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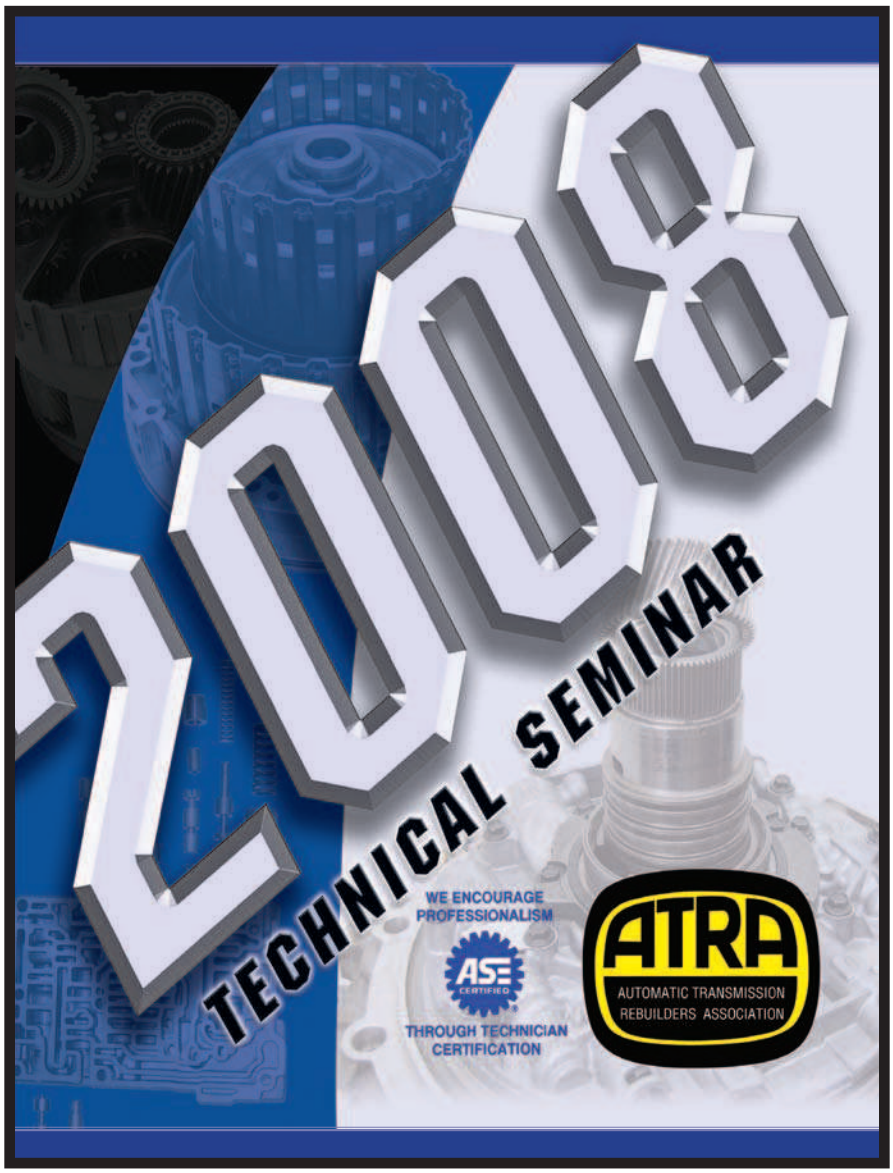

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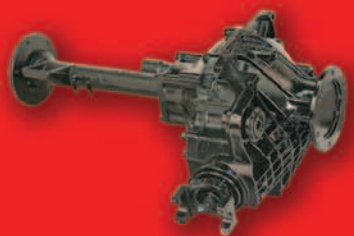

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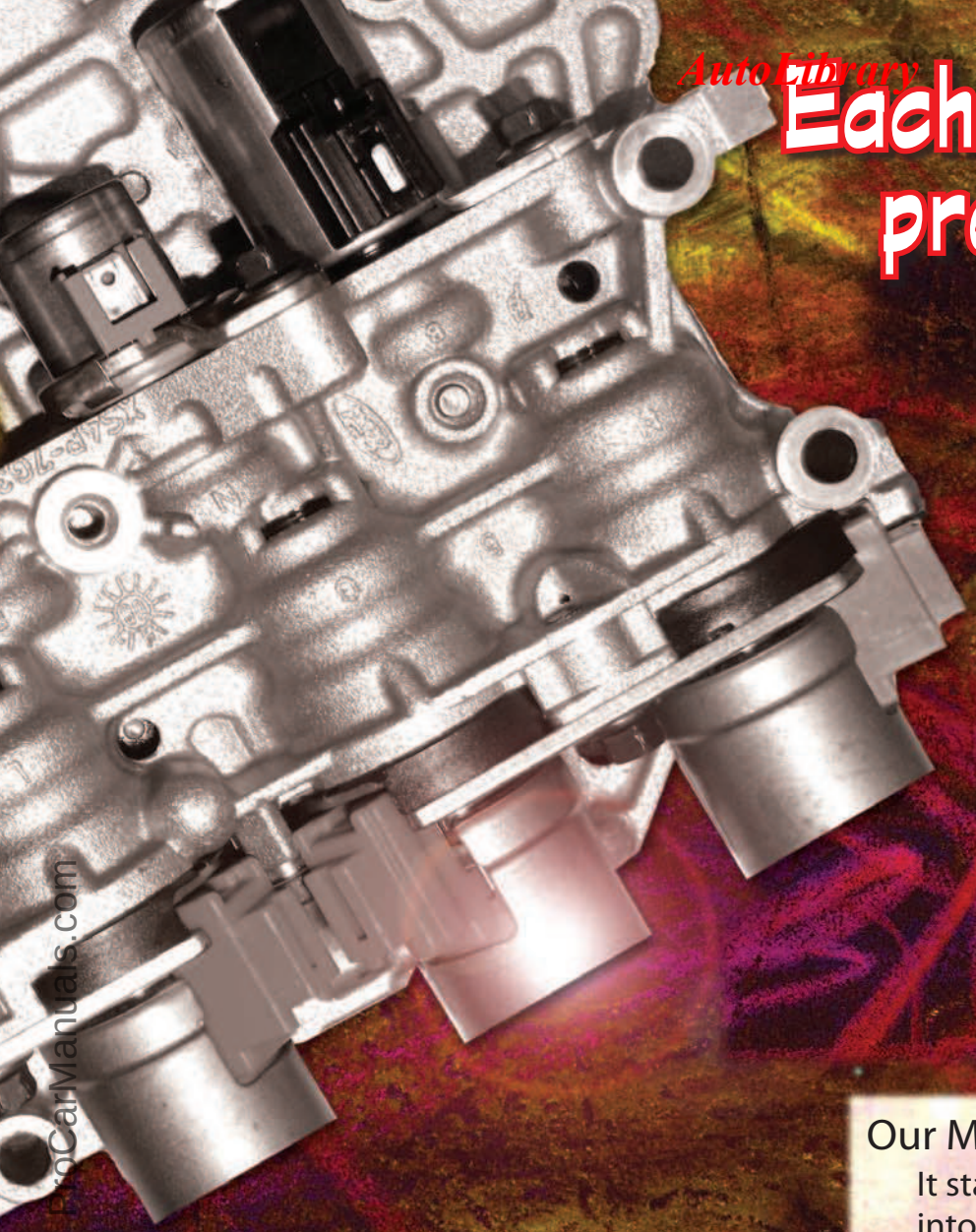

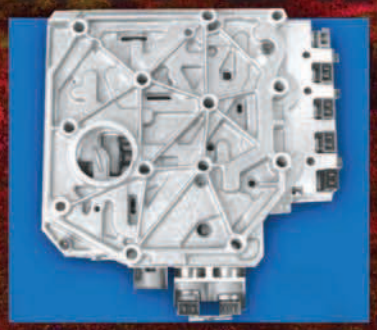

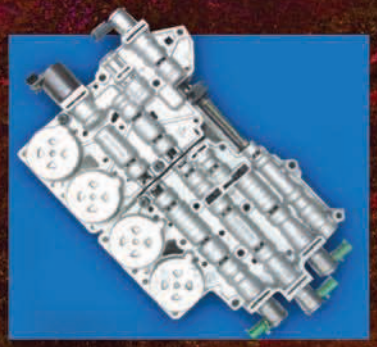

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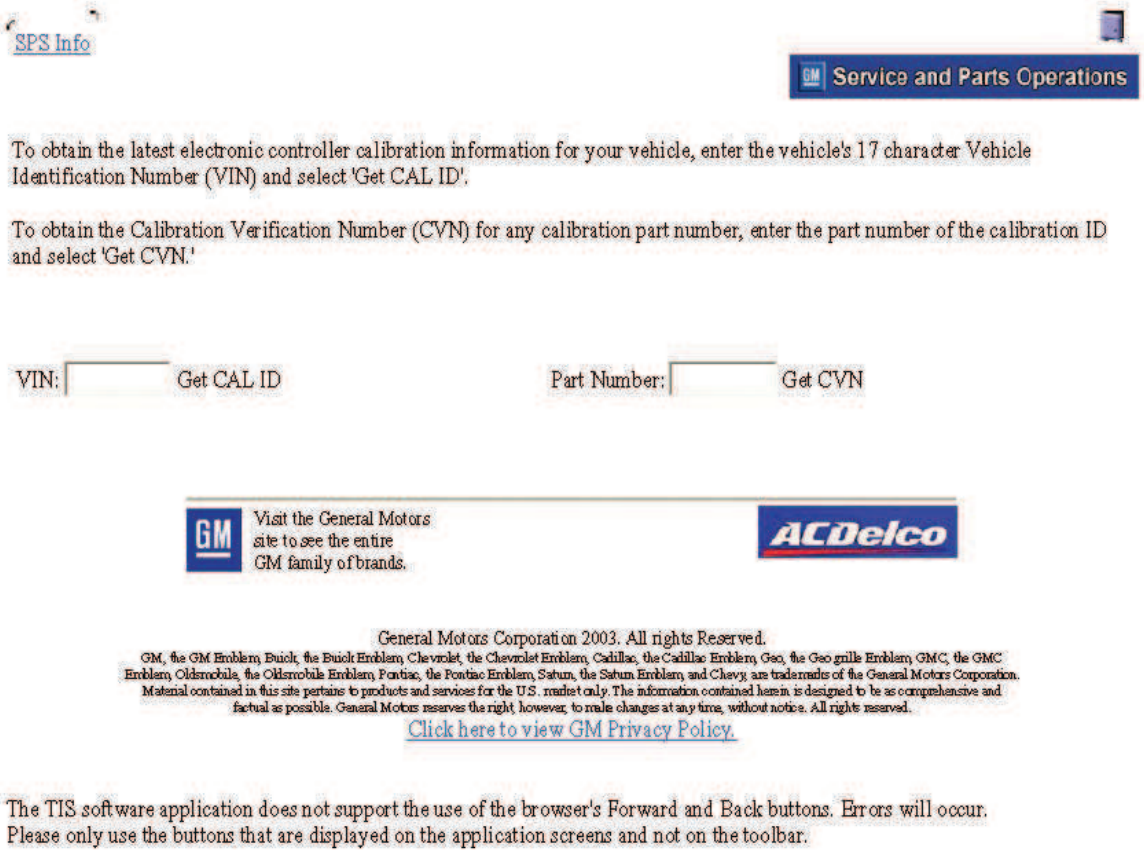
All Models

GM Calibration Web Site Update

General Motors has implemented a new design web site for calibration information. As with the old site it is free and contains the same features as the previous web site.

The new TIS2 Web site also includes an additional feature, the ability to research specific calibration numbers to see what their application is. This feature is known as the calibration verification number or CVN. To access the site enter the following web address in the address bar, http://tis2web.service.gm.com



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All Models

Calibration Updates

YEAR	BODY STYLE/MODEL	TRANSMISSION OR TRANSFER CASE	CONCERN/COMPLAINT
2007	Z BODY	6T70	Shift Flare/Bump, 6-5, 5-4, 4-3, 3-4, 2-1 or Reverse
2007	Z Body	6T70	P0777, P0797, P1825, P2715 DTC's Set
03-06	Y-D Cadillac	5L40E/6L80	Surge/Chuggle/Noise after TCC applies at low speeds
2007	C/K Truck	6L80	4-5 Flare/hard shift, possible DTC P0756 set
2006	Y Body	6L80	Delayed garage shift engagement Reverse or Forward
04-06	D-E Cadillac	5L50E	Surge/Chuggle/Noise after TCC applies at low speeds
2005	D- Cadillac	5L50E	P2119, P2501, P0315 DTC's
04-05	Z Body	4T40/45E	P0703 set
04-05	Z Body	4T40E/45E	P0335/P0650 Set, extended crank or no start
04-05	S/T	4L60E	Reduced power, P0507 DTC
03-05	S/T/C/K/H/M/L Trucks	4L60E	Lack of power at High Ambient temperatures
2004	S/T Trucks	4L60E	Surge down hill, chuggle
2005	Y car, S truck	4L60/65E	Unable to program TCM
04-05	S/T Trucks	4L60E	Reduced Power, P0606 DTC
04-05	S/T Trucks	4L60E	P0171 DTC
04-05	S/T Trucks	NV 226 T-case	Delayed 4wd application during slip conditions
2007	C/K Truck	NV246 T-Case	Intermittent Slip bump on accel with T-Case in AUTO range (TCCM UPDATE CAL)
06-07	C/K Truck	4L60E/65E or 6L80	P0851 set
2005	L/V Trucks	AF33-5	Poor fuel economy
2005	L/V Trucks	AF33-5	Flare or shudder on shift

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NV241, NV231, NV243, NV233, NV136, NV246, NV263, BW4484

Transfer Case Speed Sensor Connectors

A typical problem on high mileage vehicle applications is that the speed sensor connector becomes brittle with use. This typically leads to connector clip/lock damage as you attempt to remove the connector from the speed sensor. In the past, the problem was addressed with a service package #88987183. An updated repair has now been released. The harness connector service kit is now available as part # 15306187

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BW 4484 H2 Applications

Locked in 4WD, Binds on Turns

Some customers may comment about the Hummer H2 applications “hopping or binding” when the vehicle is in a turn. Some customers may comment regarding a lack of 4WD operation or about the transfer case failing to come out of 4wd when another range has been selected.

A common cause for this condition is a broken shift fork or collar/sleeve within the transfer case. The shift fork and the shift sleeve/collar are made of plastic and tend to break with use. An updated shift fork is available under part # 88984536 while the updated shift sleeve is available under part # 88984512.

To repair this condition the transfer case must be disassembled. Two precautions should be heeded when servicing the BW 4484 unit, Do not disassemble the planetaries when taking the transfer case apart for this concern, even though your service manual may direct you to do so.

If the planetaries come apart they will need to be retimed. To retime the planetaries locate the planetary pinion timing marks. These marks can be dots, dashes, triangles or a combination of all of the above. The marks are typically on opposite sides of the small verses large gears.

All the timing marks must be located and the pinions rotated until all the “APPROPRIATE” timing marks are facing outward. Reassemble the planetary and make sure it does not bind at all when it is rotated by hand. Failure to properly time the planetary will result in dramatic vehicle handling problems. An improperly timed planetary will bias power to one set of drive wheels, making the vehicle act as if you had a different ratio in the front verses rear differential.

The other area to pay attention to is the shift shaft. Be careful when assembling the shaft as the tip on the end of the shaft can be damaged or broken very easily.

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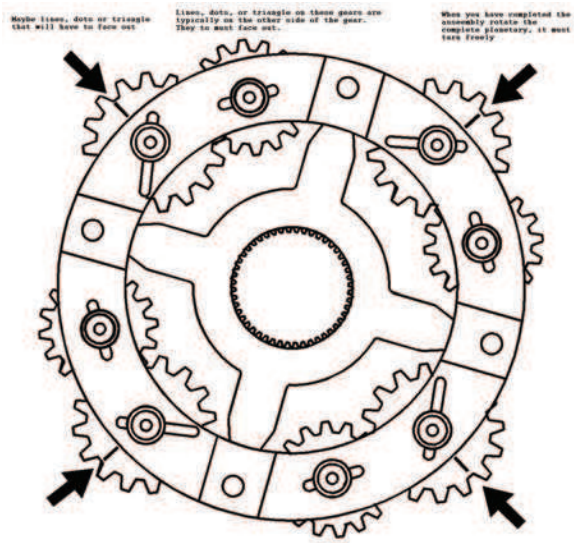
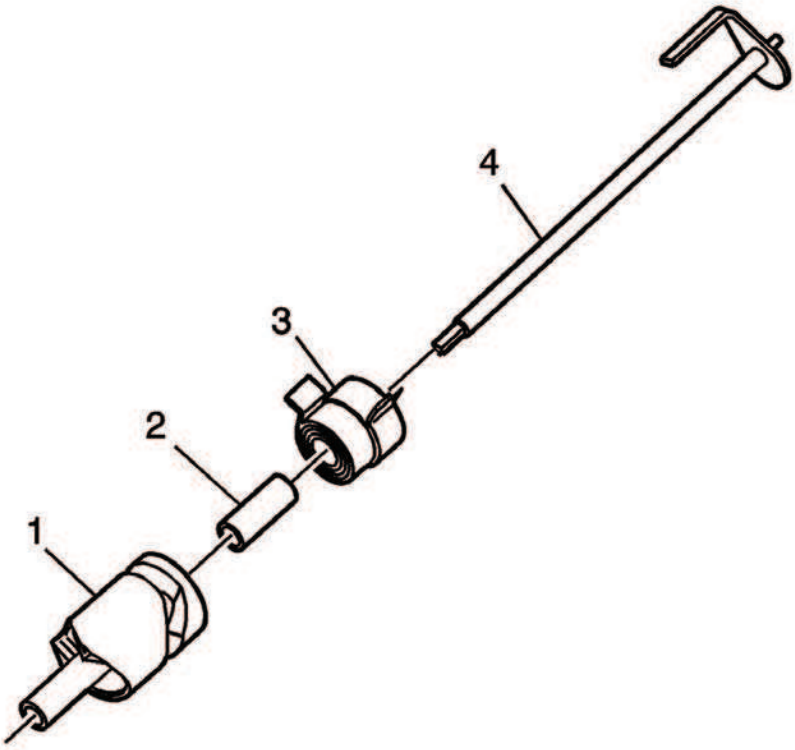
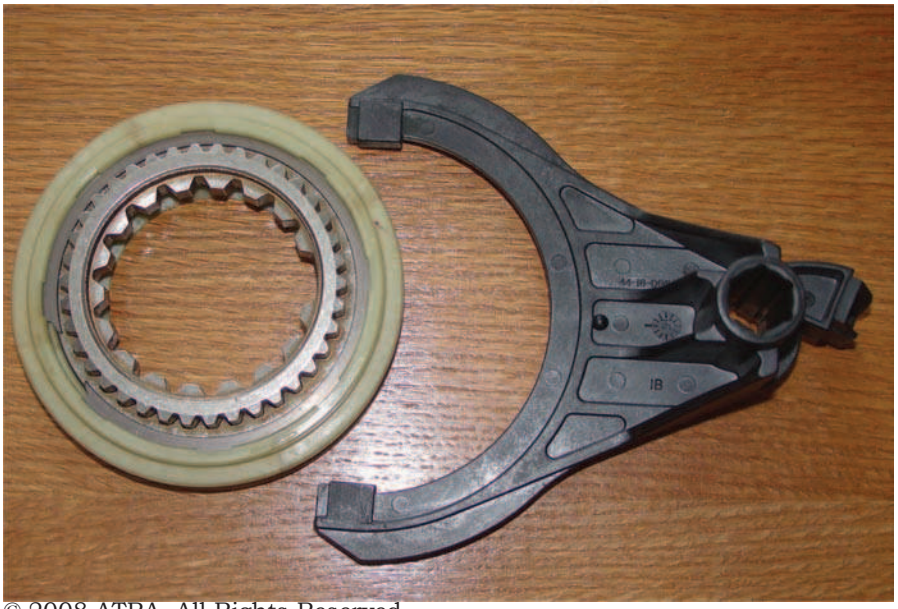
BW 4484 H2 Applications

Locked in 4WD, Binds on Turns (continued)







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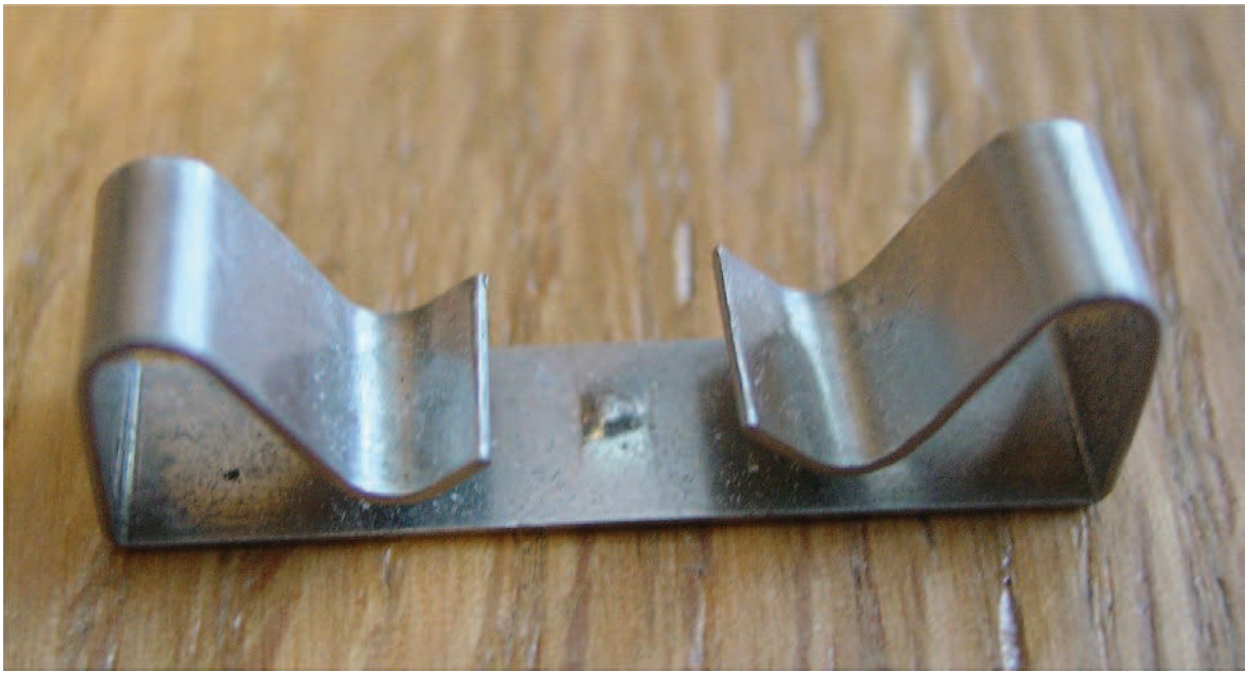
New Venture Transfer Cases

Transfer Case Fluid Leakage (RPO NP1, NP2, NP3, NP4, NP8)

Many 1998-2007 GM light duty truck and sport utility 4WD/AWD applications may experience fluid leakage in the rear case area on New Venture Gear transfer case applications. Upon inspection the technician generally finds a “pin hole” in the housing area where the oil pump is mounted. The condition is caused by movement of the oil pump in the case leading to wear in the rear housing oil pump lug locating slots. This is generally due to a missing, broken or fatigued oil pump wear reaction clip.

To repair this concern or when you have a transfer case apart for service or rebuild it is recommended to always change the reaction clip even if the clip appears to be performing properly. Previously ATRA recommended the use aftermarket reaction clips as the OEM clips would prematurely fatigue. GM has now released a fatigue resistant oil pump wear clip to address this concern. It is available under GM part number 12470559



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4L60/65/70E

Burnt Clutches, Hard Shifts

A major change has occurred with the forward sprag assembly. The update was implemented because of two concerns with the previous design.

1. Loss of forward when in OD and 3rd range. Has Manual 2nd and 1st (Sprag fails to lock)
2. Burned 3-4 clutch (Sprag fails to freewheel in 4th gear) either of the concerns could be intermittent and the sprag may appear to operate correctly when it is rotated by hand on the bench.

A design and vendor change has occurred to address the concerns. The updated sprag element can be easily identified by the “double cage” design. GM sells the updated design as complete sprag assemblies. The part numbers are as follows:

RPO	PART NUMBER
M30 and M33	24243750
M32 and M70	24241477

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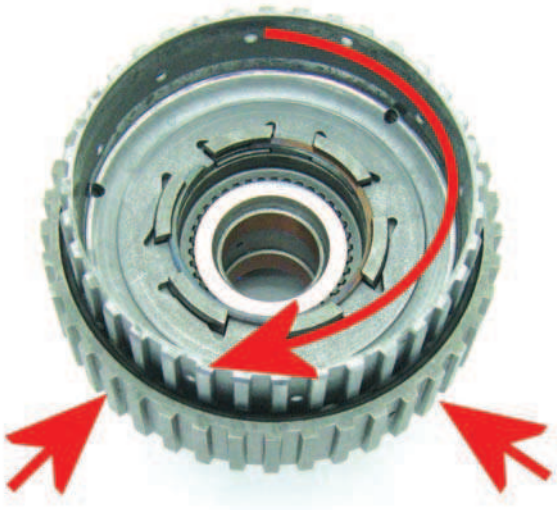
The Sprag rotates freely clockwise as shown.



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4L60/65/70E

Harsh 1-2 Shift

A calibration update was released for 2006-2008 applications designed to address 1-2 hard shift concerns. The updated calibration increased the shift adaptive learning authority, so the adapts could compensate for the shift feel concern. In addition, the 1-2 accumulator may use one or two piston springs. Applications are as follows:

2 Springs, Model Codes

7CAD, 7CBD, 7KAD, 7KZD, 7SDD, 7SFD, 7SLD, 7TDD, 7TFD, 8CAD, 8KAD, 8SFD, 8SLD, 8TFD, 8TLD

1 Spring, Model Codes

7CFD, 7CHD, 7CJD, 7CLD, 7CMD, 7CSD, 7CVD, 7CWD, 7KCD, 7KFD, 7KLD, 7KMD, 7PCD, 7PKD, 7SBD, 7SJD, 7SKD, 7SZD, 8CFD, 8CJD, 8CLD, 8CVD, 8KFD, 8KLD, 8SJD, 8SKD, 8SUD, 8SWD, 8TKD, 8TWD, 8TZD

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4L60/65/70E

Input Carrier, Reaction Carrier Shaft and Bearing Changes

An updated thrust bearing was implemented in all applications starting on Julian date 7071 (March 12, 2007).

The updated bearing is thicker with a angular lip on it's outside diameter. The carrier and the reaction carrier shaft have been updated to accommodate the change. The update will back service previous design applications if all three parts are replaced. (Bearing, carrier, reaction carrier shaft).

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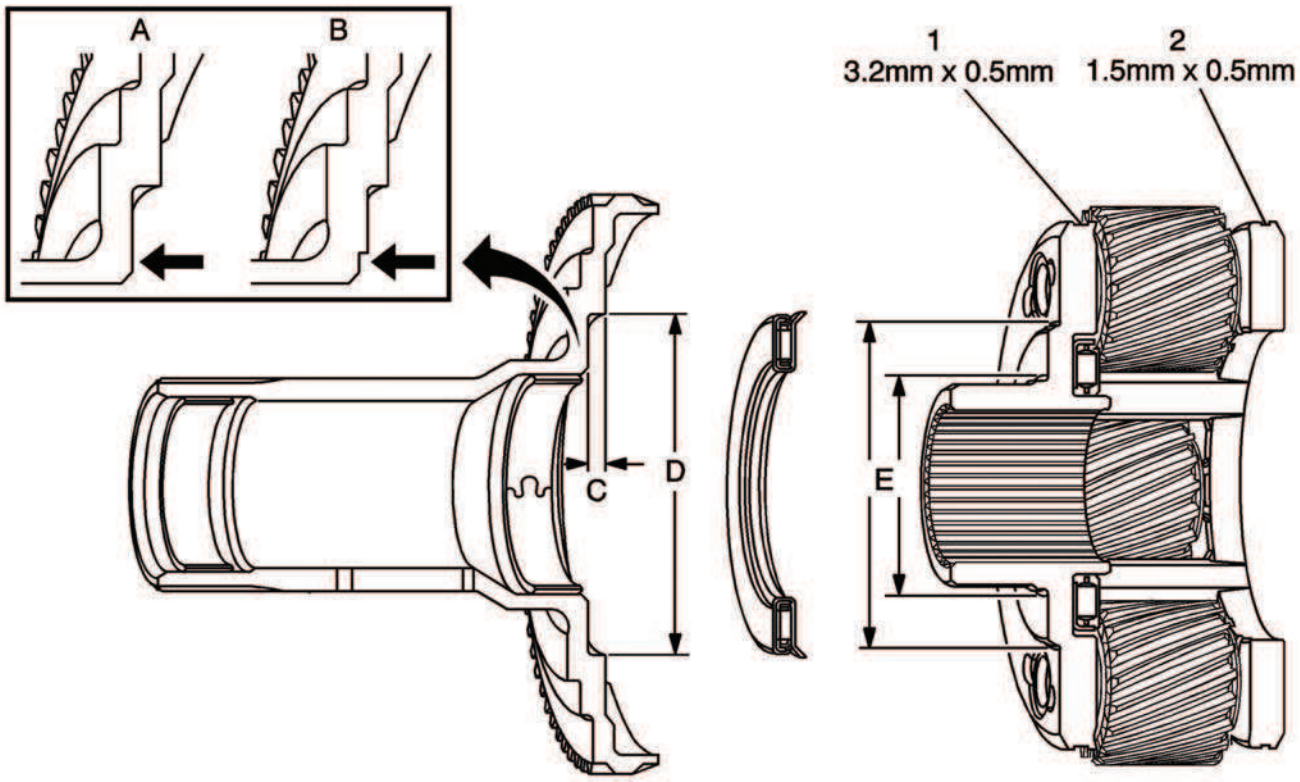

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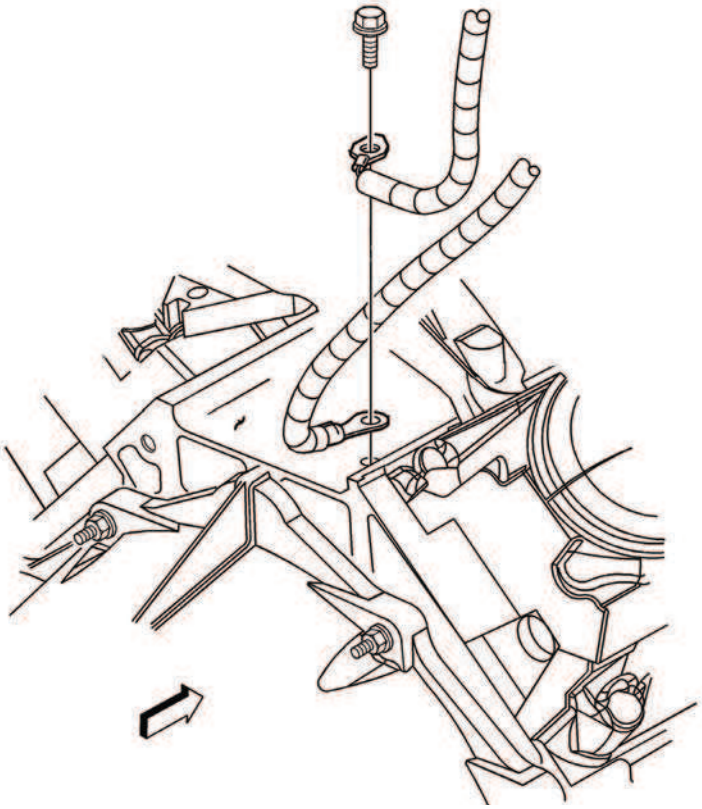
4L60E and 4L80E

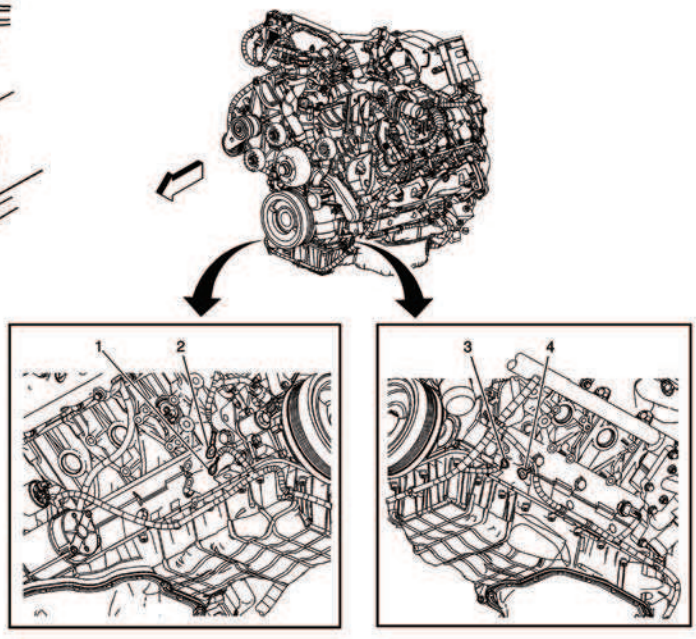
Miss/Surge/Chuggle

1997-2007 C/K Truck

Some customers may comment about a Miss/Surge/Chuggle related condition that in many instances is misdiagnosed as a transmission related problem. The concern is many times intermittent and sometimes is temperature sensitive.

A common cause for this concern is G103 located on the front or rear of the cylinder head. The location depends on the engine application. G103 is one of the ECM/PCM grounds. If G103 is corroded/loose or damaged a misfire may result. Repair G103.





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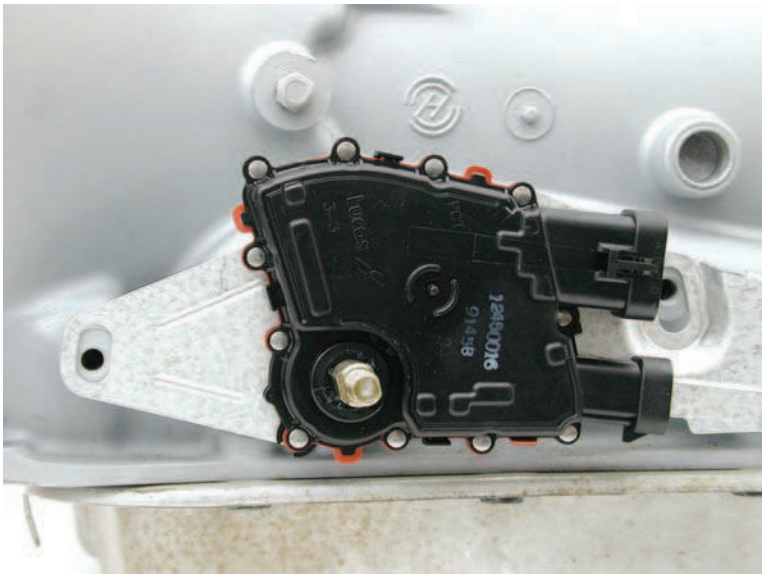
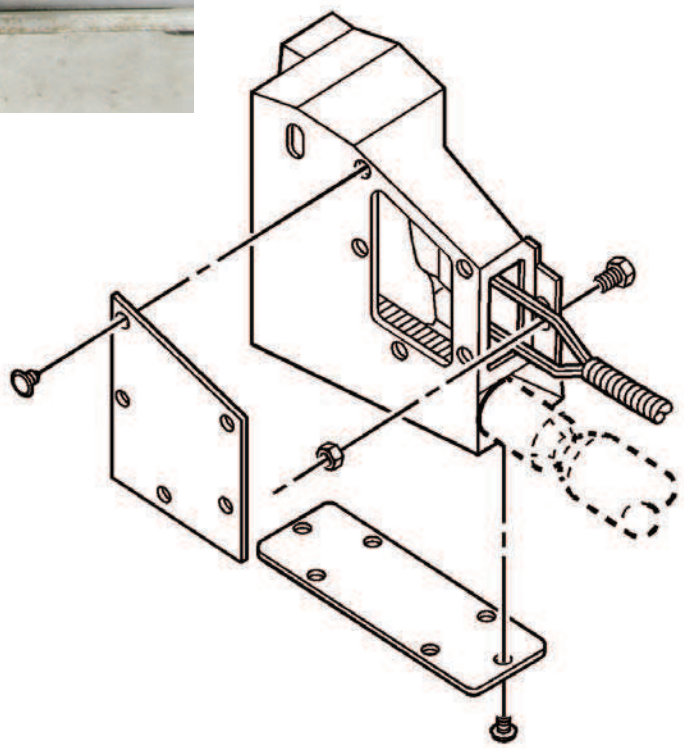
LCT 1000

Shifter Will Not Move Into Proper Position

During the winter months some customers may comment regarding how difficult it is to physically shift the transmission after operating the vehicle in Mud, Snow or Slush.

A buildup of Ice, Mud or Snow may be accumulating on the shift linkage in the NSBU switch area. Allison has addressed this concern by introducing a shield for the shifter linkage. The cover is available from Allison under part # 700028.





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6T40 (RPO MH8,MHB) 6T45 (RPO MH7,MHC)

Introduction

Two additional 6 speed transaxles have been introduced into the GM line, the 6T40 and 6T45.

The first car to receive the transmission in the United States will be the 2008 Chevrolet Malibu, followed by the 2009 Saturn Aura and Pontiac G6. The transaxle is also the primary application for the Daewoo Tosca and the Buick Lacrosse in Asia. The 6T40/45 family of transaxles is poised to become the largest 6 speed FWD applications that GM will produce.

Known as the “global 6 speed” or “GF6” the 6T40/6T45 improves fuel economy on average of 4 % while performance was improved 8% on average over its 4 speed cousins. The 6T40/6T45 share the same architecture and most of the parts are the same. The primary difference is the 6T45 is a heavy duty version of the 6T40. The heavy duty parts in the 6T45 include:

- 1.25” wide chain verses a 1” chain with the 6T40
- Input planetary is a 5 pinion assembly
- Heavier ribbed case
- Heavier Differential

Hydra-Matic
2008 6T40 (MH8)
Six Speed FWD Automatic Transaxle

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6T40 (RPO MH8,MHB)
6T45 (RPO MH7,MHC)

Features

RPO CODES:

- 6T40 car Fwd RPO MH8
- 6T40 car Awd RPO MHB
- 6T45 car Fwd RPO MH7
- 6T45 car Awd RPO MHC
- Input torque capacity 6T40 177 lb-ft (240 Nm)
- Output torque capacity 6T40 277 lb-ft (375 Nm)
- Weight 178 lbs (81kg)

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RATIOS:

1st	4.58-1
2nd	2.96-1
3rd	1.91-1
4th	1.44-1
5th	1-1
6th	.74-1
REV	2.94-1

- Final Drive “effective ratio” 2.89-1, 3.17-1 or 3.87-1
- Fluid Type—Dexron VI
- Fluid capacity Valve body cover removal—5.3-7.4 qts (5-7 liters)
- Fluid capacity fluid change—4.2-6.3 qts (4-6 liters)
- Fluid capacity Overhaul--- 7.4-9.5 qts (7-9 liters)
- No dipstick, oil level checked via a plug (most applications)
- EC3 236 mm “hyper elliptical” furnace brazed torque converter. Torque converter contains a lip seal that will be damaged if the converter is removed or installed in any position other than “vertical”. Special tools are available J46409
- 5 clutches (3 holding, 2 driving) clutch to clutch shifting
- 1 diode one way clutch
- 1 shift solenoid used (On/Off Design), SS1
- 6 Variable bleed solenoids, PCS1, PCS2, PCS3, PCS4, PCS5, TCC

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6T40 (RPO MH8,MHB)
6T45 (RPO MH7,MHC)

Features (continued)

- A Motorola (Continental) built 32 bit TCM (TEHCM) mounted internal to the transmission on the valve body (Referred to as the “control solenoid valve assembly”) The TEHCM incorporates the TCM, Solenoids, pressure switches, TFT sensor and it is bolted to the valve body.
- Gerotor type oil pump, 3 selective gears thicknesses available
- Internal Mode Switch (IMS) equipped
- Hall effect input and output speed sensors
- Performance Algorithm Shifting (PAS) programming
- Performance Algorithm Lift foot (PAL) programming
- Winter mode programming
- Sport mode and TAP shift equipped
- Adaptive Strategies with fast learn capabilities
- Reverse lock out feature
- Grade Braking
- Fwd/Awd applications can be dingy towed but Awd applications cannot be dolly towed. Neither application can be towed with the rear wheels in the air, as would happen when the vehicle is being towed by a tow truck.

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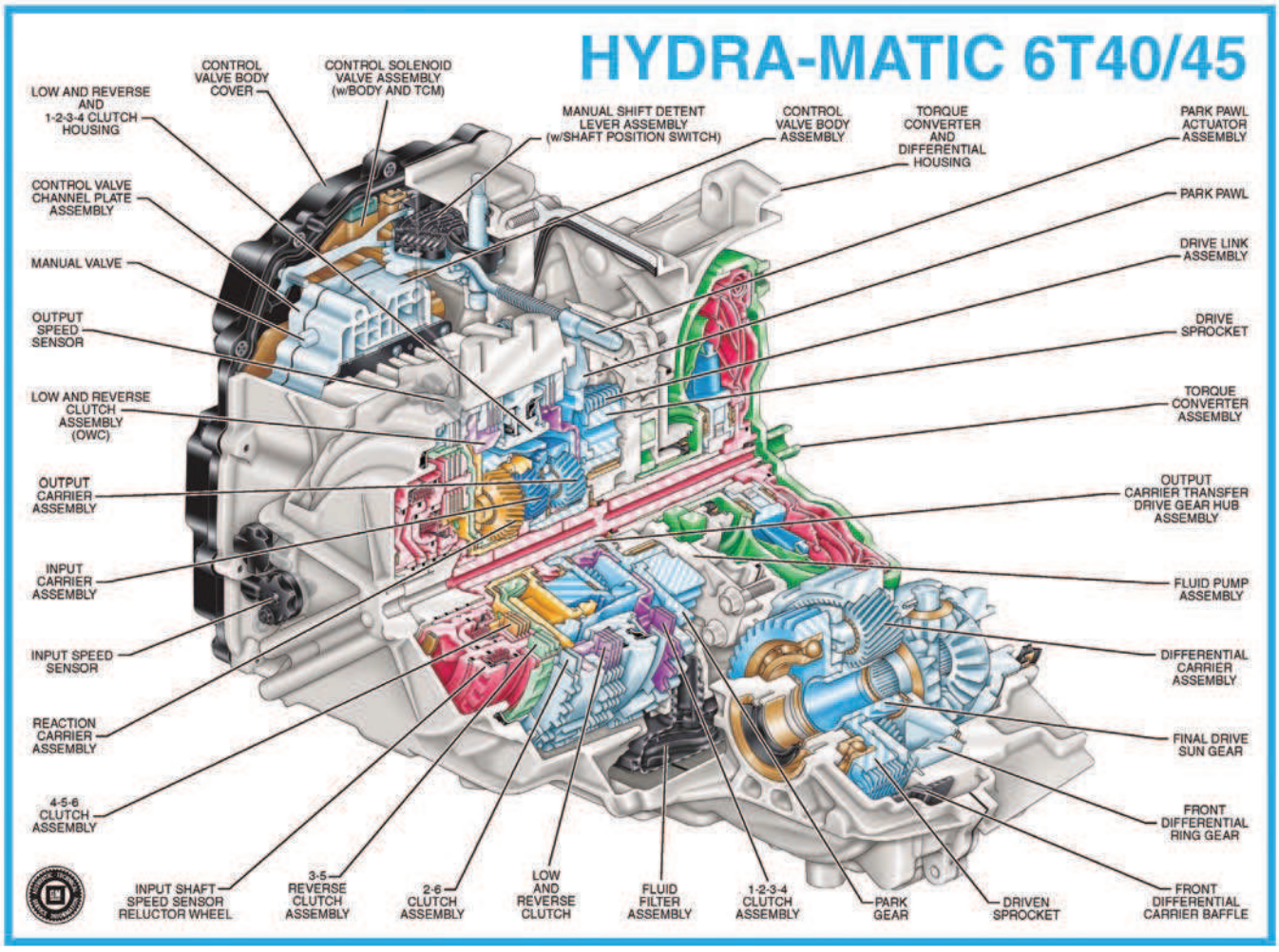
6T40 (RPO MH8,MHB)
6T45 (RPO MH7,MHC)

Exploded View



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6T40 (RPO MH8,MHB)
6T45 (RPO MH7,MHC)

Checking the Fluid Level

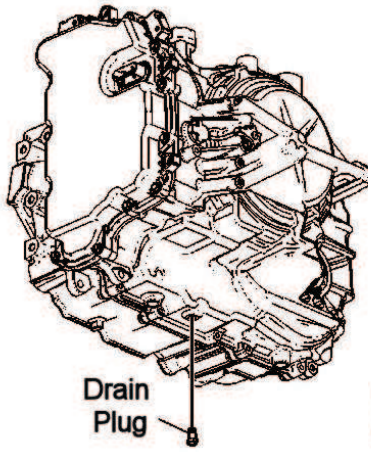
The 6T40/45 utilize a thermal type element to control the oil level in the unit similar to other GM units. Known as a “Fluid Level Control Valve” the unit is basically a thermally controlled stand pipe.

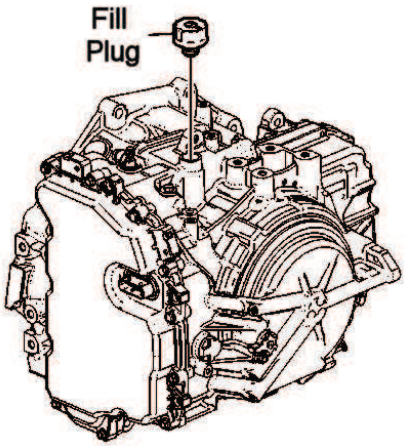
At temperatures below 60°C (140°F) fluid is allowed to drain into the sump. At temps above 60°C (140°F) drain back is blocked, allowing the side cover (valve body area) to fill with fluid.

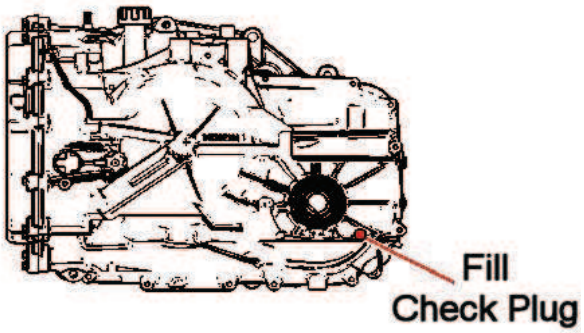
If you are changing fluid in these units make sure the unit is cold. If you remove the drain plug in the bottom of the case only about 50% of the fluid in the unit will drain, You will need to remove the bottom pan as with other transmissions to completely drain the unit. To check the fluid level, the transaxle TFT value must fall between 85°C-95°C (185°F-203°F).

Fluid temp can be checked from the “driver information center” or by using a scan tool. It is critical that the fluid be at the correct temperature or an overfill or under fill condition may occur. These units are very sensitive to overfill. As little as ½ qt overfull can lead to fluid leaking from the vent. Fluid level is checked with the engine running, fluid temp 85°C-95°C (185°F-203°F), in park, via a plug (most applications) near the axle seal area in the case.

Application	Specification	
	Metric	English
Valve Body Cover Removal - Approximate Capacity	5.0-7.0 liters	5.3-7.4 quarts
Fluid Change - Drain Plug - Approximate Capacity	4.0-6.0 liters	4.2- 6.3 quarts
Overhaul - Approximate Capacity	8.0-8.5 liters	8.5-9.0 quarts







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6T40 (RPO MH8,MHB)
6T45 (RPO MH7,MHC)

Range Reference 6T40/6T45

COMPONENT	PARK NEUTRAL	REV	1ST BRK	1ST	2ND	3RD	4TH	5TH	6TH
1-2-3-4 CLUTCH			ON	ON	ON	ON	ON		
3-5 REV CLUTCH		ON				ON		ON	
4-5-6 CLUTCH							ON	ON	ON
LOW/REV CLUTCH	ON	ON	ON						
2-6 CLUTCH					ON				ON
LOW ONE WAY			ON	ON					

NOTE: The Low/REV clutch is applied when the vehicle is in a forward range and the vehicle is stationary. As vehicle speed is indicated, the L/R clutch will be released. This increases torque capacity under load with the vehicle stationary

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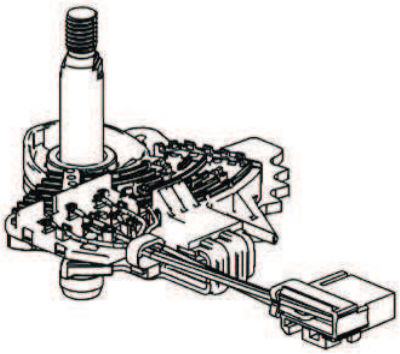
6T40 (RPO MH8,MHB)
6T45 (RPO MH7,MHC)

IMS (Internal Mode Switch)

The 6T40/6T45 Internal Mode Switch is connected mechanically to the manual shaft similar to the 4T65E application.

Electrically the IMS operates similar to other GM IMS applications. The TCM sends a bias voltage to the IMS on 4 circuits, A, B, C, P. Pin N is used for Park/Neutral starting operations and is supplied by the ECM. As the range selector is moved the IMS will ground/unground the circuits or circuit required to indicate the specific manual valve position. By monitoring the voltage sequence produced, the TCM will be able to identify the range that was selected.



Gear Selector Position	Signal A	Signal B	Signal C	Signal P
Park	LOW	HI	HI	LOW
Park/Reverse	LOW	LOW	HI	LOW
Reverse	LOW	LOW	HI	HI
Reverse/Neutral	HI	LOW	HI	HI
Neutral	HI	LOW	HI	LOW
Neutral/Drive 6	HI	LOW	LOW	LOW
Drive 6	HI	LOW	LOW	HI
Drive 6/Drive 4	LOW	LOW	LOW	HI
Drive 4	LOW	LOW	LOW	LOW
Drive 4/Drive 3	LOW	HI	LOW	LOW
Drive 3	LOW	HI	LOW	HI
Drive 3/Drive 2	HI	HI	LOW	HI
Drive 2	HI	HI	LOW	LOW
Open	HI	HI	HI	HI
Invalid	HI	HI	HI	LOW
Invalid	LOW	HI	HI	HI
HI = Source voltage LOW = 0 volts				

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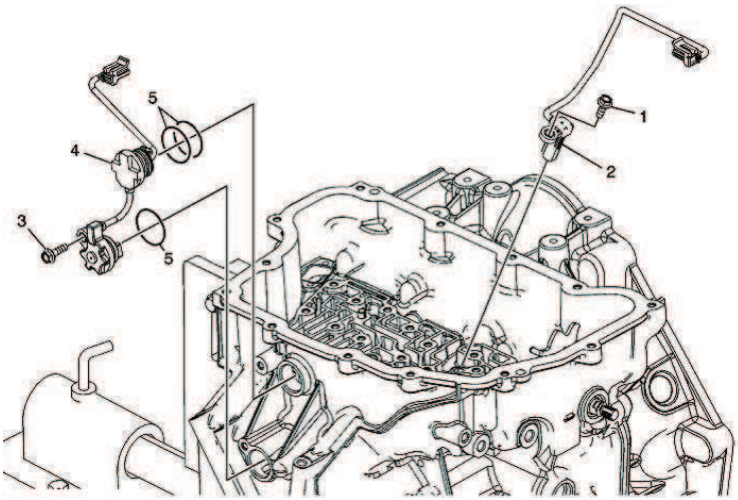
6T40 (RPO MH8,MHB)
6T45 (RPO MH7,MHC)

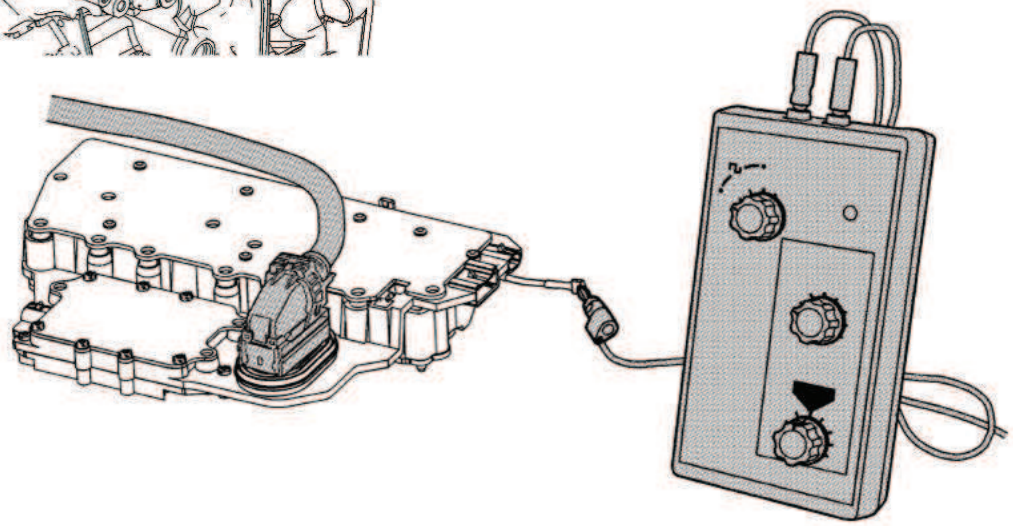
Speed Sensors

The speed sensors are “hall effect” style assemblies. The input speed sensor is mounted externally in the case. The output speed sensor is mounted under the valve body in the case.

The TCM provides a signal voltage for the sensor operation. As the transmission rotates the sensors will produce a square wave signal. The TCM will monitor the frequency of the signal to determine the input or output speed. Input Speed Sensor signals are generated by the rotation of the 3-5-R clutch assemblies and are used to calculate gear ratio and slip rates.

The Output Speed Sensor signal is generated by the rotation of the park gear. The OSS is used for indicating Vehicle speed for shift pattern control as well as Ratio calculations. Diagnosis of the speed sensors is accomplished using a signal generator and a scan tool as with the other 6 speed applications.





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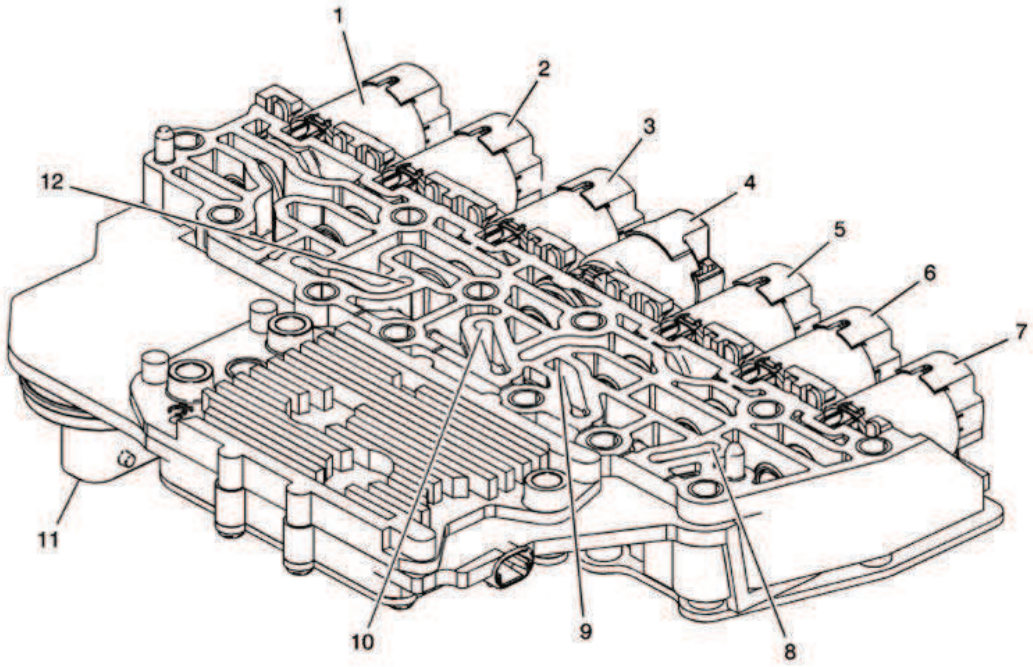
6T40 (RPO MH8,MHB)
6T45 (RPO MH7,MHC)

TEHCM Internals



1880316

1. *Pressure Control Solenoid 3 (R1/456)*
2. *Pressure Control Solenoid 2 (35R)*
3. *Torque Converter Clutch (TCC) Pressure Control Solenoid*
4. *Shift Solenoid 1 (On/Off)*
5. *Pressure Control Solenoid 5 (1234)*
6. *Pressure Control Solenoid 4 (26)*
7. *Line Pressure Control Solenoid*
8. *Transmission Fluid Pressure (TFP) Switch 2 (35R)*
9. *Transmission Fluid Pressure (TFP) Switch 3 (26)*
10. *Transmission Fluid Pressure (TFP) Switch 1 (1234)*
11. *Pass Through Connector*
12. *Transmission Fluid Pressure (TFP) Switch 4 (456/R1)*

The control solenoid (w/body and TCM) valve assembly contains the following components:

- Transmission control module (TCM)
- Clutch pressure control solenoids (Clutch PC Sol)
- Shift solenoids (SS)
- Line pressure control solenoid (Line PC Sol)
- Torque converter clutch pressure control solenoid (TCC PC Sol)
- Transmission fluid temperature sensor (TFT Sensor)
- TCM temperature sensor
- Power-up temperature sensor
- Transmission fluid pressure switches (TFP Sw)

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6T40 (RPO MH8,MHB)
6T45 (RPO MH7,MHC)

TEHCM Internals (continued)

Pressure Switches:

The pressure switches are housed as part of the control solenoid valve assembly (TEHCM). Four switches are used, 1, 2, 3 and 4. The switches act as an input to the TCM and are used for 2 basic purposes:

- To monitor clutch regulator valve and clutch hydraulic operation
- To monitor clutch CVI (Adaptive learning)

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TFP Switch	Clutch/circuit Monitored
1	1-2-3-4 Clutch
2	3-5-R Clutch
3	2-6 Clutch
4	4-5-6 and L/R Clutch

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6T40 (RPO MH8,MHB)
6T45 (RPO MH7,MHC)

Solenoids

Shift solenoid and PCS operation is controlled by the TEHCM (TCM). The TCM regulates the feed voltage to the solenoids. The TCM then regulates feed voltage and current to the solenoids. The shift solenoid is an On/Off design (N.C.) with the TCM controlling the power for the solenoid as well as the ground. The pressure control solenoids are PWM controlled. The TCM is over current and overtemp protected.

Motorola refers to the PWM solenoid's by their state, NL or NH. Normally High (N.H.) is used to describe a solenoid that allows pressure to travel to the clutch when the solenoid is turned off. Normally Low (N.L.) is used to describe a solenoid that prevents pressure from getting to a clutch when the solenoid is turned off.

The solenoids are protected by the filter plate. The filter plate is housed between the valve body and the control solenoid valve assembly (TEHCM) and must be replace anytime the valve body or control solenoid valve assembly (TEHCM) is replaced or unbolted from each other. The Filter plate is serviced with the control solenoid valve assembly (TEHCM) but it can also be ordered separately.

Gear	Shift SOL 1	1-2-3-4 CL PC SOL 5 N.L.	2-6 CL PC SOL 4 N.L.	3-5 REV CL PC SOL 2 N.H.	LOW REV 4-5-6 CL PC SOL 3 N.H.	Gear Ratio
Park	ON	OFF	OFF	OFF	ON	--
Reverse	ON	OFF	OFF	ON	ON	2.94
Neutral	ON	OFF	OFF	OFF	ON	--
1st Braking	ON	ON	OFF	OFF	ON	4.584
1st	OFF	ON	OFF	OFF	OFF	4.584
2nd	OFF	ON	ON	OFF	OFF	2.964
3rd	OFF	ON	OFF	ON	OFF	1.912
4th	OFF	ON	OFF	OFF	ON	1.446
5th	OFF	OFF	OFF	ON	ON	1
6th	OFF	OFF	ON	OFF	ON	0.746
Effective Final Drive Ratio - 6T40/45 - 3.17/3.87 For shift solenoid 1, "ON" = Solenoid Energized (Pressurized) "OFF" = Solenoid De-energized (No For pressure control solenoids, "ON" = Pressurized, "OFF" = No Pressure Normal resistance PCS 3-5 ohms at 70f, Shift solenoid 16-20 ohms at 70f						

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6T40 (RPO MH8,MHB) 6T45 (RPO MH7,MHC)

Solenoid Cleaning Process

An automated process is available that aids in cleaning debris from the solenoid assembly. Your scan tool will instruct the TCM (TEHCM) to cycle the solenoids while the system is pressurized to clean the solenoids. The transmission does not need to be disassembled to perform the cleaning process.

Simply follow the instructions on the scan tool to activate the cleaning program. This process should be completed prior to attempting to diagnose the transmission with the DT-48616 tools as described below. If the cleaning process is unsuccessful then you should diagnose the concern with DT-48616

Diagnostics

Like other GM transmissions, diagnosis is designed around the use of a quality scan tool. With the 6T40/6T45 this could not be more true as the need to access scan data is critical. Unlike other GM transmissions you have become accustomed to working with over the years, the 6T40/6T45 internal electrical components are not hard wired to the rest of the vehicle via the transmission harness. This means that the diagnostic process has changed considerably. Diagnosis is divided into 2 categories, scan diagnostics and test plate/air check diagnostics.

Solenoid and valve body diagnosis requires the following tools:

- A quality scan tool capable of communicating and commanding the TCM and its solenoids.
- Tool number DT 48616 Solenoid test plate and jumper harness DT48616-10

Remove the Control Solenoid Valve Assembly from the transmission. Install tool DT 48616 onto the Control Solenoid Valve Assembly (5Nm 44 Lb In). Apply regulated shop air (90-100 psi) to the tool. Connect the scan tool to the Control Solenoid Valve Assembly using cable DT48616-10.

Command the solenoid ON/OFF air pressure should be present on the gauge and then it should exhaust as the solenoid is cycled. If the solenoid or valve are malfunctioning the gauge pressure will not change as you cycle the solenoid. If a malfunction is determined to be present, replace the complete Control Solenoid Valve Assembly.

If the solenoid checked OK, install the gauge on another solenoid port and command that solenoid ON/OFF with the scan to repeat the process.

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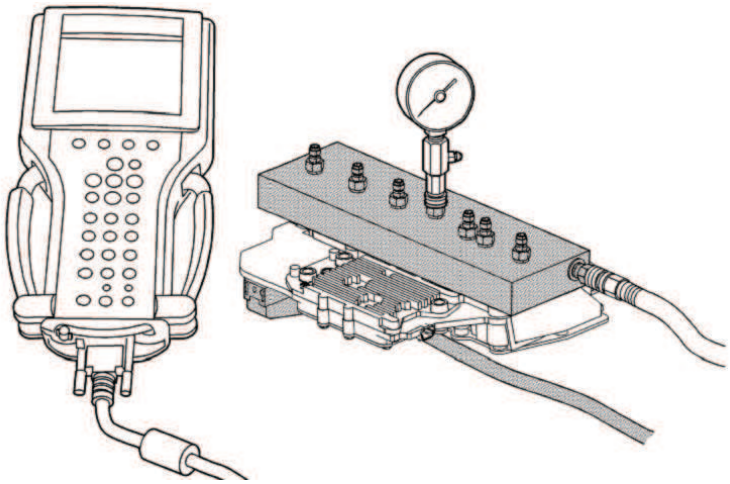
6T40 (RPO MH8,MHB)
6T45 (RPO MH7,MHC)

Solenoid Cleaning Process (continued)



NOTE: If the solenoid is malfunctioning the gauge pressure will not change as you cycle the solenoid. If a malfunction is determined to be present, replace the complete Control Solenoid Valve Assembly (TEHCM)

NOTE: The TCM (TEHCM) will normally cycle several of the solenoids ON/OFF to help keep the solenoids and the valves free of debris. Therefore this cleaning function (Dither) may cause the gauge to flicker when the TCM is cleaning the solenoid you are testing.
Do not operated the solenoids for longer than 2 minutes or damage may occur.

COMPONENT	PORT ON TEST BLOCK	Key On, Engine Off (KOEO) Normal State
PC Solenoid 2, 35R	F	Full PSI flow to gage
PC Solenoid 3, R1/456	G	Full PSI flow to gage
PC Solenoid 4, 2-6	B	No PSI flow to gage
PC Solenoid 5, 1234	C	No PSI flow to gage
Shift Solenoid	D	Full PSI flow to gage
Line Pressure Control Solenoid	A	Full PSI flow to gage
TCC PC Solenoid	E	No PSI flow to gage

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6T40 (RPO MH8,MHB)
6T45 (RPO MH7,MHC)

Adaptive Learning

The 6T40/45 are fully equipped with several adaptive learning strategies. As with some other GM applications you will need to erase the adaptive values and perform a "Fast Learn" prior to operating the vehicle. Adapts and fast learn procedures should be performed if any of the following occur:

- Internal Transmission repairs have been performed
- The valve body was replaced
- The Control Solenoid valve assembly was replaced
- The TCM was recalibrated or replaced
- Internal repairs were performed that could effect shift quality

NOTE: Fast learn is not required if a GM New or GM Rebuilt 6T40/6T45 is used. The transmission is fast learned prior to it being shipped from the plant.

To perform a fast learn:

- Use a scan tool capable of performing the fast learn procedure
- TFT 158-230°F (70-110°C), Move the selector in/out of gear 3 times
- Select the fast learn process from the scan tool menu
- Place the transmission in Drive with the vehicle stationary. The TCM will individually apply the clutches and calculate the clutch volume
- Place the transmission in Reverse with the vehicle stationary. The TCM will individually apply the clutches and calculate the clutch volume
- Shut off the engine for at least 30 seconds, open and close the door to allow "RAP" to expire or false DTC's may set, After a minimum of 30 seconds the car can be restarted , power off the scanner
- The process is now complete

The fast learn procedure will not run if:

- DTC's are set
- TFT is not between 158-230 °F (70-110°C)
- The brake switch is not working
- TP is 0% but engine RPM increases during the test
- P/N switch is improperly adjusted or is not functioning correctly
- Line pressure control system is malfunctioning

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2ML70 (RPO M99)

2 Mode Introduction

The next generation of transmissions to enter the market place has been introduced for the 2008 model year. Known as a “2 mode” design, the transmission was designated as the 2ML70 (RPO M99).

To order the 2ML70 the customer will also need to specify the 6.0L engine (RPO LFA) and the Hybrid system (RPO HP2). The 2 mode system was introduced on the Chevrolet Tahoe and GMC Yukon for the 2008 model year. It’s usage will expand for the 2009 model year into other GM applications.

The “T” model transmission will be designated for rear wheel drive applications, the “C” model will be an upscale rear wheel drive application while the “F” model will be a front wheel drive application. In addition, the 2ML70 is also used by Dodge and BMW in some of their applications.

The 2 Mode design offers several advantages over conventional automatic transmissions including substantial gains in performance, fuel economy and significant reductions in emissions. Overall fuel economy gains for the C/K truck applications range between 25-40%. In addition to the common transmission functions, the 2ML70 also eliminates the need for and alternator and a starter for the vehicle.

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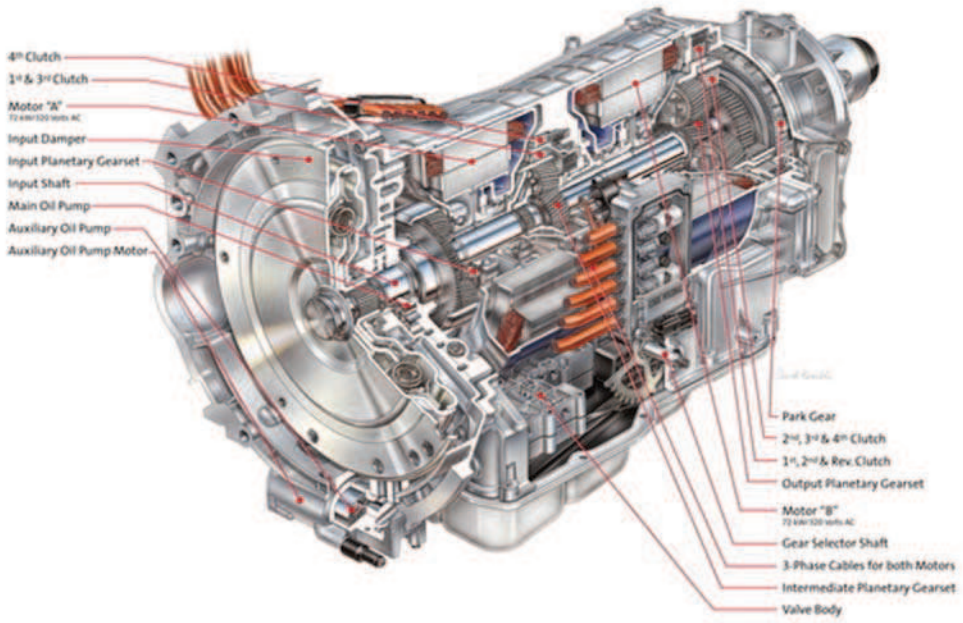
2-Mode RWD Hybrid Transmission



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2ML70 (RPO M99)

Specifications

Type 2 Mode continuous variable electric ratio hybrid transmission, four fixed gear ratios, two electric motors provide infinite variable ratios, with engine on/off operational capability

Gear Ratios

1st 3.69-1

2nd 1.70-1

3rd 1-1

4th .73-1

EVT #1 Infinity-1.70-1

EVT #2 1.70 to .5-1

Reverse Infinity to 1.70-1

- Max engine torque 380 lb-ft (515 Nm)
- Max engine power 369 bhp (275 kW)
- Two 65 kW (peak) electric motors (Drive motor #1, Drive motor #2) Y wound, 3 phase 300 volts AC, permanent magnet
- Motor cooling accomplished by a transmission fluid circulation system
- Electric motor torque 242 lb-ft (320 Nm)
- 300 volt 40 cell nickel-metal hydride battery (Located under the 2nd row seats)
- Auxiliary fluid pump
- Three planetary gear sets
- Four multiple disc clutches (2 holding, 2 driving)
- Two shift solenoids used (On/Off Design), SS1,SS2
- Six Variable bleed solenoids, PCS, PCS2, PCS3, PCS4, PCS5, TCC (TCC not used)

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2ML70 (RPO M99)

Specifications (continued)

- A Bosch built 32 bit TCM (TEHCM) mounted internal to the transmission on the valve body (Referred to as the “control solenoid with body and TCM) The TEHCM incorporates the Solenoids, pressure switches, TCM and TFT and it is bolted to the valve body.
- Output speed sensor (2 Hall Effect sensors in one housing, capable of sensing both speed and direction)
- Electronic range selection
- IMS (Range position)
- Vane style oil pump (3 selective slides and rotors)
- 12 volt three phase AC powered Auxiliary fluid pump
- Three piece die cast aluminum case
- Wet weight 374 lbs (170 kg)
- Dexron VI required
- Fluid capacity, Fluid and filter 11.5 qts (10.88 liters) Overhaul 13 qts (12.30 liters)
- Torque dampener 347mm (No torque converter)
- Pressure taps- Line, Aux pump
- Driver shift control (DSC) (When in M range)
- Shifter ranges (P,R,N,D,M)
- Default actions if in 3rd or 4th= 3rd gear, if in 1st or 2nd = 2nd gear
- Manufactured in the GMPT plant, Baltimore

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2ML70 (RPO M99)

Components and Functions

The 2 mode system requires several different control modules and subsystems for operation, they include:

Drive Motor Generator Control Module (DMGCM)
The DMGCM Contains the APM and PIM fastened together as an assembly. Cooling for the assembly is provided by a separate cooling system. The stand alone cooling system requires Dexcool and utilizes a heat exchanger mounted in the front of the vehicle and an electric coolant pump. The drive motor generator control module is connected to the poles of the drive motor battery. The high voltage system is controlled by a high current contactor relay mounted in the Hybrid battery assembly.

The Power Inverter Module (PIM)
The PIM converts 300 volts DC to 3 phase 300 volts AC to operate the drive motors. The Power Inverter Module (PIM) converts 3 phase 300 volts AC coming from the motor/generator to 300 volts DC to charge the hybrid battery. 6 high voltage shielded cables connect the PIM to the 2 electric drive motors mounted within the transmission. The high voltage cables are “orange” in color for easy identification. The PIM also contains the Hybrid Powertrain Control Module (HPCM) and 2 Motor Control Modules (MCM). The PIM, HPCM and the MCM are flashable.

The Accessory Power Module (APM)
The APM converts high voltage DC to low voltage DC (14 volts) and intermediate voltage DC (42 volts). The system charges the standard vehicle battery and provides power for the 42 volt power steering system. The APM is also capable of converting 12 volts to 300 volts for emergency jump starting the vehicle. The intermediate voltage cables are shielded and colored “Blue”.

The Hybrid Powertrain Control Module (HPCM)
The HPCM is the main controller for the hybrid transmission system. The HPCM determines which mode/motor will operate as well as features such as “Auto Stop/Start” and “Regenerative Braking”. The HPCM operates in conjunction with the Battery Energy Control Module (BECM) and the Motor Control Module (MCM) to operate the 2 transmission electric motors. The HPCM interfaces with the IMS, Auxiliary Fluid Pump, High Voltage Interlock Circuit (HVIC) and Engine RPM inputs to monitor system operation.

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2ML70 (RPO M99)

Components and Functions (continued)

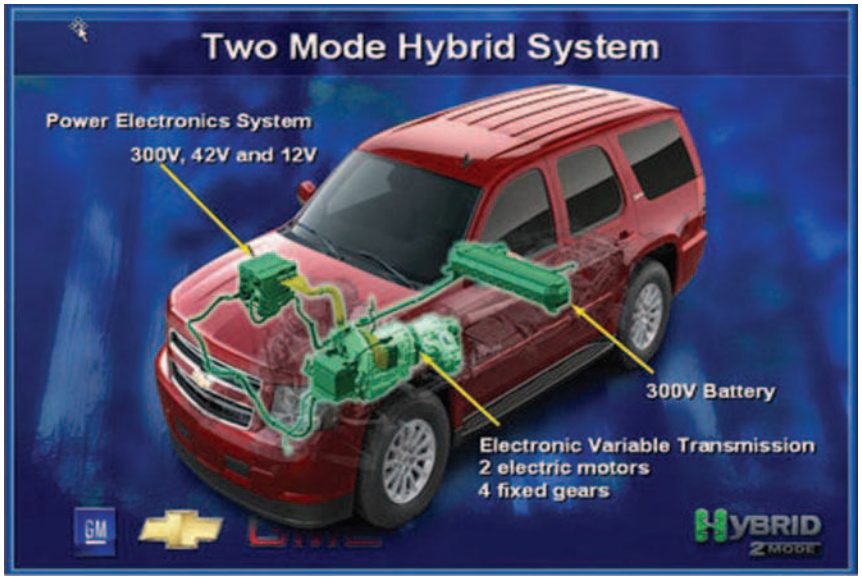
The Motor Control Module (MCM)
The MCM controls each of the transmission electric motors/generators. Each MCM controls it's respective IGBT driver circuit to control each motor separately. The MCM output is 3 phase 300 volt AC to operate the motors. The MCM is located within the PIM.

The Battery Energy Control Module (BECM)
The BECM is located in the battery pack compartment (Located under the 2nd row seats). The BECM controls the 40 cell drive motor/generator battery. It contains 2 high voltage contactor relays, a high voltage limiter relay, a battery fan relay and the battery vent fan. The BECM monitors and controls the relays and fan as well as monitors current, voltage and battery temperature.

The Auxiliary Fluid Pump Control Module (AFPCM)
The AFPCM is mounted in the engine compartment. The AFPCM controls the auxiliary fluid pump based on commands from the Hybrid Powertrain Control Module (HPCM).

Hybrid Battery Pack
The battery pack is located under the 2nd row seat. The nickel-metal hydride battery pack consists of 40 7.2 volt cells. The combined static output of the battery is 288 volts DC. The battery pack provides current for the motors as well as other vehicle systems.

Air Conditioning Control Module (AACM)
The Air conditioning control module and compressor used to control the 300 volt AC compressor.



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2ML70 (RPO M99)

Components and Functions (continued)

Drive Motors

The 2ML70 contains two 300 volt 3 phase 60-65kW AC motor/generator assemblies. The two permanent magnet motors are mounted from each end of the transmission and supported by the shafts/bushings and a support assembly. Six high voltage (orange color) cables are attached to the transmission via rigid conduit around the transmission which then transitions to flexible cable to attach the transmission to the Drive Motor Generator Control Module (DMGCM). Transmission fluid is used for normal transmission operation as well as to cool the drive motors. The motors have a seal around each end of the assembly so transmission fluid can circulate around the motor.

The motors provide the following functions:

- Engine cranking
- Battery Charging
- Transmission Reverse operation
- 2 modes of electronic variable transmission (EVT) operation.

The front motor is used to start the engine and also reacts to torque input from the rear motor for EVT operation. The rear motor drives the vehicle when reverse is selected or when auto stop is activated and the vehicle is operating only on electrical power. Motor speed and torque are controlled by the Motor Control Module (MCM) via motor position sensors mounted in the motor assemblies.

The Motor Control Module (MCM) monitors the speed/direction and angular position via resolver position sensors. The resolver position sensor contains a drive coil, 2 driven coils, and a irregular shaped rotor assembly. The rotor is attached to the drive motor shaft. The Motor Control Module (MCM) sends a 5 volt AC 10 kHz bias signal to the resolver drive coil. The Motor Control Module (MCM) then monitors the output from the 2 driven coil assemblies. Since the rotor tooth offset varies, the Motor Control Module (MCM) can then determine the exact speed, angle and direction of each motor.

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Components and Functions (continued)

Auxiliary Fluid Pump

The gerotor auxiliary fluid pump is mounted to the front of the transmission assembly. The pump is a 12 Volt 3 phase AC motor which is directly controlled by an Auxiliary Fluid Pump Control Module via the Hybrid Powertrain Control Module (HPCM). The function of the pump is to provide pressurized fluid for lube, cooling and clutch operation when the vehicle is being operated in electric or auto stop modes.

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Components and Functions (continued)

Output Speed Sensor (OSS)
The output speed sensor is a hall effect type sensor. Internally the sensor consists of 2 hall effect circuits to make the sensor capable of sensing both speed and direction. The two sensor elements in the OSS assembly are spaced approximately 1/2 a tooth apart. When the vehicle moves forward sensor A detects the synch tooth before sensor B.

When the vehicle moves in reverse sensor B detects the synch tooth before sensor A. The sensor is connected to the TEHCM (control solenoid with body and TCM) via the wiring harness. The sensor receives a 8.3-9.3 bias voltage signal from the TEHCM.

As the output shaft rotates, the sensor output is a 8.8v square wave. The electronics in the sensor combine the two signals and output a signal with a different pulse width. This signal is interpreted by the TCM regarding speed and direction

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Components and Functions (continued)

Internal Mode Switch (IMS)

The IMS (Internal Mode Switch) operates similar to other IMS applications. The function of the IMS is to tell the TEHCM and the Hybrid Powertrain Control Module (HPCM) which range has been selected and to act as P/N safety switch.

The TECHM sends an 8.3-9.3 bias voltage to the IMS on circuits A, B,C and P. The switch is mounted internally to the shift shaft linkage and as it rotates the contacts of the switch go to an "Open" or a "Closed" position. This creates either a HIGH or LOW signal on the circuit.

Unlike other applications the 2ML70 IMS has 5 additional outputs, R1, R2, D1, D2 and S. These inputs signal the Hybrid Powertrain Control Module (HPCM) regarding IMS direction. This information is used for P/N starting and for motor control.

IMS Circuits/Parameter	Selector Position				
	Park	Reverse	Neutral	Drive	Manual
Direction Switch Operating Conditions: Ignition ON, range selector in					
Direction IMS D1	HIGH	HIGH	LOW	LOW	LOW
Direction IMS D2	LOW	LOW	HIGH	HIGH	HIGH
Direction IMS R1	HIGH	LOW	LOW	HIGH	HIGH
Direction IMS R2	LOW	HIGH	HIGH	LOW	LOW
Direction IMS Start	LOW	HIGH	LOW	HIGH	HIGH
Range Switch Operating Conditions Ignition ON, range selector in appropriate gear					
IMS A	LOW	LOW	HI	HI	HI
IMS B	HI	LOW	LOW	LOW	HI
IMS C	HI	HI	HI	LOW	LOW
IMS P	LOW	HI	LOW	HI	LOW
Always HIGH status: Open/short to voltage condition					

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Solenoids and Fluid Pressure Switches

The TEHCM is built by Bosch and operates like the 6L80/90/50 applications. The TECHM contains six variable bleed solenoids (only 5 are used), two On/Off solenoids, four Pressure switches, one TFT, one TCM temp sensor and a TCM all housed in one non serviceable assembly. The TEHCM is bolted to the valve body and can only be serviced by removing the bottom pan. The TEHCM controls the hydraulic shifts, shift points, and shift feel for the transmission. Like other applications the TEHCM is programmable.

Gear	Park	Reverse	Neutral	D					
	P	EVT R	N	EVT Low	1st	2nd	3rd	4th	EVT High
Shift Solenoid 1	OFF	OFF	OFF	OFF	ON	ON	ON	ON	OFF
Shift Solenoid 2	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	ON
Line PC Solenoid 1 N.H.	ON	ON/OFF *	ON	ON/OFF*	ON	ON	ON	ON	ON
PC Solenoid 2 Trim N.H.	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	ON
PC Solenoid 3 Trim N.H.	OFF	ON	OFF	ON	ON	ON	OFF	ON	OFF
PC Solenoid 4 Trim N.L.	OFF	OFF	OFF	OFF	ON	OFF	ON	OFF	OFF
PC Solenoid 5 N.L.	OFF	ON/OFF *	OFF	ON/OFF*	OFF	OFF	OFF	OFF	OFF
1-3 Clutch	--	--	--	--	A	--	A	--	--
4th Clutch	--	--	--	--	--	--	--	A	--
Hybrid Low 1-2 Clutch	--	A	--	A	A	A	--	--	--
Hybrid Direct 2-3-4 Clutch	--	--	--	--	--	A	A	A	A

ON = The solenoid valve is energized Hydraulically. OFF = The solenoid valve is de-energized Hydraulically.
NL= Normally Low, when the solenoid is turned OFF, the solenoid has NO output pressure. NH=

A = Applied

***When the engine is running, the line pressure control solenoid is ON (pressurized) and the pressure control solenoid 5 is OFF (no pressure). When the engine is OFF (auto stop), the line pressure control solenoid is OFF (no pressure) and the pressure control solenoid 5 is ON (pressurized).**

Gear	TFP SW 1	*TFP SW 3	TFP SW 4	TFP SW 5
M1 (48 km/h (30 mph))	Low	Low	Low	High
M2 (48 km/h (30 mph))	Low	Low	Low	High
M3 (48 km/h (30 mph))	Low	Low	Low	Low
M4 (48 km/h (30 mph))	High	High	High	High
Power OFF	Low	Low	Low	Low

High = 12V (Switch Open or Pressurized)
Low = 0 volts (Switch Closed or No Pressure)
Note: All TFP switches are normally closed (NC)
*TFP switch 2 is not used

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Modes of Operation

Engine Starting
The 2 mode applications do not use a conventional starter. Instead the system relies on the transmission motor/generator to crank the engine. The 300 volt 3 phase AC motors can rotate the engine to cranking speeds that exceed 800 RPM in less than a few hundred milliseconds.

Auto Stop/Auto Start
After the engine is running the Hybrid Powertrain Control Module (HPCM) may operate the engine in the Auto Stop/Start mode. The Auto Stop feature is designed to reduce emissions output, engine wear and improve fuel economy in city type driving conditions. Engine OFF and Auto Stop modes of operation will be displayed on the tachometer. When the tachometer needle indicates OFF Auto stop will not function. If the Tachometer indicates AUTOSTOP, the engine may restart at anytime if the proper parameters are met.

Auto Stop may activate if the following conditions are present:

- Engine is running
- Hood is closed
- ECM is not requesting diagnostic information
- Gear selector is not in Reverse or Manual position
- Hybrid battery state of charge exceeds 20%
- Hybrid battery voltage, temperature and power limits are not exceeded
- Engine is warm
- Drive motor/generators have not overheated
- Power Inverter Module (PIM) temperature limits have not been exceeded
- No Hybrid system faults are present
- The Hybrid Powertrain Control Module (HPCM) has determined that engine power is not required

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Modes of Operation (continued)

The 2 mode system does not require the engine to be operational to propel the vehicle down the road. The Hybrid Powertrain Control Module (HPCM) may shut the engine off (AUTO STOP) when it determines engine power is not required. If the Hybrid Powertrain Control Module (HPCM) determines that additional power is needed, the Auto Start function will occur and drive motor #1 will be used to start the engine. It should be noted that this may occur even when the vehicle is in motion if it were operating in the electric mode.

Auto start may activate without notice if any of the following conditions occur:

- Hood is opened
- ECM requests the engine to run
- Gear selector is placed in R or M position
- Hybrid battery charge is low
- Hybrid battery voltage, temperature or power limits have been exceeded
- Engine coolant temp (ECT) is to low
- Drive motor/generator temperature limits have been exceeded
- Power Inverter Module (PIM) temperature limits have been exceeded
- The Hybrid Powertrain Control Module (HPCM) has determined that engine power is required
- A Hybrid system fault is present

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Modes of Operation (continued)

EVT Mode

Three Electronic drive modes are available, Reverse, Low and High.

High Mode #2: When High mode is selected the following occurs:

- PCS trim solenoid #3 is commanded OFF
- Shift solenoid #1 is commanded OFF
- #3 Pressure switch opens
- #1 Pressure switch opens
- #4 Pressure switch opens
- 2-3-4 clutch is applied
- Front motor#1 drives the vehicle
-

Low Mode #1 Engine OFF: When Low mode is selected the following occurs:

- PCS trim solenoid #5 is commanded ON
- Line pressure PCS is commanded OFF
- Auxiliary pump is turned ON
- 1-2 clutch is applied
- Rear motor #2 drives the vehicle
-

Low Mode #1 Engine ON: When Low mode is selected the following occurs:

- PCS #3 is commanded ON
- PCS #5 is commanded OFF
- 1-2 clutch is applied
- Front motor #1 starts the engine
- Rear motor #2 drives the vehicle if speeds are less than 25-32 mph
-

Reverse Mode: When Reverse is selected the following occurs:

- PCS #3 is commanded ON
- 1-2 clutch is applied
- Rear motor #2 operates to drive the vehicle in reverse

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Regenerative Braking/Blended Braking

When the vehicle is decelerating or coasting the Hybrid Powertrain Control Module (HPCM) can switch the system into regeneration mode. In this mode the motors now act as generators to charge the Hybrid battery. As the motors switch to generator mode, force is exerted on the drive train which helps to slow the vehicle.

Blended braking is also available with the 2 mode system. When the brake is applied, drive motor #2 switches to generator mode leading the vehicle to slow. Communication between the Hybrid Powertrain Control Module (HPCM) and Electronic Brake Control Module (EBCM) allows the 2 mode system to transparently interface with the vehicles braking system. This feature extends brake life in city driving.

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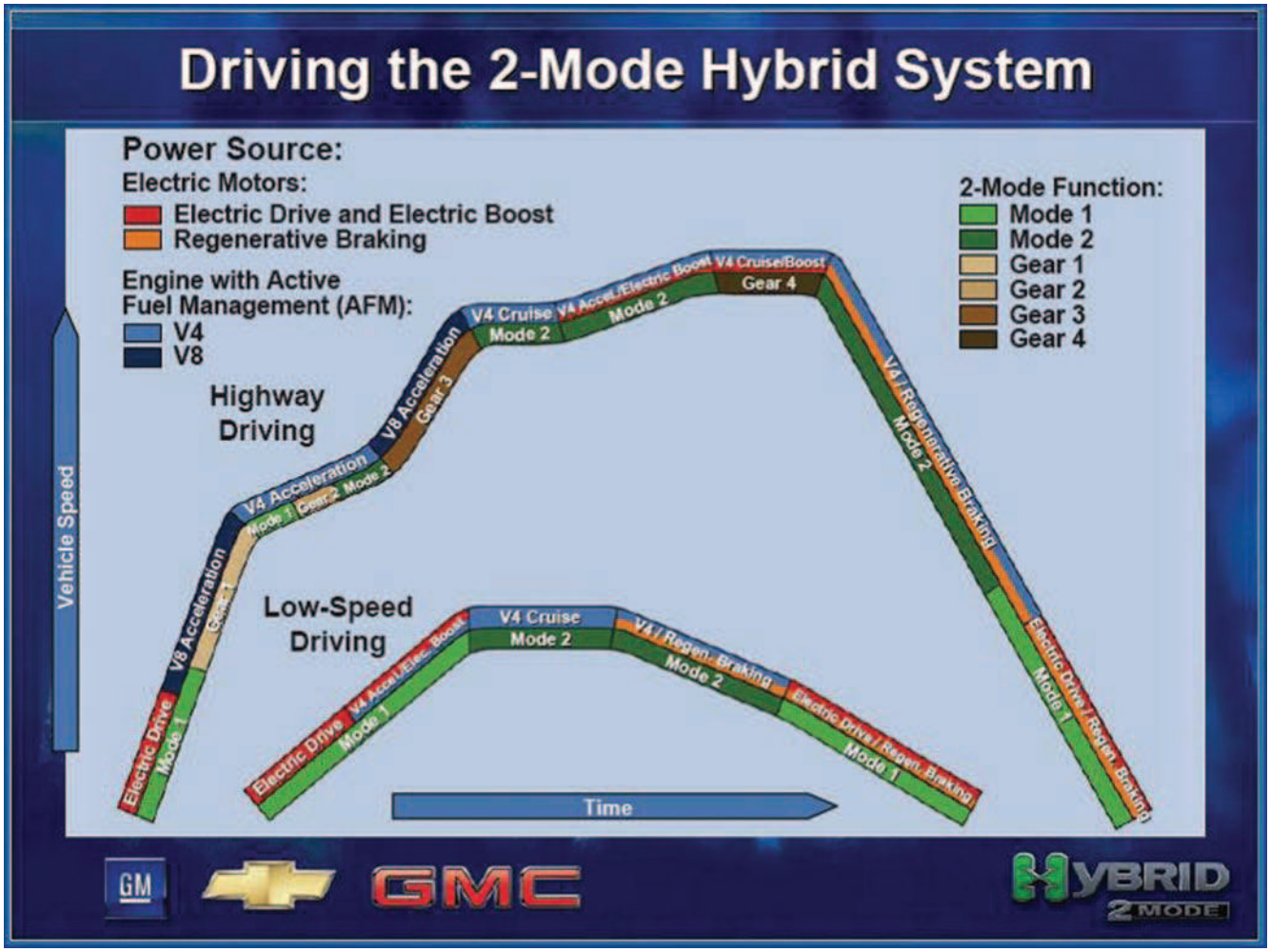

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2ML70 (RPO M99)

Servicing Precautions

Service of a 2 mode vehicle, transmission and systems requires specialized training. The 2 mode system can cause injury or death if proper service procedures are not followed. Some basic service procedures include:

- Noting where the Hazard labels are located:

Hazard labels identify where potential shock hazards may occur. Areas include: Transmission, High voltage cables (Orange or Blue) Hybrid battery, DMGCM, PIM, APM, AC compressor

- Using personal protective equipment:

"Class 0" 1000 volt electrical protective gloves are required. Do not use gloves which the date code has expired. Always check the gloves for pin holes and general overall condition.

Always Wear Proper Eye Protection.

Your digital multimeter must meet or exceed category 3 or 1000 volt specifications. This also includes its leads.

- Never place both hands across vehicle components. Touching the wrong exposed terminals or leads may lead to death or injury. Use the "1 hand rule", only use 1 hand for diagnosis and repair when possible. Keep the other hand behind your back
- Remove ALL jewelry, belt buckles, watches and other metal items before servicing these vehicles
- If High Voltage leads are disconnected insulate the ends using GM tools EL-48569 or UL listed isolation tape rated at 600 volts or more.
- ALL high voltage terminals require that they be torqued to specifications
- Never use AC powered test equipment to probe the high voltage system

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2ML70 (RPO M99)

Servicing Precautions (continued)

Before servicing any of the high voltage systems including the transmission you must disable the system using the following procedure:

- Remove the ignition key
- Remove the cover from the passenger side of the Hybrid battery assembly.
- Remove the "high voltage manual disconnect lever". Wait at least 5 minutes for the capacitors in the system to discharge.
- Disconnect the vehicles 12 volt battery.
- With a functioning approved digital multimeter, check the DC voltage across the high voltage DC positive (3) and negative (4) cables. The meter should read less than 3 volts. If excessive voltage is present, wait another 5 minutes and retest. If voltage is present refer to the service manual for further diagnostic procedures.
- Check for voltage between the high voltage manual disconnect terminal 1 and the high voltage DC positive cable (3)
- Check for voltage between the high voltage manual disconnect terminal 1 and the high voltage DC negative cable (4)
- Check for voltage between the high voltage manual disconnect terminal 2 and the high voltage DC positive cable (3)
- Check for voltage between the high voltage manual disconnect terminal 2 and the high voltage DC negative cable (4)
- All readings should be less than 3 volts. If voltage is present refer to the service manual for further diagnostic procedures.
- While the system may be disabled using and alternate procedure, that procedure is only valid if you are working on the transmission, cables, DMGCM, PIM or APM. The alternate method takes about the same amount of time to perform but it does not disable the complete system. Therefore ATRA is recommending you follow the above procedure to insure you and your workers stay safe.

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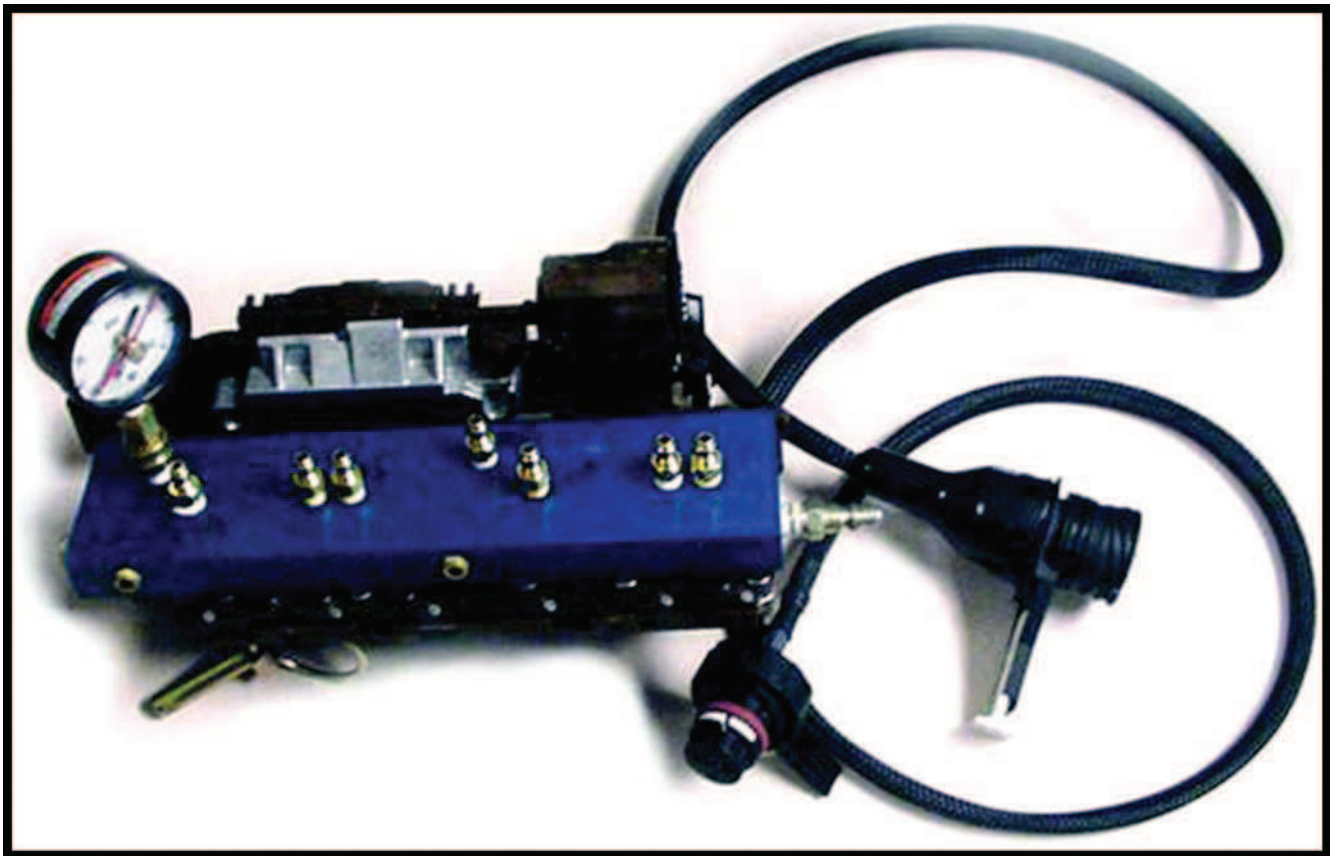
2ML70 (RPO M99)

Solenoid Cleaning Process

An automated process is available that aids in cleaning debris from the solenoid assembly. Your scan tool will instruct the TCM (TEHCM) to cycle the solenoids while the system is pressurized to clean the solenoids. The transmission does not need to be disassembled to perform the cleaning process.

Simply follow the instructions on the scan tool to activate the cleaning program. This process should be completed prior to attempting to diagnose the transmission with DT-47825 tools as described below. If the cleaning process is unsuccessful then you should diagnose the concern with DT-47825



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2ML70 (RPO M99)

Diagnostics

Like other GM transmissions, diagnosis is designed around the use of a quality scan tool. With the 2ML70 this could not be more true as the need to access scan data is critical.

Unlike other GM transmissions you have become accustomed to working with over the years, the 2ML70 internal electrical components are not hard wired to the rest of the vehicle via the transmission harness. This means that the diagnostic process has changed considerably. Diagnosis is divided into 2 categories, scan diagnostics and test plate/air check diagnostics.

Solenoid and valve body diagnosis requires the following tools:

- A quality scan tool capable of communicating and commanding the TCM and it's solenoids.
- Tool number DT 47825 Solenoid test plate and jumper harness.

Remove the Control Solenoid Valve Assembly from the transmission. Install tool DT 47825 onto the Control Solenoid Valve Assembly (5Nm 44 Lb In). Apply regulated shop air (90-100 psi) to the tool. Connect the scan tool to the Control Solenoid Valve Assembly.

Command the solenoid ON/OFF air pressure should be present on the gauge and then it should exhaust as the solenoid is cycled. If the solenoid or valve are malfunctioning the gauge pressure will not change as you cycle the solenoid. If a malfunction is determined to be present, replace the complete Control Solenoid Valve Assembly.

If the solenoid checked OK, install the gauge on another solenoid port and command that solenoid ON/OFF with the scan to repeat the process.

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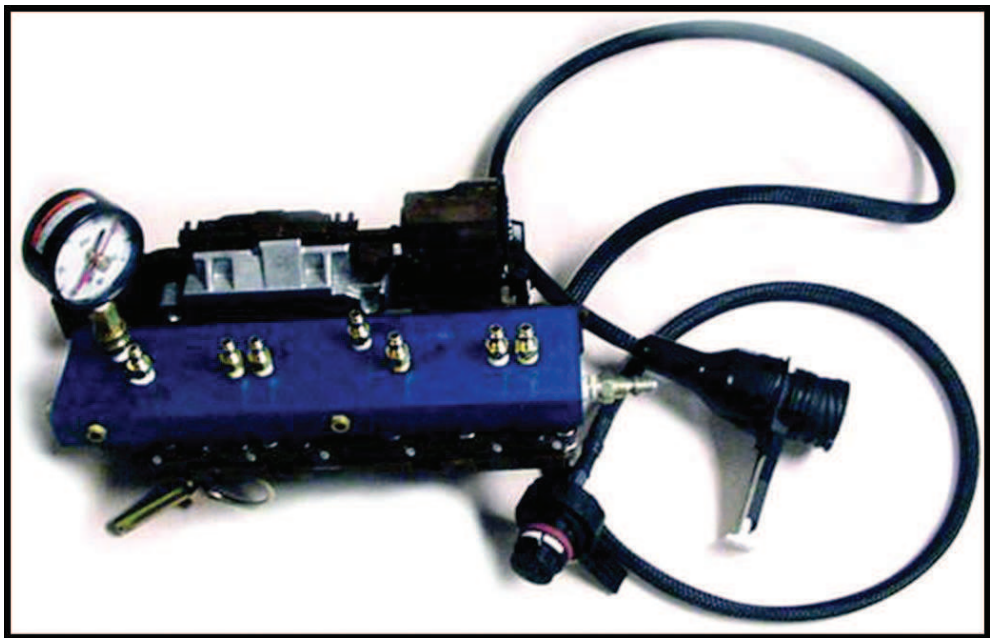
2ML70 (RPO M99)

Testing the Solenoids

If the solenoid or valve is malfunctioning the gauge pressure will not change as you cycle the solenoid. If a malfunction is determined to be present, replace the complete Control Solenoid Valve Assembly

The TCM (TEHCM) will normally cycle several of the solenoids ON/OFF to help keep the solenoids and the valves free of debris. Therefore this cleaning function (Dither) may cause the gauge to flicker when the TCM is cleaning the solenoid you are testing.



Component	Port On Test Block	Ignition ON, Engine OFF Normal State	Commanded State	
Line PC Solenoid	A	No PSI flow to gage	Increase/Decrease Approximately	
PC Solenoid 2	G	No PSI flow to gage	On - Full PSI flow to gage	Off - No PSI flow to gage
PC Solenoid 3	C	No PSI flow to gage	On - Full PSI flow to gage	Off - No PSI flow to gage
PC Solenoid 4	E	No PSI flow to gage	On - Full PSI flow to gage	Off - No PSI flow to gage
PC Solenoid 5	F	No PSI flow to gage	On - Full PSI flow to gage	Off - No PSI flow to gage
PC Solenoid 6 - **Not Used**	C	No PSI flow to gage	On - Full PSI flow to gage	Off - No PSI flow to gage
Shift Solenoid 1	H	No PSI flow to gage	On - Full PSI flow to gage	Off - No PSI flow to gage
Shift Solenoid 2	D	No PSI flow to gage	On - Full PSI flow to gage	Off - No PSI flow to gage

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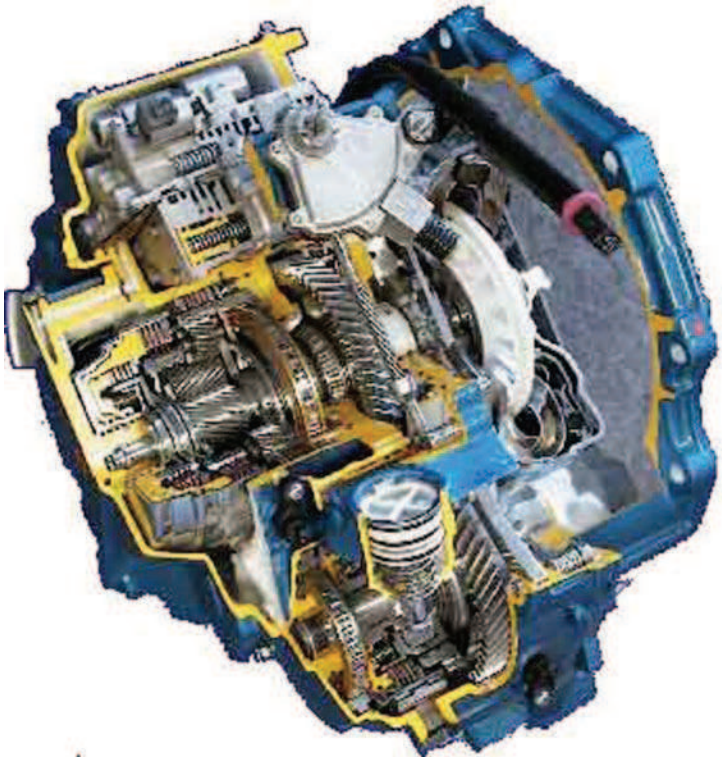
AF 17 (RPO MNF)

Introduction

The AF 17 is built by Asian Warner and is used in the Saturn Astra for the 2008 model year. RPO MNF the AF 17 is a 4 speed front wheel drive transaxle.

The AF 17 utilizes the following ratios and features:



1st 2.81-1
2nd 1.48-1
3rd 1-1
4th .74-1
Rev 2.77-1
Final Drive 4.12-1

- Manufactured in Tahara Japan
- Approximate weight 65 kg (143 lbs
- Torque converter Clutch
- 2 shift solenoids (S1, S2) ON/OFF type
- PCS solenoid (SLT) VBS type
- Lockup solenoid (SLU) PWM type
- Neutral switching solenoid (SN) ON/OFF type
- TFT sensor (OT) (Mounted on the VB, Part of the internal harness)
- An input speed sensor (ISS) (Lower sensor on case)
- An output speed sensor (OSS) (Top sensor on case)
- A Park/Neutral Switch (Mounted to the top of the case, external)
- TCM to control the transmission
- 2 one way clutches (F0, F1) (F0=Overrun oneway, F1=coast one way)
- 2 Brakes (B1, B2) (B1=2-4 band, B2= Low Reverse Clutch)
- 4 Clutches (C0, C1, C2, C3) (C0=OD clutch, C1= Forward Clutch, C2= Reverse Clutch, C3= Coast Clutch)

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AF 17 (RPO MNF)

Features

The AF 17 is similar to other transaxles you have worked with in the past. These features include:

Winter Mode
When activated by a switch the transmission starts in 3rd gear

Economy Mode
When activated by the switch, the TCM will select a shift speed table that is designed to provide the best fuel economy for the driving conditions.

Power Mode
When activated by the switch, the TCM will select a shift speed table designed to improve the vehicles acceleration and performance.

Cold Weather Line Pressure Bias
When TFT is below 10°C (50°F) and VSS is less than 5km/h (3mph) the TCM will change the pressure control solenoid command increasing line pressure during cold operation. This feature ensures correct shift time and shift feel during cold operation.

Reverse lock out

Engine torque management for all shifts

Adaptive learning

New features include:

Neutral Control
When the vehicle is stopped in "D" range with the brakes applied, the AF 17 will go to neutral by releasing the forward clutch (C1) via the neutral solenoid and the Line pressure solenoid. With the decreased load on the engine, in town fuel economy is improved. After releasing the brake the forward clutch (C1) will engage, the transmission will again be in 1st gear.

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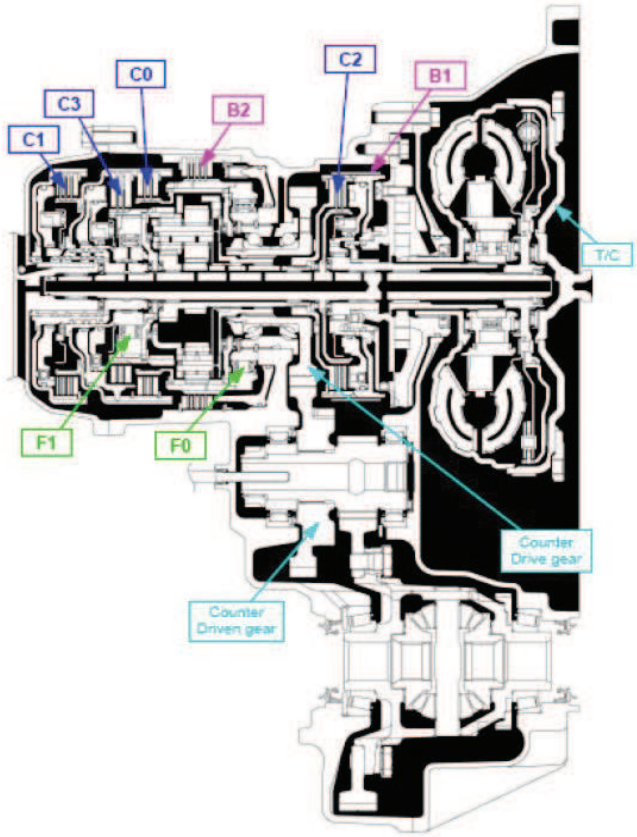
AF 17 (RPO MNF)

Cross Sectional View



Clutch & Brake		Operation
C0	Over drive clutch	Connects input shaft and front planetary ring gear when C1 operates
C1	Forward clutch	- Connects input shaft and rear planetary ring gear when F0 or / and C3 operates - Connects input shaft and front planetary ring gear when C0 operates
C2	Reverse clutch	Connects input shaft and planetary sun gear
C3	Coast clutch	Connects input shaft and rear planetary ring gear when C1 operates
B1	2nd & 4th brake	Locks rotation of planetary sun gear
B2	1st & reverse brake	Locks rotation of front planetary ring gear
F0	1 way clutch No.0	When C1 operates and the transmission is being drive by the engine, this clutch connects input shaft and rear planetary ring gear
F1	1 way clutch No.1	Locks counterclockwise rotation of front planetary ring gear

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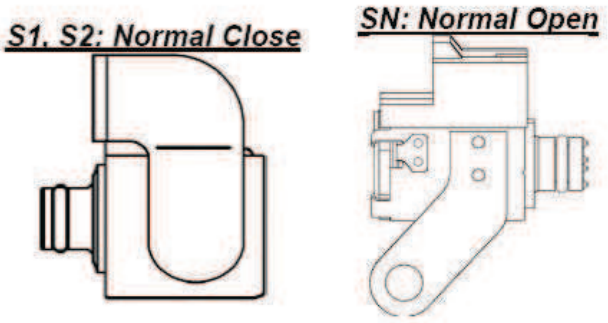
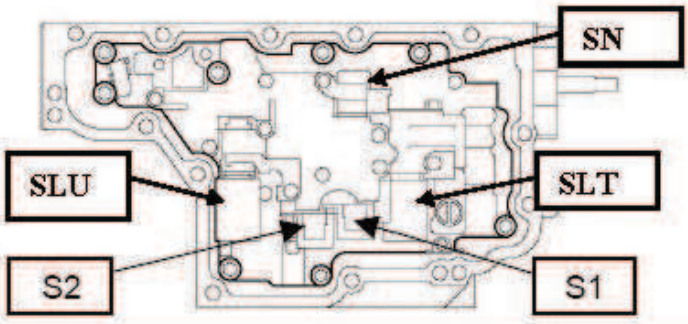
AF 17 (RPO MNF)

Solenoid Identification

Hill Hold

If the vehicle comes to a stop on an incline the hill hold feature is activated. The TCM determines that the vehicle is stopping on an incline by monitoring how fast VSS decreases prior to the brake pedal being applied. To provide the hill hold function the TCM energies the S2 (1-2,3-4) solenoid applying the B1 (2-4 band).





Gear	S1	S2
1st	Off	On
2nd	On	On
3rd	On	Off
4th	Off	Off

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AF33-5

Identification

The AF33-5 is a fully-automatic, five-speed, electronically-controlled transaxle. It's used in the Chevrolet Equinox, but mainly appears in the Saturn Ion sedan and the Vue.

The AF33-5 uses a line pressure control system which can adapt system line pressure to compensate for normal wear of clutch plates, seals, springs, etc. In effect, it learns the condition of the transmission, and adapts to that condition to provide the best possible operation.

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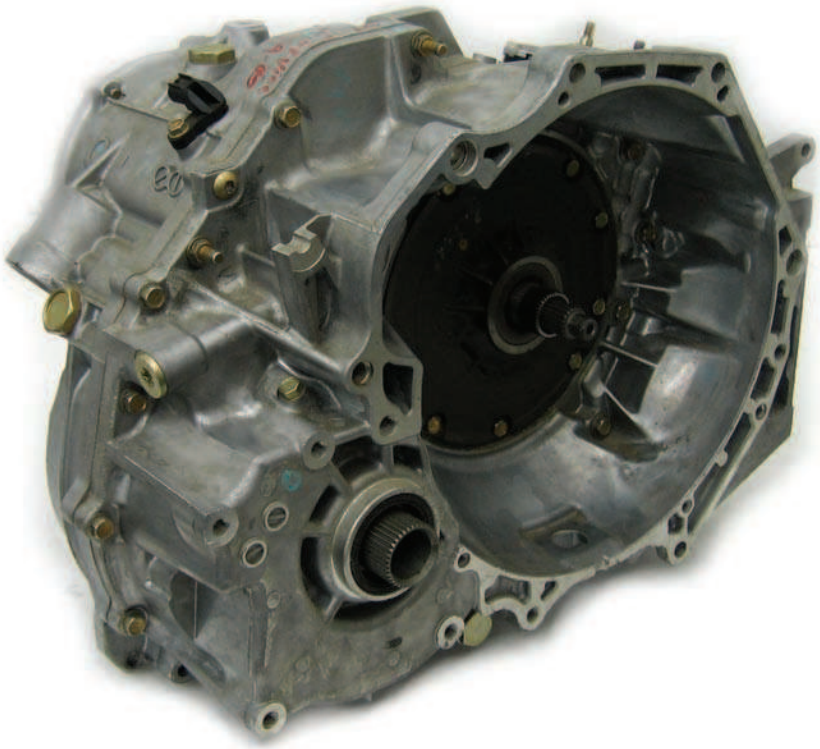

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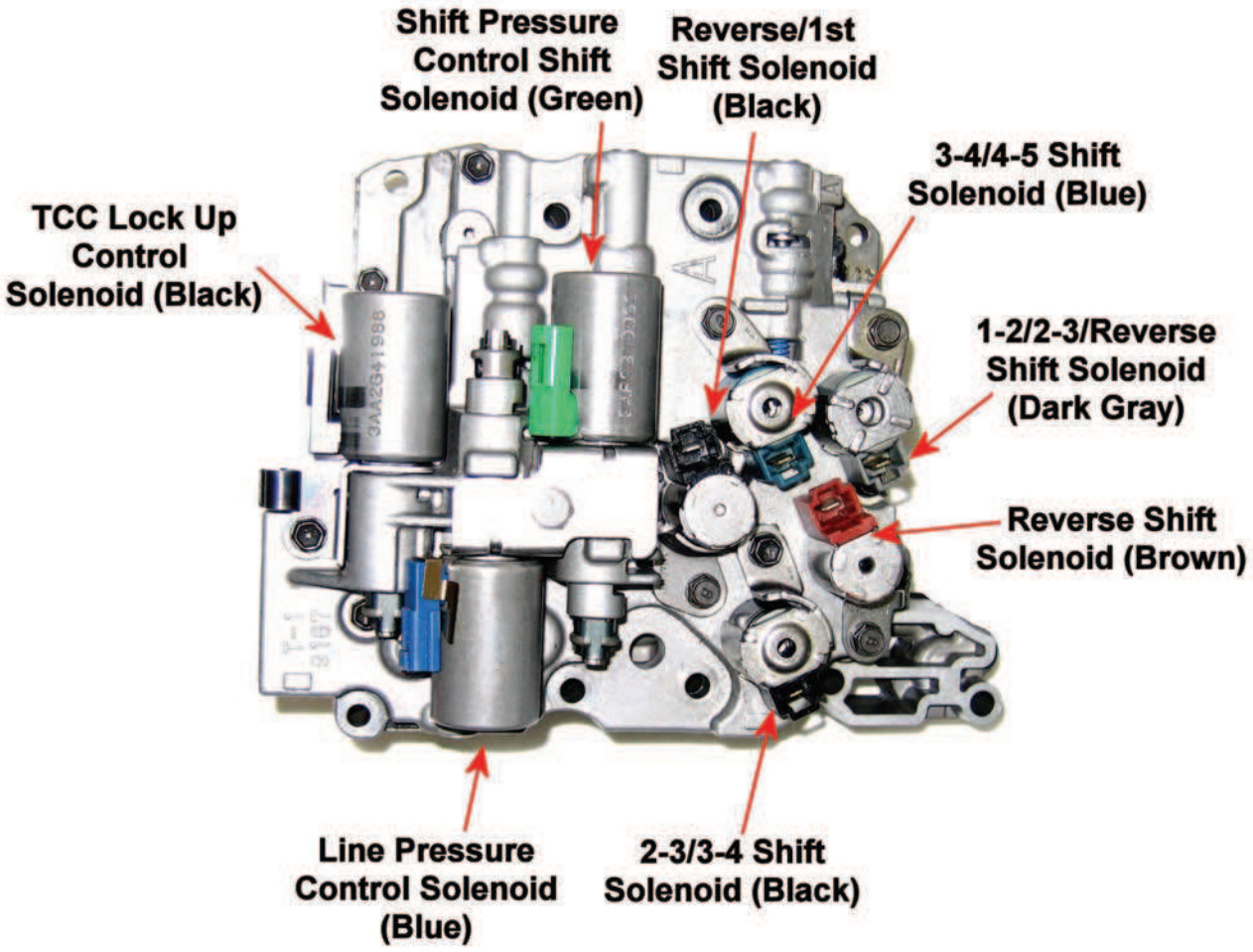
AF33-5

Solenoid Identification

The electronic shift system consists of the following components:

- TCM
- Shift Solenoids (SS1 and SS2)
- Pressure Control Solenoids (PSC)
- Lockup Solenoid (TCC)
- Input Speed Sensor (ISS)
- Output Speed Sensor (OSS)
- Transmission Fluid Temperature Sensor (TFT)
- Park/Neutral Position Switch (PNP)



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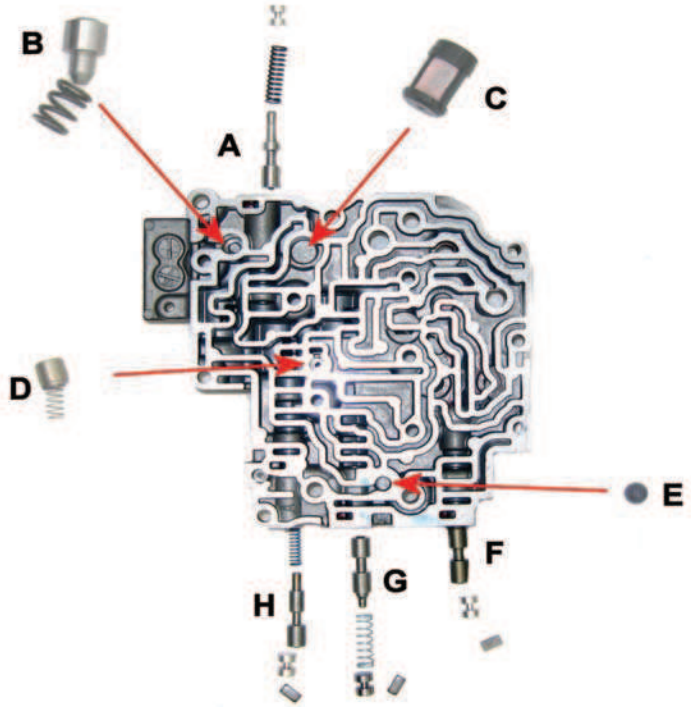
Valve Body Disassembly

The front control valve body houses all of the solenoids:

1. 1-2/2-3/Reverse Shift Solenoid (S3)(Dark Gray)
2. 3-4/4-5 Shift Solenoid (S4) (Blue)
3. Reverse Shift Solenoid (S5) (Brown)
4. 2-3/3-4 Shift Solenoid (S2) (Black)
5. Reverse/1st Shift Solenoid (S1) (Black)
6. Line Pressure Control Solenoid (SLT) (Blue)
7. TCC Solenoid (SLU) (Black)
8. Shift Pressure Control (SLS) (Green)

...and these valves and devices:

A. Solenoid Modulator Valve
B. Pressure Relief Valve
C. Fluid Strainer
D. Check Valves
E. Checkball
F. Forward Clutch Control Valve
G. Neutral Relay Valve
H. 2nd Coast Clutch Valve



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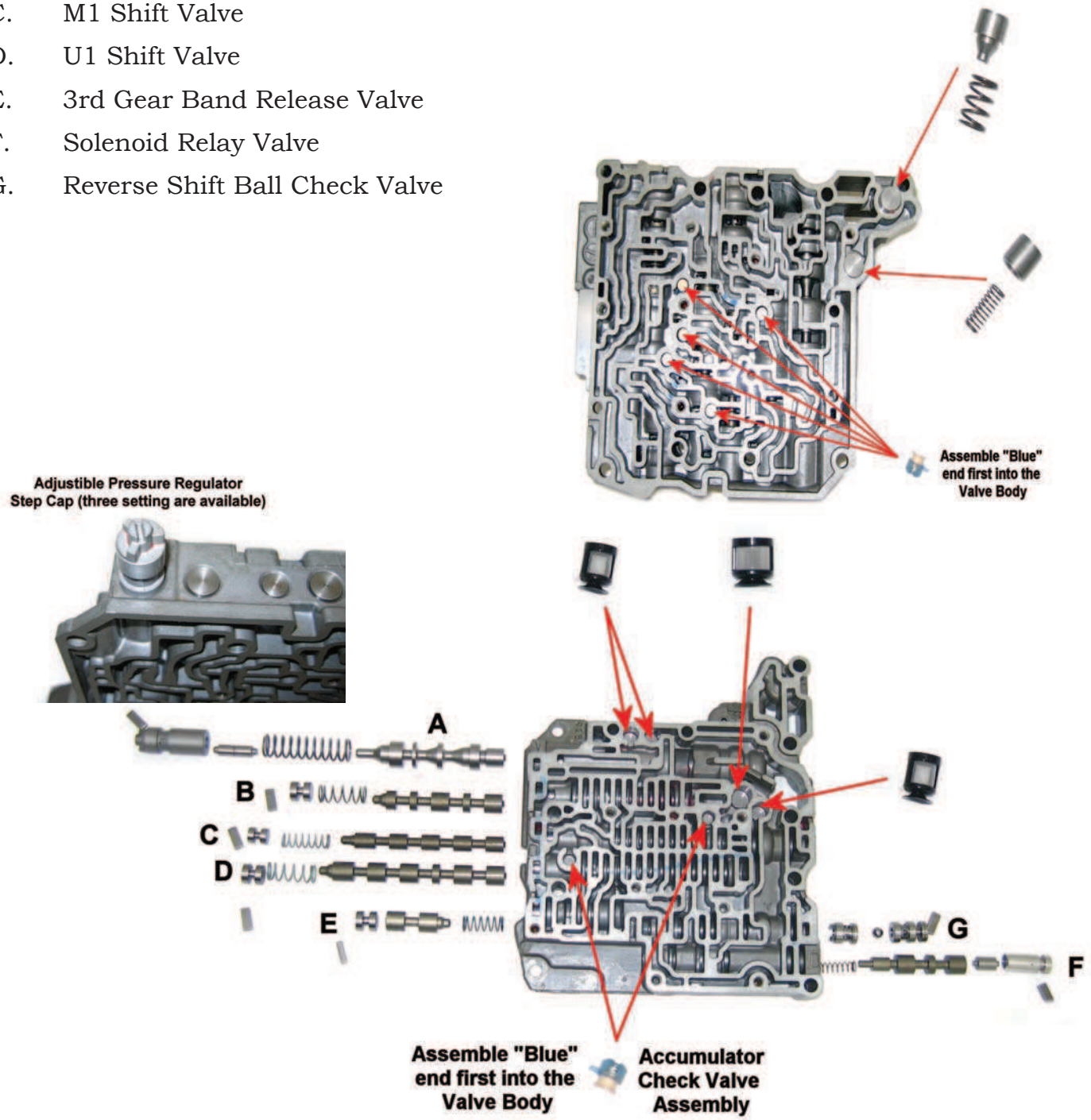
Valve Body Disassembly (continued)

The middle control valve body houses these valves:

A. Primary Regulator Valve Assembly
B. U2 Shift Valve
C. M1 Shift Valve
D. U1 Shift Valve
E. 3rd Gear Band Release Valve
F. Solenoid Relay Valve
G. Reverse Shift Ball Check Valve



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Valve Body Disassembly (continued)

The rear control valve body houses these valves and accumulators:

A. Secondary Regulator Valve
B. Line Pressure Control Accumulator Piston
C. Shift Pressure Control Valve
D. M2 Shift Valve
E. Shift Pressure Relay Valve
F. 3rd Gear Band Control Valve
G. 1-2/Reverse Control Valve
H. Lockup Relay Control Valve

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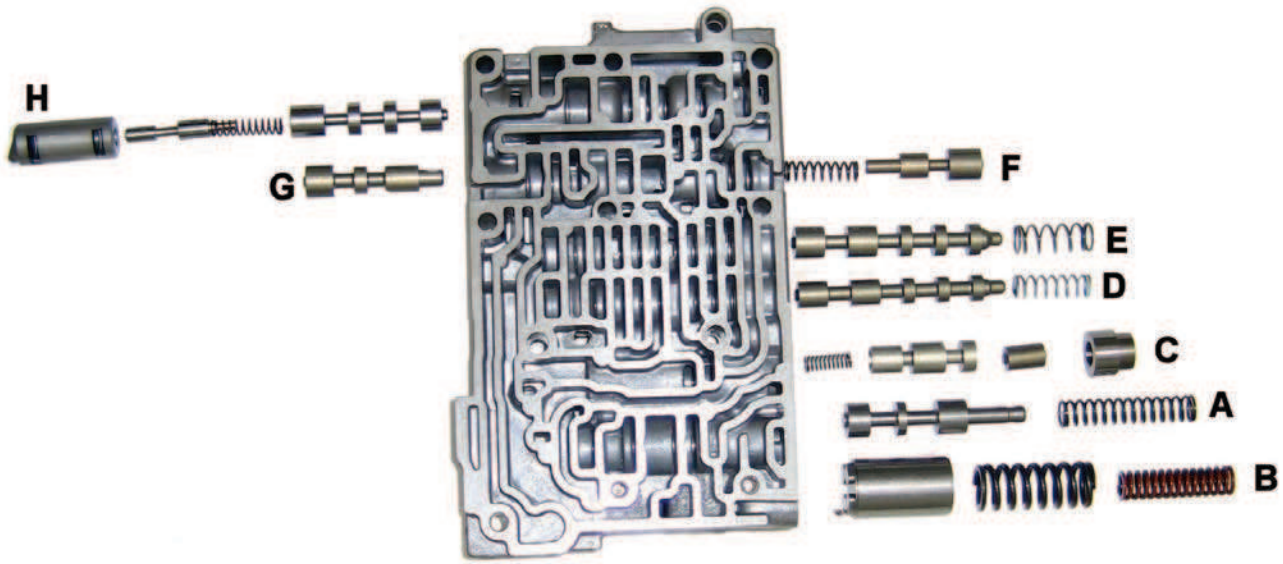

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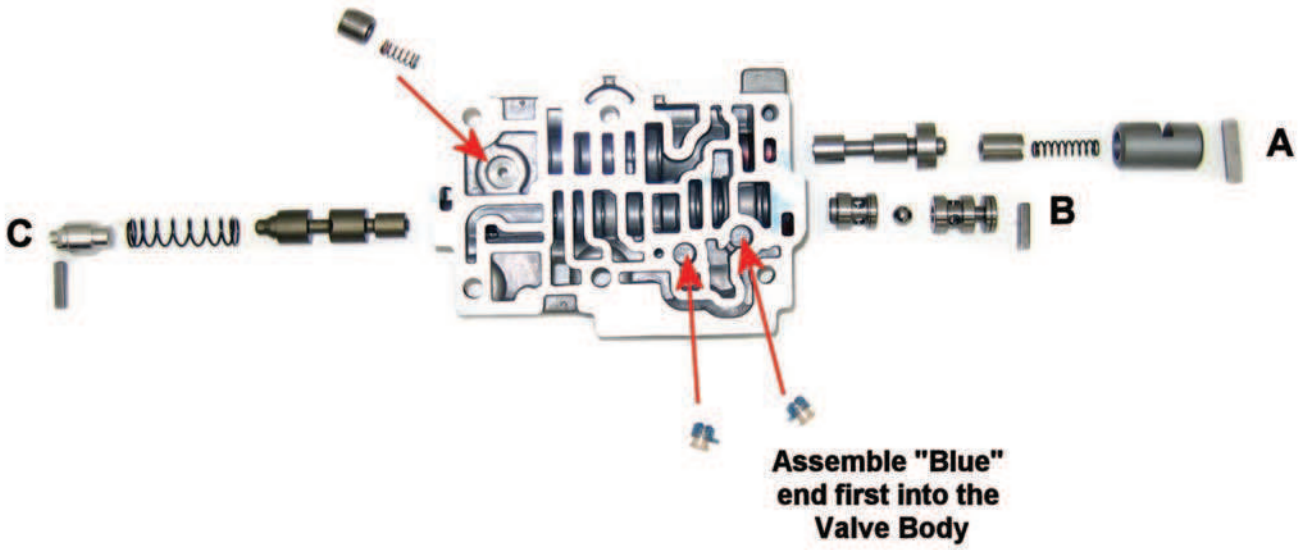
Valve Body Disassembly (continued)

The number 2 rear control valve body houses these valves:

A. Lockup Control Valve

B. Reverse Shift Restrictor Ball Check Valve

C. Lockup Control Valve



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Parker has been manufacturing quality sealing products for over 60 years, and Parker's rubber seals are a key components in all our transmission kits.

KIT COMPONENTS	TTK TOLEDO TRANS-KIT® PREMIUM BRAND	BRYCO VALUE LINE
Photo Enhanced Sub-Kit Packaging	Yes	Yes
Metal Clad Seals	Premium Brands	Non-Premium Brands
Pan Gasket	Premium Cork and Rubber, Fiber, Molded Rubber	Non-premium Cork and Rubber, Fiber, Molded Rubber
Paper Gasket	Various U.S. Manufacturers	Various U.S. Manufacturers
Metal Sealing Rings	Premium Brands, including GoldStripe®	Non-premium Brands
Rubber Components	Parker	Parker
Aftermarket Fixes	Yes	No
Friction Plates	Raybestos®	Allomatic®

To learn more about the TTK and Bryco Transmission Kits, and to obtain a complete listing of components, please contact us today at 800-582-2760.

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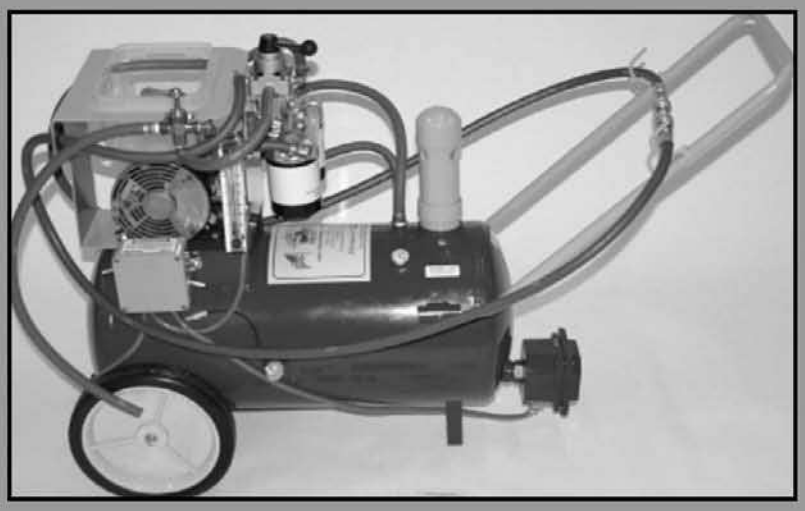

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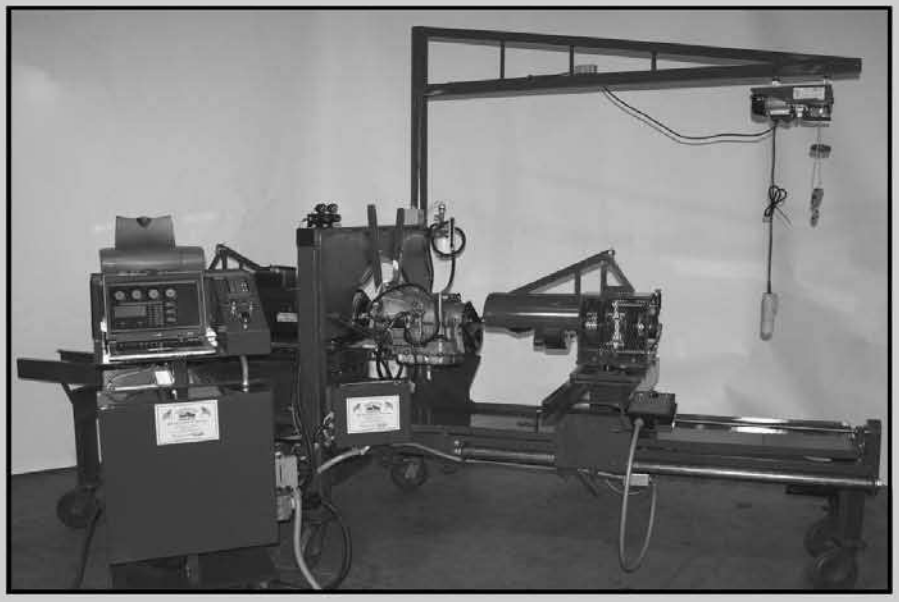

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Application

This transmission will be taking place of the 5R55S model transmission. On 2006 and up Explorer/Mountaineer, 2007 Explorer Sport Trac with the 4.6L.
The Expedition/Navigator with the 5.4L will use the 6R75.

The 6R75 is the same transmission as the 6R60 but with heavier torque capacity, this transmission will go into other applications as the current 4R75E's are phased out. The bottom line.

The transmission has Six Forward speeds, clutch to clutch (synchronous) shifting (no bands). It incorporates an internal TCM (Mechatronic Assembly). It also uses the Lapelletier Geartrain to achieve the different ratios, but never achieves a 1:1 ratio in third gear due to the planetary gearing on the pump.

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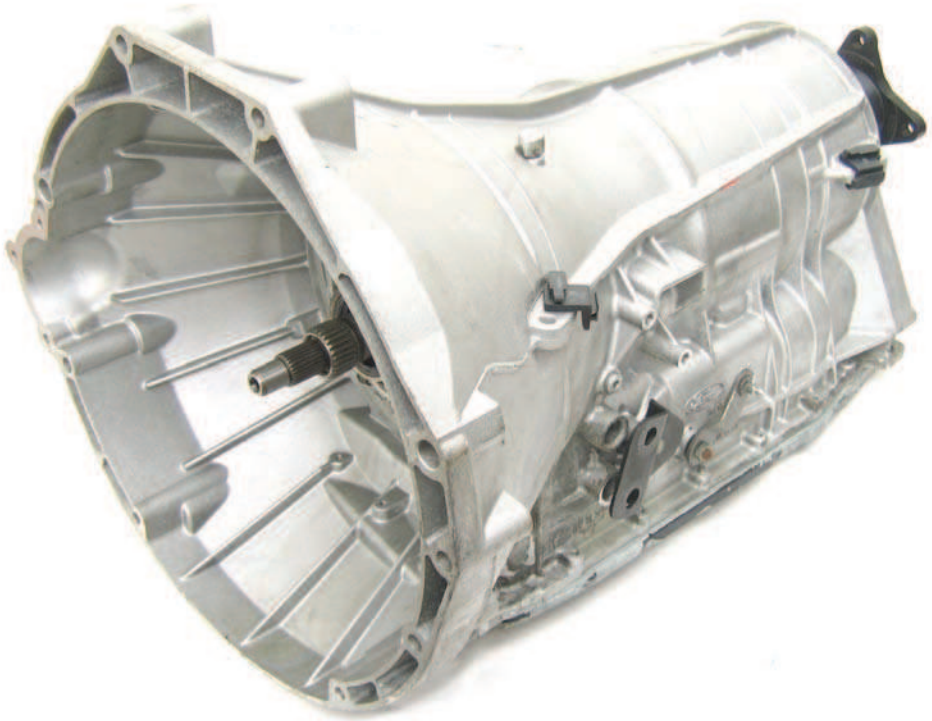

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Clutch Apply Chart

GEAR	SHIFTER POSITION	FORWARD CLUTCH (A)	DIRECT CLUTCH (B)	INTERMEDIATE CLUTCH (C)	LOW/REVERSE CLUTCH (D)	OVERDRIVE CLUTCH (E)
PARK	P				X	
REVERSE	R		X		X	
NEUTRAL	N				X	
1ST GEAR	D, 3, 2, 1	X			X	
2ND GEAR	D, 3, 2	X		X		
3RD GEAR	D, 3	X	X			
4TH GEAR	D	X				X
5TH GEAR	D		X			X
6TH GEAR	D			X		X

PLANETARY GEARSET COMPONENT:
- SUN GEAR #3
- SUN GEAR #2
- REAR CARRIER

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Fluid Checking Procedure

With the engine at an idle and the transmission in PARK, warm the engine to between 175°F and 190°F. Fill the transmission until it is between the hatch marks.

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Remove the Stick from the cap before using.

Fill the transmission until it is between the hatch marks.

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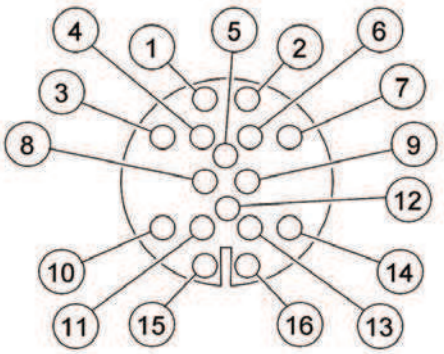
Diagnosis / Adaptive Strategies

Diagnosis is done completely through the CAN communication network. Which ever scan tool you use, it must have a CAN network interface. You must also perform the adaptive strategy after a repair.

Adaptive Strategies

1. Accelerate from rest with light throttle. The 1-2, 2-3 and 3-4 shifts must occur at engine speeds between 1300-1800 rpm
2. Continue to accelerate gently to 50 mph so that the transmission shifts into 6th gear.
3. Brake gently to a complete stop and hold foot on brake for at least 15 seconds.
4. Repeat steps 1-4 a total of five times



Pin Number	Circuit	Circuit Function
1	—	NOT USED
2	—	CAN low
3	—	NOT USED
4	—	NOT USED
5	—	NOT USED
6	—	CAN high
7	—	NOT USED
8	—	NOT USED
9	—	Term 15 (Ignition)
10	—	Park/Neutral signal (to PCM TRSW-PN T-19)
11	—	NOT USED
12	—	NOT USED
13	—	Term 31 (Ground)
14	—	Term 30 (Battery voltage)
15	—	NOT USED
16	—	Terminal 31 (Ground)

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Various Transmission Shift Quality Symptoms

2006-7 Explorer/ Mountaineer, 2007 Explorer Sport Trac

The TCM may need reprogramming if the transmission has any of the following complaints:

- Delayed engagement between P-D, N-D and R-D
- Delayed hesitation on 1-2 shift, 2-1 and/or 3-2 decel step in shifts
- Hoot noise during cold 1st gear launches from transmission pump
- Cold 2-1 flare under heavy braking
- Really cold temperatures harsh 1-2 and 2-3 shift -22-32°F.

To repair the vehicle:

- Reprogram the PCM/TCM with the latest calibration.
- Reset the TCM KAM
- Perform adaptive shift strategy learn.
- Best Part: If no improvements are made, replace the Mechatronic unit (valve body/TCM and trans filter)

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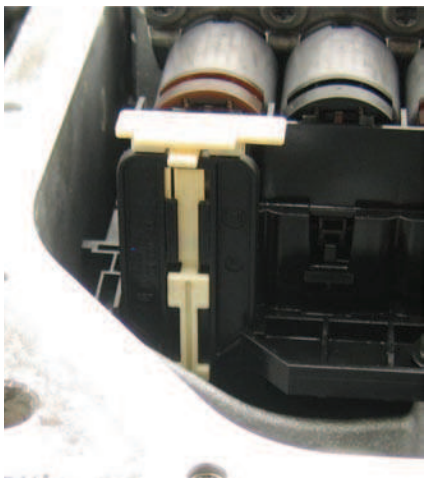
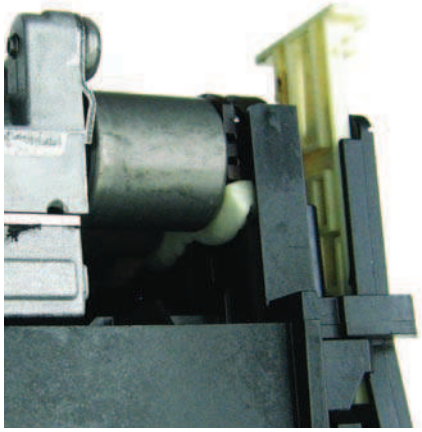
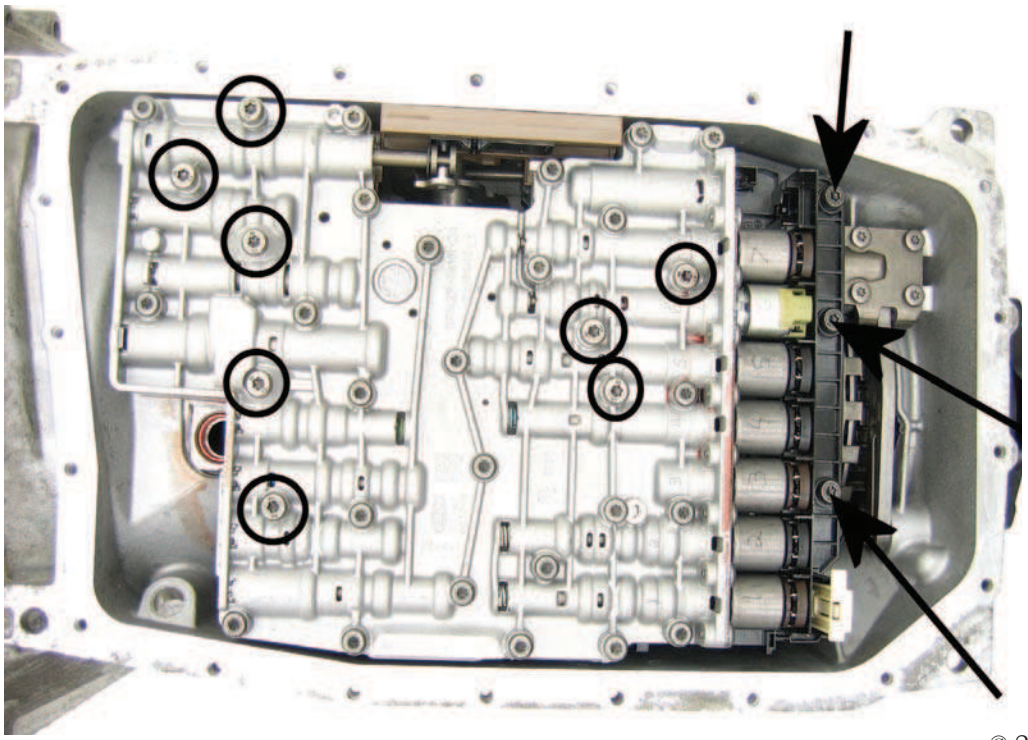
Case Connector and Valve Body Removal

To remove the case connector, press in on the release the tab. Lift the tab up to release the connector. Slide the connector out of the case. Remove only the (11) eleven blots circled below. Do not remove all of the bolts, this will split the valve body halves.







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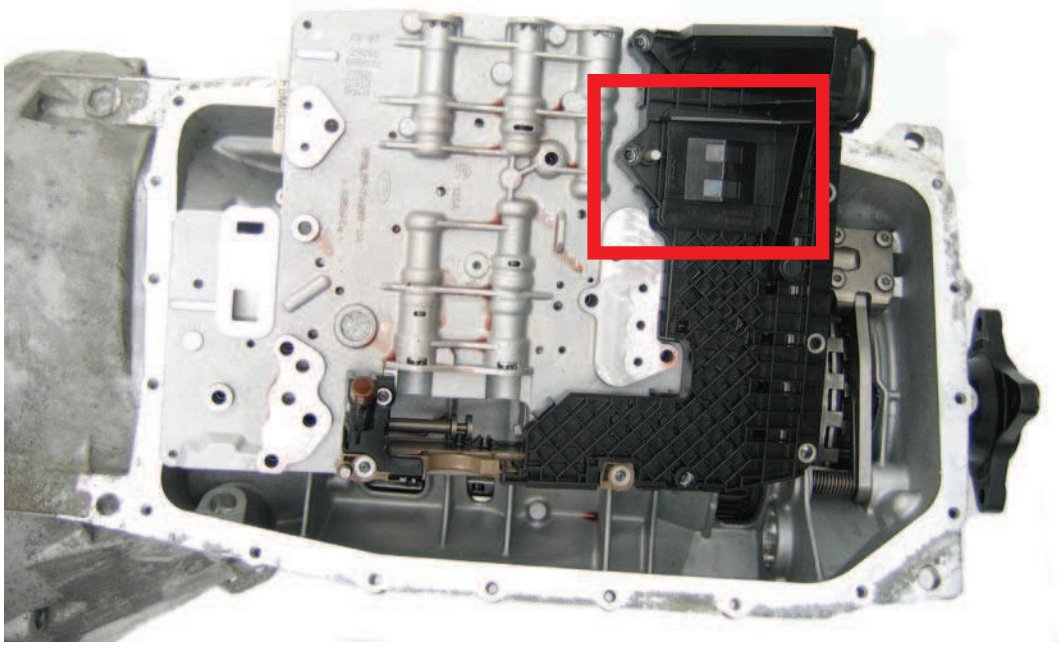
Heat Sink Element

The Heat sink is a piece of metal that is “V” bent, it acts like a return spring. Because of this, the valve body will not sit flush on the case.

NOTE: Do not touch the electrical connector, pins, or exposed solenoid pins on the TCM. Electrostatic discharge may occur and may cause damage to the TCM.



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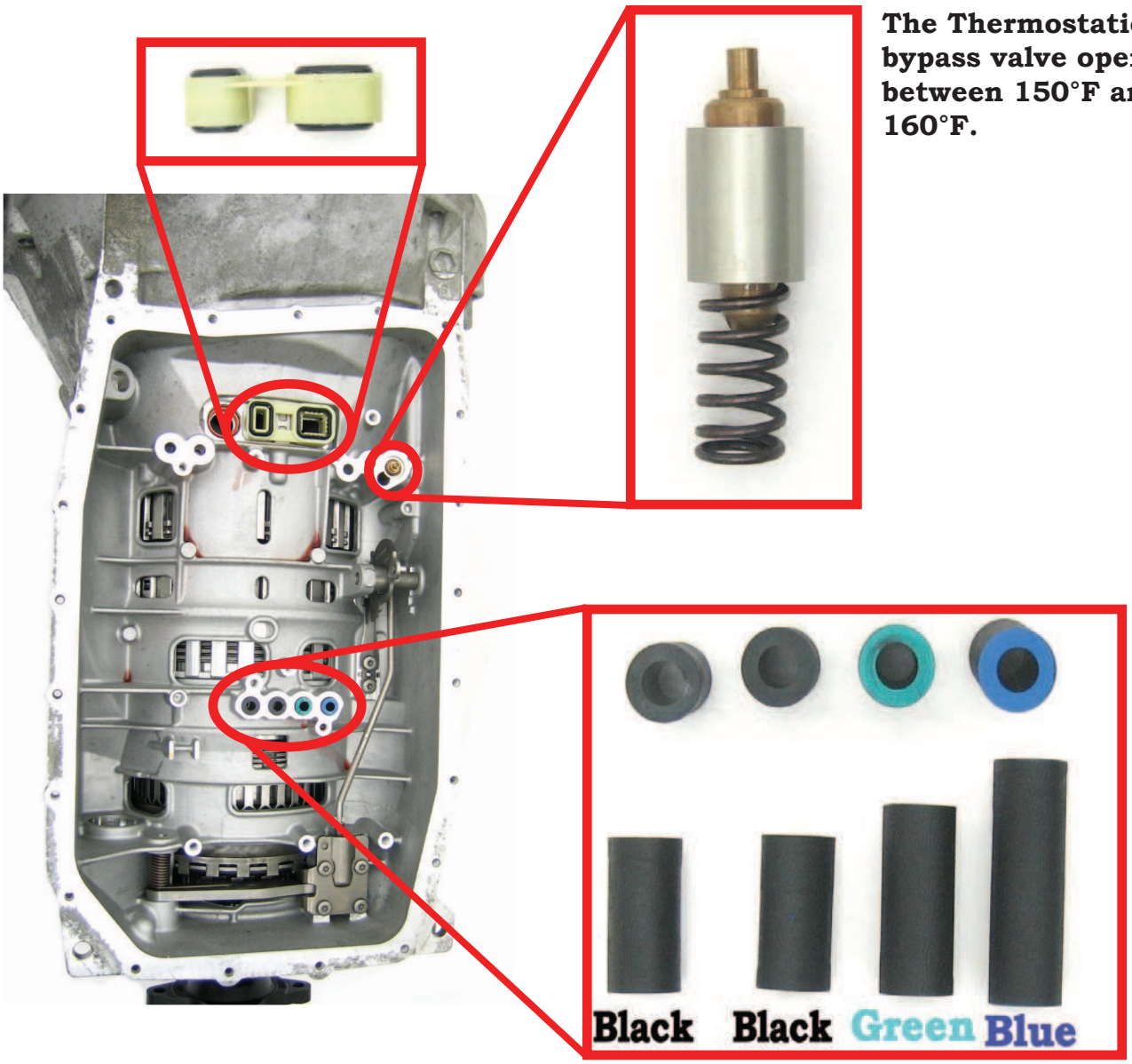
Case Components

Install the case seals and components, into the casing. Make sure the clutch seals fit snug into the casing.



The Thermostatic bypass valve opens between 150°F and 160°F.

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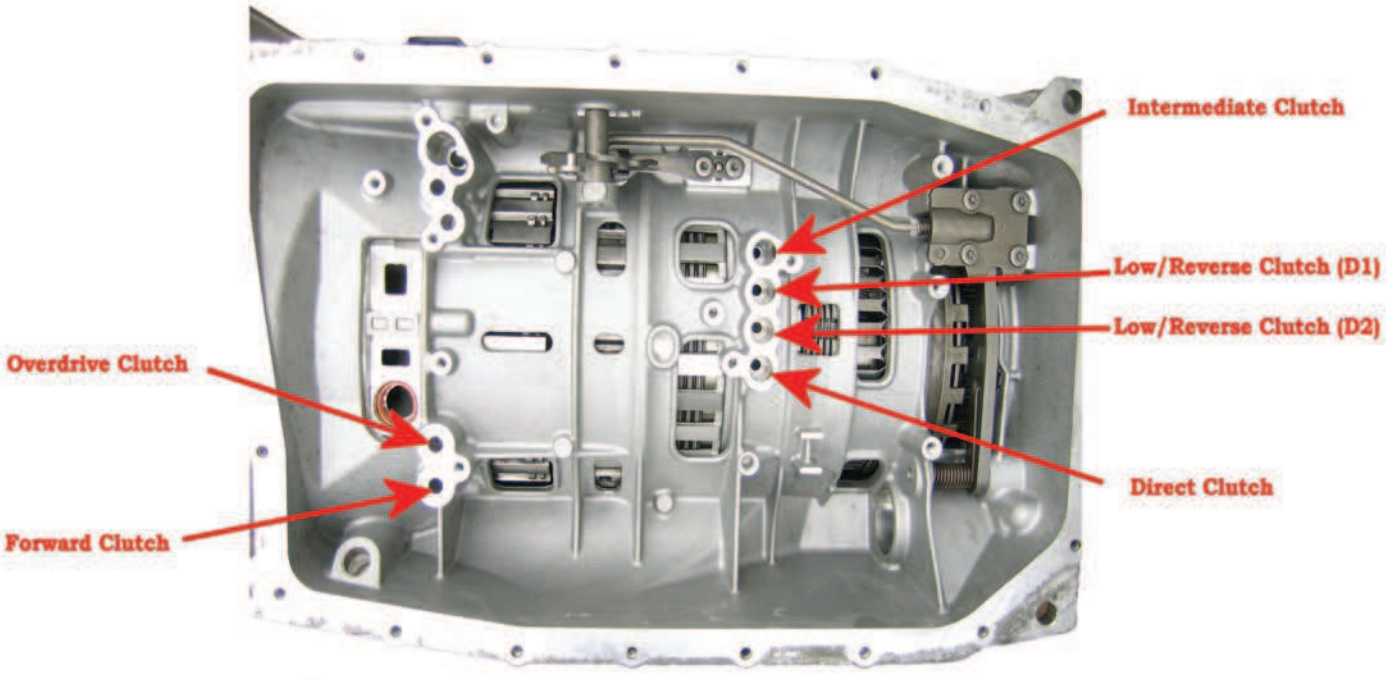
Air Checking the Transmission

During the overhaul, after the clutches are installed into the transmission, air check the clutches for proper apply. Use approximately 10 psi of regulated shop pressure. Repeat the steps using the case seals also.



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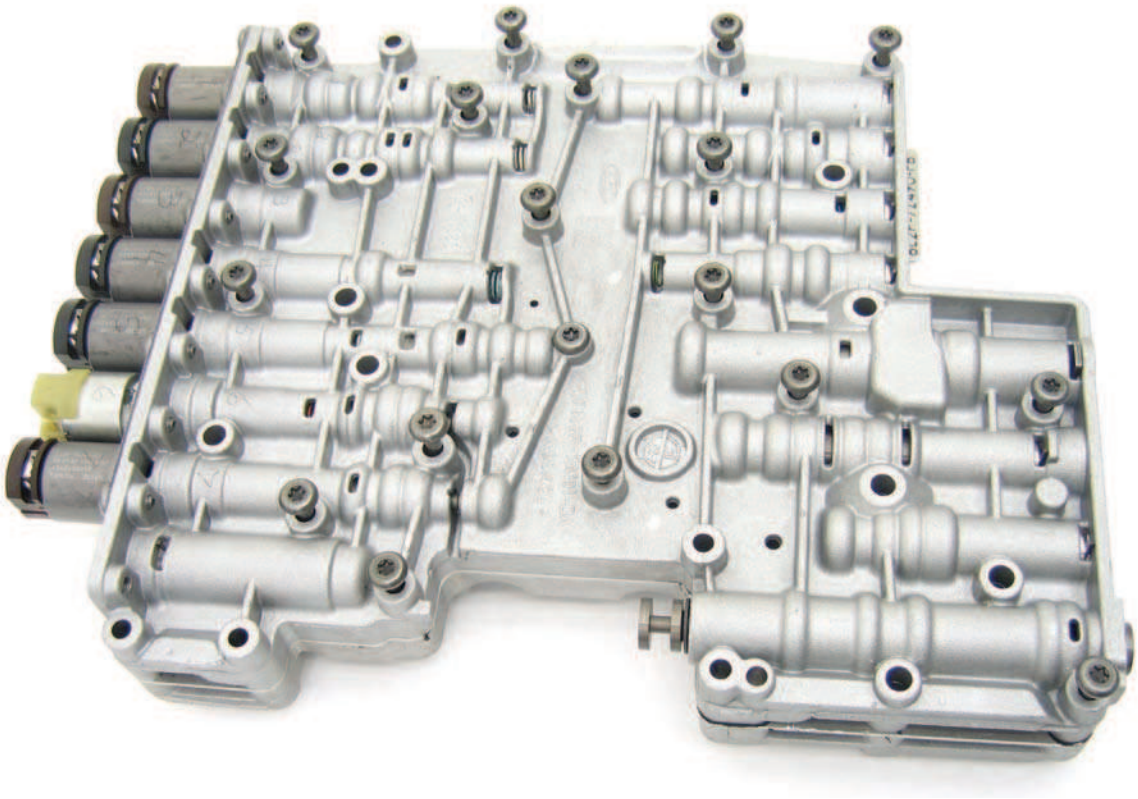
Valve Body Assembly

Split the valve body with the solenoid side (lower valve body) of the valve body facing up so we don't lose the small parts that are located in the upper valve body.



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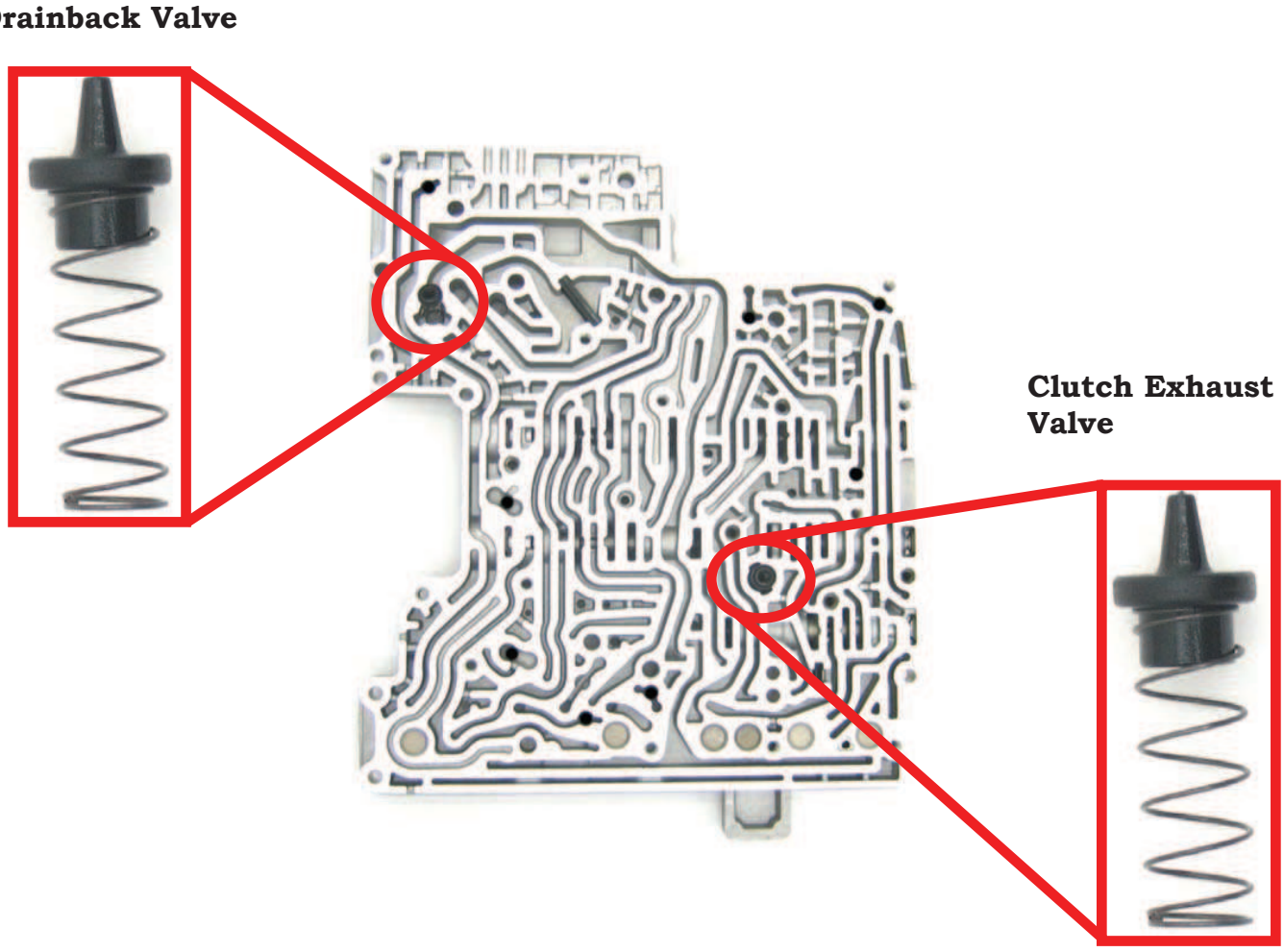
Valve Body Check Valves

Both of these valves are critical to the transmission. The drainback valve is used for converter oil control. The clutch exhaust valve is used to keep the clutches primed.



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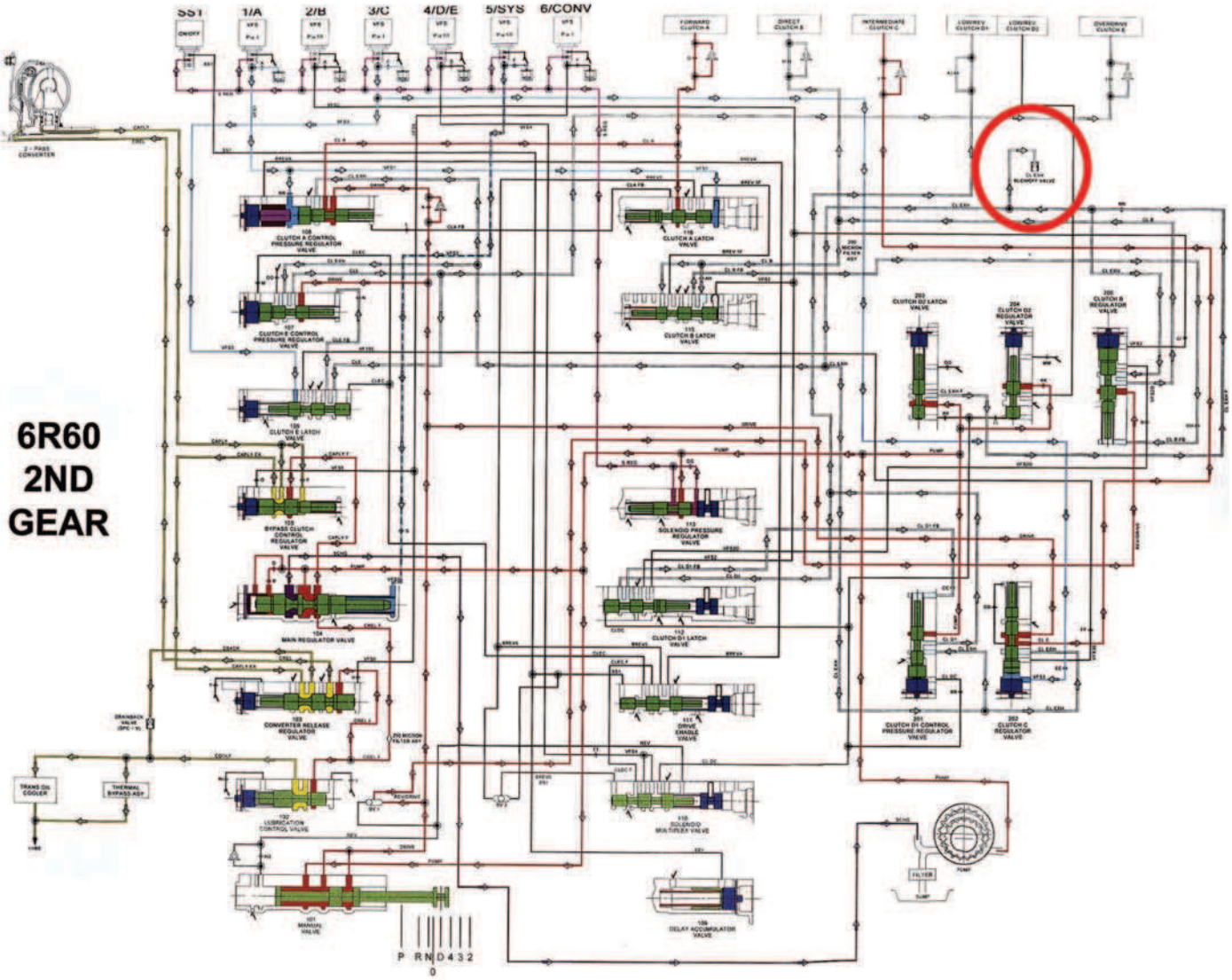
Clutch Exhaust Valve

During the release of the clutch the exhaust valve drains just enough fluid pressure from the clutch. This allows the clutch piston to have just enough oil in the chamber allowing for a smoother shift.



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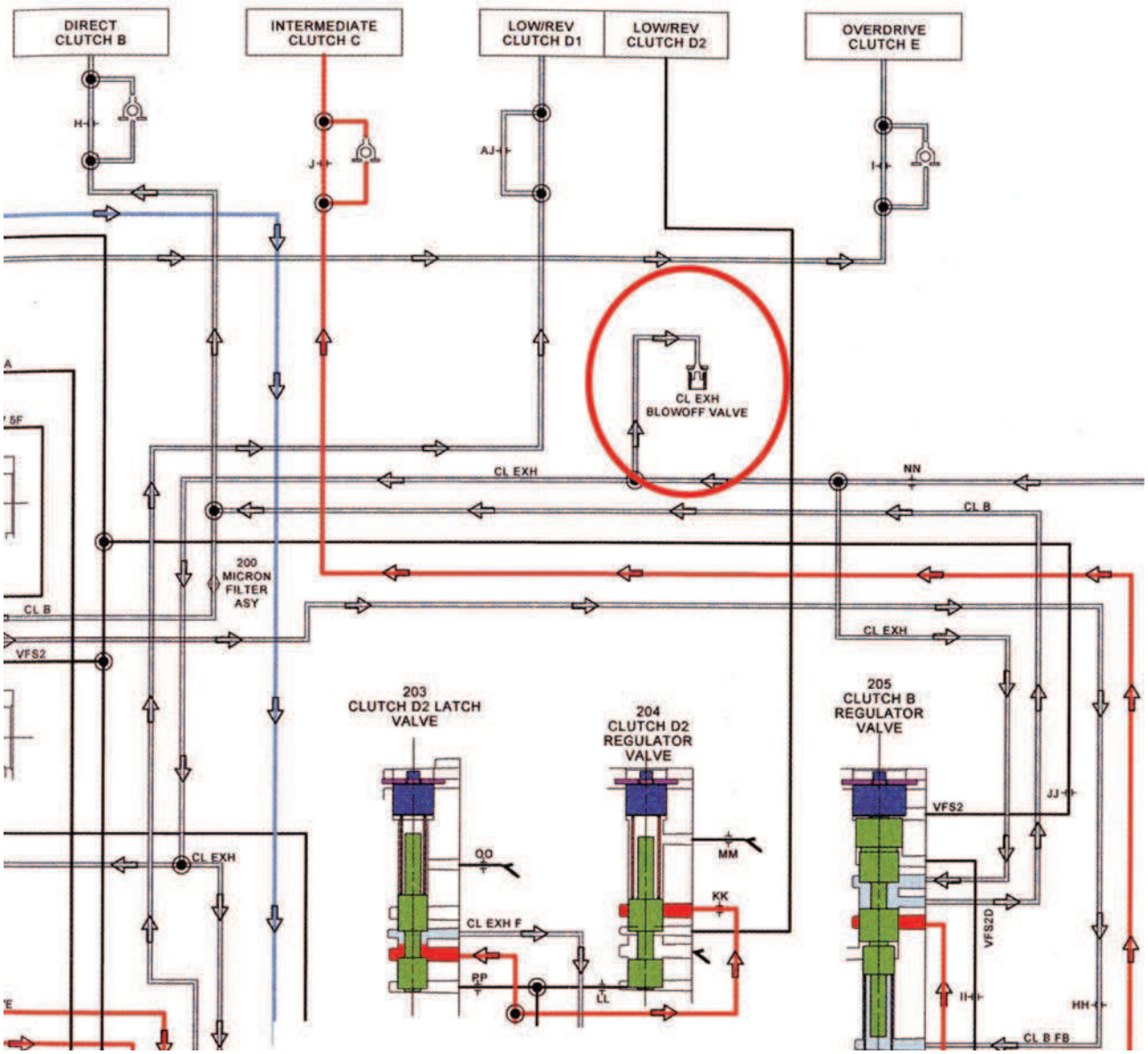
Clutch Exhaust Valve (continued)

Failure to install the clutch exhaust valve into the lower valve body will result in flared or erratic shifts.



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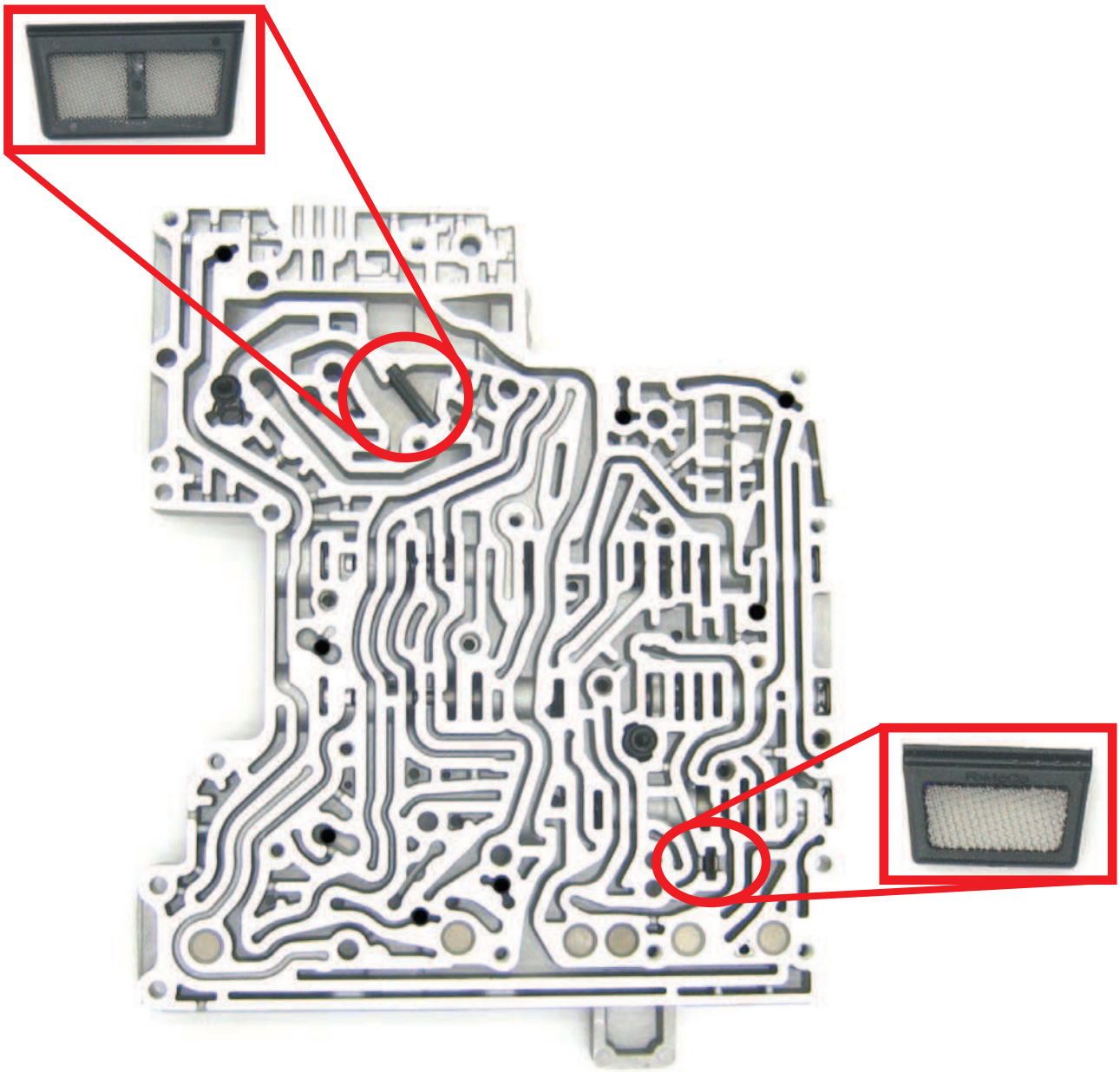
Valve Body Solenoid Filters

Solenoid filters are critical to the solenoid operation. These screens are used to filter fine particles of debris.



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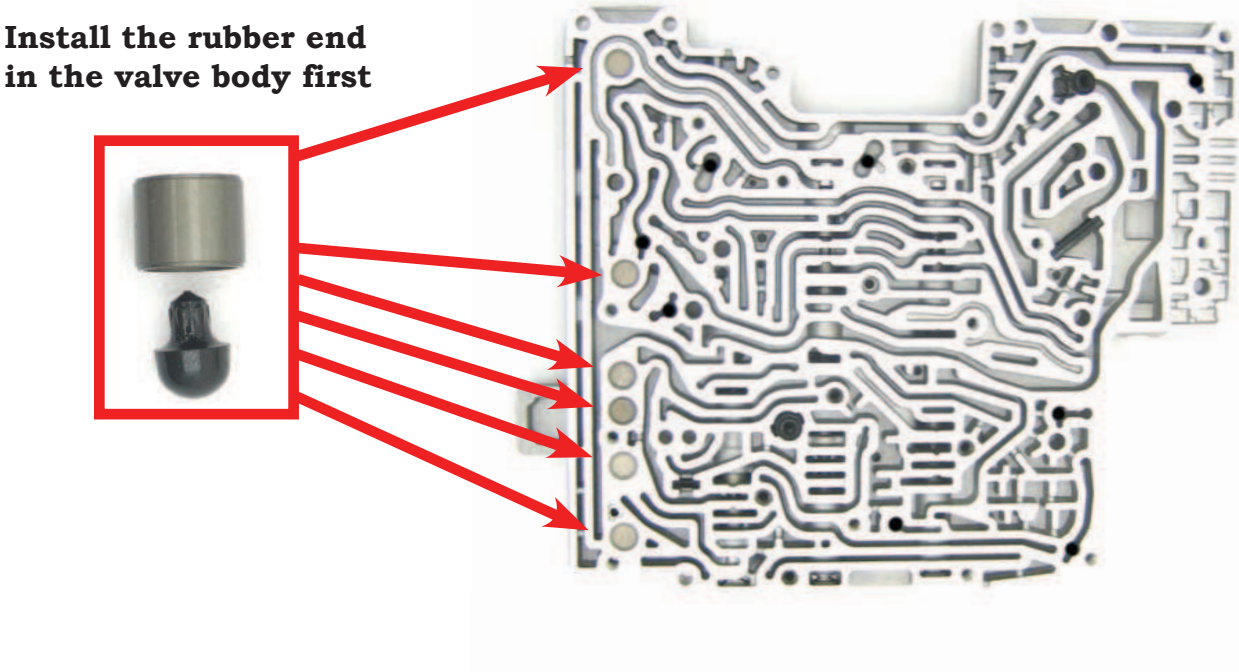
Upper Valve Body Small Parts Location

The rubber end goes INTO the valve body. These Solenoid Dampers are actually small accumulators to absorb the small pulses from the PWM solenoids.



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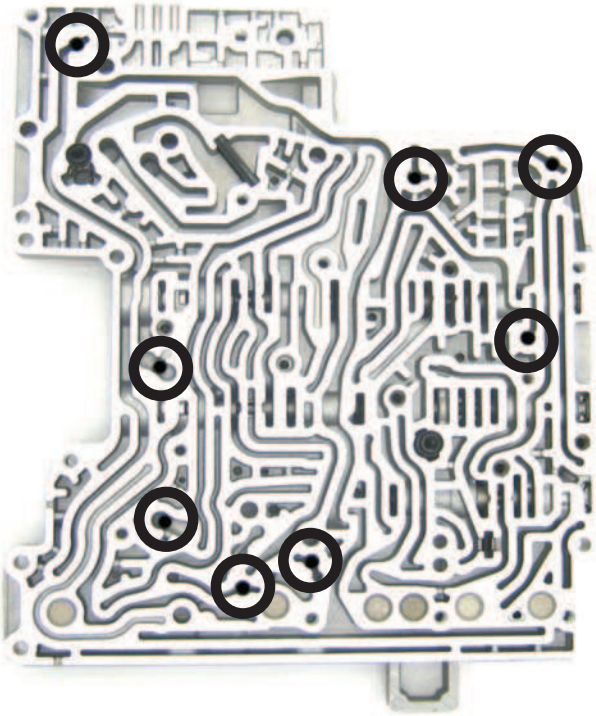
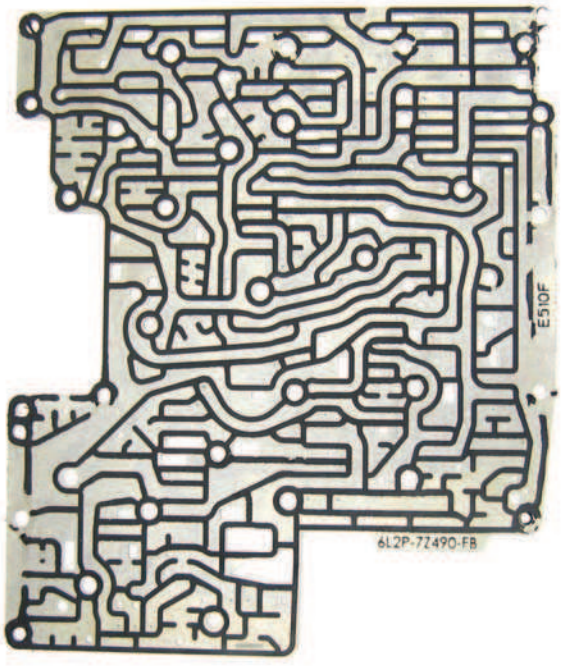
Check Ball and Separator Plate Information

There are eight (8) check balls in the Upper valve body.



This is a one time only use separator plate. It MUST be replaced on every overhaul. Contact your local parts supplier for the cost.



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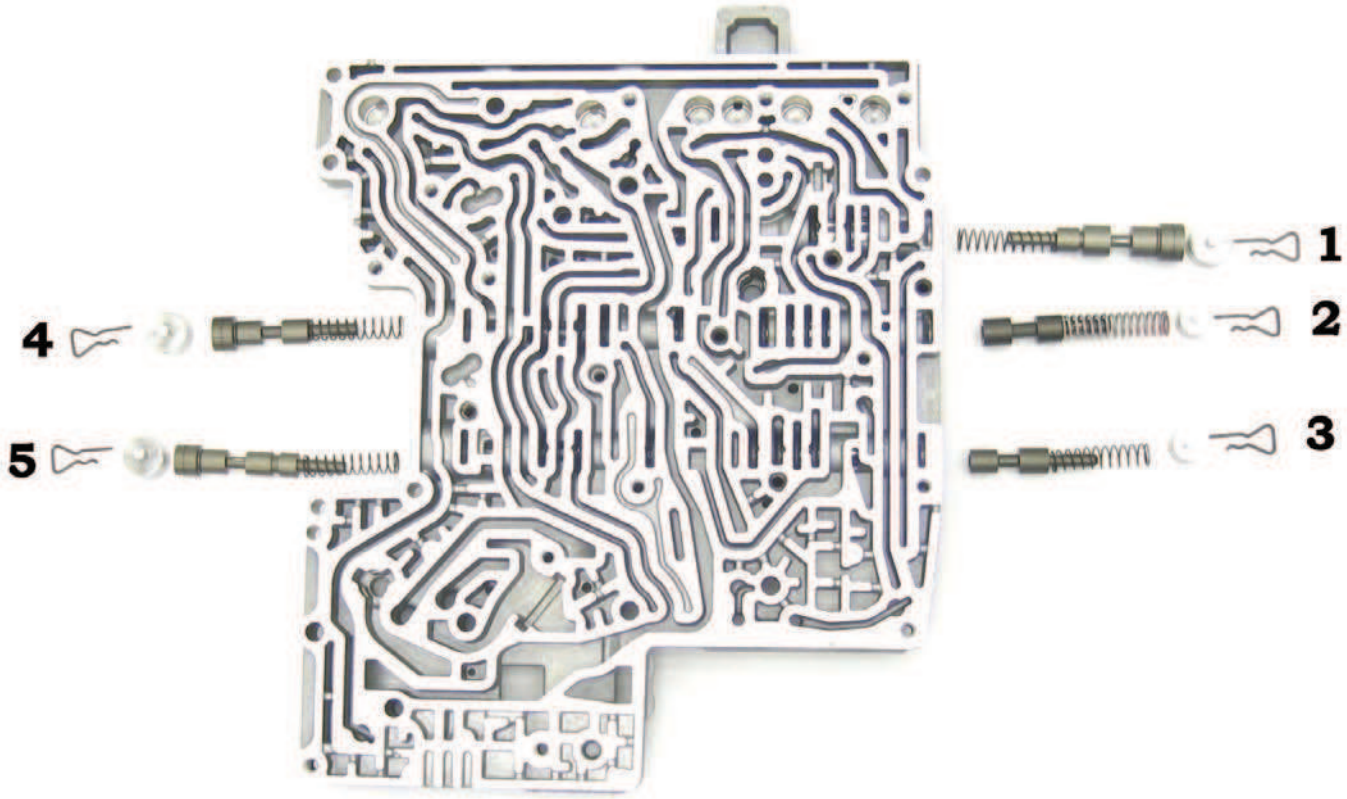
Upper Valve Body Disassembly

The upper valve body houses five (5) valves. Each one of these valves operate multiple clutches.



6R60 Upper Valve Body	
1	Clutch B/ Direct Regulator Valve
2	Clutch D2/ Low/Reverse Regulator Valve
3	Clutch D2/ Low/Reverse Latch Valve
4	Clutch C/Intermediate Regulator Valve
5	Clutch D1/Low Reverse Pressure Regulator Valve

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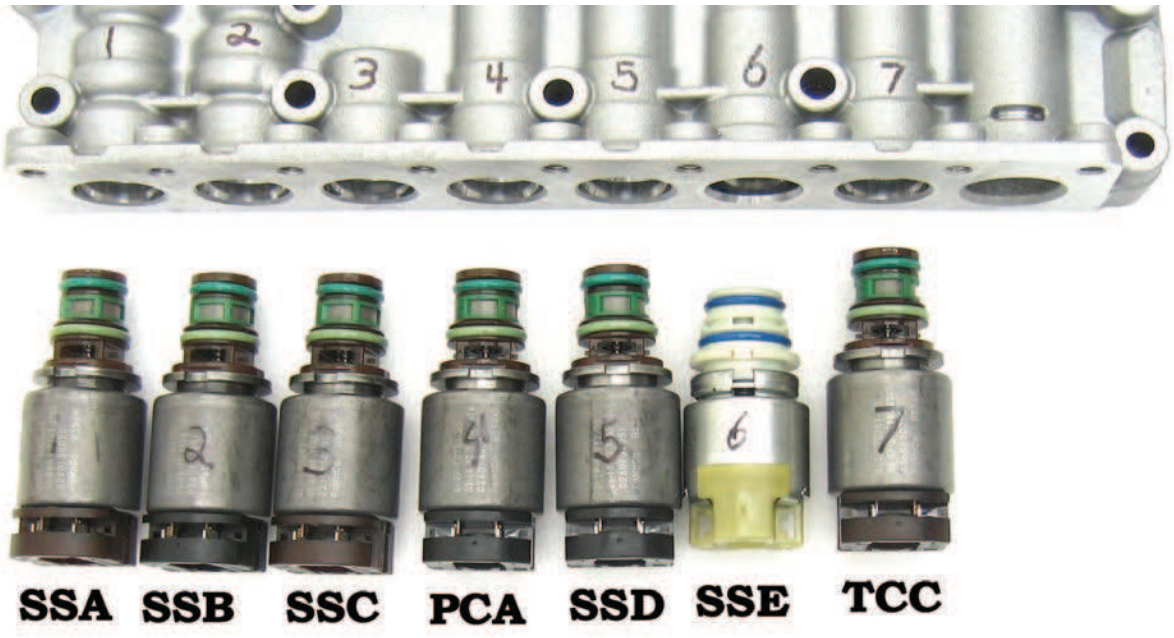
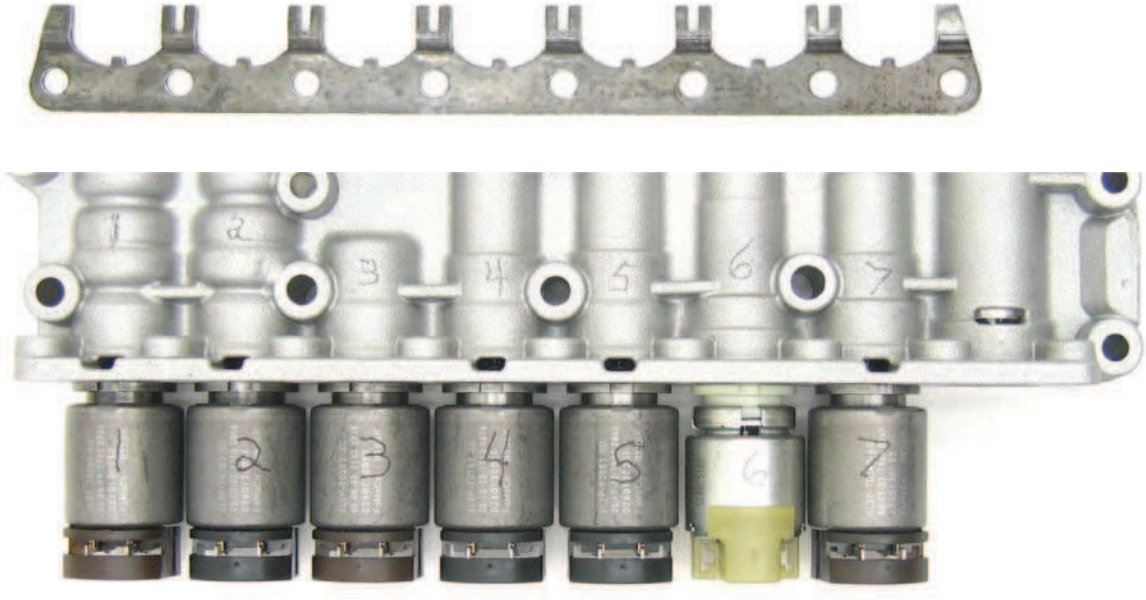
Solenoid Identification

The solenoids must be marked during the disassembly. Failure to do so may result in erratic shifts, codes, or potentially no movement. The top image was marked with a "sharpie" marker, it is effective, but may wash off during the cleaning process.
The bottom image was marked with an engraving tool, a bit harder to see, but a much more effective means of identifying the casting and solenoids.





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Lower Valve Body Disassembly

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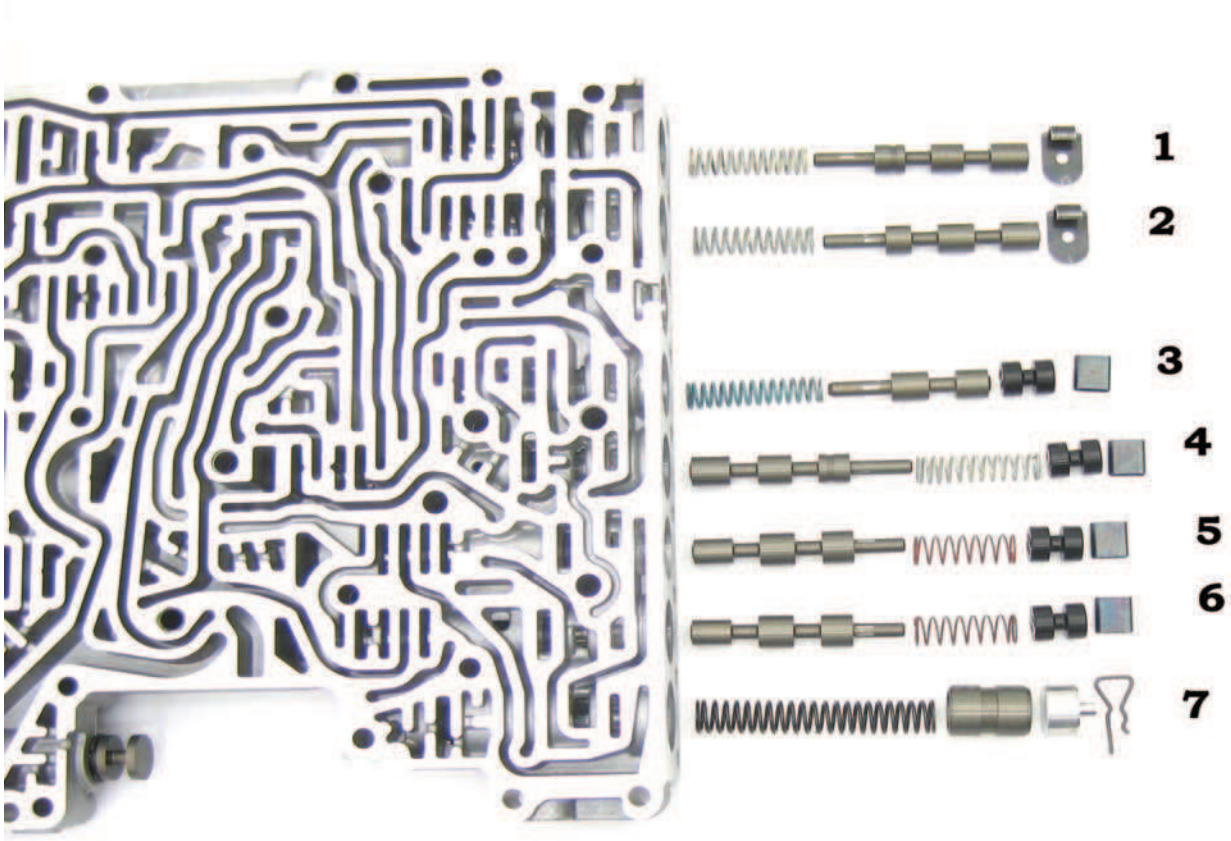

Lower Vavle Body Right Side	
1	Clutch A/Forward Latch Valve
2	Clutch B/Direct Latch Valve
3	Solenoid Pressure Regulator Valve
4	Clutch D1/Latch Valve
5	Drive Enable Valve
6	Solenoid Multiplex Valve
7	Delay Accumulator Valve

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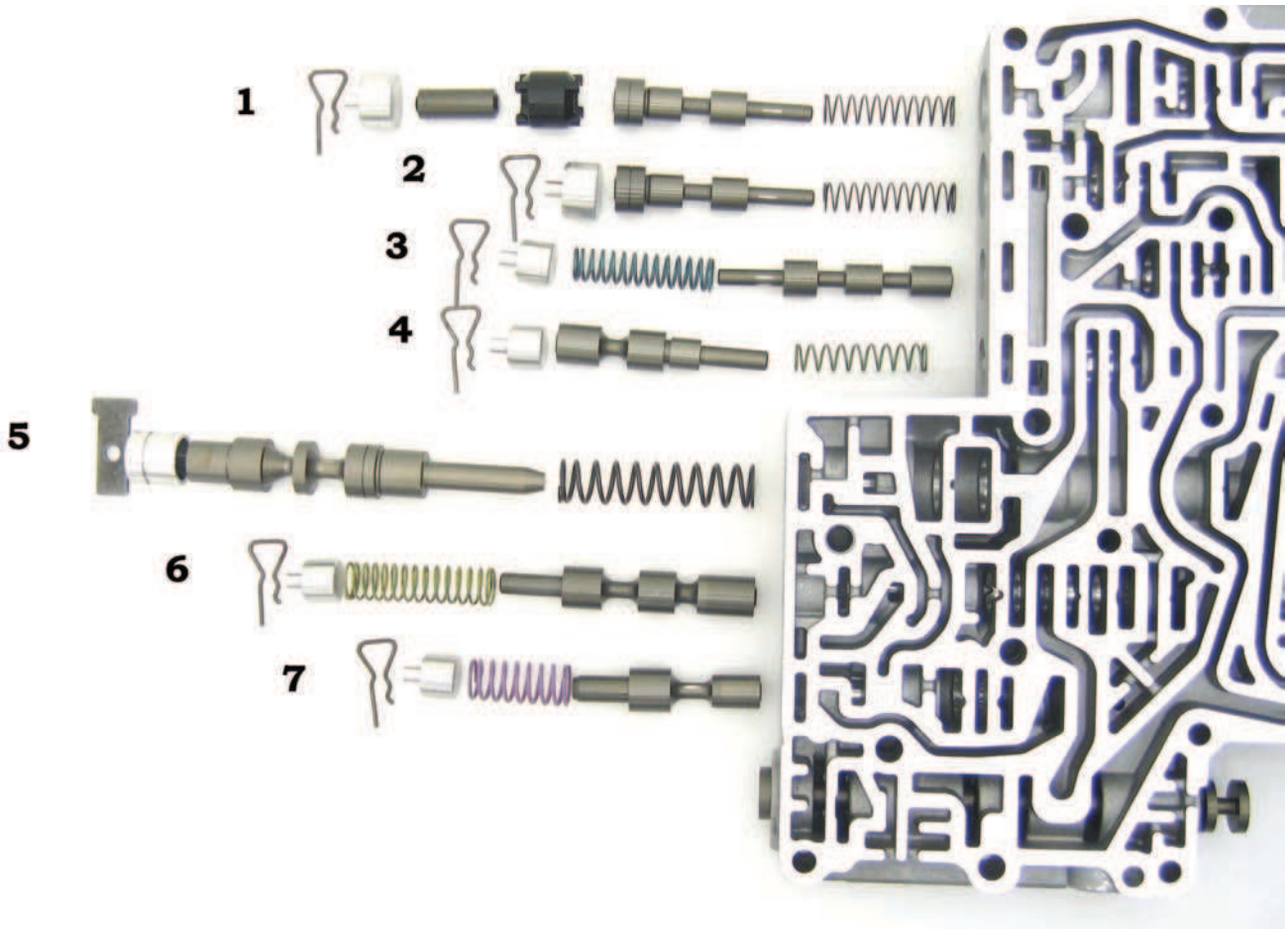
Lower Valve Body Disassembly (continued)



Lower Valve Body Left Side	
1	Clutch A/Forward Control Pressure Regulator Valve
2	Clutch E Control Pressure Regulator Valve
3	Clutch E/OD Clutch Latch Valve
4	Bypass Clutch Control Valve
5	Main Pressure Regulator Valve
6	Converter Release Regulator Valve
7	Lubrication Regulator Valve

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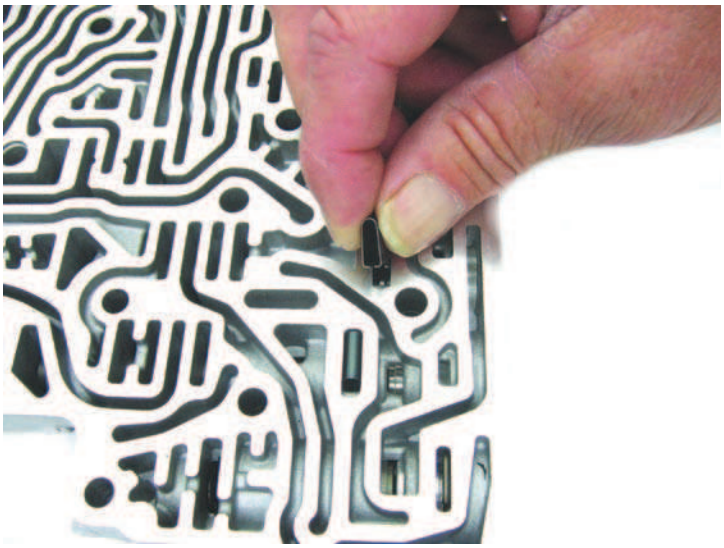
Valve Plug Retainers

There are three different types of valve and plug retainers. Two of these retainers must be positioned correctly in the valve body or the transmission may not operate correctly. The open end of the retainer is installed into the valve body first.



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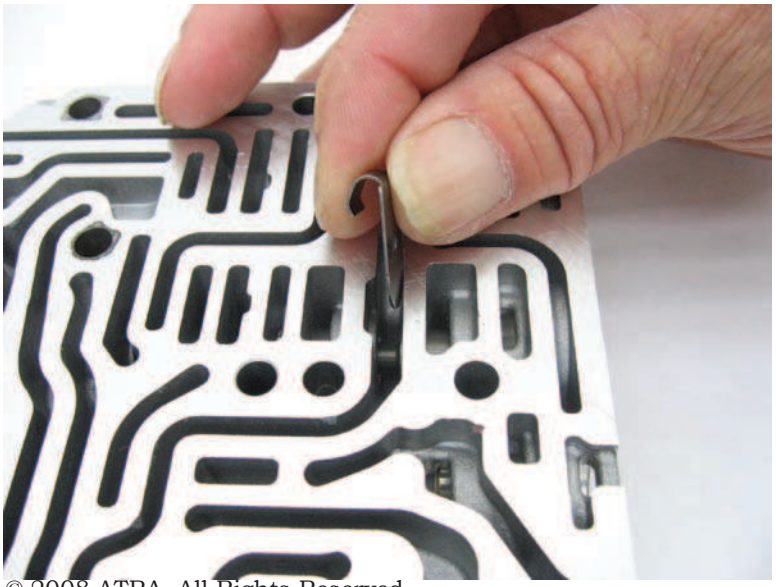
The Hooked end retainers face the separator plate. The Flat surfaces faces the outside of the bore.



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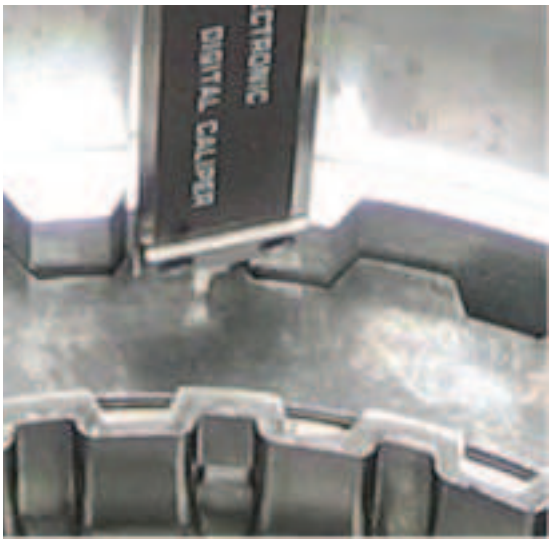
Measuring the Endplay

Measure the depth from the case to the waved plate several places around the case, record your average measurement. Then measure the height of the Low/Reverse piston, record your average measurement.

Subtract the height of the piston from the depth of the of the clutch pack, your measurement should be between 0.031-0.055 in. Selective pressure plates are available.

Measure the height of the piston

Measure the depth of the clutch



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The Lepelltier Geartrain

The Lapelletier geartrain, as used in this transmission, consists of:
- A front planet with the sun gear fixed to the front pump.
- A planetary gear set fixed to an input drum.
- A ring gear attached to the input shaft.

This assembly is used to drive a Ravigneaux gearset in the back of the transmission. What Mr. Lapelletier figured out was that if the planetary gearset in the back of the transmission is turned at one speed and the sun gear is turned at another speed — usually slower — the combination creates an overdrive ratio.

This overdriven ratio is slightly lower than the one created by holding the sun gear and driving the planet. The important thing to understand is that the combination of the single planet being driven faster than the sun gears, which are being driven in reduction, is what creates the different ratios.

It may take a while to get the hang of this new concept and it will be much easier with the parts on the bench in front of you so you can get a feel for how the reduction and overdrive takes place. For a complete explanation on how the Lepelletier geartrain works, check out Dennis Madden's article in the November/December 2006 issue of GEARS Magazine.

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The Lepelltier Geartrain (continued)

Front Pump with the Stationary Gear

Input Planetary Gear Set

Ravigneaux Gearset

Large Sun Gear

Small Sun Gear

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Wrench Light On, DTC P0783

2006 Explorer 4dr and Mountaineer vehicles built prior to 1/31/2006 equipped with a 6R60 transmission may exhibit the powertrain malfunction indicator lamp (Wrench Light) on with a diagnostic trouble code (DTC) P0783 (3-4 Shift Error). This may be the result of transmission fluid contamination, or a contaminated shift solenoid.

1. Check the transmission fluid for presence of water contamination by removing the transmission dipstick. If water contamination is present, repair the transmission aas necessary.
2. If no obvious contamination is evident, test drive vehicle to obtain transmission shifts through all gear ranges.
3. If the transmission unsuccessfully attempts the 3-4 shift up to five (5) times, then turns on the Wrench Light and reverts to fail-safe mode, the shift solenoid is suspect.
4. Remove the mechatronic assembly and replace the shift solenoid using the following steps:
    a. Remove the mechatroic assembly.
    b. Once the mechatronic assembly is removed, remove the six (6) long bolts attaching the transmission control module (TCM) to the mechatronic assembly, and carefully separate the TCM from the mechatronic assembly.

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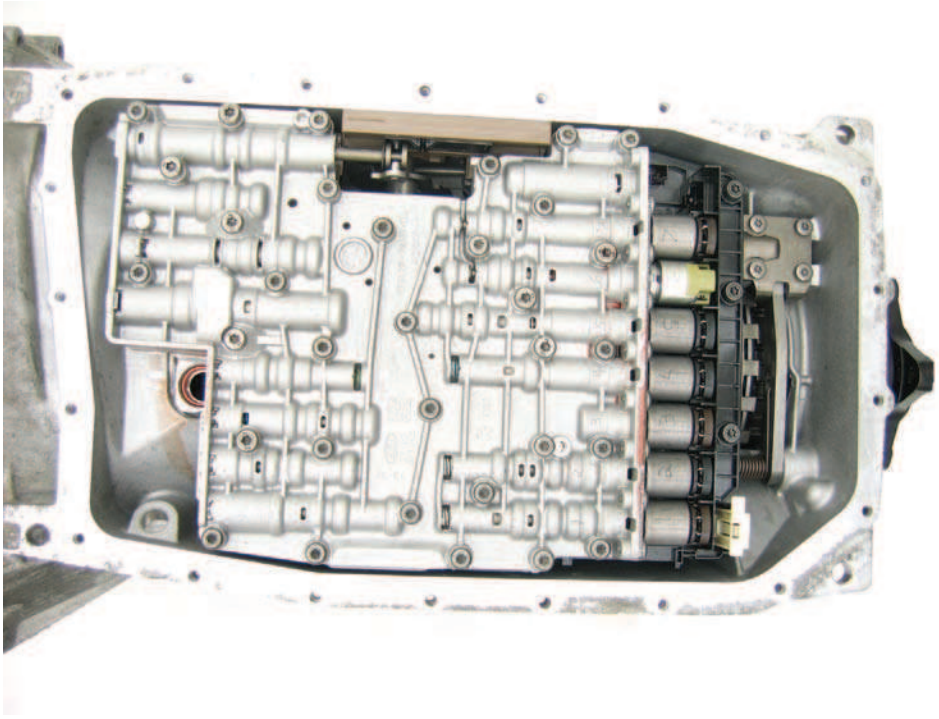

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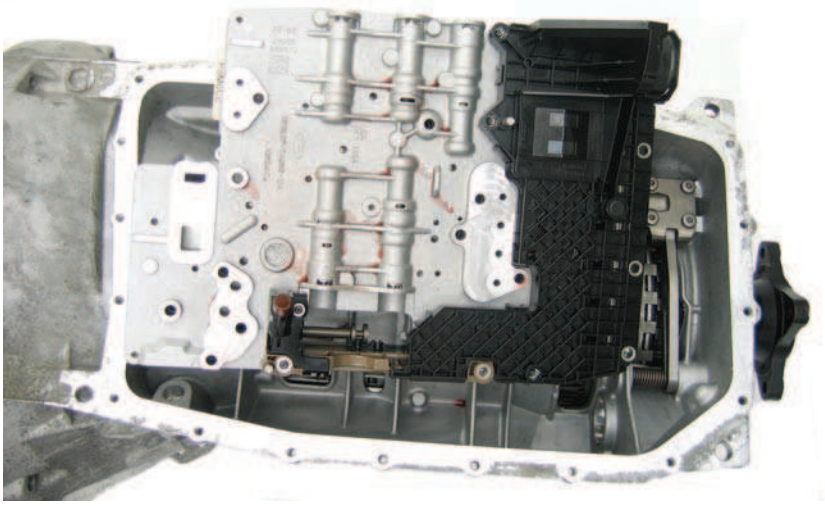
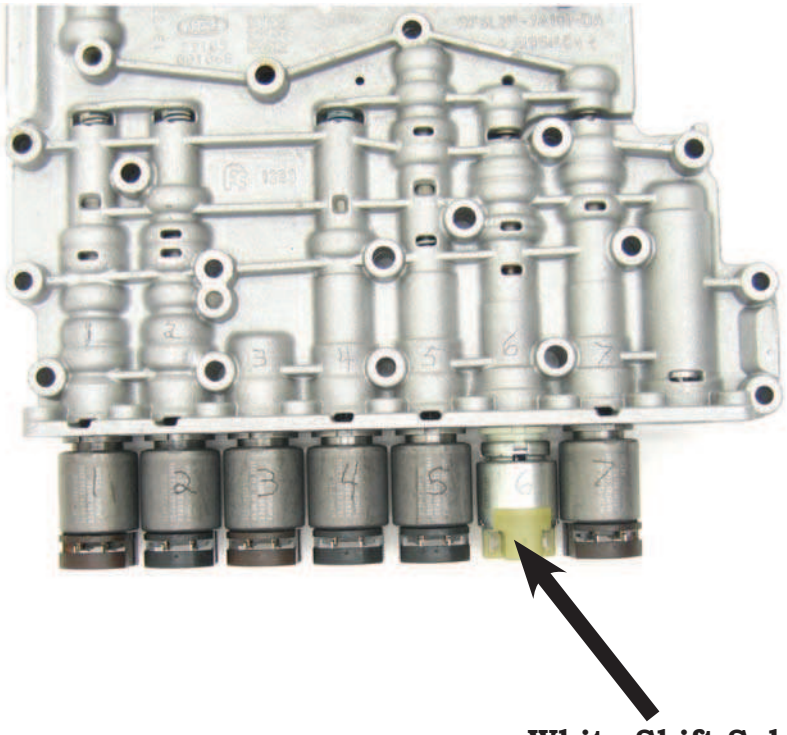
Wrench Light On, DTC P0783 (continued)

5. Remove the eight (8) solenoid bracket bolts and the solenoid bracket



Replace only the white shift solenoid. Reinstall the solenoid bracket and the eight (8) bolts. Tighten to 71 lb-in (8 N-m). Carefully reinstall the TCM onto the mechatronic assembly. Reinstall the six (6) bolts and tighten in the sequence shown in to 53 lb-in (6 N-m).



Solenoid Part Number
6L2Z-7G484-AA

White Shift Solenoid

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Mutiple Symptoms

Surge, Hesitation, TCC Cycling, No Up Shift After a Forced Downshift, Poor A/C Performance

2006-2007 Explorer 4dr/Mountaineer and 2007 Sport Trac vehicles equipped with a 4.0L engine may exhibit a surge at steady speeds, transmission torque converter clutch cycling or hanging in a lower gear after a forced downshift during cruise control operation when operated in high ambient conditions.
In addition, these vehicles may exhibit a cold hesitation/surge, engine fan noise and/or varying A/C discharge temperatures “ONLY” during low vehicle speed intermittently.

Reprogram the powertrain control module (PCM) to the latest calibration using IDS release B43.16 and higher or B44.8 and higher. This new calibration is not included in the B44 CD. Calibration files may also be obtained at www.motorcraft.com.

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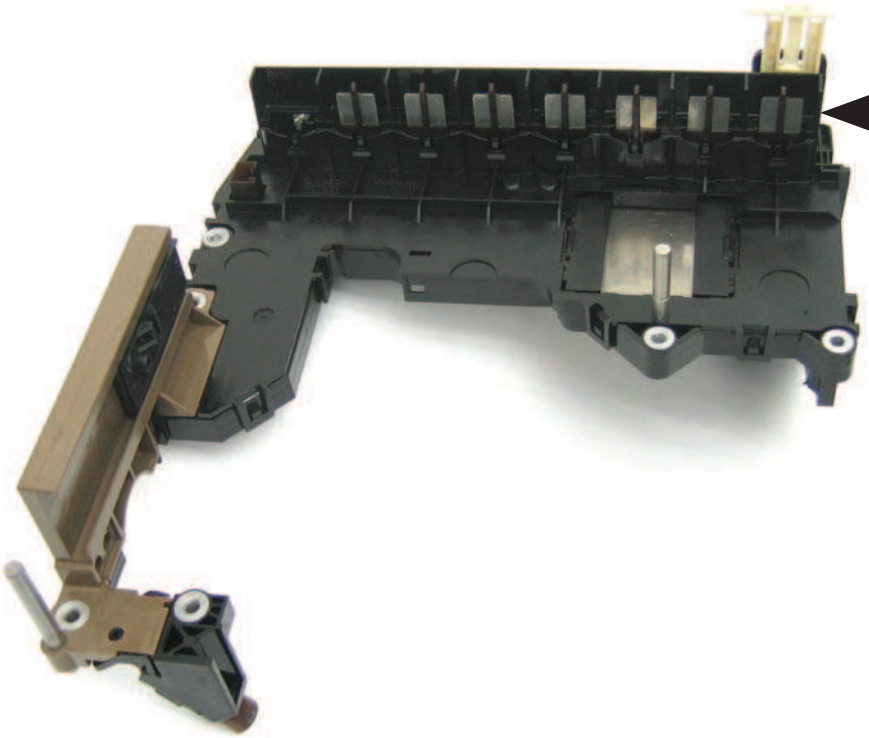
Multiple DTC's

2006-2007 Explorer and Mountaineer, 2007 Sport Trac, and 2007 Expedition vehicles may exhibit the following diagnostic trouble codes in the transmission control module (TCM) memory with or without the wrench light on. The codes include the following; P0658, P0657, P0972, P0973, P0974, P0975, P0976, P0977, P0978, P0979, P0980, P0981, P0982, P0083, P0961, P0962, P0963, P2763, P2764, P0985, P0986, P0711, P0712. The cause is contamination at the mechatronic assembly.

To repair the problem, it is necessary to remove the source of contamination from the transmission control unit (TCU)/solenoid connections and/or at the transmission fluid temperature (TFT) window. A foam barrier strip is available to prevent recurrence of the problem.

Remove mechatronic assembly. Inspect the TCM at the following locations for metal chips or other metallic contamination:



Inspect both sides of the TCU blades for machining chips or metallic contamination.

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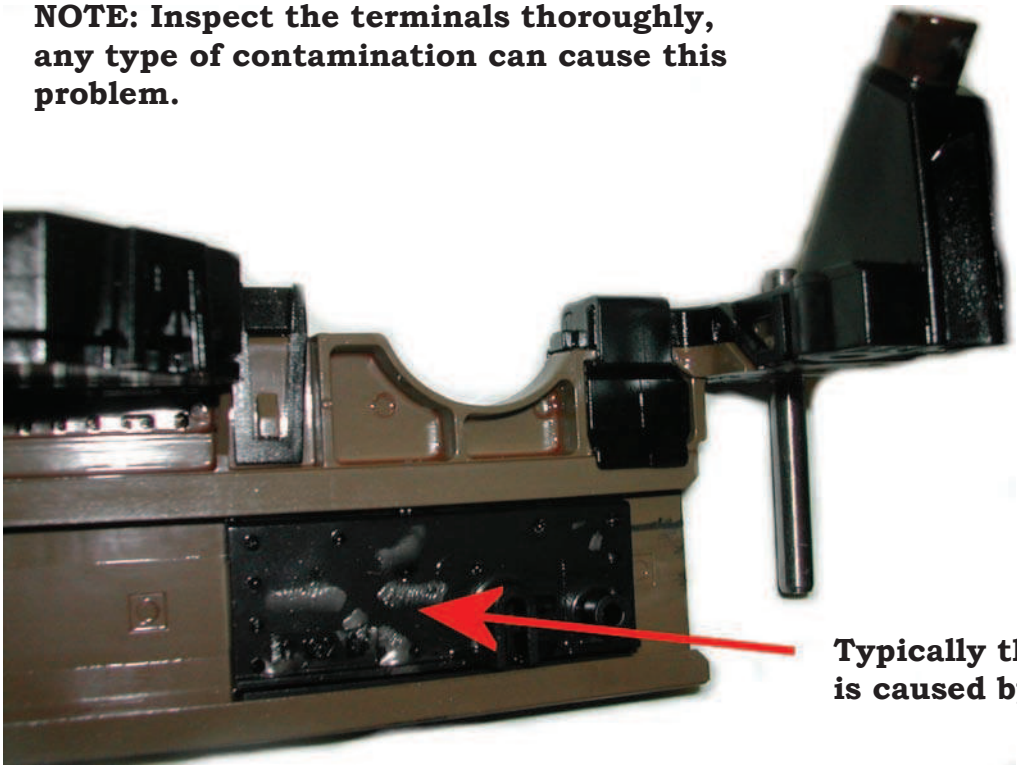
Multiple DTC's (continued)

Closely inspect all solenoid terminals for machining chips and or metallic contamination.

NOTE: Inspect the terminals thoroughly, any type of contamination can cause this problem.



Typically the contamination is caused by clutch debris.

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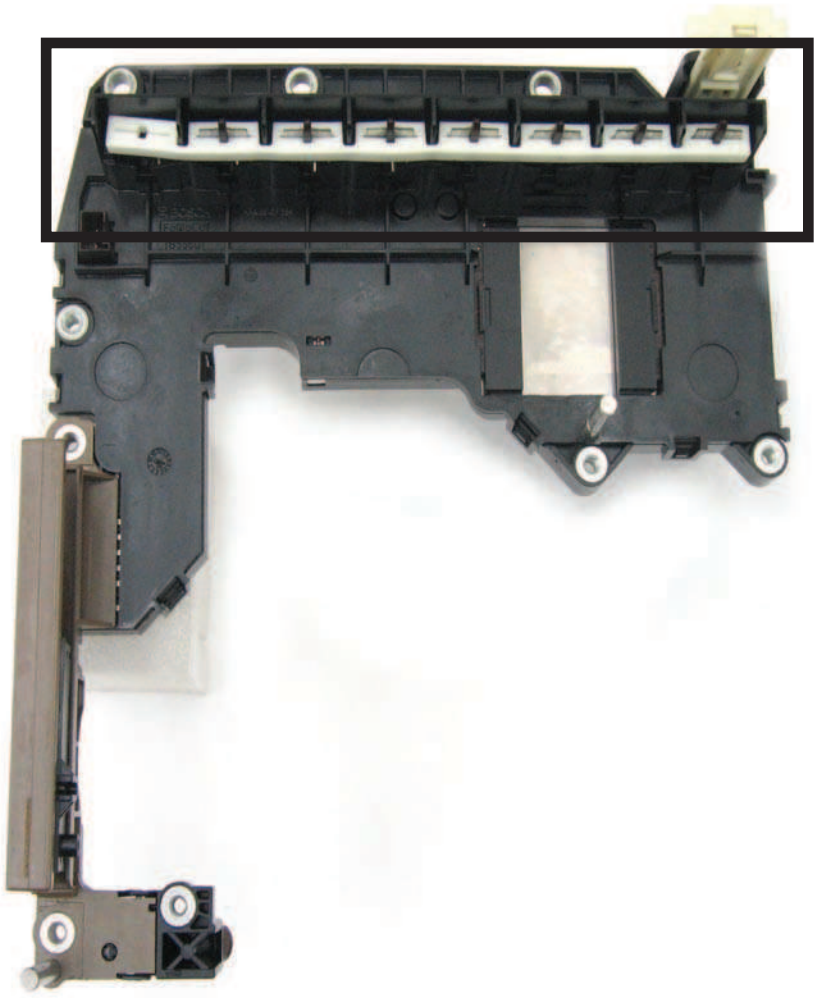
Multiple DTC's (continued)

Install the new foam barrier strip over the blades of the TCU, no special barrier strip is required for the TFT.



Install the foam barrier strip over the blades of the TCM as shown.

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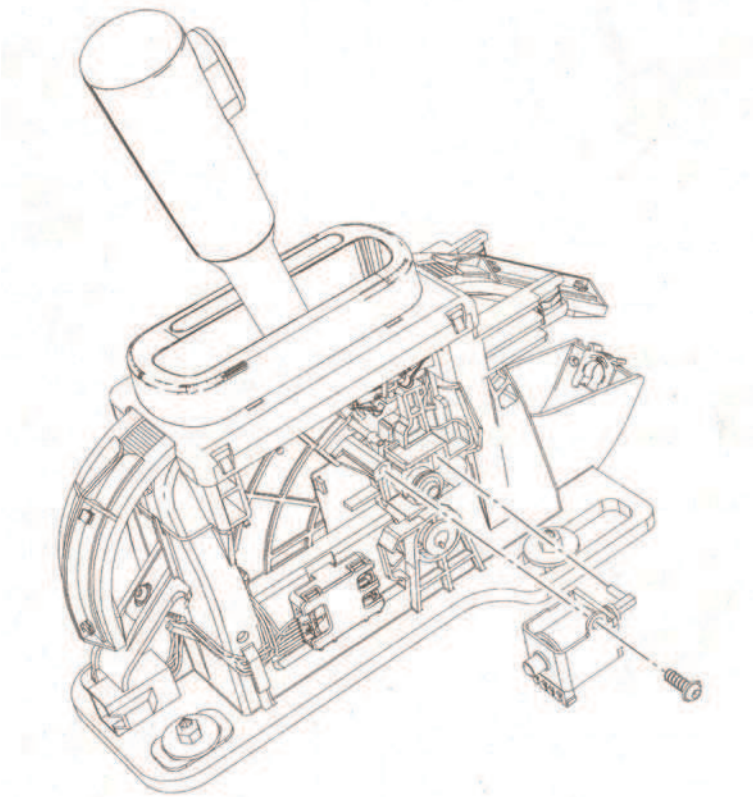
Shifter Stuck in the Park Position

2006-2007 Explorer 4dr, Mountaineer and 2007 Explorer Sport Trac vehicles built on or before 11/14/2006 may exhibit an intermittent condition where the shifter may require the use of the manual override function to get the shifter out of park.

This condition may be caused by chemicals migrating from the shifter lubricant, and being deposited on the shifter switch

1. Check the electrical system and make sure the shifter is getting power from the BOO switch (actuate brake to confirm switch signal is getting to the shifter assembly.
2. Confirm the wiring in the shifter is okay (connections are made, no cut wires).
3. If there are no issues with wiring or other electrical components, remove the Transmission Selector Lever and check it for damage. Also check Selector Lever Cable Adjustment. If they are okay replace the Transmission Selector.

PART NUMBER	PART NAME
7L2Z-7210-A	Transmission Selector Lever (6R60)
7L2Z-7210-B	Transmission Selector Lever (5R55)
7L2Z-7210-C	Transmission Selector Lever (6R60 – With Leather Rap)
7L2Z-7210-D	Transmission Selector Lever (5R55 – With Leather Rap)



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Bump Feel while Braking

2006-2008 Explorer 4dr, Mountaineer and 2007-2008 Explorer Sport Trac vehicles equipped with 6R60 transmission may exhibit a bump feeling while braking to a stop less than 10 MPH (16 Km/h).

Some vehicles built prior to 5/4/2006 may exhibit the following symptoms:

- Delayed engagements into Drive from Park Neutral or Reverse.
- Hesitation upon tip-in hesitation while accelerating from a stop.

Some tip-in hesitation is normal on this transmission in order to provide smooth operation. This calibration update will help to improve the condition. The harsh bump while braking to a stop will be eliminated. Several days of driving may be required for the transmission to fully adapt.

Adaptive Strategies

1. Accelerate from rest with light throttle. The 1-2, 2-3 and 3-4 shifts must occur at engine speeds between 1300-1800 rpm
2. Continue to accelerate gently to 50 mph so that the transmission shifts into 6th gear.
3. Brake gently to a complete stop and hold foot on brake for at least 15 seconds.
4. Repeat steps 1-4 a total of five times

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Bump Feel while Braking (continued)

1. Install IDS/PDS or equivalent and ID the vehicle.

2. Update the PCM and TCM calibration using IDS release 51.8 and higher or 52.1 and higher. Calibration files may also be obtained at www.motorcraft.com. Since the TCM cannot be independently reprogrammed, reprogram the PCM to ensure that engine and transmission calibrations are updated to the latest level simultaneously.

3. Clear TCM keep alive memory (KAM) and adaptive tables.
    a. Using your scan tool:
        1. Open Toolbox.
        2. Choose Powertrain.
        3. Choose Reset KAM.
        4. Then Choose TCM.

    b. Using your scan tool:
        1. Choose all Tests and Calibrations
        2. Scroll down the menu and Choose Reset TCM KAM.

NOTE: Resetting the TCM Keep Alive Memory is not the same as clearing the transmission adaptive tables which is under the PCM/TCM menu tree.

NOTE: Unhooking the battery WILL NOT clear the TCM Keep Alive Memory.

NOTE: DO NOT CLEAR THE PCM KAM.

4. Verify that the transmission fluid temperature (TFT) PID is above 175˚F (80˚C). If it is not at 175˚F (80˚C), drive unit approximately 3 miles (5 Km) to reach temperature.

NOTE: TFT MUST BE AT 175˚F (80˚C) OR ABOVE BEFORE PROCEEDING TO STEP

5. Drive unit to perform adaptive shift strategy learn.
    a. Accelerate from rest with light throttle. The 1-2, 2-3, and 3-4 shifts must occur at engine speeds between 1300-1800 RPM.
    b. Continue to accelerate gently to 50 MPH (80 Km/h) so that the transmission shifts into 6th gear.
    c. Brake gently to a complete stop and hold foot on the brake for at least 15 seconds.
    d. Repeat Steps (a-c) a total of five (5) times.

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5R55N/S/W

Hard to Get Out of Park

2001 S-Type Jaguar won't come out of park, on a hill or small incline.

Disconnect the linkage and shift the trans by hand, if the shifter is hard to move by hand the problem is with the rooster comb in the transmission.

Replace the rooster comb with a ford part. The Ford part is different from the Jaguar part and will work much better.

The Jaguar Original Rooster Comb. The Left edge is notched.

The Jaguar replacement Rooster Comb. The Left edge notched with a gradual slope. Part number XR8P-7C494-DA

Recommended Replacement

The Ford Rooster Comb. There is no notch just a slope.
Part number XW4P-7C494-AC

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Filtration System

Ford uses a parallel filtering system in 2003 and later E and F-series trucks. The idea is pretty simple really. Both cooler lines go into the filter. The filter actually serves as a barrier, or orifice that separates the two lines. Since the cooler creates back pressure in the outgoing cooler line its pressure is higher than the return line. It's this difference in pressure that makes the system work. As the oil flows through the lines about 5% of it makes its way through the filter — bypassing the cooler and returning back to the transmission.

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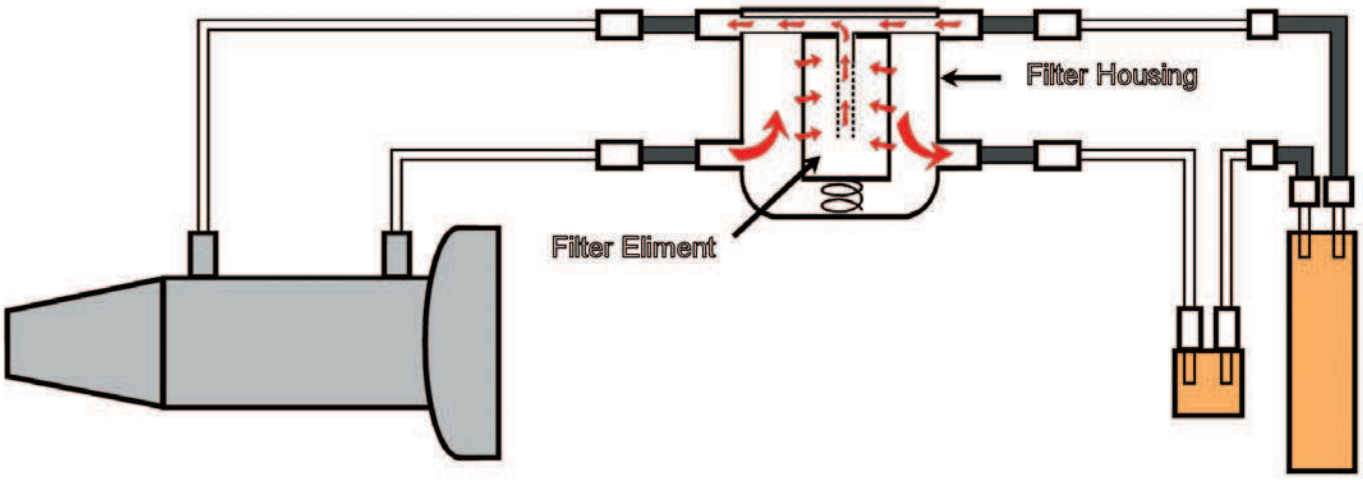

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Torqshift

Filtration System (continued)

The benefit is the filter is really fine; capable of filtering particles 2 microns or larger. If it gets clogged — even totally clogged, it doesn't affect cooler flow because it's parallel in the system. This design allows it to provide superior filtration without risking a lack of cooler flow when it clogs. Sounds great right? Well, there's a down side. Since the filter is parallel to the cooler it's the only thing that prevents the oil from bypassing the cooler and simply returning back to the trans. That is, if you took the filter out there'd be nothing the force the oil to flow to the cooler. It is the fact that the filter is so restrictive that makes the system work.

There are two considerations when you work on this system:

1. When you flush the cooler, either disconnect the lines at the remote filter and flush it from there to the cooler or leave the old filter in the housing, flush the system, then replace the filter element. If you take the filter out of the housing and then flush the cooler (from the transmission lines) you'll bypass the cooler during the flushing process.
2. If you replace the filter element be careful, not all filters are the same. If the filter you use flows more freely than the original you risk allowing too much oil to bypass the cooler. This'll cause overheating and premature transmission failure. Remember, this filter is supposed to be highly restrictive because it's the only thing separating the two cooler lines.

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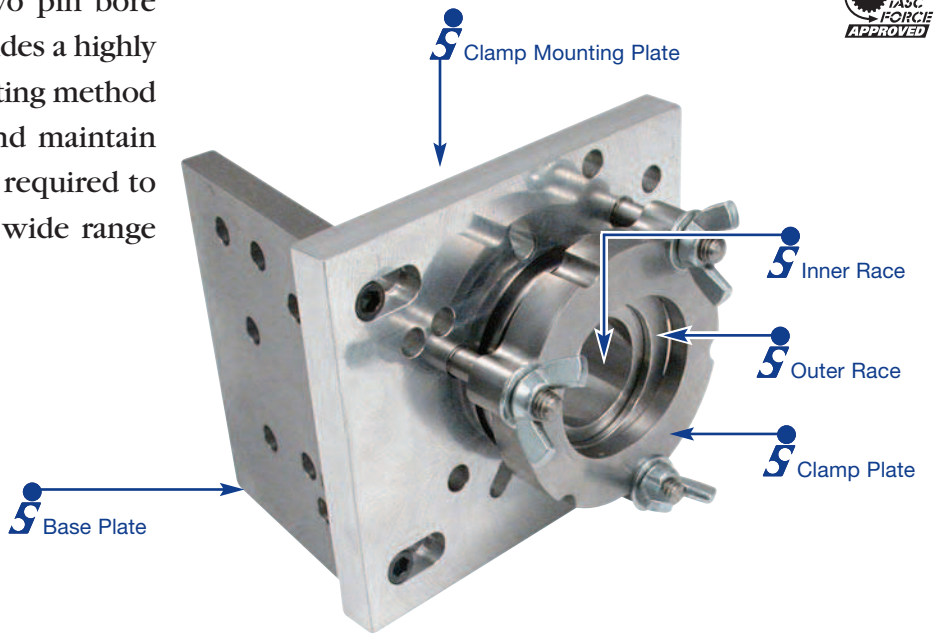
A revolution in servo repair!

The new Sonnax servo pin bore reaming fixture provides a highly adaptable rigid mounting method that allows you to locate and maintain the correct tool positioning required to repair servo pin bores in a wide range of transmissions.



Quit throwing away expensive cases because of wear and scoring of servo pin bores. The SERVO-FIX from Sonnax mounts to the case, and has a floating bearing guide to ensure proper pin centerline. This tool pilots off the OEM pin bore, so reaming is unaffected by irregular piston or seal concentricity issues. The SERVO-FIX has been designed to offer a variety of mounting options for a wide range of transmission cases and multiple bores. Use in conjunction with our new "S" series tool kits and associated pin bore repair sleeve kits.

Sonnax Part Number	Associated Kit Part Number	Application
SERVO-FIX	All "S" Series Tool Kits	Multiple Applications
S-56361J-TL	56361J-01K, Overdrive & Intermediate Servo Repair Sleeve Kit	5R55N/W/S
S-76890-TL24*	76890-24K, Master Servo Sleeve Kit	4R70W, AODE, 4L30-E, 180
	AODE: Overdrive or Reverse Servo Sleeve Kit	
	4L30-E: 1-2 Servo Sleeve Kit	
	180: Low Servo Sleeve Kit	
S-96872-TL*	96872-01K, Overdrive Servo Sleeve Kit	AXOD & E, AX4S & N, 4F50N

* Available 2008

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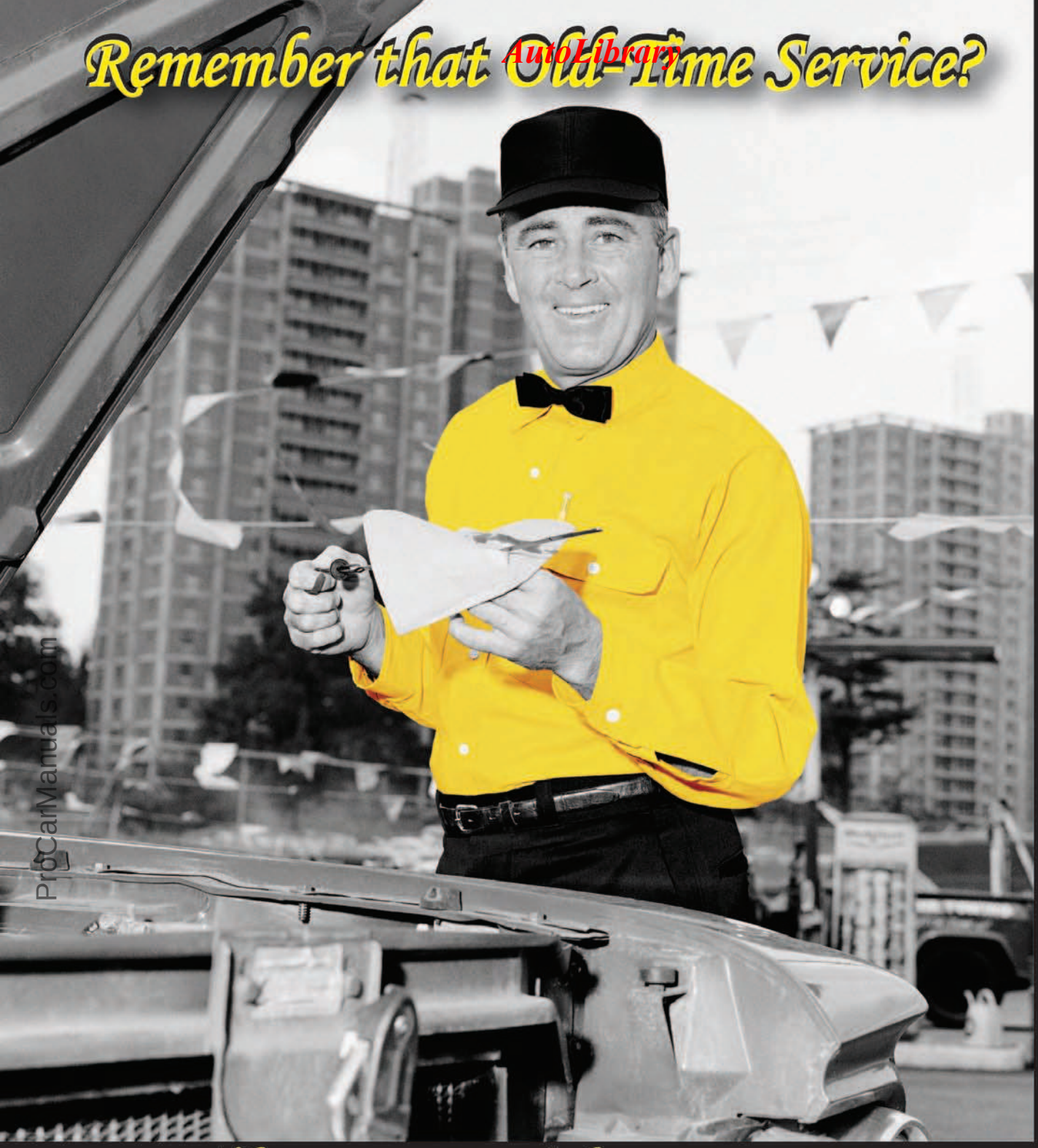
Remember that Old-Time Service?



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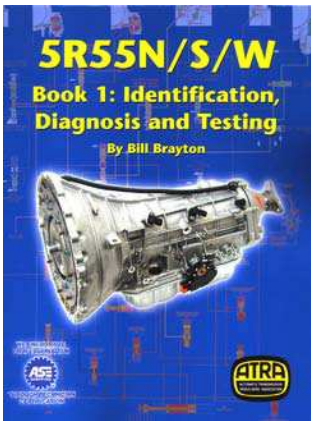


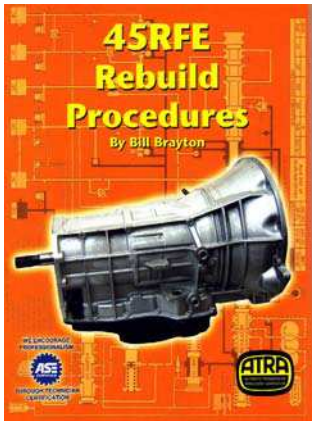
ATM-5R55N-DIAG

ATRA's 5R55N/ S/ W Technical Manual

This identification, diagnosis and testing book was written by Bill Brayton. There are sections in this book on the following topics:

Transmission Identification, Diagnosis and Electrical Diagnosis, & Transmission Operation

You can purchase this for only: **$30**



ATM-45RFE-REB

ATRA's 45RFE Rebuild Technical Manual

This rebuild manual is 56 pages of step by step rebuilding information with pictures for each step. Here are some of the topics that are covered:

Transmission Disassembly, Input Drum, Low/Reverse Sprag Rotation, & Solenoid Body Rebuild Procedures.

You can purchase this for only: **$20**

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62TE

Introduction

The 62TE is the new generation of FWD/AWD Transaxles in production for Dodge/ Chrysler. The concept has been around for many years but has been introduced in the 2007 Model Year.

These models include: “JS” Seabring, Seabring Convertible, and Avenger with the 3.5L V6 “CS” Pacifica with the 4.0L V6. The concept was to take a proven reliable 41TE (4 speed) and split the transfer/pinion drive with an underdrive/direct clutch to drive a double ratio to the final drive.

Although this is classified as a 6 speed fwd transaxle, there are 7 forward speeds with the addition of a 4th gear prime ratio that is used during a 6-4 kickdown. This prevents a double swap of components allowing for a smooth kickdown.

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Description

The planetary gear train for the 62TE transaxle provides six forward gear ratios, including two fourth gear ratios. One reverse gear ratio is also provided.

Underdrive (UD) Compounder Assembly

- Low Clutch (LC)
- Direct Clutch (DC)
- Overrunning Clutch (ORC)
- Planetary gear set

Fore-Mounted Valve Body/Solenoid/Pressure Switch Assembly

- DC solenoid
- LC solenoid
- DC pressure switch
- LC pressure switch
- Torque Converter Clutch (TC) and pressure control Solenoids
- Line Pressure Sensor (LPS)
- An additional (third) speed sensor
- A “squashed,” or flatter, torque converter
- A new cover for valve body access
- 23-way connector for the Solenoid/Pressure Switch Assembly
- A remote pinion gear
- A 2-piece, closed differential case with structural clamshell housing. The addition of the underdrive compounder assembly components improves low-end torque multiplication, enhancing low-end power capability.

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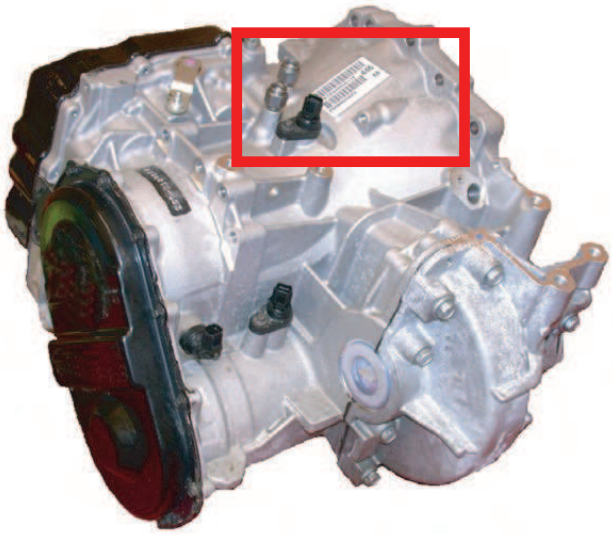
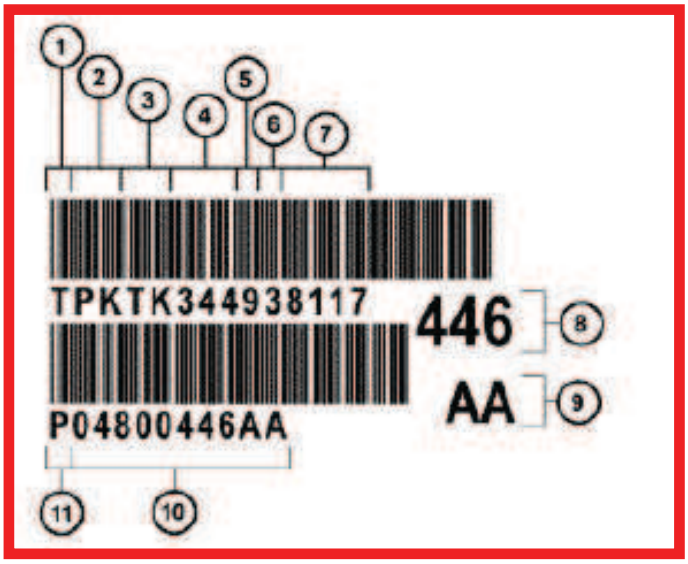
Identification

The 62TE transaxle is identified by a bar code label (1) that is fixed to the transaxle or the “PK” number (2).



The label contains a series of digits that can be translated into useful information such as transaxle part number, date of manufacture, manufacturing origin, plant shift number, build sequence number, etc. Refer to for identification label breakdown.

1. Traceability
2. Supplier Code
3. Component Code
4. Build Day (Julian Date)
5. Build Year
6. Line/Shift Code
7. Build Sequence
8. Last Three Part Number Digits
9. Revision Level
10. Transmission Part Number
11. Part Number Prefix



If the tag is not legible or missing, the “PK” number, which is stamped into the transaxle case behind the transfer gear cover, can be referred to for identifica-tion. This number differs slightly in that it contains the entire transaxle part num-ber, rather than the last three digits.

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Lubrication

The 62TE requires the use of +4 Oil. There are many different blends of oil that meet the +4 requirement (markings for +4 are clear on the labels).

During a service the 62TE fill is 5.5 qts 5.2 L

After an internal transmission repair the 62TE fill is 9.0 qts 8.5 L

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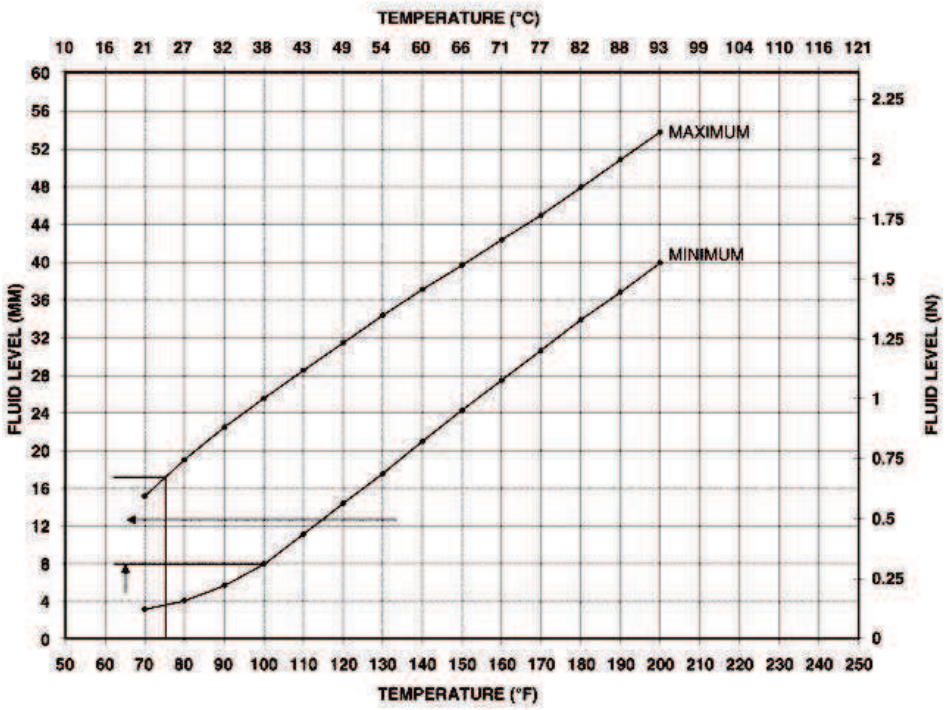
Checking the Fluid Level

When checking the fluid level it is important to be on level ground and using a scan tool, verify transmission temperature. Use the chart below to properly fill the unit with Miller Tool 9336 (wire stick). Markings on the gauge bar are separated by 10mm each indicator.



Tool 9336 Service Dipstick
(10 mm seperations)

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Clutch and Ratio Chart

A = Applied
H = Holding
* = Limp-in Mode
^ = Applied in coast only

CLUTCH APPLICATION CHART									
		ELEMENTS APPLIED							
GEAR	RATIO	UD	OD	R	2-4	L-R	LC	DC	ORC
1	4.127	A				A	A ^		H
2	2.842	A				A		A	
3 *	2.284	A			A		A ^		H
4	1.573	A			A			A	
4	1.452	A	A				A ^		H
5	1	A	A					A	
6	0.689		A		A			A	
R	3.215			A		A	A		

The process of elimination can be used to detect any unit which slips and to confirm proper operation of good units. Road test analysis can diagnose slipping units, but the cause of the malfunction cannot be determined. Practically any condition can be caused by leak-ing hydraulic circuits or sticking valves.

Understanding the Components Used

The use of an Underdrive Compounder assembly splits the pinion speed with two modes of operation (Direct and Reduction).

Three shifts require a double swap of clutch assemblies; 2-3, 3-2, and 4-2. This occurs when two elements are turned off while two different elements are engaged.

Clutch to clutch synchronization takes place within 40-70 milliseconds, producing a smooth shift. Up shifts require the underdrive assembly to have precise timing. If an in-correct, double bump sensations will be felt.

“Prime” gear shift is used for the 6-4 kick downshift for a smooth transition. To achieve this, the OD clutch is released and the UD clutch is applied giving a 4th gear “prime” ratio of 1.573.

Gear Ratios for 2nd, 4th, 5th, and 6th are the same as a 41TE. If the LC were to fail there will be no engine braking and no Reverse engagement.

Limp mode gear for the 62TE is 3rd gear.

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Pressure Testing

Pressure Testing is limited to one pressure tap located on the Pan Side of the transmission. Electronic control has allowed the use of a pressure control “reducing” solenoid and a transducer in providing a closed loop pressure control (desired command/perceived monitored pressure). Testing requires the use of a scan tool as well as the use of a pressure gauge and a simulator box (Miller Tool #8333 and the Electronic Transmission Adapter kit).

Using a simulator box select the “OFF” position on the “Input/Output Speed” switch. Ignition on, engine not running.

With the scan tool, monitor the Line Pressure during the following step. With the Transmission Simulator, turn the selector switch to each of the 3 Line Pres-sure positions.

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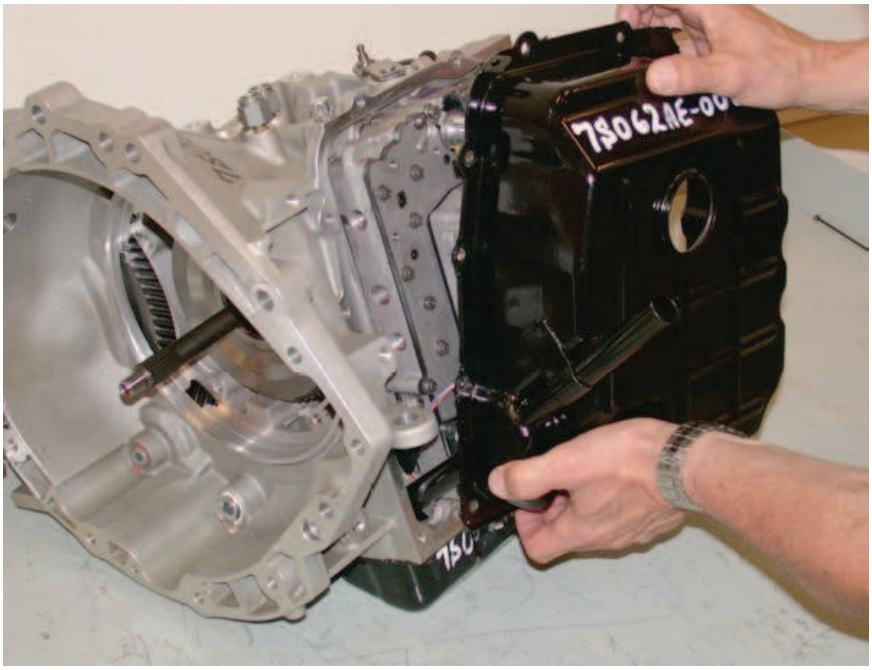

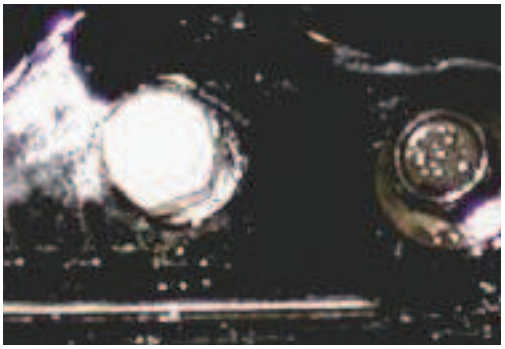

1. With the scan tool, monitor the Line Pressure, Desired Line Pressure and the TPS degrees.
2. While firmly applying the brakes, place the shifter in reverse, then slowly press the accelerator pedal to a 15° TPS degree.
3. Compare the Line Pressure reading to the Desired Line Pressure reading on the scan tool.

NOTE: All three scan tool Line Pressure readings should be steady and ± 14kPa (2.0 psi) of the reading specified on the Transmission Simulator.

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DTC's

P0122 - TPS/APP CIRCUIT LOW
P0123 - TPS/APP CIRCUIT HIGH
P0124 - TPS/APP INTERMITTENT
P0218 - HIGH TEMPERATURE OPERATION ACTIVATED
P0562 - BATTERY VOLTAGE LOW
P0604 - INTERNAL CONTROL MODULE RAM
P0613 - INTERNAL TRANSMISSION PROCESSOR
P0706 - TRANSMISSION RANGE SENSOR RATIONALITY
P0711 - TRANSMISSION TEMPERATURE SENSOR PERFORMANCE
P0712 - TRANSMISSION TEMPERATURE SENSOR LOW
P0713 - TRANSMISSION TEMPERATURE SENSOR HIGH
P0714 - TRANSMISSION TEMPERATURE SENSOR INTERMITTENT
P0716 - INPUT SPEED SENSOR 1 CIRCUIT PERFORMANCE
P0721 - OUTPUT SPEED SENSOR CIRCUIT PERFORMANCE
P0726 - ENGINE SPEED INPUT CIRCUIT RANGE/PERFORMANCE
P0729 - GEAR RATIO ERROR IN 6TH
P0731 - GEAR RATIO ERROR IN 1ST
P0732 - GEAR RATIO ERROR IN 2ND
P0733 - GEAR RATIO ERROR IN 3RD
P0734 - GEAR RATIO ERROR IN 4TH
P0735 - GEAR RATIO ERROR IN 5TH
P0736 - GEAR RATIO ERROR IN REVERSE
P0740 - TCC OUT OF RANGE
P0750 - L/R SOLENOID CIRCUIT
P0755 - 2-4 SOLENOID CIRCUIT
P075A - LC SOLENOID CIRCUIT
P0760 - OD SOLENOID CIRCUIT
P0765 - UD SOLENOID CIRCUIT
P076A - DC SOLENOID CIRCUIT
P0791 - TRANSFER SPEED SENSOR CIRCUIT
P0792 - COMPOUNDER SPEED RATIO ERROR
P083A - LC HYDRAULIC PRESSURE TEST
P083B - LC PRESSURE SWITCH RATIONALITY
P0841 - L/R PRESSURE SWITCH RATIONALITY
P0845 - 2-4 HYDRAULIC PRESSURE TEST
P0846 - 2-4 PRESSURE SWITCH RATIONALITY
P084A - DC HYDRAULIC PRESSURE TEST
P084B - DC PRESSURE SWITCH RATIONALITY
P0868 - LINE PRESSURE LOW

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DTC's (continued)

P0869 - LINE PRESSURE HIGH
P0870 - OD HYDRAULIC PRESSURE TEST
P0871 - OD PRESSURE SWITCH RATIONALITY
P0882 - TCM POWER INPUT LOW
P0883 - TCM POWER INPUT HIGH
P0844 - POWER UP AT SPEED
P0888 - TRANSMISSION RELAY ALWAYS OFF
P0890 - SWITCHED BATTERY
P0891 - TRANSMISSION RELAY ALWAYS ON
P0897 - TRANSMISSION FLUID DETERIORATED
P0933 - HYDRAULIC PRESSURE SENSOR RANGE/PERFORMANCE
P0934 - LINE PRESSURE SENSOR CIRCUIT LOW
P0935 - LINE PRESSURE SENSOR CIRCUIT HIGH
P0944 - LOSS OF HYDRAULIC PUMP PRIME
P0952 - AUTOSTICK INPUT CIRCUIT LOW
P0992 - 2-4/OD HYDRAULIC PRESSURE TEST
P1684 - BATTERY WAS DISCONNECTED
P1741 - GEAR RATIO ERROR IN 4TH PRIME
P1770 - INADEQUATE ELEMENT VOLUME L/R
P1771 - INADEQUATE ELEMENT VOLUME L/R
P1775 - SOLENOID SWITCH VALVE LATCHED IN TCC POSITION
P1776 - SOLENOID SWITCH VALVE LATCHED IN L/R POSITION
P1790 - FAULT IMMEDIATELY AFTER SHIFT
P1794 - SPEED SENSOR GROUND ERROR
P1791 - MANUAL SHIFT OVERHEAT
P273A - INADEQUATE ELEMENT VOLUME LC
P273B - INADEQUATE ELEMENT VOLUME DC
P2763 - TORQUE CONVERTER CLUTCH PRESSURE CONTROL CIRCUIT HIGH
P2764 - TORQUE CONVERTER CLUTCH PRESSURE CONTROL CIRCUIT LOW
U0100 - LOST COMMUNICATION WITH ECM/PCM
U0002 - CAN C BUS OFF PERFORMANCE
U0121 - LOST COMMUNICATION WITH ABS
U0141 - LOST COMMUNICATION WITH FCM

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Shift Solenoid Pressure Switches

Six solenoids are used to control the friction elements (clutches). The continuity of the solenoids circuits are periodically tested. Each solenoid is turned on or off depending on its current state. An inductive spike should be detected by the PCM during this test. If no spike is detected, the circuit is tested again to verify the failure.

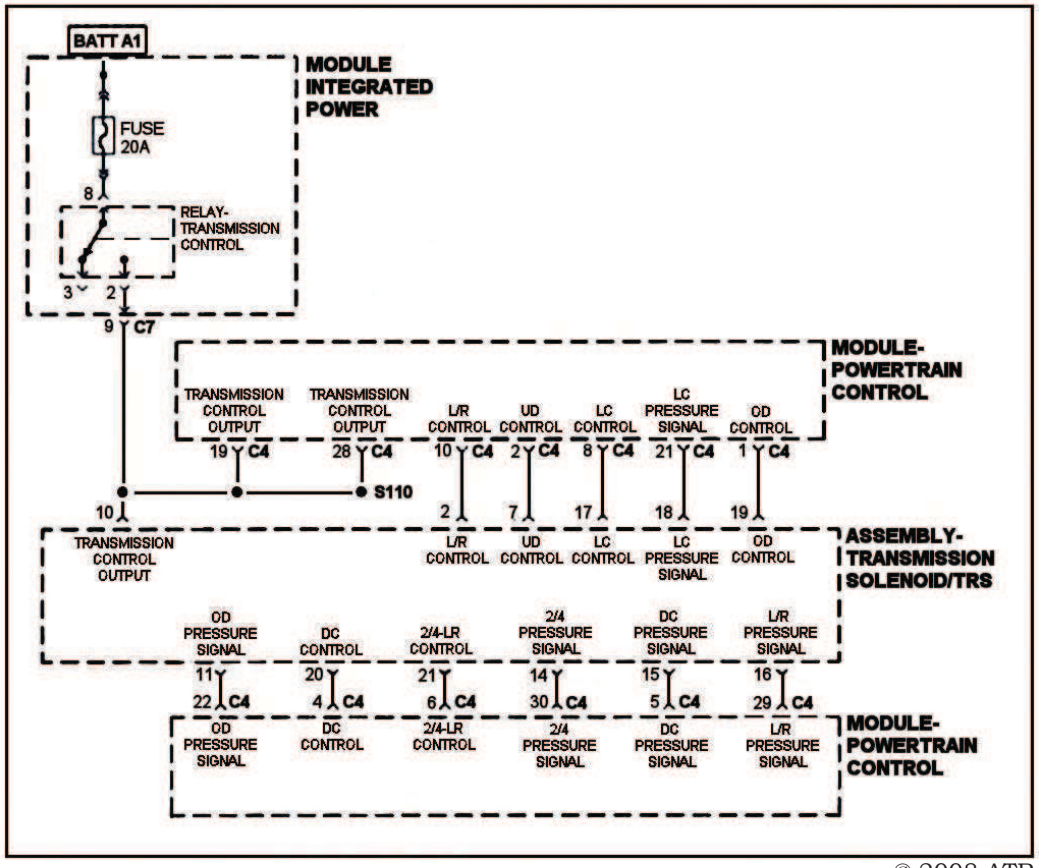
In addition to the periodic testing, the solenoid circuits are tested if a gear ratio or pressure switch error occurs. In this case, one failure will result in the appropriate DTC being set. The MIL will illuminate and the transmission goes into neutral, if the DTC is set above 35 km/h (22 mph), Limp-in mode when vehicle speed is below 35 km/h (22mph).

The Transmission system uses five pressure switches to monitor the fluid pressure in the L/R, 2/4, DC, LC, and OD elements. The pressure switches are continuously monitored for the correct states in each gear.

If a set condition is identified, 1st gear and torque converter lock-up (EMCC) will be inhibited. The vehicle will launch in 2nd gear and shift normally through the gears without allowing EMCC. If during the same key start, the set condition is no longer valid, the transmission will return to normal operation (1st and EMCC available).

Limp-in will not occur unless DTC P0841 is accompanied by a code P0706 and the MIL will illuminate after 5 minutes of substituted operation.

SOLENOID CIRCUIT



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Hydraulic Line Pressure Control

Line pressure is measured by the Line Pressure Sensor (LPS) and regulation is achieved by changing the duty cycle of the Pressure Control Solenoid (PCS) controlled by the Transmission Control System. (5% duty cycle = solenoid off = Maxline pressure, 62% duty cycle = solenoid on = Min line pressure).

The Transmission Control System calculates the desired line pressure based on inputs from both the engine and transmission. The Transmission Control System calculates torque input to the transmission and uses it as the primary input to the desired line pressure calculation. This is called Torque Based Line Pressure.

In addition, the line pressure is set to a preset level 827 or 931 kPa (120 or 135 psi) during shifts and in Park and Neutral to ensure consistent shift quality. The desired line pressure is continuously being compared to the actual line pressure. If the actual line pressure is consistently lower than the target while driving, the line pressure low DTC P0868 will set.

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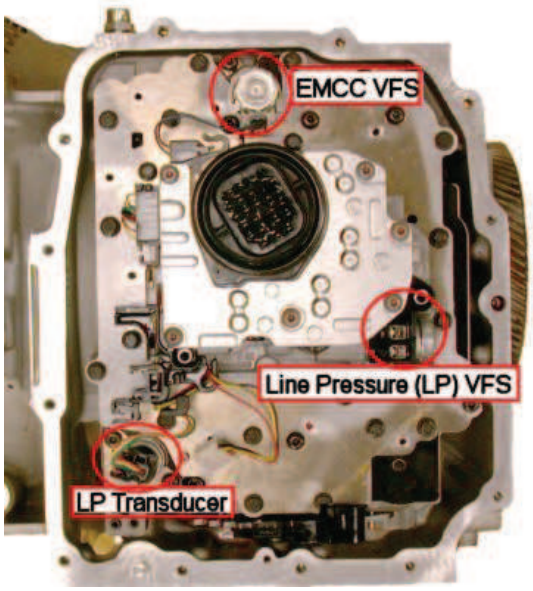

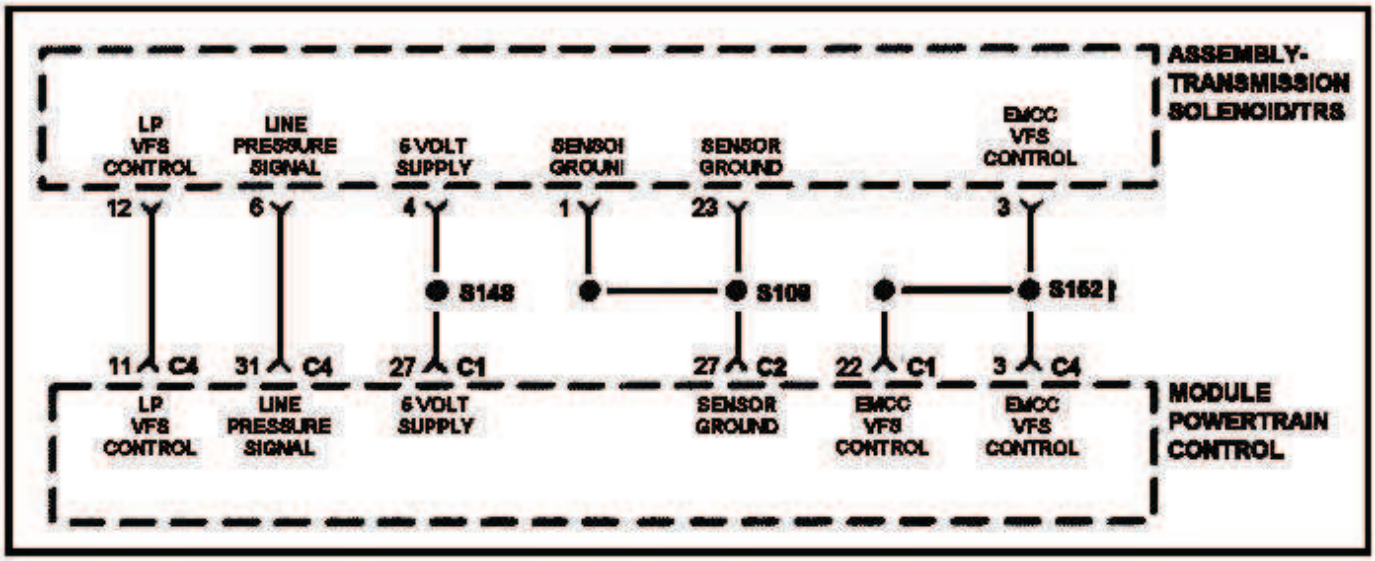

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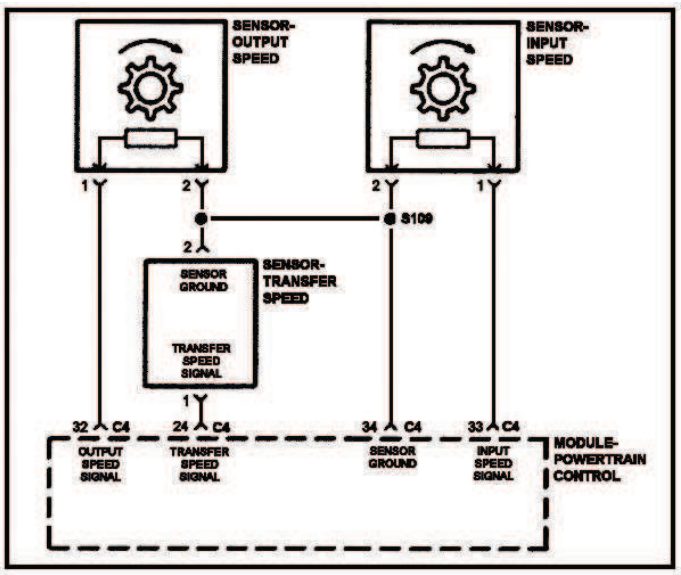
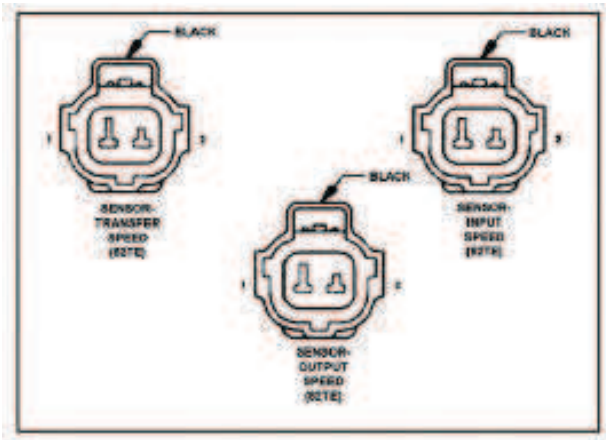
Speed Sensors (ISS, OSS, TSS)

The transmission control system uses three speed sensors, one to measure input rpm, one to measure Transfer Speed output rpm of the main transmission assembly, and a third to measure the final transmission output rpm. These inputs are essential for proper transmission operation. Therefore, the integrity of this data is verified through system checks.





1. ISS:

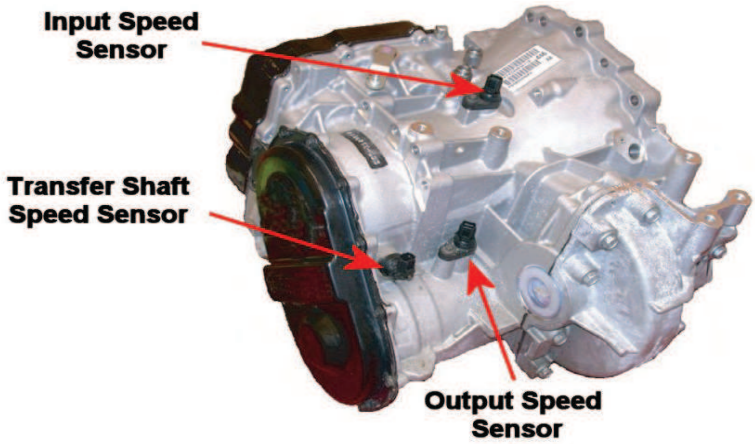
The ISS has been relocated to the top of the case, and like the 41TE, continues to read turbine speed from the input shaft.

2. TSS:

The 40/41TE OSS has been relocated to the rear of the case (backside) and renamed the TSS. It continues to read rotation of the front annulus/rear carrier assembly.

3. OSS:

The OSS is located at the rear of the case and is unique to the 62TE. It reads the rotation of the underdrive compounder output carrier.



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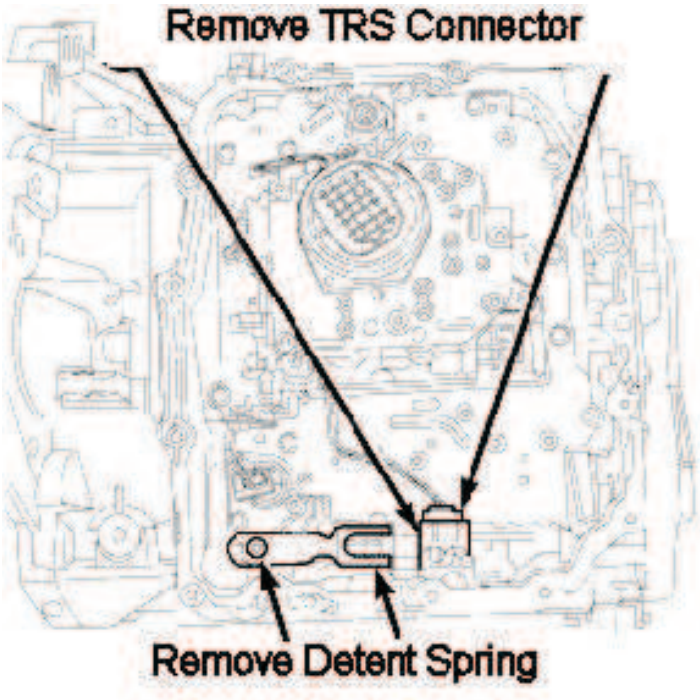
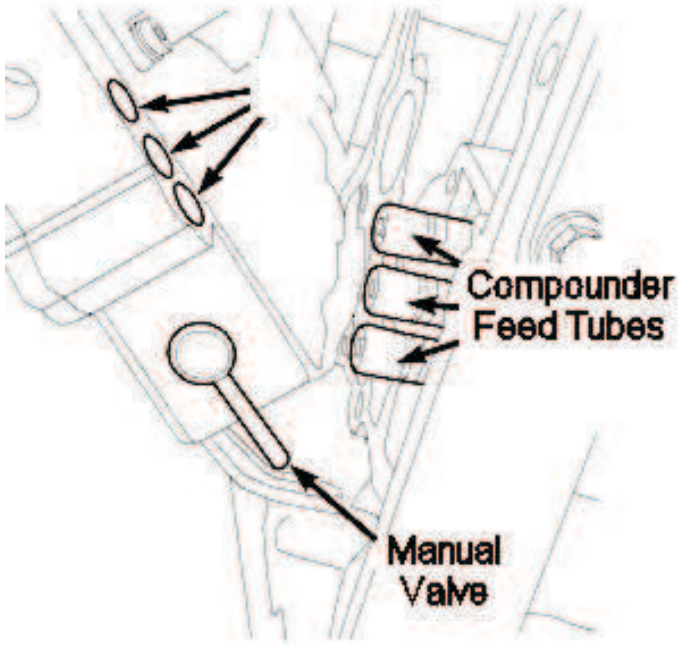
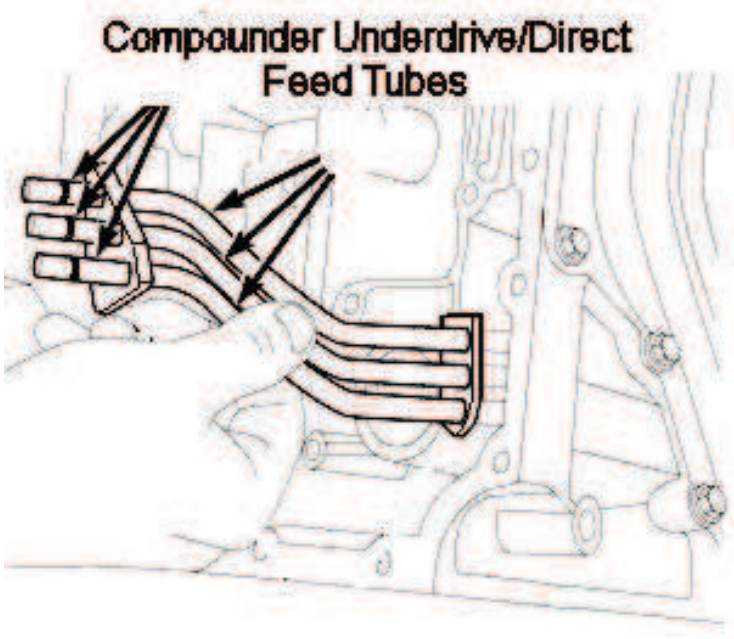
Valve Body and Compounder Feed Tubes

Disconnect the TRS sensor wiring, remove the rooster comb spring. Remove the 21 valve body bolts and carefully separate the VB from the Compounder Feed Tubes. Remove feed tubes. There are 6 accumulators. All six have the same spring count (2 springs). Remove the 2/4 seal from case. This must be done first before removing the compounder assembly. Assemble in reverse order after the compounder assembly is installed.







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Valve Body Exploded View

1: Valve Body

2: Solenoid Module, Transmission

3: Screw (only serviced with solenoid module

4: Sensor, Pressure, Line Pressure VFS, Only Serviced with Solenoid Module

5: Sensor, Trans Vari-able Force Solenoid 0-90 PSI

6: Sensor, Trans Pressure Transducer

7: Screw, Pan Head

8: Clamping Plate, Transmission valve body, Aluminum

9: Gasket, Valve Body

10: Plate, Transmission Valve Body

11: Valve Body, Only Serviced with Item #1

12: Ball, Check

13: Plate, Transmission Valve Body

14: Gasket, Valve Body

15: Pin, Chamfer.PT. Chamfer. PT. NO. FIN. SLOTED M5X12.00

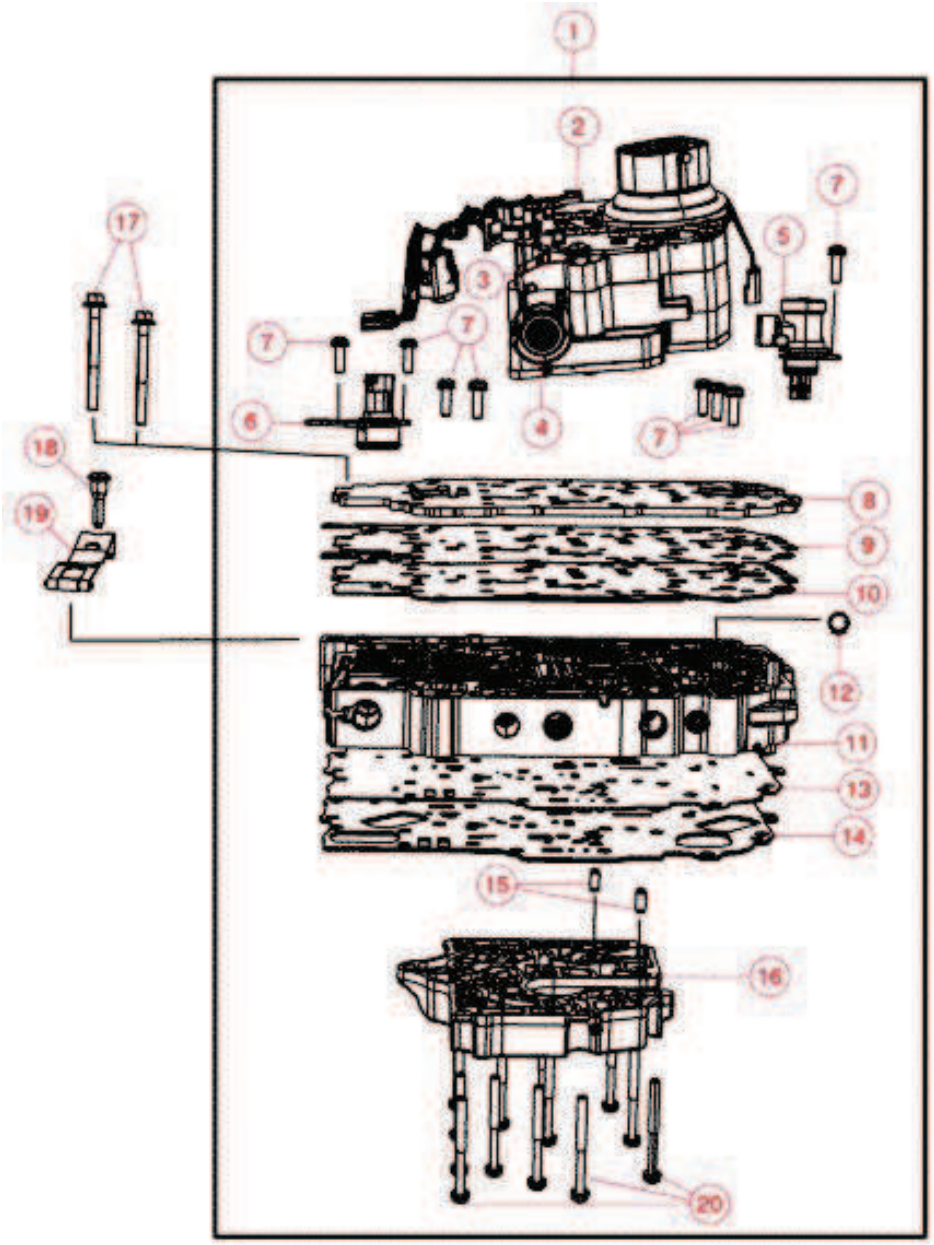
16: Transfer Plate, Aluminum Valve Body

17 Screw, HEAD ER. PT. REDUCD. M5X0.80X50.00, Valve Body to the Transmission Case

18: Screw, SPECIAL. SHOULDER. M5X0.8X31.50

19: Leaf, Spring Assy Trans Park Sprag

20: Screw,M5X0.8X55.00



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Valve Body Exploded View (continued)

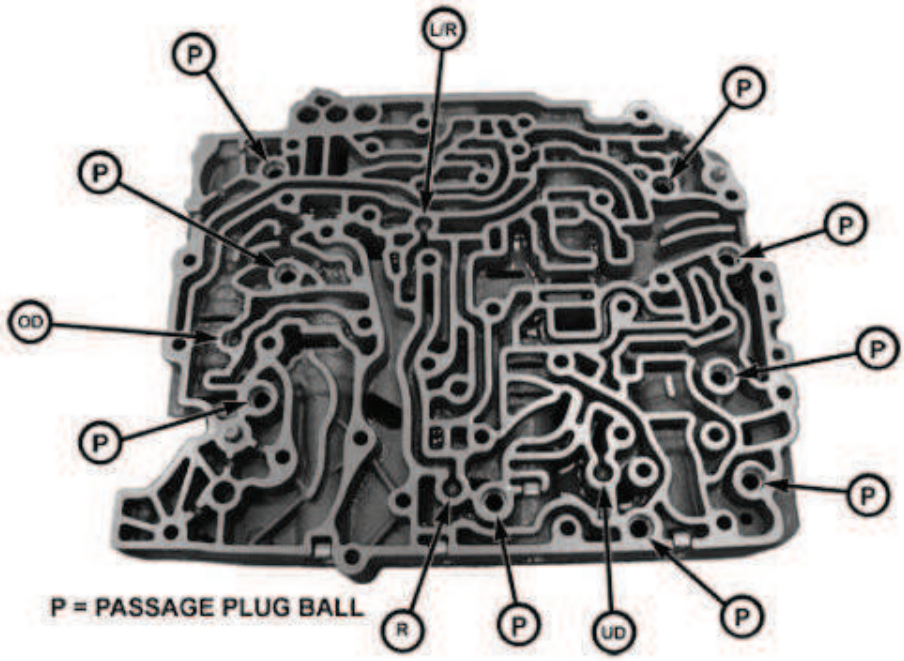
The 62TE valve body has nine (9) check balls (used for plugs) and four used in the hydraulic shift control circuit:

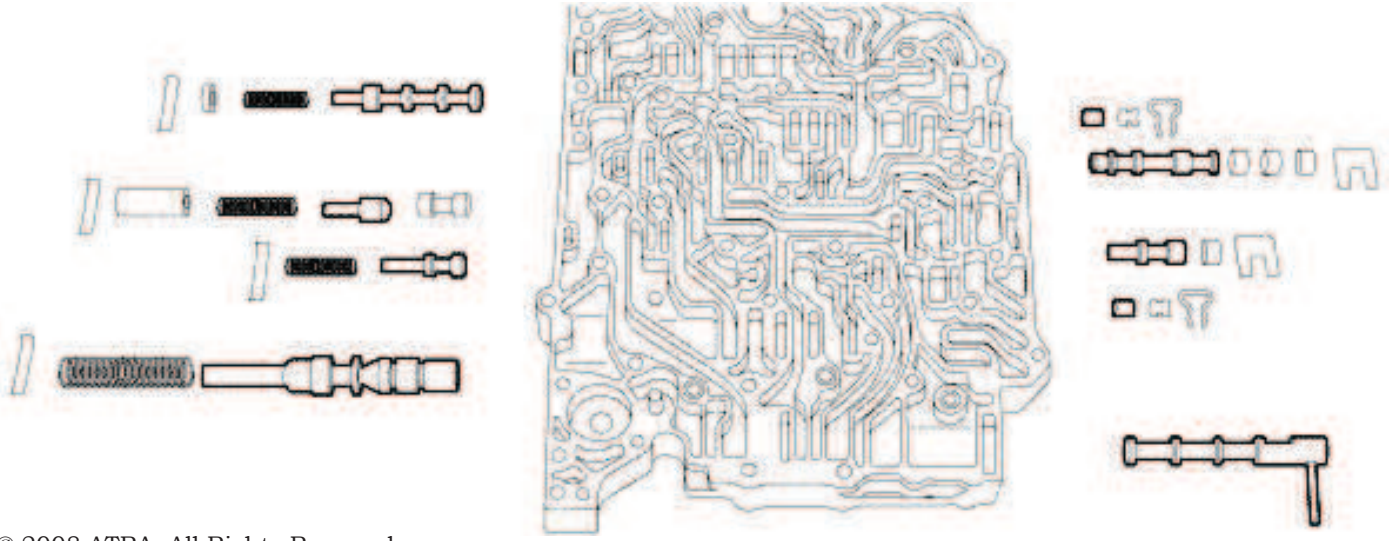
Ball 1: L/R clutch circuit, prevents L/R clutch application in Drive-Third gear, Fourth gear, Fifth gear, and Sixth gear.

Ball 2: UD Clutch circuit, allows an orifice to control fluid flow during UD clutch appli cation.

Ball 3: OD Clutch circuit, allows an orifice to control fluid flow during OD clutch appli cation.

Ball 4: Reverse Clutch circuit, allows an orifice to control fluid flow during reverse clutch application





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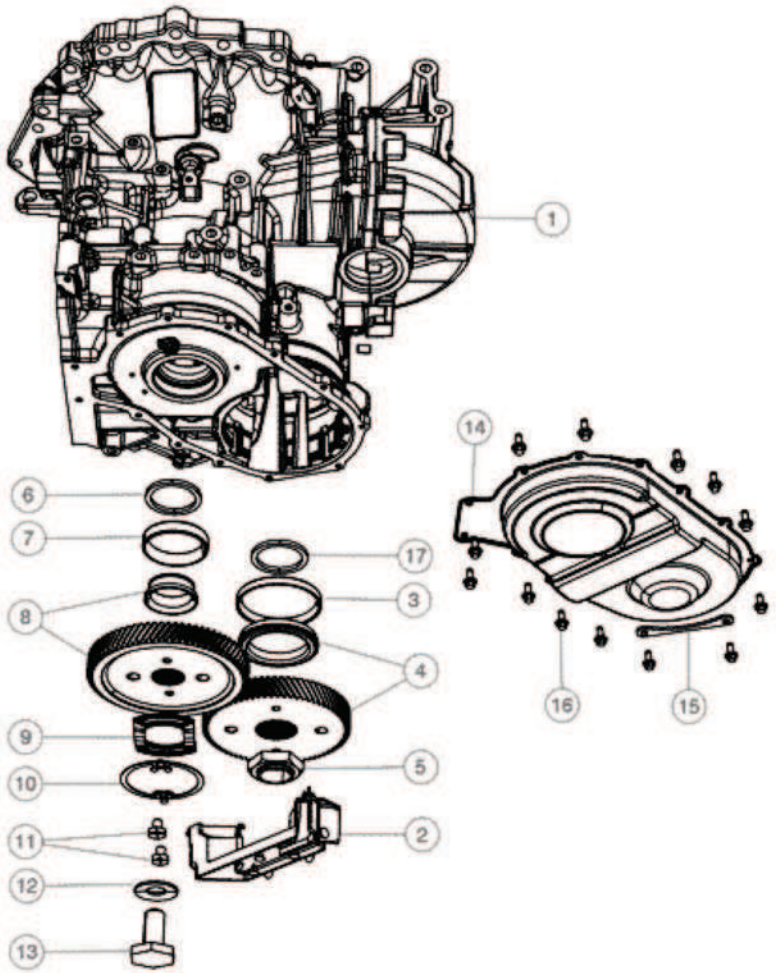
Transfer Gear Exploded View



1. Case, Transaxle
2. Deflector
3. Bearing Cup, Transfer Gear (service with retainer P/N 4900387AA)
4. Gear, Transfer (70 teeth), 41 tooth spline. Includes bearing cone.
5. Nut, Hex-M33X1.50
6. Spacer, Output/Transfer Shaft
7. Bearing Cup, Output Shaft, Serviced with the Transmission Case
8. Output Gear, 74 tooth, Includes bearing cone
9. Stirrup, Retaining Nut
10. Strap, Retaining
11. Bolt, Hex Head, M8z10.0012: Washer, Output Shaft
12. Bolt, Hex Head
13. Cover, Transmission end
14. Strap, Lower end transmission cover
15. Bolt, Hex Head, M6x1.00x14
16. Spacer, Transfer Shaft Bearing

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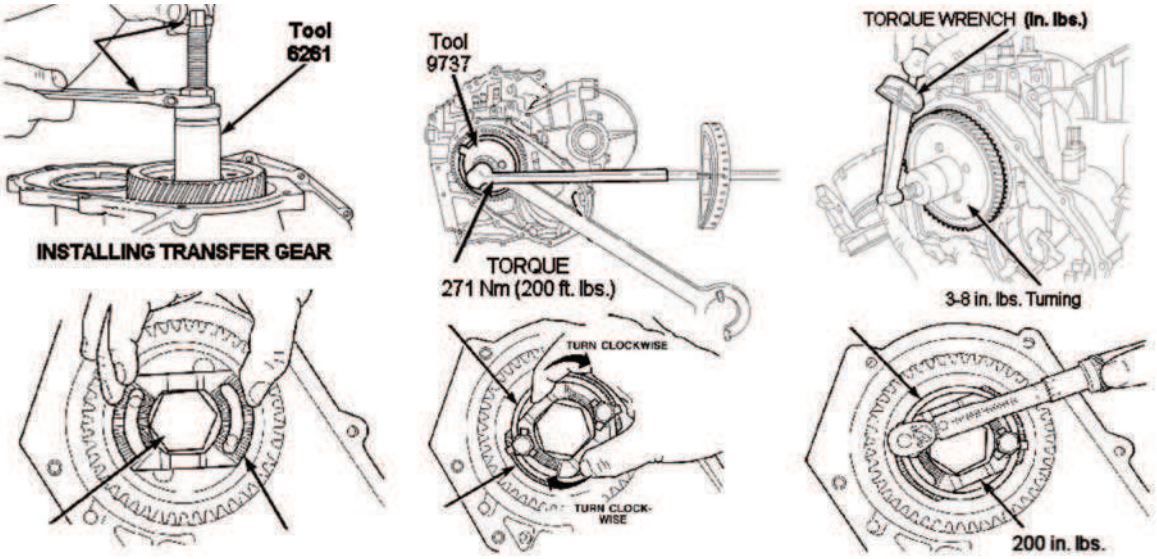
Output and Compounder Transfer Gears

The output transfer gear setting must be confirmed after the original shim selection (previous pages) to determine proper turning torque. Install the transfer gear with Tool# 6261. Torque bolt to 200 ft lbs using tool# 9739 (holder). Check to confirm that turning torque is within 3-8 in. lbs. If to tight, install thicker shim, if to loose, install thinner shim from previous chart.



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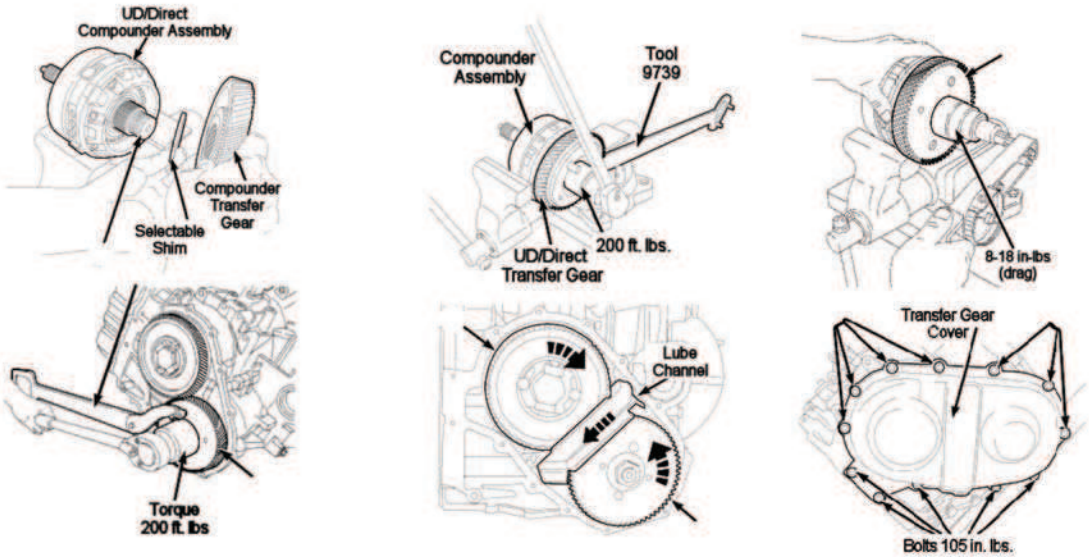
The Compounder Transfer Gears

The compounder transfer gear is set up on the bench. Desired turning pressure is 8-10 in lbs of drag. Assembly and check differential settings before assembling the compounder assembly into the case



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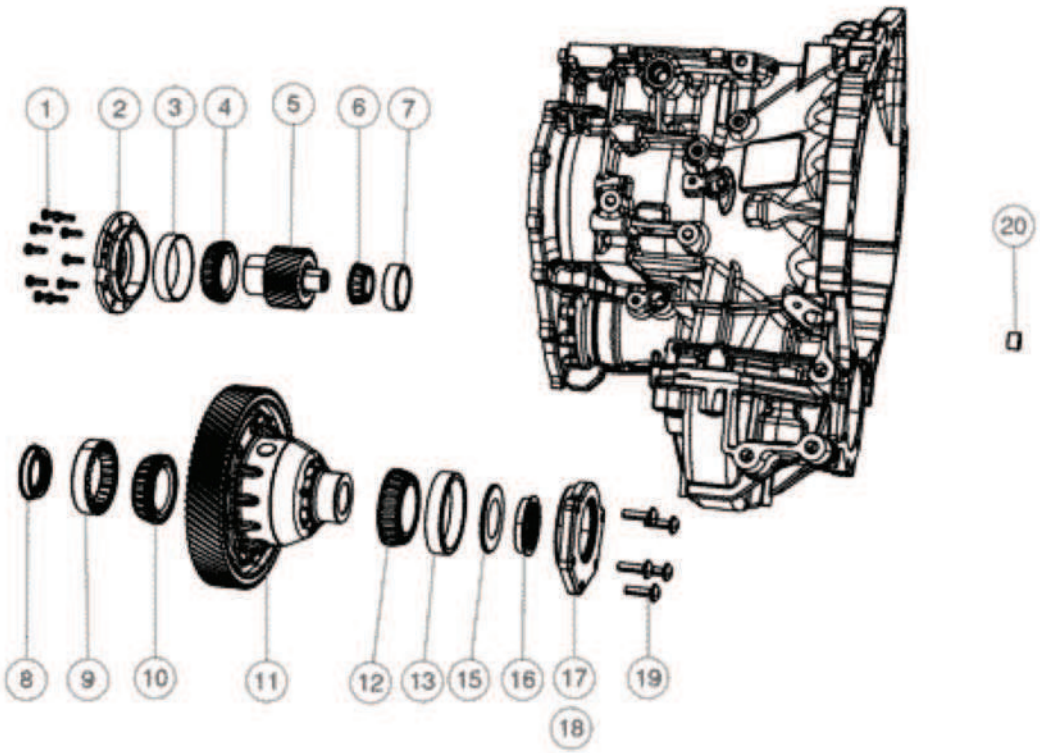
Differential Assembly



1: Screw, M6X1.0X20.0
2: Retainer, final drive pinion bearing
3: Cup, differential side
4: Bearing, differential
5: Pinion, final drive 23 teeth
6: Cone, final drive pinion
7: Cup, final drive pinion bearing
8: Seal
9: Cup, differential side
10: Bearing, differential
11: Differential Assy, complete
12: Cone, bearing tapered roller, trans right diff. bearing.
13: Cup, bearing tapered roller, trans right diff. bearing
14: Spacer
15: Dam
16: Seal
17: Extension Assy, transmission (series C, D, G, Z)
18: Extension, transmission (series E)
20: Plug, Hex Socket, 3/8-18NPTx.475

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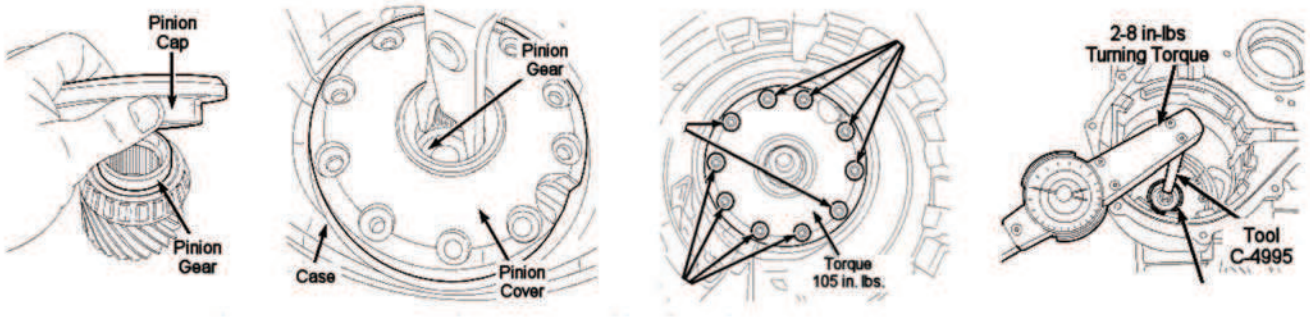
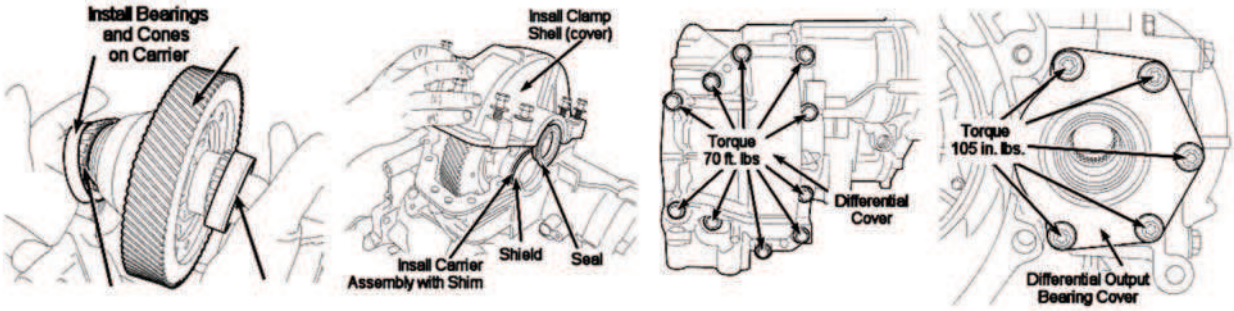
Output Pinion/Differential Set-up

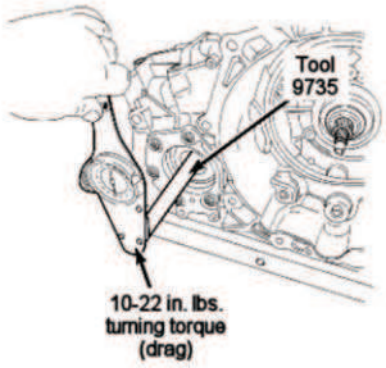
Pinion Gear with bearings installed on pinion gear and cones installed in case and cap, install the pinion in the case. Torque the bearing cap to spec. Install turning torque test adapter. Turning torque needs to be set at 2 to 8 in. lbs (drag)



The Differential must not be installed during the turning torque test!

Install the differential, bearing cups, shim, seals and oil slinger into case. Install the differential cover. Install the differential cover bolts and tighten to 95 Nm (70 ft. lbs.). Install the differential output bearing cover. Install the differen-tial output bearing cover bolts and tighten to 12 N·m (105 in. lbs.). Using the Turning Torque Tool 9735 and an inch pound torque wrench check the differential turning torque, it should be 10 to 22 in. lbs (drag).





Pinion must NOT be installed when testing turning torque

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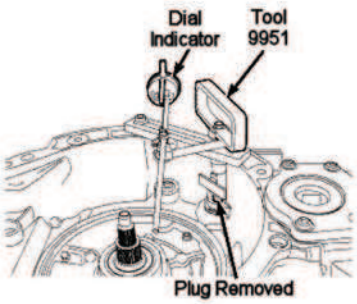
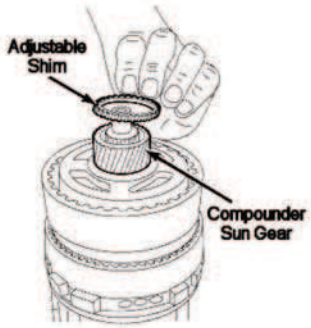
Transfer Compound Endplay Adjustment

1. Remove the plug in case
2. Install compounder End Play Tool 9951 through the hole in the front case
3. Install Dial Indicator onto tool
4. Use moderate downward pressure on end play tool and zero dial indicator
5. Use moderate upward pressure on end play tool and take reading from dial indicator, adjust the shim thickness in the underdrive unit to 0.010 to 0.020".





PART NUMBER	SERIES	SHIM SIZES	PART NUMBER	SERIES	SHIM SIZES
4800 487AA	C, D, G, Z	[4.16 - 4.21 mm]	4800 480AA	E	[2.76-2.81 mm]
4800 492AA	C, Z	[4.96 - 5.01 mm]	4800 490AA	E	[4.56 - 4.61 mm]
4800 490AA	C, D, G, Z	[4.56 - 4.61 mm]	4800 482AA	C, Z	[3.16-3.21 mm]
4800 488AA	C, Z	[4.36 - 4.41 mm]	4800 483AA	E	[3.36 - 3.41 mm]
4800 491AA	E	[4.76 - 4.81 mm]	4800 492AA	C, D, G, Z	[4.96 - 5.01 mm]
4800 484AA	C, Z	[3.56 - 3.61 mm]	4800 480AA	C, Z	[2.76-2.81 mm]
4800 486AA	C, D, G, Z	[3.96 - 4.01 mm]	4800 481AA	C, D, G, Z	[2.96-3.01 mm]
4800 492AA	E	[4.96 - 5.01 mm]	4800 493AA	C, D, G, Z	[5.16 - 5.21 mm]
4800 493AA	E	[5.16 - 5.21 mm]	4800 488AA	C, D, G, Z	[4.36 - 4.41 mm]
4800 482AA	E	[3.16-3.21 mm]	4800 481AA	E	[2.96-3.01 mm]
4800 487AA	C, Z	[4.16 - 4.21 mm]	4800 485AA	C, Z	[3.76 - 3.81 mm]
4800 483AA	G, Z, C, D	[3.36 - 3.41 mm]	4800 485AA	E	[3.76 - 3.81 mm]
4800 486AA	C, Z	[3.96 - 4.01 mm]	4800 490AA	C, Z	[4.56 - 4.61 mm]
4800 485AA	C, D, G, Z	[3.76 - 3.81 mm]	4800 480AA	C, D, E, G, Z	[2.76-2.81 mm]
4800 493AA	C, Z	[5.16 - 5.21 mm]	4800 481AA	C, D, E, G, Z	[2.96-3.01 mm]
4800 481AA	C, Z	[2.96-3.01 mm]	4800 482AA	E, G, Z, C, D	[3.16-3.21 mm]
4800 486AA	E	[3.96 - 4.01 mm]	4800 483AA	C, D, E, G, Z	[3.36 - 3.41 mm]
4800 488AA	E	[4.36 - 4.41 mm]	4800 484AA	C, D, E, G, Z	[3.56 - 3.61 mm]
4800 491AA	C, Z	[4.76 - 4.81 mm]	4800 485AA	C, D, E, G, Z	[3.76 - 3.81 mm]
4800 482AA	C, D, G, Z	[3.16-3.21 mm]	4800 486AA	C, D, E, G, Z	[3.96 - 4.01 mm]
4800 480AA	C, D, G, Z	[2.76-2.81 mm]	4800 487AA	C, D, E, G, Z	[4.16 - 4.21 mm]
4800 487AA	E	[4.16 - 4.21 mm]	4800 488AA	C, D, E, G, Z	[4.36 - 4.41 mm]
4800 491AA	C, D, G, Z	[4.76 - 4.81 mm]	4800 490AA	C, D, E, G, Z	[4.56 - 4.61 mm]
4800 484AA	E	[3.56 - 3.61 mm]	4800 491AA	C, D, E, G, Z	[4.76 - 4.81 mm]
4800 484AA	C, D, G, Z	[3.56 - 3.61 mm]	4800 492AA	C, D, E, G, Z	[4.96 - 5.01 mm]
4800 483AA	C, Z	[3.36 - 3.41 mm]	4800 493AA	C, D, E, G, Z	[5.16 - 5.21 mm]

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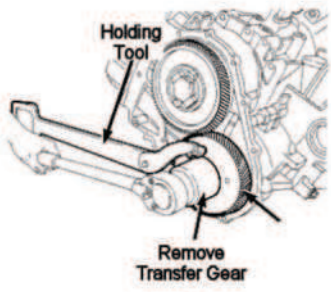
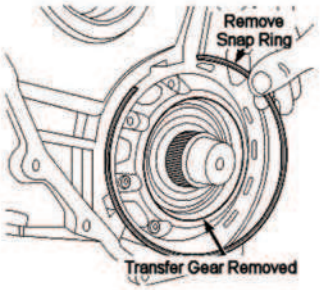
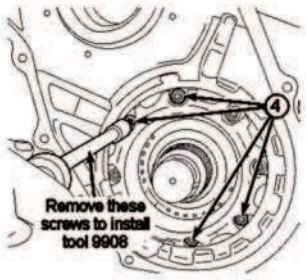
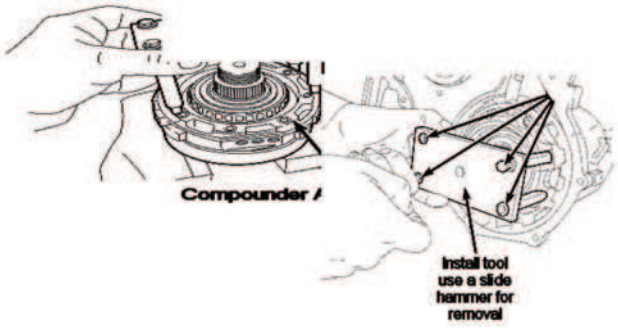
UD/Direct Compounder

The underdrive compounder assembly replaces the 41TE transfer shaft. The transaxle case is modified to accommodate the additional components. The main components of the underdrive compounder assembly are the Low Clutch (LC), Direct Clutch (DC), Overrunning Clutch (ORC), simple planetary gear set and bearing retainer transfer/underdrive shaft.

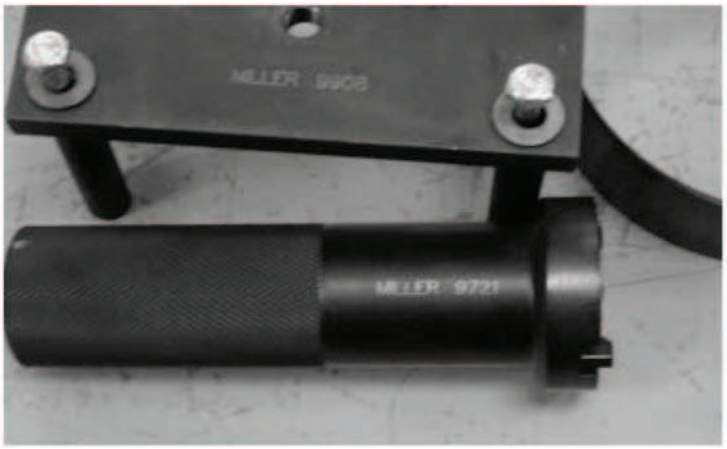








To remove the compounder assembly, first remove the valve body and feed tubes. Remove the transfer gear and snap ring holding the compounder into the case. A special tool # 9908 is needed to pull the compounder unit from the case. Install tool and use a slide hammer to remove. To install use tool 9908 for sup-port. Torque the transfer gear nut (always replace) to 200 Ft. lbs., use staking tool 9721 to secure the gear nut.



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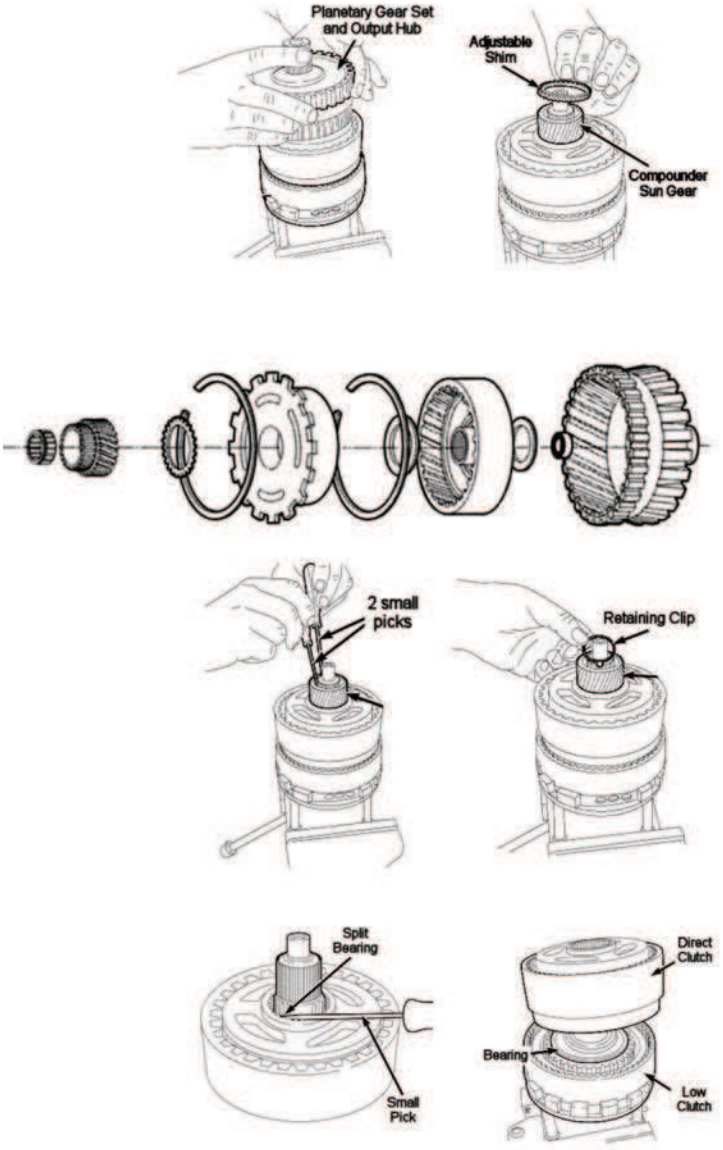
UD Compounder Disassembly

1. Separating the Compounder Assembly:
2. Remove planetary gear set/output hub
3. Remove the Helical Shim
4. Separate the planetary assembly
5. Using two small picks, remove retaining clip from transfer/underdrive shaft, (the retaining clip must be replaced during OH)
6. Remove the split bearing using a small pick
7. Separate the Direct and Low Clutch



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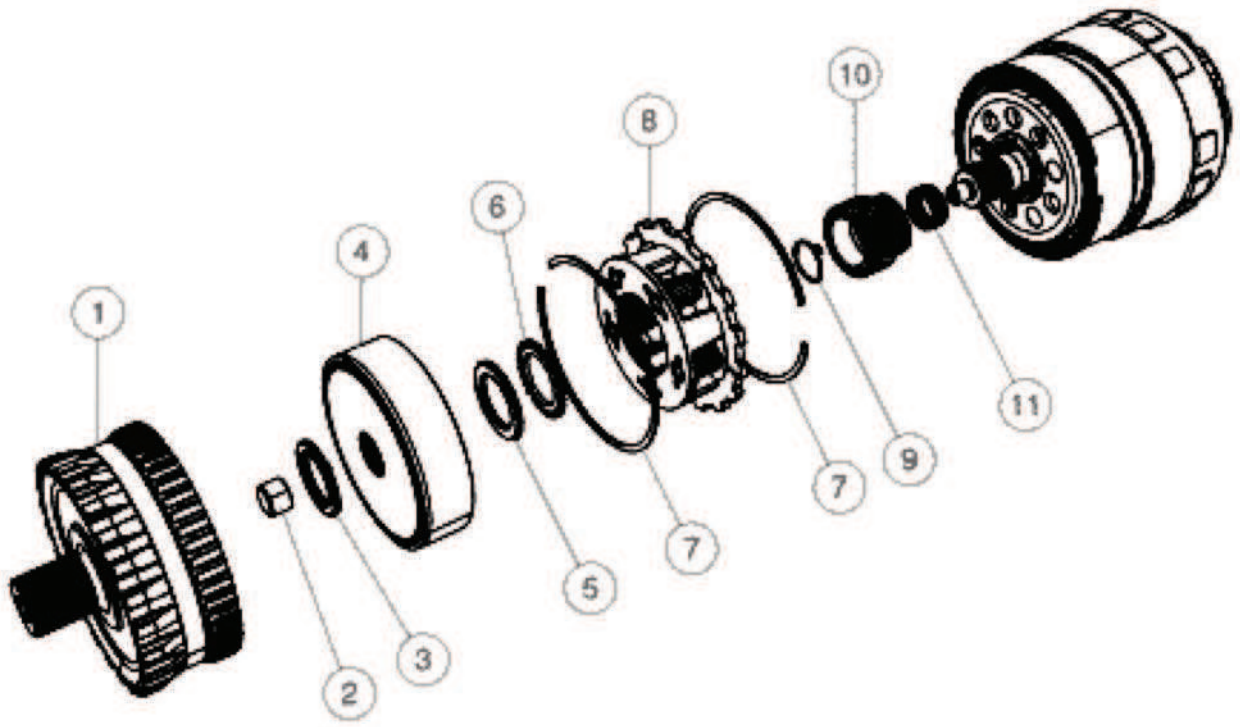
UD/Direct Compounder Planetary

Parts Description

The selectable shim part numbers were covered in the end play set up. Always verify that numbers are current and correct before ordering.



1. Shaft, Output
2. Bearing, Needle roller
3. Thrust Bearing, Trans front planet pinion carrier
4. Gear, Annulus
5. Bering, Thrust needle
6. Spacer, Selectable
7. Snap Ring, Internal Carrier to output shaft
8. Planet Carrier, Complete Underdrive carrier
9. Snap Ring, External sun gear assembly
10. Sun Gear Assembly, machined
11. Bearing, Caged needle

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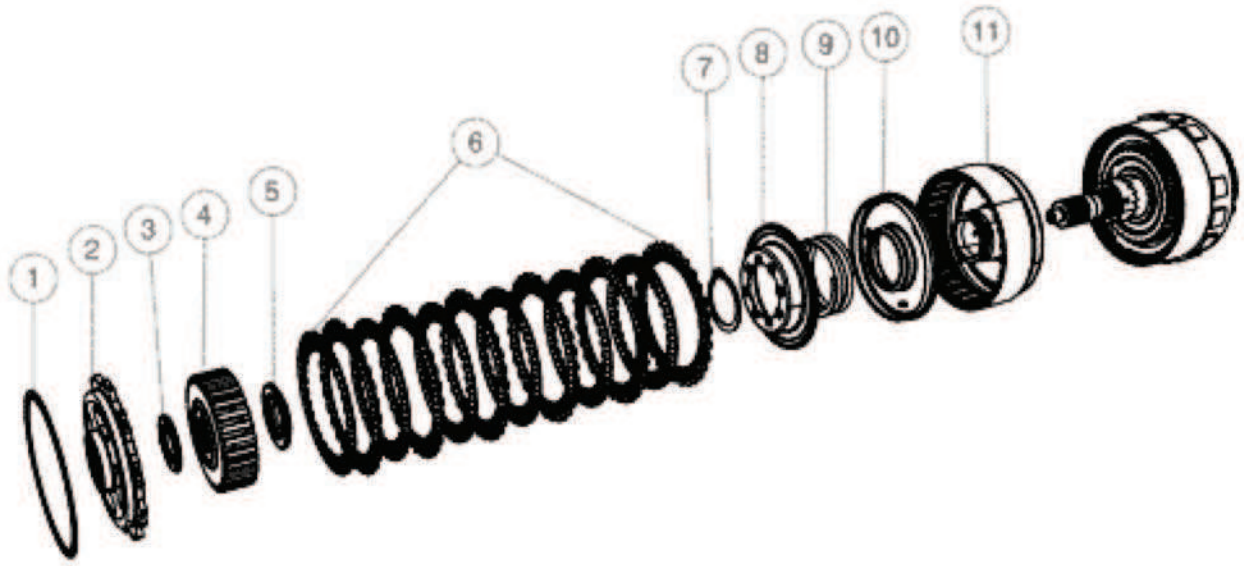
Direct Clutch Assembly



1. Snap Ring, Tapered
2. Reaction Plate Package, direct clutch, set of six
3. Thrust Bearing, trans front planet pinion carrier
4. Hub, Direct clutch
5. Needle Bearing, Thrust
6. Clutch Backage, Underdrive direct clutch
7. Snap Ring, Direct clutch piston spring retainer
8. Retainer, Direct clutch balance piston return
9. Spring, Direct clutch piston return
10. Piston, Direct clutch
11. Retainer, Direct clutch

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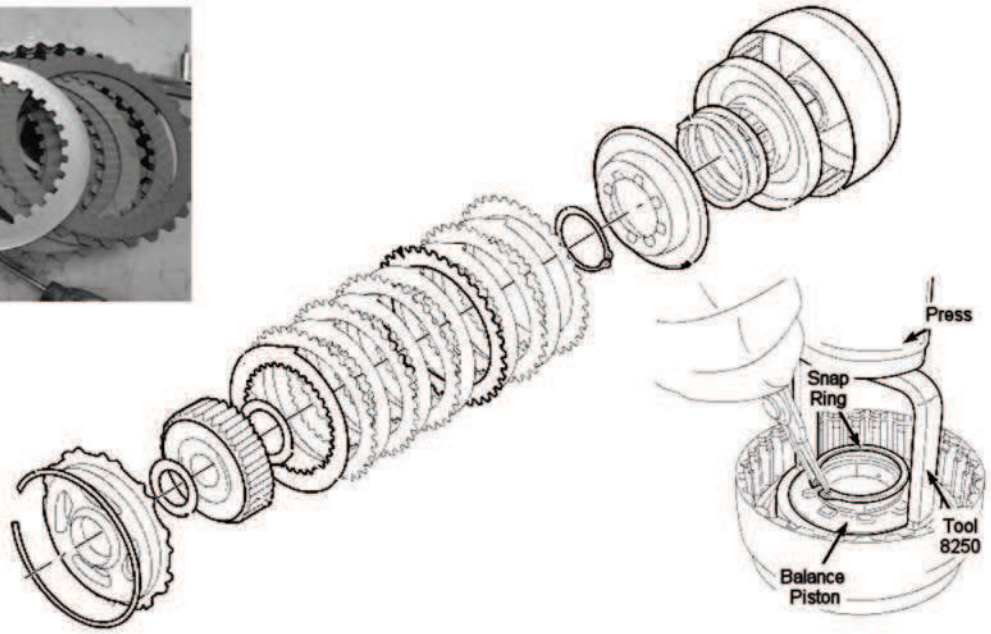
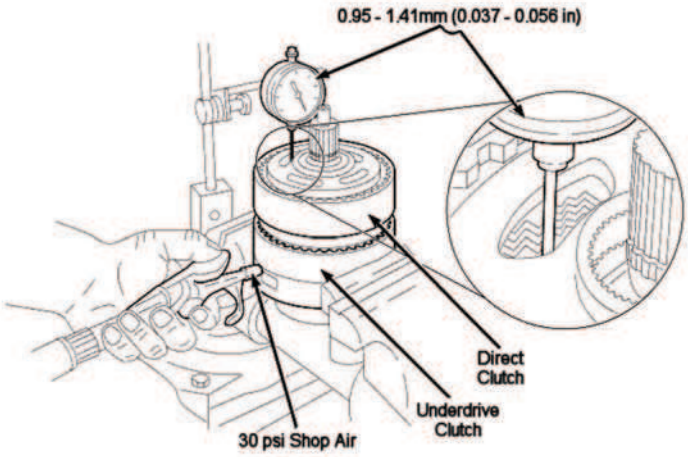
Direct Clutch Assembly and Disassembly



1. Remove Snap ring
2. Remove Selectable Plate (part numbers not available at this time)
3. Remove #1 thrust bearing, hub, and #2 thrust bearing
4. Remove single sided frictions
5. Compress Balance piston with tool 8250 and remove snap ring
6. Remove Piston ASSEMBLE (Reverse Procedure) assembling the entire compounder unit. Using air pressure, measure clearance of the Direct Clutch. Clearance is 0.95 -1.41mm (0.037 - 0.056 in)



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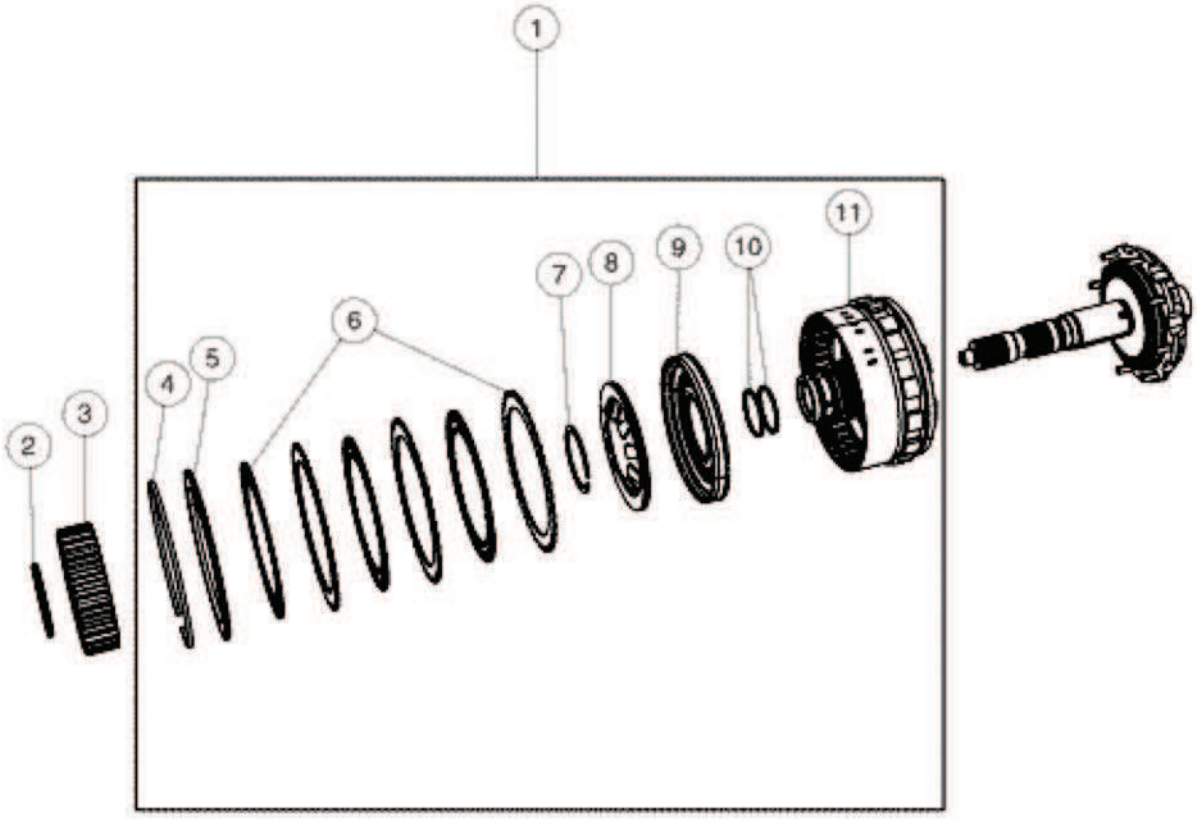
Underdrive Clutch Assembly



1. Retainer Assembly, L/R Clutch
2. Bearing Assembly, Thrust-Direct clutch retainer
3. Clutch Assembly, Overrunning clutch
4. Snap Ring Package, selective sizes 2.78 - 4.39 mm
5. Reaction Plate, Low clutch
6. Clutch Package, Underdrive low clutch
7. Snap Ring, Low clutch return spring
8. Spring, Low clutch retainer
9. Piston, Low clutch retainer
10. Seal Ring, Low clutch retainer
11. Retainer, Low clutch

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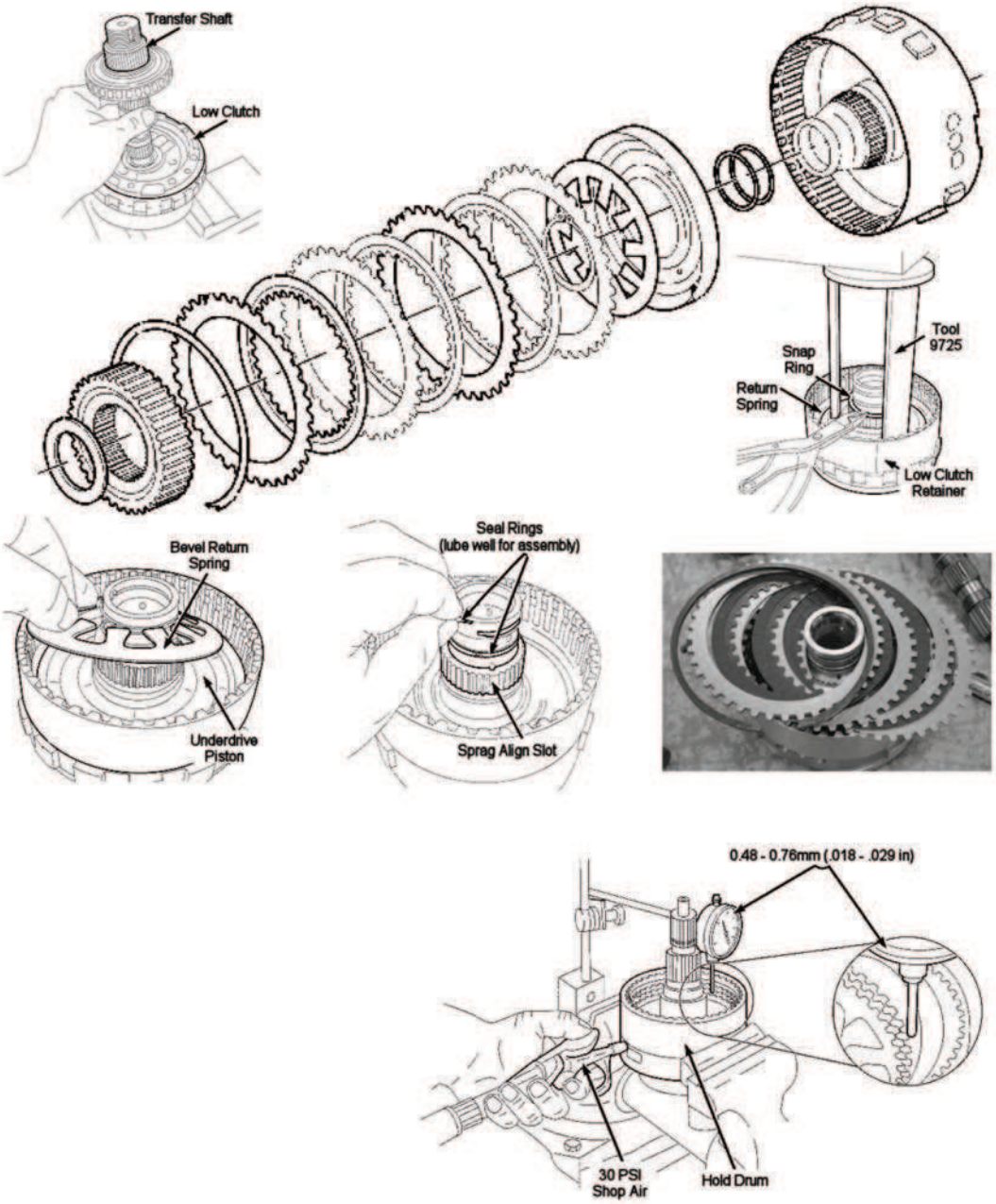
Underdrive Clutch Assembly and Disassembly

1. Remove Transfer Shaft
2. Remove Sprag, Snap Ring, Reaction Plate and Clutch Plates
3. Compress Return spring with Tool 9725
4. Remove Piston assembly Lubricate liberally! Install the piston and return spring in reverse order. Air test for clearance with 30 PSI of air pressure. Clearance should be: 0.048-0.76 mm (.018-.029 in)



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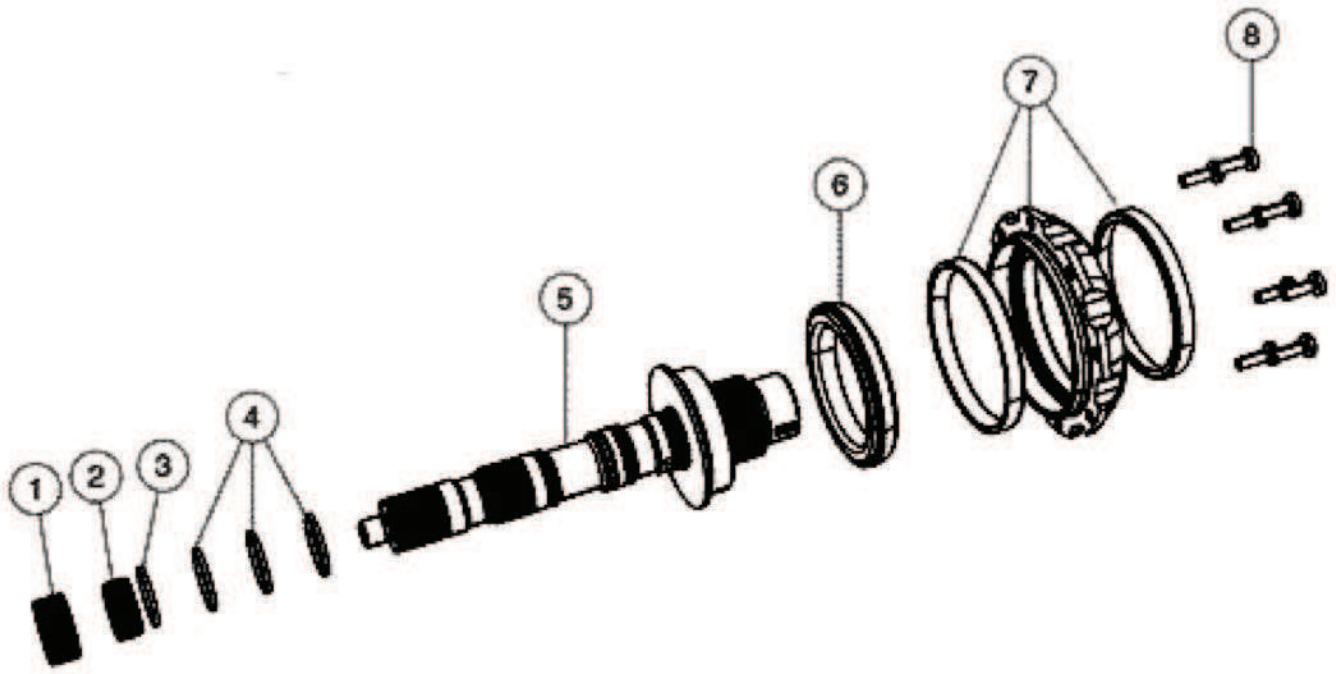
Underdrive Clutch Assembly

When Assembling, use plenty of assembly lube to assure teflon rings do not expand during assembly.



1. Bearing, Caged needle
2. Bearing, Caged needle
3. Seal Ring, Teflon, Green seal
4. Seal Ring, Teflon, White seal
5. Shaft
6. Roller Bearing, Inner tapered roller, Transfer shaft/gear
7. Retainer, Transfer gear bearing, Underdrive assembly
8. Screw, M6X1.0X20.0

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Specifications

DESCRIPTION	SPECIFICATION
Output Shaft Gear Drag Torque	3 to 8 in. lbs.
Low/Reverse Clutch Pack Clearance	0.89-1.47 mm (0.035-0.058 in.)
Reverse Clutch (Select Snap Ring)	0.89-1.37 mm 0.035-0.054 in.
Overdrive Clutch (No Selection)	0.54-2.39 mm 0..00054-0.00239 in.
Underdrive Clutch (Select Pressure Plate)	0.94-1.50 mm 0.037-0.059 in.
2/4 Clutch Clearance	0.76-2.64 mm (0.030-0.104 in.)
Input Shaft End Play	0.005 to 0.025 inch
Final Drive Remote Pinion Drag Torque	2 to 8 in-lbs (drag)
Differential Turning Torque	10 to 20 in-lbs (drag)
Low Clutch Clearance	0.48 - 0.76 mm (.018 - .029 in.)
Direct Clutch Pack Clearance	0.95 - 1.41 (0.037- 0.056

Description	Metric	Standard
Front Sun Gear Bushings	29.55 - 29.60 mm	1.163 -1.165 in.
Rear Carrier Bushing	29.75 - 30.00 mm	1.171 - 1.181 in.
Overdrive Hub / Shaft Bushing	21.52 - 21.58 mm	0.847 - 0.850 in.
Oil Pump Reaction Support Sleeve	45.27 - 45.31 mm	1.782 - 1.784 in.
Oil Pump Outer Gear to Pump Pocket	0.089-0.202 mm	0.0035-0.0079 in.
Oil Pump Outer Gear to Crescent	0.060-0.298 mm	0.0023 - 0.0117 in.
Oil Pump Inner Gear to Crescent	0.093 - 0.385 mm	0.0036 - 0.0151 in.
Oil Pump Between Both Gear end Faces and the Reaction Shaft Support	0.020-0.046 mm	0.0008-0.0018 in.
Front / Rear Carrier Pinion end Play	0.15 - 0.61 mm	0.006 - 0.024 in.
Torque Converter Hub Bushing	38.019 - 38.11	1.499 - 1.501 in.
Output Carrier Pinion End Play	0.15 - 0.76	0.006 - 0.030
Direct Clutch Retainer Bushing	39.71 - 39.75	1.563 - 1.565
Low Clutch Retainer Bushing (Steel)	28.22 - 28.26	1.111 - 1.113
Low Clutch Retainer Bushing (Brass)	30.01 - 30.03	1.181 - 1.182

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Air Pressure Test

The clutches may be tested by applying air pressure to their respective passages using Air Pressure Test Plate 9741. The valve body and oil filter must be removed and Air Pressure Test Plate 9741 installed. To make air pressure tests, proceed as follows:

NOTE: The compressed air supply must be free of all dirt and moisture. Use a pressure of 30 psi.
Remove the oil pan and the valve body. Install the Test Plate, part #9741 and tighten the bolts to 50 in. lbs. When your testing is finished install valve body and tighten bolts to 50 in. lbs. Install the oil pan bolts and tighten to 50 in. lbs. and fill transmission.

Overdrive Clutch
Apply air pressure to the overdrive clutch feed hole located on the test plate marked OD and watch for the push/pull piston to move forward. The piston should return to its starting position when the air pressure is removed.

Reverse Clutch
Apply air pressure to the reverse clutch feed hole located on the test plate marked REV and watch for the push/pull piston to move rearward. The piston should return to its starting position when the air pressure is removed.

2/4 Clutch
Apply air pressure to the feed hole located on the test plate marked 2/4 clutch. Look in the area where the 2/4 piston contacts the first separator plate and watch carefully for the 2/4 piston to move rearward. The piston should return to its original position after the air pressure is removed.

Low/Reverse Clutch
Apply air pressure to the low/reverse clutch feed hole located on the test plate marked LR. Then, look in the area where the low/reverse piston contacts the first separator plate. Watch carefully for the piston to move forward. The piston should return to its original position after the air pressure is removed.

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Air Pressure Test (continued)

Underdrive Clutch

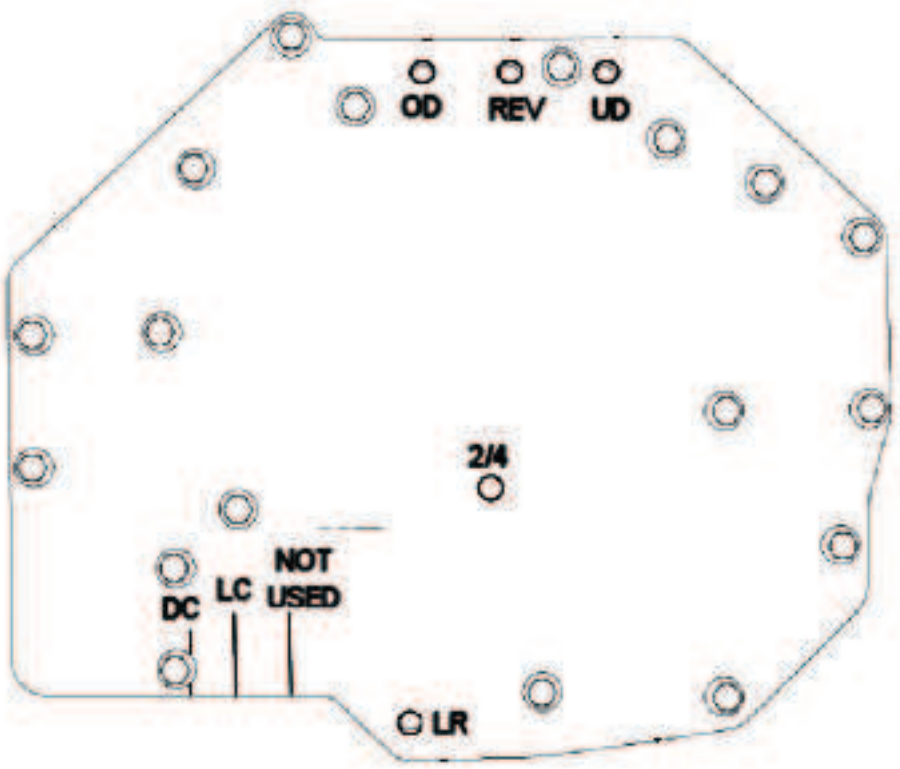
Because this clutch piston cannot be seen, its operation is checked by function. Air pressure is applied to the feed hole located on the test plate marked UD. This locks the output shaft. Use a piece of rubber hose wrapped around the input shaft and a pair of clamp-on pliers to turn the input shaft. Next apply air pressure to the underdrive clutch. The input shaft should not rotate with hand torque. Release the air pressure and confirm that the input shaft will rotate.

Direct Clutch

Apply air pressure to the feed hole located on the test plate marked DC, listen for an audible thud.

Low Clutch

Apply air pressure to the feed hole located on the test plate marked LC, listen for an audible thud.



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45RFE

Input Clutch Retainer Kit

When using input clutch retainer kit 68009648AA (or later) in 1999-2007 MY 45RFE or 545RFE transmissions, you MUST ALSO replace the OD clutch discs with the latest friction material. Order input clutch kit 05013090AF (or later) to get the latest OD clutch disc material.

Part Numbers:

- 68009648A$

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545RFE

New Filter Kit

If the sump filter is being replaced due to a split in the side of the filter along the crimp, this Tech Tip applies.

It has been discovered that the 4799662AB cooler return filter allows the torque converter to drainback. When the vehicle is started, the air in the T/C is compressed and after passing through the cooler can be directed to the sump filter.

The compressed air has the ability to split the filter. The cooler filter must be replaced as well as the sump filter. Do not reinstall a 4799662AB filter.

Cooler Filters P.N. 4799662 and 4799662AC are acceptable.

1. If the filter was P.N. 4799662AB replace both filters.
2. If a split sump filter is discovered and the cooler filter was not P.N. 4799662AB, replace the sump filter.

Part Numbers:

- 05013470A$
- 05015267A$

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RFE

Transmission Pump and Pump Cover

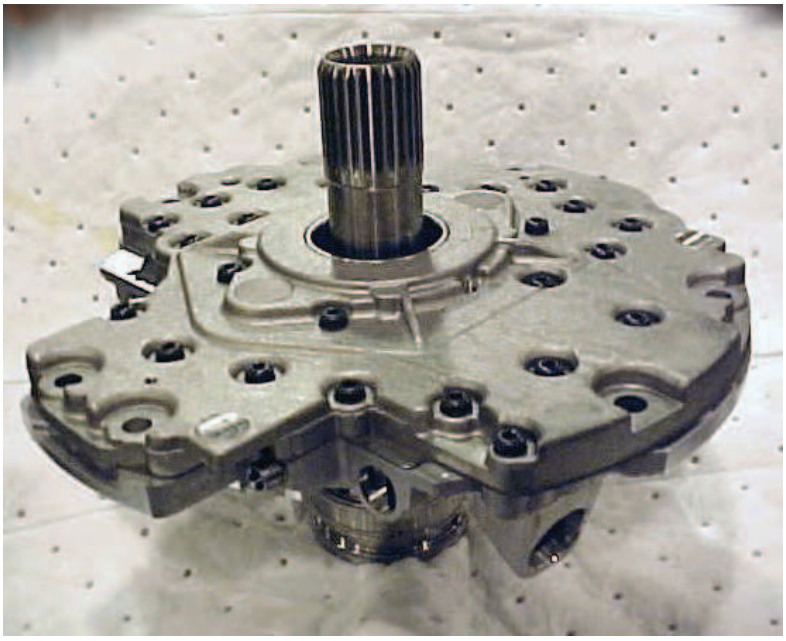
The pump cover is retained by two snap rings (inner and outer). Vehicles which have had the transmission or pump replaced may now contain a revised cover design. The revised cover is steel and is retained by only one (outer) snap ring. The two cover designs are NOT interchangeable. The pump housing was revised to accommodate the new cover design.

If ordering a pump cover for 1999-2006 vehicle which had the transmission or pump replaced after July 2006, verify which design is present and order accordingly. The original (aluminum) cover is 04799609 (service kit 68009609AA). The revised steel cover is service kit 68009859AA.

NOTE: The RFE service pump kit includes a new pump cover. If you are replacing the pump, the cover does NOT need to be ordered separately.

Part Numbers:

- 04799609
- 68004735A$
- 68009609A$
- 68009879A$



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722.6

K1 Clutch Retainer and F1 Sprag Update

There was a change to the K1 Retainer 52108541AA and F1 Overrunning Clutch 52108342AA during the 2005 model year. The height of the F1 ORC was increasing from 22.7mm to 24.7mm. The distance between the snap ring grooves in the K1 Retainer was also increased.

There is a number stamped on the end of the F1 ORC

P.N. 52108342AA – “A 722 270 00 31” which is the 22.7mm max. F1 ORC

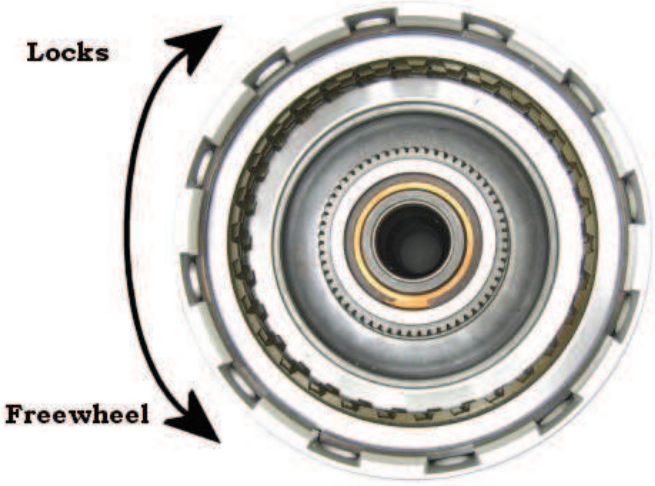
P.N. 52108342AB – “A 722 270 02 31” which is the 24.7mm max. F1 ORC

When replacing the K1 Retainer and the F1 ORC is 22.7mm (A 722 270 00 31), order part number 52108541AA.

If the F1 ORC is 24.7mm (A 722 270 02 31) order part number 52108541AB. If replacing both the K1 Retainer and F1 ORC order the AB revision level of both.

Part Numbers:

- 52108541A$



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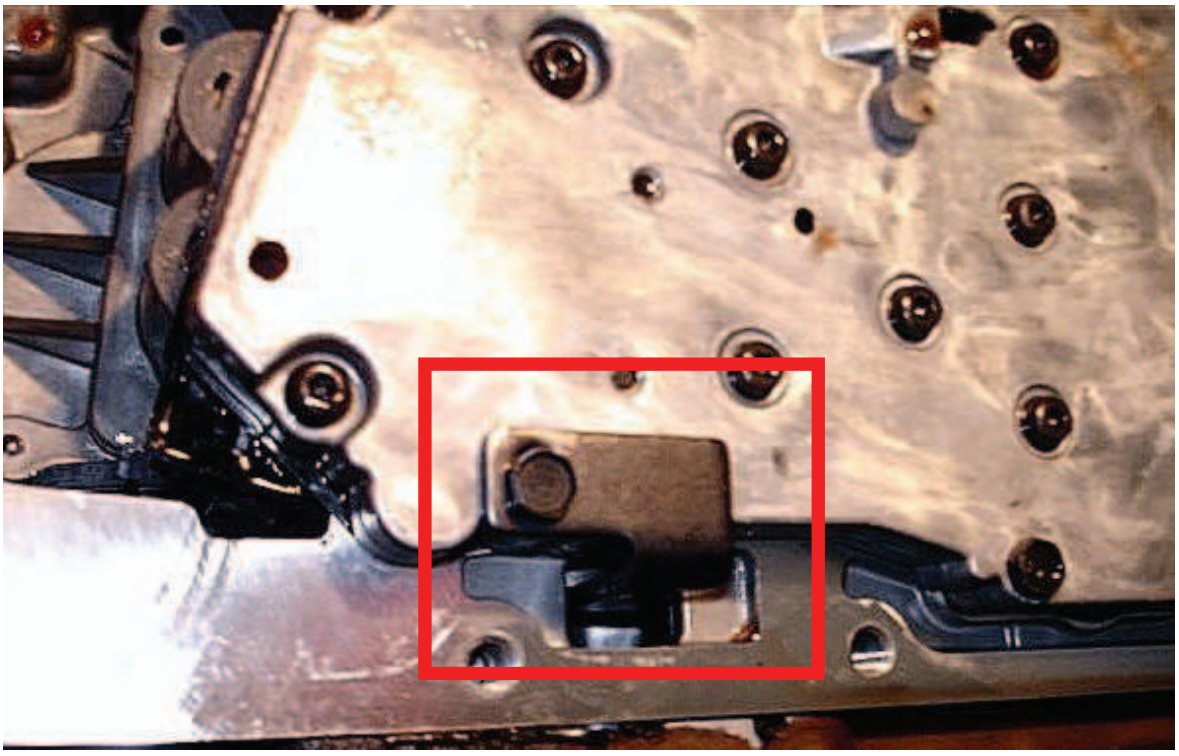
42RLE

Loss of Park

The cup plug used in retaining the park pawl anchor shaft in the 42RLE transmission can fall out of place causing a loss of park due to the anchor shaft falling out.

There was a Safety Recall E14 pertaining to the 2005 and 2006 model year Dodge Durango, Dakota, Charger and Magnum as well as the Jeep Liberty and Wrangler and the Chrysler 300 series vehicles with the 42RLE.

As a safety, during any routine service as well as major repair it is recommended to install the safety bracket that prevents this anchor pin from backing out in the case. The bracket can be purchased from Dodge; OE Part number CBP1E140. Use this when servicing any year 42RLE to assure this does not happen after your repair.



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98-presente para Ford, removedor de rótulas

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- Pilot Bushings & Bearings
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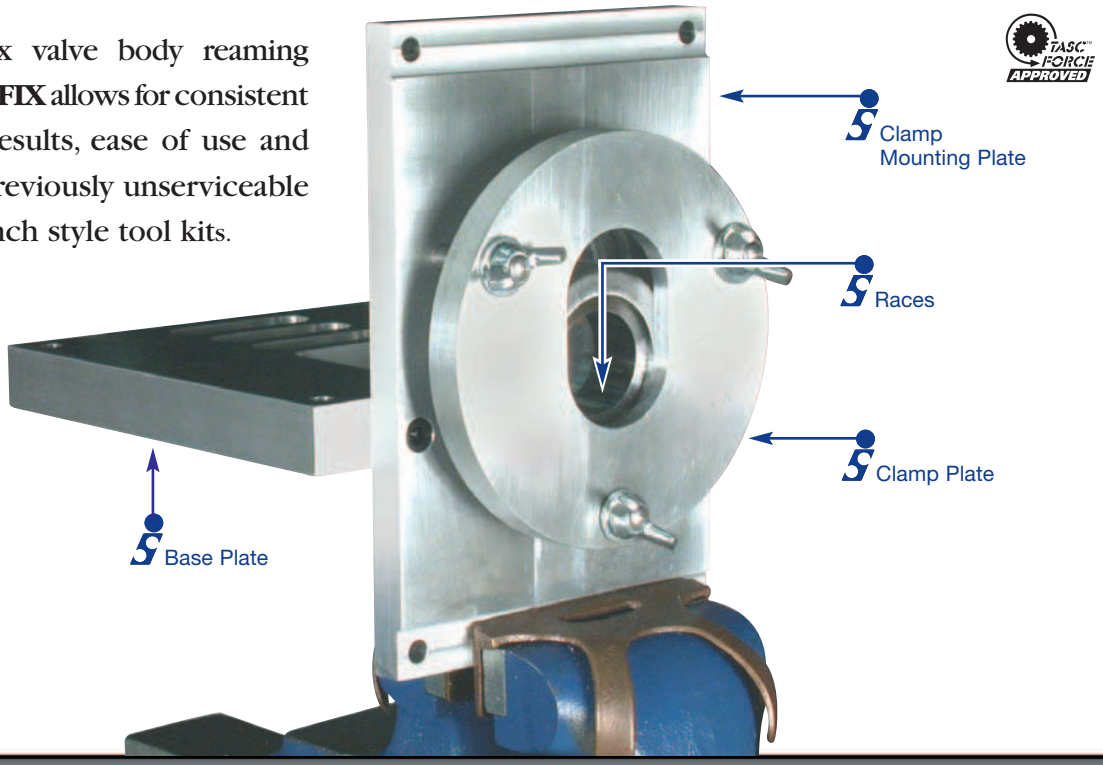

Sonnax Part Number	Associated Kit Part Number	Application
VB-FIX	All "F" Series Tool Kits	Multiple Applications
F-77754-TL4	77754-03K, -04K, TCC Regulator Valve Kits	4L60-E
F-77754-SERV	77754-03K, -04K (GM SERV), TCC Regulator Valve Kits	4L60-E
F-34200-TL16	34200-16K, Actuator Feed Limit Valve Kit	4L80-E
F-55211-TL	55211-01K, Actuator Feed Limit Valve & Sleeve Kit	5L40-E
F-55211-TL4	55211-04K, TCC Regulator Valve & Sleeve Kit	5L40-E
F-33000-TL	33000-03, TCC Control Valve	4T40-E, 4T45-E
F-84596-TL	84596-02K, Actuator Feed Limit Valve Kit	4T65-E
F-56947J-TL2	56947J-05K, TCC Control Valve Kit	5R55N/W/S
F-56947J-TL15	56947J-15K, TCC Modulator Valve Kit	5R55N/W/S
F-73840-TL	73840-RK, Pressure Regulator Valve Kit	CD4E
F-92835-TL	92835-21, Solenoid Switch Valve	41TE, 42LE, 42RLE, 45RFE, 545RFE
F-22771-TL	22771-02K, Throttle Valve Kit	42-46-47RH/RE, 31-32RH, A727, A904
F-22771A-TL7	22771A-07K, Pressure Regulator Valve Kit	RWD Chrysler, '78 & Up
F-119940-TL3	119940-03K, Main Regulator Valve Kit	VW/Audi 01M, 01N, 01P
F-119940-TL5	119940-05K, Boost Regulator Valve Kit	VW/Audi 01M, 01N, 01P
F-119940-TL6	119940-06K, Solenoid Regulator Valve Kit	VW/Audi 096/097/098, 01M, 01N, 01P
F-119940-TL7	119940-07K, Boost Regulator Valve Kit	VW/Audi 096, 097, 098
F-119940-TL8	119940-08K, Main Regulator Valve Kit	VW/Audi 096, 097, 098

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GEM Codes

DIAGNOSTIC TROUBLE CODE INDEX

DTC	Description
B1342	GEM/CTM Defective
B1483	Brake Pedal Input Circuit Failure
B1485	Brake Pedal Input Circuit Short To Power
B2105	Throttle Position Input Out Of Range Low
B2106	Throttle Position Input Out Of Range High
P0500	VSS Signal Circuit
P1804	4WD High Indicator Open/Short To Gnd
P1806	4WD High Indicator Short To Power
P1808	4WD Low Indicator Open/Short To Gnd
P1810	4WD Low Indicator Short To Power
P1812	4WD Mode Select Switch Open/Short To Gnd
P1815	4WD Mode Select Switch Short To Power
P1820	T/C LO To HI Shift Relay Open/Short To Gnd
P1822	T/C LO To HI Shift Relay Coil Short To Power
P1824	4WD Clutch Relay Circuit Failure
P1826	4WD Clutch Relay Short To Power
P1828	T/C Shift Relay Circuit Failure
P1830	T/C Shift Relay Coil Short To Power
P1836	Front Drive Shaft Speed Sensor Circuit
P1837	Rear Drive Shaft Speed Sensor Circuit
P1838	T/C Shift Motor Circuit Failure
P1846	T/C Contact Plate "A" Open Circuit
P1850	T/C Contact Plate "B" Open Circuit
P1854	T/C Contact Plate "C" Open Circuit
P1858	T/C Contact Plate "D" Open Circuit
P1866	T/C System Concern
P1867	T/C Contact Plate General Circuit Failure
P1874	Hall Effect Sensor Power Circuit Failure
P1875	Hall Effect Sensor Power Circuit Short
P1891	T/C Contact Plate Ground Return Open Circuit

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General Motors

TCCM Codes

DIAGNOSTIC TROUBLE CODE DEFINITIONS

DTC	Description
B0768	Service Indicator Circuit High
B2725	Select Switch Circuit Malfunction
C0300	Rear Speed Sensor Malfunction
C0305	Front Speed Sensor Malfunction
C0308	Motor A/B Circuit Low
C0309	Motor A/B Circuit High
C0310	Motor A/B Circuit Open
C0315	Motor Ground Circuit Open
C0323	Transfer Case Lock Circuit Low
C0324	Transfer Case Lock Circuit High
C0327	Encoder Circuit Malfunction
C0357	Park/Neutral Switch Circuit High
C0362	4L Discrete Output Circuit High
C0367	Front Axle Control Circuit High
C0374	General System Malfunction
C0376	Front/Rear Drive Shaft Speed Mismatch
C0387	Unable To Perform Shift
C0550	ECU Malfunction
C0611	VIN Information Error

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Ford DTC's

P1804, P1806, P1808 and P1810

Indicates that the GEM has encountered a fault in the 4WD indicator system. Check indictor system wiring, connections.
Check circuit # 783 (high range indicator) and circuit #784 (low range indicator) for a battery voltage signal when each indicator is commanded on. You can check for this signal at the GEM C282 connector terminals # 14 (high range indicator) and #10 (low range indicator) or you can check for this signal at the instrument cluster C286 connector at terminals #3 (high range) and #2 (low range).

If you have this signal at the instrument cluster connector, you may have an instrument cluster printed circuit problem or a faulty bulb. If you do not have the signal at the instrument cluster connector but you have a signal at the GEM connector, a circuit test would be recommended. If you are not getting a signal coming out of the GEM, check the GEM connector, terminals, power and grounds. You may have a faulty GEM module.

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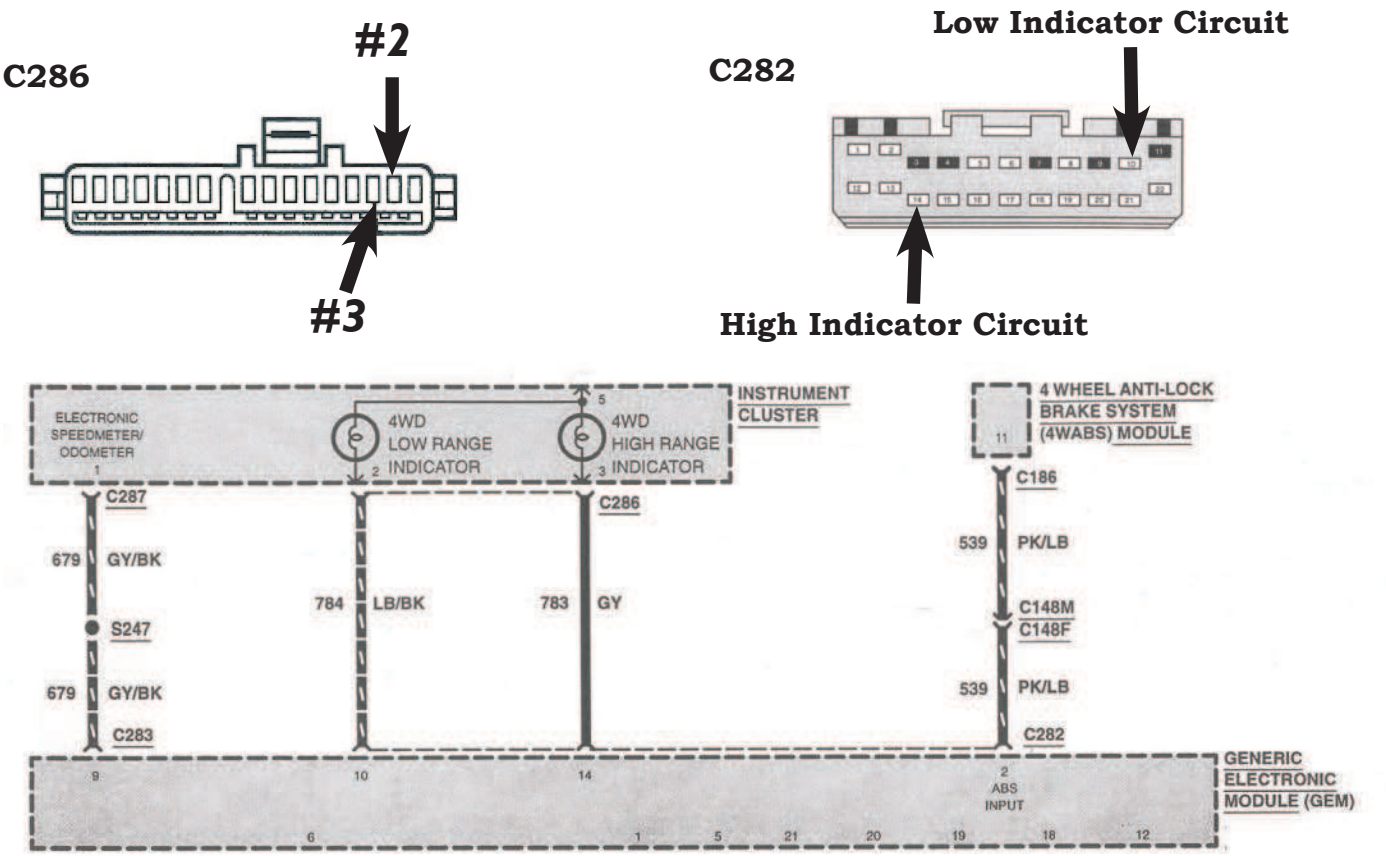

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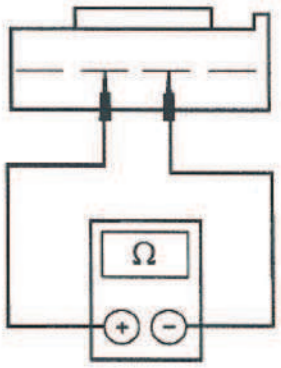
Ford DTC's

P1812 and P1815

Indicates that the GEM has encountered a fault in the mode switch circuits. Check mode switch circuit pins 2 and 3, wiring, and connections. Mode switch failures are common, replacing the switch usually repairs the problem.



Switch Position	Ohms
2WD	3700-4100
4WD High	1050-1150
4WD Low	340-380

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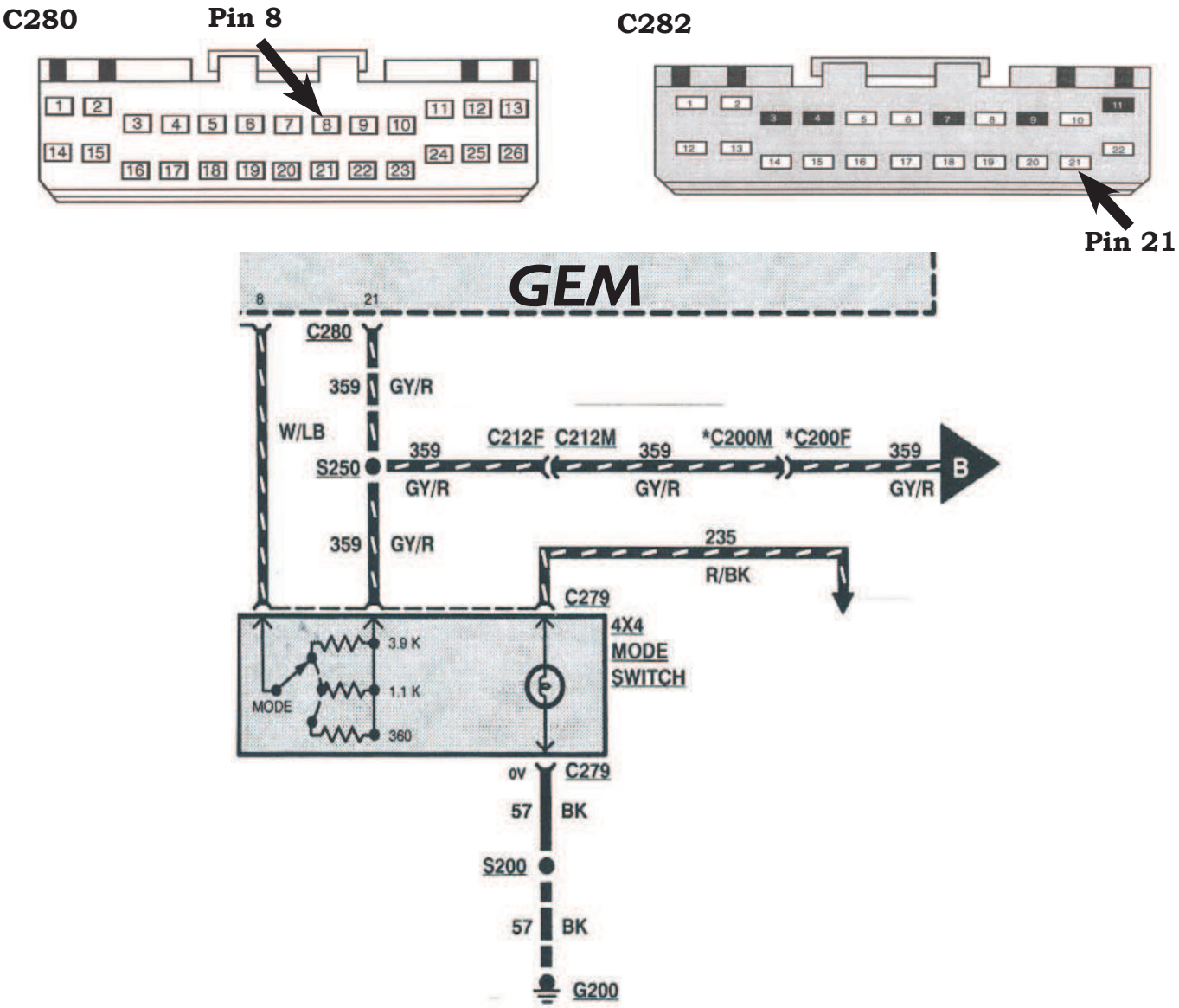
Ford DTC's

P1812 and P1815 (continued)

You can check the mode switch circuit by back probing into the GEM C280 connector terminal # 8 and the C282 connector terminal #21 and check the resistance of the mode switch and circuits. Refer to mode switch resistance chart for the correct resistance in each range.

If the resistance is within specifications, you may have an intermittent problem in the circuits, the mode switch or you may have a faulty GEM module. If the resistance is not within specifications, you can check the mode switch itself by probing into the mode switch connector terminals #2 & #3. Replace the mode switch if it is not within the specified ranges. If the mode switch is within specifications, a circuit check would be recommended.



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Ford DTC's

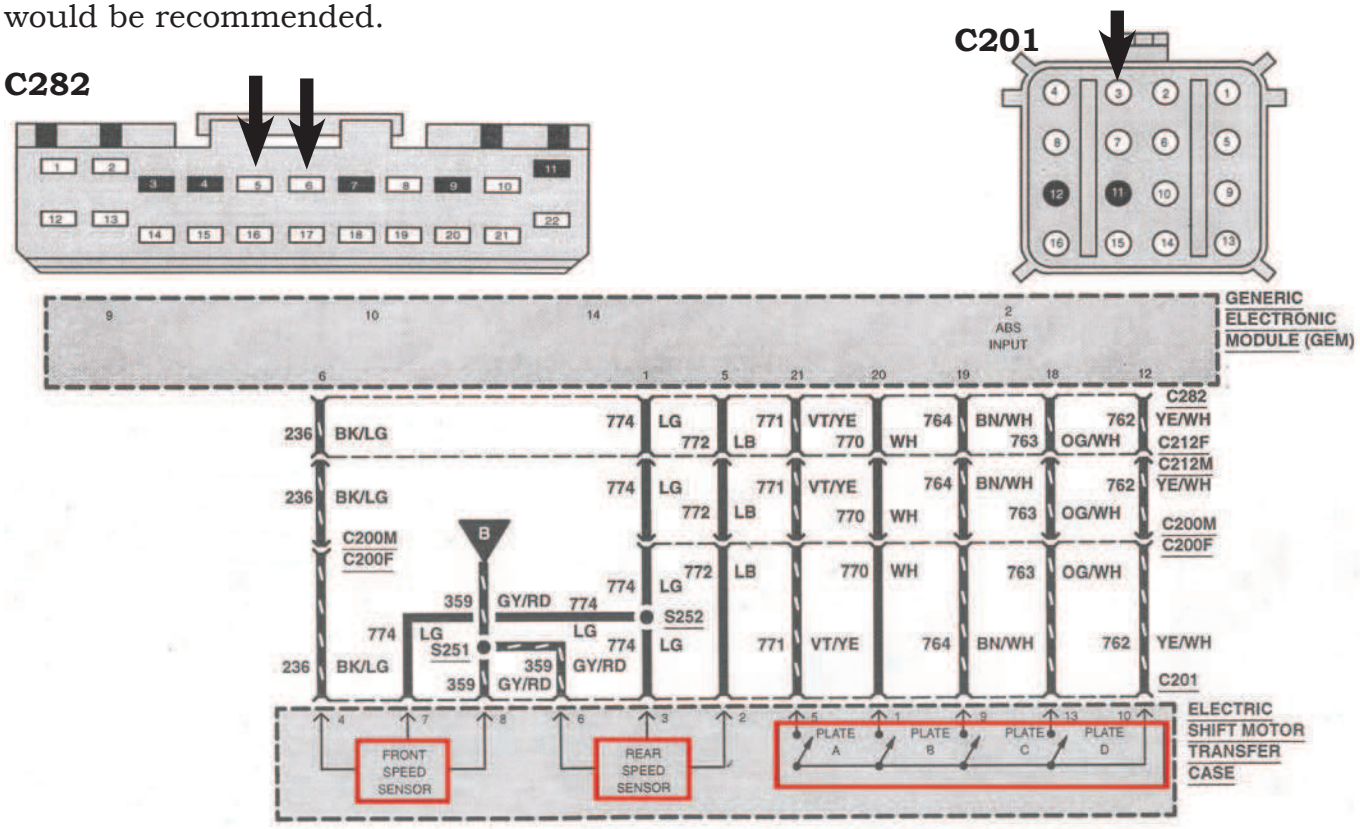
P1836, P1837, P1874 and P1875

Indicates that the GEM has encountered a fault in the drive shaft speed sensor circuits or hall effect power feed circuits.

Check the front and rear speed sensor signals by back probing into GEM connector C282 terminals # 5 (rear speed sensor) and #6 (front speed sensor). If the signals are good, you may have an intermittent problem or a faulty GEM module. If you have an erratic speed sensor signal, a circuit test would be recommended. If your circuits check out okay, suspect a faulty speed sensor. If you have no speed sensor signal at all, start by checking the speed sensor power circuit (774) at GEM C282 connector terminal #1.

If you have battery voltage at terminal #1, the next step is to check for battery voltage at the transfer case connector C201 terminals # 3 (rear speed sensor) and #7 (front speed sensor). If you do not have battery voltage at the C201 connector, a circuit test would be recommended. If you have battery voltage at the C201 connector, the next step is to check the sensor ground circuit (359) at the C201 connector terminals #6 (rear speed sensor) and #8 (front speed sensor).

You can check circuit #359 by performing a continuity check between the C201 connector and the GEM C280 connector terminal #21. If you have continuity, suspect a faulty speed sensor. If you do not have continuity or excessive resistance, a circuit check would be recommended.



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Ford DTC's

P1838

Indicates that the GEM has encountered a circuit problem in the motor circuit.

You can perform checks on the motor circuits by performing continuity checks on each of the circuits. The first step would be to check the motor circuits from the transfer case shift relay C278 connector terminals #7 & #10 to the encoder motor C201 connector terminals # 14 & #15.
The next step is to check the continuity of transfer case relay control circuit from the transfer case relay C278 connector terminal #8 to the GEM C282 connector terminal #16 and from the transfer case relay C278 connector terminal # 9 to the GEM C282 connector terminal #17. If all circuits check out okay, suspect a transfer case relay or encoder motor failure. Connection problems and encoder motor failures are common.

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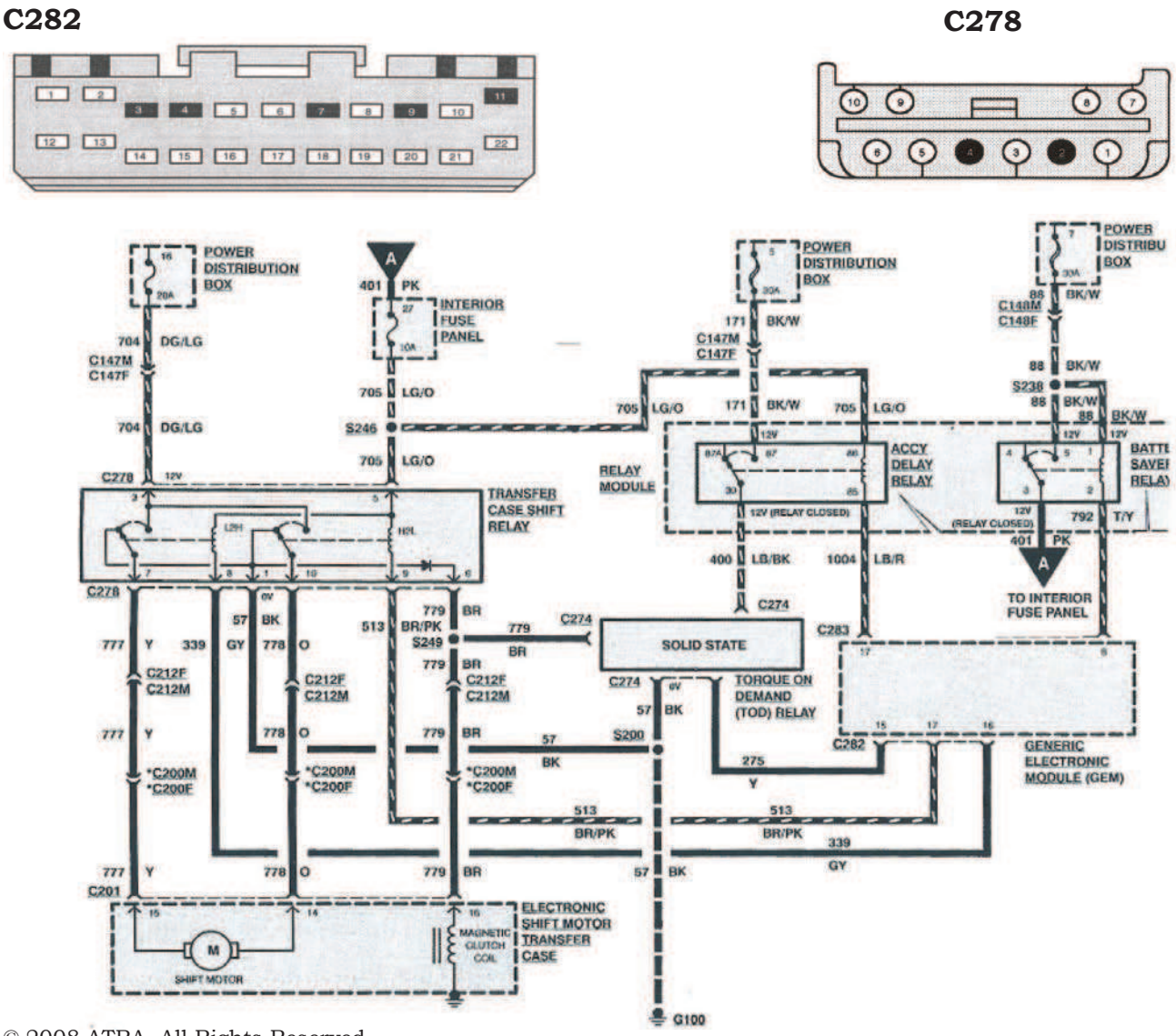

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Ford DTC's

P1846, P1850, P1854, P1858, P1867 and P1891

Indicates that the GEM has encountered a fault in the encoder plate circuits. You can check the encoder plate circuits by monitoring the encoder plate PID inputs to the GEM with your scanner.

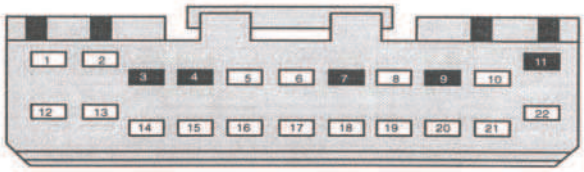
The PID's should match the 4wd encoder plate PID chart for your specific vehicle application. If the PID's do match the 4wd encoder plate PID chart, you may have an intermittent circuit problem or a faulty GEM module.

If the PID's do not match your specific 4wd encoder plate PID chart, a circuit test of the encoder circuits between the GEM C282 connector and the transfer case C201 connector is recommended. If the circuits check out good, suspect a faulty encoder motor assembly. Connection problems and encoder motor failures are common.

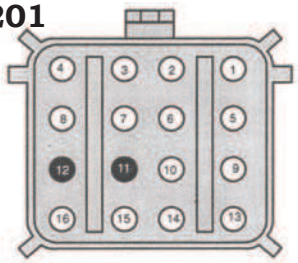
4WD MODE SWITCH PID OUTPUT

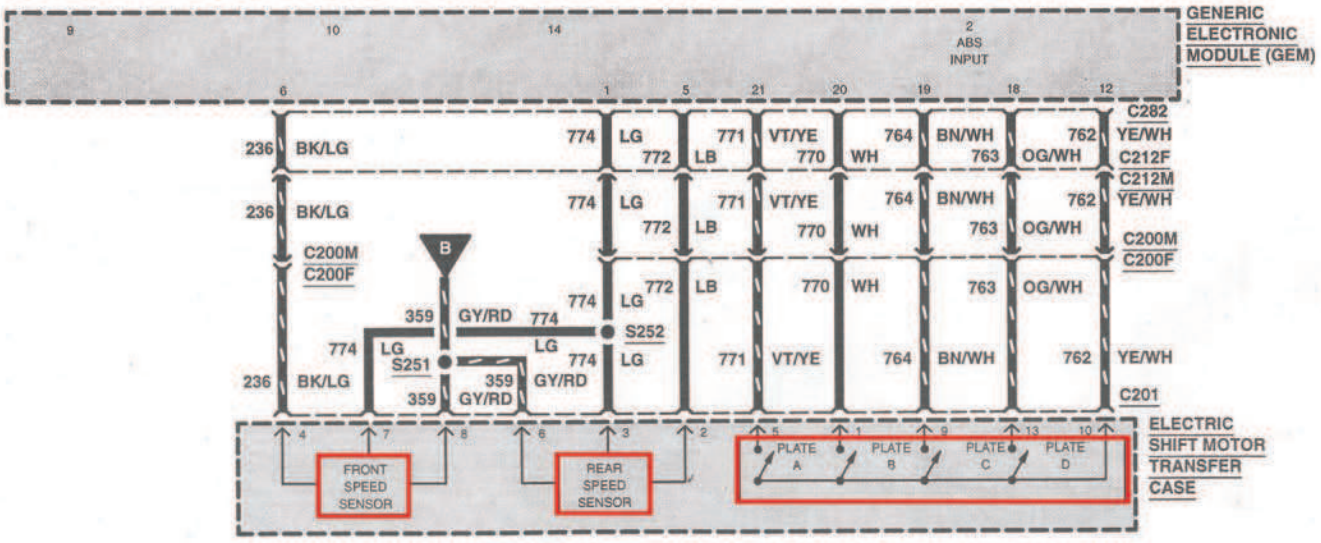
CONTACT PLATE	2H	4H
PLATE_A	CLOSED	OPEN
PLATE_B	OPEN	CLOSED
PLATE_C	CLOSED	CLOSED
PLATE_D	CLOSED	OPEN

C282



C201





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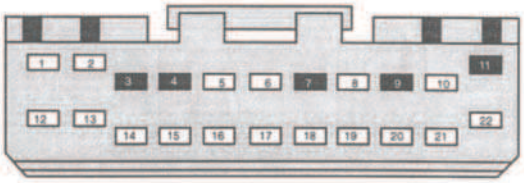
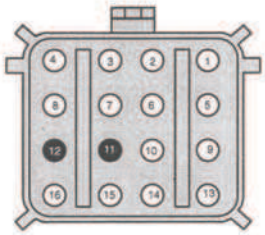
GEM and Transfer Case Connector ID's



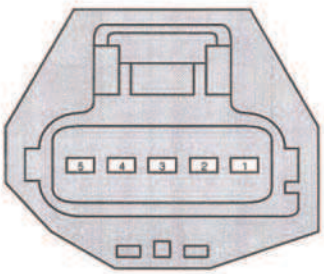
C282
GENERIC ELECTRONIC MODULE (GEM)

PIN	CIRCUIT	CIRCUIT FUNCTION
1	774 (LG)	Speed Sensor Power
2	539 (PK/LB)	Anti-Lock Brake Input
3	–	NOT USED
4	–	NOT USED
5	772 (LB)	Rear Speed Sensor Input
6	236 (BK/LG)	Front Speed Sensor Input
7	–	NOT USED
8	465 (WH/LB)	4WD Mode Switch Input
9	–	NOT USED
10	784 (LB/BK)	4WD Low Range Indicator Control
11	–	NOT USED
12	762 (YE/WH)	4WD Contact Plate Signal Return
13	810 (RD/LG)	Brake Pedal Position Input
14	783 (GY)	4x4 High Range Indicator Control
15	275 (YE)	Torque On Demand Clutch Relay Output
16	339 (GY)	4 Low to 4 High (L2H Relay Control)
17	513 (BN/PK)	4 High to 4 Low (H2L Relay Control)
18	763 (OG/WH)	Contact Plate D
19	764 (BN/WH)	Contact Plate C
20	770 (WH)	Contact Plate B
21	771 (VT/YE)	Contact Plate A
22	463 (RD/WH)	Neutral Sense Input



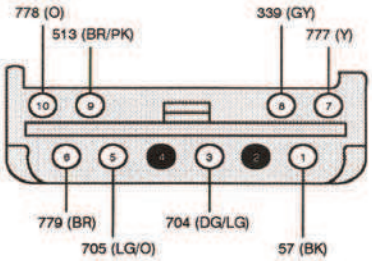
C201 (BLACK)
ELECTRIC SHIFT MOTOR TRANSFER CASE

PIN	CIRCUIT	CIRCUIT FUNCTION
1	770 (WH)	Motor Position #4
2	772 (LB)	Rear Speed Sensor Coil
3	774 (LG)	Speed Sensor Power
4	236 (BK/LG)	Front Speed Sensor Coil
5	771 (VT/YE)	Motor Position #5
6	359 (GY/RD)	Sensor Signal Return
7	774 (LG)	Speed Sensor Power
8	359 (GY/YE)	Speed Sensor Return
9	764 (BN/WH)	Motor Position #3
10	762 (YE/WH)	Motor Position #1
11	–	NOT USED
12	–	NOT USED
13	763 (OG/WH)	Motor Position #2
14	778 (OG)	Shift Relay to Motor H2L
15	777 (YE)	Shift Relay to Motor L2H
16	779 (BN)	Shift Relay to Electronic Clutch



C274
TORQUE ON DEMAND (TOD) RELAY

PIN	CIRCUIT	CIRCUIT FUNCTION
1	400 (LB/BK)	Safety Relay Load Terminal to Window Regulator Switch Feed
2	779 (BN)	Electrical Shift 4X4 Module to Electric Clutch
3	275 (YE)	Switch on to Relay
4	57 (BK)	Ground
5	400 (LB/BK)	Safety Relay Load Terminal to Window Regulator Switch Feed



C278 (BLACK)
TRANSFER CASE SHIFT RELAY

PIN	CIRCUIT	CIRCUIT FUNCTION
1	57 (BK)	Ground
2	—	NOT USED
3	704 (DG/LG)	Power (Hot at All Times)
4	—	NOT USED
5	705 (LG/O)	Power (Hot at All Times)
6	779 (BR)	Shift Relay to Electronic Clutch
7	777 (Y)	Shift Relay to Motor L2H
8	339 (GY)	Relay Coil to GEM (L2H)
9	513 (BR/PK)	Relay Coil to GEM (H2L)
10	778 (O)	Shift Relay to Motor H2L

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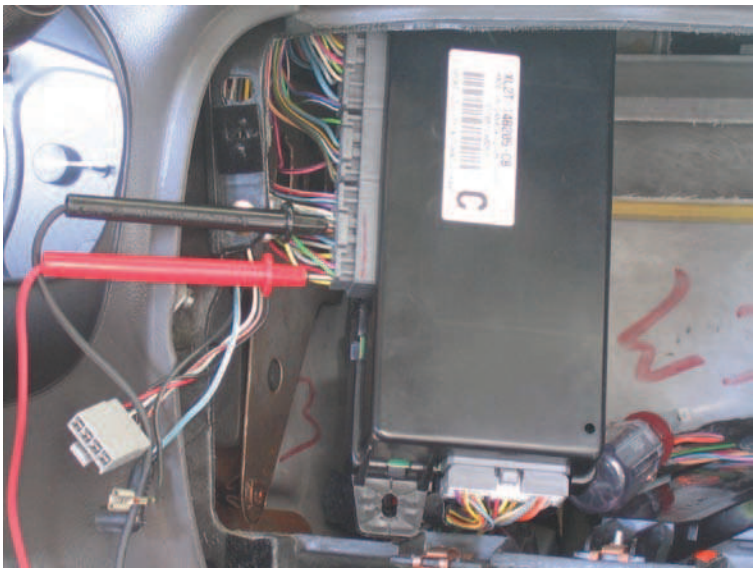
Ease of Diagnosis

Pinpoint tests on the GEM system can easily be accomplished at the encoder Motor connector terminals or at the GEM connector it self. Refer to the connector terminal ID on the previous page.

GEM modules are typically located in two different areas depending on the model.

F-Series vehicles are location on top of the fuse block on the left under side of the dash. Ford small SUV's are located behind the stereo.



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GM DTC's

B2725

Indicates the TCCM has encountered an intermittent fault in the transfer case control switch circuits. Check for proper operation of the control switch by performing the following tests.

- Verify proper voltage to switch
- Check resistance of all switch states
- Check for short to voltage in switch signal circuit
- Check for open/short to ground in signal circuit
- Check for short to 8 volt circuit
- Verify 8 volt regulated circuit is at specified voltage
- Check 8 volt regulated circuit for short to voltage
- Check 8 volt regulated circuit for short/open to ground

You can check the transfer case control switch circuits by first verifying that the transfer case control switch is getting the correct voltage to the switch. The NVG233 system uses a 12 volt reference voltage at terminal # C of the transfer case control switch C2 connector.

The NVG236 & 246 systems use an 8 volt reference voltage to its control switch system at terminal #A of the transfer case control switch C1 connector. Refer to the 4x4 system wiring schematic for your specific vehicle. If you do not have the correct reference voltage at the control switch, a circuit check would be recommended. If you have the correct reference voltage to the control switch, the next step is to check the resistance of the transfer case control switch.

This can be done by checking the resistance across the C1 connector terminals # A & #B. Resistance should be as specified. G.M. has not released the specifications for the NVG233 control switch, but the specifications for the NVG236 and 246 controls switch are as follows:

Auto 4WD	=	61.7-68.1 ohms
4HI	=	656-760 ohms
2HI	=	1.50-1.53 K ohms
4LO	=	2.32-2.37 K ohms
Neutral	=	1.015-1.035 K ohms

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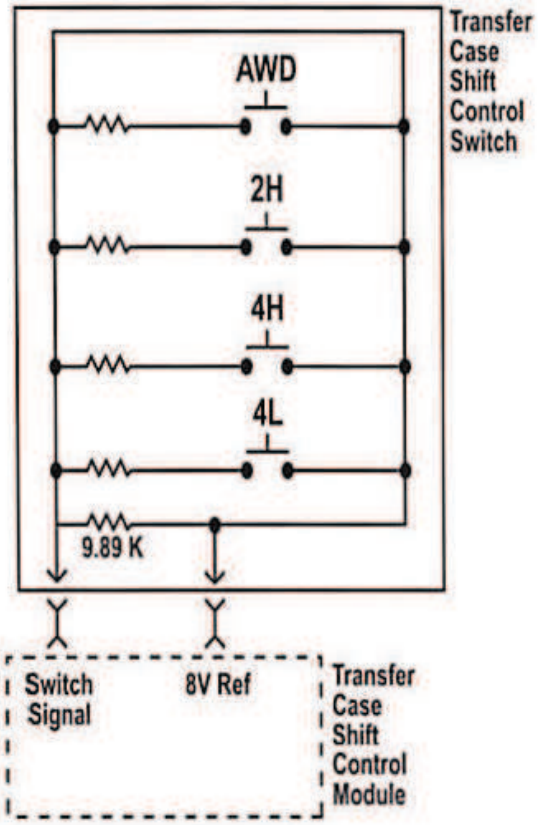
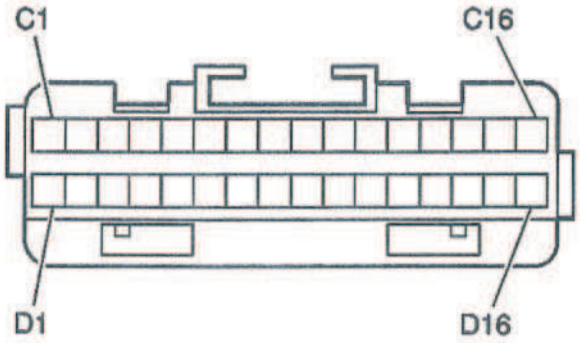
GM DTC's

B2725 (continued)

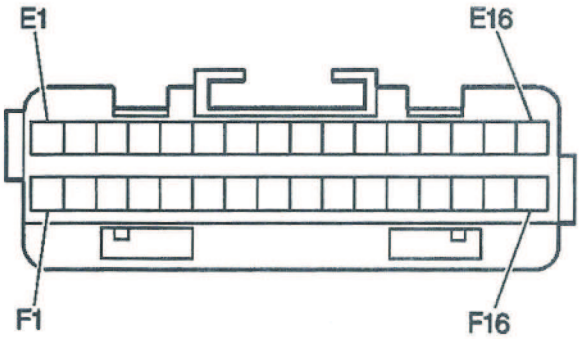
Use the following connector illustrations to diagnose your concern.



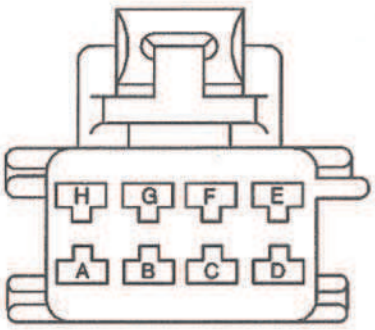
NVG 233 TCCM Connector



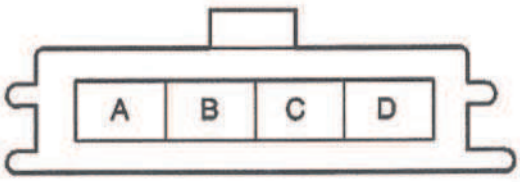
NVG 236/246 TCCM Connector



NVG 236/246 Selector Switch C1



NVG 236/246 Selector Switch C2



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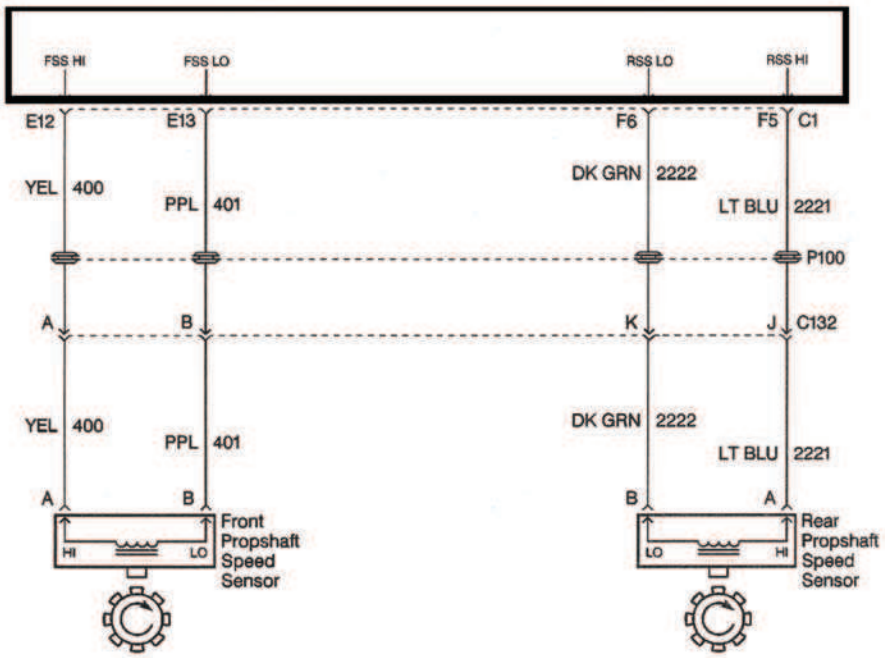
GM DTC's

C0300 and C0305

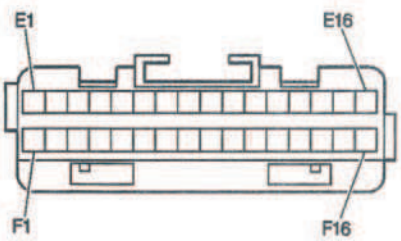
Indicates that the TCCM has received an erratic rear or front output shaft speed sensor signal. Check the front and rear output shaft speed sensor signals at the TCCM. Check wiring, connections, speed sensors. Check connector for oil contamination.

You can check the speed sensor circuits by back probing into the TCCM C1 connector terminals #E12 and #E13 (front speed sensor), terminals # F5 and #F6 (rear speed sensor) to monitor each of the speed sensor signals. The speed sensors should be producing a 3.25 VAC signal at approximately 5 mph and climb as speed increases. If the signal is correct, you may have an intermittent circuit problem or a faulty TCCM. If the speed sensor signal is erratic or there is no signal at the TCCM, a circuit test would be recommended. If the circuits check out okay, check the suspected speed sensor resistance. The resistance should be between 1300-2700 ohms.

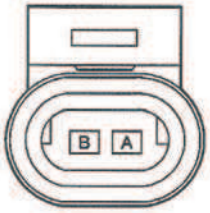
If the resistance is within specifications or your codes are intermittent, suspect connection problems.



236 and 246 TCCM Connector C1



Speed Sensor Connector



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GM DTC's

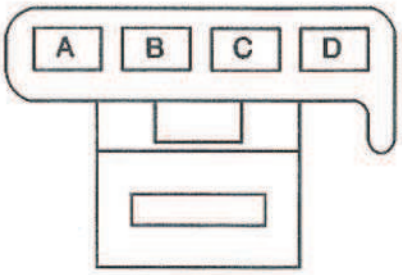
C0308, C0309 and C0310

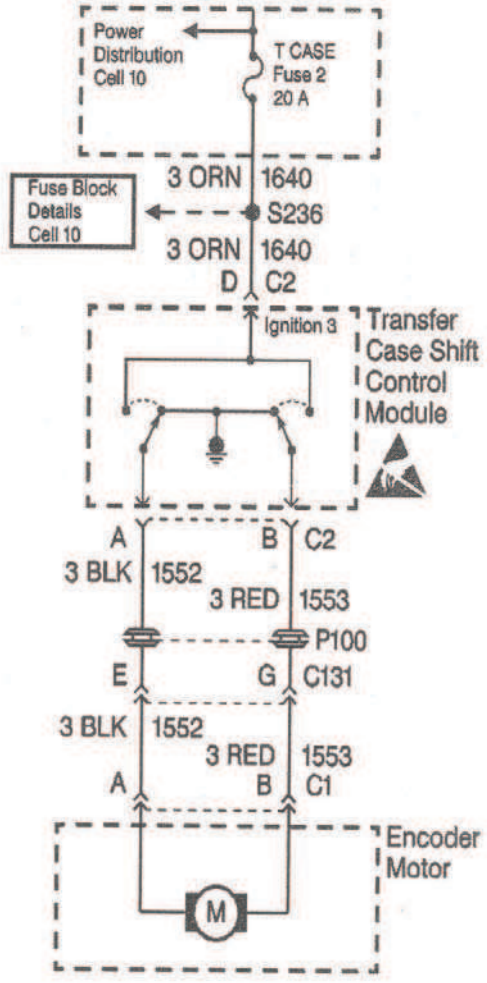
Indicates that the TCCM has encountered a problem in the A/B motor circuit. Check the A/B motor circuit for continuity. Check wiring, harnesses and connections. Connections and encoder/motor faults are common.

You can check the A/B motor circuit by back-probing into the TCCM C2 connector terminals # A & B and performing a continuity test through the motor circuit. The resistance of the A/B motor circuit should be 5-35 ohms. If the resistance at the TCCM C2 connector is correct, suspect a faulty TCCM. If the resistance is not correct, a circuit test between the TCCM C2 connector terminals #A & #B to the encoder motor C1 connector terminals #A & #B would be recommended.

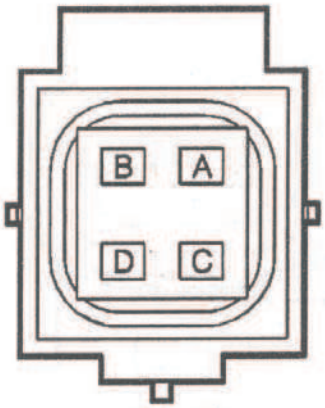
If the circuits check out okay, check the resistance of the motor at encoder motor C1 connector. Resistance should be between 5-35 ohms. If the resistance is not within specifications, replace the encoder motor assembly.

TCCM C2 Connector





Encoder Motor Circuit C1



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GM DTC's

C0323 and C0324

Indicate that the TCCM has encountered a problem in the transfer case motor lock circuit. Check lock circuit wiring, harness & connections. Encoder/motor problems are common. This is typically an encoder motor failure. Make sure all of your wiring is check before replacing the motor.

You can check the encoder lock circuit by first checking for battery voltage at the encoder motor C1 connector terminal #C. The next step is to check the resistance of the encoder lock circuit, inside the encoder motor assembly. Perform a continuity check between encoder motor C1 connector terminals #C & #D. The resistance should be between 20-80 ohms. If the resistance is not within specification, replace the encoder motor assembly. If the lock circuit resistance is within specification, a circuit check of the lock control circuit would be recommended.

The lock control circuit test can be performed between the encoder motor C1 connector terminal #D and the TCCM C1 connector terminal #E1. If the circuit tests are within specifications, suspect a faulty TCCM. Remember...encoder motor connections and internal problems are common.

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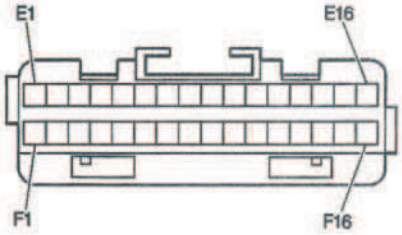
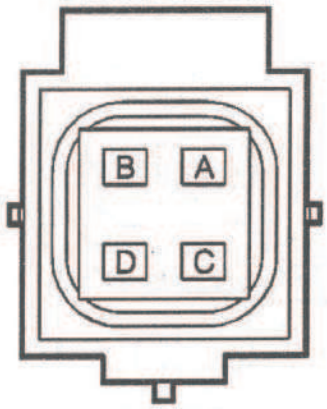
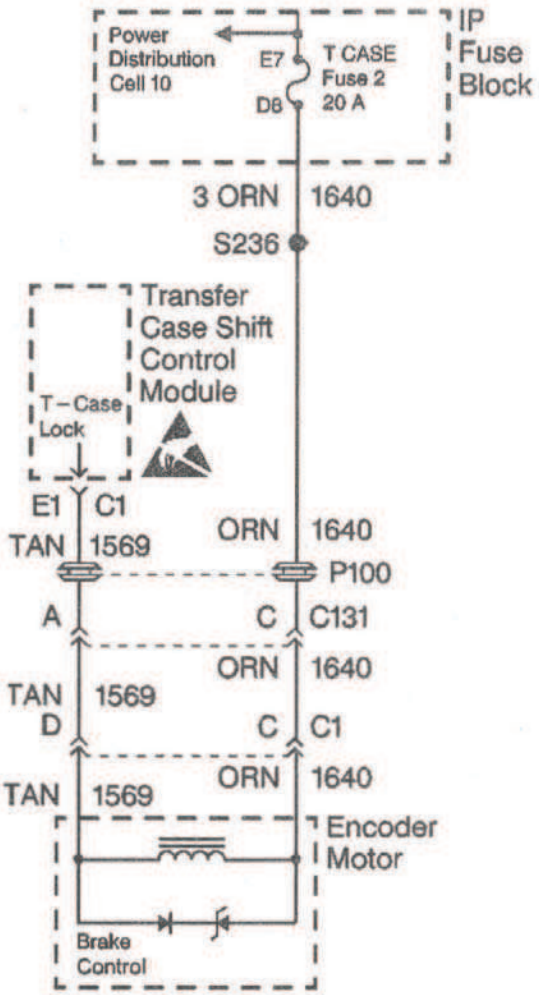
236 and 246 TCCM Connector C1



Encoder Motor Circuit C1





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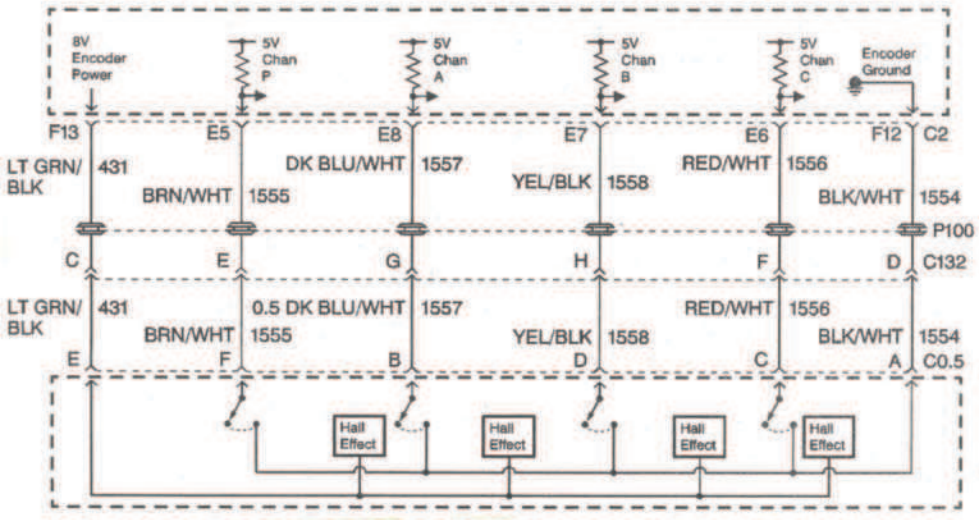
New Venture I36/233/236/246

C0327

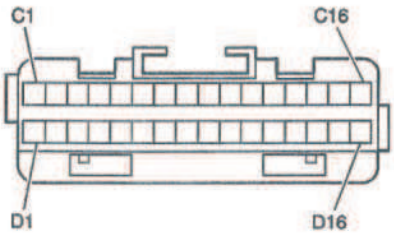
Is usually a connection problem at the encoder/motor or an internal encoder circuit problem. Replacing the encoder/motor will usually repair this code.

You can check the encoder circuits by performing circuit tests (continuity test) between the TCCM connector and the encoder motor connector. The next step is to verify that the encoder motor is receiving an 8 volt reference signal at the #E terminal of the encoder motor connector. If you have the 8v reference signal at terminal #E, the next step is to check the encoder ground circuit from the encoder connector terminal #A to the TCCM connector terminal #F12.

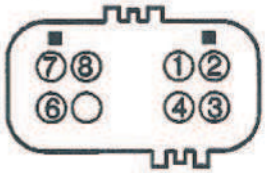
If you have good power and ground circuits and the encoder circuits check out okay, replace the encoder motor assembly. Encoder motor assembly problems are common.



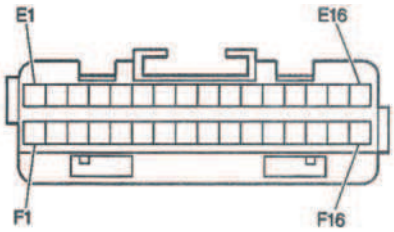
233 TCCM Connector



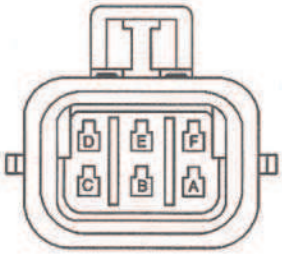
233 Encoder Connector



236/246 TCCM Connector



236/246 Encoder Connector



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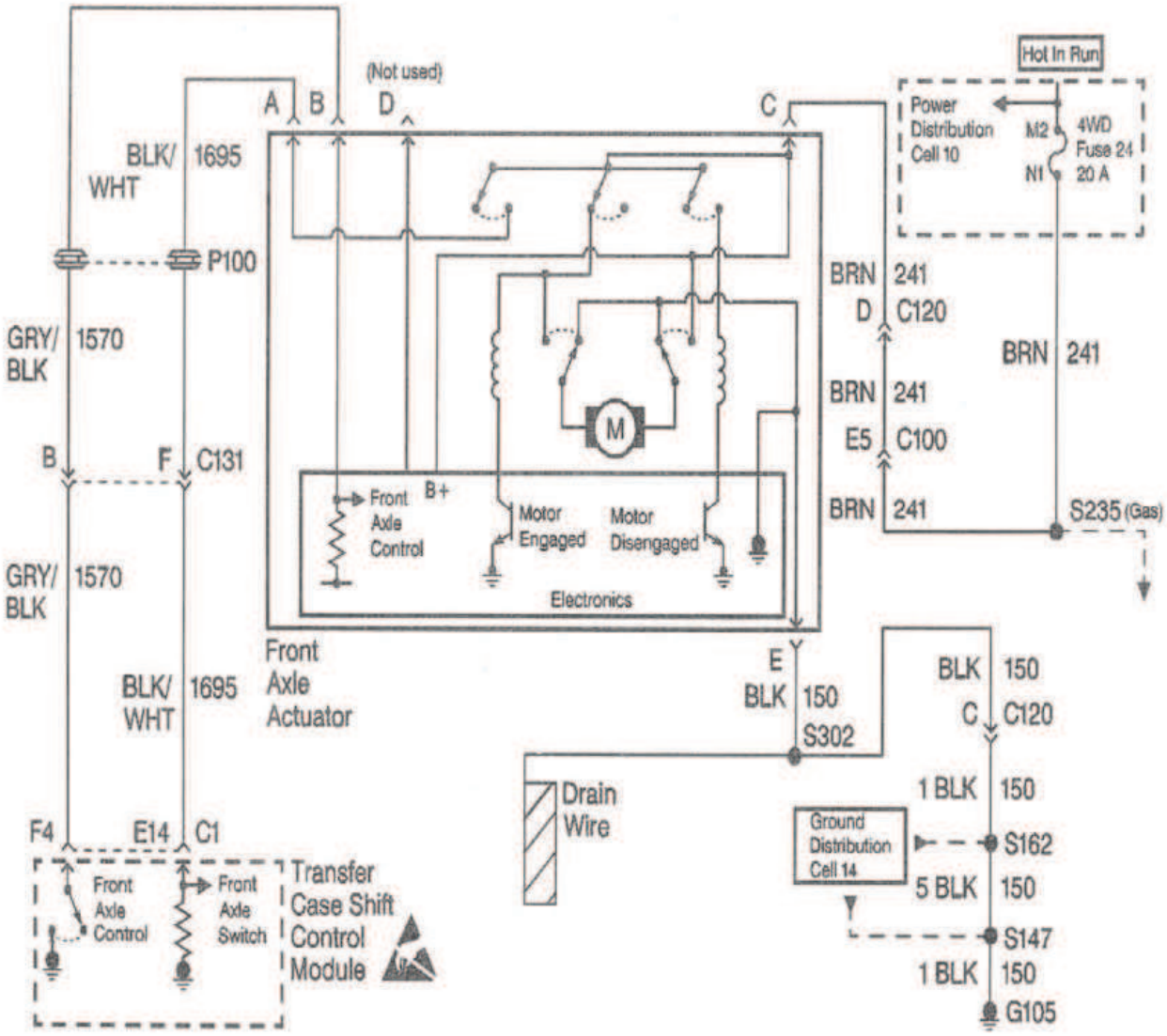
New Venture I36/233/236/246

C0367

Code C0367 indicated the TCCM has encountered a problem in the front axle actuator circuit. Check the front axle actuator harness, wiring, and connections. Connections and front axle actuator concerns are common.



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New Venture I36/233/236/246

C0367 (continued)

On the NVG246 system, check for battery voltage at the front axle actuator connector terminal #C.

The next step is to check the ground circuit on terminal #E of the actuator connector. Once the power and ground circuits have been verified, the next step is to perform a circuit test on the front axle switch and the front axle control circuits from the TCCM C1 connector terminal #E14 and the front axle actuator connector terminal #A (front axle switch) and between TCCM C1 connector terminal #F4 and the front axle actuator connector terminal #B (front axle control). On the NVG236 system, check for battery voltage at terminal #A of the 4wd indicator switch and the front axle clutch solenoid.

The next step is to perform a circuit test from the #B terminal of the 4wd indicator switch connector to the TCCM C1 connector terminal #E14 and from the #B terminal of the front axle clutch solenoid to the TCCM C1 connector terminal #F4. If the circuits check out okay, suspect an intermittent connection problem or a faulty front axle actuator. G.M recommends replacing the front axle actuator to correct this concern.

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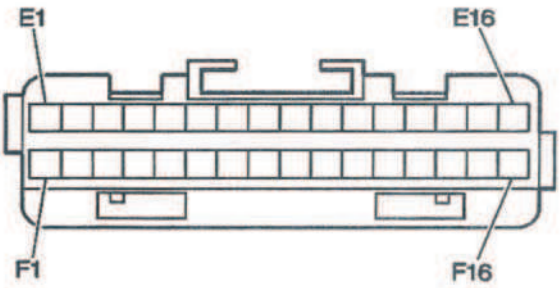
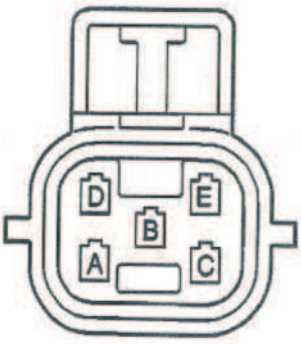
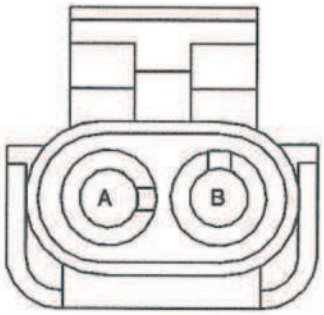
236/246 TCCM Connector C1



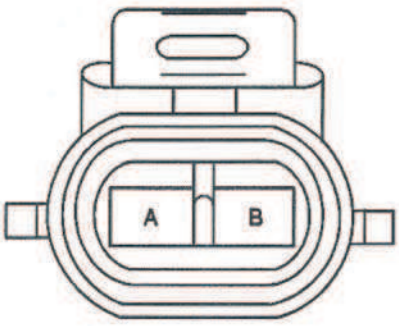
246 Front Axle Connector



236 Front Axle Connector



236 Front Axle Connector



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New Venture I36/233/236/246

C0374 and C0387

These codes are usually set because the TCCM was unable to perform the shift as requested. This is usually a mechanical problem in the transfer case or the encoder motor problem.

Remove the encoder motor and attempt to shift the transfer case manually. If the transfer case can be manually shift through all ranges, replace the encoder motor assembly. If the transfer case cannot be manually shift through all ranges, remove, disassemble and repair the transfer case.

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New Venture 136/233/236/246

C0550 and C0611

These codes are set because the TCCM suspects an internal failure (C0550) or the TCCM has a VIN recognition problem.

After checking the power and ground circuits going to the TCCM (refer to the TCCM connector terminal identification for your specific vehicle), if code C0550 returns, G.M. recommends replacing the TCCM.

If code C0611 returns, the VIN must be entered into the TCCM for your specific vehicle. If C0611 returns, G.M. recommends replacing the TCCM and re-entering the vehicle's VIN number.

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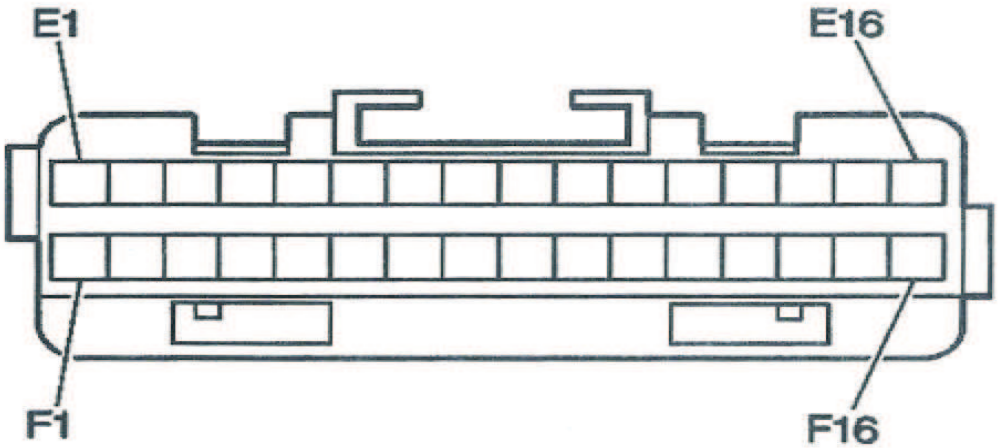
236/246 TCCM Connector C1



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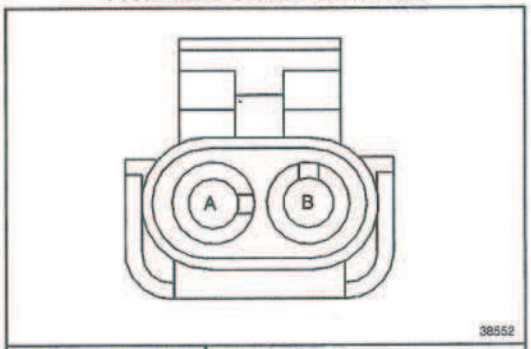
New Venture 233

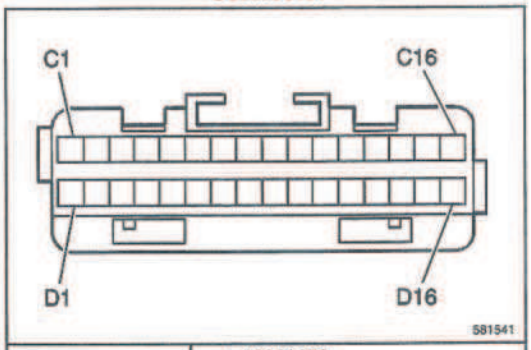
4X4 System Connector Terminal Identification

Front Axle Switch Connector



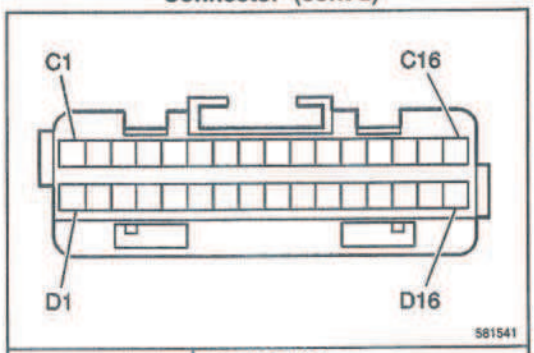
Connector Part Information	• 12103584 • 2 Way F Weather Pack Connector (BRN)		
Pin	Wire Color	Circuit No.	Function
A	BRN	241	Fuse Output - Ignition 3 - Type III Fuse
B	BLK/WHT	1695	Four Wheel Drive Front Wheel Lock Telltale

Transfer Case Shift Control Module Connector



Connector Part Information	• 12041476 • 32 Way F Micro-Pack 100 Series (BLU)		
Pin	Wire Color	Circuit No.	Function
C1	GRY/BLK	1694	4WD Drive Switch Signal - Low
C2	—	—	Not Used
C3	DK GRN/WHT	1559	4 "LO" Select Switch Output
C4	DK GRN/WHT	1562	2 'HI' Select Switch Output
C5	GRA/BLK	1564	4 "HI" Select Switch Output
C6	ORN	40	Fuse Output - Battery

Transfer Case Shift Control Module Connector (cont'd)



Connector Part Information	• 12041476 • 32 Way F Micro-Pack 100 Series (BLU)		
Pin	Wire Color	Circuit No.	Function
C7	—	—	Not Used
C8	BRN	241	Fuse Output - Ignition 3
C9	BLK/WHT	1554	Transfer Case Encoder Signal Return
C10	BLK	1050	Ground
C11	LT GRN/BLK	1563	2 'HI' Indicator Lamp Output
C12	TAN/BLK	1566	4 'HI' Indicator Lamp Output
C13	—	—	Not Used
C14	PPL/WHT	1565	4 "LO" Indicator Lamp Output
C15	—	—	Not Used
C16	BLK	1552	Transfer Case Motor Feed - CW
D1	RED	1553	Transfer Case Motor Feed - CCW
D2	LT GRN/BLK	584	Fuse Output - Brake Transmission Shift Interlock
D3	ORN	1568	Diagnostic Signal - Transfer Case Control Module
D4	BRN/WHT	1555	Transfer Position Switch Encoder Signal - Channel P
D5	RED/WHT	1556	Transfer Position Switch Encoder Signal - Channel C
D6	DK BLU/WHT	1557	Transfer Position Switch Encoder Signal - Channel A
D7	YEL/BLK	1558	Transfer Position Switch Encoder Signal - Channel B
D8	DK GRN/WHT	817	Vehicle Speed Signal - 4000 Pulses Per Mile

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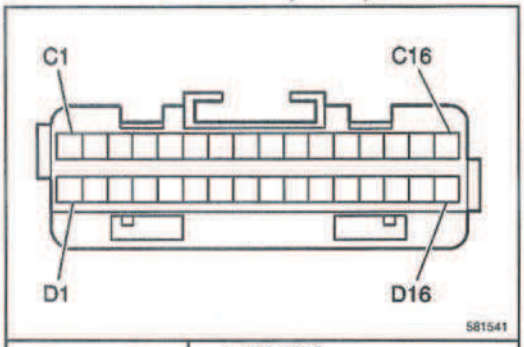
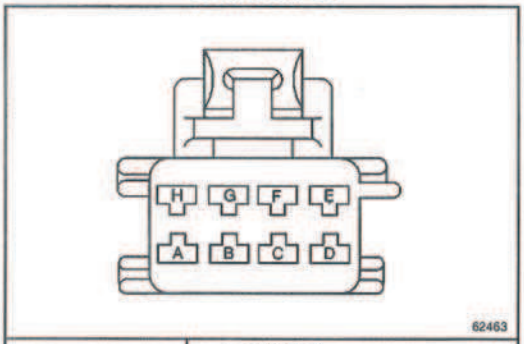
4X4 System Connector Terminal Identification (continued)

Transfer Case Shift Control Module Connector (cont'd)



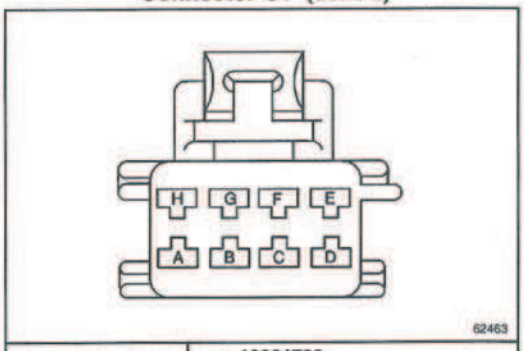
Connector Part Information	• 12041476 • 32 Way F Micro-Pack 100 Series (BLU)		
Pin	Wire Color	Circuit No.	Function
D9-D11	—	—	Not Used
D12	BLK	1050	Ground
D13	BLK	1050	Ground
D14	ORN	1640	Fuse Output - Battery
D15	ORN	1640	Fuse Output - Battery
D16	PPL	806	Fuse Output - Crank

Transfer Case Shift Select Switch Connector C1



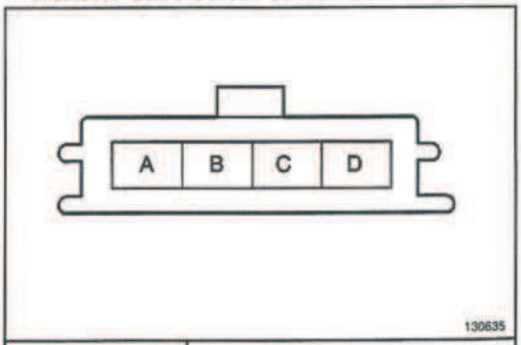
Connector Part Information	• 12064766 • 8 Way F Metri-Pack 150 Series (BLU)		
Pin	Wire Color	Circuit No.	Function
A	GRA/BLK	1564	4 "HI" Select Switch Output
B	DK GRN/WHT	1562	2 "HI" Select Switch Output
C	PPL/WHT	1565	4 "LO" Indicator Lamp Output
D	TAN/BLK	1566	4 "HI" Indicator Lamp Output

Transfer Case Shift Select Switch Connector C1 (cont'd)



Connector Part Information	• 12064766 • 8 Way F Metri-Pack 150 Series (BLU)		
Pin	Wire Color	Circuit No.	Function
E	LT GRN/BLK	1563	2 "HI" Indicator Lamp
F	DK GRN/WHT	1559	4 "LO" Select Switch Output
G	BLK	1050	Ground
H	GRA	1220	Fuse Output - Instrument Panel Lamps

Transfer Case Select Switch Connector C2



Connector Part Information	• 12045013 • 4 Way F Metri-Pack 150 Series (NAT)		
Pin	Wire Color	Circuit No.	Function
A	—	—	Not Used
B	PPL/WHT	1382	LED Dimming Signal
C	BRN	241	Fuse Output - Ignition 3
D	—	—	Not Used

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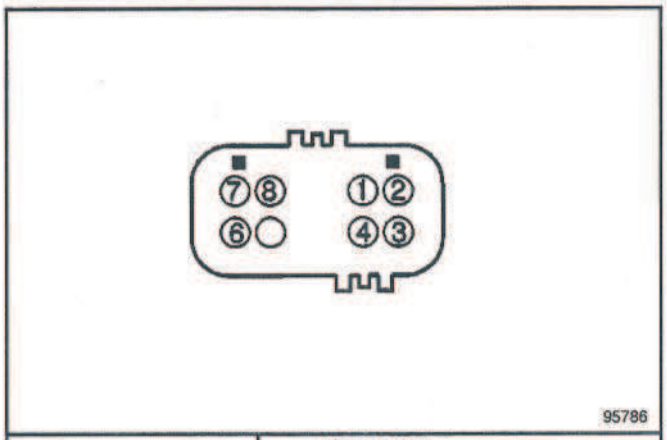
4X4 System Connector Terminal Identification (continued)

Electric Shift Transfer Case Connector



Connector Part Information		• 12124051 • 8 Way F (BLK)	
Pin	**Wire Color**	**Circuit No.**	**Function**
1	YEL/BLK	1558	Tranfer Case Position Switch Encoder Signal - Channel B
2	DK BLU/ WHT	1557	Tranfer Case Position Switch Encoder Signal - Channel A
3	BLK/WHT	1554	Tranfer Case Encoder Signal Return
4	BRN/WHT	1555	Tranfer Case Position Switch Encoder Signal - Channel P
5	—	—	Not Used
6	RED	1553	Transfer Case Motor Feed - CCW
7	BLK	1552	Transfer Case Motor Feed - CW
8	RED/WHT	1556	Tranfer Case Position Switch Encoder Signal - Channel C

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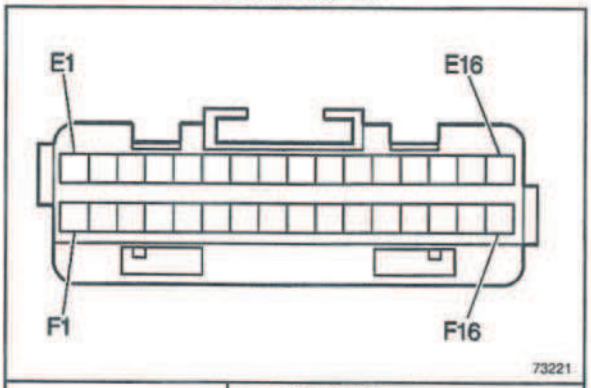
4X4 System Connector Terminal Identification

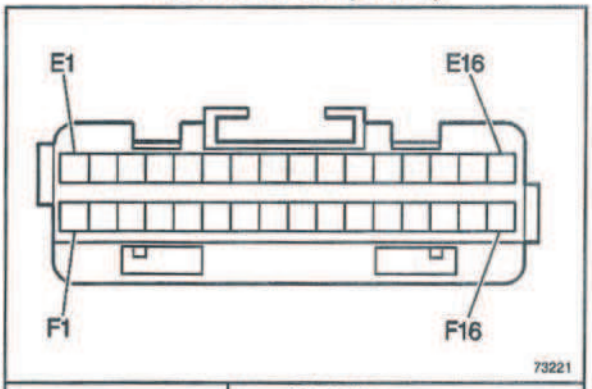
Transfer Case Control Connector End Views

Transfer Case Shift Control Module Connector C1



Connector Part Information		• 12052107 • 16 Way F Micro-Pack 100 Series (ORN)	
Pin	Wire Color	Circuit No.	Function
E1	Tan	1569	Transfer Case Lock Soleniod Output
E2	—	—	Not Used
E3	PNK	1561	AWD/4WD Indicator Lamp Output
E4	Lt GRN/ BLK	1563	2 HI Indicator Lamp Output
E5	BRN/WHT	1555	Transfer Case Position Switch Encoder Signal
E6	RED/WHT	1556	Transfer Case Position Switch Encoder Signal
E7	YEL/BLK	1558	Transfer Case Position Switch Encoder Signal
E8	DK BLU/ WHT	1557	Transfer Case Position Switch Encoder Signal
E9	DK GRN/ WHT	1133	Class 2 Serial Data Signal
E10	BRN	241	Fuse Output - Ignition 3 - Type III Fuse
E11	PPL	806	Fuse Output - Crank - Type III Fuse
E12	YEL	400	Vehicle Speed Sensor Signal
E13	PPL	401	Vehicle Speed Sensor Return
E14	BLK/WHT	1695	Four Wheel Drive Front Wheel Lock Telltale

Transfer Case Shift Control Module Connector C1 (cont'd)



Connector Part Information		• 12052107 • 16 Way F Micro-Pack 100 Series (ORN)	
Pin	Wire Color	Circuit No.	Function
E15	—	—	Not Used
E16	BLK/WHT	451	Engine Control Module Ground
F1	PPL/WHT	1565	4 LO Indicator Lamp Output
F2	TAN/BLK	1566	4 HI Indicator Lamp Output
F3	BRN	1560	Neutral Indicator Lamp Output
F4	GRA/BLK	1570	Front Axle Actuator Output
F5	LT BLU	2221	Vehicle Speed Sensor Signal
F6	DK GRN	2222	Vehicle Speed Sensor Return
F7	GRA/BLK	1694	Four Wheel Drive Switch Signal - Low
F8 - F11	—	—	Not Used
F12	BLK/WHT	1554	Transfer Case Encoder Signal Return
F13	LT GRN/ BLK	431	Reference Voltage Feed - 8 Volt Reference
F14	LT GRN/ BLK	431	Reference Voltage Feed - 8 Volt Reference
F15	—	—	Not Used
F16	LT BLU	1693	Four Wheel Drive Switch Signal

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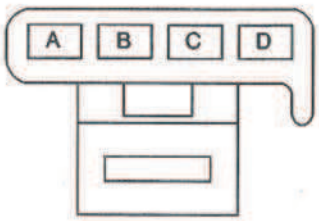
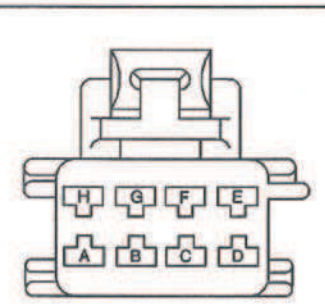
4X4 System Connector Terminal Identification (continued)

Transfer Case Shift Control Module Connector C2



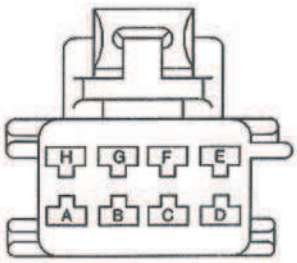
Connector Part Information	• 12052856 • 4 Way F Metri-Pack 280 Series (BLK)		
Pin	**Wire Color**	**Circuit No.**	**Function**
A	BLK	1552	Transfer Case Motor Feed - Clockwise
B	RED	1553	Transfer Case Motor Feed - Counterclockwise
C	BLK	1050	Ground
D	ORG	1640	Fuse Output - Battery - Type III Fuse

Transfer Case Select Switch Connector C1



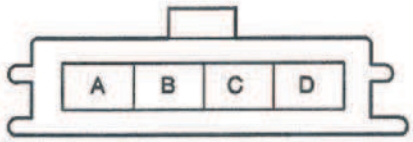
Connector Part Information	• 12064766 • 8 Way F Metri-Pack 150 Series (BLU)		
Pin	**Wire Color**	**Circuit No.**	**Function**
A	LT GRN/BLK	431	Reference Voltage Feed - 8 Volt Reference
B	LT BLU	1693	Four Wheel Drive Switch Signal
C	PPL/WHT	1565	4 LO Indicator Lamp Output
D	TAN/BLK	1566	4 HI Indicator Lamp Output

Transfer Case Select Switch Connector C1 (cont'd)



Connector Part Information	• 12064766 • 8 Way F Metri-Pack 150 Series (BLU)		
Pin	**Wire Color**	**Circuit No.**	**Function**
E	LT GRN/BLK	1563	2 HI Indicator Lamp Output
F	PNK	1561	AWD/4WD Indicator Lamp Output
G	BLK	1050	Ground
H	GRA	1220	Fuse Output - IP Lamps - Type III

Transfer Case Select Switch Connector C2



Connector Part Information	• 12045813 • 4 Way F Metri-Pack 150 Series (NAT)		
Pin	**Wire Color**	**Circuit No.**	**Function**
A	—	—	Not Used
B	PPL/WHT	1382	LED Dimming Signal
C	BRN	241	Fuse Output - Ignition 3 - Type III Fuse
D	BRN	1560	Neutral Indicator Lamp Output

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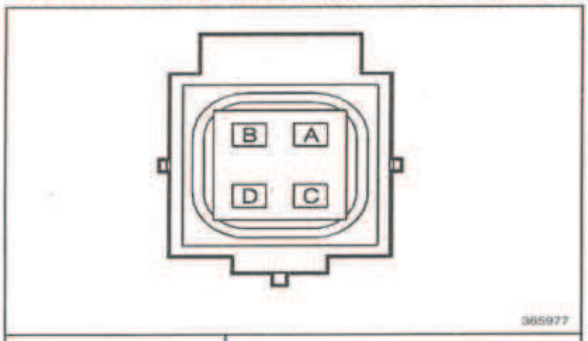
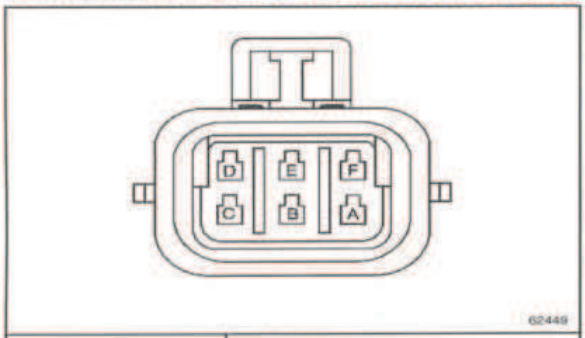
4X4 System Connector Terminal Identification (continued)

Transfer Case Encoder Motor Connector C1



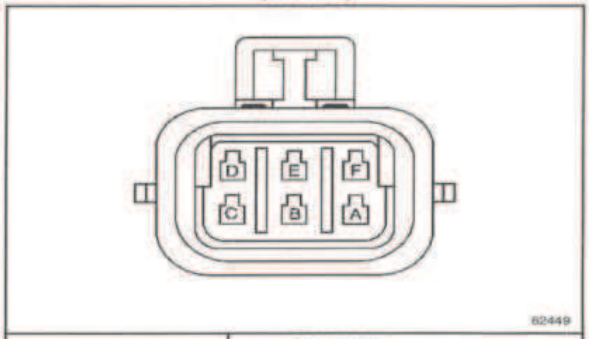
Connector Part Information	• 12191399 • 4F Metri-Pack 280 Series, Flexlock, Sealed (BLK)		
Pin	Wire Color	Circuit No.	Function
A	BLK	1552	Transfer Case Motor Feed - Clockwise
B	RED	1553	Transfer Case Motor Feed - Counterclockwise
C	ORG	1640	Fuse Output - Battery - Type III Fuse
D	TAN	1569	Transfer Case Lock Solenoid Output

Transfer Case Encoder Motor Connector C2



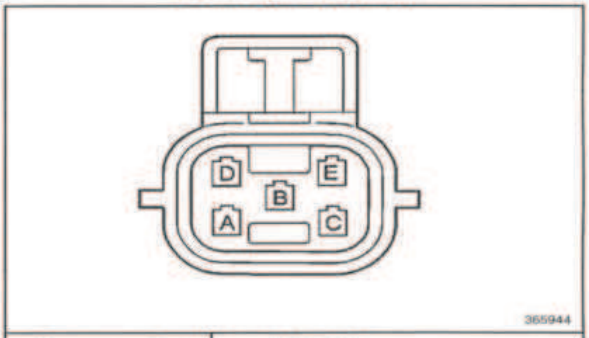
Connector Part Information	• 12052848 • 6 Way F Metri-Pack 150 Series, Sealed (BLK)		
Pin	Wire Color	Circuit No.	Function
A	BLK/WHT	1554	Transfer Case Encoder Signal Return
B	DK BLU/WHT	1557	Transfer Case Position Switch Encoder Signal
C	RED/WHT	1556	Transfer Case Position Switch Encoder Signal

Transfer Case Encoder Motor Connector C2 (cont'd)



Connector Part Information	• 12052848 • 6 Way F Metri-Pack 150 Series, Sealed (BLK)		
Pin	Wire Color	Circuit No.	Function
D	YEL/BLK	1558	Transfer Case Position Switch Encoder Signal
E	LT GRN/BLK	431	Reference Voltage Feed - 8 Volt Reference
F	BRN/WHT	1555	Transfer Case Position Switch Encoder Signal

Front Axle Actuator



Connector Part Information	• 12077591 • ASM 5F M/P 150 (BLK)		
Pin	Wire Color	Circuit No.	Function
A	BLK/WHT	1695	4WD Front Wheel Lock Telltale Feed
B	GRY/BLK	1570	Front Axle Actuator Output
C	BRN	241	Fuse Output - Ignition 3 - Type II Output
D	–	–	Not Used
E	BLK	150	Ground

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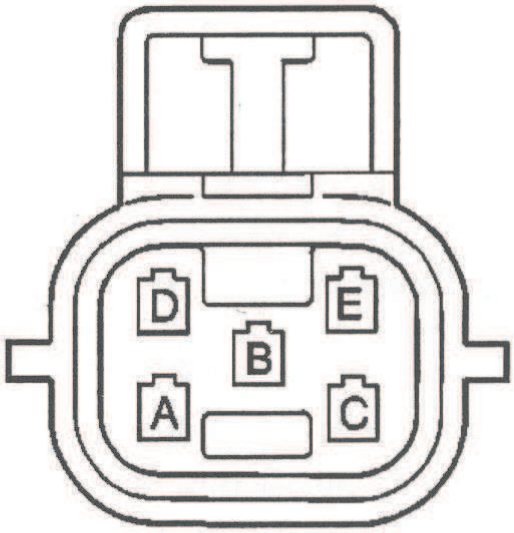
4X4 System Connector Terminal Identification (continued)



Connector Part Information		• 12077591 • ASM 5F M/P 150 (BLK)	
Pin	**Wire Color**	**Circuit No.**	**Function**
A	BLK/WHT	1695	4WD Front Wheel Lock Telltale Feed
B	GRY/BLK	1570	Front Axle Actuator Output
C	BRN	241	Fuse Output - Ignition 3 - Type II Output
D	–	–	Not Used
E	BLK	150	Ground

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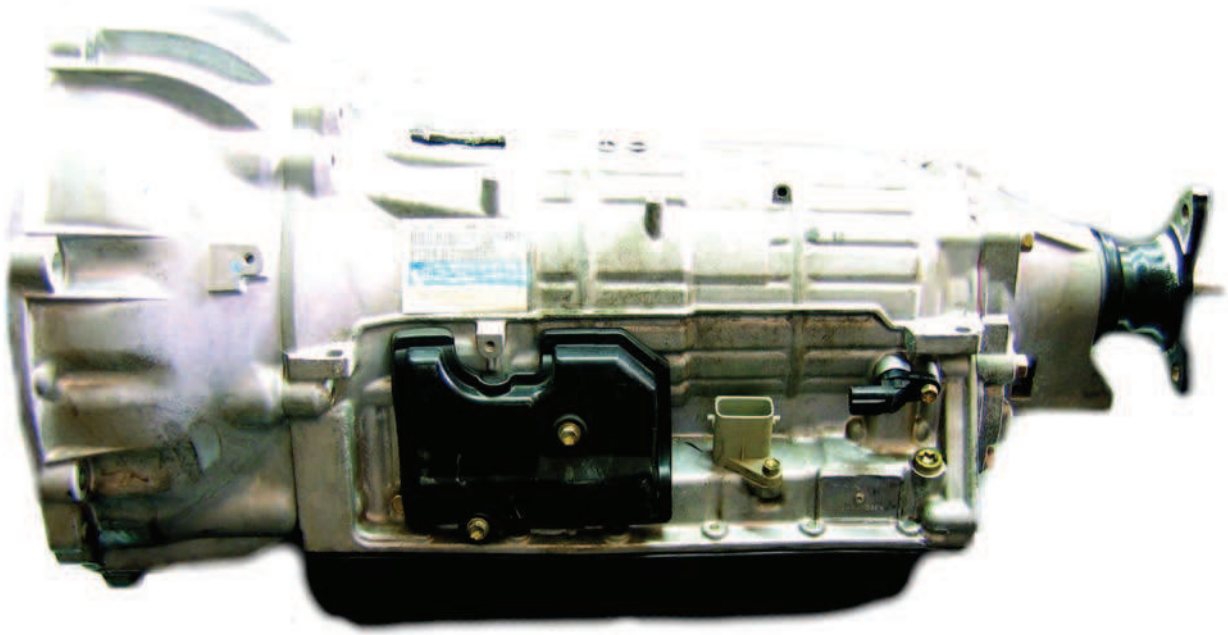
A761

Introduction

The A761E transmission is Toyota's first six speed automatic. It is said to be lightest six speed automatic speed automatic transmission in the world, weighing in at 187 pounds wet. This transmission is used in the 2004 and the 2004 and later Lexus LS430



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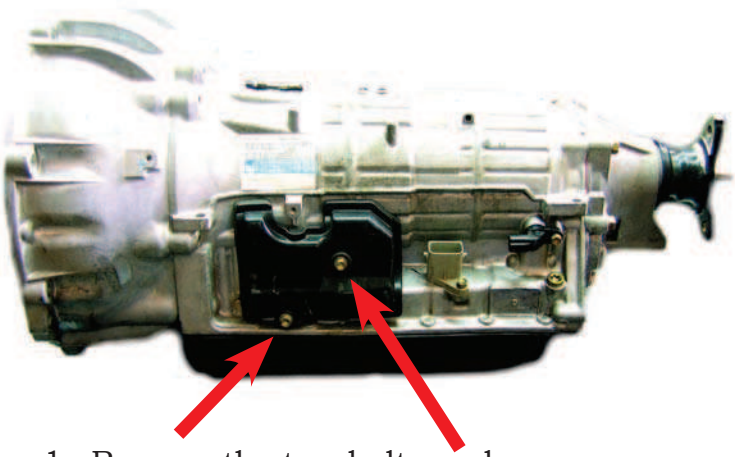
A76l

Fluid Fill Procedure

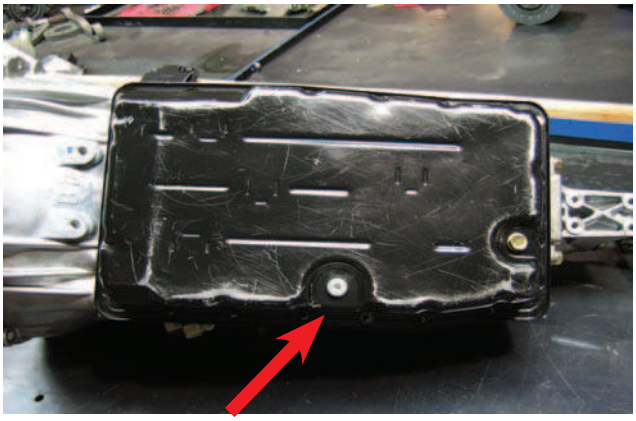
Before the Transmission is Filled
This transmission requires genuine Toyota ATF WS. In order to refill the transmission with the correct amount of fluid. The vehicle must remain level while adjusting fluid level.

SST Part # 00002-111-02

Transmission Pan Fill

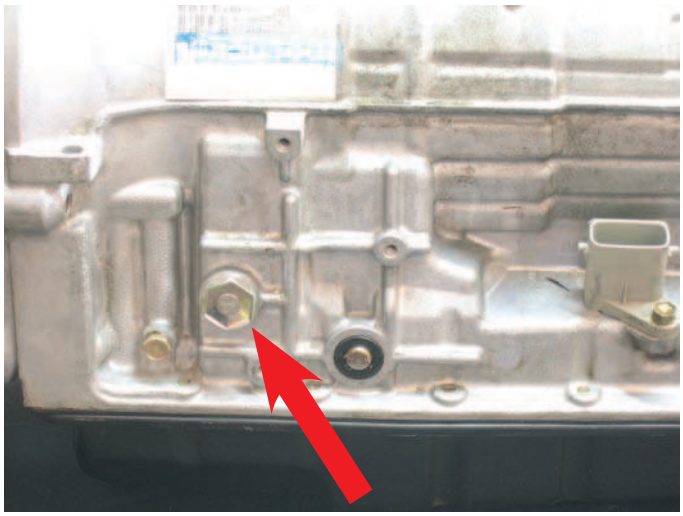


1. Remove the two bolts and case cover from the side of transmission.



2. Remove the refill plug and the overflow plug.

4. Reinstall the overflow plug after the transmission full.



3. Fill the transmission through the refill hole until fluid begins to trickle out.

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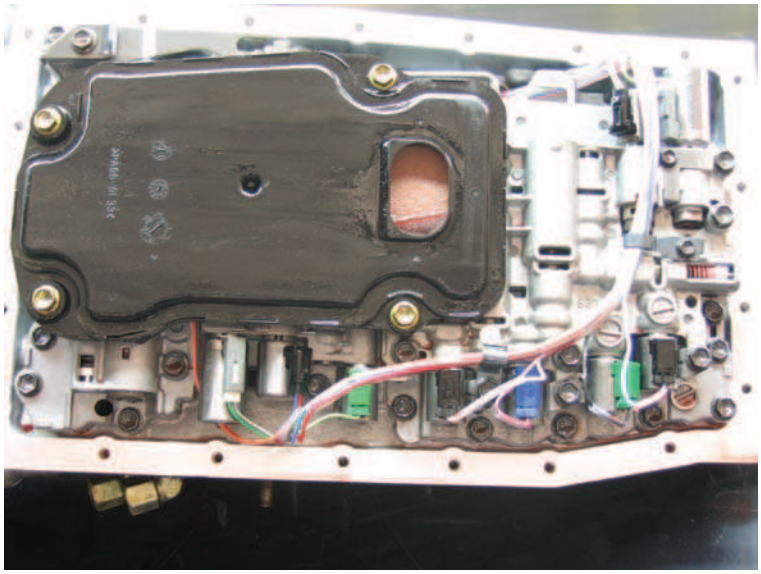
Contamination

Do not turn the transmission over before the oil pan is removed as this will contaminate the valve body with foreign matter, there is no magnet in the bottom of the pan to catch any debris that can reach the valve body when rolled over.

Install the transmission case on the overhaul attachment. Remove the 20 bolts from oil pan, carefully look at the foreign matter and particles in the pan. This will help to anticipate the type of wear you will find in the transmission



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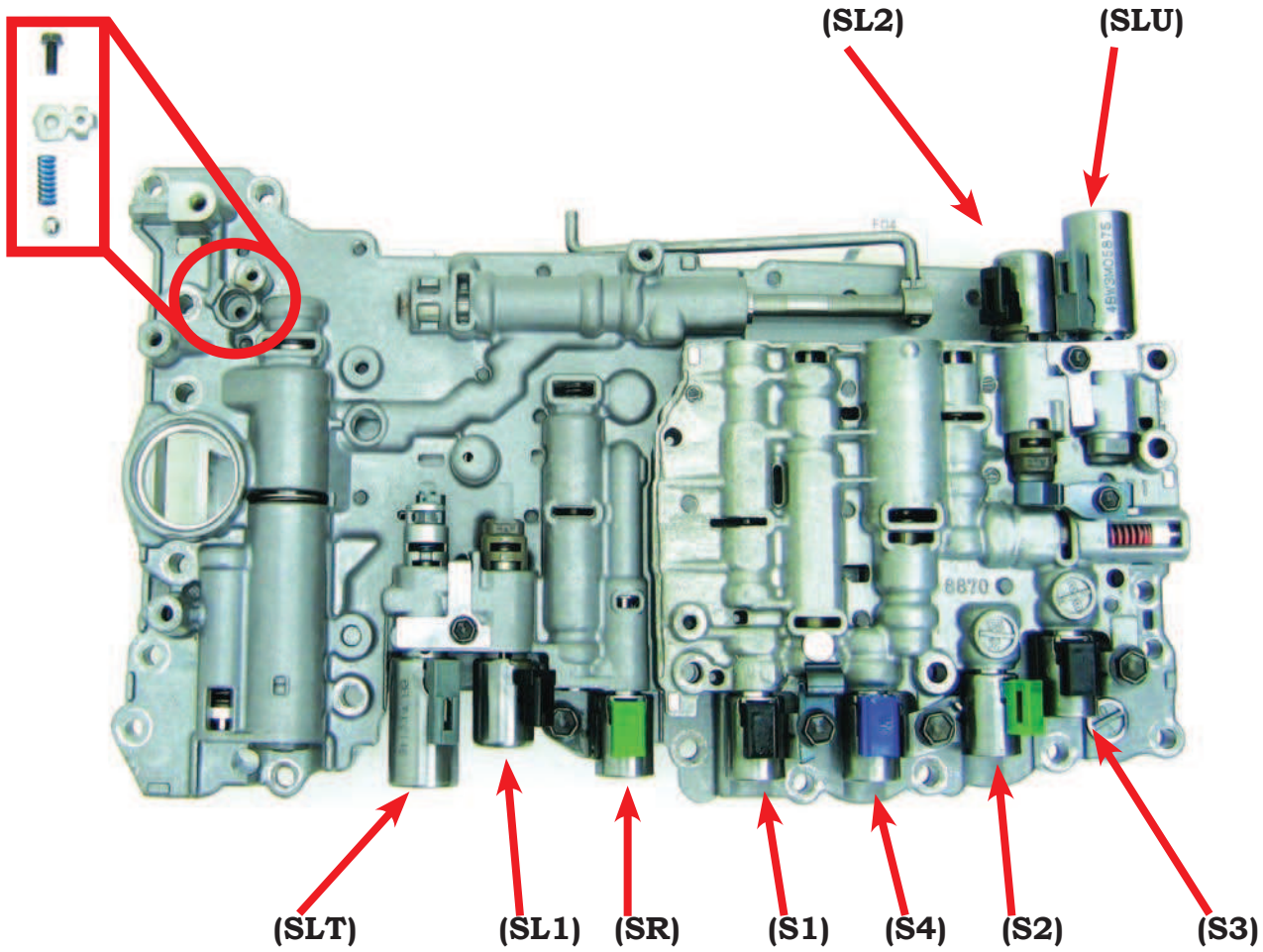
Solenoid Identification



Solenoid	Wire Color	Case Connector	Resistance
S1	Pin 8 WHT	Ground	11-15
S2	Pin 15 BLK	Ground	11-15
S3	Pin 7 Lt BLU	Ground	11-15
S4	Pin 14 PPL	Ground	11-15
SR	Pin 6 Lt GRN	Ground	11-15
SL1	Pin 11 RED	Pin 3 BLU	5-5.6
SL2	Pin 10 YEL	Pin 2 PPL	5-5.6
SLU	Pin 12 Lt GRN	Pin 4 BRN	5-5.6
SLT	Pin 13 GRN	Pin 5 GRY	5-5.6
TFT	Pin 9 ORN	Pin 1 ORN	79K-156K

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A76I

Connector Pin Identification

Using the illustration and specifications below will help you diagnose an internal wiring and solenoid concern.

Solenoid	Wire Color	Case Connector	Resistance
S1	Pin 8 WHT	Ground	11-15
S2	Pin 15 BLK	Ground	11-15
S3	Pin 7 Lt BLU	Ground	11-15
S4	Pin 14 PPL	Ground	11-15
SR	Pin 6 Lt GRN	Ground	11-15
SL1	Pin 11 RED	Pin 3 BLU	5-5.6
SL2	Pin 10 YEL	Pin 2 PPL	5-5.6
SLU	Pin 12 Lt GRN	Pin 4 BRN	5-5.6
SLT	Pin 13 GRN	Pin 5 GRY	5-5.6
TFT	Pin 9 ORN	Pin 1 ORN	79K-156K

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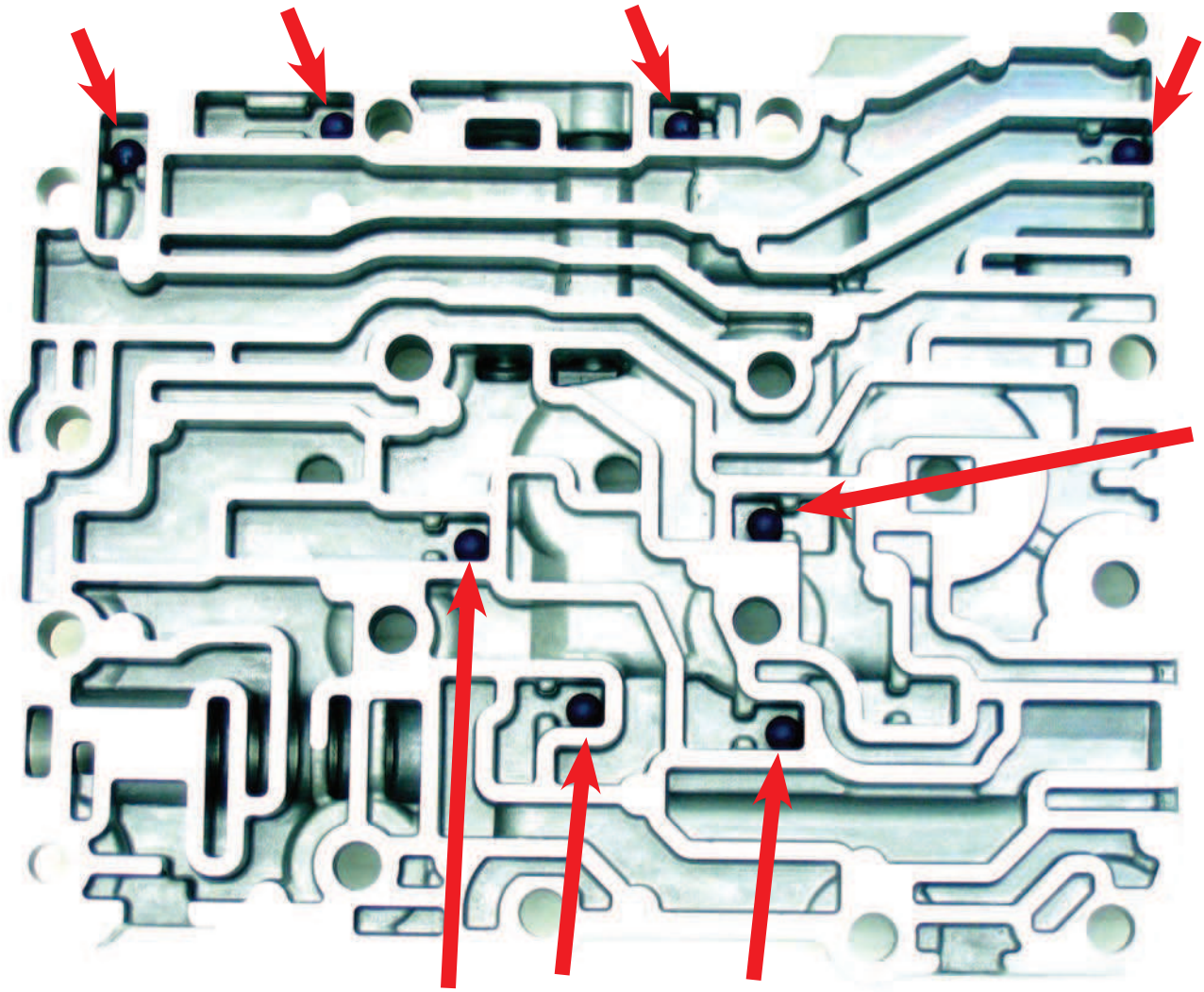
Upper Valve Body Check Ball Locations

There are eight (8) check balls in the Upper Valve Body. All of the check balls are composite, make sure during the rebuild that the check balls seat on the valve body separator plate and are not decomposed.



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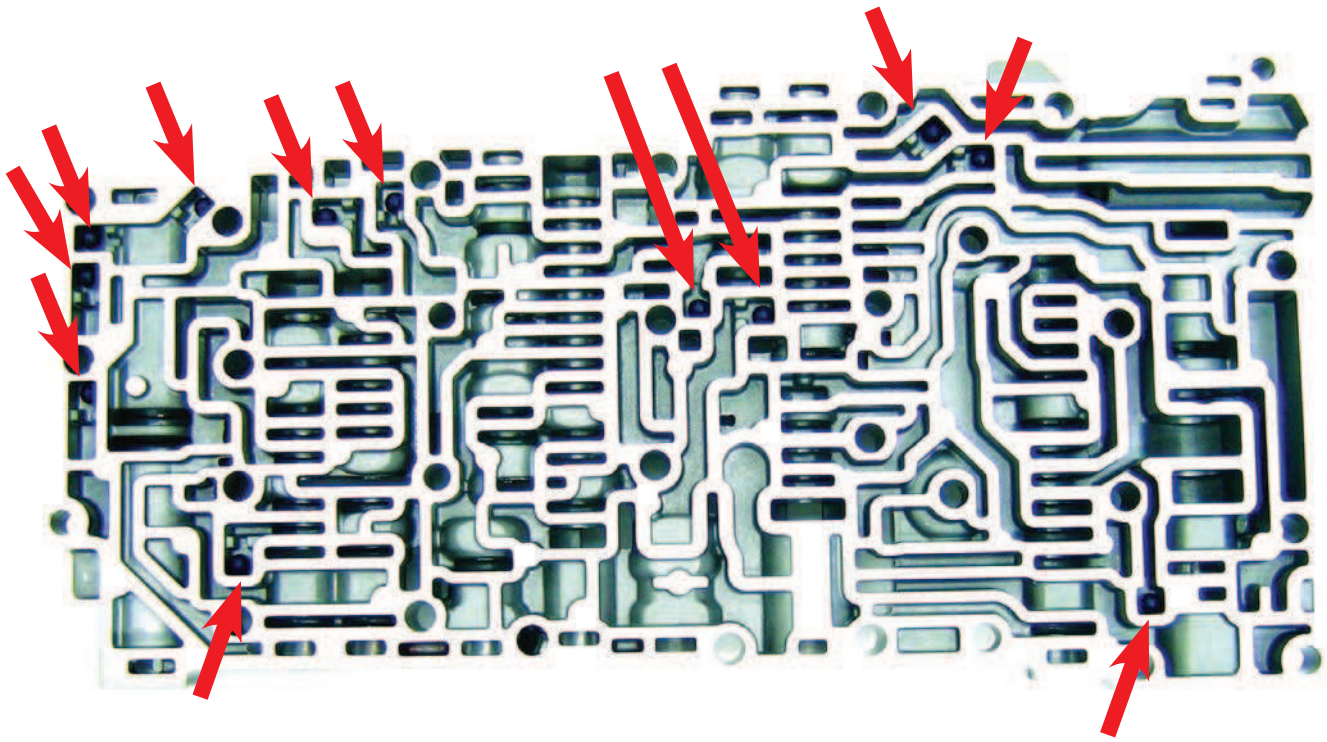
Main Valve Body Check Ball Locations

There are twelve (12) check balls in the Main Valve Body. All of the check balls are composite, make sure during the rebuild that the check balls seat on the valve body separator plate and are not decomposed.



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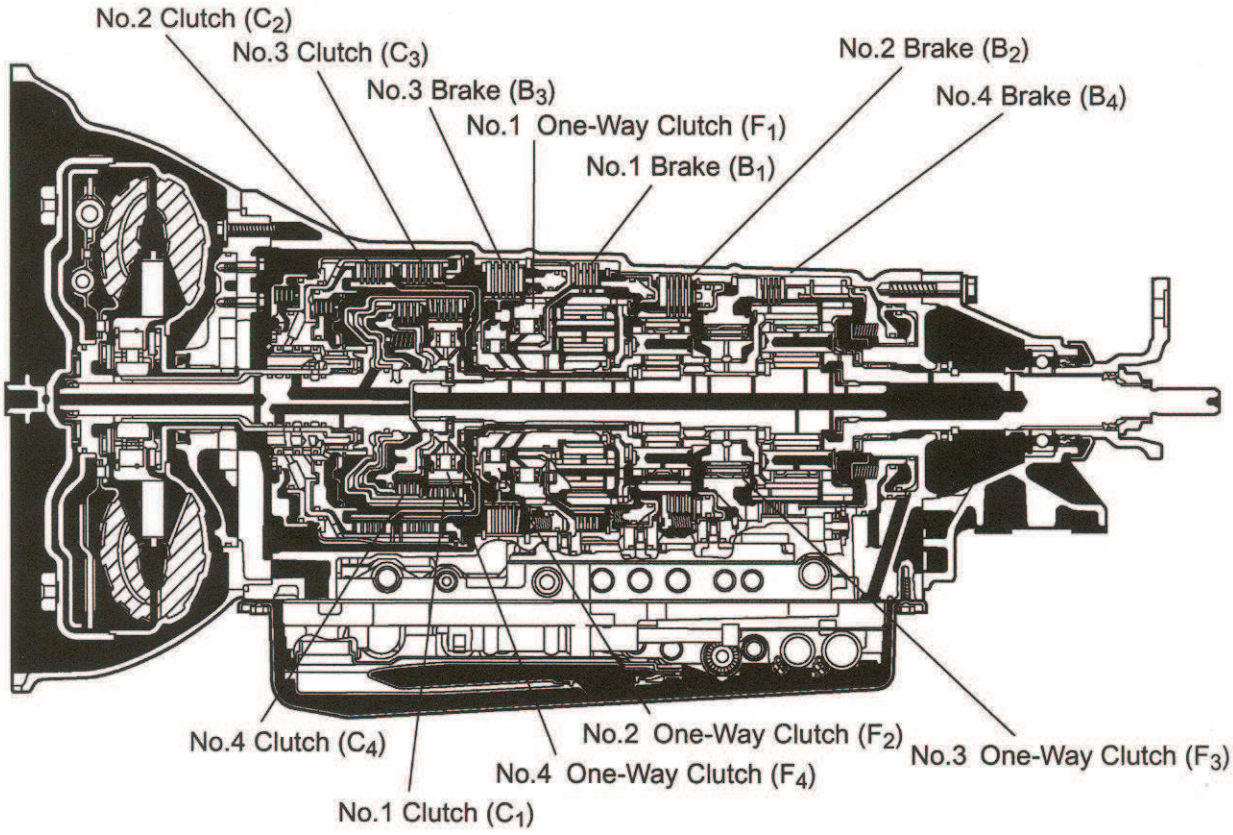
Clutch and Band Application Chart



Shift Lever Position		Solenoid Valve								Clutch				Brake				One-way Clutch			
		S1	S2	S3	S4	SR	SL1	SL2	SLU	C_1	C_2	C_3	C_4	B_1	B_2	B_3	B_4	F_1	F_2	F_3	F_4
P			ON	ON		ON		ON													
R*			ON	ON		ON		ON				○		○			○	○			
N			ON	ON		ON		ON													
D, S (6)	1st		ON	ON		ON		ON		○			○							○	○
	2nd	ON	ON	ON		ON		ON	ON	○			○			○		○	○		○
	3rd	ON		ON		ON		ON	ON	○		○	○			●		○			○
	4th	ON				ON		ON	ON	○	○	●	○			●					○
	5th	ON			ON		ON		ON	●	○	○		○		●					
	6th	ON	ON		ON		ON		ON	●	○			●	○	●					

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Codes and Definitions

- *1 : ● ... MIL (Malfunction Indicator Lamp) light up
- *2 : "○" mark means ECM memorizes the malfunction code if the ECM detects the DTC detection condition.
- This DTC may be output when the clutch, brake and gear components etc. inside the automatic transmission are damaged.

DTC No. (See Page)	Detection Item	Trouble Area	MIL *1	Memory *2
P0500 (05-228)	Vehicle Speed Sensor "A"	• Open or short in speed sensor (SP2) circuit • Speed sensor (SP2) • ECM	●	○
P0705 (05-615)	Transmission Range Sensor Circuit Malfunction (PRNDL Input)	• Open or short in park/neutral position switch circuit • Park/neutral position switch • ECM	●	○
P0710 (05-622)	Transmission Fluid Temperature Sensor "A" Circuit	• Open or short in ATF temperature sensor circuit • Transmission wire (ATF temperature sensor) • ECM	●	○
P0711 (05-627)	Transmission Fluid Temperature Sensor "A" Performance	• Open or short in ATF temperature sensor circuit • Transmission wire (ATF temperature sensor) • ECM	●	○
P0712 (05-622)	Transmission Fluid Temperature Sensor "A" Circuit Low Input	• Short in ATF temperature sensor circuit • Transmission wire (ATF temperature sensor) • ECM	●	○
P0713 (05-622)	Transmission Fluid Temperature Sensor "A" Circuit High Input	• Open in ATF temperature sensor circuit • Transmission wire (ATF temperature sensor) • ECM	●	○
P0717 (05-630)	Turbine Speed Sensor Circuit No Signal	• Open or short in speed sensor (NT) circuit • Speed sensor (NT) • ECM • Automatic transmission (clutch, brake or gear, etc.)	●	○
P0724 (05-634)	Brake Switch "B" Circuit High	• Short in stop light switch signal circuit • Stop light switch • ECM	●	○
P0729 (05-636)	Gear 6 Incorrect Ratio	• Valve body is blocked up or stuck (reverse sequence valve) • Automatic transmission (clutch, brake or gear, etc.) • ECM	●	○
P0748 (05-641)	Pressure Control Solenoid "A" Electrical (Shift Solenoid Valve SL1)	• Open or short in shift solenoid valve SL1 circuit • Shift solenoid valve SL1 • ECM	●	○
P0751 (05-644)	Shift Solenoid "A" Performance (Shift Solenoid Valve S1)	• Shift solenoid valve S1 remains open or closed • Valve body is blocked • No.2 brake malfunction (Driving is difficult.) • Automatic transmission (clutch, brake or gear, etc.) • ECM	●	○
P0756 (05-650)	Shift Solenoid "B" Performance (Shift Solenoid Valve S2)	• Shift solenoid valve S2 remains open or closed • Valve body is blocked • Automatic transmission (clutch, brake or gear, etc.) • ECM	●	○

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Codes and Definitions (continued)

P0761 (05-655)	Shift Solenoid "C" Performance (Shift Solenoid Valve S3)	• Shift solenoid valve S3 remains open or closed • Valve body is blocked • Automatic transmission (clutch, brake or gear, etc.) • ECM	●	○
P0766 (05-661)	Shift Solenoid "D" Performance (Shift Solenoid Valve S4)	• Shift solenoid valve S4 remains open or closed • Shift solenoid valve SL2 remains open or closed • Valve body is blocked (Brake control valve) • Automatic transmission (clutch, brake or gear, etc.) • ECM	●	○
P0778 (05-666)	Pressure Control Solenoid "B" Electrical (Shift Solenoid Valve SL2)	• Open or short in shift solenoid valve SL2 circuit • Shift solenoid valve SL2 • ECM	●	○
P0781 (05-669)	1-2 Shift (1 -2 Shift Valve)	• Valve body is blocked up or stuck (1-2 shift valve) • Automatic transmission (clutch, brake or gear, etc.) • ECM	●	○
P0850 (05-615)	Park/Neutral Switch Input Circuit	• Short in park/neutral position switch circuit • Park/neutral position switch • ECM	●	○
P0973 (05-674)	Shift Solenoid "A" Control Circuit Low (Shift Solenoid Valve S1)	• Short in shift solenoid valve S1 circuit • Shift solenoid valve S1 • ECM	●	○
P0974 (05-674)	Shift Solenoid "A" Control Circuit High (Shift Solenoid Valve S1)	• Open in shift solenoid valve S1 circuit • Shift solenoid valve S1 • ECM	●	○
P0976 (05-677)	Shift Solenoid "B" Control Circuit Low (Shift Solenoid Valve S2)	• Short in shift solenoid valve S2 circuit • Shift solenoid valve S2 • ECM	●	○
P0977 (05-677)	Shift Solenoid "B" Control Circuit High (Shift Solenoid Valve S2)	• Open in shift solenoid valve S2 circuit • Shift solenoid valve S2 • ECM	●	○
P0979 (05-680)	Shift Solenoid "C" Control Circuit Low (Shift Solenoid Valve S3)	• Short in shift solenoid valve S3 circuit • Shift solenoid valve S3 • ECM	●	○
P0980 (05-680)	Shift Solenoid "C" Control Circuit High (Shift Solenoid Valve S3)	• Open in shift solenoid valve S3 circuit • Shift solenoid valve S3 • ECM	●	○
P0982 (05-683)	Shift Solenoid "D" Control Circuit Low (Shift Solenoid Valve S4)	• Short in shift solenoid valve S4 circuit • Shift solenoid valve S4 • ECM	●	○
P0983 (05-683)	Shift Solenoid "D" Control Circuit High (Shift Solenoid Valve S4)	• Open in shift solenoid valve S4 circuit • Shift solenoid valve S4 • ECM	●	○
P0985 (05-686)	Shift Solenoid "E" Control Circuit Low (Shift Solenoid Valve SR)	• Short in shift solenoid valve SR circuit • Shift solenoid valve SR • ECM	●	○
P0986 (05-686)	Shift Solenoid "E" Control Circuit High (Shift Solenoid Valve SR)	• Open in shift solenoid valve SR circuit • Shift solenoid valve SR • ECM	●	○
P2714 (05-689)	Pressure Control Solenoid "D" Performance (Shift Solenoid Valve SLT)	• Shift solenoid valve SLT remains open or closed • Valve body is blocked • Automatic transmission (clutch, brake or gear, etc.) • ECM	●	○

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Codes and Definitions (continued)

P2716 (05-694)	Pressure Control Solenoid "D" Electrical (Shift Solenoid Valve SLT)	• Open or short in shift solenoid valve SLT circuit • Shift solenoid valve SLT • ECM	●	○
P2757 (05-697)	Torque Converter Clutch Pressure Control Solenoid Performance (Shift Solenoid Valve SLU)	• Shift solenoid valve SLU remains open or closed • Valve body is blocked • Shift solenoid valve SLU • Torque converter clutch • Automatic transmission (clutch, brake or gear, etc.) • Line pressure is too low • ECM	●	○
P2759 (05-703)	Torque Converter Clutch Pressure Control Solenoid Control Circuit Electrical (Shift Solenoid Valve SLU)	• Open or short in shift solenoid valve SLU circuit • Shift solenoid valve SLU • ECM	●	○

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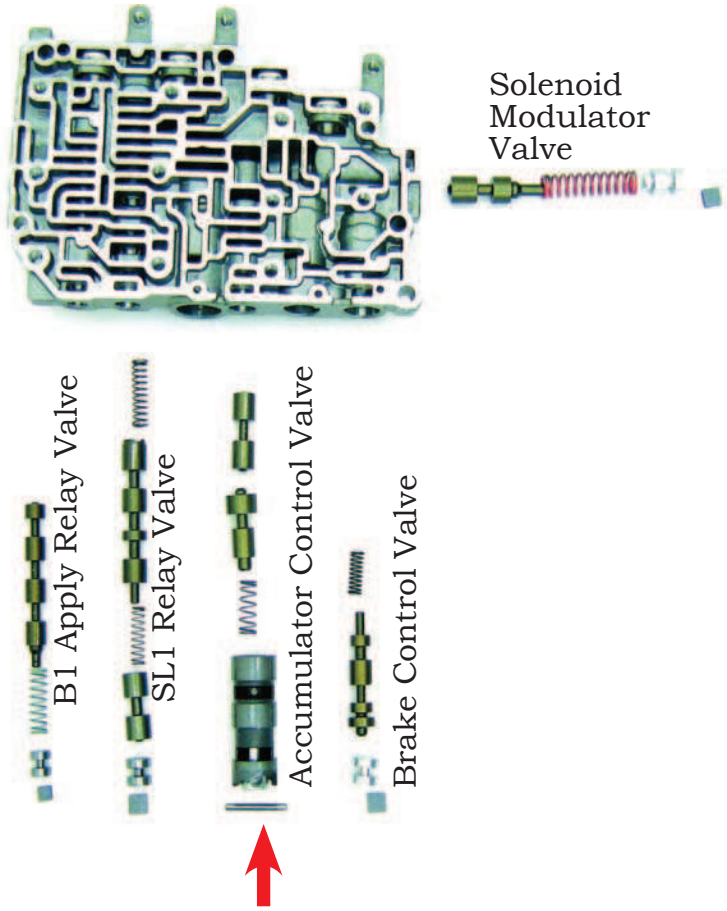
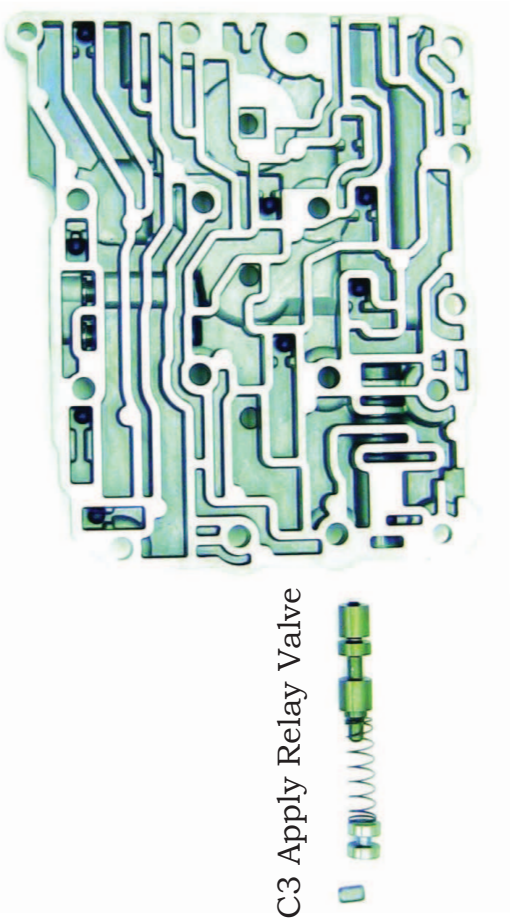
Valve Body Exploded View

Lower #2 Valve Body



Mark the setting before you remove the Pressure boost valve.

Upper #2 Valve Body



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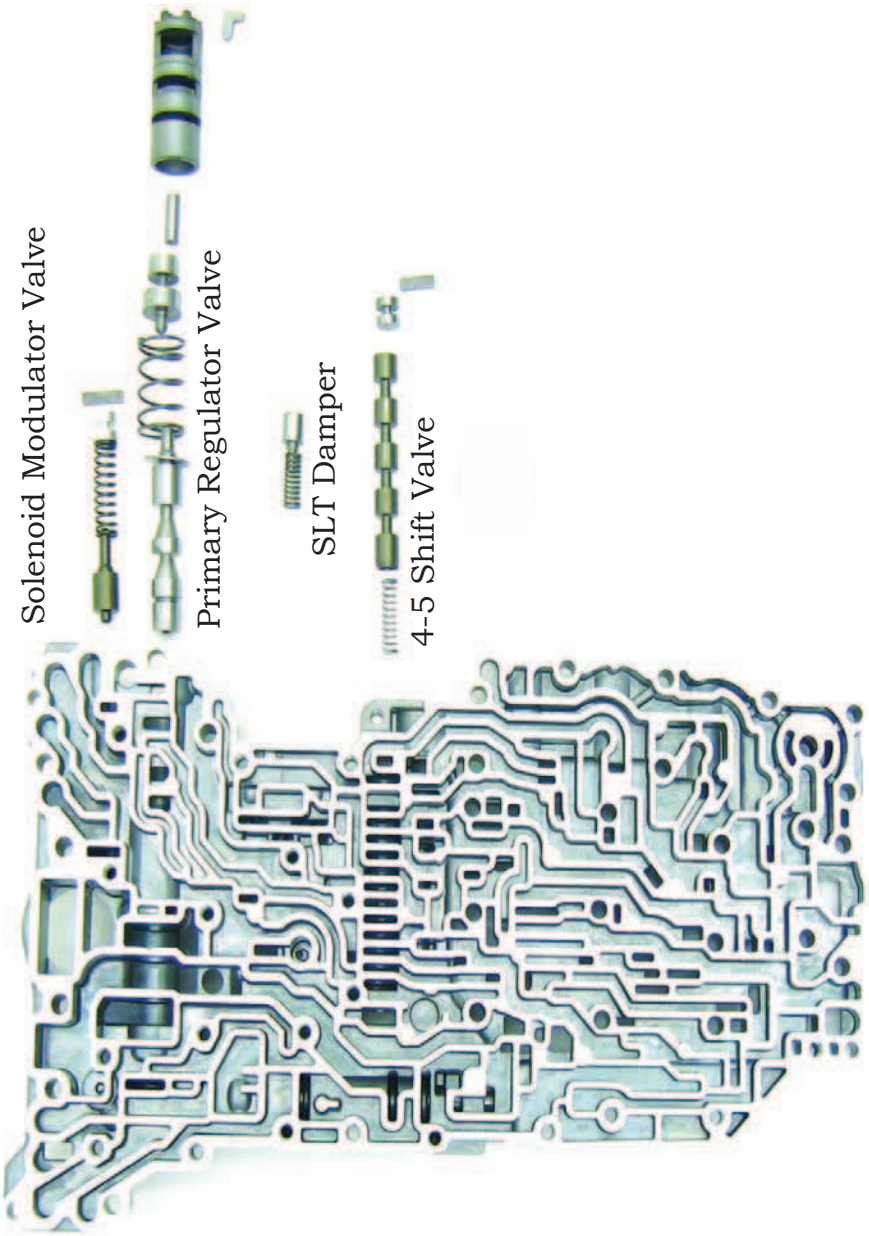
Valve Body Exploded View (continued)

Lower #1 Valve Body



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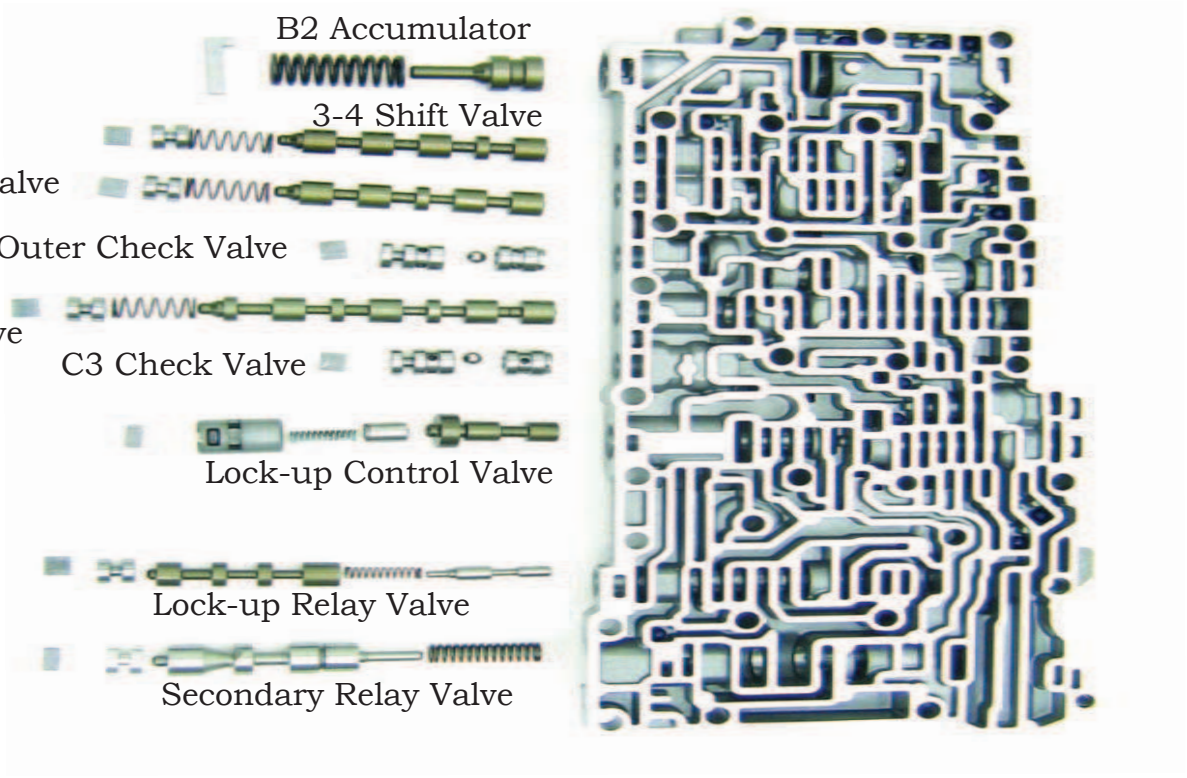
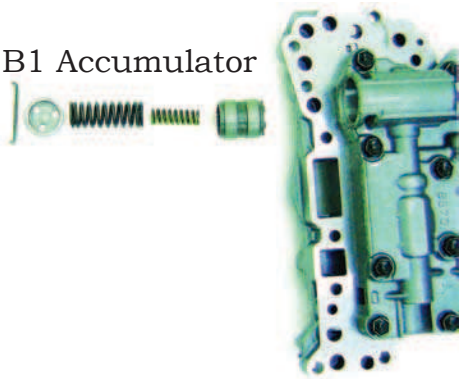
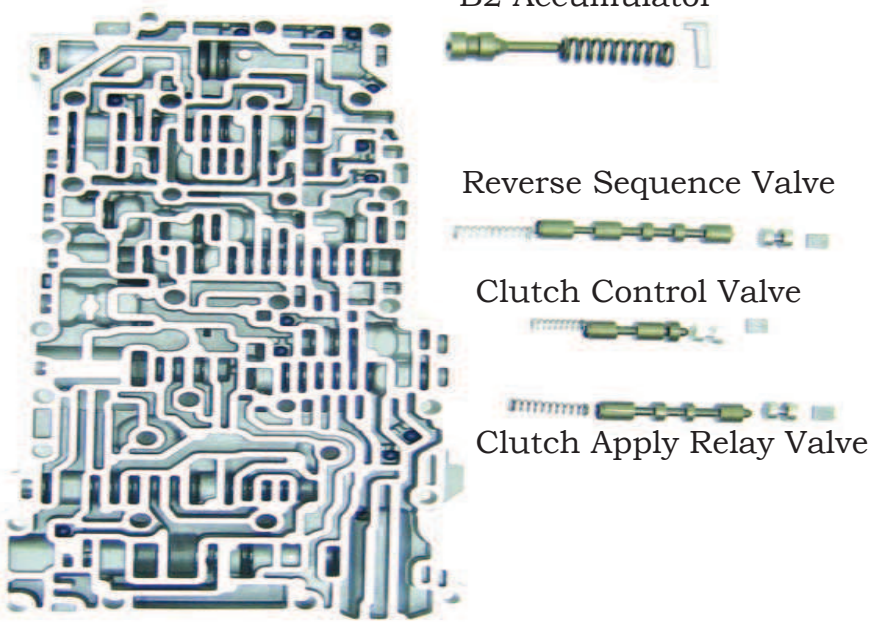
Valve Body Exploded View (continued)

Upper #1 Valve Body







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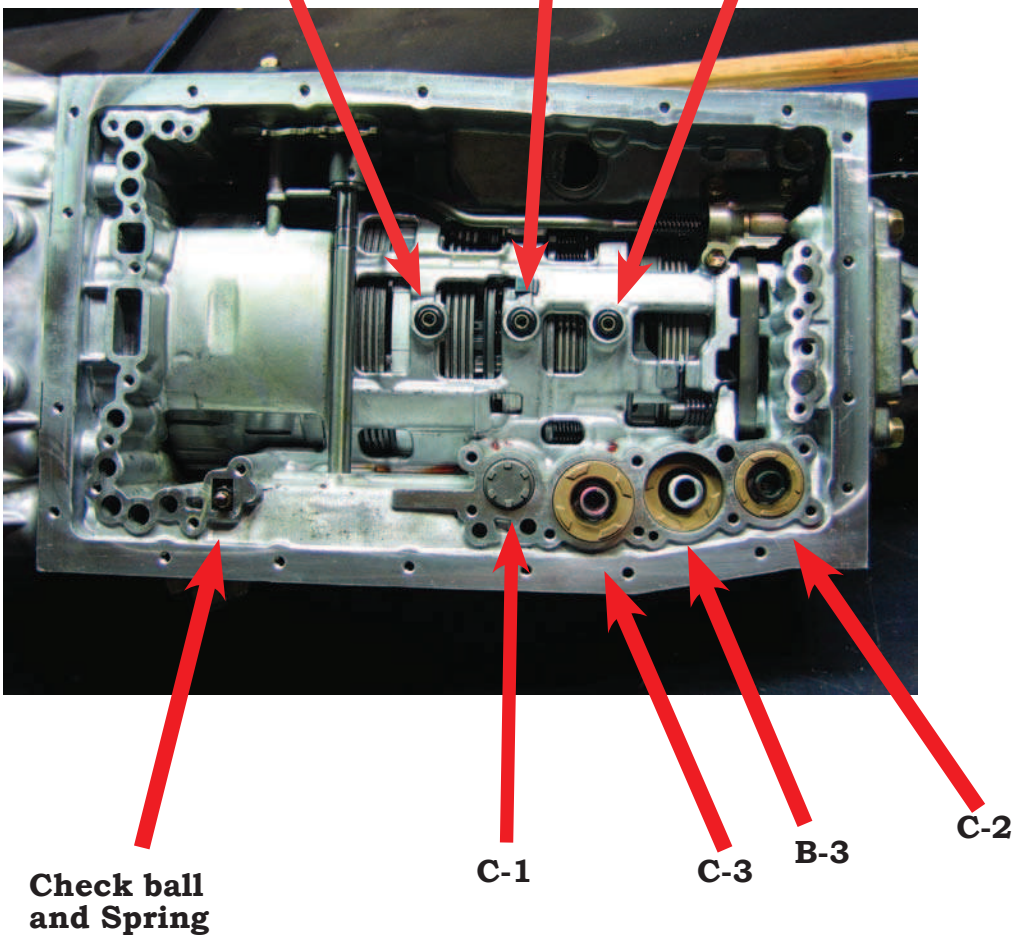
Accumulator Piston Identification

During disassembly inspect the accumulator pistons, springs and bores for wear or damage.

During reassembly always replace the valve body to case seals in the case for the B-1, B-2, and B-3 applications.



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Accumulator Identification (continued)

C1 Accumulator Piston and Spring

Inner Spring **Free Length** 44.98 mm	**Outer Diameter** 11.30 mm	**Color** Natural
Outer Spring **Free Length** 46.36 mm	**Outer Diameter** 17.10 mm	**Color** Natural

C3 Accumulator Piston and Spring

Inner Spring **Free Length** 44.0 mm	**Outer Diameter** 14.0 mm	**Color** Yellow
Outer Spring **Free Length** 76.65 mm	**Outer Diameter** 20.10 mm	**Color** Natural
Small Balance Spring **Free Length** 22.06 mm	**Outer Diameter** 14.05 mm	**Color** Pink

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Accumulator Identification (continued)

B3 Accumulator Piston and Spring

Inner Spring
Free Length
65.5 mm

Outer Diameter
19.5 mm

Color
Orange/Red

Balance Spring
Free Length
29.75 mm

Outer Diameter
16.15 mm

Color
White

C2 Accumulator Piston and Spring

Inner Spring
Free Length
63.14 mm

Outer Diameter
16.0 mm

Color
Gray/White

Balance Spring
Free Length
17.57 mm

Outer Diameter
14.04 mm

Color
Green

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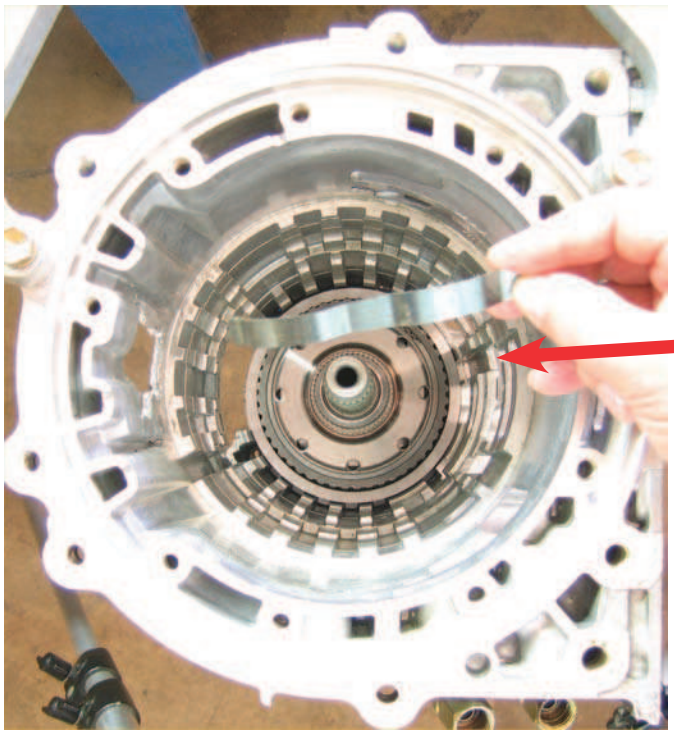
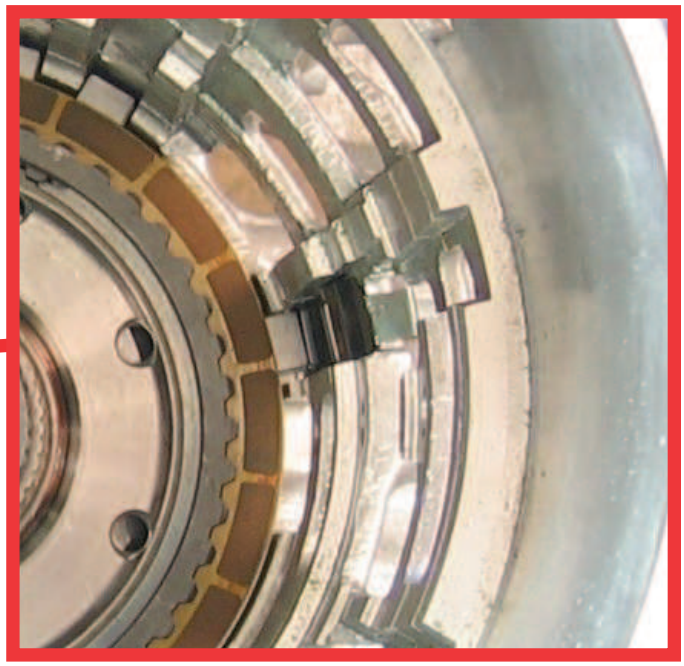
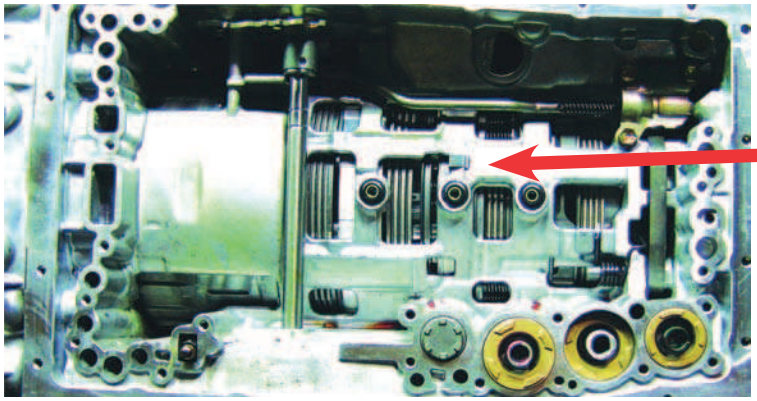
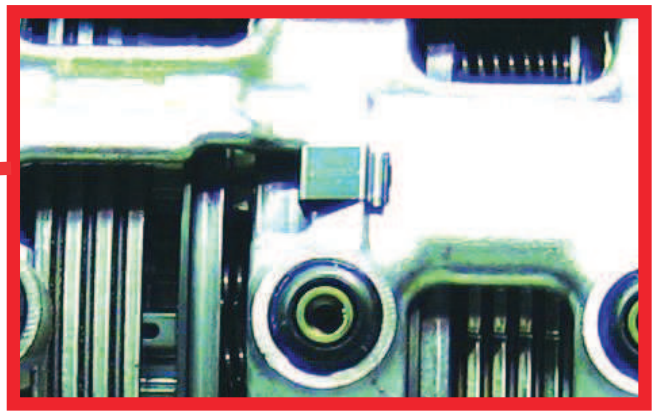
Brake Plate Stopper

Install the brake plate stopper anti-rattle spring into the case. the spring clips on to the case and should be installed as shown. The brake plate stopper anti-rattle spring is used to prevent the rattling of the B4, B2, and B1 steel plates. If left out the steel clutch plates would rattle in Park, Neutral, 1st, 2nd and 3rd gears.









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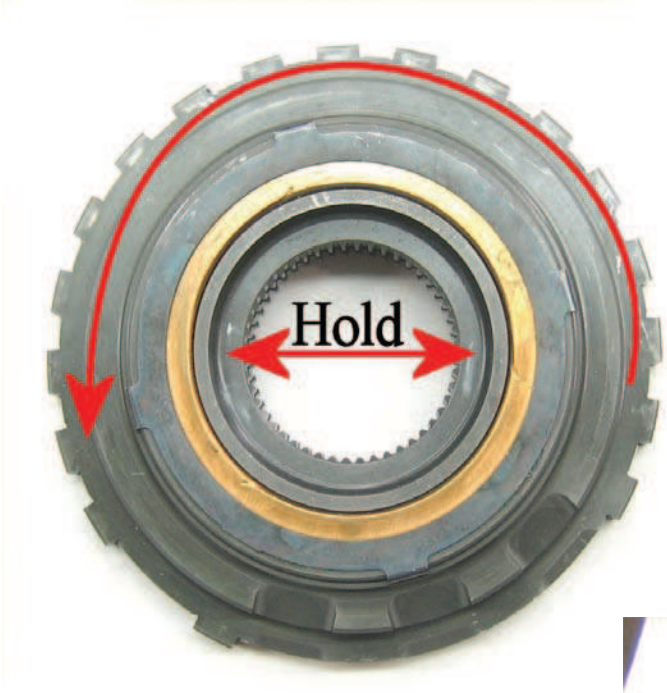
Low/Reverse Sprag Assembly

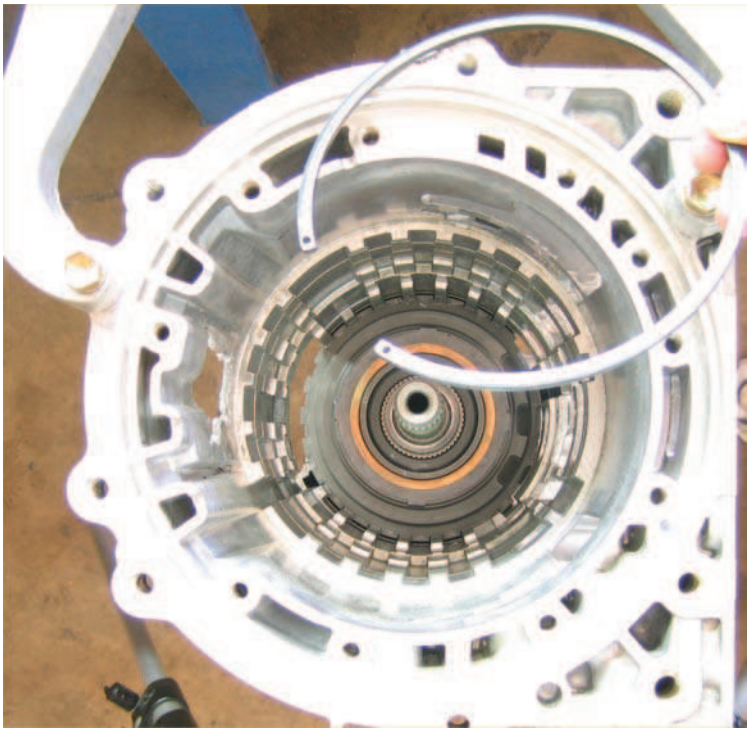
The Low/Reverse sprag freewheels counter clockwise and locks clockwise while holding the inner race.

If the sprag is installed incorrect a no forward gear in drive and/or a bind on the 1-2 shift.



Hold the inter race. The Outside flange will turn freely counter clockwise and lock clockwise.

After installing the sprag into the case. Install the snap ring on top of the Low/Reverse sprag assembly.



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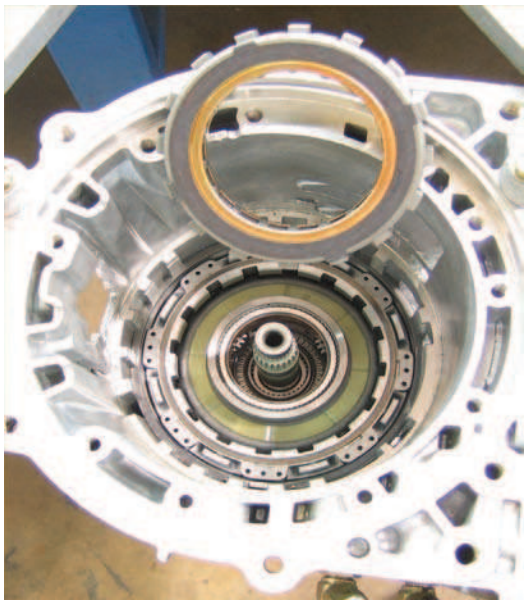
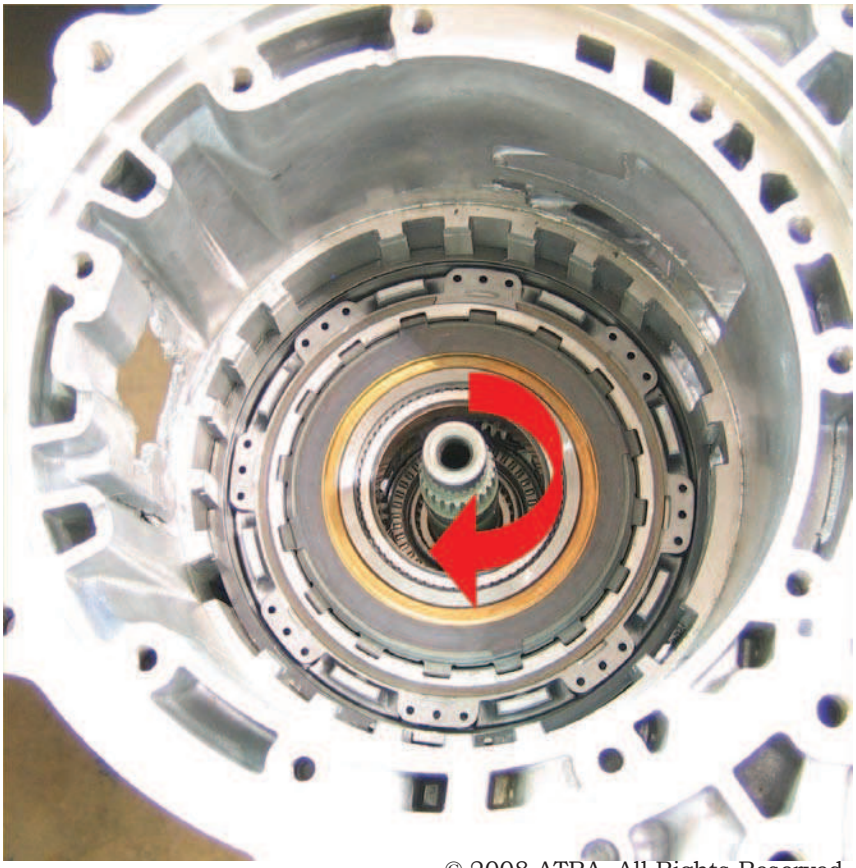
No. 3 Sprag Assembly

Install the 3rd brake cylinder and snap ring into the case. Check the oil pressure apply hole, make sure it lines up. Cylinder #3 aligns with the oil pressure apply hole of the transmission case. Install the No. 3 Sprag assembly into the case as shown. All four tabs must be up! The inner race should rotate freely in a clockwise rotation.



All four tabs must be up! The inner race should rotate freely in a clockwise rotation.



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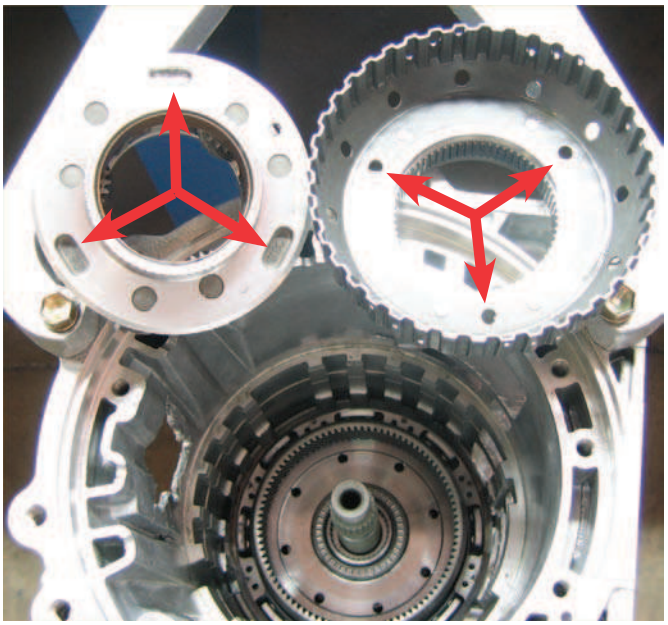
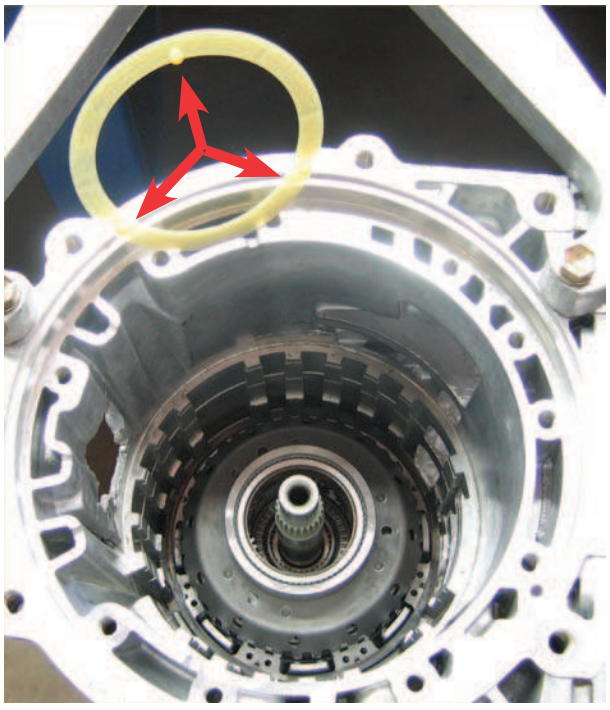
Front Planetary Assembly

When installing the one way clutch inner race onto the front planetary make sure that the holes line up with the slots. On the planetary for the tabs on the thrust washer.

If this is not in place you'll end up with no end play and wipe the thrust washer out, then the transmission.





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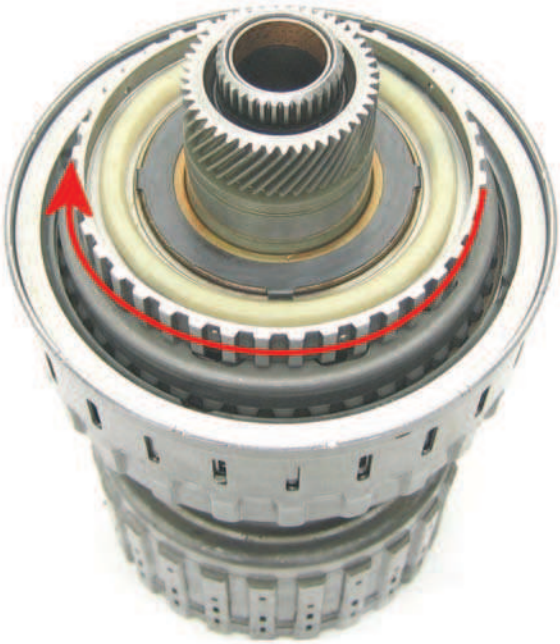
No. 2 Sprag Assembly

Install the No. 2 sprag assembly and thrust washers. The No. 2 sprag assembly rotates freely clockwise and locks counterclockwise. If installed wrong a no 2nd gear and/or bind on the 2-3 shift.



Make sure the sprag assembly turns freely clockwise and locks counter clockwise

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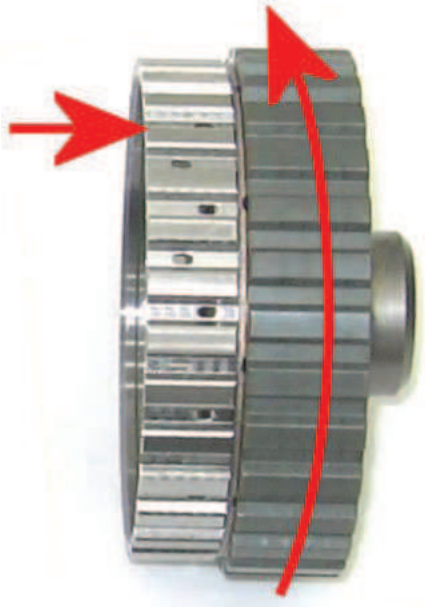
No. 4 Sprag Assembly

Install the input shaft assembly into the direct and the reverse clutch drum. Install the No. 4 sprag assembly into the input clutch drum. With the sprag installed hold the coast clutch hub, the sprag assembly should turn freely clockwise and locks counter clockwise



Make sure the sprag assembly turns freely clockwise and locks counter clockwise

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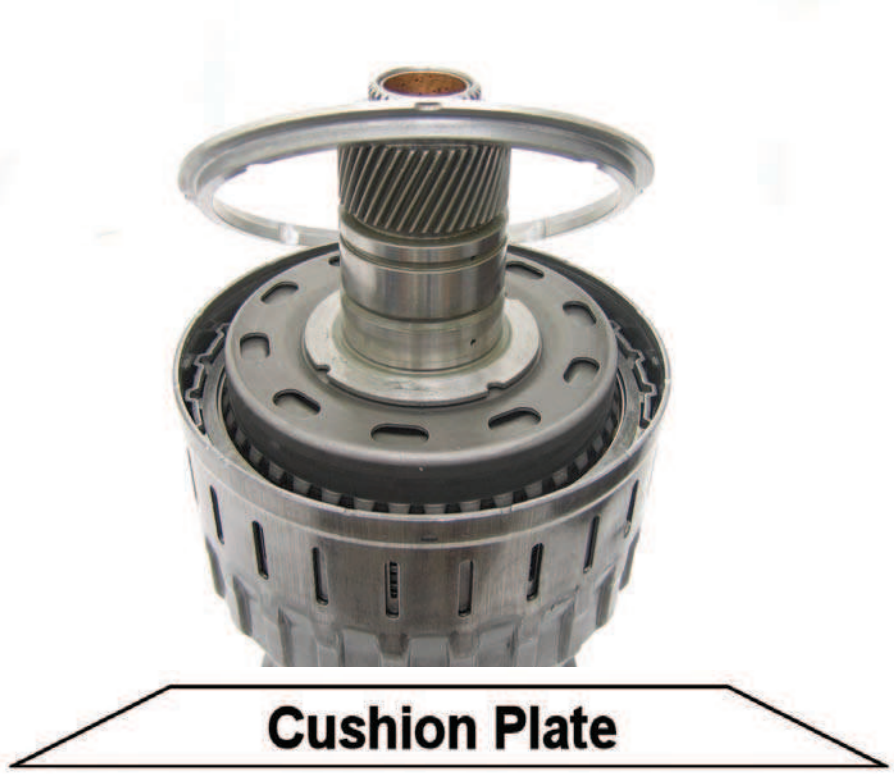
Reverse Clutch Reaction Sleeve

Install reverse clutch reaction sleeve and snap ring. During the assembly make sure the cushion plate is installed as shown. If the cushion plate is installed upside down, the clutch clearance will be to loose, potentially causing shift concerns.



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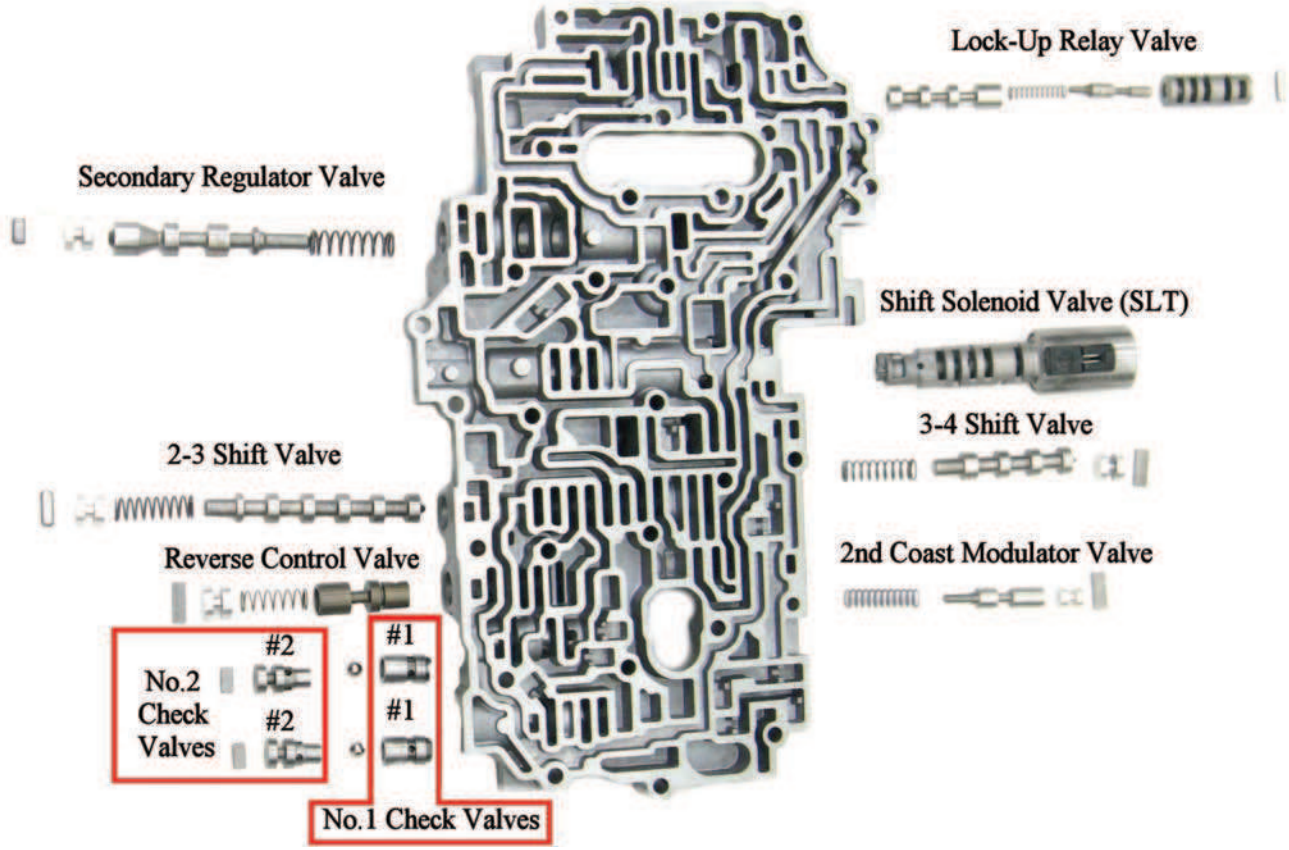
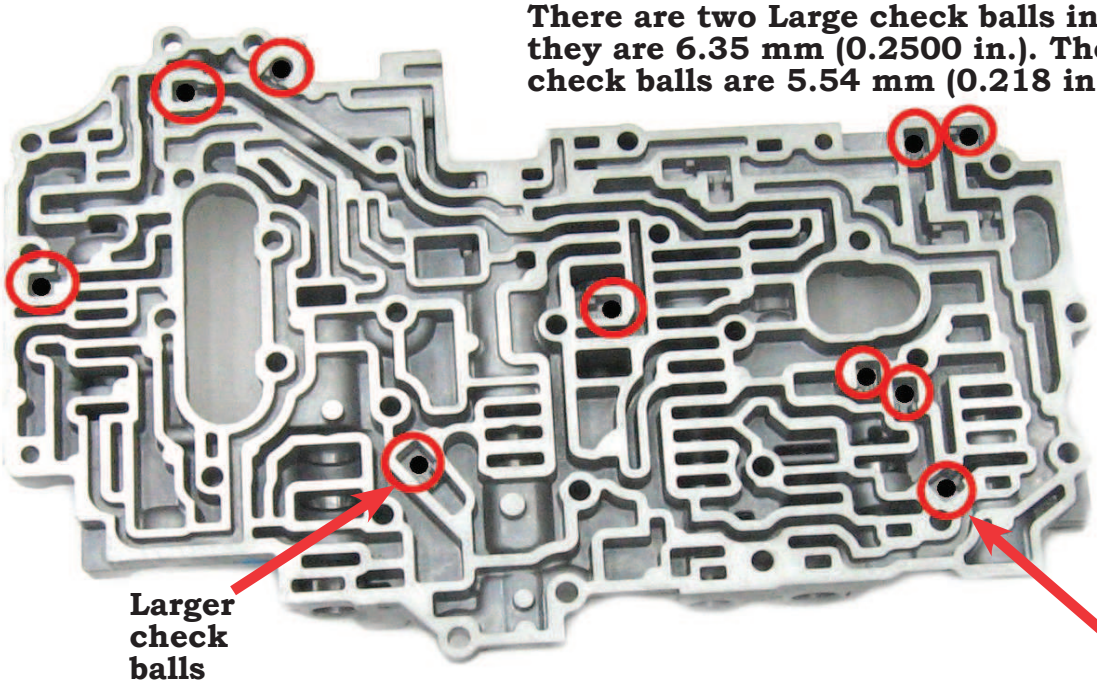
Upper Valve Body Exploded View



There are two Large check balls in the valve body, they are 6.35 mm (0.2500 in.). The rest of the check balls are 5.54 mm (0.218 in.)



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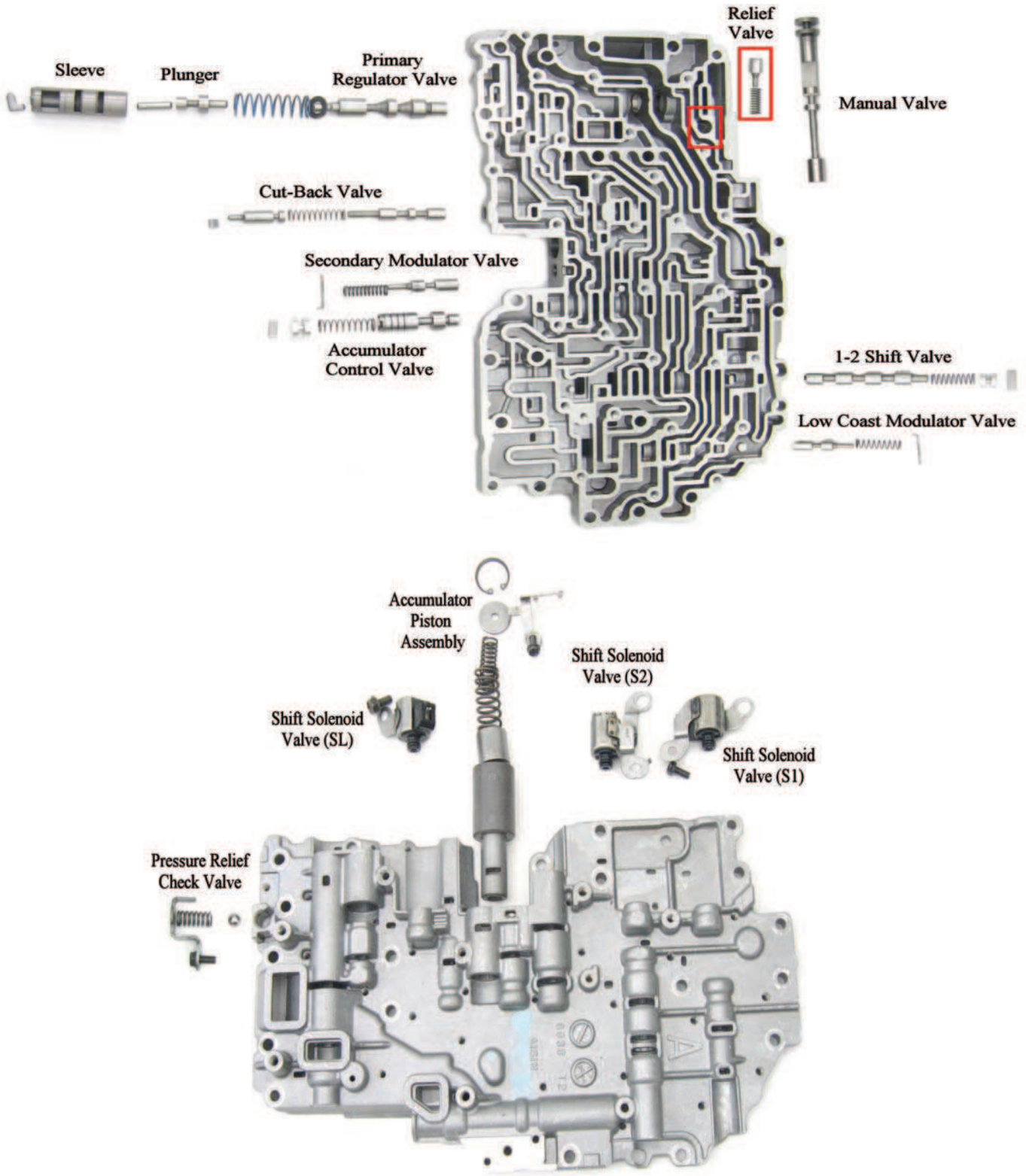
Lower Valve Body Exploded View



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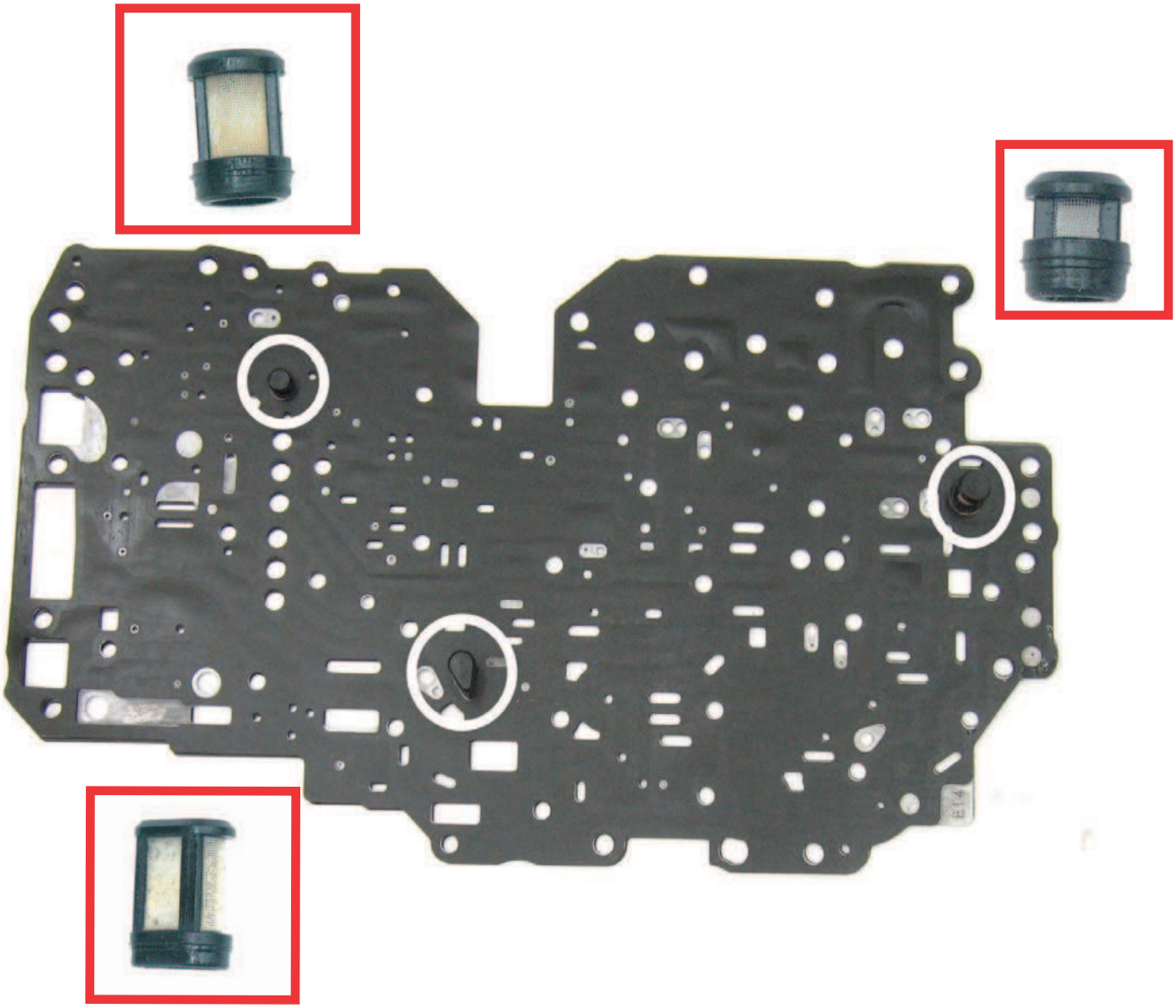
Separator Plate Oil Strainers

During the installation, always install the strainers into the valve body separator plate. The strainers have a lip on one side of the element, this lip should snap into the separator plate.

A no reverse or no upshift concern could occur if the strainers are installed into the valve body channel casting and not the separator plate.



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F4A42/5I, F5A5I, F5HF1-2

Applications

YEAR	MODEL	ENGINE SIZE	TRANSMISSION	SPRAG
1997	Diamante	3.5 Liter Sohc	F4A51-2-D5A	No
1998-99	Diamante	3.5 Liter Sohc	F4A51-2-D5B	Yes
2000-04	Diamante	3.5 Liter Sohc	F4A51-2-CZB	Yes
2000	Eclipse	2.4 Liter Sohc	F4A42-2-M6B	Yes
2001	Eclipse	2.4 Liter Sohc	F4A42-2-J6B	Yes
2002-05	Eclipse	2.4 Liter Sohc	F4A51-2-JZB	Yes
2000-01	Eclipse	3.0 Liter Sohc	F4A51-2-E5B	Yes
2002-05	Eclipse	3.0 Liter Sohc	F4A51-2-FZB	Yes
2004-05	Eclipse	3.0 Liter Sohc (VIC)	F4A51-2-LZP	Yes
2006-07	Eclipse	2.4 Liter Sohc (MIVEC)	F4A4B-4-L3Z	Yes
2006-07	Eclipse	3.8 Liter Sohc (MIVEC)	F5A5A-4-C1Z	Yes
2004-06	Endeavor	3.8 Liter Sohc	F4A5A-4-L1Z	Yes
2004-06	Endeavor	3.8 Liter Sohc	W4A5A-4-T1ZE	Yes
1999-00	Galant	2.4 Liter Sohc	F4A42-2-M6B	Yes
2001	Galant	2.4 Liter Sohc	F4A42-2-J6B	Yes
2002-03	Galant	2.4 Liter Sohc	F4A42-2-JZB	Yes
1999	Galant	3.0 Liter Sohc	F4A51-2-D6B	Yes
2000-01	Galant	3.0 Liter Sohc	F4A51-2-E6B	Yes
2002-03	Galant	3.0 Liter Sohc	F4A51-2-FZB	Yes
2004-06	Galant	2.4 Liter Sohc (MIVEC)	F4A4B-4-L1Z	Yes
2004	Galant	3.8 Liter Sohc	F4A5A-4-F2Z	Yes
2005-06	Galant	3.8 Liter Sohc	F4A5A-4-F1Z	Yes
2007	Galant Ralli-Art	3.8 Liter Sohc (MIVEC)	F5A5A-4-C1Z	Yes

YEAR	MODEL	ENGINE SIZE	TRANSMISSION	SPRAG
1997-99	Mirage	1.5 Liter Sohc	F4A41-1-M8A	No
2000	Mirage	1.5 Liter Sohc	F4A41-1-M8B	Yes
2001	Mirage	1.5 Liter Sohc	F4A41-1-J8B	Yes
1997-99	Mirage	1.8 Liter Sohc	F4A42-1-M8A	No
2000-01	Mirage	1.8 Liter Sohc	F4A42-1-M8B	Yes
2001-03	Mirage	1.8 Liter Sohc	F4A42-1-J8B	Yes
2003	Lancer	2.0 Liter Sohc	F4A42-1-JZB	Yes
2004	Lancer	2.0 Liter Sohc	F4A4B-1-J1Z	Yes
2004-07	Lancer	2.4 Liter Sohc (MIVEC)	F4A4B-4-L2Z	Yes
2003	Outlander	2.4 Liter Sohc	F4A42-2-NZB	Yes
2003	Outlander	2.4 Liter Sohc	W4A42-2-RZD	Yes
2004-06	Outlander	2.4 Liter Sohc (MIVEC)	F4A4B-4-N1Z	Yes
2004-06	Outlander	2.4 Liter Sohc (MIVEC)	WA44B-4-R1Z	Yes

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F4A42/5I

Identification Codes

40/50 SERIES A/T I.D. CODE

F 4 A 42 K1 M 8 A 5

Drive Axle
F=Front Wheel Drive
R=Rear Wheel Drive

Forward Speeds
4=Four Speeds
5=Five Speeds

Transmission Type
A=Automatic
M=Manual

Capacity
41=Light Duty
42=Standard Duty
51=Heavy Duty

Manufacturing Plant
K=Kyoto Works
Note: The "K" is not always stamped into all transmission codes

Development Sequence
1=1st Design
2=2nd Design

Manufacturing Use Only
Note: When the "K" is not always stamped into the code this digit will be dropped off

One-Way Clutch & Planetary Ratio
A= No One-Way Clutch (Sprag)
B=One-Way Clutch (Sprag)*

A & B=F4A41-42	A & B=F4A51
1st=2.842	2.842
2nd=1.529	1.495
3rd=1.000	1.000
4tfh= .712	.731
Rev=2.480	2.720

Speedo Gear Ratio

4 & M=27/36	7 &Q=30/36
5 & N=28/36	8 & R=31/36
6 & P=29/36	9 & S=32/36

Final Drive Ratio

F4A41-42	F4A51
B=N/A	3.274
D=N/A	3.497
E=3.770	3.735
F=3.769	N/A
M=4.042	4.018
U=4.407	4.324
W=4.626	N/A

* OWC* may also be embossed into the case to the left of the code block indicating it is equipped with the One-Way Clutch (Sprag)
NOTE: The final drive ratio includes the primary reduction ratio of 1.186:1 for the F4A41-42 and 1.119:1 for the F4A51

TRANSAXLE I.D. CODES

Final Drive Ratio:

F4A41-42	F4A51
A = N/A	A = 3.269
B = N/A	B = 3.274
C = N/A	C = 3.491
D = N/A	D = 3.497
E = 3.770	E = 3.735
F = 3.769	F = 3.728
J = 4.041	J = N/A
L = 4.212	L = 4.011
M = 4.042	M = 4.018
N = 4.406	N = N/A
R = 4.625	R = 4.520
U = 4.407	T = 4.316
W = 4.626	U = 4.324
	W = N/A

Planetary Ratio:

A & B = F4A41-42	A & B = F4A51
1st = 2.842	2.842
2nd = 1.529	1.495
3rd = 1.000	1.000
4th = .712	.731
Rev = 2.480	2.720

Speedo Gear Ratio:

F4A41-42	F4A51
4 & M = 27/36	5 & N = 28/36
6 & P = 29/36	7 & Q = 30/36
8 & R = 31/36	9 & S = 32/36

Z = No vehicle speed sensor, vehicle speed is calculated using the output speed sensor

NOTE: The final drive ratios above include the primary reduction ratio of 1.186 for the F4A41-42 and 1.119 for the F4A51

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F4A/F5A Series

Clutch and Band Application Charts

Mitsubishi

OPERATING ELEMENT / SELECTOR LEVER POSITION			ENGINE START	PARKING MECHANISM	UNDER DRIVE CLUTCH (UD)	REVERSE CLUTCH (REV)	OVER-DRIVE CLUTCH (OD)	DIRECT CLUTCH (DIR)	LOW-REVERSE BRAKE (LR)	SECOND BRAKE (2ND)	REDUCTION BRAKE (RED)	ONE-WAY CLUTCH (OWC-L)	ONE-WAY CLUTCH (OWC-D)
P		Parking	OK	×	–	–	–	–	×	–	×	–	–
R		Reverse	–	–	–	×	–	–	×	–	×	–	–
N		Neutral	OK	–	–	–	–	–	×	–	×	–	–
D	Sport mode	1st	–	–	×	–	–	–	×*	–	×	×	×
		2nd	–	–	×	–	–	–	–	×	×	–	×
		3rd	–	–	×	–	×	–	–	–	×	–	×
		4th	–	–	×	–	×	×	–	–	–	–	–
		5th	–	–	–	–	×	×	–	×	–	–	–

×: Function element – : Not applicable

*NOTE: * operates only when the vehicle is stationary [at approximately 10 km/h (6.2 mph) or less].*

Kia/Hyundai

ITEM		UD	OD	2ND	LR	REV	RED	DIR	OWC2	OWC1
P		-	-	-	O	-	O	-	-	-
R		-	-	-	O	O	O	-	-	-
N		-	-	-	O	-	O	-	-	-
D	1	O	-	-	O	-	O	-	O	O
	2	O	-	O	-	-	O	-	O	O
	3	O	O	-	-	-	O	-	O	-
	4	-	O	O	-	-	O	-	O	-
	5	-	O	O	-	-	-	O	-	-

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F4A/F5A Series

Pressure Specifications

4-Speed

STANDARD HYDRAULIC PRESSURE TEST

MEASUREMENT CONDITION			STANDARD HYDRAULIC PRESSURE kPa					
SELECTOR LEVER POSITION	SHIFT POSITION	ENGINE SPEED (r/min)	UNDERDRIVE CLUTCH PRESSURE [UD]	REVERSE CLUTCH PRESSURE [RV]	OVERDRIVE CLUTCH PRESSURE [OD]	LOW AND REVERSE BRAKE PRESSURE [LR]	SECOND BRAKE PRESSURE [2ND]	TORQUE CONVERTER PRESSURE [DR]
P	-	2,500	-	-	-	310 - 390 (46 - 57)	-	250 - 390 (37 - 57)
R	Reverse	2,500	-	1,270 - 1,770 (185 - 256)	-	1,270 - 1,770 (185 - 256)	-	500 - 700 (73 - 101)
N	-	2,500	-	-	-	310 - 390 (46 - 57)	-	250 - 390 (37 - 57)
D	1st gear	2,500	1,010 - 1,050 (147 - 152)	-	-	1,010 - 1,050 (147 - 152)	-	500 - 700 (73 - 101)
	2nd gear	2,500	1,010 - 1,050 (147 - 152)	-	-	-	1,010 - 1,050 (147 - 152)	500 - 700 (73 - 101)
	3rd gear	2,500	590 - 690 (85 - 100)	-	590 - 690 (85 - 100)	-	-	450 - 650 (65 - 94)
	4th gear	2,500	-	-	590 - 690 (85 - 100)	-	590 - 690 (85 - 100)	450 - 650 (65 - 94)

5-Speed

MEASUREMENT CONDITION			STANDARD HYDRAULIC PRESSURE MPa (psi)						
TRANSMISSION RANGE	SHIFT POSITION	ENGINE SPEED (r/min)	UNDERDRIVE CLUTCH PRESSURE [UD]	REVERSE CLUTCH PRESSURE [RV]	OVERDRIVE CLUTCH PRESSURE [OD]	DIRECT CLUTCH PRESSURE [DIR]	LOW-REVERSE BRAKE PRESSURE [LR]	SECOND BRAKE PRESSURE [2ND]	REDUCTION BRAKE PRESSURE [RED]	TORQUE CONVERTER CLUTCH PRESSURE [DR]
P	-	2,500	-	-	-	-	0.31 – 0.39 (44 – 56)	-	0.31 – 0.39 (44 – 56)	0.22 – 0.36 (32 – 52)
R	Reverse	2,500	-	1.27 – 1.77 (185 – 256)	-	-	1.27 – 1.77 (185 – 256)	-	1.27 – 1.77 (185 – 256)	0.50 – 0.73 (73 – 106)
N	-	2,500	-	-	-	-	0.31 – 0.39 (44 – 56)	-	0.31 – 0.39 (44 – 56)	0.22 – 0.36 (32 – 52)
Sport mode	1st gear	2,500	0.95 – 1.06 (137 – 153)	-	-	-	0.95 – 1.06 (137 – 153)	-	0.95 – 1.06 (137 – 153)	0.50 – 0.73 (73 – 106)
	2nd gear	2,500	0.95 – 1.06 (137 – 153)	-	-	-	-	0.95 – 1.06 (137 – 153)	0.95 – 1.06 (137 – 153)	0.50 – 0.73 (73 – 106)
	3rd gear	2,500	0.78 – 0.90 (113 – 131)	-	0.78 – 0.90 (113 – 131)	-	-	-	0.78 – 0.88 (113 – 128)	0.45 – 0.72 (65 – 104)
	4th gear	2,500	0.78 – 0.90 (113 – 131)	-	0.78 – 0.90 (113 – 131)	0.78 – 0.88 (113 – 128)	-	-	-	-
	5th gear	2,500	-	-	0.78 – 0.90 (113 – 131)	0.78 – 0.88 (113 – 128)	-	0.78 – 0.88 (113 – 128)	-	-

NOTE: When the torque converter pressure is measured, the engine speed should be 1,500 r/min or less.

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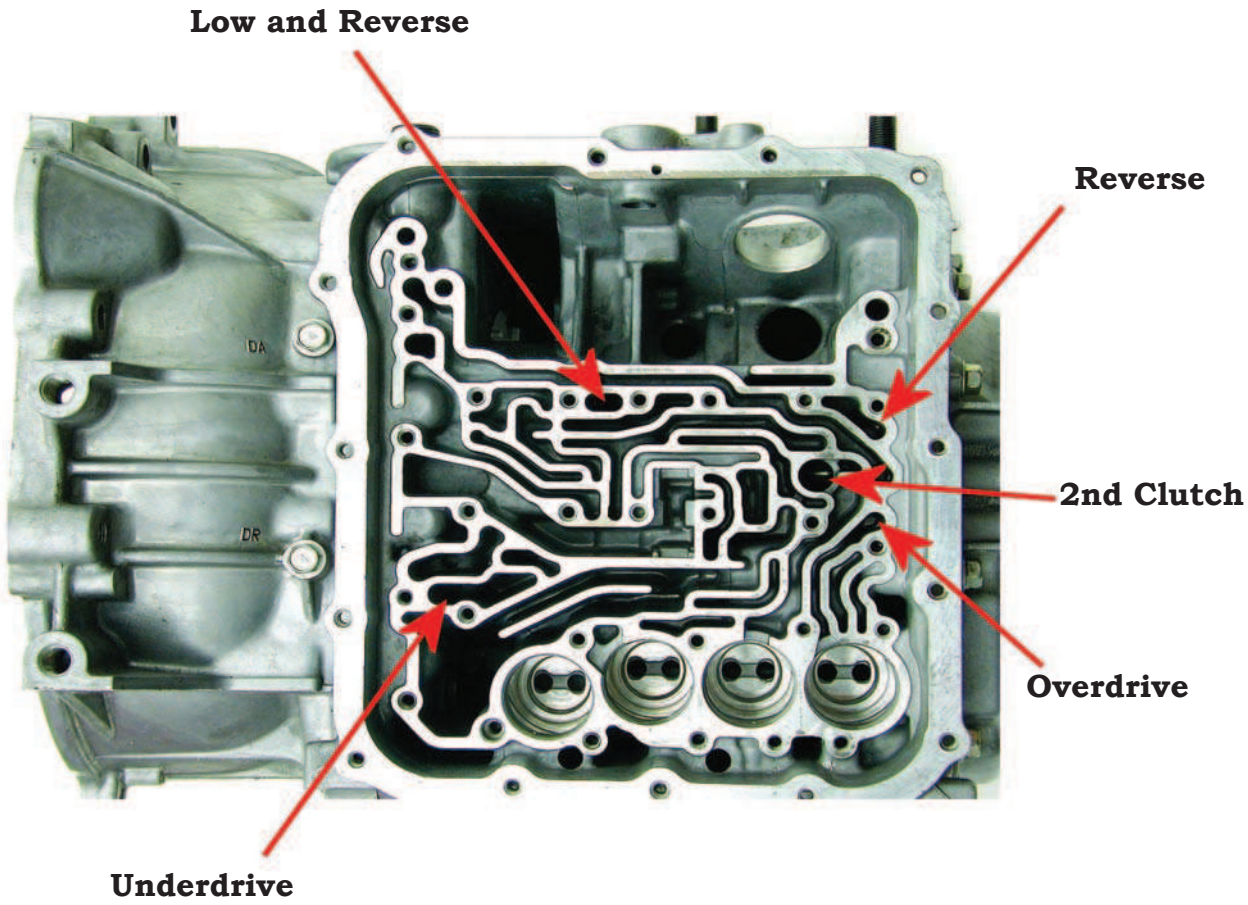
F4A Series

Air Checking the Transmission

Always use regulated clean shop air before you perform the air test.



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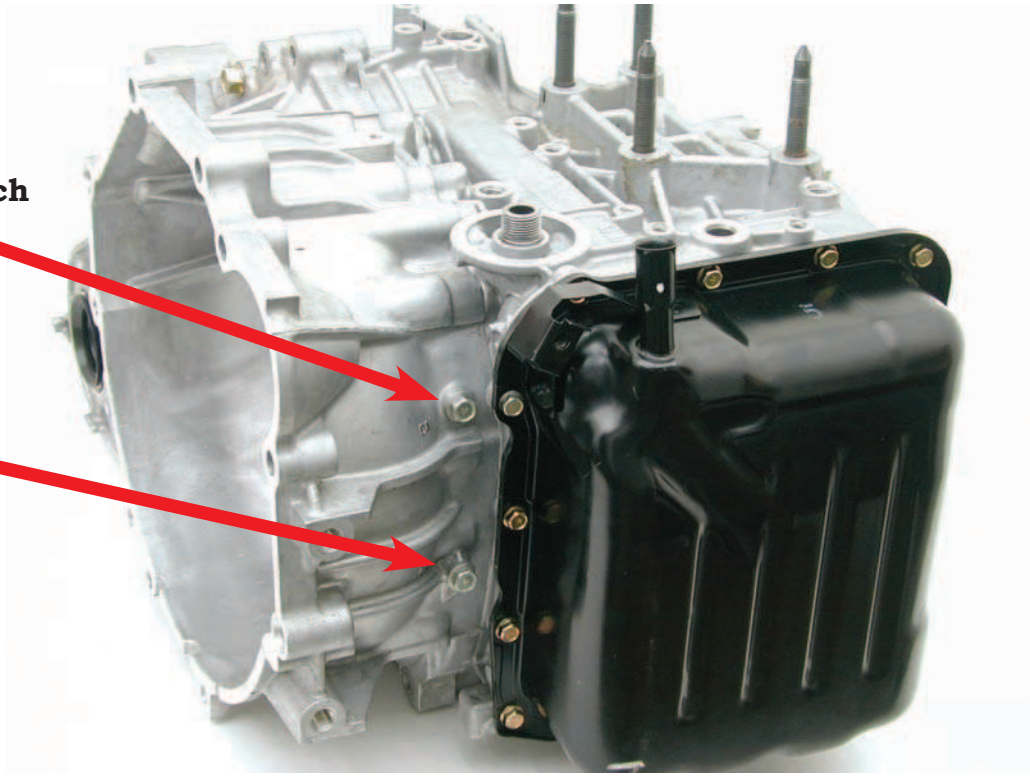
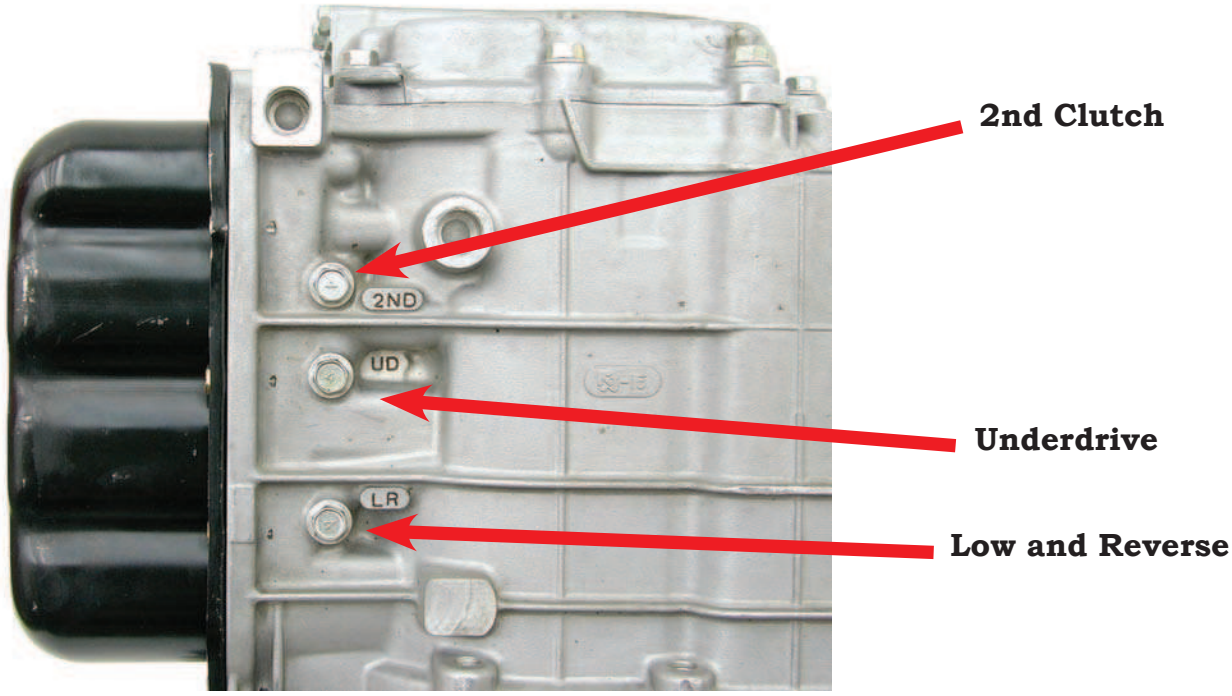
F4A/F5A Series

Pressure Tap Locations





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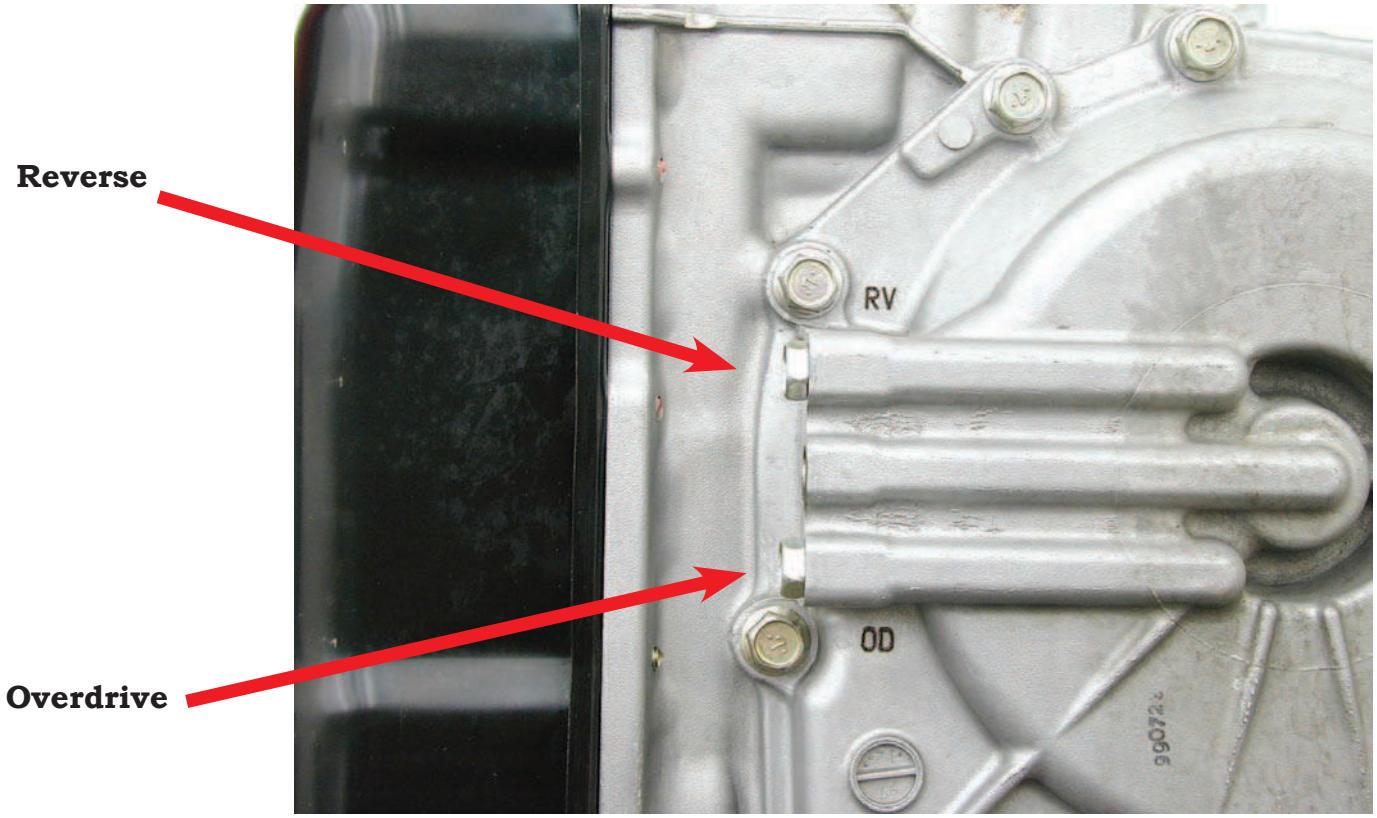
F4A/F5A Series

Pressure Tap Locations (continued)



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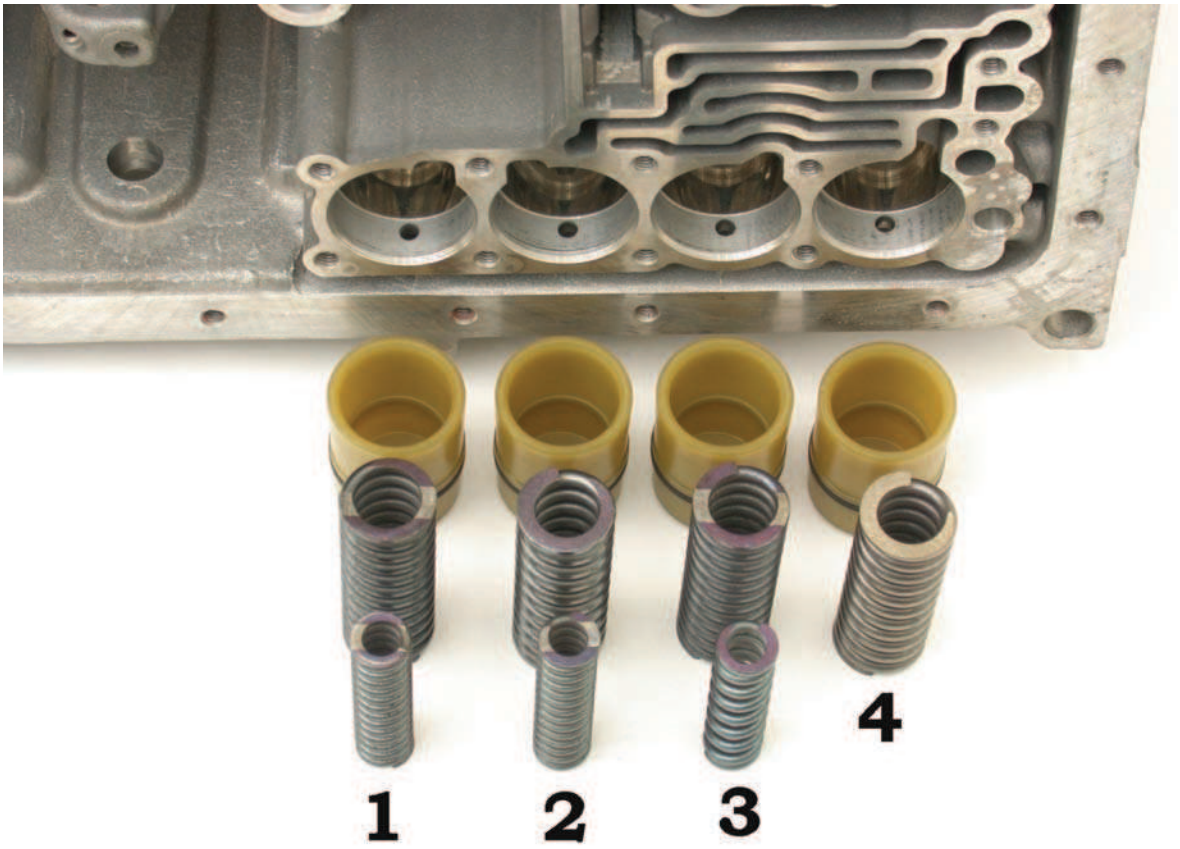
F4A/F5A Series

Accumulator Piston Positions

During reassembly install the springs first then the pistons.



Accumulator Piston	I.D. Color	Outer	Inner
1. LR Brake	Colorless	2.60 in	2.25 in
2. UD Clutch	Yellow	2.60 in	2.30 in
3. 2nd Brake	White	2.53 in	2.12 in
4. OD Clutch	Colorless	2.50 in	

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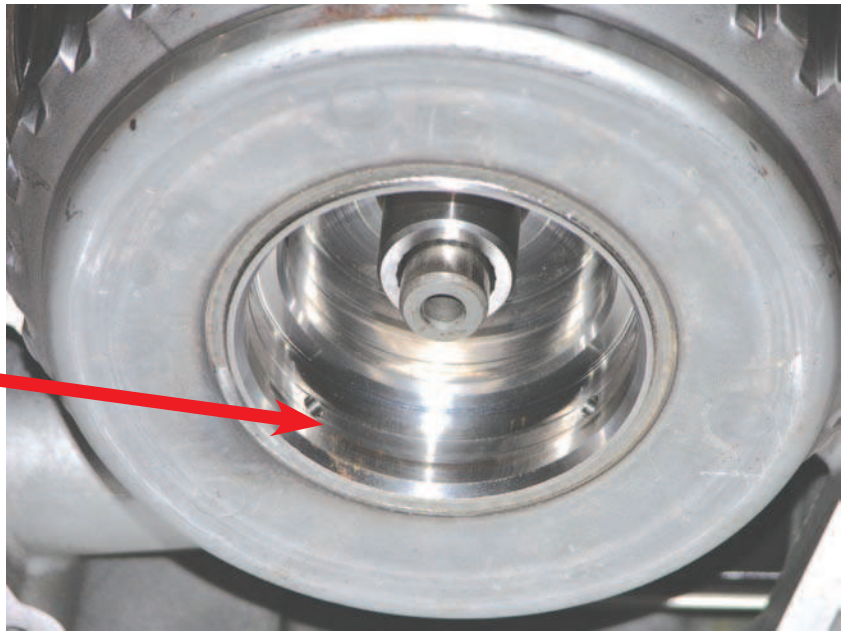
F4A/F5A Series

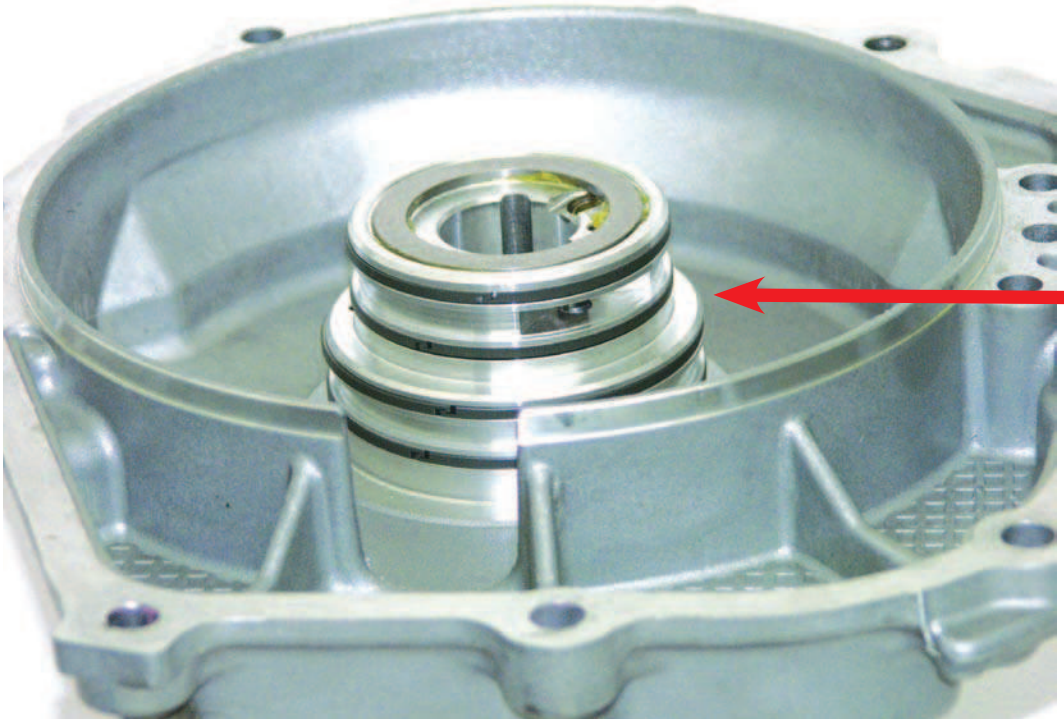
2-3 Shift Flare

A 2-3 Shift Flare, Soft, or Bumpy shift can be caused by the rear cover seal rings and ring tower for wear or damage. Check ring seal surfaces in drum assembly.

Inspect the end cover and ring grooves for wear. This area is a HIGH failure rate.

Check the drum ring land surface for damage





Check the end cover ring lands for damage

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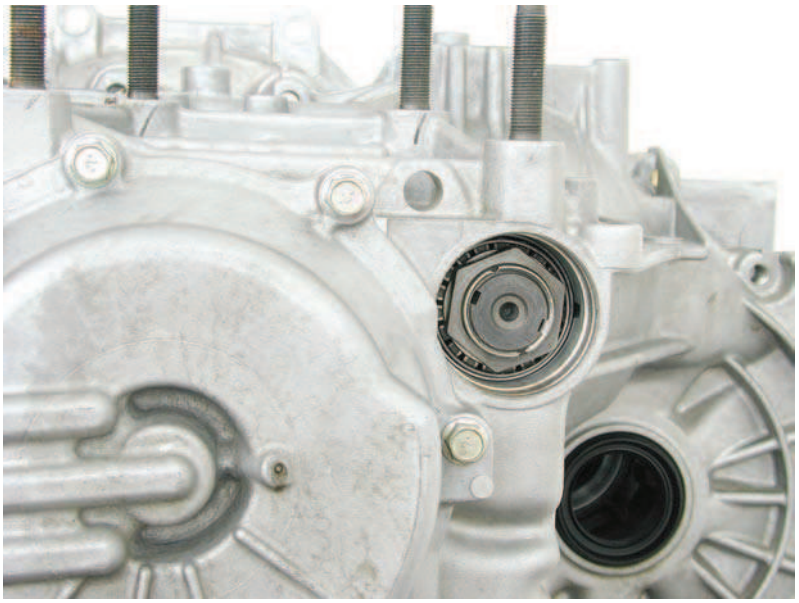
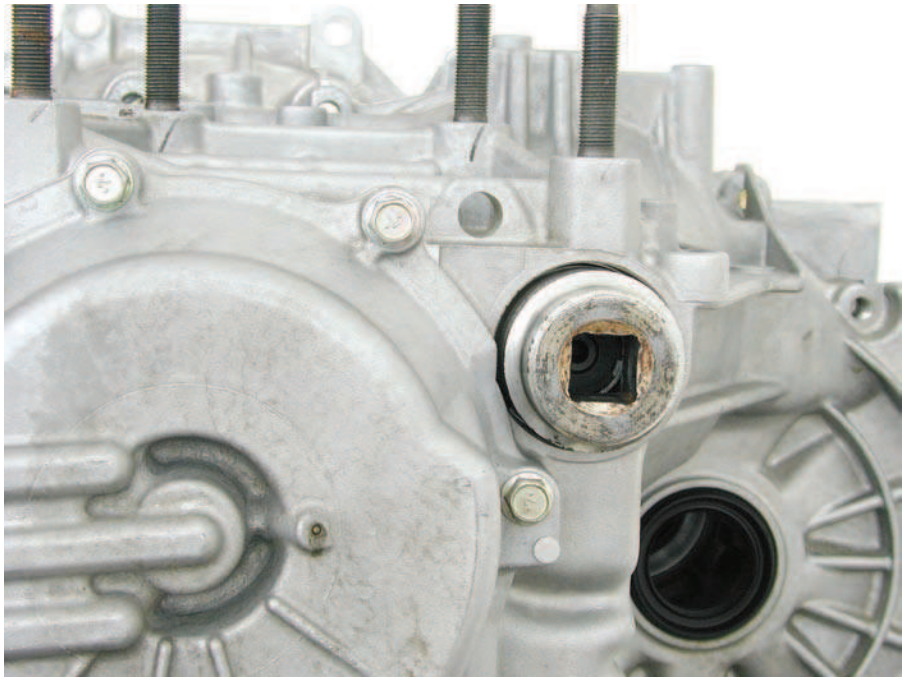
F4A/F5A Series

Transfer Gear Lock Nut

The Lock Nut is Left hand thread. Use a punch or equivalent tool to release the locking tab on the nut flange.
During the installation torque the Transfer Gear nut to 133-155 ft lbs.





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F4A/F5A Series

Low Sprag

The Low Sprag holds in First gear and freewheels in all other forward gears. The sprag rotates freely in a counter clockwise rotation and locks in a clockwise rotation.

If the sprag were installed incorrectly a no forward in the drive position and a bind in 2nd gear.

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The sprag rotates freely in a counter clockwise rotation and locks in a clockwise rotation.

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F4A/F5A Series

2nd Clutch

The 2C clutch clearance can be check two different ways. One method of checking it is without the wave spring and applying pressure down to the clutch packs to obtain the clearance. Your measurement will be 0.035-0.050 in.

The second method is using the factory tools with the wave spring installed and not applying pressure to the clutch pack. Your measurement will be between 0.043-0.061 in.

The broken wave spring is a common failure, when this happens it can damage the pump, stick valves and destroy other components. Make sure to thoroughly clean the unit if this happens.

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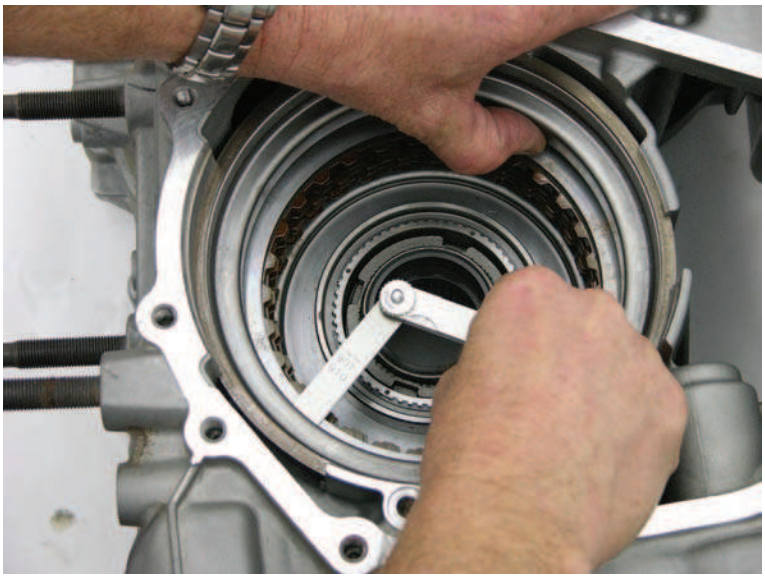

This spring is used on F4A51 models w/V6 always replace the wave spring with an updated thicker wave spring.

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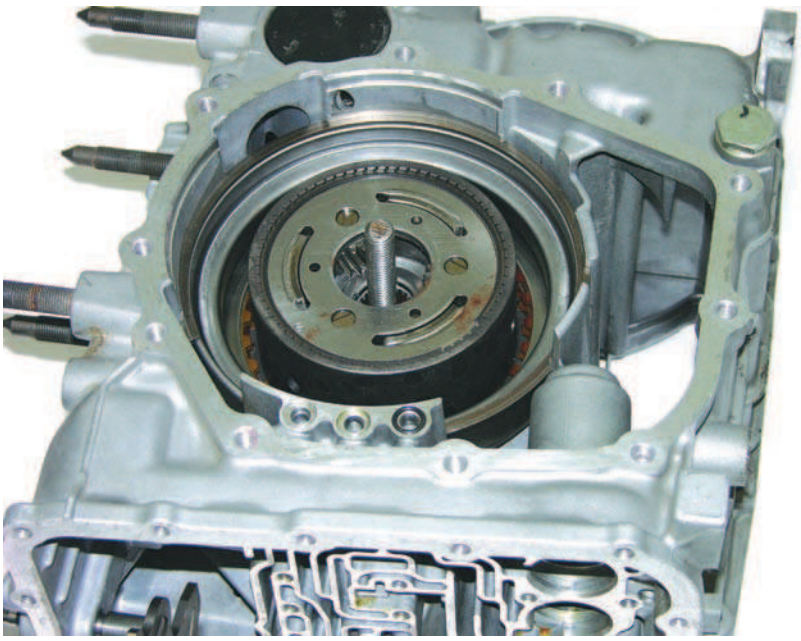
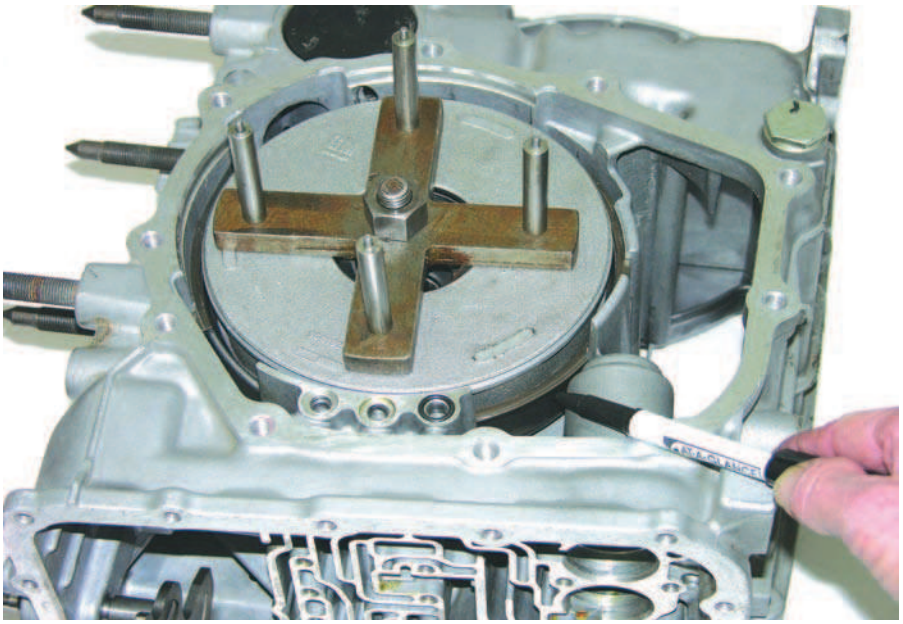
F4A/F5A Series

Installing the C2 Piston

When installing the C2 piston, install thick snap ring, then install the retainer plate with the step facing down. Then install the thicker snap ring.

You will need to use a tool to compress the 2C clutch piston housing in order to install the snap ring in to the case. You can use a 4L30E reverse piston and standard compressor tools.





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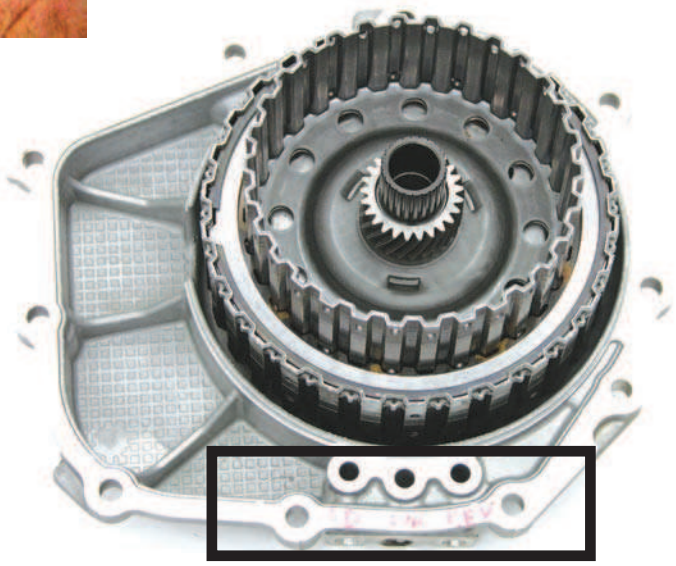
F4A/F5A Series

Installing the Overdrive and Reverse Clutch

During the reassembly of the overdrive and reverse clutch packs. Check the Overdrvie clutches with even force around the clutch pack. The average clearance is between 0.040-0.047 in. Use the same procedure for the Reverse clutch packs. The average clearance is between 0.059-0.067 in.

To ease installation of the Overdrive and Reverse drums into the case, spline the sun shell into clutch packs. Then install the sun shell and drum assembly into the case and install the end cover last.



Air check the clutches Through the end cover

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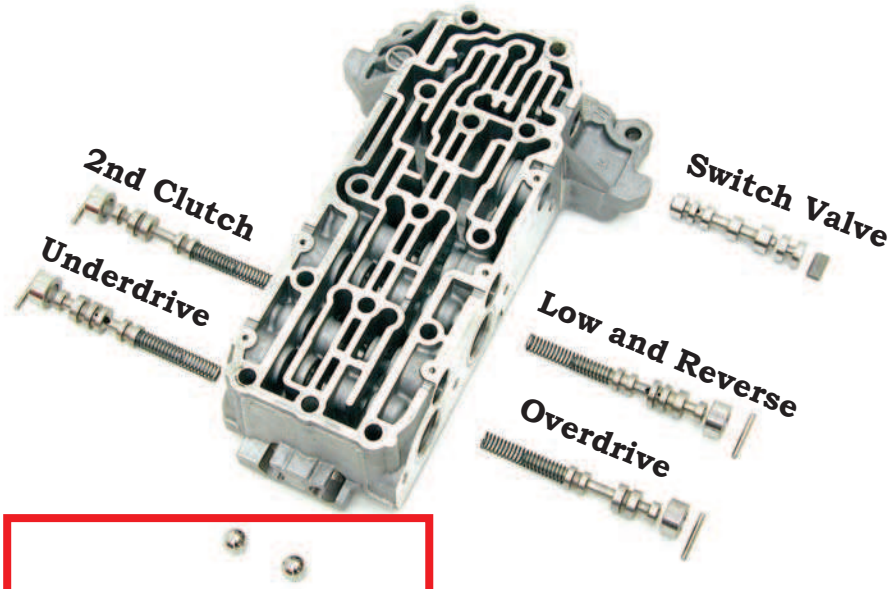
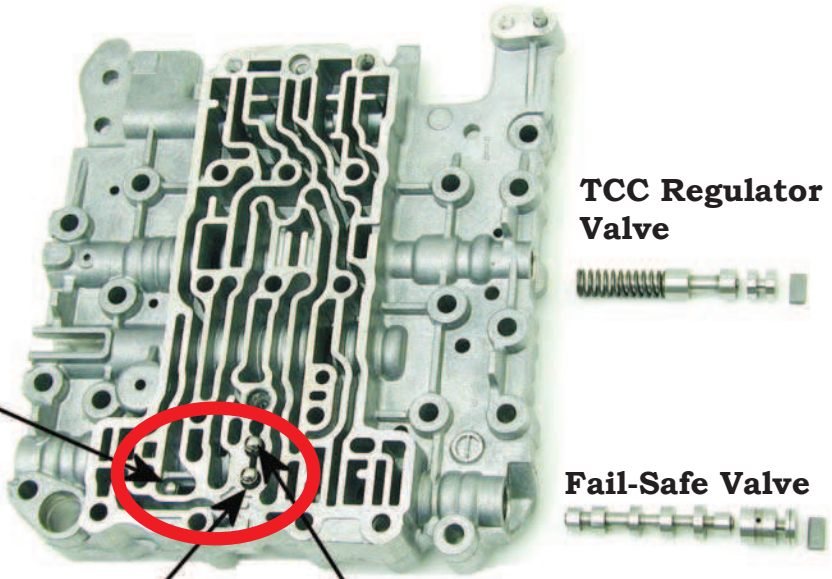
F4A Series

Valve Body (4 Speed)

There are two check balls in the auxiliary valve body that are used to bleed air out of the clutch exhaust circuits. These two check balls are held against the case with no springs.



These Check Balls are used to bleed air out of the clutch exhaust circuits.



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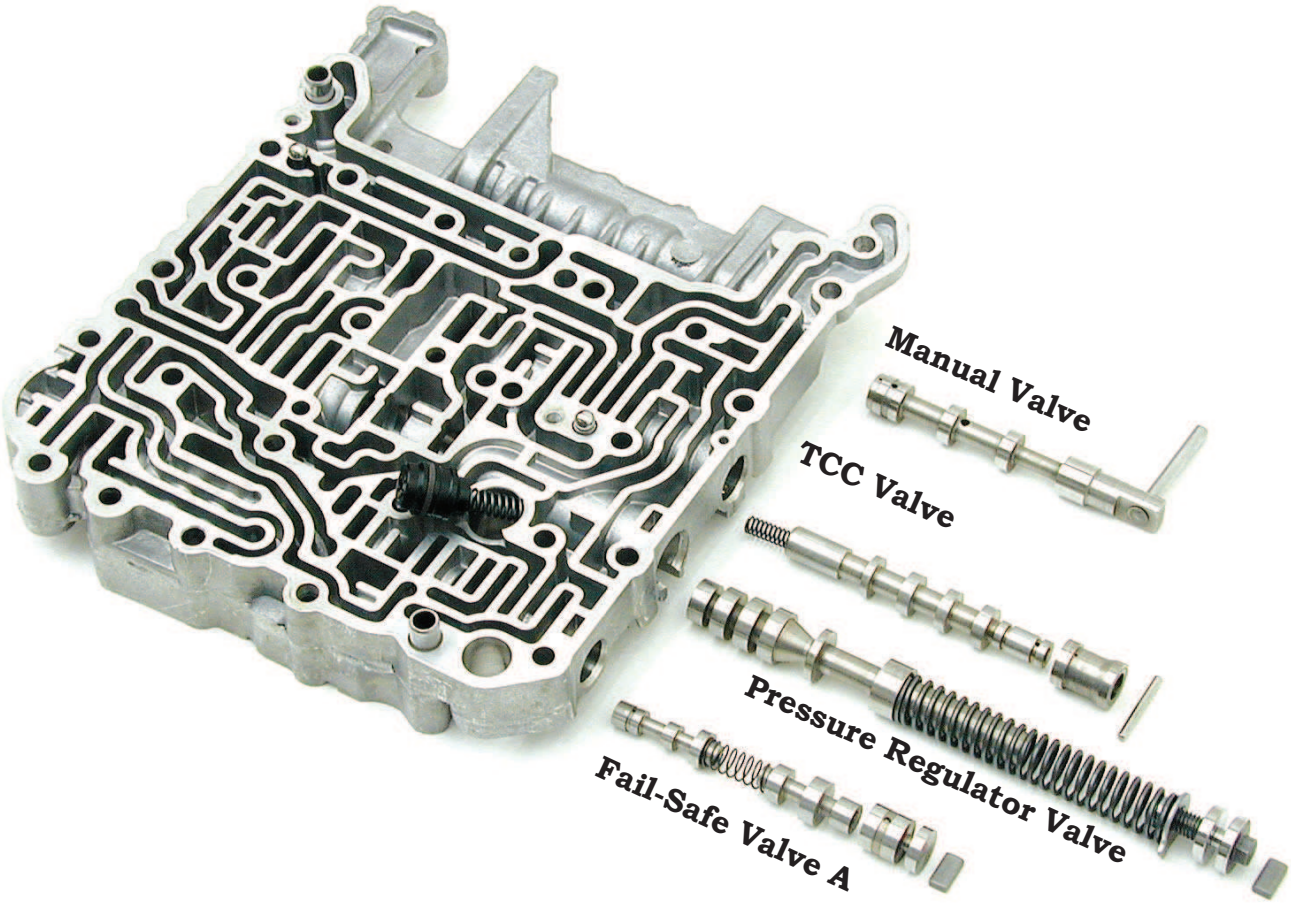
F4A Series

Valve Body (4 Speed) (Continued)

The Pressure Regulator valve is adjustable, but it is also a high wear item. The valve and bore must be checked during a rebuild.



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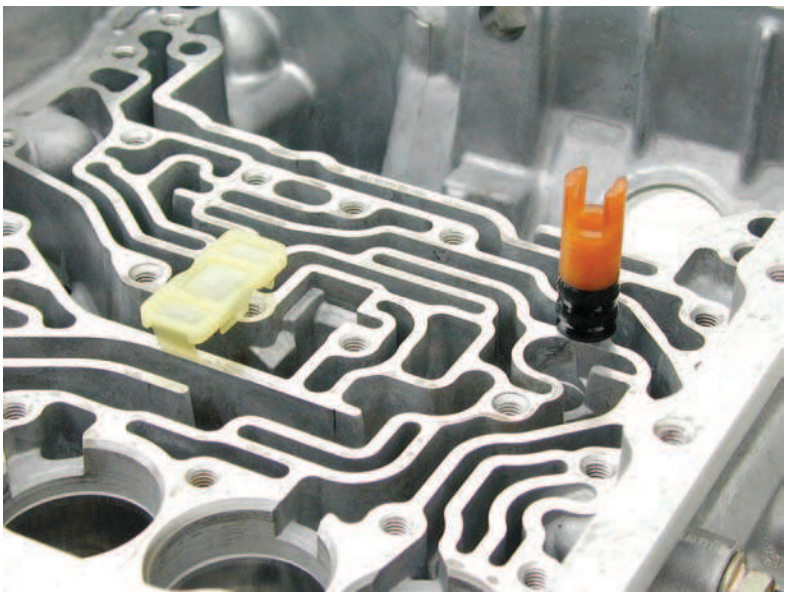
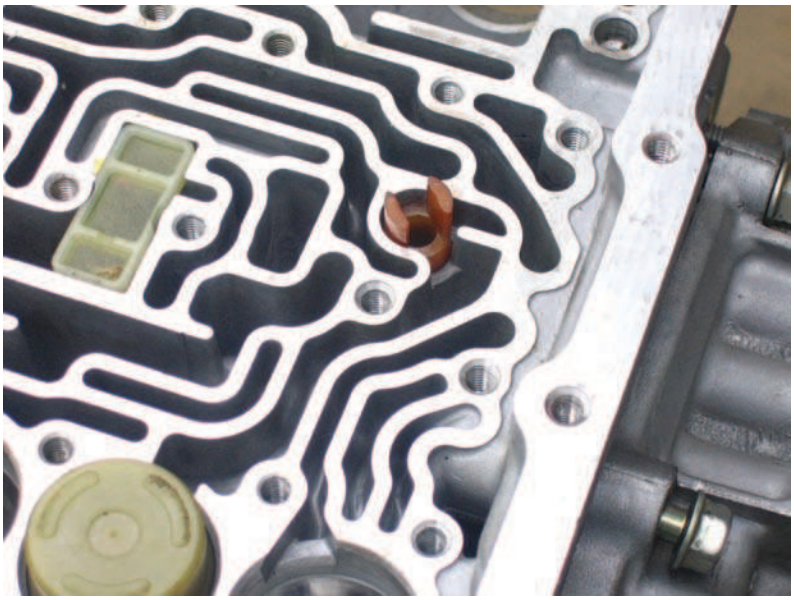
F4A/F5A Series

2C Transfer Tube

The 2C Transfer Tube completes the hydraulic circuit between the valve body and the 2C clutch/accumulator. Make sure the support legs DO NOT sit across the case passage. If the legs sit across the case passage the unit will bind up during the 2-3 shift.





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F4A/F5A Series

Troubleshooting

SOLENOID VALVE OPERATING ELEMENTS OF EACH SHIFT RANGE

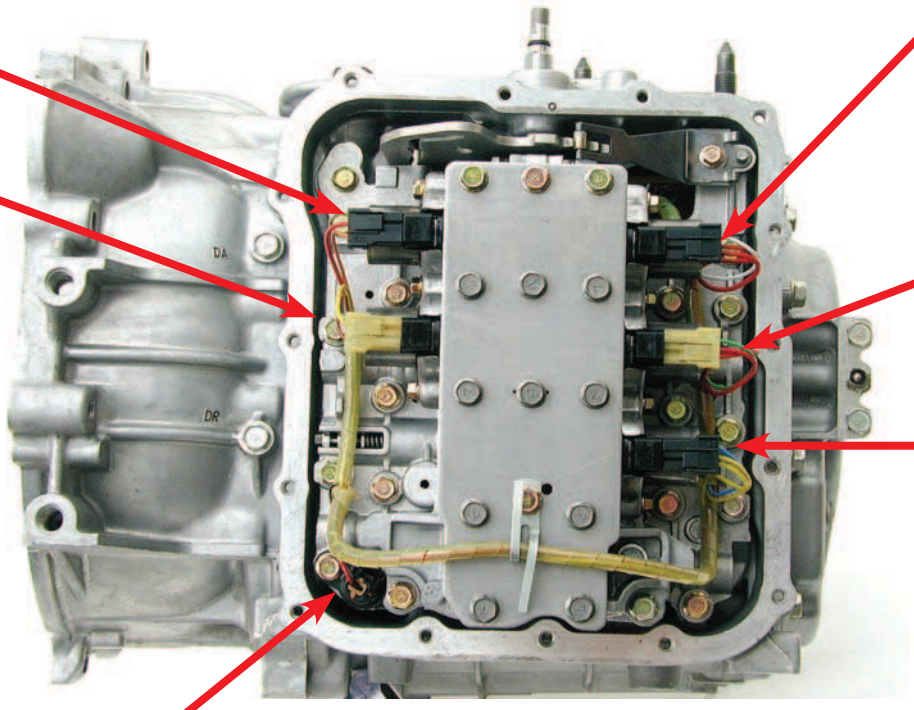
Item	Solenoid valve					
Shift range	LR (DIR)	2ND	UD	OD	RED	DCC (reference)
First speed	OFF (LR)	ON	OFF	ON	OFF	OFF
Second speed	ON (LR)	OFF	OFF	ON	OFF	OFF
Third speed	ON (DIR)	ON	OFF	OFF	OFF	OFF
Fourth speed	ON (DIR)	OFF	ON	OFF	OFF	ON
Fifth speed	OFF (DIR)	OFF	ON	OFF	ON	ON
Reverse	OFF (LR)	ON	ON	ON	OFF	OFF
Neutral, parking	OFF (LR)	ON	ON	ON	OFF	OFF

NOTE: The solenoids are normally open and applying the clutch when they are in the OFF (de-energized) mode . When their energized the solenoid closes and the clutch is released

Solenoid Operation and Testing

<5A/T>

DRIVING CONDITION	DATA LIST ITEM				
	DIR-L/R	UD	2C	OD	REDU
Driving at constant speed of 10 km/h (6.2 mph) in 1st gear	0%	0%	100%	100%	0%
Driving at constant speed of 30 km/h (19 mph) in 2nd gear	100%	0%	0%	100%	0%
Driving at constant speed of 50 km/h (31 mph) in 3rd gear	100%	0%	100%	0%	0%
Driving at constant speed of 50 km/h (31 mph) in 4th gear	0%	0%	100%	0%	100%
Driving at constant speed of 70 km/h (36 mph) in 5th gear	0%	100%	0%	0%	100%



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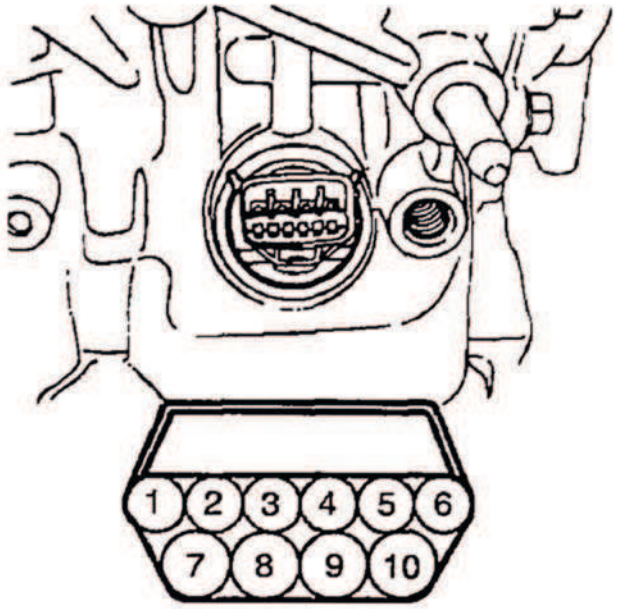
F5A Series

Solenoid Specifications

Early models use a metal body solenoid. Late models, after the 2000 model year, use a solenoid made of plastic. The Metal and the Plastic solenoids are not interchangeable with each other.

Connector View at the Transmission



Solenoid Duty Cycle and Pressure Valves

SOLENOID VALVE CHART

Solenoid Valve	DUTY (%)			
	0%	50%	75%	100%
UD, OD, LR, 2ND, RED (61.27 Hz)	10.5 +/- 0.1 kg/m^2	6.4 +/- 0.25kg/m^2	3.6 +/- 0.25kg/m^2	Below 0.1kg/m^2
DCCSV (30.64 Hz)	10.5 +/- 0.1 kg/m^2	5.9 +/- 0.3kg/m^2	3.2 +/- 0.3kg/m^2	Below 0.1 kg/m^2

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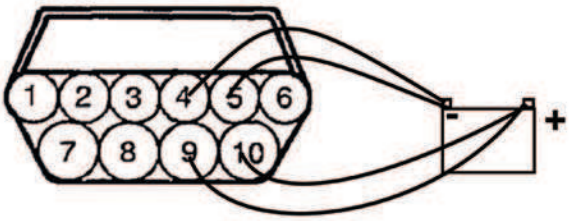
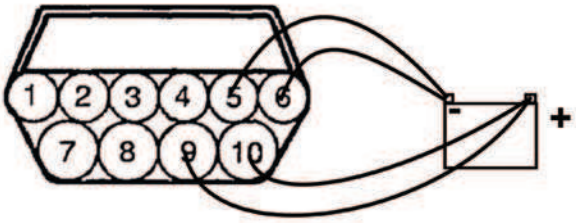
F5A Series

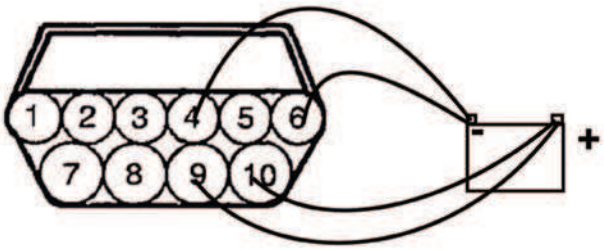
Forcing the Shifts on the 5-Speed



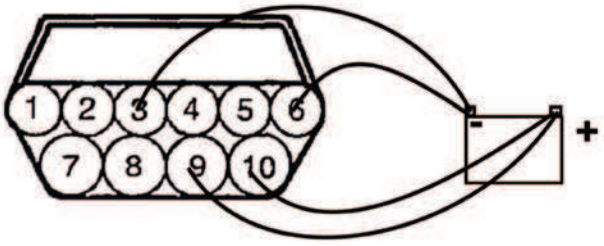
1st Gear



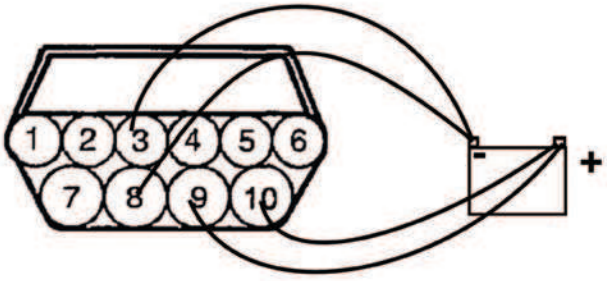
2nd Gear



3rd Gear



4th Gear



5th Gear

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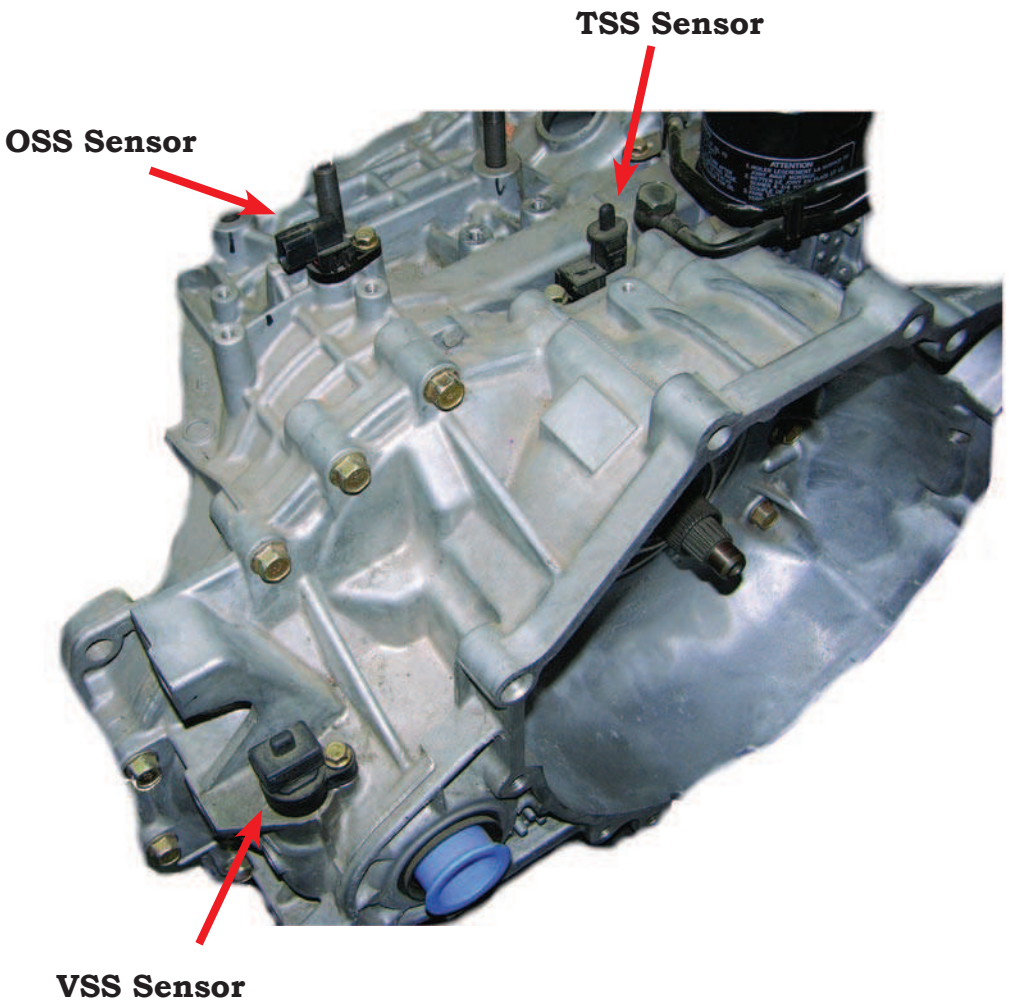
F4A/F5A Series

OSS and TSS

Unlike the KM units these two speed sensors can not be installed incorrectly. However they do have problems with corrosion and sensor damage. Codes P0715, P0717, P0720, P0721, P0722 may be set. Check the sensors for intermittent or no signal at the TCM and at the sensor.



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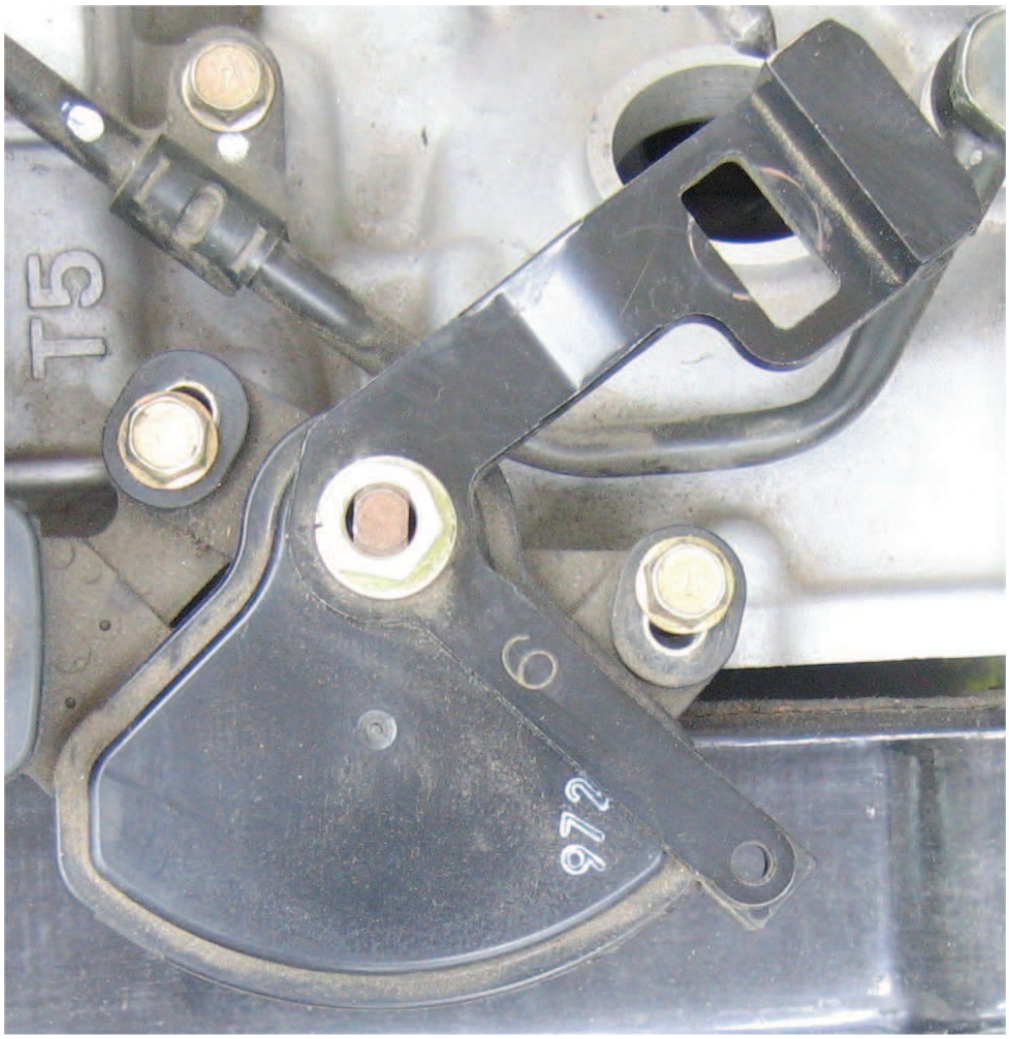
F5A Series

P0707 and P0708

Codes P0707 & P0708 may be set due to the range switch being out of adjustment. With the selector in Neutral, make sure the alignment arm is directly over the alignment tab on the range switch.



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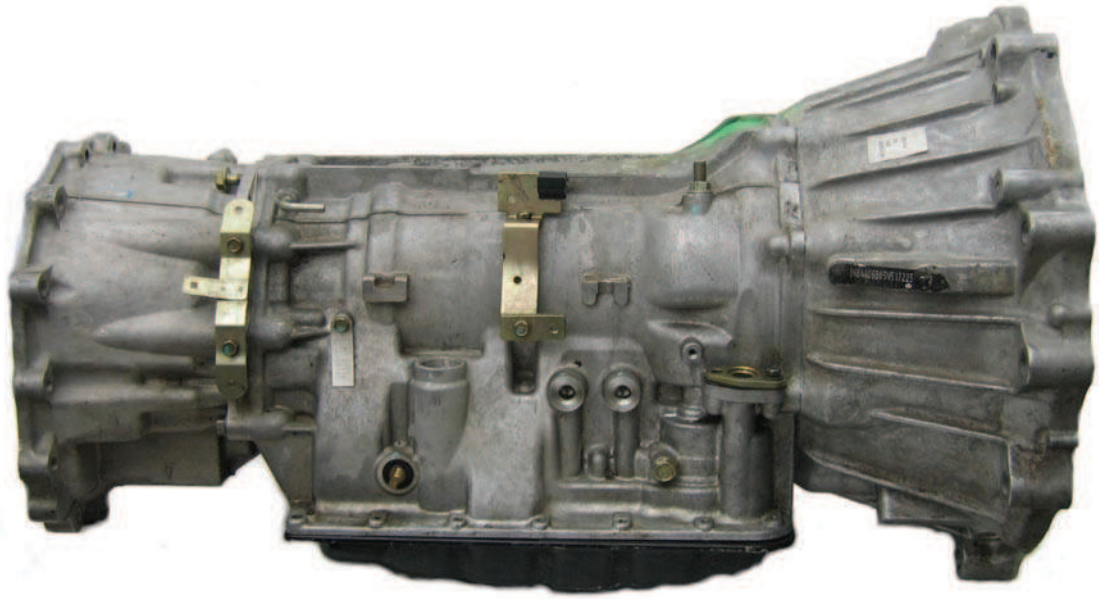
RE5R05A

Introduction

Starting in mid-2002, JATCO introduced the RE5R05A: a rear-wheel drive, 5-speed automatic transmission used in the Infiniti Q45. Since then, this unit has appeared in Infiniti and Nissan drivetrains. Infiniti uses it in CX25, FX35, FX45, G35, M35/35x, Q45, and QX56 vehicles. Nissan uses it in the 350Z, Z, Frontier, Pathfinder, Armada, Titan, and Xterra.



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Applications

INFINITI

Model	Geartrain	Year	Engine
FX35	RWD/AWD	2003-06	3.5L V6
FX45	AWD	2003-06	4.5L V8
G35	RWD/AWD	2003-06	3.5L V6
M35	RWD/AWD	2006	3.5L V6
M45	RWD	2003-06	4.5L V8
Q45	RWD	2002-06	4.5L V8
QX56	RWD/4X4	2004-06	4.5L V8

NISSAN

Model	Geartrain	Year	Engine
350Z	RWD	2003-06	3.5L V6
Frontier	RWD/4X4	2005-06	2.5L L4 / 3.5L V6
Pathfinder	RWD/4X4	2004-06	5.6L V8
Armada	RWD/4X4	2004-06	5.6L V8
Pathfinder	RWD/4X4	2004-06	4.0L V6
Titan	RWD/4X4	2004-06	5.6L V8
Xterra XE	RWD/4X4	2005-06	4.0L V6

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RE5R05A

Computer System

There are two separate controller systems that are used for the RE5R05A transmission applications. The TCM and the ECM are separate controllers that share information through a multiplex type system.

The TCM is located in the transmission on the later vehicles and on the right kick panel on earlier model vehicles. The TCM includes all of the Transmission electronics, the TCM, Solenoids, TRS, ISS, OSS and Pressure switch circuit board. This makes diagnosing the RE5R05A difficult if you don't have the correct scan tool or the proper adapters for the scan tool.

TCM Function

The Function of the TCM is to:

- Receive information from the input signals sent from the various switches and sensors mounted on the transmission and share information from the ECM.
- Determine required pressures, shift points, lock-up operation, and engine breaking operation based on the various switches and sensors.

The TCM is constantly learning, this is called adaptive strategy. During this process the TCM is constantly monitoring the driving conditions and driver behavior.

Adaptive Strategy allows the customer to feel a flawless shift until the transmission is not capable of that shift. Typically this is at about the 75,000-100,000 mile marker. During and up until that time of repair the TCM is constantly raising and lowering pressures. This could cause you problems after an overhaul, if the computer is not reset.

NOTE: It is always recommended to reset the adaptive strategies before test driving the vehicle after overhaul.

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Adaptive Strategies

Before the transmission can start its adaptive learning process, the TCM must first relearn some very important parameters. The vehicle must be cleared of codes and at normal operating temperature. The following Relearn procedures MUST be done if the Battery, Sensor connector, TCM or ECM is disconnected!

All of these relearns can be done using the Consult 2 or manually. Be aware that all of the manual relearn procedures are done using time specifications.

NOTE: The technician must use a clock to determine the time sequences.

1. Accelerator Pedal Released Position Learning:

This is an operation to learn the fully released position of the Accelerator Pedal Position by monitoring the output signal.

Operation Procedure:

1. Make sure the accelerator pedal is fully released.
2. Turn the ignition switch to the ON position, wait at least 2 seconds.
3. Turn the ignition switch to the OFF position, wait at least 10 seconds.
4. Turn the ignition switch to the ON position, wait at least 2 seconds.
5. Turn the ignition switch to the OFF position, wait at least 10 seconds.

2. Throttle Valve Closed Position Learning:

This is an operation to learn the fully closed position of the Throttle Valve Position by monitoring the output signal.

Operation Procedure:

1. Make sure the accelerator pedal is fully released.
2. Turn the ignition switch to the ON position.
3. Turn the ignition switch to the OFF position, wait at least 10 seconds. (make sure the throttle valve moves during the 10 seconds in the OFF position by confirming the operating sound.)

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Adaptive Strategies (continued)

Preparation:

Before performing Idle Air Volume Learning, make sure the following conditions are met. The learning procedure will stop if any of the following are not met prior to starting the procedure.

1. Battery Charging Voltage: More then 12.9V
2. Engine Coolant: (70 - 100°C) 158 - 212°F
3. PNP Switch: ON:
4. Electrical Loads: OFF (A/C, Head lamps, Rear Window Defogger) **NOTE: On vehicles equipped with daytime running light systems, apply the parking brake BEFORE you turn the ignition switch to the on position, this will keep the lights OFF.**
5. Steering Wheel: Neutral (Straight-ahead position)
6. Vehicle Speed: Stopped
7. Transmission: Operation temperature

Operation Procedure:

1. Perform the Accelerator Pedal Released Position Relearn procedure.
2. Perform the Throttle Valve Closed Position Relearning procedure.
3. Start the engine and run it until it reaches operation temperature.
4. Once the engine is at operating temperature, turn the ignition OFF and wait for 10 seconds.
5. Confirm the Accelerator Pedal is fully released, turn the ignition ON and wait for 3 seconds.
6. Repeat the following procedures below QUICKLY five times within five seconds.
7. Fully depress the accelerator pedal.
8. Fully release the accelerator pedal..
9. Wait 7 seconds, fully depress the accelerator pedal and keep it there for approximately 20 seconds until the MIL stops blinking and turned ON.
10. Fully release the accelerator pedal within 3 seconds after the MIL light goes OUT.
11. Start the engine and let it idle.
12. Wait 20 seconds
13. Rev the engine two or three times and make sure the idle speed and ignition timing are within the specifications. **(In the P or N position Idle 650 RPM +/- 50, 15 BTDC)**
14. If the engine is not idling properly, the relearn procedure did not take or there is a problem with other engine related components.

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Inputs and Outputs

Input/Output Signal of TCM

	Control item		Line pressure control	Vehicle speed control	Shift control	Lock-up control	Engine brake control	Fail-safe function (*3)	Self-diag-nostics function
Input	Accelerator pedal position signal (*4)		X	X	X	X	X	X	X
	Vehicle speed sensor A/T (revolution sensor)		X	X	X	X		X	X
	Vehicle speed sensor MTR(*1) (*4)		X	X	X	X			X
	Closed throttle position signal(*4)		(*2) X	(*2) X		X	(*2) X		X
	Wide open throttle position signal(*4)		(*2) X	(*2) X			(*2) X		X
	Turbine revolution sensor 1		X	X		X		X	X
	Turbine revolution sensor 2 (for 4th speed only)		X	X		X		X	X
	Engine speed signals(*4)					X			X
	PNP switch		X	X	X	X	X	X	X
	A/T fluid temperature sensors 1, 2		X	X	X	X	X	X	X
	ASCD	Operation signal(*4)		X	X	X	X		
		Overdrive cancel signal(*4)		X		X	X		
	TCM power supply voltage signal		X	X	X	X	X		X
Out-put	Direct clutch solenoid (ATF pressure switch 5)			X	X			X	X
	Input clutch solenoid (ATF pressure switch 3)			X	X			X	X
	High & low reverse clutch solenoid (ATF pressure switch 6)			X	X			X	X
	Front brake solenoid (ATF pressure switch 1)			X	X			X	X
	Low coast brake solenoid (ATF pressure switch 2)			X	X		X	X	X
	Line pressure solenoid		X	X	X	X	X	X	X
	TCC solenoid					X		X	X
	Self-diagnostics table(*4)								X
	Starter relay							X	X

*1: Spare for vehicle speed sensor·A/T (revolution sensor)
*2: Spare for accelerator pedal position signal
*3: If these input and output signals are different, the TCM triggers the fail-safe function.
*4: CAN communications

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Clutch and Band Chart

Floor Shift Models

Shifter Position		I/C	HLR/C	D/C	R/B	FR/B	LC/B	Fwd/B	1st OWC	Fwd OWC	3rd OWC
P											
R			A		A	A			✱		✱
N											
D	1st		a*				a**	A	✱	✱	✱
	2nd			A				A		✱	✱
	3rd		A	A		A			✪✪		✱
	4th	A	A	A					✪✪		
	5th	A	A			A			✪✪		✪✪
4	1st		a*				a**	A	✱	✱	✱
	2nd			A				A		✱	✱
	3rd		A	A		A			✪✪		✱
	4th	A	A	A					✪✪		
3	1st		a*				a**	A	✱	✱	✱
	2nd			A				A		✱	✱
	3rd		A	A		A			✪✪		✱
	4th	A	A	A					✪✪		
2	1st		a*				a**	A	✱	✱	✱
	2nd			A		A	A	A		✱	✱
	3rd		A	A		A			✪✪		✱
	4th	A	A	A					✪✪		
1	1st		A			A	A	A	✱	✱	✱
	2nd			A		A	A	A		✱	✱
	3rd		A	A		A			✪✪		✱
	4th	A	A	A					✪✪		

A = Applied
a* = Operates under priming conditions
a** = Operates under priming conditions
✱ = Operates during progressive acceleration
✪✪ = Operates and effects power while coasting

I/C: Intermediate Clutch
HLR/C: High and Low Reverse Clutch
D/C: Direct Clutch
R/B: Reverse Brake
FR/B: Front Brake
LC/B: Low Clutch Brake
Fwd/B: Forward Brake
1st OWC: 1st One-Way Clutch
Fwd OWC: Forward One-Way Clutch
3rd OWC: 3rd Onw-Way Clutch

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Clutch and Band Chart (continued)

Column Shift Models

Shifter Position		I/C	HLR/C	D/C	R/B	FR/B	LC/B	Fwd/B	1st OWC	Fwd OWC	3rd OWC
P											
R			A		A	A			*		*
N											
D	1st		a*				a**	A	*	*	*
	2nd			A				A		*	*
	3rd		A	A		A			∞		*
	4th	A	A	A					∞		
	5th	A	A			A			∞		∞
M5	1st		a*				a**	A	*	*	*
	2nd			A				A		*	*
	3rd		A	A		A			∞		*
	4th	A	A	A					∞		
	5th	A	A			A			∞		∞
M4	1st		a*				a**	A	*	*	*
	2nd			A				A		*	*
	3rd		A	A		A			∞		*
	4th	A	A	A					∞		
M3	1st		a*				a**	A	*	*	*
	2nd			A				A		*	*
	3rd		A	A		A			∞		*
M2	1st		a*				a**	A	*	*	*
	2nd			A		A	A	A		*	*
M1	1st		A			A	A	A	*	*	*
	2nd			A		A	A	A		*	*

A = Applied
a* = Operates under priming conditions
a** = Operates under priming conditions
* = Operates during progressive acceleration
∞ = Operates and effects power while coasting

I/C: Intermediate Clutch
HLR/C: High and Low Reverse Clutch
D/C: Direct Clutch
R/B: Reverse Brake
FR/B: Front Brake
LC/B: Low Clutch Brake
Fwd/B: Forward Brake
1st OWC: 1st One-Way Clutch
Fwd OWC: Forward One-Way Clutch
3rd OWC: 3rd One-Way Clutch

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DTC's

DTC		Items (Consult-II Screen Terms)
OBD-II	Except OBD-II	
Consult-II GST (*1)	Consult-II only "A/T"	
N/A	P0615	Starter Relay Circuit
P0700	P0700	TCM
P0705	P0705	PNP Switch Circuit
P0710	P1710	ATF Temperature Sensor Circuit
P0717	P0717	Turbine Revolution Speed Sensor
P0720	P0720	Vehicle Speed Sensor Circuit A/T
N/A	P0725	Engine Speed Signal
P0740	P0740	TCC Solenoid Circuit
P0744	P0744	A/T TCC Solenoid Voltage Function
P0745	P0745	Line Pressure Solenoid Circuit
N/A	P1705	Throttle Position Sensor Circuit Meter
N/A	P1721	Vehicle Speed Sensor Circuit Meter
P1730	P1730	A/T Interlock
N/A	P1731	A/T 1st Braking
P1752	P1752	I/C Solenoid Circuit
P1754 (*2)	P1754	I/C Solenoid Function
P1757	P1757	FR/B Solenoid Circuit
P1759 (*2)	P1759	FR/B Solenoid Function
P1762	P1762	D/C Solenoid Circuit
P1764 (*2)	P1764	D/C Solenoid Function
P1767	P1767	HLR/C Solenoid Circuit
P1769	P1769	HLR/C Solenoid Function
P1772	P1772	LC/B Solenoid Circuit
P1774	P1774	LC/B Solenoid Function
N/A	P1815	Manual Mode Switch Circuit
N/A	P1841	ATF Pressure Switch #1 Circuit
N/A	P1843	ATF Pressure Switch #3 Circuit
N/A	P1845	ATF Pressure Switch #5 Circuit
N/A	P1846	ATF Pressure Switch #6 Circuit
U1000	U1000	CAN Communication Circuit
*1: These Numbers are prescribed by SAE J2012		
*2: These malfunctions cannot be displayed MIL if another malfunction is assigned to MIL		

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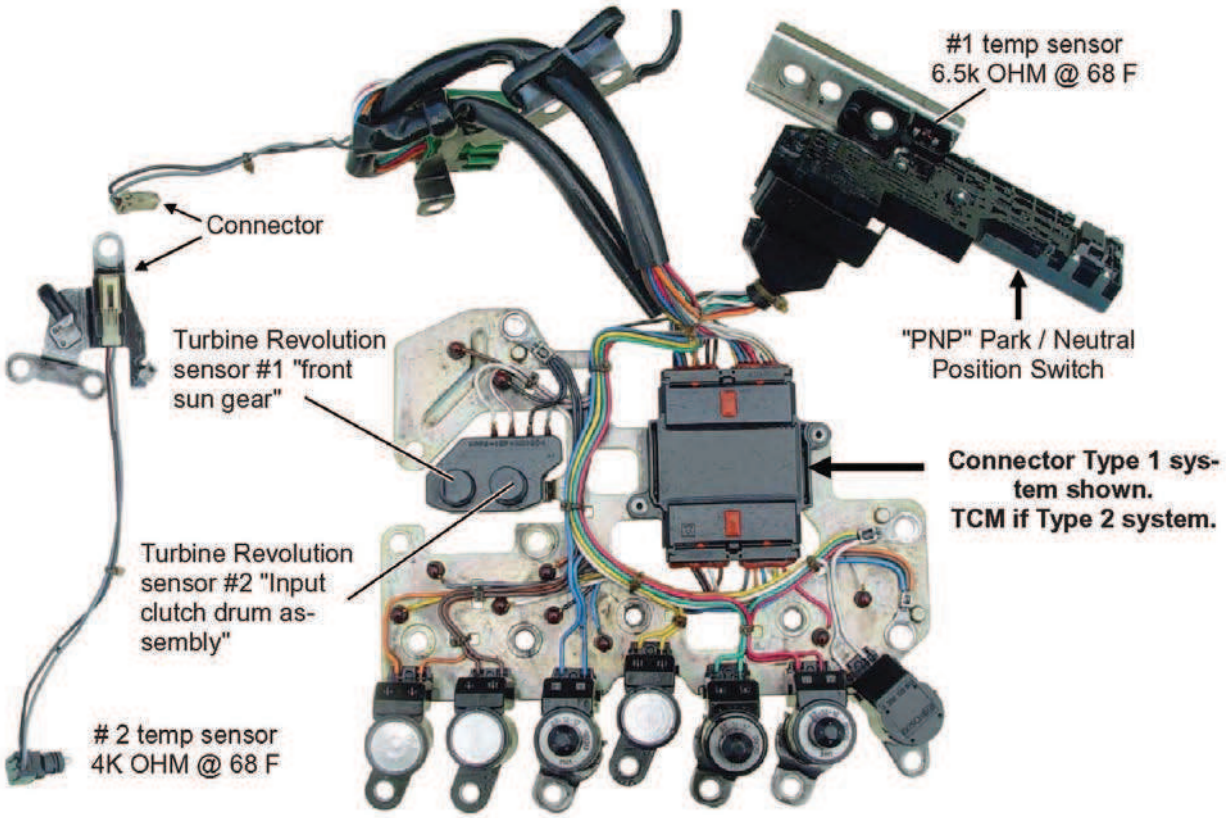
Fail Safe and Sensor Locations

The Fail-Safe mode for this transmission is fixed in 2nd, 4th, or 5th (depending on the failed position). The customer will fill a “slipping” or “poor acceleration”.

Even when the electronic circuits are normal, under special conditions (like wheel spin or drastically stopping the tire rotation), the transmission can go into fail-safe mode. If this happens, switch “OFF” the ignition switch for 10 seconds, then switch it “On” again to return to the normal shift pattern.

Gear Position		ATF Pressure Switch Output					Fail-safe Function	Clutch Pressure Output Pattern After Fail-safe Function					
		SW3 (I/C)	SW6 (HLR/C)	SW5 (D/C)	SW1 (FR/B)	SW2 (LC/B)		I/C	HLR/C	D/C	FR/B	LC/B	L/U
A/T Interlock Coupling Pattern	3rd	NG	X	X	NG		Held in 2nd Gear	OFF	OFF	ON	OFF	OFF	OFF
	4th	NG	X	X	NG		Held in 2nd Gear	OFF	OFF	ON	OFF	OFF	OFF
	5th	X	NG	NG	X		Held in 2nd Gear	OFF	OFF	ON	OFF	OFF	OFF
NG= NO Good													
X= OK													



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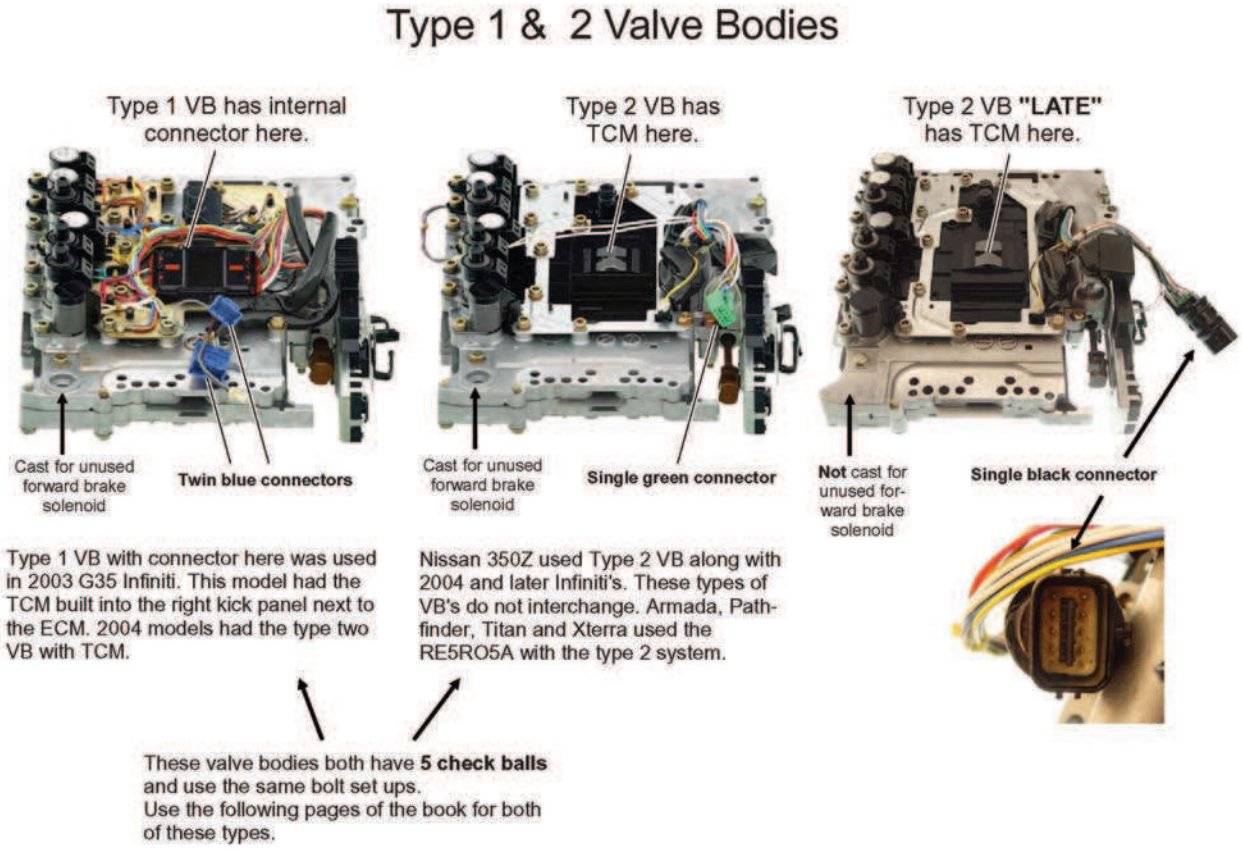
Computer and Wiring

The TCM on the Type 2 is actually the complete transmission computer system; that is, it combines the TCM, pressure switches, input speed sensors and the TR sensor connector and Solenoid connector, and bolts onto the valve body. This is becoming a common practice: almost all manufacturers seem to be heading in this direction.



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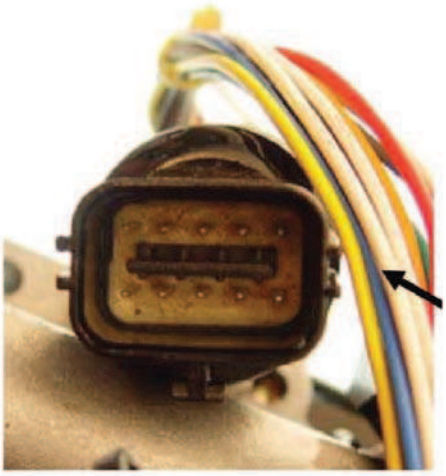
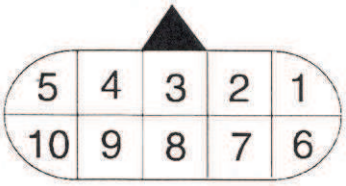
TCM Pins





TCM INSPECTION TABLE

Data are reference value and are measured between each terminal and ground.

Terminal No.	Wire color	Item	Condition		Data (Approx.)
1	P	Power supply (Memory back-up)	Always		Battery voltage
2	P	Power supply (Memory back-up)	Always		Battery voltage
3	L	CAN-H	–		–
4	V	K-line (CONSULT-II signal)	The terminal is connected to the data link connector for CONSULT-II.		–
5	B	Ground	Always		0V
6	BR *1 Y/R *2	Power supply		–	Battery voltage
				–	0V
7	R	Back-up lamp relay		Selector lever in "R" position.	0V
				Selector lever in other positions.	Battery voltage
8	P	CAN-L	–		–

Terminal No.	Wire color	Item	Condition		Data (Approx.)
9	B/R	Starter relay		Selector lever in "N"," P" positions.	Battery voltage
				Selector lever in other positions.	0V
10	B	Ground	Always		0V

*1: Column shift
*2: Floor shift

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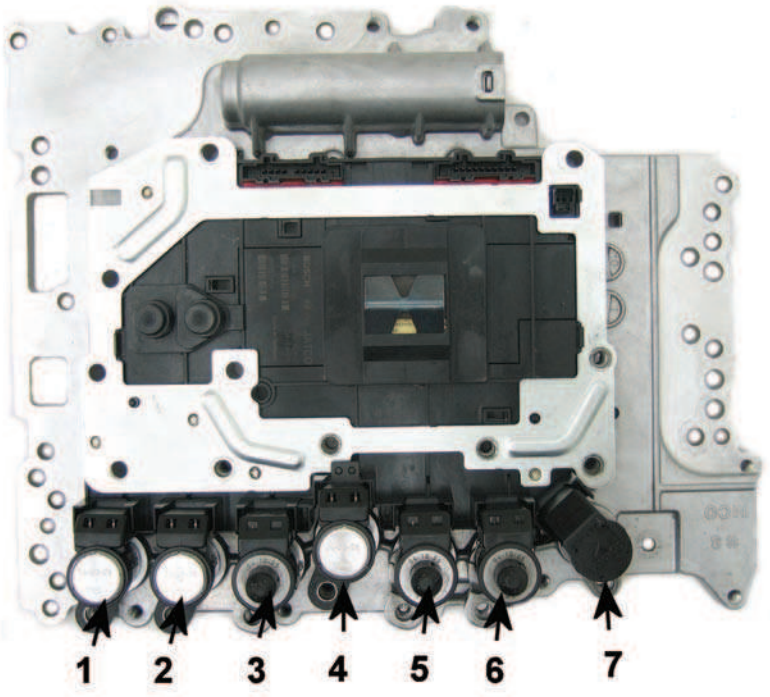
Solenoids

There are seven (7) solenoids on the valve body:

1. Line Pressure Solenoid
2. TCC Solenoid
3. High and Low Solenoid
4. Front Brake Control Solenoid
5. Input Clutch Control Solenoid
6. Direct Clutch Control Solenoid
7. Low Coast Brake Solenoid



All of the solenoids operate and connect directly to the TCM. All of the solenoids except the TCC solenoid have 3.3 ohms resistance. The TCC solenoid has 23 ohms resistance. The TCM controls all of them using a duty cycled signal.

When checking solenoid operation you'll need a CAN adapter for your scan tool or an interface adapter that checks the solenoid operation.

When checking the solenoid operation via your scan tool the data will read in amps. All of the solenoids operate between 0.0-0.8 amps. Something interesting to look at is the operating range for these solenoids. For example, the TCC solenoid will run at 0.2-0.4 amps dur-ing slip and 0.4-0.7 amps when it's fully locked up.

The input clutch, front brake, direct clutch, and high and low clutch solenoids operate at 0.6-0.8 amps while disengaging the clutches (solenoids energized), and 0.0-0.05 amps when the clutches are engaged (solenoids de-energized).

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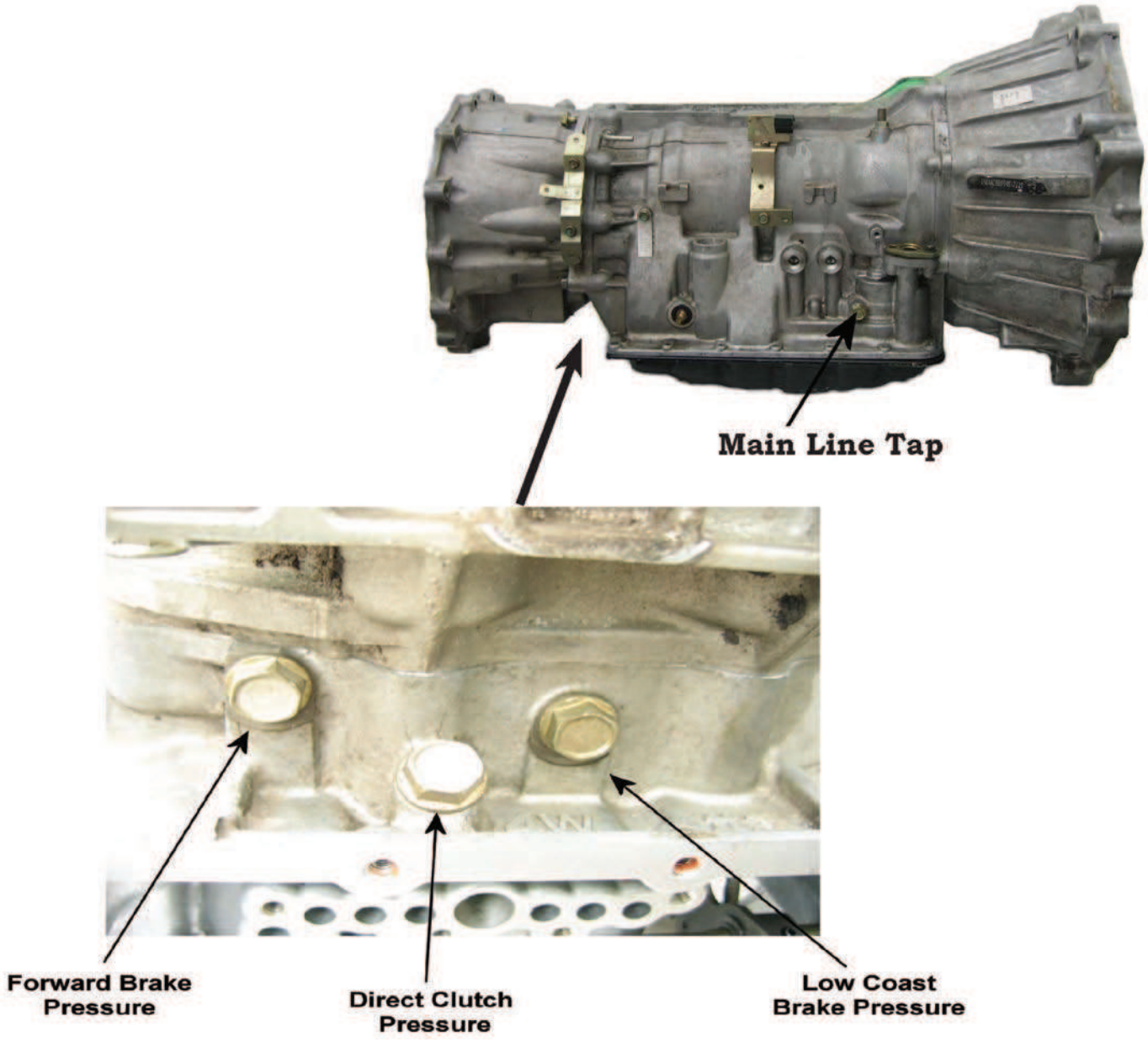
Pressure Specifications

Engine Speed	Line Pressure Specifications	
	Reverse Position	Drive Position
At Idle Speed	62-67 psi	55-62 psi
At Stall Speed	233-283 psi	190-218 psi



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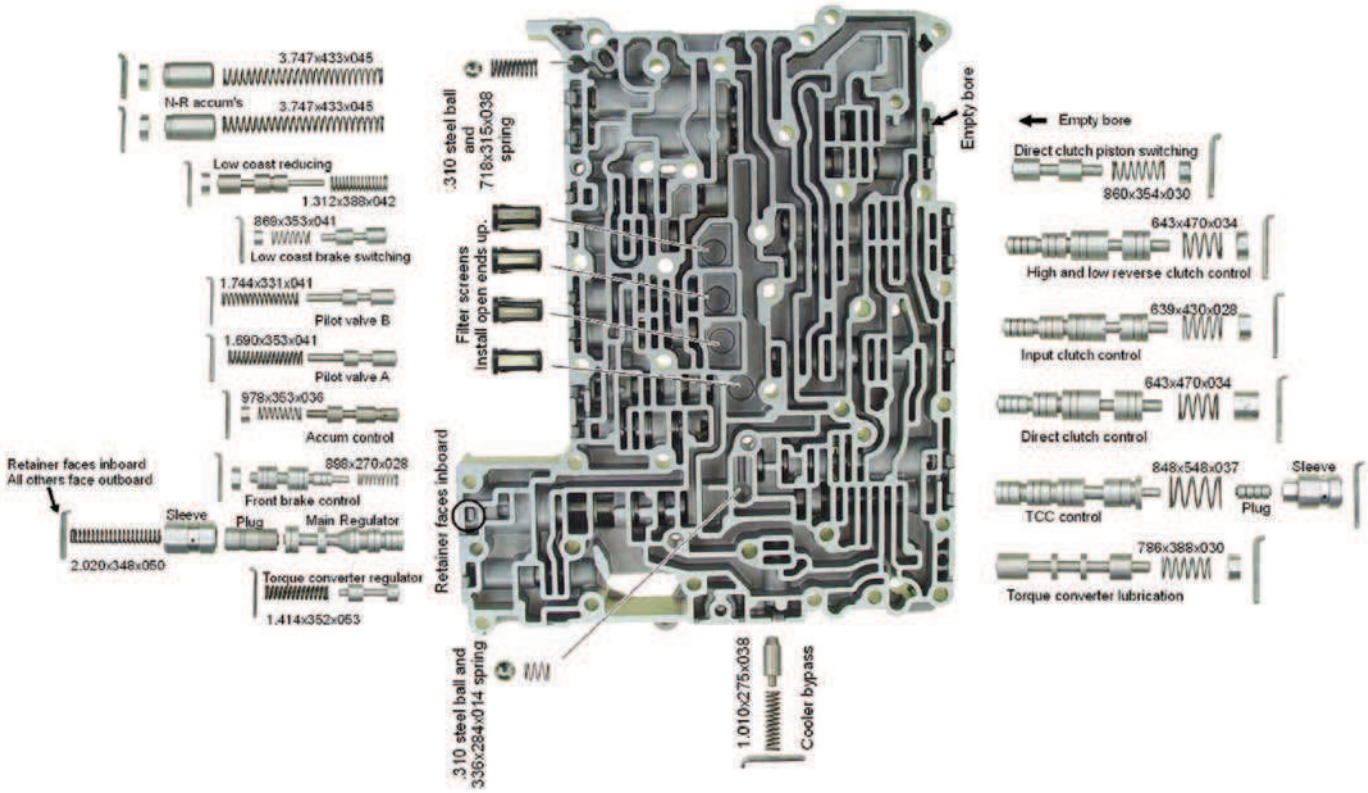
Lower Valve Body

The valve bodies are not interchangeable. If you are replacing the valve body or using some parts for interchange, make sure you identify the year of the valve body. Earlier models are assembled with the accumulator pistons next to the pucks towards the outside of the valve body housing and have an empty bore opposite of the accumulators.



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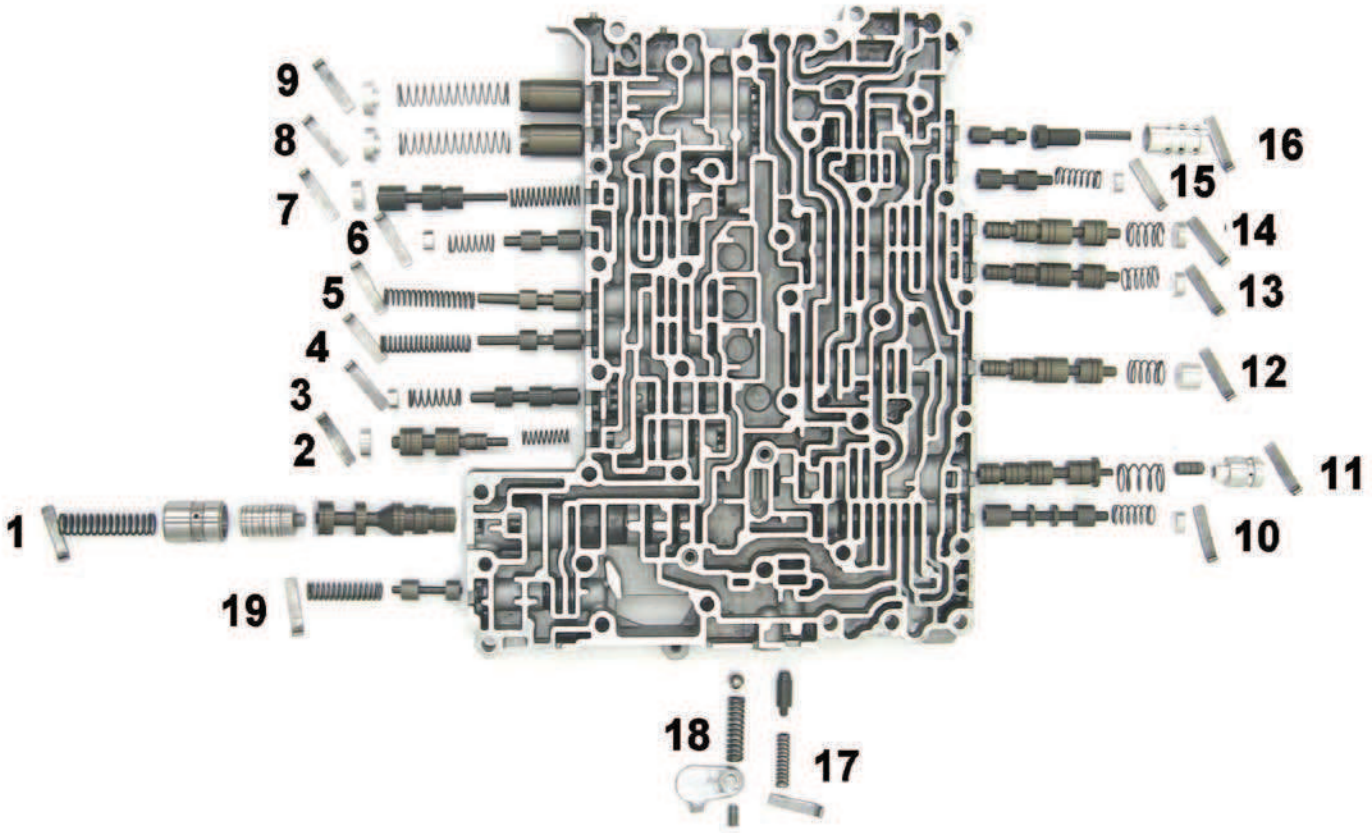
Lower Valve Body (continued)

Later model valve bodies assemble the accumulators with the pistons towards the inside of the valve body away from the pucks. They also have a valve that is opposite of the accumulator setup.



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Valve Descriptions

1. (a) Pressure Regulator Valve, (b) Pressure Regulator Plug, (c) Pressure Regulator Sleeve: Adjusts the oil discharged from the oil pump to the optimum levels (line pres sure) for normal operation.

2. Front Brake Control Valve: When the front brake is applied, this valve adjusts line pressure to optimum levels (front brake pressure) and supplies it to the front brake. (In 1st, 2nd, 3rd, and 5th gears, it adjusts the clutch pressure.

3. Accumulator Control Valve: Adjusts the pressure (accumulator control pressure) acting on the accumulator piston and low coast reducing valve for normal operation.

4. Pilot Valve A: Adjusts the line pressure and produces the constant pressure (pilot pressure) required for line pressure, shifting, and lockup control.

5. Pilot Valve B: Adjusts the line pressure and produces the constant pressure (pilot pressure) required for shifting.

6. Low Coast Brake Switching Valve: During engine braking, this valve supplies the line pressure to the low coast brake reducing valve.

7. Low Coast Brake Reducing Valve: When the low coast brake is applied, this valve adjusts the line pressure to optimum levels (low coast brake pressure) and supplies it to the low coast brake.

8. N-R Accumulator: Produces stabilizing pressure for N-R ranges.

9. N-D Accumulator: Produces stabilizing pressure in N-D ranges.

10. Torque Converter Lubrication Valve: Operates during lockup to switch the torque converter, cooling and lubrication systems' oil paths.

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Valve Descriptions (continued)

11. Torque Converter Regulator Valve: (a) TCC Control Valve, (b) TCC Control Plug, (c) TCC Control Sleeve: Applies or releases the converter clutch. By performing the lock-up operation transiently, it provides a smooth converter clutch apply.

12. Direct Clutch Control Valve: When the direct clutch is applied, this valve adjusts line pressure to optimum levels (direct clutch pressure) and supplies it to the direct clutch. (In 2nd, 3rd, and 4th gears, it adjusts the clutch pressure.)

13. Input Clutch Control Valve: When the input clutch is applied, this valve adjusts line pressure to optimum levels (input clutch pressure) and supplies it to the input clutch. (In 4th and 5th gears, it adjusts the clutch pressure.)

14. High and Low Reverse Clutch Control Valve: When the high and low reverse clutch is applied, this valve adjusts line pressure to optimum levels (high and low reverse clutch pressure) and supplies it to the high and low reverse clutch. (In 1st, 3rd, 4th and 5th gears, it adjusts the clutch pressure.)

15. Direct Clutch Piston Switching Valve: Operates in 4th gear and switches the direct clutch coupling capacity.

16. Direct Clutch Regulating Valve

17. Cooler Bypass Valve: Allows excess oil to bypass cooler circuit without being fed into it.

18. Line Pressure Relief Valve: Discharges excess oil from line pressure circuit.

19. To prevent too much pressure from reaching the torque converter, line pressure is adjusted to optimum levels; this is called torque converter operating pressure.

20. Manual Valve: Sends line pressure to each circuit according to the selector position.

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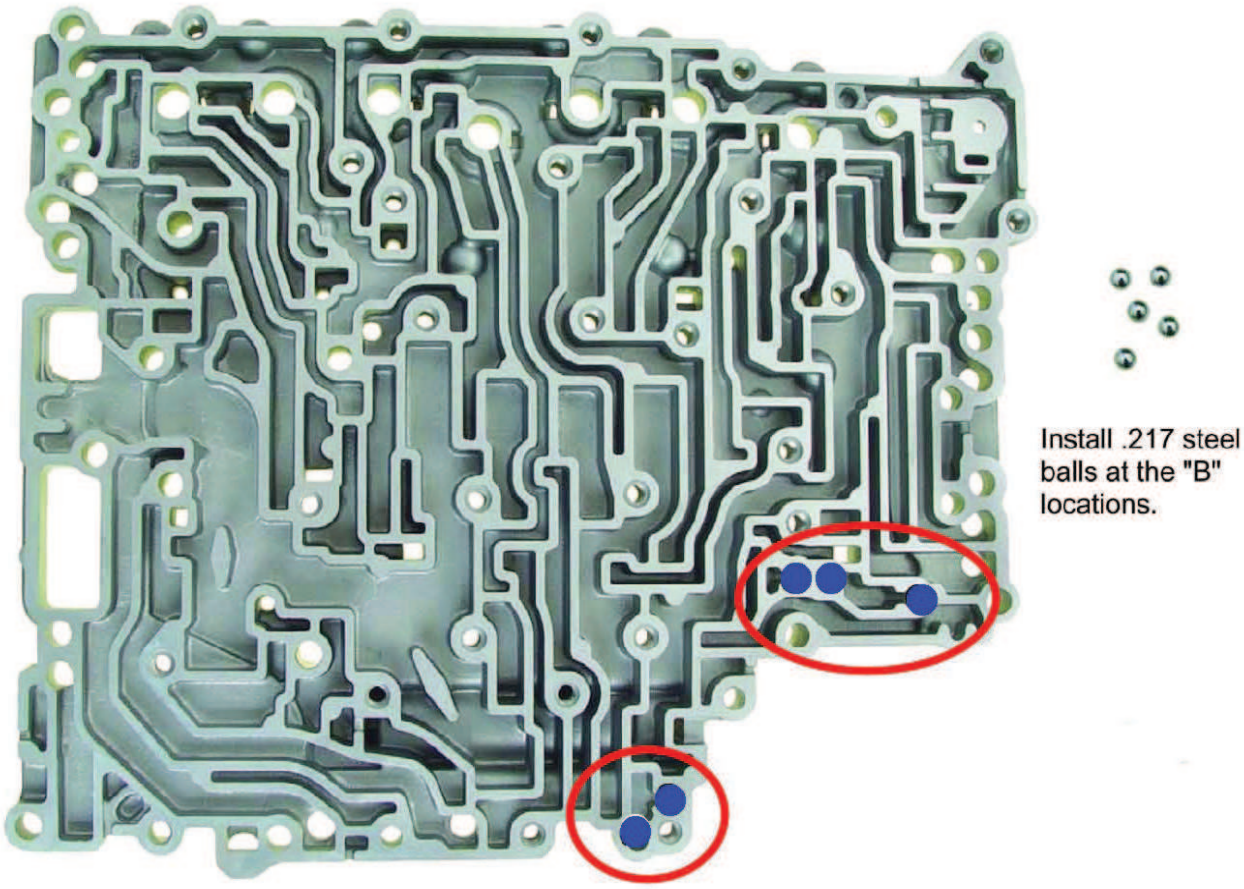
Upper Valve Body Check Ball Locations

2003

There is a distinct difference between the valve body casings. The locations of the check balls are also different between the years.



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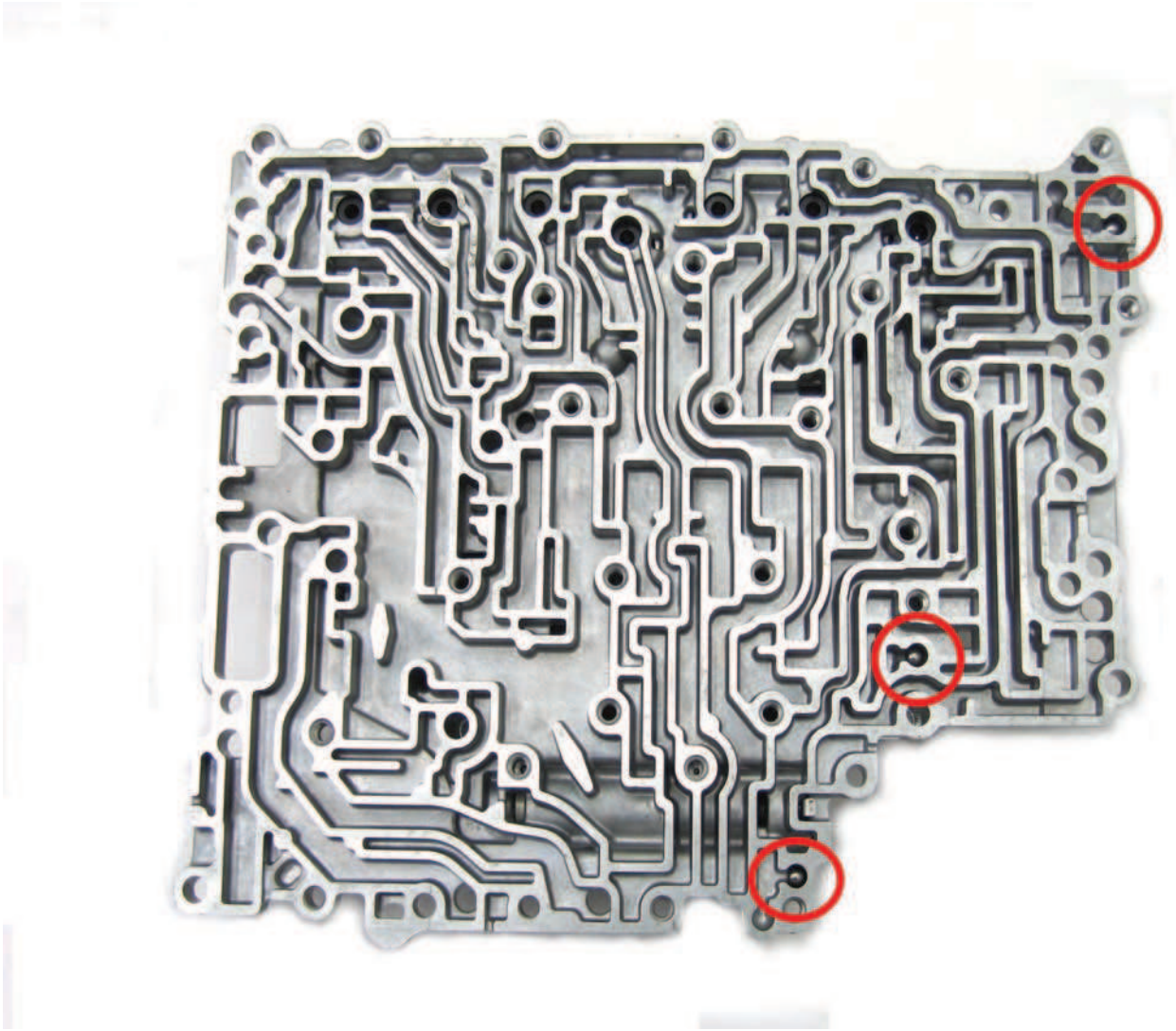
Upper Valve Body Check Ball Locations

2004 and up

There is a distinct difference between the valve body casings. The locations of the check balls are also different between the years.



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Front Brake Servo and Band

Install the anchor pin and the servo assembly into the case. Install the band assembly into the case, install the front sun gear assembly to the front carrier assembly. The front sun shell is where the band rides. Adjusting the band is pretty straightforward:

1. Use a brake band clip or equivalent to make sure the band contacts the shell assembly.
2. Loosen the anchor locknut and tighten the anchor end pin to 44 in-lbs.
3. Mark the anchor pin with a marker.
4. Back off the anchor end pin exactly three turns.
5. Hold the pin in place and tighten the locknut.

This will be your last and only chance to adjust the band, because once the transmission is in the vehicle.

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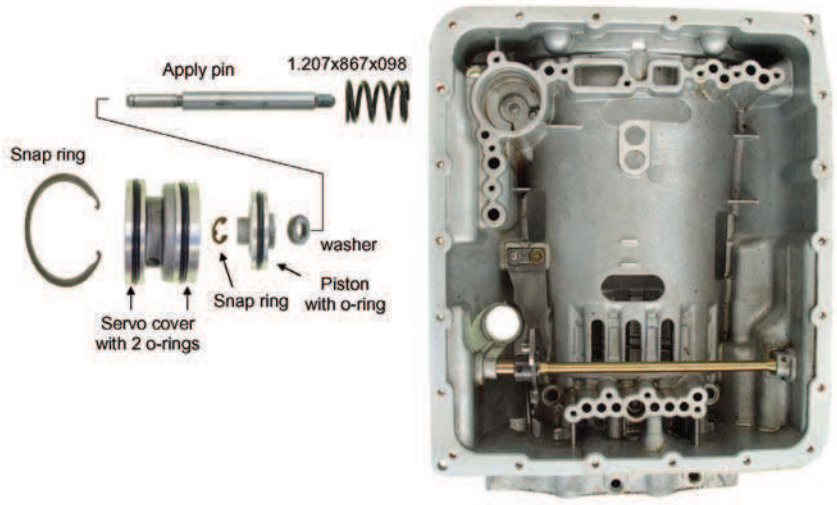

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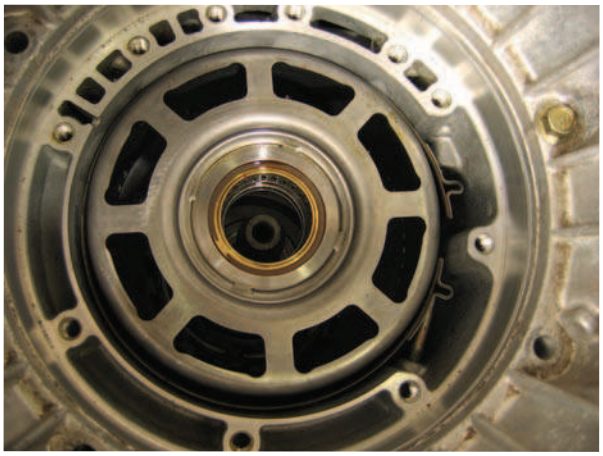

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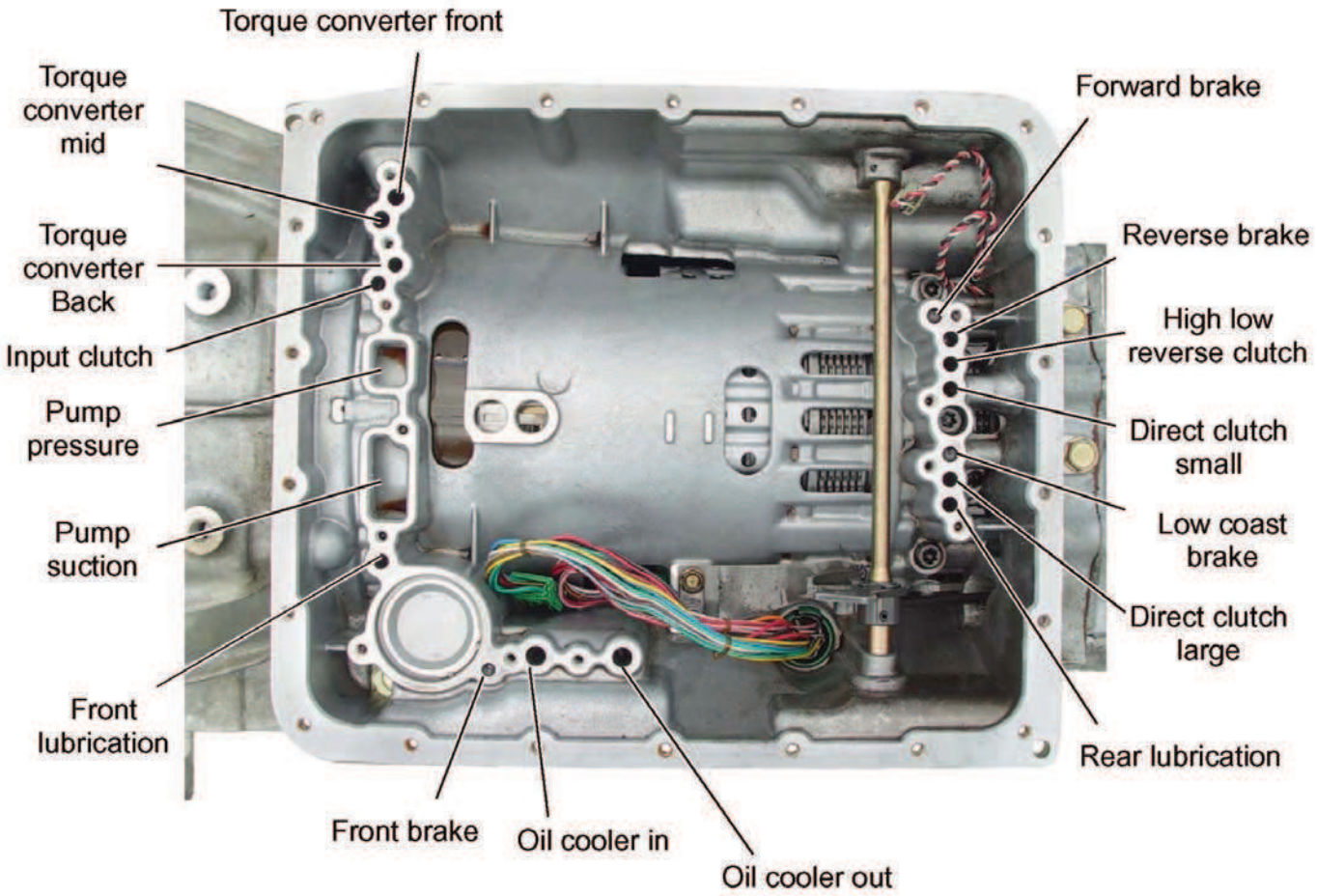
Air Checks

Air checking the clutches is pretty straight forward, use controlled shop air to make your tests. The last thing you want to do is blow a seal or damage a hard part.



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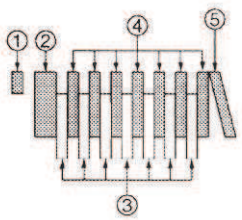
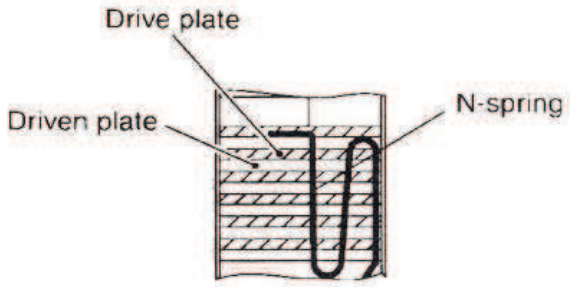
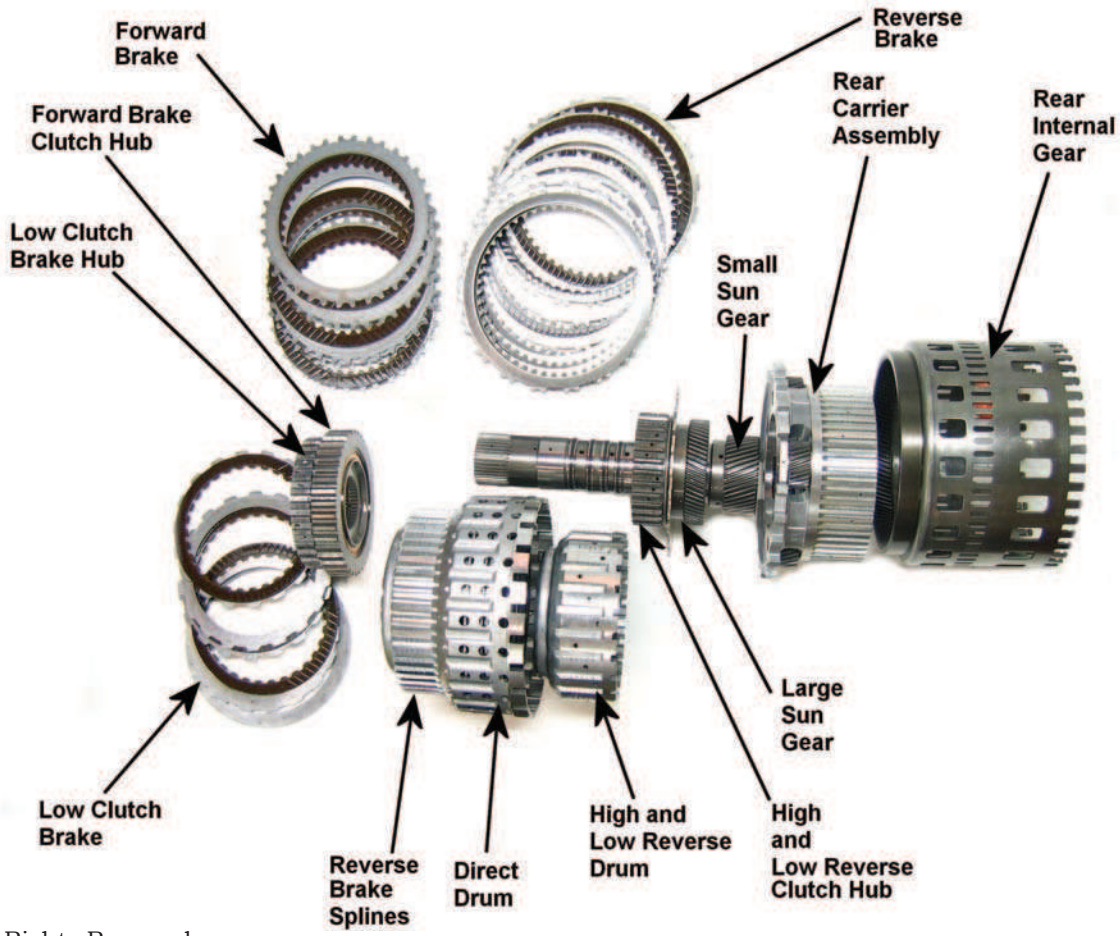
Clutch Drum and Hard Part ID

This is the lower half of the transmission. During the rebuild it is very important to get the Low Clutch Brake hub splined properly to the clutches.

Install the Reverse Brake Clutches, install the cushion plate as illustrated. Before installing the retaining plate, install the "N-spring" as shown.







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Clutch Drum and Hard Part ID (continued)

The Jatco RE5R05A, accomplished a similar style of the Lepelletier geartrain. They used a sun gear and shell assembly just like the GM and Ford units, except this sun gear isn't splined to the stator support, it's mounted using a sprag so it can freewheel in one direction.

It also uses a band to prevent the sun gear from freewheeling when needed. The sun shell assembly sits on the stator support, the front planetary splines to the sun gear, and the ring gear that's attached to the input drum splines to the planetary. And unlike the gear train used by GM and Ford, this design allows for a 1:1 ratio.

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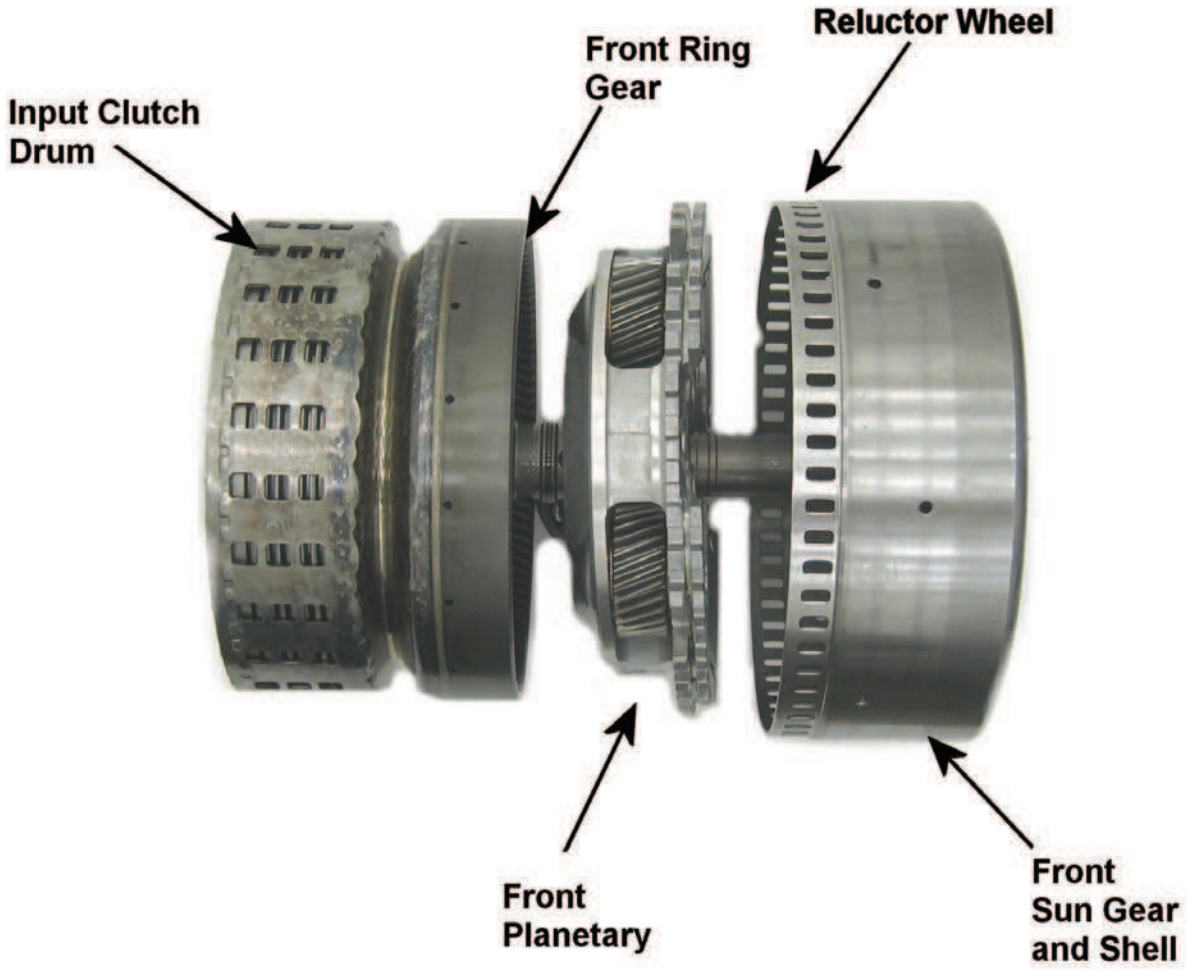

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Clutch Drum and Hard Part ID (continued)

The clutch-and-band application chart says that the band is on in first, second, third and fifth. It isn't on in fourth: If the band applied in fourth it'd create a bind-up. And it has to come back on in fifth because without it the transmission would shift to neutral.

More important is when the band comes on; this provides the input shaft with that all-important reduction we're looking for. Without that reduction we would have that super overdrive that would not be practical, so reducing the input shaft speed gives you a high enough ratio to improve gas mileage, while still providing adequate power.

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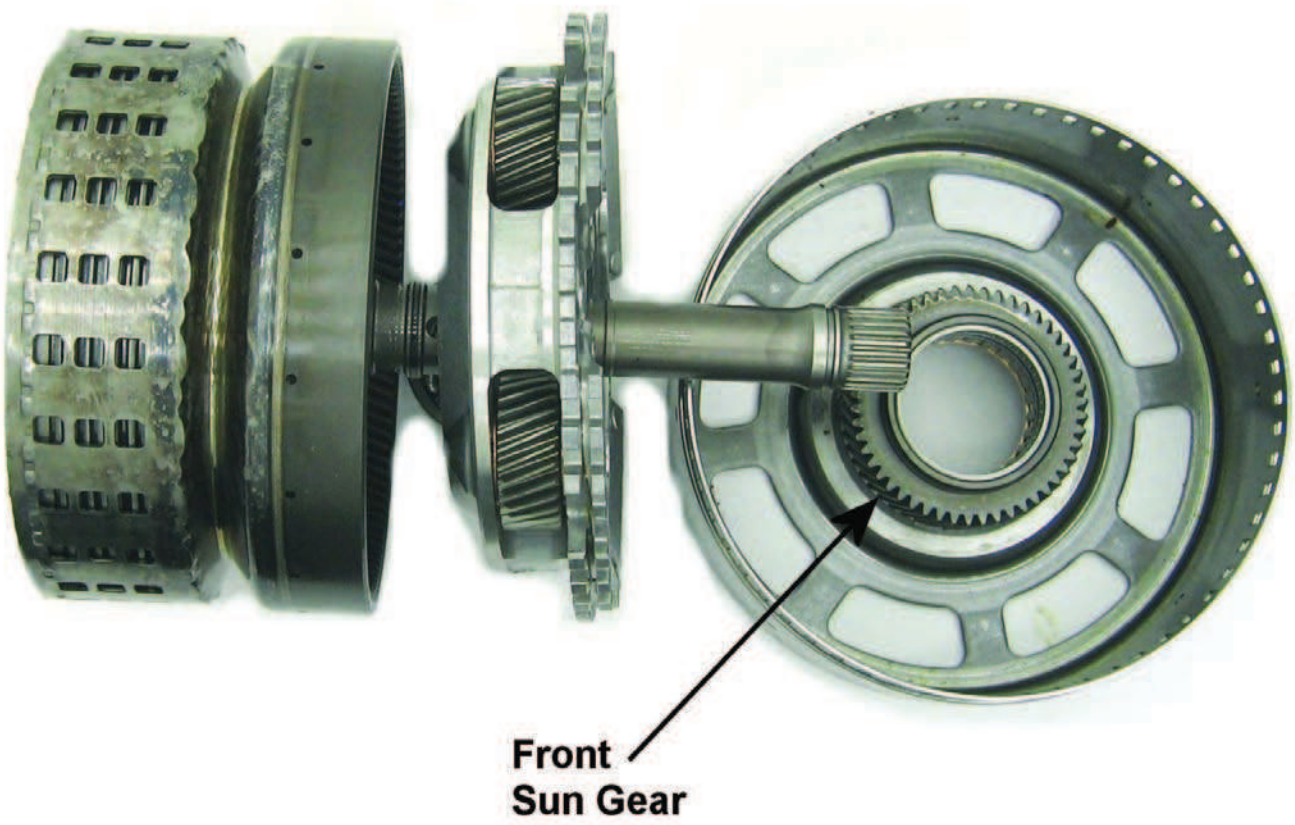

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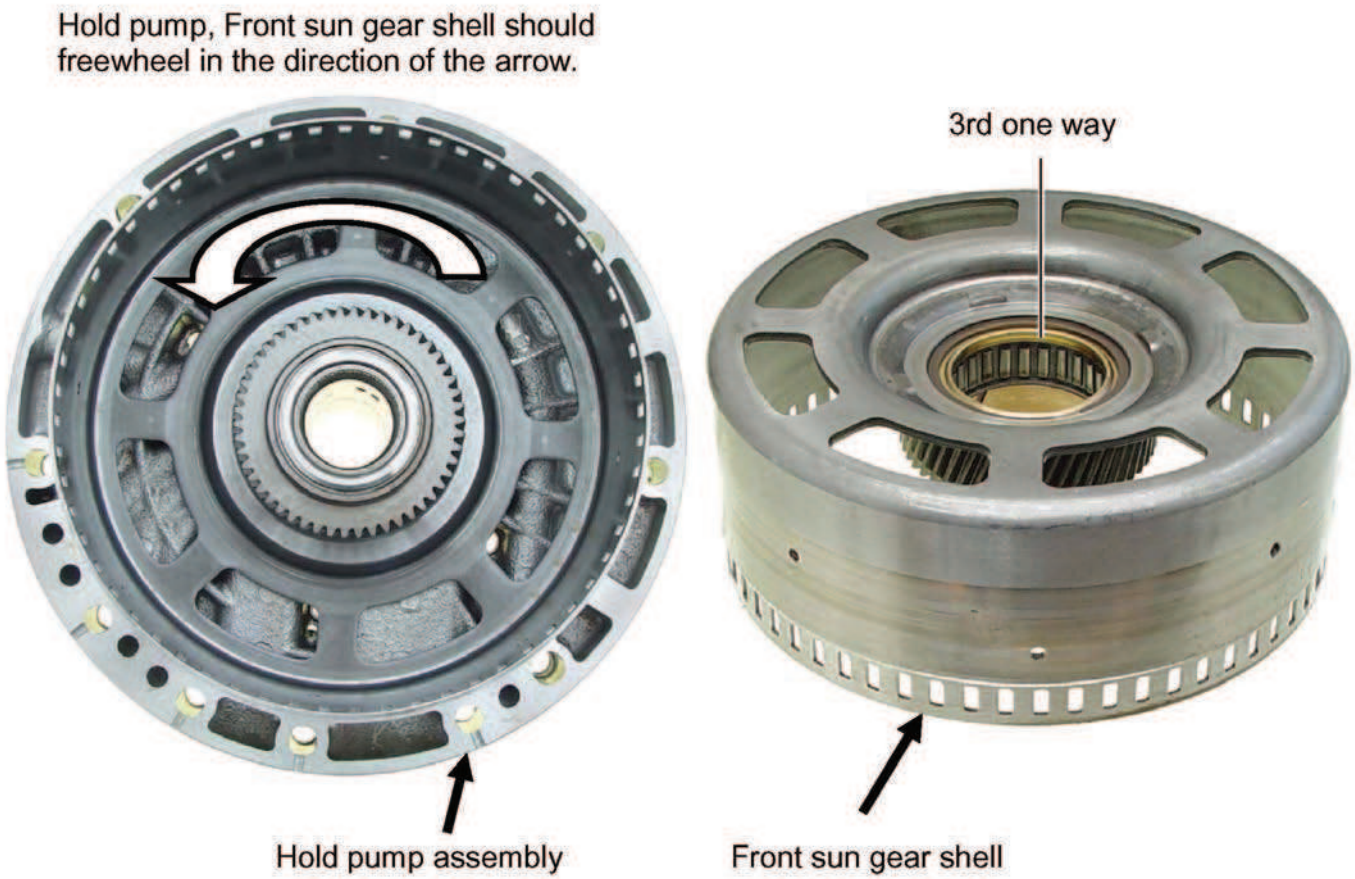
3rd Sprag Assembly

The 3rd One-way sprag allows the front sun gear to turn freely in the forward direction but fastens it for reverse rotation.



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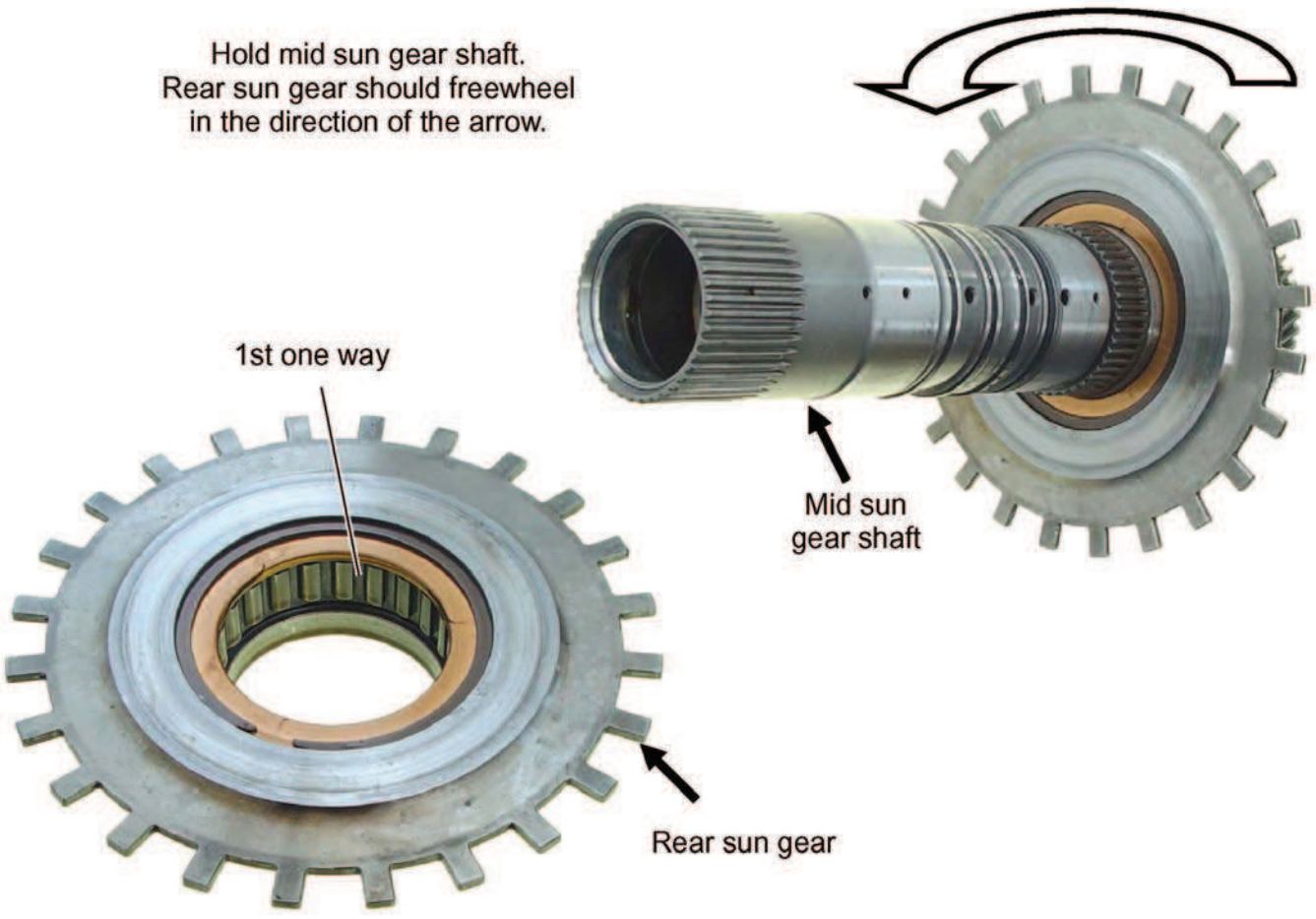
1st Sprag Assembly

Allows the mid-sun gear to turn freely forward relative to the mid-sun gear but fastens it for reverse rotation.



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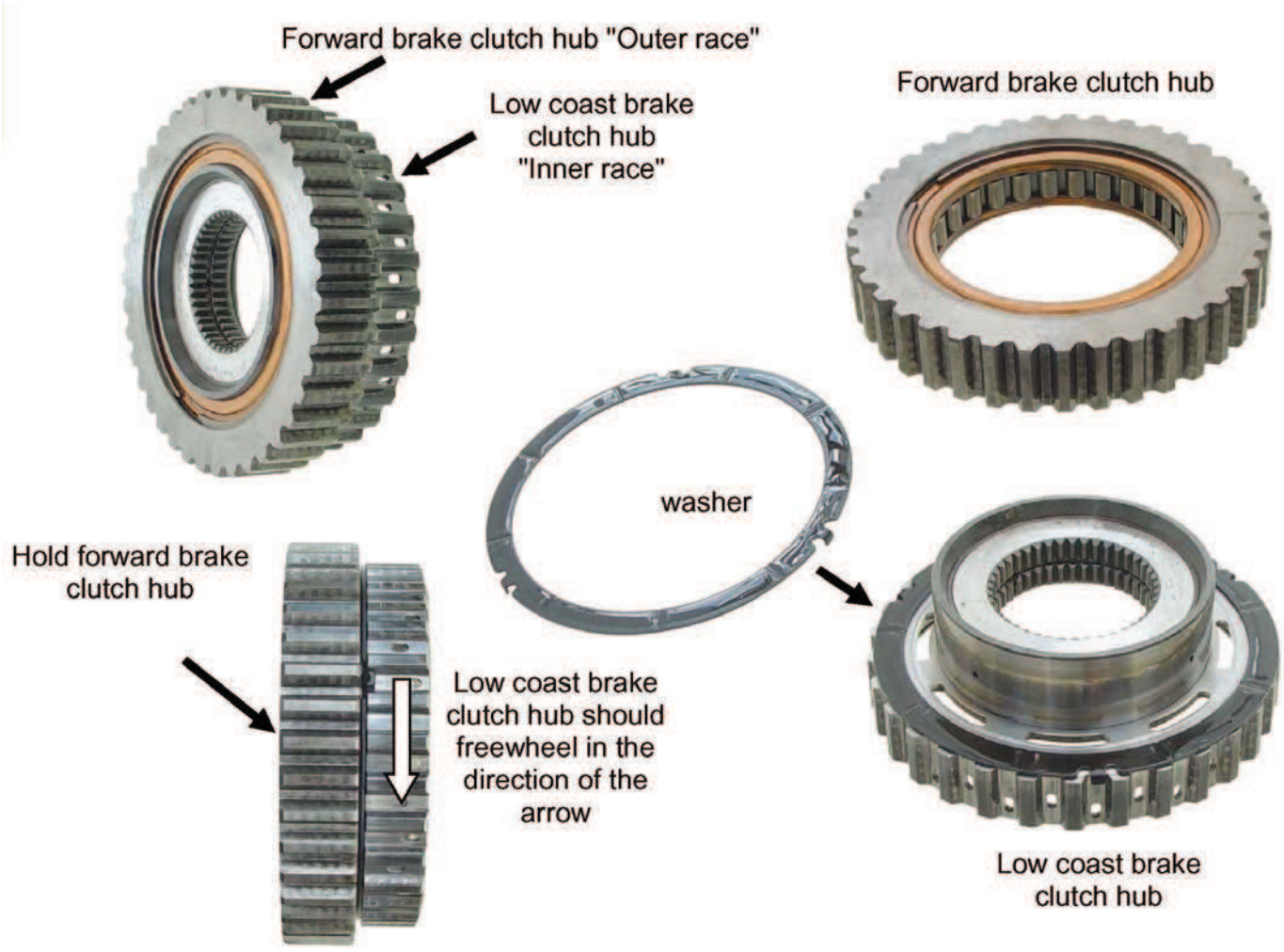
Forward Sprag Assembly

Allows the mid-sun gear to turn freely in the forward direction but fastens it for the reverse direction.



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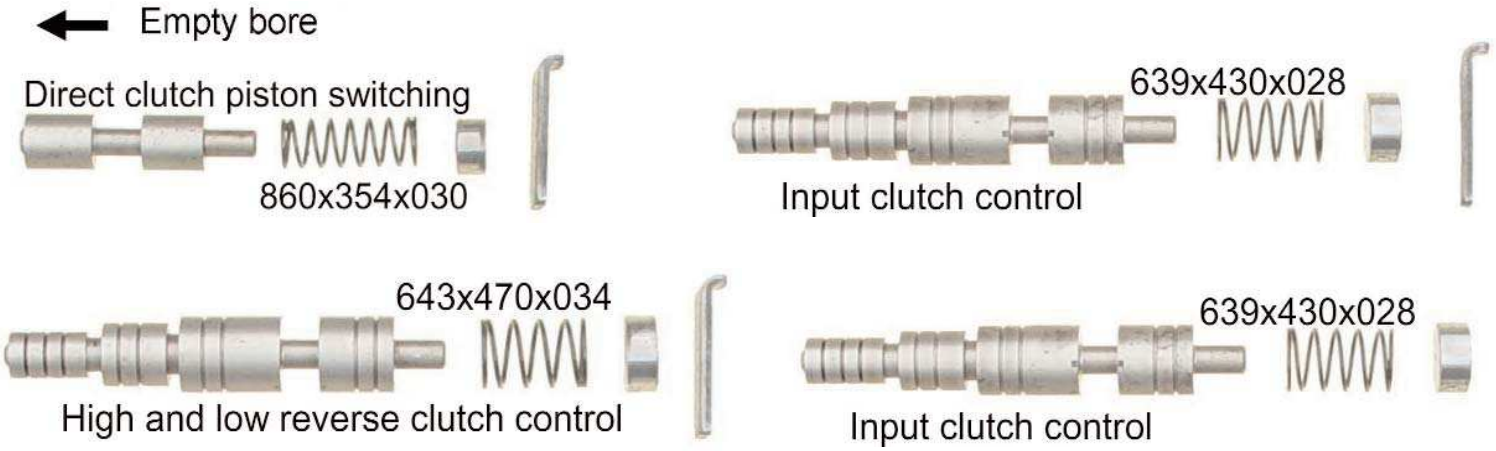

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