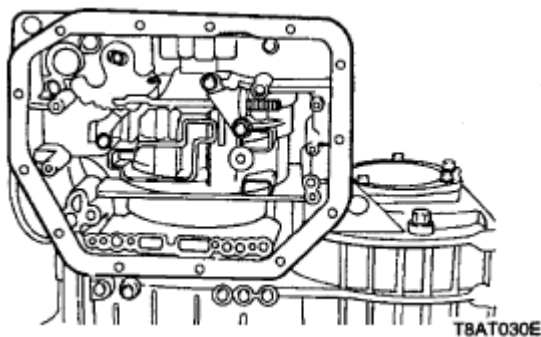


Fig. 138: Identifying Solenoid Valve Connector
Courtesy of HYUNDAI MOTOR CO.

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

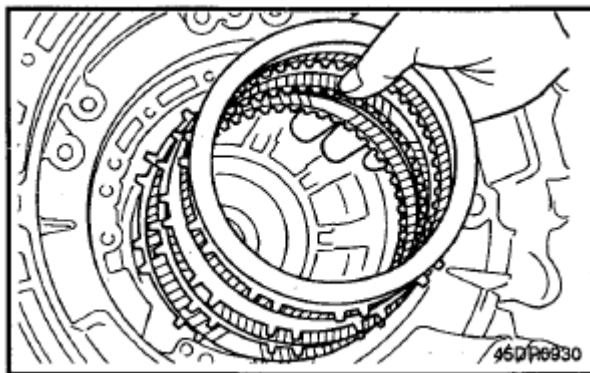


Fig. 139: Identifying Input Speed Sensor Connector
Courtesy of HYUNDAI MOTOR CO.

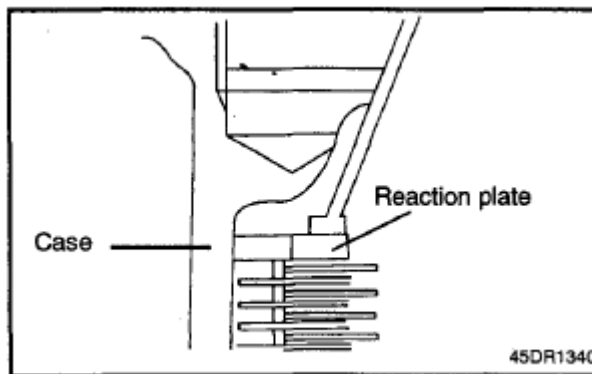


Fig. 140: Identifying Output Speed Sensor Connector
Courtesy of HYUNDAI MOTOR CO.

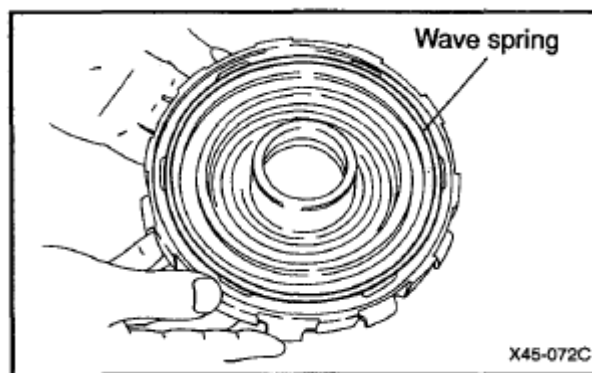


Fig. 141: Identifying Vehicle Speed Sensor Connector
Courtesy of HYUNDAI MOTOR CO.

5. Disconnect the ground wire (A).

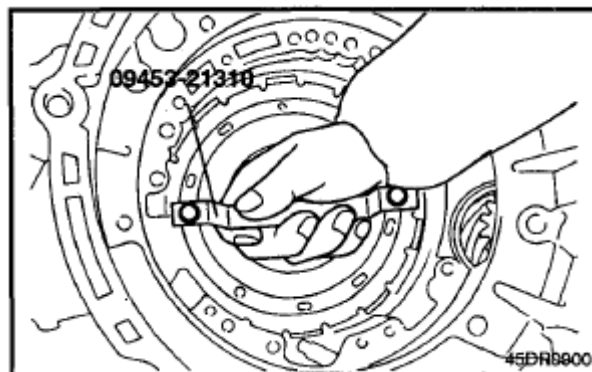


Fig. 142: Identifying Ground Wire
Courtesy of HYUNDAI MOTOR CO.

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

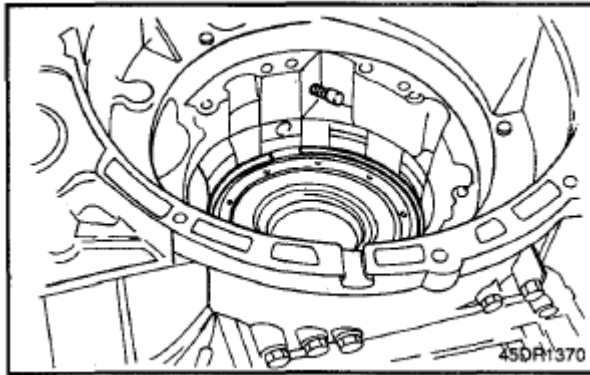


Fig. 143: Identifying Power Steering Pressure Sensor Connector
 Courtesy of HYUNDAI MOTOR CO.

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

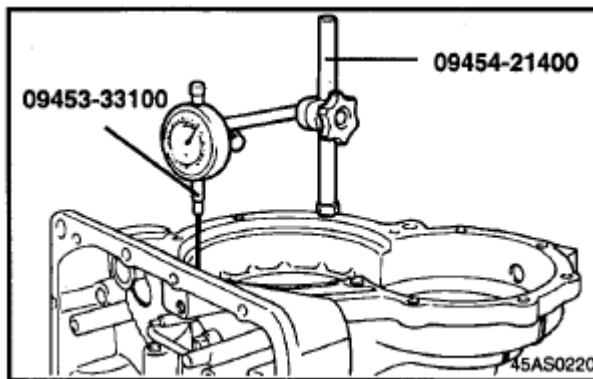


Fig. 144: Identifying Power Steering Hose Mounting Bolts
 Courtesy of HYUNDAI MOTOR CO.

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

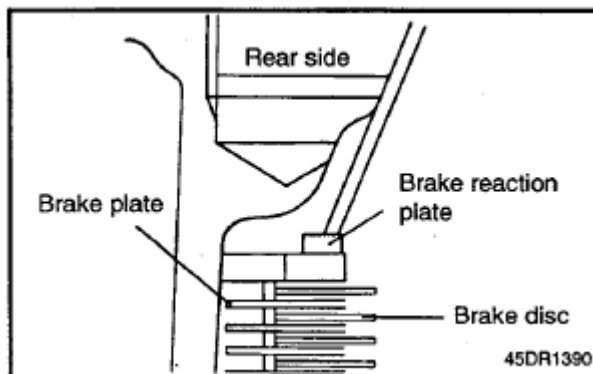


Fig. 145: Identifying EPS Connector

Courtesy of HYUNDAI MOTOR CO.

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

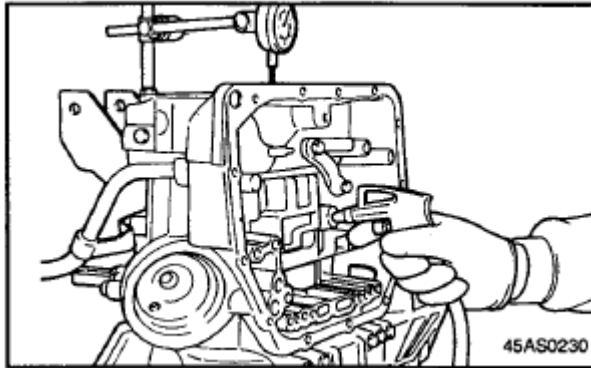


Fig. 146: Identifying Transaxle Mounting Bolts
Courtesy of HYUNDAI MOTOR CO.

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

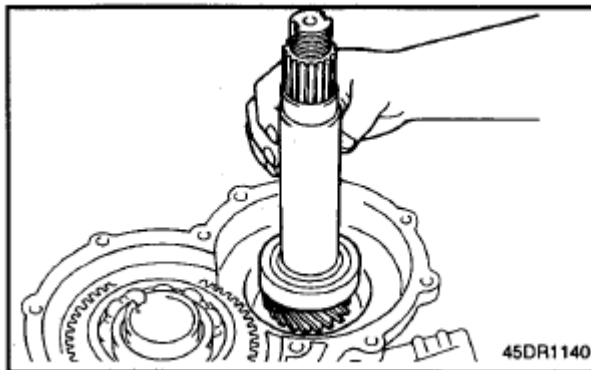


Fig. 147: Identifying Special Tool
Courtesy of HYUNDAI MOTOR CO.

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

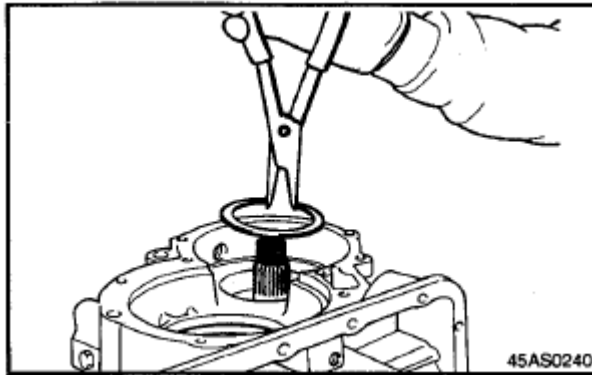


Fig. 148: Identifying Transaxle Insulator Mounting Bolt
Courtesy of HYUNDAI MOTOR CO.

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

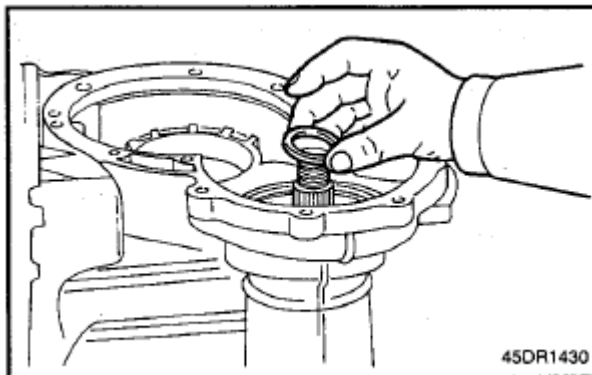


Fig. 149: Identifying Under Cover
Courtesy of HYUNDAI MOTOR CO.

16. Drain transaxle oil.
17. Disconnect the power steering pump hose (A).

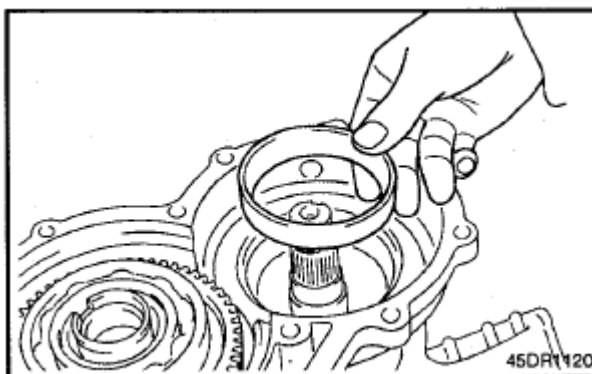


Fig. 150: Identifying Power Steering Pump Hose

Courtesy of HYUNDAI MOTOR CO.

18. Disconnect the lower arm assembly from the knuckle, (see FRONT HUB / KNUCKLE)
19. Disconnect the tie rod end ball joint from the knuckle after removing the split pin. (see FRONT HUB / KNUCKLE)
20. Disconnect the stabilizer bar link, (see FRONT STABILIZER BAR)
21. Remove the front roll stopper mounting bolt, (see MECHANICAL POWER STEERING SYSTEM)
22. Remove the front exhaust pipe, (see INTAKE AND EXHAUST SYSTEM)
23. Remove the rear roll stopper mounting bolt, (see MECHANICAL POWER STEERING SYSTEM)
24. Using the SST (09624-38000) and holding the cross member (A) with a jack, remove the steering bolt.

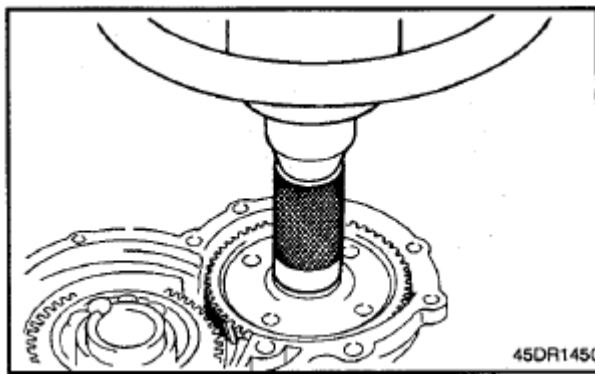


Fig. 151: Identifying Special Tool And Cross Member
Courtesy of HYUNDAI MOTOR CO.

25. Remove the cross member.
26. Remove drive shaft from transaxle. (See FRONT AXLE)
27. Install a jack for supporting the transaxle assembly.
28. Remove the transaxle under mounting bolts (A) and the drive plate bolts (B).

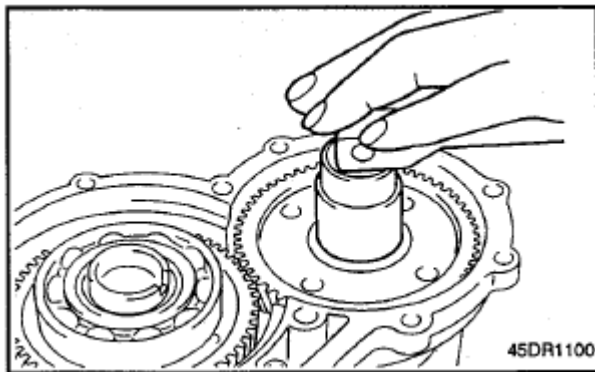


Fig. 152: Identifying Transaxle Under Mounting And Drive Plate Bolts
Courtesy of HYUNDAI MOTOR CO.

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

INSTALLATION

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 Ib.ft) - A

45.1~52.0 Nm (460~530 Kgf.cm, 33.3~38.3 Ib.ft) - B

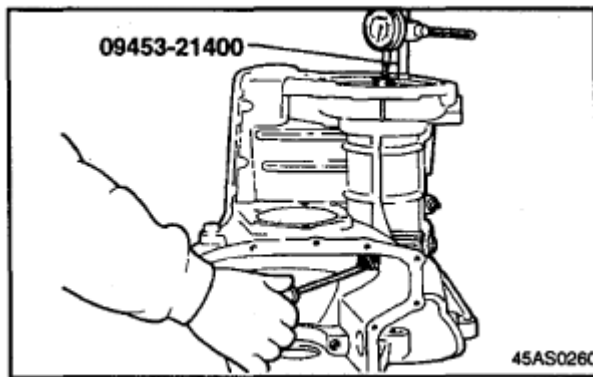


Fig. 153: Identifying Transaxle Under Mounting And Drive Plate Bolts
Courtesy of HYUNDAI MOTOR CO.

3. After removing a jack, insert the drive shafts, (see **FRONT AXLE**)
4. Supporting the cross member with the SST (09624-38000), tighten the steering column bolt and the cross member mounting bolts, (see **MECHANICAL POWER STEERING SYSTEM**)

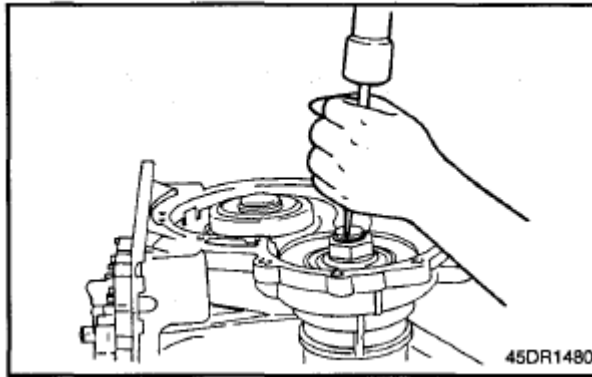


Fig. 154: Identifying Special Tool And Cross Member
Courtesy of HYUNDAI MOTOR CO.

5. Tighten the rear roll stopper mounting bolt, (see MECHANICAL POWER STEERING SYSTEM)

TORQUE:

49.0~63.7 Nm (500~650 Kgf.cm, 36.2~47.0 Ib.ft)

6. Install the front exhaust pipe, (see INTAKE AND EXHAUST SYSTEM)
7. Tighten the front roll stopper mounting bolt, (see MECHANICAL POWER STEERING SYSTEM)

TORQUE:

49.0~63.7 Nm (500~650 Kgf.cm, 36.2~47.0 Ib.ft)

8. Install the steering bar tie rod, the stabilizer bar link and the lower arm assembly, (see FRONT STABILIZER BAR and FRONT HUB / KNUCKLE)
9. Clamp the power steering pump hose (A).

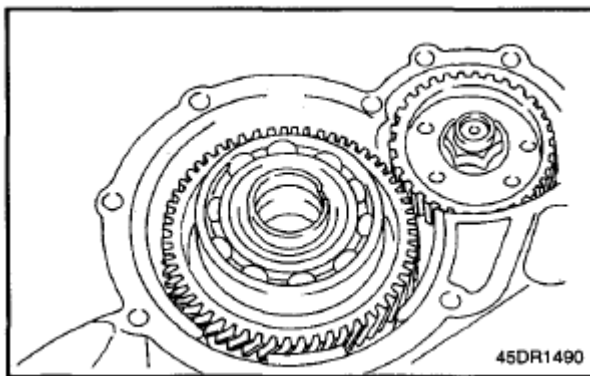


Fig. 155: Identifying Power Steering Pump Hose
Courtesy of HYUNDAI MOTOR CO.

10. Install the under cover (A).

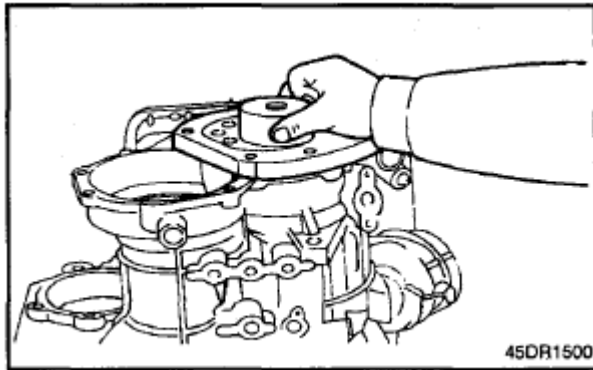


Fig. 156: Identifying Under Cover
Courtesy of HYUNDAI MOTOR CO.

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 Ib.ft)

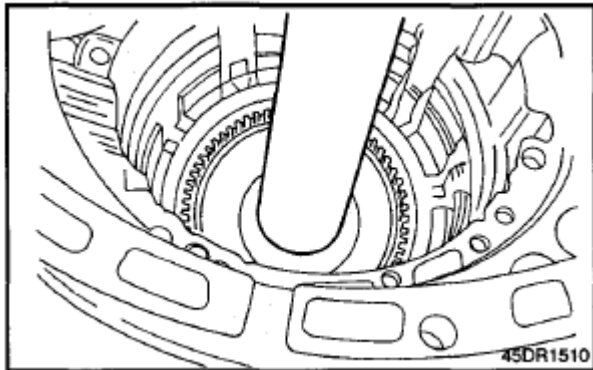


Fig. 157: Identifying Transaxle Insulator Mounting Bolt
Courtesy of HYUNDAI MOTOR CO.

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

TORQUE:

32.4~49.0 Nm (350~420 Kgf.cm, 23.9~36.2 Ib.ft) - A

63.7~83.4 Nm (650~850 Kgf.cm, 47.0~61.5 Ib.ft) - B

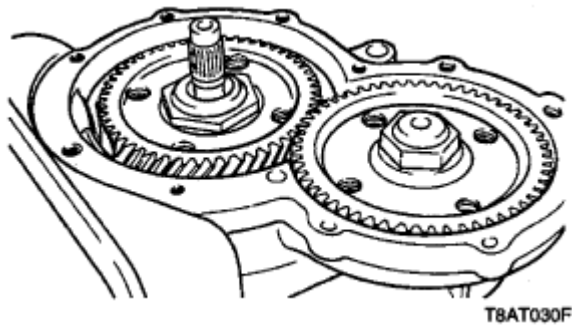


Fig. 158: Identifying Transaxle Mounting Bolts
Courtesy of HYUNDAI MOTOR CO.

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

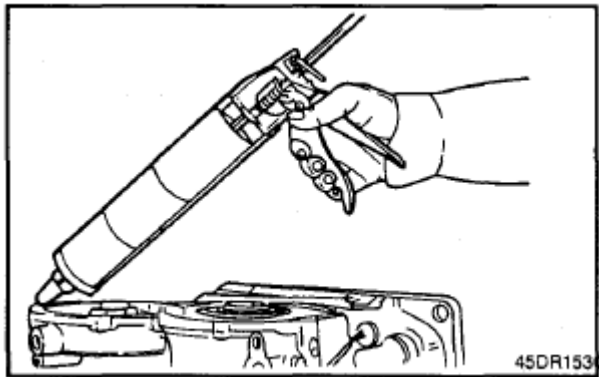


Fig. 159: Identifying Special Tool
Courtesy of HYUNDAI MOTOR CO.

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

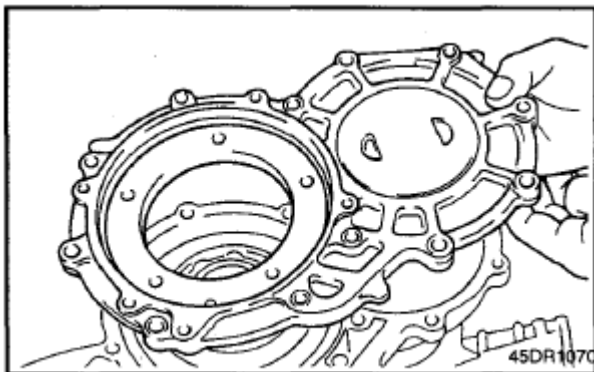


Fig. 160: Identifying EPS Connector
Courtesy of HYUNDAI MOTOR CO.

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

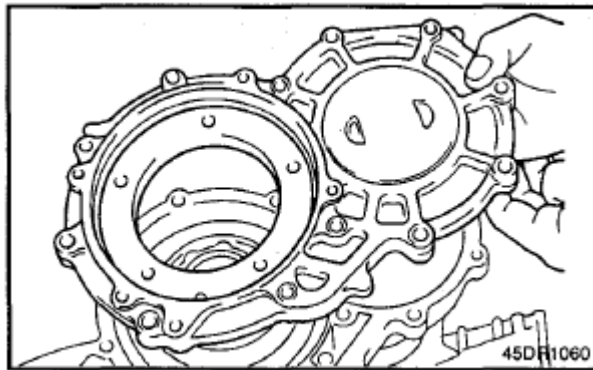
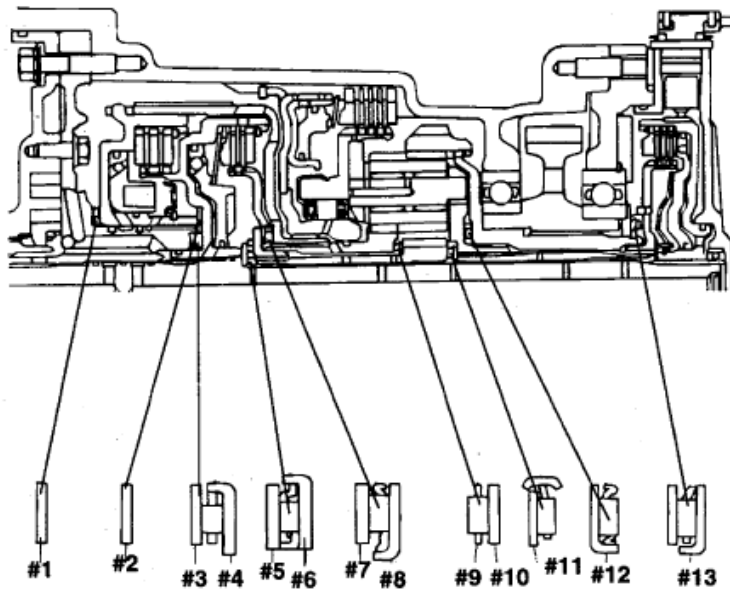


Fig. 161: Identifying Power Steering Hose Mounting Bolts
Courtesy of HYUNDAI MOTOR CO.

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



X45-077B

Fig. 162: Identifying Power Steering Pressure Sensor Connector
Courtesy of HYUNDAI MOTOR CO.

17. Connect the transaxle wire harness connector and the control cable.
 1. Install the wiring brackets (A).

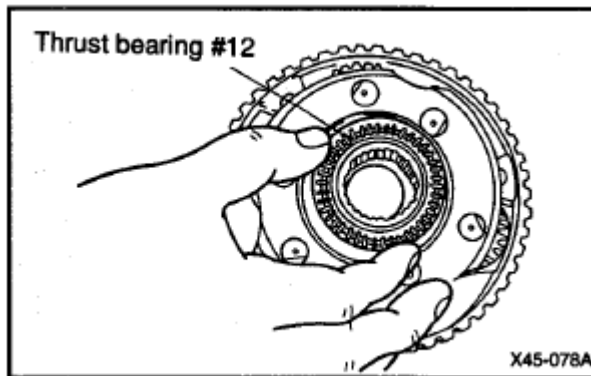


Fig. 163: Identifying Wiring Brackets
Courtesy of HYUNDAI MOTOR CO.

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

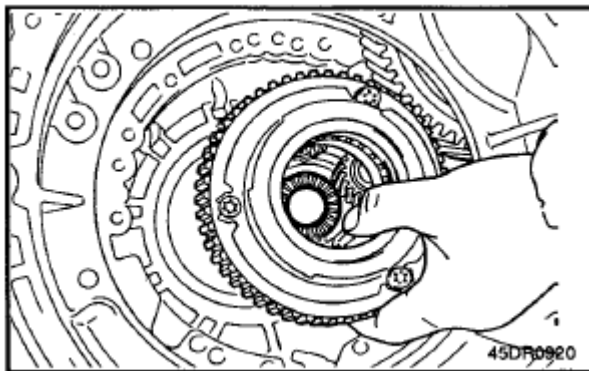


Fig. 164: Identifying Inhibitor Switch Connector And Shift Cable
Courtesy of HYUNDAI MOTOR CO.

3. Connect the solenoid valve connector (A).

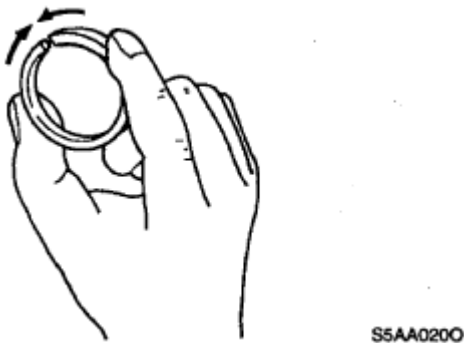


Fig. 165: Identifying Solenoid Valve Connector
Courtesy of HYUNDAI MOTOR CO.

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

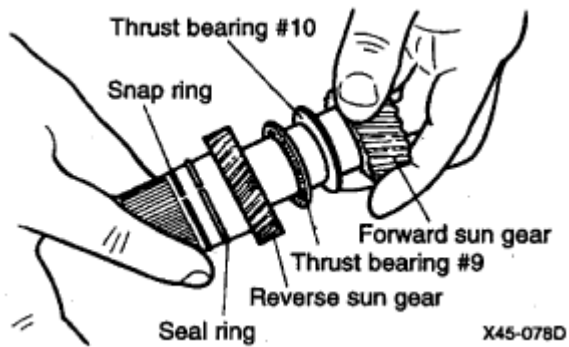


Fig. 166: Identifying Input Speed Sensor Connector
Courtesy of HYUNDAI MOTOR CO.

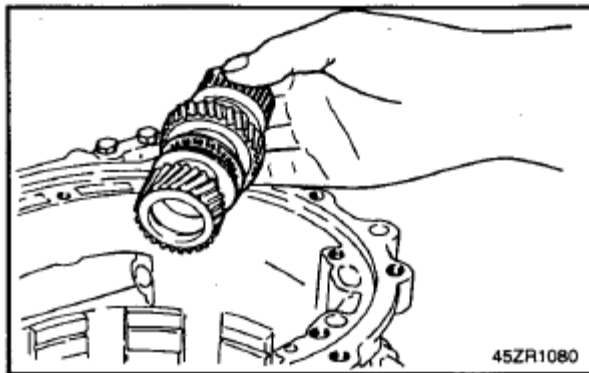


Fig. 167: Identifying Output Speed Sensor Connector
Courtesy of HYUNDAI MOTOR CO.

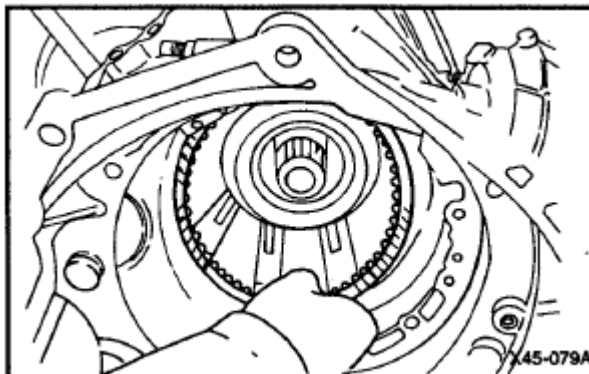


Fig. 168: Identifying Vehicle Speed Sensor Connector
Courtesy of HYUNDAI MOTOR CO.

5. Connect the ground wire (A).

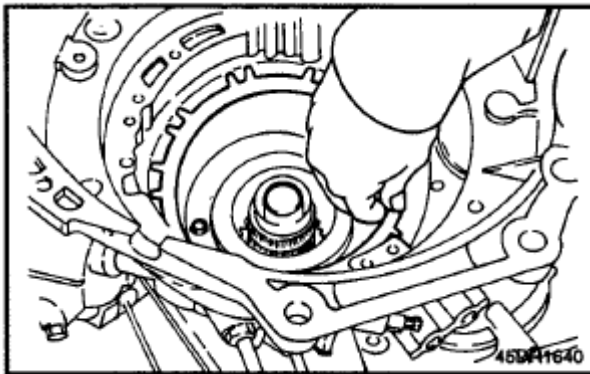


Fig. 169: Identifying Ground Wire
Courtesy of HYUNDAI MOTOR CO.

18. Connect engine wiring.
 1. Connect the RH rear oxygen sensor connector).

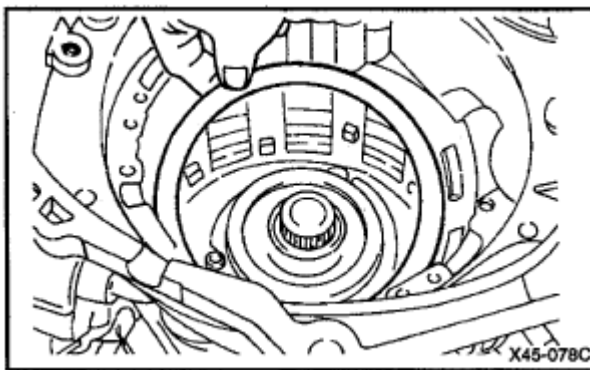


Fig. 170: Identifying RH Rear Oxygen Sensor Connector
Courtesy of HYUNDAI MOTOR CO.

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

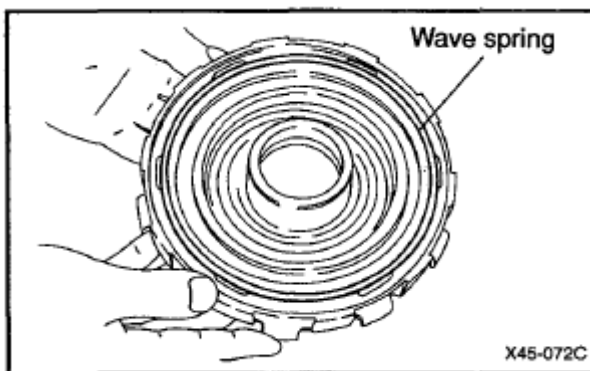


Fig. 171: Identifying LH Rear Oxygen Sensor Connector And CPS Connector
Courtesy of HYUNDAI MOTOR CO.

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

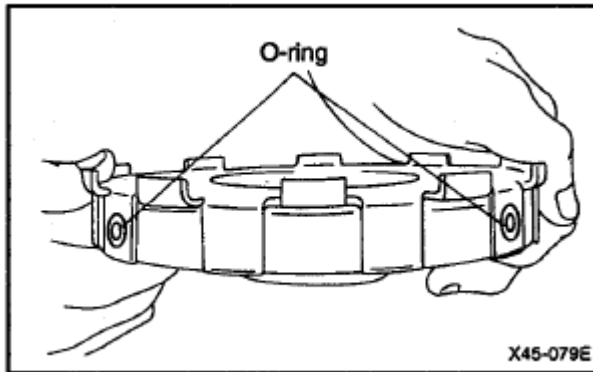


Fig. 172: Identifying Transaxle Oil Cooler Hoses
Courtesy of HYUNDAI MOTOR CO.

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 **POWERTRAIN CONTROL MODULE (PCM)**)
 4. Install the intake air hose (D) and the air cleaner assembly (A).

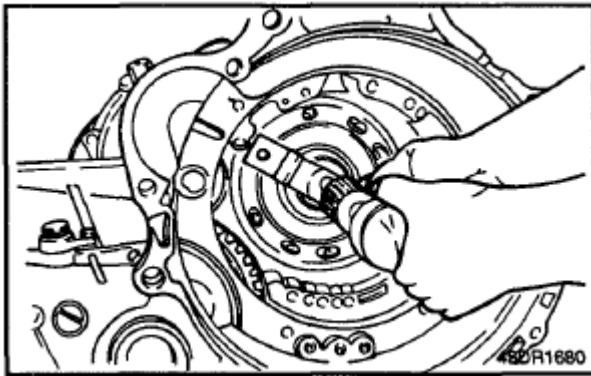


Fig. 173: Identifying AFS Connector, Intake Air Hose And Air Cleaner
Courtesy of HYUNDAI MOTOR CO.

22. Install the engine cover (A).

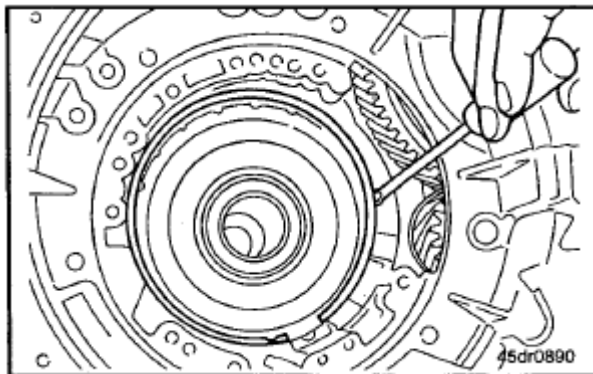


Fig. 174: Identifying Engine Cover
Courtesy of HYUNDAI MOTOR CO.

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

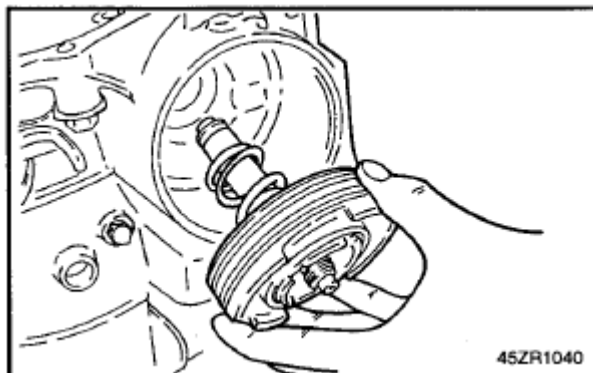


Fig. 175: Identifying Battery Negative Terminal
Courtesy of HYUNDAI MOTOR CO.

AUTOMATIC TRANSAXLE CONTROL SYSTEM

SHIFT LEVER

COMPONENTS

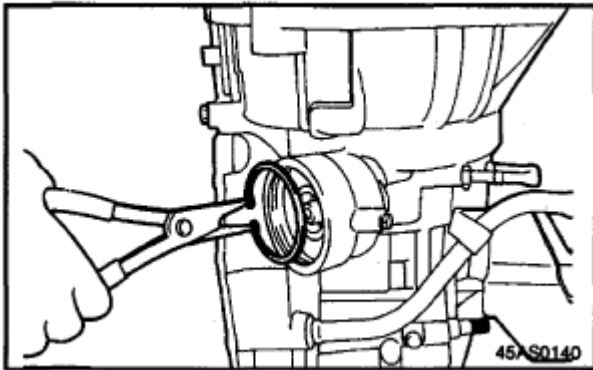


Fig. 176: Identifying Shift Lever Component
Courtesy of HYUNDAI MOTOR CO.

REMOVAL

1. Remove the shift lever knob (A).

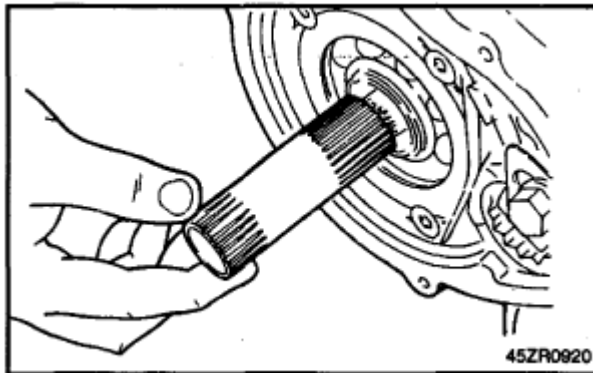


Fig. 177: Identifying Shift Lever Knob
Courtesy of HYUNDAI MOTOR CO.

2. Remove the indicator assembly (A).

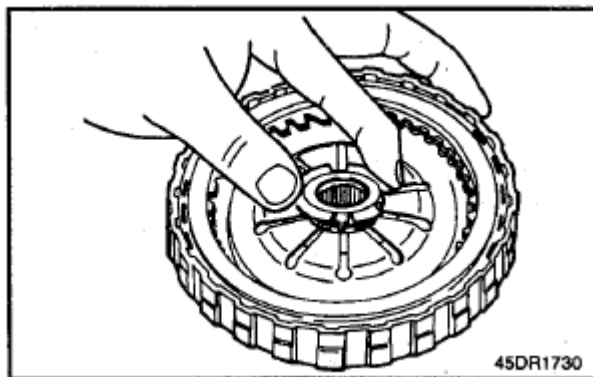


Fig. 178: Identifying Indicator Assembly

Courtesy of HYUNDAI MOTOR CO.

3. Remove the two bolts (A) in the console box.

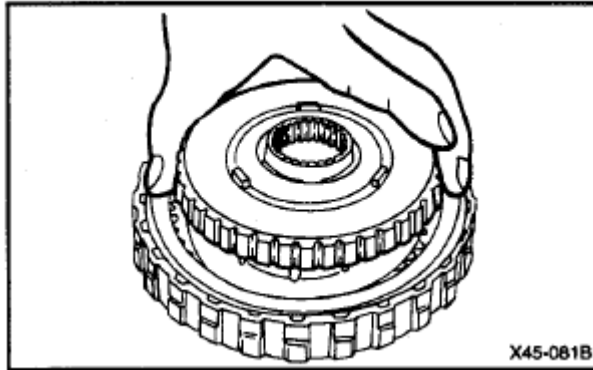


Fig. 179: Identifying Console Box Bolts
Courtesy of HYUNDAI MOTOR CO.

4. Remove the two screws (A) mounting floor air duct.

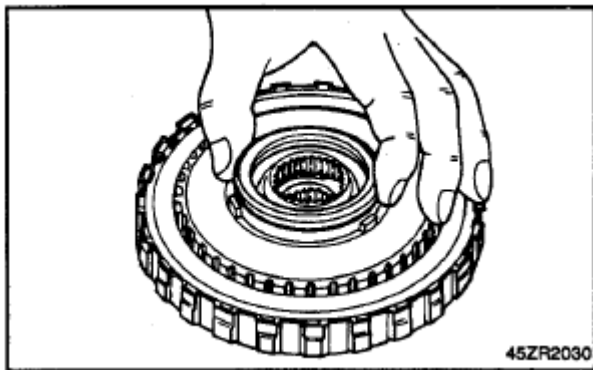


Fig. 180: Identifying Mounting Floor Air Duct Screws
Courtesy of HYUNDAI MOTOR CO.

5. Disconnect the interlock connector (A).

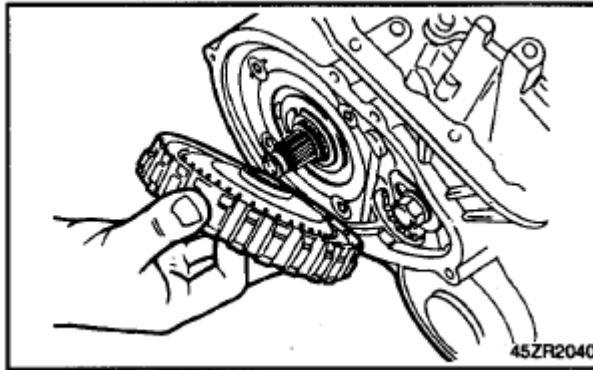


Fig. 181: Identifying Interlock Connector
Courtesy of HYUNDAI MOTOR CO.

6. Disconnect the control cable (A).

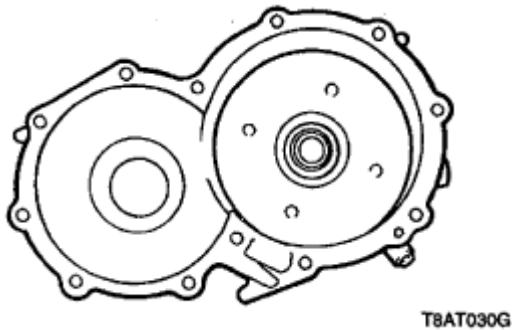


Fig. 182: Identifying Control Cable
Courtesy of HYUNDAI MOTOR CO.

7. Remove the shift lever assembly (A). (Bolt: 4EA)

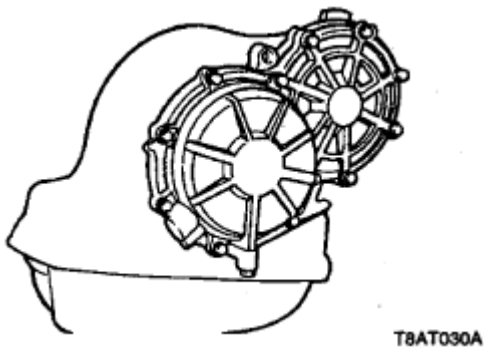


Fig. 183: Identifying Shift Lever Assembly
Courtesy of HYUNDAI MOTOR CO.

INSPECTION

1. Adjusting method for T/M control cable.
 1. Set room side lever and T/M side lever to "N" position.
 2. Connect room side lever and shift cable.
 3. Connect T/M side lever (A) to cable in the following order.
 - a. Push cable (B) lightly to "F" direction shown to eliminate FREE PLAY of cable.
 - b. Tighten adjusting nut.

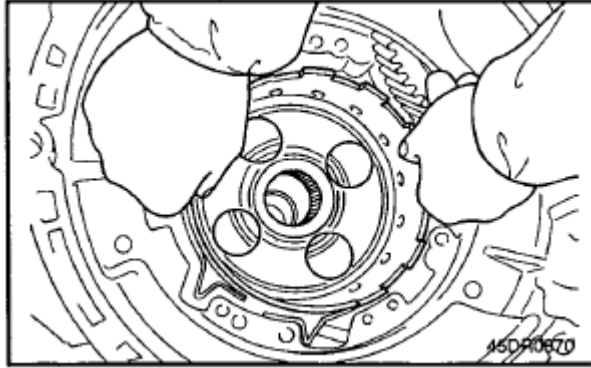


Fig. 184: Identifying T/M Side Lever
Courtesy of HYUNDAI MOTOR CO.

4. After adjusting according to (2)- (4). Check to be sure that this part operates surely at each range of T/M side corresponding to each position of room lever.

INSTALLATION

1. Installation is the reverse of removal.