2007 TRANSMISSION

Automatic Transaxle (A4CF2) - Elantra

GENERAL

SPECIFICATION

GENERAL SPECIFICATION

Transaxle model		A4CF2
Engine model		Gasoline 2.0L
T/con		3 elements 2 phases 1 stage
T/con size (ø)		236
O/PUMP type		Parachoid
T/M CASE type		Separated
Friction elements		Clutch: 3EA
		Brake: 2EA
		OWC : 1EA
Planetary gear		2EA
Gear ratio	1st	2.919
	2nd	1.551
	3rd	1.000
	4th	0.713
	Reverse	2.480
Final gear ratio		3.849
Fluid pressure balance piston		3EA
Stall speed		2,000-2,700 rpm
Accumulator		4EA
Solenoid valve		6EA (PWM:5EA, VFS:1EA)
Gear shift position		7 range (P,R,N,D,3,2,L)
Oil filter		1EA

- PWM : Pulse Width Modulation
- VFS : Variable Force Solenoid

TIGHTENING TORQUE

TIGHTENING TORQUE SPECIFICATION

Item	Nm	kgf.m	lb-ft
Control cable bracket	15~22	1.5~2.2	11~16
Input shaft speed sensor	10~12	1.0~1.2	7~8
Output shaft speed sensor	10~12	1.0~1.2	7~8
Manual control lever	17~21	1.7~2.1	13~15

Inhibitor switch	10~12	1.0~1.2	7~8
Oil pan	10~12	1.0~1.2	7~8
Valve body mounting bolt	10~12	1.0~1.2	7~8
Oil drain plug	35~45	3.5~4.5	25~32
Pressure check plug	8~10	0.8~1.0	6~7
Front roll support bracket bolt	60~80	6.0~8.0	43~58
Rear roll support bracket bolt	60~80	6.0~8.0	43~58
Transaxle support bracket bolt	60~80	6.0~8.0	43~58

LUBRICANT

LUBRICANT SPECIFICATION

Item	Specified lubricant	Quantity
Transaxle fluid liter (US qt, lmp.qt)	GENUINE DIAMOND ATF SP-III or SK ATF SP-III	6.6 (6.9, 5.81)

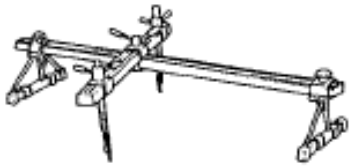
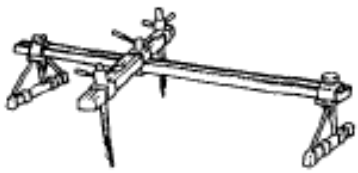
SEALANT

SEALANT SPECIFICATION

Item	Specified sealant
Rear cover Torque converter housing Oil pan	LOCTITE FMD-546

SPECIAL TOOL

SPECIAL TOOL DESCRIPTION

Tool (Number and name)	Illustration	Use
09200-38001 Engine support fixture	 AKGF020A	Removal and installation of the transaxle.
09624-38000 Crossmember supporter	 KKBF030A	Supporting of the crossmember.

AUTOMATIC TRANSAXLE SYSTEM

DESCRIPTION

The new small sized automatic transaxle (A4CF2) is for gasoline 2.0 engine.

The transaxle (A4CF2) is improved on the durability, fuel consumption and efficiency by the new main features as followed.

The new main features

1. The hydraulic centrifugal oil pressure balance piston.
2. The full line pressure variable control system.
3. The long travel damper clutch.
4. The disc type return spring.
5. The ultra flat torque converter.

FUNCTIONS

FUNCTIONS REFERENCE CHART

Item	Contents
Components	The full line pressure variable control operates in the valve body to improve the fuel consumption.
	The long travel damper clutch is applied to the torque converter to improve the engine revolution change reduction capability and the fuel consumption. (17~20°)
	The oil pump of the trochocentric type is changed to parachoid type to improve the processing and the capacity efficiency at the low RPM range.
	The disc type return spring is applied to the low & reverse brake to improve the durability and reduce the length.
	The hydraulic centrifugal oil pressure balance piston is applied to the inside of clutch to improve the durability and the shift control capability.
	The low noise gear and the gear teeth face grinding are applied to the transfer driven gear to improve the noise and the durability.
Electronic control system	The oil pressure value set by TCM is coupled with the engine torque so that the stable shift feeling can be improved.
	The engine torque reduction control operates effectively to improve the shift feeling and the durability.
	It can be the skip shift of 1<-->3 and 2<-->4 when shifting.
	The reverse clutch, not L/R brake is controlled when controlling the N-->R shift so that the N->R shift feeling can be improved.
	The range of the damper clutch direct control expands to improve the fuel consumption.
	The current control chip is installed into the TCM to regulate the solenoid control current and control the oil pressure securely according to the change of the

	temperature and voltage.
	The FPC (Flexible Printed Circuit) harness is composed of the thin and flat copper in the insulating film like electric wire.
	The tachometer is operated by the change of the frequency forwarded from the TCM to the instrument cluster, not vehicle speed sensor.

TRANSAXLE STRUCTURE

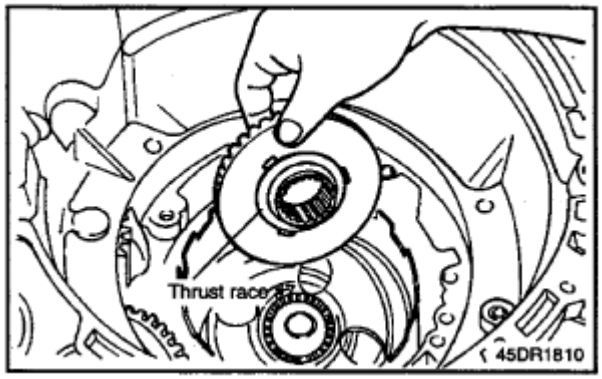


Fig. 1: Identifying Sectional View Of Transaxle

MECHANICAL SYSTEM

FUNCTION

TORQUE CONVERTER

The torque converter, as the power plant which delivers the power of engine to the automatic transaxle, consists of 3 elements, 2 phases and 1stage type.

- The flowing section form of the torque converter changes the round type to the flat type to reduce the length of the torque converter.
- The maximum operating degree of the damper clutch installed inside the transaxle increases from 11° to 18° to improve the engine revolution change reduction capability and the fuel consumption

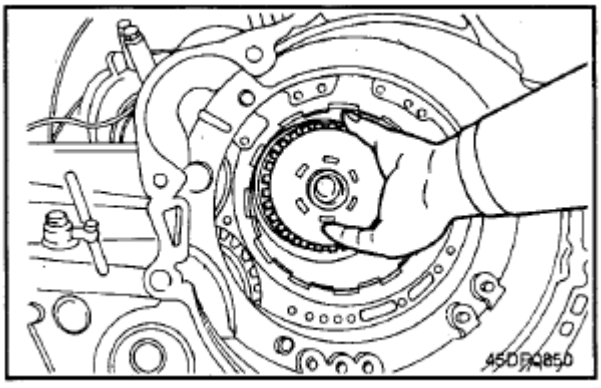


Fig. 2: Identifying Length Of Torque Converter And Maximum Operating Degree Of Damper Clutch

OIL PUMP

The oil pump is made of the aluminum (the reaction shaft support) to loose the weight and selects the parachoid type to improve the processing and the capacity efficiency at the low RPM range.

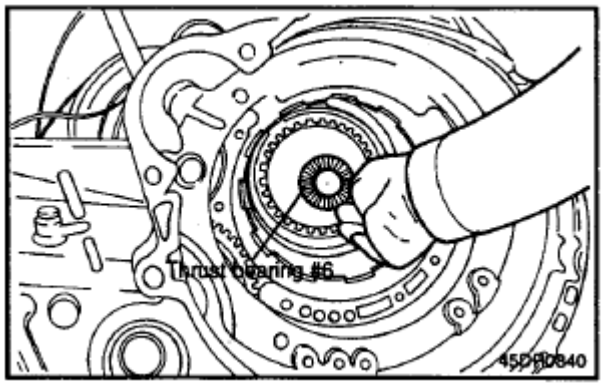


Fig. 3: Identifying Pharacoid Type And Trocoid Type Oil Pump

BRAKES

The automatic transaxle (A4CF2) uses the low and reverse brake and the second brake. The low and reverse brake is fixed by the low and reverse annulus gear and overdrive planetary carrier at the 1st speed.

- The disc type return spring is applied to the low and reverse brake and it minimizes the slip of the friction material from the uniform spring operation power to improve the durability and reduce the length.

  The overdrive sun gear is held on the transaxle case by the second brake at the 2nd speed.

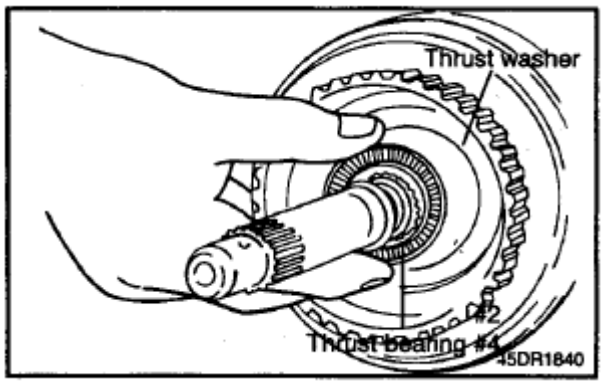


Fig. 4: Identifying Disc Type Return Spring On Low And Reverse Brake

CLUTCH

The multiple clutches and the one way clutch are used as the transaxle device.

The retainer of each clutch is composed of the precision sheet metal parts to realize the productivity and the light weight.

The hydraulic centrifugal oil pressure balance device places inside the clutch assembly.

Generally the oil remained in the piston oil pressure chamber pushes the piston by the centrifugal force. But to prevent the piston from being pushed, the oil filled in between the piston and the return spring retainer occurs the centrifugal force and both of the power is offset so that the piston don't move. In result, it improves the durability and the shift control ability.

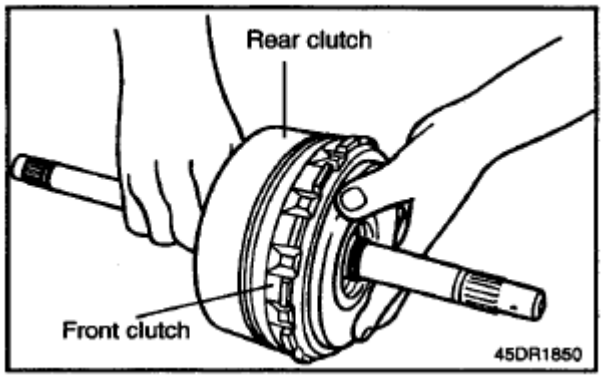


Fig. 5: Identifying Clutch Assembly Components

1. UNDERDRIVE CLUTCH

The underdrive clutch is engaged at 1st, 2nd and 3rd speed.

The driving force of input shaft is delivered to the underdrive sun gear.

The operating oil pressure in the underdrive clutch components operates between the piston and the retainer

and pushes the piston to the clutch discs to deliver the driving force from the retainer to the hub.

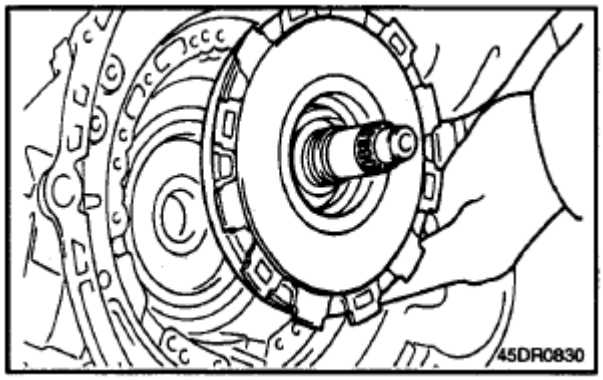


Fig. 6: Identifying Underdrive Clutch Components

2. REVERSE CLUTCH AND OVERDRIVE CLUTCH

The reverse clutch is engaged at the reverse and delivers the driving force of input shaft to the reverse sun gear. The overdrive clutch is engaged at the 3rd and 4th speed and delivers the driving force of input shaft to the overdrive planetary carrier and the low and reverse annulus gear.

The operating oil pressure of the reverse clutch operates between the reverse clutch retainer and overdrive clutch retainer and it has the whole overdrive clutch moved to deliver into the hub via retainer.

STRUCTURE OF THE REVERSE AND THE OVERDRIVE CLUTCH

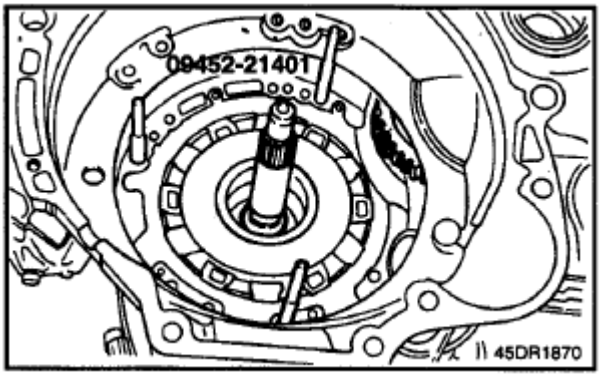


Fig. 7: Identifying Reverse And Overdrive Clutch Components

PARKING SYSTEM

The parking system for A4CF2 model is the cam type. The roller type installed to the existing new generation AT needs the support to move the roller when operating the parking system and is so complicated. But the cam type for A4CF2 model doesn't need the support and the structure is simply. It only needs the guide to prevent from moving the cam idly.

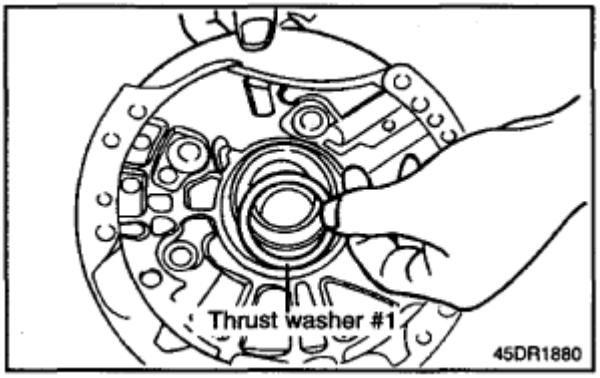


Fig. 8: Identifying Parking System Components

POWER TRAIN

OPERATING ELEMENT OF EACH SHIFTING RANGE

	UD/C	OD/C	REV/C	2-4/B	LR/B	OWC
P					•	

R			•		•	
N					•	
D1	•					•
D2	•			•		
D3	•	•				
D4		•		•		
L	•				•	•

OPERATION

HYDRAULIC CONTROL SYSTEM

MAIN FEATURES

The VFS (Variable Force Solenoid) installed in the valve body is applied to transaxle (A4CF2). VFS varies the line pressure from 4.5bar to 10.5bar according to throttle open angle and shift range to improve the fuel consumption and shift ability.

And the reducing valve which is installed in the valve body makes the solenoid control pressure using the reducing pressure instead of the line pressure like the HIVEC transaxle.

The material of spool valve in the valve body is changed from the steel to aluminum to reduce the oil leakage by the thermal expansion between the valve body and spool valve at the high temperature.

The switch valve, the solenoid valve and the fail safe valve are operated to drive the vehicle at the 3rd speed and reverse even thought the malfunction of the electronic control parts occur.

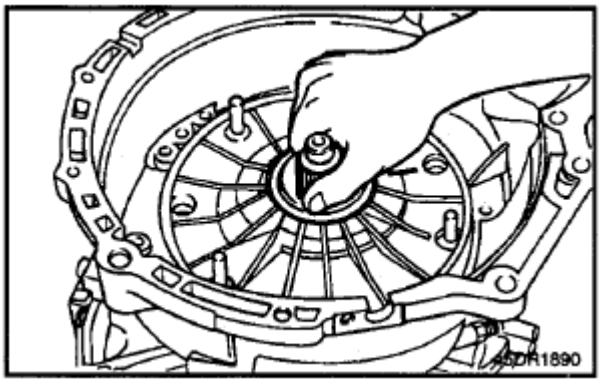


Fig. 9: Line Pressure Graph

STRUCTURE OF HYDRAULIC CIRCUIT

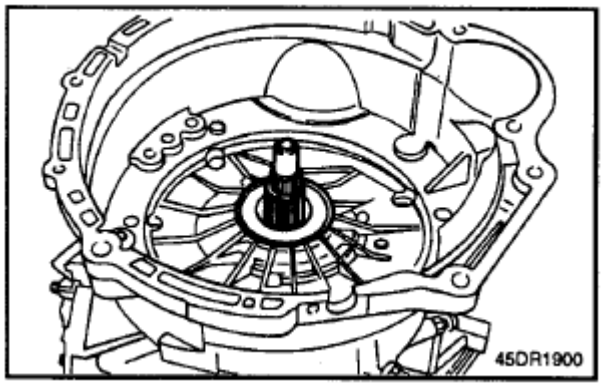


Fig. 10: Hydraulic Circuit Diagram

ELECTRONIC CONTROL SYSTEM

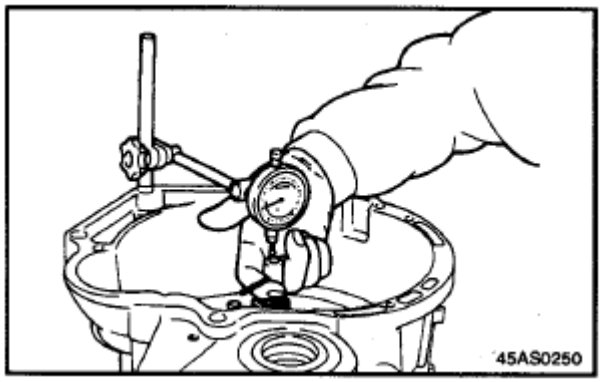


Fig. 11: Electronic Control System Diagram

SENSOR AND ACTUATOR FUNCTION

SENSOR AND ACTUATOR FUNCTION REFERENCE

ITEM	FUNCTION
Input shaft speed sensor	Detect the input shaft rpm (TURBINE RPM) at the OD/RVS retainer
Output shaft speed sensor	Detect the output shaft rpm (T/F DRIVE GEAR RPM) at the T/F drive gear
Engine rpm signal	Receive the engine rpm via CAN communication with ECM
Fluid temperature sensor	Detect the temperature of ATF through the thermistor
Brake switch	Detect the brake operation at the contact switch of the brake pedal
Inhibitor switch	Detect the position of select lever through the contact switch
ON/OFF solenoid valve	Control the hydraulic passage for the shift control
VFS solenoid valve	Change the line pressure from 4.5 bar to 10.5 bar according to throttle open angle and shift ranges
PCSV-A	Control the OD or L/R hydraulic pressure to the pressure control valve for shift control
	Control the 2/4 or REV hydraulic pressure to the pressure control valve for shift

PCSV-B	control
PCSV-C	Control the UD hydraulic pressure to the pressure control valve for shift control
PCSV-D	Control the hydraulic pressure for the damper clutch control
Torque reduction operation signal	Receive the signal of engine reduction pressure operation from ECM via CAN communication
Cluster	Send the signal of the current position of shift lever and vehicle speed and operate the lamp, distance meter and speed meter

TCM

The TCM which is adapted to the new small sized automatic transaxle (A4CF2) is integrated into the ECM and deliver information via CAN communication.

ITEMS AND SIEMENS TCM REFERENCE

ITEM	SIEMENS TCM
Hardware	Integrated type
Duty driving	Chopping method
Main oil pressure control components	Turbin torque, Vehicle speed
ATF Temp, compensation control	Independently
Direct control range	Wide

• TLE6288 current control chip

The TLE6288 current control chip is installed into the TCM to regulate the solenoid control current and control the oil pressure securely according to the change of the temperature and voltage. In this case, the control signal of solenoid valve is divided into the Peak signal and the Hold signal.

1. Peak : The 12 voltage signal applied to move the solenoid plunger quickly.
2. Hold : The signal applied to keep holding the pulled solenoid valve.

FPC (FLEXIBLE PRINTED CIRCUIT) HARNESS

The FPC (Flexible Printed Circuit) harness is composed of the thin and flat copper in the insulating film like electric wire.

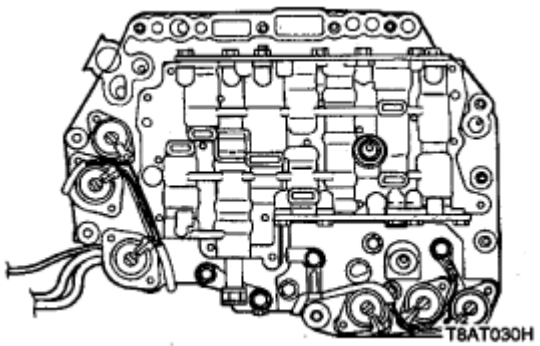


Fig. 12: Identifying Flexible Printed Circuit Harness

FLEXIBLE PRINTED CIRCUIT HARNESS REFERENCE

Item	Round Wire Type	FPC Type
Weight (g)	96.6	72
Practical use of space	Low	High
TM installation capability	Bad	Good
Softness	High	Low
Drawing modification	Normal	Low
Quality occurring	High	Low
Tighten in solenoid valve	Bad	Good
Measurement	Unstable	Stable

CAN COMMUNICATION

LAYOUT

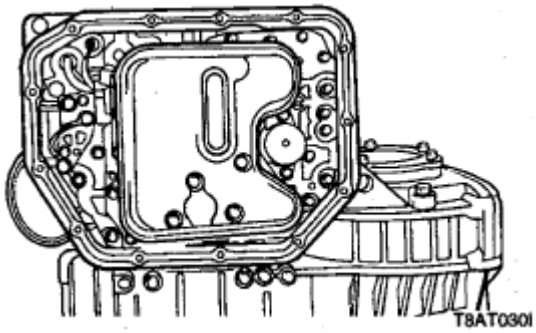


Fig. 13: CAN Communication Diagram

ECM- TCM CAN COMMUNICATION ERROR MANAGEMENT

ECM- TCM CAN COMMUNICATION ERROR MANAGEMENT

No.	Item	Error management
1	Engine rpm	3,000 RPM
2	Engine torque	80%
3	Vehicle speed	0 km/h
4	A/C Switch	OFF
5	Engine coolant temperature	70°C
6	TPS	50%
7	Shift range hold signal	OFF

HYDRAULIC CIRCUIT

N RANGE, P RANGE

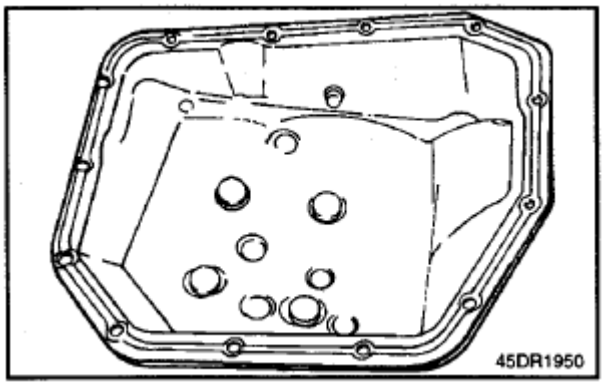


Fig. 14: Hydraulic Circuit Diagram (N Range, P Range)

D RANGE (1ST)

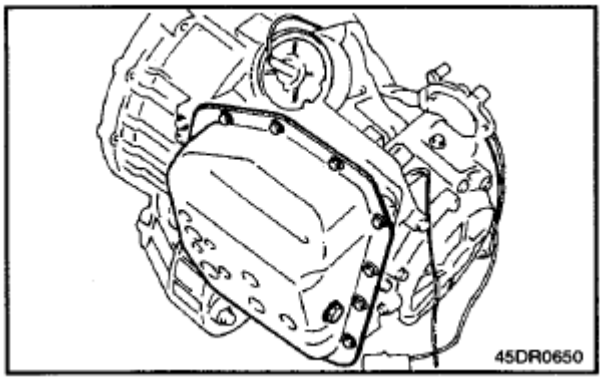


Fig. 15: Hydraulic Circuit Diagram (D Range (1ST))

D RANGE (2ND)

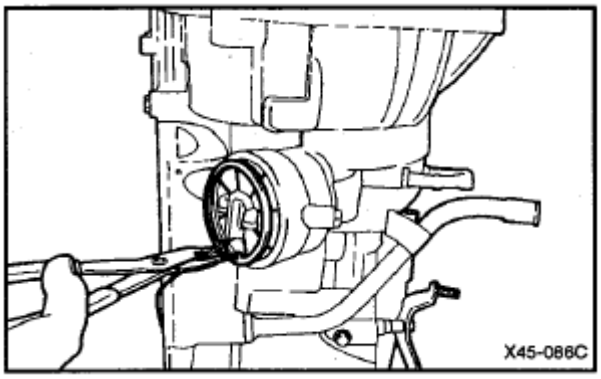


Fig. 16: Hydraulic Circuit Diagram (D Range (2ND))

D RANGE (3RD)

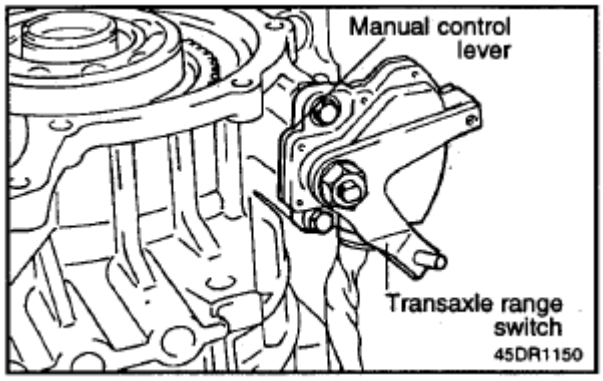


Fig. 17: Hydraulic Circuit Diagram (D Range (3RD))

D RANGE (4TH)

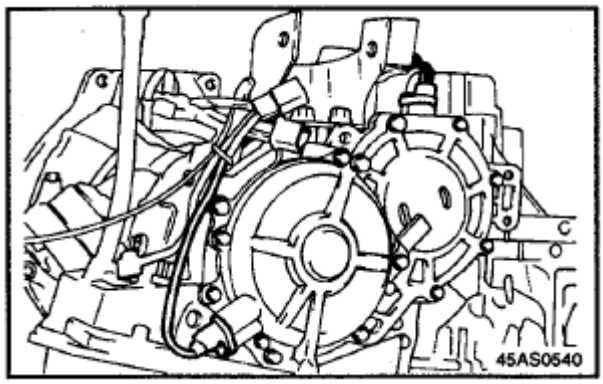


Fig. 18: Hydraulic Circuit Diagram (D Range (4TH))

R RANGE

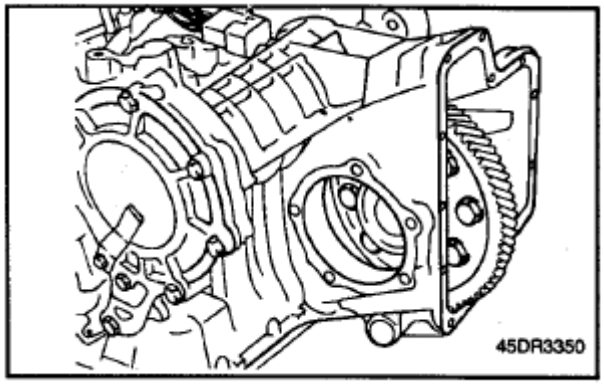


Fig. 19: Hydraulic Circuit Diagram (R Range)

L RANGE

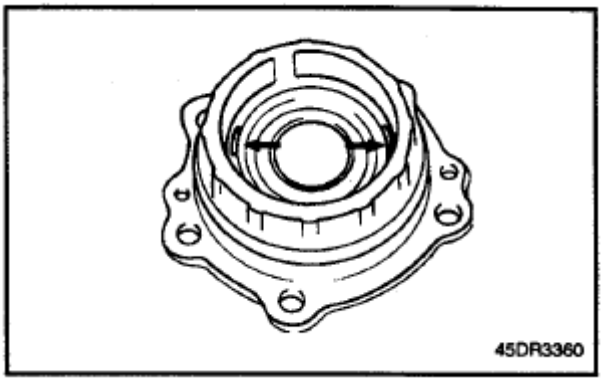


Fig. 20: Hydraulic Circuit Diagram (L Range)

BASIC INSPECTION ADJUSTMENT

TRANSAXLE FLUID LEVEL

INSPECTION

1. Drive the vehicle until the fluid reaches normal operating temperature [70~80°C (158~176°F)].
2. Place the vehicle on a level surface.
3. Move the gear selector lever through all gear positions. This will fill the torque converter with trans fluid. Set the selector lever to the "N" (Neutral) 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 transmission overhaul may be necessary.

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

   Automatic transaxle fluid :

   DIAMOND ATF SP-III, SK ATF SP-III

   Automatic transaxle fluid capacity:

   6.6liter (6.9 US qt, 5.81lmp.qt)

NOTE: Low fluid level can cause a variety of abnormal conditions because it allows the pump to take in air along with fluid. Air trapped in the hydraulic system forms bubbles, which are compressible. Therefore, pressures will be erratic, causing delayed shifting, slipping clutches and brakes, etc. Improper filling can also raise fluid level too high. When the transaxle has

too much fluid, gears churn up foam and cause the same conditions which occur with low fluid level, resulting in accelerated deterioration of automatic transaxle fluid. In either case, air bubbles can cause overheating, and fluid oxidation, which can interfere with normal valve, clutch, and brake operation. Foaming can also result in fluid escaping from the transaxle vent where it may be mistaken for a leak.

6. Insert the oil level gauge securely.

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

REPLACEMENT

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

1. Disconnect the hose, which connects the transmission and the oil cooler (inside the radiator).
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.

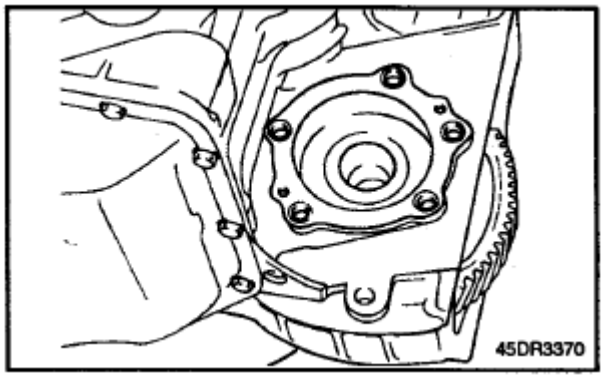


Fig. 21: Identifying Drain Plug

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

TORQUE:

35-45 Nm (3.5~4.5kgf.m, 25-32lb-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" or "P" position.
11. Drive the vehicle until the fluid temperature rises to the normal temperature (70~80°C (158~176°F)), and then check the fluid level again. The fluid level must be at the HOT mark.
12. Firmly insert the oil level gauge into the oil filler tube.

TORQUE CONVERTER STALL TEST

This test measures the maximum engine speed when the select lever is at the "D" or "R" position and the torque converter stalls to test the operation of the torque converter, starter motor and one-way clutch operation and the holding performance of the clutches and brakes in the transmission.

CAUTION: Do not let anybody stand in front of or behind the vehicle while this test is being carried out.

1. Check the automatic transmission fluid level and temperature and the engine coolant temperature.
   - Fluid level : At the HOT mark on the oil level gauge
   - Fluid temperature : 80~100°C (176~212°F)
   - Engine coolant temperature : 80~100°C (176~212°F)
2. Check both rear wheels (left and right).
3. Pull the parking brake lever on, with the brake pedal fully depressed.
4. Start the engine.
5. Move the select lever to the "D" position, fully depress the accelerator pedal and take a reading of the

maximum engine speed at this time.

CAUTION:

- **The throttle should not be left fully open for any more than eight seconds.**
- **If carrying out the stall test two or more times, move the select lever to the "N" position and run the engine at 1,000 r/min to let the automatic transaxle fluid cool down before carrying out subsequent tests.**
- **Move the select lever to the "R" position and carry out the same test again.**

Stall rpm : 2,000~2,700 RPM

TORQUE CONVERTER STALL TEST CONDITION

Range	Condition	Passable cause
R range slip	Reverse	REV in D range normal L/R in D range abnormal
D1 rang slip	D range 1st/Sports mode 1st	L/R in reverse range abnormal UD in reverse range normal
D3 range slip	3rd gear hold	OD in 3rd gear slip (1st and 2nd gear normal)
Forwarding, reverse slip	D range, R range	Torque converter Oil pump, Manual valve in the valve Driving device abnormal

ELEMENTS IN USE IN EACH GEAR

OPERATING ELEMENT OF EACH SHIFTING RANGE

	UD/C	OD/C	REV/C	2-4/B	LR/B	OWC
P					•	
R			•		•	
N					•	
D1	•					•
D2	•			•		
D3	•	•				
D4		•		•		
L	•				•	•

HYDRAULIC PRESSURE TEST

1. Warm up the engine until the automatic transaxle fluid temperature is 80~100°C (176~212°F).
2. Jack up the vehicle so that the wheels are free to turn.
3. Connect the special tools (09452-21500, 09452-21000) oil pressure gauge to each pressure discharge port.

4. Measure the hydraulic pressure at each port under the conditions given in the standard hydraulic pressure table, and check that the measured values are within the standard value ranges.
5. If a value is outside the standard range, correct the problem while referring to the hydraulic pressure test diagnosis table.

a. Bottom side

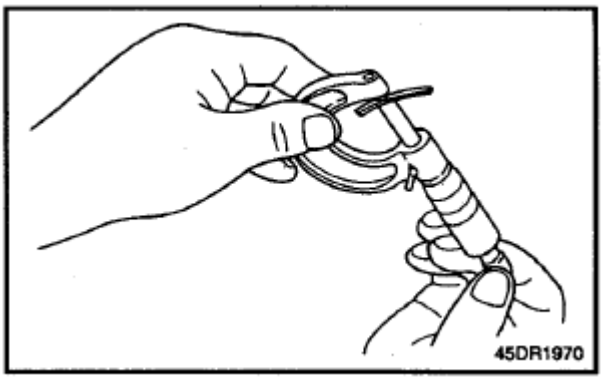


Fig. 22: Identifying Pressure Discharge Ports

STANDARD HYDRAULIC PRESSURE TABLE

STANDARD HYDRAULIC PRESSURE TABLE

No.	Shift range position	Operation					Measuring	Oil pressure (kgf/cm^2)				
		PCSV-A	PCSV-B	PCSV-C	PCSV-D	ON/OFF		LR	2/4 (2ND)	UD	OD	REV
1	D	0	100	0	0	ON	LR	10.5±0.2	0	10.5±0.2	0	0
2	?	50	?	?	?	?	?	5.3±0.4	?	?	?	?
3	?	75	?	?	?	?	?	1.0±0.3	?	?	?	?
4	?	100	?	?	?	?	?	0	?	?	?	?
5	?	?	0	?	100	OFF	2/4 (2ND)	0	10.5±0.2	?	?	?
6	?	?	50	?	?	?	?	?	5.3±0.4	?	?	?
7	?	?	75	?	?	?	?	?	0.9±0.3	?	?	?
8	?	?	100	?	?	?	?	?	0	?	?	?
9	?	0	?	?	?	?	OD	?	?	?	10.5±0.2	?
10	?	50	?	?	?	?	?	?	?	?	5.6±0.4	?
11	?	75	?	?	?	?	?	?	?	?	1.0±0.3	?
12	?	100	?	?	?	?	?	?	?	?	0	?
13	?	?	?	0	0	?	UD	?	?	10.5±0.2	?	?
14	?	?	?	50	?	?	?	?	?	5.6±0.4	?	?
15	?	?	?	75	?	?	?	?	?	1.0±0.3	?	?
16	?	0	?	100	?	?	?	?	?	0	?	?
17	R	?	0	?	?	ON	REV	17.7±0.8	?	?	?	17.7±(

18	?	?	50	?	?	↑	?	?	?	?	?	8.7±0
19	?	?	75	?	?	?	?	?	?	?	?	0.9±0
20	?	?	100	?	?	?	?	?	?	?	?	0

[Measure condition]

• Oil pump revolution : 2500rpm

• LPCSV Duty ratio : 0%

NOTE:

The oil pressure values of "0" marked on the above table must measure less than 0.1 kgf/cm^2 when testing.

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

TROUBLESHOOTING

DIAGNOSTIC TROUBLE CODES (INSPECTION PROCEDURE)

Check the Diagnostic Trouble Codes

1. Turn the ignition switch to OFF.
2. Connect the Hi-scan tool to the DLC connector for diagnosis.
3. Turn the ignition switch to ON.
4. Check the diagnostic trouble codes using the Hi-scan tool.
5. Read the output diagnostic trouble codes. Then follow the remedy procedures according to the "DIAGNOSTIC TROUBLE CODE DESCRIPTION" on the following pages.

NOTE:

- **A maximum of 10 diagnostic trouble codes (in the sequence of occurrence) can be stored in the Random Access Memory (RAM) incorporated within the control module.**
- **The same diagnostic trouble code can be stored one time only.**
- **If the number of stored diagnostic trouble codes or diagnostic trouble patterns exceeds 10, already stored diagnostic trouble codes will be erased in sequence, beginning with the oldest.**
- **Do not disconnect the battery until all diagnostic trouble codes or diagnostic trouble patterns have been read out, because all stored diagnostic trouble codes or diagnostic trouble patterns will be cancelled when the battery is disconnected.**
- **All diagnostic trouble codes are deleted from memory the 200th time the ATF temperature reaches 50°C (122°F) after memorization of the most recent diagnostic code.**

6. Delete the diagnostic trouble code.

7. Disconnect the Hi-scan tool.

NOTE: DTC cleaning should only be done with the scan tool.

DIAGNOSTIC TROUBLE CODE TABLE

DIAGNOSTIC TROUBLE CODE CHART

No.	Code	Item	MIL	Remark
1	**P0605**	Internal Control Module Read Only Memory (ROM) Error	•	
2	**P0707**	TRANSAXLE RANGE SWITCH CIRCUIT LOW INPUT	•	
3	**P0708**	TRANSAXLE RANGE SWITCH CIRCUIT HIGH INPUT	•	
4	**P0711**	TRANSAXLE FLUID TEMPERATURE SENSOR RATIONALITY	•	
5	**P0712**	TRANSAXLE FLUID TEMPERATURE SENSOR CIRCUIT LOW INPUT	•	
6	**P0713**	TRANSAXLE FLUID TEMPERATURE SENSOR CIRCUIT HIGH INPUT	•	
7	**P0716**	A/T INPUT SPEED SENSOR RATIONALITY	•	
8	**P0717**	A/T INPUT SPEED SENSOR CIRCUIT - OPEN or SHORT (GND)	•	
9	**P0722**	A/T OUTPUT SPEED SENSOR CIRCUIT - OPEN or SHORT (GND)	•	
10	**P0731**	GEAR 1 INCORRECT RATIO	•	
11	**P0732**	GEAR 2 INCORRECT RATIO	•	
12	**P0733**	GEAR 3 INCORRECT RATIO	•	
13	**P0734**	GEAR 4 INCORRECT RATIO	•	
14	**P0741**	TORQUE CONVERTER CLUTCH STUCK OFF	•	
15	**P0742**	TORQUE CONVERTER CLUTCH STUCK ON	•	
16	**P0743**	TORQUE CONVERTER CLUTCH CONTROL SOLENOID VALVE - OPEN or SHORT (GND)	•	
17	**P0748**	VFS SOLENOID VALVE CIRCUIT - OPEN or SHORT (GND)	X	
18	**P0750**	ON/OFF (SCSV-A) SOLENOID VALVE CIRCUIT - OPEN or SHORT (GND)	•	
19	**P0755**	PCSV-A (OD & LR) SOLENOID VALVE CIRCUIT - OPEN or SHORT (GND)	•	
20	**P0760**	PCSV-B (2-4 SOLENOID VALVE) CIRCUIT - OPEN or SHORT (GND)	•	
21	**P0765**	PCSV-C (UD) SOLENOID VALVE CIRCUIT - OPEN or SHORT (GND)	•	
22	**P0880**	TCM POWER SIGNAL ERROR	•	
23	**U0001**	CAN Communication Malfunction	•	
24	**U0100**	CAN MI-COM OR CIRCUIT MAL	•	

DTC P0605 INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR

COMPONENT LOCATION

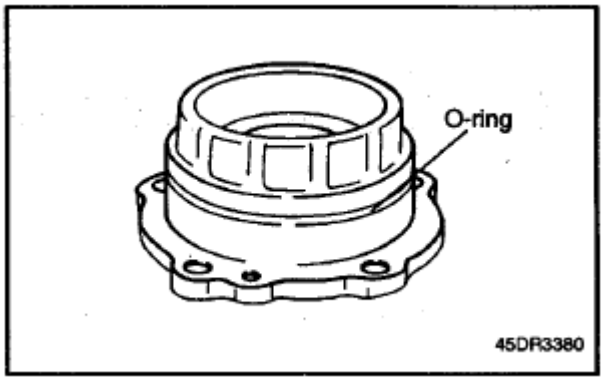


Fig. 23: Identifying Internal Control Module

GENERAL DESCRIPTION

The TCU check ROM I.D all the time, in order to maintain for best condition and surrounding.

DTC DESCRIPTION

The TCU set this code When the ROM I.D is changed by external force or input non-available data.

DTC DETECTING CONDITION

DTC DETECTING CONDITION CHART

Item	Detecting Condition	Possible Cause
DTC Strategy	• Check sum fault	• Faulty TCM
Enable Conditions	• IG "ON"	
Threshold Value	• CAN message transfer error	
Diagnostic Time	• More than 1sec	
Fail safe		

MONITOR SCANTOOL DATA

1. Connect scantool to data link connector (DLC).
2. Ignition "ON".
3. Confirm the "ROM I.D".
4. Perform the "ROM UP-DATE".
5. Perform the Re-diagnosis.
6. Is "DTC" disappeared?

YES

- Fault is intermittent caused by poor contact in the sensor's and/or PCM/TCM's connector or was repaired and PCM/TCM 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

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

VERIFICATION OF VEHICLE REPAIR

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

1. Connect scan tool and select "Diagnostic Trouble Codes (DTCs)" mode
2. Using a 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 P0707 TRANSAXLE RANGE SWITCH - LOW INPUT

COMPONENT LOCATION

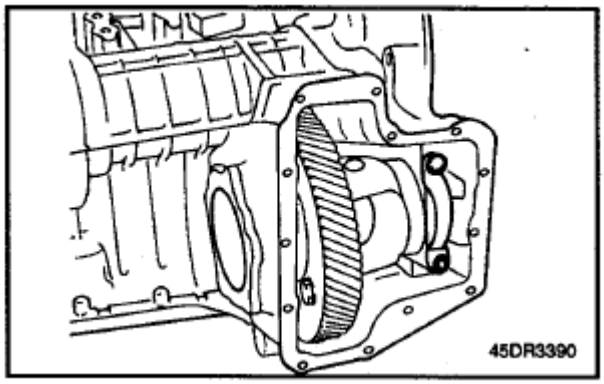


Fig. 24: Identifying Transaxle Range Switch

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	• Open or short in circuit • Faulty Shift cable adjustment • Faulty Inhibitor switch and Manual control lever position adjustment • Faulty TRANSAXLE RANGE SWITCH • Faulty TCM (PCM)
Enable Conditions	• Engine Speed > or = 1200rpm • Battery Voltage < or = 10V	
Threshold value	• No signal detected	
Diagnostic Time	• More than 30 sees	
Fail Safe	• Recognition as previous signal. o 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	

SIGNAL WAVEFORM

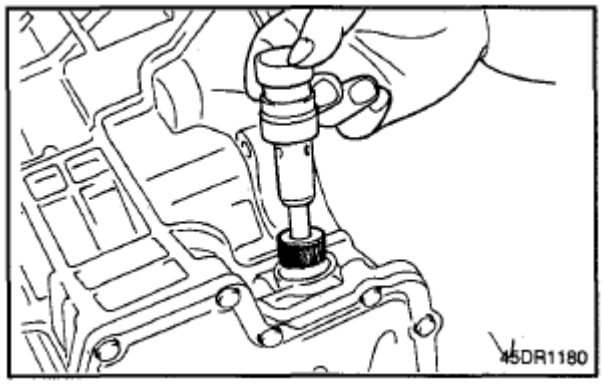


Fig. 25: Scantool Display - CURRENT DATA

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. Move selector lever from "P" range to "L" range.

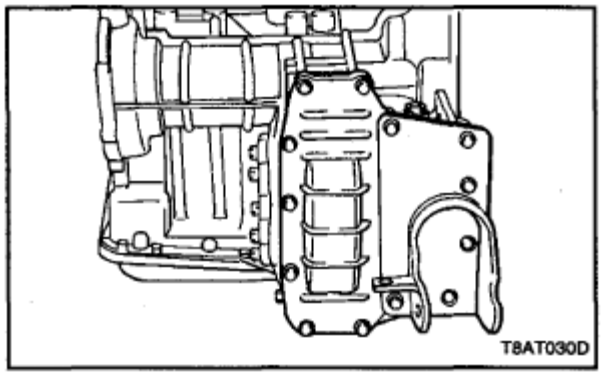


Fig. 26: Scantool Display - TRANSAXLE RANGE SWITCH Parameter

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

YES

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

NO

- Go to "**TERMINAL & CONNECTOR INSPECTION**" procedure.

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

TERMINAL & CONNECTOR INSPECTION

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

YES

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

NO

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

POWER SUPPLY CIRCUIT INSPECTION

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

       Specification : approx. B+

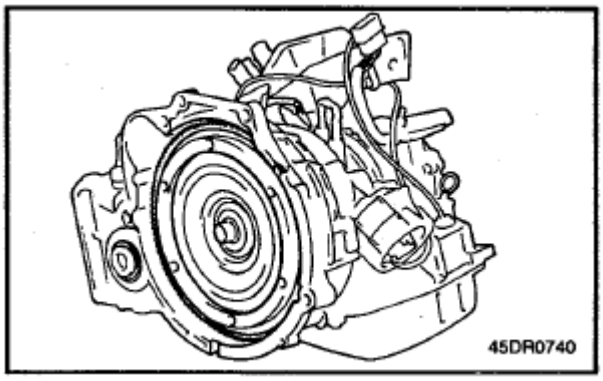


Fig. 27: Measuring Voltage Between Transaxle Range Switch Terminal 8 And Chassis Ground

    4. Is voltage within specifications?

       YES

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

       NO

       - Check that Fusel-10A is installed or not blown.
       - Check for open in harness. Repair as necessary and go to "**VERIFICATION OF VEHICLE REPAIR**" procedure.

SIGNAL CIRCUIT INSPECTION

1. Ignition "OFF".
2. Disconnect "TRANSAXLE RANGE SWITCH" and "TCM (PCM)" connector.
3. Measure resistance between each terminal of the sensor harness connector and TCM (PCM) harness connector as below.

Specification :

RESISTANCE SPECIFICATION

Pin No of "TRANSAXLE RANGE SWITCH"	CBG01 No.1	CBG01 No.7	CBG01 No.6	CBG01 No.2	CBG01 No.5	CBG01 No.3
Pin No of "TCM (PCM)" harness	CBG-A No.6	CBG-A No.7	CBG-A No.8	CBG-A No.9	CBG-A No. 11	CBG-A No. 12
Specification	0ohms	0ohms	0ohms	0ohms	0ohms	0ohms

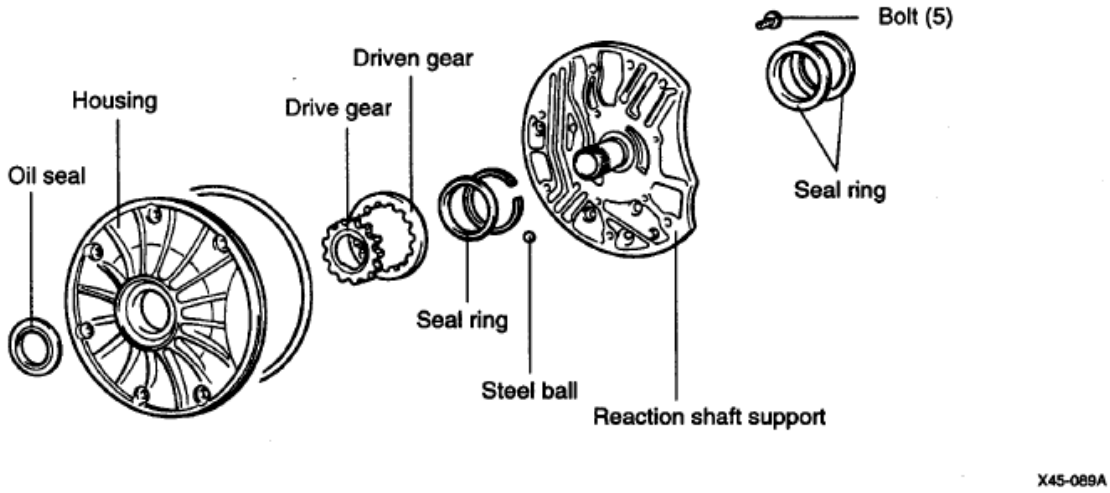


Fig. 28: Measuring Resistance Between Transaxle Range Switch Terminal 1 And TCM (PCM) Terminal 6

4. Is resistance within specifications?

   YES

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

   NO

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

COMPONENT INSPECTION

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

   Specification : approx. 0 ohms

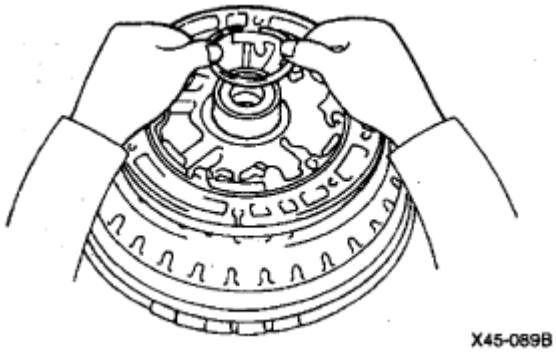


Fig. 29: Measuring Resistance Between Transaxle Range Switch Terminal 1 And Terminal 8

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 and then go to "**VERIFICATION OF VEHICLE REPAIR**" procedure.

NO

- Replace "TRANSAXLE RANGE SWITCH" as necessary and Go to "**VERIFICATION OF VEHICLE REPAIR**" procedure.

VERIFICATION OF VEHICLE REPAIR

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

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 multiple signals	• Open or short in TRANSAXLE RANGE SWITCH • Faulty Shift cable adjustment • Faulty Inhibitor switch and Manual control lever position adjustment • Faulty TRANSAXLE RANGE SWITCH • Faulty PCM
Enable Conditions	• Battery Voltage > or = 10V	
Threshold value	• Multiple signal	
Diagnostic Time	• More than 10 sees	
Fail Safe	• Recognition as previous signal o When signal is input "D" and "N" at the same time, TCM regards it as "N" RANGE o After PCM/TCM Reset, if the PCM/TCM detects multiple signal or no signal, then it holds the 3rd gear position	

SIGNAL WAVEFORM

Refer to **DTC P0707**.

MONITOR SCANTOOL DATA

Refer to **DTC P0707**.

TERMINAL & CONNECTOR INSPECTION

Refer to **DTC P0707**.

POWER SUPPLY CIRCUIT INSPECTION

1. Disconnect "TRANSAXLE RANGE SWITCH" connector.
2. Ignition "ON" & Engine "OFF".

3. Measure voltage between each terminal of the sensor harness connector and chassis ground.

   Specification :

   VOLTAGE SPECIFICATION

TERMINAL No.	1	2	3	4	5	6	7	8	9	10
SPECIFICATION	0V	0V	0V	0V	0V	0V	0V	12V	0V	12V

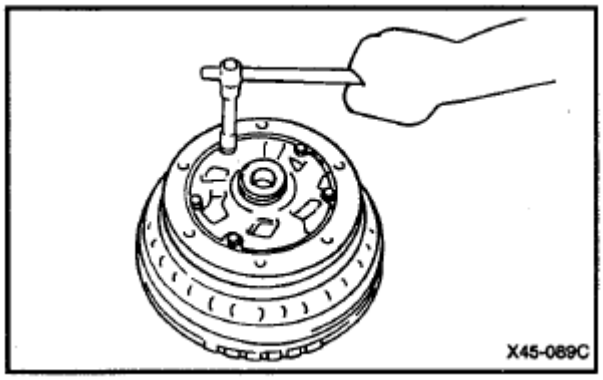


Fig. 30: Measuring Voltage Between Transaxle Range Switch Terminal 8 And Chassis Ground

4. Is voltage within specifications?

   YES

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

     NO

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

SIGNAL CIRCUIT INSPECTION

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

   Specification : Infinite

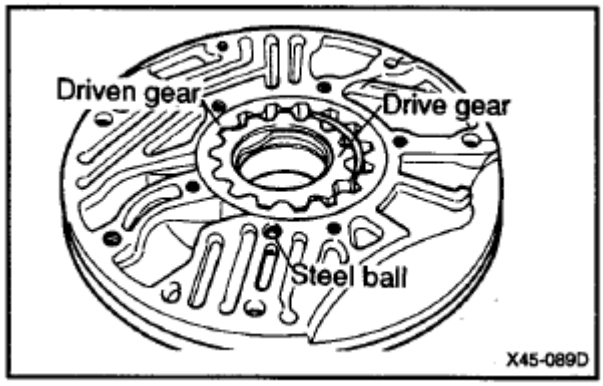


Fig. 31: Measuring Resistance Between Transaxle Range Switch Terminal 2 And Terminal 7

4. Is resistance within specifications?

   YES

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

     NO

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

COMPONENT INSPECTION

Refer to **DTC P0707**.

VERIFICATION OF VEHICLE REPAIR

Refer to **DTC P0707**.

DTC P0711 TRANSAXLE FLUID TEMPERATURE SENSOR RATIONALITY

COMPONENT LOCATION

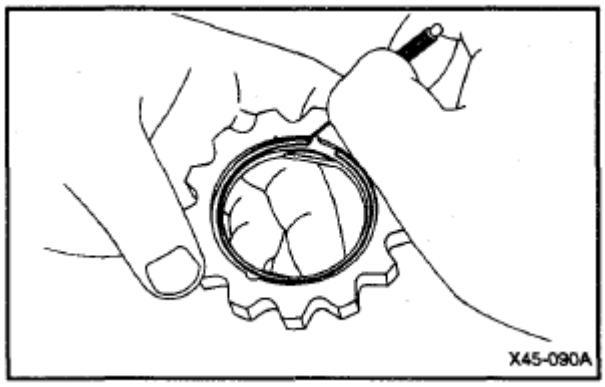


Fig. 32: Identifying Automatic Transaxle Fluid Temperature Sensor

GENERAL DESCRIPTION

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

DTC DESCRIPTION

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

DTC DETECTING CONDITION

DTC DETECTING CONDITION CHART

Item		Detecting Condition	Possible cause
DTC Strategy		• Check rationality	• Sensor signal circuit is short to ground • Faulty sensor • Faulty PCM
Enable Conditions	**Case 1**	• Output Speed > or = 1000rpm • Engine Speed > or = 1000rpm • ATF temperature < or = 30°C or < or = 50° C (Ambient temp. > -7°C) • Accumulated time in condition > or = 5min	
	Case 2	• Output Speed > or = 1000rpm • Engine Speed > or = 1000rpm • ATF temperature > 73.5°C • Accumulated time in condition > or = 5min	
Threshold value	**Case 1**	• Present Oil temp - Oil temp When the time starts < or = 2°C (35.6°F)	

	Case 2	• ATF temperature < or = -10°C	
Diagnostic Time		• More than 1 sec	
Fail Safe		• Learning control and Intelligent shift are inhibited • Fluid temperature is regarded as 80°C (176° F)	

SPECIFICATION

TEMPERATURE AND RESISTANCE SPECIFICATION

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

MONITOR SCANTOOL DATA

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

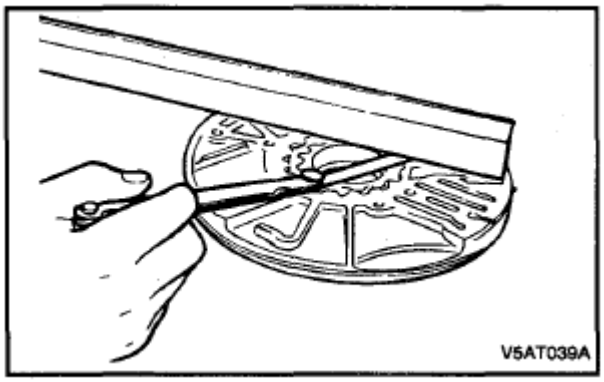


Fig. 33: Scantool Display - TRANSAXLE FLUID TEMPERATURE SENSOR Parameter

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

   YES

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

NO

- Go to "**TERMINAL & CONNECTOR INSPECTION**" procedure.

TERMINAL & CONNECTOR INSPECTION

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

YES

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

NO

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

SIGNAL CIRCUIT INSPECTION

1. Ignition "ON" & Engine "OFF".
2. Disconnect the "TRANSAXLE FLUID TEMPERATURE SENSOR" connector.
3. Measure the voltage between terminal "5" of the "TRANSAXLE FLUID TEMPERATURE SENSOR" harness connector and chassis ground.

   Specification : Approx. 5 V

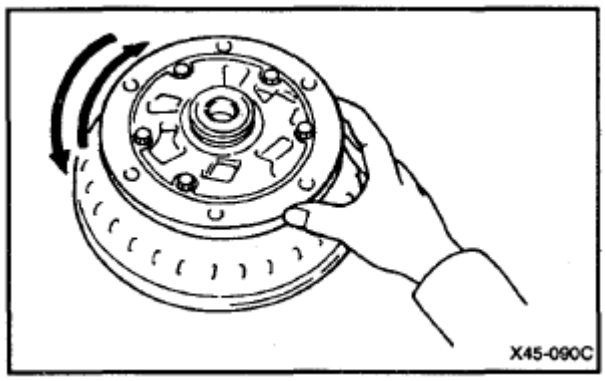


Fig. 34: Measuring Voltage Between Transaxle Fluid Temperature Sensor Connector Terminal 5

And Chassis Ground

4. Is voltage within specifications?

YES

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

NO

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

COMPONENT INSPECTION

1. CHECK "TRANSAXLE FLUID TEMPERATURE SENSOR"
   1. Ignition "OFF".
   2. Disconnect the "TRANSAXLE FLUID TEMPERATURE SENSOR" connector.
   3. Measure the resistance between terminals "5" and "6" of the "TRANSAXLE FLUID TEMPERATURE SENSOR".

      Specification : Refer to "**REFERENCE DATA**"

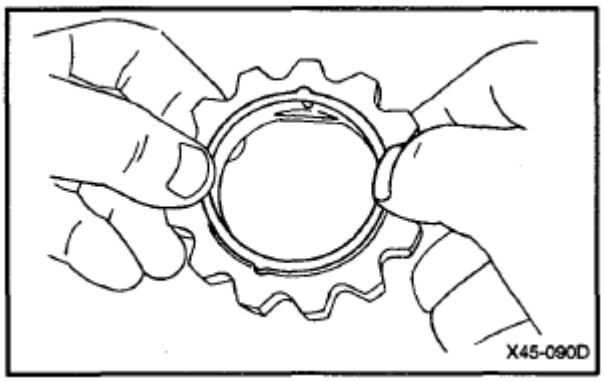


Fig. 35: Measuring Resistance Between Transaxle Fluid Temperature Sensor Terminals 5 And 6

[REFERENCE DATA]

TEMPERATURE AND RESISTANCE SPECIFICATION

TEMP.[°C (°F)]	Resistance (kohms)	TEMP.[°C (°F)]	Resistance (ohms)
-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 5 "Check PCM/TCM" as below.

   NO

   - Replace "TRANSAXLE FLUID TEMPERATURE SENSOR" as necessary and Go to "**VERIFICATION OF VEHICLE REPAIR**" procedure.

5. CHECK TCM
   1. Ignition "ON" & Engine "OFF".
   2. Connect "TRANSAXLE FLUID TEMPERATURE SENSOR" connector.
   3. Install scan tool and select a SIMU-SCAN.
   4. Simulate voltage (0-->5V) to "TRANSAXLE FLUID TEMPERATURE SENSOR" signal circuit.

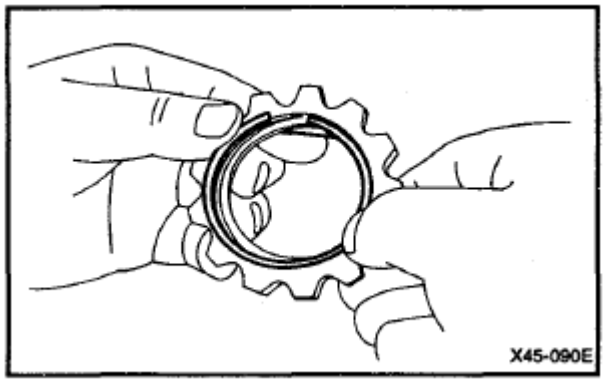


Fig. 36: Scantool Display - SIMU-SCAN

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

   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 and then go to "**VERIFICATION OF VEHICLE REPAIR**" procedure.

VERIFICATION OF VEHICLE REPAIR

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

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

YES

- Go to the applicable troubleshooting procedure.

NO

- System performing to specification at this time.

DTC P0712 FLUID (OIL) TEMPERATURE SENSOR CIRCUIT - LOW

COMPONENT LOCATION

Refer to **DTC P0711**.

GENERAL DESCRIPTION

Refer to **DTC P0711**.

DTC DESCRIPTION

Refer to **DTC P0711**.

DTC DETECTING CONDITION

DTC DETECTING CONDITION CHART

Item	Detecting Condition	Possible cause
DTC Strategy	• Check for Voltage range	• Sensor signal circuit is short to ground • Faulty sensor
Enable Conditions	• Battery Voltage > or = 10V	
Threshold Value	• Voltage < 0.05V	
Diagnostic Time	• More than 1sec	
	• Learning control and Intelligent shift are	

Fail Safe	inhibited • Fluid temperature is regarded as 80°C (176°F)	• Faulty PCM

SPECIFICATION

Refer to **DTC P0711**.

MONITOR SCANTOOL DATA

Refer to **DTC P0711**.

TERMINAL & CONNECTOR INSPECTION

Refer to **DTC P0711**.

SIGNAL CIRCUIT INSPECTION

Refer to **DTC P0711**.

COMPONENT INSPECTION

Refer to **DTC P0711**.

VERIFICATION OF VEHICLE REPAIR

Refer to **DTC P0711**.

DTC P0713 FLUID (OIL) TEMPERATURE SENSOR CIRCUIT - HIGH

COMPONENT LOCATION

Refer to **DTC P0711**.

GENERAL DESCRIPTION

Refer to **DTC P0711**.

DTC DESCRIPTION

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

DTC DETECTING CONDITION

DTC DETECTING CONDITION CHART

Item	Detecting Condition	Possible cause
DTC Strategy	• Check for Voltage range	• Sensor signal circuit is short to ground • Faulty sensor • Faulty PCM
Enable Conditions	• Battery Voltage > or = 10V	
Threshold Value	• Voltage > or = 4.9V	
Diagnostic Time	• More than 1sec	
Fail Safe	• Learning control and Intelligent shift are inhibited • Fluid temperature is regarded as 80°C (176°F)	

SPECIFICATION

Refer to **DTC P0711**.

MONITOR SCANTOOL DATA

Refer to **DTC P0711**.

TERMINAL & CONNECTOR INSPECTION

Refer to **DTC P0711**.

SIGNAL CIRCUIT INSPECTION

1. Ignition "OFF".
2. Disconnect the "TRANSAXLE FLUID TEMPERATURE SENSOR" connector.
3. Measure the voltage between terminal "5" of the "TRANSAXLE FLUID TEMPERATURE SENSOR" harness connector and chassis ground.

   Specification : Approx. 5 V

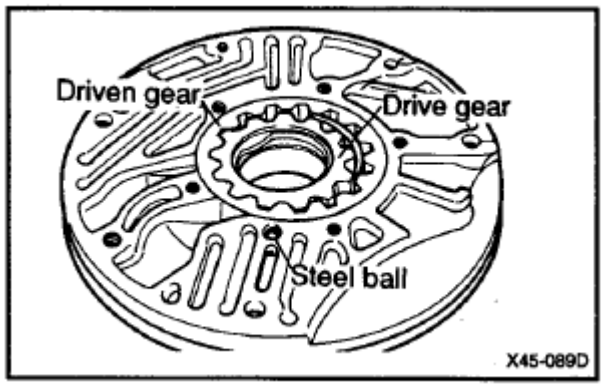


Fig. 37: Measuring Voltage Between Transaxle Fluid Temperature Sensor Connector Terminal 5

And Chassis Ground

4. Is voltage within specifications ?

YES

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

NO

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

GROUND CIRCUIT INSPECTION

1. Ignition "OFF".
2. Disconnect the "TRANSAXLE FLUID TEMPERATURE SENSOR" connector.
3. Measure the resistance between terminal "6" of the "TRANSAXLE FLUID TEMPERATURE SENSOR" harness connector and chassis ground.

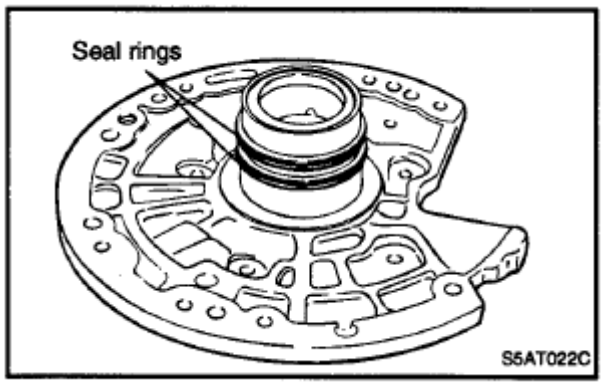


Fig. 38: Measuring Resistance Between Transaxle Fluid Temperature Sensor Connector Terminals 6 And Chassis Ground

4. Is resistance within specifications ?

YES

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

NO

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

COMPONENT INSPECTION

Refer to **DTC P0711**.

VERIFICATION OF VEHICLE REPAIR

Refer to **DTC P0711**.

DTC P0716 INPUT SPEED SENSOR RANGE/PERFORMANCE

COMPONENT LOCATION

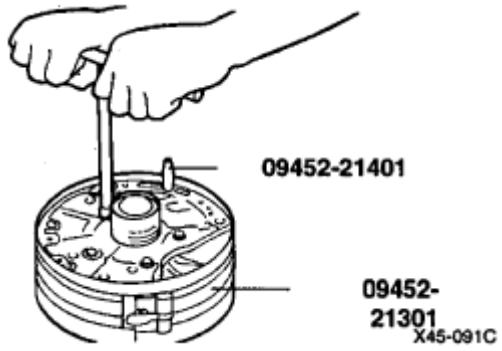


Fig. 39: Identifying Input Speed Sensor

GENERAL DESCRIPTION

The input (turbine) speed sensor outputs pulse-signals according to the revolutions of the input shaft of the transmission. The PCM/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 PCM/TCM sets this code if an output pulse-signal is not detected, from the input speed sensor, when the vehicle is running faster than 19 Mile/h (30 Km/h). The Fail-Safe function will be set by the PCM/TCM if this code is detected.

DTC DETECTING CONDITION

DTC DETECTING CONDITION CHART

Item	Detecting Condition	Possible cause
DTC Strategy	• Speed rationality check	• Signal circuit is open or short. • Sensor power circuit is open • Sensor ground circuit is open • Faulty INPUT SPEED SENSOR
Enable Conditions	• Battery Voltage > or = 10V	
Threshold value	• Input speed > or = 8000rpm	
Diagnostic Time	• More than 1sec	
Fail Safe	• Locked into 3rd or 2nd gear • Manual shifting is possible (2nd --> 3rd, 3rd	

	--> 2nd)	• Faulty PCM/TCM

SPECIFICATION

Input shaft & Output shaft speed sensor

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

SIGNAL WAVEFORM

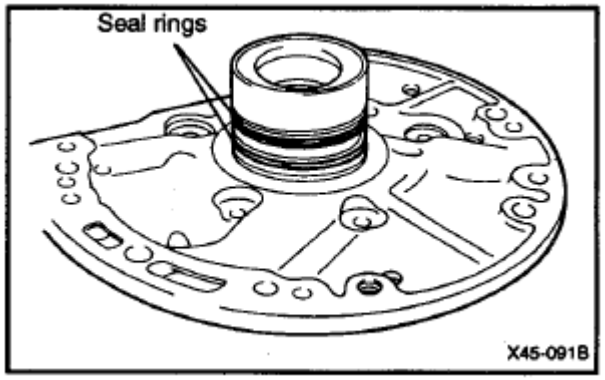


Fig. 40: Signal Waveform Graph

MONITOR SCANTOOL DATA

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

   Specification : Increasing Gradually

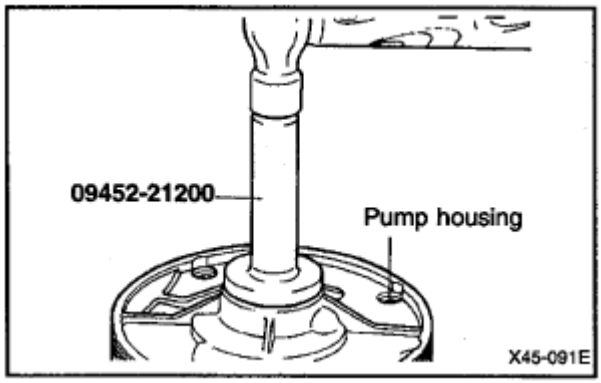


Fig. 41: Scantool Display - INPUT SPEED SENSOR Parameter

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

   YES

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

   NO

   - Go to "**TERMINAL & CONNECTOR INSPECTION**" procedure.

TERMINAL & CONNECTOR INSPECTION

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

   YES

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

   NO

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

SIGNAL CIRCUIT INSPECTION

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

   Specification : approx. 5V

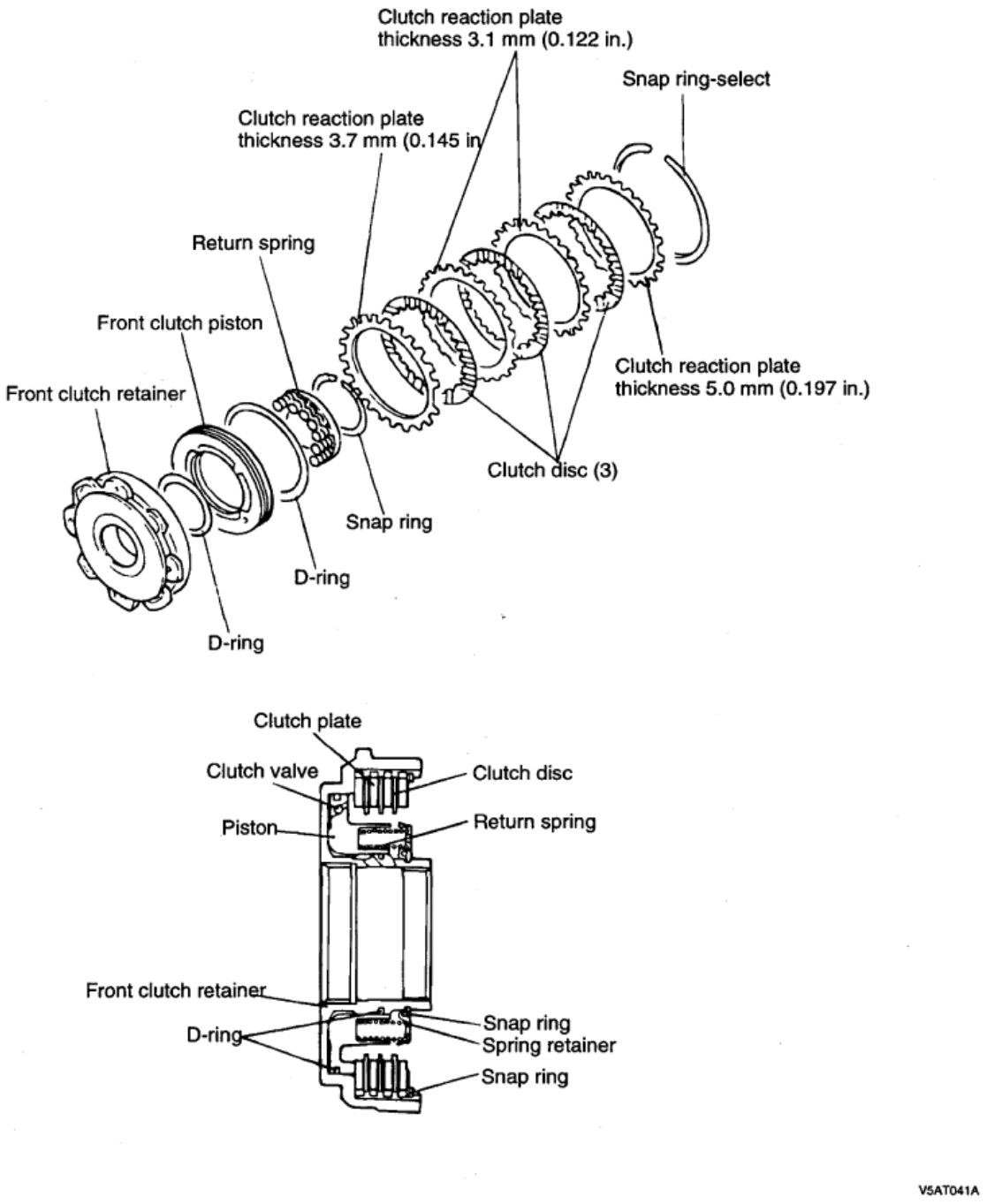


Fig. 42: Measuring Voltage Between Input Speed Sensor Connector Terminal 2 And Chassis Ground

4. Is voltage within specifications?

YES

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

NO

- Check for open or short in harness. Repair as necessary and Go to "**VERIFICATION OF VEHICLE REPAIR**" procedure.
- If signal circuit in harness is OK, Go to 5 "Check PCM/TCM" of the "Component Inspection" procedure.

POWER SUPPLY CIRCUIT INSPECTION

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

   Specification : approx. B+

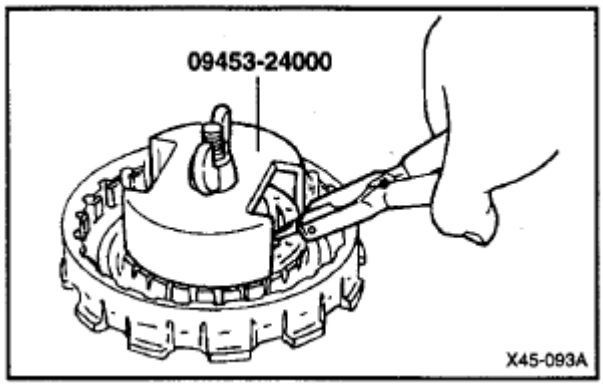


Fig. 43: Measuring Voltage Between Input Speed Sensor Connector Terminal 3 And Chassis Ground

4. Is voltage within specifications?

   YES

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

   NO

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

GROUND CIRCUIT INSPECTION

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

ground.

Specification : approx. 0 ohms

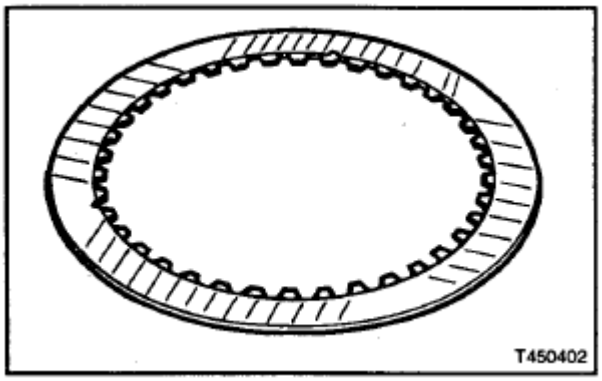


Fig. 44: Measuring Resistance Between Input Speed Sensor Connector Terminal 1 And Chassis Ground

4. Is resistance within specifications?

   YES

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

   NO

   - Check for open in harness. Repair as necessary and Go to "**VERIFICATION OF VEHICLE REPAIR**" procedure.
   - If ground circuit in harness is OK, Go to 5 "Check PCM/TCM" of the "Component Inspection" procedure.

COMPONENT INSPECTION

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

      Specification : Refer to "**REFERENCE DATA**"

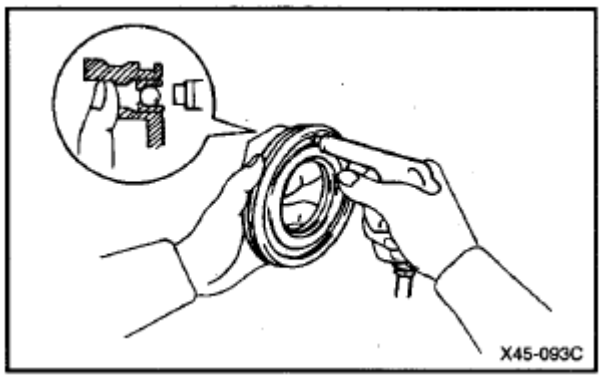


Fig. 45: Measuring Resistance Between Input Speed Sensor Connector Terminals 1 And 2

4. Is resistance within specifications?

   [REFERENCE DATA]

   REFERENCE DATA

Data	Reference Data	
Current	22 mA	
Air Gap	Input sensor	1.3mm (0.051 in)
	Output sensor	0.85mm (0.033in)
Resistance	Input sensor	Above 4 Mohms
	Output sensor	Above 4 Mohms
Voltage	High	4.8 ~ 5.2V
	Low	Below 0.8V

   YES

   - Go to 5 "Check PCM/TCM" as below.

   NO

   - Replace "INPUT SPEED SENSOR" as necessary and Go to "**VERIFICATION OF VEHICLE REPAIR**" procedure.

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

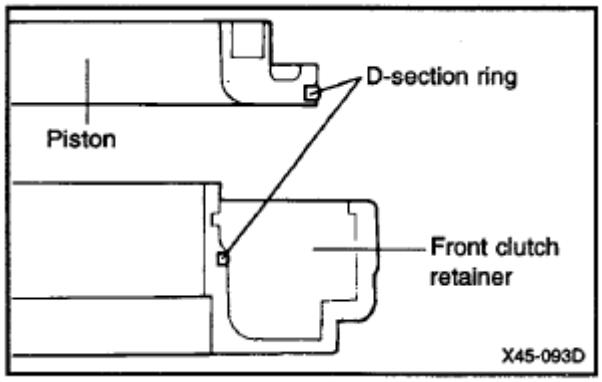


Fig. 46: Scantool Display - SIMU-SCAN

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

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

   YES

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

   NO

   - Substitute with a known-good PCM/TCM and check for proper operation. If the problem is corrected, replace PCM/TCM as necessary and then go to "**VERIFICATION OF VEHICLE REPAIR**" procedure.

VERIFICATION OF VEHICLE REPAIR

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

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

   YES

   - Go to the applicable troubleshooting procedure.

   NO

   - System performing to specification at this time.

DTC P0717 INPUT SPEED SENSOR CIRCUIT - NO SIGNAL

COMPONENT LOCATION

Refer to **DTC P0716**.

GENERAL DESCRIPTION

Refer to **DTC P0716**.

DTC DESCRIPTION

Refer to **DTC P0716**.

DTC DETECTING CONDITION

DTC DETECTING CONDITION CHART

Item	Detecting Condition	Possible cause
DTC Strategy	• Speed rationality check	• Signal circuit is open or short. • Sensor power circuit is open • Sensor ground circuit is open • Faulty INPUT SPEED SENSOR • Faulty PCM/TCM
Enable Conditions	• Battery Voltage > or = 10V • Engine speed > or = 2600rpm • Lever position : D,3,2,L • Vehicle speed > 16mph (25km/h)	
Threshold value	• Input speed = 0	
Diagnostic Time	• More than 1sec	
Fail Safe	• Locked into 3rd or 2nd gear	

SPECIFICATION

Refer to **DTC P0716**.

SIGNAL WAVEFORM

Refer to **DTC P0716**.

MONITOR SCANTOOL DATA

Refer to **DTC P0716**.

TERMINAL & CONNECTOR INSPECTION

Refer to **DTC P0716**.

SIGNAL CIRCUIT INSPECTION

Refer to **DTC P0716**.

POWER SUPPLY CIRCUIT INSPECTION

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

   Specification : approx. B+

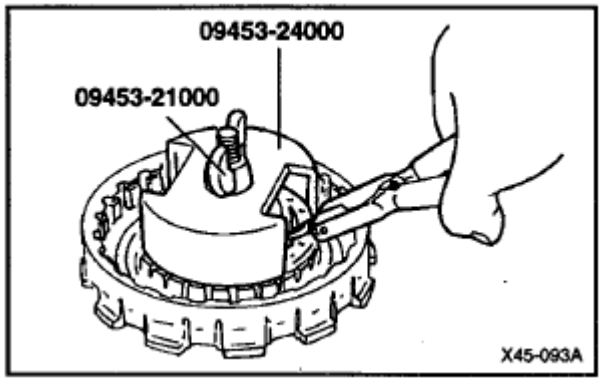


Fig. 47: Measuring Voltage Between Input Speed Sensor Connector Terminal 3 And Chassis Ground

4. Is voltage within specification?

   YES

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

   NO

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

GROUND CIRCUIT INSPECTION

Refer to **DTC P0716**.

COMPONENT INSPECTION

Refer to **DTC P0716**.

VERIFICATION OF VEHICLE REPAIR

Refer to **DTC P0716**.

DTC P0722 OUTPUT SPEED SENSOR CIRCUIT - NO SIGNAL

COMPONENT LOCATION

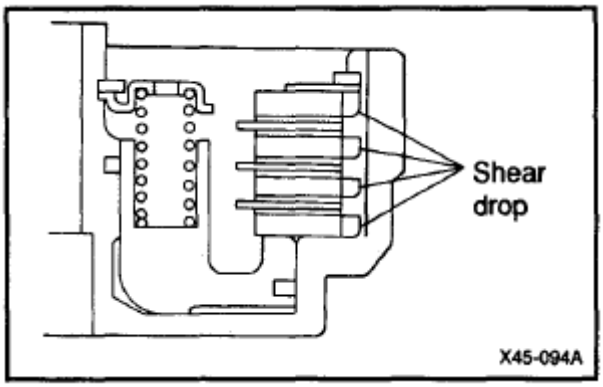


Fig. 48: Identifying Output Speed Sensor

GENERAL DESCRIPTION

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

DTC DESCRIPTION

The TCM sets this code if the calculated value of the pulse-signal is noticeably different from the value calculated, using the Vehicle Speed Sensor output, when the vehicle is running faster than 12mph (20km/h). The TCM will initiate the fail safe function if this code is detected.

DTC DETECTING CONDITION

DTC DETECTING CONDITION CHART

Item		Detecting Condition	Possible cause
DTC Strategy		• Speed rationality check	• Signal circuit is open or short • Sensor power circuit is open
Enable Conditions	**Case 1**	• Battery Voltage > or = 10V • TPS 5: 7% or current gear > or = 2 • Engine speed > or = 2600rpm • Lever position : D • State of brake : OFF • Vehicle speed > or = 20Km/h	
	Case 2	• Battery Voltage > or = 10V • Lever position : D,3,2 • State of brake : OFF	

Threshold value	**Case 1**	• Output speed = 0	• Sensor ground circuit is open • Faulty OUTPUT SPEED SENSOR • Faulty PCM
	Case 2	• Output speed = 0	
Diagnostic Time	**Case 1**	• more than 4sec	
	Case 2	• more than 4sec	
Fail Safe		• Locked into 3rd or 2nd gear • Apply an electric current to solenoid valve • Manual shifting is possible (2nd --> 3rd, 3rd --> 2nd)	

SPECIFICATION

Refer to **DTC P0716**.

SIGNAL WAVEFORM

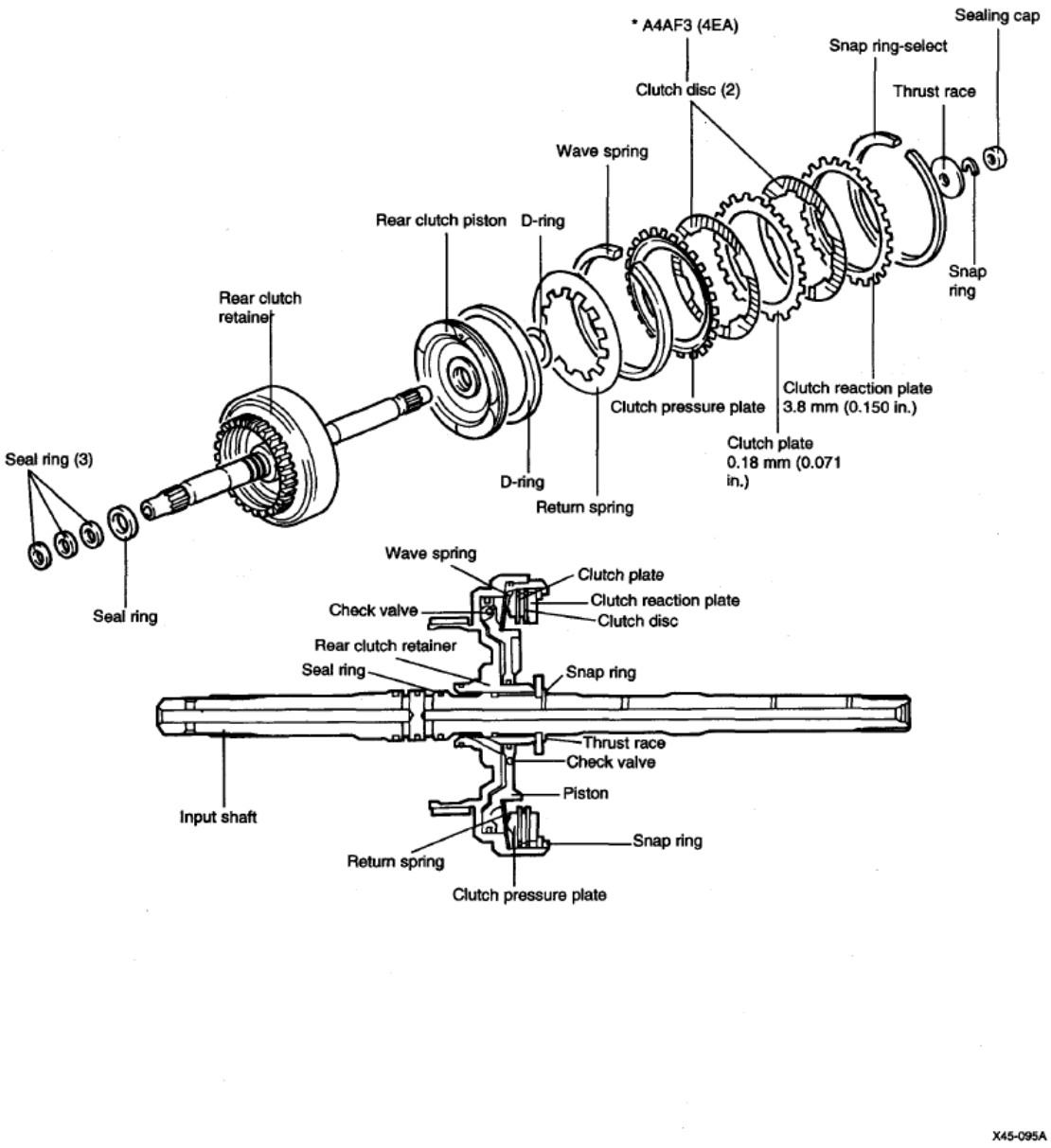


Fig. 49: Signal Waveform Graph

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

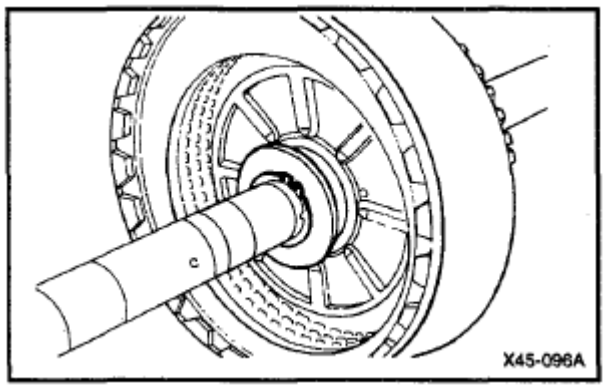


Fig. 50: Scantool Display - OUTPUT SPEED SENSOR Parameter

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

   YES

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

   NO

   - Go to "**TERMINAL & CONNECTOR INSPECTION**" procedure.

TERMINAL & CONNECTOR INSPECTION

Refer to **DTC P0716**.

SIGNAL CIRCUIT INSPECTION

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

   Specification : approx. 5V

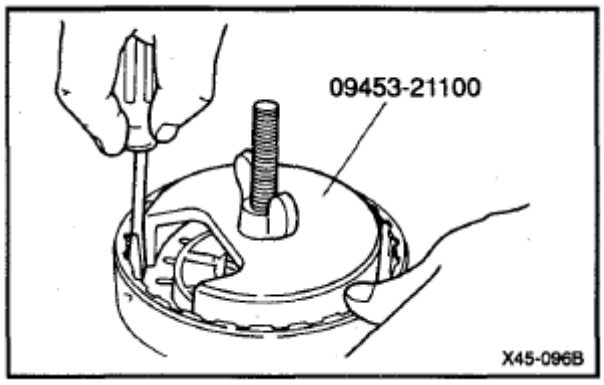


Fig. 51: Measuring Voltage Between Output Speed Sensor Connector Terminal 2 And Chassis Ground

4. Is voltage within specification?

   YES

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

   NO

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

POWER SUPPLY CIRCUIT INSPECTION

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

   Specification : approx. B+

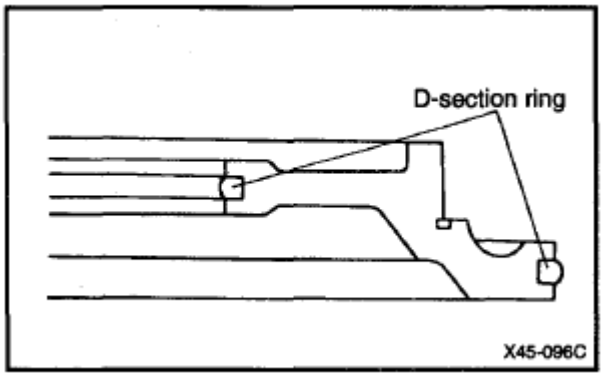


Fig. 52: Measuring Voltage Between Output Speed Sensor Connector Terminal 3 And Chassis Ground

4. Is voltage within specification?

YES

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

NO

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

GROUND CIRCUIT INSPECTION

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

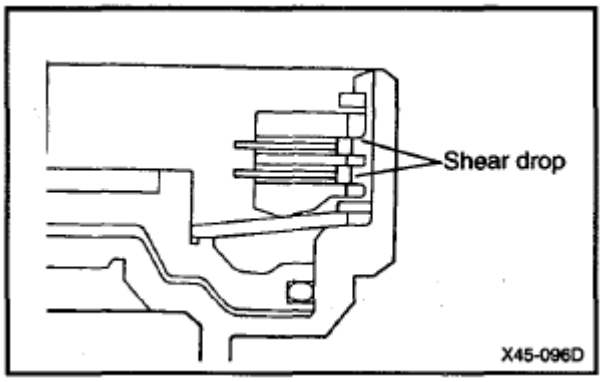


Fig. 53: Measuring Resistance Between Output Speed Sensor Connector Terminal 1 And Chassis Ground

4. Is resistance within specifications?

YES

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

NO

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

COMPONENT INSPECTION

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

       Specification : Refer to "**REFERENCE DATA**"

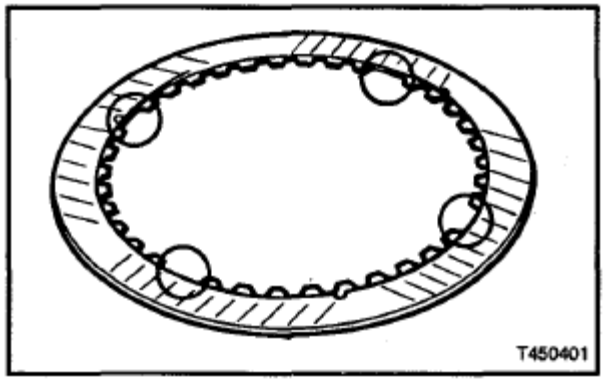


Fig. 54: Measuring Resistance Between Output Speed Sensor Connector Terminals 1 And 2

    4. Is resistance within specifications?

[REFERENCE DATA]

REFERENCE DATA

Data	Reference Data	
Current	22 mA	
Air gap	Input sensor	1.3mm (0.051 in)
	Output sensor	0.85mm (0.033in)
	1 (red) - 2 (black)	Infinite

Resistance	1 (black) -2 (red)	Approx. 3.89 Mohms
	1 (red) - 3 (black)	Approx. 6.55 Mohms
	1 (black) - 3 (red)	Approx. 5.27 Mohms
	2 (red) - 3 (black)	Approx. 17.5 Mohms
	2 (black) - 3 (red)	Infinite

YES

- Go to 2 "Check PCM/TCM" as below.

NO

- Replace "OUTPUT SPEED SENSOR" as necessary and Go to "**VERIFICATION OF VEHICLE REPAIR**" procedure.

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

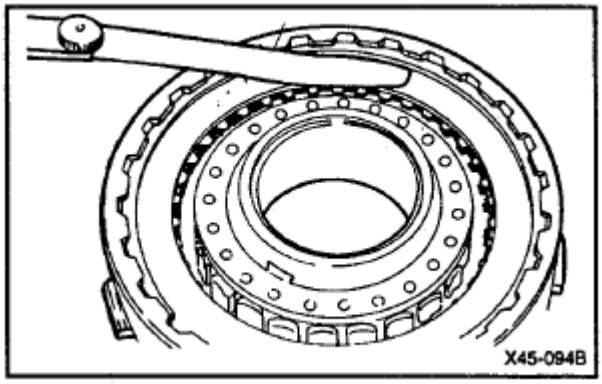


Fig. 55: Scantool Display - SIMU-SCAN

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

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

YES

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

NO

- Substitute with a known-good PCM/TCM and check for proper operation. If the problem is corrected, replace PCM/TCM as necessary and then go to "**VERIFICATION OF VEHICLE REPAIR**" procedure.

VERIFICATION OF VEHICLE REPAIR

Refer to **DTC P0716**.

DTC P0731 GEAR 1 INCORRECT RATIO

COMPONENT LOCATION

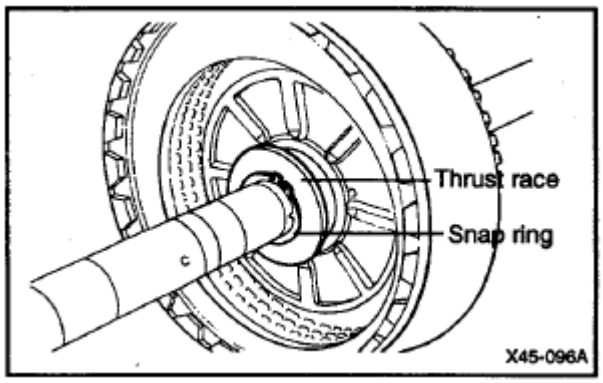


Fig. 56: Identifying UD Clutch And L/R Brake

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 2.842, then the input speed is 2,842 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	• Engine speed > 450rpm • Output speed > 200rpm • Lever position : D,3,2,L	

Conditions	• Input speed > 0rpm • A/T oil temp output > or = -10°C (14°F) • 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 brake or One way clutch
Threshold value	• | Input speed/1st gear ratio - output speed | > or = 200rpm	
Diagnostic Time	• More than 1sec	
Fail Safe	• Locked into 3rd gear. (If diagnosis code P0731 is output four times, the transaxle is locked into 3rd gear)	

SIGNAL WAVEFORM

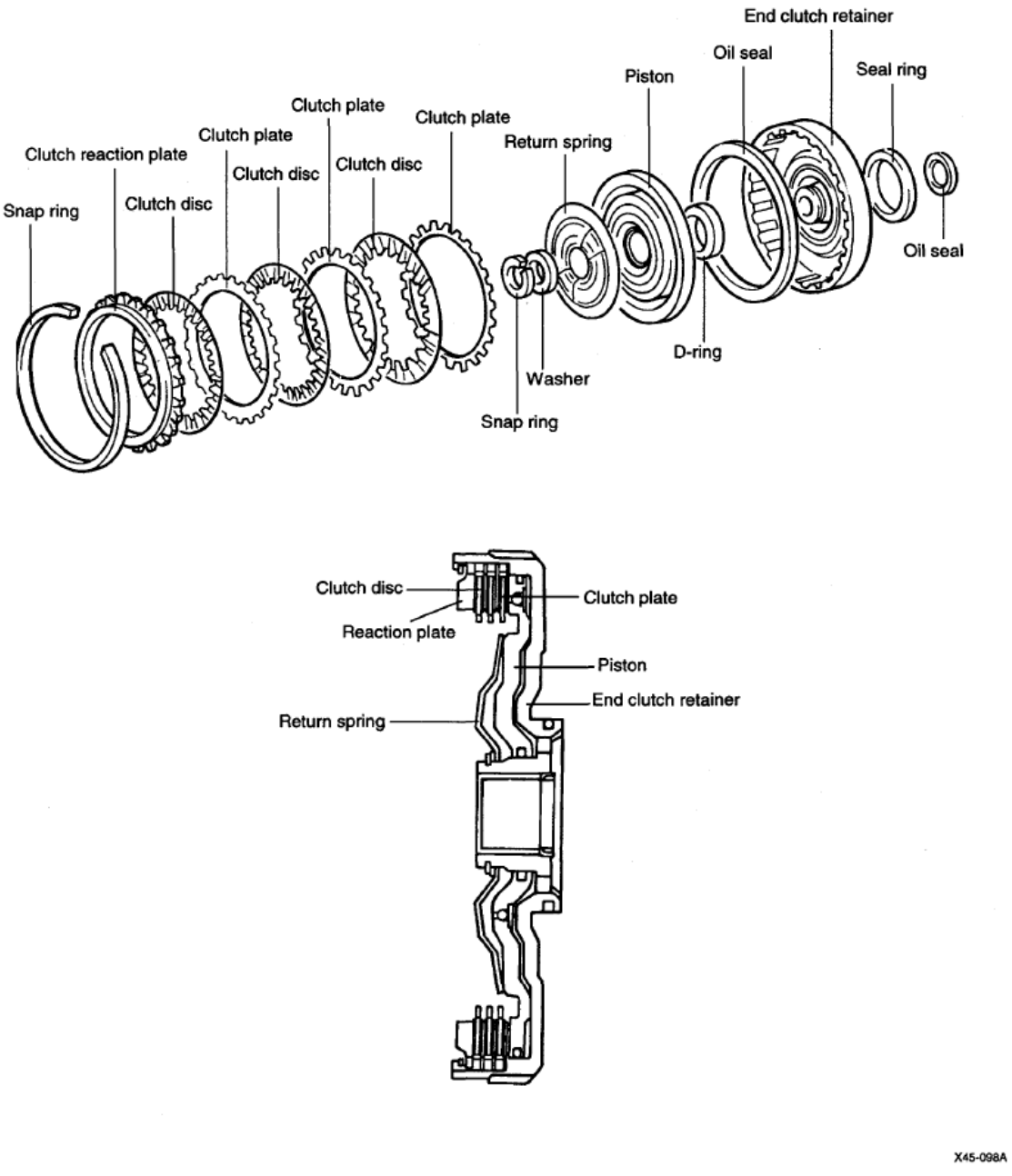


Fig. 57: Signal Waveform Graph

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 : 2000-2700 engine rpm

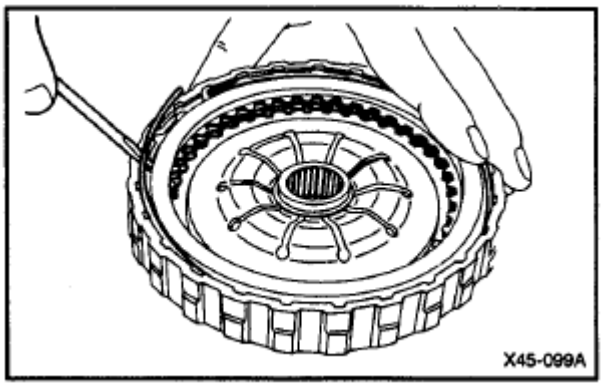


Fig. 58: Scantool Display - ENGINE SPEED

OPERATING ELEMENT OF EACH SHIFTING RANGE

OPERATING ELEMENT OF EACH SHIFTING RANGE

	UD/C	OD/C	REV/C	2-4/B	LR/B	OWC
P					•	
R			•		•	
N					•	
D1	•					•
D2	•			•		
D3	•	•				
D4		•		•		
L	•				•	•

Stall test procedure in D1 and reason

Procedure

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

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

Reason for stall test

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

5. Is "STALL TEST" within specification?

YES

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

NO

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

CAUTION:

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

SIGNAL CIRCUIT INSPECTION

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

   Specification : INPUT SPEED - (OUTPUT SPEED x 1st GEAR RATIO) < 200 RPM

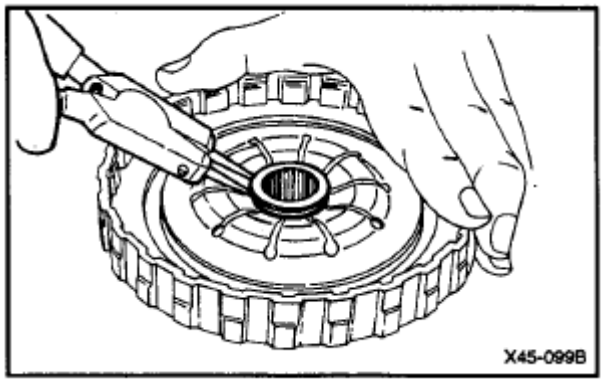


Fig. 59: Scantool Display - ENGINE SPEED

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

   YES

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

   NO

   - Check for electrical noise of circuit in INPUT & OUTPUT SPEED SENSOR or Replace INPUT & OUTPUT SPEED SENSOR. Repair as necessary and Go to "**VERIFICATION OF VEHICLE REPAIR**" procedure.

COMPONENT INSPECTION

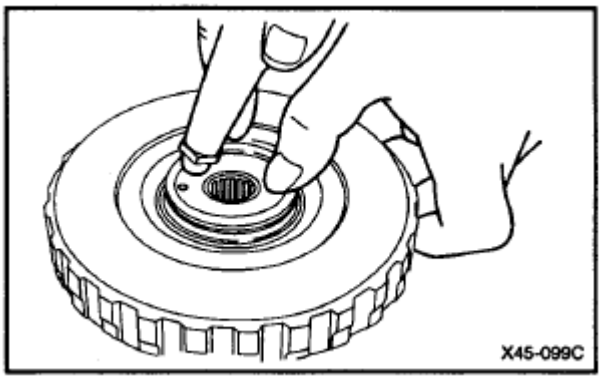


Fig. 60: Identifying Pressure Discharge Ports

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

   Specification :

STANDARD HYDRAULIC PRESSURE TABLE

STANDARD HYDRAULIC PRESSURE TABLE

No.	Shift range position	Operation					Measuring	Oil pressure (kgf/cm^2)			
		PCSV-A	PCSV-B	PCSV-C	PCSV-D	ON/OFF		LR	2/4 (2ND)	UD	OD
1	D	0	100	0	0	ON	LR	10.5±0.2	0	10.5±0.2	0
2	?	50	?	?	?	?	?	5.3±0.4	?	?	?
3	?	75	?	?	?	?	?	1.0±0.3	?	?	?
4	?	100	?	?	?	?	?	0	?	?	?
5	?	?	0	?	100	OFF	2/4 (2ND)	0	10.5±0.2	?	?
6	?	?	50	?	?	?	?	?	5.3±0.4	?	?
7	?	?	75	?	?	?	?	?	0.9±0.3	?	?
8	?	?	100	?	?	?	?	?	0	?	?
9	?	0	?	?	?	?	OD	?	?	?	10.5±0.2
10	?	50	?	?	?	?	?	?	?	?	5.6±0.4
11	?	75	?	?	?	?	?	?	?	?	1.0±0.3
12	?	100	?	?	?	?	?	?	?	?	0
13	?	?	?	0	0	?	UD	?	?	10.5±0.2	?
14	?	?	?	50	?	?	?	?	?	5.6±0.4	?
15	?	?	?	75	?	?	?	?	?	1.0±0.3	?
16	?	0	?	100	?	?	?	?	?	0	?
17	R	?	0	?	?	ON	REV	17.7±0.8	?	?	?
18	?	?	50	?	?	↑	?	?	?	?	?
19	?	?	75	?	?	?	?	?	?	?	?
20	?	?	100	?	?	?	?	?	?	?	?

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

5. Is oil pressure value within specifications?

YES

- Repair AUTO TRANSAXLE (Clutch or Brake) as necessary and Go to "**VERIFICATION OF VEHICLE REPAIR**" procedure.

NO

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

VERIFICATION OF VEHICLE REPAIR

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

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

YES

- Go to the applicable troubleshooting procedure.

NO

- System performing to specification at this time.

DTC P0732 GEAR 2 INCORRECT RATIO

COMPONENT LOCATION

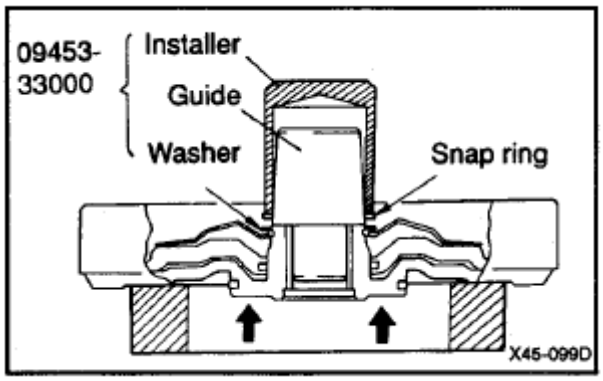


Fig. 61: Identifying UD Clutch And 2nd Clutch

GENERAL DESCRIPTION

The value of the input shaft speed should be equal to the value of the output shaft speed, when multiplied by the 2nd gear ratio, while the transaxle is engaged in the 2nd gear. For example, if the output speed is 1000 rpm and the 2nd gear ratio is 1.529, then the input speed is 1,592 rpm.

DTC DESCRIPTION

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

DTC DETECTING CONDITION

DTC DETECTING CONDITION CHART

Item	Detecting Condition	Possible cause

DTC Strategy	• 2nd gear incorrect ratio	• Faulty input speed sensor • Faulty output speed sensor • Faulty UD clutch or 2-4 brake
Enable Conditions	• Engine speed > 450rpm • Output speed > 500rpm • Lever position : D,3,2 • Input speed > 0rpm • A/T oil temp output > or = -10°C (14°F) • 11V < Battery Voltage < or = 16V • TRANSAXLE RANGE SWITCH is normal and after 2sec is passed from IG ON	
Threshold value	• | Input speed/2nd gear ratio - output speed | > or = 200rpm	
Diagnostic Time	• More than 1sec	
Fail Safe	• Locked into 3rd gear. (If diagnosis code P0732 is output four times, the transaxle is locked into 3rd gear)	

SIGNAL WAVEFORM

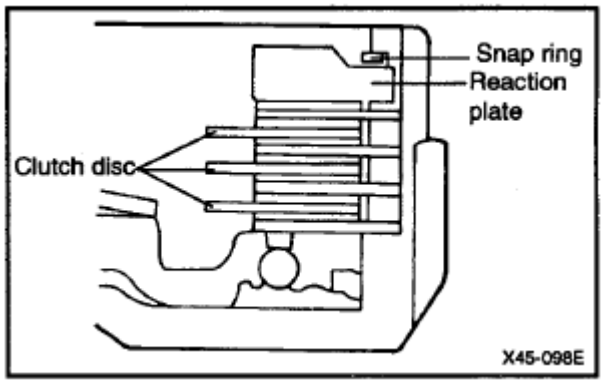


Fig. 62: Signal Waveform Graph

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 : 2000~2700 engine rpm

   * This test is possible only for "HOLD S/W" or "SPORTS MODE" applied vehicles.

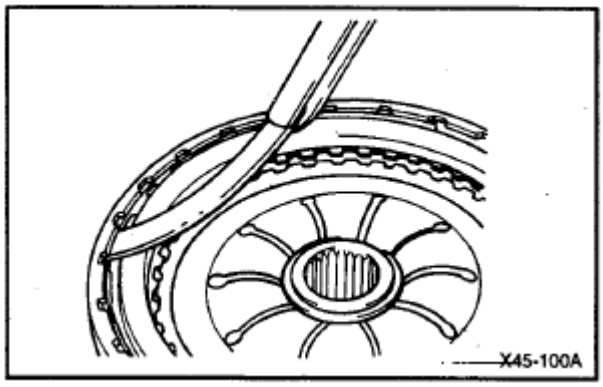


Fig. 63: Scantool Display - ENGINE SPEED

OPERATING ELEMENT OF EACH SHIFTING RANGE

	UD/C	OD/C	REV/C	2-4/B	LR/B	OWC
P					•	
R			•		•	
N					•	
D1	•					•
D2	•			•		
D3	•	•				
D4		•		•		
L	•				•	•

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 BRAKE can be detected by stall test in D2.

   Reason for stall test

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

YES

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

NO

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

CAUTION:

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

SIGNAL CIRCUIT INSPECTION

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

   Specification : INPUT SPEED - (OUTPUT SPEED x 2nd GEAR RATIO) < or = 200 RPM

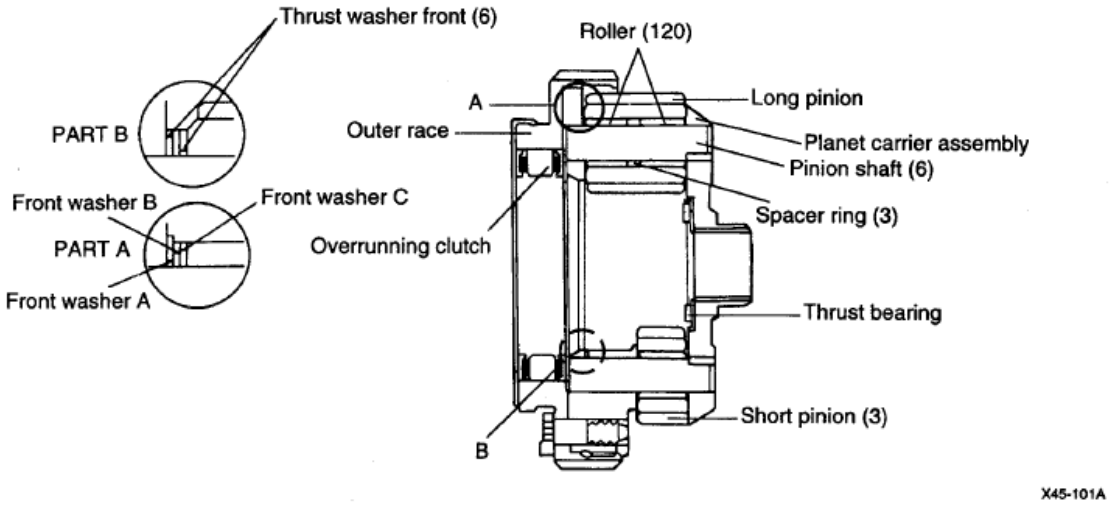


Fig. 64: Scantool Display - ENGINE SPEED

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

   YES

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

   NO

   - Check for electrical noise of circuit in INPUT & OUTPUT SPEED SENSOR or Replace INPUT & OUTPUT SPEED SENSOR. Repair as necessary and Go to "**VERIFICATION OF VEHICLE REPAIR**" procedure.

COMPONENT INSPECTION

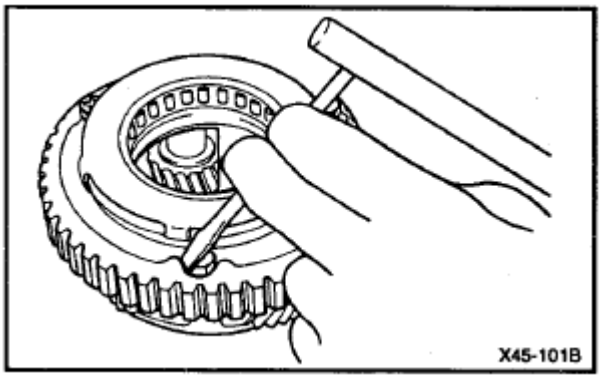


Fig. 65: Identifying Pressure Discharge Ports

1. Connect oil pressure gauge to "UD" and "2-4/B" port.
2. Engine "ON".
3. Drive a car with gear position 2 in "SPORTS MODE".

4. Compare it with reference data as below.

   Specification :

   STANDARD HYDRAULIC PRESSURE TABLE

STANDARD HYDRAULIC PRESSURE TABLE

No.	Shift range position	Operation					Measuring	Oil pressure (kgf/cm^2)				
		PCSV-A	PCSV-B	PCSV-C	PCSV-D	ON/OFF		LR	2/4 (2ND)	UD	OD	
1	D	0	100	0	0	ON	LR	10.5±0.2	0	10.5±0.2	0	
2	?	50	?	?	?	?	?	5.3±0.4	?	?	?	
3	?	75	?	?	?	?	?	1.0±0.3	?	?	?	
4	?	100	?	?	?	?	I	0	?	?	?	
5	?	?	0	?	100	OFF	2/4 (2ND)	0	10.5±0.2	?	?	
6	?	?	50	?	?	?	?	?	5.3±0.4	?	?	
7	r	?	75	?	?	?	?	?	0.9±0.3	?	?	
8	?	?	100	?	?	?	?	?	0	?	?	
9	?	0	?	?	?	?	OD	?	?	?	10.5±0.2	
10	?	50	?	?	?	?	?	?	?	?	5.6±0.4	
11	?	75	?	?	?	?	?	?	?	?	1.0±0.3	
12	?	100	?	?	?	?	?	?	?	?	0	
13	?	?	?	0	0	?	UD	?	?	10.5±0.2	?	
14	?	?	?	50	?	?	?	?	?	5.6±0.4	?	
15	?	?	?	75	?	?	?	?	?	1.0±0.3	?	
16	?	0	?	100	?	?	?	?	?	0	?	
17	R	?	0	?	?	ON	REV	17.7±0.8	?	?	?	17
18	?	?	50	?	?	?	?	?	?	?	?	8.
19	?	?	75	?	?	?	?	?	?	?	?	0.
20	?	?	100	?	?	?	?	?	?	?	?	

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

5. Is oil pressure value within specifications?

   YES

   - Repair AUTO TRANSAXLE (Clutch or Brake) as necessary and Go to "**VERIFICATION OF VEHICLE REPAIR**" procedure.

   NO

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

VERIFICATION OF VEHICLE REPAIR

Refer to **DTC P0731**.

DTC P0733 GEAR 3 INCORRECT RATIO

COMPONENT LOCATION

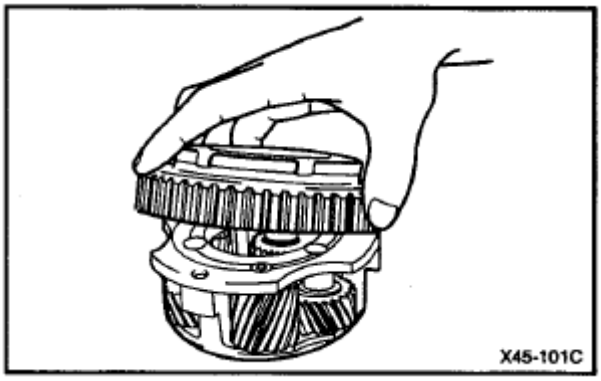


Fig. 66: Identifying UD Clutch And OD Clutch

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 1.000, then the input speed is 1,000 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	• Faulty input speed sensor • Faulty output speed sensor
Enable Conditions	• Engine speed > 450rpm • Output speed > 900rpm • Lever position : D,3 • A/Toil temp output > or = -10°C (14°F) • 11V < Battery Voltage < or = 16V • TRANSAXLE RANGE SWITCH is normal and after 2sec is passed from IG ON	

Threshold value	• | Input speed/3rd gear ratio - output speed | > or = 200rpm	• Faulty UD clutch or OD clutch
Diagnostic Time	• More than 1sec	
Fail Safe	• Locked into 3rd gear. (If diagnosis code P0733 is output four times, the transaxle is locked into 3rd gear)	

SIGNAL WAVEFORM

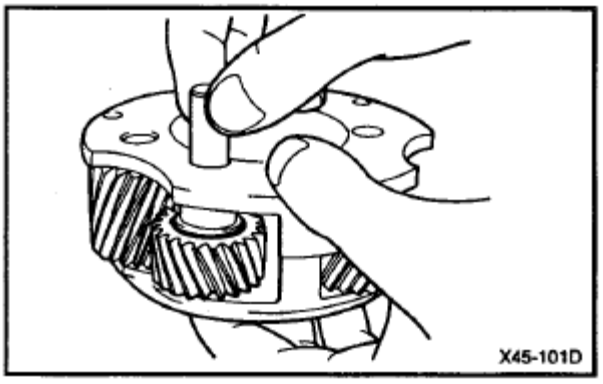


Fig. 67: Signal Waveform Graph

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 : 2000~2700 engine rpm

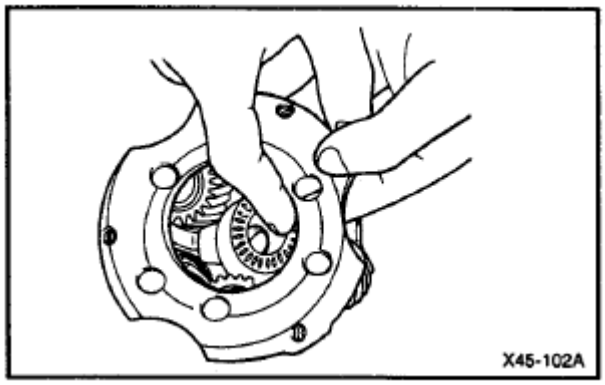


Fig. 68: Scantool Display - ENGINE SPEED

OPERATING ELEMENT OF EACH SHIFTING RANGE

OPERATING ELEMENT OF EACH SHIFTING RANGE

	UD/C	OD/C	REV/C	2-4/B	LR/B	OWC
P					•	
R			•		•	
N					•	
D1	•					•
D2	•			•		
D3	•	•				
D4		•		•		
L	•				•	•

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 OD clutch can be detected by stall test in D3.

Reason for stall test

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

5. Is "STALL TEST" within specification?

YES

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

NO

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

CAUTION:
1. **Do not let anybody stand in front of or behind the vehicle while this test is being carried out.**
2. **Check the A/T fluid level and temperature and the engine**

coolant temperature.

- **Fluid level: At the hot mark on the oil level gauge.**
- **Fluid temperature : 176 °F~212 °F (80~100 °C).**
- **Engine coolant temperature : 176 °F~212 °F (80~100 °C).**

3. **Chock both rear wheel (left and right).**
4. **Pull the parking brake lever on with the brake pedal fully depressed.**
5. **The throttle should not be left fully open for more than eight second.**
6. **If carrying out the stall test two or more time, move the select lever to the "N" position and run the engine at 1,000 rpm to let the A/T fluid cool down before carrying out subsequent.**

SIGNAL CIRCUIT INSPECTION

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

   Specification : INPUT SPEED - (OUTPUT SPEED x 3rd GEAR RATIO) < or = 200 RPM

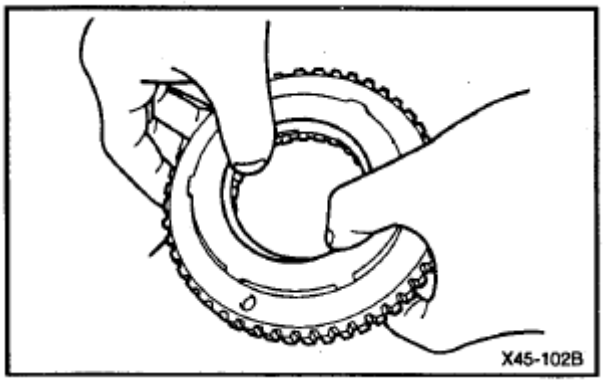


Fig. 69: Scantool Display - ENGINE SPEED

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

   YES

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

   NO

   - Check for electrical noise of circuit in INPUT & OUTPUT SPEED SENSOR or Replace INPUT &

OUTPUT SPEED SENSOR. Repair as necessary and Go to "**VERIFICATION OF VEHICLE REPAIR**" procedure.

COMPONENT INSPECTION

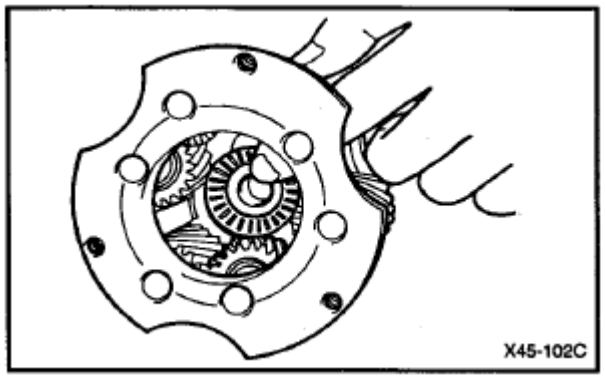


Fig. 70: Identifying Pressure Discharge Ports

1. Connect oil pressure gauge to "UD" and "OD" port.
2. Engine "ON".
3. Disconnect the solenoid valve connector.
4. Drive a car with gear position 3 in fail mode.
5. Compare it with reference data as below.

Specification : Refer to the "**STANDARD HYDRAULIC PRESSURE TABLE**"

STANDARD HYDRAULIC PRESSURE TABLE

STANDARD HYDRAULIC PRESSURE TABLE

No.	Shift range position	Operation					Measuring	Oil pressure (kgf/cm^2)			
		PCSV-A	PCSV-B	PCSV-C	PCSV-D	ON/OFF		LR	2/4 (2ND)	UD	OD
1	D	0	100	0	0	ON	LR	10.5±0.2	0	10.5±0.2	0
2	?	50	?	?	?	?	?	5.3±0.4	?	?	?
3	?	75	?	?	?	?	?	1.0±0.3	?	?	?
4	?	100	?	?	?	?	?	0	?	?	?
5	?	?	0	?	100	OFF	2/4 (2ND)	0	10.5±0.2	?	?
6	?	?	50	?	?	?	?	?	5.3±0.4	?	?
7	?	?	75	?	?	?	?	?	0.9±0.3	?	?
8	?	?	100	?	?	?	?	?	0	?	?
9	?	0	?	?	?	?	OD	?	?	?	10.5±0.2
10	?	50	?	?	?	?	?	?	?	?	5.6±0.4
11	?	75	?	?	?	?	?	?	?	?	1.0±0.3
12	?	100	?	?	?	?	?	?	?	?	0

13	?	?	?	0	0	?	UD	?	?	10.5±0.2	?
14	?	?	?	50	?	?	?	?	?	5.6±0.4	?
15	?	?	?	75	?	?	?	?	?	1.0±0.3	?
16	?	0	?	100	?	?	?	?	?	0	?
17	R	?	0	?	?	ON	REV	17.7±0.8	?	?	?
18	?	?	50	?	?	↑	?	?	?	?	?
19	?	?	75	?	?	?	?	?	?	?	?
20	?	?	100	?	?	?	?	?	?	?	?
* The values are subject to change according to vehicle model or condition.											

6. Is oil pressure value within specifications?

YES

- Repair AUTO TRANSAXLE (Clutch or Brake) as necessary and Go to "**VERIFICATION OF VEHICLE REPAIR**" procedure.

NO

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

VERIFICATION OF VEHICLE REPAIR

Refer to **DTC P0731**.

DTC P0734 GEAR 4 INCORRECT RATIO

COMPONENT LOCATION

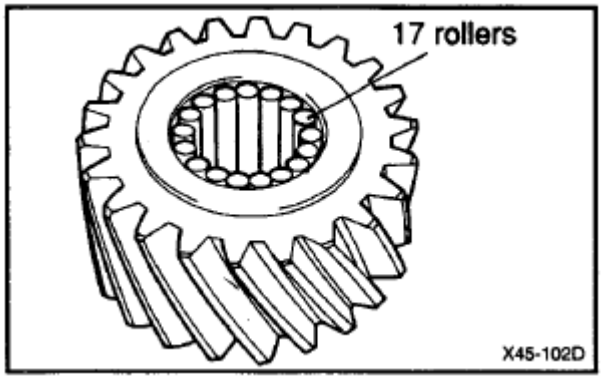


Fig. 71: Identifying UD Clutch And 2nd Brake

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 0.712, then the input speed is 712 rpm.

DTC DESCRIPTION

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

DTC DETECTING CONDITION

DTC DETECTING CONDITION CHART

Item	Detecting Condition	Possible cause
DTC Strategy	• 4th gear incorrect ratio	• Faulty input speed sensor • Faulty output speed sensor • Faulty UD clutch or 2nd brake
Enable Conditions	• Engine speed > 450rpm • Output speed > 900rpm • Lever position : D • Input speed > 300rpm • A/T oil temp output > or = -10°C (14°F) • TRANSAXLE RANGE SWITCH is normal and above 2sec is passed from IG ON	
Threshold value	• | Input speed/4th gear ratio - output speed | > or = 200rpm	
Diagnostic Time	• More than 1sec	
Fail Safe	• Locked into 3rd gear. (If diagnosis code P0734 is output four times, the transaxle is locked into 3rd gear)	

SIGNAL WAVEFORM

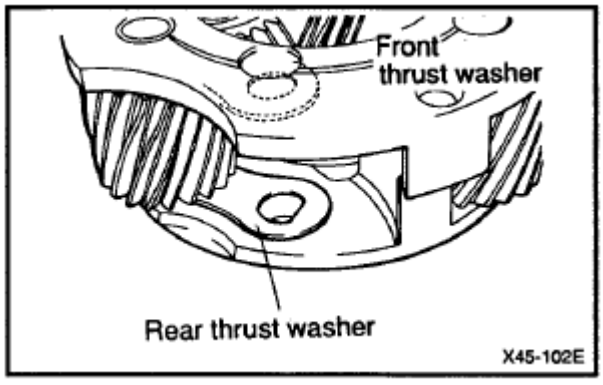


Fig. 72: Signal Waveform Graph

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 4th GEAR RATIO) < or = 200 RPM

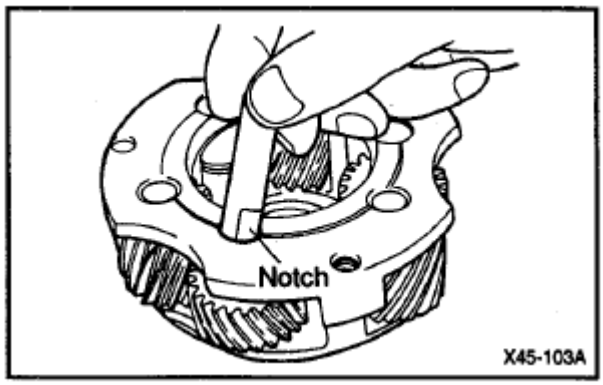


Fig. 73: Scantool Display - ENGINE SPEED

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

   YES

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

   NO

   - Check for electrical noise of circuit in INPUT & OUTPUT SPEED SENSOR or Replace INPUT & OUTPUT SPEED SENSOR. Repair as necessary and Go to "**VERIFICATION OF VEHICLE REPAIR**" procedure.

COMPONENT INSPECTION

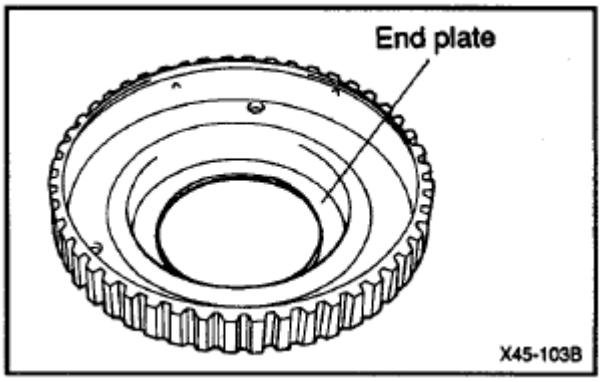


Fig. 74: Identifying UD Clutch And 2nd Clutch

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

   Specification : Refer to the "**STANDARD HYDRAULIC PRESSURE TABLE**"

   STANDARD HYDRAULIC PRESSURE TABLE

   STANDARD HYDRAULIC PRESSURE TABLE

No.	Shift range position	Operation					Measuring	Oil pressure (kgf/cm^2)				
		PCSV-A	PCSV-B	PCSV-C	PCSV-D	ON/OFF		LR	2/4 (2ND)	UD	OD	
1	D	0	100	0	0	ON	LR	10.5±0.2	0	10.5±0.2	0	
2	?	50	?	?	?	?	?	5.3±0.4	?	?	?	
3	?	75	?	?	?	?	?	1.0±0.3	?	?	?	
4	?	100	?	?	?	?	?	0	?	?	?	
5	?	?	0	?	100	OFF	2/4 (2ND)	0	10.5±0.2	?	?	
6	?	?	50	?	?	?	?	?	5.3±0.4	?	?	
7	?	?	75	?	?	?	?	?	0.9±0.3	?	?	
8	?	?	100	?	?	?	?	?	0	?	?	
9	?	0	?	?	?	?	OD	?	?	?	10.5±0.2	
10	?	50	?	?	?	?	?	?	?	?	5.6±0.4	
11	?	75	?	?	?	?	?	?	?	?	1.0±0.3	
12	?	100	?	?	?	?	?	?	?	?	0	
13	?	?	?	0	0	?	UD	?	?	10.5±0.2	?	
14	?	?	?	50	?	?	?	?	?	5.6±0.4	?	
15	r	?	?	75	?	?	?	?	?	1.0±0.3	?	
16	?	0	?	100	?	?	?	?	?	0	?	
17	R	?	0	?	?	ON	REV	17.7±0.8	?	?	?	17
18	?	?	50	?	?	?	?	?	?	?	?	8
19	?	?	75	?	?	?	?	?	?	?	?	0
20	?	?	100	?	?	?	?	?	?	?	?	

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

5. Is oil pressure value within specifications?

   YES

   - Repair AUTO TRANSAXLE (Clutch or Brake) as necessary and Go to "**VERIFICATION OF VEHICLE REPAIR**" procedure.

NO

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

VERIFICATION OF VEHICLE REPAIR

Refer to **DTC P0731**.

DTC P0741 TORQUE CONVERTER CLUTCH CIRCUIT - STUCK OFF

COMPONENT LOCATION

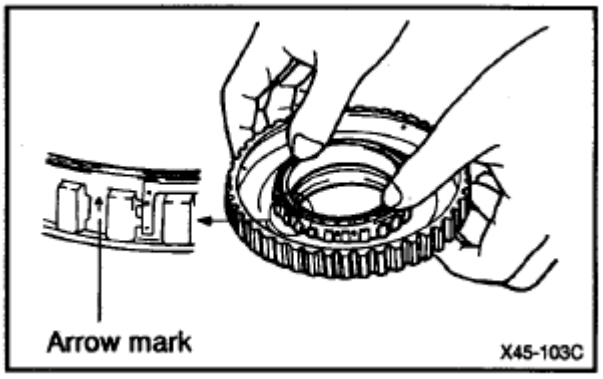


Fig. 75: Identifying Torque Converter Clutch

GENERAL DESCRIPTION

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

DTC DESCRIPTION

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

DTC DETECTING CONDITION

DTC DETECTING CONDITION CHART

Item	Detecting Condition	Possible cause
DTC Strategy	• Stuck "OFF"	* TORQUE CONVERTER (DAMPER) CLUTCH : TCC • Faulty TCC or oil pressure system • Faulty TCC solenoid valve • Faulty body control valve • Faulty PCM/TCM
Enable Conditions	• Duty of Damper clutch solenoid valve = 100%	
Threshold value	• Detect the Lock-up clutch control duty = 100% for 2sec	
Diagnostic Time	• More than 2 times	
Fail Safe	• Damper clutch abnormal system (If diagnosis code P0741 is output four times, TORQUE CONVERTER (DAMPER) CLUTCH is not controlled by PCM/TCM)	

MONITOR SCANTOOL DATA

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

   Specification : TCC SOL. DUTY > 30% (In that condition TCC SLIP< 100RPM)

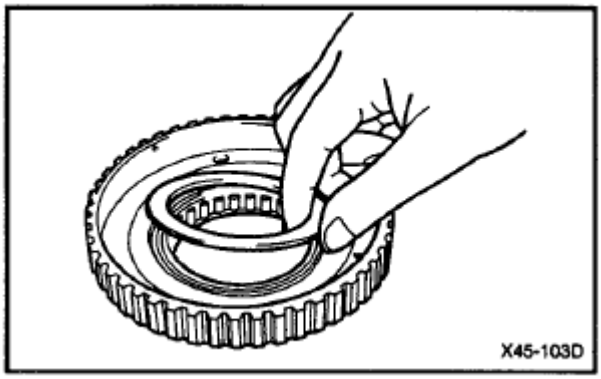


Fig. 76: Scantool Display - TORQUE CONVERTER (DAMPER) CLUTCH Parameter

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

   YES

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

   NO

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

COMPONENT INSPECTION

1. CHECK TORQUE CONVERTER CLUTCH SOLENOID VALVE
    1. Connect scantool to data link connector (DLC).
    2. Ignition "ON" & Engine "OFF".
    3. Select A/T solenoid valve actuator test and operate actuator test.
    4. Is Actuator Testing performed normally?

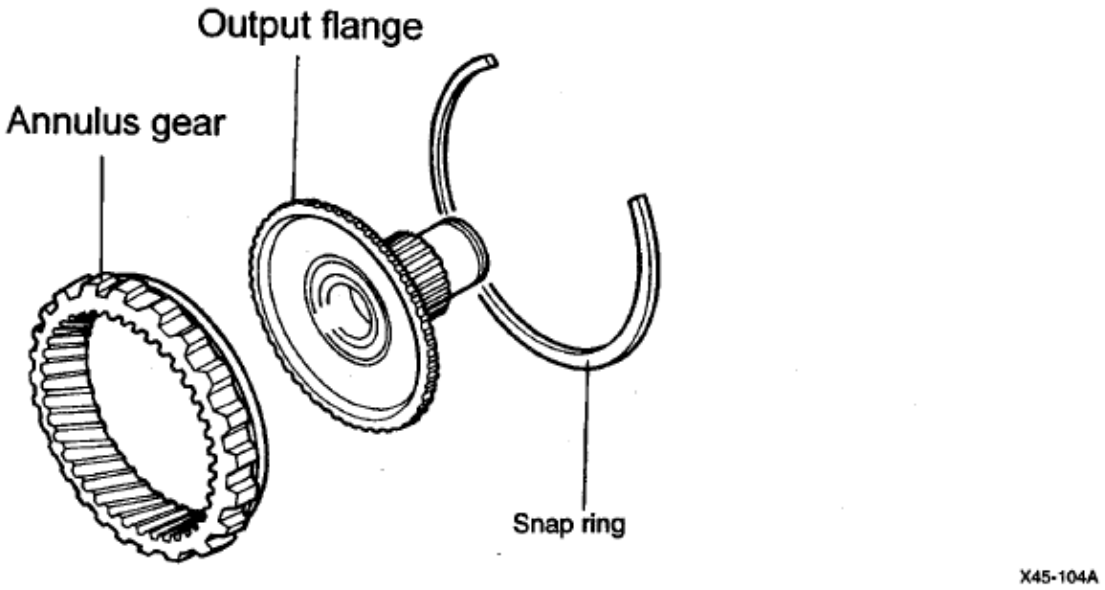


Fig. 77: Scantool Display - ACTUATION TEST

YES

- Go to 2 "Check OIL PRESSURE" as below.

NO

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

2. CHECK OIL PRESSURE

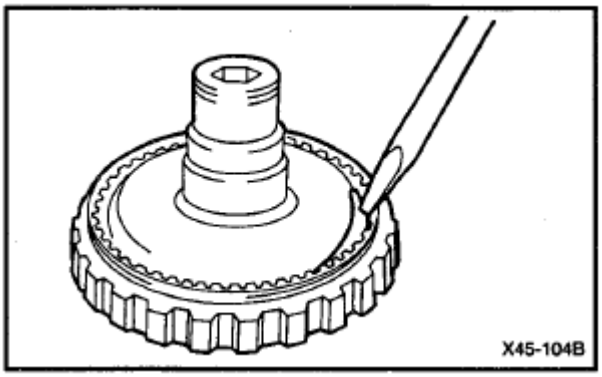


Fig. 78: Identifying DA, UD And LR Ports

1. Connect oil pressure gauge to "DA" port.
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 4tf gear and operate the "TCC SOLENOID VALVE DUTY" more than 35%.

   Specification : Above 2.0~4.6kg/cm^2 (196~451 kpa, 28.4~65.4psi) (Engine Speed : 2500rpm, DCC sol Duty : 50%)

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 (possible to 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 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 in value between engine speed and turbine speed). If a very small amount of slip rpm is maintained though the TCM applies 0% duty ratio value, then the TCM determines that the Torque Converter Clutch is stuck ON and sets this code.

DTC DETECTING CONDITION

DTC DETECTING CONDITION CHART

Item	Detecting Condition	Possible cause
DTC Strategy	• Stuck "ON"	* TORQUE CONVERTER (DAMPER) CLUTCH : TCC • Faulty TCC or oil pressure system • Faulty TCC solenoid valve • Faulty body control valve • Faulty TCM (PCM)
Enable Conditions	• Throttle position > 20% • Output speed > 1000 rpm • Engine speed > 0rpm • A/T range switch D,3 • The time after the last shift was finished > 3secs • Duty of Damper clutch solenoid valve = 0% • ATF temperature > -10°C (14°F)	
Threshold value	• | Engine rpm - Input speed sensor rpm | < or = 5 rpm	
Diagnostic Time	• More than 3 seconds	
Fail Safe	• Damper clutch abnormal system (If diagnosis code P0741 is output four times, TORQUE CONVERTER (DAMPER) CLUTCH is not controlled by PCM/TCM)	

MONITOR SCANTOOL DATA

1. Connect scantool to data link connector (DLC).
2. Engine "ON".

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

   Specification : TCC SLIP > 5RPM

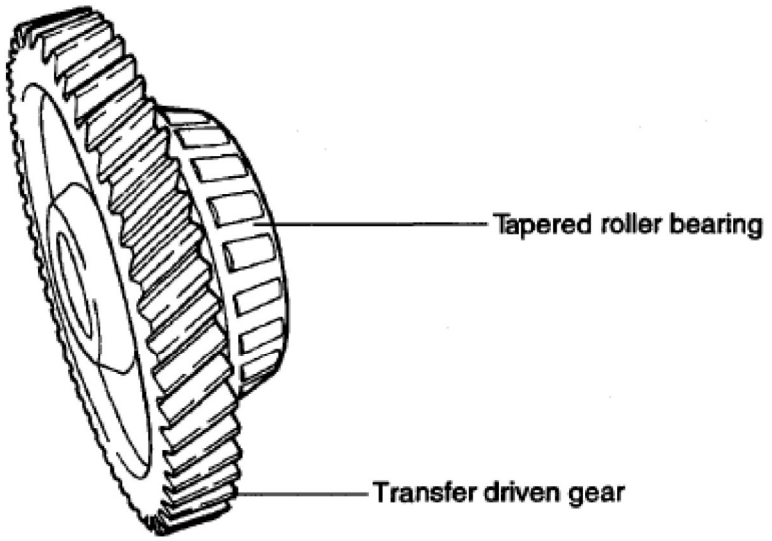


Fig. 79: Scantool Display - TORQUE CONVERTER (DAMPER) CLUTCH Parameter

5. Is TCC SLIP within specifications?

   YES

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

   NO

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

COMPONENT INSPECTION

1. CHECK TORQUE CONVERTER CLUTCH SOLENOID VALVE
   1. Connect scantool to data link connector (DLC).
   2. Ignition "ON" & Engine "OFF".
   3. Select A/T solenoid valve actuator test and operate actuator test.
   4. Is Actuator Testing performed normally?

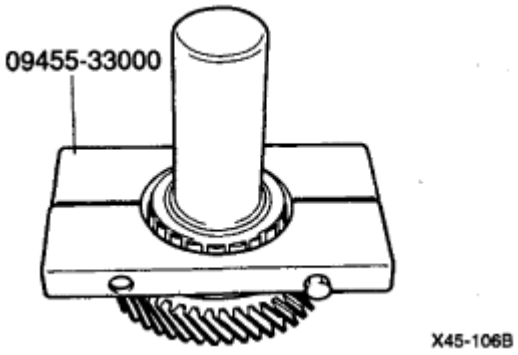


Fig. 80: Scantool Display - ACTUATION TEST

YES

- Go to 2 "Check OIL PRESSURE" as below.

NO

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

2. CHECK OIL PRESSURE

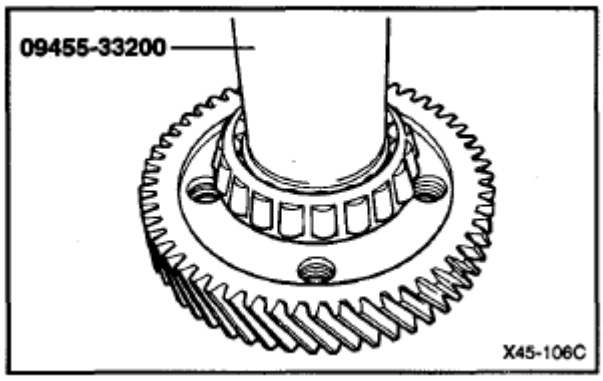


Fig. 81: Identifying DR Port

1. Connect oil pressure gauge to "DR" port.
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. Above 5.1~7.1 kg/cm^2 (500~696kpa, 72.5~100.99psi)

6. Is oil pressure value within specification?

YES

- Repair TORQUE CONVERTER CLUTCH (REPLACE Torque Converter) as necessary and go to "**VERIFICATION OF VEHICLE REPAIR**" procedure.

NO

- Replace A/T assembly (possible to BODY CONTROL VALVE faulty) as necessary and Go to "**VERIFICATION OF VEHICLE REPAIR**" procedure.

VERIFICATION OF VEHICLE REPAIR

Refer to **DTC P0741**.

DTC P0743 TORQUE CONVERTER CLUTCH CIRCUIT - ELECTRICAL

COMPONENT LOCATION

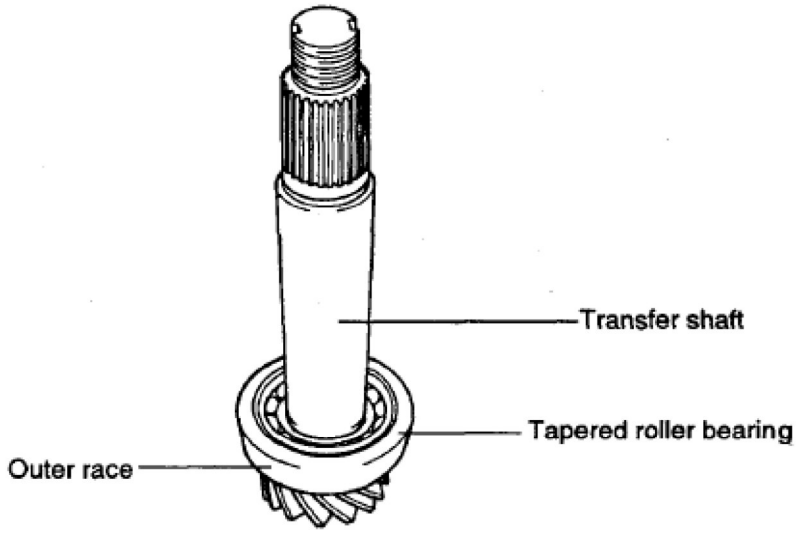


Fig. 82: Identifying PCSV-A, PCSV-B, PCSV-C And PCSV-D

GENERAL DESCRIPTION

Refer to **DTC P0741**.

DTC DESCRIPTION

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

DTC DETECTING CONDITION

DTC DETECTING CONDITION CHART

Item		Detecting Condition	Possible cause
DTC Strategy		• Check voltage range	* TORQUE CONVERTER (DAMPER) CLUTCH : TCC • Open or short in circuit • Faulty TCC SOLENOID VALVE • Faulty PCM/TCM
Enable Conditions	**Case 1**	• Solenoid status = open	
	Case 2	• Solenoid status = open • time after TCM turns "ON" = 0.5sec	
Threshold value	**Case 1**	• Feed back voltage < 5.5V	
	Case 2	• Feed back voltage > Battery voltage-1	
Diagnostic Time		• more than 1sec	
Fail Safe		• Locked in 3 rd gear	

SPECIFICATION

Solenoid Valve for Pressure Control

- Sensor type : Normal open 3-way
- Operating temperature : -30°C~130°C (-22~266°F)
- Frequency :
  - PCSV-A,B,C,D : 50Hz (at the ATF temp. -20°C above)
  - VFS : 400-1000

    * KM series : 35Hz
- Internal resistance:
  - Internal resistance : 3.5 ± 0.2ohms (20°C or 68°F)
- Surge voltage : 56 V

SIGNAL WAVEFORM

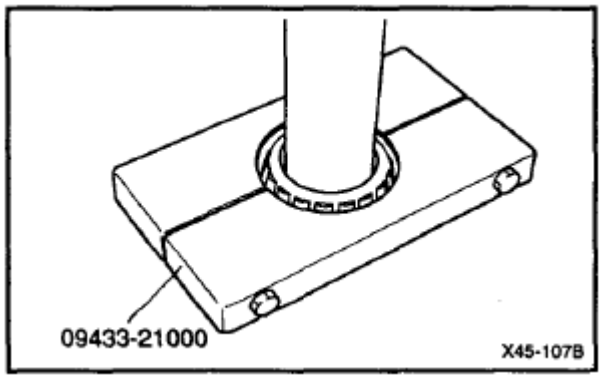


Fig. 83: Signal Waveform Graph

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 35%.

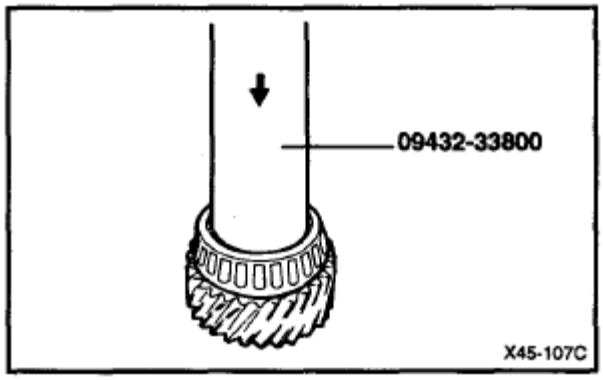


Fig. 84: Scantool Display - TCC SOL. VALVE Parameter

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

YES

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

NO

- Go to "**TERMINAL & CONNECTOR INSPECTION**" procedure.

TERMINAL & CONNECTOR INSPECTION

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

   YES

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

   NO

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

POWER SUPPLY CIRCUIT INSPECTION

1. Connect "A/T SOLENOID VALVE" connector and install device for measuring wave form.
2. Turn on the engine and operate damper clutch.
3. Measure wave form between terminal "4" of the sensor harness connector and chassis ground.

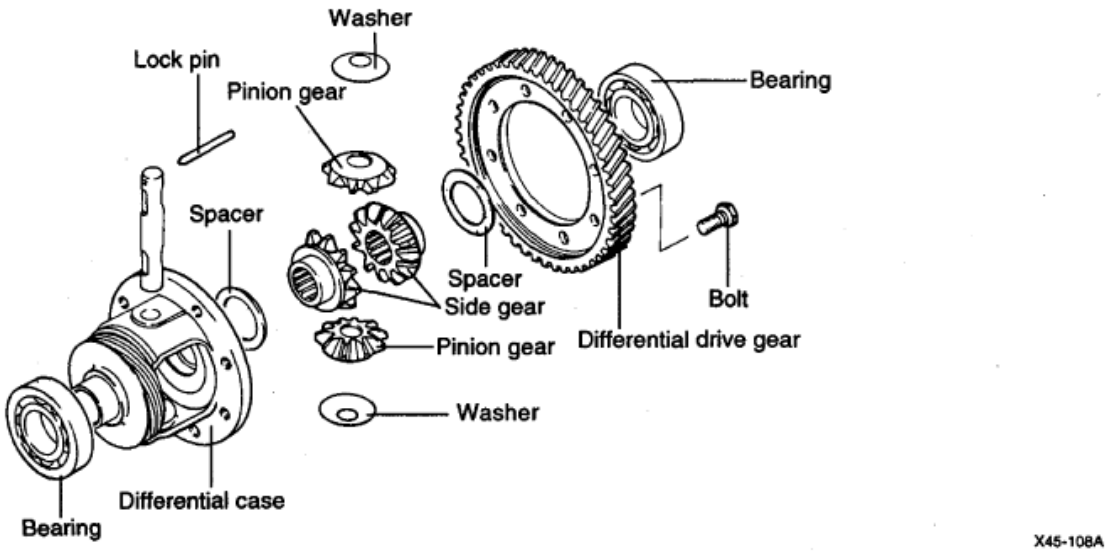


Fig. 85: Measuring Waveform Between Terminal 4 Of Sensor Connector And Chassis Ground

4. Is measured normally operating wave form?

   YES

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

NO

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

SIGNAL CIRCUIT INSPECTION

1. Check signal circuit open inspection
   1. Ignition "OFF".
   2. Disconnect "A/T SOLENOID VALVE" connector and "PCM/TCM" connector.
   3. Measure resistance between terminal "4" of the ATM SOLENOID VALVE harness connector and terminal "18" of the PCM/TCM harness connector.

      Specification: approx. 0 ohms

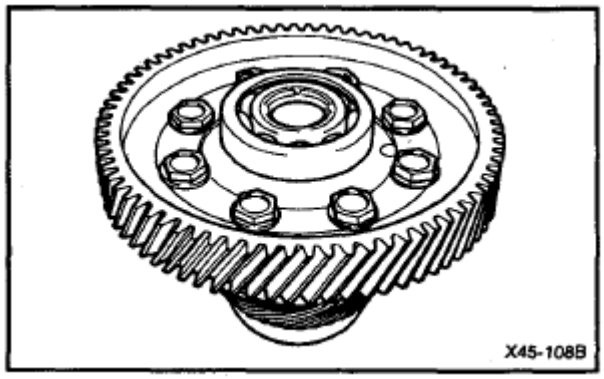


Fig. 86: Measuring Resistance Between ATM Solenoid Valve Terminal 4 And PCM/TCM Terminal 18

   4. Is resistance within specifications?

      YES

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

      NO

      - Check for open in harness. Repair as necessary and go to "**VERIFICATION OF VEHICLE REPAIR**" procedure.
2. Check signal circuit short inspection
   1. Ignition "OFF".
   2. Disconnect "A/T SOLENOID VALVE" connector and "PCM/TCM" connector.
   3. Measure resistance between terminal "4" of the ATM SOLENOID VALVE harness and chassis ground.

Specification: Infinite

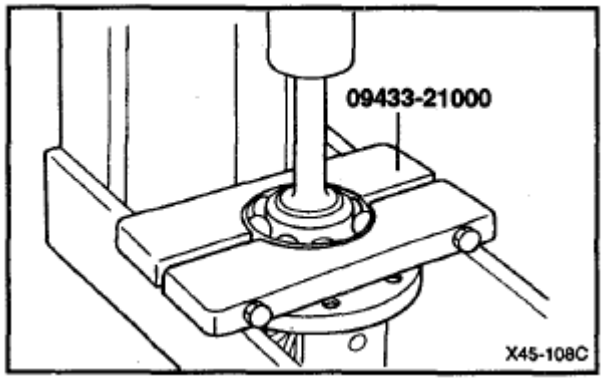


Fig. 87: Measuring Resistance Between ATM Solenoid Valve Terminal 4 And Chassis Ground

4. Is resistance within specifications?

   YES

   - Go to 3 "Signal Circuit Ground Inspection" procedure.

   NO

   - Check for short to ground in harness. Repair as necessary and go to "**VERIFICATION OF VEHICLE REPAIR**" procedure.

3. Check signal circuit ground inspection
   1. Ignition "OFF".
   2. Disconnect "A/T SOLENOID VALVE" connector and "PCM/TCM" connector.
   3. Measure resistance between terminal "7" of the ATM SOLENOID VALVE harness and chassis ground.

      Specification: approx. 0ohms

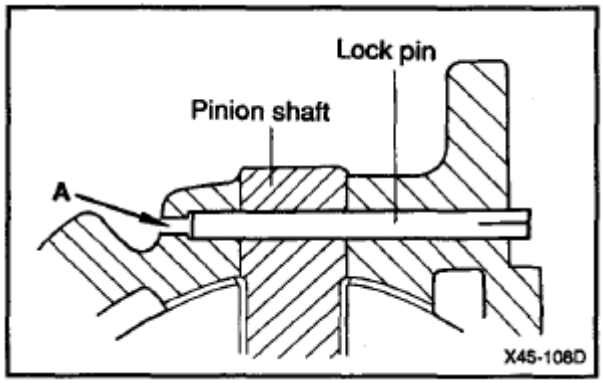


Fig. 88: Measuring Resistance Between ATM Solenoid Valve Terminal 7 And Chassis Ground

4. Is resistance within specifications?

YES

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

NO

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

COMPONENT INSPECTION

1. CHECK SOLENOID VALVE
    1. Ignition "OFF".
    2. Disconnect "A/T SOLENOID VALVE" connector.
    3. Measure resistance between terminal "4" and terminal "7" of the ATM SOLENOID VALVE harness connector.

    Specification: Approximately 3.5±0.2ohms [(25°C (77°F)]

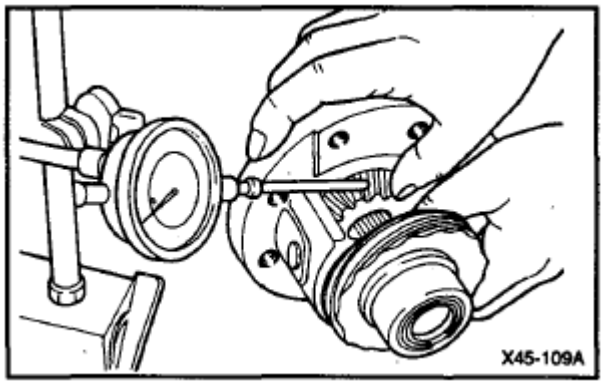


Fig. 89: Measuring Resistance Between ATM Solenoid Valve Terminals 4 And 7

4. Is resistance within specification?

YES

- Go to 2 "Check PCM/TCM" as below.

NO

- Replace DCC SOLENOID VALVE as necessary and go to "**VERIFICATION OF**

VEHICLE REPAIR" procedure.

2. CHECK PCM/TCM
    1. Connect scantool to data link connector (DLC).
    2. Ignition "ON" & Engine "OFF".
    3. Select A/T solenoid valve actuator test and operate actuator test.
    4. Is Actuator Testing performed normally?

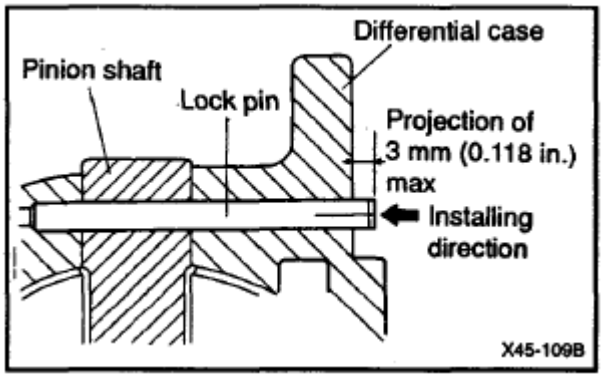


Fig. 90: Scantool Display - ACTUATION TEST

YES

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

NO

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

ACTUATOR TEST CONDITION

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

VERIFICATION OF VEHICLE REPAIR

Refer to **DTC P0741**.

DTC P0748 VFS SOLENOID VALVE CIRCUIT - OPEN OR SHORT (GND)

COMPONENT LOCATION

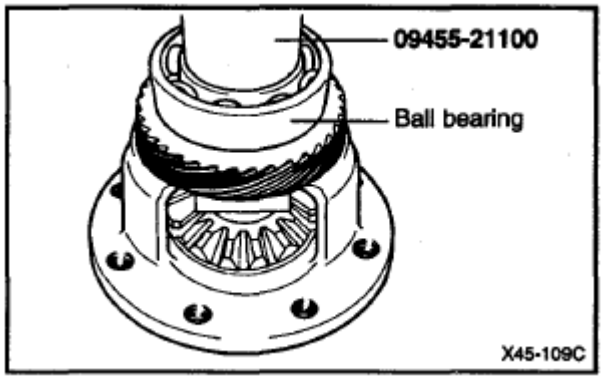


Fig. 91: Identifying VFS Solenoid Valve

GENERAL DESCRIPTION

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

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

In VFS, the amount is decided by how widely spool valve open the passage of going through.

DTC DESCRIPTION

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

DTC DETECTING CONDITION

DTC DETECTING CONDITION CHART

Item	Detecting Condition	Possible cause
DTC Strategy	• Check feed back period	• Open or short in circuit • Faulty VF SOLENOID VALVE • Faulty PCM/TCM
Enable Conditions	• 10% < or = Output duty < or = 90% • Battery voltage > or = 9V	
Threshold value	• Circuit open or short to ground or short to Battery	
Diagnostic Time	• More than 1sec	
Fail Safe	• Prohibited VFS control	

SPECIFICATION

Refer to **DTC P0743**.

SIGNAL WAVEFORM

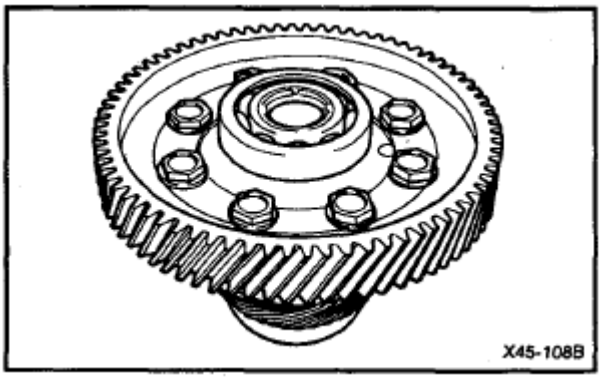


Fig. 92: Signal Waveform Graph

MONITOR SCANTOOL DATA

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

Fig. 93: Scantool Display - VF SOL. VALVE Parameter

YES

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

NO

- Go to "**TERMINAL & CONNECTOR INSPECTION**" procedure.

TERMINAL & CONNECTOR INSPECTION

Refer to **DTC P0743**.

POWER SUPPLY CIRCUIT INSPECTION

1. Connect "A/T SOLENOID VALVE" connector and install device for measuring wave form.
2. Turn on the Engine and operate VFS SOLENOID VALVE.
3. Measure wave form between terminal "9" of the sensor harness connector and chassis ground.

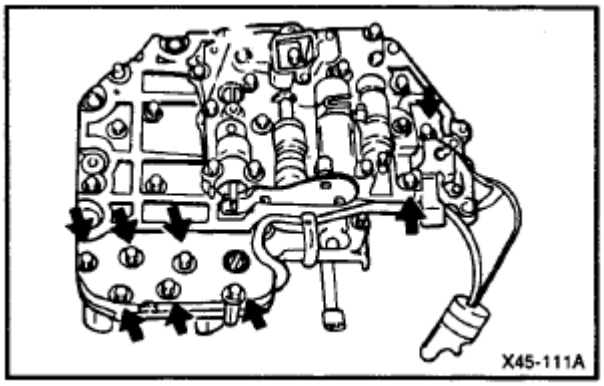


Fig. 94: Measuring Waveform Between Terminal 9 Of Sensor Connector And Chassis Ground

4. Is measured normally operating wave form?

   YES

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

   NO

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

SIGNAL CIRCUIT INSPECTION

1. Check signal circuit open inspection
   1. Ignition "OFF".
   2. Disconnect "A/T SOLENOID VALVE" connector and "PCM/TCM" connector.
   3. Measure resistance between terminal "9" of the ATM SOLENOID VALVE harness connector and terminal "19" of the PCM/TCM harness connector

Specification: approx. 0 ohms

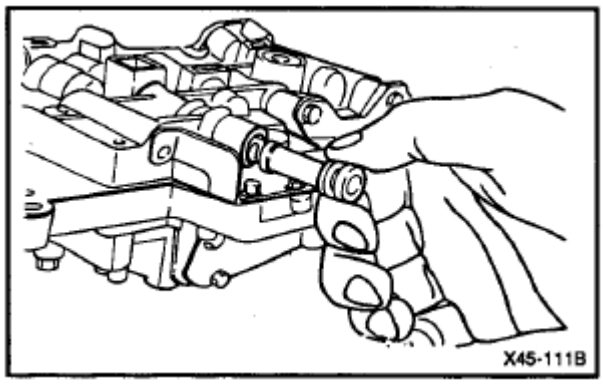


Fig. 95: Measuring Resistance Between ATM Solenoid Valve Terminal 9 And PCM/TCM Terminal 19

4. Is resistance within specifications?

   YES

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

   NO

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

2. Check signal circuit short inspection
   1. Ignition "OFF".
   2. Disconnect "A/T SOLENOID VALVE" connector and "PCM/TCM" connector.
   3. Measure resistance between terminal "9" of the ATM SOLENOID VALVE harness and chassis ground.

      Specification: Infinite

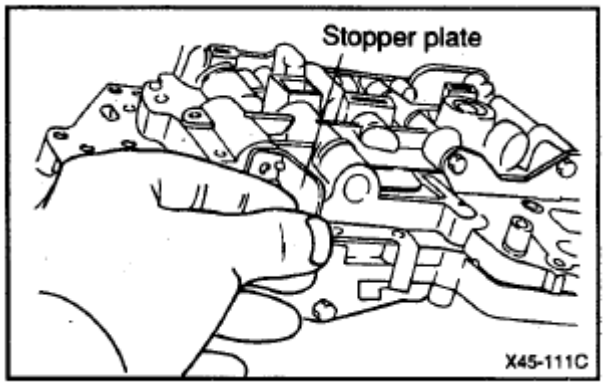


Fig. 96: Measuring Resistance Between ATM Solenoid Valve Terminal 9 And Chassis Ground

4. Is resistance within specifications?

YES

- Go to 3 "Signal Circuit Ground Inspection" procedure.

NO

- Check for short to ground in harness. Repair as necessary and go to "**VERIFICATION OF VEHICLE REPAIR**" procedure.

3. Check signal circuit ground 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: approx. 0ohms

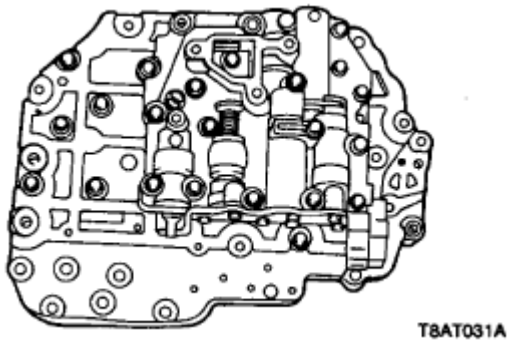


Fig. 97: Measuring Resistance Between ATM Solenoid Valve Terminal 10 And Chassis Ground

4. Is resistance within specifications?

YES

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

NO

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

COMPONENT INSPECTION

1. CHECK SOLENOID VALVE
    1. Ignition "OFF".
    2. Disconnect "A/T SOLENOID VALVE" connector.
    3. Measure resistance between terminal "9" and terminal "10" of the ATM SOLENOID VALVE harness connector.

       Specification: Approximately 3.5±0.2ohms [(25°C (77°F)]

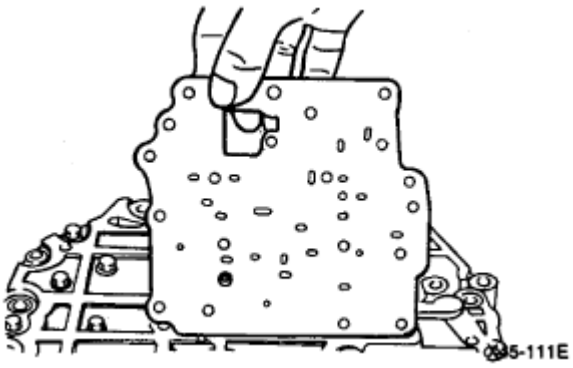


Fig. 98: Measuring Resistance Between ATM Solenoid Valve Terminals 9 And 10

    4. Is resistance within specification?

       YES

       - Go to 2 "Check PCM/TCM" as below.

       NO

       - Replace "VF SOL VALVE" as necessary and go to "**VERIFICATION OF VEHICLE REPAIR**" procedure.
2. CHECK PCM/TCM
    1. Connect scantool to data link connector (DLC).
    2. Ignition "ON" & Engine "OFF".
    3. Select A/T Solenoid valve Actuator test and Operate Actuator test.
    4. Can you hear operating sound for "VF SOL VALVE" Actuator Testing Function?

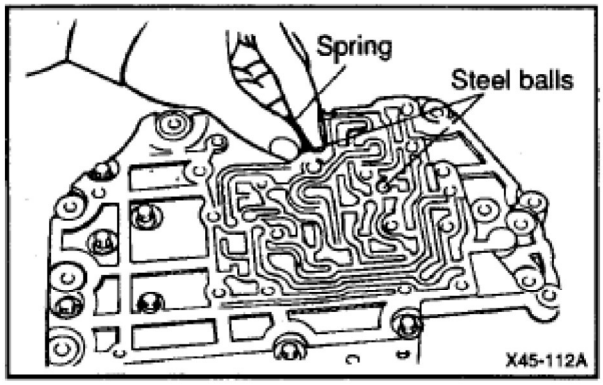


Fig. 99: Scantool Display - ACTUATION TEST

YES

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

NO

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

ACTUATOR TEST CONDITION

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

VERIFICATION OF VEHICLE REPAIR

Refer to **DTC P0741**.

DTC P0750 ON/OFF (SCSV-A) SOLENOID VALVE CIRCUIT - OPEN OR SHORT (GND)

COMPONENT LOCATION

Refer to **DTC P0743**.

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 HIVEC automatic transmission consists of a: LR (Low and Reverse Brake), 2ND (2nd Brake), UD (Under Drive Clutch), OD (Over Drive Clutch).

DTC DESCRIPTION

The PCM/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 PCM/TCM judges that the Low 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	• Open or short in circuit • Faulty ON/OFF SOLENOID VALVE • Faulty PCM/TCM
Enable Conditions	• 16V > Actuator (TCU) power supply voltage >10V	
Threshold value	• Circuit open or short to ground	
Diagnostic Time	• More than 0.3 sec	
Fail Safe	• Locked in 3rd gear.	

SPECIFICATION

Refer to **DTC P0743**.

SIGNAL WAVEFORM

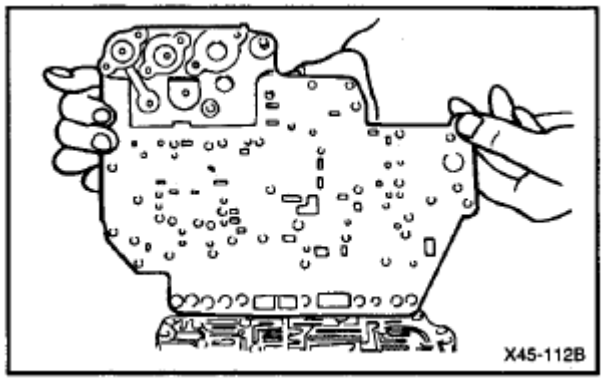


Fig. 100: Signal Waveform Graph

MONITOR SCANTOOL DATA

1. Connect scantool to data link connector (DLC).
2. Engine "ON".

3. Monitor the "ON/OFF SOL VALVE" parameter on the scantool.
4. Shift gear at each position.

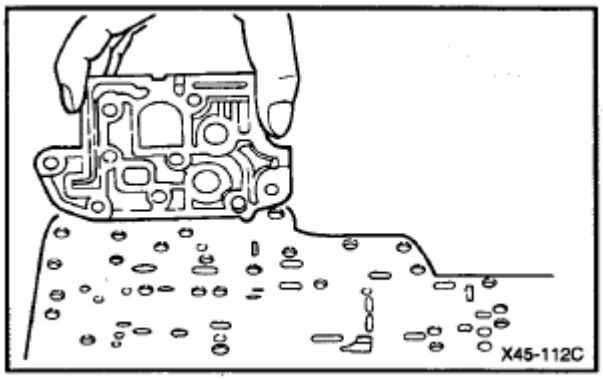


Fig. 101: Scantool Display - ON/OFF SOL VALVE Parameter

5. Does "ON/OFF SOL VALVE" follow the reference data?

YES

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

NO

- Go to "**TERMINAL & CONNECTOR INSPECTION**" procedure.

TERMINAL & CONNECTOR INSPECTION

Refer to **DTC P0743**.

POWER SUPPLY CIRCUIT INSPECTION

1. Connect "A/T SOLENOID VALVE" connector and install device for measuring wave form.
2. Turn on the Engine and operate ON/OFF (SCSV-A) SOLENOID VALVE.
3. Measure wave form between terminal "3" of the sensor harness connector and chassis ground.

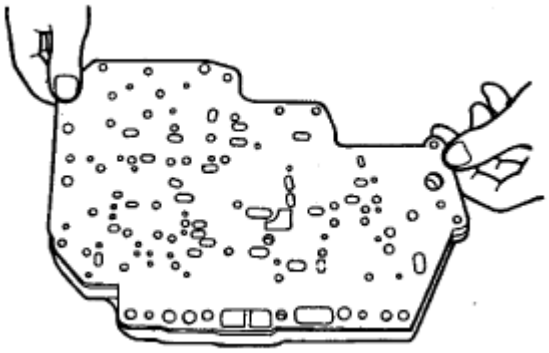


Fig. 102: Measuring Waveform Between Terminal 3 Of Sensor Connector And Chassis Ground

4. Is measured normally operating wave form?

YES

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

NO

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

SIGNAL CIRCUIT INSPECTION

1. Check signal circuit open inspection
    1. Ignition "OFF".
    2. Disconnect "A/T SOLENOID VALVE" connector and "PCM/TCM" connector.
    3. Measure resistance between terminal "3" of the ATM SOLENOID VALVE harness connector and terminal "16" of the PCM/TCM harness connector.

       Specification: approx. 0 ohms

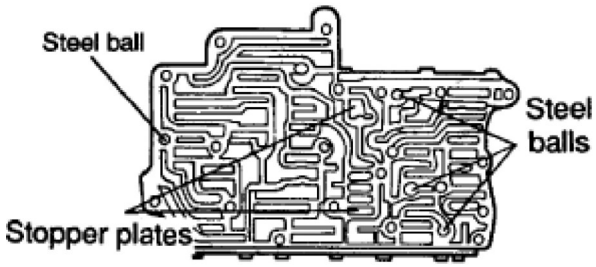


Fig. 103: Measuring Resistance Between ATM Solenoid Valve Terminal 3 And PCM/TCM Terminal 16

    4. Is resistance within specifications?

YES

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

NO

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

2. Check signal circuit short inspection
    1. Ignition "OFF".
    2. Disconnect "A/T SOLENOID VALVE" connector and "PCM/TCM" connector.
    3. Measure resistance between terminal "3" of the ATM SOLENOID VALVE harness and chassis ground.

       Specification: Infinite

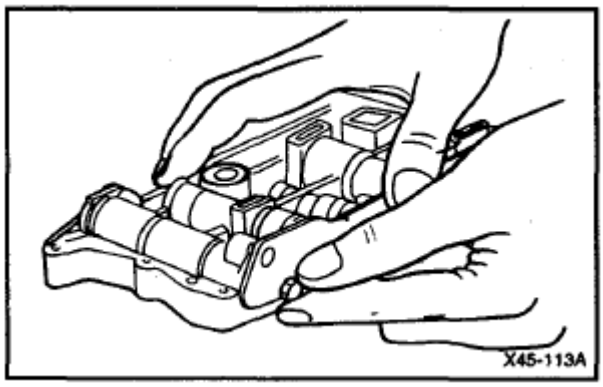


Fig. 104: Measuring Resistance Between ATM Solenoid Valve Terminal 3 And Chassis Ground

    4. Is resistance within specifications?

YES

- Go to 3 "Signal Circuit Ground Inspection" procedure.

NO

- Check for short to ground in harness. Repair as necessary and go to "**VERIFICATION OF VEHICLE REPAIR**" procedure.

3. Check signal circuit ground inspection
    1. Ignition "OFF".
    2. Disconnect "A/T SOLENOID VALVE" connector and "PCM/TCM" connector.
    3. Measure resistance between terminal "7" of the ATM SOLENOID VALVE harness and chassis ground.

Specification: approx. 0 ohms

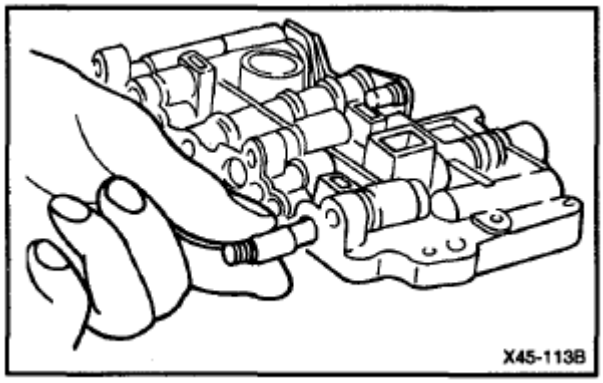


Fig. 105: Measuring Resistance Between ATM Solenoid Valve Terminal 7 And Chassis Ground

4. Is resistance within specifications?

YES

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

NO

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

COMPONENT INSPECTION

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

       Specification: Approximately 3.5±0.2ohms [(25°C (77°F)]

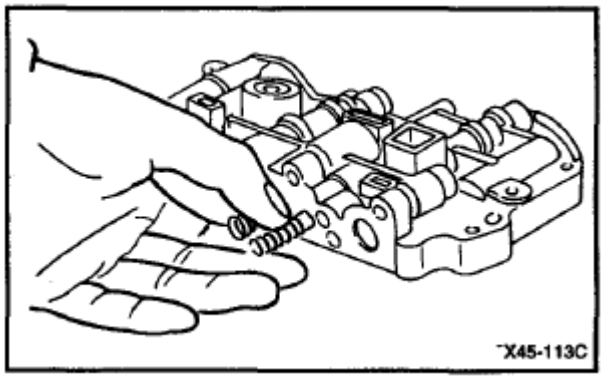


Fig. 106: Measuring Resistance Between ATM Solenoid Valve Terminals 3 And 7

4. Is resistance within specification?

YES

- Go to 2 "Check PCM/TCM" as below.

NO

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

2. CHECK PCM/TCM
   1. Connect scantool to data link connector (DLC).
   2. Ignition "ON" & Engine "OFF".
   3. Select A/T solenoid valve actuator test and operate actuator test.
   4. Is Actuator Testing performed normally?

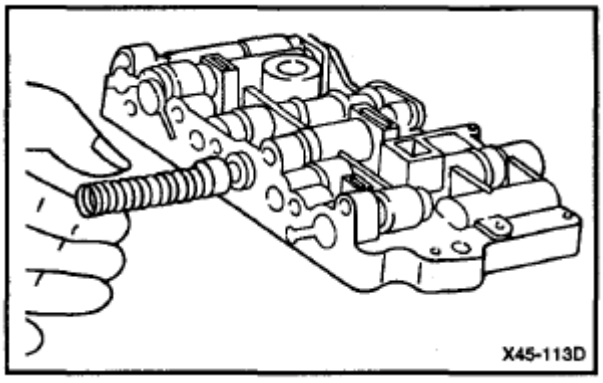


Fig. 107: Scantool Display - ACTUATION TEST

YES

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

NO

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

ACTUATOR TEST CONDITION

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

VERIFICATION OF VEHICLE REPAIR

Refer to **DTC P0743**.

DTC P0755 PCSV-A (OD & LR) SOLENOID VALVE CIRCUIT - OPEN OR SHORT (GND)

COMPONENT LOCATION

Refer to **DTC P0743**.

GENERAL DESCRIPTION

Refer to **DTC P0750**.

DTC DESCRIPTION

The PCM/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 PCM/TCM judges that Under Drive Clutch 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	• Open or short in circuit • Faulty UD SOLENOID VALVE
Enable Conditions	• 16V > Actuator (TCU) power supply voltage > 10V	
Threshold value	• Circuit open or short to ground	

Diagnostic Time	• More than 0.3 sec	• Faulty PCM/TCM
Fail Safe	• Locked in 3rd gear.	

SPECIFICATION

Refer to **DTC P0743**.

SIGNAL WAVEFORM

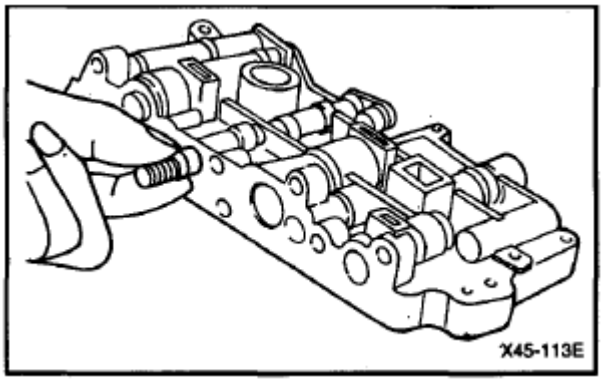


Fig. 108: Signal Waveform Graph

MONITOR SCANTOOL DATA

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

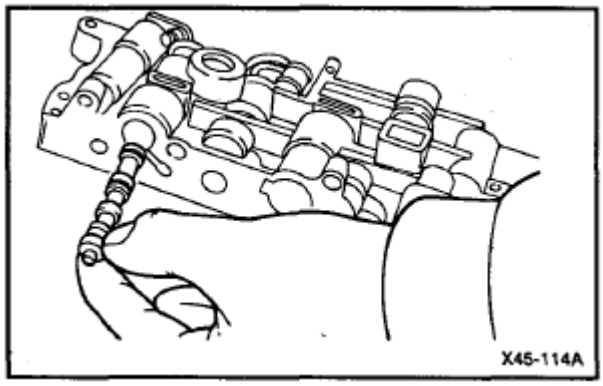


Fig. 109: Scantool Display - PCSV-A (OD & LR) SOLENOID VALVE Parameter

5. Does "PCSV-A (OD & LR) SOLENOID VALVE" follow the reference data?

YES

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

NO

- Go to "**TERMINAL & CONNECTOR INSPECTION**" procedure.

TERMINAL & CONNECTOR INSPECTION

Refer to **DTC P0743**.

POWER SUPPLY CIRCUIT INSPECTION

1. Connect "A/T SOLENOID VALVE" connector and install device for measuring wave form.
2. Turn on the Engine and operate PCSV-A (OD & LR) SOLENOID VALVE.
3. Measure wave form between terminal "1" of the sensor harness connector and chassis ground.

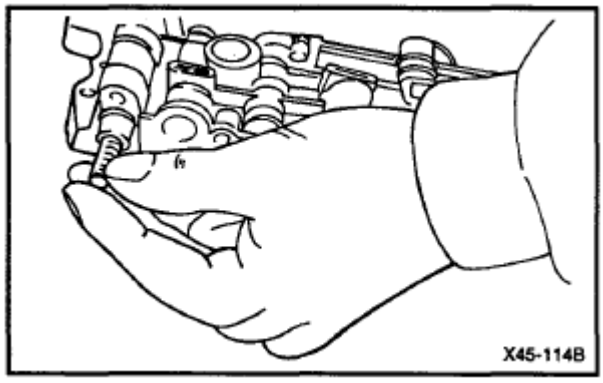


Fig. 110: Measuring Waveform Between Terminal 1 Of Sensor Connector And Chassis Ground

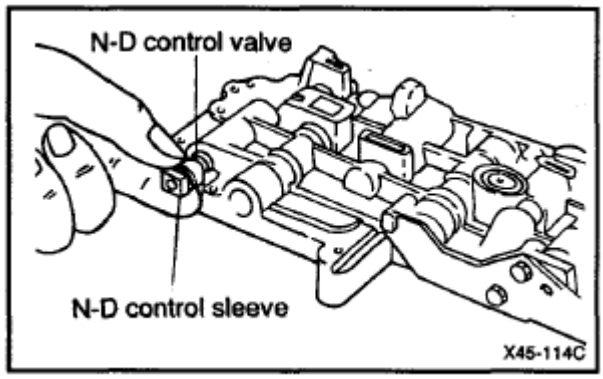


Fig. 111: Signal Waveform Graph

4. Is measured normally operating wave form?

YES

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

NO

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

SIGNAL CIRCUIT INSPECTION

1. Check signal circuit open inspection
    1. Ignition "OFF".
    2. Disconnect "A/T SOLENOID VALVE" connector and "PCM/TCM" connector.
    3. Measure resistance between terminal "1" of the ATM SOLENOID VALVE harness connector and terminal "46" of the PCM/TCM harness connector.

       Specification: approx. 0 ohms

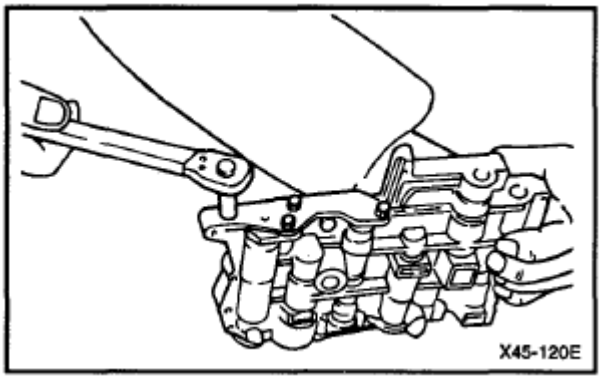


Fig. 112: Measuring Resistance Between ATM Solenoid Valve Terminal 1 And PCM/TCM Terminal 46

    4. Is resistance within specifications?

       YES

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

       NO

       - Check for open in harness. Repair as necessary and go to "**VERIFICATION OF VEHICLE REPAIR**" procedure.
2. Check signal circuit short inspection
    1. Ignition "OFF".

2. Disconnect "A/T SOLENOID VALVE" connector and "PCM/TCM" connector.
3. Measure resistance between terminal "1" of the ATM SOLENOID VALVE harness and chassis ground.

   Specification: Infinite

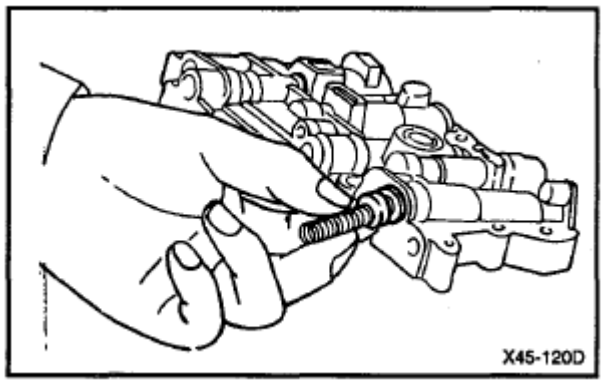


Fig. 113: Measuring Resistance Between ATM Solenoid Valve Terminal 1 And Chassis Ground

4. Is resistance within specifications?

YES

- Go to 3 "Signal Circuit Ground Inspection" procedure.

NO

- Check for short to ground in harness. Repair as necessary and go to "**VERIFICATION OF VEHICLE REPAIR**" procedure.

3. Check signal circuit ground inspection
   1. Ignition "OFF".
   2. Disconnect "A/T SOLENOID VALVE" connector and "PCM/TCM" connector.
   3. Measure resistance between terminal "7" of the ATM SOLENOID VALVE harness and chassis ground.

      Specification: approx. 0ohms

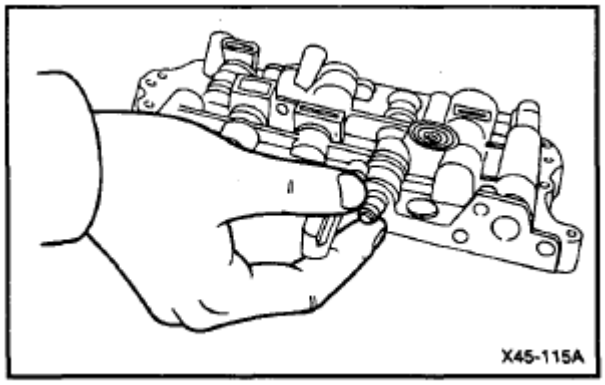


Fig. 114: Measuring Resistance Between ATM Solenoid Valve Terminal 7 And Chassis Ground

4. Is resistance within specifications?

YES

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

NO

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

COMPONENT INSPECTION

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

       Specification: Approximately 3.5±0.2ohms [(25°C (77°F)]

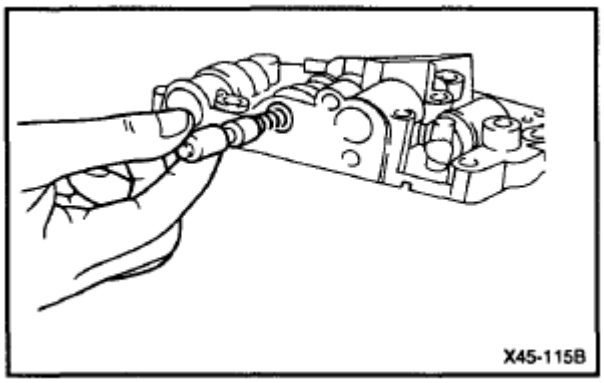


Fig. 115: Measuring Resistance Between ATM Solenoid Valve Terminals 1 And 7

4. Is resistance within specification?

YES

- Go to 2 "Check PCM/TCM" as below.

NO

- Replace PCSV-A (OD & LR) SOLENOID VALVE as necessary and go to "**VERIFICATION OF VEHICLE REPAIR**" procedure.

2. CHECK PCM/TCM
   1. Connect scantool to data link connector (DLC).
   2. Ignition "ON" & Engine "OFF".
   3. Select ATM solenoid valve actuator test and operate actuator test.
   4. Is Actuator Testing performed normally?

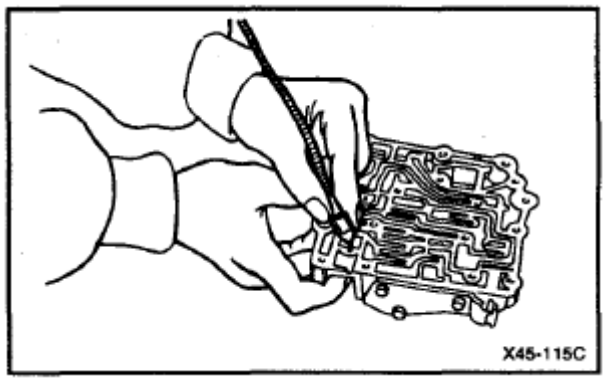


Fig. 116: Scantool Display - ACTUATION TEST

YES

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

NO

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

ACTUATOR TEST CONDITION

1. IG SWITCH ON
2. TRANSAXLE RANGE SWITCH is normal
3. P RANGE

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

VERIFICATION OF VEHICLE REPAIR

Refer to **DTC P0741**.

DTC P0760 PCSV-B (2-4 SOLENOID VALVE) CIRCUIT - OPEN OR SHORT (GNP)

COMPONENT LOCATION

Refer to **DTC P0743**.

GENERAL DESCRIPTION

Refer to **DTC P0750**.

DTC DESCRIPTION

The PCM/TCM checks the 2nd brake drive 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 2nd Brake drive 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	• Open or short in circuit • Faulty 2-4 SOLENOID VALVE • Faulty PCM/TCM
Enable Conditions	• 16V > Actuator (TCU) power supply voltage >10V	
Threshold value	• Circuit open or short to ground	
Diagnostic Time	• More than 0.3 sec	
Fail Safe	• Locked in 3rd gear	

SPECIFICATION

Refer to **DTC P0743**.

SIGNAL WAVEFORM

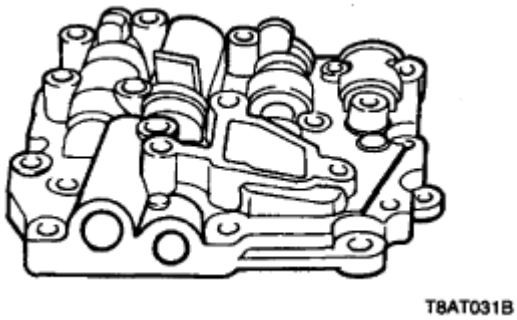


Fig. 117: Signal Waveform Graph

MONITOR SCANTOOL DATA

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

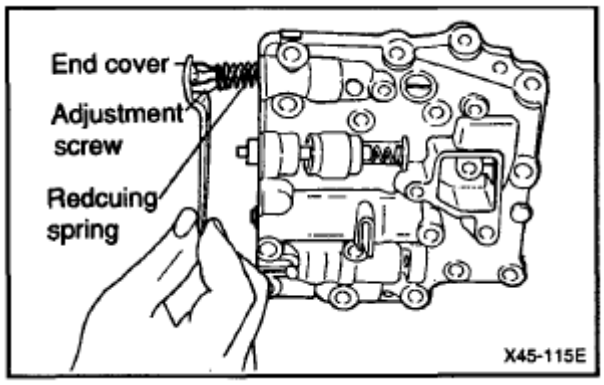


Fig. 118: Scantool Display - PCSV-B (2-4 SOLENOID VALVE) Parameter

5. Does "PCSV-B (2-4SOLENOID VALVE)" follow the reference data?

YES

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

NO

- Go to "**TERMINAL & CONNECTOR INSPECTION**" procedure.

TERMINAL & CONNECTOR INSPECTION

Refer to **DTC P0743**.

POWER SUPPLY CIRCUIT INSPECTION

1. Connect "A/T SOLENOID VALVE" connector and install device for measuring wave form.
2. Turn on the Engine and operate PCSV-B (2-4 SOLENOID VALVE).
3. Measure wave form between terminal "2" of the sensor harness connector and chassis ground.

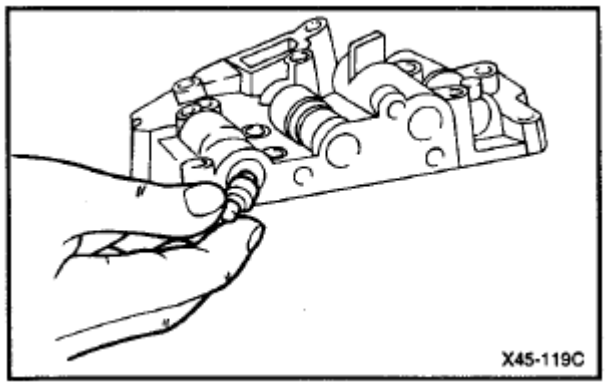


Fig. 119: Measuring Waveform Between Terminal 2 Of Sensor Connector And Chassis Ground

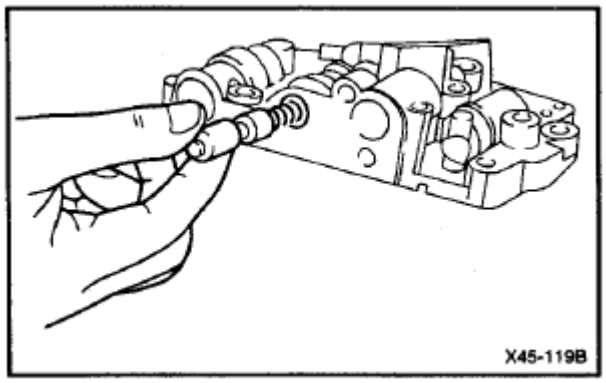


Fig. 120: Signal Waveform Graph

4. Is measured normally operating wave form?

YES

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

NO

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

SIGNAL CIRCUIT INSPECTION

1. Check signal circuit open inspection
    1. Ignition "OFF".
    2. Disconnect "A/T SOLENOID VALVE" connector and "PCM/TCM" connector.
    3. Measure resistance between terminal "2" of the ATM SOLENOID VALVE harness connector and terminal "17" of the PCM/TCM harness connector.

       Specification: approx. 0 ohms

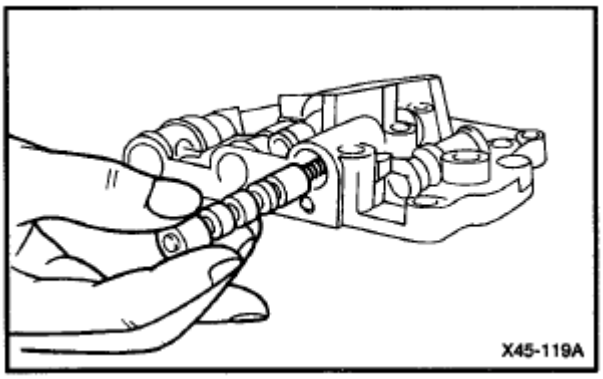


Fig. 121: Measuring Resistance Between ATM Solenoid Valve Terminal 2 And PCM/TCM Terminal 17

    4. Is resistance within specifications?

       YES

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

       NO

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

       Specification: Infinite

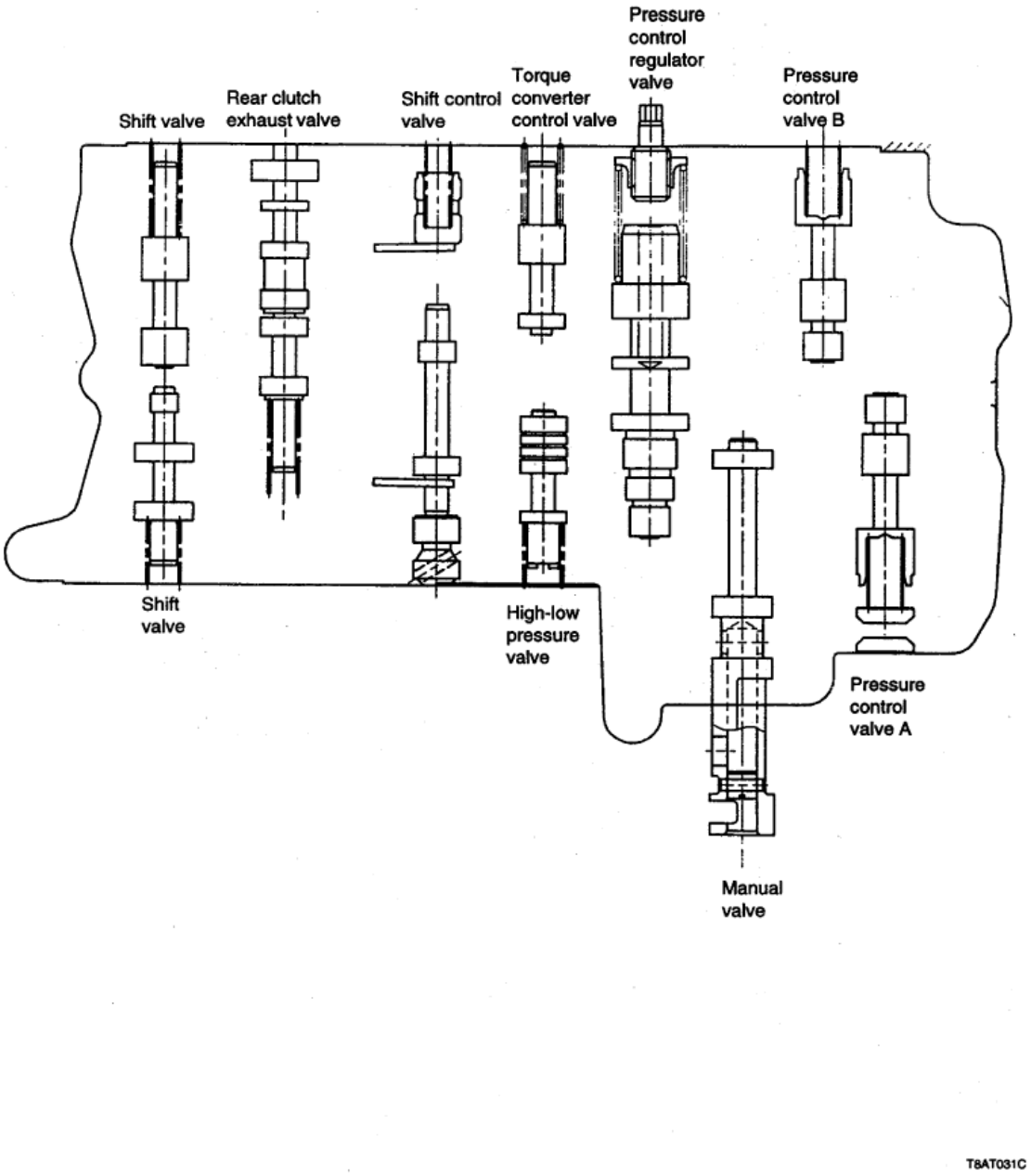


Fig. 122: Measuring Resistance Between ATM Solenoid Valve Terminal 2 And Chassis Ground

4. Is resistance within specifications?

YES

- Go to 3 "Signal Circuit Ground Inspection" procedure.

NO

- Check for short to ground in harness. Repair as necessary and go to "**VERIFICATION OF**

VEHICLE REPAIR" procedure.

3. Check signal circuit ground inspection
    1. Ignition "OFF".
    2. Disconnect "A/T SOLENOID VALVE" connector and "PCM/TCM" connector.
    3. Measure resistance between terminal "7" of the ATM SOLENOID VALVE harness and chassis ground.

       Specification: approx. O ohms

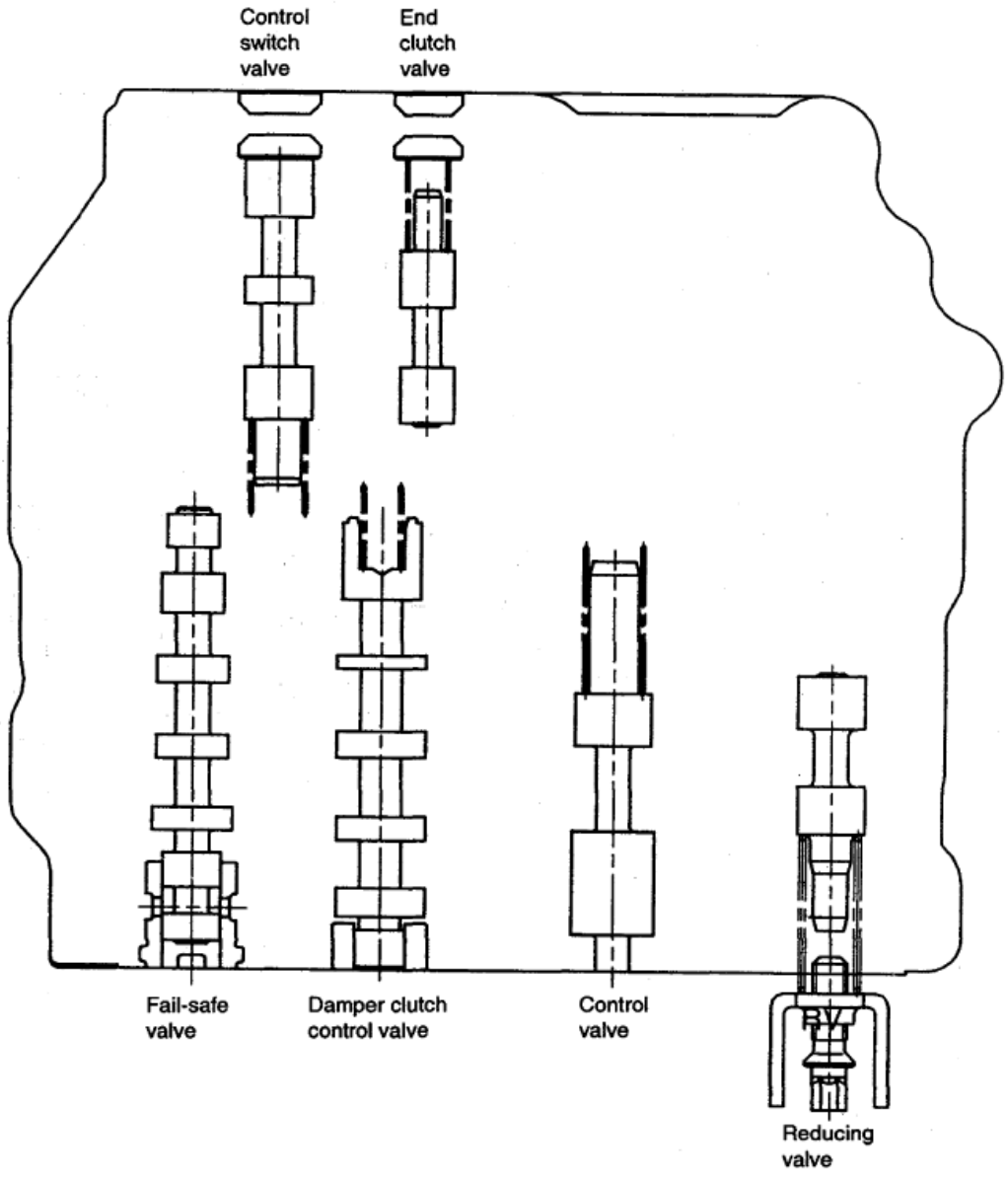


Fig. 123: Measuring Resistance Between ATM Solenoid Valve Terminal 7 And Chassis Ground

4. Is resistance within specifications?

YES

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

NO

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

COMPONENT INSPECTION

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

      Specification: Approximately 3.5±0.2ohms [(25°C (77°F)]

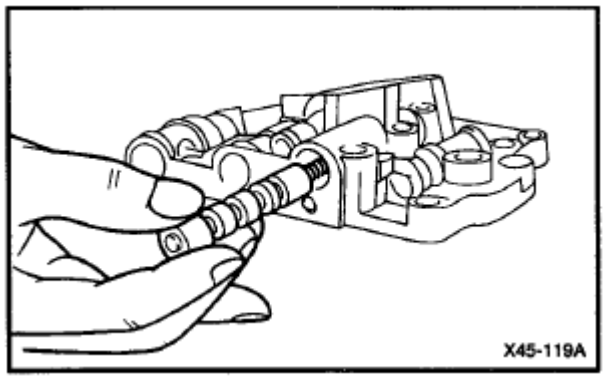


Fig. 124: Measuring Resistance Between ATM Solenoid Valve Terminals 2 And 7

   4. Is resistance within specification?

      YES

      - Go to 2 "Check PCM/TCM" as below.

      NO

      - Replace PCSV-B (2-4 SOLENOID VALVE) as necessary and go to "**VERIFICATION OF VEHICLE REPAIR**" procedure.
2. CHECK PCM/TCM
   1. Connect scantool to data link connector (DLC).
   2. Ignition "ON" & Engine "OFF".
   3. Select A/T solenoid valve actuator test and operate actuator test.
   4. Is Actuator Testing performed normally?

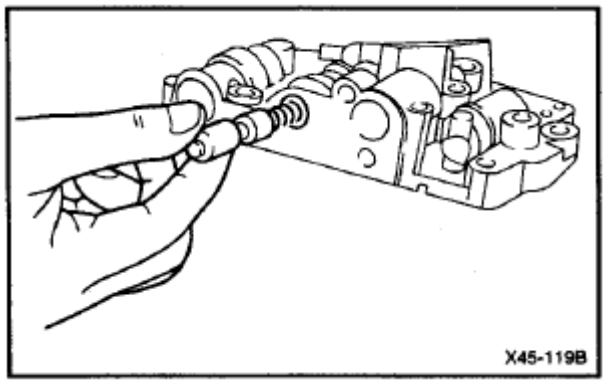


Fig. 125: Scantool Display - ACTUATION TEST

YES

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

NO

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

ACTUATOR TEST CONDITION

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

VERIFICATION OF VEHICLE REPAIR

Refer to **DTC P0743**.

DTC P0765 PCSV-C (UD) SOLENOID VALVE CIRCUIT - OPEN OR SHORT (GND)

COMPONENT LOCATION

Refer to **DTC P0743**.

GENERAL DESCRIPTION

Refer to **DTC P0750**.

DTC DESCRIPTION

The PCM/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 PCM/TCM judges that the OVER DRIVE CLUTCH drive 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	• Open or short in circuit • Faulty UD SOLENOID VALVE • Faulty PCM/TCM
Enable Conditions	• 16V > Actuator (TCU) power supply voltage >10V	
Threshold value	• Circuit open or short to ground	
Diagnostic Time	• More than 0.3 sec	
Fail Safe	• Locked in 3rd gear.	

SPECIFICATION

Refer to **DTC P0743**.

SIGNAL WAVEFORM

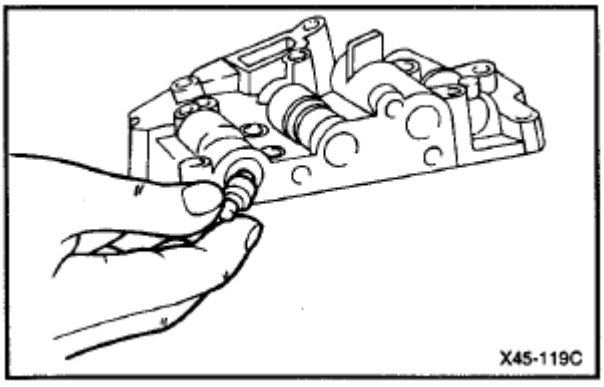


Fig. 126: Signal Waveform Graph

MONITOR SCANTOOL DATA

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

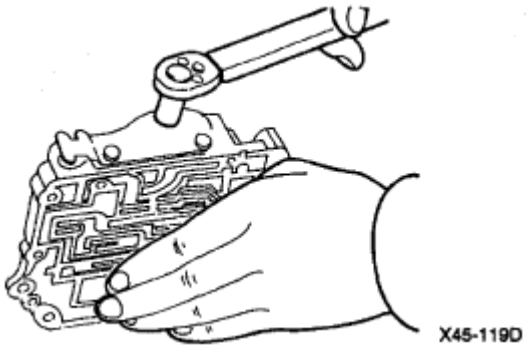


Fig. 127: Scantool Display - PCSV-C (UD) SOLENOID VALVE Parameter

5. Does "PCSV-C (UD) SOLENOID VALVE" follow the reference data?

   YES

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

   NO

   - Go to "**TERMINAL & CONNECTOR INSPECTION**" procedure.

TERMINAL & CONNECTOR INSPECTION

Refer to **DTC P0743**.

POWER SUPPLY CIRCUIT INSPECTION

1. Connect "A/T SOLENOID VALVE" connector and install device for measuring wave form.
2. Turn on the Engine and operate PCSV-C (UD) SOLENOID VALVE.
3. Measure wave form between terminal "8" of the sensor harness connector and chassis ground.

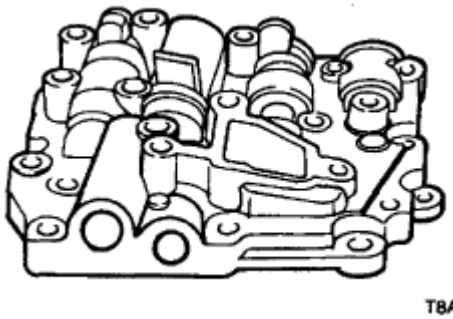


Fig. 128: Measuring Waveform Between Terminal 8 Of Sensor Connector And Chassis Ground

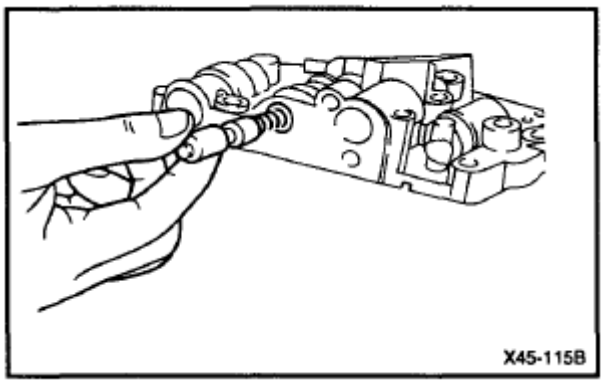


Fig. 129: Signal Waveform Graph

4. Is measured normally operating wave form?

YES

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

NO

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

SIGNAL CIRCUIT INSPECTION

1. Check signal circuit open inspection
    1. Ignition "OFF".
    2. Disconnect "A/T SOLENOID VALVE" connector and "PCM/TCM" connector.
    3. Measure resistance between terminal "8" of the ATM SOLENOID VALVE harness connector and terminal "48" of the PCM/TCM harness connector.

       Specification: approx. 0 ohms

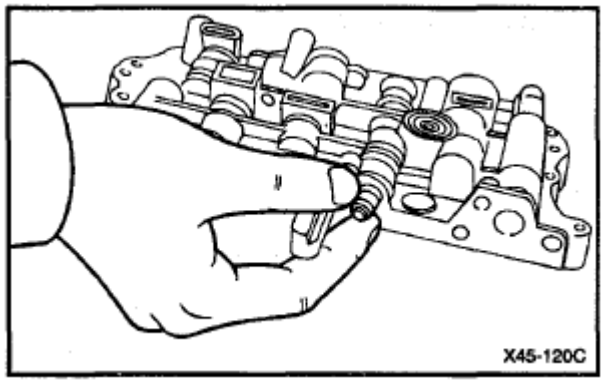


Fig. 130: Measuring Resistance Between ATM Solenoid Valve Terminal 8 And PCM/TCM

Terminal 48

4. Is resistance within specifications?

YES

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

NO

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

2. Check signal circuit short inspection
   1. Ignition "OFF" & Engine "OFF".
   2. Disconnect "A/T SOLENOID VALVE" connector and "PCM/TCM" connector.
   3. Measure resistance between terminal "8" of the ATM SOLENOID VALVE harness and chassis ground.

      Specification: Infinite

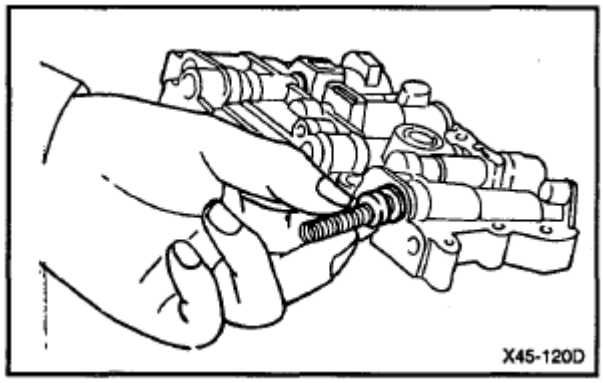


Fig. 131: Measuring Resistance Between ATM Solenoid Valve Terminal 8 And Chassis Ground

   4. Is resistance within specifications?

YES

- Go to 3 "Signal Circuit Ground Inspection" procedure.

NO

- Check for short to ground in harness. Repair as necessary and go to "**VERIFICATION OF VEHICLE REPAIR**" procedure.

3. Check signal circuit ground inspection

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

   Specification: approx. 0ohms

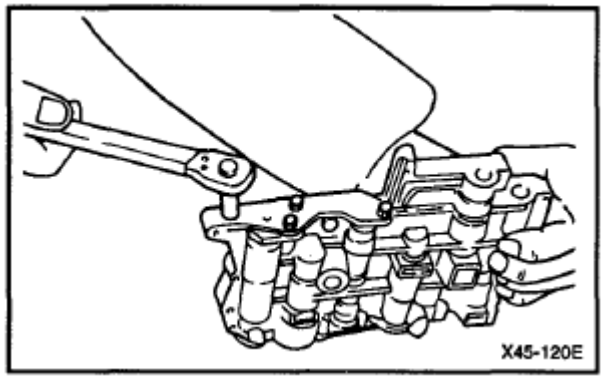


Fig. 132: Measuring Resistance Between ATM Solenoid Valve Terminal 7 And Chassis Ground

4. Is resistance within specifications?

   YES

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

   NO

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

COMPONENT INSPECTION

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

      Specification: Approximately 3.5±0.2ohms [(25°C (77°F)]

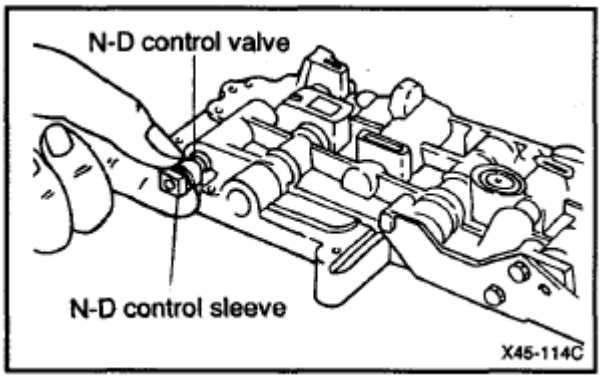


Fig. 133: Measuring Resistance Between ATM Solenoid Valve Terminals 7 And 8

4. Is resistance within specification?

YES

- Go to 2 "Check PCM/TCM" as below.

NO

- Replace PCSV-C (UD) SOLENOID VALVE as necessary and go to "**VERIFICATION OF VEHICLE REPAIR**" procedure.

2. CHECK PCM/TCM
   1. Connect scantool to data link connector (DLC).
   2. Ignition "ON" & Engine "OFF".
   3. Select A/T solenoid valve actuator test and operate actuator test.
   4. Is Actuator Testing performed normally?

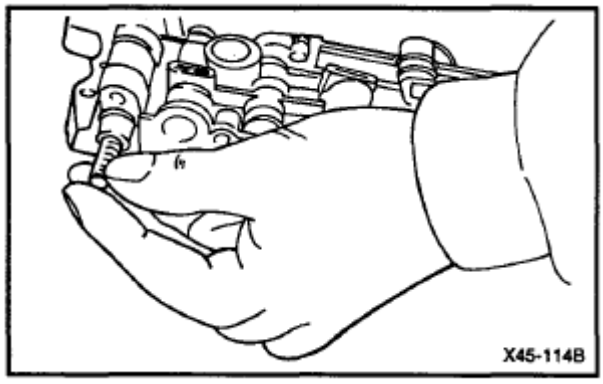


Fig. 134: Scantool Display - ACTUATION TEST

YES

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

NO

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

ACTUATOR TEST CONDITION

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

VERIFICATION OF VEHICLE REPAIR

Refer to **DTC P0743**.

DTC P0880 TCM POWER SIGNAL ERROR

COMPONENT LOCATION

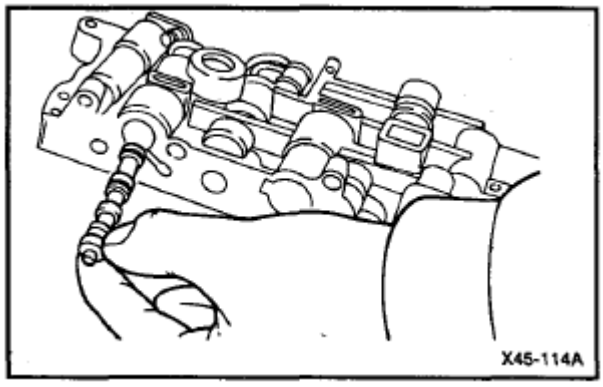


Fig. 135: Identifying TCM

GENERAL DESCRIPTION

The TCM monitors suppling voltage to "SOLENOID VALVE".

The gear position is fixed at 3rd gear when input value is higher or lower than specification.

DTC DESCRIPTION

The TCM set this code If an input voltage is higher or lower than specification.

DTC DETECTING CONDITION

DTC DETECTING CONDITION CHART

Item	Detecting Condition	Possible cause
DTC Strategy	• Check communication	• Open or Short in harness • Faulty TCM
Enable Conditions	• 22V > or = Input voltage to TCM > or = 9V and after 0.5 sec is passed from IG ON	
Threshold value	• 24.5V < Input voltage to TCM < 7V	
Diagnostic Time	• More than 0.1 sec	
Fail Safe	• Locked in 3 rd gear	

SIGNAL WAVEFORM

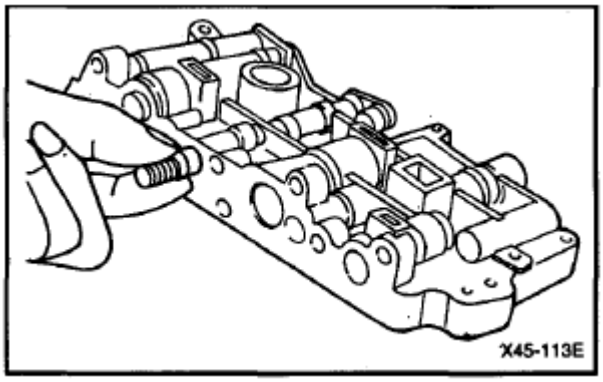


Fig. 136: Signal Waveform Graph

MONITOR SCANTOOL DATA

1. Connect scantool to data link connector (DLC).
2. Ignition "ON" & Engine "OFF".
3. Monitor the "BATTERY VOLTAGE" parameter on the scantool.

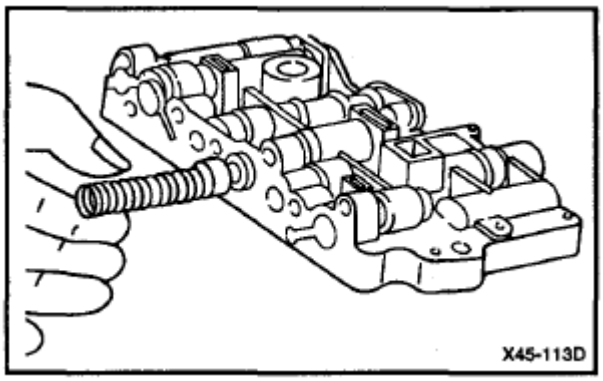


Fig. 137: Scantool Display - BATTERY VOLTAGE Parameter

4. Does "BATTERY VOLTAGE" follow the reference data?

   YES

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

   NO

   - Go to "**TERMINAL & CONNECTOR INSPECTION**" procedure.

TERMINAL & CONNECTOR INSPECTION

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

   YES

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

   NO

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

POWER SUPPLY CIRCUIT INSPECTION

1. Ignition "ON" & Engine "OFF".
2. Disconnect the "PCM/TCM" connector.
3. Measure voltage between terminal No"49" of TCM harness connector and chassis ground and then terminal No"50" of the TCM harness connector and chassis ground.

   Specification : approx. 12V

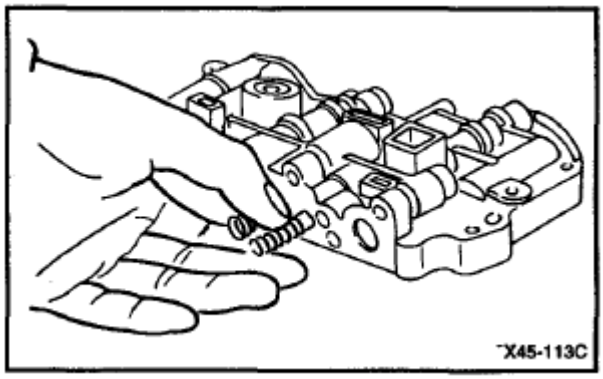


Fig. 138: Measuring Resistance Between TCM Connector Terminal 49 And 50

4. Is voltage within specifications?

YES

- Fault is intermittent caused by poor contact in the sensor's and/or PCM/TCM's connector or was repaired and PCM/TCM memory was not cleared. And go to **VERIFICATION OF VEHICLE REPAIR** procedure.

NO

- Substitute with a known-good PCM/TCM and check for proper operation. If the problem is corrected, replace PCM/TCM as necessary and then go to "**VERIFICATION OF VEHICLE REPAIR**" procedure.

VERIFICATION OF VEHICLE REPAIR

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

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

YES

- Go to the applicable troubleshooting procedure.

NO

- System performing to specification at this time.

DTC U0001 CAN COMMUNICATION MALFUNCTION

COMPONENT LOCATION

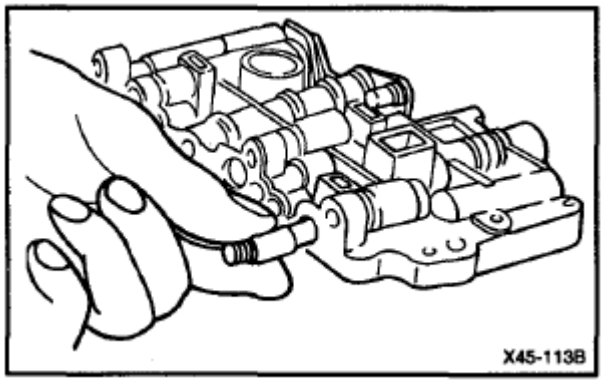


Fig. 139: Identifying TCM

GENERAL DESCRIPTION

The TCM can either receive data from the Engine Control Module or ABS control module, or it can send data to the ECM and ABSCM by using CAN communication. The CAN communication is one of the vehicle communication methods, which is now widely used to transfer the vehicle data.

DTC DESCRIPTION

The TCM reads data on the CAN-BUS line and checks whether the data is equal to the data which the TCM sent before. If the data is not the same the TCM decides that either the CAN-BUS line or TCM are malfunctioning and sets this code.

DTC DETECTING CONDITION

DTC DETECTING CONDITION CHART

Item	Detecting Condition	Possible cause
DTC Strategy	• Check communication	• Open or short in CAN communication harness • Faulty ECM • Faulty TCM
Enable Conditions	• Input Speed > 1000rpm	
Threshold value	• No message from ems	
Diagnostic Time	• More than 0.5sec	
Fail Safe	• INTELLIGENT SHIFT is inhibited • Learning for oil pressure control is inhibited • Torque Retard requirement is inhibited • Direct connection control of DCC is inhibited	

SIGNAL WAVEFORM

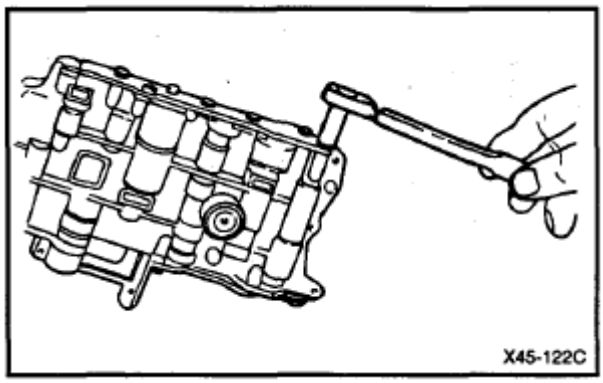


Fig. 140: Signal Waveform Graph

MONITOR SCANTOOL DATA

1. Connect scantool to data link connector (DLC).
2. Engine "ON".
3. Monitor the "CAN COMMUNICATION SERVICE DATA (ENGINE RPM, VEHICLE SPEED SENSOR, THROTTLE P. SENSOR)" parameters on the scantool.

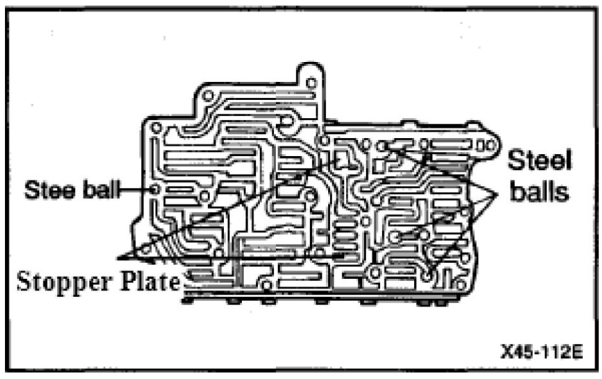


Fig. 141: Scantool Display - ENGINE SPEED

4. Does "CAN BUS LINE DATA" follow the reference data?

YES

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

NO

- Go to "**TERMINAL & CONNECTOR INSPECTION**" procedure.

TERMINAL & CONNECTOR INSPECTION

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

   YES

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

   NO

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

SIGNAL CIRCUIT INSPECTION

1. Ignition "ON" & Engine "OFF".
2. Disconnect the "PCM/TCM" connector.
3. Measure resistance between terminal "77" and "78" of the "PCM/TCM" harness connector.

   Specification : Approx. 120 ohms

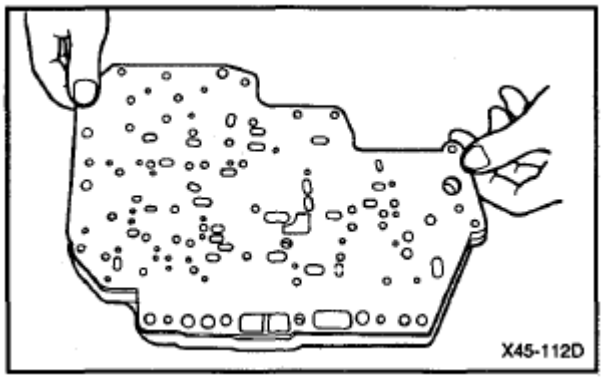


Fig. 142: Measuring Resistance Between PCM/TCM Connector Terminal 77 And 78

4. Is measured resistance within specifications?

   YES

   - Substitute with a known-good PCM/TCM and check for proper operation. If the problem is corrected, replace PCM/TCM as necessary and then go to "**VERIFICATION OF VEHICLE REPAIR**" procedure.

   NO

- Check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage of ECM, and then Repair or replace Resistance for CAN communication 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 U0100 CAN MI-COM OR CIRCUIT MAL

COMPONENT LOCATION

Refer to **DTC U0001**.

GENERAL DESCRIPTION

Refer to **DTC U0001**.

DTC DESCRIPTION

Refer to **DTC U0001**.

DTC DETECTING CONDITION

DTC DETECTING CONDITION CHART

Item	Detecting Condition	Possible cause
DTC Strategy	• Check communication	• Open or short in CAN communication harness
Enable Conditions	• Input Speed > 1000rpm	
Threshold value	• No message from ems	
Diagnostic Time	• More than 1.5sec	
	• INTELLIGENT SHIFT is inhibited	

Fail Safe	• Learning for oil pressure control is inhibited • Torque Retard requirement is inhibited • Direct connection control of DCC is inhibited	• Faulty ECM • Faulty TCM

SIGNAL WAVEFORM

Refer to **DTC U0001**.

MONITOR SCANTOOL DATA

Refer to **DTC U0001**.

TERMINAL & CONNECTOR INSPECTION

Refer to **DTC U0001**.

SIGNAL CIRCUIT INSPECTION

Refer to **DTC U0001**.

VERIFICATION OF VEHICLE REPAIR

Refer to **DTC U0001**.

AUTOMATIC TRANSAXLE

COMPONENTS (1)

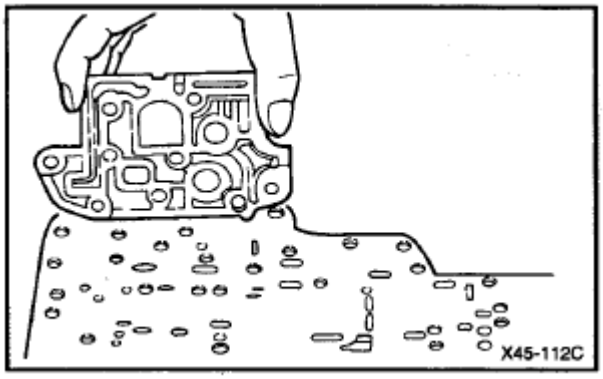


Fig. 143: Identifying Automatic Transaxle Components (1 Of 2)

COMPONENTS (2)

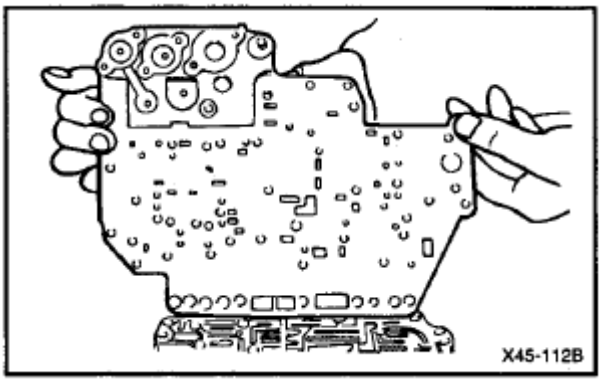


Fig. 144: Identifying Automatic Transaxle Components (2 Of 2)

REMOVAL

CAUTION:
- **Use fender covers to avoid damaging painted surfaces.**
- **To avoid damage, unplug the wiring connectors carefully while holding the connector portion.**

NOTE:
- **Mark all wiring and hoses to avoid misconnection.**

1. Remove the engine cover (A).

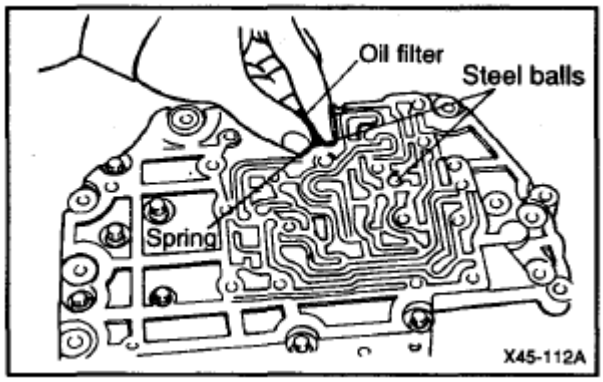


Fig. 145: Identifying Engine Cover

2. Remove the battery (A) after removing the battery terminal.

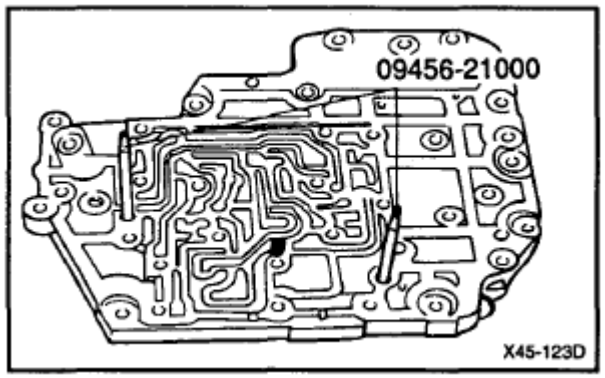


Fig. 146: Identifying Battery

3. Remove the air duct assembly (A).

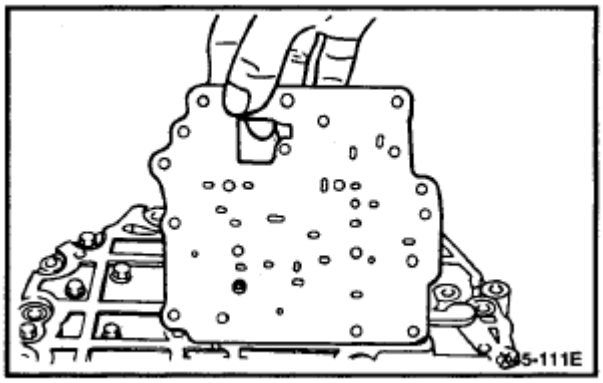


Fig. 147: Identifying Air Duct Assembly

4. Remove the air cleaner assembly (D) by disconnecting the AFS (Air Flow Sensor) connector (A), the clamp (B) and the ECM connector (C).

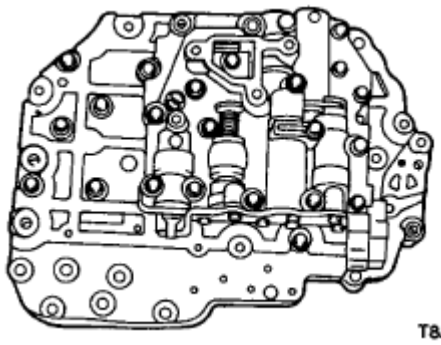


Fig. 148: Identifying Air Cleaner Assembly, Air Flow Sensor Connector And ECM Connector

5. Remove the battery tray (A).

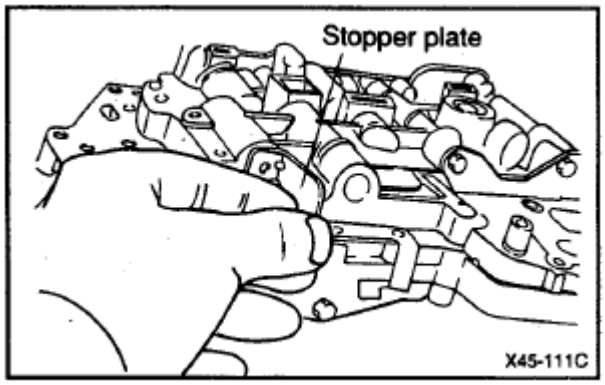


Fig. 149: Identifying Battery Tray

6. Remove the ground cable from transaxle (A).

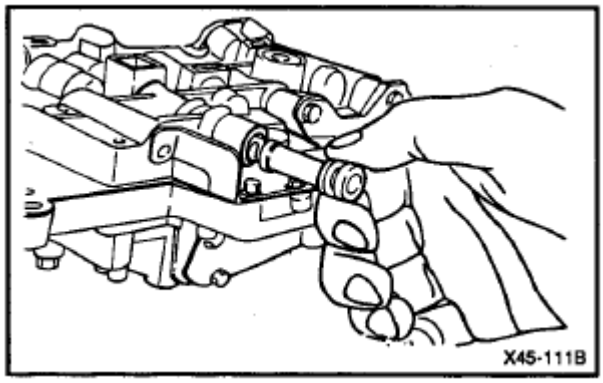


Fig. 150: Identifying Ground Cable

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

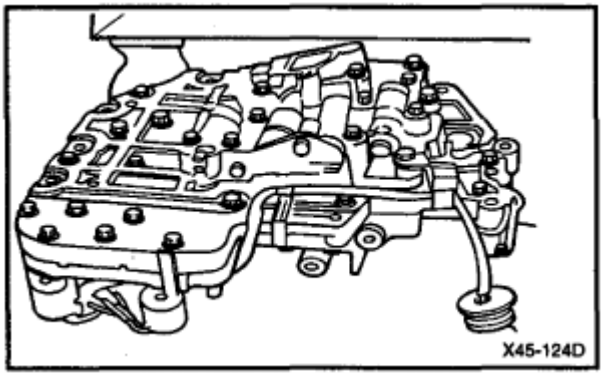


Fig. 151: Identifying Inhibitor Switch Connector, Solenoid Valve Connector And Input Shaft Speed Sensor Connector

8. Disconnect the output shaft speed sensor connector (A).

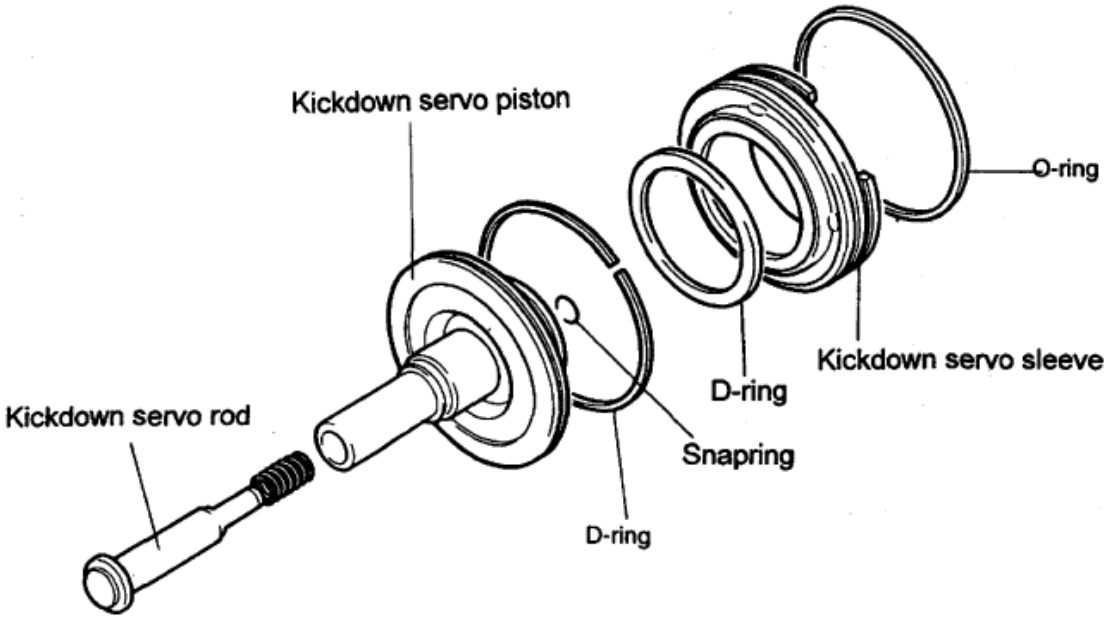


Fig. 152: Identifying Output Shaft Speed Sensor Connector

9. Remove the control cable assembly (A).

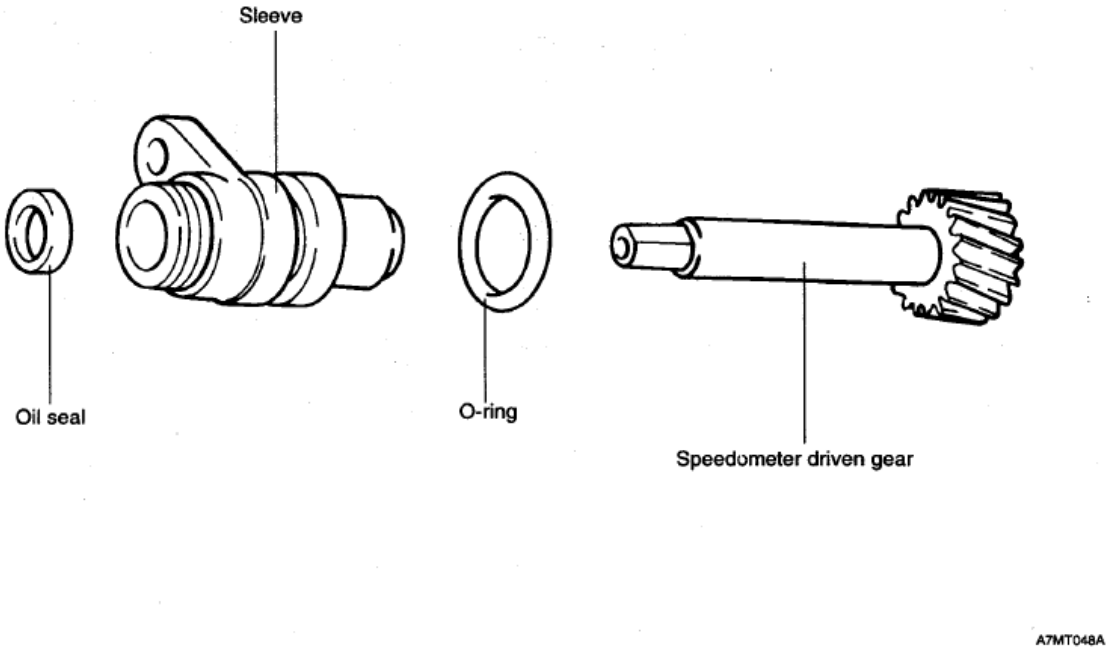


Fig. 153: Identifying Control Cable Assembly

10. Remove the oil cooler hoses (A).

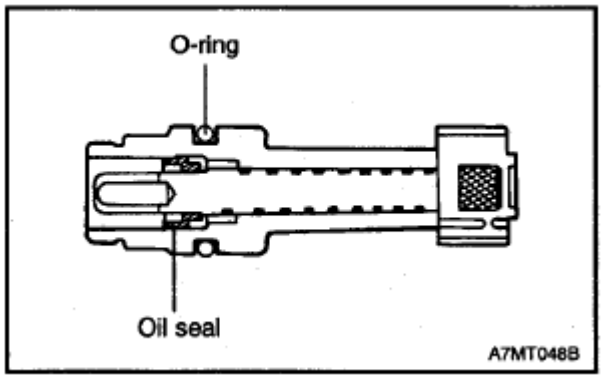


Fig. 154: Identifying Oil Cooler Hoses

11. Install the special tools (09200-38001), the engine support fixture and the adapter on the engine assembly.

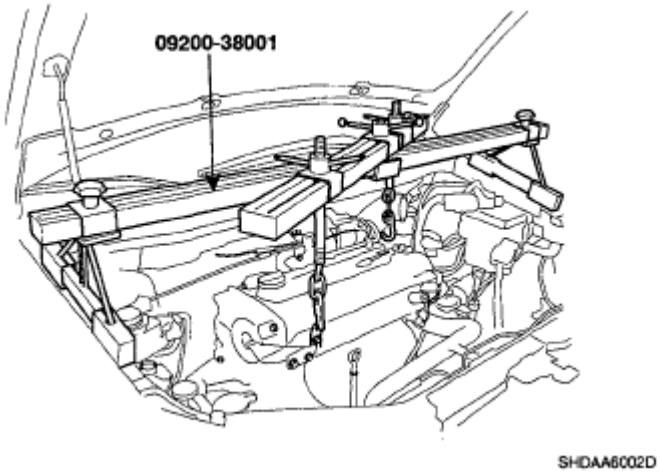


Fig. 155: Identifying Special Tools (09200-38001) And Engine Support Fixture On Engine Assembly

12. Remove the transaxle upper mounting bolts (A-2ea) and the starter motor mounting bolts (B-2ea).

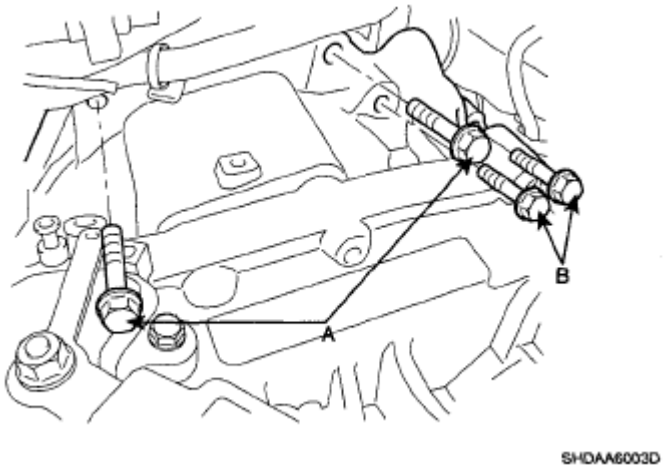


Fig. 156: Identifying Transaxle Upper Mounting Bolts And Starter Motor Mounting Bolts

13. After removing the four bolts, take the transaxle support bracket (A) off.

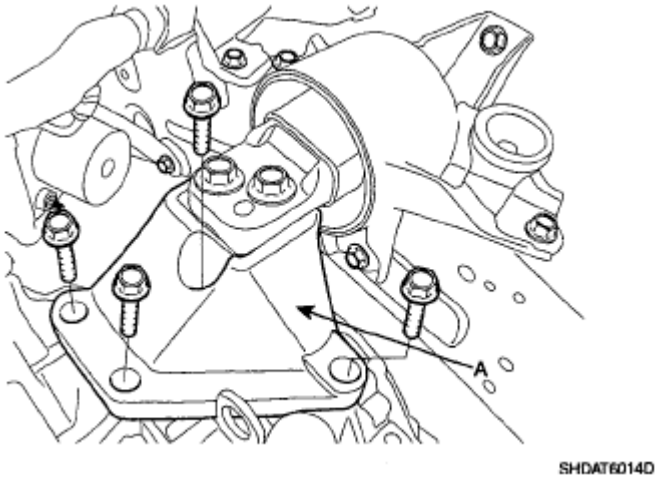


Fig. 157: Identifying Transaxle Support Bracket Bolts

14. Remove the steering joint assembly bolt (A), (refer to **STEERING COLUMN/SHAFT** in ST group)

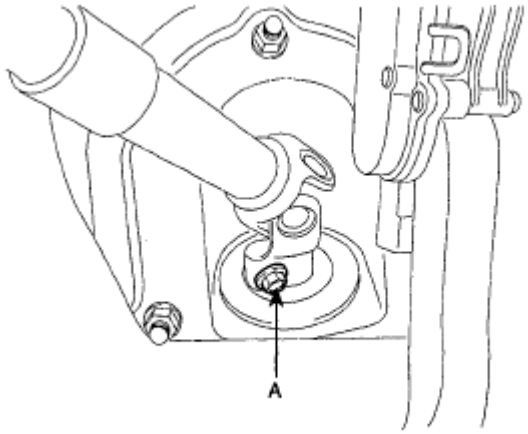


Fig. 158: Identifying Steering Joint Assembly Bolt

15. Remove the front wheels and tires, (refer to **TIRES/WHEELS**)
16. Remove the side mud cover (A).

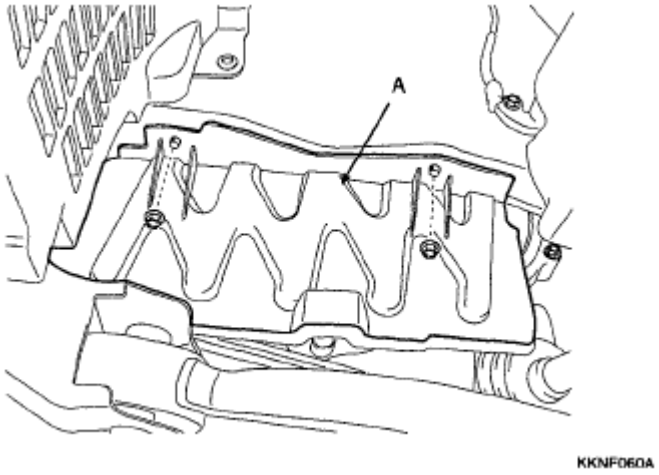


Fig. 159: Identifying Side Mud Cover

17. Remove the under shield cover (A, B).

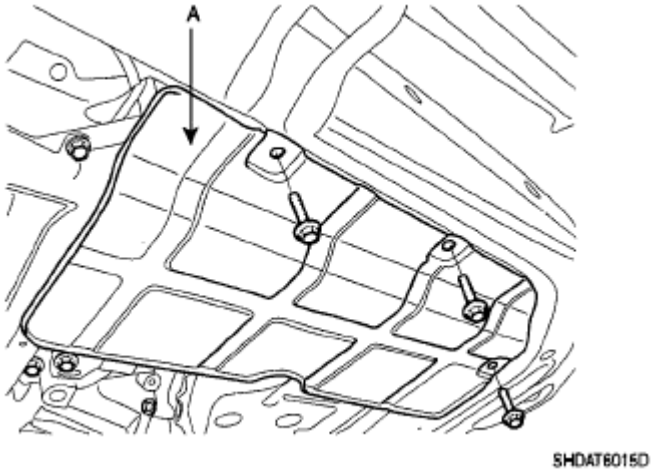


Fig. 160: Identifying Under Shield Cover (1 Of 2)

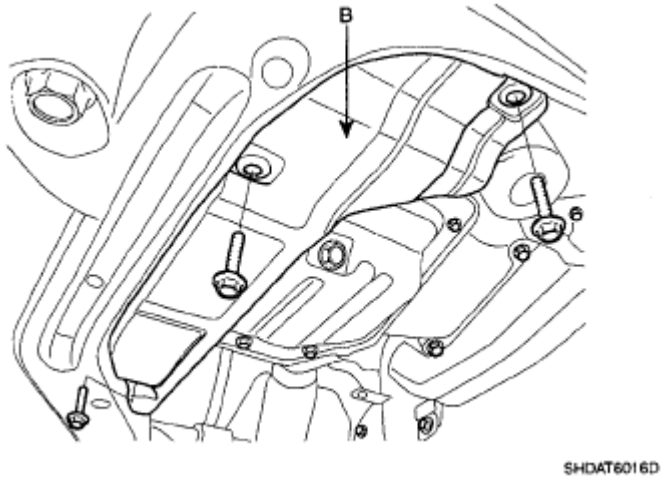


Fig. 161: Identifying Under Shield Cover (2 Of 2)

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

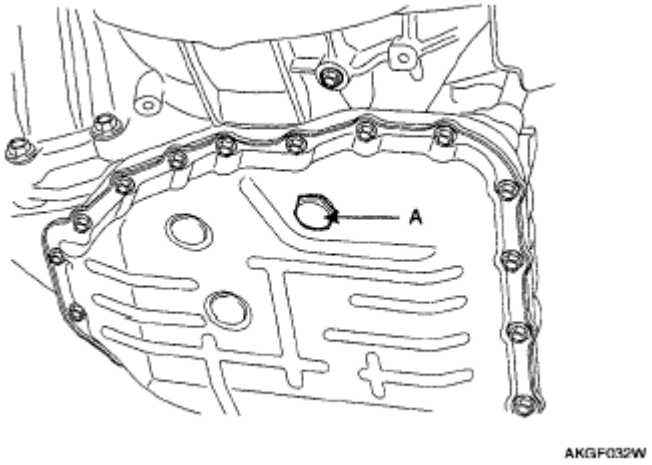


Fig. 162: Identifying Oil Drain Plug

19. Remove the lower arm ball joint mounting nut, the stabilizer link mounting nut, and the tie rod end mounting nut from the front knuckles, (refer to **FRONT SUSPENSION SYSTEM** in SS group)
20. Remove the roll stopper mounting bolts (A, B).

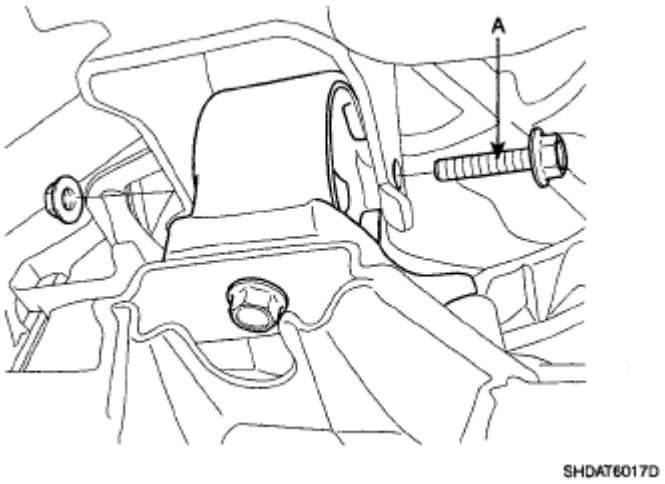


Fig. 163: Identifying Roll Stopper Mounting Bolts (1 Of 2)

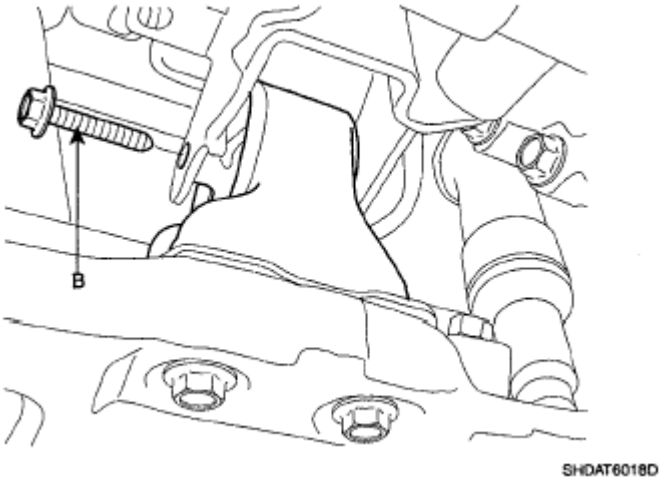


Fig. 164: Identifying Roll Stopper Mounting Bolts (2 Of 2)

21. Remove the muffler hanger rubber (A).

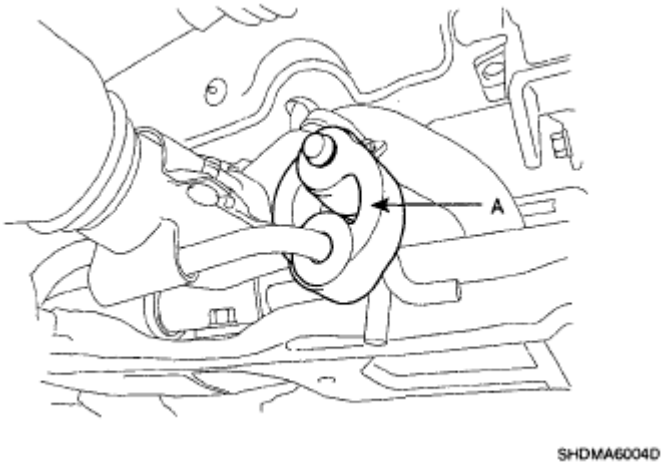


Fig. 165: Identifying Muffler Hanger Rubber

22. Supporting the sub frame (A) with a jack and the Special tool (09624-38000), remove the mounting bolts (refer to **REAR STABILIZER BAR**).

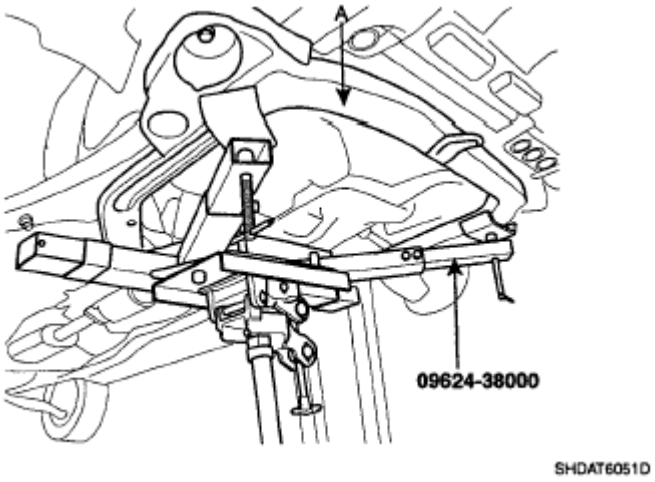


Fig. 166: Supporting Sub Frame With Jack And Special Tool (09624-38000)

23. Disconnect the drive shafts (A,B) from the transaxle.

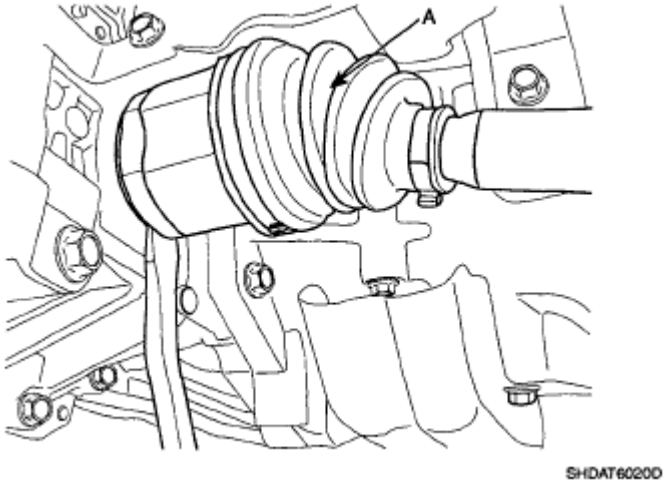


Fig. 167: Identifying Drive Shaft (1 Of 2)

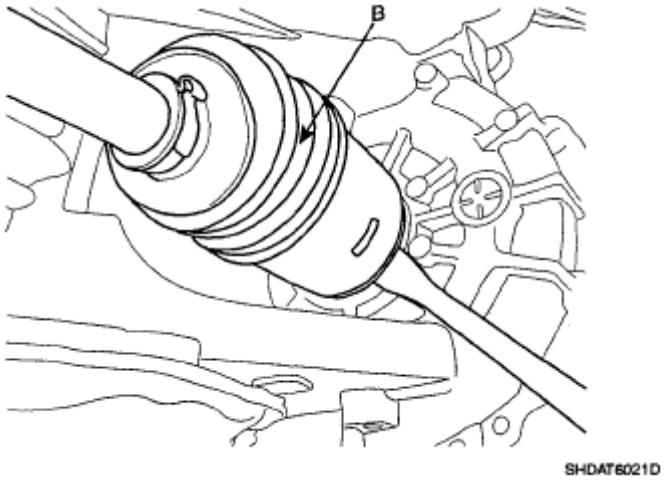


Fig. 168: Identifying Drive Shaft (2 Of 2)

24. Remove the drive plate mounting bolts (A-4ea).

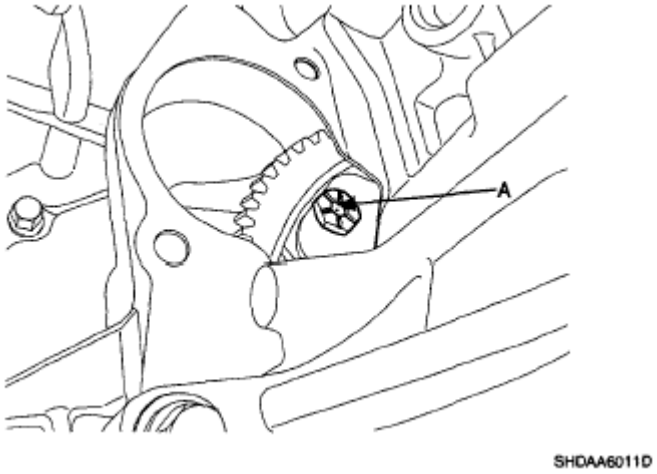


Fig. 169: Identifying Drive Plate Mounting Bolts

25. Supporting the transaxle with a jack, remove the transaxle lower mounting bolts (A-3ea, B-2ea).

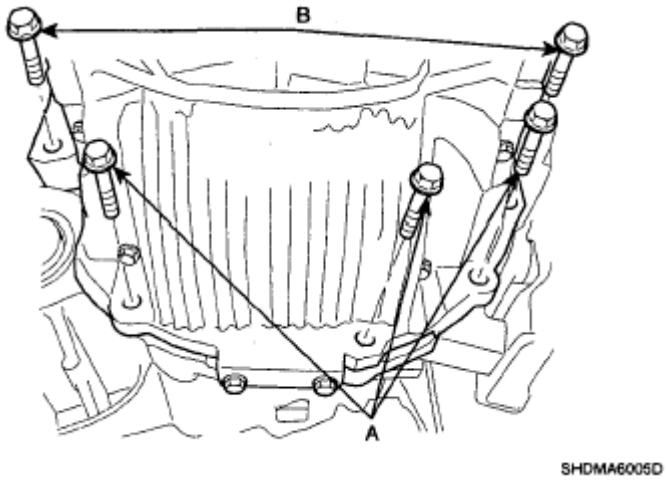


Fig. 170: Identifying Transaxle Lower Mounting Bolts

26. Lowering the jack slowly, remove the transaxle.

CAUTION: When removing the transaxle assembly, be careful not to damage any surrounding parts or body components.

INSTALLATION

1. Install the transaxle lower mounting bolts (A-3ea, B-2ea) after fitting the transaxle assembly into the engine assembly.

   TORQUE : 43-55Nm (4.3-5.5kgf.m, 31.1-39.8lb-ft)

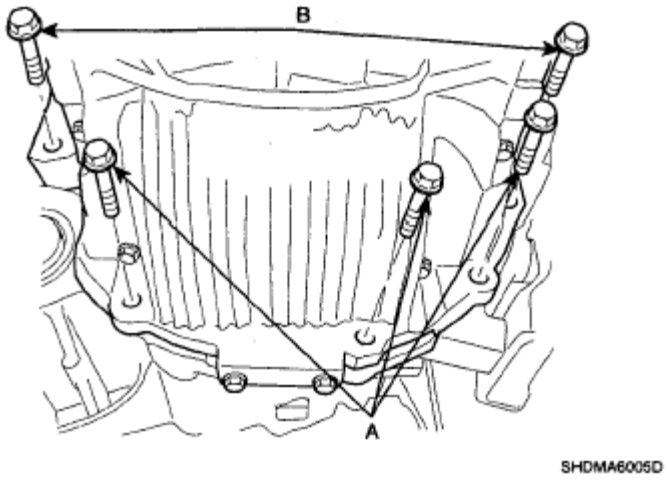


Fig. 171: Identifying Transaxle Lower Mounting Bolts

2. Install the drive plate mounting bolts (A-4ea).

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

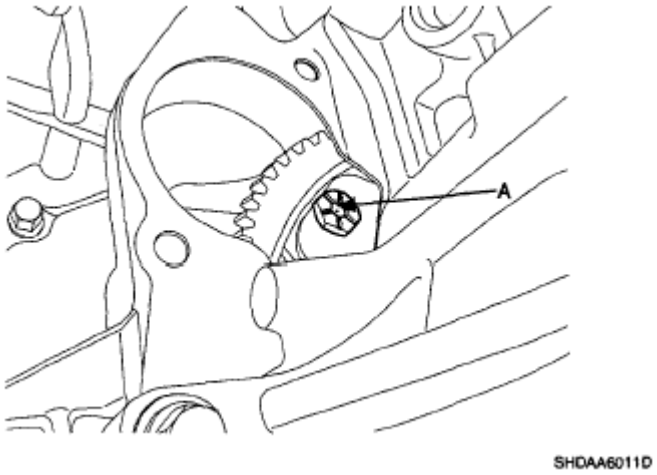


Fig. 172: Identifying Drive Plate Mounting Bolts

3. Connect the drive shafts (A, B) to the transaxle.

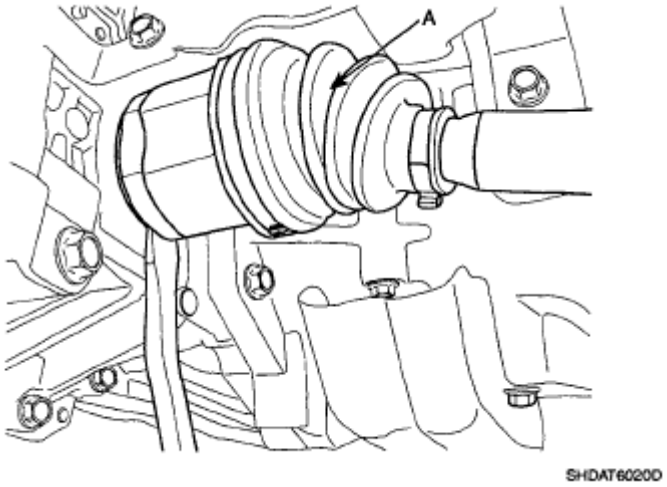


Fig. 173: Identifying Drive Shaft (1 Of 2)

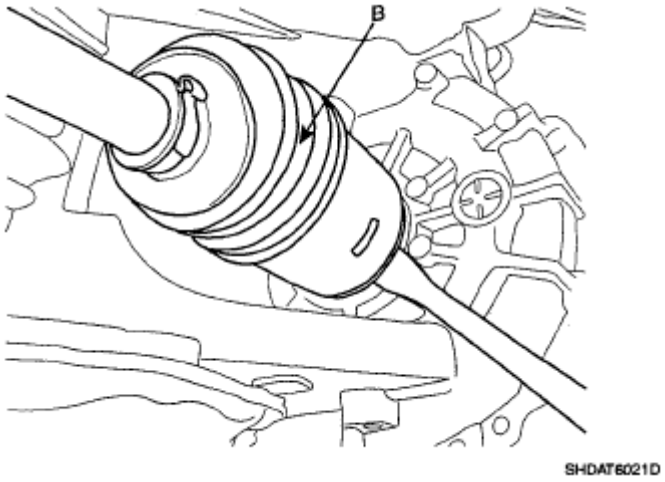


Fig. 174: Identifying Drive Shaft (2 Of 2)

4. Supporting the sub frame (A) with a jack and the Special tool (09624-38000), install the mounting bolts, (refer to **REAR STABILIZER BAR**).

   TORQUE : 140-160Nm (14-16kgf.m, 101-118lb-ft)

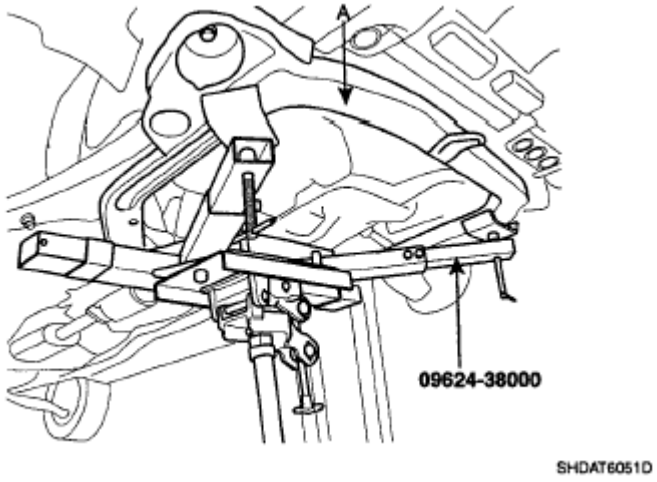


Fig. 175: Supporting Sub Frame With Jack And Special Tool (09624-38000)

5. Install the muffler hanger rubber (A).

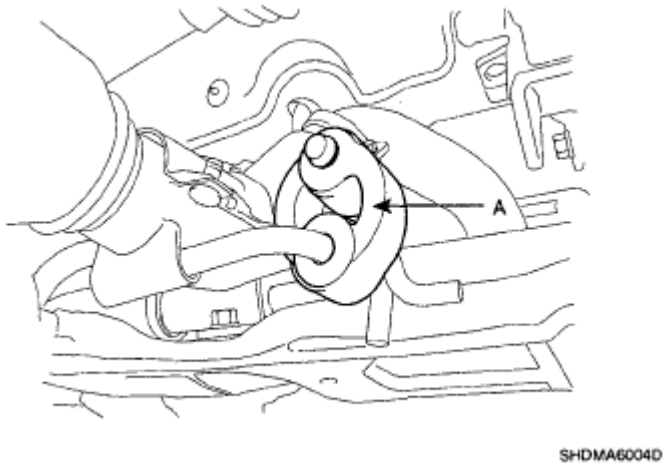


Fig. 176: Identifying Muffler Hanger Rubber

6. Install the roll stopper mounting bolts (A, B).

   TORQUE : 50-65Nm (5-6.5kgf.m, 36.2-47.0lb-ft)

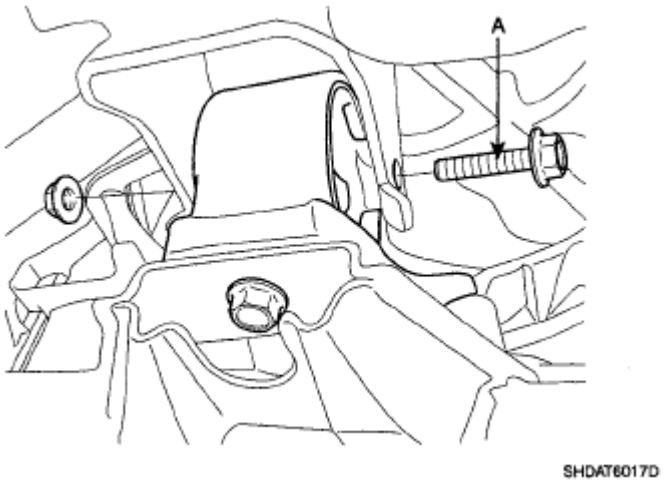


Fig. 177: Identifying Roll Stopper Mounting Bolts (1 Of 2)

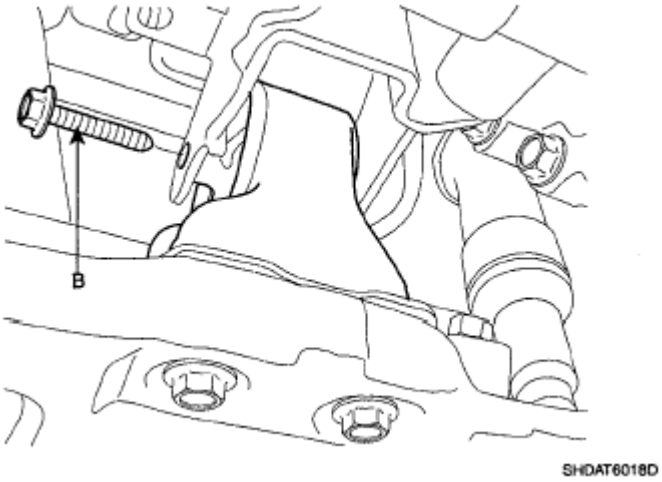


Fig. 178: Identifying Roll Stopper Mounting Bolts (2 Of 2)

7. Install the lower arm ball joint mounting nut, the stabilizer link mounting nut, and the tie rod end mounting nut to the front knuckles, (refer to **FRONT SUSPENSION SYSTEM** in SS group)
8. Install the under shield cover (A, B).

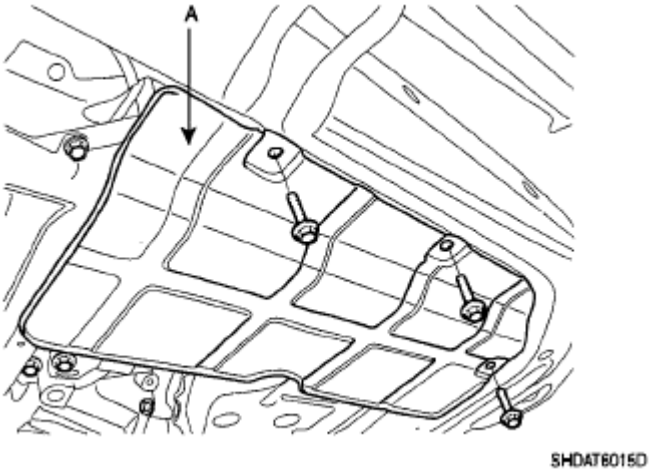


Fig. 179: Identifying Under Shield Cover (1 Of 2)

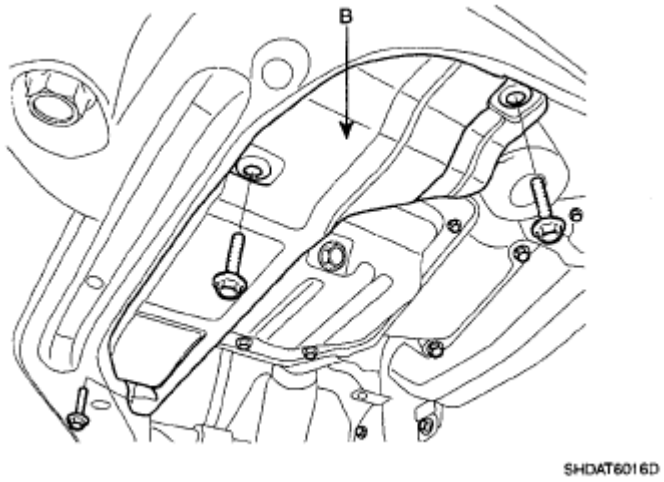


Fig. 180: Identifying Under Shield Cover (2 Of 2)

9. Install the side mud cover (A).

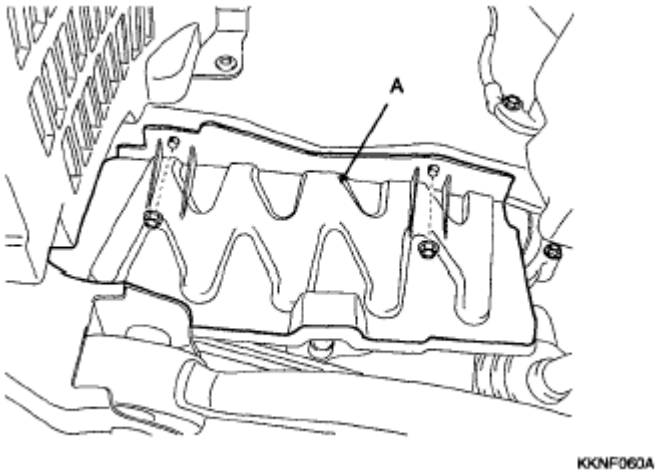


Fig. 181: Identifying Side Mud Cover

10. Install the front wheels and tires, (refer to **TIRES/WHEELS**)
11. Install the steering joint assembly bolt (A), (refer to **STEERING COLUMN/SHAFT** in ST group)

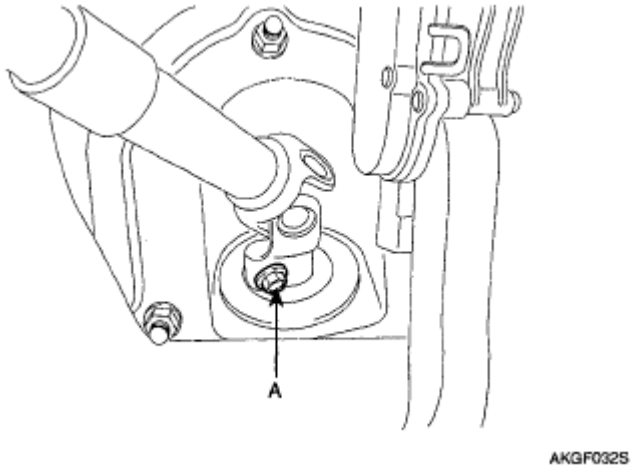


Fig. 182: Identifying Steering Joint Assembly Bolt

12. Install the transaxle support bracket bolts (A).

    TORQUE : 60-80Nm (6.0-8.0kgf.m, 43.4-57.8lb-ft)

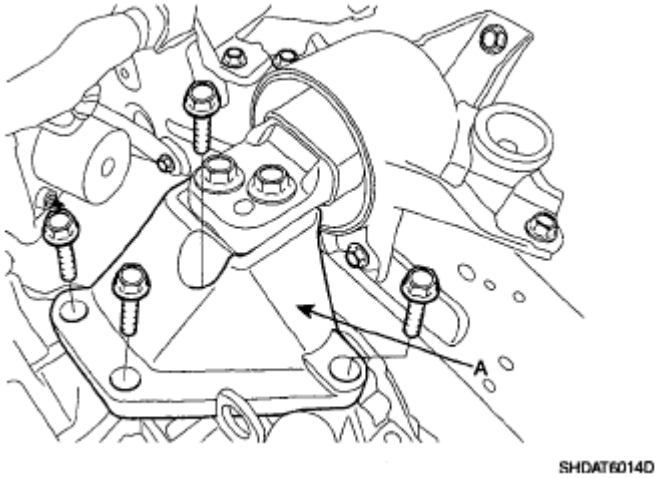


Fig. 183: Identifying Transaxle Support Bracket Bolts

13. Install the transaxle upper mounting bolts (A-2ea) the starter motor mounting bolts (B-2ea).

    TORQUE :

    [A] 60-80Nm (6.0-8.0kgf.m, 43.4-57.8lb-ft)

    [B] 39-60Nm (3.9-6.0kgf.m, 28.2-43.4lb-ft)

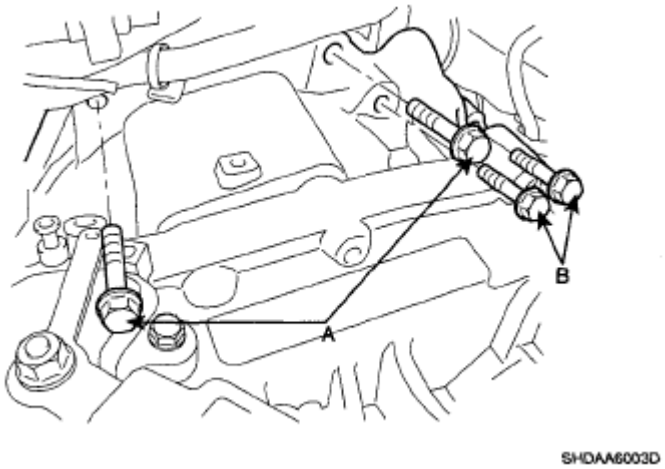


Fig. 184: Identifying Transaxle Upper Mounting Bolts And Starter Motor Mounting Bolts

14. Remove the special tool (09200-38001).

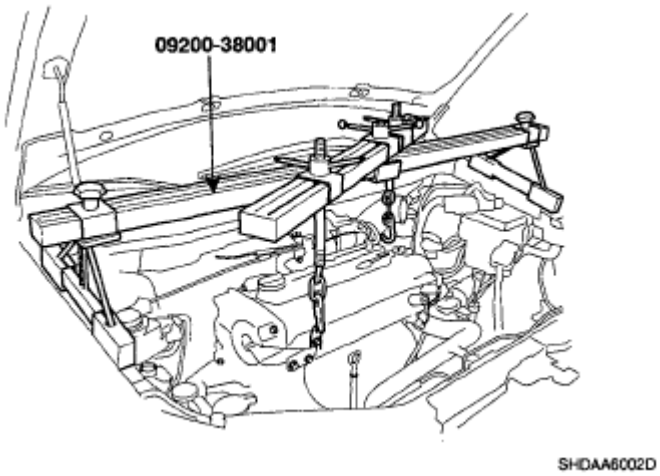


Fig. 185: Identifying Special Tool (09200-38001)

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

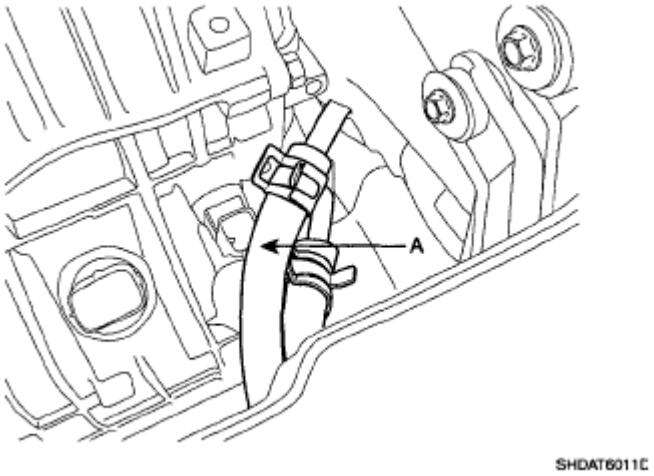


Fig. 186: Identifying Transaxle Oil Cooler Hoses

16. Install the control cable assembly (A).

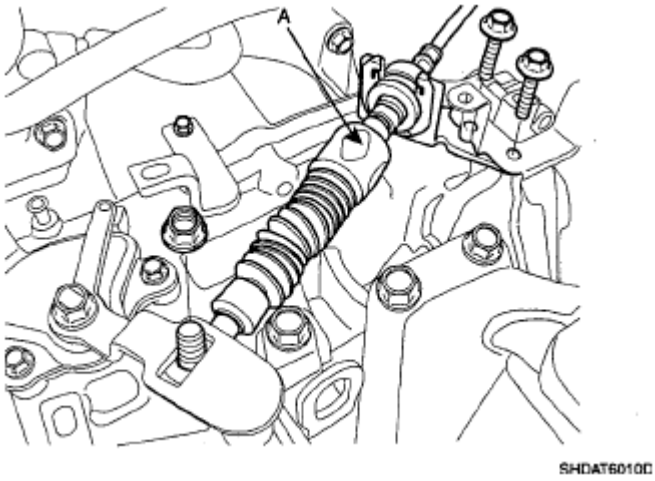


Fig. 187: Identifying Control Cable Assembly

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

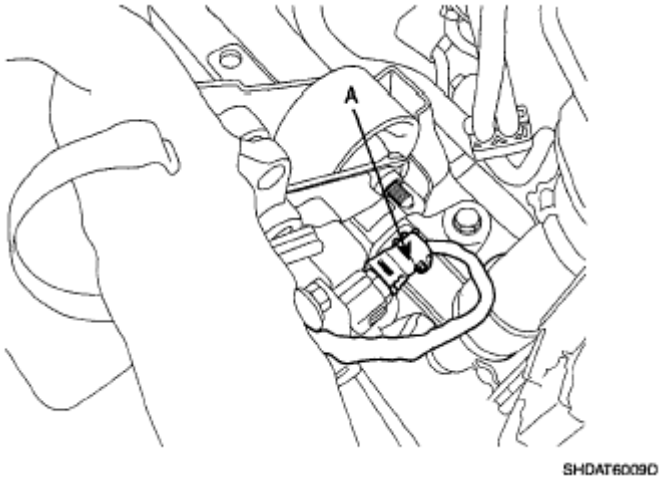


Fig. 188: Identifying Output Speed Sensor Connector

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

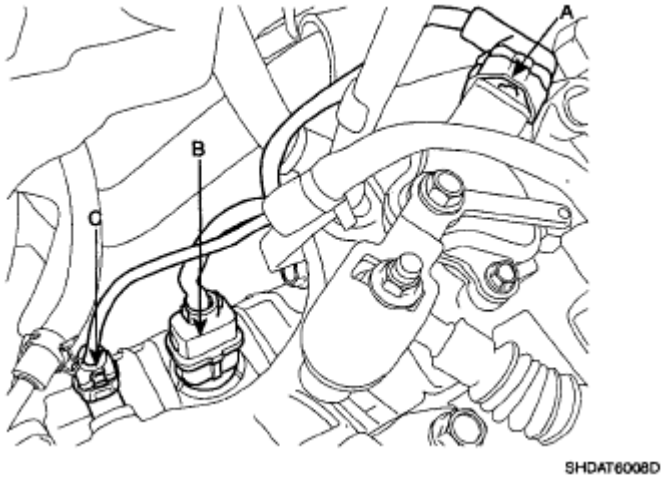


Fig. 189: Identifying Inhibitor Switch Connector, Solenoid Valve Connector And Input Shaft Speed Sensor Connector

19. Install the ground cable (A) to transaxle.

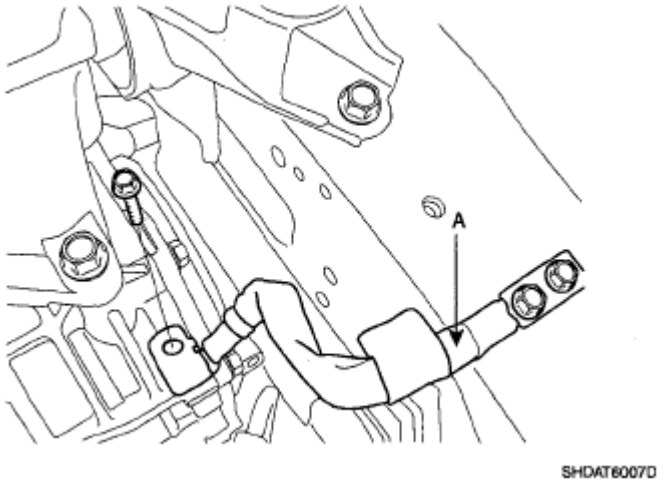


Fig. 190: Identifying Ground Cable

20. Install the battery tray (A).

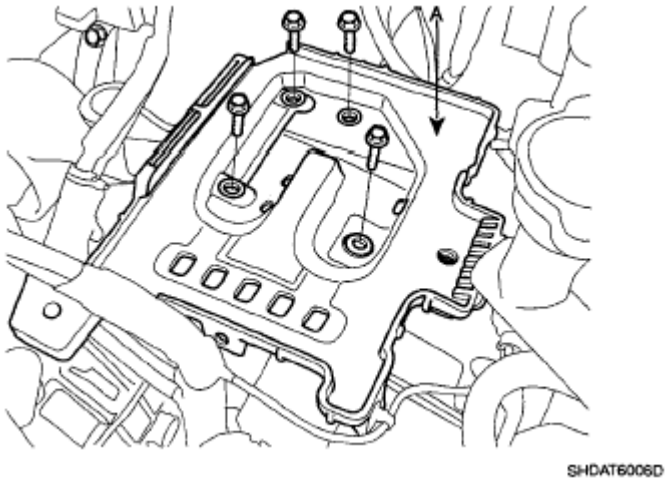


Fig. 191: Identifying Battery Tray

21. Install the air cleaner assembly (D) by connecting the AFS (Air Flow Sensor) connector (A), the clamp (B) and the ECM connector (C).

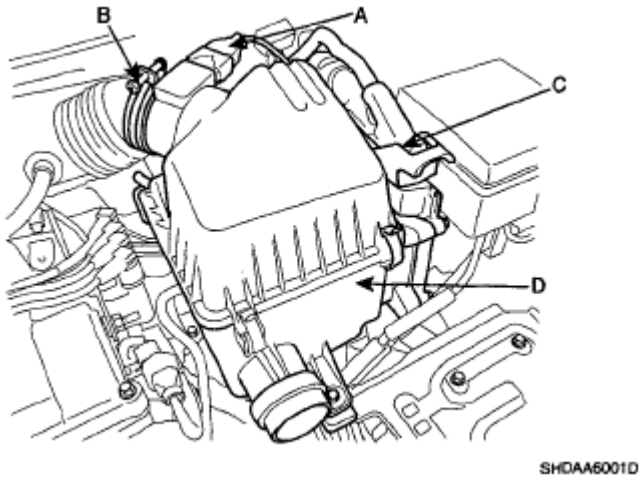


Fig. 192: Identifying Air Cleaner Assembly, Air Flow Sensor Connector And ECM Connector

22. Install the air duct assembly (A).

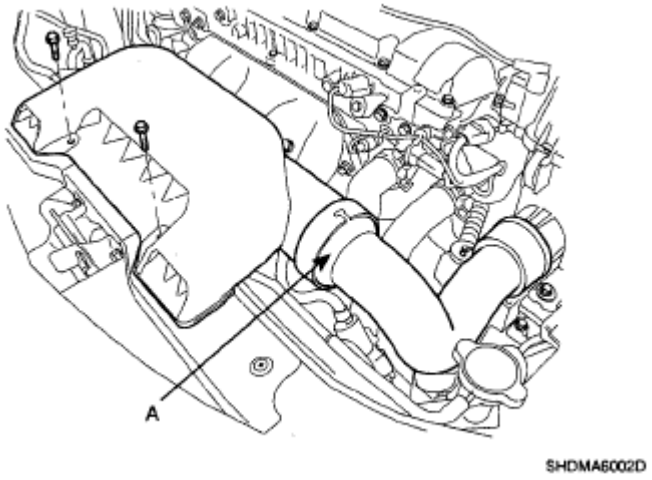


Fig. 193: Identifying Air Duct Assembly

23. Install the battery (A) and the battery terminal.

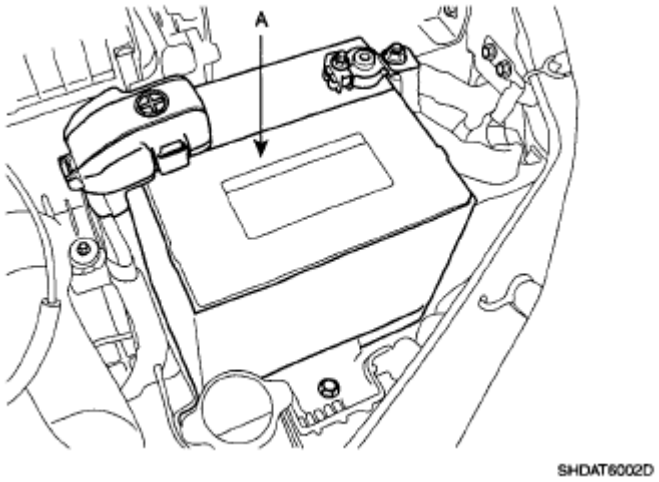


Fig. 194: Identifying Battery

24. Install the engine cover (A).

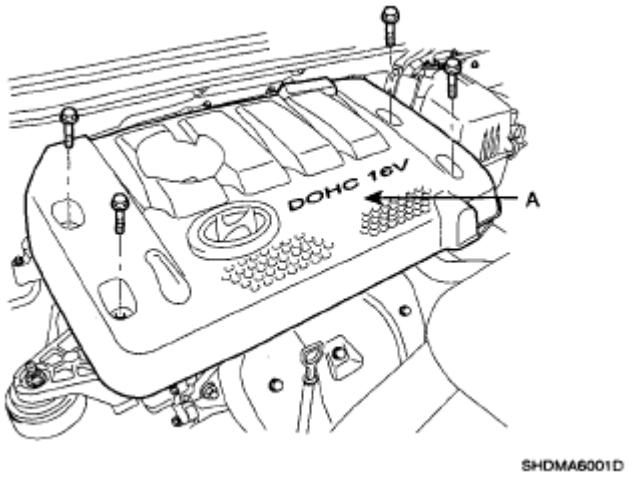


Fig. 195: Identifying Engine Cover

After completing the installation perform the following procedure;

- Adjust the shift cable.
- Refill the transaxle fluid.
- Clean the battery posts and cable terminals with sandpaper and grease them to prevent corrosion before installing.

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 to the cigar jack under the center fascia.

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

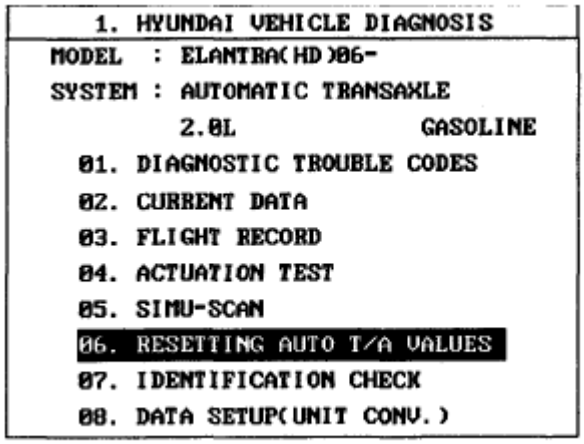


Fig. 196: High-Scan Pro Display - HYUNDAI VEHICLE DIAGNOSIS

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

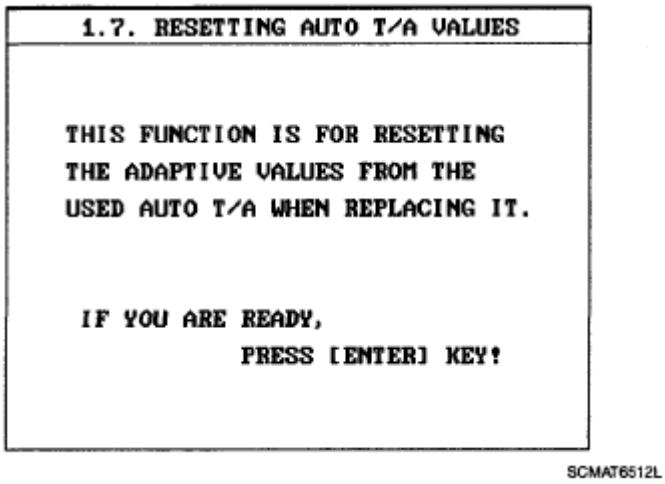


Fig. 197: High-Scan Pro Display - RESETTING AUTO T/A VALUES

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

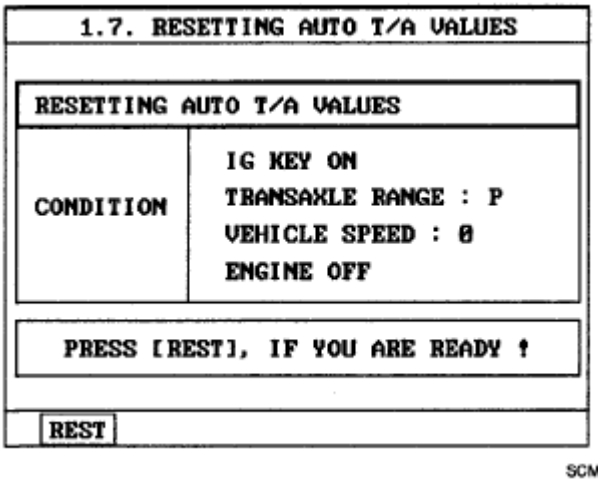


Fig. 198: High-Scan Pro Display - RESETTING AUTO T/A VALUES

ADJUSTMENT

1. Install the transaxle control cable and adjust as follows.
2. Move the shift lever and the transaxle range switch to the "N" Position, and install the control cable.
3. When connecting the control cable to the transaxle mounting bracket, install the clip until it contacts the control cable.
4. Remove any free-play in the control cable by adjusting nut and then check to see that the select lever moves smoothly.
5. Check to see that the control cable (A) has been adjusted correctly.

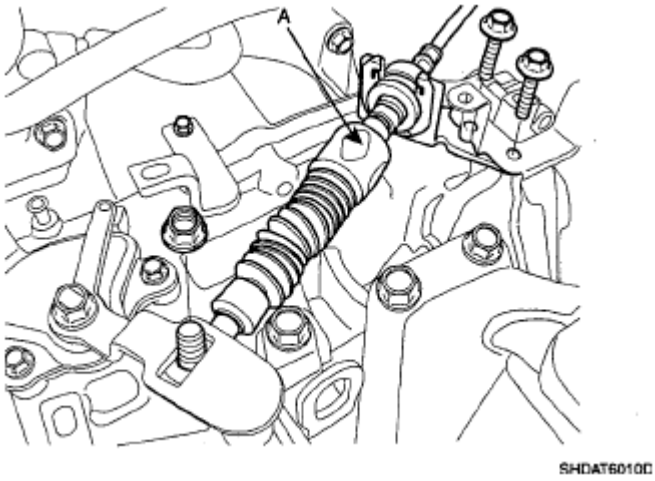


Fig. 199: Identifying Control Cable

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.

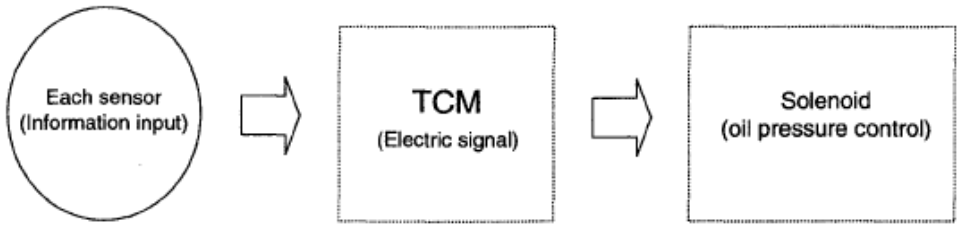


Fig. 200: TCM Communication Diagram

• 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 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.

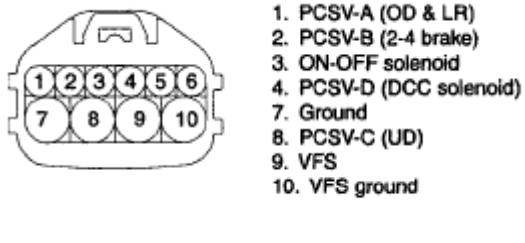


Fig. 201: Identifying PWM Solenoid Valve Terminals

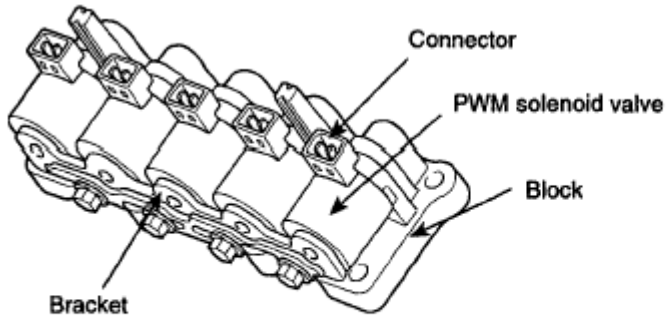


Fig. 202: Identifying PWM Solenoid Valve, Bracket And Connector

PWM (PULSE WIDTH MODULATION) SOLENOID

PULSE WIDTH MODULATION SOLENOID VALVE POSITION REFERENCE

Range	PWM solenoid valve				
	PCSV-A	PCSV-B	PCSV-C	PCSV-D	ON, OFF
N, P	OFF	ON	ON	OFF	ON
1st	ON	ON	OFF	OFF	ON
2nd	ON	OFF	OFF	ON	OFF
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

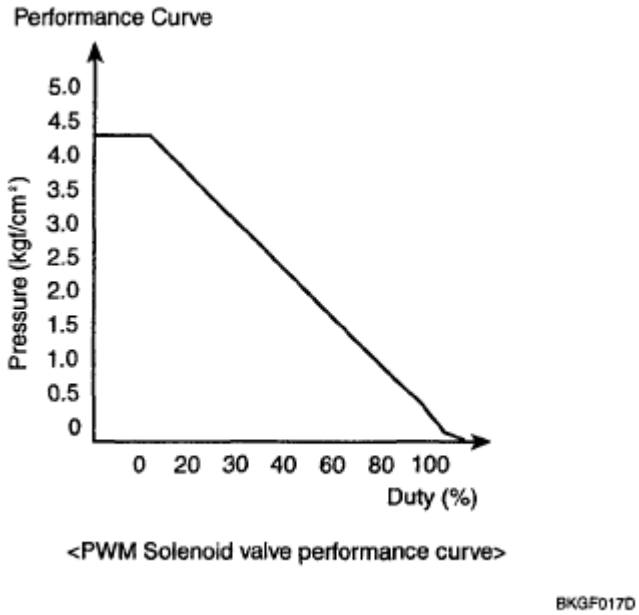


Fig. 203: PWM Solenoid Valve Pressure Graph

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

Oil pressure range: 0~4.3 kgf/cm^2 (0~422kpa, 0~61.2psi)

VOLTAGE AND RESISTANCE SPECIFICATION

Type	3way & Normal High
Supply voltage	12V
Coil resistance	3.2±0.2ohms (at 25°C, 77°F)
Cycle	50Hz

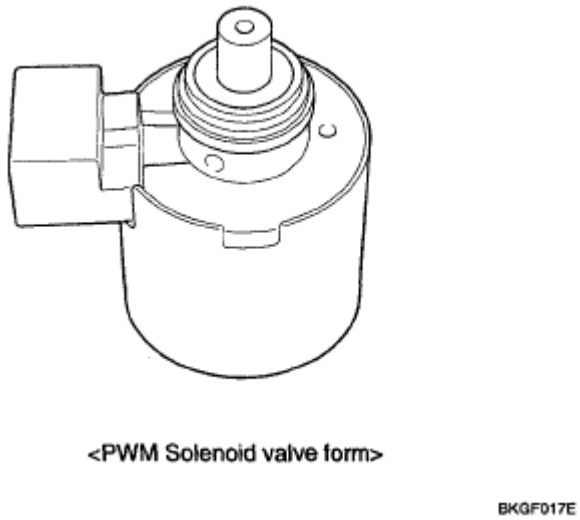


Fig. 204: Identifying PWM Solenoid Valve

REMOVAL

1. Remove the battery terminal.
2. Lift the vehicle.
3. Remove the under cover.
4. Loosen the drain plug and drain the transaxle oil.
5. Remove the oil pan.
6. Remove the oil filter.
7. Remove the valve body (refer to Valve Body Disassembly in overhaul)
8. Disconnect the main harness (A) from valve body.

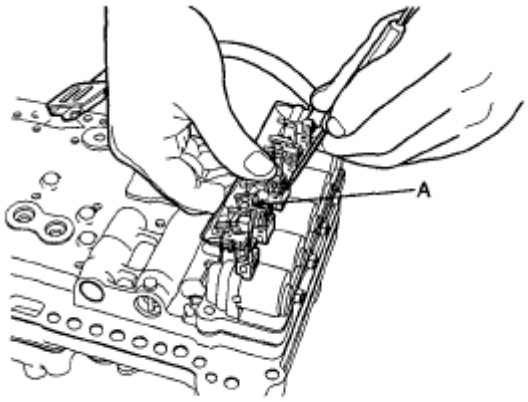


Fig. 205: Disconnecting Main Harness From Valve Body

9. Remove the solenoid valve assembly (A).

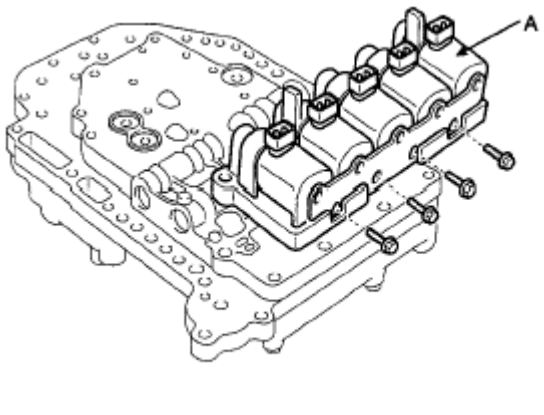


Fig. 206: Identifying Solenoid Valve Assembly

INSTALLATION

1. Install the solenoid valve.

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

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 valve body (refer to Valve Body Reassembly in overhaul)

   TORQUE:

   10~12Nm (1.0~1.2kgf.m,

   7~8lb-ft)

4. Install the oil filter.

   TORQUE :

   10~12Nm (1.0~1.2kgf.m,

   7~8lb-ft)

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

   Liquid gasket Part name : Threebond 1281B

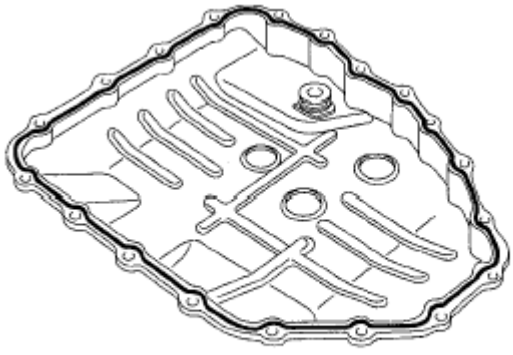


Fig. 207: Identifying Liquid Gasket On Oil Pan

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

   TORQUE:

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

7. Install the drain plug.

   TORQUE:

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

8. Installation is the reverse of the removal.

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.

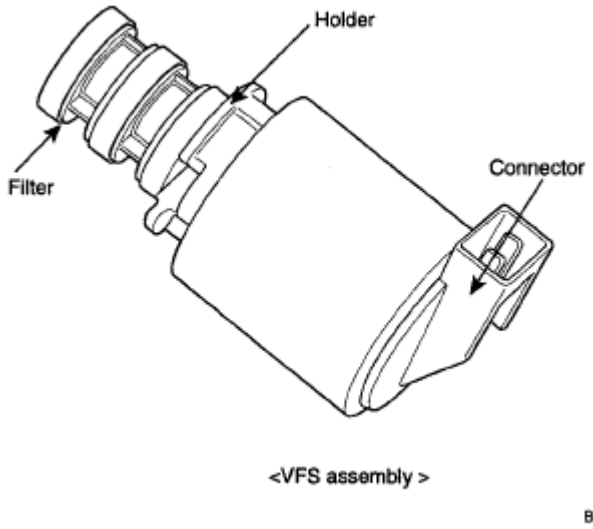


Fig. 208: Identifying Variable Force Solenoid Valve Connector, Holder And Filter

VFS (VARIABLE FORCE SOLENOID) VALVE CONTROL FEATURE

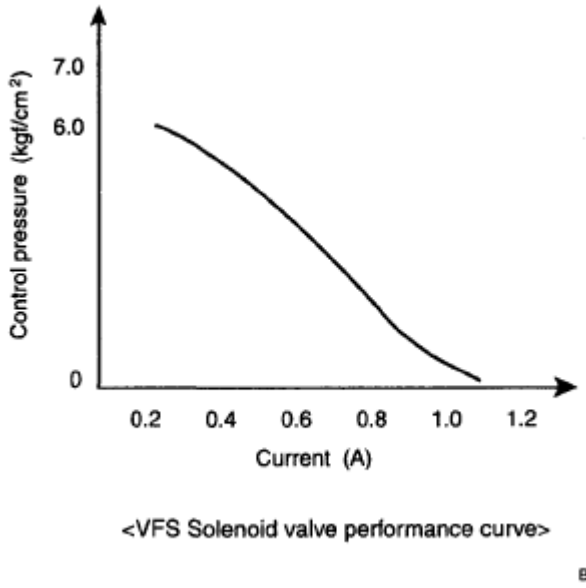


Fig. 209: Variable Force Solenoid Valve Control Pressure Graph

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

VOLTAGE AND RESISTANCE SPECIFICATION

type	3way & Normal High
Input voltage	12V
Coil resistance	3.5±0.2ohms (at 25°C, 77°F)
Operating current	0 ~ 1200 mA

REMOVAL

1. Remove the battery terminal.
2. Lift the vehicle.
3. Remove the under cover.
4. Loosen the drain plug and drain the transaxle oil.
5. Remove the oil pan.
6. Remove the oil filter.
7. Remove the valve body (refer to Valve Body Disassembly in overhaul)
8. Disconnect the VFS solenoid valve connector (A).

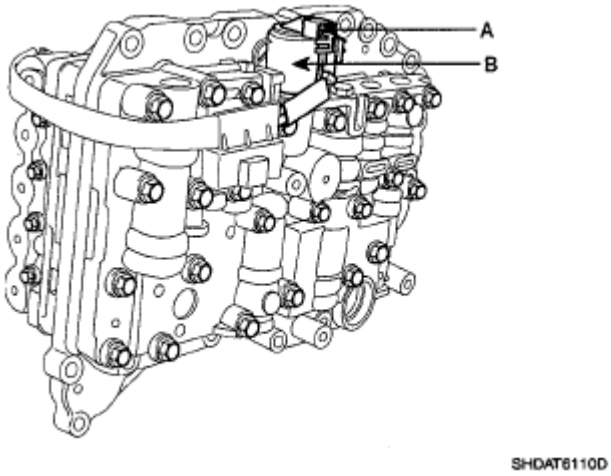


Fig. 210: Identifying VFS Solenoid Valve Connector

9. Remove the solenoid valve assembly (B).

INSTALLATION

1. Install the solenoid valve (B).

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

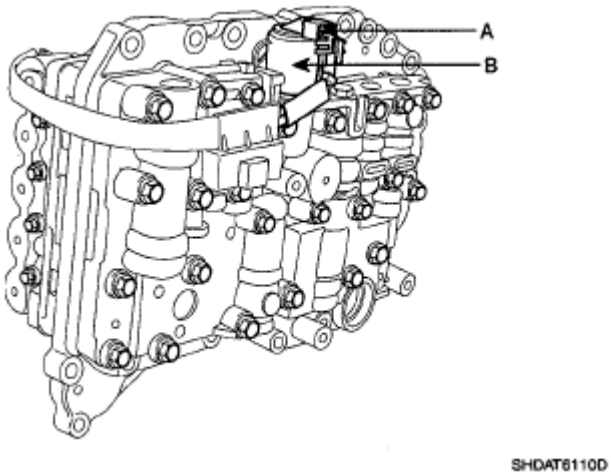


Fig. 211: Identifying VFS Solenoid Valve Connector And Solenoid Valve

2. Connect the solenoid valve connector (A).

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

3. Install the valve body (refer to Valve Body Reassembly in overhaul)

   TORQUE:

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

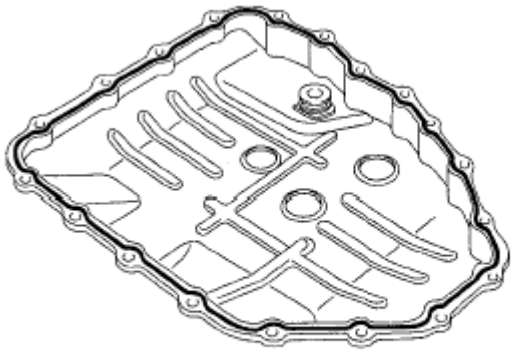
4. Install the oil filter.

   TORQUE :

   5~7Nm (0.5~0.7kgf.m, 4~5lb-ft)

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

   Liquid gasket Part name : Threebond 1281B



AKGF006T

Fig. 212: Identifying Liquid Gasket On Oil Pan

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

   TORQUE:

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

7. Install the drain plug.

   TORQUE:

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

8. Installation is the reverse of the removal.

INPUT SPEED SENSOR

DESCRIPTION

INPUT SPEED SENSOR DESCRIPTION

Sensor type	1. Type : HALL SENSOR 2. Operating voltage : DC 12V 3. Current consumption : 22mA (Max)
Function	1. Input shaft speed sensor: Detect the input shaft rotation at the OD & REV retainer side to control oil pressure when shifting. 2. Feedback control, clutch-clutch control, damper clutch control, shift range control, incorrect ratio control and sensor trouble detection signal.
Connector	 1. Ground 2. Input 3. Power source SHDAT6041L

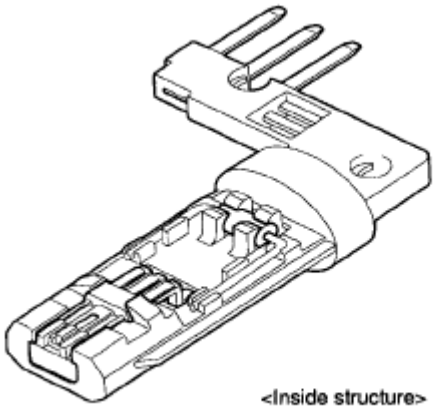


Fig. 213: Identifying Inside Structure Of Input Speed Sensor

VOLTAGE AND RESISTANCE SPECIFICATION

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

REMOVAL

1. Remove the battery terminal.
2. Remove the battery and battery tray.
3. Remove the air duct.

4. Remove the air cleaner assembly (refer to **REMOVAL**)
5. Remove the input shaft speed sensor connector (A).

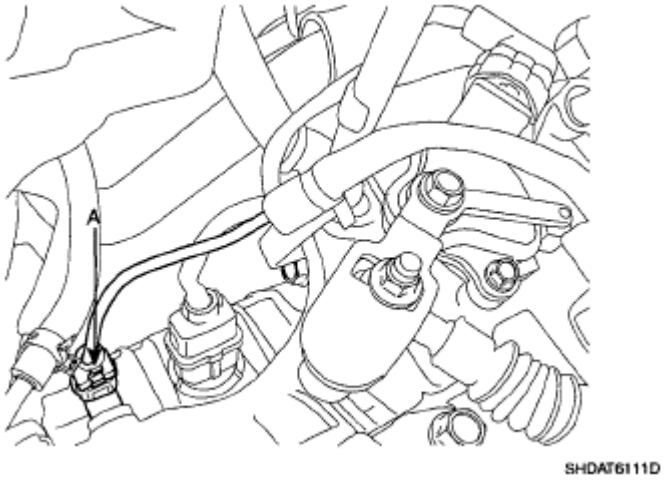


Fig. 214: Identifying Input Shaft Speed Sensor Connector

6. Remove the input shaft speed sensor (A).

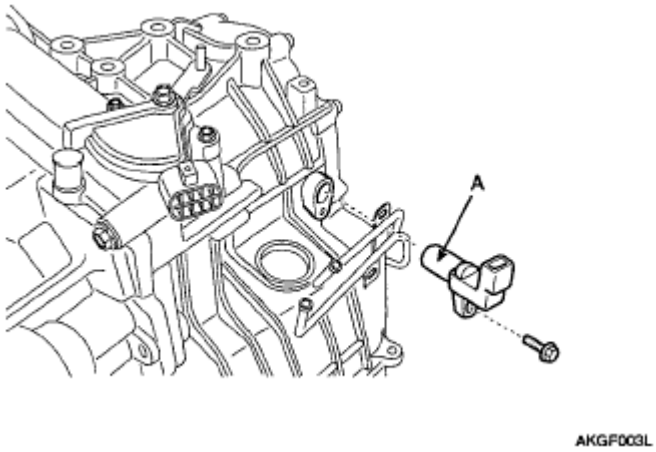


Fig. 215: Identifying Input Shaft Speed Sensor

INSTALLATION

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

   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.

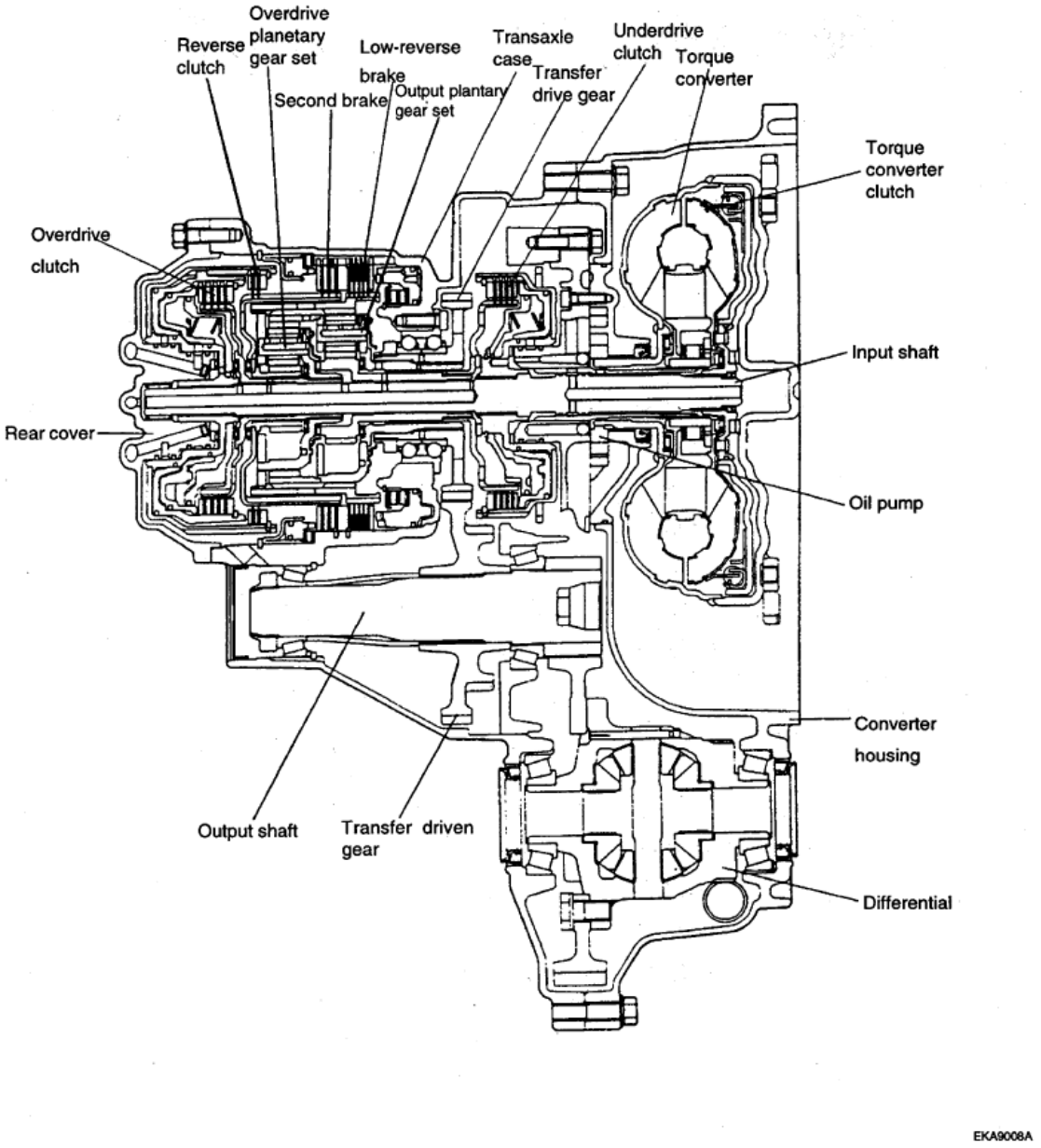
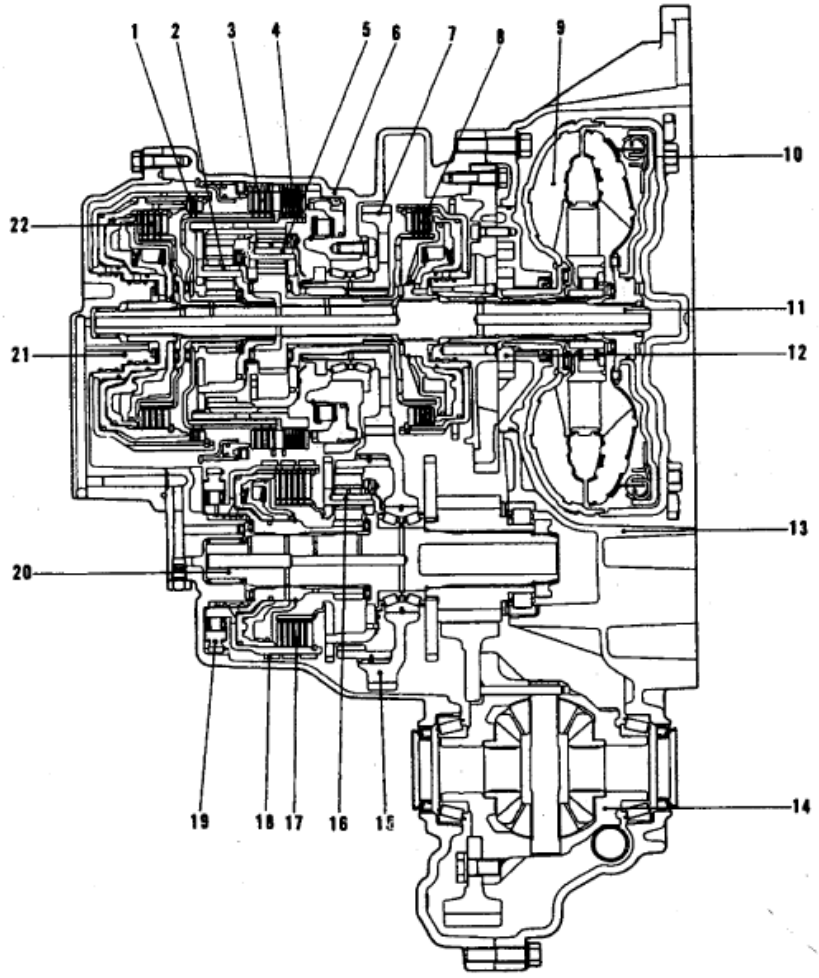


Fig. 216: Identifying Input Shaft Speed Sensor

3. Check the connector for dust, dirt, or oil, and then connect the input shaft speed sensor connector (A) securely.



1. REVERSE CLUTCH
2. OVER DRIVE PLANETARY GEAR SET
3. SECOND BRAKE
4. LOW & REVERSE BRAKE
5. OUTPUT PLANETARY GEAR SET
6. TRANSMISSION CASE
7. TRANSFER DRIVE GEAR
8. UNDER DRIVE CLUTCH
9. TORQUE CONVERTER
10. DAMPER CLUTCH
11. INPUT SHAFT
12. OIL PUMP
13. CONVERTER HOUSING
14. DIFFERENTIAL
15. TRANSFER DRIVEN GEAR
16. DIRECT PLANETARY GEAR SET
17. DIRECT CLUTCH
18. REDUCTION BRAKE
19. ONE WAY CLUTCH
20. OUTPUT SHAFT
21. REAR COVER
22. OVER DRIVE CLUTCH

EKB9004A

Fig. 217: Identifying Input Shaft Speed Sensor Connector

4. Installation is the reverse of removal.

OUTPUT SPEED SENSOR

DESCRIPTION

OUTPUT SPEED SENSOR DESCRIPTION

Sensor type	1. Type : HALL SENSOR 2. Output voltage : DC 12V 3. Current consumption : 22mA (Max)
Function	1. Output shaft speed sensor : Detect the output shaft rpm (T/F DRIVE GEAR RPM) at the T/F drive gear 2. Feedback control, clutch-clutch control, damper clutch control, shift range control, incorrect ratio control and sensor trouble detection signal.
Connector	 1. Ground 2. Input 3. Power source SHDAT6042L

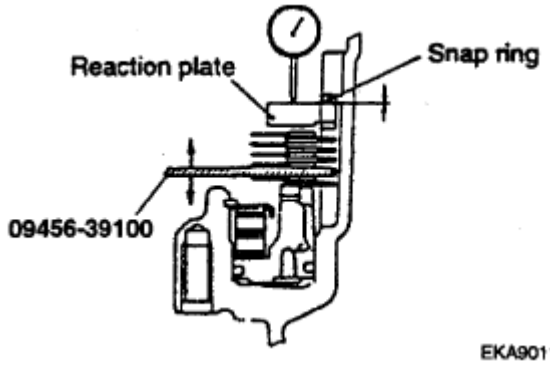


Fig. 218: Identifying Inside Structure Of Output Speed Sensor

VOLTAGE AND RESISTANCE SPECIFICATION

Item	Inspection item	Standard value
Air gap	Output shaft speed sensor	0.033in (0.85mm)
Sensor resistance	Output shaft speed sensor	Over 1 Mohms
Output voltage	HIGH	Over 4.8V
	LOW	Below 0.8V

REMOVAL

1. Remove the battery terminal.
2. Remove the battery and battery tray.
3. Remove the air duct.
4. Remove the air cleaner assembly (refer to **REMOVAL**)
5. Remove the output shaft speed sensor connector (A).

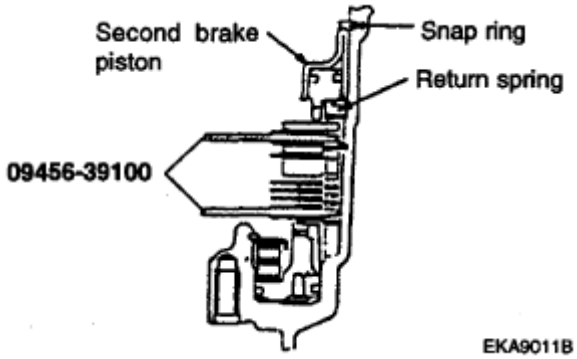


Fig. 219: Identifying Output Shaft Speed Sensor Connector

6. Remove the output shaft speed sensor (A).

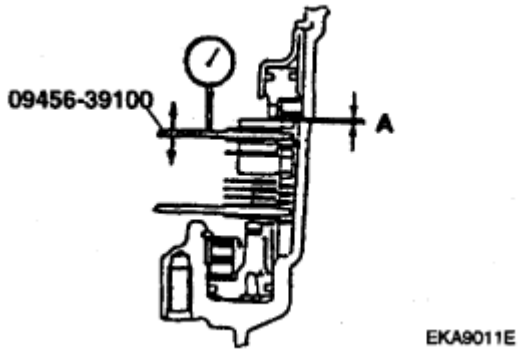


Fig. 220: Identifying Output Shaft Speed Sensor

INSTALLATION

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

   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.

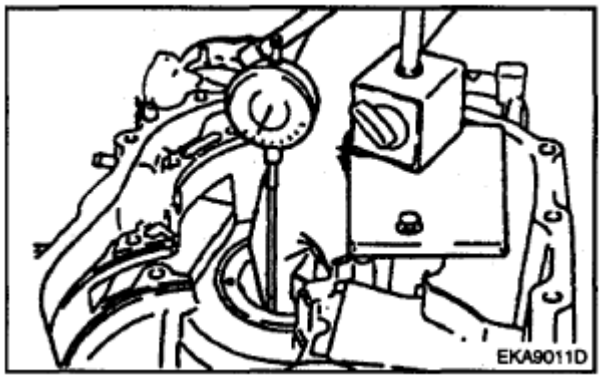


Fig. 221: Identifying Output Shaft Speed Sensor

3. Check the connector for dust, dirt, or oil, then connect the output shaft speed sensor connector (A) securely.

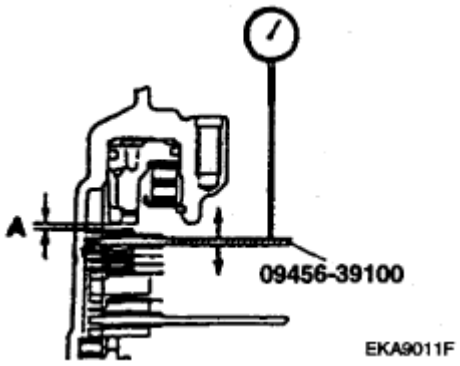


Fig. 222: Identifying Output Shaft Speed Sensor Connector

4. Installation is the reverse of removal.

TRANSAXLE OIL TEMPERATURE SENSOR

DESCRIPTION

TRANSAXLE OIL TEMPERATURE SENSOR DESCRIPTION

Sensor type	1. Type : Thermister 2. Use available temperature :-40~160°C (-40~320°F)
Function and feature	1. Detect the temperature of ATF through the thermistor which is exposed outside. 2. When shifting the range, it is used as the oil pressure control information.
Connector	

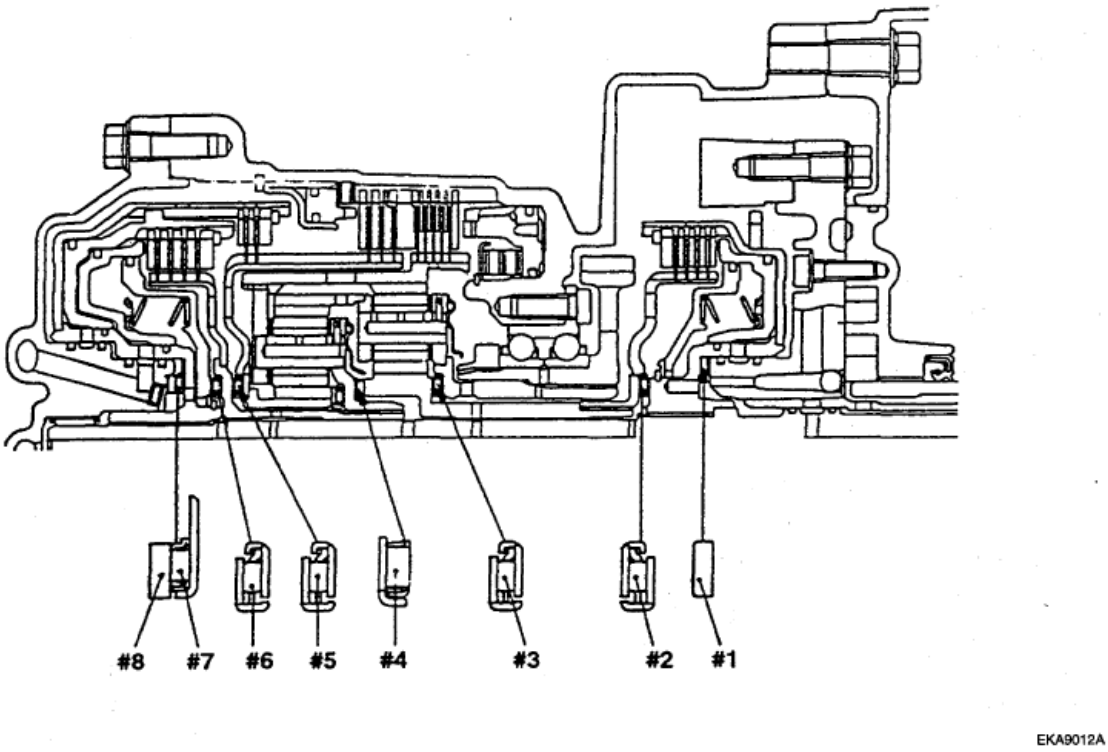
5. Sensor input
6. Groud

SHDAT6043L

TEMPERATURE AND RESISTANCE SPECIFICATION

Temp.[°C (°F)]	Resistance (Kohms)	Temp.[°C (°F)]	Resistance (Kohms)
-40 (-40)	139.5	80 (176)	1.08
-20 (-4)	47.4	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		

INSTALLATION LOCATION



EKA9012A

Fig. 223: Identifying Transaxle Oil Temperature Sensor Installation Location

REMOVAL

1. Remove the battery terminal.
2. Lift the vehicle.
3. Remove the under cover.

4. Loosen the drain plug and drain the transaxle oil.
5. Remove the oil pan.
6. Remove the oil filter.
7. Remove the valve body (refer to Valve Body Disassembly in overhaul)
8. Disconnect the main harness connector (A) from the valve body.

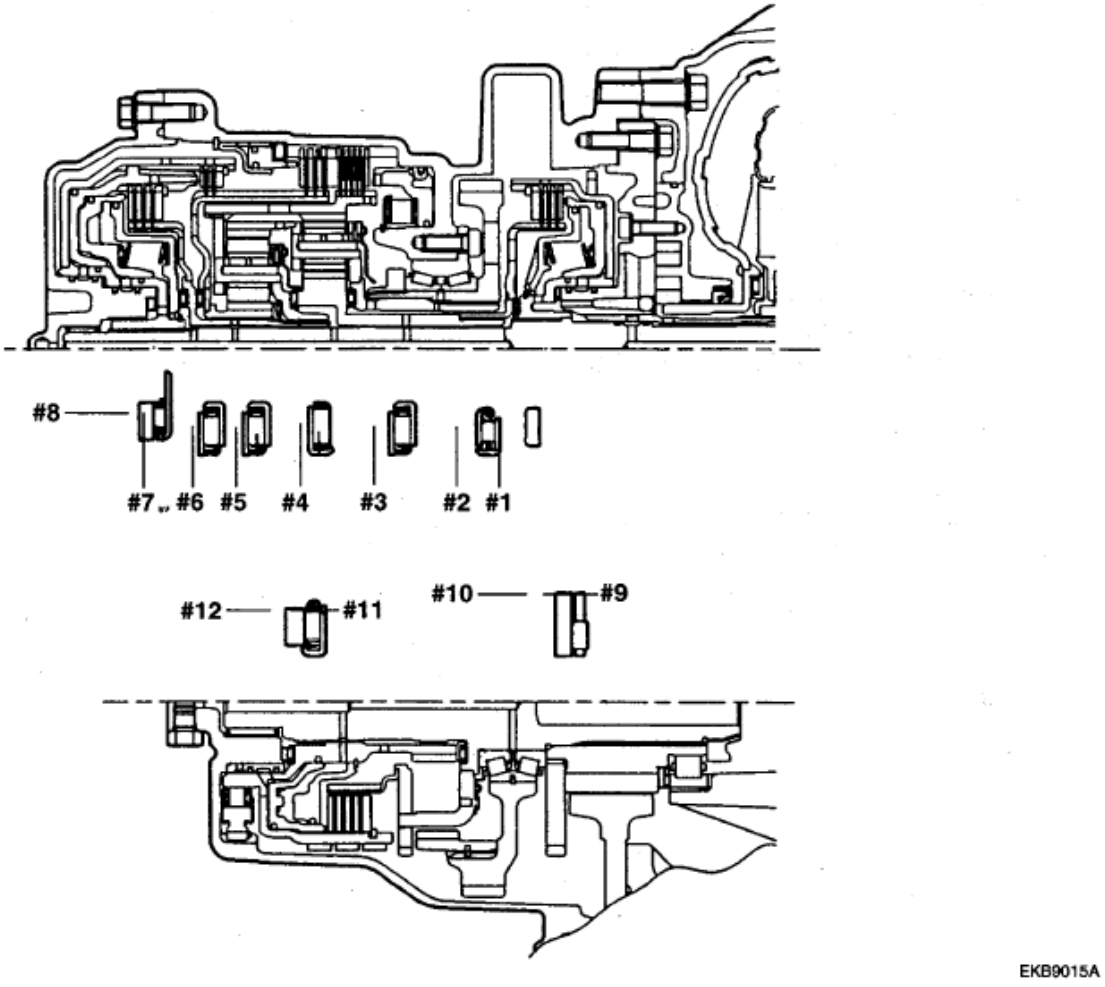


Fig. 224: Identifying Valve Body Main Harness Connector

INSTALLATION

1. Connect the main harness connector (A) to the valve body.

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

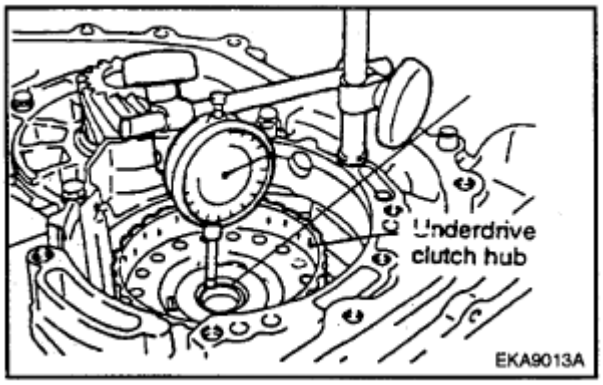


Fig. 225: Identifying Valve Body Main Harness Connector

2. Install the valve body (refer to Valve Body Reassembly in overhaul)

   TORQUE:

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

3. Install the oil filter.

   TORQUE:

   5~7Nm (0.5~0.7kgf.m, 4~5lb-ft)

4. Continue to apply liquid gasket at application points at the oil pan with 00.098in (2.5mm) thickness.

   Liquid gasket Part name : Threebond 1281B

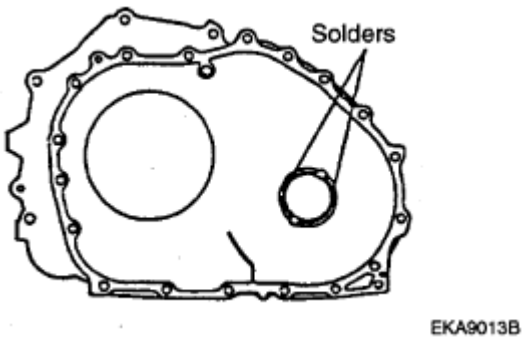


Fig. 226: Identifying Liquid Gasket On Oil Pan

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.

   TORQUE :

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

7. Installation is the reverse of the removal.

TRANSAXLE RANGE (TR) SWITCH

DESCRIPTION

TRANSAXLE RANGE SWITCH DESCRIPTION

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".

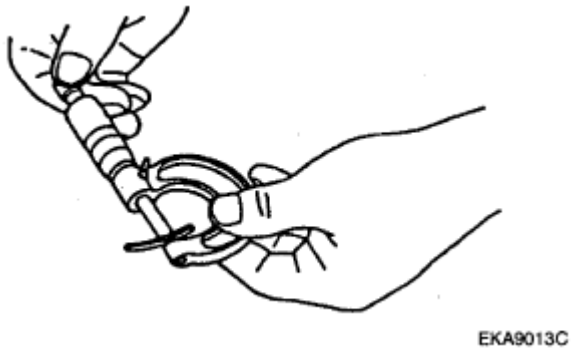


Fig. 227: Locating Transaxle Range Switch Installation Location

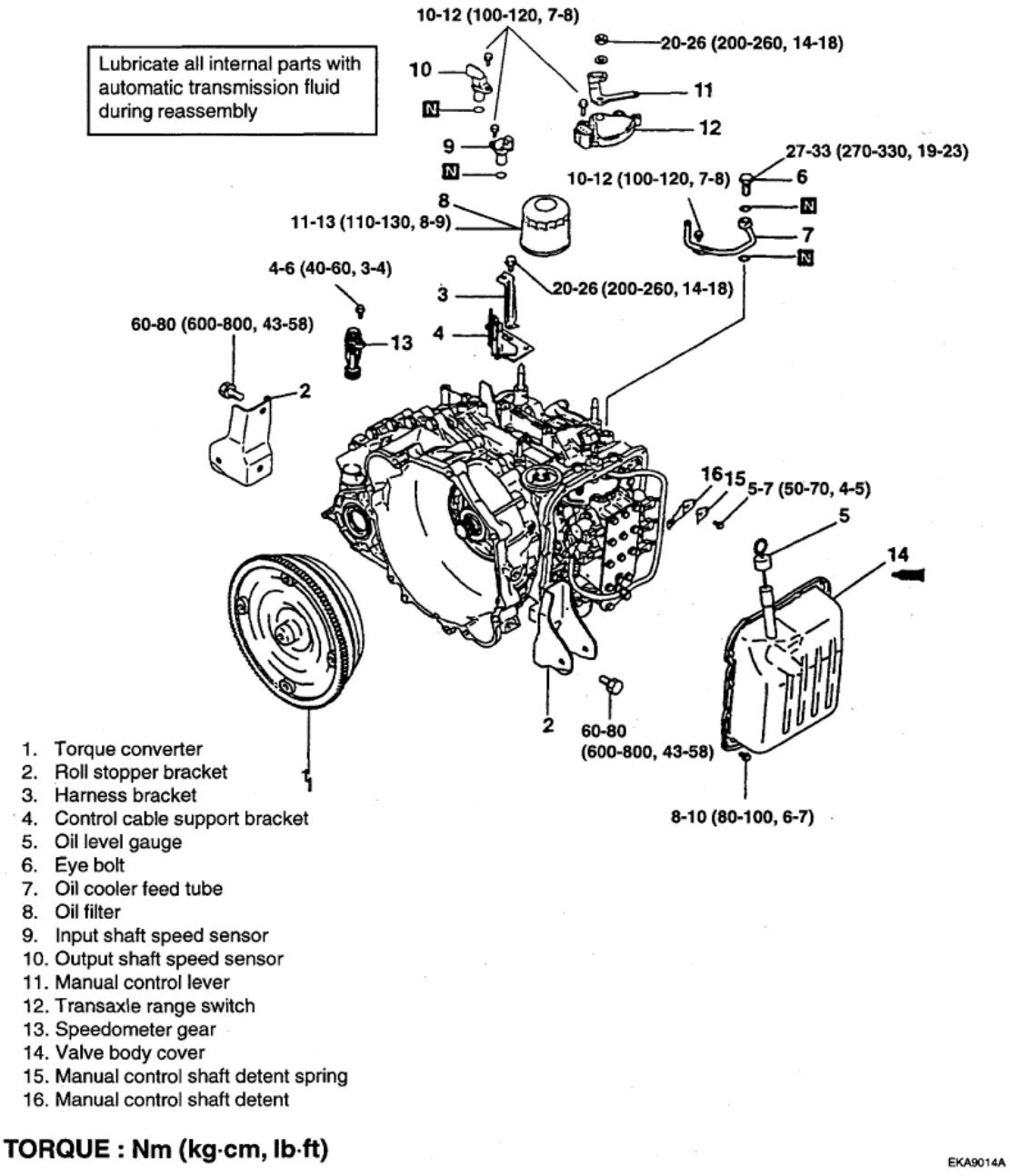


Fig. 228: Shift Lever Position Reference Chart

REMOVAL

1. Remove the battery terminal.
2. Remove the battery and battery tray.
3. Remove the air duct.
4. Remove the air cleaner assembly (refer to **REMOVAL**)
5. Disconnect the inhibitor switch connector (A).

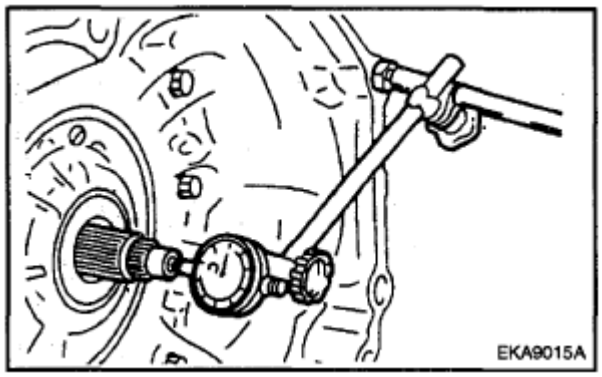


Fig. 229: Identifying Inhibitor Switch Connector

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

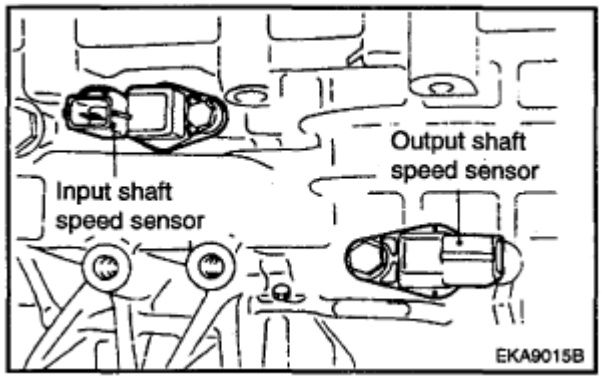


Fig. 230: Identifying Control Cable

7. Remove the inhibitor switch and manual control lever.

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

   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 (A) to the manual control lever.

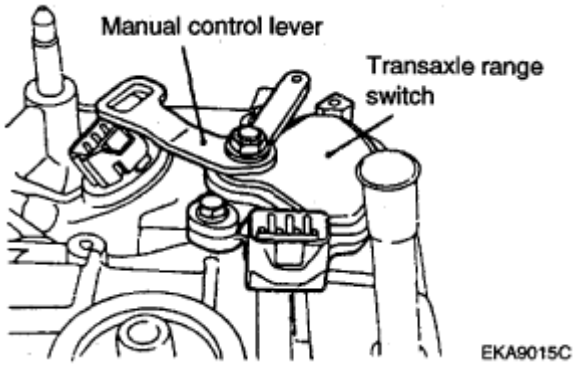


Fig. 231: Identifying Control Cable

5. Connect the inhibitor switch connector (A).

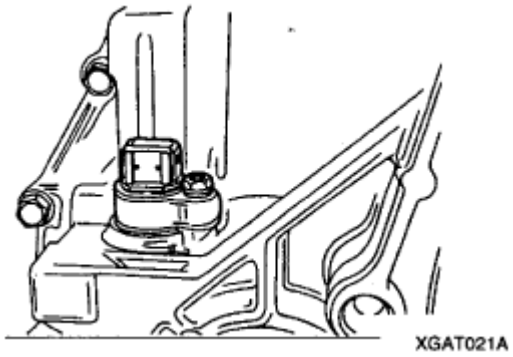


Fig. 232: Identifying Inhibitor Switch Connector

6. Installation is the reverse of the removal.
7. Turn the ignition switch ON after installation.

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

SHIFT LEVER

COMPONENTS (1)

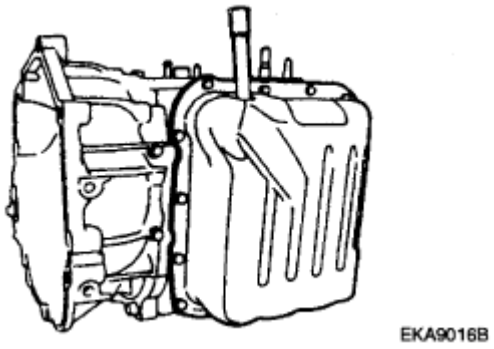


Fig. 233: Identifying Shift Lever Components (1 Of 2)

COMPONENTS (2)

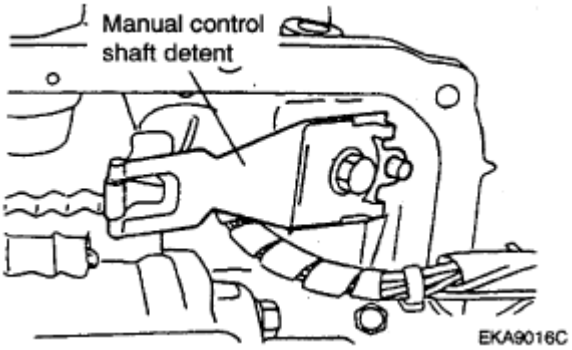


Fig. 234: Identifying Shift Lever Components (2 Of 2)

REMOVAL

1. Remove the shift lever knob (A).

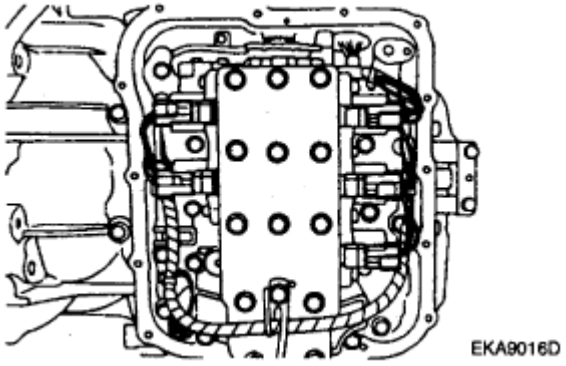


Fig. 235: Identifying Shift Lever Knob

2. Remove the center console cover (A).

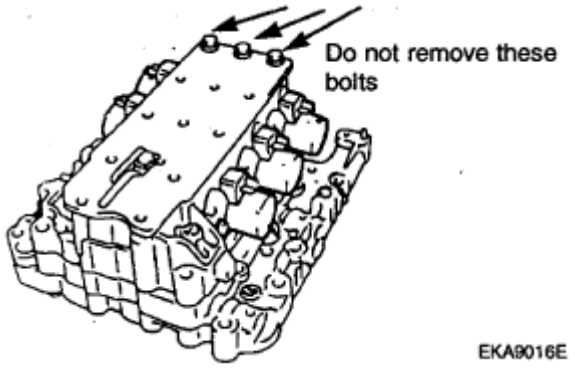


Fig. 236: Identifying Center Console Cover

3. Remove the center console, (refer to **CONSOLE** in BD group)

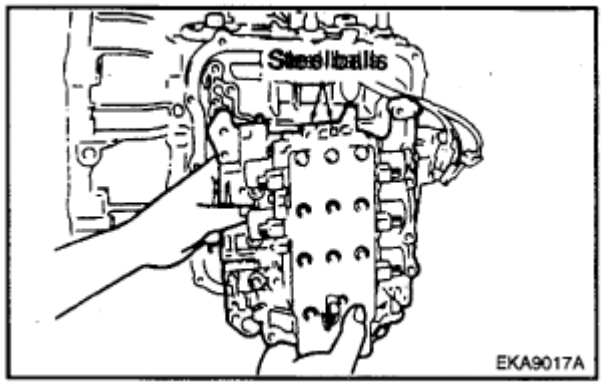


Fig. 237: Identifying Center Console

4. Remove the control cable assembly (B) by removing the clamp (A).

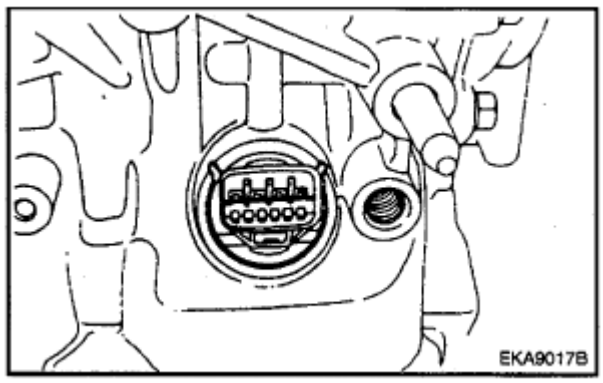


Fig. 238: Identifying Control Cable Assembly

5. Disconnect the interlock switch connector (A).

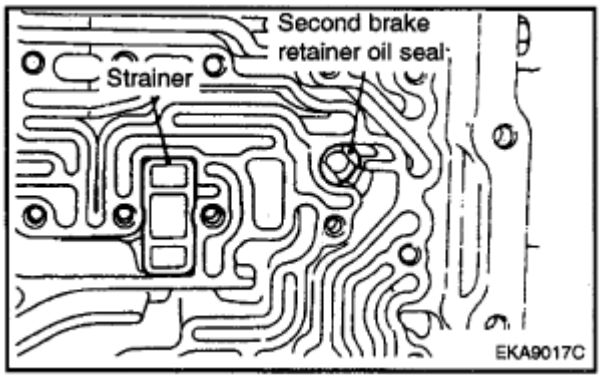


Fig. 239: Identifying Interlock Switch Connector

6. Remove the shift lever assembly (A).

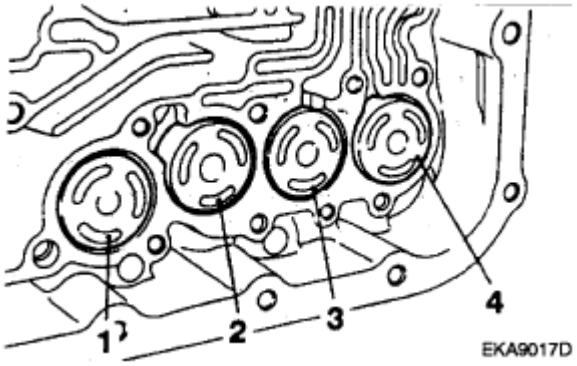


Fig. 240: Identifying Shift Lever Assembly

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

NOTE: In case, remove the crush pad and cowl cross bar (refer to CRASH PAD and HEATER UNIT).

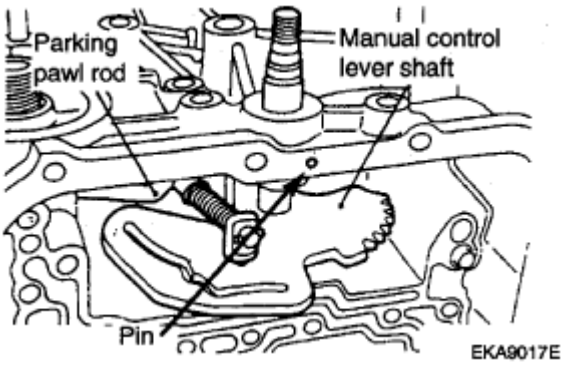


Fig. 241: Identifying Retainer

8. Remove the control cable assembly from the transaxle (refer to **REMOVAL**).
9. Remove the control cable assembly.

INSTALLATION

1. Install the control cable assembly to transaxle (refer to **INSTALLATION**).
2. Install the retainer (A) and nuts (B).

   TORQUE:

   12-15Nm (1.2-1,5kgf.m, 8.7-10.8lb-ft)

   NOTE: In case, install the crush pad and cowl cross bar (refer to CRASH PAD and HEATER UNIT).

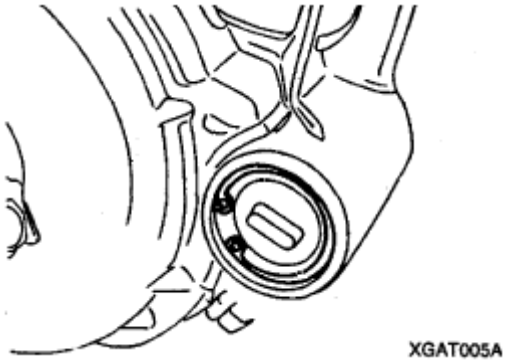


Fig. 242: Identifying Retainer

3. Install the shift lever assembly (A).

   TORQUE : 9-14Nm (0.9-1.4kgf.m, 8.7-10.8lb-ft)

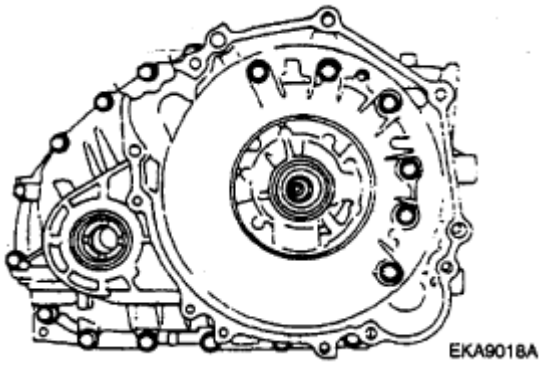


Fig. 243: Identifying Shift Lever Assembly

4. Connect the interlock switch connector (A).

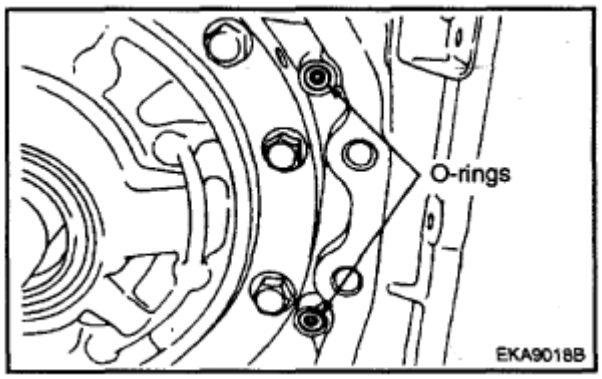


Fig. 244: Identifying Interlock Switch Connector

5. Install the control cable assembly (B) by installing the clamp (A).

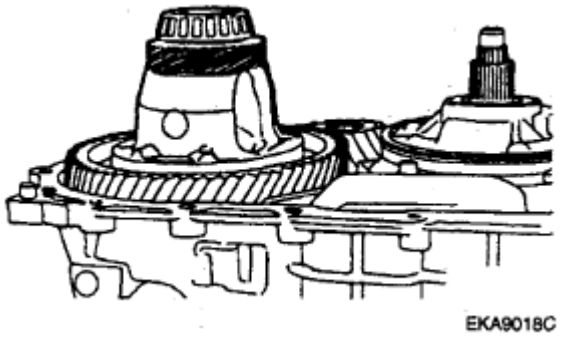


Fig. 245: Identifying Control Cable Assembly

6. Install the center console, (refer to **CONSOLE** in BD group)

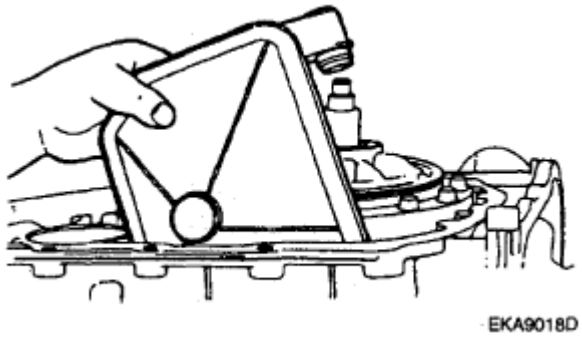


Fig. 246: Identifying Center Console

7. Install the center console cover (A).

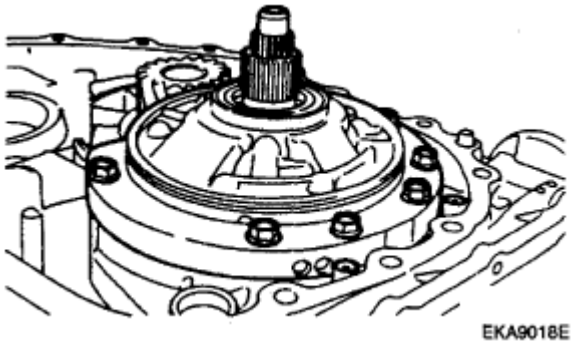


Fig. 247: Identifying Center Console Cover

8. Install the shift lever knob (A).

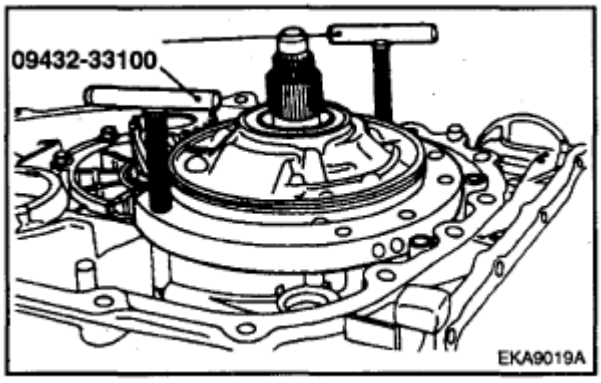


Fig. 248: Identifying Shift Lever Knob

ADJUSTMENT

Adjusting method for the control cable

1. Set room side lever and T/M side lever (A) to "N" position.
2. Connect the room side lever and shift cable, (refer to **INSTALLATION**)
3. Connect the T/M side lever (A) to cable (B) in this following order;
    1. Push the cable (B) lightly to "F" direction shown to eliminate FREE PLAY of the cable (B).
    2. Tighten the adjusting nut (C).

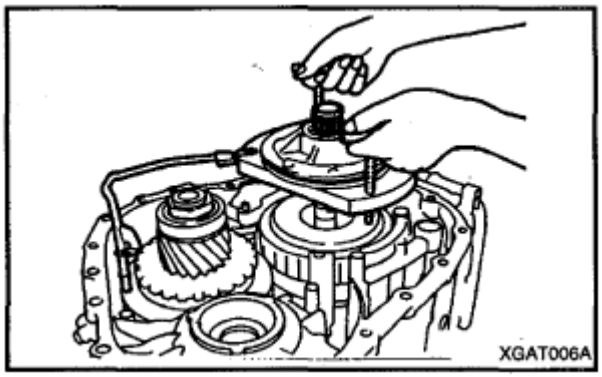


Fig. 249: Identifying T/M Side Lever And Cable

4. After adjusting the cable (B) according to procedure no. 2-3, check to be sure that this part operates surely at each range of T/M side corresponding to each position of room lever.

