2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

2007 TRANSMISSION

Automatic Transaxle (A5HF1) - Santa Fe

GENERAL

SPECIFICATIONS

GENERAL SPECIFICATIONS

Engine type	lambda -3.3	
Transaxle type		A5HF1
-	1ST	3.789
	2ND	2.064
Coorretio	3RD	1.421
Gear Tatio	4TH	1.034
	5TH	0.728
	REV.	3.808
Final gear ratio		3.684
T/M oil capacity (<i>l</i>)	10.9

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

TRANSAXLE OIL SPECIFICATION

Recommended transaxle oil		Diamond ATF SP III or SK ATF SP III	
Check & Rep	plenishment	Every one year or every 14,880 mile (24,000 km)	
Private use		Every 99,200 mile (160,000 km)	
		Every 29,760 mile (48,000 km)	
		1. Driving on rough road (bumpy road, gravel road, snowy road, unpaved road etc.)	
Replacement	Business use	2. Driving on mountain road, ascent/descent	
		3. Repetition of short distance driving	
		 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 REFERENCE

Tool (Number and name)	Illustration	Use

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AUTOMATIC TRANSAXLE SYSTEM

DESCRIPTION

1. Structure & Technical highlights

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- 2. SSP(Single sided plate) -Overdrive clutch -2ND brake
- 3. Reduction band (Piston increased)
- 4. Direct planetary gear (3→4 pinions)

- 6. High capacity torque converter
- 7. Bearing outer diameter increased (Φ5 mm)
- 8. Differential gear (Increased width by 2mm)
- 9. Differential capacity increased (6.1→7)

EKBF002A

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 shirtings)
 - Effects

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Improved power transmission efficiency and fuel consumption



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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

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- 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 RANGE

_											
		UD Clutch	OD Clutch	2ND Brake	LR Brake	REV Clutch	RED Brake	DIR Clutch	OWC1	OWC2	
	Р	-	-	-	0	-	0	-	-	-	
R		-	-	-	0	0	0	-	-	-	
	N	-	-	-	0	-	0	-	-	-	
	1st	0	-	-	0	-	0	-	•	•	
	2nd	0	-	0	-	-	0	-	-	•	
D	3rd	0	0	-	-	-	0	-	-	•	
	4th	-	0	0	-	_	0	-	-	•	
	5th	-	0	0	-	-	-	0	-	-	
(•	• : Locked when driving)										

CLUTCHES AND BRAKES RANGE REFERENCE

FUNCTIONS OF CLUTCHES AND BRAKES

CLUTCHES AND BRAKES FUNCTION CHART

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

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One way clutch 1	OWC1	Control the rotational direction of the low & reverse ring gear
One way clutch 2	OWC2	Control the rotational direction of the direct sun gear

AUTOMATIC TRANSAXLE HYDRAULIC CIRCUIT

P/N



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

D (1 RANGE)

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

D (2 RANGE)

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

D (3 RANGE)

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

D (4 RANGE)

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

D (5 RANGE)

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

R RANGE

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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	Remark
1	P0707	TRANSAXLE RANGE SWITCH CIRCUIT LOW INPUT	ON	<u>D 1ST GEAR</u>
2	P0708	TRANSAXLE RANGE SWITCH CIRCUIT HIGH INPUT	ON	ELECTRONIC CONTROL SYSTEM
3	P0712	TRANSAXLE FLUID TEMPERATURE SENSOR CIRCUIT LOW INPUT	ON	SIGNALS OF SPORTS MODE SWITCH
4	P0713	TRANSAXLE FLUID TEMPERATURE SENSOR CIRCUIT HIGH INPUT	ON	TROUBLESHOOTING
5	P0717	A/T INPUT SPEED SENSOR CIRCUIT - OPEN or SHORT (GND)	ON	INSPECTION CHART FOR TROUBLE SYMPTOMS
6	P0722	AT OUTPUT SPEED SENSOR CIRCUIT - OPEN or SHORT (GND)	ON	ROAD TEST
7	P0731	GEAR 1 INCORRECT RATIO	ON	SIGNAL WAVEFORM
8	P0732	GEAR 2 INCORRECT RATIO	ON	DTC P0708 TRANSAXLE RANGE

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

				SWITCH - HIGH INPUT
9	P0733	GEAR 3 INCORRECT RATIO	ON	MONITOR SCANTOOL DATA
10	P0734	GEAR 4 INCORRECT RATIO	ON	SIGNAL CIRCUIT INSPECTION
11	P0735	GEAR 5 INCORRECT RATIO	ON	DTC P0717 INPUT SPEED SENSOR CIRCUIT - NO SIGNAL
12	P0741	TORQUE CONVERTER CLUTCH STUCK OFF	ON	GROUND CIRCUIT INSPECTION
13	P0742	TORQUE CONVERTER CLUTCH STUCK ON	ON	SPECIFICATION
14	P0743	TORQUE CONVERTER CLUTCH CONTROL SOLENOID VALVE - OPEN or SHORT (GND)	ON	GROUND CIRCUIT INSPECTION
15	P0748	VFS solenoid - OPEN or SHORT (GND)	OFF	VERIFICATION OF VEHICLE REPAIR
16	P0750	LOW and REVERSE SOLENOID VALVE CIRCUIT - OPEN or SHORT (GND)	ON	SIGNAL WAVEFORM
17	P0755	UNDERDRIVE SOLENOID VALVE CIRCUIT - OPEN or SHORT (GND)	ON	DTC P0741 TORQUE CONVERTER CLUTCH CIRCUIT - STUCK OFF
18	P0760	SECOND SOLENOID VALVE CIRCUIT - OPEN or SHORT (GND)	ON	SPECIFICATION
19	P0765	OVERDRIVE SOLENOID VALVE CIRCUIT - OPEN or SHORT (GND)	ON	DTC P0748 PRESSURE CONTROL SOLENOID VALVE A - ELECTRICAL
20	P0770	RED SOLENOID	ON	DTC P0750 SHIFT CONTROL SOLENOID VALVE A CIRCUIT MALFUNCTION
21	P0885	A/T CONTROL RELAY - OPEN or SHORT (GND)	ON	DTC P0755 SHIFT CONTROL SOLENOID VALVE B CIRCUIT MALFUNCTION
22	P0890	TCM power Relay sense circuit low	ON	COMPONENT INSPECTION
23	P0891	TCM power Relay sense circuit High	ON	DTC P0760 SHIFT CONTROL SOLENOID VALVE C CIRCUIT MALFUNCTION

INPUT/OUTPUT SIGNAL VOLTAGE CHECK SHEET



SCMAA6001N

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Fig. 10: Identifying C130-A And C130-B Connector Terminals Courtesy of HYUNDAI MOTOR CO.

INPUT/OUTPUT SIGNAL VOLTAGE REFERENCE

PIN	Chack itom	Condition	Input/Output value		Measurement	Domorks
No.	Check item	Condition	Туре	Level	Value	Neillai K5
A01	2nd CAN_HI	-	-	-	-	-
A02	2nd CAN_LO	-	-	-	-	-
A03	P Range Selection	P Position Otherwise	DC Voltage	V BAT Max. 1.0V	12.9V 0V	
A04	R Range Selection	R Position Otherwise	DC Voltage	V_BAT Max. 1.0V	12.3V 0V	
A05	N Range Selection	N Position Otherwise	DC Voltage	V_BAT Max. 1.0V	13.2V 0V	
A06	D Range Selection	D Position Otherwise	DC Voltage	V_BAT Max. 1.0V	13.2V 0V	
A07	Select Position	-	DC Voltage	V_BAT Max. 1.0V	13.2V 0V	
A08	Up Position	-	DC Voltage	V_BAT Max. 1.0V	13.2V 0V	
A09	Down Position	-	DC Voltage	V_BAT Max. 1.0V	13.2V 0V	
A12	N.A	-	-	-	-	
A14	N.A	-	-	-	-	
A19	N.A	-	-	-	-	
A20	A/T Control Relay	Relay On Relay Off	DC Voltage	V_BAT Max. 1.0V Vpeak : Max. 70V Resistance : 6800hms	13.8V 0V -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% darr; AT receiving HI : V_BAT*70%? LO : V_BAT*30%?	11.3V 0.14/0.32V	V_BAT : 13.2V

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

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	
		IG Off	Max. 0.5 V			
		IG On	V_BAT			
		IG. Key On	MAX. +/- 75V (ECU GND)			
		IG. Key Off	MAX. +/- 75V (ECU GND)		0V 11.9V +30V/-10V or less ?	
A60	A/T PWR Source	Idle	MAX. +/- 75V (ECU GND)	DC Voltage		
		Key Off from Idle	MAX. +/- 75V (ECU GND)			
		Fuse 1/2/3 Removal Condition	MAX. +/- 75V (ECU GND)			
		W/H Open		DTC Spec : P0888	DTC : P0888	
	G1 16 D	Running	Pulse	HI : V_BAT LO : Max. 1.0V Freq.: $50 \pm 2Hz$ (Reference)		
A73	Shift Position Signal (To Cluster)	1 gear 2 gear	Duty ?	12.5±2% 27.5±2%	N.A	Sports mode
		3 gear	?	42.5±2%		
		4 gear	?	57.5±2%		
		5 gear	?	72.5±2%		
				HI : V_BAT	14.4V	
B03	UD Solenoid	Shifting	Pulse	LO : Max. 1.0V Vpeak : Max. 70V	0.35V 56.3V	
		W/H Open		DTC Spec : P0755	DTC : P0755	
		i				1

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

B05	N.A	-	-	-	_	
B06	Oil temperature sensor_ATM	Idle	Analog	0.5V ~ 4.5V	4.4V 3.1V	16Hz
D 00	Output speed	30kph	Delas	HI : Min. 4.0V LO : Max. 1.0V	5.08V 0.34V	
B09	sensor	W/H Open	- Puise	DTC Spec : P0722	DTC: P0722	
D10	Input speed	Idle	Dula	HI : Min. 4.0V LO : Max. 1.0V	5.06V 0.35V	620117
B10	sensor	W/H Open	- Fuise	DTC Spec : P0717	DTC: P0717	03002
B20	N.A					
B22	LR Solenoid	Shifting	Pulse	HI : V_BAT LO : Max. 1.0V Vpeak: Max. 70V	13.9V 0.38V 56.1V	
		W/H Open		DTC Spec : P0750	DTC : P0750	
B26	N.A	-	-	-	_	
B27	N.A	-	-	-		
		Idle		Max. 50 mV	13mV	WTS &
B33	GND_Sensor	W/H Open	DC Voltage	DTC Spec: P0118/1115	DTC:P0118/ P1115	OTS_ATM
			Pulse	HI:V_BAT	15.4V	
		D Solenoid Shifting		LO : Max. 1.0V	0.45V	
B42	OD Solenoid			Vpeak : Max. 70V	56.3V	
		W/H Open		DTC Spec : P0765	DTC : P0765	
				HI:V_BAT	15.4V	
		Lock Up on		LO : Max. 1.0V	0.45V	
B43	DCC solenoid		Pulse	Vpeak : Max. 70V	56.3V	
		W/H Open]	DTC Spec : P0743	DTC : P0743	
				HI : V_BAT	15.4V	
		Shifting		LO : Max. 1.0V	0.45V	
B44	RED Solenoid	Silliung	Pulse	Vpeak : Max. 70V	56.3V	
		W/H Open]	DTC Spec : P0770	DTC : P0770	
				HI:V_BAT	15.4V	
		Shifting		LO: Max. 1.0V	0.45V	
				Vneak · Max		

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

				70V	56.3V	
B45	2ND Solenoid	W/H Open	Pulse	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 hudraulic system with fluid and move the selector lever to the "N" (Neutral) or "P" (Park) position.
- 4. Before removing the oil level gauge, wipe all contaminants from around the oil level gauge. Then take out the oil level gauge and check the condition of the fluid.

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

5. Check that the fluid level is at the HOT mark on the oil level gauge. If the fluid level is low, add automatic transaxle fluid until the level reaches the "HOT" mark.

Auto transaxle fluid:

DIAMOND ATF SP-III, SK ATF SP-III

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

Quantity : 10.9 *l*

- NOTE: Low fluid level can cause a variety of a abnormal conditions because it allows the pump to take in air along with fluid. Air trapped in the hydraulic system forms bubbles, which are 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 use 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.

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe



KKRE004C

<u>Fig. 11: Identifying Drain Plug</u> 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

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

COMPONENT LOCATION



AKKF102A

Fig. 12: Identifying Transaxle Range Switch Component Location - Low Input 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 CHART

Item	Detecting Condition	Possible cause
DTC Strategy	• Check for no signal	
Enable Conditions	 Engine state = "RUN" 11V < or = Battery Voltage < or = 16V TPS > or = 3% 	• Open or short in circuit
Threshold value	• No signal detected	 Open of short in circuit Faulty TRANSAXLE BANGE SWITCH
Diagnostic Time	• More than 30seconds	• Faulty TCM (PCM)
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 	

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

\circ When sports mode S/W is ON without P,R,N,
D-RANGE signals, it is regarded sports mode.
(DTC is not set)

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.



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Fig. 13: 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 terminal condition. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
- 2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

deterioration, or damage.

3. Has a problem been found?

YES

• Repair as necessary and go to "VERIFICATION OF VEHICLE REPAIR" procedure.

NO

• Go to "**POWER CIRCUIT INSPECTION**" procedure.

POWER SUPPLY CIRCUIT INSPECTION

- 1. CHECK POWER TO RANGE SWITCH
 - 1. Disconnect "TRANSAXLE RANGE SWITCH" connector.
 - 2. Ignition "ON" & Engine "OFF".
 - 3. Measure voltage between terminal "8" of the sensor harness connector and chassis ground.

Specification : approx. B+



SCMAA6100N

Fig. 14: 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 "<u>VERIFICATION OF VEHICLE</u> <u>REPAIR</u>" procedure.

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

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 :

RESISTANCE SPECIFICATION

Pin No of "TRANSAXLE RANGE SWITCH"	C108 No.1	C108 No.3	C108 No.4	C108 No.7
Pin No of "PCM" harness	C130-A No.6	C130-A NO.3	C130-A No.5	C130-A No.4
Specification	0ohms	0ohms	0ohms	0ohms



SCMAA6101N

Fig. 15: Measuring Resistance Between Each Terminal Of Sensor Harness Connector And TCM (PCM) Harness Connector Courtesy of HYUNDAI MOTOR CO.

4. Is resistance within specifications?

YES

• Go to "<u>COMPONENT INSPECTION</u>" procedure.

NO

• Check for Open in harness. Repair as necessary and Go to "<u>VERIFICATION OF VEHICLE</u> <u>REPAIR</u>" procedure.

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

COMPONENT INSPECTION

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

Specification : approx. 0 ohms



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

SCMAA6102N

Fig. 16: 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 "<u>VERIFICATION OF VEHICLE</u> <u>REPAIR</u>" procedure.

NO

• Replace "TRANSAXLE RANGE SWITCH" as necessary and Go to "<u>VERIFICATION OF</u> <u>VEHICLE REPAIR</u>" procedure.

VERIFICATION OF VEHICLE REPAIR

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

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

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

YES

• Go to the applicable troubleshooting procedure.

NO

• System performing to specification at this time.

DTC P0708 TRANSAXLE RANGE SWITCH - HIGH INPUT

COMPONENT LOCATION

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 CHART

Item	Detecting Condition	Possible cause
DTC Strategy	• Check for No signal	
Enable Conditions	 Engine state = "RUN" 11V < or = Battery Voltage < or = 16 V TPS > or = 3% 	• Open or short in
Threshold value	• Multiple signal	SWITCH
Diagnostic Time	• More than 30sec	Faulty TRANSAXLE RANGE SWITCH E
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 	• Faulty PCM

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

detects multiple signal or no signal, then it	
holds the 3rd gear position	

MONITOR SCANTOOL DATA

Refer to DTC P0707.

TERMINAL & CONNECTOR INSPECTION

Refer to **<u>DTC P0707</u>**.

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 :

VOLTAGE SPECIFICATION

TERMINAL (C108)	1	3	4	7	8	9	10
SPECIFICATION	0V						



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

SCMAA6103N

<u>Fig. 17: Measuring Voltage Between Terminal Of Sensor Harness Connector And Chassis Ground</u> 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 "<u>VERIFICATION OF VEHICLE</u> <u>REPAIR</u>" procedure.

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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



SCMAA6104N

Fig. 18: Measuring Resistance Between Terminals Of Sensor Harness To Check For Short 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 "<u>VERIFICATION OF VEHICLE</u> <u>REPAIR</u>" procedure.

COMPONENT INSPECTION

Refer to **<u>DTC P0707</u>**.

VERIFICATION OF VEHICLE REPAIR

Refer to **<u>DTC P0707</u>**.

DTC P0712 FLUID (OIL) TEMPERATURE SENSOR CIRCUIT - LOW

COMPONENT LOCATION

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AKKF104A

Fig. 19: 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

Item	Detecting Condition	Possible cause
DTC Strategy	Check rationality	
Enable Conditions	• Engine state = RUN	
Threshold Value	• voltage < 0.07V	• Sensor signal circuit is short to ground
Diagnostic Time	• more than 10sec	• Faulty sensor
Fail Safe	• Learning control and Intelligent shift are inhibited	• Faulty PCM
i un balc	 Fluid temperature is regarded as 80°C (176°F) 	

DTC DETECTING CONDITION CHART

SPECIFICATION

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

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		

RESISTANCE SPECIFICATION

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

<u>Fig. 20: Scan Tool Display - Transaxle Fluid Temperature Sensor Parameter</u> Courtesy of HYUNDAI MOTOR CO.

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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 terminal condition. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
- 2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
- 3. Has a problem been found?

YES

• Repair as necessary and go to "<u>VERIFICATION OF VEHICLE REPAIR</u>" procedure.

NO

• Go to "<u>COMPONENT INSPECTION</u>" 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

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SCMAA6105N

Fig. 21: Measuring Voltage Between Terminal "1" Of "TRANSAXLE FLUID TEMPERATURE SENSOR" Harness 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 "<u>VERIFICATION OF</u> <u>VEHICLE REPAIR</u>" 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"



1.TRANSAXLE FLUID TEMPERATURE SENSOR 2.Sensor ground

SCMAA6106N

Fig. 22: Measuring Resistance Between Terminals "1" And "2" Of "TRANSAXLE FLUID TEMPERATURE SENSOR" Courtesy of HYUNDAI MOTOR CO.

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[REFERENCE DATA]

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		

4. Is resistance within specifications?

YES

• Go to "2CHECK 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

<u>Fig. 23: Scan Tool Display - Transaxle Fluid Temperature Sensor</u> Courtesy of HYUNDAI MOTOR CO.

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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 "<u>VERIFICATION OF</u> <u>VEHICLE REPAIR</u>" 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).

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DTC DETECTING CONDITION

DTC DETECTING CONDITION CHART

Item	Detecting Condition	Possible cause
DTC Strategy	• Check for Voltage range	
Enable Conditions	 Intake air temperature > or = -23.5°C Engine state = RUN Warm up driving time > 287.5 sec 	 Sensor signal circuit is short to
Threshold Value	• voltage > or = 4.9 V	ground
Diagnostic Time	• more than 1sec	• Faulty sensor
Fail Safe	• Learning control and Intelligent shift are inhibited	• Faulty PCM
	 Fluid temperature is regarded as 80°C (176°F) 	

SPECIFICATION

Refer to DTC P0712.

MONITOR SCANTOOL DATA

Refer to DTC P0712.

TERMINAL & CONNECTOR INSPECTION

Refer to DTC P0712.

SIGNAL CIRCUIT INSPECTION

Refer to DTC P0712.

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.

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1.TRANSAXLE FLUID TEMPERATURE SENSOR 2.Sensor ground

SCMAA6107N

Fig. 24: Measuring Resistance Between Terminal "2" Of "TRANSAXLE FLUID <u>TEMPERATURE SENSOR" Harness Connector And Chassis Ground</u> Courtesy of HYUNDAI MOTOR CO.

4. Is resistance within specifications ?

YES

• Go to "<u>COMPONENT INSPECTION</u>" procedure.

NO

• Check for open in harness. Repair as necessary and Go to "<u>VERIFICATION OF VEHICLE</u> <u>REPAIR</u>" procedure

COMPONENT INSPECTION

Refer to DTC P0712.

VERIFICATION OF VEHICLE REPAIR

Refer to **<u>DTC P0712</u>**.

DTC P0717 INPUT SPEED SENSOR CIRCUIT - NO SIGNAL

COMPONENT LOCATION

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SCMAA6108N

Fig. 25: Identifying Input Speed Sensor Component 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

Item	Detecting Condition	Possible cause
DTC Strategy	• Speed rationality check	
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 	 Signal circuit is open or short. Sensor power circuit is open Sensor ground circuit is
Threshold value	No signal	open
Diagnostic Time	• More than 1sec	Faulty INPUT SPEED SENSOP
Fail Safe	 Locked into 3rd or 2nd gear Manual shifting is possible (2nd> 3 rd, 3 rd> 2nd) 	• Faulty PCM/TCM

DTC DETECTING CONDITION

SPECIFICATION

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

SIGNAL WAVEFORM



Fig. 26: 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

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FIG.1) Idling FIG.2) Accelerating

SCMAT6100N

Fig. 27: Scan Tool Display - Input Speed Sensor 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 terminal condition. These faults can be caused by interference from other electrical systems and mechanical or chemical damage.
- 2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
- 3. Has a problem been found?

YES

• Repair as necessary and go to "VERIFICATION OF VEHICLE REPAIR" procedure.

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• Go to "<u>SIGNAL CIRCUIT INSPECTION</u>" 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



SCMAA6110N

Fig. 28: 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 "<u>POWER CIRCUIT INSPECTION</u>" procedure.

NO

- Check for open or short in harness. Repair as necessary and Go to "<u>VERIFICATION OF</u> <u>VEHICLE REPAIR</u>" procedure.
- If signal circuit in harness is OK, Go to "2Check 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+

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

SCMAA6111N

Fig. 29: 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 "<u>VERIFICATION OF VEHICLE</u> <u>REPAIR</u>" 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



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

SCMAA6112N

Fig. 30: Measuring Resistance Between Terminal "1" of INPUT SPEED SENSOR Harness Connector And Chassis Ground Courtesy of HYUNDAI MOTOR CO.

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4. Is resistance within specification?

YES

• Go to "<u>COMPONENT INSPECTION</u>" procedure.

NO

- Check for open in harness. Repair as necessary and Go to "<u>VERIFICATION OF VEHICLE</u> <u>REPAIR</u>" procedure.
- If ground circuit in harness is OK, Go to "2Check 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 "**<u>REFERENCE DATA</u>**"



SCMAA6113N

Fig. 31: Measuring Resistance Between Terminal "1", "2" And "2", "3" "INPUT SPEED SENSOR" Connector Courtesy of HYUNDAI MOTOR CO.

4. Is resistance within specifications?

[REFERENCE DATA]

RESISTANCE SPECIFICATION

Data	Reference Data						
Current	22 mA						
Air Con	Input sensor	1.3 mm					
All Gap	Output sensor	0.85 mm					

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Decistorea	Input sensor	Above 4 Mohms			
Resistance	Output sensor	Above 4 Mohm			
Voltago	High	4.8 ~ 5.2V			
vonage	Low	Below 0.8V			

YES

• Go to "2CHECK PCM" as below.

NO

• Replace "INPUT SPEED SENSOR" as necessary and Go to "<u>VERIFICATION OF</u> <u>VEHICLE REPAIR</u>" 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.

	1.5 SIMU-8	CAN				1.5 SIMU-8	CAN		
×	NT (INPUT SPEED)	144	rpn	1	×	NT (INPUT SPEED)	244	a. Joint	
	THROTTLE P. SENSOR	0	%	-		THEOTTLE P.SENSOR	8	%	⊺ ∎∣
	NO (OUTPUT SPEED)	8	rpn			NO (OUTPUT SPEED)	0	rpn	
	DCC SOLENOID DUTY	8	*	•		DCC SOLENOID DUTY	8	*	•
	SIMULATION OF FE	EQUENCY				SIMULATION OF FR	EQUENCY		
	FREQUENCY	DUT	Y			FREQUENCY	DUT	Y	
	150 Hz	50	%			250 Hz	50	%	
	(CH B ONLY)				CH B ONLY)		
	METR SIML SLCT +		FIX			METR SINL SLCT +	-	FIX	
FIG	à.1)					FIG.2)			

EKBF105G

Fig. 32: 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.

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

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

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

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 "<u>VERIFICATION OF</u> <u>VEHICLE REPAIR</u>" 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



SCMAA6109N

Fig. 33: Identifying Output Speed Sensor Component Location Courtesy of HYUNDAI MOTOR CO.

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 roms by counting the frequency of the pulses. This value, together with the throttle position data, is

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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

Item	Detecting Condition	Possible cause
DTC Strategy	Speed rationality check	
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 	 Signal circuit is open or short Sensor power circuit is open
Threshold value	• Vehicle speed calculated from output speed < or = 10% (the vehicle speed from vehicle speed sensor)	 Sensor ground circuit is open
Diagnostic Time	• More than 1sec	Faulty OUTPUT SPEED SENSOR
Fail Safe	 Locked into 3rd or 2nd gear. Apply an electric current to solenoid valve Manual shifting is possible (2nd> 3 rd, 3 rd> 2nd) 	• Faulty PCM

DTC DETECTING CONDITION CHART

SPECIFICATION

Refer to DTC P0717.

SIGNAL WAVEFORM

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe



Fig. 34: 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) Low-speed FIG.2) High-speed

SCMAT6720L

Fig. 35: Scan Tool Display - Output Speed Sensor Courtesy of HYUNDAI MOTOR CO.

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

YES

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• 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 "<u>VERIFICATION OF VEHICLE REPAIR</u>" 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



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

SCMAA6115N

Fig. 36: 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 CIRCUIT INSPECTION**" procedure.

NO

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

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

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+



SCMAA6116N

Fig. 37: Measuring Voltage Between Terminal "3" Of "OUTPUT 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 "<u>VERIFICATION OF VEHICLE</u> <u>REPAIR</u>" 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.

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe



SCMAA6117N

Fig. 38: Measuring Resistance Between Terminal "1" Of OUTPUT SPEED SENSOR Harness 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 "<u>VERIFICATION OF VEHICLE</u> <u>REPAIR</u>" procedure.
- If ground circuit is OK, Go to "2Check 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"



SCMAA6118N

Fig. 39: Measuring Resistance Between Terminal "1", "2" And "2", "3" Of "OUTPUT SPEED SENSOR" Connector

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

Courtesy of HYUNDAI MOTOR CO.

4. Is resistance within specifications?

[REFERENCE DATA]

RESISTANCE SPECIFICATION

Data	Reference Data						
Current	22 mA						
Ain Com	Input sensor	1.3 mm					
Air Gap	Output sensor	0.85 mm					
Desistance	Input sensor	Above 4 Mohms					
Resistance	Output sensor	Above 4 Mohms					
Voltago	High	4.8 ~ 5.2V					
voltage	Low	Below 0.8V					

YES

• Go to "2CHECK PCM/TCM" as below.

NO

• Replace "OUTPUT SPEED SENSOR" as necessary and Go to "<u>VERIFICATION OF</u> <u>VEHICLE REPAIR</u>" procedure.

2. CHECK PCM

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

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe



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

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

EKBF106G

Fig. 40: 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 "<u>VERIFICATION OF</u> <u>VEHICLE REPAIR</u>" procedure.

VERIFICATION OF VEHICLE REPAIR

Refer to **<u>DTC P0717</u>**.

DTC P0731 GEAR 1 INCORRECT RATIO

COMPONENT LOCATION

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe



Fig. 41: Identifying UD Clutch, L And R Brake 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 4.497, then the input speed is 4,497 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 CHART

Item	Detecting Condition	Possible cause
DTC Strategy	• 1st gear incorrect ratio	
Enable Conditions	 Engine speed > 450rpm Output speed > 150rpm Shift stage 1st. gear Input speed > 0 rpm A/T oil temp output > or = -23°C (-9.4°F) 11V < or = Battery Voltage < or = 16 V TRANSAXLE RANGE SWITCH is normal and after 2sec is passed from IG ON 	 Faulty Input speed sensor Faulty output speed sensor Faulty UD clutch or LR,RED brake or One way clutch 1,2
Threshold value	 input speed - output speed x 1st gear ratio < or = 200rpm 	
Diagnostic	• more than 4sec	

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

Fail Safe• Locked into 3 rd gear

SIGNAL WAVEFORM



A : INPUT SPEED SENSOR B : OUTPUT SPEED SENSOR EKBF107A

Fig. 42: 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

1.2 CURRENT	DATA	81/	25
			•
× ENGINE RPM	2552	rym	•
× PG-A(INPUT SPEED)	0	rpn	
× PG-B(OUTPUT SPEED)	0	rpn	
× SHIFT POSITION	1ST	GEAR	
* SELECT LEVER SW.	D		
RED SOLENOID DUTY	99.6	%	
PRESSURE SOLENOID	99.6	%	
OIL TEMPERATURE	158	°F	
			Ŧ
FIX SCRN FULL PAI	RT GRPH]	

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Fig. 43: Scan Tool Display - ENGINE RPM Courtesy of HYUNDAI MOTOR CO.

OPERATING ELEMENT OF EACH SHIFTING RANGE

SHIFT RANGE REFERENCE

CEAD	ELEMENT								
POSITION	L/R BRAKE	2ND BRAKE	U/D CLUTCH	O/D CLUTCH	RED BRAKE	DIR CLUTCH	REV CLUTCH	OWC1	OWC2
1st	0		0		0			•	•
2nd		0	0		0				•
3rd			0	0	0				•
4th		0		0	0				•
5th		0		0		0			
REV	0				0		0		
N,P	0				0				

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

Stall test procedure in 01 and reason

Procedure

- 1. Warm up the engine.
- 2. After positioning the select lever in "D", depress the foot brake pedal fully after that, depress the accelerator pedal to the maximum.

* The slippage of 1st gear operating parts can be detected by stall test in D

Reason for stall test

- 1. If there is no mechanical defaults in A/T, all slippages 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 of specification.
- 4. If output speed revolution is output. It means that the foot brake force is not applied fully. Remeasuring is required.
- 5. Is "STALL TEST" within specification?

YES

• Go to "SIGNAL CIRCUIT INSPECTION" procedure.

NO

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

- Go to "<u>COMPONENT INSPECTION</u>" 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 stall test is being performed more than once, move the selector lever to W and run the engine at 1000 RPM to allow the transaxle fluid to cool prior to subsequent tests.

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	01/25
ж	ENGINE RPM	2000 rp	m 👘
×	PG-A(INPUT SPEED)	1964 rp	~
×	PG-B(OUTPUT SPEED)	434 rp	-
×	SHIFT POSITION	1ST GEA	R
×	SELECT LEVER SW.	D	
	RED SOLENOID DUTY	99.6 %	
	PRESSURE SOLENOID	99.6 %	
	OIL TEMPERATURE	145 °F	
	FIX SCRN FULL PA	RT GRPH	

SCMAA6161N

Fig. 44: Scan Tool Display - INPUT SPEED Courtesy of HYUNDAI MOTOR CO.

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

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

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 "<u>VERIFICATION OF VEHICLE</u> <u>REPAIR</u>" procedure.

COMPONENT INSPECTION



SCMAA6162N

Fig. 45: Identifying Automatic Transaxle Bolt Location 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 REFERENCE

LEVER	INPUT	VFS	SC	DLENG	DID V (%	/AL ⁄0)				
POSITION	SPEED	CURRENT	LR	DCC	2ND	UD	OD	RED (1)	ELEMENT	P (MPa)
D	2500rpm	200mA	0	0	100	0	100	0		1.03 ± 0.02
?	?	?	60	?	?	?	?	?	LR	0.52 ± 0.04
?	?	?	75	?	?	?	?	?]	0.23 ±

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

										0.04
?	?	?	100	?	?	?	?	?		0
?	?	?	100	?	0	0	100	0		1.03±0.02
?	?	?	?	?	60	?	?	?	200	0.55 ± 0.04
?	?	?	?	?	75	?	?	?	ZND	0.22 ± 0.04
?	?	?	?	?	100	?	?	?		0
?	?	?	100	?	100	0	0	0		$\begin{array}{c} 1.03 \pm \\ 0.02 \end{array}$
?	?	?	?	?	?	?	60	?	OD	$\begin{array}{c} 0.52 \pm \\ 0.04 \end{array}$
?	?	?	?	?	?	?	75	?		0.21 ± 0.04
?	?	?	?	?	?	?	100	?		0
?	?	?	100	?	100	0	0	0		$\begin{array}{c} 1.03 \pm \\ 0.02 \end{array}$
?	?	?	?	?	?	60	?	?	UD	0.47 ± 0.04
?	?	?	?	?	?	75	?	?		0.17 ±0.04
?	?	?	?	?	?	100	?	?		0
?	?	?	100	?	0	100	0	0		1.03 ± 0.02
?	?	?	?	?	?	?	?	60	RED ⁽¹⁾	$\begin{array}{c} 0.54 \pm \\ 0.04 \end{array}$
?	?	?	?	?	?	?	?	75		0.27 ± 0.04
?	?	?	?	?	?	?	?	100		0
?	?	?	100	?	0	100	0	100		0
?	?	?	75	?	?	?	?	?		0.27 ± 0.04
?	?	?	60	?	?	?	?	?	DIR ⁽¹⁾	0.54 ± 0.04
?	?	?	0	?	?	?	?	?		1.03 ± 0.02
R	?	250mA	0	?	100	100	100	0	LR	1.55 ± 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 "<u>VERIFICATION OF</u> <u>VEHICLE REPAIR</u>" procedure.

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

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. 46: 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

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

2nd gear ratio, while the transaxle is engaged in the 2nd gear. For example, if the output speed is 1000 rpm and the 2nd gear ratio is 2.442, then the input speed is 2,442 rpm.

DTC DESCRIPTION

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

Item	Detecting Condition	Possible cause
DTC Strategy	• 2nd gear incorrect ratio	
Enable Conditions	 Engine speed > 450rpm Output speed > 300rpm Shift stage 2nd. gear Input speed > 0 rpm A/T oil temp output > or = -23°C (-9.4°F) 11V < or = Battery Voltage < or = 16 V TRANSAXLE RANGE SWITCH is normal and after 2sec is passed from IG ON 	 Faulty Input speed sensor Faulty output speed sensor Faulty UD clutch or 2nd, RED brake or One way clutch 2
Threshold value	• input speed - output speed x 2nd gear ratio > or = 200rpm	
Diagnostic Time	• more than 4sec	
Fail Safe	• Locked into 3 rd gear	

DTC DETECTING CONDITION CHART

SIGNAL WAVEFORM

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe



A : INPUT SPEED SENSOR B : OUTPUT SPEED SENSOR

EKBF108A

Fig. 47: 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

	1.2 CURRENT DATA 01/2	27
×	ENGINE RPM 2617 rpm	-
×	NT (INPUT SPEED) 0 rpm	
×	NO (OUTPUT SPEED) Ø rpm	
×	SHIFT POSITION 2ND GEAR	
×	SELECT LEVER SW. D	
	PRESSURE SOLENOID 96 %	
	OIL TEMPERATURE 109 °F	
	HOLD SWITCH STANDARD	
		•
	FIX SCRN FULL PART GRPH HELP	

SCMAA6163N

Fig. 48: Scan Tool Display - SHIFT POSITION Courtesy of HYUNDAI MOTOR CO.

OPERATING ELEMENT OF EACH SHIFTING RANGE

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

CEAD		ELEMENT							
POSITION	L/R BRAKE	2ND BRAKE	U/D CLUTCH	O/D CLUTCH	RED BRAKE	DIR CLUTCH	REV CLUTCH	OWC1	OWC2
1st	0		0		0			•	•
2nd		0	0		0				•
3rd			0	0	0				•
4th		0		0	0				•
5th		0		0		0			
REV	0				0		0		
N,P	0				0				

SHIFTING RANGE REFERENCE

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

Stall test procedure in D2 and reason

Procedure

- 1. Warm up the engine.
- 2. After positioning the select lever in "D" or "ON" of the HOLD SW (Operate UP SHIFT in case of "SPORTS MODE"), depress the foot brake pedal fully after that, depress the accelerator pedal to the maximum.

* The slippage of 2nd gear operating parts can be detected by stall test in D2.

Reason for stall test

- 1. If there is no mechanical defaults in A/T, all slippages 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 of specification.
- 4. If output speed revolution is output. It means that the foot brake force is not applied fully. Remeasuring is required.
- 5. Is "STALL TEST" within specification?

YES

• Go to "SIGNAL CIRCUIT INSPECTION" procedure.

NO

• Go to "<u>COMPONENT INSPECTION</u>" procedure.

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

- 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 stall test is being performed more than once, move the selector lever to W and run the engine at 1000 RPM to allow the transaxle fluid to cool prior to subsequent tests.

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 : INPUT SPEED - (OUTPUT SPEED x GEAR RATIO) < or = 200 RPM

	1.2 CURRENT	DATA	01/	25
				4
×	ENGINE RPM	1993	rpm	
×	PG-A(INPUT SPEED)	1959	rpn	
×	PG-B(OUTPUT SPEED)	801	rpn	
×	SHIFT POSITION	2ND (GEAR	
×	SELECT LEVER SW.	Ð		
l	RED SOLENOID DUTY	99.6	%	
	PRESSURE SOLENOID	35.3	%	
	OIL TEMPERATURE	147	°F	
				T
	FIX SCRN FULL PAR	RT GRPH		

SCMAA6164N

Fig. 49: Scan Tool Display - INPUT SPEED Courtesy of HYUNDAI MOTOR CO.

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

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

• Go to "<u>COMPONENT INSPECTION</u>" 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 "<u>VERIFICATION OF VEHICLE</u> <u>REPAIR</u>" procedure.

COMPONENT INSPECTION



SCMAA6165N

Fig. 50: Identifying "UD" And "2ND" And "RED" Port Courtesy of HYUNDAI MOTOR CO.

- 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 (DTC P0731)

5. Is oil pressure value within specifications?

YES

• Repair AUTO TRANSAXLE (Clutch or Brake) as necessary and Go to "<u>VERIFICATION OF</u> <u>VEHICLE REPAIR</u>" procedure.

NO

• Replace AUTO TRANSAXLE (BODY CONTROL VALVE faulty) as necessary and Go to "VERIFICATION OF VEHICLE REPAIR" procedure.

VERIFICATION OF VEHICLE REPAIR

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

Refer to DTC P0731.

DTC P0733 GEAR 3 INCORRECT RATIO

COMPONENT LOCATION





OD CLUTCH

EKBF300C

Fig. 51: Identifying OD Clutch And UD Clutch 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 1.686, then the input speed is 1,686 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 CHART

Item	Detecting Condition	Possible cause
DTC Strategy	• 3rd gear incorrect ratio	
Enable Conditions	 Engine speed > 450rpm Output speed > 300rpm Shift stage 3rd. gear Input speed > 0rpm A/T oil temp output > or = -23°C (-9.4°F) 11V < or = Battery Voltage < or = 16V 	 Faulty Input speed sensor Faulty output speed sensor

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

	• TRANSAXLE RANGE SWITCH is normal and after 2sec is passed from IG ON	• Faulty UD, OD clutch or RED brake or One way clutch 2
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



A : INPUT SPEED SENSOR B : OUTPUT SPEED SENSOR

EKBF109A

Fig. 52: 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

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

	1.2 CURRENT	DATA	81/	27
				4
×	ENGINE RPH	2596	rpm	•
×	NT (INPUT SPEED)	0	rpn	
×	NO (OUTPUT SPEED)	0	rpn	
×	SHIFT POSITION	3RD (GEAR	
×	SELECT LEVER SW.	D		
	RED SOLENOID DUTY	99	%	
	PRESSURE SOLENOID	99	%	
	OIL TEMPERATURE	-40	°F	
				•
	FIX SCRN FULL PAL	RT GRPH	HELP	j

SCMAA6166N

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

OPERATING ELEMENT OF EACH SHIFTING RANGE

CEAD	ELEMENT								
POSITION	L/R BRAKE	2ND BRAKE	U/D CLUTCH	O/D CLUTCH	RED BRAKE	DIR CLUTCH	REV CLUTCH	OWC1	OWC2
1st	0		0		0			•	•
2nd		0	0		0				•
3rd			0	0	0				•
4th		0		0	0				•
5th		0		0		0			
REV	0				0		0		
N,P	0				0				

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

Stall test procedure in D3 and reason

Procedure

- 1. Warm up the engine.
- 2. After making 3rd gear hold by disconnecting the solenoid connector, and Then depress the foot brake pedal fully After that, step on the accelerator pedal to the maximum.

* The slippage of 3rd gear operating parts can be detected by stall test in D3.

Reason for stall test

- 1. If there is no mechanical defaults in A/T, all slippages occur in torque converter.
- 2. Therefore, engine revolution is output, but input and output speed revolution must be "zero" due to

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

wheel's lock.

- 3. If OD clutch system (3rd gear operating part) has faults, input speed revolution will be out of specification.
- 4. If output speed revolution is output. It means that the foot brake force is not applied fully. Remeasuring is required.
- 5. Is "STALL TEST" within specification?

YES

• Go to "SIGNAL CIRCUIT INSPECTION" procedure.

NO

- Go to "<u>COMPONENT INSPECTION</u>" 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 stall test is being performed more than once, move the selector lever to W and run the engine at 1000 RPM to allow the transaxle fluid to cool prior to subsequent tests.

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

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

1.2 CURRENT	DATA	81/27
		4
× ENGINE RPH	2048	rpn
× NT (INPUT SPEED)	1998	rpn
× NO (OUTPUT SPEED)	1186	rpn
× SHIFT POSITION	3RD (SEAR
VEHICLE SPEED	31	MPH
THROTTLE P. SENSOR	4	%
DCC SOLENOID DUTY	0	%
DAMPER CLUTCH SLIP	49	rpn
FIX SCRN FULL PAL	RT GRPH	HELP

SCMAA6167N

Fig. 54: Scan Tool Display - Input And Output Speed Sensor Courtesy of HYUNDAI MOTOR CO.

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

YES

• Go to "<u>COMPONENT INSPECTION</u>" 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 "<u>VERIFICATION OF VEHICLE</u> <u>REPAIR</u>" procedure.

COMPONENT INSPECTION



Fig. 55: Identifying "UD" And "OD" And "RED" Port 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".

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

4. Compare it with reference data as below.

Specification : refer to **STANDARD OIL PRESSURE TABLE (DTC P0731)**

5. Is oil pressure value within specifications?

YES

• Repair AUTO TRANSAXLE (Clutch or Brake) as necessary and Go to "<u>VERIFICATION OF</u> <u>VEHICLE REPAIR</u>" 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





EKBF300E

Fig. 56: Identifying 2nd Brake And OD Clutch 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 1.233, then the input speed is 1,233 rpm.

DTC DESCRIPTION

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

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

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

DTC DETECTING CONDITION CHART

SIGNAL WAVEFORM



A : INPUT SPEED SENSOR B : OUTPUT SPEED SENSOR

EKBF110A

Fig. 57: Identifying Signal Waveform Courtesy of HYUNDAI MOTOR CO.

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

MONITOR SCANTOOL DATA

* Go to "SIGNAL CIRCUIT INSPECTION" procedure.

OPERATING ELEMENT OF EACH SHIFTING RANGE

SHIFTING RANGE REFERENCE

CEAD	ELEMENT									
POSITION	L/R BRAKE	2ND BRAKE	U/D CLUTCH	O/D CLUTCH	RED BRAKE	DIR CLUTCH	REV CLUTCH	OWC1	OWC2	
1st	0		0		0			•	•	
2nd		0	0		0				•	
3rd			0	0	0				•	
4th		0		0	0				•	
5th		0		0		0				
REV	0				0		0			
N,P	0				0					

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

	1.2 CURRENT	DATA	01/25
×	ENGINE RPM	2015	rpa
×	PG-A(INPUT SPEED)	1980	rpn
×	PG-BCOUTPUT SPEED)	1611	rpm
×	SHIFT POSITION	4TH G	EAR
×	SELECT LEVER SW.	D	
	RED SOLENOID DUTY	99.6	%
	PRESSURE SOLENOID	35.3	%
	OIL TEMPERATURE	149	F
			T
	FIX SCRN FULL PA	RT GRPH	

SCMAA6170N

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

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

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

YES

• Go to "<u>COMPONENT INSPECTION</u>" 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 "<u>VERIFICATION OF VEHICLE</u> <u>REPAIR</u>" procedure.

COMPONENT INSPECTION



SCMAA6171N

Fig. 59: Identifying "2ND" And "OD" And "RED" 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 (DTC P0731)**

5. Is oil pressure value within specifications?

YES

• Repair AUTO TRANSAXLE (Clutch or Brake) as necessary and Go to "<u>VERIFICATION OF</u> <u>VEHICLE REPAIR</u>" procedure.

NO

• Replace AUTO TRANSAXLE (BODY CONTROL VALVE faulty) as necessary and Go to "VERIFICATION OF VEHICLE REPAIR" procedure.

VERIFICATION OF VEHICLE REPAIR

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

Refer to DTC P0731.

DTC P0735 GEAR 5 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 5th gear ratio, while the transaxle is engaged in the 5th gear. For example, if the output speed is 1,000 rpm and the 5th gear ratio is 0.868, then the input speed is 868 rpm.

DTC DESCRIPTION

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

Item	Detecting Condition	Possible cause
DTC Strategy	• 5th gear incorrect ratio	
Enable Conditions	 Engine speed > 450rpm Output speed > 300rpm Shift stage 5th. gear Input speed > 0rpm A/T. sil terms sutput > cn = 228C (0.48E) 	• Faulty Input speed sensor

DTC DETECTING CONDITION CHART
2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

	 11V < or = Battery Voltage < or = 16V TRANSAXLE RANGE SWITCH is normal 	• Faulty OD, DIR clutch or 2nd brake
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. 61: Identifying Signal Waveform Courtesy of HYUNDAI MOTOR CO.

MONITOR SCANTOOL DATA

* "Signal circuit Inspection" procedure

OPERATING ELEMENT OF EACH SHIFTING RANGE

SHIFTING RANGE REFERENCE

CEAD				EL	EMENT				
POSITION	L/R BRAKE	2ND BRAKE	U/D CLUTCH	O/D CLUTCH	RED BRAKE	DIR CLUTCH	REV CLUTCH	OWC1	OWC2
1st	0		0		0			•	•
2nd		0	0		0				•
3rd			0	0	0				•
4th		0		0	0				•
5th		0		0		0			
REV	0				0		0		

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

N,P 0 0 0 0 0

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	/25
×	ENGINE BPH	1993 rpm	•
×	PG-A(INPUT SPEED)	1942 rpm	
×	PG-B(OUTPUT SPEED)	22 48 rpm	1
×	SHIFT POSITION	5TH GEAR	1
×	SELECT LEVER SW.	D	
	RED SOLENOID DUTY	0.0 %	
	PRESSURE SOLENOID	35.3 %	
	OIL TEMPERATURE	150 °F	1
	FIX SCRN FULL PA	RT GRPH	

SCMAA6172N

Fig. 62: Scan Tool Display - Input And Output Speed Sensor Courtesy of HYUNDAI MOTOR CO.

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

YES

• Go to "<u>COMPONENT INSPECTION</u>" 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 "<u>VERIFICATION OF VEHICLE</u> <u>REPAIR</u>" procedure.

COMPONENT INSPECTION

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe



SCMAA6173N

Fig. 63: Identifying "OD" And "2nd" And "DIR" 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 (DTC P0731)

5. Is oil pressure value within specification?

YES

• Repair AUTO TRANSAXLE (Clutch or Brake) as necessary and Go to "<u>VERIFICATION OF</u> <u>VEHICLE REPAIR</u>" procedure.

NO

• Replace AUTO TRANSAXLE (BODY CONTROL VALVE faulty) as necessary and Go to "<u>VERIFICATION OF VEHICLE REPAIR</u>" 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.

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

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 valve between engine speed and turbine speed). To decrease the slip of the Damper Clutch, the PCM/TCM increases the duty ratio by applying more hyraulic pressure. When slip rpm does not drop with 100% duty ratio, the PCM/TCM determines that the Torque Converter Clutch is stuck OFF and sets this code.

DTC DETECTING CONDITION

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

DTC DETECTING CONDITION CHART

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 > 40%)

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

	1.2 CURRENT DATA 86/	25
×	TCC SOLENOID DUTY 51.4 2	1
×	DAMPER CLUTCH SLIP 0 rpm	۱.
×	SHIFT POSITION 5TH GEAR	1-
×	SELECT LEVER SW. D	
	LR SOLENOID DUTY 0.4 %	
	UD SOLENOID DUTY 100.0%	
	2ND SOLENOID DUTY 0.4 %	
	OD SOLENOID DUTY 8.4 %	{
		v
	FIX SCRN FULL PART GRPH	
FIC	G.1)	_

FIG.1) : Normal status

LLLG112A

Fig. 64: Scan Tool Display - ICC SOLENOID DUTY 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 "<u>COMPONENT INSPECTION</u>" 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 "2CHECK OIL PRESSURE" as below.

NO

• Replace "TCC SOLENOID VALVE" as necessary and go to "<u>VERIFICATION OF</u> <u>VEHICLE REPAIR</u>" procedure.

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

2. CHECK OIL PRESSURE



Fig. 65: 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/cm²)-(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 "<u>VERIFICATION</u> <u>OF VEHICLE REPAIR</u>" procedure.

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

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 valve 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 CHART

Item	Detecting Condition	Possible cause
DTC Strategy	• Stuck "ON"	
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 	* TORQUE CONVERTER (DAMPER) CLUTCH : TCC • Faulty TCC or oil
Threshold value	• Engine rpm - Input speed sensor rpm < or = 20 rpm	• Faulty TCC of on pressure system
Diagnostic Time	• More than 1sec	• Faulty feet solehold valve
	• Damper clutch abnormal system (If diagnosis code	• Faulty body control valve

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

Fail Safa	P0741 is output four times, TORQUE CONVERTER	• Faulty TCM (PCM)
Fall Sale	(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

	1.2	2 CURREN	T DATA	86	/Z
					1
< TCC	SOLENOII	DUTY	51.4	1.	
DAM	PEB CLUTC	CH SLIP	8	rpn	J
< SHI	FT POSITI	ION	5TH	GEAR	1
< SEL	ECT LEVER	R SV.	D		
LR	SOLENOID	DUTY	0.4	*	
UD	SOLENOID	DUTY	100.	e%	L
2ND	SOLENOII	DUTY	0.4	%	
OD	SOLENOID	DUTY	8.4	%	ł
					1
	CODN	PUTT	OPT COPPU		

FIG.1) : Normal status

LLLG112A

Fig. 66: Scan Tool Display - TCC SOLENOID DUTY 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 "<u>COMPONENT INSPECTION</u>" procedure.

COMPONENT INSPECTION

- 1. CHECK TORQUE CONVERTER CLUTCH SOLENOID VALVE
 - 1. Connect scantool to data link connector (DLC).

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

- 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 "2CHECK OIL PRESSURE" as below.

NO

- Repair or replace as necessary and then go to "<u>VERIFICATION OF VEHICLE REPAIR</u>" procedure.
- 2. CHECK OIL PRESSURE



Fig. 67: 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

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

• 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 "<u>VERIFICATION OF VEHICLE REPAIR</u>" procedure.

VERIFICATION OF VEHICLE REPAIR

Refer to **<u>DTC P0741</u>**.

DTC P0743 TORQUE CONVERTER CLUTCH CIRCUIT - ELECTRICAL

COMPONENT LOCATION



AKKF116A

Fig. 68: Identifying Torque Converter Clutch Components 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.

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

DTC DETECTING CONDITION

DTC DETECTING CONDITION CHART

Item	Detecting Condition	Possible cause
DTC Strategy	Check voltage range	
Enable Conditions	 16 V > Voltage Battery > 11V 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
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% 	 Open or short in circuit Faulty TCC SOLENOID VALVE Faulty PCM/TCM
Diagnostic Time	• More than 2 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
 - \circ VFS : 600 ± 20Hzs
- Internal resistance :
 - o 2.7~3.40hms (68°F or 20°C) LR, 2ND, UD, OD, RED, DCC
 - $\circ~4.35\pm0.35 ohms$ (68°F or 20°C) VFS
- Surge voltage : 56 V (except VFS)

SIGNAL WAVEFORM

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe



FIG.1) : Operating of "DCCSV"

EKBF115A

Fig. 69: 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 40%.

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe





LLLG114A

Fig. 70: Monitor "TCC SOL. VALVE" Parameter On Scantool 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

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

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 "<u>VERIFICATION OF VEHICLE REPAIR</u>" procedure.

NO

• Go to "TERMINAL & CONNECTOR INSPECTION" procedure.

TERMINAL & CONNECTOR INSPECTION

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

YES

• Repair as necessary and then go to "VERIFICATION OF VEHICLE REPAIR" procedure.

NO

• Go to "POWER SUPPLY CIRCUIT INSPECTION" procedure.

POWER SUPPLY CIRCUIT INSPECTION

- 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



SCMAA6120N

Fig. 71: Measuring Voltage Between Terminal "6" Of Sensor Harness Connector And Chassis Ground Courtesy of HYUNDAI MOTOR CO.

4. Is voltage within specifications?

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

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 "<u>VERIFICATION OF VEHICLE</u> <u>REPAIR</u>" 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 "9" of the ATM SOLENOID VALVE harness connector and terminal "43" of the TCM harness connector.

Specification: approx. 0 ohms



SCMAA6121N

Fig. 72: Measuring Resistance Between Terminal "9" Of ATM SOLENOID VALVE Harness Connector Courtesy of HYUNDAI MOTOR CO.

4. Is resistance within specifications?

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

• Go to "2Check signal circuit short inspection" procedure.

NO

- Check for open in harness. Repair as necessary and go to "<u>VERIFICATION OF VEHICLE</u> <u>REPAIR</u>" 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



SCMAA6122N

Fig. 73: Measuring Resistance Between Terminal "9" Of ATM SOLENOID VALVE Harness And Chassis Ground Courtesy of HYUNDAI MOTOR CO.

4. Is resistance within specifications?

YES

• Go to "<u>COMPONENT INSPECTION</u>" procedure.

NO

• Check for short to ground in harness. Repair as necessary and go to "<u>VERIFICATION OF</u> <u>VEHICLE REPAIR</u>" 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

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

harness connector.

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



SCMAA6123N

Fig. 74: Measuring Resistance Between Terminal "6" And Terminal "9" Of ATM SOLENOID VALVE Harness Connector Courtesy of HYUNDAI MOTOR CO.

4. Is resistance within specification?

YES

• Go to "2CHECK PCM/TCM" as below.

NO

• Replace TCC SOLENOID VALVE as necessary and go to "<u>VERIFICATION OF</u> <u>VEHICLE REPAIR</u>" 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?

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

1	.4 ACTUATION TEST 07/
DAMPER CLU	TCH CONTROL SOL. VALVE
DURATION	5 SECONDS
METHOD	ACTIVATION
CONDITION	IG.KEY ON ENGINE OFF
PRESS (S	TRT], IF YOU ARE READY !
SELECT T	EST ITEN USING UP/DOWN KEY
STRT	

FIG. 1) ACTUATION TEST

SCMAA6180N

Fig. 75: Scan Tool Display - TCC SOLENOID VALVE Actuator Testing Function Courtesy of HYUNDAI MOTOR CO.

YES

• Go to "VERIFICATION OF VEHICLE REPAIR" procedure.

NO

• Replace PCM/TCM as necessary and go to "<u>VERIFICATION OF VEHICLE REPAIR</u>" 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 **<u>DTC P0741</u>**.

DTC P0748 PRESSURE CONTROL SOLENOID VALVE A - ELECTRICAL

COMPONENT LOCATION

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe



AKKF116U

Fig. 76: Identifying Pressure Control Solenoid Valve Components Location Courtesy of HYUNDAI MOTOR CO.

GENERAL DESCRIPTION

Variable Force Solenoid (Linear Solenoid) : With the duty control which uses higher frequency (600Hz), instead of the existing PWM type which adapts low frequency (60Hz) to control, spool valve can be controlled precisely.

In PWM control, the amount of oil flow is determined by the duration of "ON" signal among continuously repeated ON/OFF signals.

In VFS, the amount is decided by the width of the oil passage.

DTC DESCRIPTION

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

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

DTC DETECTING CONDITION CHART

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Diagnostic Time	• More than 2 seconds	
Fail Safe	• Locked in 3rd gear (Control relay off)	

SPECIFICATION

Refer to DTC P0743.

SIGNAL WAVEFORM



FIG.1) : Wave form of "VFS"

EKBF116A

Fig. 77: 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.

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SCMAT6736L

Fig. 78: Monitor "PRESS CONTROL SOL. VALVE" Parameter On Scantool 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

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

poor connection, bending, corrosion, contamination, deterioration or damage. Repair or replace as necessary and go to "<u>VERIFICATION OF VEHICLE REPAIR</u>" 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 "7" of the sensor harness connector and chassis ground.
- 3. Measure voltage of VFS solenoid valve.

Specification: Approx. 12V



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

SCMAA6125N

Fig. 79: Measuring Voltage Of VFS Solenoid Valve 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 "<u>VERIFICATION OF VEHICLE</u> <u>REPAIR</u>" procedure.

SIGNAL CIRCUIT INSPECTION

1. Check signal circuit open inspection.

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

- 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



SCMAA6126N

Fig. 80: Measuring Resistance Between Terminal "7", "8" Of ATM SOLENOID VALVE Harness Connector Courtesy of HYUNDAI MOTOR CO.

4. Is resistance within specifications?

YES

• Go to "2Check signal circuit short inspection" procedure.

NO

- Check for open in harness. Repair as necessary and go to "<u>VERIFICATION OF VEHICLE</u> <u>REPAIR</u>" procedure.
- 2. Check signal circuit short inspection
 - 1. Ignition "OFF".
 - 2. Disconnect "A/T SOLENOID VALVE" connector and "PCM/TCM" connector
 - 3. Measure resistance between terminal "8" of the ATM SOLENOID VALVE harness and chassis ground.

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Specification: Infinite



SCMAA6127N

Fig. 81: Measuring Resistance Between Terminal ''8'' 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 "<u>VERIFICATION OF</u> <u>VEHICLE REPAIR</u>" 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)]



2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

Fig. 82: 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 "2CHECK 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?

1	4 ACTUATION TEST	08/13						
PRESSURE C	ONTROL SOLENOID VALUE	E						
DURATION	1 SECONDS							
METHOD	ACTIVATION							
CONDITION	DITION IG. KEY ON							
	ENGINE OFF							
PRESS [STRT], IF YOU ARE READY !								
SELECT T	EST ITEH USING UP/DOWN KEY							
STRT								
FIG.1)								

FIG. 1) ACTUATION TEST

SCMAA5181N

Fig. 83: Scan Tool Display - Pressure Control Solenoid Valve Courtesy of HYUNDAI MOTOR CO.

YES

• Go to "<u>VERIFICATION OF VEHICLE REPAIR</u>" procedure.

NO

• Replace PCM/TCM as necessary and go to "<u>VERIFICATION OF VEHICLE REPAIR</u>" procedure.

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

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



AKKF117G

Fig. 84: Identifying Shift Control Solenoid Valve Parts 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

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

and Reverse control solenoid circuit is malfunctioning and sets this code.

DTC DETECTING CONDITION

DTC DETECTING CONDITION CHART

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 LR SOLENOID VALVE 				
Threshold value	• Out of available voltage range	• Faulty PCM/TCM				
Diagnostic Time	• More than 2 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)
 - \circ DCC : 30.64HZ
 - $\circ \ VFS: 600 \pm 20 Hzs$
- Internal resistance :
 - $\circ~2.7$ ~ 3.40hms (68°F or 20°C) LR, 2ND, UD, OD, RED, DCC
 - $\circ~4.35\pm0.35ohms$ (68°F or 20°C) VFS
- Surge voltage : 56 V (except VFS)

SIGNAL WAVEFORM

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe



FIG.1) : "2nd" gear → "1st" gear

EKBF117A

Fig. 85: 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.

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe





SCMAT6741L

Fig. 86: Monitor ''LR SOL. VALVE'' Parameter On Scantool 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

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

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 "<u>VERIFICATION OF VEHICLE REPAIR</u>" procedure.

NO

• Go to "TERMINAL & CONNECTOR INSPECTION" procedure.

TERMINAL & CONNECTOR INSPECTION

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

YES

• Repair as necessary and then go to "VERIFICATION OF VEHICLE REPAIR" procedure.

NO

• Go to "POWER SUPPLY CIRCUIT INSPECTION" procedure.

POWER SUPPLY CIRCUIT INSPECTION

- 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



SCMAA6120N

Fig. 87: Measuring Voltage Between Terminal "6" Of Sensor Harness Connector And Chassis Ground Courtesy of HYUNDAI MOTOR CO.

4. Is voltage within specifications?

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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 "<u>VERIFICATION OF VEHICLE</u> <u>REPAIR</u>" 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



SCMAA6130N

Fig. 88: Measuring Resistance Between Terminal "11" Of ATM SOLENOID VALVE Harness Connector Courtesy of HYUNDAI MOTOR CO.

4. Is resistance within specifications?

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

• Go to "2Check signal circuit short inspection" procedure.

NO

- Check for open in harness. Repair as necessary and go to "<u>VERIFICATION OF VEHICLE</u> <u>REPAIR</u>" 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



SCMAA6131N

Fig. 89: Measuring Resistance Between Terminal "11" Of ATM SOLENOID VALVE <u>Harness And Chassis Ground</u> Courtesy of HYUNDAI MOTOR CO.

4. Is resistance within specifications?

YES

• Go to "<u>COMPONENT INSPECTION</u>" procedure.

NO

• Check for short to ground in harness. Repair as necessary and go to "<u>VERIFICATION OF</u> <u>VEHICLE REPAIR</u>" 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

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

harness connector.

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



SCMAA6132N

Fig. 90: Measuring Resistance Between Terminal "6" And Terminal "11" Of ATM SOLENOID VALVE Harness Connector Courtesy of HYUNDAI MOTOR CO.

4. Is resistance within specification?

YES

• Go to "2CHECK PCM/TCM" as below.

NO

• Replace LR SOLENOID VALVE as necessary and go to "<u>VERIFICATION OF VEHICLE</u> <u>REPAIR</u>" 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?

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

1	.4 ACTUATION TEST 02/1						
LR SOLENOI	D						
DURAT I ON	5 SECONDS						
METHOD ACTIVATION							
CONDITION IG. KEY ON ENGINE OFF							
PRESS [STRT], IF YOU ARE READY !							
SELECT T	EST ITEM USING UP-DOWN KEY						
STRT							

FIG. 1) ACTUATION TEST

SCMAA6182N

Fig. 91: Scan Tool Display - LR SOLENOID Courtesy of HYUNDAI MOTOR CO.

YES

• Go to "VERIFICATION OF VEHICLE REPAIR" procedure.

NO

• Replace PCM/TCM as necessary and go to "<u>VERIFICATION OF VEHICLE REPAIR</u>" 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 **<u>DTC P0741</u>**.

DTC P0755 SHIFT CONTROL SOLENOID VALVE B CIRCUIT MALFUNCTION

COMPONENT LOCATION

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe



Fig. 92: Identifying Shift Control Solenoid Valve B 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

D)T	С	D	E	ſΕ	C'	ΓI	N	; (C	0	N	D	Ľ	ΓI	0	N	CH	[AR]	Γ
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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 UD SOLENOID VALVE 			
Threshold value	• Out of available voltage range	• Faulty PCM/TCM			
Diagnostic Time	• More than 2 seconds				

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

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

SPECIFICATION

Refer to DTC P0750.

SIGNAL WAVEFORM



FIG.1) : "N" → "D"

EK8F118A

Fig. 93: 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.
2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe



NOID DURY 149.4/ DSITION - LEVER SM. B ENOID DUTY 188.8/ ENOID DUTY 188.8/ SOLENOID DUTY 98.8// PERATURE 179 *F YERATURE 179 *F YERATURE 178 *F YERATURE 174 *F NOID DUTY 95.6 % SOLENOID 35.3 % YERATURE 174 *F YERATURE 174 *F I.2 CURRENT DATA 89/25	NID SOLENOID RUTY 109 AV × SHIFT POSITION - × SELECT LEVER SV. R 2ND SOLENOID DUTY 109.8% RED SOLENOID DUTY 109.8% RED SOLENOID DUTY 109.8% PRESSURE SOLENOID 98.8% OIL TEMPERATURE 179 FIG.2) 1.2 CUBRENT DATA 09/25 × DE SOLENOID DUTY 0.4 × SHIFT POSITION 2ND GERH × SELECT LEVER SW. D 2ND SOLENOID DUTY 0.4 2 × SHIFT POSITION 2ND GERH × SELECT LEVER SW. D 2ND SOLENOID DUTY 0.4 3 OD SOLENOID DUTY 99.6% PRESSURE PRESSURE SOLENOID 35.3% 01L TEMPERATURE 1.2 CUBRENT PARA 69/25 × DENOID DUTY 108.04/ × SELECT SUENOID DUTY 1.2	ID SOLENOID BULLY 148.4/ SHIFT POSITION - SELECT LEVER SW. B ZHD SOLENOID DUTY 188.8/ OD SOLENOID DUTY 188.8/ RED SOLENOID DUTY 188.8/ OIL TEMPERATURE 178 *F IT SCRM FULL PART GRPH IC.2 CUBRENT DATA 99/25 SHIFT POSITION 2ND GEAR SHIFT POSITION 2ND GEAR SHIFT POSITION 2ND GEAR SELECT LEVER SW. D SALENOID DUTY 99.6 % PRESSURE SOLENOID DUTY 189.11/2 I.2 CUBRENT DATA 69/25 I.2 CUBRENT DATA 69/25 Y FIK SCRN FULL PABT GRPH IG-4 9/25 I.2 CUBRENT DATA 69/25 <	UD SOLENOI D RUTY 140.4/ SHIFT POSITION - SELECT LEVER SW. B ZND SOLENOI D DUTY 180.8% QD SOLENOI D DUTY 180.8% RED SOLENOI D DUTY 180.8% RED SOLENOI D DUTY 99.6% PRESSURE SOLENOI D 98.8% QIL TEMPERATURE 170 °F I.2 CUBRENT DATA 69/25 UD SOLENOI D DUTY 9.4 / SHIFT POSITION 2ND GEAR SELECT LEVER SW. D 2ND SOLENOI D DUTY 9.4 / SHIFT POSITION 2ND GEAR SELECT LEVER SW. D 2ND SOLENOI D DUTY 99.6% PRESSURE SOLENOI D DUTY 99.6% PRESSURE SOLENOI D DUTY 99.6% PRESSURE SOLENOI D DUTY 99.6% FIK SCEN FULL PART GRPH IG.4) 1.2 CUBRENT DATA 1.2 CUBRENT DATA 69/22 SHIFT POSITION 4TH GEAR SELECT LEVER SU. D 2ND SOLENOI D DUTY 6.4 % OD SOLENOI D DUTY 8.4 % SHIFT POSITION 4TH GEAR	UD SOLENOI D RUTY 140.4/ SHIFT POSITION - SELECT LEVER SV. B 2ND SOLENOI D DUTY 108.6% RED SOLENOI D DUTY 108.6% RED SOLENOI D DUTY 108.6% RED SOLENOI D DUTY 99.6% PRESSURE SOLENOI D 96.8% OIL TEMPERATURE 178 °F I.2 CURRENT DATA 09/25 1.2 CURRENT DATA 09/25 (UD SOLENOI D DUTY 9.4 % SELECT LEVER SW. D 2ND SOLENOI D DUTY 9.4 % SELECT LEVER SW. D 2ND SOLENOI D DUTY 108.6% RED SOLENOI D DUTY 108.6% VID SOLENOI D DUTY 108.6% SELECT LEVER SW. D 1.2 CURRENT DATA 69/25 (UD SOLENOI D DUTY 108.1% SELECT LEVER SW. D 1.2 CURRENT DATA 69/25 (UD SOLENOI D DUTY 10.4 % SELECT LEVER SW. D <	NUD SOLENOID RUTY 1405.0/ SHIFT POSITION - SELECT LEVER SW. B 2ND SOLENOID DUTY 108.6% RED SOLENOID DUTY 108.6% PRESSURE SOLENOID DUTY 99.6% PRESSURE SOLENOID DUTY 99.6% PIH SCRM FIG.2) 1.2 CURRENT DATA 09.25 1.2 CURRENT DATA 99.4 / 9.4 / SELECT LEVER SW. D 1.2 CURRENT DATA 09.25 * UD SOLENOID DUTY 9.4 / SHIFT POSITION 2ND GEAR * SELECT LEVER SW. D 2ND SOLENOID DUTY 0.4 % OD SOLENOID DUTY 108.6% RED SOLENOID DUTY 0.4 % OD SOLENOID DUTY 108.6% RED SOLENOID DUTY 108.6% RED SOLENOID DUTY 108.6% RED SOLENOID DUTY 108.6% PRESSURE SOLENOID DUTY 108.6% PRESSURE SOLENOID DUTY 108.6% SHIFT POSITION 174 *F FIX SCRN FULL PART GRPH	NUD SOLENOID BUTY 1485.4/ SHIFT POSITION - X SELECT LEVER SW. B 2ND SOLENOID DUTY 108.6% OD SOLENOID DUTY 108.6% OD SOLENOID DUTY 108.6% OD SOLENOID DUTY 198.6% OIL TEMPERATURE 178 *F PRESSURE SOLENOID DUTY 99.6 % PRESSURE SOLENOID DUTY 99.6 % PIN SCRM FIG.2) 1.2 CURRENT DATA 4 UD SOLENOID DUTY 9.4 % X SHIFT POSITION 2ND GEAR X SELECT LEVER SW. D 2ND SOLENOID DUTY 8.4 % OD SOLENOID DUTY 8.4 % Y DD SOLENOID DUTY 8.4 % Y DD SOLENOID DUTY 8.4 % Y DD SOLENOID DUTY 8.4 % OD SOLENOID DUTY 8.4 % Y DD SOLENOID DUTY 8.4 % Y DD SOLENOID DUTY 8.4 % Y DE SOLENOID DUTY 108.6% Y PRESSURE SOLENOID DUTY 9.6 % Y PRESSURE SOLENOID 35.3 % 0 Y ID SOLENOID DUTY 8.4 % Y ELECT LEVER SW. D 2ND SOLENOID DUTY 8.4 % Y DSOLENOID DUTY 8.4 % Y DSOLENOID DUTY 8.4 % Y D SOLENOID	M UD SOLENDID DUTY 100.0/	٨
NOID DUTY 188.8/ DSITION - LEVER SW. B ENDID DUTY 188.8/ NOID DUTY 188.8/ NOID DUTY 188.8/ NOID DUTY 188.8/ NOID DUTY 189.8/ SOID DUTY 189.8/ SOID DUTY 99.6 % S SOLENOID 98.8 % PERATURE 178 *F T F T CUBRENT DATA 99/25 SITION SITION 2ND GEAR EUER SW. D NOID DUTY 99.6 % S SOLENOID 35.3 % EBATURE 174 *F RN (FULL) PART GEPH SOLENOID 1.2 CUBRENT DATA 69/25 NOID 1.2 CUBRENT DATA 1010 180.19	ND SOLENOID DUTY 109.0/ SHIFT POSITION - SELECT LEVER SV. B 2ND SOLENOID DUTY 108.6% OD SOLENOID DUTY 108.6% PRESSURE SOLENOID DUTY 99.6% PRESSURE SOLENOID DUTY 99.6% OIL TEMPERATURE 170 *F	UD SOLENDID DUTY 148.4/ SHIFT POSITION - SELECT LEVER SW. B 2ND SOLENOID DUTY 188.8% OD SOLENOID DUTY 188.8% OD SOLENOID DUTY 188.8% PRESSURE SOLENOID DUTY 99.6 % PRESSURE SOLENOID DUTY 99.6 % OIL TEMPERATURE 178 °F I.2 CUBRENT DATA 69/25 SELECT LEVER SW. D 1.2 CUBRENT DATA 69/25 SELECT LEVER SW. 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RN FULL PART GRPH	FIX SCRN FULL PART GRPH	FIX SCRN FULL PART GRPH IG 4) I.2 CURRENT DATA 69/25 IG 4) IBS.UL 69/25 ID SOLENOID DUTY IBS.UL A SELECT LEVER SV. D D 2ND SOLENOID DUTY 0.4 % B OD SOLENOID DUTY 0.4 % PRESSURE SOLENOID DUTY PRESSURE SOLENOID 35.3 % OIL TEMPERATURE	FIX SCRN FULL PART GRPH IG.4) I.2 CURRENT DATA 69/25 I.2 CURRENT DATA 69/25 SHIFT POSITION 4TH GEAR SELECT LEVER SV. D 2ND SOLENOID DUTY 6.4 % OD SOLENOID DUTY 6.4 % RED SOLENOID DUTY 99.6 % PRESSURE SOLENOID 35.3 % OIL TEMPERATURE 174 *F FIX SCRN	FIX SCRN FULL PART GRPH I.2 CURRENT DATA 69/25 UD SOLENOID RUTY 109.04 SHIFT POSITION 4TH GEAR SELECT LEVEE SW. D 2ND SOLENOID DUTY 6.4 OD SOLENOID DUTY 6.4 RED SOLENOID DUTY 99.6 PRESSURE SOLENOID 35.3 OIL TEMPERATURE 174 FIX SCRN	FIX SCRN FULL [PART] [GRPH]	FIX SCRN FULL PART GRPH		Ŧ
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	HD SOLENGID DUTY 188.02 SHIFT POSITION 4TH GEAR SELECT LEVER SW. D 2ND SOLENGID DUTY 0.4 % OD SOLENGID DUTY 0.4 %	UD SOLENGID DUTY SHIFT POSITION SELECT LEVER SW. D 2ND SOLENGID DUTY OD SOLENGID DUTY RED SOLENGID DUTY PRESSURE SOLENGID 35.3 % OIL TEMPERATURE 174 *F	UD SOLENGID DUTY 188.02 SHIFT POSITION 4TH GEAR SELECT LEVER SV. D 2ND SOLENGID DUTY 6.4 % OD SOLENGID DUTY 6.4 % RED SOLENGID DUTY 99.6 % PRESSURE SOLENGID 35.3 % OIL TEMPERATURE 174 *F FIX [SCRN] FULL [PART] [CRPH]	UD SOLENGID DUTY 198.02 SHIFT POSITION 4TH GEAR SELECT LEVER SV. D 2ND SOLENGID DUTY 8.4 % OD SOLENGID DUTY 8.4 % RED SOLENGID DUTY 99.6 % PRESSURE SOLENGID 35.3 % OIL TEMPERATURE 174 °F FIX SCRN FULL PART GRPH	► ID SOLENOID DUTY 188.04 ► SHIFT FOSITION 4TH GEAR ► SELECT LEVEE SW. D 2ND SOLENOID DUTY 0.4 % OD SOLENOID DUTY 0.4 % PRESSURE SOLENOID DUTY 99.6 % PRESSURE SOLENOID 35.3 % 0IL TENPERATURE OIL TENPERATURE 174 *F FIX SCEN FULL [PART] [GRPH]	► ID SOLENOID DUTY 188.14* ► SHIFT FOSITION 4TH GEAR ► SELECT LEVER SV. D 2ND SOLENOID DUTY 0.4 % OD SOLENOID DUTY 0.4 % RED SOLENOID DUTY 9.4 % PRESSURE SOLENOID DUTY 9.5 % OIL TENPERATURE 174 *F FIX SCRN [FULL] [PART] [GRPH]		
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010 Pol 100.08	× SHIFT POSITION 4TH GEAR × SELECT LEVEE SV. D 2ND SOLENOID DUTY 8.4 % OD SOLENOID DUTY 8.4 %	SHIFT POSITION 4TH GEAR SELECT LEVEE SV. D 2ND SOLENOID DUTY 0.4 % OD SOLENOID DUTY 0.4 % RED SOLENOID DUTY 99.6 % PRESSURE SOLENOID 35.3 % OIL TEMPERATURE 174 *F	SHIFT POSITION 4TH GEAR SELECT LEVEE SV. D ZND SOLENOID DUTY 8.4 % RED SOLENOID DUTY 99.6 % PRESSURE SOLENOID 35.3 % OIL TEMPERATURE 174 *F F F F FIX [SCRN] [PULL] [PART] [CRPH]	SHIFT POSITION 4TH GEAR SELECT LEVEE SW. D 2ND SOLENOID DUTY 0.4 % OD SOLENOID DUTY 0.4 % RED SOLENOID DUTY 0.4 % PRESSURE SOLENOID DUTY 99.6 % PRESSURE SOLENOID 35.3 % OIL TEMPERATURE 174 *F FIX SCRN FULL PART	× SHIFT POSITION 4TH GEAR × SELECT LEVER SV. D 2ND SOLENOID DUTY 6.4 % OD SOLENOID DUTY 6.4 % RED SOLENOID DUTY 99.6 % PRESSURE SOLENOID 35.3 % OIL TEMPERATURE 174 °F FIX] [SCRN] [FULL] [PART] [GRPH] - [G.6]	× SHIFT POSITION 4TH GEAR × SELECT LEVER SV. D 2ND SOLENOID DUTY 8.4 % OD SOLENOID DUTY 8.4 % RED SOLENOID DUTY 99.6 % PRESSURE SOLENOID 35.3 % OIL TEMPERATURE 174 °F FIX] SCRN [FULL] [PART] [GRPH] FICK6)	1.2 CURRENT DATA 89/	1
SITION 4TH GEAR	× SELECT LEVER SW. D 2ND SOLENOID DUTY 0.4 % OD SOLENOID DUTY 0.4 %	SELECT LEVER SV. D 2ND SOLENOID DUTY 6.4 % OD SOLENOID DUTY 8.4 % RED SOLENOID DUTY 99.6 % PRESSURE SOLENOID 35.3 % OIL TEMPERATURE 174 *F	SELECT LEVER SV. D ZND SOLENOID DUTY 0.4 % OD SOLENOID DUTY 0.4 % RED SOLENOID DUTY 99.6 % PRESSURE SOLENOID 35.3 % OIL TEMPERATURE 174 *F [FIX SCRN FULL PART (CRPH)	SELECT LEVER SV. D 2ND SOLENOID DUTY 0.4 % OD SOLENOID DUTY 0.4 % RED SOLENOID DUTY 99.6 % PRESSURE SOLENOID 35.3 % OIL TEMPERATURE 174 *F FIX SCRN FULL PART	× SELECT LEVER SW. D 2ND SOLENOID DUTY 0.4 % OD SOLENOID DUTY 0.4 % RED SOLENOID DUTY 9.6 % PRESSURE SOLENOID 35.3 % OIL TEMPERATURE 174 °F FIN [SCRN] [FULL] [PART] [GRPH]	× SELECT LEVER SW. D 2ND SOLENOID DUTY 0.4 % OD SOLENOID DUTY 0.4 % RED SOLENOID DUTY 99.6 % PRESSURE SOLENOID 35.3 % OIL TENPERATURE 174 °F FIN [SCRN] [FULL] [PART] [GRPH] FIG.6)	1.2 CURRENT DATA 09/	4
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NOID DUTY 8.4 %	OD SOLENOID DUTY 8.4 %	OD SOLENOID DUTY 0.4 % RED SOLENOID DUTY 99.6 % PRESSURE SOLENOID 35.3 % OIL TEMPERATURE 174 *F	OD SOLENOID DUTY 8.4 % RED SOLENOID DUTY 99.6 % PRESSURE SOLENOID 35.3 % OIL TEMPERATURE 174 *F PIX SCRN FULL PART GRPH	OD SOLENOID DUTY 8.4 % RED SOLENOID DUTY 99.6 % PRESSURE SOLENOID 35.3 % OIL TEMPERATURE 174 °F FIX SCRN FULL PART GRPH	OD SOLENOID DUTY 8.4 % RED SOLENOID DUTY 99.6 % PRESSURE SOLENOID 35.3 % OIL TEMPERATURE 174 *F FIX SCRN FULL PART GRPH FIC.6)	OD SOLENOID DUTY 0.4 % RED SOLENOID DUTY 99.6 % PRESSURE SOLENOID 35.3 % OIL TEMPERATURE 174 °F FIX SCRN FULL PART GRPH - GR6)	1.2 CUBRENT DATA 89/ UD SOLENOID DUTY 1889.11/ SHIFT POSITION 4TH GEAR SELECT LEVER SV. D	4
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NOID DITY 99.6 %	RED SOLENOLD DUTY 99.4 %	PRESSURE SOLENOID 35.3 % OIL TEMPERATURE 174 *F	PRESSURE SOLENOID 35.3 % OIL TEMPERATURE 174 *F PIX [SCRN] [PULL] [PART] [GRPH]	PRESSURE SOLENOID 35.3 % OIL TEMPERATURE 174 *F FIX SCRN FULL PART GRPH	PRESSURE SOLENOID 35.3 % OIL TENPERATURE 174 *F FIX SCRN FULL PART GRPH	PRESSURE SOLENOID 35.3 % OIL TEMPERATURE 174 *F FIX [SCRN] [PULL] [PART] [GRPH] IG.6)	1.2 CURRENT DATA 89/ MID SOLENOID RUTY 189/12 SHIFT POSITION 4TH GEAR SELECT LEVER SW. D 2ND SOLENOID DUTY 0.4 % OD SOLENOID DUTY 0.4 %	•
		OIL TENPERATURE 174 *F	FINE-SOULE SOLETVID 30.3 Å OIL TEMPERATURE 174 * F Image: Source of the source of t	OIL TEMPERATURE 174 *F	OIL TENPERATURE 174 *F	OIL TENPERATURE 174 *F	1.2 CURRENT DATA 09/ DO SOLENGID DUTY 109.02 SHIFT POSITION 4TH GEAR SELECT LEVER SV. D 2ND SOLENOID DUTY 0.4 % OD SOLENOID DUTY 0.4 % RED SOLENOID DUTY 0.4 %	•
30.54010 35.3 %	LURPSONE SOFEMOID 32'3 2	OIL TEMPERATURE 174 F	OIL TEMPERATURE 174 F	OIL TEMPERATURE 174 F	OIL TENPERATURE 174 F FIX SCRN FULL PART GRPH	FIX SCRN FULL FART GRPH	1.2 CUBRENT DATA 09/ * DD SOLENGID DUTY 100.01/2 * SHIFT POSITION 4TH GEAR * SELECT LEVER SM. D 2ND SOLENGID DUTY 0.4 % OD SOLENGID DUTY 0.4 % RED SOLENGID DUTY 99.6 % NUMBER ON DUTY 99.6 %	
ERATURE 174 F		T	FIX SCRN FULL PART GRPH	FIN SCRN FULL PART GRPH	FIX] [SCRN] [FULL] [FART] [GRPH]	FIX] SCRH [FULL] [PART] [GRPH] FICK6)	1.2 CURRENT DATA 09// UD SOLENOID RUTY 149.4/ SHIFT POSITION 47H GEAR SELECT LEVER SW. D 2ND SOLENOID DUTY 0.4 % RED SOLENOID DUTY 99.6 % PRESSURE SOLENOID 35.3 %	
	OIL TEMPERATURE 174 *F	the second se	FIX SCRN FULL PART GRPH	FIX SCRN FULL PART GRPH	FIX SCRN FULL FART GRPH	[FIX] SCRH [FULL] [FART] [GRPH] FIG.6)	1.2 CURRENT DATA 09/ ID SOLENOID RUTY 189/14/ SHIFT POSITION 4TH GEAR SELECT LEVER SW. D 2ND SOLENOID DUTY 8.4 % RED SOLENOID DUTY 8.4 % RED SOLENOID DUTY 99.6 % PRESSURE SOLENOID 35.3 % OIL TEMPERATURE 174 *F	
T	OIL TEMPERATURE 174 °F	FIX SCRN FULL PART GRPH	the second		FIG.6)	FIG.6)	1.2 CURRENT DATA 09/ LD SOLENDID DUTY 109.14/ SHIFT POSITION 4TH GEAR SELECT LEVER SV. D 2ND SOLENOID DUTY 8.4 % OD SOLENOID DUTY 8.4 % RED SOLENOID DUTY 99.6 % PRESSURE SOLENOID 35.3 % OIL TEMPERATURE 174 °F	1
NOID DUTY 8.4 NOID DUTY 9.4 SNOID DUTY 99.6 SSOLENOID 35.3 PERATURE 174	RED SOLENOID DUTY 99.6 % PRESSURE SOLENOID 35.3 %	FIX SCRN FULL PART GRPH	Loc of the second secon	-IG.6)			1.2 CURRENT DATA 69 M UD SIGLENGED RUTY 100.800 M SELECT LEVER SM. 0 SELECT LEVER SM. 0 2ND SIGLENGED DUTY 6.4.2	
SOLENOID 35.3 %	PRESSURE SOLENOID 35.3 %	OIL TEMPERATURE 174 *F	OIL TEMPERATURE 174 *F	OIL TEMPERATURE 174 *F	OIL TENPERATURE 174 *F FIX SCRN FULL PART GRPH	OIL TEMPERATURE 174 *F FIX SCRM FULL PART GRPH IG.6)	1.2 CURRENT DATA 09/ × HO SOLENGID RUTY 189/1/2 × SHIFT POSITION 4TH GEAR × SELECT LEVER SW. D 2ND SOLENGID DUTY 0.4 % OD SOLENGID DUTY 0.4 % RED SOLENGID DUTY 99.6 %	
'ERATURE 174 *F			FIX SCRN FULL PART GRPH	FIX SCRN FULL PART GRPH	FIX] SCRN] [FULL] [PART] [GRPH]	FIX] SCRN] [FULL] [PART] [GRPH] [GL6]	1.2 CURRENT DATA 09/ 4 UD SOLENOID RUIY 149/14/ 4 SHIFT POSITION 4TH GEAR 4 SELECT LEVER SM. D 2ND SOLENOID DUTY 0.4 % 0D SOLENOID DUTY 0.4 % RED SOLENOID DUTY 99.6 % PRESSURE SOLENOID 35.3 %	
1	OIL TEMPERATURE 174 *F		FIX SCRN FULL PART GRPH	FIX SCRN FULL PART GRPH	FIN SCRN FULL FART GRPH	FIN SCRN FULL FART GRPH	1.2 CURRENT DATA 89/ UD SOLENDID EUTY 189.44/ SHIFT POSITION 4TH GEAR SELECT LEVER SW. D 2ND SOLENDID DUTY 8.4 % OD SOLENDID DUTY 8.4 % OD SOLENDID DUTY 8.4 % PRESSURE SOLENDID 35.3 % OIL TEMPERATURE 174 *F	
CBN [FULL] [PART] (GRPH)	OIL TENPERATURE 174 °F FIX SCRN [FULL] [FART] [GRPH] FIG.6)	IG.6)	lG.0)				1.2 CURRENT DATA 09/ D SOLENOID RUTY 100.04/ SHIFT POSITION 4TH GEAR SELECT LEVER SW. D 2ND SOLENOID DUTY 0.4 % RED SOLENOID DUTY 0.4 % RED SOLENOID DUTY 99.6 % PRESSURE SOLENOID 35.3 % OIL TEMPERATURE 174 *F FIX SCRN FULL PART GRPH FIG.6)	-
RN [FULL] PART] (GRPH)	OIL TEMPERATURE 174 *F	-(G.6)	FIG. 1) P.N	FIG. 1) P.N	FIG. 1) P.N	FIG. 1) P.N	1.2 CURRENT DATA 09/ DO SOLENOID EUTY 109.0/ SHIFT POSITION 4TH GEAR SELECT LEVER SM. D 2ND SOLENOID DUTY 0.4 % RED SOLENOID DUTY 0.4 % RED SOLENOID DUTY 99.6 % PRESSURE SOLENOID 35.3 % OIL TEMPERATURE 174 *F FIK [SCRN] [FULL] [PART] [GRPH] FIG. 6)	25
RM [FULL] PABT] (GRPH]	OIL TEMPERATURE 174 *F (FIX] [SCRN] [FULL] [PART] [GRPH] FIG. 1) P,N FIG. 2) "P"	FIG. 1) P,N	FIG. 1) P.N	FIG. 1) P,N	FIG. 1) P.N	FIG. 1) P.N	1.2 CURRENT DATA 09/ UD SOLENOID RUTY 149.44/ SHIFT POSITION 4TH GEAR SELECT LEVER SW. D 2ND SOLENOID DUTY 0.4 % RED SOLENOID DUTY 0.4 % RED SOLENOID DUTY 99.6 % PRESSURE SOLENOID 35.3 % OIL TEMPERATURE 174 *F FIX SCRN [FULL] PART [GRPH] FIG. 1) P.N FIG. 20 "P"	×
RM [FUIL] [PABT] (GRPH]	OIL TENPERATURE 174 "F FIX SCRN FULL PART GRPH FIG. 6) FIG. 1) P,N FIG. 2) "R"	FIG. 1) P,N FIG. 2) "R"	FIG. 1) P,N FIG. 2) "R"	FIG. 1) P,N FIG. 2) "R"	FIG. 1) P.N FIG. 2) "R"	FIG. 1) P.N FIG. 2) "R"	1.2 CURRENT DATA 09/2 * ID SOLENGID RUTY 189/14/2 * SHIFT POSITION 4TH GEAR * SELECT LEVER SW. D 2ND SOLENGID DUTY 0.4 % OD SOLENGID DUTY 0.4 % RED SOLENGID DUTY 0.4 % PRESSURE SOLENGID DUTY 99.6 % PRESSURE SOLENGID 35.3 % 01L TEMPERATURE OIL TEMPERATURE 174 *F FIG. 6) FIG. 2) "R"	Z5
T BN [FULL] PART] (GRPH] N N 1") 1st" gear	OIL TEMPERATURE 174 *F	FIG. 1) P.N FIG. 2) "R" FIG. 3) "D 1st" gear	FIG. 1) P.N FIG. 2) "R" FIG. 3) "D 1st" gear	FIG. 1) P,N FIG. 2) "R" FIG. 3) "D 1st" gear	FIG. 1) P,N FIG. 2) "R" FIG. 3) "D 1st" gear	FIG. 1) P,N FIG. 2) "R" FIG. 3) "D 1st" gear	1.2 CURRENT DATA 09// UD SOLENOID RUTY 149.4/ SHIFT POSITION 4TH GEAR SELECT LEVER SM. D 2ND SOLENOID DUTY 0.4 % GD SOLENOID DUTY 0.4 % PRESSURE SOLENOID DUTY 99.6 % PRESSURE SOLENOID DUTY 99.6 % PRESSURE SOLENOID DUTY 97.4 % FIX SCRN FULL FIX SCRN FULL FIG. 1) P.N FIG. 2) "R" FIG. 3) "D 1st" gear	Z5
RM [FULL] [PABT] [GRPH]	OIL TEMPERATURE 174 *F (FIK] [SCRN] [FULL] [PART] [GRPH] FIG. 1) P.N FIG. 2) "R" FIG. 3) "D 1st" gear	FIG. 1) P,N FIG. 2) "R" FIG. 2) "D 1st" gear	FIG. 1) P.N FIG. 2) "R" FIG. 3) "D 1st" gear	FIG. 1) P.N FIG. 2) "R" FIG. 3) "D 1st" gear	FIG. 1) P.N FIG. 2) "R" FIG. 3) "D 1st" gear	FIG. 1) P.N FIG. 2) "R" FIG. 3) "D 1st" gear	1.2 CURRENT DATA 09/2 ID SOLENOID EUTY 109.04/2 SHIFT POSITION 4TH GEAR SELECT LEVER SW. D 2ND SOLENOID DUTY 0.4 % RED SOLENOID DUTY 0.4 % PRESSURE SOLENOID DUTY 9.6 % PRESSURE SOLENOID 35.3 % 01L TEMPERATURE 01L TEMPERATURE 174 *F FIG. 1) P,N FIG. 2) "R" FIG. 3) "D 1st" gear FIO. 4) Post"	₹
RN [FUILL] PABT] (GRPH] N "") 1st" gear nd" gear	OIL TEMPEBATURE 174 *F FIR. [SCRN] [FUIL] [PART] [GRPH] FIG. 1) P,N FIG. 2) "R" FIG. 3) "D 1st" gear FIG. 4) "2nd" gear	FIG. 1) P.N FIG. 2) "R" FIG. 3) "D 1st" gear FIG. 4) "2nd" gear	FIG. 1) P.N FIG. 2) "R" FIG. 3) "D 1st" gear FIG. 4) "2nd" gear	FIG. 1) P,N FIG. 2) "R" FIG. 3) "D 1st" gear FIG. 4) "2nd" gear	FIG. 1) P.N FIG. 2) "R" FIG. 3) "D 1st" gear FIG. 4) "2nd" gear	FIG. 1) P.N FIG. 2) "R" FIG. 3) "D 1st" gear FIG. 4) "2nd" gear	1.2 CURRENT DATA 69/ 1.2 CURRENT DATA 69/ 1.2 CURRENT DATA 69/ 1.4 DO SOLENOID CUTY 109.0/ SHIFT POSITION 4TH GEAR SELECT LEVER SM. D 2ND SOLENOID DUTY 6.4 % RED SOLENOID DUTY 6.4 % RED SOLENOID DUTY 99.6 % PRESSURE SOLENOID 35.3 % OIL TEMPERATURE 174 *F FIG. 1) P.N FIG. 2) "R" FIG. 3) "D 1st" gear FIG. 4) "2nd" gear	₹
N "" "" "" "" "" " " " " " "	OIL TEMPEBATURE 174 *F FIK. SCRM FULL PABT GRPH FIG. 1) P.N FIG. 2) "R" FIG. 3) "D 1st" gear FIG. 4) "2nd" gear FIG. 4) "3rd" gear	FIG. 1) P,N FIG. 2) "R" FIG. 2) "C 1st" gear FIG. 3) "D 1st" gear FIG. 4) "2nd" gear	FIG. 1) P,N FIG. 2) "R" FIG. 3) "D 1st" gear FIG. 4) "2nd" gear	FIG. 1) P,N FIG. 2) "R" FIG. 3) "D 1st" gear FIG. 4) "2nd" gear FIG. 5) "3rd" gear	FIG. 1) P,N FIG. 2) "R" FIG. 3) "D 1st" gear FIG. 4) "2nd" gear FIG. 5) "3rd" gear	FIG. 1) P,N FIG. 2) "R" FIG. 3) "D 1st" gear FIG. 4) "2nd" gear FIG. 5) "3rd" gear	1.2 CURRENT DATA 09//	-
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RM [FUIL] [PABT] [GRPH] N "") 1st" gear nd" gear rd" gear th" gear	OIL TEMPERATURE 174 *F FIG. 1) P,N FIG. 2) "R" FIG. 3) "D 1st" gear FIG. 4) "2nd" gear FIG. 5) "3rd" gear FIG. 6) "4th" gear	FIG. 1) P,N FIG. 2) "R" FIG. 3) "D 1st" gear FIG. 4) "2nd" gear FIG. 5) "3rd" gear FIG. 6) "4th" gear	FIG. 1) P.N FIG. 2) "R" FIG. 3) "D 1st" gear FIG. 4) "2nd" gear FIG. 5) "3rd" gear FIG. 6) "4th" gear	FIG. 1) P,N FIG. 2) "R" FIG. 3) "D 1st" gear FIG. 4) "2nd" gear FIG. 5) "3rd" gear FIG. 6) "4th" gear	FIG. 1) P,N FIG. 2) "R" FIG. 3) "D 1st" gear FIG. 4) "2nd" gear FIG. 5) "3rd" gear FIG. 6) "4th" gear	FIG. 1) P.N FIG. 2) "R" FIG. 3) "D 1st" gear FIG. 4) "2nd" gear FIG. 5) "3rd" gear FIG. 6) "4th" gear	1.2 CURRENT DATA 69/ UD SOLENOID CUTY 109.0/ SHIFT POSITION 4TH GEAR SELECT LEVER SM. D 2ND SOLENOID DUTY 6.4 % RED SOLENOID DUTY 6.4 % RED SOLENOID DUTY 99.6 % PRESSURE SOLENOID 35.3 % OIL TEMPERATURE 174 *F FIG. 1) P,N FIG. 2) "R" FIG. 3) "D 1st" gear FIG. 4) "2nd" gear FIG. 5) "3rd" gear FIG. 6) "4th" gear	-
Tem [Full] [PART] [CRPH] N 1" 1" 1 at" gear rd" gear th" gear th" gear	OIL TEMPEBATURE 174 *F FIK. [SCRM] [FULL] [PABT] [GRPH] FIG. 1) P,N FIG. 2) "R" FIG. 3) "D 1st" gear FIG. 4) "2nd" gear FIG. 5) "3rd" gear FIG. 6) "4th" gear FIG. 7) "5th" gear	FIG. 1) P,N FIG. 2) "R" FIG. 2) "R" FIG. 3) "D 1st" gear FIG. 4) "2nd" gear FIG. 5) "3rd" gear FIG. 6) "4th" gear FIG. 7) "5th" gear	FIG. 1) P.N FIG. 2) "R" FIG. 3) "D 1st" gear FIG. 4) "2nd" gear FIG. 5) "3rd" gear FIG. 6) "4th" gear FIG. 6) "4th" gear	FIG. 1) P,N FIG. 2) "R" FIG. 3) "D 1st" gear FIG. 4) "2nd" gear FIG. 5) "3rd" gear FIG. 6) "4th" gear	FIG. 1) P,N FIG. 2) "R" FIG. 3) "D 1st" gear FIG. 4) "2nd" gear FIG. 5) "3rd" gear FIG. 6) "4th" gear FIG. 6) "5th" gear	FIG. 1) P.N FIG. 2) "R" FIG. 3) "D 1st" gear FIG. 4) "2nd" gear FIG. 5) "3rd" gear FIG. 6) "4th" gear FIG. 6) "5th" gear	1.2 CURRENT DATA 09/ I.2 CURRENT DATA 09/ I.3 SOLENOID EUTY 109.0/ SHIFT POSITION 4TH GEAR SELECT LEVER SW. D 2ND SOLENOID DUTY 0.4 % RED SOLENOID DUTY 0.4 % RED SOLENOID DUTY 99.6 % PRESSURE SOLENOID 35.3 % OIL TEMPERATURE 174 *F FIG. 1) P,N FIG. 2) "R" FIG. 3) "D 1st" gear FIG. 4) "2nd" gear FIG. 5) "3rd" gear FIG. 6) "4th" gear FIG. 7) "5th" gear	-
N I Sen [FUILL] [PABT] [GBPH] I I I I I I I I I I I I I	OIL TEMPERATURE 174 *F FIG. 1) P,N FIG. 2) "R" FIG. 3) "D 1st" gear FIG. 5) "3rd" gear FIG. 6) "4th" gear FIG. 7) "5th" gear	FIG. 1) P,N FIG. 2) "R" FIG. 3) "D 1st" gear FIG. 4) "2nd" gear FIG. 5) "3rd" gear FIG. 6) "4th" gear FIG. 7) "5th" gear	FIG. 1) P.N FIG. 2) "R" FIG. 3) "D 1st" gear FIG. 4) "2nd" gear FIG. 5) "3rd" gear FIG. 6) "4th" gear FIG. 7) "5th" gear	FIG. 1) P.N FIG. 2) "R" FIG. 3) "D 1st" gear FIG. 4) "2nd" gear FIG. 5) "3rd" gear FIG. 6) "4th" gear FIG. 7) "5th" gear	FIG. 1) P.N FIG. 2) "R" FIG. 3) "D 1st" gear FIG. 4) "2nd" gear FIG. 5) "3rd" gear FIG. 6) "4th" gear FIG. 7) "5th" gear	FIG. 1) P,N FIG. 2) "R" FIG. 3) "D 1st" gear FIG. 4) "2nd" gear FIG. 5) "3rd" gear FIG. 6) "4th" gear FIG. 7) "5th" gear	1.2 CURRENT DATA 09/2 ID SOLENOID EUTY 109.04/2 SHIFT POSITION 4TH GEAR SELECT LEVER SW. D 2ND SOLENOID DUTY 0.4 % RED SOLENOID DUTY 0.4 % PRESSURE SOLENOID DUTY 0.4 % PRESSURE SOLENOID 35.3 % 01L TEMPERATURE 01L TEMPERATURE 174 *F FIG. 1) P,N FIG. 2) "R" FIG. 3) "D 1st" gear FIG. 4) "2nd" gear FIG. 5) "3rd" gear FIG. 6) "4th" gear FIG. 7) "5th" gear	-

SCMAT6745L

Fig. 94: Monitor ''UD SOL. VALVE'' Parameter On Scantool 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.

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poor connection, bending, corrosion, contamination, deterioration or damage. Repair or replace as necessary and go to "<u>VERIFICATION OF VEHICLE REPAIR</u>" 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



SCMAA6135N

<u>Fig. 95: Measuring Voltage Between Terminal ''5'' Of Sensor Harness Connector And Chassis</u> <u>Ground</u> 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 "<u>VERIFICATION OF VEHICLE</u> <u>REPAIR</u>" procedure.

SIGNAL CIRCUIT INSPECTION

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- 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



SCMAA6136N

<u>Fig. 96: Measuring Resistance Between Terminal "3" Of ATM SOLENOID VALVE Harness</u> <u>Connector Of PCM/TCM Harness Connector</u> Courtesy of HYUNDAI MOTOR CO.

4. Is resistance within specifications?

YES

• Go to "2Check signal circuit short inspection" procedure.

NO

- Check for open in harness. Repair as necessary and go to "<u>VERIFICATION OF VEHICLE</u> <u>REPAIR</u>" 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

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ground.

Specification: Infinite



SCMAA6137N

Fig. 97: Measuring Resistance Between Terminal ''3'' Of ATM SOLENOID VALVE Harness <u>And Chassis Ground</u> Courtesy of HYUNDAI MOTOR CO.

4. Is resistance within specifications?

YES

• Go to "<u>COMPONENT INSPECTION</u>" procedure.

NO

• Check for short to ground in harness. Repair as necessary and go to "<u>VERIFICATION OF</u> <u>VEHICLE REPAIR</u>" 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)]

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SCMAA6138N

Fig. 98: Measuring Resistance Between Terminal "3" And Terminal "5" Of ATM SOLENOID VALVE Harness Connector Courtesy of HYUNDAI MOTOR CO.

4. Is resistance within specification?

YES

• Go to "2CHECK PCM/TCM" as below.

NO

- Replace UD SOLENOID VALVE as necessary and go to "<u>VERIFICATION OF</u> <u>VEHICLE REPAIR</u>" 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?

1	.4 ACTUATION TEST	03/13
UD SOLENOI	D	
DURAT I ON	5 SECONDS	
METHOD	ACTIVATION	
CONDITION	IG. KEY ON	
	ENGINE OFF	
PRESS IS	TRT], IF YOU ARE REA	ADY T
SELECT T	est iten using up/down key	
STRT		
FIG.1)		

FIG. 1) ACTUATION TEST

Fig. 99: Scan Tool Display - UD SOLENOID VALVE Courtesy of HYUNDAI MOTOR CO. SCMAA6183N

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YES

• Go to "VERIFICATION OF VEHICLE REPAIR" procedure.

NO

• Replace PCM/TCM as necessary and go to "<u>VERIFICATION OF VEHICLE REPAIR</u>" 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



AKKF119F

Fig. 100: Identifying Shift Control Solenoid Valve C Parts 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

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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	CHART
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Item	Detecting Condition	Possible cause
DTC Strategy	Check voltage range	
Enable Conditions	 16V > Voltage Battery > 11 V 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
Threshold value	• Out of available voltage range	• Faulty PCM/TCM
Diagnostic Time	• More than 2 seconds	
Fail Safe	• Locked in 3rd gear. (Control relay off)	

SPECIFICATION

Refer to DTC P0750.

SIGNAL WAVEFORM

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

EKBF119A

Fig. 101: 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.

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LD DUTY 108.6% TION - ER SW. R D DUTY 108.6% D DUTY 108.6% D DUTY 108.6% ID DUTY 99.6% OLENOID 98.8% ATURE 176 °F V I FULL PART GRPH 22 CURRENT DATA 18/25 D DUTY 9.4 / 10M 2ND GEAR ER SW. D D DUTY 188.6% D DUTY 188.6% D DUTY 99.6% D DUTY 188.6% D DUTY 99.6% D DUTY 188.6% D DUTY 95.6% D LENOID 35.3% TURE 176 °F V
10 DUTY 108.6× TION - ER SW. R D DUTY 108.6% D DUTY 108.6% D DUTY 108.6% D DUTY 108.6% D DUTY 99.6% OLENOID 98.8% ID DUTY 99.6% FULL PART GRPH 2 CURBENT DATA 10/22 P DUTY 9.4 P DUTY 9.4 P DUTY 9.4 P DUTY 8.4% D DUTY 108.6% D DUTY 9.6% D DUTY 9.6% D DUTY 9.6% DUTY 108.6% DUTY 108.6% DUTY 9.6% DUTY 9.6% DUTY 9.6% PULL PART GRPH TO
TION - ER SW. R D DUTY 100.6% D DUTY 100.6% ID DUTY 99.6% OLENOI D 98.8% ATURE 176 °F
ER SW. R D DUTY 108.6% D DUTY 108.6% D DUTY 108.6% ID DUTY 99.6% ATURE 176 °F V FULL PART GRPH 2 CURRENT DATA 18/25 TO DUTY 0.4 × 100 2ND GEAR CR SW. D D DUTY 0.4 % D DUTY 108.6% ID DUTY 99.6% D DUTY 99.6% D DUTY 99.6% ID DUTY 90.6% ID DUTY 90
D DUTY 188.6% D DUTY 188.6% D DUTY 188.6% ID DUTY 99.6% ATURE 176 °F V [FULL] PART GRPH 2 CURRENT DATA 18/25 D DUTY 8.4% D DUTY 8.4% D DUTY 188.6% D DUTY 188.6% D DUTY 99.6% V FULL PART GRPH
D DUTY 100.6% ID DUTY 99.6 % OLENOID 98.8 % ATURE 176 °F FULL PART GRPH 2 CURRENT DATA 18/25 1004 2ND GEAR IS SU. D DUTY 99.6 % DUTY 100.6% DUTY 100.6% DUTY 99.6 % DUTY 99.6 % DUTY 99.6 % DUTY 99.6 % DUTY 99.6 % DUTY 100.6% ID DUTY 99.6 % DUTY 100.6% ID DUTY 99.6 % DUTY 100.6% ID DUTY 99.6 % DUTY 100.6% ID DUTY 99.6 % ID DUTY 90.6 % ID
ID DUTY 99.6 % OLENOID 98.8 % ATURE 176 °F ↓ [FULL] PART GRFH 2 CURRENT DATA 10/25 10 0.4 / 10 0.4 / 10 0.4 % 10 0.4
OLENOID 98.8 % ATURE 176 °F Y FULL FULL PART GRPH 2 CURBENT DATA 10/25 10 2.2 101Y 0.4 2 1001Y 0.4 2 1001Y 0.4 2 0 1001Y 0.4 2 0 0 0 0 0 10 10 35.3 % 10 10 35.3 % 10 10 35.3 % 10 10 10 10.2 10.2 10.2 10.2 10.2 10.2 10.2 10.2 10.2 <
ATURE 176 °F T FULL PART GRPH 2. CURRENT DATA 18/25 10 DUTY 0.4 2 100N 2ND GEAR 2R SW. D DUTY 0.4 2 DUTY 0.4 2 DUTY 180.6% DUTY 190.6 % DUTY 99.6 % DUTY 99.6 % ID DUTY 99.6 % ITURE 176 °F V FULL PART GRPH
FULL PART GRPH .2 CURBENT DATA 16/25 .10 DUTY 0.4 A FION 2ND GEAB A D DUTY 0.4 X D DUTY 0.4 X D DUTY 108.6% D DUTY 108.6% VIURE 176 PULL PART GRPH
[FULL] PART [GRFH] .2 CURRENT DATA 18/25 ID DUTY 0.4 > DUTY 0.4 > DUTY 0.4 > DUTY 180.6% > DUTY 180.8% > DUTY 180.8% > DUTY 180.8% > DUTY 187.3% YUURE 176 * F [FULL] PART [GRPH]
2 CURRENT DATA 10/25 ID DUTY 0.4 FION 2ND GEAR ER SW. D D DUTY 0.4 D DUTY 9.6 NLENOID 35.3 YUURE 176 FULL PART
2 CURRENT DATA 10/25 ID DUTY 0.4 FION 2ND GEAR ER SW. D D DUTY 0.4 NULENOID 35.3 YUURE 176 FULL PART
2 CURRENT DATA 10/25 ID DUFY 0.4 FION 2ND GEAR ER SW. D D DUTY 0.4 D DUTY 0.4 D DUTY 0.6 NLENOID 35.3 VTURE 176 PULL PART
ID DUIN 0.4 A FIOH 2ND GEAR E FIOH 2ND GEAR E SR SM. D D DUITY 0.4 X O DUTY 1080.6% ID DUTY NLENOID 35.3 X NUENOID 35.3 X ITURE 176 F FULL PART GEPH V Image: Comparison of the second secon
ID DUTY 0.4 Z FIOM 2ND GEAR ER ER SM. D D DUTY 0.4 X D DUTY 180.6% NLENOID 35.3 X NULENOID 35.3 X YURE 176 F PULL PART GEPH Y Y
FION 2ND GEAB ER SW. D 0 DUTY 0.4 % 0 DUTY 180.6% 1D DUTY 9.6 % NLENOID 35.3 % YUURE 176 *F PULL PART
SR SW. D D DUTY B.4 % D DUTY 188.6% D DUTY 188.6% D DUTY 95.6 % DLENOID 35.3 % MTURE 176 * F FULL PART
DUITY 0.4 % DUITY 180.6% DUTY 99.6 % DLENOID 35.3 % NURE 176 *F FULL PART
D DUTY 100. 6% D DUTY 99.6 % DLENOID 35.3 % NTURE 176 *F FULL PART GRPH
D DUTY 99.6 % DLENOID 35.3 % NTUBE 176 *F FULL PART GRPH
DULENOID 35.3 % ATURE 176 °F
TURE 176 *F
FULL PART GRPH
FULL PART GRPH
2 CURRENT DATA 18/25
D DUTY 0.4 2
TON 4TH GEAR
TION 4TH GEAB
110N 4TH GEAB TE SW. D DUTY 188.6%
HON 4TH GEAB EB SW. D DUTY 189.6% DUTY 8.4 %
HON 4TH GEAB EE SW. D DUTY 188.6% DUTY 8.4 % DUTY 9.6 %
10M 4TH GEAR ER SW. D D DUTY 188.6% D DUTY 8.4 % D DUTY 9.6 % KLENOID 35.3 %
HOM 4TH GEAB ER SW. D D DUTY 188.8% D DUTY 84.4% D DUTY 99.6% MLENOID 35.3% TUBE 176.6%
ION 4TH GEAB EB SW. D D DUTY 188.6% D DUTY 8.4 % D DUTY 9.6 % VLENOI D 35.3 % ITURE 176 °F
ION 4TH GEAB EB SW. D D DUTY 188.6% D DUTY 8.4 % D DUTY 9.6 % VLENOID 35.3 % ITURE 176 °F FULL PART
2 CURRENT DATA 18

SCMAT6750L

Fig. 102: Monitor ''2nd SOL. VALVE'' Parameter On Scantool 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

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

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 "<u>VERIFICATION OF VEHICLE REPAIR</u>" 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. 103: Measuring Resistance Between Terminal "4" Of ATM SOLENOID VALVE Harness Connector Courtesy of HYUNDAI MOTOR CO.

SCMAA6140N

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4. Is resistance within specifications?

YES

• Go to "2Check signal circuit short inspection" procedure.

NO

- Check for open in harness. Repair as necessary and go to "<u>VERIFICATION OF VEHICLE</u> <u>REPAIR</u>" 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



SCMAA6141N

Fig. 104: Measuring Resistance Between Terminal "4" Of ATM SOLENOID VALVE Harness And Chassis Ground Courtesy of HYUNDAI MOTOR CO.

4. Is resistance within specifications?

YES

• Go to "<u>COMPONENT INSPECTION</u>" procedure.

NO

• Check for short to ground in harness. Repair as necessary and go to "<u>VERIFICATION OF</u> <u>VEHICLE REPAIR</u>" procedure.

COMPONENT INSPECTION

1. CHECK SOLENOID VALVE

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

- 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)]



SCMAA6142N

Fig. 105: 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 "2CHECK PCM/TCM" as below.

NO

• Replace 2nd SOLENOID VALVE as necessary and go to "<u>VERIFICATION OF</u> <u>VEHICLE REPAIR</u>" 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?

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

ZND SOLENO	ID						
URATION	5 SECONDS						
METHOD ACTIVATION							
CONDITION	IG. XEY ON ENGINE OFF						
PRESS [S	TRT], IF YOU ARE READY !						
SELECT T	EST ITEN USING UP/DOWN KEY						

FIG. 1) ACTUATION TEST

SCMAA6184N

Fig. 106: Scan Tool Display - SOLENOID VALVE Actuator Testing Function Courtesy of HYUNDAI MOTOR CO.

YES

• Go to "VERIFICATION OF VEHICLE REPAIR" procedure.

NO

• Replace PCM/TCM as necessary and go to "<u>VERIFICATION OF VEHICLE REPAIR</u>" 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 **<u>DTC P0750</u>**.

DTC P0765 SHIFT CONTROL SOLENOID VALVE D CIRCUIT MALFUNCTION

COMPONENT LOCATION

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe



Fig. 107: Identifying Shift Control Solenoid Valve D Parts 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

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 OD SOLENOID VALVE
Threshold value	• Out of available voltage range	• Faulty PCM/TCM
Diagnostic Time	• More than 2 seconds	
Fail Safe	• Locked in 3rd gear.(Control relay off)	

DTC DETECTING CONDITION CHART

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SPECIFICATION

Refer to DTC P0750.

SIGNAL WAVEFORM



FB	СН	Ĥ	5.6	9 4	1	1.F	l m	ş	C		1	10	Ŷ	
MIN:	145	i. 8	nV	AU	庄 :		8.3	ΖV		168	:	16	i. 3	V
FREQ		2	. 06	3)	Hz		DU	17:	5	3 %				
	و				ļ							į	ļ	
					·		+					į		*****
	ļ							·				ļ		
hinn	inn	hn	пñ	n	in.	'n	inr	n	m	nr	h	int	hr	h
	1111	HH	-	11	44		111	44	1.1.1		4	44	11	Щ
) 	WH	łH		#}			111	H	H		H	##	11	H
Pran in	nni	1.UT	uu	u u	цп	nn	uч	uu	uu	nn	uu	чu	មួយ	ЦЦ
In	ii N D	12	001	ŧ٦	CUI	20	L HO	EMO	П	REC		ME	NIL	-
	21.0	-	-	-	00						-	•••	10	I
FIG.	£)													

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

EKBF120A

Fig. 108: 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.

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe



	DATA 11	4.5
		•
OD SOLENOID DUTY	100.08	
* SHIFT POSITION	-	1
* SELECT LEVER SW.	B	
UD SOLENOID DUTY	168.6%	
2ND SOLENOID DUTY	108.6%	
RED SOLENOID DUTY	99.6 %	
PRESSURE SOLENOID	99.6 %	
OIL TEMPERATURE	181 °F	
		T
FIX SCBN FULL PA	RT GRPH	
FIG.2)		
(when a second s		
1.2 CURRENT	Dete 11	/25
		TA.
N OD SOLENOID DUTY	100.8/	
SHIFT POSITION	2ND GEAR	
* SELECT LEVER SW.	D	1
UD SOLENOID DUTY	0.4 %	1.
2ND SOLENOID DUTY	8.4 %	
RED SOLENOID DUTY	99.6 %	
PRESSURE SOLENOLD	38.8 %	
OIL TEMPERATURE	191 °F	
FIX SCRN FULL PA	RT CRPH	
ITA GOAN FOLL	ai jean	
FIG.4)		
4 3 CHR0748	P.48.0 14	C 261
1.2 COREPT		14
OD SOLEMOID DUTY	0.4 Z	-
× SHIFT POSITION	4TH GEAR	
* SELECT LEVER SW.	D	1
UD SOLEMOID DUTY	189.6%	۱.
2ND SOLENOID DUTY	8.4 %	1
RED SOLENOID DUTY	99.6 %	
PRESSURE SOLENOLD	35.3 %	1
Contraction Continued	181 °F	
OIL TEMPERATURE	101 4	
OIL TEMPERATURE		۱.
OIL TEMPERATURE	In Connel	T

SCMAT6755L

Fig. 109: Monitor ''OD SOL. VALVE'' Parameter On Scantool 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.

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

poor connection, bending, corrosion, contamination, deterioration or damage. Repair or replace as necessary and go to "<u>VERIFICATION OF VEHICLE REPAIR</u>" 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



SCMAA6145N

Fig. 110: Measuring Resistance Between Terminal "12" Of ATM SOLENOID VALVE Harness Connector Courtesy of HYUNDAI MOTOR CO.

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4. Is resistance within specifications?

YES

• Go to "2Check signal circuit short inspection" procedure.

NO

- Check for open in harness. Repair as necessary and go to "<u>VERIFICATION OF VEHICLE</u> <u>REPAIR</u>" 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



SCMAA6146N

Fig. 111: 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 "<u>COMPONENT INSPECTION</u>" procedure.

NO

• Check for short to ground in harness. Repair as necessary and go to "<u>VERIFICATION OF</u> <u>VEHICLE REPAIR</u>" procedure.

COMPONENT INSPECTION

1. CHECK SOLENOID VALVE

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

- 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)]



SCMAA6147N

Fig. 112: Measuring Resistance Between Terminal "5" And Terminal "12" Of ATM SOLENOID VALVE Harness Connector Courtesy of HYUNDAI MOTOR CO.

4. Is resistance within specification?

YES

• Go to "2CHECK PCM/TCM" as below.

NO

• Replace OD SOLENOID VALVE as necessary and go to "<u>VERIFICATION OF</u> <u>VEHICLE REPAIR</u>" 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?

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1.4 ACTUATION TEST 05/13								
OD SOLENOI	D							
DURATION	DURATION 5 SECONDS							
METHOD	ACTIVATION							
CONDITION	CONDITION IG.KEY ON ENGINE OFF							
PRESS (S	TRT], IF YOU ABE REA	DY 1						
SELECT T	EST ITEH USING UP-DOWN KEY							
STRT								

FIG. 1) ACTUATION TEST

SCMAA6185N

Fig. 113: Scan Tool Display - OD SOLENOID VALVE Courtesy of HYUNDAI MOTOR CO.

YES

• Go to "VERIFICATION OF VEHICLE REPAIR" procedure.

NO

• Replace PCM/TCM and go to "<u>VERIFICATION OF VEHICLE REPAIR</u>" 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 **<u>DTC P0750</u>**.

DTC P0770 SHIFT CONTROL SOLENOID VALVE E CIRCUIT MALFUNCTION

COMPONENT LOCATION

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe



Fig. 114: Identifying Shift Control Solenoid Valve E Parts 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 CHART

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 RED SOLENOID VALVE
Threshold value	• Out of available voltage range	• Faulty PCM/TCM
Diagnostic Time	• More than 2 seconds	

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

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

SPECIFICATION

Refer to DTC P0750.

SIGNAL WAVEFORM



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

FB	CH (1	ØV	2.8	nS .	CH I	8 1	0 V
MIN: -	72	. 9 n V	AU	8:	8.8 V	HAS	: :	16.1 V
FREQ:		2.8	0 X	Hz	DUTY :	57 2	ζ	
	1			1				1
				1	1			
		D	10040-0		prosequence 1		9 0	
Distance	Contin	tional		ahainte	nonbana	at an an an an		ntennh vin st
		mii	TU I				ШŰ	MINR
Prese a					Teadew P			enternation of the second
110	LD	Z00		CURS	MEMO	REX	2	HENU
FIG.2)							

EKBF121A

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.

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe



	1.2 CURRENT	DATA 12	23
			4
×	RED SOLENOID DUTY	99.6 2	
×	SHIFT POSITION	-	٦.
×	SELECT LEVER SW.	B	
	UD SOLENOID DUTY	108.8%	
	2ND SOLENOID DUTY	109.8%	1-
	OD SOLENOID DUTY	188.8%	
	PRESSURE SOLENOLD	98.8 2	
	OIL TEMPERATURE	181 °F	
	VIE THE BARLOND	101 1	1_
-+			
_	FIX SCRA FULL PAR	KI GRPH	
FIC	G.2)		
	1 2 CHIMPENS	DATA 12	175
-	1.2 CORRENT	DALM 12	14
	RED SOLENOID DUTY	119 6 7	-
21	CULET BOOTTION	2ND CEAD	
21		200 0200	1
~	ODLEGI LEVER OW.		
		0.3 %	-
- 1	ZRU SOLENOID DUTY	0.4 %	
	OD SOLENOID DUTY	189.8%	
	PRESSURE SOLENOID	35.3 %	
	OIL TEMPERATURE	181 °F	
	FIX SCRN FULL PAP	GRPH	
FIC	3,4)		
-	1.2 CURRENT	DATA 12/	25
	PER SOLENOID DUTY	99.6.7	1
Ξ.	CULTET BOOLTION	ATH CRAP	
21		410 9566	1
	SELECT LEVER OW.		
- 1	UD SOLEMOID DOIY	100.04	
- 6	ZND SOLENOID DUTY	0.4 %	
- 19	OD SOLEMOID DUTY	0.4 %	1
	STREET INF CALENALD		1
- P	PRESSURE SULEIVID	35.3 %	
	DIL TEMPERATURE	35.3 % 163 °F	
	OIL TEMPERATURE	35.3 % 163 *F	
	DIL TEMPERATURE	35.3 % 163 *F	•

SCMAA6175N

Fig. 116: Monitor ''RED SOL. VALVE'' Parameter On Scantool 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,

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

poor connection, bending, corrosion, contamination, deterioration or damage. Repair or replace as necessary and go to "<u>VERIFICATION OF VEHICLE REPAIR</u>" 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



SCMAA6150N

Fig. 117: Measuring Resistance Between Terminal "10" Of ATM SOLENOID VALVE Harness Connector Courtesy of HYUNDAI MOTOR CO.

4. Is resistance within specifications?

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

YES

• Go to "2Check signal circuit short inspection" procedure.

NO

- Check for open in harness. Repair as necessary and go to "<u>VERIFICATION OF VEHICLE</u> <u>REPAIR</u>" 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



SCMAA6151N

Fig. 118: Measuring Resistance Between Terminal ''10'' Of ATM SOLENOID VALVE Harness And Chassis Ground Courtesy of HYUNDAI MOTOR CO.

4. Is resistance within specifications?

YES

• Go to "<u>COMPONENT INSPECTION</u>" procedure.

NO

• Check for short to ground in harness. Repair as necessary and go to "<u>VERIFICATION OF</u> <u>VEHICLE REPAIR</u>" procedure.

COMPONENT INSPECTION

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

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

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)]



SCMAA6152N

Fig. 119: Measuring Resistance Between Terminal "6" And Terminal "10" Harness Connector Courtesy of HYUNDAI MOTOR CO.

4. Is resistance within specification?

YES

• Go to "2CHECK PCM/TCM" as below.

NO

• Replace RED SOLENOID VALVE as necessary and go to "<u>VERIFICATION OF</u> <u>VEHICLE REPAIR</u>" 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?

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

1	.4 ACTUATION TEST 86/1				
RED SOLENO	ID VALUE(ONLY 5 AT)				
DURATION	5 SECONDS				
METHOD	ACTIVATION				
CONDITION	IG.KEY ON ENGINE OFF				
PRESS [STRT], IF YOU ARE READY !					
SELECT T	EST ITEN USING UP/DOWN KEY				
STRT					

FIG. 1) ACTUATION TEST

SCMAA6186N

Fig. 120: Scan Tool Display - RED SOLENOID VALVE Actuator Testing Function Courtesy of HYUNDAI MOTOR CO.

YES

• Go to "VERIFICATION OF VEHICLE REPAIR" procedure.

NO

• Replace PCM/TCM as necessary and go to "<u>VERIFICATION OF VEHICLE REPAIR</u>" 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 **<u>DTC P0750</u>**.

DTC P0885 A/T RELAY CIRCUIT MALFUNCTION

COMPONENT LOCATION

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe



SCMAT6759L

Fig. 121: Identifying A/T Relay Components Location 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, a voltage value that is out of specification is detected, the TCM sets this code.

DTC DETECTING CONDITION

Item	Detecting Condition	Possible cause	
DTC Strategy	Check voltage range		
	• 16V > Voltage Battery > 11V		
Enable Conditions	• In gear state (no gear shifting) 500msec is passed from turn on the relay	• Open or short in circuit	
Conditions	• A/T Relay = ON	• Faulty A/T control	
	• Engine state = RUN	relay	
Threshold value	• 16V > Voltage Battery > 11V	• Faulty PCM/TCM	
Diagnostic Time	• 1 second	-	
Fail Safe	• Locked in 3 rd gear.(control relay off)		

DTC DETECTING CONDITION CHART

MONITOR SCANTOOL DATA

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

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

- 2. Ignition "ON" & Engine "OFF".
- 3. Monitor the "A/T CON. RELAY VOLT" parameter on the scantool.

Specification : Approx. B+



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

EKBF122A

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 "<u>VERIFICATION OF VEHICLE REPAIR</u>" procedure.

NO

• Go to "TERMINAL & CONNECTOR INSPECTION" procedure.

TERMINAL & CONNECTOR INSPECTION

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

YES

• Repair as necessary and then go to "VERIFICATION OF VEHICLE REPAIR" procedure.

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

NO

• Go to "POWER 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 connector and chassis ground.

Specification : Approx. B+



LKKG113B

Fig. 123: Measuring Voltage Between Terminal "1" Of "A/T CONTROL RELAY" 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 "<u>VERIFICATION OF VEHICLE</u> <u>REPAIR</u>" 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.

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

4. Turn ignition switch OFF --> ON

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



LKKG113C

Fig. 124: Measuring Voltage Between Terminal "4" Of "A/T CONTROL RELAY" Harness Connector And Chassis Ground Courtesy of HYUNDAI MOTOR CO.

5. Is voltage within specifications?

YES

• Go to "2Check Supplying Power to solenoid valve" procedure.

NO

- Check for open in harness. Repair as necessary and Go to "<u>VERIFICATION OF</u> <u>VEHICLE REPAIR</u>" 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 "<u>VERIFICATION</u> <u>OF VEHICLE REPAIR</u>" 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

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe



SCMAA6155N

Fig. 125: Measuring Resistance Between Terminal "3" Of "A/T CONTROL RELAY" Harness 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 "<u>VERIFICATION OF</u> <u>VEHICLE REPAIR</u>" 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

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe



LKKG113E

Fig. 126: Measuring Resistance Between Terminal "2" Of "A/T CONTROL RELAY" Harness Connector Courtesy of HYUNDAI MOTOR CO.

4. Is resistance within specifications?

YES

Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to "<u>VERIFICATION OF</u> <u>VEHICLE REPAIR</u>" procedure.

NO

• Replace Front Area Module and then go to "<u>VERIFICATION OF VEHICLE REPAIR</u>" 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

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

Refer to DTC P0885.

GENERAL DESCRIPTION

Refer to DTC P0885.

DTC DESCRIPTION

Refer to DTC P0885.

DTC DETECTING CONDITION

DTC DETECTING CONDITION CHART

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)	

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.

VERIFICATION OF VEHICLE REPAIR

Refer to DTC P0885.

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

DTC P0891 AT RELAY - OPEN CIRCUIT

COMPONENT LOCATION

Refer to DTC P0885.

GENERAL DESCRIPTION

Refer to DTC P0885.

DTC DESCRIPTION

Refer to **<u>DTC P0885</u>**.

DTC DETECTING CONDITION

DTC DETECTING CONDITION CHART

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)	

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.

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VERIFICATION OF VEHICLE REPAIR

Refer to DTC P0885.

AUTOMATIC TRANSAXLE

COMPONENTS (1)



- 6. Differential assembly
- 12. Direct planetary carrier assembly
- 17. Differential bearing case
- 18. Transaxle case

LKKG001A

Fig. 127: Identifying Automatic Transaxle Components (1 Of 2) **Courtesy of HYUNDAI MOTOR CO.**
2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

COMPONENTS (2)



- 16. Low&Reverse brake return spring
- 17. Low&Reverse brake piston
- 18. Transaxle case

LKKG001B

Fig. 128: 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.

- 4. 2nd brake return spring 5. 2nd brake pressure plate
- 6. 2nd brake discs

- Brake plates
- - - 10. Brake discs

 - 12. Low&Reverse brake pressure plate

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NOTE: • Mark wires or hoses for identification.

- 1. Remove the engine cover, (see <u>CHARGING SYSTEM (ENGINE ELECTRICAL SYSTEM (G6EA-GSL 2.7))</u>)
- 2. Remove the battery (A).



SCMAT6001D

<u>Fig. 129: Identifying Battery</u> Courtesy of HYUNDAI MOTOR CO.

3. Disconnect the AFS connector (A).



Fig. 130: Identifying AFS Connector Courtesy of HYUNDAI MOTOR CO.

- 4. Remove the air cleaner assembly (B) by loosening the clamp bolt (C) and the clips and removing the two mounting bolts (D).
- 5. Remove the battery tray (B) by removing the four mounting bolts (A-4ea).

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SCMAT6006D

Fig. 131: Identifying Battery Tray And Mounting Bolts Courtesy of HYUNDAI MOTOR CO.

6. Remove the ECM (A).



SCMAT6002N

Fig. 132: Identifying ECM Courtesy of HYUNDAI MOTOR CO.

7. Remove the inhibitor switch connector (A).

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SCMAT6007D

Fig. 133: Identifying Inhibitor Switch Connector Courtesy of HYUNDAI MOTOR CO.

8. Remove the solenoid valve connector (A).



SCMAT6008D

Fig. 134: Identifying Solenoid Valve Connector Courtesy of HYUNDAI MOTOR CO.

9. Remove the input speed sensor connector (A).

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SCMAT6009D

Fig. 135: Identifying Input Speed Sensor Connector Courtesy of HYUNDAI MOTOR CO.

10. Remove the output speed sensor connector (A).



SCMAT6010D

Fig. 136: Identifying Output Speed Sensor Connector Courtesy of HYUNDAI MOTOR CO.

11. Remove the vehicle speed sensor connector (A).

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Fig. 137: Identifying Vehicle Speed Sensor Connector Courtesy of HYUNDAI MOTOR CO.

12. Remove the control cable assembly (C) by removing the nut (A) and clip (B).



SCMAT6012D

Fig. 138: Identifying Control Cable Assembly, Nut And Clip Courtesy of HYUNDAI MOTOR CO.

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

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SCMAT6003N

<u>Fig. 139: Identifying Transaxle Oil Cooler Hoses And Clamps</u> Courtesy of HYUNDAI MOTOR CO.

14. Remove the CKP sensor connector (A).



SCMAT6004N

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

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

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Fig. 141: Identifying Transaxle Mounting Bolts Courtesy of HYUNDAI MOTOR CO.

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



SCMAT6006N

Fig. 142: Identifying Special Tool (09200-38001) Courtesy of HYUNDAI MOTOR CO.

17. Remove the transaxle insulator mounting bolts (A-4ea).

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SCMAT6015D

Fig. 143: Identifying Transaxle Insulator Mounting Bolts Courtesy of HYUNDAI MOTOR CO.

- 18. Remove the front wheels, (see **FRONT SUSPENSION SYSTEM**)
- 19. Lift up the vehicle.
- 20. Remove the power steering column joint bolt and the EPS connector, (see <u>GENERAL (STEERING</u> <u>SYSTEM)</u>)
- 21. Remove the under cover (A).



SCMAT6007N

<u>Fig. 144: Identifying Under Cover</u> Courtesy of HYUNDAI MOTOR CO.

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

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SCMAT6008N

Fig. 145: Identifying Oil Drain Plug Courtesy of HYUNDAI MOTOR CO.

23. Drain power steering fluid through the return tube (A). (see <u>GENERAL (STEERING SYSTEM)</u>)



SCMAT6010L

<u>Fig. 146: Identifying Return Tube</u> Courtesy of HYUNDAI MOTOR CO.

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

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SCMAT6009N

Fig. 147: Identifying Power Steering Pressure Tube And Power Steering Oil Pump Courtesy of HYUNDAI MOTOR CO.

- 25. Disconnect the lower arm, the tie rod end ball joint, the stabilizer bar link from the front knuckle, (see **FRONT SUSPENSION SYSTEM**)
- 26. Remove the roll stopper mounting bolts (A-3ea, B-3ea).



Fig. 148: Identifying Roll Stopper Mounting Bolts Courtesy of HYUNDAI MOTOR CO.

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe



SCMAT6011N

Fig. 149: Identifying Roll Stopper Mounting Bolts Courtesy of HYUNDAI MOTOR CO.

27. Remove the muffler hanger rubber (A).



SCMAT6012N

Fig. 150: Identifying Muffler Hanger Rubber Courtesy of HYUNDAI MOTOR CO.

28. Remove the mounting bolts from the sub frame by supporting the sub frame by using the special tool (09624-38000). (see **FRONT SUSPENSION SYSTEM**)

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe



SCMAT6013N

Fig. 151: Identifying Special Tool (09624-38000) Courtesy of HYUNDAI MOTOR CO.

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



SCMAT6014N

Fig. 152: Identifying Front Roll Support And Transaxle Courtesy of HYUNDAI MOTOR CO.

30. Remove the front muffler assembly (A).

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe



SCMAT6015N

Fig. 153: Identifying Front Muffler Assembly Courtesy of HYUNDAI MOTOR CO.

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



SCMAT6016N

Fig. 154: Identifying Inner Shaft Bracket Bolts Courtesy of HYUNDAI MOTOR CO.

32. Remove drive shaft (A, B) from transaxle. (see **DRIVESHAFT**).

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe



SCMAT6017N

Fig. 155: Identifying Drive Shaft To Transaxle Courtesy of HYUNDAI MOTOR CO.



SCMAT6018N

Fig. 156: Identifying Drive Shaft To Transaxle Courtesy of HYUNDAI MOTOR CO.

- 33. Install a jack for supporting the transaxle assembly.
- 34. In case of 4WD, remove the transfer case assembly, (see <u>MANUAL TRANSAXLE (M5GF2)</u> '<u>TRANSFER CASE</u> ')
- 35. Remove the left side cover (A).

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe



SCMAT6019N

<u>Fig. 157: Identifying left side cover</u> Courtesy of HYUNDAI MOTOR CO.

36. Remove the ground (A).



SCMAT6020N

Fig. 158: Identifying Ground Courtesy of HYUNDAI MOTOR CO.

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

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe



SCMAT6021N

Fig. 159: Identifying Starter Motor Mounting Bolts And Bolts Courtesy of HYUNDAI MOTOR CO.

38. Remove the cover (A).



SCMAT6022N

<u>Fig. 160: Identifying Cover</u> Courtesy of HYUNDAI MOTOR CO.

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

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe



SCMAT6023N

Fig. 161: Identifying Drive Plate Bolts And Transaxle Lower Mounting Bolts Courtesy of HYUNDAI MOTOR CO.

40. 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 lower mounting bolts (B-4ea, C-1ea).

TORQUE:

[B] 40~47 N.m (4.0~4.7 kgf.m, 28.9~34.0 lb-ft)

[C] 80~100 N.m (8~10 kgf.m, 57.9~72.3 lb-ft)

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe



SCMAT6024N

Fig. 162: Identifying Transaxle Lower Mounting Bolts Courtesy of HYUNDAI MOTOR CO.

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

TORQUE:

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

- 4. In case of 4WD, Install the transfer case assembly, (see 'TRANSFER CASE ')
- 5. Install the cover (A).



SCMAT6022N

<u>Fig. 163: Identifying Cover</u> Courtesy of HYUNDAI MOTOR CO.

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

TORQUE:

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

[A] 43~55 Nm (4.3~5.5 kgf.m, 31.1~39.8 lb-ft)

[B] 33~50 Nm (3.3~5.0 kgf.m, 23.9~36.2 lb-ft)



SCMAT6021N

Fig. 164: Identifying Starter Motor Mounting Bolts Courtesy of HYUNDAI MOTOR CO.

7. Install the ground (A).



SCMAT6020N

<u>Fig. 165: Identifying Ground</u> Courtesy of HYUNDAI MOTOR CO.

8. Install the left side cover (A).

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe



SCMAT6019N

Fig. 166: Identifying Left Side Cover Courtesy of HYUNDAI MOTOR CO.

9. After removing a jack, insert the drive shafts (A, B). (see **DRIVESHAFT**)



SCMAT6017N

Fig. 167: Identifying Drive Shaft To Transaxle Courtesy of HYUNDAI MOTOR CO.

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe



SCMAT6018N

Fig. 168: Identifying Drive Shaft To Transaxle Courtesy of HYUNDAI MOTOR CO.

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

TORQUE:

50~65 Nm (5.0~6.5 kgf.m, 36.2~47.0 lb-ft)



SCMAT6016N

Fig. 169: Identifying Inner Shaft Bracket Bolts Courtesy of HYUNDAI MOTOR CO.

11. Install the front muffler assembly (A), (see <u>CHARGING SYSTEM (ENGINE ELECTRICAL</u> <u>SYSTEM (G6EA-GSL 2.7))</u>)

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe



SCMAT6015N

Fig. 170: Identifying Front Muffler Assembly Courtesy of HYUNDAI MOTOR CO.

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

TORQUE:

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



SCMAT6014N

Fig. 171: Identifying Front Roll Support And Transaxle Courtesy of HYUNDAI MOTOR CO.

13. Install the sub frame supported by the special tool (09624-38000). (see <u>FRONT SUSPENSION</u> <u>SYSTEM</u>)

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe



SCMAT6013N

Fig. 172: Identifying Special Tool (09624-38000) Courtesy of HYUNDAI MOTOR CO.

14. Tighten the roll stopper mounting bolts (A-3ea, B-3ea).

TORQUE:

50~65 Nm (5.0~6.5 kgf.m, 36.2~47.0 lb-ft)



SCMAT6010N

Fig. 173: Identifying Roll Stopper Mounting Bolts Courtesy of HYUNDAI MOTOR CO.

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe



SCMAT6011N

Fig. 174: Identifying Roll Stopper Mounting Bolts Courtesy of HYUNDAI MOTOR CO.

15. Install the muffler hanger rubber (A).



SCMAT6012N

Fig. 175: Identifying Muffler Hanger Rubber Courtesy of HYUNDAI MOTOR CO.

- 16. Connect the lower arm, the tie rod end ball joint, the stabilizer bar link to the front knuckle, (see **FRONT <u>SUSPENSION SYSTEM</u>**)
- 17. Connect the power steering pressure tube (A) to the power steering oil pump.

TORQUE:

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

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe



SCMAT6009N

Fig. 176: Identifying Power Steering Pressure Tube And Power Steering Oil Pump Courtesy of HYUNDAI MOTOR CO.

18. Install the under cover (A).



SCMAT6007N

Fig. 177: Identifying Under Cover Courtesy of HYUNDAI MOTOR CO.

- 19. Install the steering column joint bolt and the EPS connector, (see **GENERAL (STEERING SYSTEM)**)
- 20. Connect the return tube (A) with a clamp, (see <u>GENERAL (STEERING SYSTEM)</u>)

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe



SCMAT6010L

<u>Fig. 178: Identifying Return Tube</u> Courtesy of HYUNDAI MOTOR CO.

- 21. Install the front wheels and tires.
- 22. Tighten the transaxle insulator mounting bolt (A-4ea).

TORQUE:

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



SCMAT6015D

Fig. 179: Identifying Transaxle Insulator Mounting Bolts Courtesy of HYUNDAI MOTOR CO.

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

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe



SCMAT6006N

Fig. 180: Identifying Special Tool (09200-38001) Courtesy of HYUNDAI MOTOR CO.

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

TORQUE:

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



SCMAT6005N

Fig. 181: Identifying Transaxle Mounting Bolts Courtesy of HYUNDAI MOTOR CO.

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

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe



SCMAT6003N

Fig. 182: Identifying Transaxle Oil Cooler Hoses And Clamps Courtesy of HYUNDAI MOTOR CO.

26. Install the control cable assembly (C) by tightening the nut (A) and clip (B).

TORQUE:

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



SCMAT6012D

Fig. 183: Identifying Control Cable Assembly, Nut And Clip Courtesy of HYUNDAI MOTOR CO.

27. Install the inhibitor switch connector (A).

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe



SCMAT6007D

Fig. 184: Identifying Inhibitor Switch Connector Courtesy of HYUNDAI MOTOR CO.

28. Install the solenoid valve connector (A).



SCMAT6008D

Fig. 185: Identifying Solenoid Valve Connector Courtesy of HYUNDAI MOTOR CO.

29. Install the input speed sensor connector (A).

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe



SCMAT6009D

Fig. 186: Identifying Input Speed Sensor Connector Courtesy of HYUNDAI MOTOR CO.

30. Install the output speed sensor connector (A).



SCMAT6010D

Fig. 187: Identifying Output Speed Sensor Connector Courtesy of HYUNDAI MOTOR CO.

31. Install the vehicle speed sensor connector (A).

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe



Fig. 188: Identifying Vehicle Speed Sensor Connector Courtesy of HYUNDAI MOTOR CO.

32. Install the battery tray (B) by tightening the four mounting bolts (A-4ea).



SCMAT6006D

Fig. 189: Identifying Battery Tray And Mounting Bolts Courtesy of HYUNDAI MOTOR CO.

33. Install the air cleaner assembly (B) by fastening the clamp bolt (C) and the clips and installing the two mounting bolts (D).

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe



SCMAT6001N

Fig. 190: Identifying AFS Connector Courtesy of HYUNDAI MOTOR CO.

- 34. Connect the AFS connector (A).
- 35. Install the battery (A).



SCMAT6001D

<u>Fig. 191: Identifying Battery</u> Courtesy of HYUNDAI MOTOR CO.

- 36. Refill the transaxle fluid, (see 'SERVICE ADJUSTMENT PROCEDURE')
- 37. Refill the power steering fluid and bleed the air. (see <u>GENERAL (STEERING SYSTEM)</u>)
- 38. Install the engine cover, (see <u>CHARGING SYSTEM (ENGINE ELECTRICAL SYSTEM (G6EA-GSL 2.7))</u>)

NOTE: When replacing the automatic transaxle, reset the automatic transaxle's values by using the High- Scan Pro.

a. Connect the Hi-Scan Pro connector to the data link connector under the crash pad and power cable

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

to the cigar jack under the center facia.

- b. Turn the ignition switch on and power on the Hi-Scan Pro.
- c. Select the vehicle's name.
- d. Select "AUTOMATIC TRANSAXLE'.



Fig. 192: Scan Tool Display - Resetting Auto T/A Values Courtesy of HYUNDAI MOTOR CO.

e. Select 'RESETTING AUTO T/A VALUES' and perform the procedure.

1.7.	RESETTING AUTO T/A VALUES
THIS	FUNCTION IS FOR RESETTING
THE F	DAPTIVE VALUES FROM THE
USED	AUTO T/A WHEN REPLACING IT.
IFY	OU ARE READY,
	PRESS FENTERI VEU.
	TRESS LEWIERS REI:

SCMAT6512L

Fig. 193: Scan Tool Display - Resetting Auto T/A Values Courtesy of HYUNDAI MOTOR CO.

f. Perform the procedure by pressing F1 (REST).

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe



SCMAT6513L

Fig. 194: Scan Tool Display - Resetting Auto T/A Values Courtesy of HYUNDAI MOTOR CO.

AUTOMATIC TRANSAXLE CONTROL SYSTEM

SOLENOID VALVE

DESCRIPTION

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



Fig. 195: Solenoid Valve Function Diagram Courtesy of HYUNDAI MOTOR CO.

• PWM (Pulse Width Modulation) SOLENOID VALVE

Structure and functions

PWM solenoid valve is composed of five solenoid valves and the oil capacity in the solenoid valve is changed by the electric duty value of TCM. The oil pressure of the valve body and the torque converter engages or

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

disengages the damper clutch. The solenoid valves send the operating oil pressure to the clutches and brakes at the each range and also control the strength and weakness of oil pressure to reduce the shock when shifting the range.



1.Fluid temperature sensor 2.Fluid temperature sensor ground 3.UD Solenoid valve 4.2ND Solenoid valve 5.A/T battery 6.A/T battery 7.A/T battery 8.VF Solenoid valve ground 9.DCC Solenoid valve 10.RED Solenoid valve 11.LR Solenoid valve 12.OD Solenoid valve

SCMAA6003N

Fig. 196: Identifying PWM Solenoid Valve Connector Terminals Courtesy of HYUNDAI MOTOR CO.



SCMAT6002L

Fig. 197: Identifying PWM Solenoid Valve Courtesy of HYUNDAI MOTOR CO.

PWM (PULSE WIDTH MODULATION) SOLENOID

PWM SOLENOID VALVE SPECIFICATION

	PWM solenoid valve						
Range	PCSV-A (SCSV-	PCSV-B (SCSV-	PCSV-C (SCSV-	PCSV-D (TCC	ON, OFF (SCSV-		
	B)	C)	D)	SV)	A)		
N, P	OFF	ON	ON	OFF	ON		
1st	ON	ON	OFF	OFF	ON		
2nd	ON	OFF	OFF	ON	OFF		
2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

3rd	OFF	ON	OFF	ON	OFF
4th	OFF	OFF	ON	ON	OFF
Reverse	OFF	OFF	ON	OFF	ON
LOW	OFF	ON	OFF	OFF	ON

PWM (PULSE WIDTH MODULATION) SOLENOID VALVE CONTROL FEATURE

Performance Curve



<PWM Solenoid valve performance curve>

BKGF017D

Fig. 198: PWM Solenoid Valve Performance Curve Courtesy of HYUNDAI MOTOR CO.

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

PWM SOLENOID VALVE SPECIFICATION

Item	Contents		
Туре	3way & Normal High		
Input resistance	12V		
Coil resistance	3.2±0.20hms		
Pulse	50HZ		

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe



<PWM Solenoid valve form>

SCMAT6003L

Fig. 199: Identifying PWM Solenoid Valve Courtesy of HYUNDAI MOTOR CO.

REMOVAL

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



SCMAT6033D

<u>Fig. 200: Identifying Solenoid Valve And Supporting Bracket</u> Courtesy of HYUNDAI MOTOR CO.

INSTALLATION

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

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

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe



SCMAT6033D

Fig. 201: Identifying Solenoid Valve And Supporting Bracket Courtesy of HYUNDAI MOTOR CO.

2. Connect the solenoid valve connector.

CAUTION: When connecting the solenoid valve connector, check the connector for rust, dirt, or oil, then reconnect it.

3. Continue to apply liquid gasket at application points at the oil pan with 02.5mm (0.098in) thickness.

Liquid gasket Part name : Threebond 1281B



SCMAT6052D

Fig. 202: Identifying Oil Pan Gasket Area Courtesy of HYUNDAI MOTOR CO.

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

TORQUE :

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

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

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

TORQUE :

35~45Nm (3.5~4.5kgf.m, 25~32lb-ft)

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

VFS (VARIABLE FORCE SOLENOID) VALVE

DESCRIPTION

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



SCMAT6011L

Fig. 203: Identifying Filter, Holder And Connector Courtesy of HYUNDAI MOTOR CO.

VFS (VARIABLE FORCE SOLENOID) VALVE CONTROL FEATURE

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe



<VFS Solenoid valve performance curve>

BKGF018B

Fig. 204: VFS Solenoid Valve Performance Curve Courtesy of HYUNDAI MOTOR CO.

PWM solenoid valve is controlled linearly according to the current value.

PWM SOLENOID VALVE SPECIFICATION

Item	Contents		
type	3way & Normal High		
Input resistance	12V		
Coil resistance	3.5 ± 0.2 ohms		
Operating current	0 ~ 1200 mA		
Pulse	50HZ		



1.Fluid temperature sensor 2.Fluid temperature sensor ground 3.UD Solenoid valve 4.2ND Solenoid valve 5.A/T battery 6.A/T battery 7.A/T battery 8.VF Solenoid valve ground 9.DCC Solenoid valve 10.RED Solenoid valve 11.LR Solenoid valve 12.OD Solenoid valve

SCMAA6003N

Fig. 205: Identifying PWM Solenoid Valve Connector Terminals Courtesy of HYUNDAI MOTOR CO.

REMOVAL

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

- 1. Remove the battery terminal.
- 2. Lift the vehicle.
- 3. Remove the splash shield.
- 4. Loosen the drain plug and drain the transaxle oil.
- 5. Remove the oil pan.
- 6. Remove the VFS reservoir (A).



SCMAT6034D

Fig. 206: Identifying VFS Reservoir Courtesy of HYUNDAI MOTOR CO.

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

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe



KKCF009D

Fig. 207: Identifying Solenoid Valve Assembly Courtesy of HYUNDAI MOTOR CO.

INSTALLATION

1. Install the solenoid valve (A).

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

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe



KKCF009D

Fig. 208: Identifying Solenoid Valve Assembly Courtesy of HYUNDAI MOTOR CO.

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

CAUTION: When connecting the solenoid valve connector, check the connector for rust, dirt, or oil, then reconnect it.

3. Install the VFS reservoir (A).



Fig. 209: Identifying VFS Reservoir Courtesy of HYUNDAI MOTOR CO. SCMAT6034D

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

4. Continue to apply liquid gasket at application points at the oil pan with ø2.5mm (0.098in) thickness.

Liquid gasket Part name : Threebond 1281B



SCMAT6052D

Fig. 210: Identifying Oil Pan Gasket Area Courtesy of HYUNDAI MOTOR CO.

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

TORQUE :

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

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

TORQUE :

35~45Nm (3.5~4.5kgf.m, 25~32lb-ft)

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

INPUT SPEED SENSOR

DESCRIPTION

INPUT SPEED SENSOR DESCRIPTION CHART

Sensor type	1. Type : HALL SENSOR
	2. Operating voltage : DC 12V
	3. Current consumption : 22mA (Max)
	1. Input shaft speed sensor: Detect the input shaft rotation at the OD & REV retainer side

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe





BKGF012B

Fig. 211: Identifying Input Speed Sensor Courtesy of HYUNDAI MOTOR CO.

INPUT SPEED SENSOR DESCRIPTION CHART

Item	Inspection item	Standard value	
Air gap	Input shaft speed sensor	0.05in (1.3mm)	
Sensor resistance	Input shaft speed sensor	Over 4 Mohms	
Output voltage	HIGH	Over 4.8V	
Output Voltage	LOW	Below 0.8V	

REMOVAL

- 1. Remove the battery terminal.
- 2. Remove the battery and battery tray.
- 3. Remove the air cleaner assembly.
- 4. Remove the input shaft speed sensor connector.
- 5. Remove the input shaft speed sensor (A).

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe



SCMAT6037D

Fig. 212: Identifying Input Shaft Speed Sensor Courtesy of HYUNDAI MOTOR CO.

INSTALLATION

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

TORQUE:

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

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

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

OUTPUT SPEED SENSOR

DESCRIPTION

OUTPUT SPEED SENSOR DESCRIPTION CHART

Sensor type	 Type : HALL SENSOR Output voltage : DC 12V Current consumption : 22mA (Max)
Function	 Output shaft speed sensor: Detect the output shaft rpm (T/F DRIVE GEAR RPM) at the T/F drive gear Feedback control, clutch-clutch control, damper clutch control, shift range control,

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe





BKGF012B

Fig. 213: Identifying Input Speed Sensor Courtesy of HYUNDAI MOTOR CO.

INPUT SPEED SENSOR DESCRIPTION CHART

Item	Inspection item	Standard value	
Air gap	Output shaft speed sensor	0.05in (1.3mm)	
Sensor resistance	Output shaft speed sensor	Over 4 Mohms	
Output voltage	HIGH	Over 4.8V	
Output voltage	LOW	Below 0.8V	

REMOVAL

- 1. Remove the battery terminal.
- 2. Remove the battery and battery tray.
- 3. Remove the air cleaner assembly.
- 4. Remove the output shaft speed sensor connector.
- 5. Remove the output shaft speed sensor (A).

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe



SCMAT5039D

Fig. 214: Identifying Output Shaft Speed Sensor Courtesy of HYUNDAI MOTOR CO.

INSTALLATION

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

TORQUE:

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

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

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

TRANSAXLE OIL TEMPERATURE SENSOR

DESCRIPTION

TRANSAXLE OIL TEMPERATURE SENSOR DESCRIPTION

Sensor type	 Type : Thermister Use available temperature :-40~160°C (-40~320°F)
Function and feature	 Detect the temperature of ATF through the thermistor which is exposed outside. When shifting the range, it is used as the oil pressure control information.

2007 Hyundai Santa Fe Limited 2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe 1.Fluid temperature sensor 2.Fluid temperature sensor ground 3.UD Solenoid valve 4.2ND Solenoid valve 5.A/T battery 6.A/T battery 7.A/T battery Connector 8.VF Solenoid valve ground 9.DCC Solenoid valve 10.RED Solenoid valve 11.LR Solenoid valve 12.OD Solenoid valve SCMAA6006N

RESISTANCE REFERENCE

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		

REMOVAL

- 1. Remove the battery terminal.
- 2. Lift the vehicle.
- 3. Remove the splash shield.
- 4. Loosen the drain plug and drain the transaxle oil.
- 5. Remove the oil pan.
- 6. Disconnect the oil temperature sensor connector and remove the sensor (A) from the valve body.



SCMAT6042D

Fig. 215: Identifying Sensor And Valve Body Courtesy of HYUNDAI MOTOR CO.

INSTALLATION

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

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

CAUTION: When connecting the oil temperature connector, check the connector for rust, dirt, or oil, then reconnect it.



SCMAT6042D

Fig. 216: Identifying Sensor And Valve Body Courtesy of HYUNDAI MOTOR CO.

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

Liquid gasket Part name : Threebond 1281B



SCMAT6052D

Fig. 217: Identifying Oil Pan Gasket Area Courtesy of HYUNDAI MOTOR CO.

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

TORQUE:

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

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

4. Install the drain plug.

TORQUE :

35~45Nm (3.5~4.5kgf.m, 25~32lb-ft)

5. Installation is the reverse of the removal.

TRANSAXLE RANGE (TR) SWITCH

DESCRIPTION

TRANSAXLE RANGE (TR) SWITCH DESCRIPTION CHART

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



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



SCMAA6007N

Fig. 218: Identifying Transaxle Range (TR) Switch Courtesy of HYUNDAI MOTOR CO.

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

Terminal No. Shift lever	Р	R	N	D	3	2	L
1				•			
2						•	
3	•						
4			•				
5					•		•
6							
7		•					
8	•	٠	•	•	•	٠	•
9	•		•				
10	•		٠				

Fig. 219: Transaxle Switch Range Reference Courtesy of HYUNDAI MOTOR CO.

REMOVAL

- 1. Remove the battery terminal.
- 2. Remove the battery and battery tray.
- 3. Remove the air cleaner assembly.
- 4. Disconnect the inhibitor switch connector (A).



SCMAT6045D

Fig. 220: Identifying Inhibitor Switch Connector Courtesy of HYUNDAI MOTOR CO.

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

SCMAT6008L

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe



SCMAT6046D

Fig. 221: Identifying Control Cable And Manual Control Lever Courtesy of HYUNDAI MOTOR CO.

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



SCMAT6047D

Fig. 222: Identifying Inhibitor Switch And Manual Control Lever Courtesy of HYUNDAI MOTOR CO.

INSTALLATION

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

TORQUE

2007 TRANSMISSION Automatic Transaxle (A5HF1) - Santa Fe

Shaft nut: 17~21 Nm (1.7~2.1 kgf.m, 12~15lb-ft)

Bolt (2EA): 10~12Nm (1.0~1.2kgf.m, 7~8lb-ft)

- 4. Install the control cable to the manual control lever.
- 5. Connect the inhibitor switch connector.
- 6. Installation is the reverse of the removal.
- 7. Turn the ignition switch ON after installation.

Move the shift lever from "P" range to "L" range, and verify that the A/T gear position indicator follows the transaxle range switch.