"2007" SEMINAR INFORMATION

INDEX

GM & Ford

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"Tech is Rev'n in 2007" Seminar Information

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The information and part numbers contained in this booklet have been carefully compiled from industry sources known for their reliability, but ATSG does not guarantee its accuracy.

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Lubegard

ROSTRA

4L60/65/70-E

PRODUCTION CHANGES / INPUT SPEED SENSOR ADDED

CHANGE: A new turbine input shaft speed sensor (ISS) has been added in some limited models beginning with the 2006 model year and expanded to additional platforms for 2007. (Refer to the chart in figure 1 for model usage)
The ISS assembly is a three wire hall-effect sensor that is mounted internally to the oil pump assembly. (See figure 2)
The ISS uses the rotor teeth located on the turbine input shaft to generate a digital voltage signal of varying frequency that corresponds to the rotational speed of the input shaft. (See figure 3)
This also required the addition of a new internal wire harness assembly. (See figure 4)

REASON: The ISS signal is an input to the control module (PCM or TCM) that will be used to better monitor and control line pressure, shift patterns, torque converter clutch slip speed and gear ratios. This component will allow the 4L60/65/70-E transmissions to enable use of computer instructions (algorithm) related to shift energy, and abuse torque management and provide much improved diagnostic capabilities.

Note: ***The new turbine input shaft speed sensor was gradually phased into production and certain design level criteria had to be followed. The following information is intended to provide a general outline of the stages involved to implement the use of the ISS.***

CHANGE: ***(1)*** Effective February 1st, 2005, the oil pump cover now uses a new design TCC valve with a single spring. (See figure 5)

REASON: Simplifies the assembly process, eliminates the possibility of springs becoming bound or bent and reduces material cost.

CHANGE: ***(2)*** Effective March 7th, 2005, the oil pump cover now uses a more compact boost valve and sleeve. (See figure 6) The snap ring groove location for the boost sleeve is now situated 2.57”(in.) from the bottom of the bore compared to 2.68”(in.) for the previous design. (Refer to figure 7) The bore length for the boost sleeve and snap ring has been reduced by 0.106”(in.).

REASON: Necessary in order to prepare for the new input speed sensor (ISS) assembly that will be packaged into the pump cover.

CHANGE: ***(3)*** After July 16th, 2005, the pump cover casting was modified in order to situate the ISS connector. This modification removed metal directly below the PR valve and boost sleeve bore and extended a cast wall inward. The internal TCC release passage was also modified at this time. The ISS mounting holes are not yet machined into the oil pump cover. (This is shown in figure 7 also)

REASON: Establishes a mounting point for the ISS connector, creates a mounting surface for the ISS assembly and will enable placement of the ISS assembly in a position to target rotor teeth on the turbine input shaft.

4L60/65/70-E

PRODUCTION CHANGES / INPUT SPEED SENSOR ADDED

CHANGE: Oil pump cover changes also affected the stator shaft and stator shaft sleeve so as to relocate with oil passages within the oil pump cover.
At the same time, the turbine shaft oil seal ring grooves were moved inboard towards the rear of the unit approximately 0.190"(in.) to create an area to manufacture 15 rotor teeth.

REASON: To correlate with changes in the stator shaft and sleeve assembly.

CHANGE: ***(4)*** Late in 2005 and early in the 2006 model year, some pre ISS models may still not have the ISS mounting holes machined into the cover. This will be evident as a smooth un-machined surface without the ISS mounting holes. As ISS models were introduced, the machining took place and the input speed sensor (ISS) was added. (See figure 8)
For non ISS models, an ISS hole plug will be used in place of the ISS assembly. (See figure 9)

SERVICE INFORMATION:

Unit Identification - Refer to the chart shown in figure 1 for a list of transmissions and vehicle platforms known to use an ISS at the time of this printing.

Input Speed Sensor - The ISS assembly as shown in figure 2, is internal to the transmission. Operation of the ISS should be thoroughly evaluated with a scan tool to monitor RPM prior to transmission removal for any repairs. Due to the ISS circuitry design with its internal integrated circuit (IC) chip, it is not beneficial to measure the internal resistance and therefore no internal resistance values have been made available. Improper converter clutch operation or possible converter drain back concerns may be caused if the o-ring seal is damaged or omitted when servicing the ISS.
The steel locating brackets are necessary to keep the ISS wiring from coming in contact with the rotating reverse input clutch housing. These brackets push fit on to aluminum bosses that are cast into the oil pump cover.
At the time of this printing, the OEM part number for the ISS assembly is ***24237866***.

Turbine Input Shaft - The turbine input shaft as shown in figure 3 now has 15 rotor teeth added to trigger the ISS. The oil seal ring grooves have been relocated inboard towards the rear of the unit approximately 0.190"(in.) when compared to the previous design. Some pre ISS model turbine input shafts may have the rotor teeth machined in place and some may not. This was a manufacturing option. For this reason, great care must be taken when replacing the input clutch housing and turbine shaft assembly. A measurement from the front most oil seal ring groove to the base of the input shaft where it is pressed into the clutch housing must be taken and compared to the replacement component to ensure compatibility or transmission failure will be the result.

4L60/65/70-E

PRODUCTION CHANGES / INPUT SPEED SENSOR ADDED

SERVICE INFORMATION:

Internal Wire Harness **-** The internal wiring harness as shown in figure 4 contains additional circuits for ISS equipped transmissions and can be easily identified by the black 20-way pass-thru connector. Non ISS transmissions use the previous design harness which has a light grey connector. The ISS circuit shares pin position E (Ckt 839) for ignition feed voltage. This is a pre existing circuit and is spliced internally to supply power to the ISS. The additional pin terminals are K (Ckt 1230) for ISS signal and also V (Ckt 1231) for low reference.
At the time of this printing, the OEM part number for the new internal wire harness for ISS equipped transmissions is ***24234121***.

TCC Valve **-** The new design TCC valve uses a single spring and is shown along with the previous design level valve with dual springs in figure 5. The new valve incorporates a spring pocket to prevent incorrect installation by only allowing the spring to be assembled into the pocket end of the valve. Components of the previous and current designs may not be intermixed. However, the current design TCC valve and spring can be used to back service the previous design level.

Boost Valve and Sleeve **-** The boost sleeve as shown in figure 6 and its corresponding valve have been made shorter in overall length. No components of the current and previous designs may be intermixed, nor interchanged together as an assembly in place of the other. There are two versions of the current design boost valve and sleeve assembly with different valve land dimensions for standard and high performance use. The pressure regulator valve, pressure regulator valve spring and pressure regulator isolator spring remain the same as the previous design.

Oil Pump Cover **-** An outline of the oil pump cover and stator shaft changes can be seen in figure 7. Great care must be taken if the oil pump cover and/or stator shaft are to be replaced. This is due to the many changes in the oil pump cover casting and corresponding stator shaft sleeve oil passages. These pieces must be compatible with the turbine input shaft being used or transmission failure will be the result.
The boost sleeve and pressure regulator valve can not be serviced from the sump area on units equipped with an ISS because of the location of the ISS connector as shown in figure 8. This operation will require removal of the transmission and oil pump assembly. Pre ISS or non ISS models equipped with an ISS hole plug as seen in figure 9 will still allow access to the boost valve sleeve and pressure regulator valve from the sump. If the o-ring is damaged or omitted from the ISS hole plug then improper converter clutch operation or converter drain back concerns may be evident. Failure to install the ISS hole plug if required will result in low or no converter charge and no movement.

Fault Codes **-** Refer to figure 10 for diagnostic trouble code (DTC) information.

4L60/65/70-E

PRODUCTION CHANGES / INPUT SPEED SENSOR ADDED

Note: ***Transmission models and vehicle platforms that are indicated with an asterisk (*) are designated for export to Australia and will not be seen in the North American market.***

YEAR	BROADCAST CODE	TRANS	ENGINE	PLATFORM
2006	6 SJD	4L60-E	5.3 LITER	S-TRUCK (2WD)
2006	6 KLD	4L60-E	5.3 LITER	T-TRUCK (4WD)
2006	6 SKD	4L70-E	6.0 LITER	T-TRUCK (4WD)
2006	6 TKD	4L70-E	6.0 LITER	T-TRUCK (4WD)
2007	7 CLD	4L60-E	4.8/5.3 LTR	G-VAN (2WD)
2007	7 CLD	4L60-E	4.8/5.3 LTR	C-TRUCK (2WD)
2007	7 CFD	4L70-E	6.0 LITER	C-TRUCK (2WD)
2007	7 CVD	4L60-E	5.3 LITER	C-TRUCK (2WD)
2007	7 KFD	4L70-E	6.0 LITER	K-TRUCK (4WD)
2007	7 SBD	4L65-E	6.0 LITER	S-TRUCK (2WD)
2007	7 SFD	4L60-E	3.7 LITER	S-TRUCK (2WD)
2007	7 SJD	4L60-E	5.3 LITER	S-TRUCK (2WD)
2007	7 SLD	4L60-E	2.9 LITER	S-TRUCK (2WD)
2007	7 KLD	4L60-E	5.3 LITER	T-TRUCK (4WD)
2007	7 SKD	4L70-E	6.0 LITER	T-TRUCK (4WD)
2007	7 TFD	4L60-E	3.7 LITER	T-TRUCK (4WD)
2007	7 TKD	4L70-E	6.0 LITER	T-TRUCK (4WD)
2007	7 TLD	4L60-E	2.9 LITER	T-TRUCK (4WD)
2007	7 HBD *	4L65-E	3.6 LITER	CAR - HOLDEN *
2007	7 HSD *	4L60-E	3.6 LITER	CAR - HOLDEN *
2007	7 HTD *	4L60-E	5.7/6.0 LTR	CAR - HOLDEN *

Figure 1

4L60/65/70-E

PRODUCTION CHANGES / INPUT SPEED SENSOR ADDED

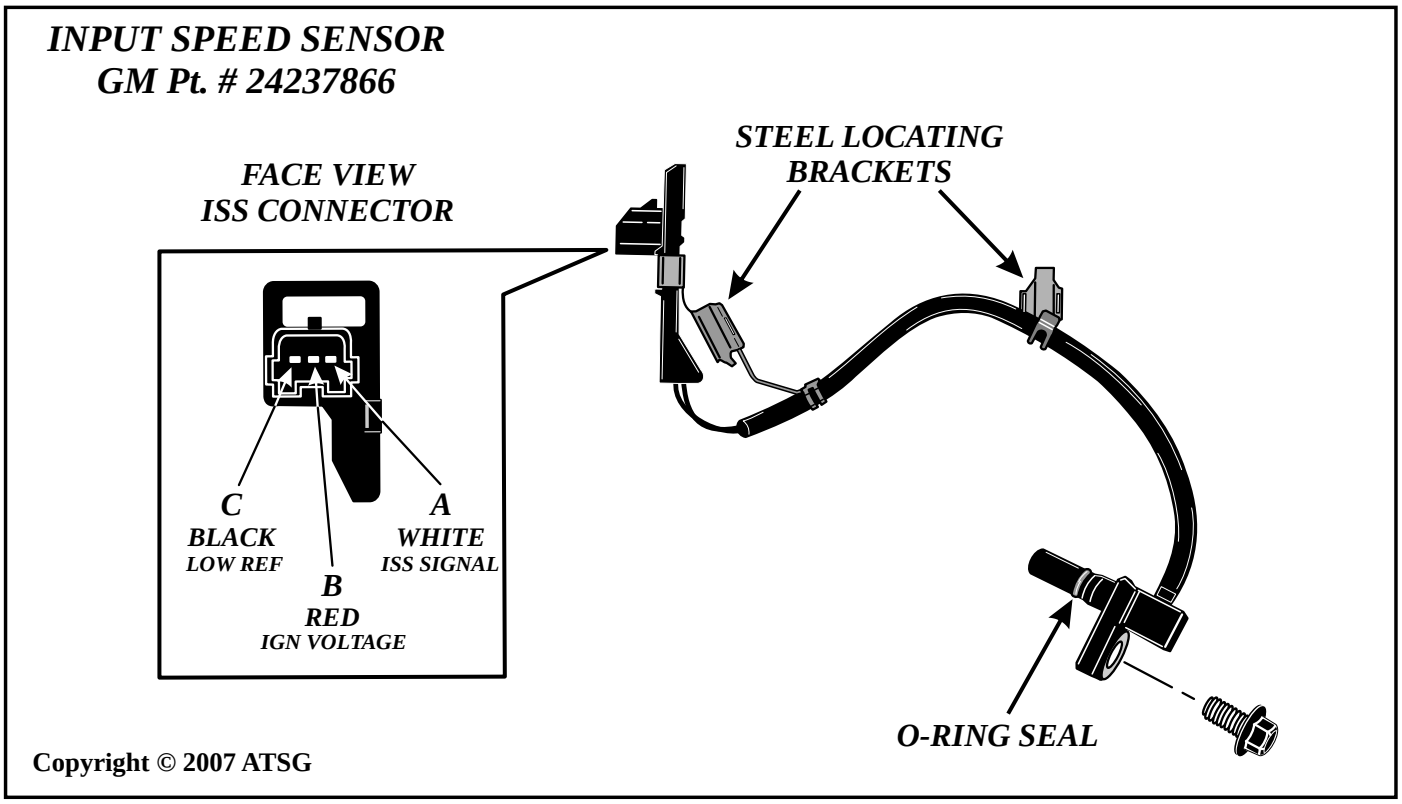


Figure 2

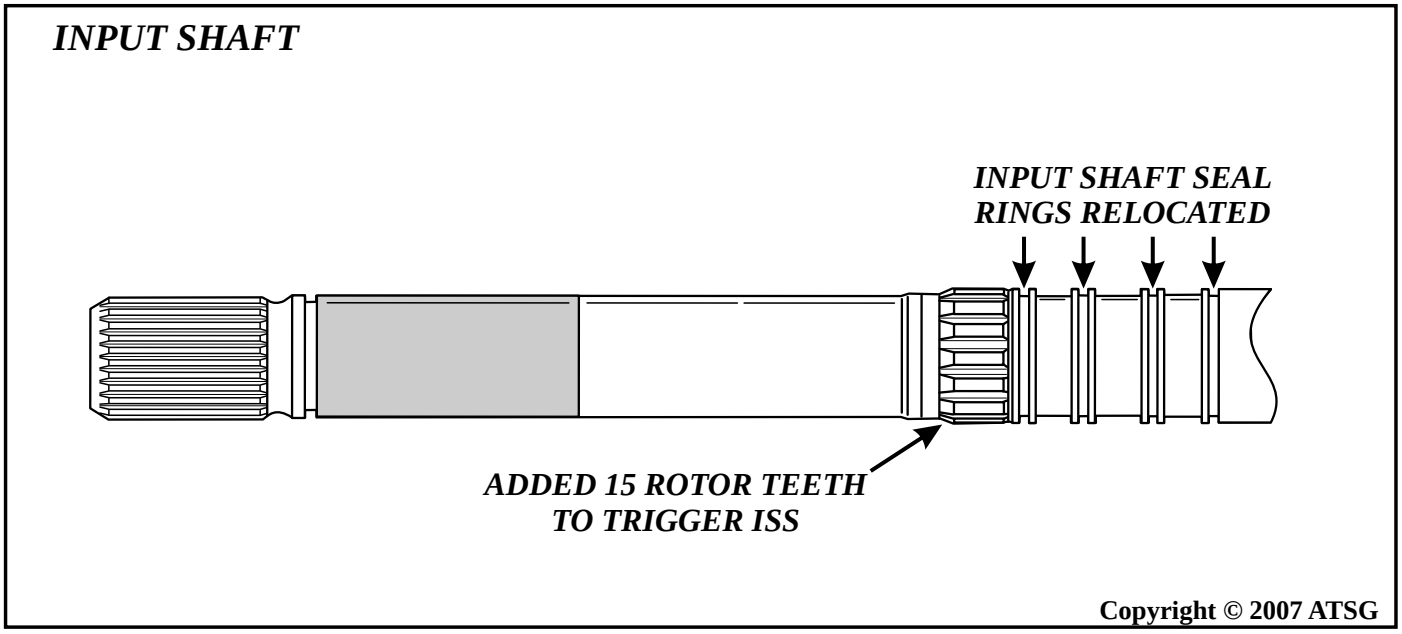


Figure 3

4L60/65/70-E

PRODUCTION CHANGES / INPUT SPEED SENSOR ADDED

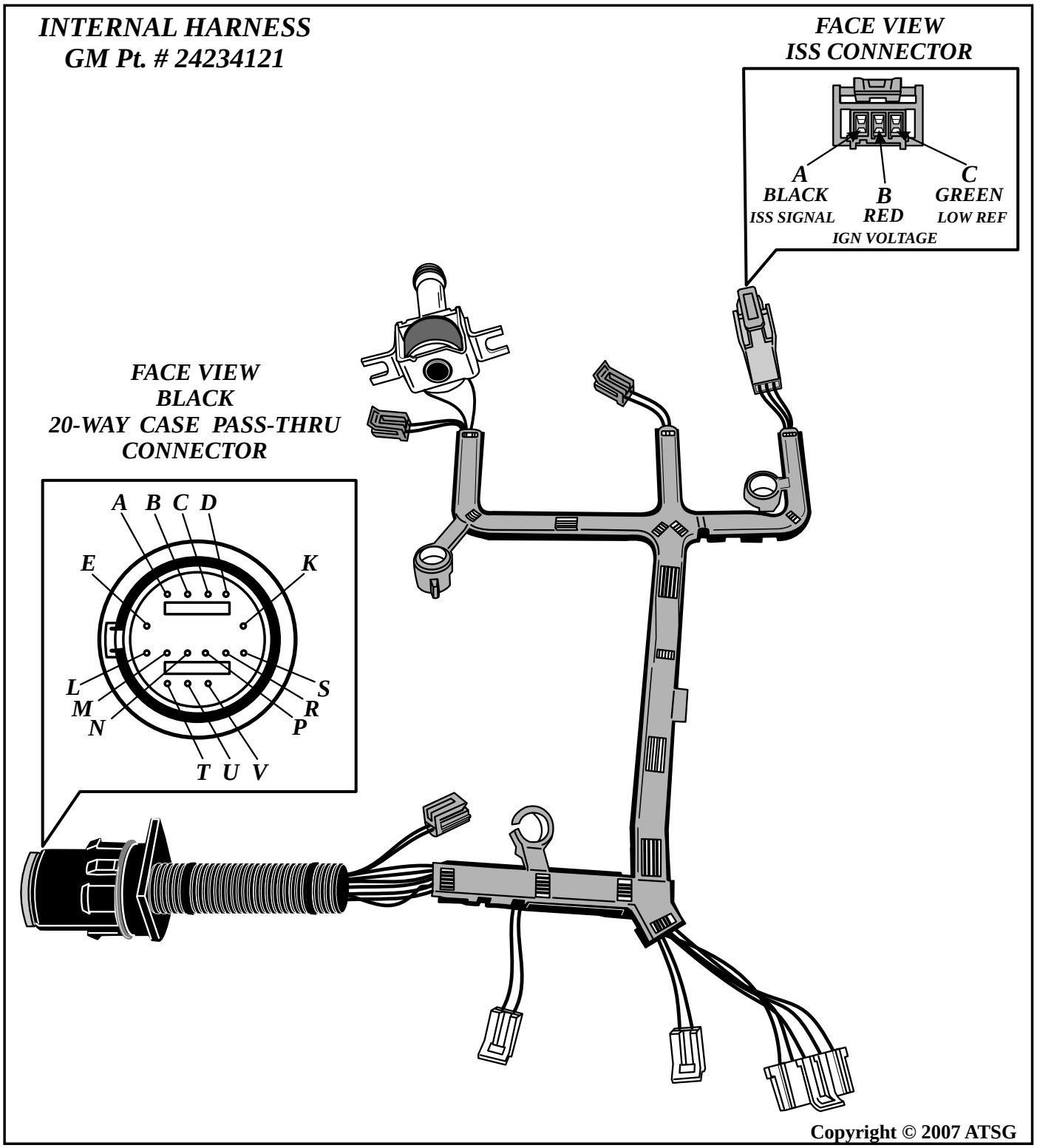


Figure 4

4L60/65/70-E

PRODUCTION CHANGES / INPUT SPEED SENSOR ADDED

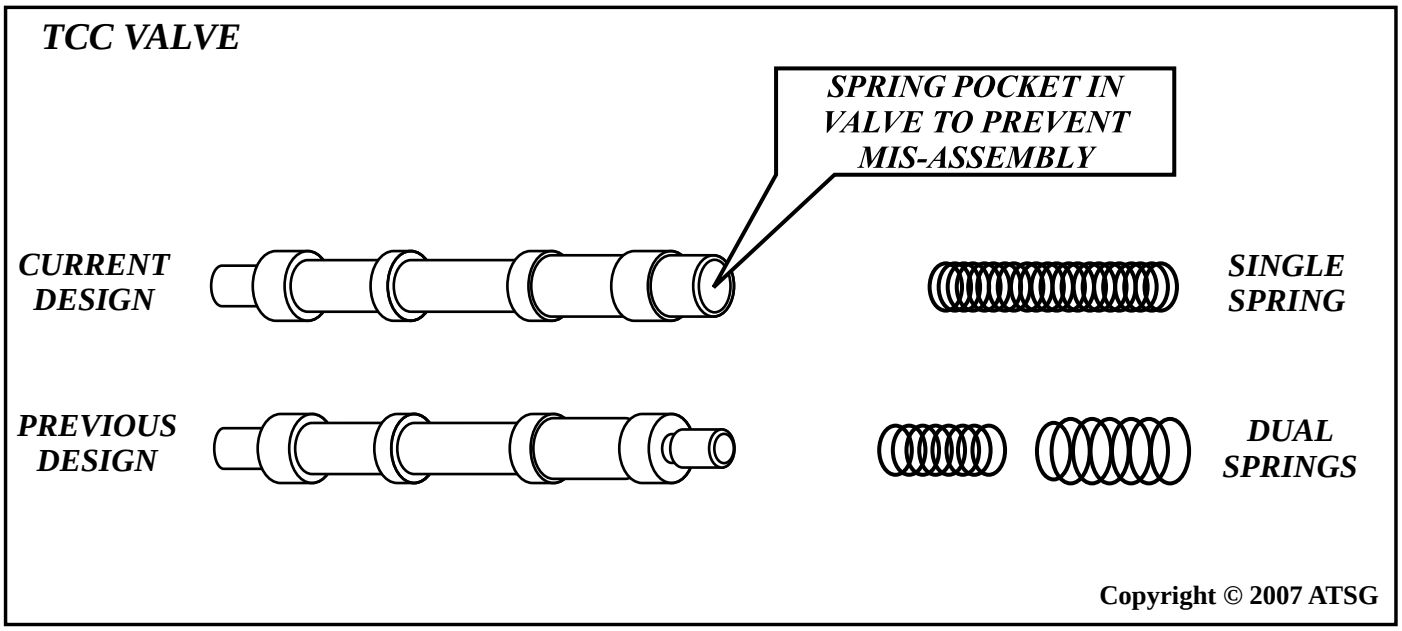


Figure 5

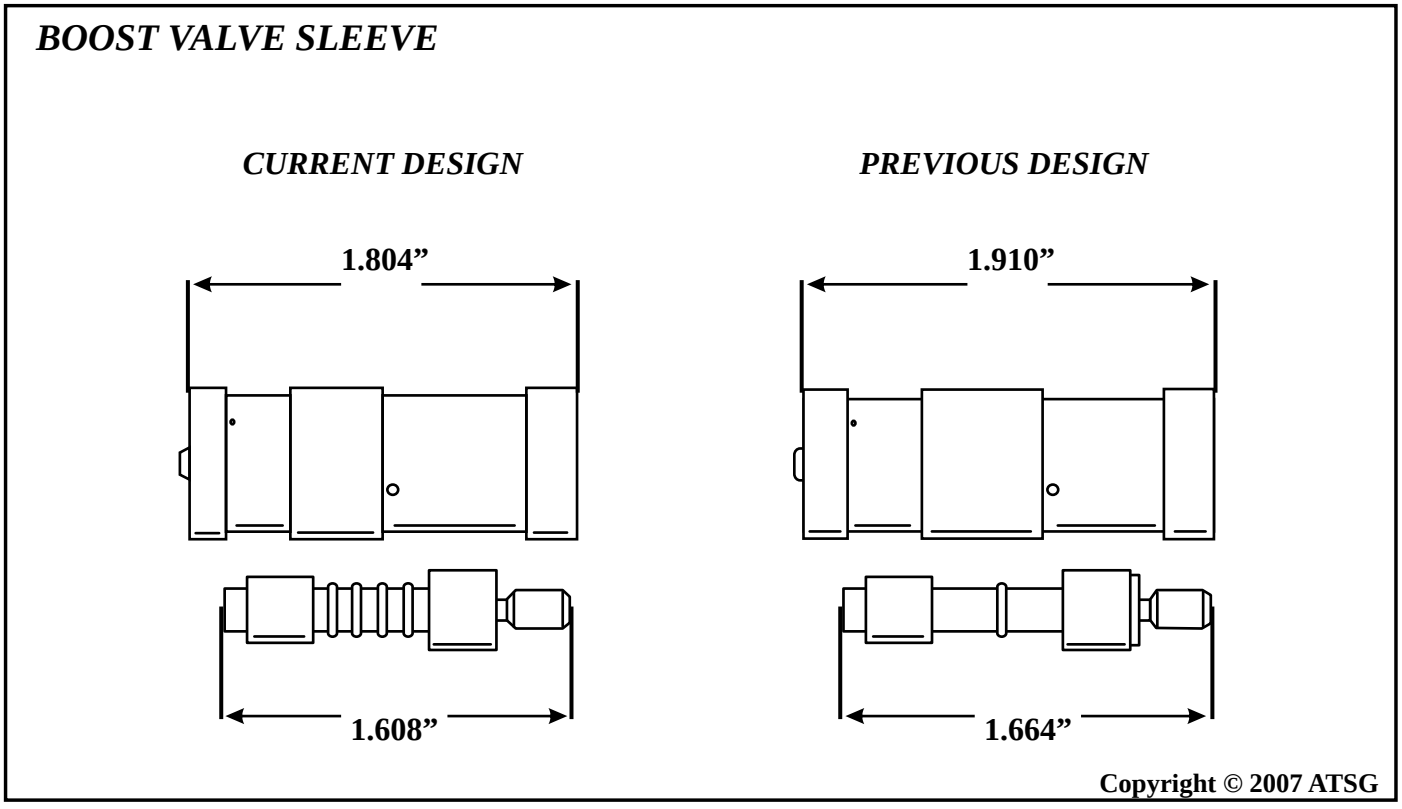


Figure 6

4L60/65/70-E

PRODUCTION CHANGES / INPUT SPEED SENSOR ADDED

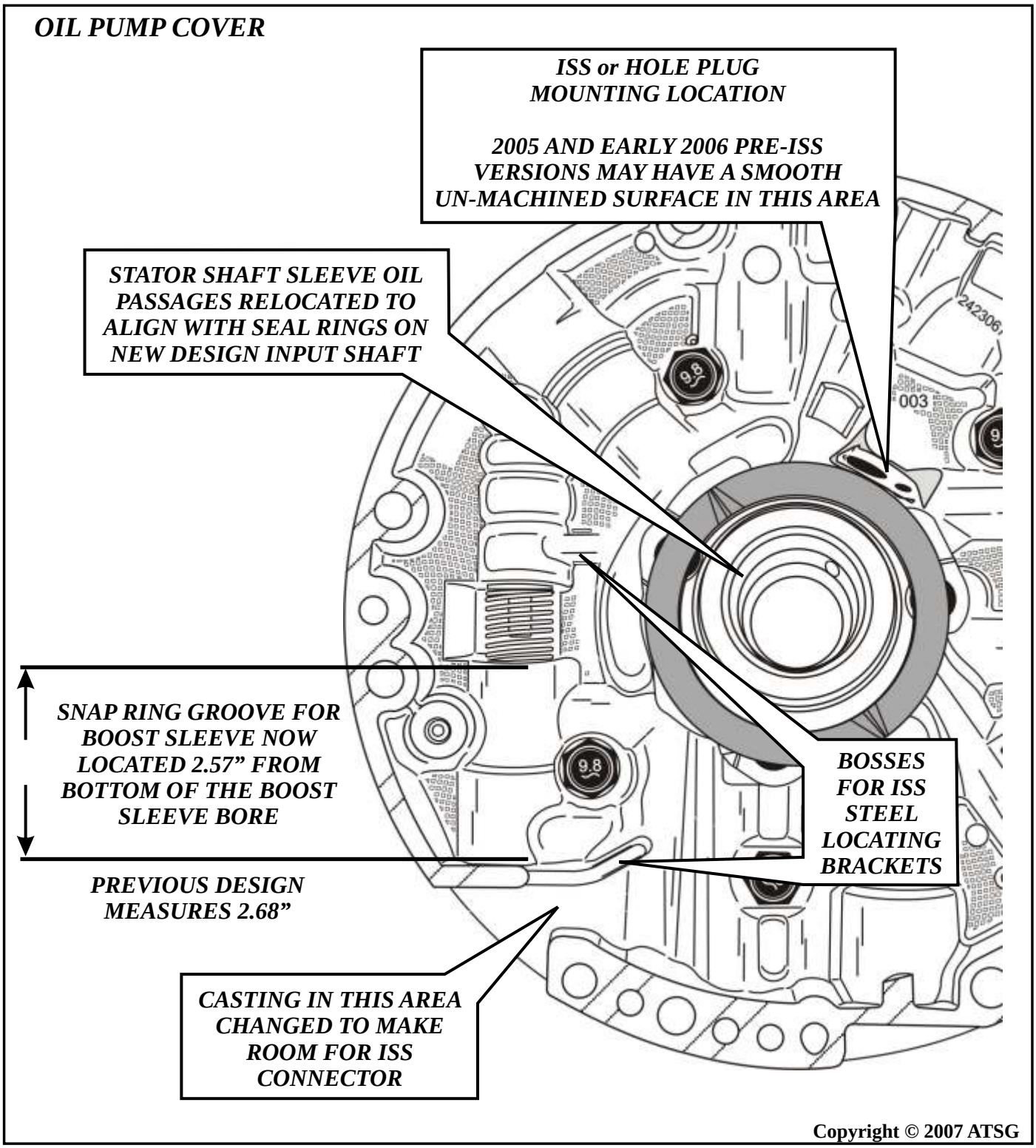


Figure 7

4L60/65/70-E

PRODUCTION CHANGES / INPUT SPEED SENSOR ADDED

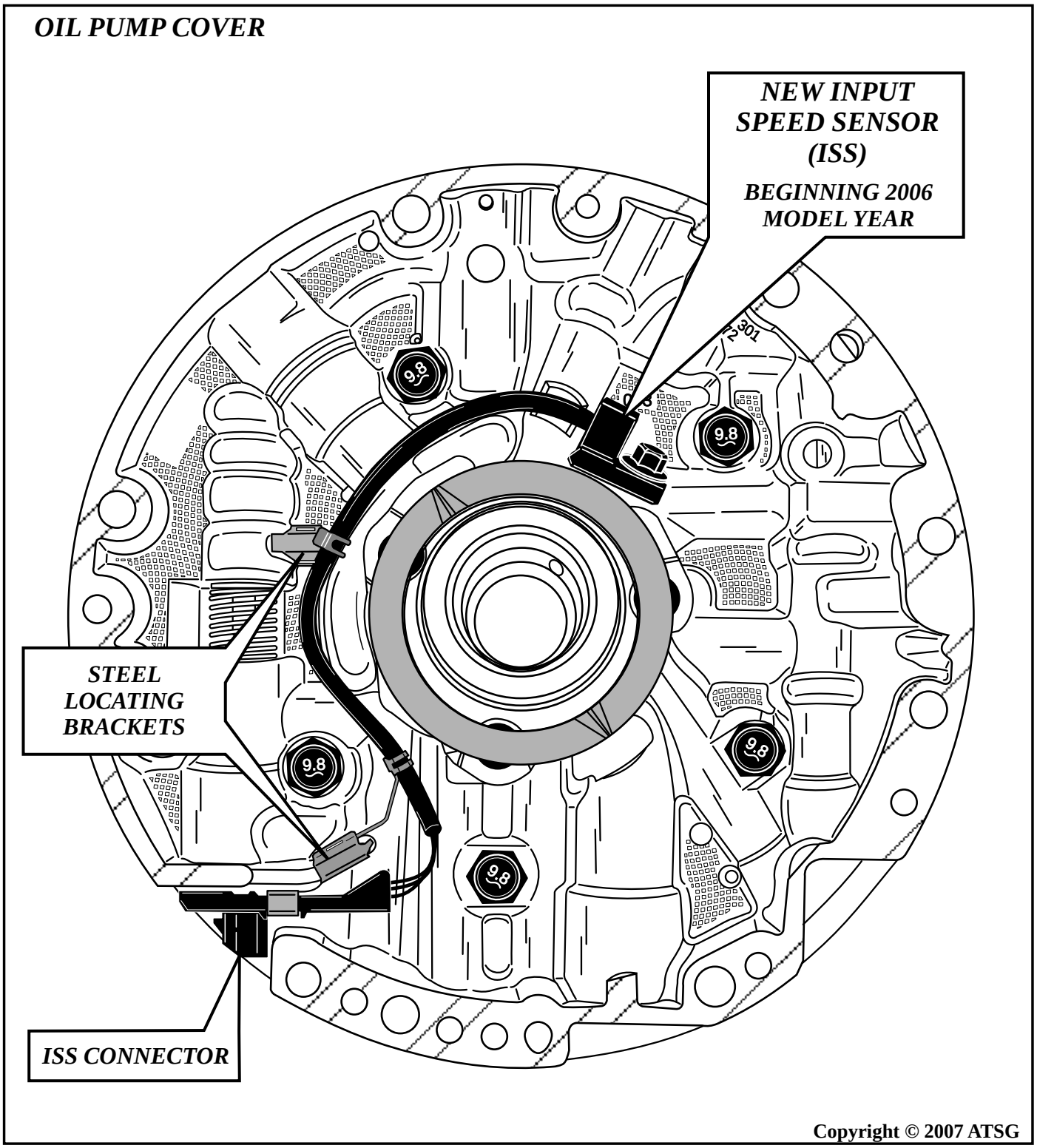


Figure 8

4L60/65/70-E

PRODUCTION CHANGES / INPUT SPEED SENSOR ADDED

OIL PUMP COVER

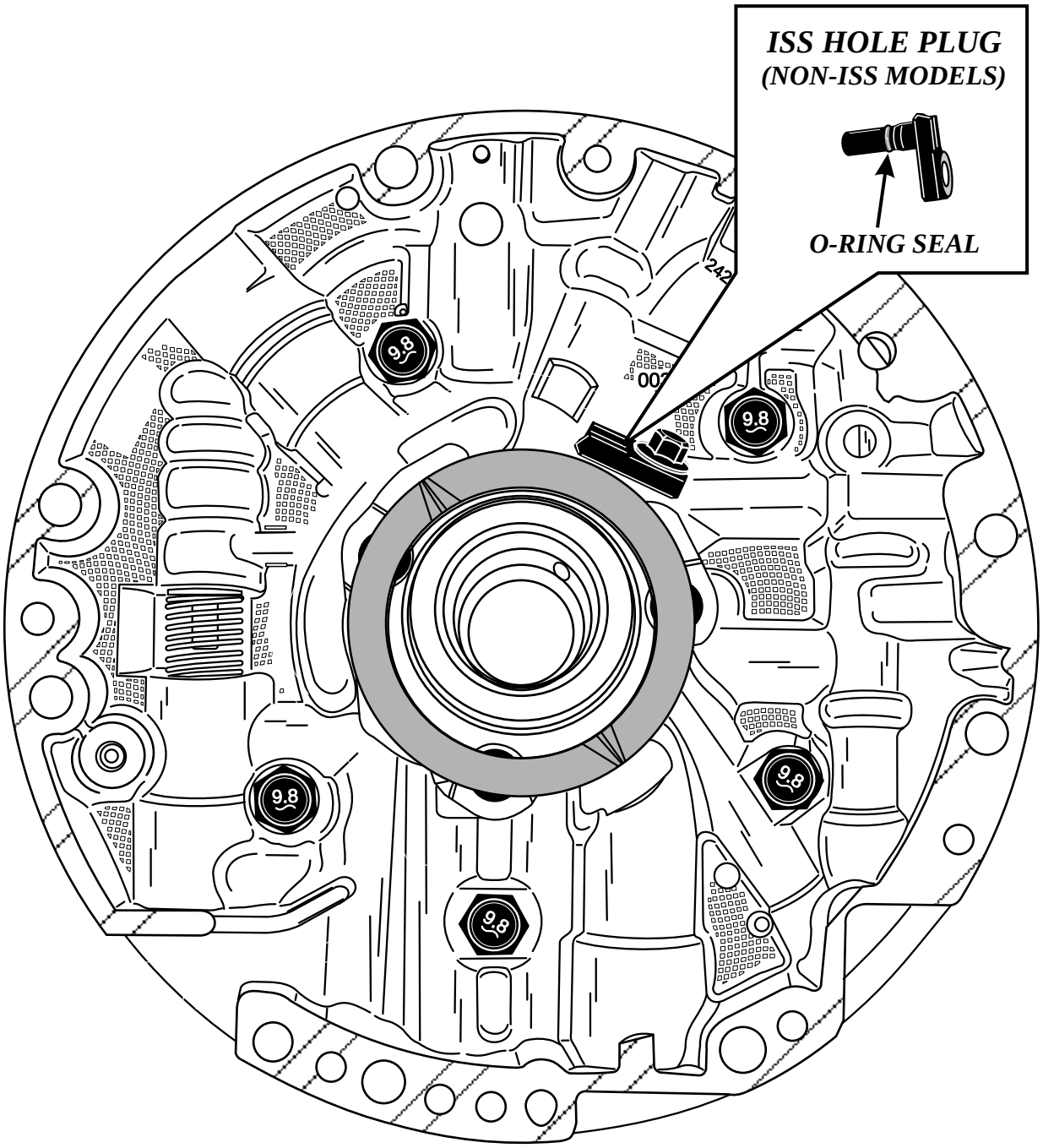


Figure 9

4L60/65/70-E

PRODUCTION CHANGES / INPUT SPEED SENSOR ADDED

Note: ***Fault codes P0716 and P0717 are assigned directly to the operation of the ISS. The fault code definitions, default action and code setting criteria are as indicated in the chart shown below. Units equipped with the ISS provide a more precise monitoring of gear ratio and converter clutch slip speed. As a result, we can now expect to see other fault codes such as the P0730 series for ratio errors as well as P0741 and P0742 for diagnosis of converter clutch operation.***

DTC	DEFINITION	CRITERIA
P0716	ISS Performance	An unrealistic change in ISS rpm is detected PCM/TCM compares transmission input and output speed to determine a system problem
P0717	ISS Ckt Low Volts	Low signal voltage from ISS is detected PCM/TCM saw input speed less than 100 rpm with the engine running

Both fault codes P0716 and P0717 are type B diagnostics which will illuminate the malfunction indicator light (MIL) upon completion of two consecutive trips with the failure present.

Once the fault code (DTC) is set, it will force a default action designed to protect the transmission.

Figure 10

GENERAL MOTORS

SHIFT ADAPTS

COMPLAINT: A 1998 Buick Lesabre comes into the shop with a complaint of an intermittent harsh 1-2 shift. A code P1811 is stored indicating "Maximum Shift Adapt" has been reached.

CAUSE:

TAP CELL ADAPTS:

With the scan tool in the Transmission Data Mode, (Refer to Figure 1), the shift time for the 1-2 shift is indicating that the shift took 0.70 seconds to complete. This shift time exceeds the normal time the shift should have taken. No conventional GM automatic transmission should exceed 0.65 seconds shift time.

The P1811 indicates that the PCM has attempted to compensate for the intermittent shift timing error by raising line pressure during the 1-2 shift as seen in the shift adapt report in Figure 2.The numbers without minus signs indicate how much line rise will be added to the next 1-2 shift for that particular Tap Cell.

The Tap Cells are numbered from 4 to 16, four being light throttle, eight being about medium throttle and 12 and higher being heavy throttle. The amount of line pressure the PCM can remove or provide will range from -30.00 to 30.00 positive pressure. By viewing these tap cells not only can you tell which shift is causing the harsh complaint, but also at what throttle the problem is occurring.

Within specs, the closer each Tap Cell is to one another the healthier that transmission is and the better it will perform.

STEADY STATE ADAPTS:

The Steady State Adapts are an extremely useful tool because they can pin point which component is causing the complaint, this is especially helpful on intermittent complaints. The Steady State Adapts represent the "in gear" status of a components ability to prevent slippage.

Should a component slip, this would be seen on the scan tools adaptive data list, (Refer to Figure 2), and would indicate a number which shows how much line pressure is going to be increased to keep that component from slipping. The worse it's slipping the higher that number will be, when there is no problem the steady state will be zero.

As can be seen in Figure 2, there is a problem with second gear, that steady state is elevated while the rest are zero. This would explain the above complaint.

CORRECTION: Using a 4T65E as an example, to correct slightly elevated Tap Cells usually requires replacement of the pressure control solenoid.

Another reason is, after repairs are completed, the PCM still believes it must slam that component on, in other words, it does not know the problem has been fixed. You must reset the shift adapts for the transmission to return to normal operating conditions.

If steady states are out of spec, that usually indicates internal problems.

Sometimes, if the problem is occurring frequently, the shift times will be higher than normal.

SERVICE INFORMATION:

If it becomes necessary to disconnect the battery to reset the shift adapts, and the radio no longer plays because the anti-theft code was wiped out, go to www.radio-code.com for that vehicles radio code.

Sonnax

VBX

LIVE DATA

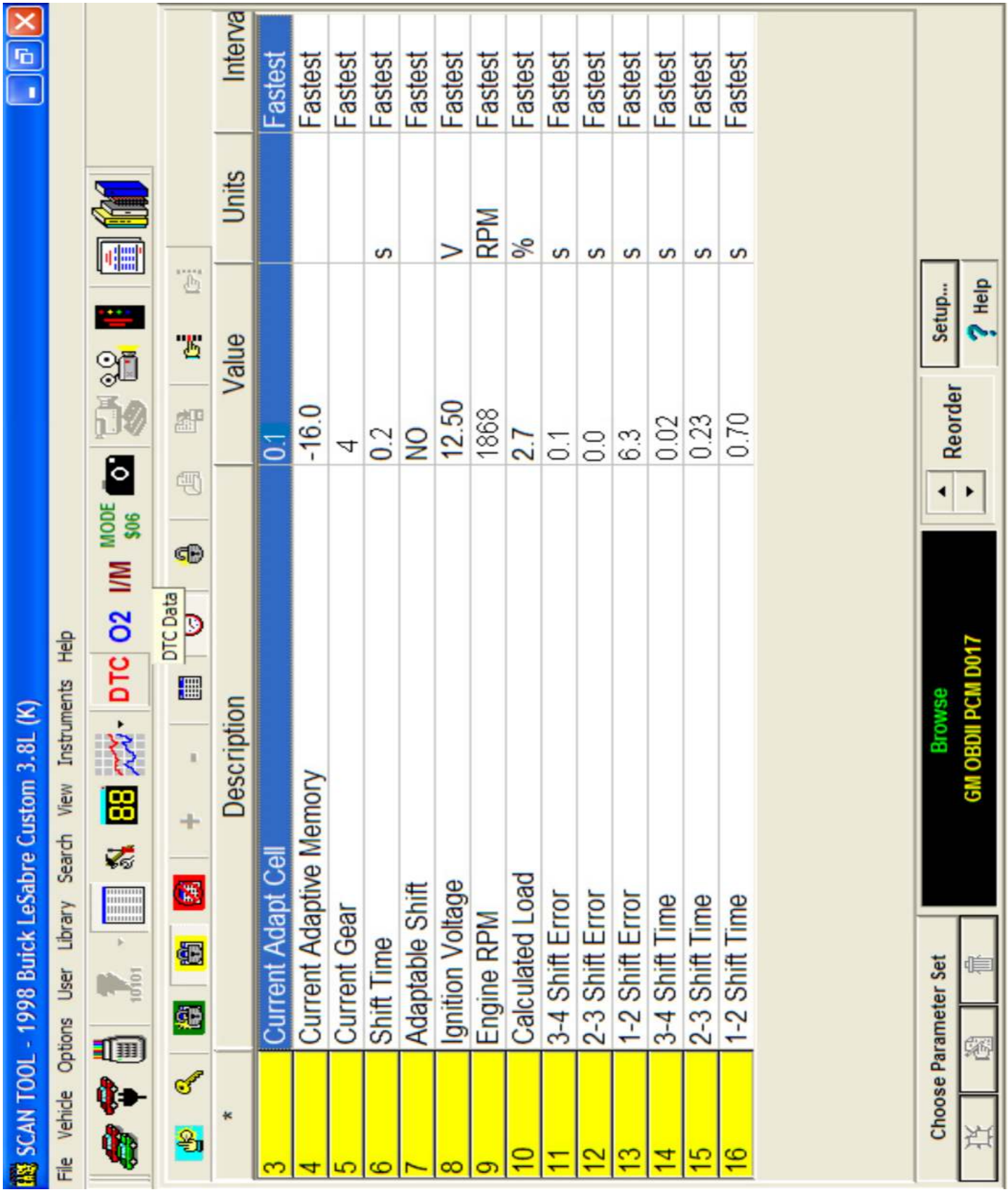
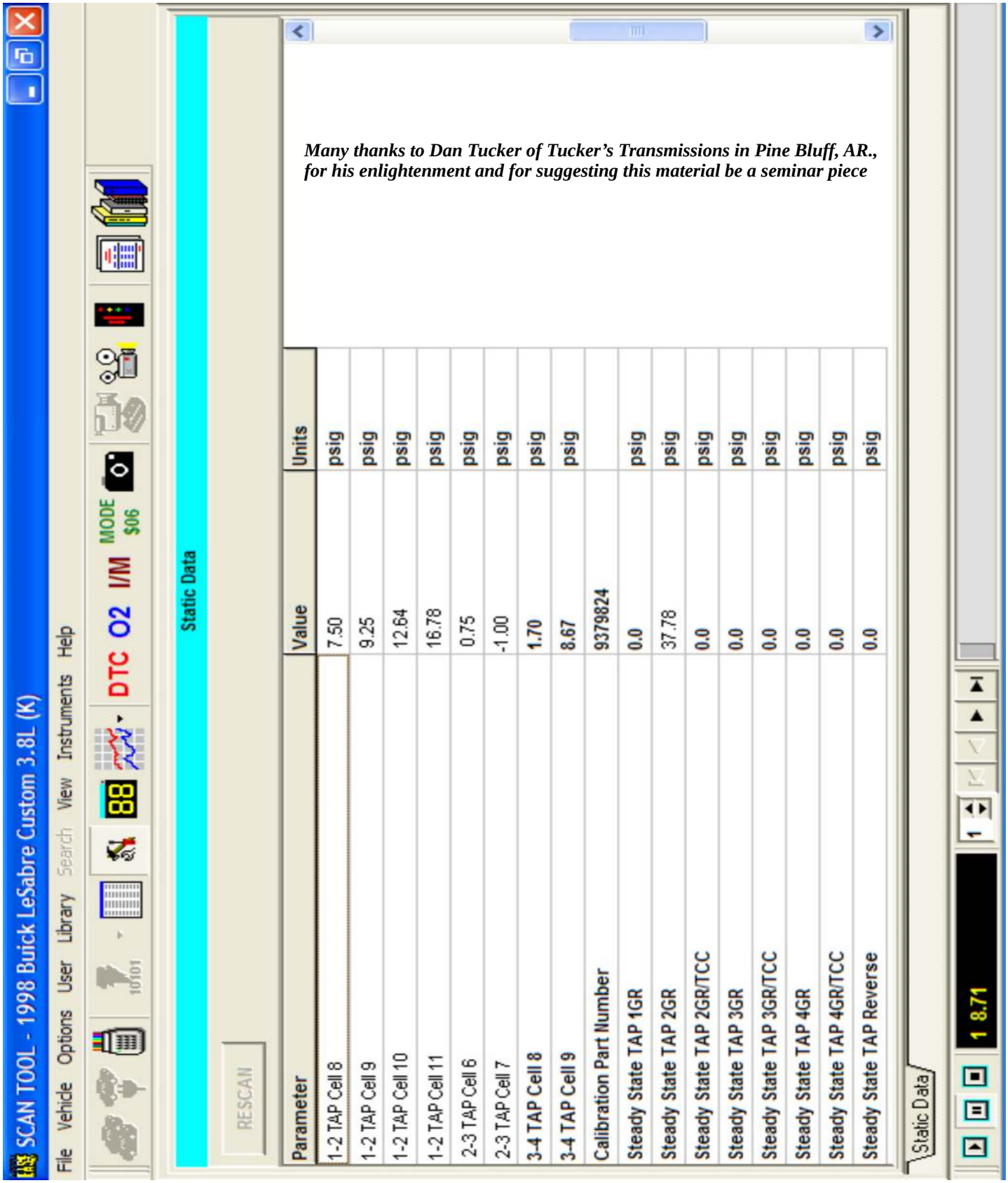


Figure 1

A & Reds

ADAPTIVE STATE DATA



Many thanks to Dan Tucker of Tucker's Transmissions in Pine Bluff, AR., for his enlightenment and for suggesting this material be a seminar piece

Figure 2

2004 & LATER CADILLAC

TPMS WARNING LAMP ILLUMINATED

COMPLAINT: Transmission repairs have been completed on a 2004 Cadillac Deville, after delivery of the car to the customer, the car comes back to shop with a complaint of a warning lamp that is on which was not on prior to repairs. It is the Tire Pressure Monitoring System Warning Lamp, (Refer to Figure 1).
A scan of all areas of the PCM reveals no codes stored. However, when the Body Control Module (BCM) is scanned, codes C0750 and C0755 are found indicating there is a problem with the left and right front tire pressure monitors.

CAUSE: During the re-assembly of the vehicle, the left and right front wheels were switched to opposite sides. This action caused the Tire Pressure Monitoring System Sensors in each of those wheels (Refer to Figure 2) to alert the TPMS, turn on the warning lamp and store the above mentioned codes. This occurs because this is a Direct TPMS system, in other words it is a stand alone system whose only purpose is to monitor tire pressures.
Indirect systems use the vehicles ABS system by measuring wheel speed and should not be affected by switching wheel locations.

CORRECTION: Anytime wheels are rotated, tires changed, balanced or tire pressures are incorrect, the system must be reprogrammed. To reprogram, either a capable scan tool is required or the keyless entry key fob along with a magnet, which is Kent-Moore Tool J-41760 as shown in Figure 3, is needed to accomplish a manual reprogramming.

The reprogramming procedure without the scan tool is as follows:

(1) Turn the ignition ON.
(2) Using the Key Fob, lock and unlock the vehicles doors.
(3) Press the lock and unlock buttons at the same time, a single horn chirp will sound in approximately 10 seconds, indicating that the TPM system is in the relearn mode.
(4) Start with the left front (driver side) tire, hold the magnet over the valve stem until the horn chirps once.
(5) Then proceed to repeat Step 4 in the following order: Right Front Tire; Right Rear Tire; Left Rear Tire. Each time the magnet is held over the valve stem the horn will chirp once to indicate that the sensor was recognized.
(6) At this time the horn should chirp twice to indicate that the reprogramming was successful.
(7) Tire pressures can be checked using the vehicles Driver Information Center (DIC) or a capable scan tool.

NOTES:
(1) The entire reprogramming procedure must be completed within 5 minutes, if not, start over.
(2) Individual TPM sensor reprogramming must be accomplished within 1 minute, if not, start over.
(3) If the horn chirps twice before reprogramming is complete, this indicates the TPM receiver has exited the programming mode, start over.
(4) DO NOT replace the tire stem cap with anything other than the O.E. cap. Any other cap can block the transmitters signal because the tire stem is the transmitters antenna.

SERVICE INFORMATION:
Kent-Moore Reprogramming Tool (Magnet).....J-41760

TIRE PRESSURE MONITORING SYSTEM WARNING LAMP

DRIVER INFORMATION CENTER

Figure 1

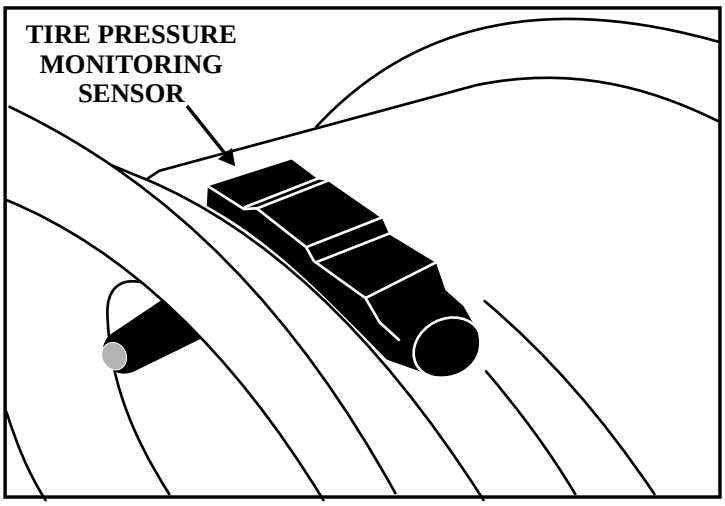


Figure 2

KENT-MOORE REPROGRAMMING TOOL J-41760

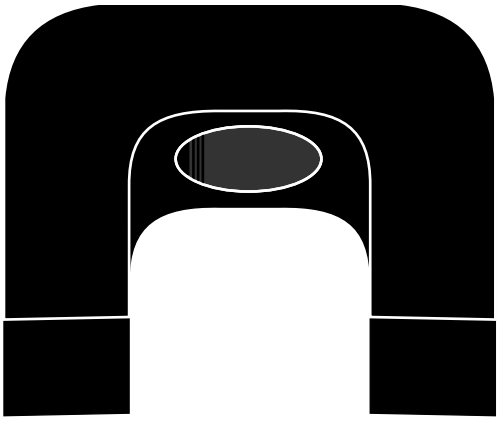


Figure 3

4L60/65/70-E

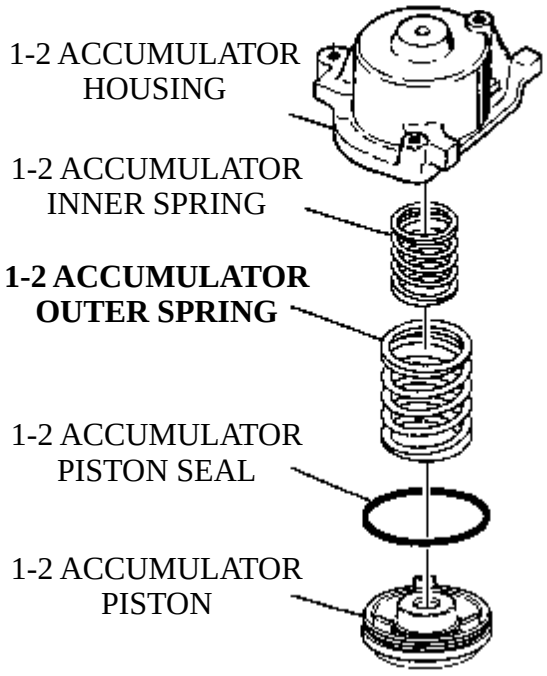
SLIDE BUMP OR CHATTER ON 1-2 SHIFT

COMPLAINT: Before and/or after overhaul, a GM vehicle equipped with a 4L60/65/70-E series transmission may exhibit a noticeable slide bump or chatter on the 1-2 up shift at various throttle openings.

CAUSE: The 1-2 accumulator spring rate may be one cause of the problem.

CORRECTION: Check and verify that there are no line pressure and rise problems that may indicate a faulty pressure control solenoid, worn boost valve sleeve in the oil pump cover or actuator feed limit valve bore wear problem in the valve body.
Check for a sticking accumulator valve in the valve body.
Check servo apply pin length and 1-2 accumulator assembly for piston or pin wear and repair or replace as necessary.
If all of the previous checks indicate no problems then the complaint may be resolved by removing the outer accumulator spring and replacing it with a much lighter spring.
A suitable replacement may be found from an earlier version 700R4/4L60 transmission 1-2 or 3-4 accumulator. (See figure 1)

Note: ***This only applies to 1-2 accumulators with double springs and the piston arrangement as shown in figure 1.***



Many thanks to Mark Glasser from X-PERT Transmission in Philadelphia Pa.

Figure 1

GM/BMW 5L40E
NO REVERSE

COMPLAINT: Before or after overhaul vehicles equipped with the 5L40E transmission may exhibit a no reverse engagement condition.

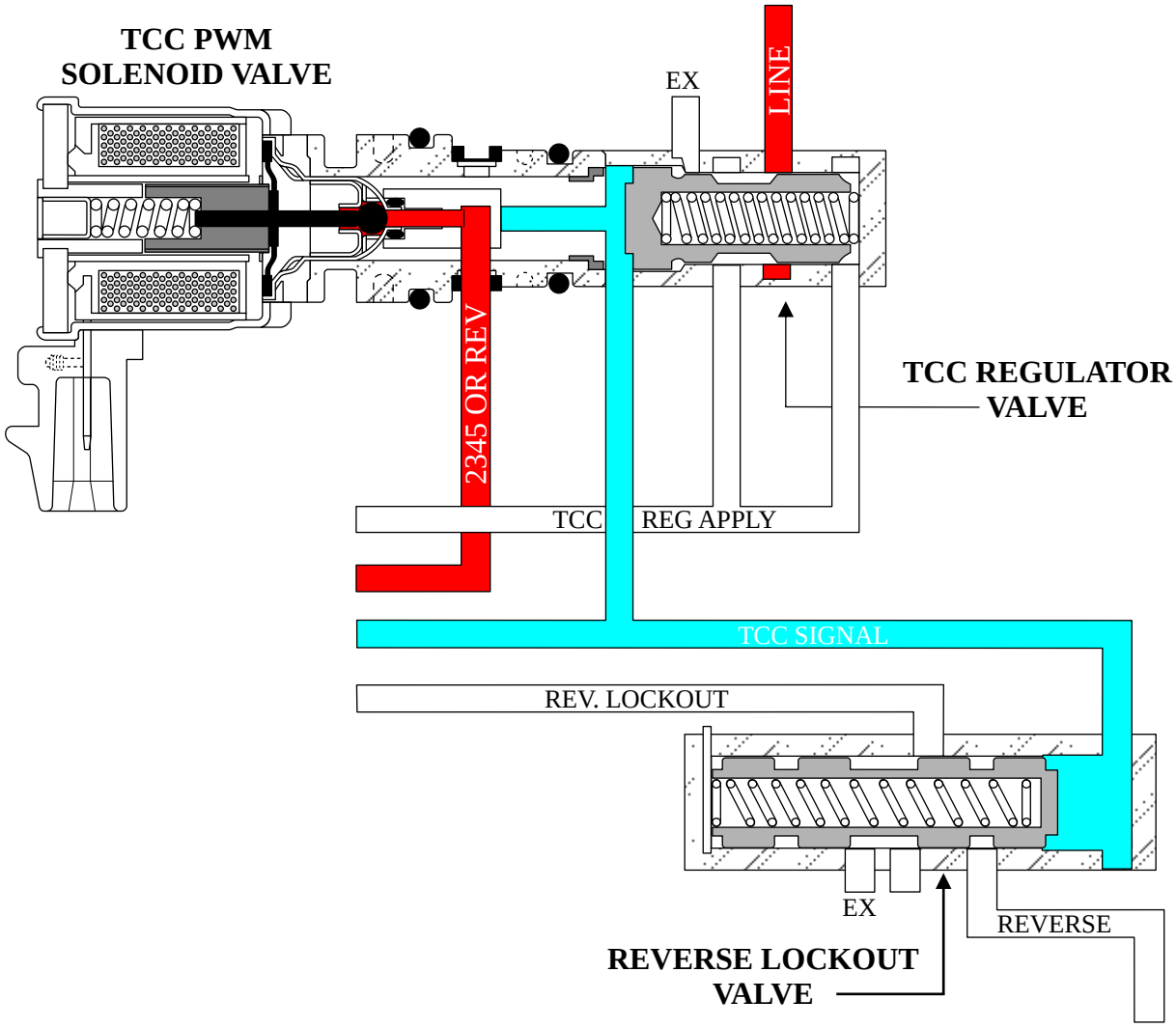
CAUSE: One cause may be a restricted or flooded TCC PWM SOLENOID. Oil pressure from the manual valve is directed to the TCC PWM Solenoid in 2nd, 3rd, 4th, 5th, and Reverse gears. If the solenoid becomes restricted in Reverse, oil pressure can build up and cause the REVERSE LOCKOUT VALVE to stroke in the valve body, and prevent the reverse clutch from applying, leaving the vehicle with no reverse engagement. Refer to Figures 1 and 2 for a partial hydraulic schematic of the PWM Solenoid and the Reverse Lockout Valve.

CORRECTION: Replace the TCC Pwm Solenoid and verify the Reverse Lockout valve is not stuck. Refer to Figures 3 and 4 for the location of the Solenoid and the Reverse Lockout Valve-train.

SERVICE INFORMATION:

TCC PWM SOLENOID.....24212690

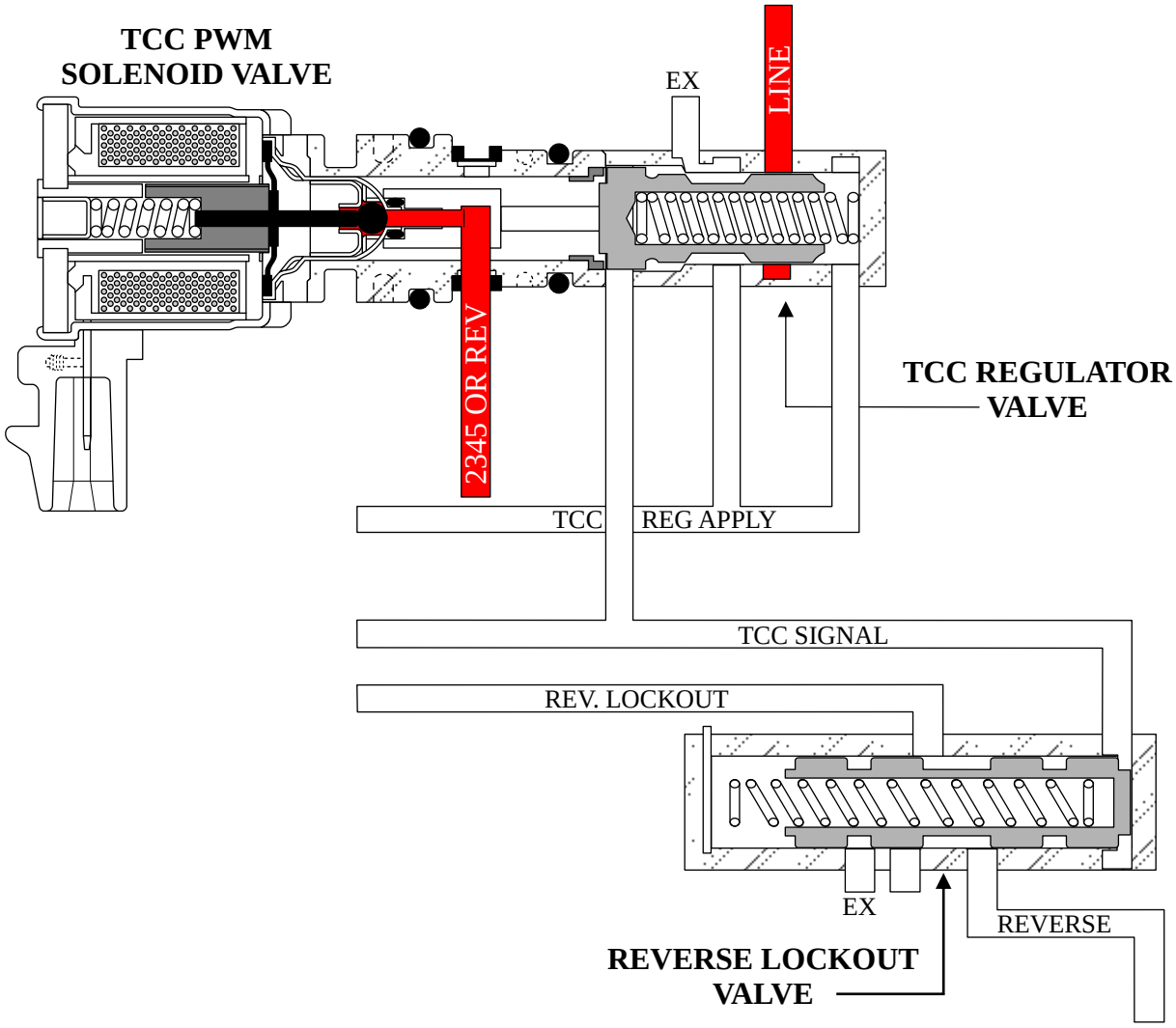
TORQUE CONVERTER CLUTCH APPLIED



Oil pressure from the manual valve is directed into the 2,3,4,5, and Reverse circuit in 2nd, 3rd, 4th, 5th, and Reverse gears. In the forward ranges, 2,3,4,5 oil is utilized to control movement of the TCC REGULATOR VALVE for lockup/TCC apply. In Reverse, it is used to control the REVERSE LOCKOUT VALVE, for reverse lockout function. If this solenoid becomes restricted, oil pressure can build up enough to stroke the REVERSE LOCKOUT VALVE, inhibiting reverse from engaging by blocking oil pressure from going to the reverse clutch.

Figure 1

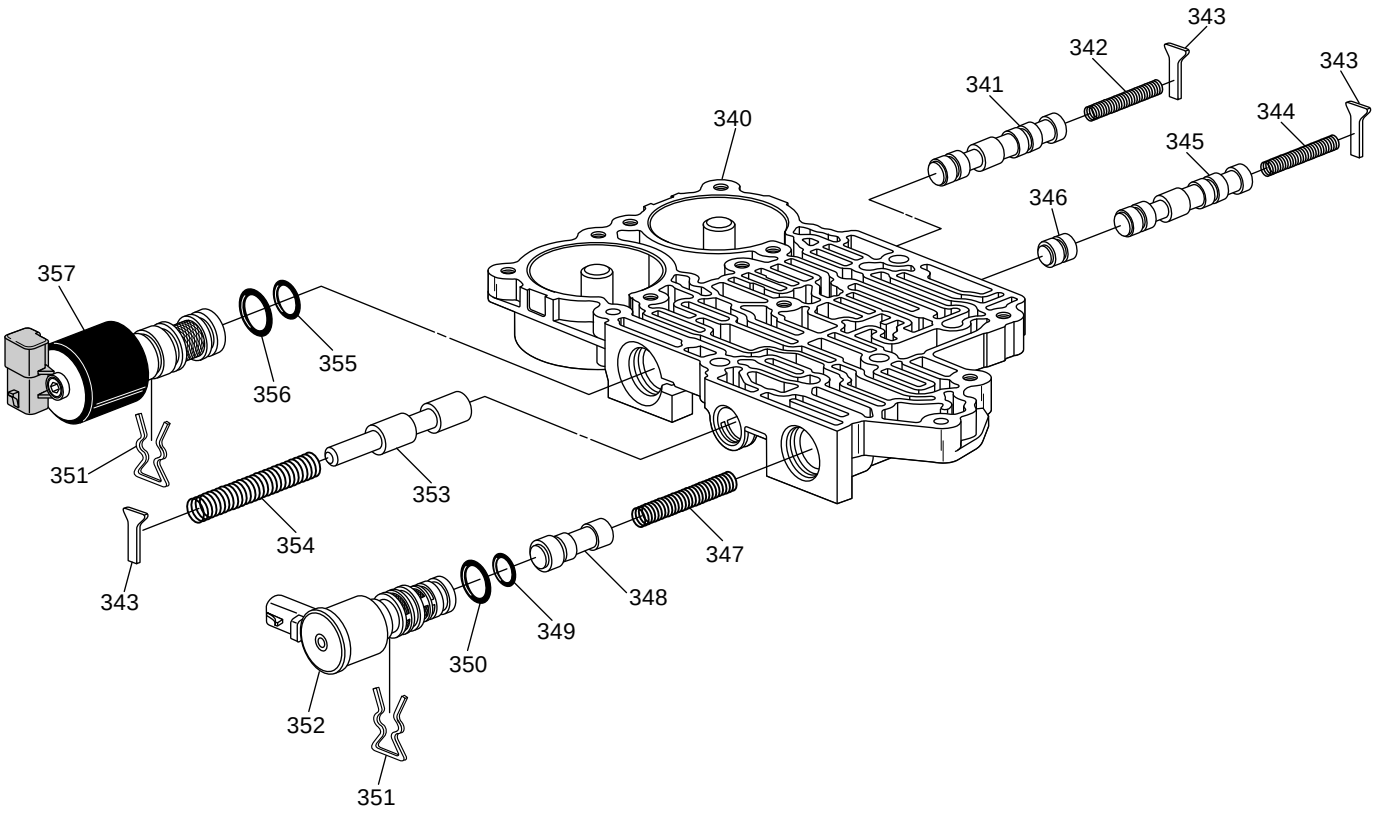
TORQUE CONVERTER CLUTCH NOT APPLIED



Summary: Reverse Lockout valve in the position to allow Reverse application

Figure 2

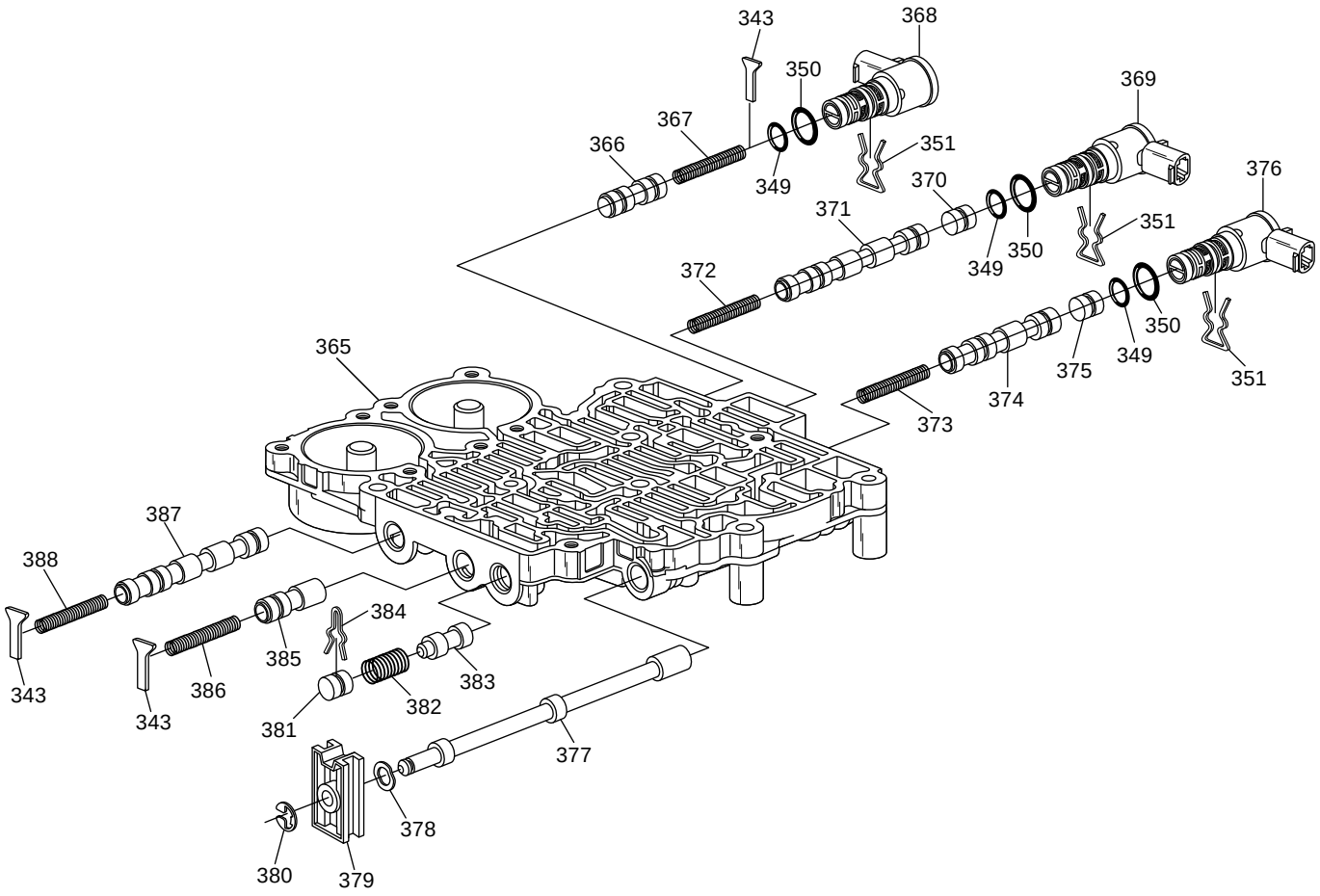
FRONT VALVE BODY ASSEMBLY EXPLODED VIEW



340 FRONT VALVE BODY CASTING ASSEMBLY
341 SAFETY MODE VALVE
342 SAFETY MODE VALVE SPRING
343 VALVE SPRING RETAINER
344 3-4 SHIFT VALVE SPRING
345 3-4 SHIFT VALVE
346 3-4 SHIFT CONTROL VALVE
347 TCC REGULATOR APPLY VALVE SPRING
348 TCC REGULATOR APPLY VALVE
349 SOLENOID ASSEMBLY SMALL "O" RING SEAL
350 SOLENOID ASSEMBLY LARGE "O" RING SEAL
351 SOLENOID ASSEMBLY RETAINER
352 TCC/PWM SOLENOID ASSEMBLY
353 FEED LIMIT VALVE
354 FEED LIMIT VALVE SPRING
355 PRESSURE CONTROL SOLENOID SMALL "O" RING SEAL
356 PRESSURE CONTROL SOLENOID LARGE "O" RING SEAL
357 PRESSURE CONTROL SOLENOID ASSEMBLY

Figure 3

REAR VALVE BODY ASSEMBLY EXPLODED VIEW



343 VALVE SPRING RETAINER
349 SOLENOID ASSEMBLY SMALL "O" RING SEAL
350 SOLENOID ASSEMBLY LARGE "O" RING SEAL
351 SOLENOID ASSEMBLY RETAINER
365 REAR VALVE BODY CASTING ASSEMBLY
366 1-2 SHIFT CONTROL VALVE
367 1-2 SHIFT CONTROL VALVE SPRING
368 1-2 SHIFT SOLENOID ASSEMBLY
369 2-3 SHIFT SOLENOID ASSEMBLY
370 2-3 SHIFT CONTROL VALVE
371 2-3 SHIFT VALVE
372 2-3 SHIFT VALVE SPRING
373 4-5 SHIFT VALVE SPRING
374 4-5 SHIFT VALVE
375 4-5 SHIFT CONTROL VALVE
376 4-5 SHIFT SOLENOID ASSEMBLY
377 MANUAL VALVE
378 MANUAL VALVE LINK "WAVED" WASHER
379 MANUAL VALVE LINK
380 MANUAL VALVE LINK "E" CLIP RETAINER
381 LOW PRESSURE CONTROL VALVE BORE PLUG
382 LOW PRESSURE CONTROL VALVE SPRING
383 LOW PRESSURE CONTROL VALVE
384 LOW PRESSURE CONTROL VALVE BORE PLUG RETAINER
385 REVERSE LOCKOUT VALVE
386 REVERSE LOCKOUT VALVE SPRING
387 1-2 SHIFT VALVE
388 1-2 SHIFT VALVE SPRING

Figure 4

GM AND BMW 5L40-E
BONDED PISTON INSTALLERS

5L40-E Bonded Pistons are now available from two aftermarket sources. Transtec, Corteco and Precision International. These pistons come only in kits. The Transtec kit consists of 9 pistons that will fit 2002 and up models. Precision International has three different kits. 1. Covers 99-05 models, combo, which consists of 14 pistons. 2. To cover 99-05 BMW AWD vehicles, this kit consists of 9 pistons. 3. To cover 99-05 models except AWD, which consists of 11 pistons. The next issue is getting pistons installed. You may be able to sneak a few of these pistons into their drums without installers, but the center support is not forgiving. The Center Support has no chamfers to allow any ease of assembly. There are two options available to install these pistons. Option 1. Use the sizing cones and SEAL-E-ZEE spray, available from Lube Gard. Size the inner and outer piston seals of the piston with the cones then spray the rubber as directed on the label. This will freeze the rubber so the piston can be installed. See Figure 1. Option 2. Purchase the installers from your local distributer or Kent Moore SPX. ***Note: the Kent Moore numbers listed are for 2002 up models only***. Refer to the updated part numbers listed below.

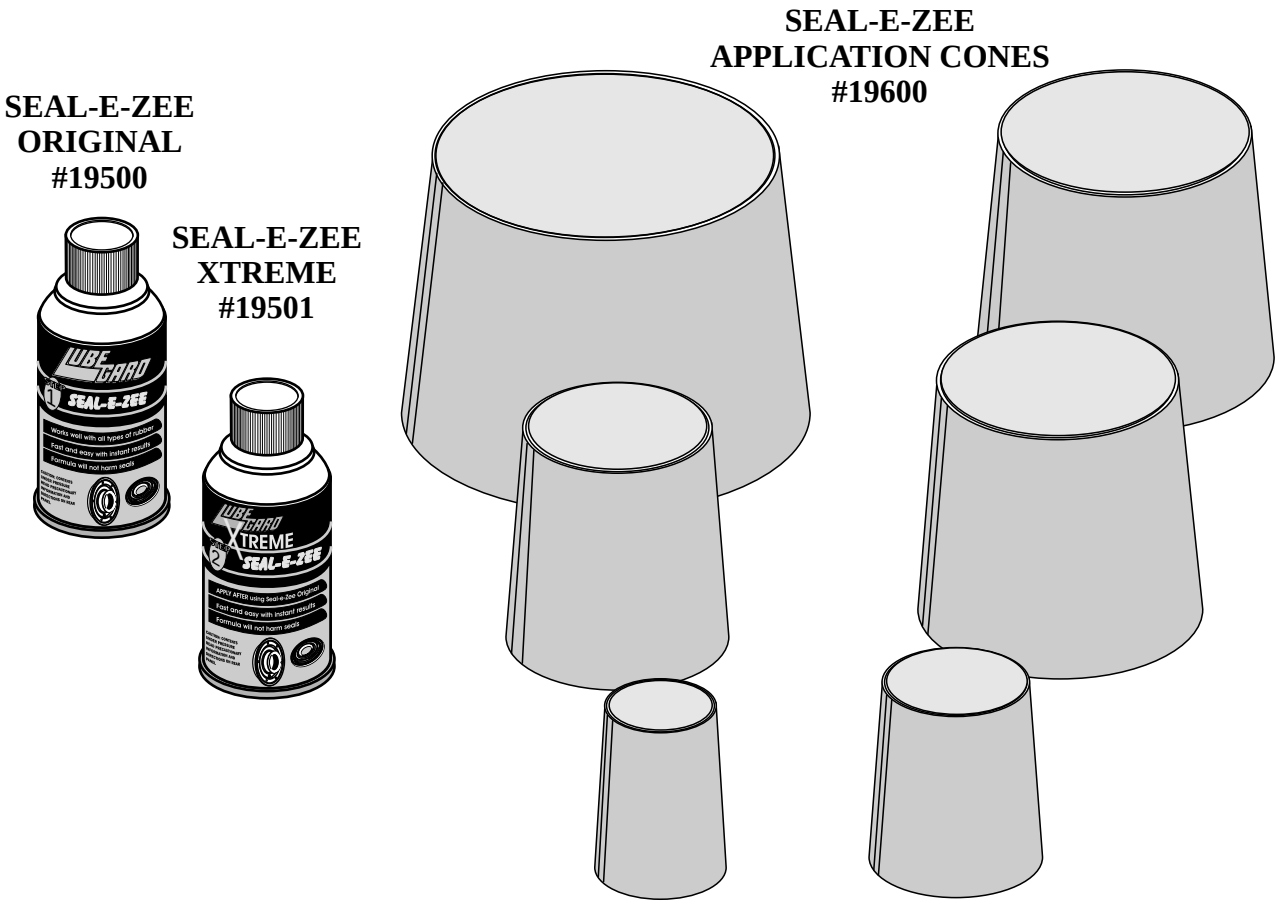
Option 1 Part numbers , See Figure 1

SEAL-E-ZEE Original.....#19500
SEAL-E-ZEE Xtreme.....#19501
SEAL-E-ZEE Application cones.....#19600

Option 2 Kent Moore Part numbers

DIRECT CLUTCH PISTON INNER (Figure 2).....J-45133
FORWARD CLUTCH PISTON INNER (Figure 3).....J-45134
COAST CLUTCH PISTON INNER (Figure 4).....J-45132
OVERDRIVE CLUTCH PISTON OUTER (Figure 5).....J-45135
LOW REVERSE CLUTCH PISTON INNER (Figure 6).....J-45140
LOW REVERSE CLUTCH PISTON OUTER (Figure 6).....J-45136
LOW REVERSE CLUTCH PISTON PUSHER (Figure 6).....J-45688
2ND CLUTCH PISTON INNER AND OUTER *KIT* (Figure 7).....J-46240
2ND COAST PISTON INNER AND OUTER WITH PUSHER *KIT* (Figure 8).....J-46239

ALTERNATIVE BONDED PISTON INSTALLERS



Note: To use these installers find two cones to compress the inner and outer lip of the bonded piston. Spray SEAL-E-ZEE as directed in the instructions on the label, lubricate drum surface and install piston.

Figure 1

DIRECT CLUTCH PISTON INSTALLATION

INSTALLER AVAILABLE
J-45133

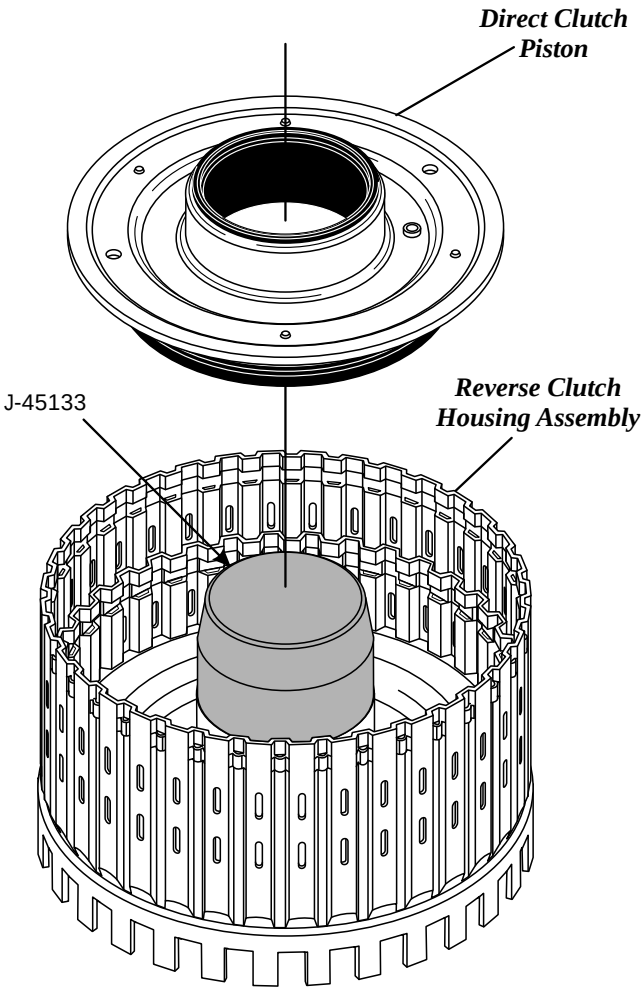


Figure 2

FORWARD CLUTCH PISTON INSTALLATION

INSTALLER AVAILABLE
J-45134

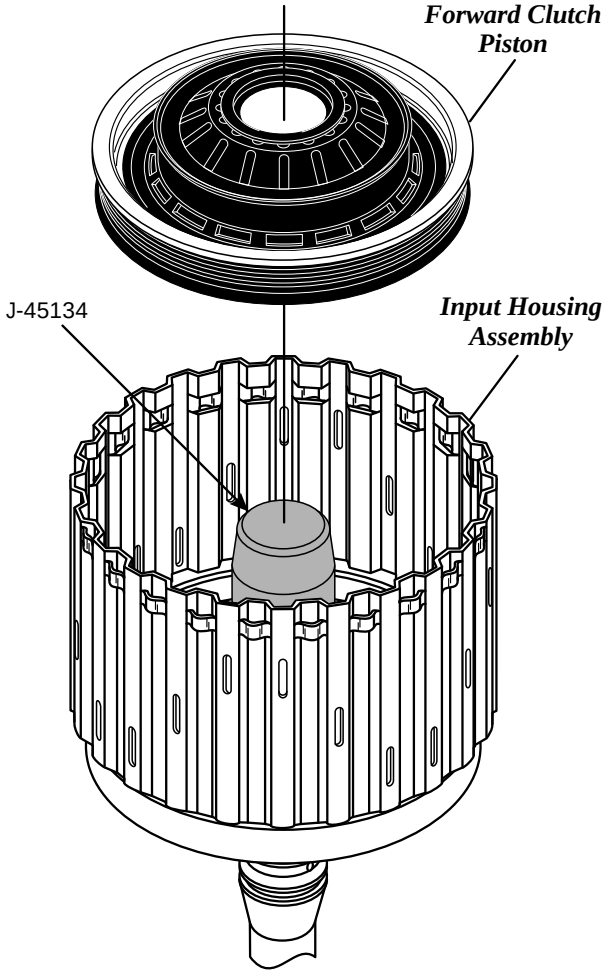


Figure 3

COAST CLUTCH PISTON INSTALLATION

INSTALLER AVAILABLE
J-45132

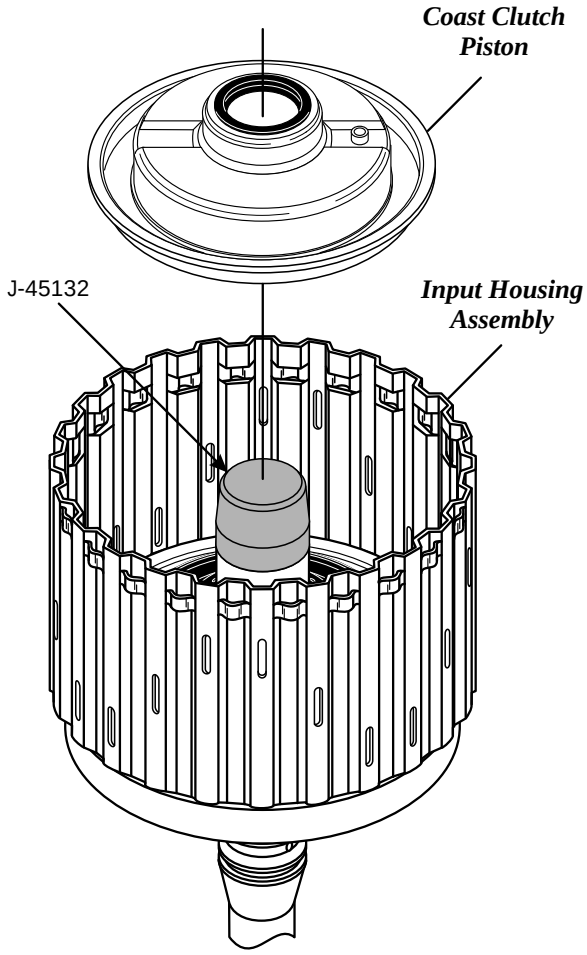


Figure 4

OVERDRIVE CLUTCH PISTON INSTALLATION

INSTALLER AVAILABLE
J-45135

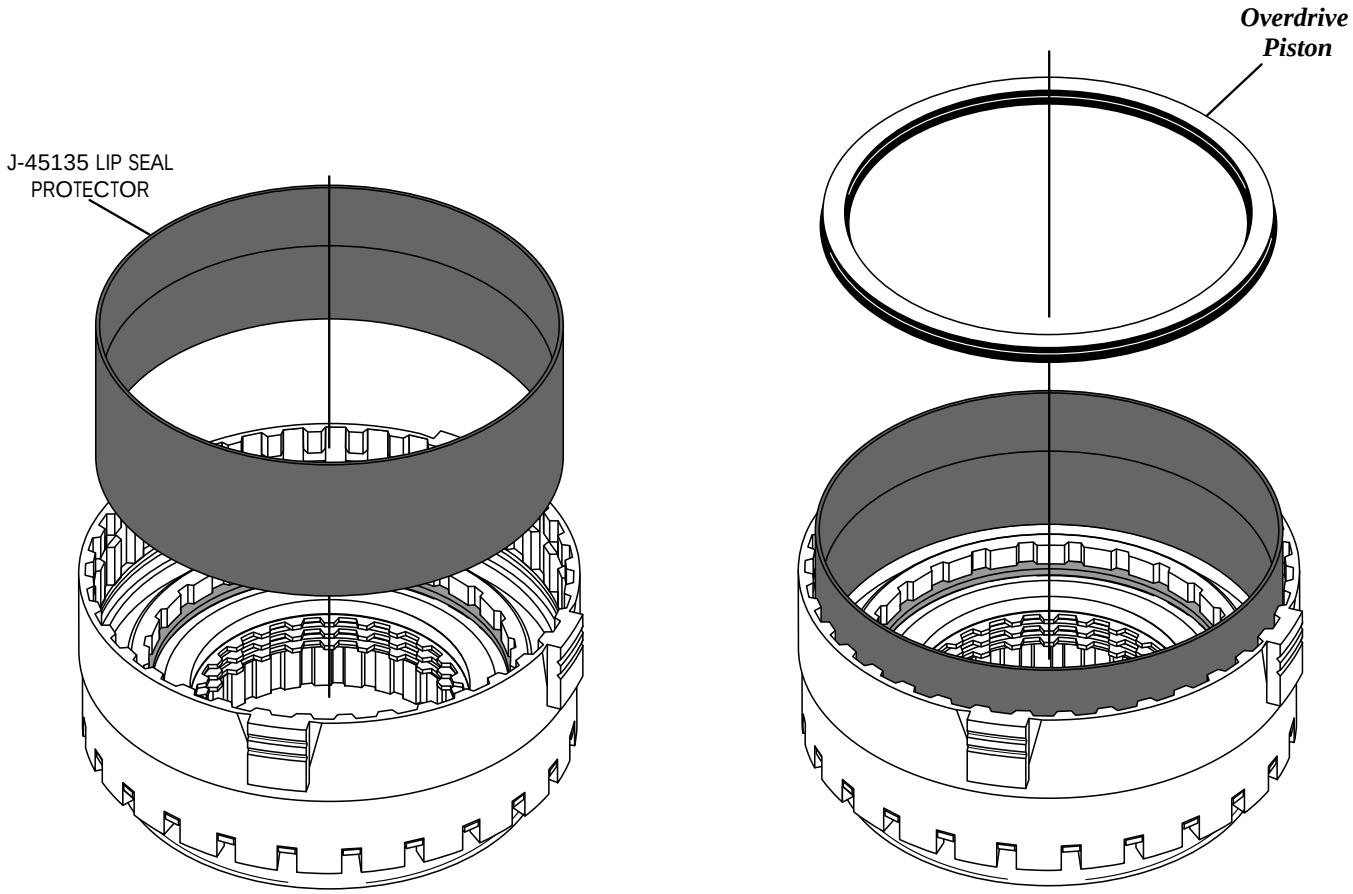


Figure 5

LOW REVERSE PISTON INSTALLATION

INSTALLERS AVAILABLE
J-45140 LOW REVERSE INNER
J-45136 LOW REVERSE OUTER
J-45688 LOW REVERSE PISTON PUSHER

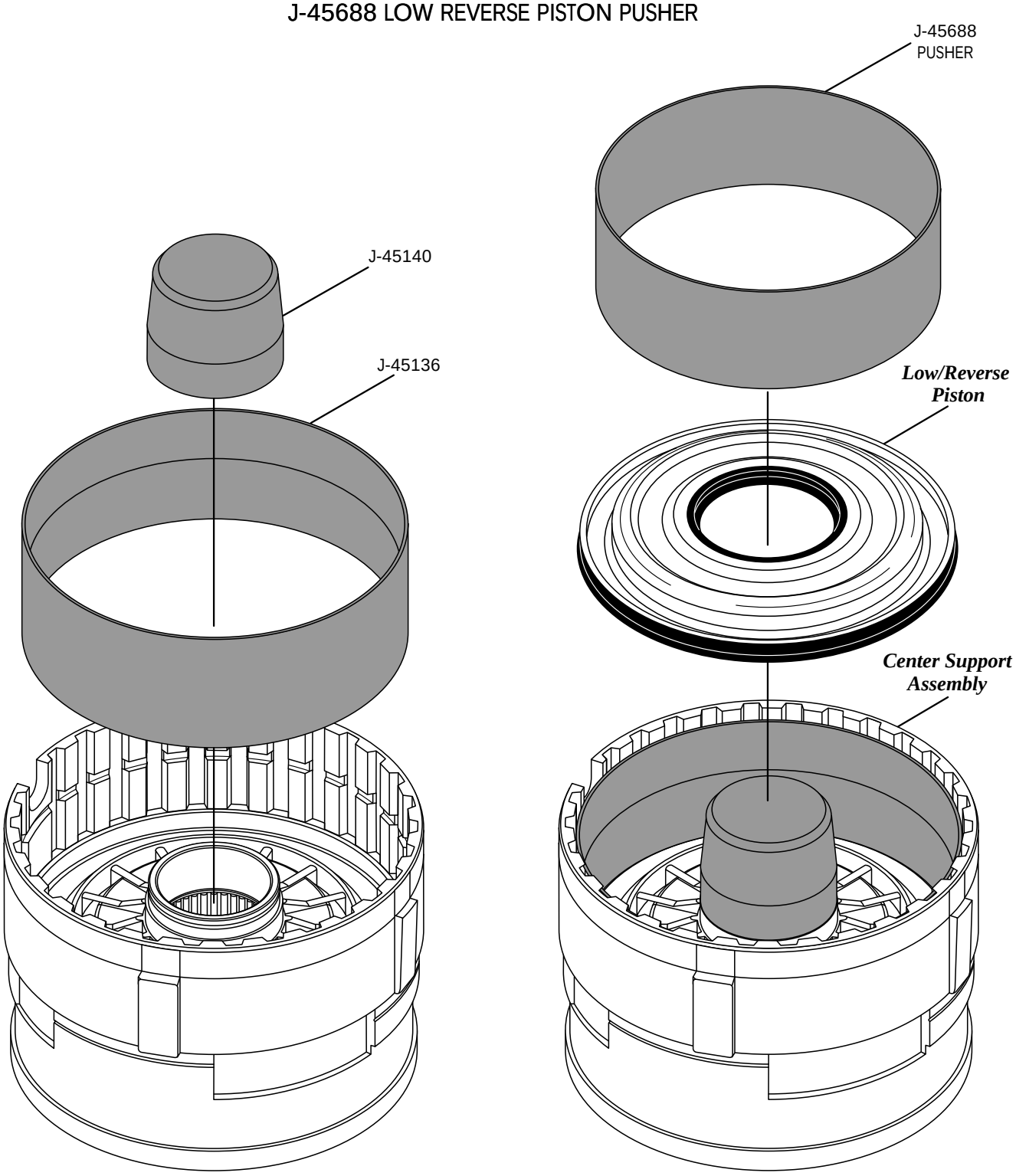


Figure 6

2ND PISTON INSTALLATION

INSTALLERS ONLY AVAILABLE IN KIT J-46240

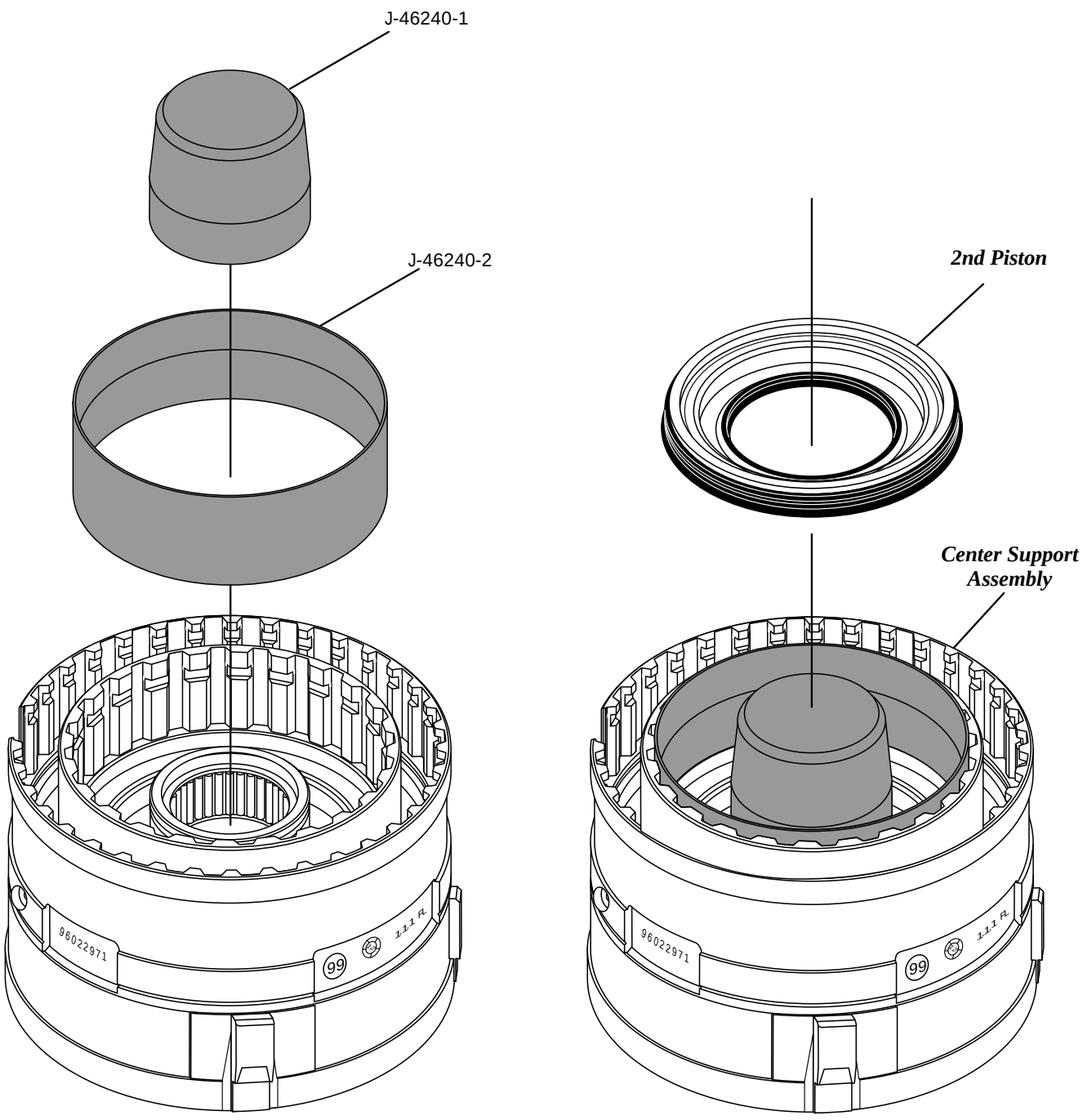


Figure 7

2ND COAST PISTON INSTALLATION

INSTALLERS ONLY AVAILABLE IN KIT J-46239

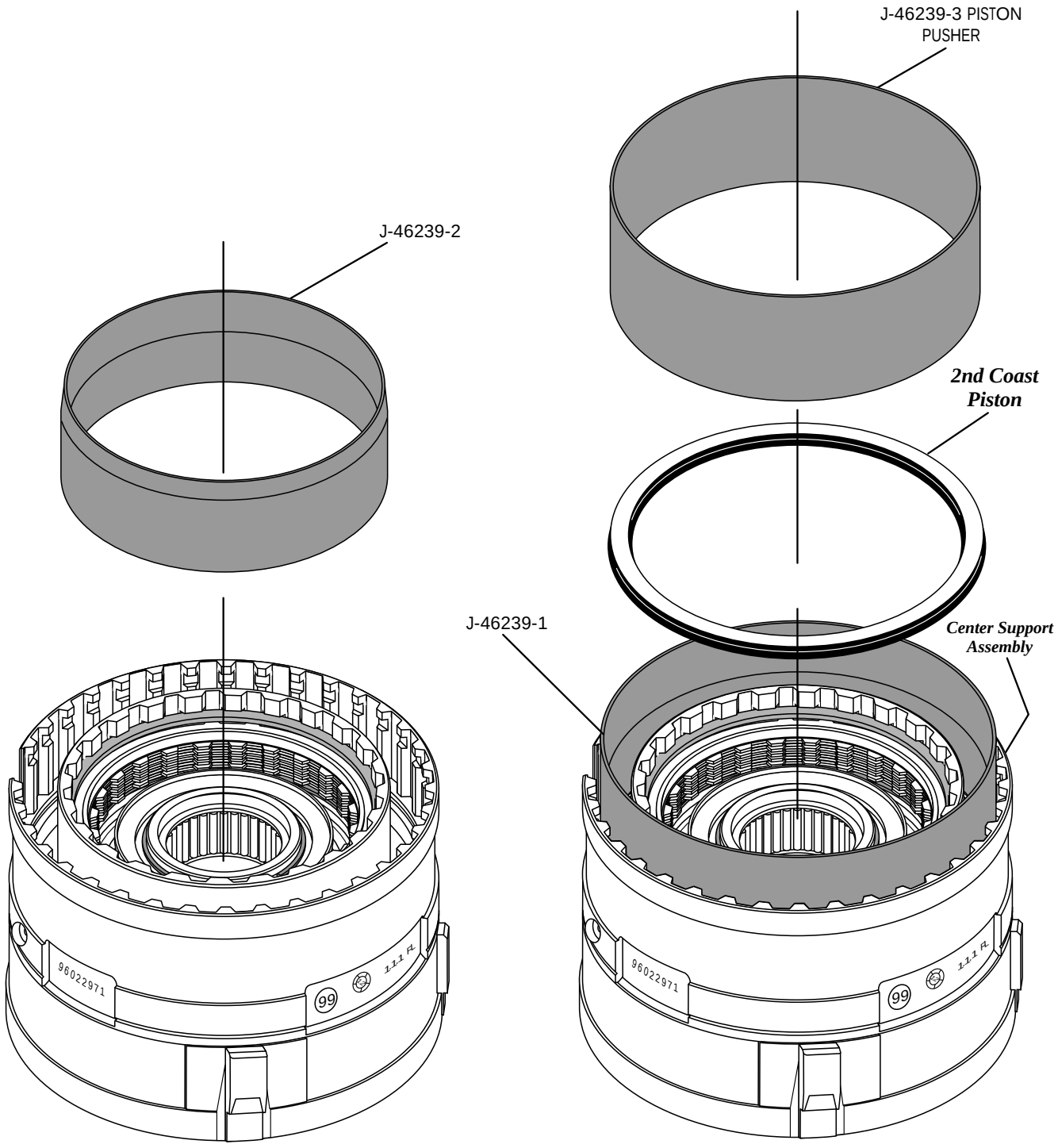


Figure 8

HYDRA-MATIC 6L80 *(6 Speed)*
PRELIMINARY INFORMATION

The new Hydra-matic 6L80 (6 Speed) is a fully automatic, six speed, rear wheel drive, electronically controlled transmission that features clutch to clutch shifting. It was first introduced in the 2006 Corvette, and is scheduled for Pick-ups in 2007, as shown in Figure 1. It consists primarily of a four element torque converter, two planetary gear sets, five clutch packs, one sprag and a hydraulic pressurization and control system. Two planetary gear sets provide the six forward gear ratios and reverse. Changing gear ratios is fully automatic and is accomplished through the use of a Transmission Control Module (TCM), that is ***located within the transmission.*** The TCM receives and monitors various electronic sensor inputs, and uses this information to shift the transmission at the optimum time. The TCM commands shift solenoids and variable bleed Clutch Pressure Control (CPC) solenoids within the transmission to control shift timing. The TCM controls shift feel through the CPC solenoids. The TCM also controls the apply and release of the torque converter clutch which allows the engine to deliver the maximum fuel efficiency without sacrificing vehicle performance. This manual contains procedures necessary to diagnose, overhaul and/or repair the new 6L80 (6 Speed) transmission from General Motors.

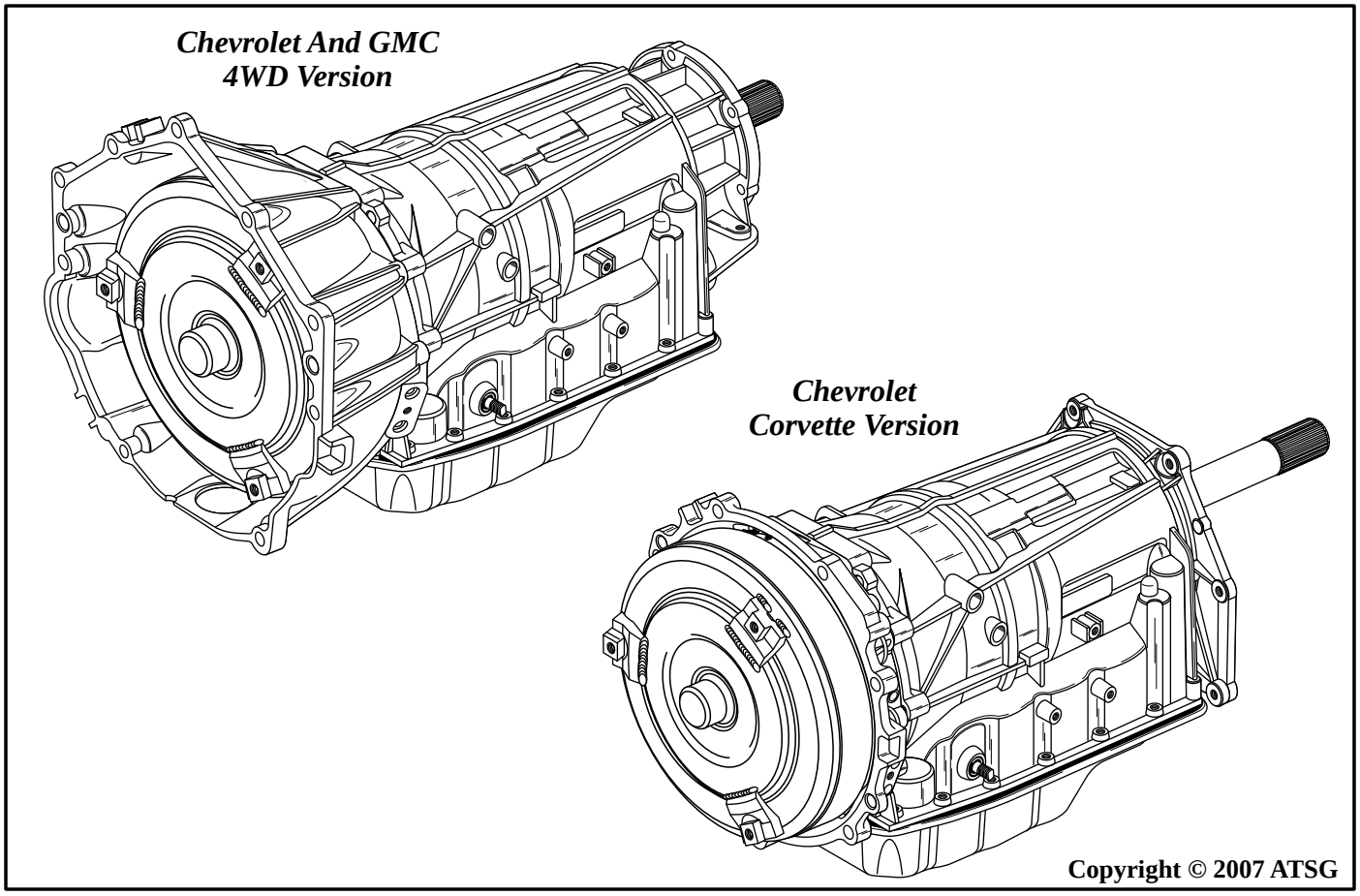


Figure 1

GENERAL DESCRIPTION

The new Hydra-matic 6L80 (6 Speed) is a fully automatic, six speed, rear wheel drive, electronically controlled transmission that features clutch to clutch shifting. It consists primarily of a four element torque converter, two planetary gear sets, five clutch packs, one sprag and a hydraulic pressurization and control system.

The four element torque converter contains a pump, a turbine, a pressure plate splined to the turbine, and a stator assembly. The torque converter acts as a fluid coupling to smoothly transmit power from the engine to the transmission. It also hydraulically provides additional torque multiplication when required. The pressure plate, when applied, provides a mechanical "direct drive" coupling of the engine to the turbine shaft of the transmission.

The two planetary gear sets provide the six forward gear ratios and reverse. Changing gear ratios is fully automatic and is accomplished through the use of a Transmission Control Module (TCM) located within the transmission. The TCM receives and monitors various electronic sensor inputs, and uses this information to shift the transmission at the optimum time.

The TCM commands shift solenoids and variable bleed Clutch Pressure Control (CPC) solenoids within the transmission to control shift timing. The TCM controls shift feel through the CPC solenoids. The TCM also controls the apply and release of the torque converter clutch which allows the engine to deliver the maximum fuel efficiency without sacrificing vehicle performance.

The hydraulic system primarily consists of a vane type pump, two control valve bodies, converter housing and case. The pump maintains the working pressures needed to apply the clutch pistons that apply or release the friction components. These friction components, when applied or released, support the shifting qualities of the transmission.

The friction components used in this transmission consist of five multiple disc clutches. The multiple disc clutches combine with one mechanical sprag clutch, to deliver seven different gear ratios through the gearsets that then transfer torque through the output shaft. Refer to Figure 4 for the component application chart for this transmission.

SHIFT QUADRANTS

The transmission shift quadrants vary by model. There may be four to seven different positions shown on the shift quadrants, as shown in Figure 2 and in Figure 3.

Standard Shift Quadrant

P - Park position enables the engine to be started while preventing the vehicle from moving. For safety reasons, the vehicle's parking brake should always be used in addition to the "Park" position. Park position should not be selected until the vehicle has come to a complete stop.

R - Reverse enables the vehicle to be operated in a rearward direction.

N - Neutral position enables the engine to start and operate without driving the vehicle. If necessary, this position should be selected to restart the engine while the vehicle is moving.

D - Drive range should be used for all normal driving conditions for maximum efficiency and fuel economy. Drive range allows the transmission to operate in each of the six forward gear ratios. Downshifts to a lower gear are available for safe passing, by depressing the accelerator, or by manually selecting a lower gear with the shift lever.

Manual Shift Ranges

Some vehicles are equipped with a shift quadrant that allow manual range selection. For example, "M" manual range and/or manual range "2" or "1", as shown in Figure 2. These ranges can be used for conditions where it may be desirable to control the selection of gear ratios. These conditions include trailer towing, driving on hilly terrain, and are also helpful for engine braking when descending slight grades.

M - When manual mode is selected, the current gear range will be the highest attainable range with all of the lower gears available. Plus/Minus buttons may be used to select the desired range of gears for the current driving conditions.

Continued on next Page

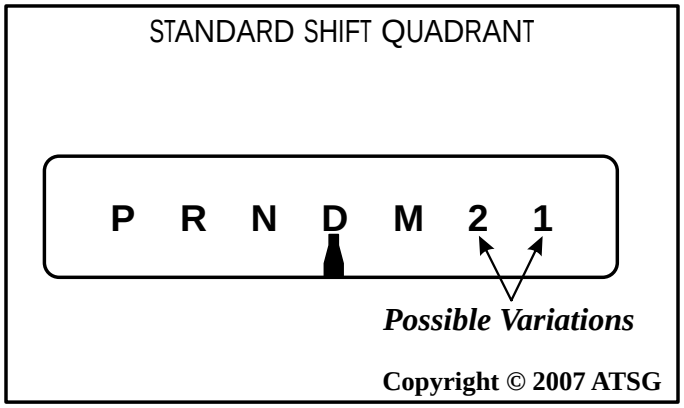


Figure 2

Standard Shift Quadrant (Cont'd)

2 - Manual 2nd just adds more performance for congested traffic and hilly terrain. It has the same starting ratio (1st gear) as the Drive range, but prevents the transmission from shifting above 2nd gear. Manual 2nd can be used to retain 2nd gear for acceleration and engine braking as desired. Manual 2nd can be selected at any vehicle speed, but will downshift into 2nd gear, only if vehicle speed is low enough not to over-rev the engine. This speed is calibrated in the TCM.

1 - Manual 1st has the same starting ratio as Drive range but prevents the transmission from shifting above 1st gear. Manual 1st can be used for heavy towing and engine braking as desired. Manual 1st can be selected at any vehicle speed but will downshift into 1st gear, only if vehicle speed is low enough not to over-rev the engine. This speed is calibrated in the TCM.

SHIFT QUADRANTS (CONT'D)

Driver Shift Control (DSC) Quadrant

Some vehicles are equipped with Driver Shift Control (DSC) version of the selector system, as shown in Figure 3. This configuration allows the driver to manually shift between forward gears.

P - Park position enables the engine to be started while preventing the vehicle from moving. For safety reasons, the vehicle's parking brake should always be used in addition to the "Park" position. Park position should not be selected until the vehicle has come to a complete stop.

Driver Shift Control (DSC) Quadrant (Cont'd)

R - Reverse enables the vehicle to be operated in a rearward direction.

N - Neutral position enables the engine to start and operate without driving the vehicle. If necessary, this position should be selected to restart the engine while the vehicle is moving.

D - Drive range should be used for all normal driving conditions for maximum efficiency and fuel economy. Drive range allows the transmission to upshift and downshift in each of the six forward gear ratios, according to the normal shift pattern that is programed in the TCM.

M/S - In the M/S (Manual or Sport) position, the driver may manually select the range of gears by tapping the selector lever towards "+" or "-" to cause an upshift or downshift, as shown in Figure 3. The transmission will shift up or down depending on the request that is made by tapping the selector lever.

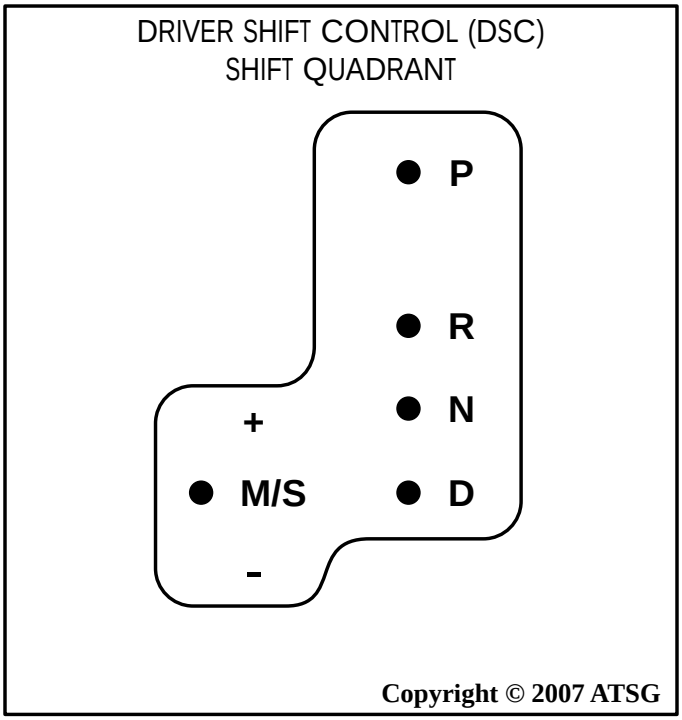
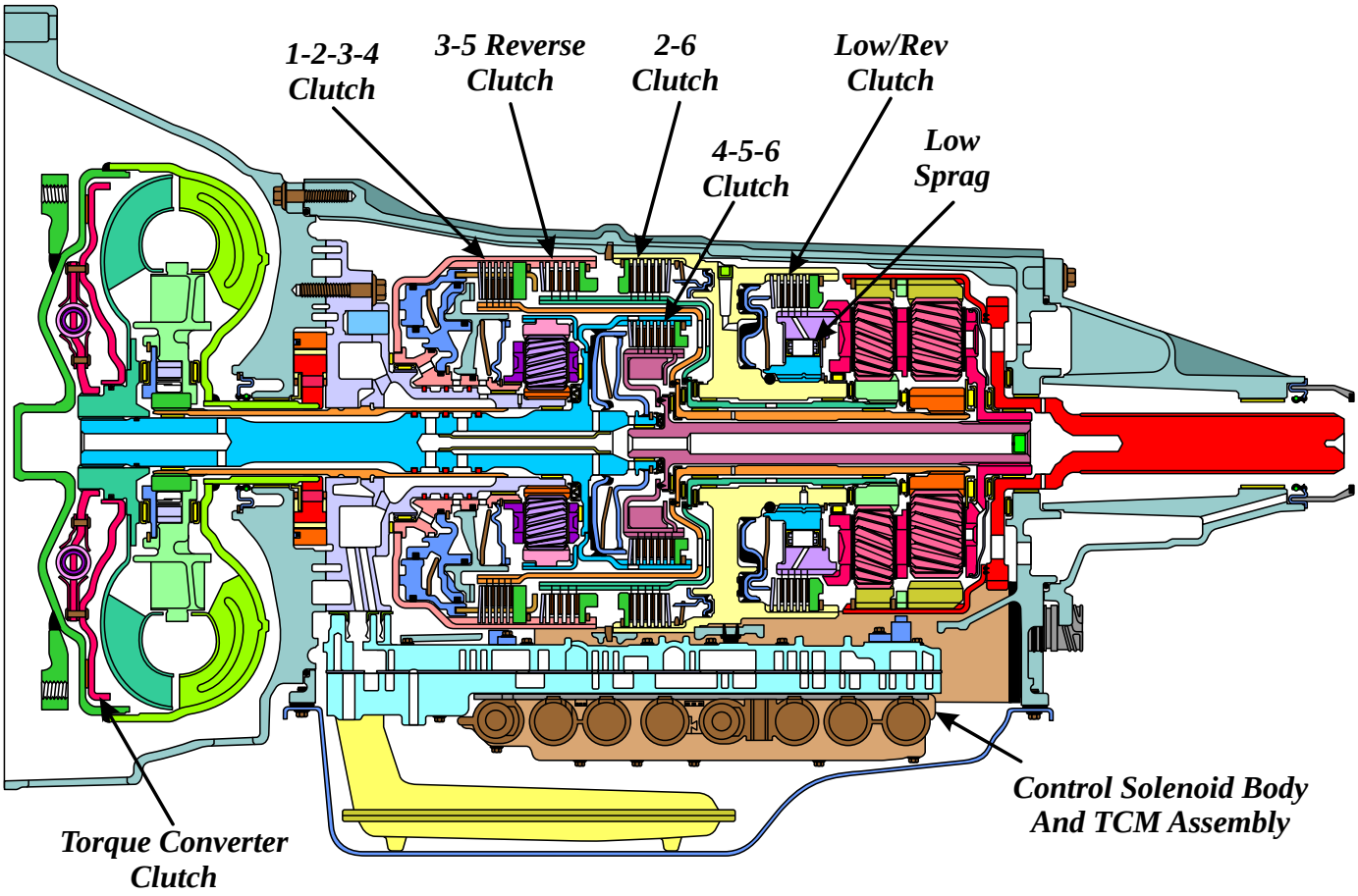


Figure 3

INTERNAL COMPONENT IDENTIFICATION AND LOCATION



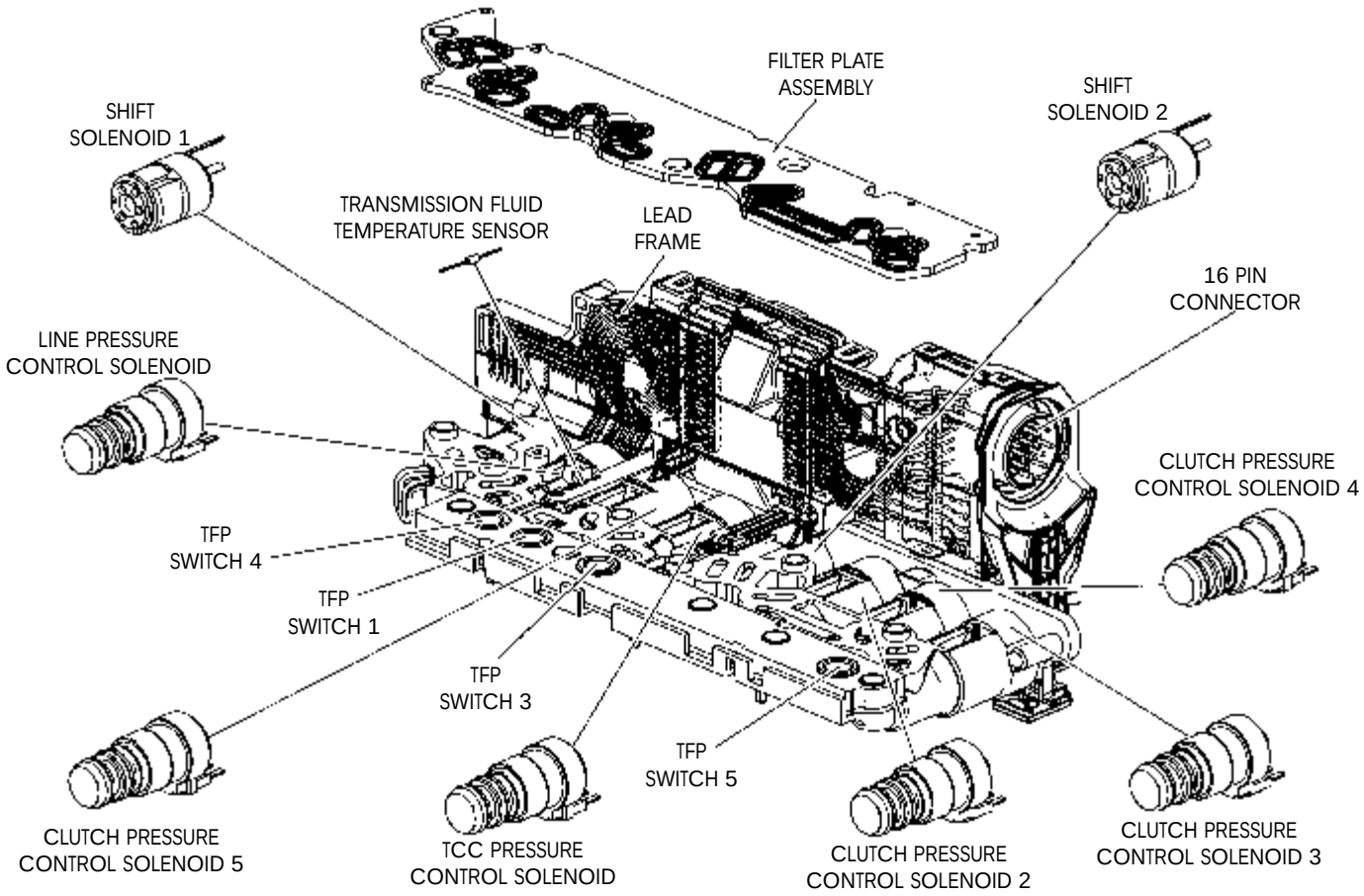
COMPONENT APPLICATION CHART

RANGE	1-2-3-4 Clutch	3-5, Rev Clutch	4-5-6 Clutch	2-6 Clutch	Low & Rev Clutch	Low Sprag	Torq Conv Clutch	GEAR RATIO	
Park					Applied				
Reverse		Applied			Applied			3.06	
Neutral					Applied				
"D"-1st	Applied				Applied	Holding		4.03	
"D"-2nd	Applied			Applied			Applied*	2.36	
"D"-3rd	Applied	Applied					Applied*	1.53	
"D"-4th	Applied		Applied				Applied*	1.15	
"D"-5th		Applied	Applied				Applied*	0.85	
"D"-6th			Applied	Applied			Applied*	0.67	
"M"-2nd	Applied			Applied			Applied*	2.36	
"M"-1st	Applied				Applied	Holding		4.03	

** TCC IS AVAILABLE IN 2ND THRU 6TH GEAR, BASED ON THROTTLE POSITION, FLUID TEMP AND VEHICLE SPEED.*

Figure 4

CONTROL SOLENOID BODY AND TCM ASSEMBLY



SOLENOID APPLICATION CHART

RANGE	Shift Sol. 1	Shift Sol. 2	CPC Sol. 5 1-2-3-4 CL.	CPC Sol. 4 2-6 CL.	CPC Sol. 2 3-5 Rev CL.	CPC Sol. 3 4-5-6, Low/Rev CL.	TCC PC Sol. Torq Conv CL.	LINE PC Sol. Line Pres Cont	GEAR RATIO
Park	ON	ON	OFF	OFF	ON	OFF	OFF	ON**	
Reverse	ON	OFF	OFF	OFF	OFF	OFF	OFF	ON**	3.06
Neutral	ON	ON	OFF	OFF	OFF	ON	OFF	ON**	
"D"-1st	OFF	ON	ON	OFF	ON	ON	OFF	ON**	4.03
"D"-2nd	OFF	ON	ON	ON	ON	ON	ON*	ON**	2.36
"D"-3rd	OFF	ON	ON	OFF	OFF	ON	ON*	ON**	1.53
"D"-4th	OFF	ON	ON	OFF	ON	OFF	ON*	ON**	1.15
"D"-5th	OFF	ON	OFF	OFF	OFF	OFF	ON*	ON**	0.85
"D"-6th	OFF	ON	OFF	ON	ON	OFF	ON*	ON**	0.67
"M"-2nd	OFF	ON	ON	ON	ON	ON	ON*	ON**	2.36
"M"-1st	OFF	ON	ON	OFF	ON	ON	OFF	ON**	4.03

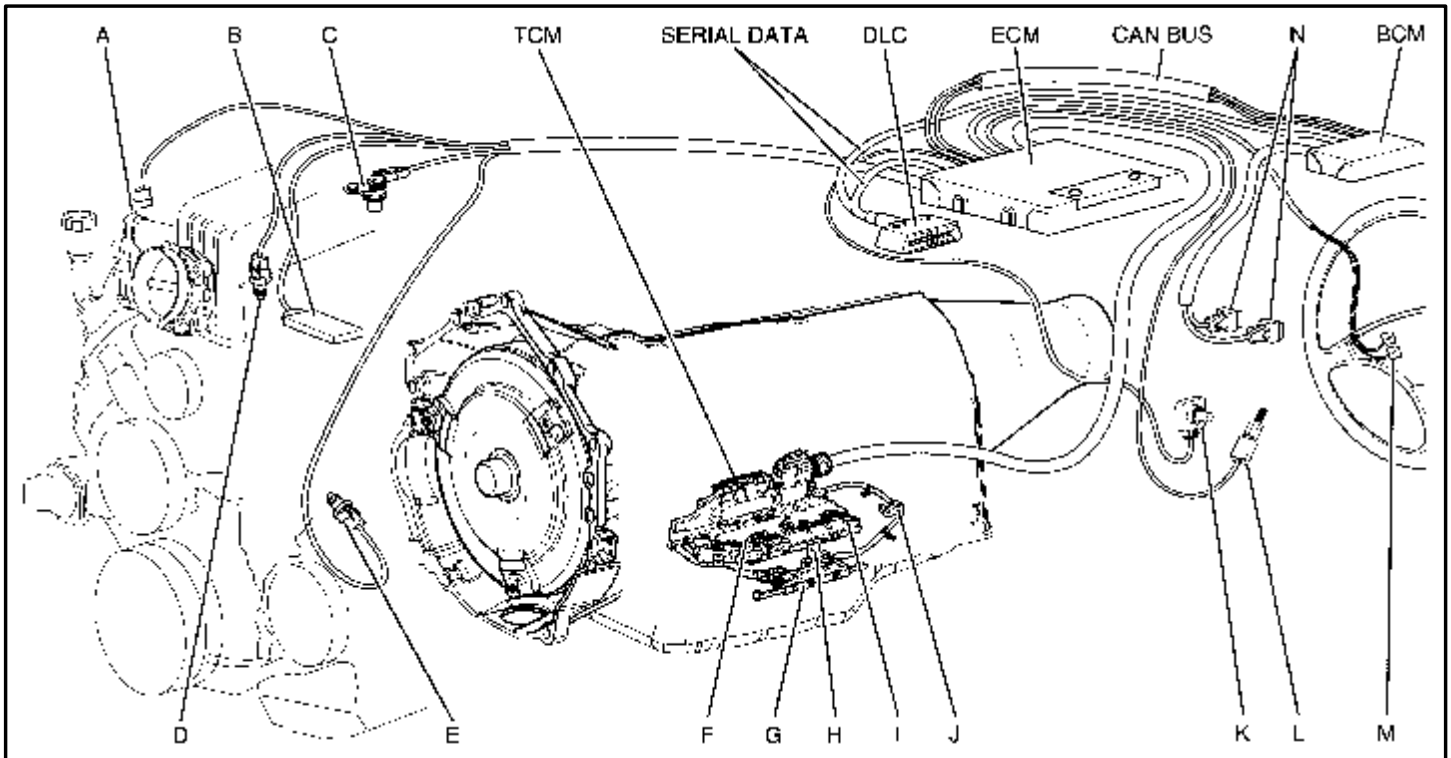
FOR SHIFT SOLENOIDS 1 AND 2: "ON" = ENERGIZED (PRESSURIZED), "OFF" = DE-ENERGIZED (NO PRESSURE).
FOR CPC SOLENOIDS 2, 3, 4, 5: "ON = PRESSURIZED, "OFF" = NO PRESSURE.
** TCC IS AVAILABLE IN 2ND THRU 6TH GEAR, BASED ON THROTTLE POSITION, FLUID TEMP AND VEHICLE SPEED.*
*** CONSTANTLY VARIES LINE PRESSURE BASED ON THROTTLE POSITION, FLUID TEMP, AND GEAR STATE.*

ELECTRONIC COMPONENTS

In the 6L80 transmission, the TCM, both shift solenoids, all 6 of the pressure control solenoids, the TFT sensor and fluid pressure switches are contained in one unit, the Control Solenoid Body and TCM Assembly, which is located in the bottom pan, as shown in Figure 6.

Electrical signals from various sensors provide information to the TCM about vehicle speed, throttle position, engine coolant temp, fluid temp, range selector position, engine speed, turbine speed and operating mode. The TCM uses this information to determine the precise moment to upshift or downshift, apply or release the TCC, and what pressure is needed to apply the clutches. This type of control provides consistent and precise shift points and shift quality based on the actual operating conditions of the vehicle.

Adaptive shift control technology enables the TCM to continually monitor and compare shift performance to the optimum shift, and make adjustments to the factory settings to continually deliver excellent shift quality.



INFORMATION SENSORS

A MULTI-PORT ELECTRONIC INJECTION
B MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR
C ENGINE SPEED SENSOR
D MANIFOLD AIR TEMP (MAT) SENSOR
E ENGINE COOLANT TEMP (ECT) SENSOR
F TRANSMISSION FLUID TEMP (TFT) SENSOR
G TRANSMISSION MANUAL SHIFT SHAFT POSITION SWITCH ASSEMBLY
H INPUT SPEED SENSOR (ISS)
I TRANSMISSION FLUID PRESSURE SWITCHES
J OUTPUT SPEED SENSOR (OSS)
K ACCELERATOR PEDAL POSITION (APP) SENSOR
L BRAKE SWITCH
M DRIVER SHIFT CONTROL (DSC) SWITCHES
N OPERATING MODE SELECTION SWITCHES

ELECTRONIC CONTROLLERS

TRANSMISSION CONTROL MODULE (TCM)

ENGINE CONTROL MODULE (ECM)

BODY CONTROL MODULE (BCM)

DIAGNOSTIC LINK CONNECTOR (DLC)

ELECTRONICALLY CONTROLLED TRANSMISSION COMPONENTS

LINE PRRESSURE CONTROL SOLENOID

CLUTCH PRES CONTROL SOLENOID 2

CLUTCH PRES CONTROL SOLENOID 3

CLUTCH PRES CONTROL SOLENOID 4

CLUTCH PRES CONTROL SOLENOID 5

TCC PRESSURE CONTROL SOLENOID

SHIFT SOLENOID 1

SHIFT SOLENOID 2

Figure 6

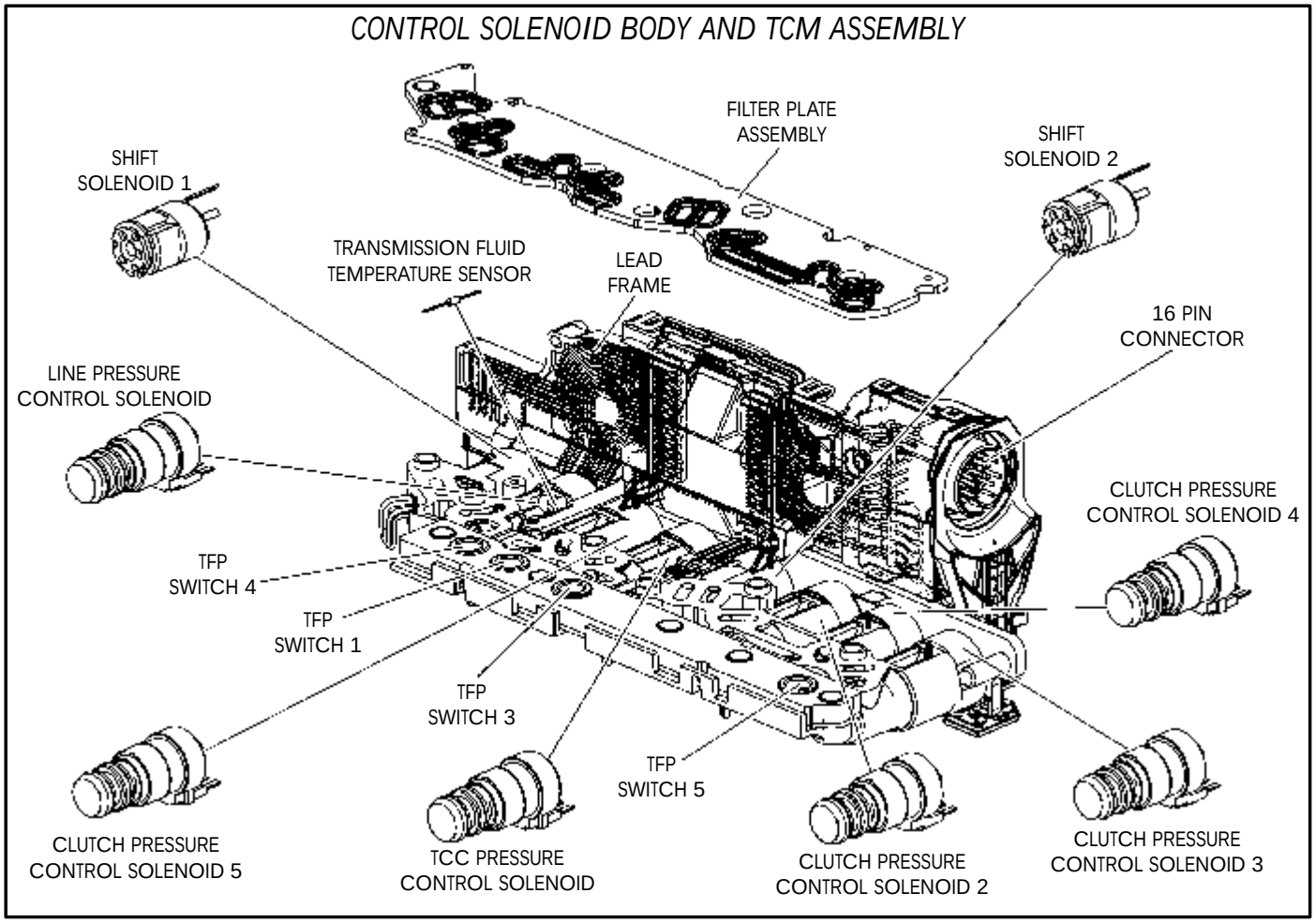


Figure 7

ELECTRONIC COMPONENTS (CONT'D)

Control Solenoid Body And TCM Assembly

The Control Solenoid Body and TCM Assembly bolts directly to the lower and upper valve body assemblies inside the transmission. The solenoid assembly utilizes a lead frame system to connect the components to the TCM, as shown in Figure 7. There are no wires used for these components. The Control Solenoid Body and TCM Assembly connect to the external harness 16 way connector using a pass-thru sleeve. All fluid passages to the switches and solenoids are protected from debris by a serviceable filter plate assembly, as shown in Figure 7. In addition to the components shown in Figure 7, there are two temperature sensors located ***inside*** the TCM that are not shown, the TCM Temperature Sensor and the Power Up Temperature Sensor.

The components shown in Figure 7 are diagnosed seperately, but serviced as an assembly.

Transmission Fluid Temperature (TFT) Sensor

The TFT sensor is part of the control solenoid body and TCM assembly, and is not serviced separately, as shown in Figure 7 and 8. The TFT sensor is a resistor, or thermister, which changes value based on temperature. The sensor has a negative-temperature coefficient, which means as the temp increases, the resistance decreases, and as the temp decreases, the resistance increases. The TCM supplies a voltage reference signal to the sensor and measures the voltage drop in the circuit. The TCM uses this information to maintain shift quality and torque converter clutch apply quality over the entire operating temperature range. If the TCM detects an improper signal from the TFT sensor, a DTC will be activated.

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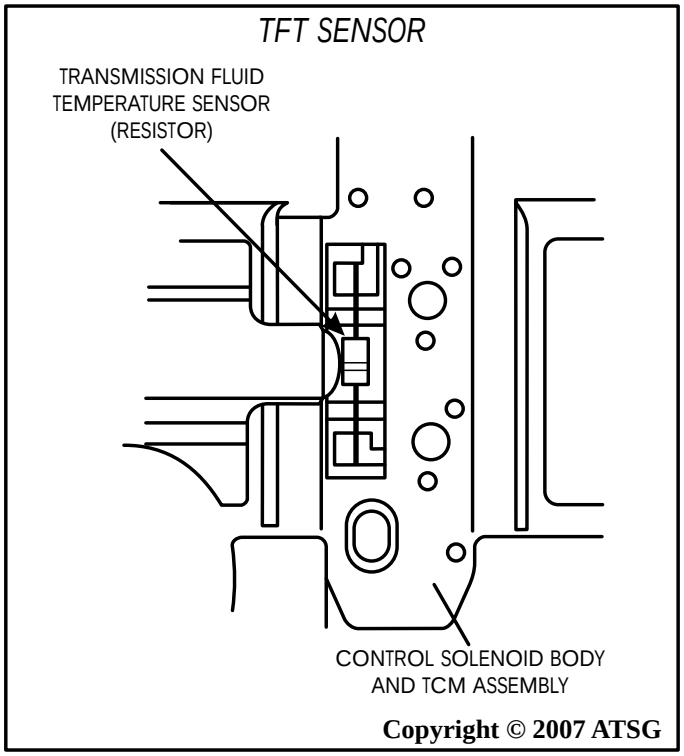
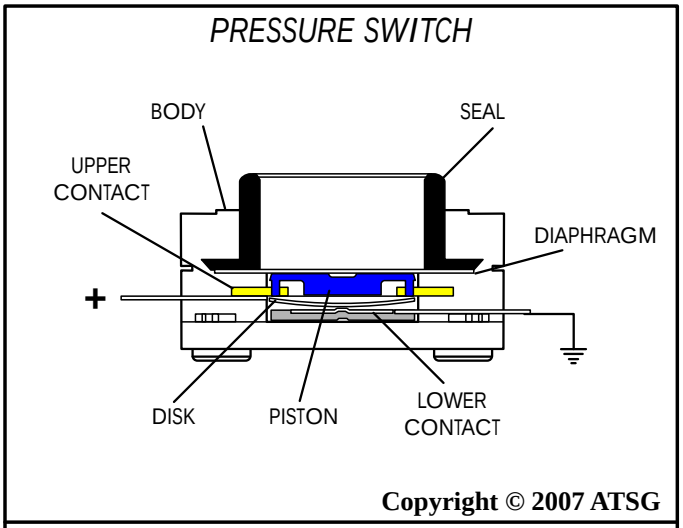


Figure 8



Pressure Switch Logic				
Selector Position	***Switch 1***	***Switch 3***	***Switch 4***	***Switch 5***
Park	***1***	***0***	***0***	***0***
Reverse	***0***	***0***	***0***	***0***
Neutral	***1***	***0***	***0***	***0***
"D"-1st	***1***	***1***	***0***	***1***
"D"-2nd	***1***	***0***	***0***	***1***
"D"-3rd	***0***	***1***	***0***	***1***
"D"-4th	***1***	***1***	***0***	***0***
"D"-5th	***0***	***1***	***1***	***0***
"D"-6th	***1***	***0***	***1***	***0***
"M"-1st	***1***	***1***	***0***	***0***
1 = Pressurized 0 = Exhausted				

Figure 9

ELECTRONIC COMPONENTS (CONT'D)

Fluid Pressure Switches

The transmission fluid pressure switches located in the control solenoid body and TCM assembly are normally closed. When closed, these switches allow current flow through the switch. When fluid pressure is routed to the switch, pressure moves the diaphragm, piston and disk such that the circuit opens and there is no current flow. See Figure 9 for a cut-away view and a pressure switch logic chart.

TFP switch 1 sends a signal to the TCM to indicate the state of the 3-5 and reverse clutch regulator valve.

TFP switch 3 sends a signal to the TCM to indicate the state of the 2-6 clutch regulator valve.

TFP switch 4 sends a signal to the TCM to indicate the state of the 1-2-3-4 clutch regulator valve.

TFP switch 5 sends a signal to the TCM to indicate the state of CBR1/4-5-6 clutch regulator valve. (CBR1 = Clutch Braking 1st)

The fluid pressure switches are part of the Control Solenoid Body and TCM Assembly, and are not serviced separately.

Continued on next Page

ELECTRONIC COMPONENTS (CONT'D)

SHIFT SOLENOIDS 1 AND 2

Shift solenoids 1 and 2 are both identical, normally closed, 3 port, ON/OFF type solenoids controlled by the TCM. These shift solenoids work in combination with the clutch pressure control solenoids to control the various shift and clutch regulator valves in the valve body.

When the TCM provides a path to ground for the electrical circuit to energize (Turn ON) the solenoid, current flows through the coil assembly in the solenoid and creates a magnetic field. The magnetic field moves the plunger and metering ball assembly to the right, as shown in Figure 10, against the exhaust seat, thereby blocking the exhaust passage and creating solenoid control pressure.

Shift solenoids are de-energized (Turned OFF) when the TCM opens the path to ground for the solenoid's electrical circuit. With the solenoid OFF, solenoid spring force moves the plunger and metering ball assembly to the left, as shown in Figure 10, away from the exhaust seat and against the feed seat. This blocks actuator feed limit fluid from entering the solenoid and allows any existing solenoid control pressure to exhaust through the solenoid.

Shift Solenoids 1 and 2 are part of the Control Solenoid Body and TCM Assembly, and are not serviced separately.

Shift Solenoid 1

Actuator feed limit fluid feeds the shift solenoid 1 fluid circuit to control clutch select valve 2. When shift solenoid 1 is energized (ON), actuator feed limit fluid is allowed to pass through the solenoid, thereby creating solenoid 1 control pressure, as shown in Figure 10. Solenoid 1 control pressure acts against clutch select valve 2 spring force, to move the valve to the apply position.

When shift solenoid 1 is de-energized (OFF), actuator feed limit fluid is blocked from feeding the solenoid 1 circuit, and any existing solenoid 1 control pressure exhausts through the solenoid, as shown in Figure 10.

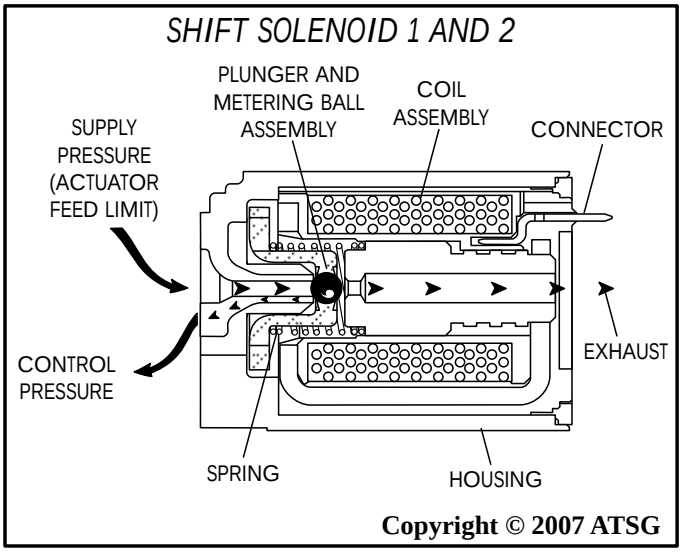


Figure 10

Shift Solenoid 2

Actuator feed limit fluid feeds the shift solenoid 2 fluid circuit to control clutch select valve 3. When shift solenoid 2 is energized (ON), actuator feed limit fluid is allowed to pass through the solenoid, thereby creating solenoid 2 control pressure, as shown in Figure 10. Solenoid 2 control pressure acts against clutch select valve 3 spring force, to move the valve to the apply position.

When shift solenoid 2 is de-energized (OFF), actuator feed limit fluid is blocked from feeding the solenoid 2 circuit, and any existing solenoid 2 control pressure exhausts through the solenoid, as shown in Figure 10.

Fail-Safe or Protection Mode

If for any reason, the entire electronic control system of the transmission, or any one of the electrical components within the Control Solenoid Body and TCM Assembly becomes disabled, the transmission will default to fail-safe mode. If the transmission is in 1st, 2nd or 3rd gear during an electrical failure, the transmission will default to 3rd gear. If the transmission is in 4th, 5th or 6th gear during an electrical failure, the transmission will default to 5th gear.

ELECTRONIC COMPONENTS (CONT'D)

PRESSURE CONTROL SOLENOIDS

Line Pressure Control (PC) Solenoid

The line pressure (PC) solenoid is a precision electronic pressure regulator that controls line pressure based on current flow through its coil windings. The TCM varies current to the ***"normally-high"*** amperage line pressure control (PC) solenoid from approximately 0.1 amp (maximum line pressure), to 1.0 amps (minimum line pressure). As current flow is increased, the magnetic field produced by the coil moves the solenoid's variable restriction further away from the exhaust port, as shown in Figure 11. Opening the exhaust port decreases the control pressure, which is routed to the isolator (boost) valve, as shown in Figure 11, which ultimately decreases line pressure. As the current flow is decreased, the reduced magnetic field allows the spring force to move the variable restriction to the left, as shown in Figure 11, closer to the exhaust port, increasing control pressure from the solenoid, which ultimately increases line pressure.

As the throttle position (engine torque) increases, the current flow is decreased by the TCM, which increases the pressure output of the line pressure (PC) solenoid. If the TCM detects a line pressure control solenoid electrical malfunction, a DTC will be activated.

NORMALLY-HIGH PRESSURE CONTROL SOLENOID

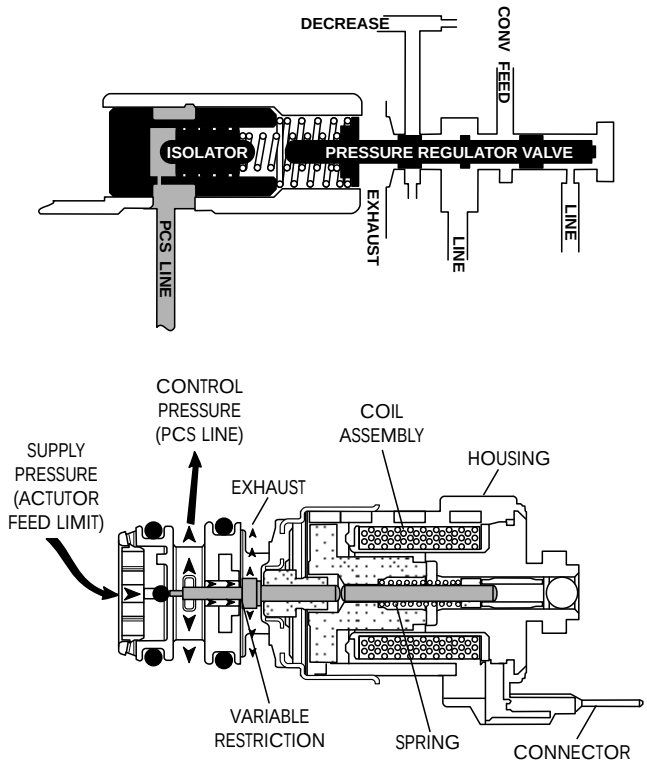


Figure 11

The line pressure control (PC) solenoid is part of the Control Solenoid Body And TCM Assembly and is not serviced separately.

If for any reason, the entire electronic control system of the transmission fails, the line pressure control solenoid will be OFF, and maximum line pressure will be the result. This will create harsh engagements and/or failsafe operation.

If the transmission is in 1st, 2nd or 3rd during an electrical failure, the transmission will default to 3rd gear. All solenoids will default to their normal state. If the torque converter clutch was applied, it will release.

If the transmission is in 4th, 5th or 6th during an electrical failure, the transmission will default to 5th gear. All solenoids will default to their normal state. If the torque converter clutch was applied, it will release.

The transmission will stay in 5th gear default range until the ignition has been turned off or the transmission has been shifted to Reverse. When the vehicle is restarted and shifted back into Drive, the transmission will then operate in the 3rd gear default range.

ELECTRONIC COMPONENTS (CONT'D)
TORQUE CONVERTER CLUTCH (TCC) SOLENOID

The Torque Converter Clutch (TCC) PC Solenoid is a ***"normally-low"amperage***, electronic pressure regulator used to control the apply and release of the torque converter clutch based on current flow through its coil windings. The TCC PC solenoid regulates actuator feed limit fluid pressure to the TCC regulator valve, located in the lower valve body, and provides a signal pressure to shift the TCC control valve, located in the pump, to the apply position, as shown in Figure 12. When the TCM determines to apply the TCC, the TCC PC solenoid is commanded to specific pressures, dependent on vehicle operating conditions, resulting in a smooth apply or release of the TCC. The solenoid's ability to "Ramp" the TCC apply and release pressures results in a smoother TCC operation.

When vehicle operating conditions are appropriate to apply the TCC, the TCM increases current flow to allow the TCC PC solenoid to increase PCS TCC fluid pressure, to move the TCC control valve to the apply position, as shown in Figure 12, and move the TCC regulator valve to the regulating position to regulate fluid pressure proportional to solenoid pressure. Release pressure is directed to exhaust, and regulated apply pressure is directed to the apply side of the converter clutch plate/damper assembly. The TCM then increases the pressure to control a slippage of 20-80 RPM between the clutch plate and converter cover. This "Ramping" procedure for improved dampening of engine vibrations and allows the TCC to apply at low engine speeds in 2nd, 3rd, 4th, 5th and 6th gear.

Release of the TCC is achieved by decreasing TCC solenoid pressure to a level low enough to allow spring force to move the TCC control valve and TCC regulating valve to the release position.

There are also some operating conditions that may prevent or enable TCC apply, such as engine temp, transmission temperature, brake switch activation.

If the TCM detects that the TCC system is stuck ON or OFF, a DTC will be activated.

The TCC PC Solenoid is part of the Control Solenoid Body And TCM Assembly and is not serviced separately.

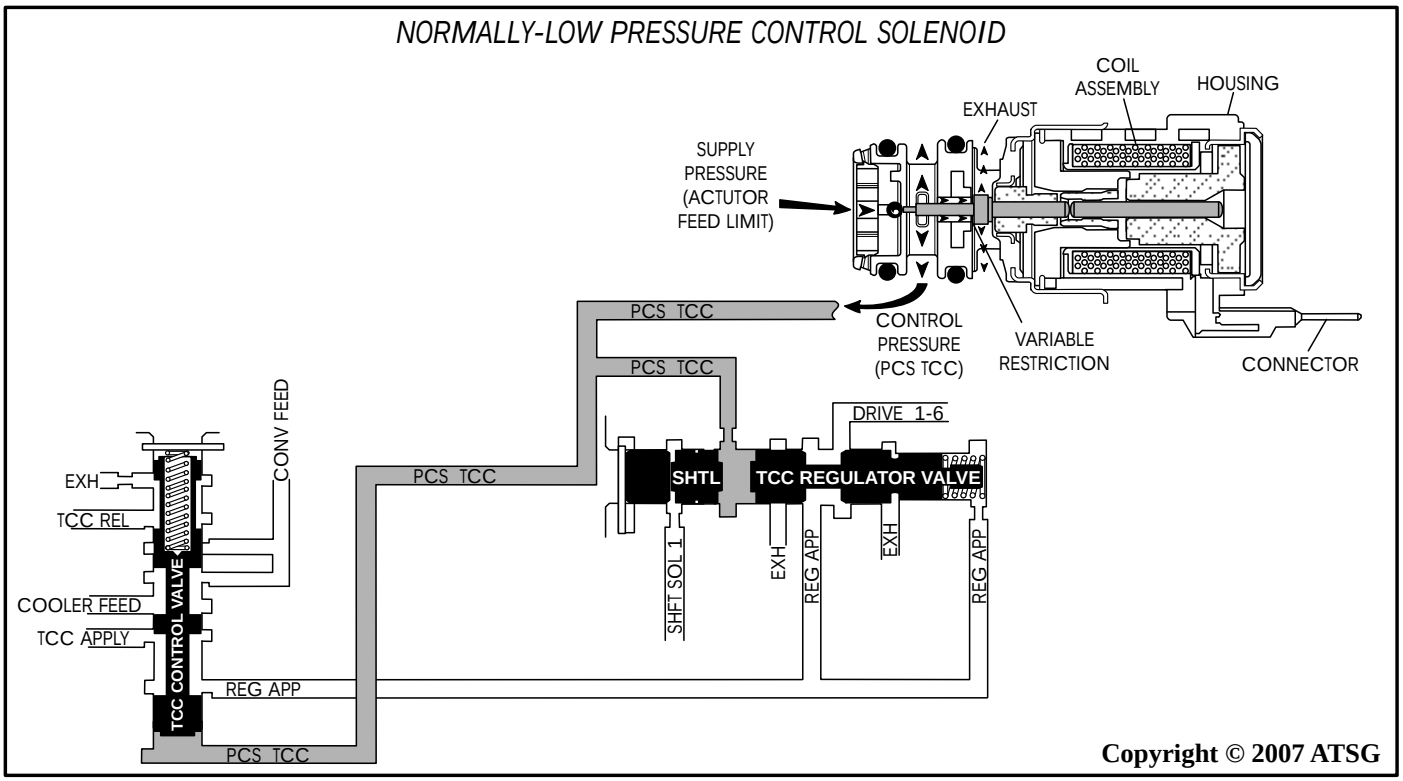


Figure 12

ELECTRONIC COMPONENTS (CONT'D)

CLUTCH PRESSURE CONTROL (CPC) SOLENOIDS 2,3,4 AND 5

There are two different types of clutch pressure control solenoids. Clutch pressure control (PC) solenoids 2 and 3 are ***"normally-high"*** amperage pressure control solenoids, as shown in Figure 14, and are identical to the line pressure control solenoid. Clutch pressure control (PC) solenoids 4 and 5 are ***"normally-low"*** amperage pressure control solenoids, as shown in Figure 13, and are identical to the TCC PC solenoid.

The Clutch Pressure Control PC Solenoids are part of the Control Solenoid Body And TCM Assembly and are not serviced separately.

Clutch Pressure Control Solenoid 2

Clutch pressure control (PC) solenoid 2 controls fluid flow to the 3-5/reverse clutch regulator valve and the 3-5/reverse boost valve. When commanded the solenoid controls the flow of exhaust fluid out of the solenoid to maintain a specific commanded control pressure. This allows the TCM to control the apply and release of the 3-5 and reverse clutch.

Clutch Pressure Control Solenoid 3

Clutch pressure control (PC) solenoid 3 controls fluid flow to the 4-5-6 clutch regulator valve and the 4-5-6 boost valve. When commanded the solenoid controls the flow of exhaust fluid out of the solenoid to maintain a specific commanded control pressure. This allows the TCM to control the apply and release of the 4-5-6 clutch.

Clutch Pressure Control Solenoid 4

Clutch pressure control (PC) solenoid 4 controls fluid flow to the 2-6 clutch regulator valve. When commanded the solenoid controls the flow of exhaust fluid out of the solenoid to maintain a specific commanded control pressure. This allows the TCM to control the apply and release of the 2-6 clutch.

Clutch Pressure Control Solenoid 5

Clutch pressure control (PC) solenoid 5 controls fluid flow to the 1-2-3-4 clutch regulator valve and the 1-2-3-4 boost valve. When commanded the solenoid controls the flow of exhaust fluid out of the solenoid to maintain a specific commanded control pressure. This allows the TCM to control the apply and release of the 1-2-3-4 clutch.

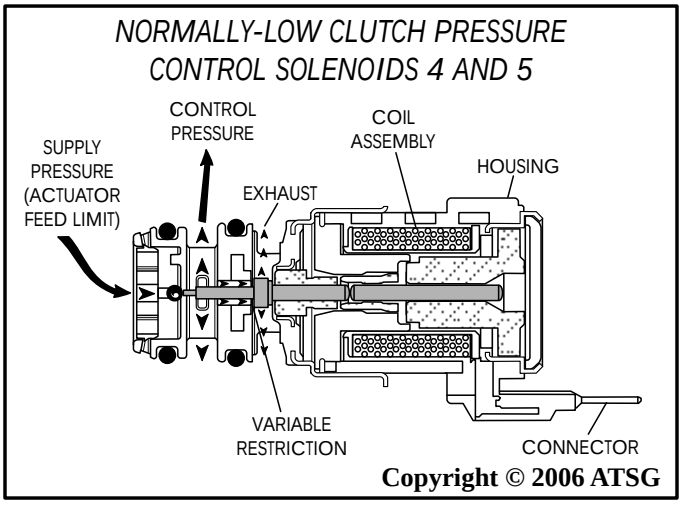


Figure 13

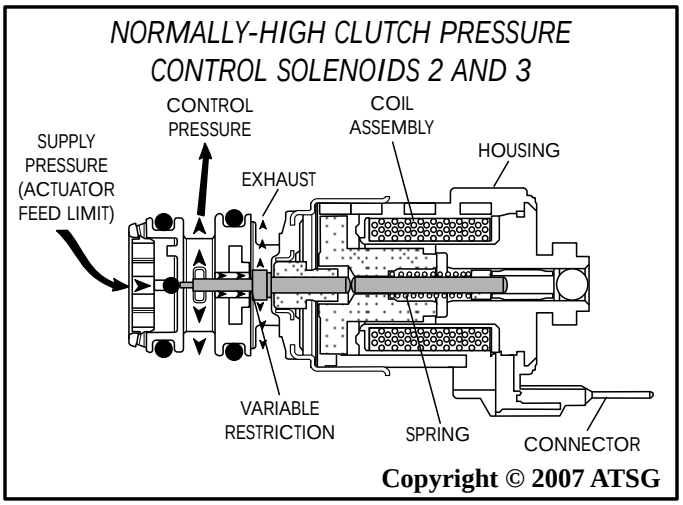


Figure 14

Transmission Adapt Function

Programming within the TCM also allows for automatic adjustments in shift pressure that are based on the changing characteristics of the transmission components. As the apply components within the transmission wear or change over time, the time required to apply a clutch increases or decreases. In order to compensate for these changes, the TCM adjusts the pressure commands to the various pressure control solenoids, to maintain the original calibrations. The automatic adjusting process is referred to as "Adaptive Learning" and is used to ensure consistent shift feel and increase the transmission's durability.

ELECTRONIC COMPONENTS (CONT'D)

TRANSMISSION MANUAL SHIFT POSITION SWITCH ASSEMBLY

The Transmission Manual Shift Position Switch Assembly, sometimes referred to as Internal Mode Switch (IMS), is a sliding contact switch that connects to the manual valve, with a connector that plugs into the control solenoid body and TCM assembly, and is shown in Figure 16.

There are four inputs to the TCM from the position switch assembly, that indicate which transmission gear range has been selected. The state of each input is available for display on the scan tool. The four input parameters represented are Signal A, Signal B, Signal C, and Signal P (Parity).

A fifth input signal "N" (P/N Start), does not input to the TCM, but goes directly to the ECM to determine a Park/Neutral state and allow the engine to be started. Routing Signal N to the ECM will allow the engine to be started, even with a dead TCM. Signal N is not a signal used by the TCM for manual shift selector position logic. A logic chart has been provided for you in Figure 15, and a partial wire schematic in Figure 17.

The Transmission Manual Shift Position Switch assembly is serviced separately.

If the TCM detects an improper signal from the transmission manual shift position switch (IMS) assembly, a DTC will be activated.

INTERNAL MODE SWITCH LOGIC

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	LOW	LOW	HI

HI = 12 Volts
LOW = 0 Volts

Internal Mode Switch Terminal Identification

Terminal	Function
A	Park/Neutral Start Signal "N" (Direct to ECM)
B	Mode Switch Switch Signal "A"
C	Mode Switch Switch Signal "B"
D	Mode Switch Switch Signal "C"
E	Mode Switch Switch Signal "P"
F	12 Volt Feed From TCM

Figure 15

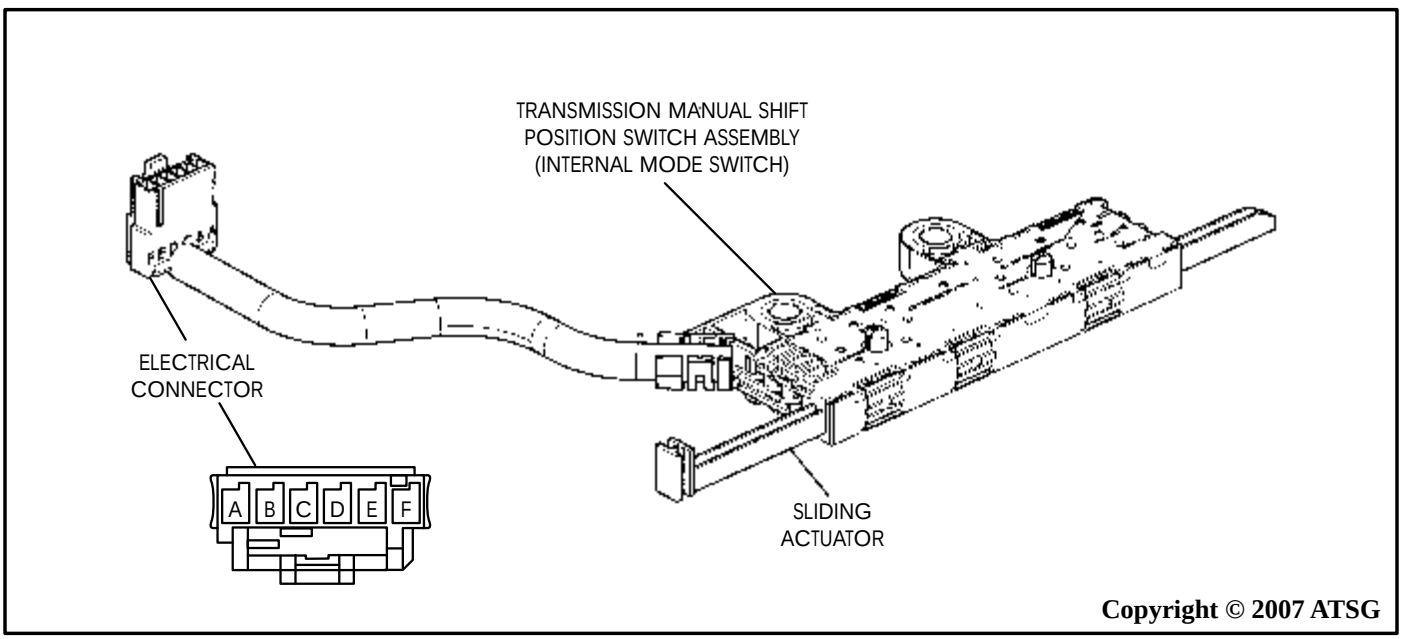


Figure 16

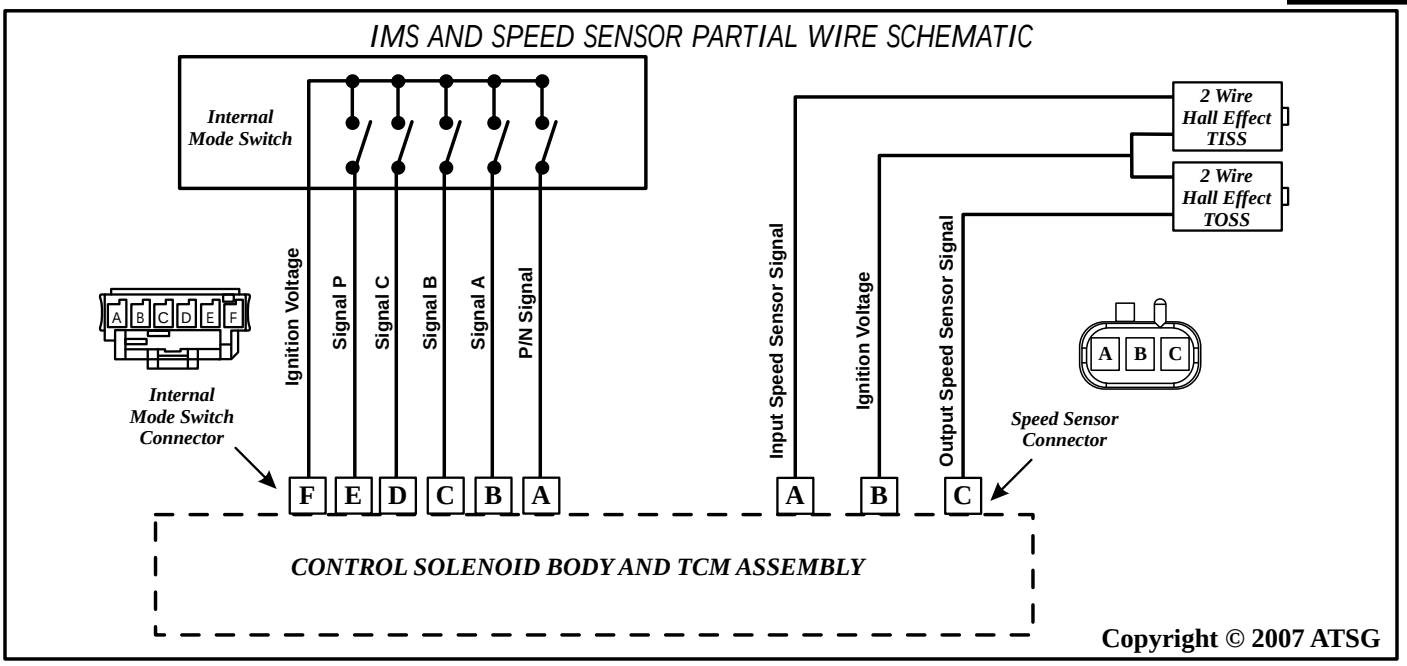


Figure 17

ELECTRONIC COMPOMENTS (CONT'D)

TRANSMISSION SPEED SENSORS

The speed sensors are both 2 wire hall-effect type sensors which bolt to the valve body assembly and connects to the control solenoid body and TCM assembly through a wire harness and connector, as shown in Figure 17 and 18.

If the TCM detects an improper signal from the input or output speed sensors, a DTC will be activated.

Input Speed Sensor Assembly

The input speed sensor faces the 1-2-3-4 and 3-5-R clutch housing and is triggered by splines on the housing outside diameter. The sensor receives 8.3-9.3 volts from the TCM, and produces a signal frequency based on the spline profile and speed of the 1-2-3-4 clutch housing. The TCM uses this signal to determine line pressure, shift timing, TCC slip speed and gear ratio.

Output Speed Sensor Assembly

The output speed sensor faces the output shaft housing and is triggered by slots in the housing outside diameter. The sensor receives 8.3-9.3 volts from the TCM, and produces a signal frequency based on the machined slots and speed of the output shaft housing. The TCM uses this signal to determine line pressure, shift timing, vehicle speed and gear ratio.

SPEED SENSOR TERMINAL IDENTIFICATION

Terminal Number	*Function*
A	***Input Speed Sensor Signal***
B	***Ignition Voltage***
C	***Output Speed Sensor Signal***

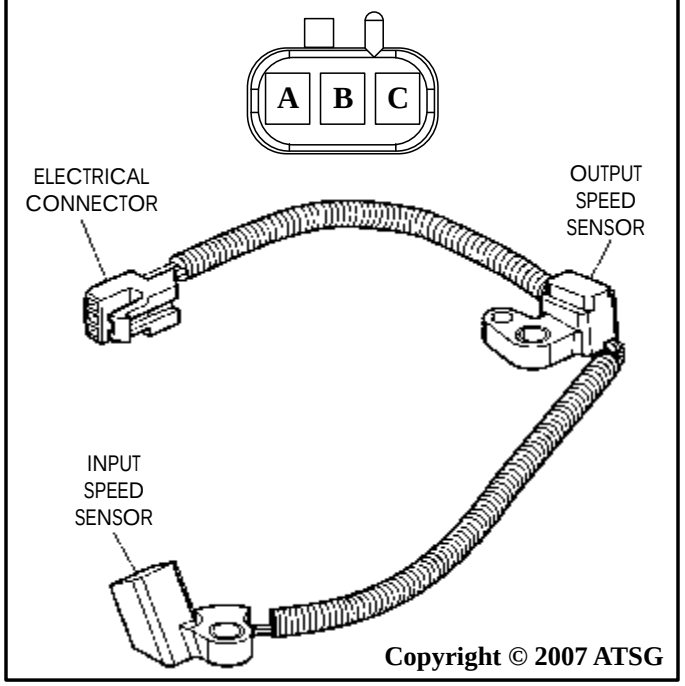
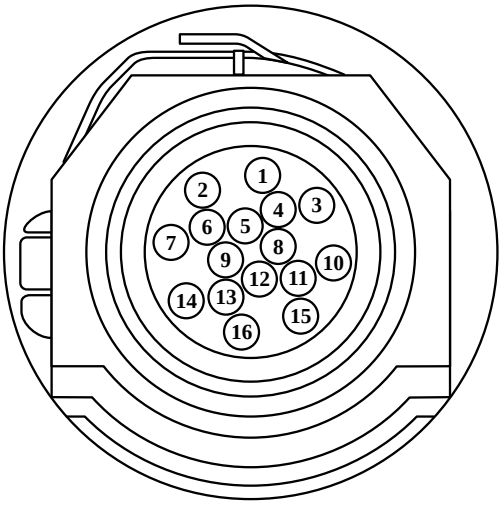


Figure 18

ROCKLAND
B&W

16-WAY CASE CONNECTOR TERMINAL IDENTIFICATION



View Looking Into 16-Way Case Connector

Pin No.	*Function*
1	*Not Used*
2	*Not Used*
3	*Park/Neutral Signal*
4	*Battery Voltage Feed*
5	*Ground*
6	*Brake Pedal Apply Signal*
7	*Tap Up/Tap Down Switch*
8	*Not Used*
9	*Accessory Voltage Power*
10	*CAN Hi*
11	*CAN Lo*
12	*Run/Crank Voltage Power*
13	*CAN Lo 2*
14	*CAN Hi 2*
15	*Replicated OSS Signal*
16	*Not Used*

Figure 19

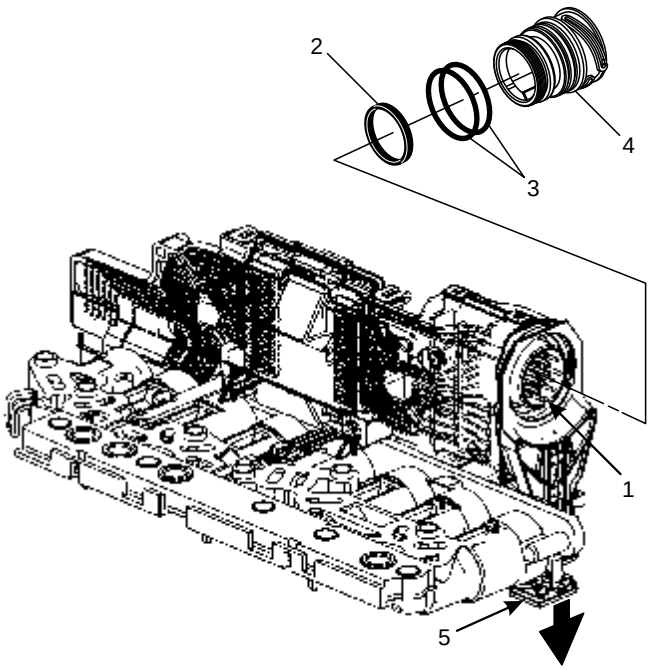
ELECTRONIC COMPOMENTS (CONT'D)

16-Way Case Connector

The 16-way transmission case connector is also part of the control solenoid body and TCM assembly, as shown in Figure 20, and ***is not*** serviced seperately. The case connector and the terminal identification chart are both illustrated in Figure 19, for diagnostic purposes. We have also provided a full wiring schematic in Figure 20.

Since the case connector is part of the TCM and is located internally, there is an additional sleeve with "O" rings and a seal required to seal the passage in the case, as shown in Figure 19. Once the control solenoid body and TCM assembly has been installed onto the valve body, you must pull the retaining tab down, as shown in Figure 20, install the pass through sleeve with the "O" rings and seal, and then press the retaining tab back up engaging the tab into the pass through sleeve.

TRANSMISSION CASE TO TCM SLEEVE ASSEMBLY



1 16-WAY TRANSMISSION CASE CONNECTOR.
2 TCM ASSEMBLY TO TRANSMISSION CASE SLEEVE SEAL.
3 CASE SLEEVE TO TRANSMISSION CASE "O" RING SEALS (2).
4 TRANSMISSION CASE SLEEVE ASSEMBLY.
5 TRANSMISSION CASE SLEEVE RETAINING TAB.

Figure 20

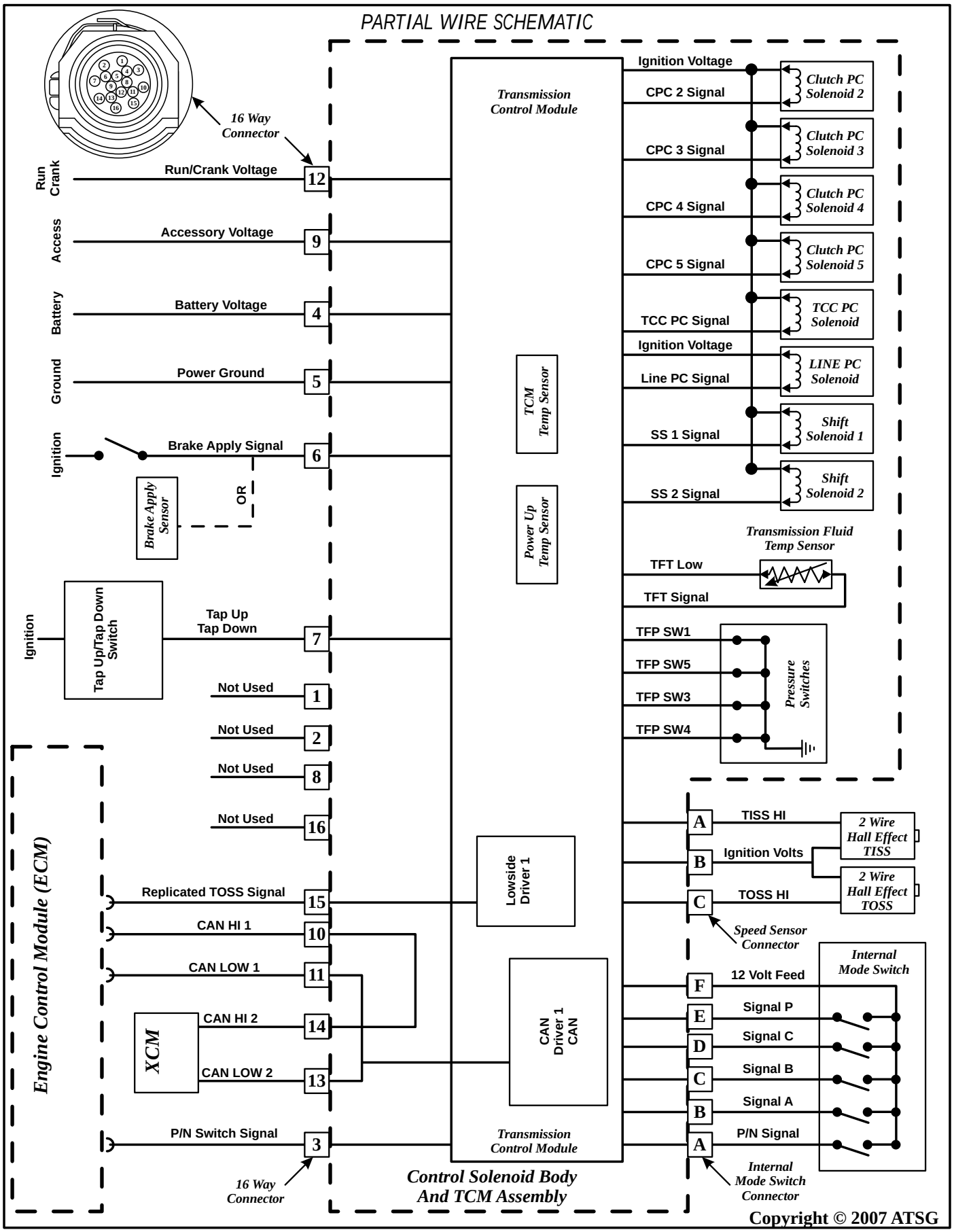


Figure 21

Automatic Transmission Service Group

DIAGNOSTIC TROUBLE CODE (DTC) IDENTIFICATION		
DTC	DESCRIPTION	DTC TYPE*
P0218	*Transmission Fluid Overtemperature, Over 270°F for 10 minutes.*	A
P0562	*System Voltage Low, 11 volts or less for 10 seconds.*	A
P0563	*System Voltage High, Greater than 18 volts for 12 seconds.*	A
P0601	*TCM (Internal), Read Only Memory (ROM).*	A
P0602	*TCM, Not Programmed.*	A
P0603	*TCM (Internal), Long term memory reset.*	A
P0604	*TCM (Internal), Random Access Memory (RAM).*	A
P0634	*TCM (Internal), Overtemperature.*	A
P0667	*TCM (Internal), Temperature Sensor Performance.*	A
P0668	*TCM (Internal), Temperature Sensor circuit voltage low.*	A
P0669	*TCM (Internal), Temperature Sensor circuit voltage high.*	A
P0703	*Brake Switch Circuit, signal is invalid for 4 seconds.*	A
P0711	*Transmission Fluid Temperature (TFT), Sensor performance.*	C
P0712	*Transmission Fluid Temperature (TFT), Sensor circuit voltage low.*	A
P0713	*Transmission Fluid Temperature (TFT), Sensor circuit voltage high.*	A
P0716	*Input Speed Sensor (ISS), Sensor performance.*	A
P0717	*Input Speed Sensor (ISS), Sensor circuit voltage low.*	A
P0719	*Brake Switch Circuit, Circuit voltage low.*	A
P0722	*Output Speed Sensor (OSS), Sensor circuit voltage low.*	C
P0723	*Output Speed Sensor (OSS), Sensor intermittent.*	B
P0724	*Brake Switch Circuit, Circuit voltage high.*	A
P0729	*Incorrect 6th Gear Ratio.*	C
P0731	*Incorrect 1st Gear Ratio.*	A
P0732	*Incorrect 2nd Gear Ratio.*	A
P0733	*Incorrect 3rd Gear Ratio.*	A
P0734	*Incorrect 4th Gear Ratio.*	A
P0735	*Incorrect 5th Gear Ratio.*	A
P0736	*Incorrect Reverse Gear Ratio.*	A
P0741	*Torque Converter Clutch (TCC), System Stuck OFF.*	A
P0742	*Torque Converter Clutch (TCC), System Stuck ON.*	B
P0751	*Shift Solenoid (SS) 1 Valve Performance, Stuck OFF.*	B
P0752	*Shift Solenoid (SS) 1 Valve Performance, Stuck ON.*	A

***DTC TYPES**

A - Emission-related, turns the MIL "ON" immediately after the 1st failure.

B - Emission-related, turns the MIL "ON" after two consecutive drive cycles with failure.

C - Non-emission-related, no lamps and may display message on driver information center.

Figure 22

DIAGNOSTIC TROUBLE CODE (DTC) IDENTIFICATION		
DTC	DESCRIPTION	DTC TYPE*
P0776	*Clutch Pressure Control (PC) Solenoid 2, Stuck OFF.*	A
P0777	*Clutch Pressure Control (PC) Solenoid 2, Stuck ON.*	A
P0796	*Clutch Pressure Control (PC) Solenoid 3, Stuck OFF.*	A
P0797	*Clutch Pressure Control (PC) Solenoid 3, Stuck ON.*	A
P0815	*Upshift Switch Circuit Error.*	C
P0816	*Downshift Switch Circuit Error.*	C
P0826	*Upshift and Downshift Switch Circuit Error.*	C
P0842	*Transmission Fluid Pressure (TFP) Switch 1, Circuit Voltage Low.*	C
P0843	*Transmission Fluid Pressure (TFP) Switch 1, Circuit Voltage High.*	C
P0851	*Park/Neutral Position (PNP) Switch, Circuit Voltage Low.*	C
P0852	*Park/Neutral Position (PNP) Switch, Circuit Voltage High.*	C
P0872	*Transmission Fluid Pressure (TFP) Switch 3, Circuit Voltage Low.*	C
P0873	*Transmission Fluid Pressure (TFP) Switch 3, Circuit Voltage High.*	C
P0877	*Transmission Fluid Pressure (TFP) Switch 4, Circuit Voltage Low.*	C
P0878	*Transmission Fluid Pressure (TFP) Switch 4, Circuit Voltage High.*	C
P0961	*Line Pressure Control (PC) Solenoid, System Performance.*	A
P0962	*Line Pressure Control (PC) Solenoid, Circuit Voltage Low.*	A
P0963	*Line Pressure Control (PC) Solenoid, Circuit Voltage High.*	A
P0965	*Clutch Pressure Control (PC) Solenoid 2, System Performance.*	A
P0966	*Clutch Pressure Control (PC) Solenoid 2, Circuit Voltage Low.*	A
P0967	*Clutch Pressure Control (PC) Solenoid 2, Circuit Voltage High.*	A
P0969	*Clutch Pressure Control (PC) Solenoid 3, System Performance.*	A
P0970	*Clutch Pressure Control (PC) Solenoid 3, Circuit Voltage Low.*	A
P0971	*Clutch Pressure Control (PC) Solenoid 3, Circuit Voltage High.*	A
P0973	*Shift Solenoid 1 (SS), Control Circuit Voltage Low.*	A
P0974	*Shift Solenoid 1 (SS), Control Circuit Voltage High.*	A
P0976	*Shift Solenoid 2 (SS), Control Circuit Voltage Low.*	A
P0977	*Shift Solenoid 2 (SS), Control Circuit Voltage High.*	A
P0989	*Transmission Fluid Pressure (TFP) Switch 5, Circuit Voltage Low.*	C
P0990	*Transmission Fluid Pressure (TFP) Switch 5, Circuit Voltage High.*	C
P1621	*TCM (Internal), Long Term Memory Performance.*	A
P1684	*TCM (Internal), Power Up Temperature Sensor Performance.*	A

***DTC TYPES**

A - Emission-related, turns the MIL "ON" immediately after the 1st failure.

B - Emission-related, turns the MIL "ON" after two consecutive drive cycles with failure.

C - Non-emission-related, no lamps and may display message on driver information center.

Figure 23

DIAGNOSTIC TROUBLE CODE (DTC) IDENTIFICATION		
DTC	DESCRIPTION	DTC TYPE*
P1685	***TCM (Internal), Power Up Temperature Sensor, Circuit Voltage Low.***	**A**
P1686	***TCM (Internal), Power Up Temperature Sensor, Circuit Voltage High.***	**A**
P1751	***Shift Valve 1, Performance of Clutch Select Valve 2.***	**A**
P1825	***Internal Mode Switch, Invalid Range***	**A**
P1831	***TCM (Internal), Driver No. 2, (Controls Line Pressure & Shift Lock Solenoids).***	**A**
P1832	***TCM (Internal), Driver No. 2, (Controls Line Pressure & Shift Lock Solenoids).***	**C**
P1876	***Up and Down Shift Switch Performance, Range Switch Not In D3.***	**C**
P1915	***Internal Mode Switch, Start In Wrong Range.***	**A**
P2534	***Ignition Switch, Start Circuit Voltage Low.***	**A**
P2714	***Clutch Pressure Control (PC) Solenoid 4, Stuck OFF.***	**A**
P2715	***Clutch Pressure Control (PC) Solenoid 4, Stuck ON.***	**A**
P2719	***Clutch Pressure Control (PC) Solenoid 4, System Performance.***	**A**
P2720	***Clutch Pressure Control (PC) Solenoid 4, Circuit Voltage Low.***	**A**
P2721	***Clutch Pressure Control (PC) Solenoid 4, Circuit Voltage High.***	**A**
P2723	***Clutch Pressure Control (PC) Solenoid 5, Stuck OFF.***	**A**
P2724	***Clutch Pressure Control (PC) Solenoid 5, Stuck ON.***	**A**
P2728	***Clutch Pressure Control (PC) Solenoid 5, System Performance.***	**A**
P2729	***Clutch Pressure Control (PC) Solenoid 5, Circuit Voltage Low.***	**A**
P2730	***Clutch Pressure Control (PC) Solenoid 5, Circuit Voltage High.***	**A**
P2762	***TCC Pressure Control (PC) Solenoid, System Performance.***	**A**
P2763	***TCC Pressure Control (PC) Solenoid, Circuit Voltage High.***	**A**
P2764	***TCC Pressure Control (PC) Solenoid, Circuit Voltage Low.***	**A**

***DTC TYPES**

A - Emission-related, turns the MIL "ON" immediately after the 1st failure.

B - Emission-related, turns the MIL "ON" after two consecutive drive cycles with failure.

C - Non-emission-related, no lamps and may display message on driver information center.

Figure 24

FAIL-SAFE OR PROTECTION MODE

If for any reason, the entire electronic control system of the transmission, or any one of the electrical components within the Control Solenoid Body and TCM Assembly becomes disabled, the transmission will default to fail-safe mode. If the transmission is in 1st, 2nd or 3rd gear during an electrical failure, the transmission will default to 3rd gear. If the transmission is in 4th, 5th or 6th gear during an electrical failure, the transmission will default to 5th gear.

If for any reason, the entire electronic control system of the transmission fails, the line pressure control solenoid will be OFF, and maximum line pressure will be the result. This will create harsh engagements and garage shifts. The TCC PC solenoid would also be OFF, resulting in no torque converter clutch apply.

6L80 CHECKBALL LOCATION AND FUNCTION

Number 1 Checkball

The number one checkball is located in the upper valve body, as shown in Figure 25. When the transmission is operating in Drive 1st, 2nd, 3rd, 4th, 5th or 6th gear, drive 1-6 fluid seats the checkball against the drive braking passage and enters the 2-6 clutch/1-2-3-4 clutch feed circuit to apply the 1-2-3-4 clutch.

Number 2 Checkball

The number two checkball is located in the upper valve body, as shown in Figure 25. This shuttle type checkball is seated against the reverse passage while the transmission is operating in Park, Neutral and Drive 1st. With the checkball in this position, shift solenoid 1 fluid enters the CSV2 enable circuit to the "clutch select valve 2". When the transmission is operating in Reverse, the checkball seats against shift solenoid 1 passage to allow reverse fluid to enter the CSV2 enable circuit and hold the "clutch select valve 2" in the applied position.

Number 3 Checkball

The number three checkball is located in the upper valve body, as shown in Figure 25. This shuttle type checkball is seated against the 4-5-6 clutch passage while the transmission is operating in Park, Reverse, Neutral, Drive 1st, 2nd and 3rd gear. With the checkball in this position, shift solenoid 2 fluid enters the CSV3 enable circuit to apply the "clutch select valve 3". When the transmission is operating in Drive 4th, 5th or 6th gear, the checkball seats against the shift solenoid 2 passage to allow 4-5-6 clutch fluid to enter the CSV3 enable circuit and hold the "clutch select valve 3" in the applied position.

Number 4 Checkball

The number four checkball is located in the upper valve body, as shown in Figure 25. This shuttle type checkball is seated against the 4-5-6 clutch passage by Pressure Solenoid 5 fluid, while the transmission is operating in Park, Reverse, Neutral, Drive 1st, 2nd and 3rd gear. With the checkball in this position, PS 5 fluid enters the CSV2 latch circuit to hold the "clutch select valve 2" in the released position. When the transmission is operating in Drive 4th, 5th or 6th gear, 4-5-6 clutch fluid seats the checkball against the PS 5 passage to allow 4-5-6 clutch fluid to enter the CSV2 latch circuit to hold the "clutch select valve 2" in released the position.

Number 5 Checkball

The number five checkball is located in the upper valve body, as shown in Figure 25. This shuttle type checkball is seated against the Drive 1-6 passage by 3-5/Reverse Feed fluid while the transmission is operating in Reverse. With the checkball in this position, 3-5/Reverse Feed fluid enters the 3-5/Reverse Supply circuit and is routed to the number 7 checkball. When the transmission is operating in Drive 1st, 2nd, 3rd, 4th, 5th or 6th gear, Drive 1-6 fluid seats the ball against the 3-5/Reverse Feed passage to allow Drive 1-6 fluid to enter the 3-5/Reverse Supply circuit.

Number 6 Checkball

The number six checkball is located in the upper valve body, as shown in Figure 25. This "one way orifice control" type checkball is used to differentiate the flow rate of fluid between applying and releasing the 1-2-3-4 clutch. 2-6 clutch/1-2-3-4 clutch feed fluid opens the checkball, while the transmission is operating in Drive 1st, 2nd, 3rd, 4th, 5th or 6th gear. With the ball in this position, 2-6 clutch/1-2-3-4 clutch feed fluid flows freely into the 1-2-3-4 clutch feed passage. When Park, Reverse or Neutral is selected after the transmission was operating in Drive, exhausting 1-2-3-4 clutch feed fluid seats the checkball, and forces exhausting fluid through orifice number 32, which allows for a controlled exhaust of the 1-2-3-4 clutch.

Number 7 Checkball

The number seven checkball is located in the upper valve body, as shown in Figure 25. This "one way orifice control" type checkball is used to differentiate the flow rate of fluid between applying and releasing the 3-5/Reverse clutch. 3-5/Reverse Supply fluid pressure seats the checkball against the 3-5/Reverse Feed passage, while the transmission is operating in Reverse, Drive 1st, 2nd, 3rd, 4th, 5th or 6th gear. With the checkball in this position, 3-5/Reverse Supply fluid is forced through orifice number 25 before entering the 3-5/Reverse Feed passage. The orifice helps control the apply rate of the 3-5/Reverse clutch when the transmission shifts into Reverse, 3rd or 5th gear. When Park or Neutral is selected after the transmission was operating in Drive, or Reverse, exhausting 3-5/Reverse Feed fluid unseats the checkball. This allows for a faster exhaust of 3-5/Reverse Feed fluid and a quick release of the 3-5/Reverse clutch.

6L80 CHECKBALL LOCATION AND FUNCTION

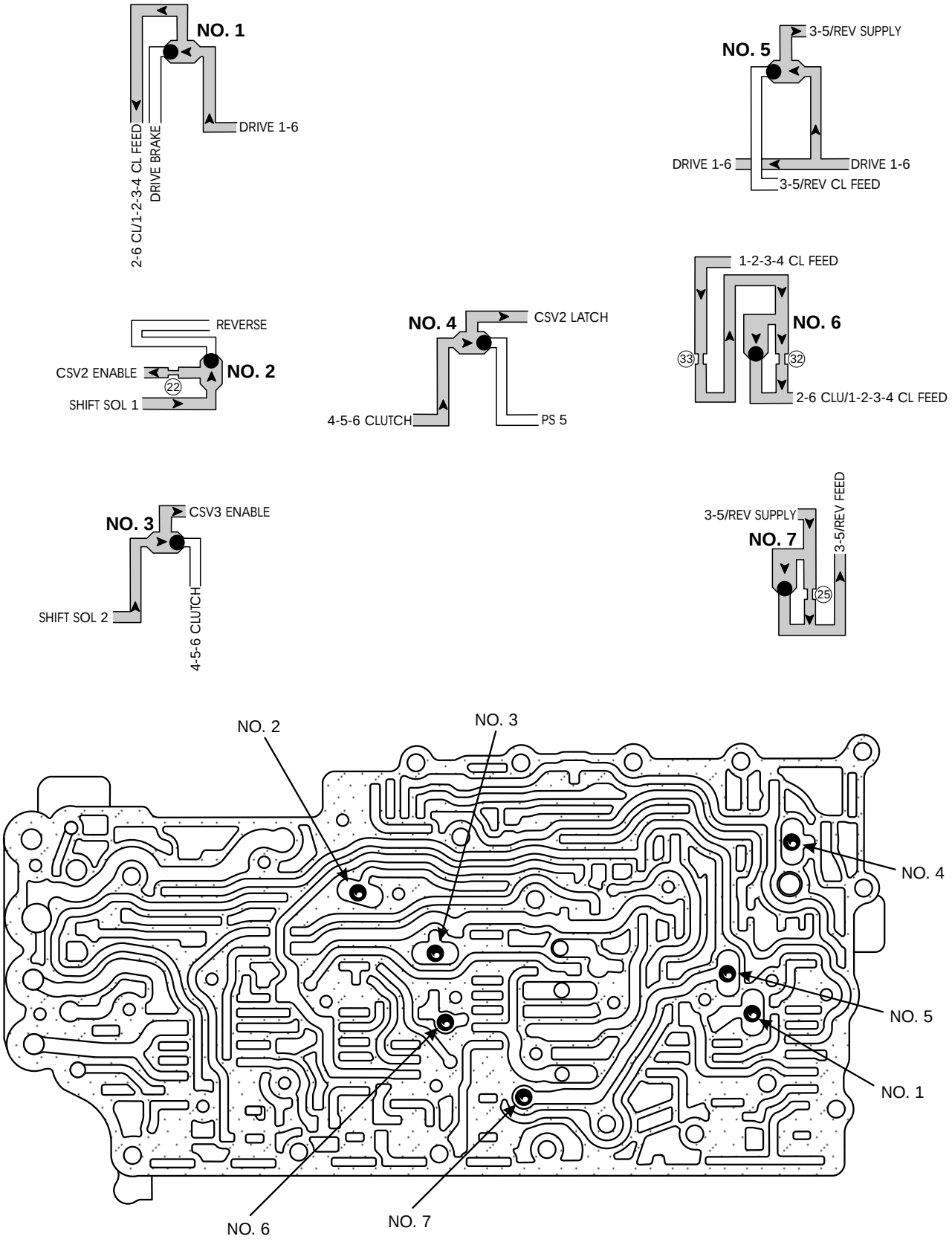
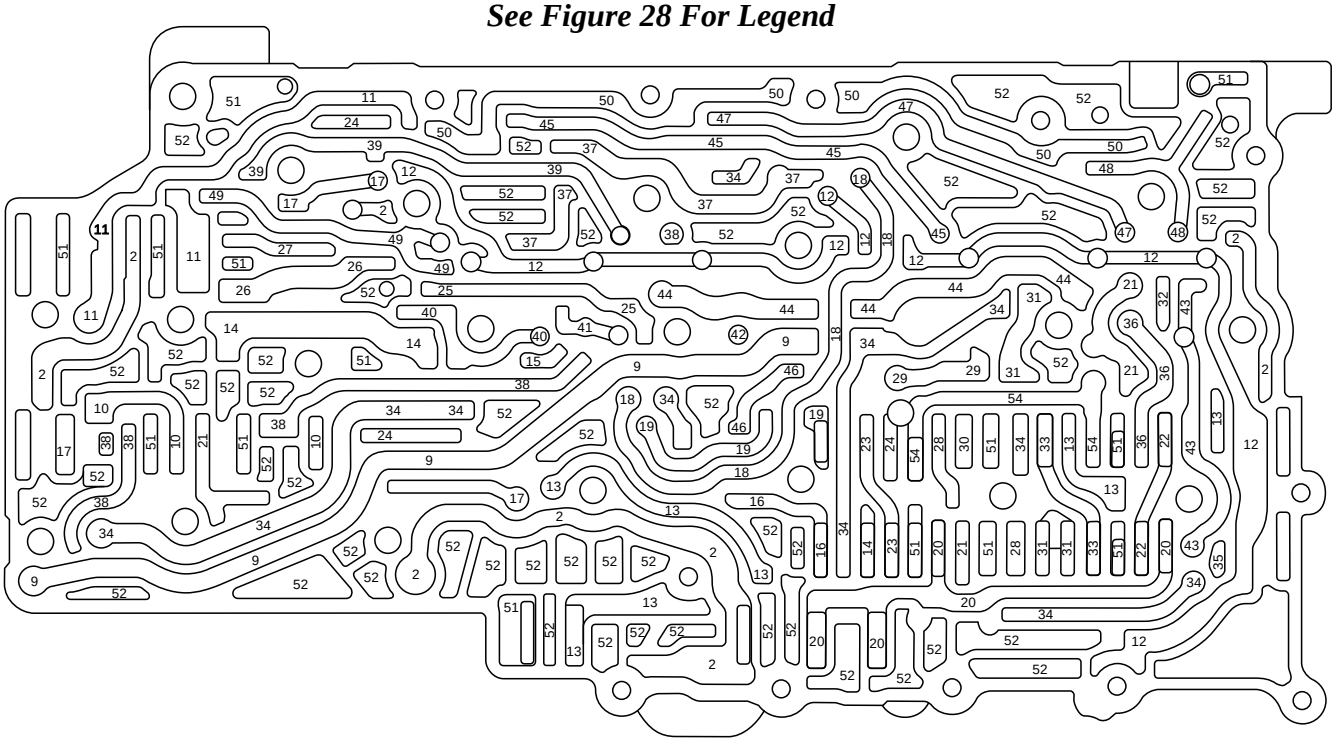


Figure 25

SUPERIOR

LOWER VALVE BODY, SPACER PLATE SIDE
See Figure 28 For Legend



LOWER VALVE BODY, TCM/SOLENOID BODY SIDE
See Figure 28 For Legend

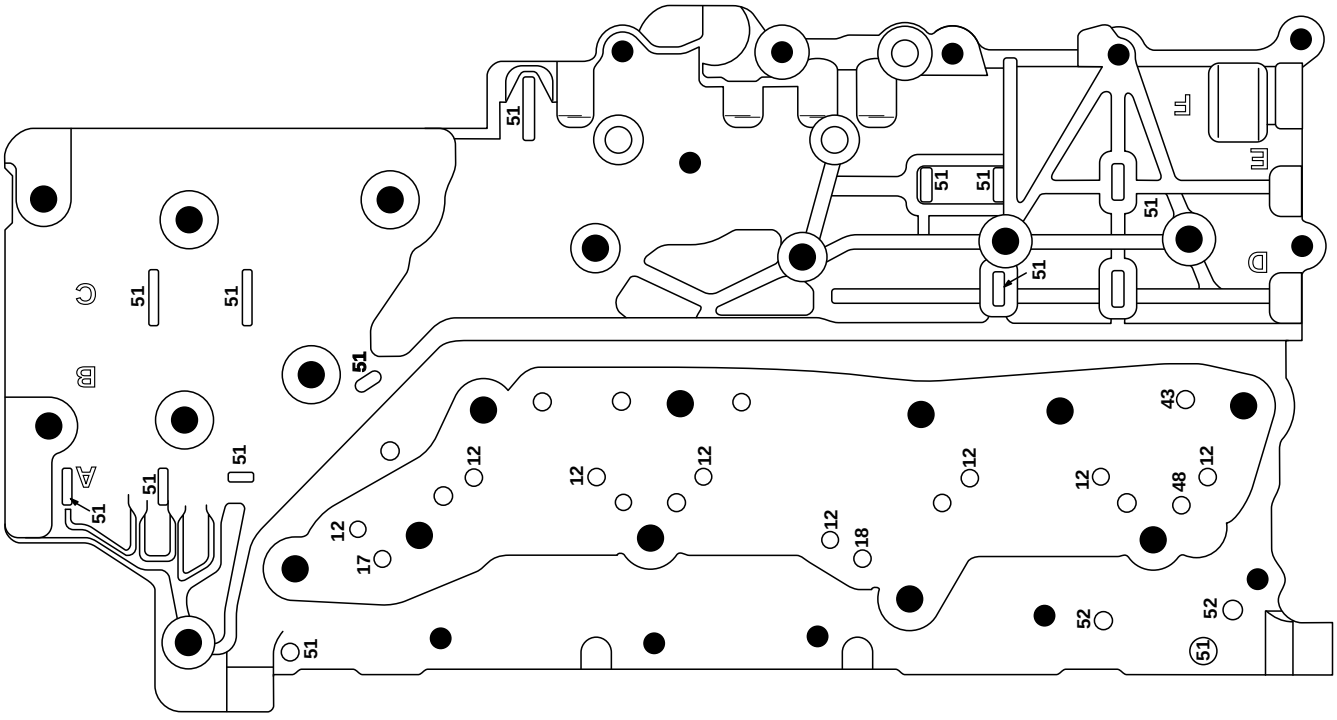
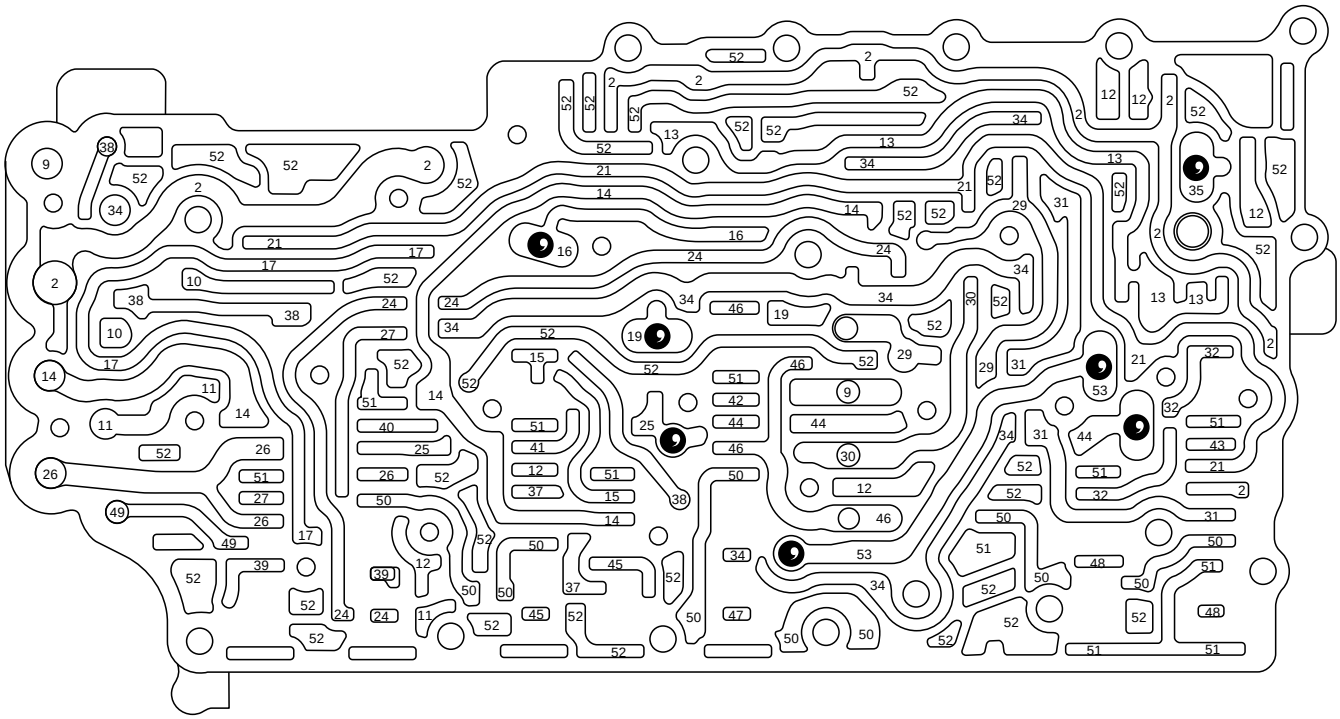


Figure 26

ALTO

UPPER VALVE BODY, SPACER PLATE SIDE
See Figure 28 For Legend



UPPER VALVE BODY, CASE SIDE
See Figure 28 For Legend

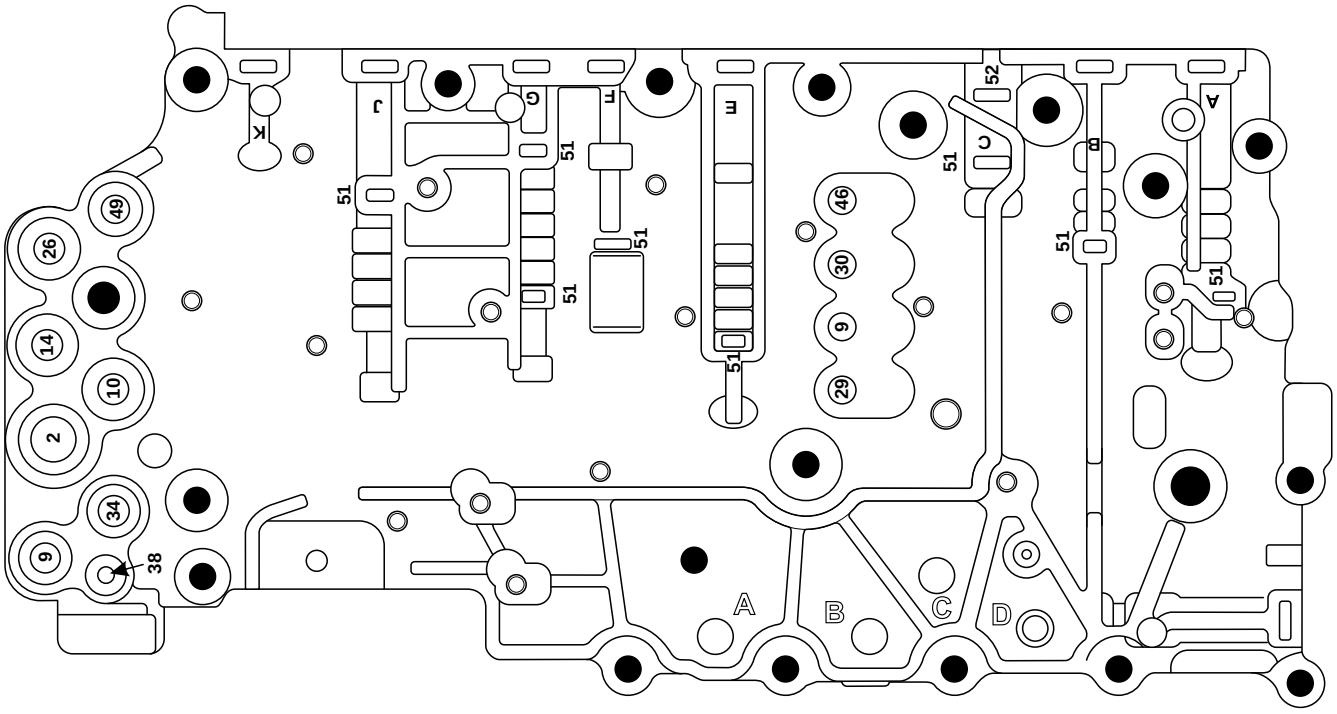


Figure 27

WIT

PASSAGE IDENTIFICATION LEGEND

1 SUCTION
2 LINE
3 DECREASE
4 CONVERTER FEED
5 CONVERTER FEED LIMIT
6 TCC RELEASE
7 TCC APPLY
8 COOLER FEED
9 CENTER LUBE
10 REGULATOR APPLY
11 COMPENSATOR FEED
12 ACTUATOR FEED LIMIT
13 REVERSE
14 3-5/REVERSE CLUTCH
15 3-5/REVERSE CLUTCH FEEDBACK
16 CSV2 ENABLE (Clutch Select Valve 2)
17 SHIFT SOLENOID 1
18 SHIFT SOLENOID 2
19 CSV3 ENABLE (Clutch Select Valve 3)
20 DRIVE
21 DRIVE 1-6
22 DRIVE BRAKE
23 1-2-3-4 CLUTCH DEFAULT FEED
24 1-2-3-4 CLUTCH DEFAULT
25 1-2-3-4 CLUTCH FEED
26 1-2-3-4 CLUTCH
27 1-2-3-4 CLUTCH FEEDBACK
28 CBR1/CBR FEED (Clutch Braking 1st)
29 CBR1 (Clutch Braking 1st)
30 CBR (Clutch Braking)
31 CBR1/4-5-6 CLUTCH FEED
32 CBR1 FEEDBACK
33 4-5-6 CLUTCH FEED
34 4-5-6 CLUTCH
35 CSV2 LATCH
36 DRIVE B
37 3-5/REVERSE FEED
38 PCS TCC (Pressure Control Solenoid)
39 PCS 1234 CLUTCH (Pressure Control Solenoid)
40 PCS 4 (Pressure Conrol Solenoid)
41 PCS 2
42 PCS 3
43 PCS 5
44 2-6 CLUTCH/1-2-3-4 CLUTCH FEED
45 PCS 3-5/REVERSE CLUTCH
46 2-6 CLUTCH
47 PCS 2-6 CLUTCH
48 PCS CBR1/4-5-6 CLUTCH
49 PCS LINE
50 EXHAUST BACKFILL
51 EXHAUST
52 VOID
53 3-5/REVERSE SUPPLY
54 3-5/REVERSE CLUTCH FEED
55 VENT
56 CONVERTER SEAL DRAINBACK
57 FRONT LUBE

Figure 28

TYPICAL SPACER PLATE
See Figure 28 For Legend

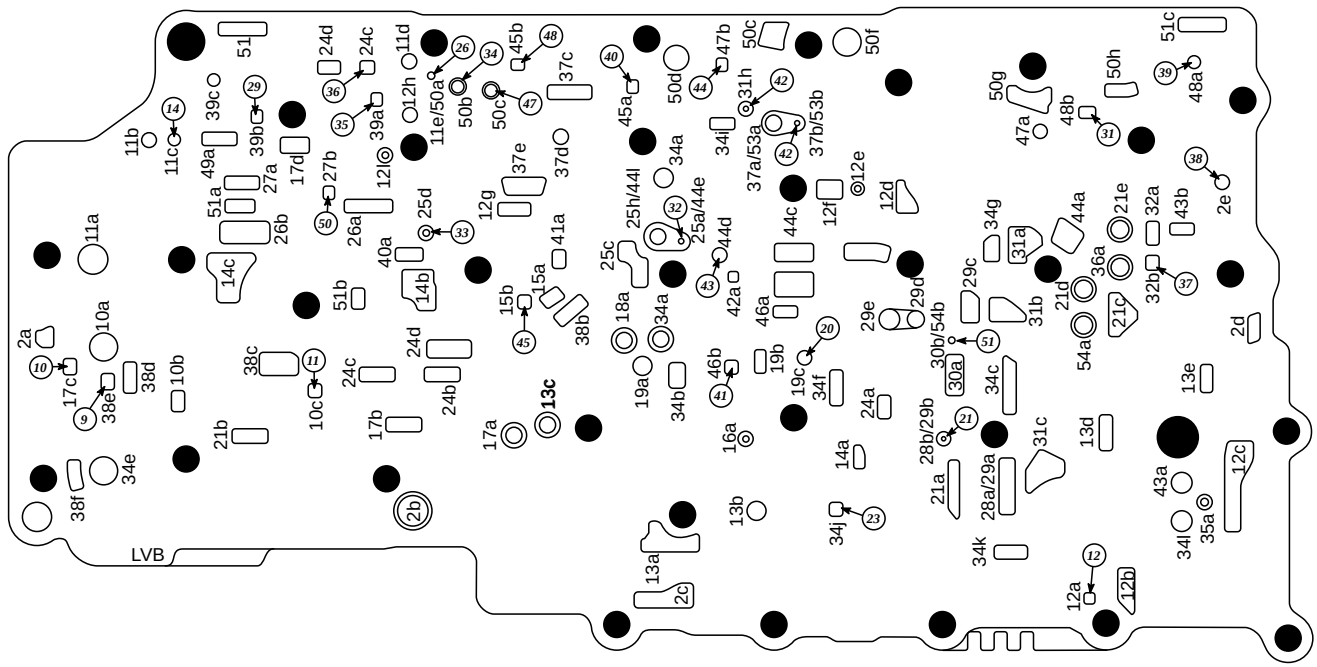


Figure 29

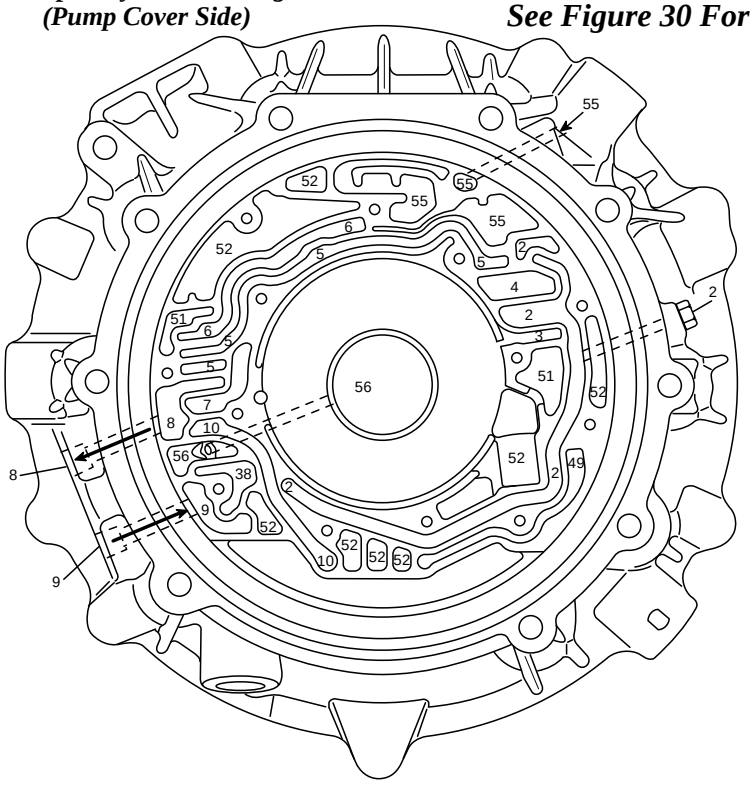
PASSAGE IDENTIFICATION LEGEND

1 SUCTION
2 LINE
3 DECREASE
4 CONVERTER FEED
5 CONVERTER FEED LIMIT
6 TCC RELEASE
7 TCC APPLY
8 COOLER FEED
9 CENTER LUBE
10 REGULATOR APPLY
11 COMPENSATOR FEED
12 ACTUATOR FEED LIMIT
13 REVERSE
14 3-5/REVERSE CLUTCH
15 3-5/REVERSE CLUTCH FEEDBACK
16 CSV2 ENABLE (Clutch Select Valve 2)
17 SHIFT SOLENOID 1
18 SHIFT SOLENOID 2
19 CSV3 ENABLE (Clutch Select Valve 3)
20 DRIVE
21 DRIVE 1-6
22 DRIVE BRAKE
23 1-2-3-4 CLUTCH DEFAULT FEED
24 1-2-3-4 CLUTCH DEFAULT
25 1-2-3-4 CLUTCH FEED
26 1-2-3-4 CLUTCH
27 1-2-3-4 CLUTCH FEEDBACK
28 CBR1/CBR FEED (Clutch Braking 1st)
29 CBR1 (Clutch Braking 1st)
30 CBR (Clutch Braking)
31 CBR1/4-5-6 CLUTCH FEED
32 CBR1 FEEDBACK
33 4-5-6 CLUTCH FEED
34 4-5-6 CLUTCH
35 CSV2 LATCH
36 DRIVE B
37 3-5/REVERSE FEED
38 PCS TCC (Pressure Control Solenoid)
39 PCS 1234 CLUTCH (Pressure Control Solenoid)
40 PCS 4 (Pressure Conrol Solenoid)
41 PCS 2
42 PCS 3
43 PCS 5
44 2-6 CLUTCH/1-2-3-4 CLUTCH FEED
45 PCS 3-5/REVERSE CLUTCH
46 2-6 CLUTCH
47 PCS 2-6 CLUTCH
48 PCS CBR1/4-5-6 CLUTCH
49 PCS LINE
50 EXHAUST BACKFILL
51 EXHAUST
52 VOID
53 3-5/REVERSE SUPPLY
54 3-5/REVERSE CLUTCH FEED
55 VENT
56 CONVERTER SEAL DRAINBACK
57 FRONT LUBE

Figure 30

PUMP BODY AND PUMP COVER
See Figure 30 For Legend

Pump Body/Bell Housing (Pump Cover Side)



Pump Cover (Bell Housing Side)

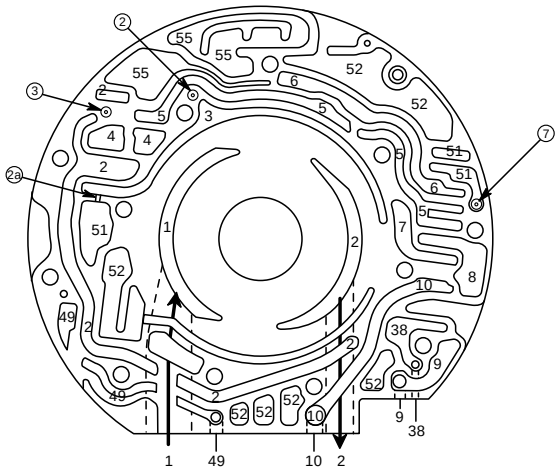


Figure 31

TRANSMISSION CASE
See Figure 30 For Legend

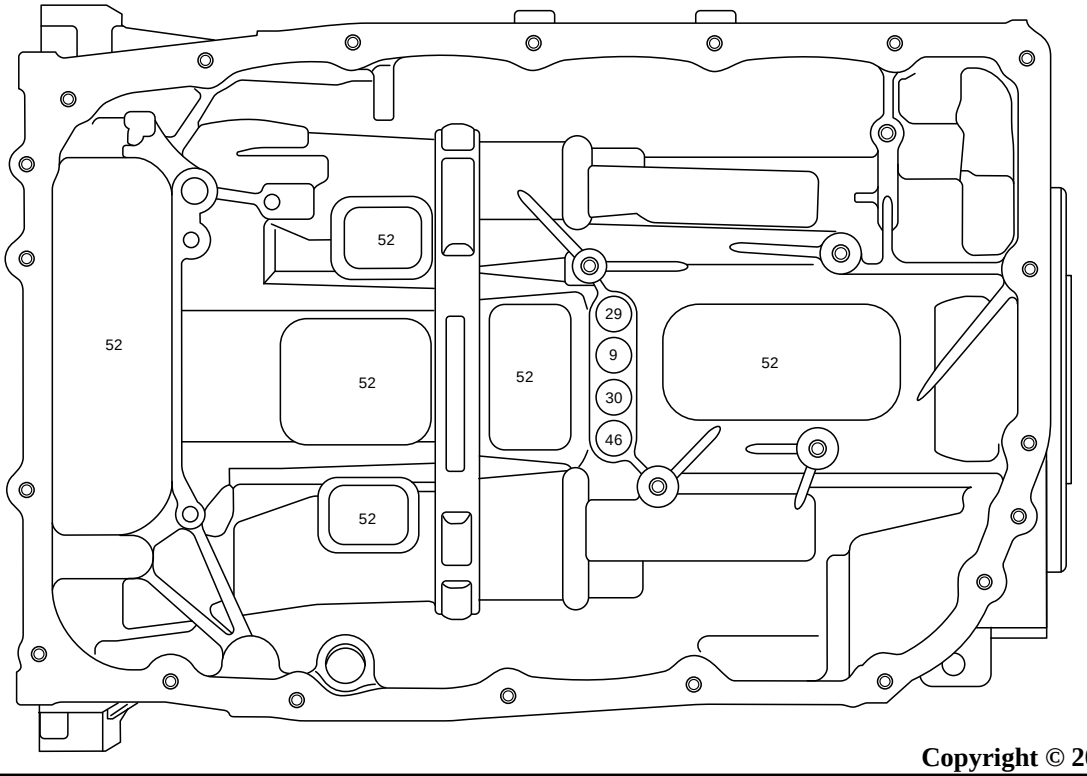
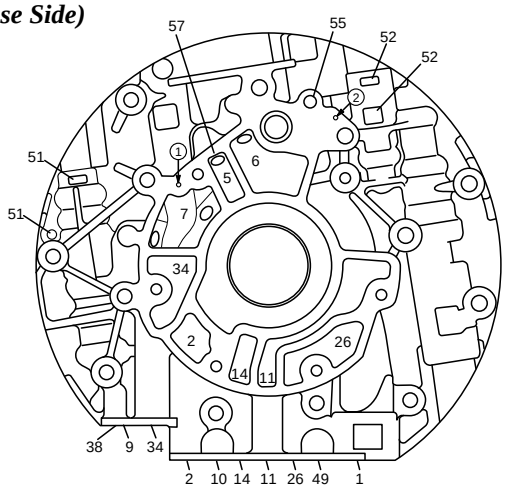


Figure 32

PUMP COVER AND CLUTCH SUPPORT
See Figure 30 For Legend

Pump Cover (Case Side)



Clutch Support (Pump Cover Side)

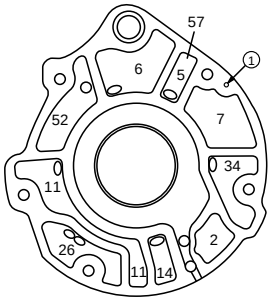
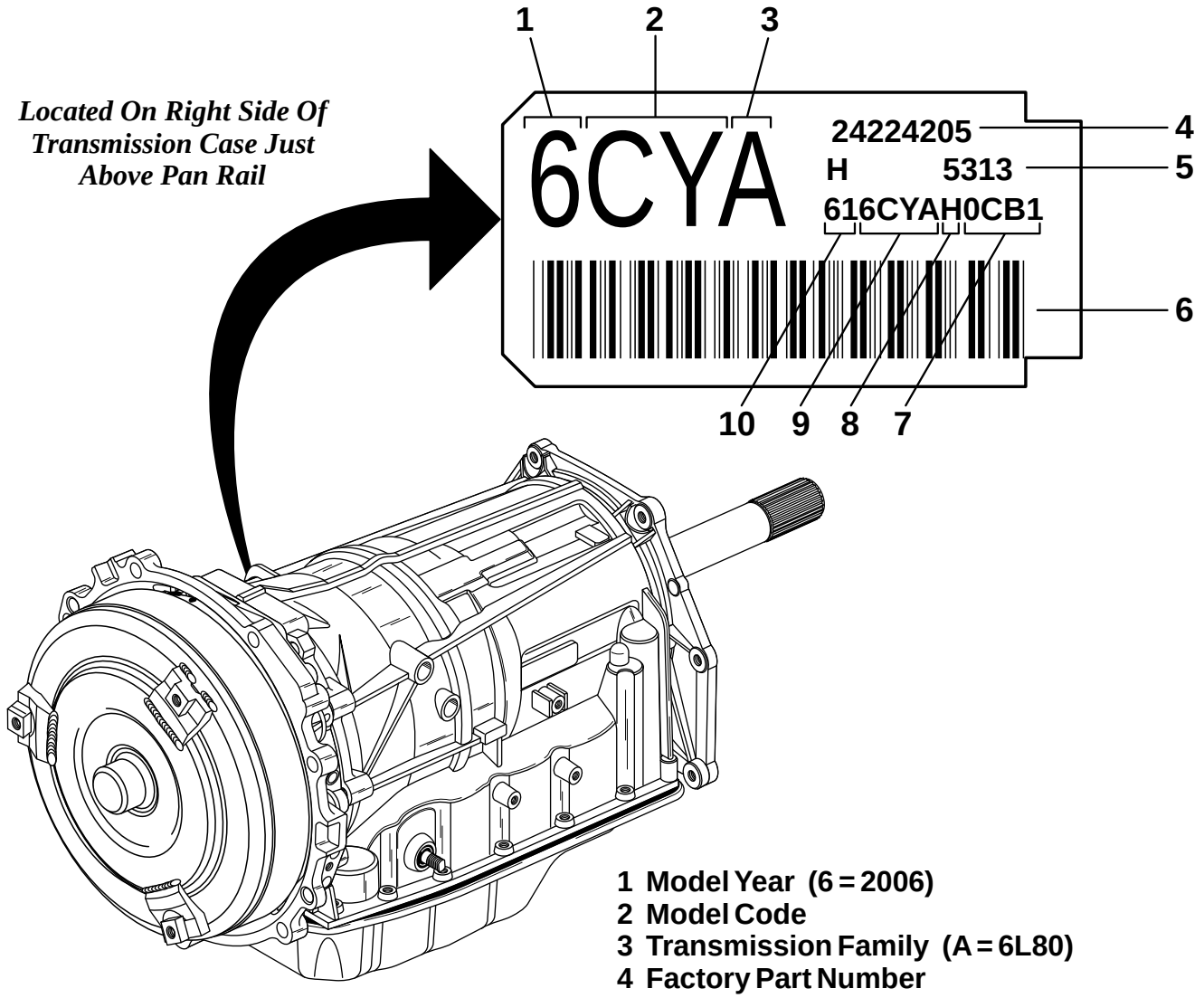


Figure 33

IDENTIFICATION TAG LOCATION AND INFORMATION



1 Model Year (6 = 2006)
2 Model Code
3 Transmission Family (A = 6L80)
4 Factory Part Number
5 Julian Date 5 = Year, 313 = Day Of Year
6 Bar Code
7 Sequential Serial Number
8 Assembly Plant Code
9 Broadcast Code
10 Transmission I.D.

Figure 34

DEXRON VI®	*TRANSMISSION FLUID REQUIREMENTS*	*DEXRON VI®*
Pan Removal - Approximate Capacity		**6.5 Quarts**
Overhaul - Approximate Capacity (Cadillac STSV/XLRV)		**10 Quarts**
Overhaul - Approximate Capacity (Corvette)		**12.5 Quarts**

Figure 35

SATURN VUE VT20/25E

NO RATIO CHANGE

COMPLAINT: After overhaul or valve body removal, the transmission does not change ratio.

CAUSE: The Variable Control Valve lever has not been indexed correctly into the Drive Pulley Follower pocket, or the Ratio Control Motor lever has been wedged between the pintle and the housing.

CORRECTION: The Ratio Control Motor (Stepper Motor) is a bi-directional device which is located on top of the valve body as shown in Figure 1. The Ratio Control Motor indexes with a lever that is attached to the Variable Control Valve in the valve body as shown in Figure 2.
The opposite end of this lever then sits inside a pocket of the Drive Pulley Follower as viewed from the valve body case side with the valve body removed as seen in Figure 3.
This spring loaded follower rides on the movable drive pulley half and reacts to the movement of the drive pulley as it ratios as shown in Figure 4.

With one end of the lever being in the Ratio Control Motor and the other end being in the Drive Pulley Follower, (Refer to Figure 5), the follower acts as a movable pivot point for the lever. As a result of this action, it becomes a mechanical sensor influencing the variable ratio control valve tailoring the feed fluid into the drive pulley piston.

When the valve body is installed where the Variable Control Valve Lever misses the drive Pulley Follower pocket, the valve is unable to respond to the movement of the Ratio Control Motor which will prevent ratio changes of the pullys keeping the transmission in low range.

This can easily be corrected as the valve body is on top of the transmission, just remove the valve body and index the lever into the pocket and re-fasten the valve body to case. Then re-install the Ratio Control Motor being careful that the lever sits inside the pintle pocket and not wedged between the pintle and housing.

RATIO CONTROL MOTOR LOCATION

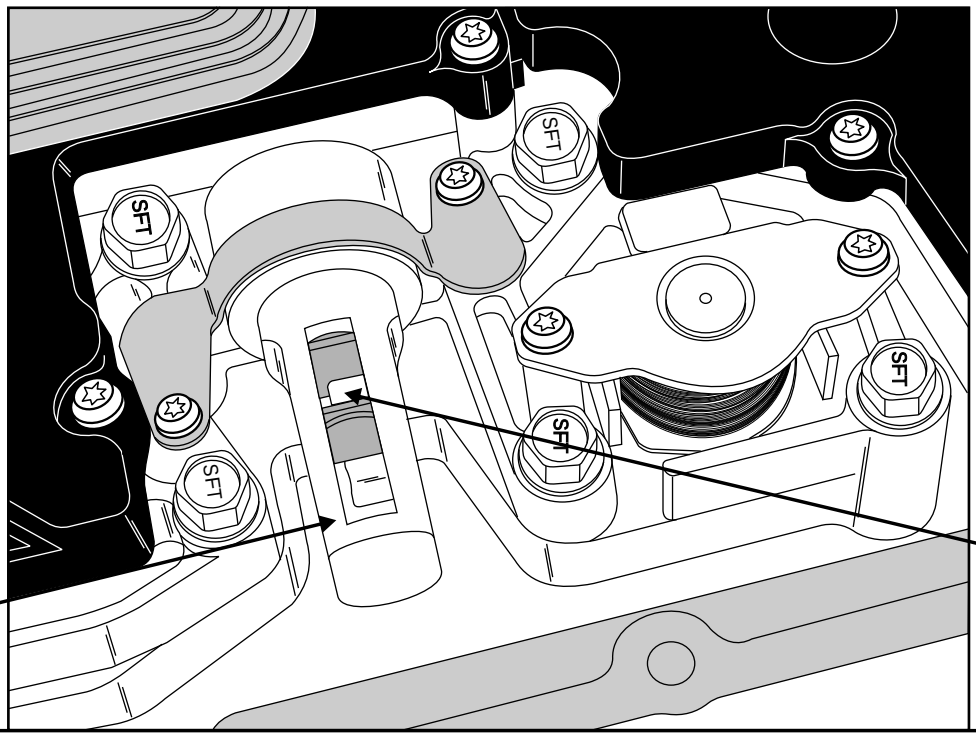


Figure 1

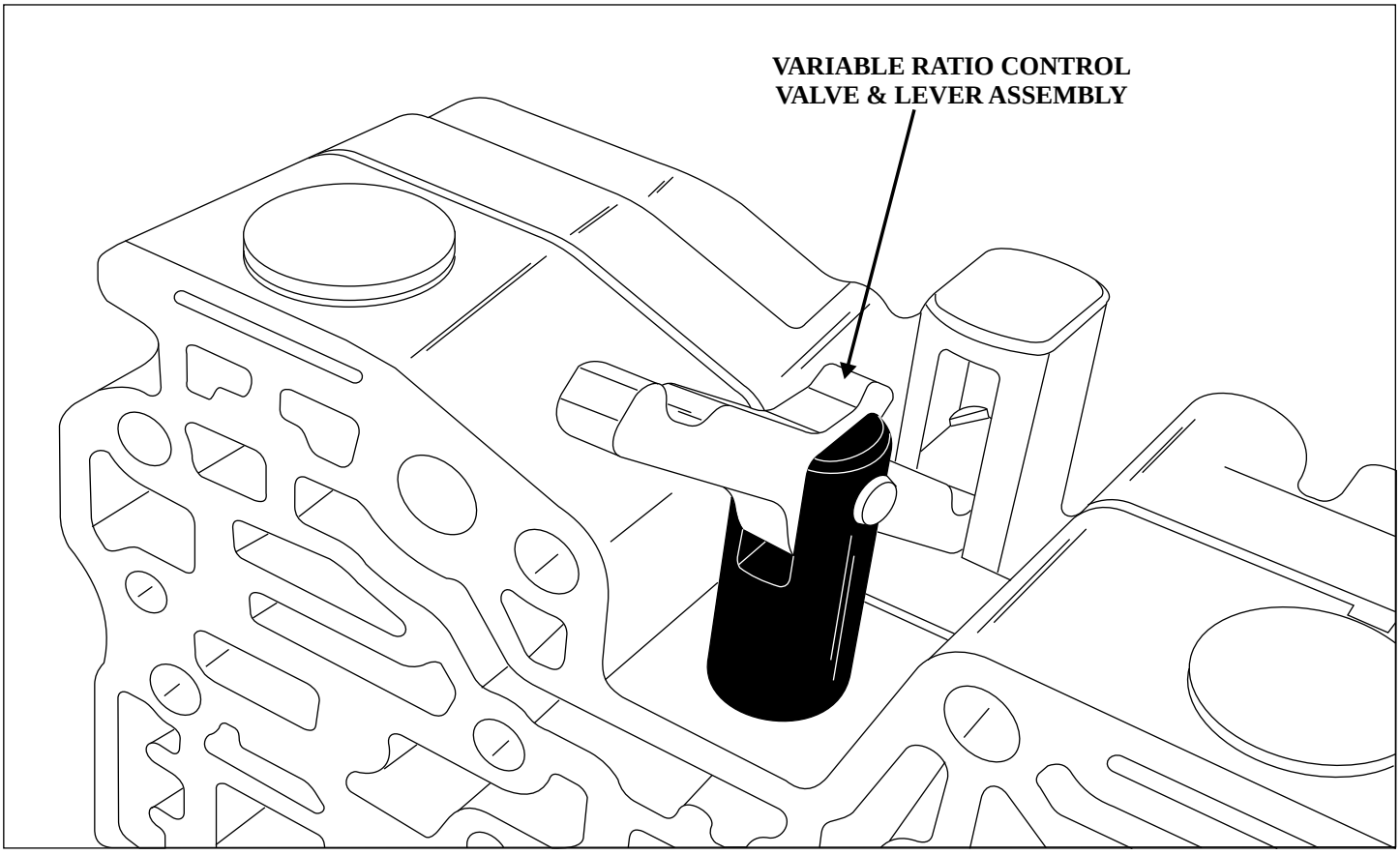


Figure 2

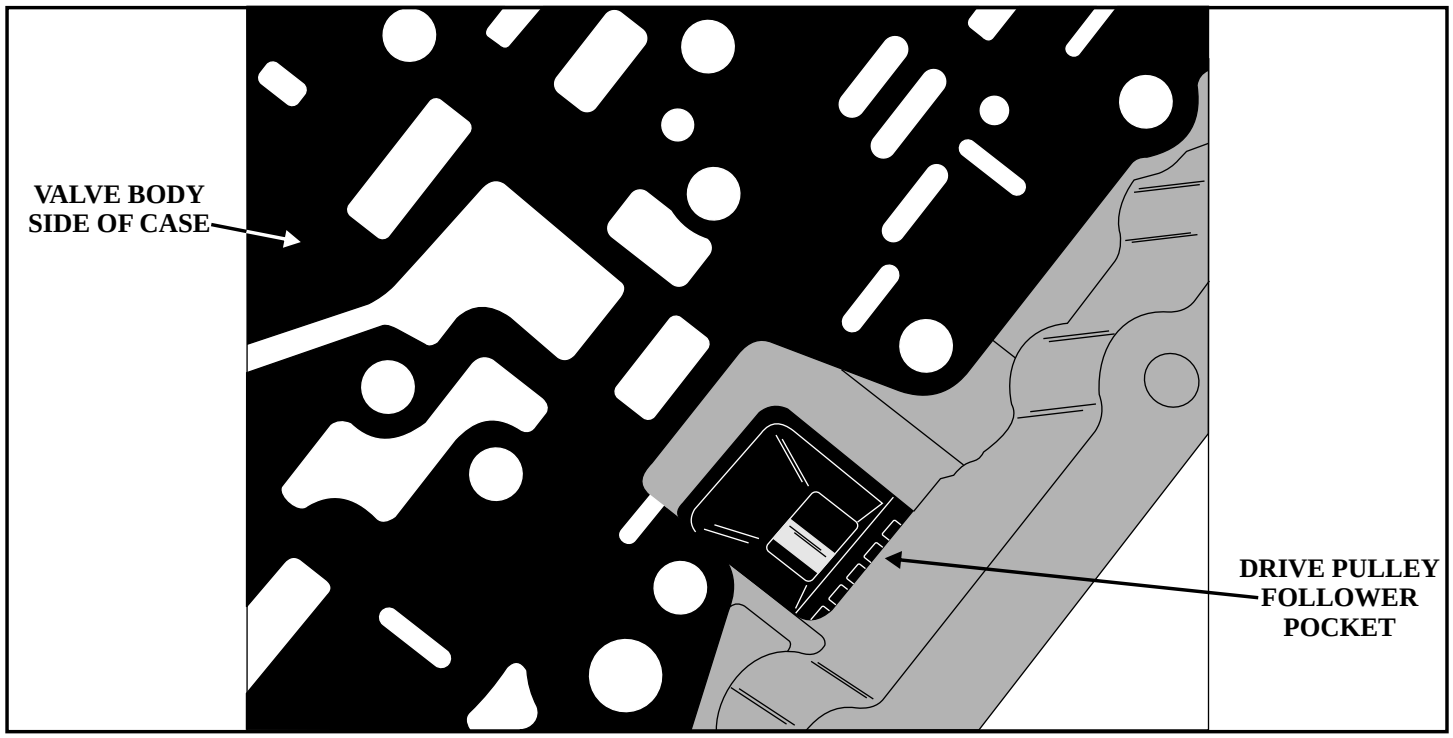


Figure 3

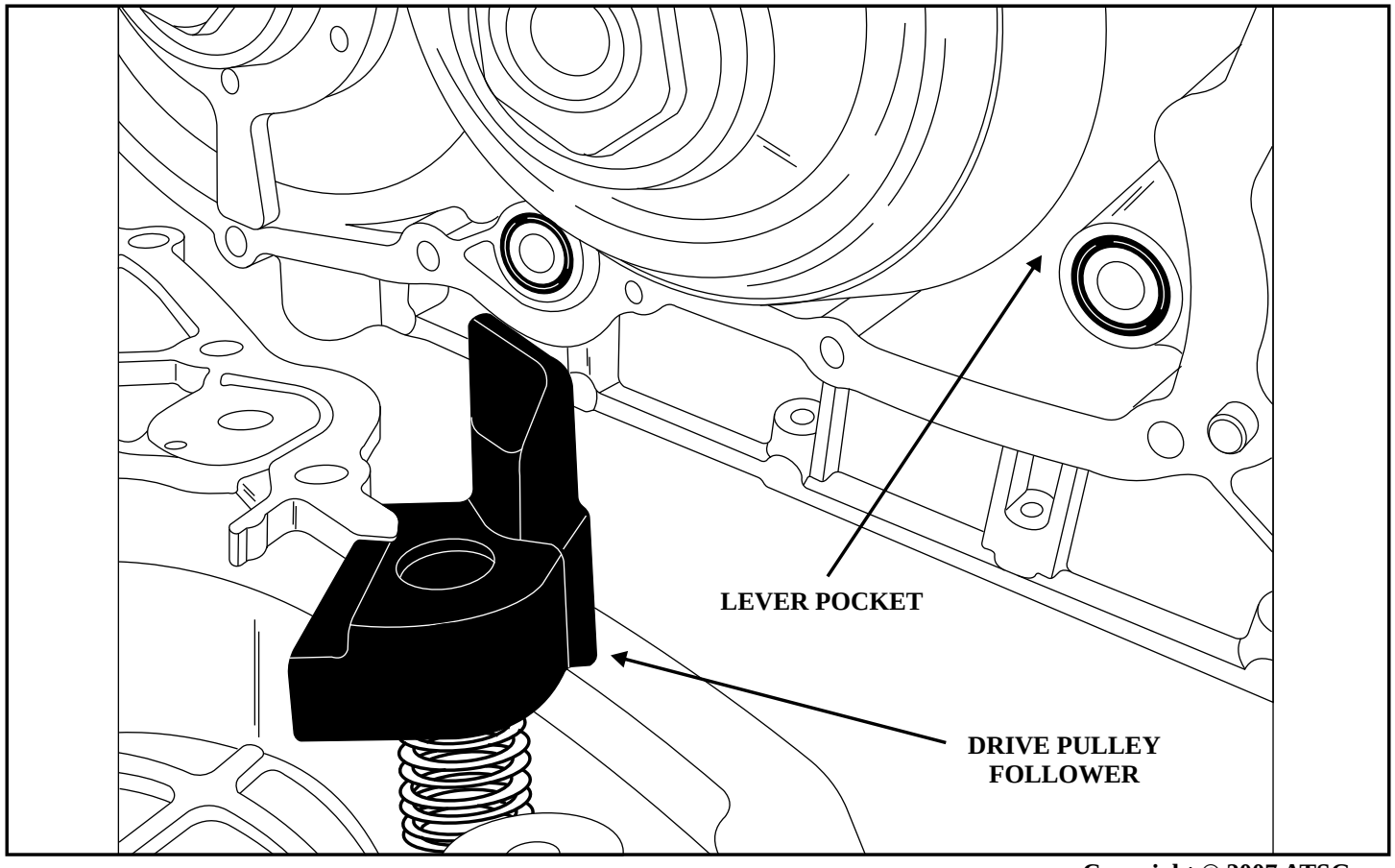


Figure 4

A TO Z TOOLS BLACK & WHITE

RATIO CONTROL MOTOR (RCM) OVERVIEW

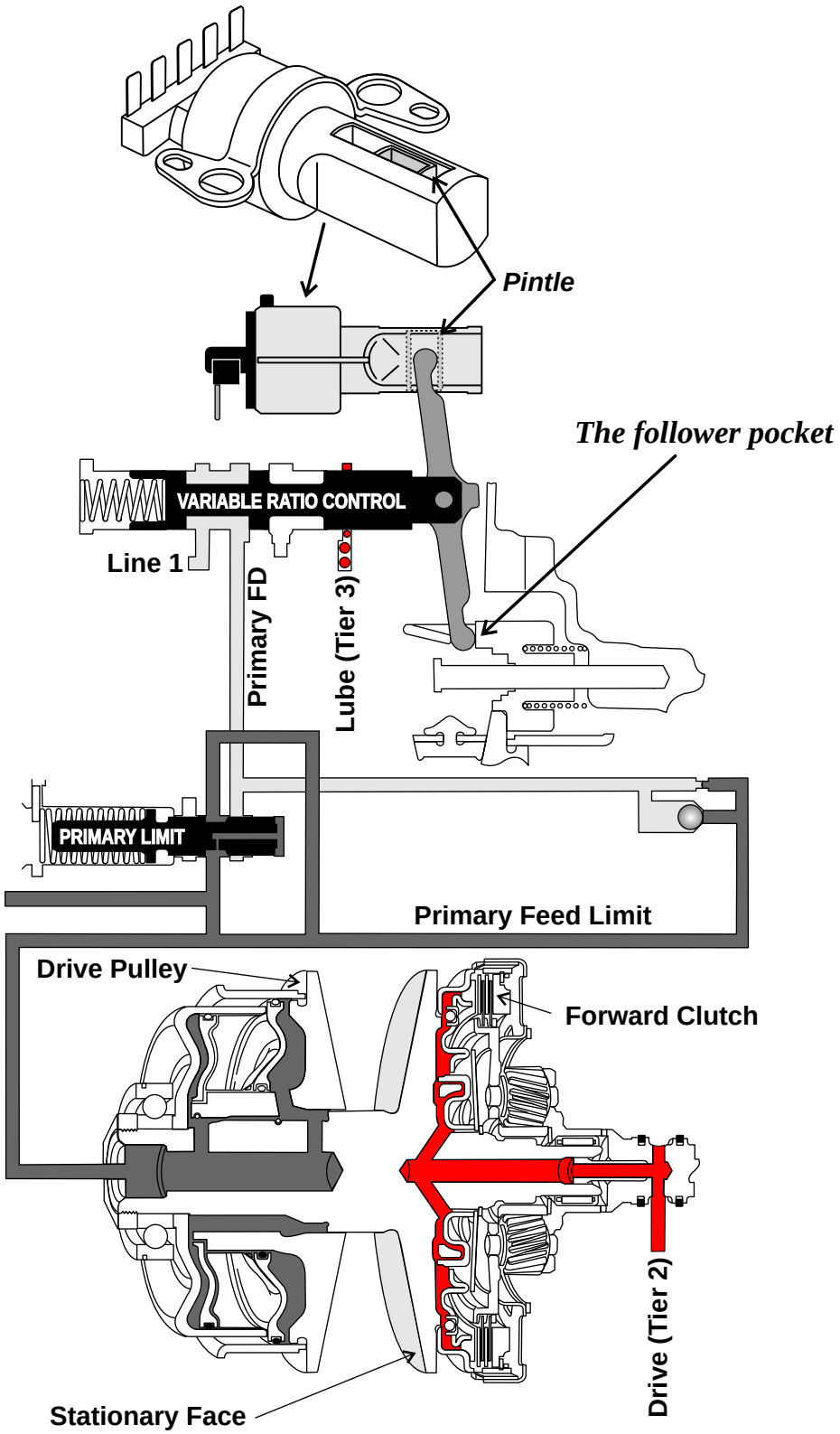


Figure 5

CADILLAC/OLDSMOBILE 4T80E
NO MOVEMENT IN D4 POSITION

COMPLAINT: After an overhaul, a vehicle equipped with the 4T80E automatic transaxle may exhibit a no move condition in the D4 range.

CAUSE: One cause may be the Manual Link and Clip Assembly installed incorrectly. If the Manual Link is installed incorrectly into the Detent Lever, it will throw off the manual valve position enough that line pressure at the manual valve will be blocked and not fill the Drive passage. Note: When in the wrong position, Park will be a little difficult to select but it will go.

CORRECTION: Make certain the Manual Link and Clip Assembly is inserted correctly into the Detent Lever or Rooster Comb. The drawings in Figures 1 and 2 show ***INCORRECT INSTALLATION***. The drawings in Figures 3 and 4 show ***CORRECT INSTALLATION***.

INCORRECT INSTALLATION

Note the position of the detent lever in the illustration below. The detent lever (rooster comb) is not in proper alignment with the detent roller. Notice also the manual link and clip assembly is not properly aligned.

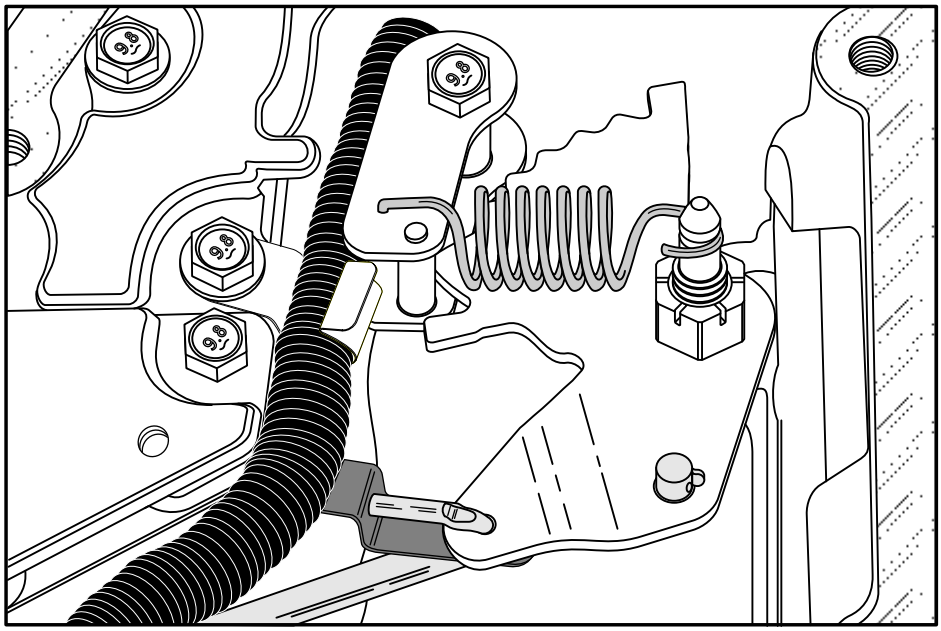


Figure 1

INCORRECT INSTALLATION

Notice the manual valve is extended and not flush with the edge of the bore in the illustration below. With the selector lever in Park, this indicates the manual valve is not correctly adjusted.

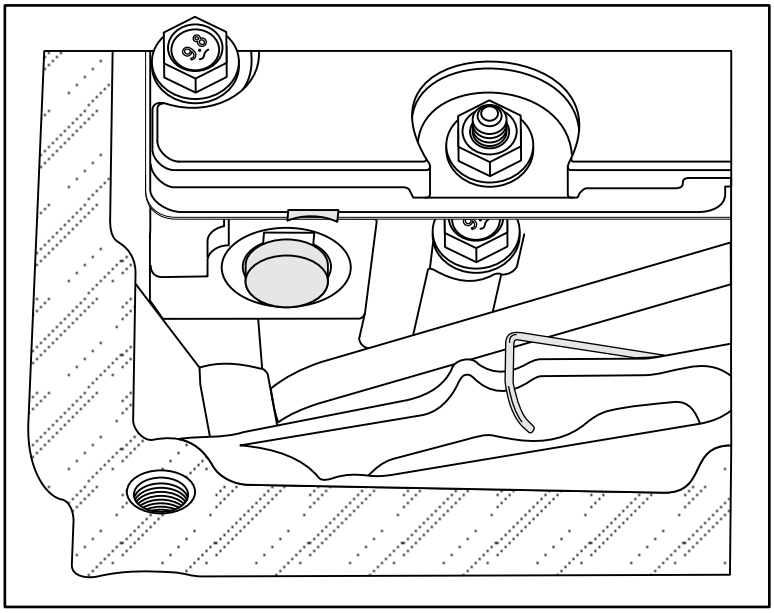


Figure 2

CORRECT INSTALLATION

Note the position of the detent lever in the illustration below. The detent lever (rooster comb) is properly aligned with the detent roller. Notice also the manual link and clip assembly is also properly aligned.

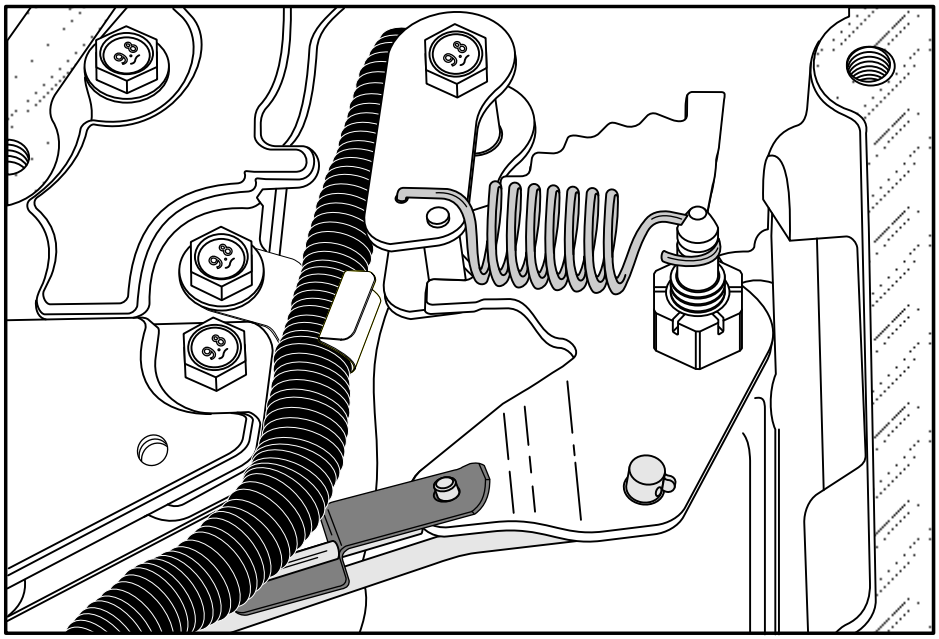


Figure 3

CORRECT INSTALLATION

Notice the manual valve is flush with the edge of the bore in the illustration below. With the selector lever in Park, this indicates the manual valve is correctly adjusted.

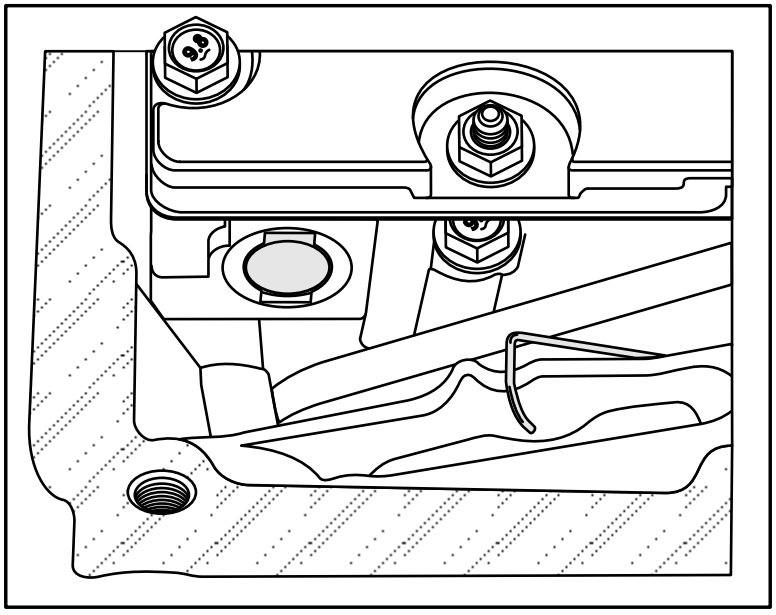


Figure 4

ALLISON 1000/2000

TRANSMISSION PRESSURE SWITCH "STUCK" CODE DIAGNOSIS

COMPLAINT: A truck comes into the shop with complaints of erratic shifting, a shift to the wrong gear and limp mode with the "MIL" Lamp illuminated. A diagnostic scan of the TCM can reveal Diagnostic Trouble Codes P0841, P0842, P0846, P0847, P0871, P0872, P0876, P0877, P1710, P1711, P1714 or P1715.
These codes indicate that one or more of the pressure switches in the Transmission Pressure Switch Assembly (Refer to Figure 1), is either "Stuck Open" or "Stuck Closed". The most common of these codes is P0872/P1711 for 'Pressure Switch "E" Stuck Closed, which will be used as the base of the following diagnosis. Refer to Figure 2 for pressure switch identification.

CAUSE: The P0872/P1711 code indicates that the "E" Pressure Switch is indicating a signal that is different from the commanded position of the "E" shift valve. Unlike, for example a 4L80E, which uses oil directed from the manual valve to open and close the pressure switches, the Allison 1000/2000 series uses oil directed from the shift valves to accomplish that task. The valve body passages that feed the pressure switches can be seen in Figure 3. The only pressure switch in the Allison that uses oil from the manual valve is the Reverse Pressure Switch, Refer to Figure 4 for "Worm Track" identification.
This means that there could be a mechanical problem with Shift Solenoid "E", Shift valve "E" is stuck or the "E" pressure switch is stuck closed. The same could be true with Shift Solenoids "C" and "D" as well as Shift Valves "C" and "D" when diagnosing other pressure switch codes. So, the way the diagnostic course goes is, shift solenoid controls shift valve and shift valve operates pressure switch, (Except Reverse). Refer to Figures 5 and 6 for solenoid and valve identification.

CORRECTION: When diagnosing code P0872/P1711, start by checking the pressure switch assembly ranging by comparing the PSA range chart in Figure 7 with the ranging on the scan tools data list. The chart indicates both switch status and scan tool parameter status.

Since Shift Solenoids C, D and E are identical, one can be switched with the other to see if the solenoid is causing the pressure switch code. The shift valve is either stuck or not, and the pressure switch assembly can be checked for mechanical operation on the bench with an ohm meter connected to the switch terminals and physically pushing on the switch and releasing it while watching the meter to see if it changes from an open to a closed state, See Figure 8.

SERVICE INFORMATION:
There is much confusion between wiring diagrams and scan tool parameter displays concerning the pressure switch identification. Referring to Figure 9, notice that the pressure switch electrical circuits are labeled A, B, C and D, but the pressure switch identification is Pressure Switch C, D, E and R. Be careful not to confuse this.

IMPORTANT NOTE: A faulty Neutral Safety Back Up (NSBU) Switch can cause P0872/P1711 to be stored **FALSELY.** Refer to Figure 10 for the NSBU Switch Logic chart.

TRANSMISSION FLUID PRESSURE SWITCH LOCATION

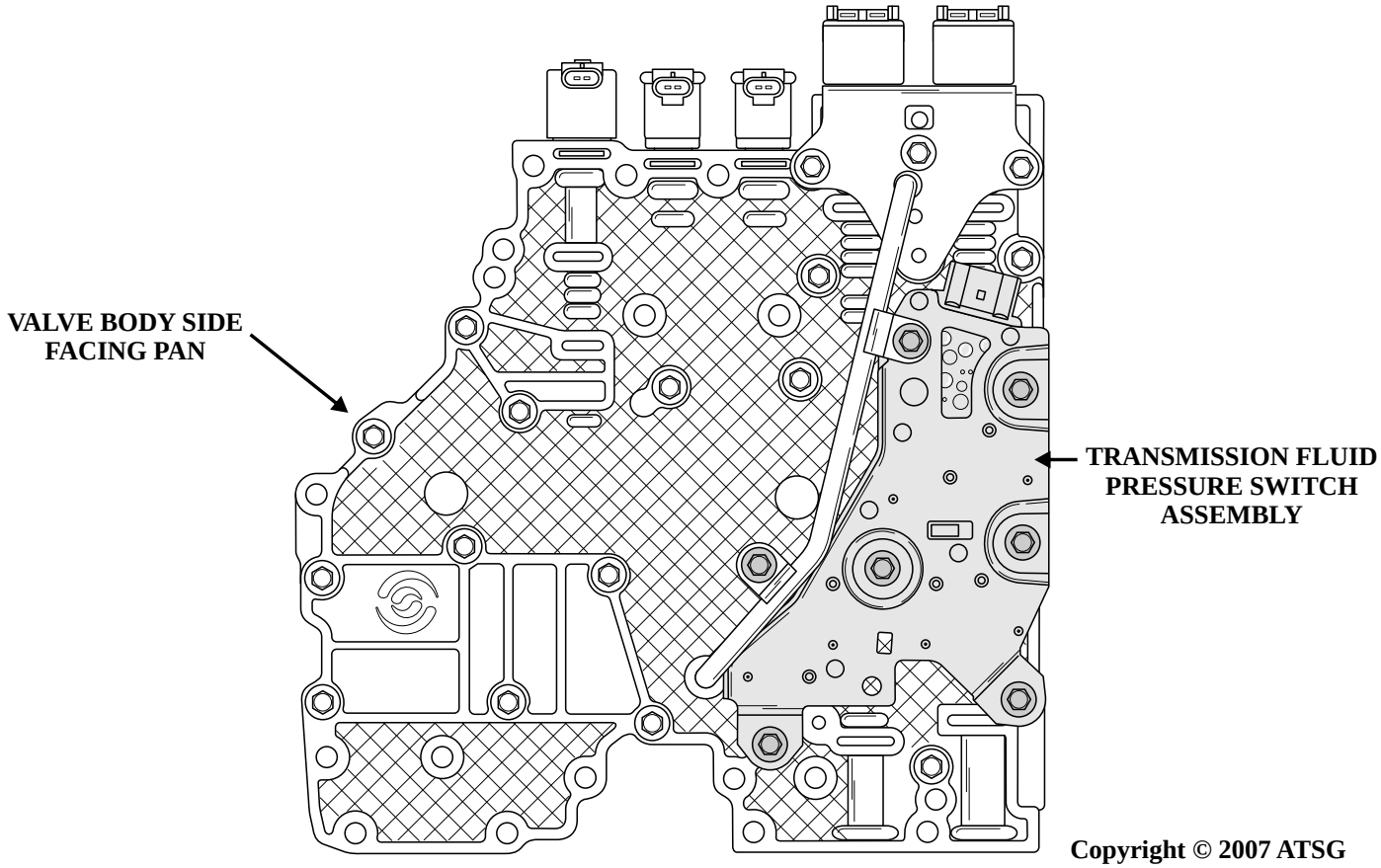


Figure 1

TRANSMISSION FLUID PRESSURE SWITCH IDENTIFICATION

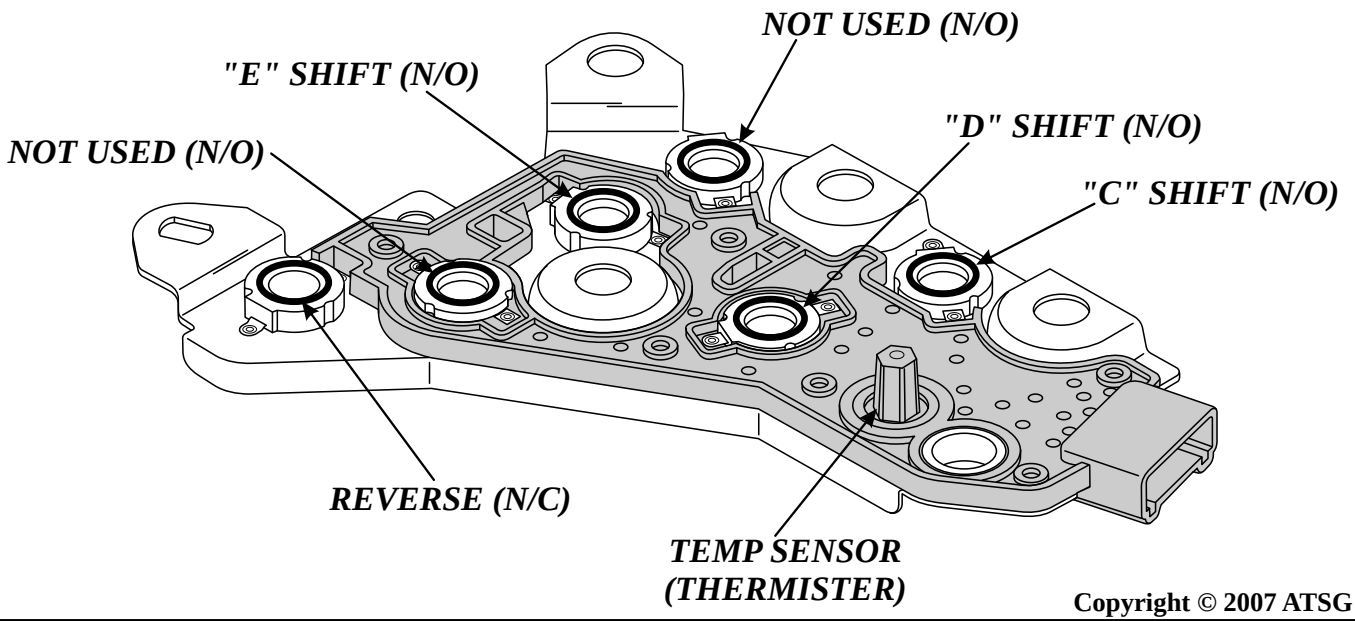
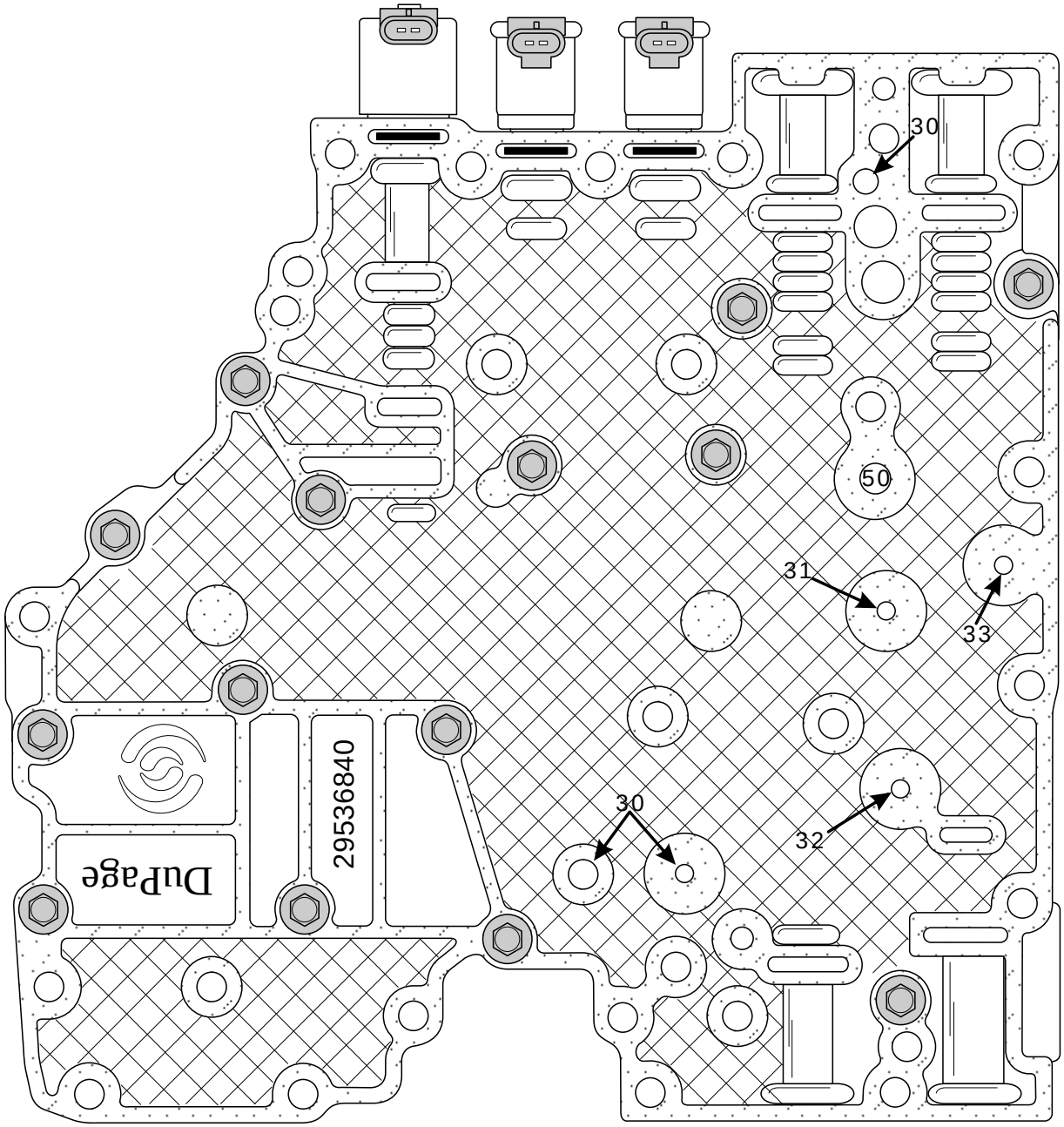


Figure 2

VALVE BODY PRESSURE SWITCH FEED PASSAGES

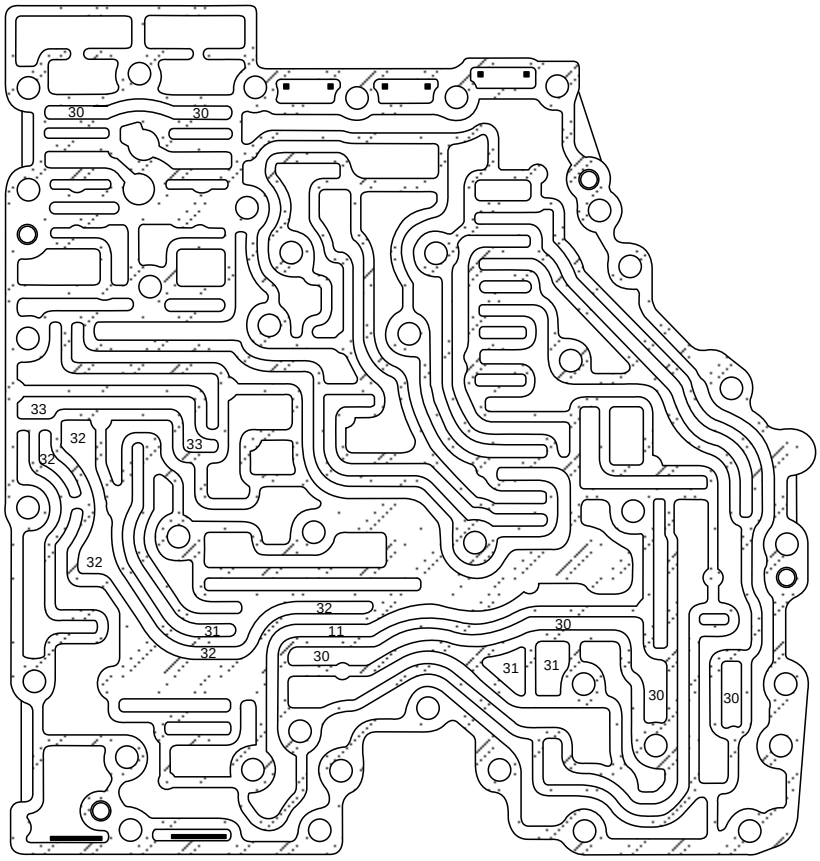


Passage # 30.....Reverse Pressure Switch
Passage # 31....."D" Shift Valve Pressure Switch
Passage # 32....."E" Shift Valve Pressure Switch
Passage # 33....."C" Shift Valve Pressure Switch

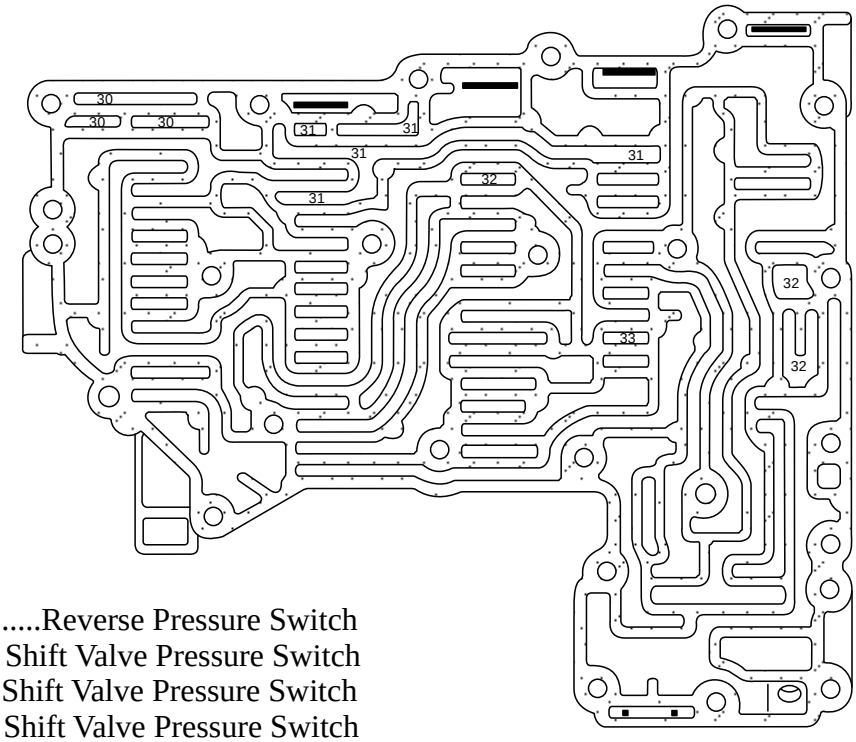
Figure 3

VALVE BODY PRESSURE SWITCH FEED PASSAGES

MAIN VALVE BODY



SHIFT VALVE BODY



Passage # 30.....Reverse Pressure Switch
Passage # 31....."D" Shift Valve Pressure Switch
Passage # 32....."E" Shift Valve Pressure Switch
Passage # 33....."C" Shift Valve Pressure Switch

Figure 4

"MAIN" VALVE BODY EXPLODED VIEW

1. MAIN VALVE BODY CASTING.
2. ALIGNMENT DOWELS (5 REQUIRED).
3. MAIN CONTROL RELIEF VALVE.
4. MAIN CONTROL RELIEF VALVE SPRING.
5. MAIN CONTROL RELIEF VALVE SPRING RETAINER.
6. EXHAUST BACKFILL VALVE SPRING RETAINER.
7. EXHAUST BACKFILL VALVE SPRING.
8. EXHAUST BACKFILL VALVE.
9. BOLT, M6 X 1.0 X 50 (23 REQUIRED)
10. SOLENOID "F" TRIM VALVE SPRING.
11. SOLENOID "F" TRIM VALVE.
12. SOLENOID "F" TRIM VALVE SLEEVE.
13. SOLENOID "F" SMALL "O" RING.
14. SOLENOID "F" LARGE "O" RING.
15. SOLENOID "F" (LOCK-UP PWM).
16. SOLENOID "F" RETAINING CLIP.
17. SHIFT SOLENOID "D" SMALL "O" RING.
18. SHIFT SOLENOID "D" LARGE "O" RING.
19. SHIFT SOLENOID "D".
20. SHIFT SOLENOID "D" RETAINING CLIP.
21. SHIFT SOLENOID "E" SMALL "O" RING.
22. SHIFT SOLENOID "E" LARGE "O" RING.
23. SHIFT SOLENOID "E".
24. TRIM PRESSURE ACCUMULATORS.
25. TRIM PRESSURE ACCUMULATOR SPRINGS.
26. TRIM SOLENOID "A" AND "B" RETAINING BRACKET.
27. TRIM "B" VALVE SPRING.
28. TRIM "B" VALVE.
29. TRIM GAIN VALVE.
30. TRIM SOLENOID "B" "O" RING (BLACK).
31. TRIM SOLENOID "B" (N/O PWM) (Snout Diameter = .665").
32. TRIM SOLENOID "A" (N/C PWM) (Snout Diameter = .645").
33. TRIM SOLENOID "A" "O" RING (GREEN).
34. TRIM GAIN VALVE.
35. TRIM "A" VALVE (Note I.D. Ring Between Lands).
*36. TRIM "A" VALVE SPRING. (Early Models Did Not Use This Spring)

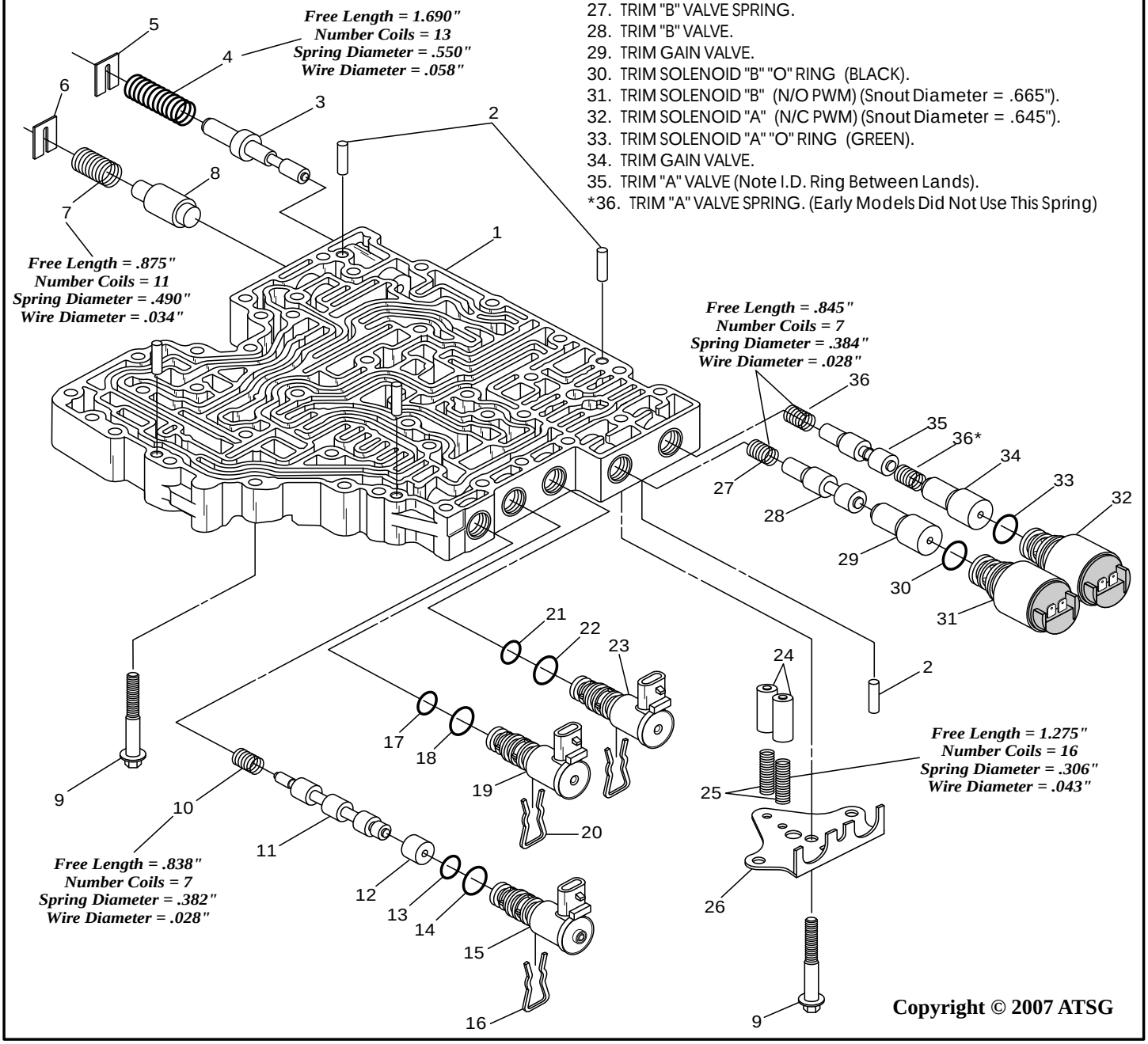


Figure 5

"SHIFT" VALVE BODY EXPLODED VIEW

1. SHIFT VALVE BODY CASTING.
2. SOLENOID SCREEN.
3. SHIFT SOLENOID "C".
4. SHIFT SOLENOID "C" RETAINING CLIP.
5. MANUAL SELECTOR VALVE.
6. MANUAL SELECTOR VALVE PIN.
7. SOLENOID "D" SHIFT VALVE.
8. SOLENOID "D" SHIFT VALVE SPRING.
9. SOLENOID "D" SHIFT VALVE BORE PLUG.
10. SOLENOID "D" SHIFT VALVE LINE-UP RETAINER.
11. SOLENOID "E" SHIFT VALVE.
12. SOLENOID "E" SHIFT VALVE SPRING.
13. SOLENOID "E" SHIFT VALVE BORE PLUG.
14. SOLENOID "E" SHIFT VALVE LINE-UP RETAINER.
15. SOLENOID "C" SHIFT VALVE.
16. SOLENOID "C" SHIFT VALVE SPRING.
17. SOLENOID "C" SHIFT VALVE LINE-UP RETAINER.
18. MAIN CONTROL VALVE.
19. MAIN CONTROL VALVE SPRING.
20. MAIN CONTROL VALVE LINE-UP RETAINER.

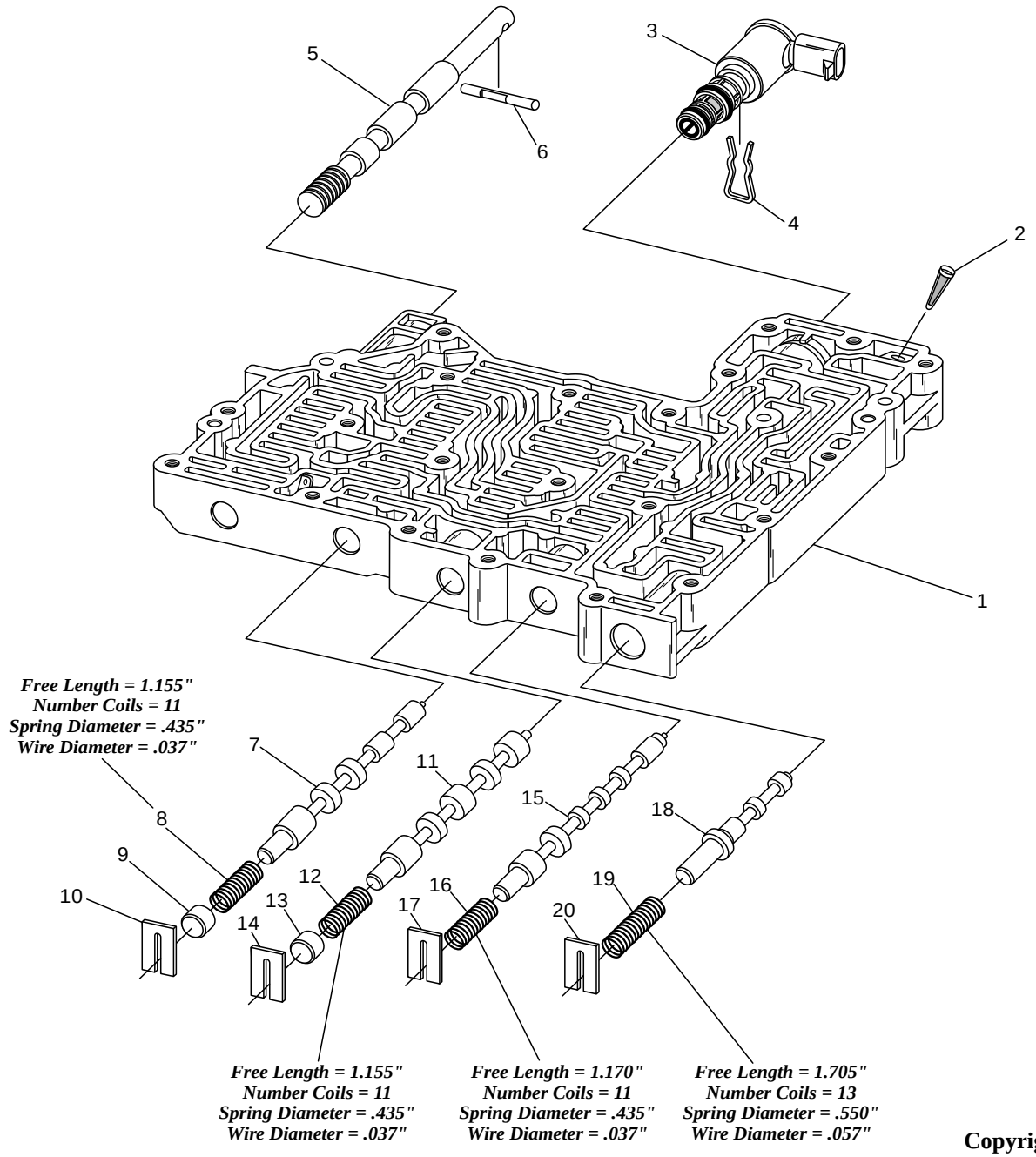


Figure 6

PRESSURE SWITCH STATUS CHART

RANGE	PRESSURE SWITCH C (N.O.)		PRESSURE SWITCH D (N.O.)		PRESSURE SWITCH E (N.O.)		PRESSURE SWITCH R (N.C.)	
	SWITCH STATUS	SCAN TOOL STATUS	SWITCH STATUS	SCAN TOOL STATUS	SWITCH STATUS	SCAN TOOL STATUS	SWITCH STATUS	SCAN TOOL STATUS
R	CLOSED	ON*	CLOSED	ON	CLOSED	ON	CLOSED	ON
N	CLOSED	ON	CLOSED	ON	CLOSED	ON	OPEN	OFF
1	OPEN	OFF	CLOSED	ON	OPEN	OFF	OPEN	OFF
2	OPEN	OFF	OPEN	OFF	OPEN	OFF	OPEN	OFF
3	CLOSED	ON	OPEN	OFF	OPEN	OFF	OPEN	OFF
4	CLOSED	ON	OPEN	OFF	CLOSED	ON	OPEN	OFF
5	OPEN	OFF**	OPEN	OFF	CLOSED	ON	OPEN	OFF

N.O. = Normally Open N.C. = Normally Closed
****Pressure Switch "C" reverts to the CLOSED/ON state with throttle applied in Reverse.***
*****Model year 2001 ONLY; In 5th range Pressure Switch "C" remains in the CLOSED/ON state until 3900 RPM is attained.***

Figure 7

BENCH TESTING PRESSURE SWITCH ASSEMBLY

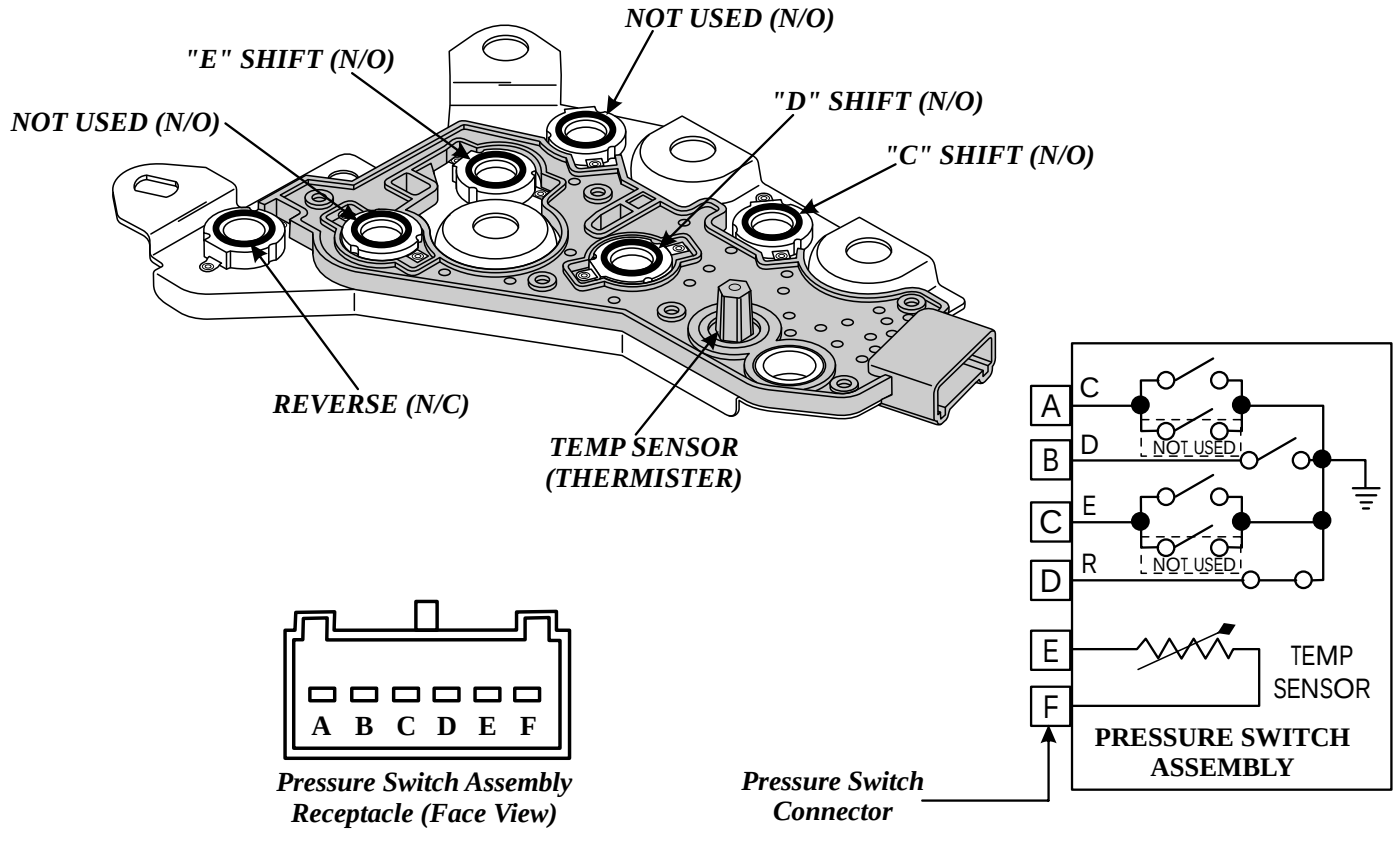


Figure 8

PRESSURE SWITCH CONNECTOR PIN FUNCTION AND IDENTIFICATION

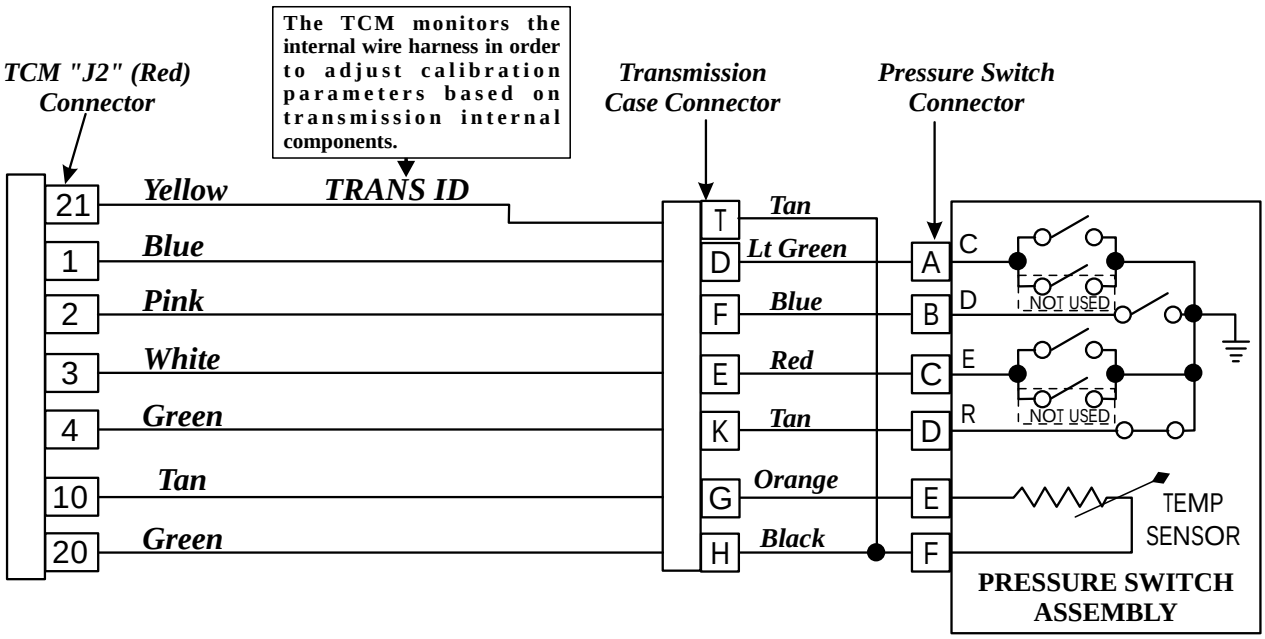


Figure 9

NEUTRAL SAFETY BACK UP (NSBU) SWITCH LOGIC				
GEAR SELECTOR POSITION	**RANGE "A"**	**RANGE "B"**	**RANGE "C"**	**RANGE "P"**
Park (P)	ON	OFF	OFF	ON
Reverse (R)	ON	ON	OFF	OFF
Neutral (N)	OFF	ON	OFF	ON
D	OFF	ON	ON	OFF
3	ON	ON	ON	ON
2	ON	OFF	ON	OFF
1	OFF	OFF	ON	ON
OFF = 12 Volts **ON = 0 Volts**				

Figure 10

ISUZU/CHEVY/GMC JR403E

INSTRUMENT CLUSTER WARNING LAMPS REMAIN "ON"

COMPLAINT: The truck comes into the shop with a transmission problem. During the complaint verification road test, the technician notices that the Battery Discharge, Brake system, Low Vacuum and Low Fuel Warning Lamps are illuminated, (Refer to Figure 1).
After the rebuilt transmission is installed and during the initial road test, the same warning lamps are still illuminated, the truck performed flawlessly and there were no other problems including the fact that the fuel gauge functioned properly.
Upon questioning the owner of the vehicle, it is discovered that the alternator had recently been replaced, but the lamps still remained on, no fuses were blown.

CAUSE: Referring to the instrument cluster diagram in Figure 2, Battery voltage is supplied to most of the IC Lamps from fuse #5. What is unusual is the 4 warning lamps that remain on, they have their own respective ground paths that would normally be used to illuminate the lamp. BUT, they each have their own splice and diode in their ground circuits which ties them all in the shared circuit going to fuse #19. ***In other words, voltage is supplied through each ground path through a diode.***
If only fuse #5 is pulled out, all lamps that are supplied power by this fuse go out. When only fuse #19 is pulled out, the 4 lamps that won't go out finally turn off.
It would seem that fuse #19 was acting as a ground path for the malfunctioning 4 lamps instead of a power supply.
If each of the individual ground paths were shorted to ground, they should remain lit with fuse #19 removed, but, they remained on.
Referring to the wire diagram in Figure 3, It can be seen that fuse #19 receives power through the Charging Relay. When the system is functioning correctly it is the alternator that supplies power from terminal 1 to energize the charging relay coil which then closes the contacts inside the relay allowing power to then be supplied to fuse #19. Power from fuse #19 is then sent to each of the warning lamps ground circuit. Since each of these circuits do not go to ground unless there is a problem with the system it is responsible for, these lamps would remain off.
When there is a problem in one of the systems that a warning lamp is responsible for, and the lamp came on, the diode in the circuit is sufficient enough to not let the power supply coming from fuse #19 to not interfere with the normal function of turning that lamp on.
The problem is, if the alternator does not energize the relay coil, or the coil is burnt out, the contacts in the relay would be connected to a ground path. This would cause fuse #19 to act as a ground path which would illuminate the 4 warning lamps.
The coil in the relay was damaged and would not energize sufficiently to allow the internal relay contacts to pull together and supply power to fuse #19, (this may have been caused by the alternator going bad). Instead it remained grounded keeping the 4 warning lamps lit.
The charging relay can provide a ground path or a power supply. When operating normally it is a power supply.

CORRECTION: When the charging relay acts as a ground, the alternator may be bad, the wire from terminal 1 at the alternator to terminal 4 of the charging relay is broken or the relay is malfunctioning. The relay will not interchange with any other relay in the underdash fuse box which is why it is the only BLUE colored relay in the panel as shown in Figure 4. Replace the relay or repair the broken wire.

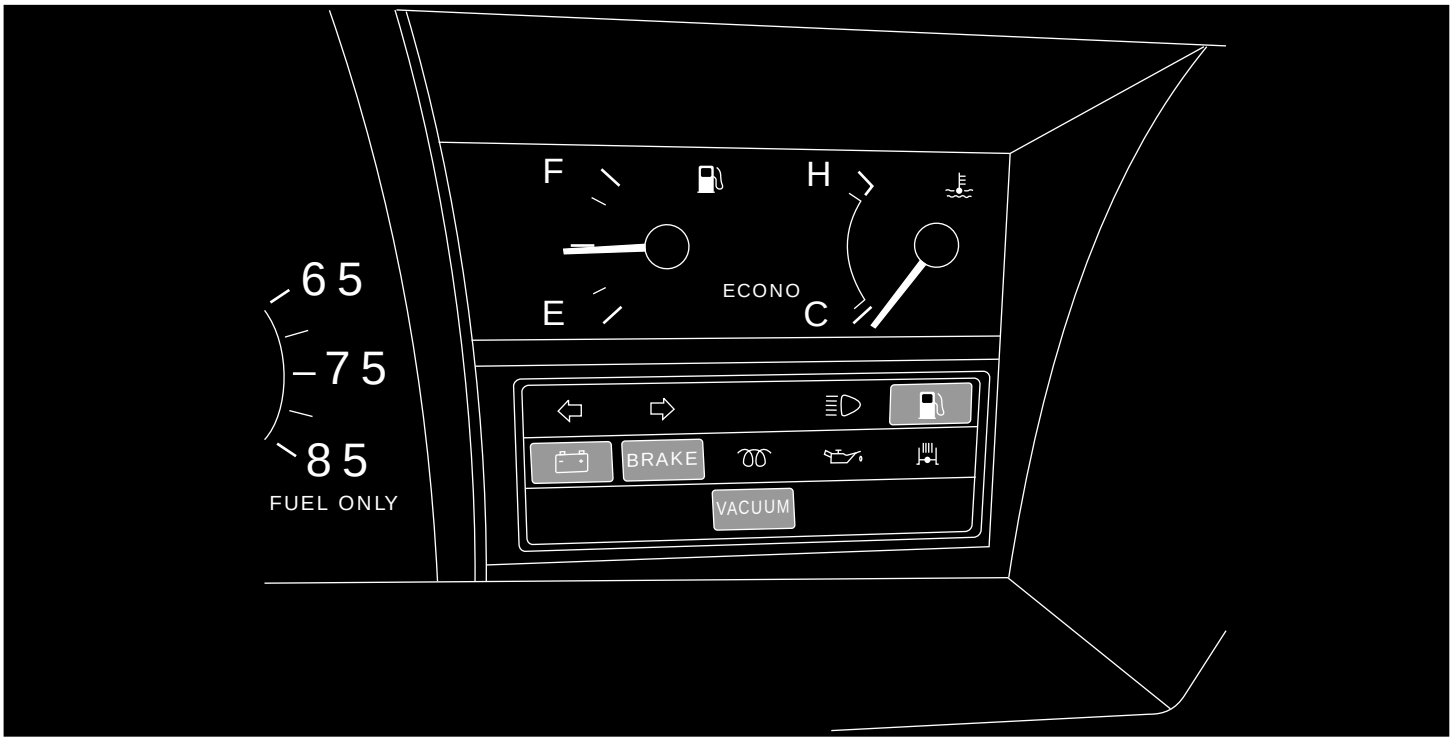


Figure 1

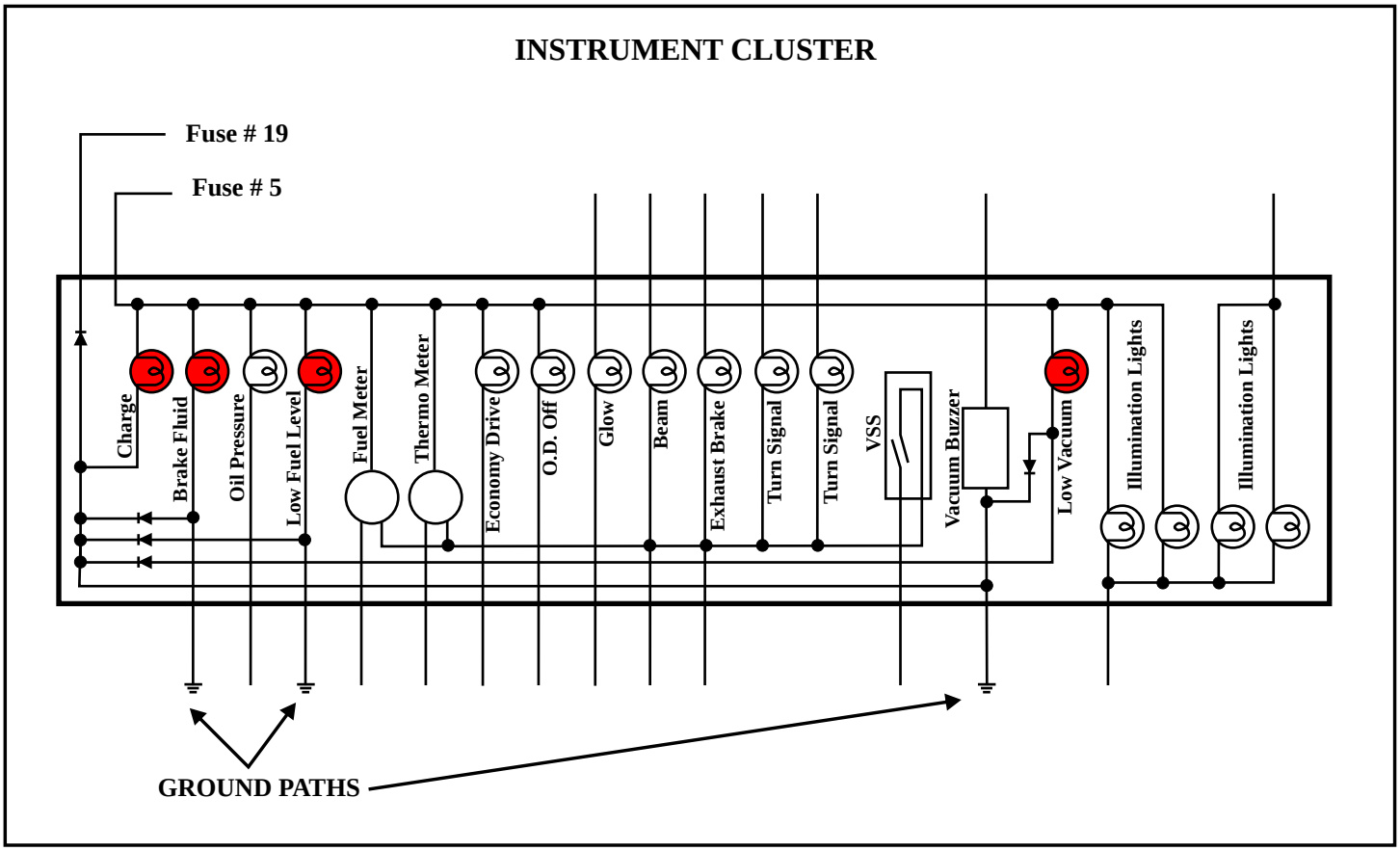


Figure 2

CHARGING RELAY CIRCUIT DIAGRAM

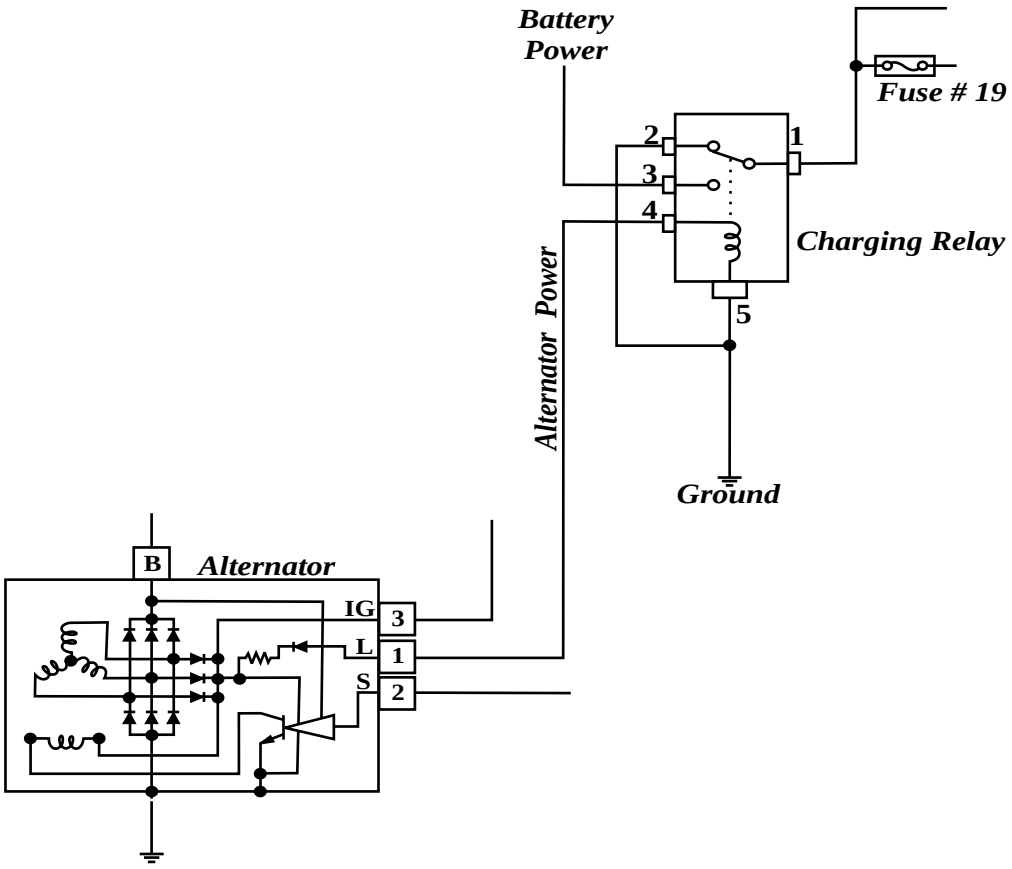


Figure 3

FUSE AND RELAY PANEL IS LOCATED BELOW THE GLOVE BOX

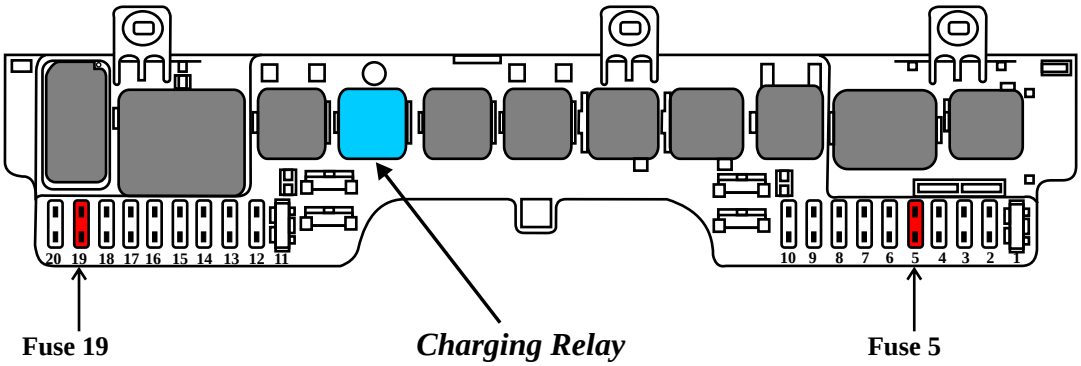


Figure 4

ISUZU/CHEVY/GMC JR403E 1995 & EARLIER

NO ENGINE BRAKING ASSIST/NO CRANK OR HARD START

COMPLAINT: The truck will have no engine braking assist from the exhaust brake system and may also have an intermittent no crank condition and/or starting will difficult.

CAUSE: The coolant recovery tank is mounted on the frame rail over a relay junction box as shown in Figure 1.The relay box usually has a cover over it to protect it from the elements and other contamination. The cover has a bracket to hold the overflow hose in place. At some point in time the relay box cover is not re-installed or fell off allowing the overflowing coolant to blow into the open relay box.
Contained within the relay box are the exhaust brake, starter and glow plug relays. Depending on which relay gets corroded and no longer has electrical contact with its circuits will produce one or more of the above complaints, (Refer to Figure 2).

Should water contamination compromise the glow plug relays, the number 5 fuse in the under dash fuse box will blow, (Refer to Figure 3). The number 5 fuse supplies power to relays as well as many of the instrument cluster indicator and warning lamps, See Figure 4.

CORRECTION: Once the damaged relays are replaced and electrical integrity is restored, some attempt should be made to protect the relay box from future contamination.
For the 1995and a half model year this relay box was moved to the outside rear of the cab. It is vital that the relay box cover be in place as there would be nothing to protect the relays from inclement weather.

SERVICE INFORMATION:
Relays and relay box components can be purchased from RC Truck Parts at www.rc-truckparts.com or 305-863-3933.

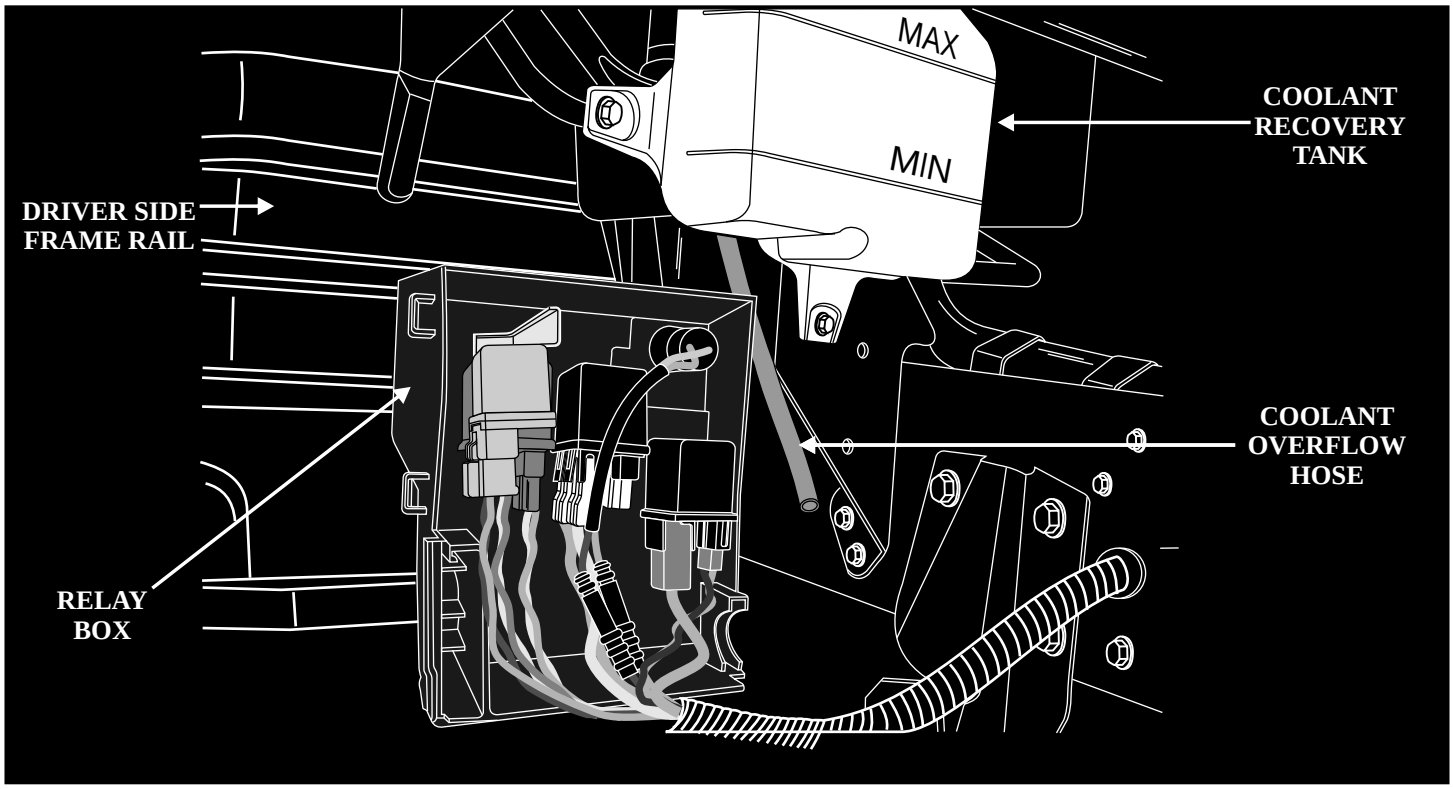


Figure 1

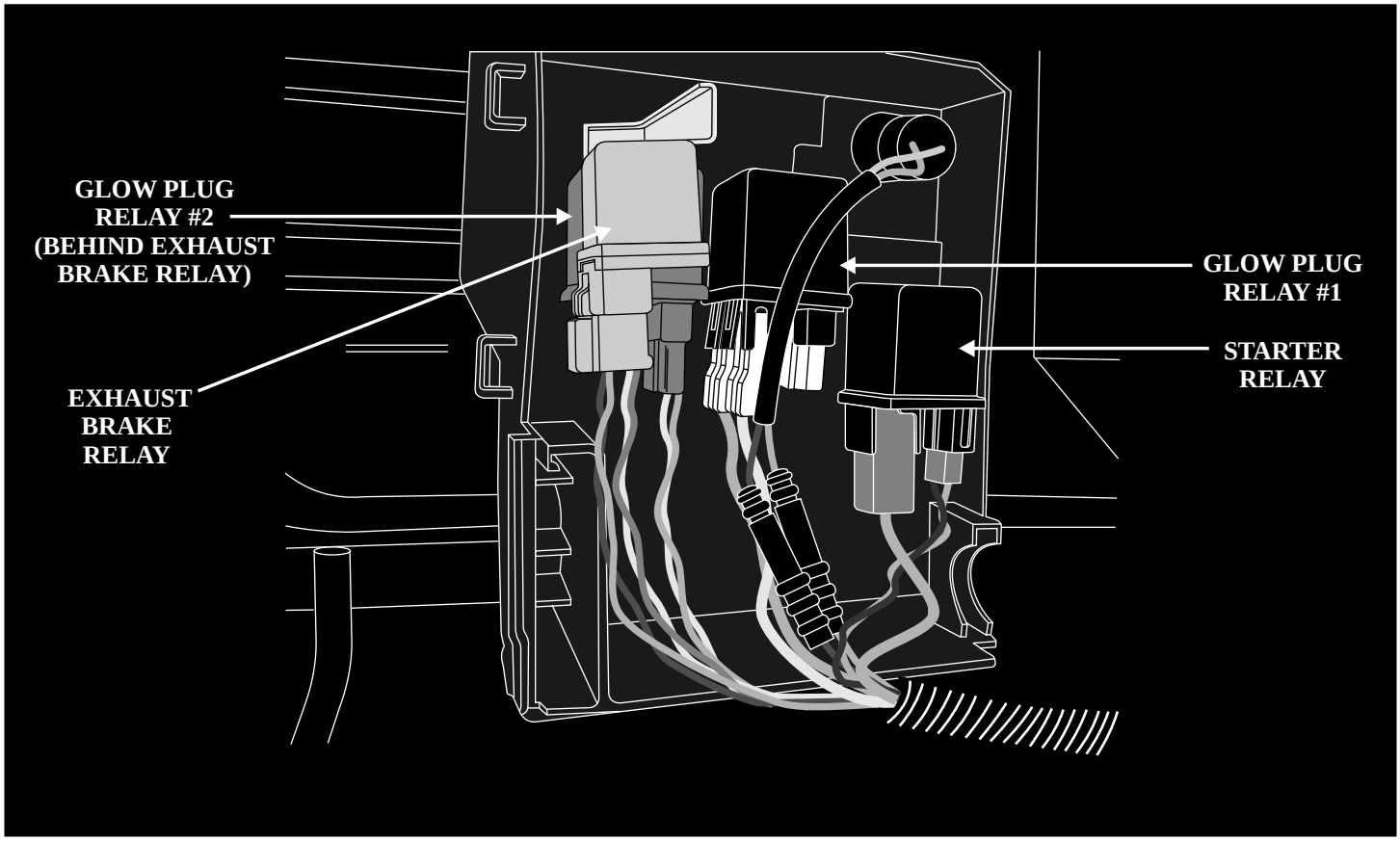


Figure 2

UNDERDASH FUSE BOX

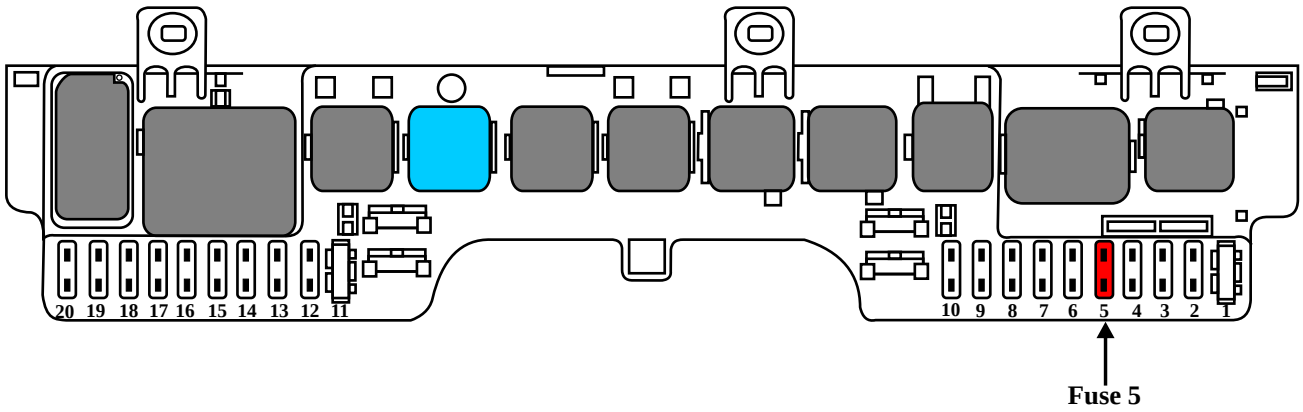


Figure 3

INSTRUMENT CLUSTER WARNING LAMPS

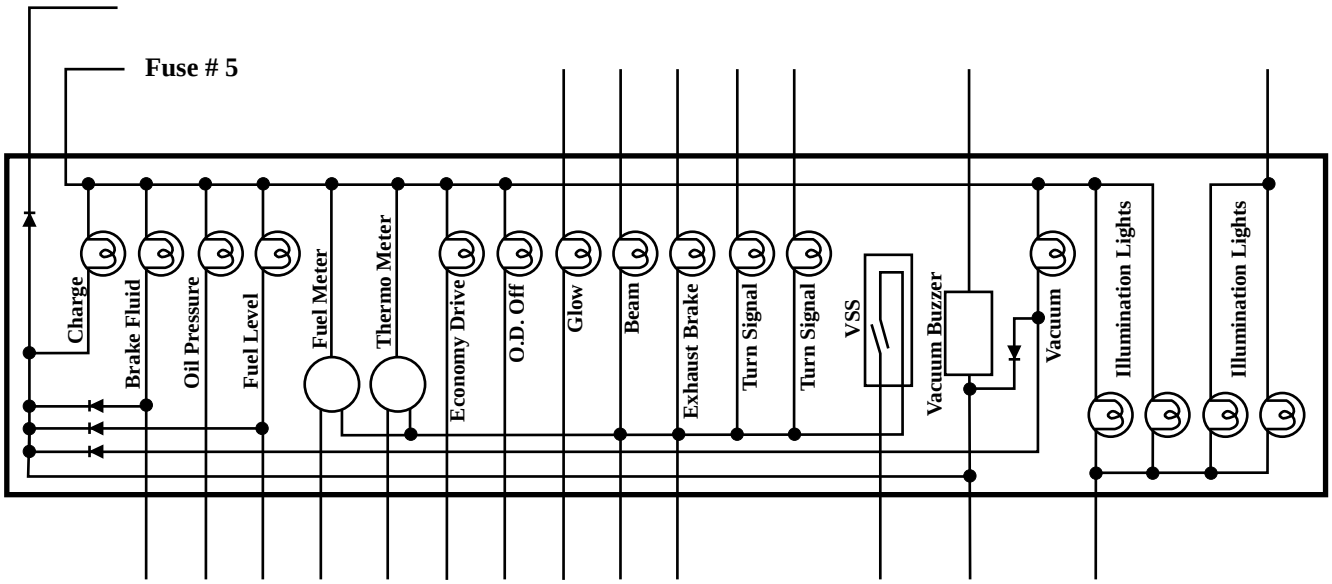


Figure 4

AISIN SEIKI 450-43LE

NO REVERSE

COMPLAINT: After overhaul, the transmission seems to operate reasonably well when the truck is cold, although shift quality is not the best. Once the truck has been driven one to two miles, shift quality deteriorates further and reverse is slipping badly. Reverse movement is non-existant on any degree of incline.

CAUSE: The pressure control solenoid has been installed 180 degrees out as shown in Figures 1 and 2.

CORRECTION: Install the Pressure Control Solenoid with the solenoid feed ports facing the corresponding passages in the valve body as seen in Figures 3 and 4.

A special thanks to Rob Profeta of Sunrise Transmission in Islip Terrace, N.Y. for sharing his experience with us and for providing the photos that made this bulletin possible.

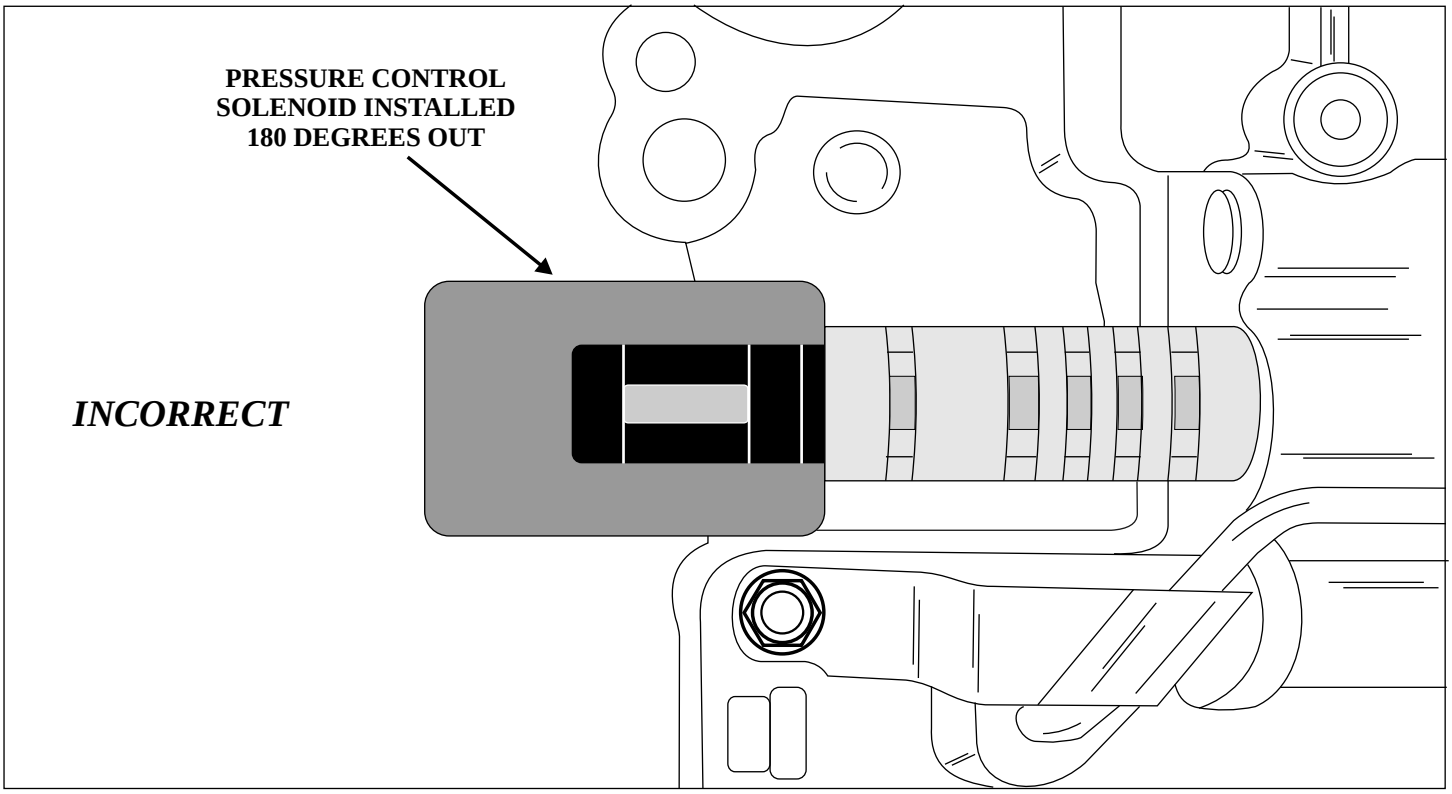


Figure 1

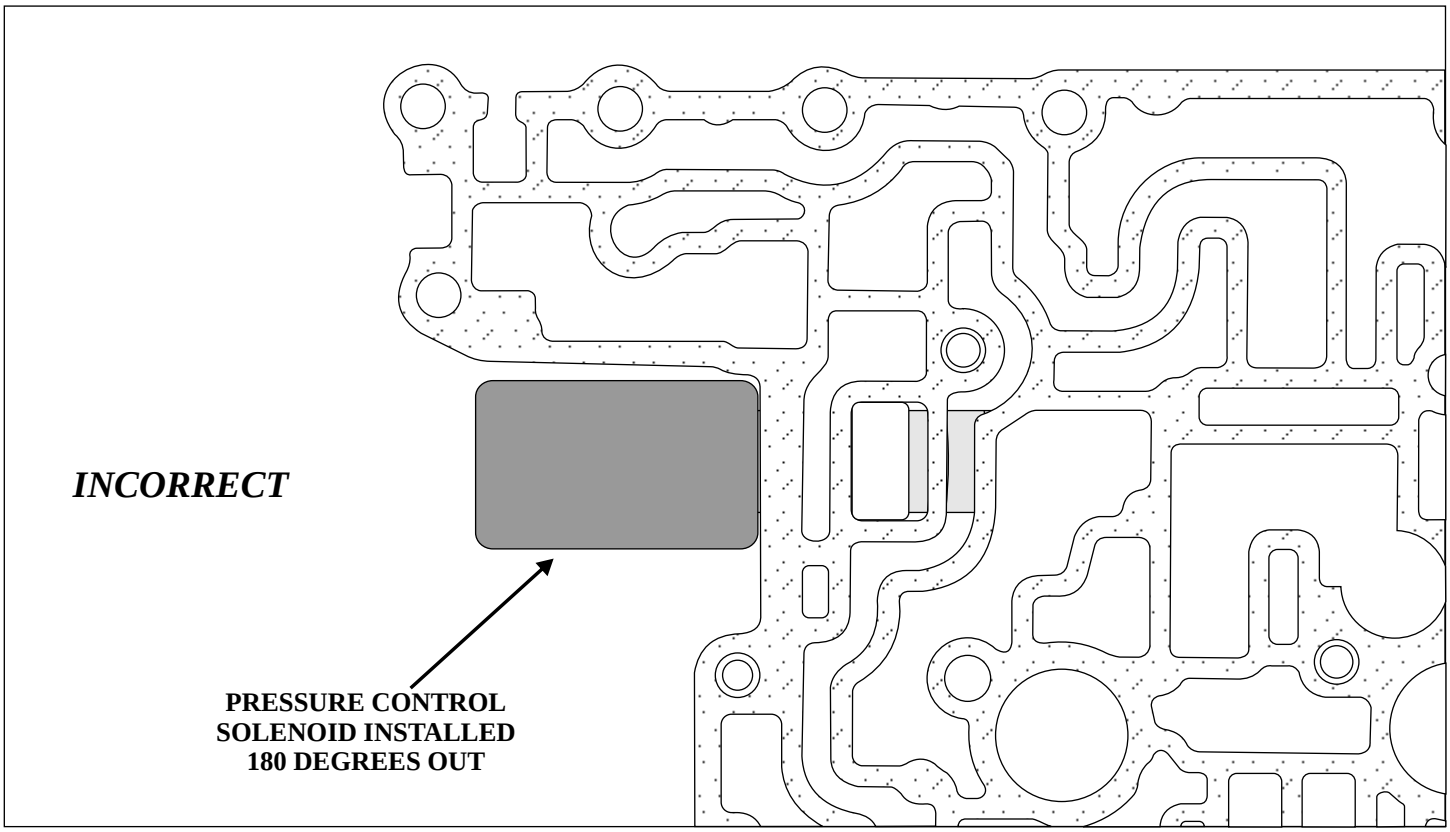


Figure 2

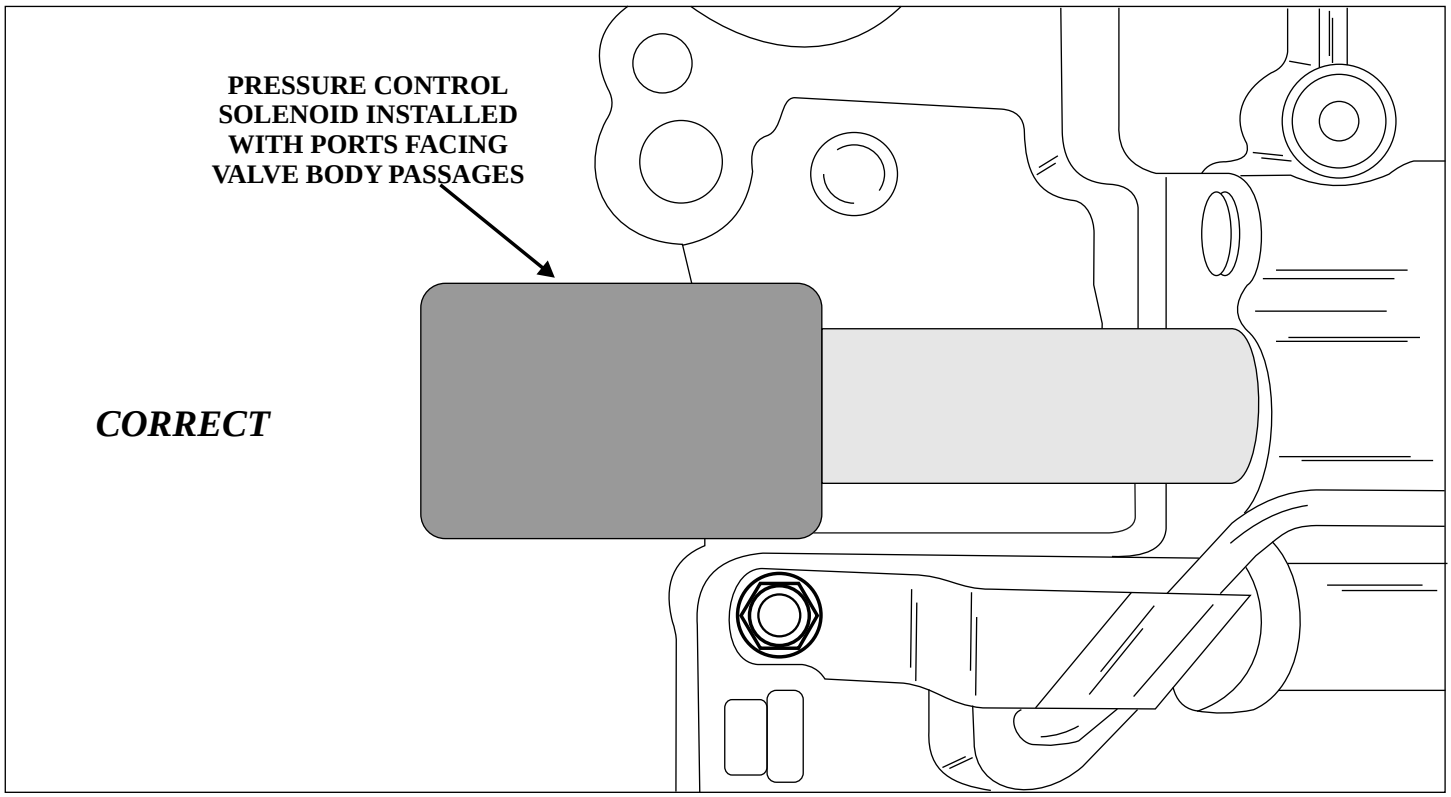


Figure 3

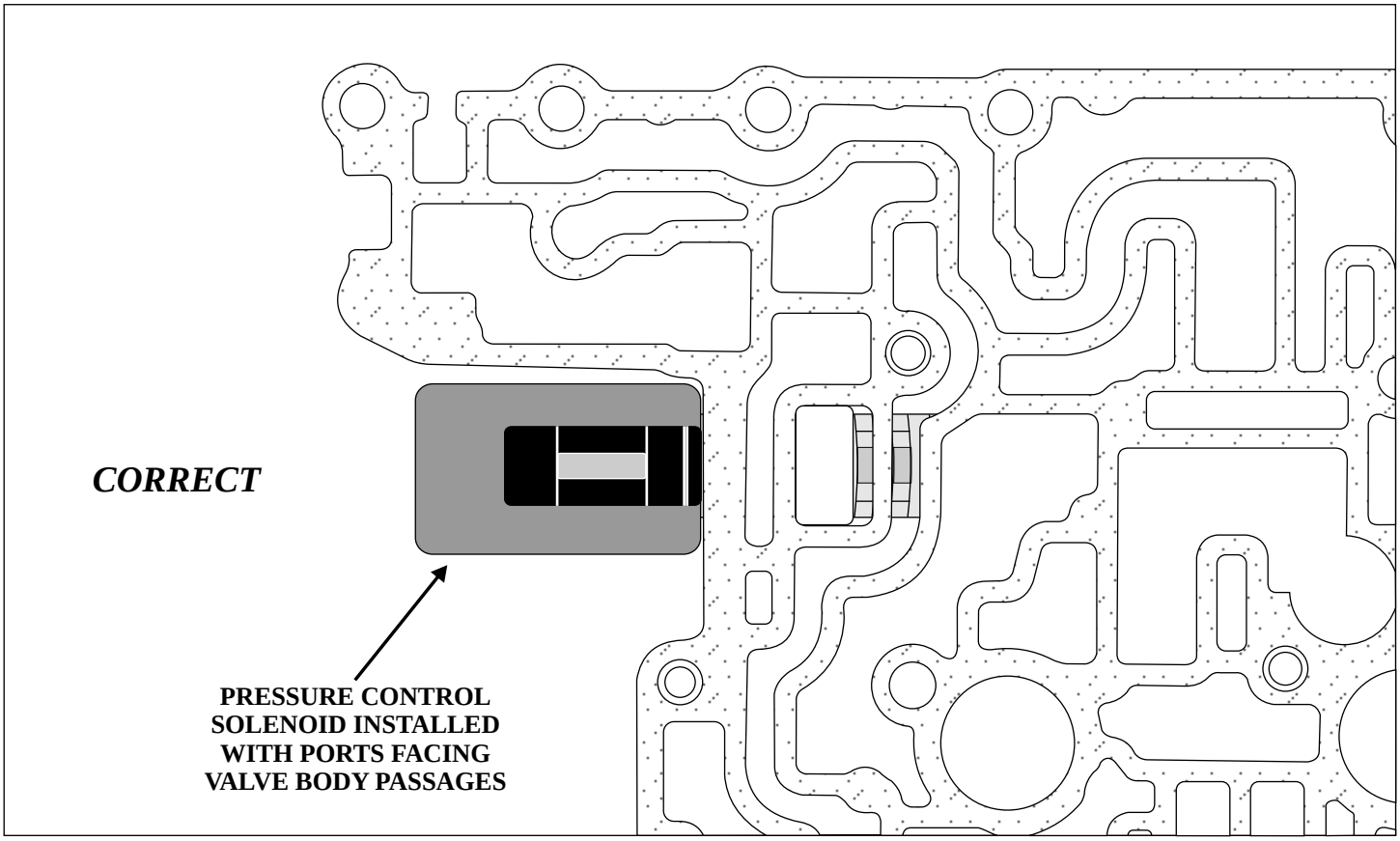


Figure 4

FORD 5R110W
NEW DESIGN LOW REVERSE SNAP RING

CHANGE: Sometime in the 2005 model year Ford Motor Company redesigned the Low/Reverse Clutch retaining snap ring for the Diesel and Gas applications replacing the two previous designs . There was a Ford Customer Satisfaction program, 05B27 Supplement #1 that ended in September of 2006 that would cover the replacement of this snap ring and or transmission case under warranty regardless of miles, on certain 2005 models. This new snap ring is a mandatory replacement and will back service all models.

REASON: The reason for this replacement was, "When the affected vehicles are used for snow plowing, it is common to shift between forward and reverse repeatedly, and at times, rapidly. Under this condition, the snap ring that retains the low/reverse clutch in the 5R110 Torqshift transmission may rotate out of position and become partially unseated from the transmission case splines, leading to either partial or complete loss of transmission reverse gear function. This program is being conducted to change the snap ring to a revised design to avoid this concern."

PARTS AFFECTED:

Low reverse snap ring, and it's assembly in to the case. The new snap ring has tabs, as shown in Figure 1, that are to be located at the 12 and 1 o'clock position in the case as shown in Figure 2. Refer to Figure 3 for a breakdown of the Low Reverse Clutch assembly.

SERVICE INFORMATION:

LOW REVERSE SNAP RING (Diesel).....5C3Z-7D483-E
LOW REVERSE SNAP RING (Gas).....5C3Z-7D483-D
NOTE: There is a service pack available from Ford Motor Company , that was one of the service options under the Customer Satisfaction Program mentioned above, that includes the new snap ring, pump to case gasket, solenoid body to case gasket, pump seal, sump filter and front pump bolts. At this time the kit is less expensive than the snap ring alone. The part numbers for these kits are as follows:
LOW REVERSE SNAP RING SERVICE KIT (Diesel).....5C3Z-7D483-W
LOW REVERSE SNAP RING SERVICE KIT (Gas).....5C3Z-7D483-Y

NEW DESIGN LOW REVERSE SNAP RING

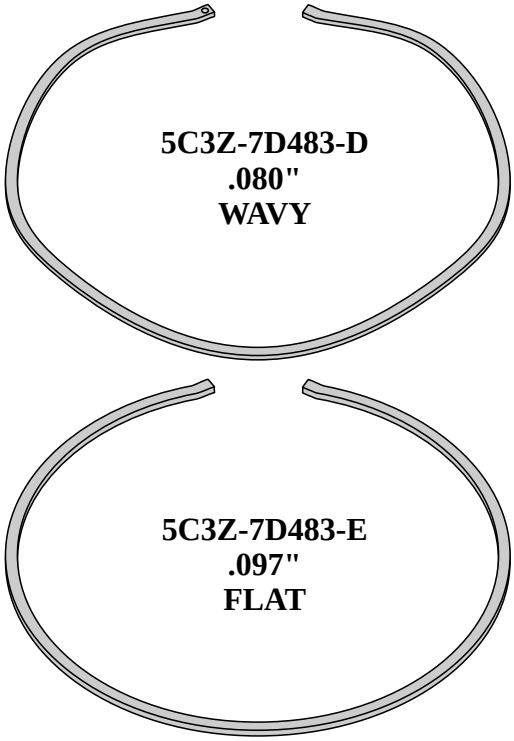
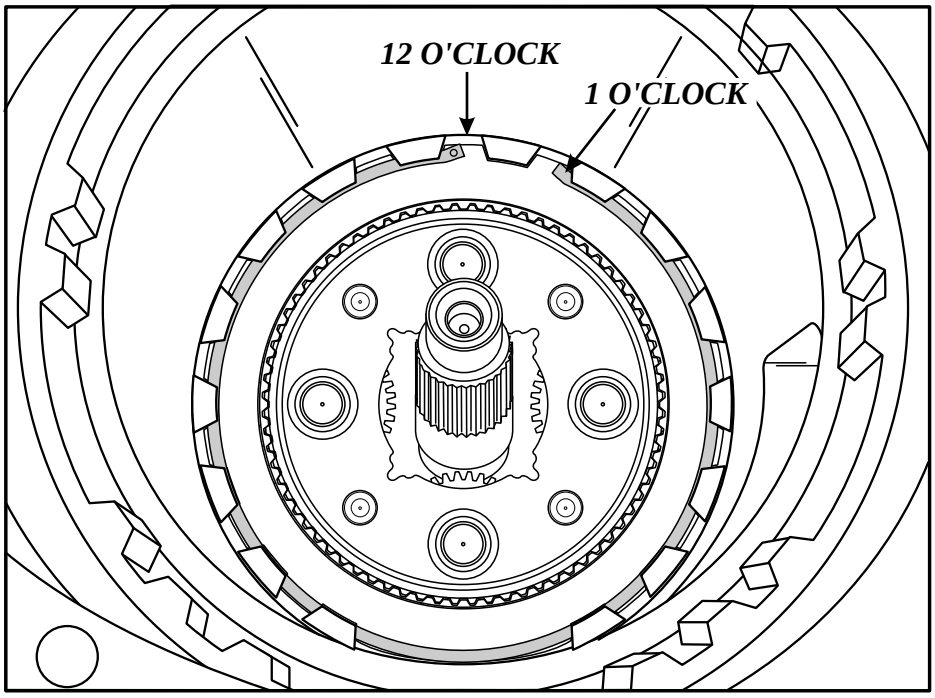


Figure 1

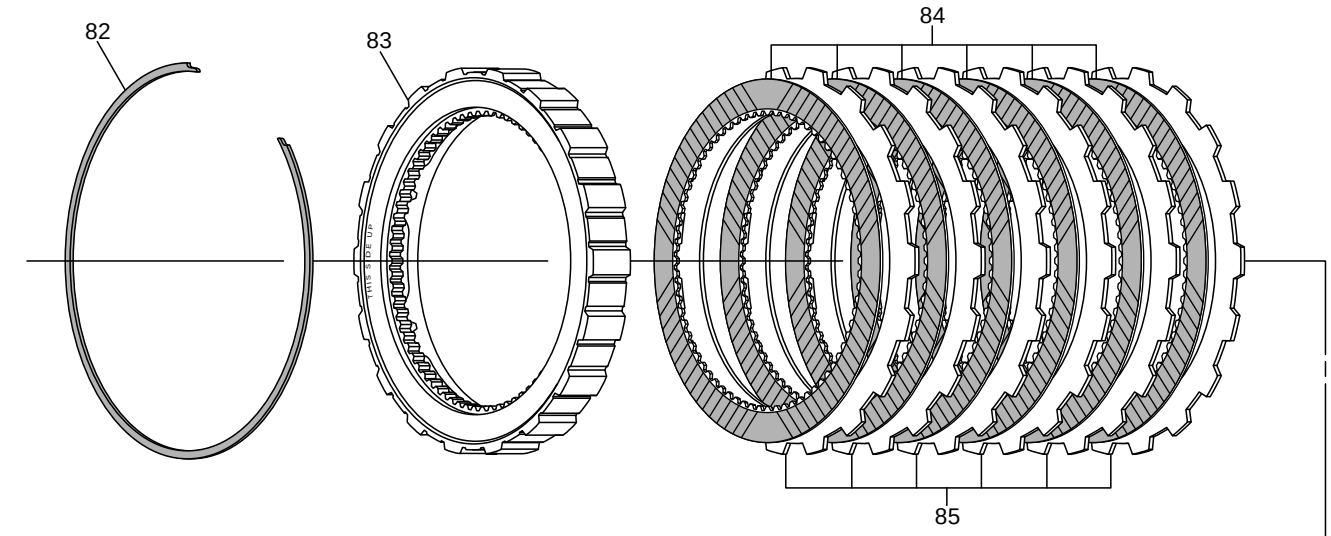
LOW REVERSE SNAP RING INSTALLATION

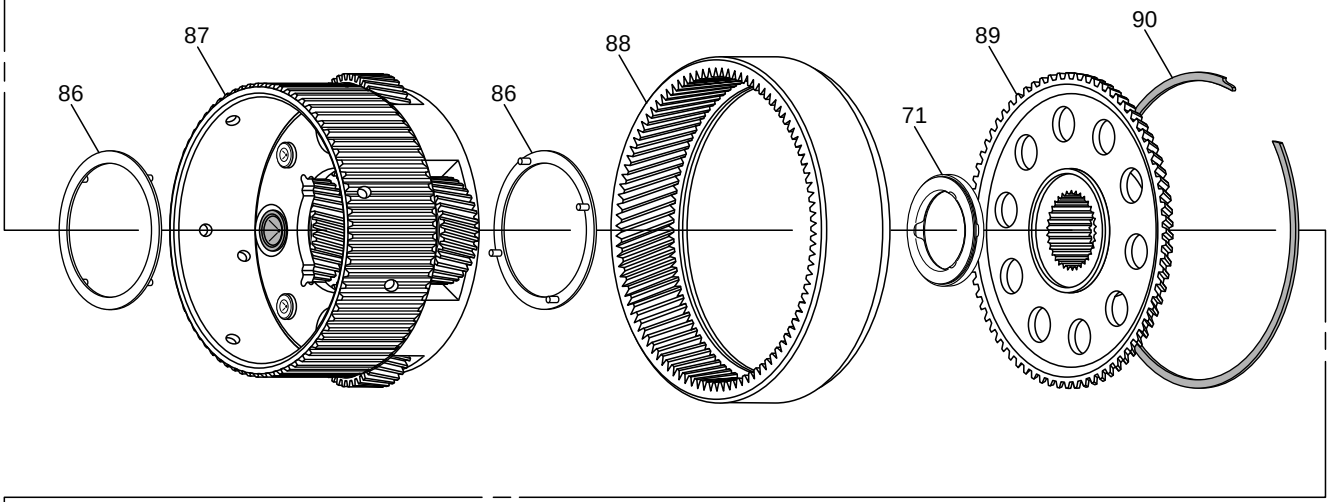


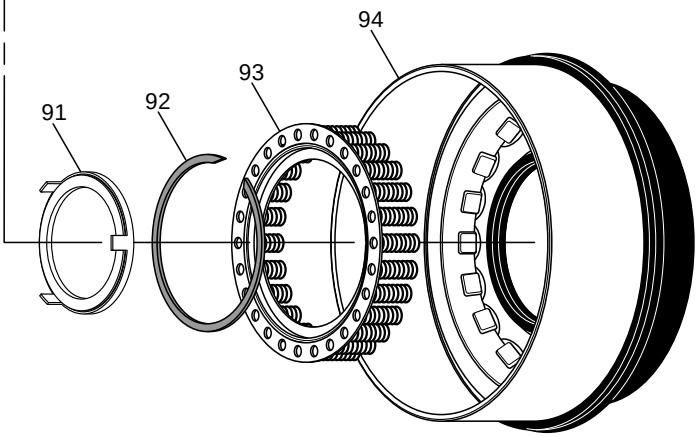
Verify the left end of the snap ring is in the 12 o'clock position in the case and the right end of the snap ring is in the 1 o'clock position

Figure 2

LOW/REVERSE CLUTCH PARTS EXPLODED VIEW







71 NUMBER 15 THRUST BEARING ASSEMBLY
82 LOW DIODE RETAINING SNAP RING
83 LOW DIODE ASSEMBLY
84 REVERSE CLUTCH FRICTION PLATES (6)
85 REVERSE CLUTCH STEEL PLATES (6)
86 NUMBER 13 AND 14 REAR CARRIER THRUST WASHERS
87 REAR PLANETARY CARRIER ASSEMBLY
88 REAR PLANETARY CARRIER INTERNAL RING GEAR
89 REAR PLANETARY CARRIER INTERNAL RING GEAR HUB
90 REAR PLANETARY CARRIER RING GEAR HUB SNAP RING
91 NUMBER 16 THRUST BEARING ASSEMBLY
92 LOW/REVERSE CLUTCH RETURN SPRING SNAP RING
93 LOW/REVERSE CLUTCH RETURN SPRING ASSEMBLY
94 LOW/REVERSE CLUTCH PISTON

Figure 3

FORD 5R110W

LOSS OF REVERSE & SEVERAL FORWARD GEARS

COMPLAINT: The vehicle comes in, or comes back, with a complaint of no reverse and a perceived loss of fourth gear. The transmission seems to have shifted three times at one point in time and only twice another time.

CAUSE: The cause of the complaint was the fact that the center support sleeve had walked forward out of position thereby blocking the direct clutch feed holes, Refer to Figure 1.
The loss of reverse is easily explained after inspection of the clutch application chart in Figure 2. The loss of fourth gear and the shift issues are not that easy, and here is why. The 5R110W is a six speed transmission. The shift strategy is such that it uses only five speeds at any given time. When the transmission is cold, (5° F or less), the transmission will shift 1-2-3-4-6, skipping fifth gear. When the transmission warms up, it will shift 1-2-3-5-6, skipping fourth gear.

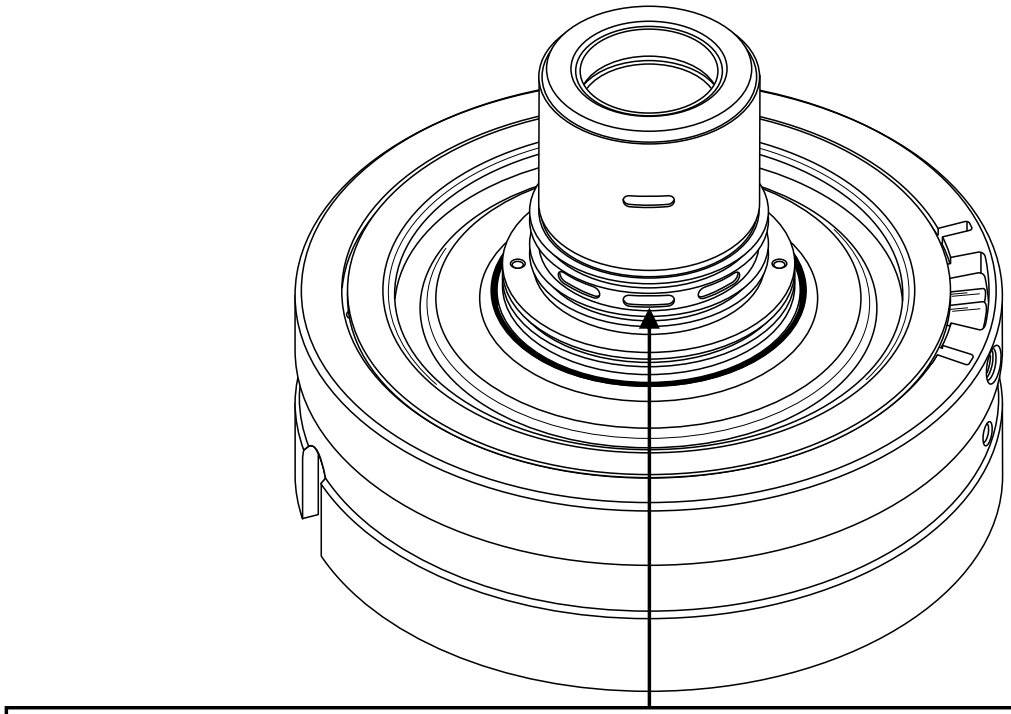
Because the direct clutch is used in reverse, fifth and sixth gear, when cold the transmission without the direct clutch would only shift 1-2-3-4, in other words, it would shift only three times. When it warms up it would only shift 1-2-3, in other words, it would only shift twice. Because the gear ratios in fourth, fifth and sixth gears being so close to each other, see gear ratios in Figure 2, it would be extremely difficult to tell which gear has been skipped or lost.

CORRECTION: Replacement of the center support corrected the complaint.

Many thanks to Trent at Acadiana Transmission in Lafayette, La. for sharing his experience with us making this bulletin possible.

LOSS OF REVERSE & SEVERAL FORWARD GEARS

5R110W CENTER SUPPORT



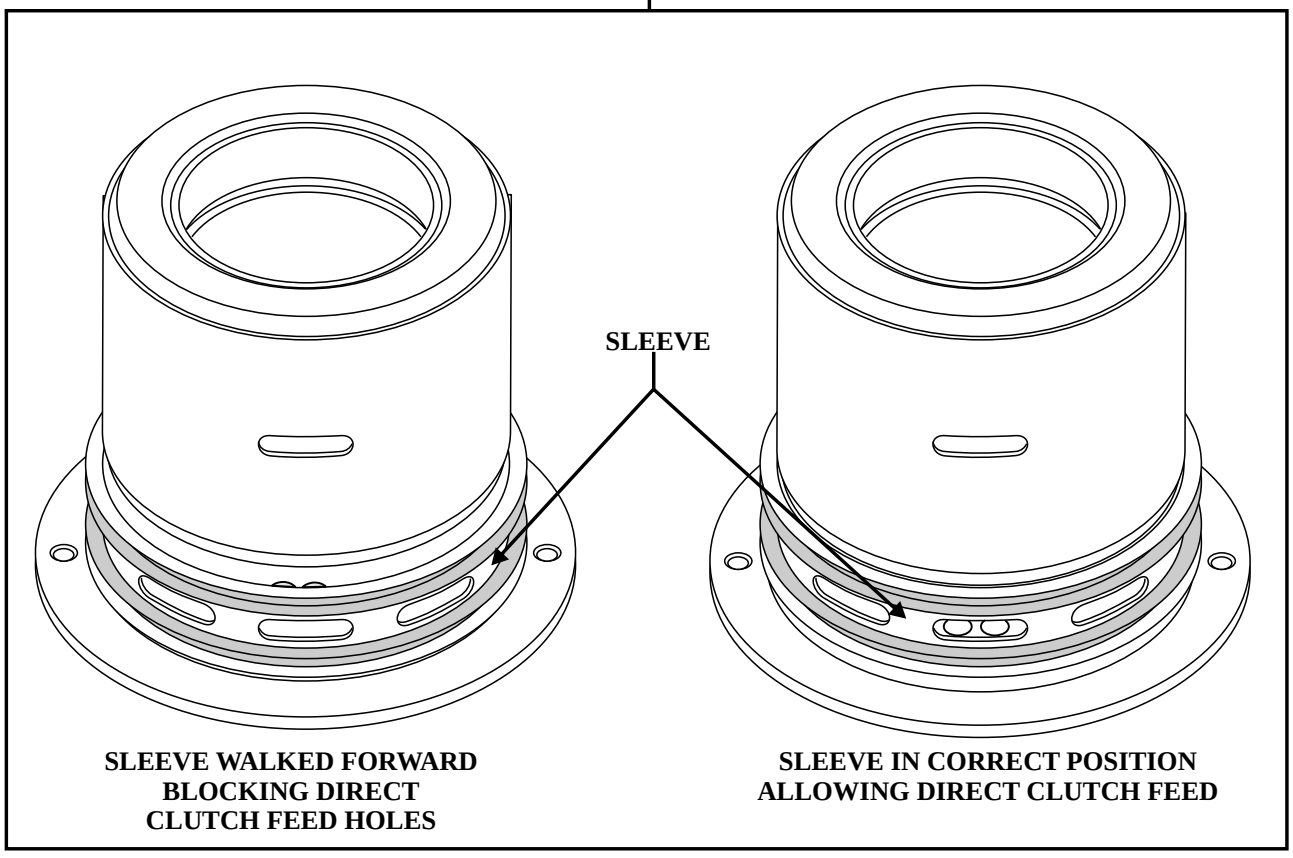
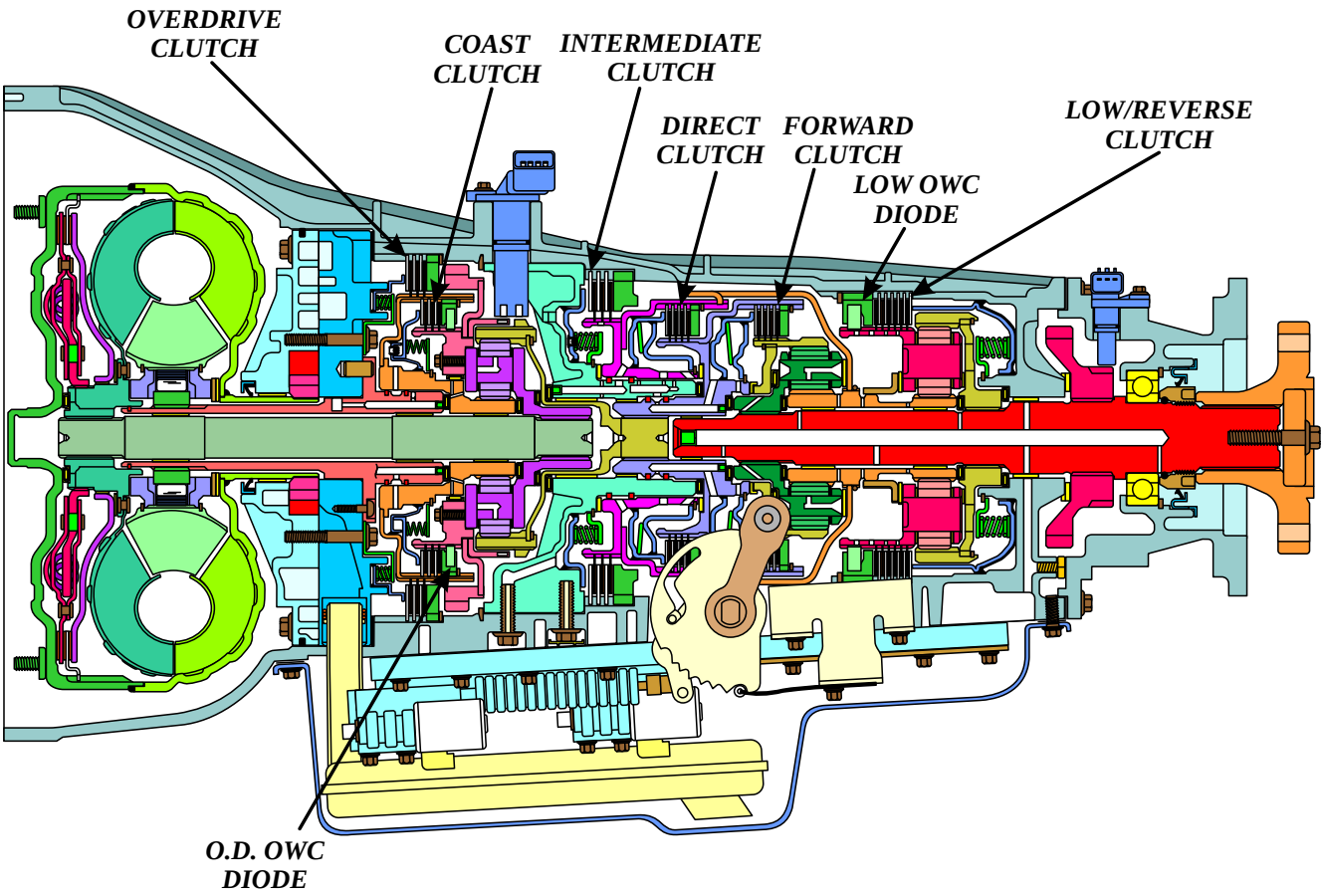


Figure 1

COMPONENT APPLICATION CHART



COMPONENT APPLICATION CHART *WITH TOW/HAUL "OFF"*

Range/Gear	*Fwd. Clutch*	*Int. Clutch*	*Direct Clutch*	*O.D. Clutch*	*Coast Clutch*	*Lo/Rev Clutch*	*O.D. Diode*	*Low Diode*	*Gear Ratio*	*Eng Brak*
Park/Neut						*ON (a) (c)*				
Reverse			*ON (d)*		*ON*	*ON (a)*			*2.88*	
O.D.- 1st	*ON (d)*					*ON (a) (c)*	*HOLD*	*HOLD*	*3.09*	
O.D.- 2nd	*ON (d)*			*ON*			*O/R*	*HOLD*	*2.20*	
O.D.- 3rd	*ON (d)*	*ON*					*HOLD*	*O/R*	*1.54*	
O.D.- 4th (b)	*ON (d)*	*ON*		*ON*			*O/R*	*O/R*	*1.09*	
O.D.- 5th	*ON (d)*		*ON*				*HOLD*	*O/R*	*1.00*	
O.D.- 6th	*ON (d)*		*ON*	*ON*			*O/R*	*O/R*	*0.71*	
Man- 3rd	*ON (d)*	*ON*			*ON*		*HOLD*	*O/R*	*1.54*	*YES*
Man- 2nd	*ON (d)*			*ON*		*ON (a)*	*O/R*	*HOLD*	*2.20*	*YES*
Man- 1st	*ON (d)*				*ON*	*ON (a)*	*HOLD*	*HOLD*	*3.09*	*YES*

(a) PCM Calibration Controlled
(b) Cold Strategy
(c) 30 psi Until 5 kmh (3 mph)
(d) Clutch Applied Through Manual Valve Position

Figure 2

FORD 5R110W
NO TCC AND OR DTC P0741

COMPLAINT: After overhaul, Ford trucks equipped with the 5R110W or "Torqueshift" transmission, may exhibit a NO Torque Converter Clutch Application along with a Diagnostic Trouble Code P0741 Torque Converter Clutch Stuck OFF.

CAUSE: The cause may be, that during the Pump rebuild, the Torque Converter Control Valve sleeve was mis-assembled and pushed too far into the bore opening the CCL circuit, which is the regulated apply circuit for the Torque Converter Clutch, to an exhaust.

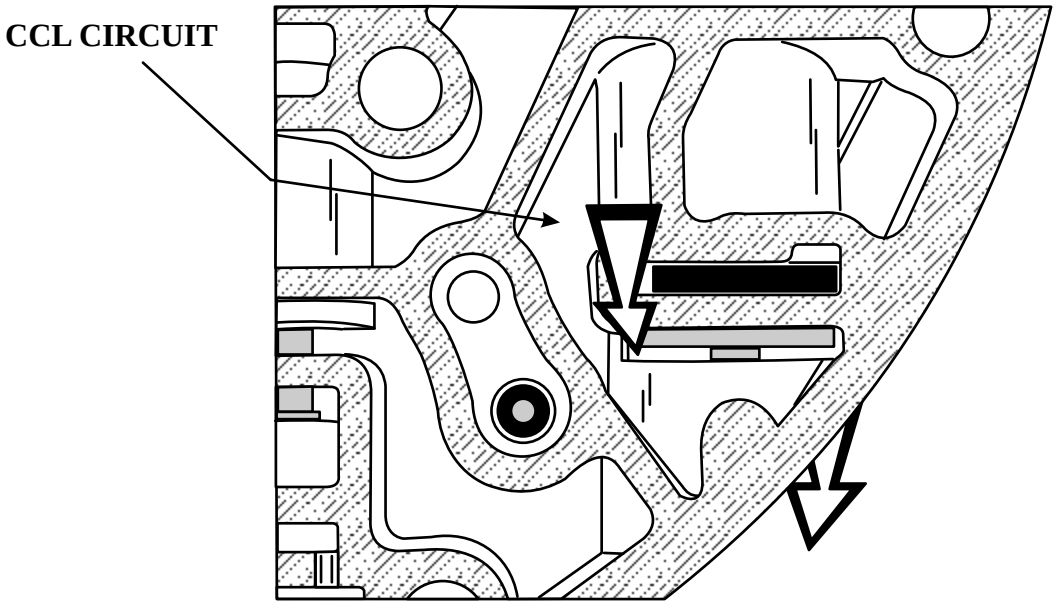
CORRECTION: Refer to Figure 1 for a view of the in-correct and correct installation of the retainer, and ensure that the feed holes in the sleeve are visible. Refer to Figure 2 for a breakdown of the complete pump assembly and location of the Torque Converter Control Valve line-up.

A special thanks to Todd Turner at Todd Turner's Transmissions in Ocala, FL., for sharing his experience with us to make this bulletin possible.

DACCO

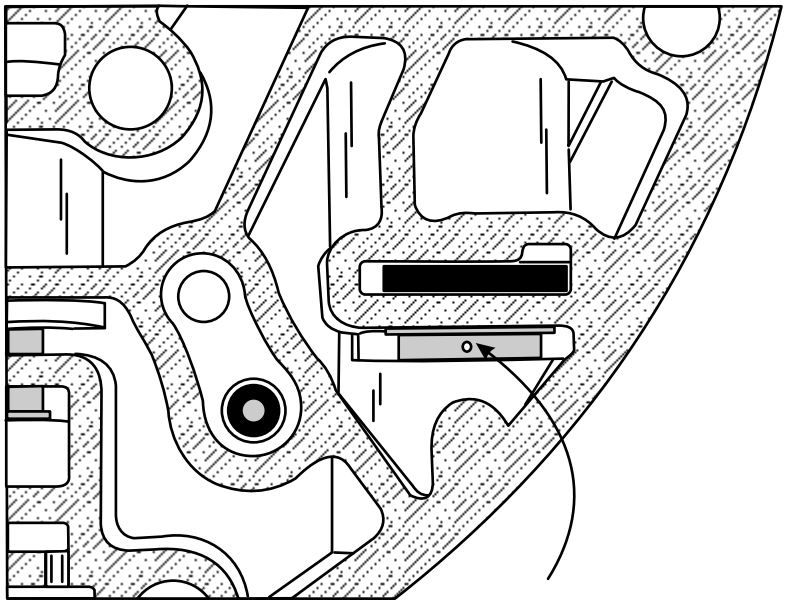
AXIOM

INCORRECT RETAINER LOCATION



Summary: The CCL circuit, which is regulated Converter apply pressure, will be drained at the end of the Converter Control Valve sleeve

CORRECT RETAINER LOCATION

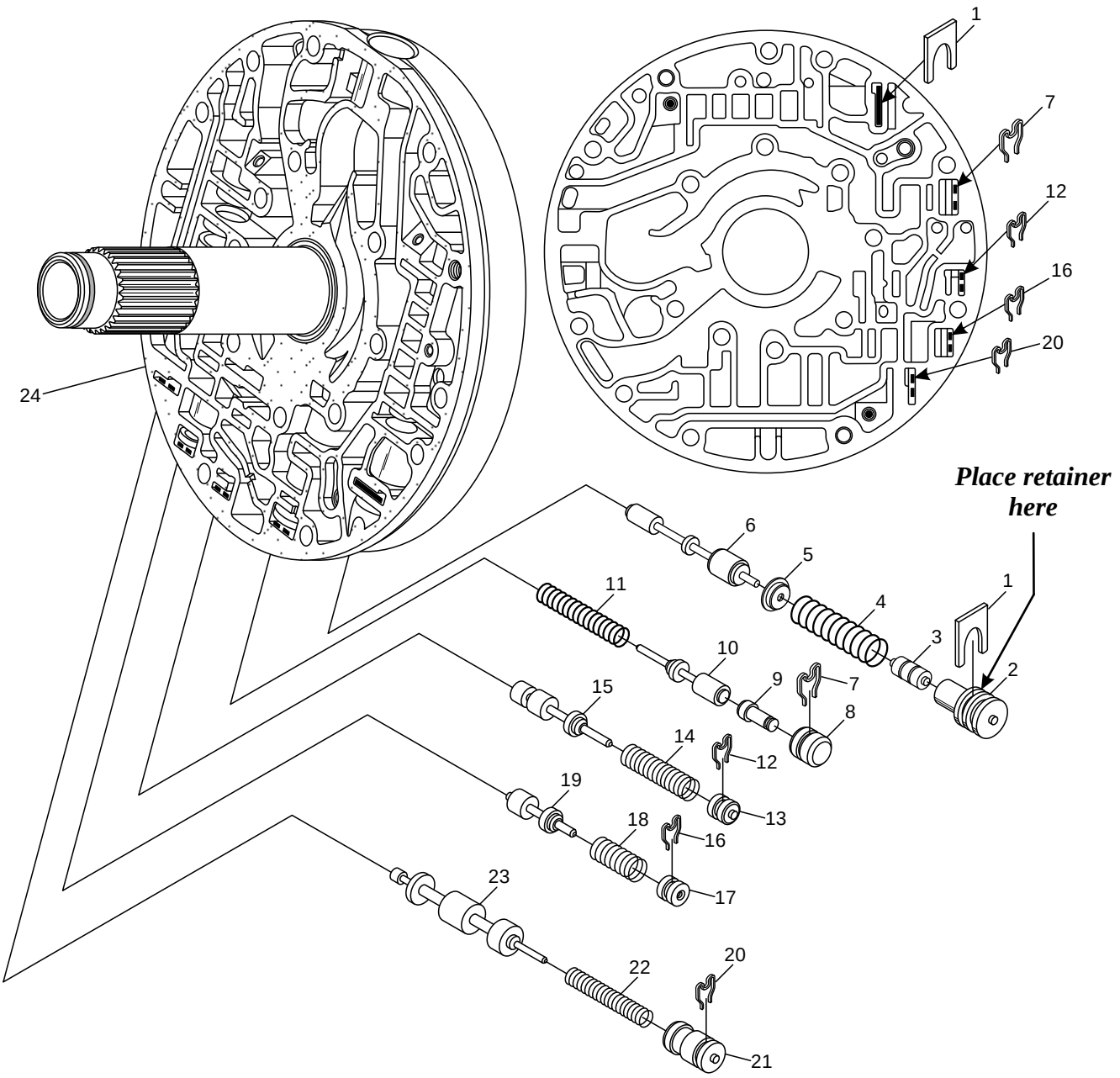


When the retainer is installed correctly, the feed holes in the Converter Control Valve sleeve can be seen

Figure 1

Phoenix

OIL PUMP COVER ASSEMBLY EXPLODED VIEW



1 CONVERTER CLUTCH CONTROL VALVE BORE PLUG RETAINER.
2 CONVERTER CLUTCH CONTROL VALVE SLEEVE.
3 CONVERTER CLUTCH CONTROL VALVE PLUG.
4 CONVERTER CLUTCH CONTROL VALVE SPRING.
5 CONVERTER CLUTCH CONTROL VALVE SPRING SEAT.
6 CONVERTER CLUTCH CONTROL VALVE.
7 COOLER BYPASS VALVE BORE PLUG RETAINER (ORANGE I.D.).
8 COOLER BYPASS VALVE BORE PLUG.
9 THERMOSTATIC VALVE ASSEMBLY.
10 COOLER BYPASS VALVE.
11 COOLER BYPASS VALVE SPRING.
12 CONVERTER PRESSURE LIMIT VALVE BORE PLUG RETAINER.
13 CONVERTER PRESSURE LIMIT VALVE BORE PLUG.
14 CONVERTER PRESSURE LIMIT VALVE SPRING.
15 CONVERTER PRESSURE LIMIT VALVE.
16 CONVERTER ANTI-DRAIN BACK VALVE BORE PLUG RETAINER.
17 CONVERTER ANTI-DRAIN BACK VALVE BORE PLUG.
18 CONVERTER ANTI-DRAIN BACK VALVE SPRING.
19 CONVERTER ANTI-DRAIN BACK VALVE.
20 MAIN REGULATOR VALVE BORE PLUG RETAINER.
21 MAIN REGULATOR VALVE BORE PLUG.
22 MAIN REGULATOR VALVE SPRING.
23 MAIN REGULATOR VALVE.
24 OIL PUMP COVER ASSEMBLY.

Figure 2

FORD 5R110W

NO TCC APPLICATION

COMPLAINT: After overhaul, No TCC application is seen, the scan tool indicates that the signal for lock-up was given, but no rpm drop took place which is confirmed by the storage of code P0741 for "TCC Stuck Off".

CAUSE: A small piece of metal debris from the original transmission damage has finally come loose from the cooler and lodged itself in the TCC feed hole of the solenoid body gasket, (Refer to Figures 1 & 2).

CORRECTION: Make certain the cooler has been thoroughly flushed and the in line filter, located in the cooler line manifold, has been changed. Be aware of additional oil to air coolers, if the transmission sustained severe damage, they may not flush satisfactorily and will require replacement.

NOTE: It is not recommended to reuse the solenoid gasket after washing it in solvent as we have had complaints of the rubber beading becoming deformed.

Many thanks to Joel Adams from Eagle Transmission for sharing his experience with us and for taking the detailed photos.

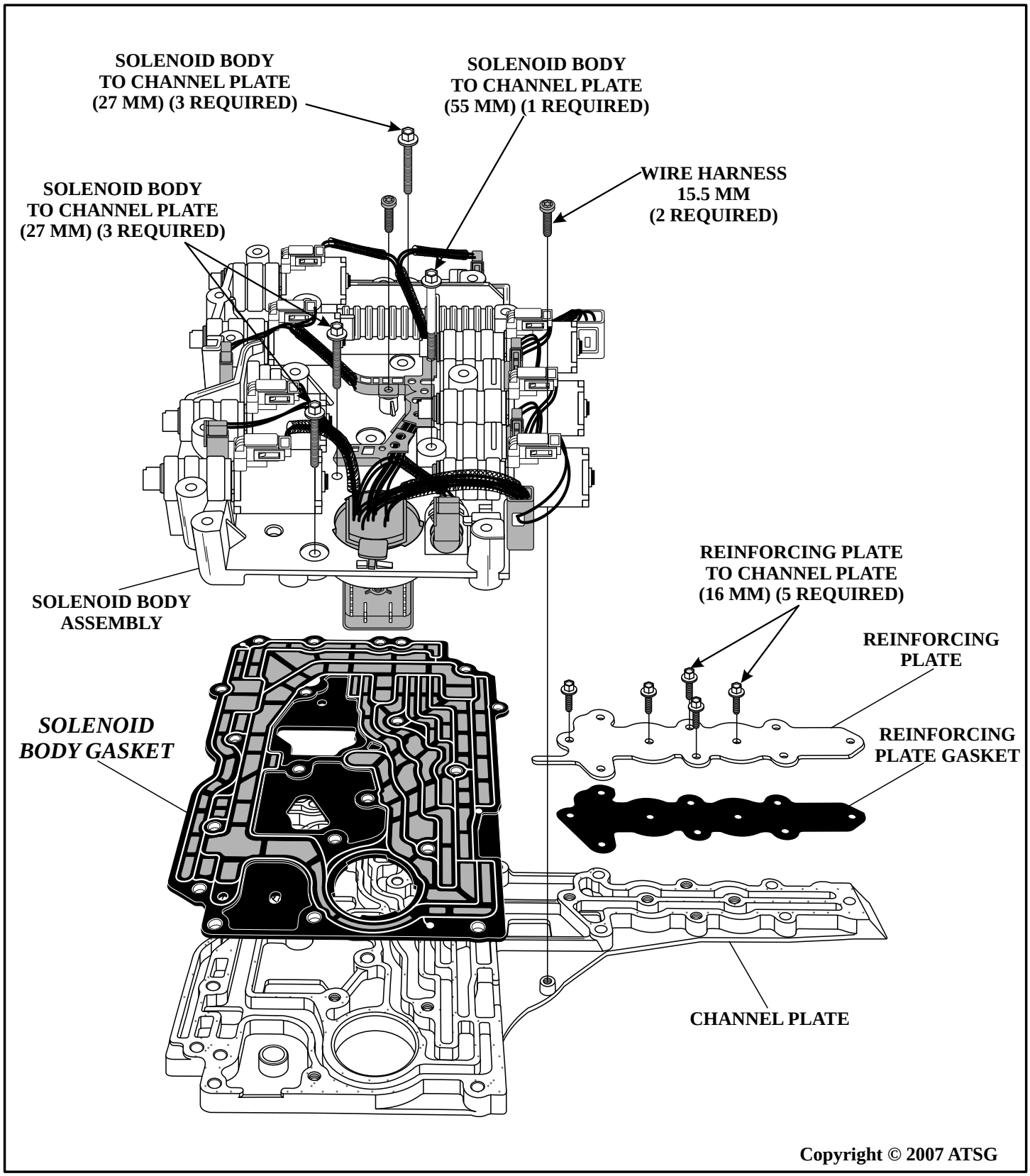

SOLENOID BODY
TO CHANNEL PLATE
(27 MM) (3 REQUIRED)
SOLENOID BODY
TO CHANNEL PLATE
(55 MM) (1 REQUIRED)
WIRE HARNESS
15.5 MM
(2 REQUIRED)
SOLENOID BODY
TO CHANNEL PLATE
(27 MM) (3 REQUIRED)
SOLENOID BODY
ASSEMBLY
REINFORCING PLATE
TO CHANNEL PLATE
(16 MM) (5 REQUIRED)
REINFORCING
PLATE
SOLENOID
BODY GASKET
REINFORCING
PLATE GASKET
CHANNEL PLATE
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Figure 1

5R110W SOLENOID BODY GASKET

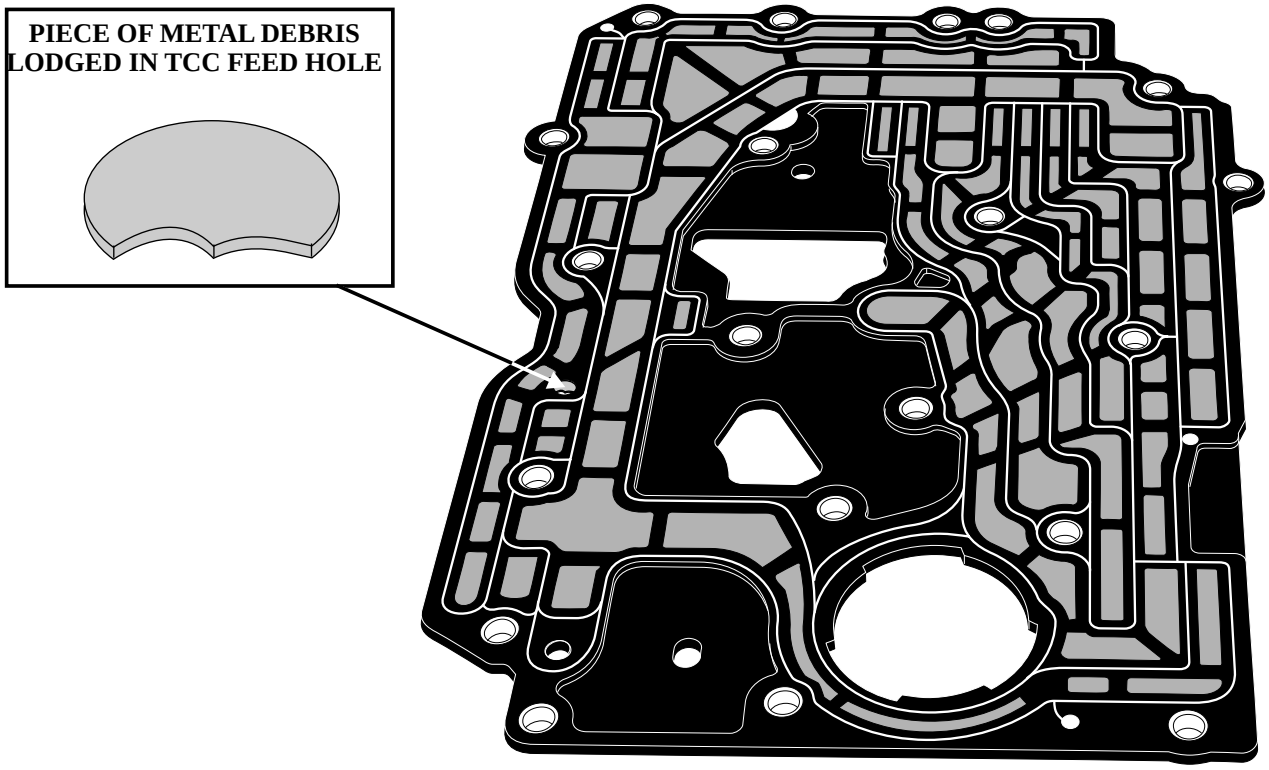


Figure 2

5R110W

DELAYED FORWARD ENGAGEMENT/SHUDDER ON TAKE OFF

COMPLAINT: Before and/or after overhaul, a Ford truck equipped with a 5R110W transmission may exhibit a noticeable delayed forward engagement and/or chatter while in first gear at various throttle openings.

CAUSE: The cause may be a poor seal at the forward clutch sealing rings. (See figure 1)

CORRECTION: Check and verify that there are no line pressure and rise problems that may indicate a faulty pressure control solenoid, sticking PR valve, boost valve or faulty oil pump.
Carefully inspect the forward clutch housing, piston and the seal ring area in the center support for any wear or damage and repair or replace as necessary.
Place the completely assembled forward clutch housing into the center support and air check the forward clutch through the support to see if excessive leakage is revealed with the air check.
If excessive leakage is detected, then the problem may be resolved by replacing the original step cut style sealing rings with a pair of solid endless style rings used for the stator support to reverse input clutch drum in a 4L60E transmission. The sizing tool for the 4L60E rings can also be used to ensure proper fit. After installing and sizing the new rings, check for a slight drag when installing the forward clutch housing into the center support and perform the air check again to see a noticeable difference.

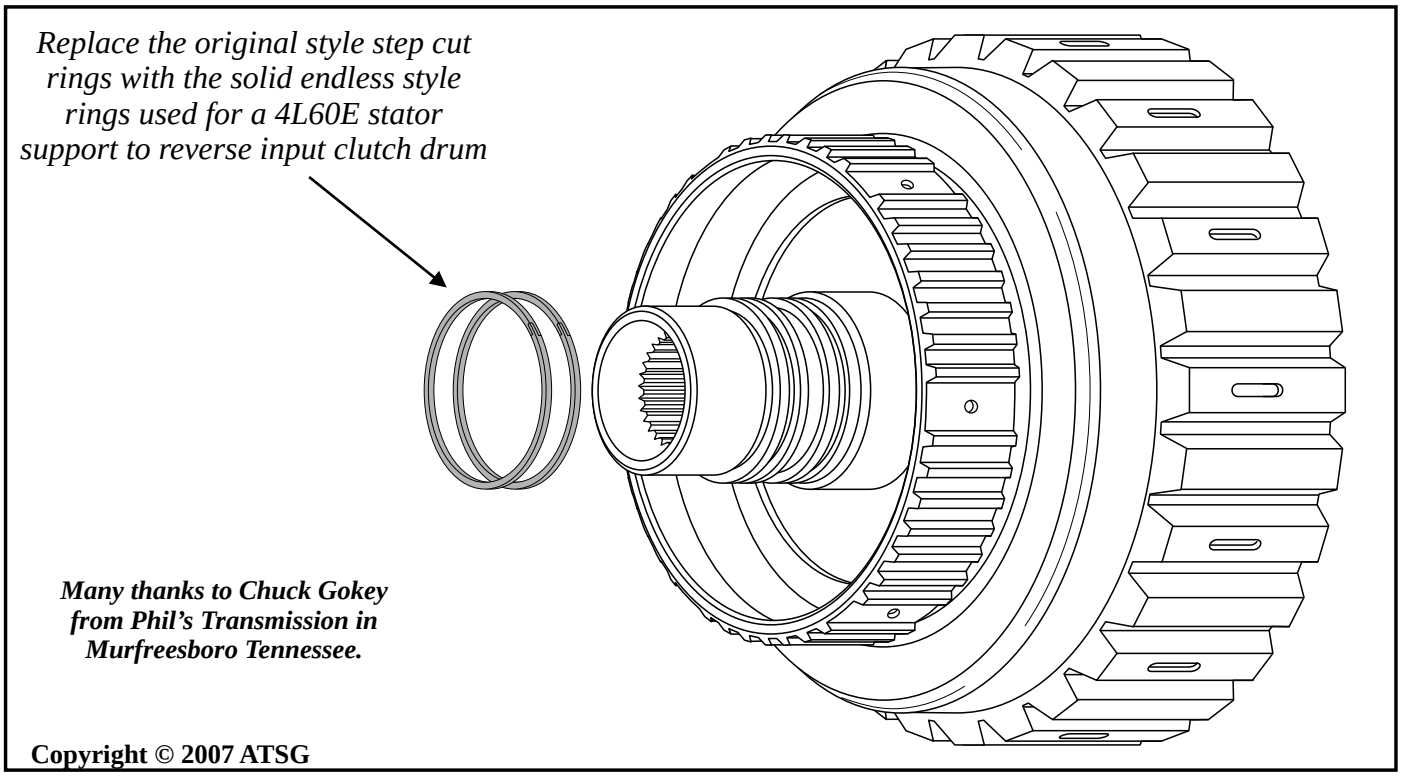


Figure 1

FORD 4R70W/4R70/75E

EPC SOLENOID & BRACKET IDENTIFICATION

COMPLAINT: After EPC Solenoid replacement, the transmission slips or chatters at times. A line pressure check revealed that line pressure is erratic.

CAUSE: The incorrect EPC solenoid was installed. It did not match the solenoid retaining bracket.

CORRECTION: The latest design EPC solenoid has a **Black** connector and requires the newly designed retaining bracket. If either of the previously designed EPC Solenoids ***(Tan or Green Connector)*** are used with the newly designed retaining bracket, the solenoid will not be correctly positioned in its bore which will result in a loss of line pressure.

The EPC Solenoid with the **Tan** connector and part number ***F8AZ-7G383-AB*** and the EPC Solenoid with the **Green** connector and part number ***XL3Z-7G383-AB*** require the retaining bracket with part number ***F6AZ-7H111-A***, (Refer to Figure 1). The newly designed EPC Solenoid with part number ***5C2Z-7G383-AB*** requires the newly designed retaining bracket with part number ***5C2Z-7H111-AB***, (Refer to Figure 2).

The retaining groove on the newly designed solenoid is located at the base of the stem, while the retaining groove on the Tan and Green Connector solenoids are positioned .298" away from the base of the stem.

Although the ***F8AZ*** solenoid is listed from 1998-2000 in most parts manuals, and the ***XL3Z*** solenoid is listed for use from 2001-2004, the ***XL3Z*** solenoid can actually be used on 1998 to 2004 models, with the only difference being, the ***XL3Z*** solenoid having a slightly higher line pressure response on the heavy throttle end of the spectrum. The ***5C2Z*** solenoid must be used on 2005 and later models.

SERVICE INFORMATION:

1998-2000 EPC Solenoid With Tan Connector.....F8AZ-7G383-AB
2001-2004 EPC Solenoid With Green Connector.....XL3Z-7G383-AB
1998-2004 EPC Solenoid Retaining Bracket.....F6AZ-7H111-A
2005 & Later EPC Solenoid With Black Connector.....5C2Z-7G383-AB
2005 & Later EPC Solenoid Retaining Bracket.....5C2Z-7H111-AB

EPC SOLENOID & BRACKET IDENTIFICATION

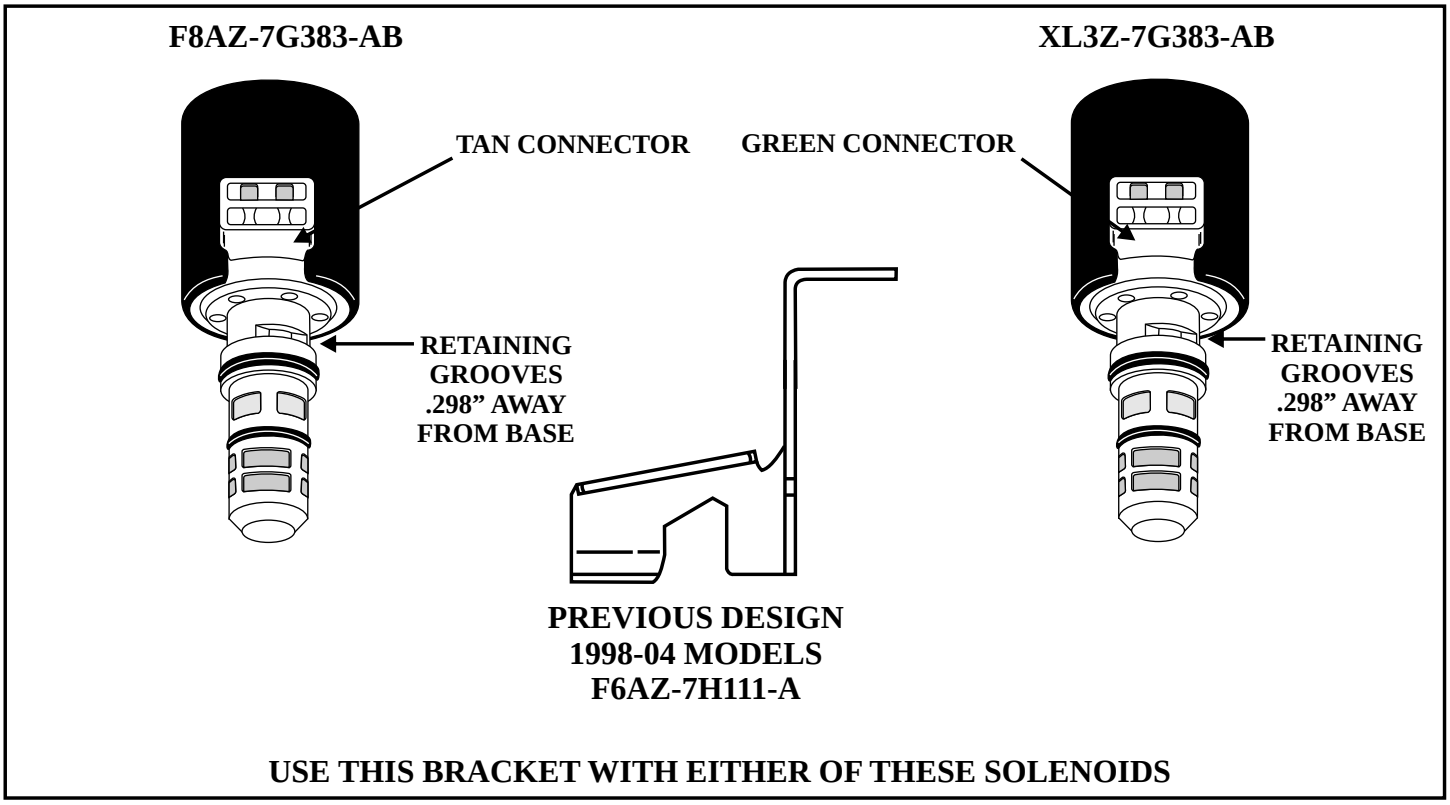


Figure 1

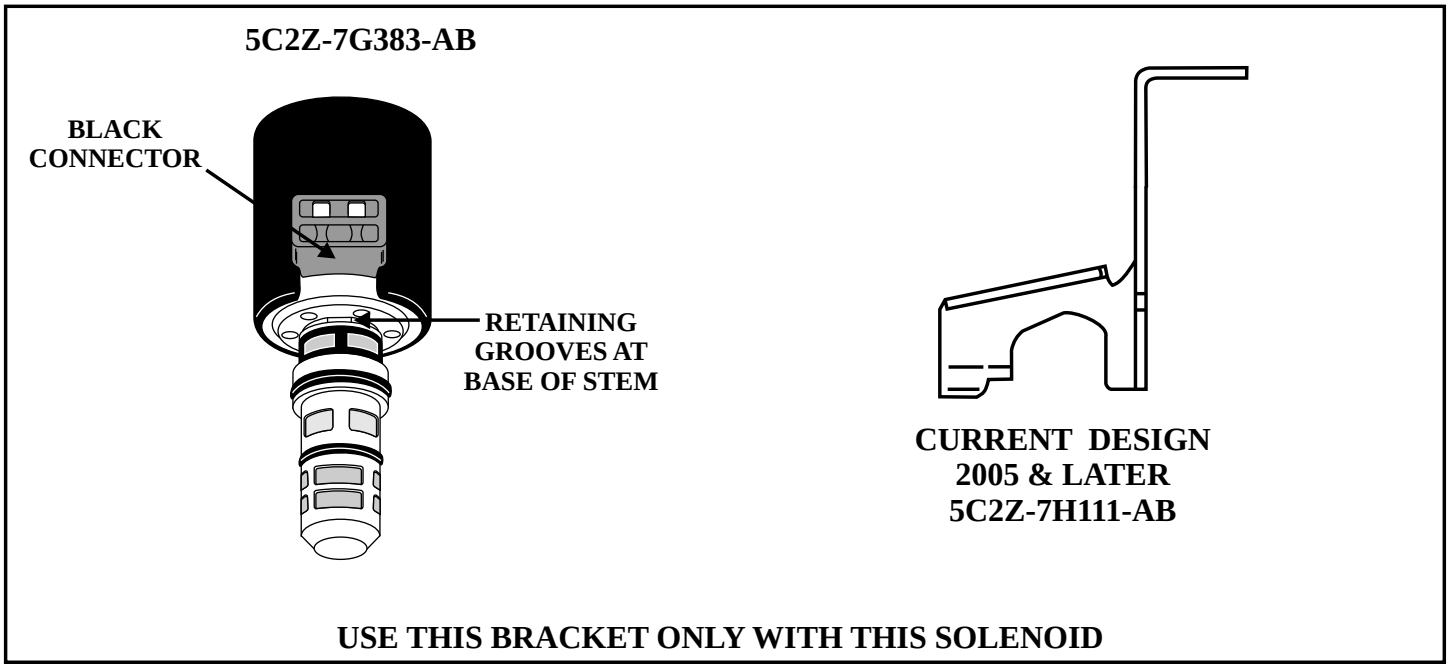


Figure 2

FORD 4R75E
EXCESSIVE SLIP IN FORWARD

COMPLAINT: Excessive slip in all forward ranges, possible metal debris found in sump.

CAUSE: Cracked forward clutch drum, along the snap ring groove area as shown in figure 1. The metal debris found in the transmission sump is the result of the forward drum pressure plate hitting the inside area of the drive shell. Be aware that upon dis-assemby of a 4R75E if no debris is found in the sump, but the forward clutches are scorched. The crack along the snap ring groove may not be easily seen, check by placing a screw driver or scribe in the snap ring groove and slightly prying to reveal any failure in this area.

CORRECTION: 1. Replace Forward drum. 2 Re-calibrate the PCM with program # 06B06.

SERVICE INFORMATION:

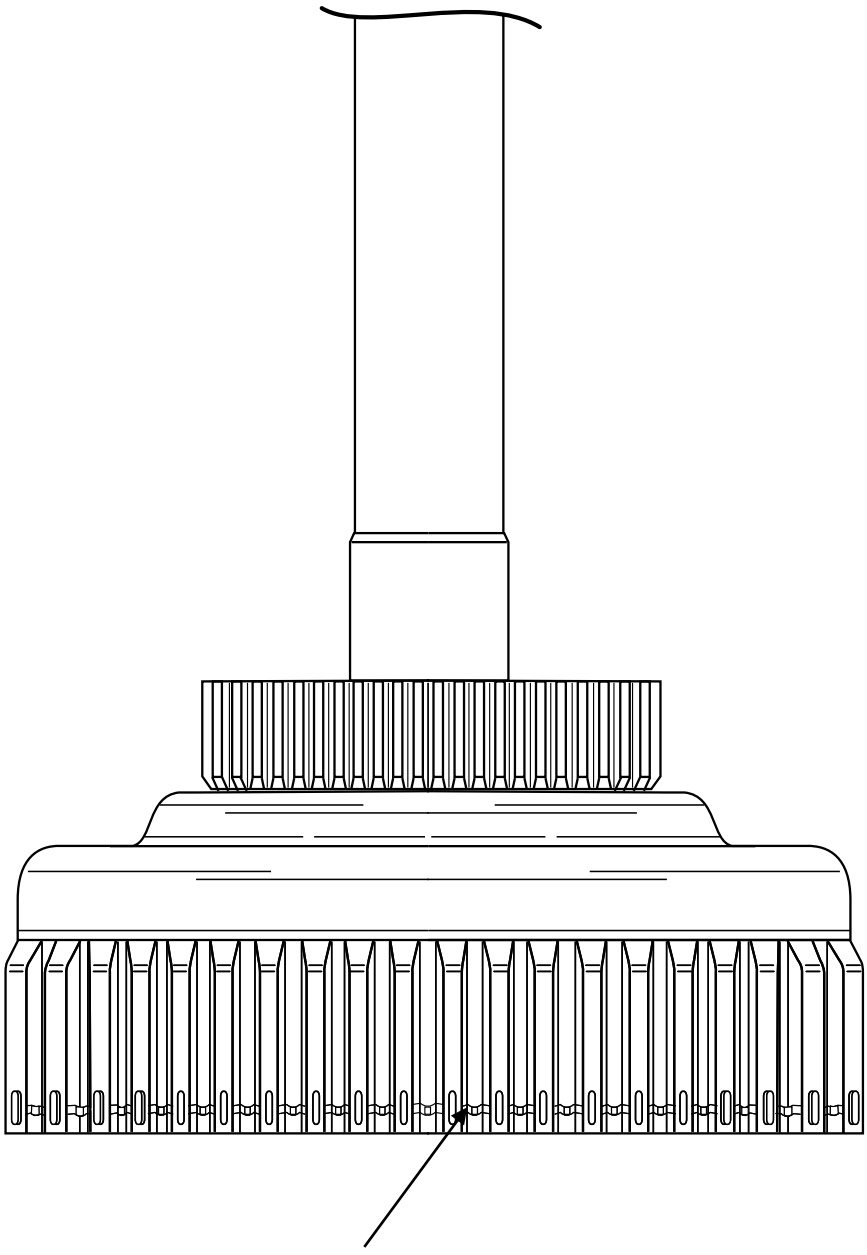
(1) FORWARD CLUTCH DRUM.....3L3Z-7F207-AA

(2) In April 2006, Ford Motor Co. issued a news letter to vehicle owners with the Vehicle Identification Number listed in the letter. The letter states that this failure is caused by the Powertrain Control Module's shift timing strategy, during excessive 4-3 downshifts that may occur during certain driving conditions (city taxi driving). Ford Motor Company provided a Costumer Satisfaction Program **#06B06**. Which would re-calibrate the PCM with a revised transmission shift control strategy, free of charge that ended on **August 22, 2006** regardless of mileage. Once this update was completed, an Extended Coverage Program **#06N06** for certain 2005 to 2006 Crown Victoria long wheel base vehicles, to replace the forward clutch cylinder also free of charge. The program extends coverage of the forward clutch cylinder to 3 years or 150,000 miles from the start date of the vehicle warranty, whichever occurs first. It is a one time replacement program. This program covers certain vehicles that were built at the St. Thomas Assembly Plant from Job #1 2005 through February 26, 2006. Coverage is also automatically transferred to second owners. If the vehicle owner already paid to have the forward clutch drum repaired before receiving the news letter, a refund would be provided under program **#06N06** when a paid original receipt was presented to the local dealer **before May 22, 2006.** Even if the forward clutch drum was replaced the vehicle owner still needed to have program **#06B06** performed to update the PCM transmission shift control strategy calibration.

NOTE: ATSG has received several tech calls on vehicles that are not listed or covered under this Costumer Satisfaction Program showing up in shops with the same failure of the forward clutch drum. We have also found on some of these vehicles with as little as 35,000 miles, the valve body would have severe wear in the Pressure Regulator Valve bore. This may also cause Forward drum failure due to pressure spikes. See Figure 2 .

Special thanks to Wayne Deveau from Transmissions of West Palm Beach Inc. in Florida. For the great photos and help putting this information together.

FORWARD CLUTCH DRUM



CRACKS ALONG SNAP RING GROOVE

Figure 1

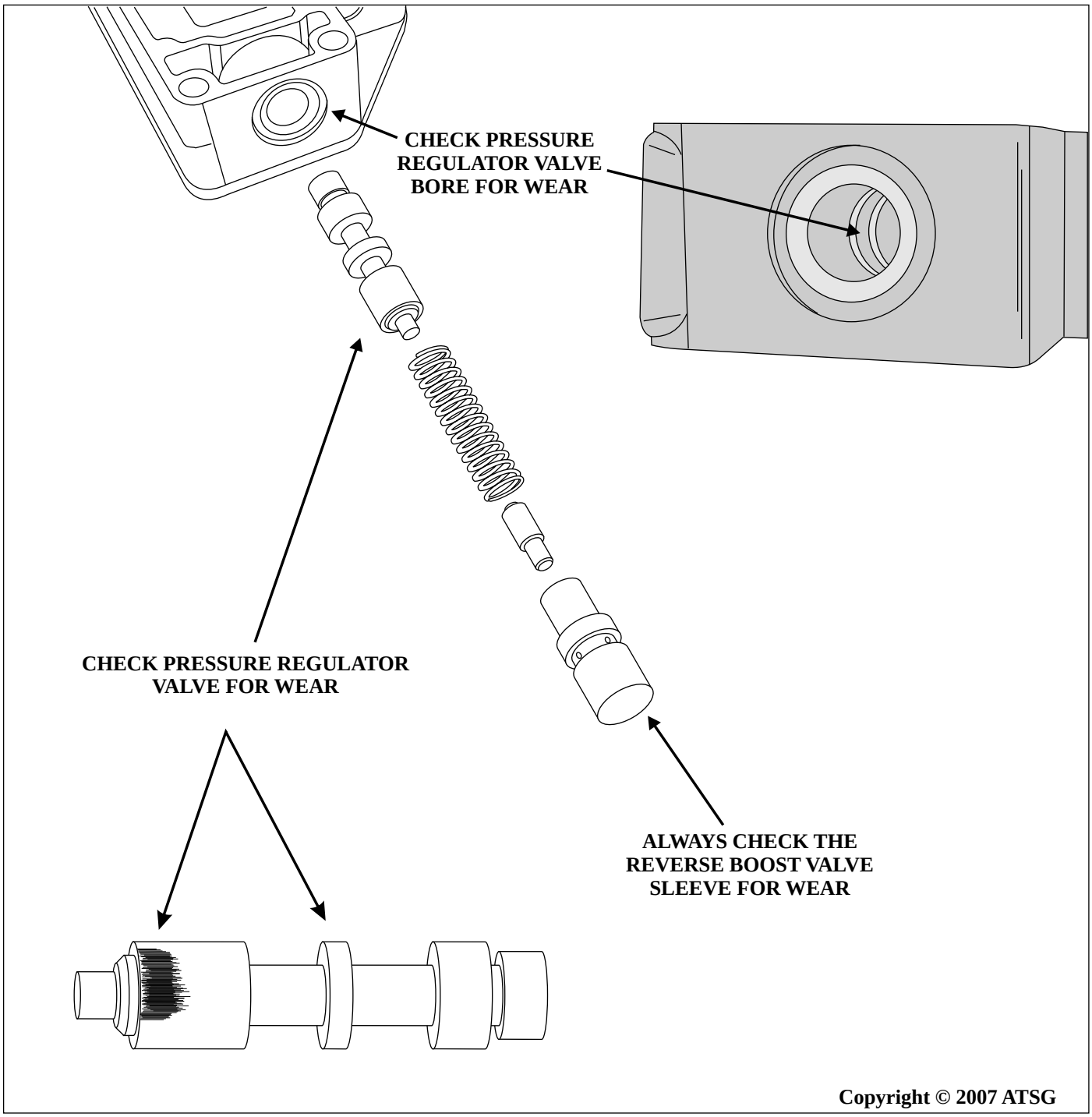

CHECK PRESSURE REGULATOR VALVE BORE FOR WEAR
CHECK PRESSURE REGULATOR VALVE FOR WEAR
ALWAYS CHECK THE REVERSE BOOST VALVE SLEEVE FOR WEAR
Copyright © 2007 ATSG

Figure 2

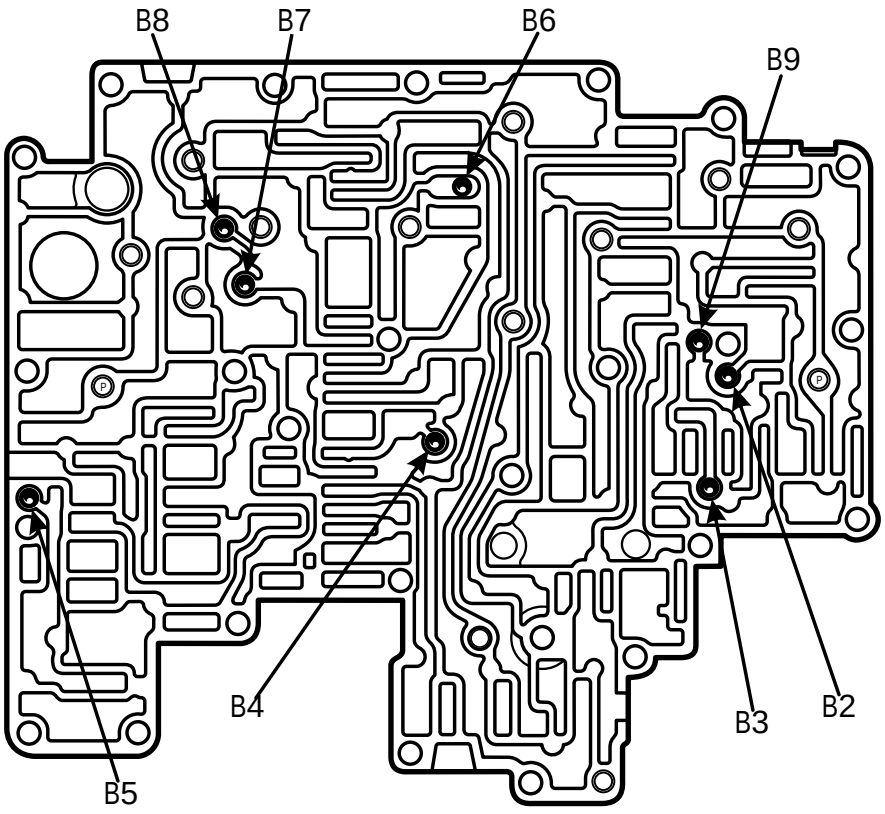
FORD 4R70/75E
TCC APPLICATION ON TOP OF 2ND GEAR

COMPLAINT: This bulletin applies to the following models, Ford 2005-06 Crown Victoria, E150, E250, Expedition, F150, Mercury Grand Marquis, Lincoln Town Car and the 2006 Lincoln Mark L1. These vehicles may experience an un-commanded TCC apply immediately after the 1-2 shift. This may be perceived as a lack of power and diagnostic trouble codes P0742 or P1742 may be stored indicating that lockup is stuck "ON".

CAUSE: The #7 check ball in the valve body, (Refer to Figure 1), has become too small and is allowing line pressure from the 2-3 shift valve to stroke the Bypass Clutch Control Valve which will apply the converter clutch as soon as a 1-2 shift occurs as shown in the hydraulic diagram in Figure 2. The hydraulic diagram in Figure 3 illustrates how the TCC circuit should operate when the #7 check ball is the correct size.

CORRECTION: Although this bulletin refers to specific years and models, any 4R70W, 4R70/75E in any vehicle would have the same complaint should the #7 check ball become too small.
Replacement of the #7 check ball will remove the complaint and restore TCC to computer control strategies.

4R70W/4R70/75E CHECKBALL LOCATIONS



B2 - In the Forward Clutch circuit near the 3-4 shift valve.
B3 - In the Direct Clutch circuit near the 2-3 backout valve.
B4 - In the Overdrive and Forward Clutch circuits near the 1-2 shift valve.
B5 - In the Reverse circuit near orifice number one.
B6 - Shuttle ball between the Low and Reverse circuits.
B7 - Between the L234 and Torque Converter Clutch circuits.
B8 - Between the L234 and Intermediate Clutch circuits.
B9 - Between the FC34 and 23BP circuits (1996-Up Only).

Figure 1

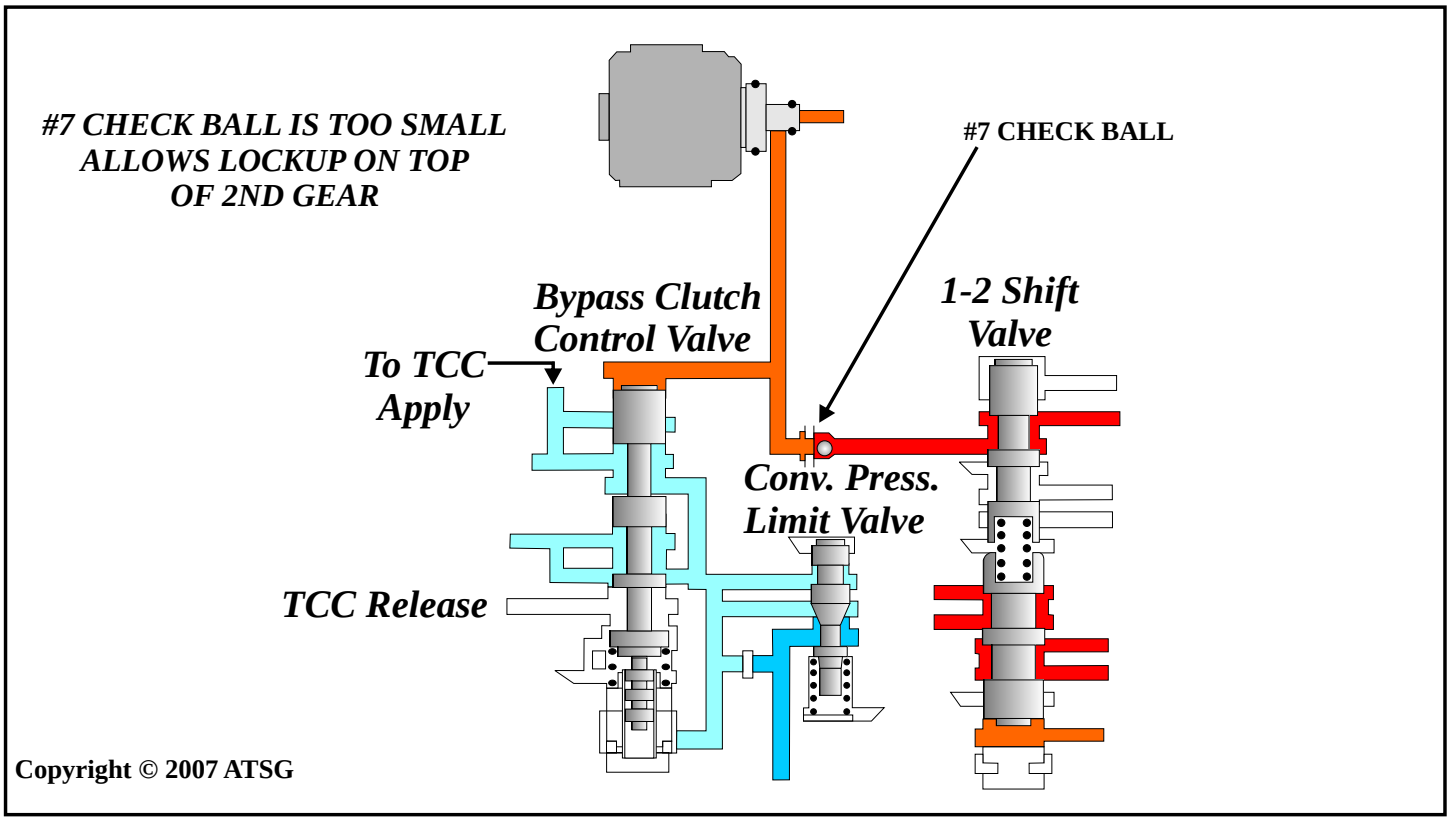


Figure 2

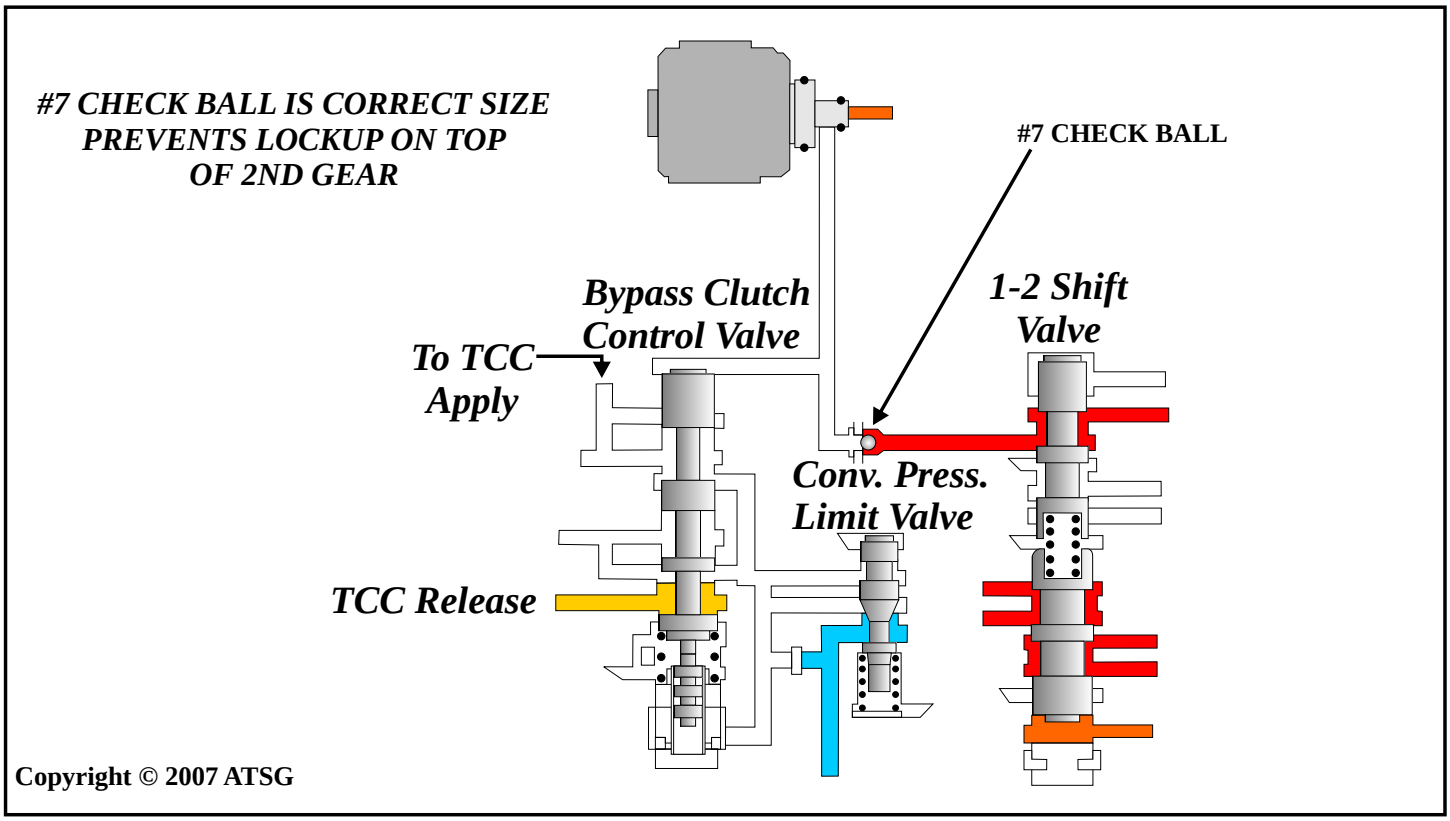


Figure 3

FORD

KEY SWITCH- HIGH TURNING EFFORT WITH P0500 STORED

COMPLAINT: This bulletin covers most vehicles built between 1998-2002 that would come into the shop with a complaint of the key cylinder sticking or binding and the storage of VSS codes P0500 or P1502.

CAUSE: The cause is the "Key-In-Ignition" Warning Chime Switch, located on the key cylinder, (Refer to Figure 1). The contact arm of the chime switch (See Figure 1) gets caught in the Key cylinder causing the above complaints. The newly designed chime switch now has a tapered contact arm (See Figure 1) to prevent this from happening.

CORRECTION: The service procedure for changing this chime switch is as follows:

(1) Disconnect the battery ground cable and wait at least one minute.
(2) Insert ignition key and turn it to the "RUN" position.
(3) Insert a punch into the access hole (located in the lower steering column shroud, below the key cylinder) and press the release button while pulling out the key cylinder.
NOTE: Some vehicles do not have an access hole and require lower shroud removal.
(4) Remove the faulty orange plastic key chime warning switch by prying upward on the plastic retainer, while sliding the switch away from the key insertion end, (See Figure 1).
(5) Install the new key chime switch and reinstall the key cylinder.
(6) Verify proper function of the key cylinder and the key chime switch.

SERVICE INFORMATION:

Key-In-Ignition Warning Chime Switch Only.....XL2Z-11A127-AB
NOTE: If a new key cylinder is needed, it comes with a new Key-In-Ignition Warning Chime Switch. Key cylinders are ordered by application and by how the key is cut, so take the key cylinder and the keys with you to the dealer.

A special thanks to Darryl Keels from Econo Transmissions in Wilmington, N.C. for sharing this experience with us in order to make this bulletin possible.

KEY-IN-IGNITION WARNING CHIME

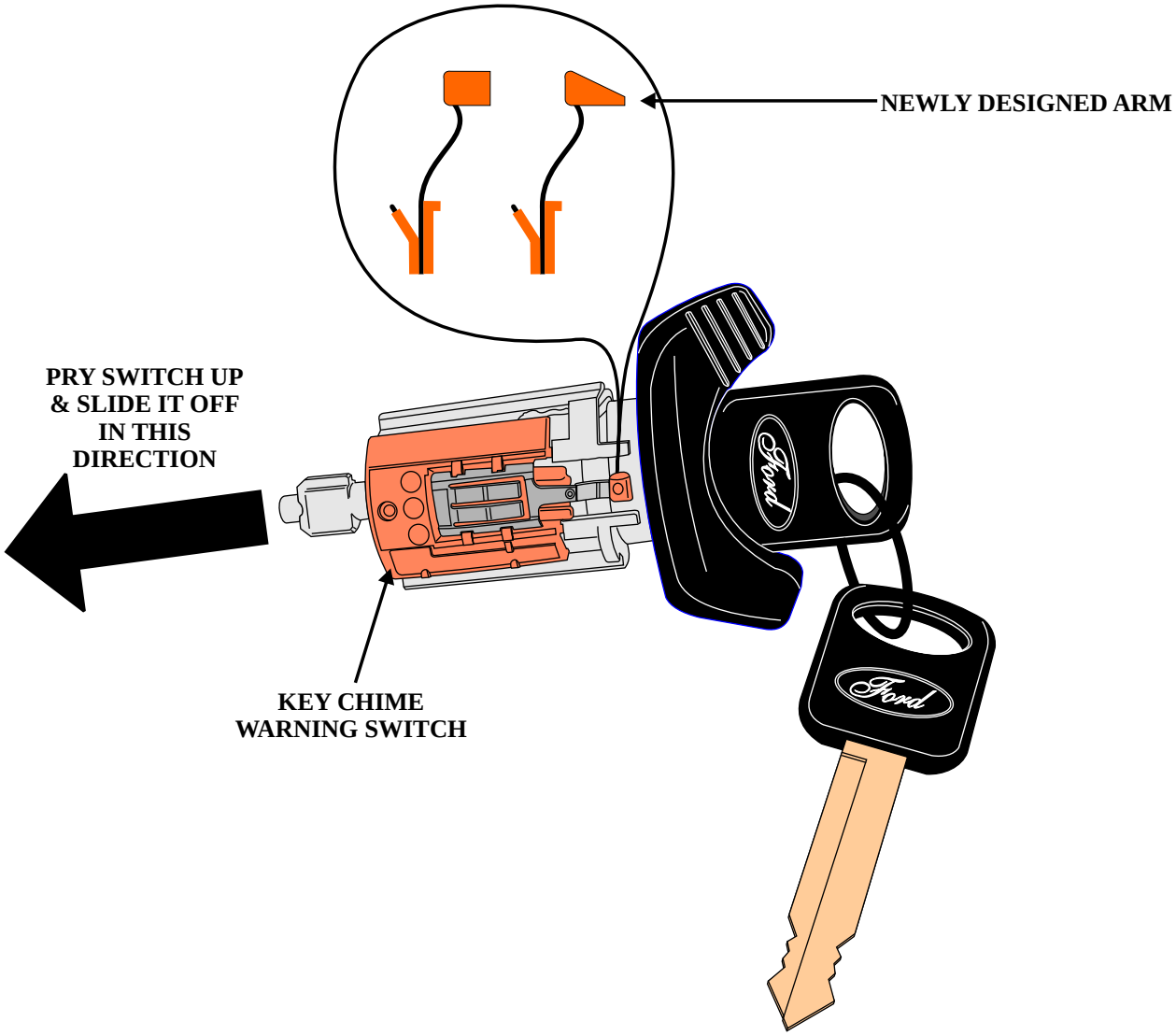


Figure 1

AVI

Techpac

Transtech

BC

Life Automotive