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"Tech is Rev'n in 2007" Seminar Information

Introduction

Thank you for attending ATSG's "Top Tech Tricks for 2006" technical training seminar. We strive to provide a quality seminar designed to help professionals like your self to stay on top of the trade with information that can be used to fix problems and repair transmissions for years to come. These seminars are presented across the US and Canada with a wide spectrum of technicians attending them so we encourage any suggestions that you may have. It is our interest to see the transmission industry prosper and that begins with getting the right price for a job done once. Getting the right price but doing the job 3 or 4 times hurts both the employee and the employer. Without question, training and information make for great companions in transmission repair. You can submit your suggestions by either e-mail or snail-mail. To send by e-mail, please use atsgsem@atsg.biz or atsgsem@atsgmiami.com. By snail-mail please use the address located at the bottom of the page. Thank you.

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Lubegard

Rostra

MITSUBISHI
F4A40/50 SERIES
NEW PLASTIC BODY SOLENOID

CHANGE: In the 2000 model year, some Mitsubishi F4A40/50 series transaxles were equipped with newly designed Plastic Body Solenoids.

REASON: The reason for the change was for calibration issues. The flow rate of the plastic body solenoid is 1.8 liters per minute. The Previous design Metal Body solenoids, which are still in use on other models, flow at 2.5 liters per minute.

PARTS AFFECTED:

The solenoids are the only change and are model dependant. Refer to Figure 1 for the identification of the new solenoid. The part number is etched in the end of the solenoid casing. See Figure 2 for the Solenoid locations on the valve body of the F4A series front wheel drive models.

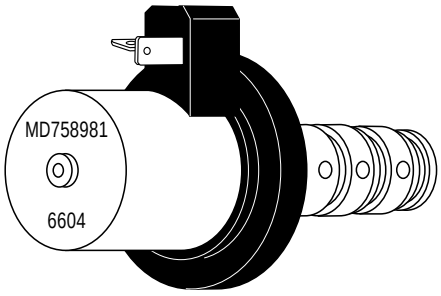
INTERCHANGE:

The two different solenoids are not interchangeable because of the flow rate, although they will fit in all of the valve body bores. Refer to the chart in Figure 3 for model applications of both versions of the Solenoid.

Special thanks to Bob Nutall

SOLENOID IDENTIFICATION

METAL BODY
MD758981



PLASTIC BODY
MR486941

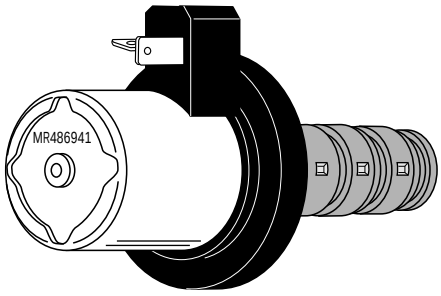
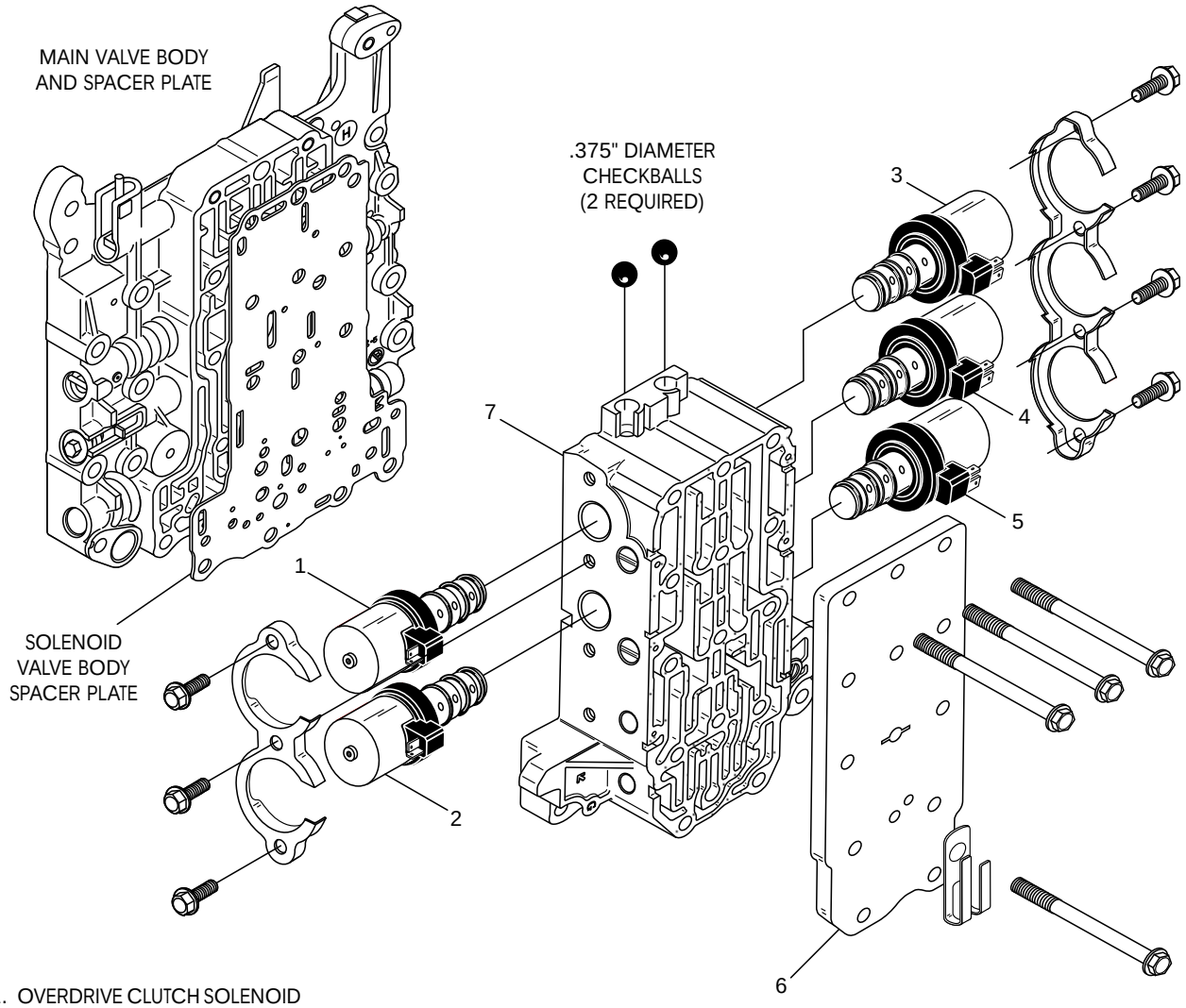


Figure 1

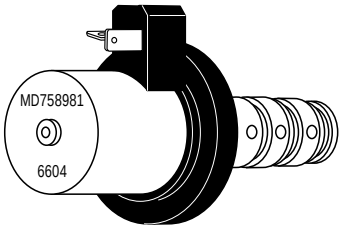
SOLENOID IDENTIFICATION AND LOCATIONS
F4A40/50 SERIES



1. OVERDRIVE CLUTCH SOLENOID
2. LOW/REVERSE CLUTCH SOLENOID
3. UNDERDRIVE CLUTCH SOLENOID
4. SECOND CLUTCH SOLENOID
5. TCC CONTROL SOLENOID
6. OUTER VALVE BODY COVER
7. OUTER VALVE BODY ASSEMBLY

Figure 2

METAL BODY SOLENOID VEHICLE APPLICATIONS
MD758981



Diamante 1997 to 2004 3.8L F4A51

Eclipse 2000 and UP 2.4L, 3.0L & 3.8L F4A42, F4A51 & F5A5A

Endeavor 2004 and UP 3.8L F4A5A & W4A5A

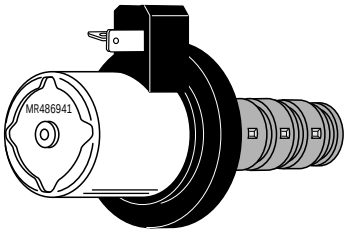
Galant 1999 and UP 2.4L ,3.0L & 3.8L F4A4B & F4A5A

Mirage 1997 to 1999 1.5L & 1.8L F4A41 & F4A42

Montero 2001 to 2006 3.5L & 3.8L V4A51 & V5A51

Montero Sport 1999 to 2004 3.0L & 3.5L R4A51 & V4A51

PLASTIC BODY SOLENOID VEHICLE APPLICATIONS
MR486941



Mirage 2000 to 2002 2.0L F4A4B

Lancer 2002 and UP 2.0L & 2.4L F4A4B

Lancer Sportback 2004 2.4L F4A4B

Outlander 2003 to 2006 2.4L F4A4B & W4A4B

Figure 3

MISTUBISHI/HYUNDAI

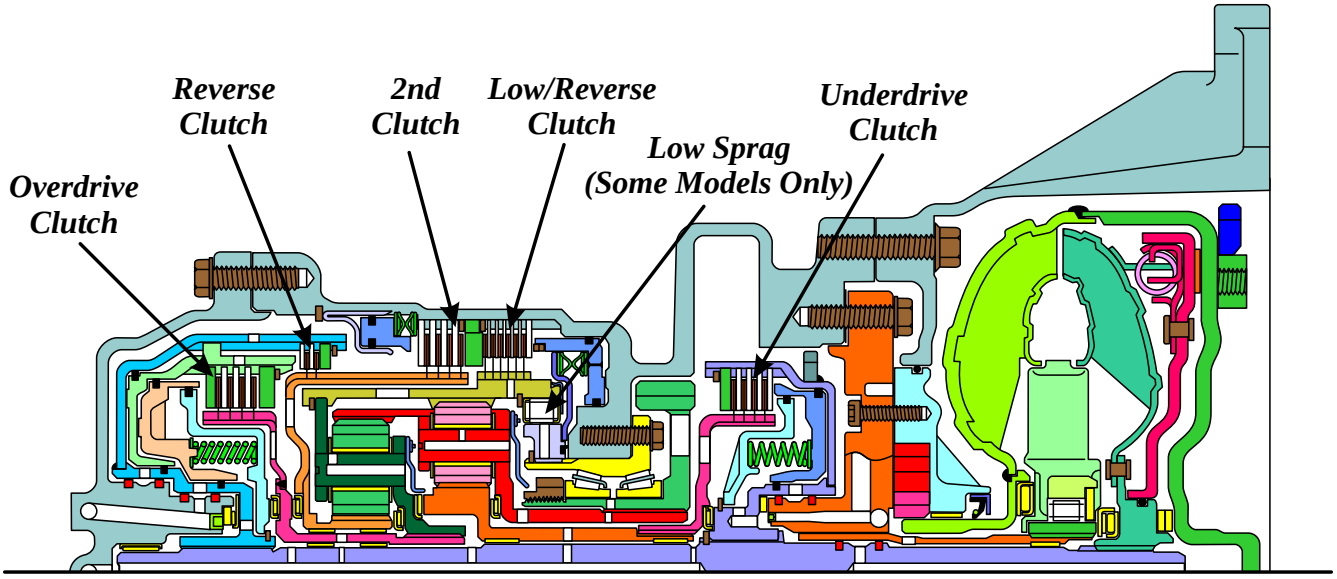
F4A40/50 SERIES
NEUTRALIZING AT 6MPH OR ON 2-1 DOWNSHIFT

COMPLAINT: Before or after overhaul, Mitsubishi and or Hyundai vehicles equipped with the F4A-40/50 or F4A-40/50 series transaxles, may exhibit a neutral while taking off from a stop at 6 mph while in 1st gear or while the vehicle is coming to a stop and making a 2-1 downshift. When the shifter is moved to Manual Low, 1st gear will re-engage.

CAUSE: The cause may be a bad Low Sprag. Figure 1 shows the computer strategy of the Low Reverse Clutch application thru the Low Reverse Solenoid. The chart shows the Low Reverse Clutch is turned OFF at 6 mph. It is the responsibility of the Low Sprag to hold from 6 mph up until the 1-2 upshift occurs. The Low Sprag also has to come back on during the 2-1 downshift. If the sprag does not hold it will cause the neutralizing effect. Notice that when the selector is in Manual Low, the Low Reverse Clutch stays ON while in 1st gear.

CORRECTION: Replace the Low Sprag as shown in Figure 2 and ensure the inner and outer races are good. Refer to Figure 2 to ensure the sprag is assembled correctly in the Output Internal Ring Gear, and verify that the carrier freewheels in the correct direction as shown in Figure 3.

MITSUBISHI F4A41, F4A42, F4A51 COMPONENT AND SOLENOID APPLICATION CHART



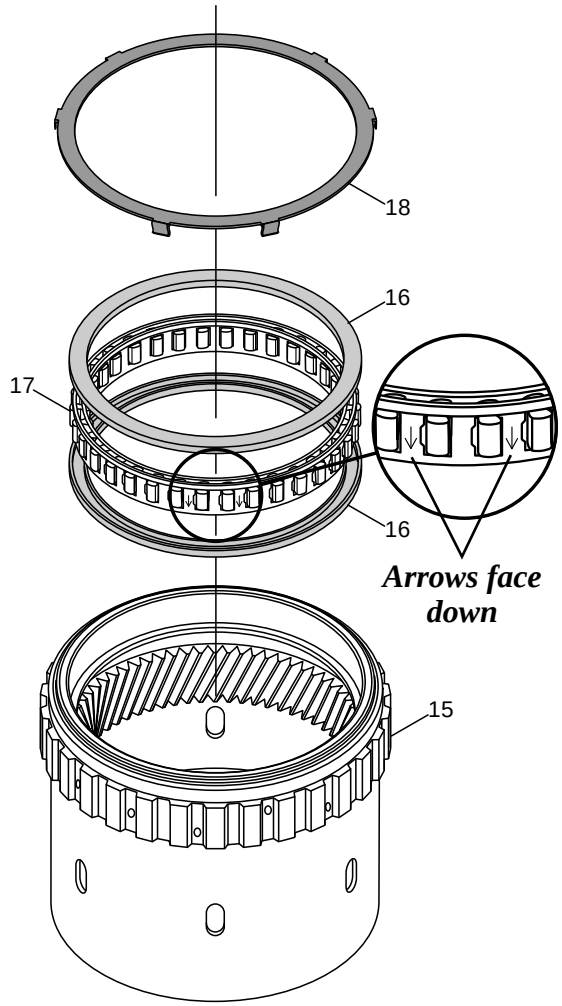
INTERNAL COMPONENT AND SOLENOID APPLICATION CHART

Gear Range	Reverse Clutch	Underdrive Clutch	2nd Clutch	Overdrive Clutch	Low/Rev Clutch	Low Sprag	U.D. Sol	2nd Sol	O.D. Sol	L/R Sol
Park					ON		ON	ON	ON	OFF
Reverse	ON				ON		ON	ON	ON	OFF
Neutral							ON	ON	ON	ON
Dr-1st		ON			ON*	HOLD	OFF	ON	ON	OFF to ON*
Dr-2nd		ON	ON				OFF	OFF	ON	ON
Dr-3rd		ON		ON			OFF	ON	OFF	ON
Dr-4th			ON	ON			ON	OFF	OFF	ON
M-3rd		ON		ON			OFF	ON	OFF	ON
M-2nd		ON	ON				OFF	OFF	ON	ON
M-1st		ON			ON		OFF	ON	ON	OFF

** Low/Reverse clutch is applied below 6 mph then RELEASED, on units equipped with low sprag . This is controlled by the turning the Low Reverse Solenoid from OFF to ON.*

Figure 1

LOW SPRAG LOCATION AND INSTALLATION



15 OUTPUT INTERNAL RING GEAR.
16 LOW SPRAG END BEARINGS (2 REQUIRED).
17 LOW SPRAG ASSEMBLY.

Figure 2

LOW SPRAG FREEWHEEL OPERATION

PLANETARY SHOULD FREEWHEEL COUNTER-CLOCKWISE AND LOCK CLOCKWISE

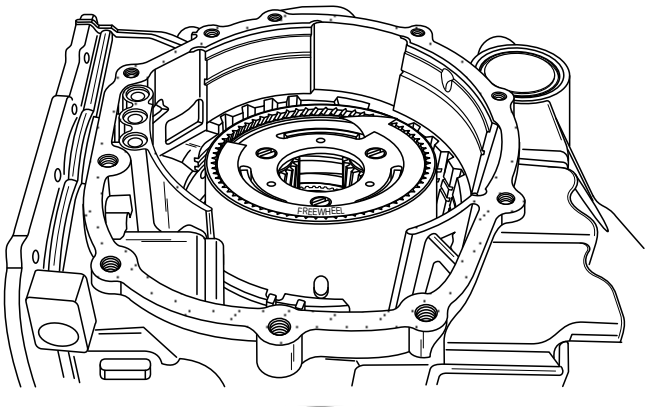


Figure 3

MISTUBISHI/HYUNDAI

F4A40/50 SERIES
SHUDDER OR SLIP IN REVERSE

COMPLAINT: Before or after overhaul, Mitsubishi and or Hyundai vehicles equipped with the F4A40/50 or F4A40/50 series transaxles, may exhibit a shudder or slip while backing up

CAUSE: The cause may be, that the Overdrive / Reverse Clutch Drum is cracked around the weld on the back of the drum as shown in Figure 1. ***CAUTION:*** This crack is easy to miss!

CORRECTION: Replace the Overdrive / Reverse Clutch Drum and renew the piston seals as shown in Figure 2.

Special thanks to Billy Johnson

OVERDRIVE / REVERSE CLUTCH DRUM

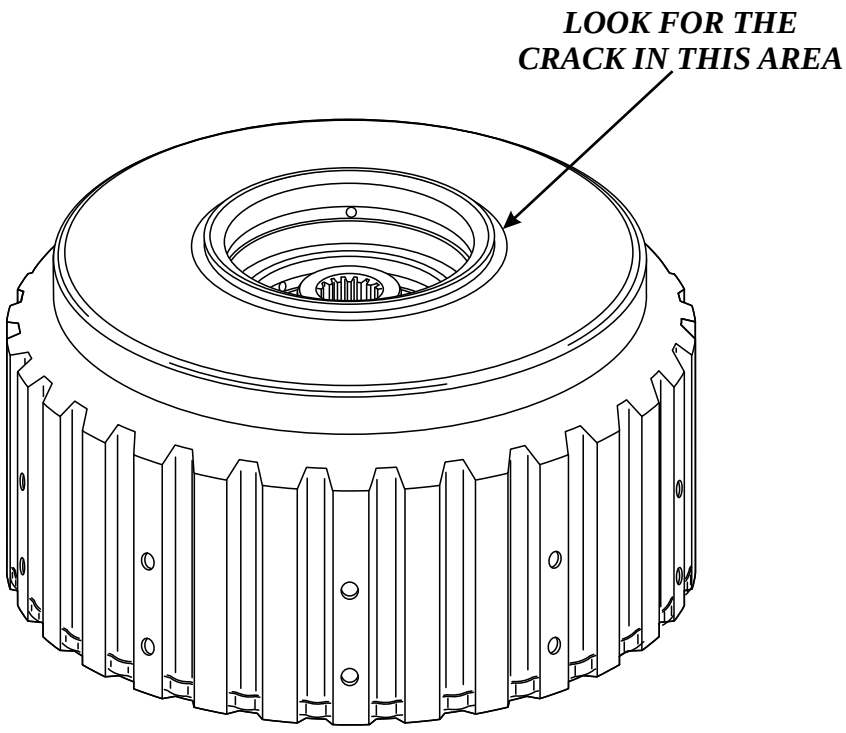
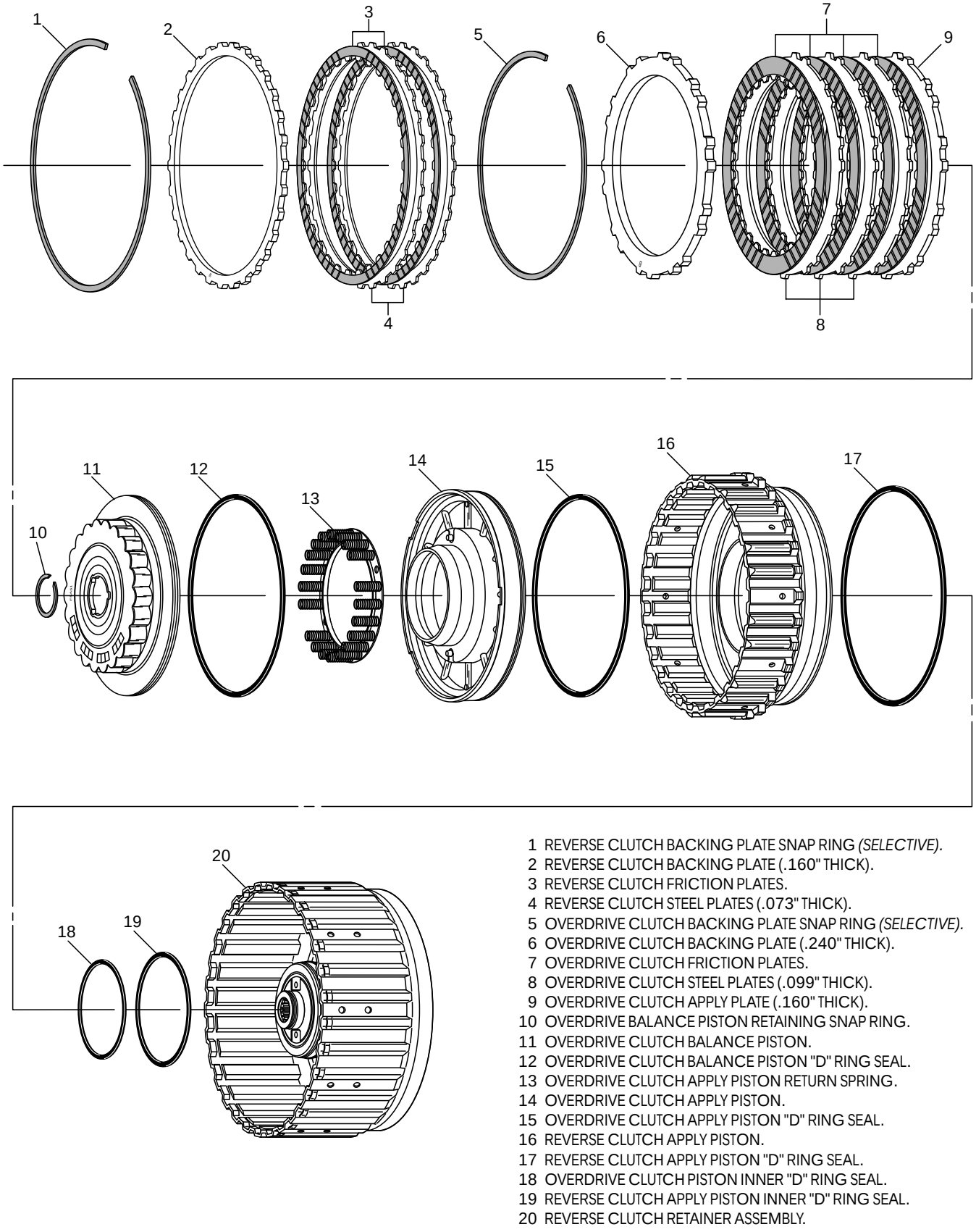


Figure 1

REVERSE/OVERDRIVE CLUTCH HOUSING EXPLODED VIEW



1 REVERSE CLUTCH BACKING PLATE SNAP RING *(SELECTIVE)*.
2 REVERSE CLUTCH BACKING PLATE (.160" THICK).
3 REVERSE CLUTCH FRICTION PLATES.
4 REVERSE CLUTCH STEEL PLATES (.073" THICK).
5 OVERDRIVE CLUTCH BACKING PLATE SNAP RING *(SELECTIVE)*.
6 OVERDRIVE CLUTCH BACKING PLATE (.240" THICK).
7 OVERDRIVE CLUTCH FRICTION PLATES.
8 OVERDRIVE CLUTCH STEEL PLATES (.099" THICK).
9 OVERDRIVE CLUTCH APPLY PLATE (.160" THICK).
10 OVERDRIVE BALANCE PISTON RETAINING SNAP RING.
11 OVERDRIVE CLUTCH BALANCE PISTON.
12 OVERDRIVE CLUTCH BALANCE PISTON "D" RING SEAL.
13 OVERDRIVE CLUTCH APPLY PISTON RETURN SPRING.
14 OVERDRIVE CLUTCH APPLY PISTON.
15 OVERDRIVE CLUTCH APPLY PISTON "D" RING SEAL.
16 REVERSE CLUTCH APPLY PISTON.
17 REVERSE CLUTCH APPLY PISTON "D" RING SEAL.
18 OVERDRIVE CLUTCH PISTON INNER "D" RING SEAL.
19 REVERSE CLUTCH APPLY PISTON INNER "D" RING SEAL.
20 REVERSE CLUTCH RETAINER ASSEMBLY.

Figure 2

MITSUBISHI/HYUNDAI
TRANSMISSION RELAY CODE
P1723 OR MITSUBISHI CODE 54

COMPLAINT: Some Mitsubishi and Hyundai vehicles, equipped with the F4A40/50 series transaxle, may arrive at your shop with a Transmission Control Relay code P1723, or a Mitsubishi code 54, or in limp mode, which is 3rd gear starts, with no codes.

CAUSE: The cause may be that the Trans Control Relay ***may*** be damaged from water dripping down onto it from a leaking heater core located just above the relay on the center fire wall. See Figure 1. The Trans Control Module, Engine Control Module and Trans Control Relay are located on the floor behind the center console. When the relay develops condensation inside of it, it can not close and connect the 12 volts needed to power up the solenoids in the transmission .

CHECK- Mitsubishi models - Refer to Figure 2 and back probe into terminals 9 and 10 of the case connector , and see if there is battery voltage when the ignition is switched on. If there is no voltage, refer to partial wire schematic in Figure 3 . Verify that terminal 2, of the Transmission Control Relay is a good ground. Verify that terminal 1 has battery voltage from Fuse 13, with the ignition on. Verify that there is battery voltage coming from the TCM from terminal 89 when the ignition is switched on. If all of these check correctly, turn the ignition on and probe into terminal 3 at the Transmission Control Relay, if there is no voltage coming out of terminal 3, replace the Transmission Control Relay. ***NOTE: This relay circuit is very similar to the circuit in the 604 family. If there is a problem in the relay circuit, there may only be voltage sent to pin 4 at the relay for less than 2 seconds and it is then turned off and may or may not set a relay code. This can be easy to miss be careful!***

CORRECTION: Replace the heater core and replace the Trans Control Relay.

Special thanks to
Robert at Inner City trans

COMPONENT LOCATIONS

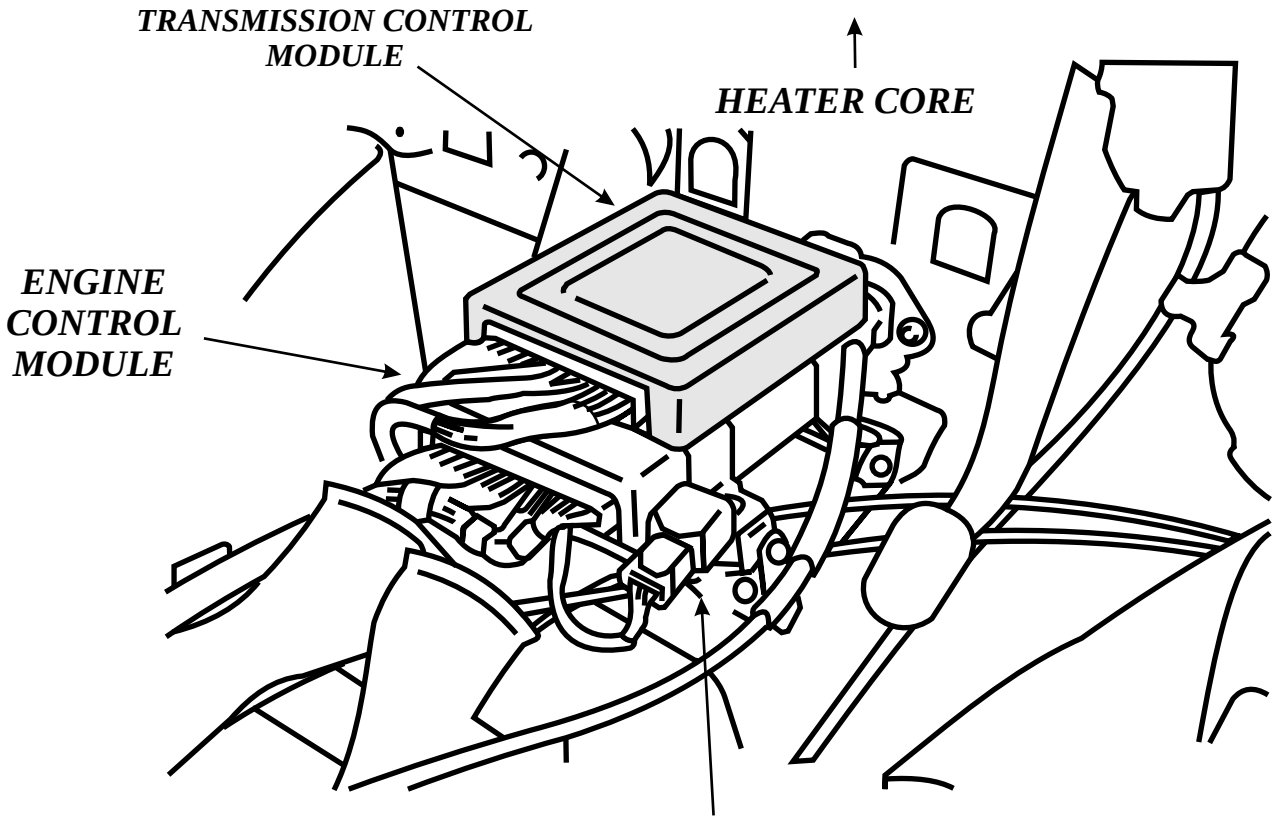
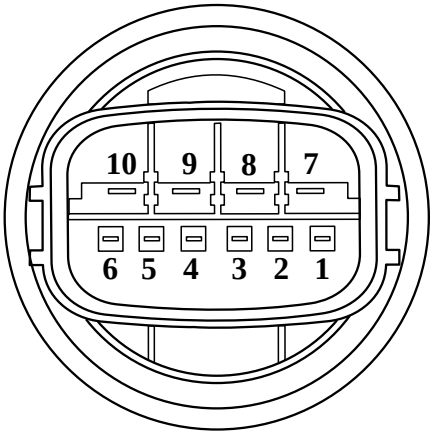


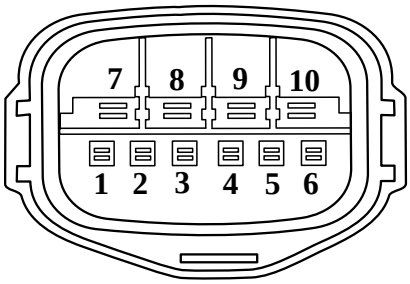
Figure 1

CASE CONNECTOR TERMINAL IDENTIFICATION AND INTERNAL COMPONENT RESISTANCE CHART

"Mitsubishi and Stratus Only"



View Looking Into Transaxle Case Connector



View Looking Into Transaxle Harness Connector

INTERNAL COMPONENT RESISTANCE CHART

COMPONENT	*TERMINALS*	*RESISTANCE*
Underdrive Solenoid	*Terminals 9 and 3*	*Approximately 3.6 Ohms @ 72 °F*
2nd Solenoid	*Terminals 9 and 4*	*Approximately 3.6 Ohms @ 72 °F*
Overdrive Solenoid	*Terminals 9 and 5*	*Approximately 3.6 Ohms @ 72 °F*
Low/Rev Solenoid	*Terminals 10 and 6*	*Approximately 3.6 Ohms @ 72 °F*
TCC Solenoid	*Terminals 10 and 7*	*Approximately 3.6 Ohms @ 72 °F*
TFT Sensor	*Terminals 1 and 2*	*Approximately 9.05 k. Ohms @ 72°F*

TERMINAL NUMBER	INTERNAL WIRE COLOR	CIRCUIT DESCRIPTION
1	*Red*	*5 Volt Power to TFT Sensor*
2	*Black*	*Ground to TFT Sensor*
3	*White*	*Ground to Underdrive Solenoid*
4	*Green*	*Ground to 2nd Clutch Solenoid*
5	*Orange*	*Ground to Overdrive Solenoid*
6	*Brown*	*Ground to Low/Reverse Solenoid*
7	*Blue*	*Ground to TCC Solenoid*
8		*Not Used*
9	*Red*	*Power to Underdrive, 2nd, and Overdrive Solenoids*
10	*Yellow*	*Power to TCC and Low/Reverse Solenoids*

NOTE: Wire colors may vary.

Figure 2

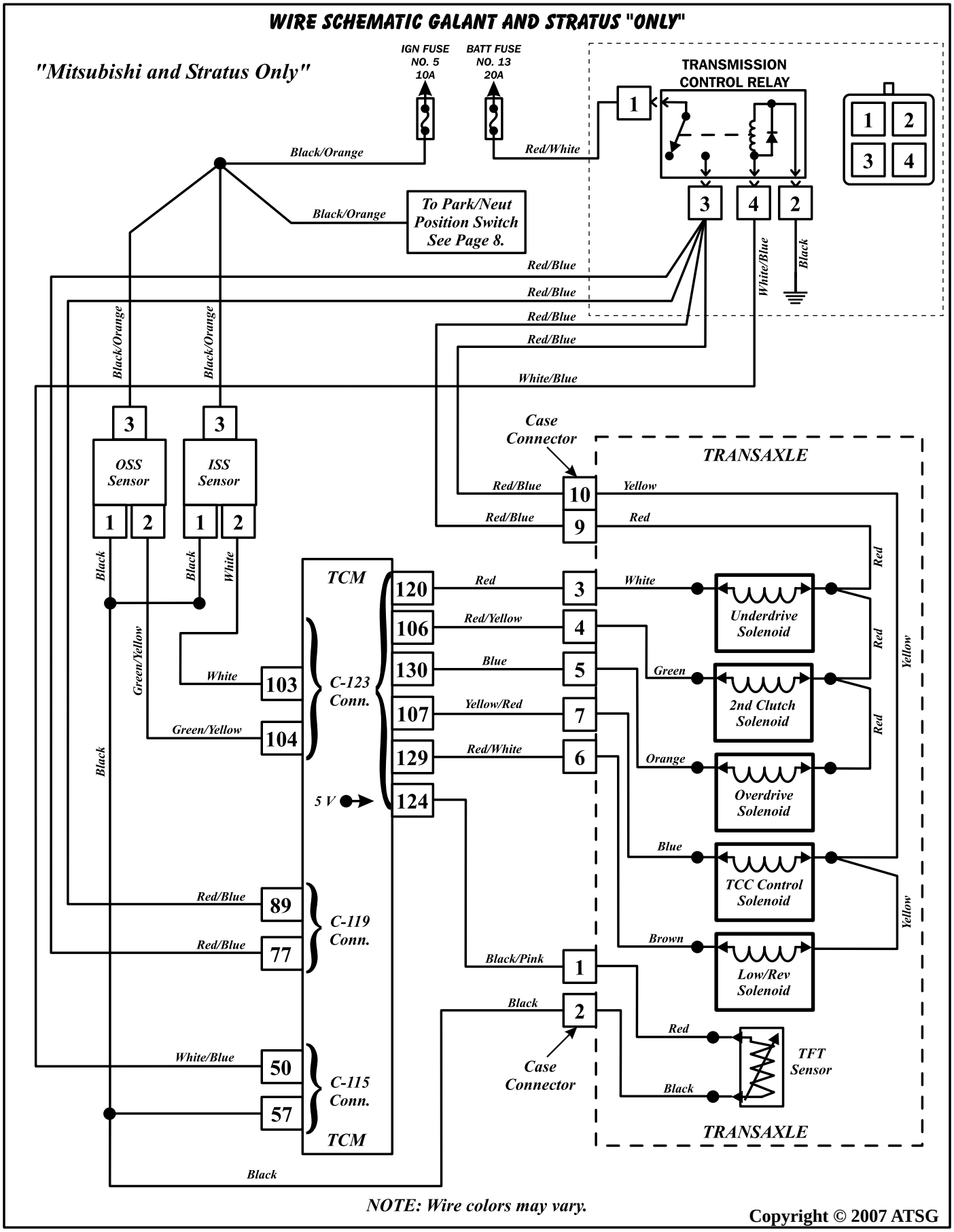

WIRE SCHEMATIC GALANT AND STRATUS "ONLY"
"Mitsubishi and Stratus Only"
IGN FUSE NO. 5 10A
BATT FUSE NO. 13 20A
TRANSMISSION CONTROL RELAY
Black/Orange
Red/White
To Park/Neut Position Switch See Page 8.
Red/Blue
White/Blue
Black
OSS Sensor
ISS Sensor
Case Connector
TRANSAXLE
TCM
C-123 Conn.
C-119 Conn.
C-115 Conn.
5 V
Green/Yellow
Yellow/Red
Red/White
Black/Pink
Underdrive Solenoid
2nd Clutch Solenoid
Overdrive Solenoid
TCC Control Solenoid
Low/Rev Solenoid
TFT Sensor
NOTE: Wire colors may vary.
Copyright © 2007 ATSG

Figure 3

AXIOM

Sonnax

HYUNDAI A4A/B & F4A40/50 SERIES TRANSMISSIONS

2-3 FLARE, NO FOURTH, NO LOCKUP

COMPLAINT: All Hyundai models built from 1995 to 2005 may exhibit complaints of but not limited to a flare on the 2-3 shift, no lockup application, no fourth gear, 1-2 shift only or harsh garage shifts. In addition, codes P0711, P0712 or P0713 concerning ATF temperature sensor faults are stored.

CAUSE: A Transmission Fluid Temperature Sensor malfunction resulting in storing any of the above mentioned codes can cause the complaints listed above.

The computer strategy corresponding to the above codes is as follows:

(1) P0711 - TFT PERFORMANCE MALFUNCTION
The MIL will be turned on with P0700 stored indicating the TCM has requested from the PCM that the MIL be turned on.

(2) P0712 - TFT CIRCUIT SHORTED
MIL is turned on.
Flare on the 2-3 shift.

(3) P0713 - TFT CIRCUIT OPEN
MIL is turned on.
Harsh Garage shifts
Damper clutch does not engage
No 4th gear command, stays in 3rd
2nd gear hold (1-2 shift only).

CORRECTION: Replace TFT sensor or repair sensor wiring. The ATF Temp Sensor location for the A4BF1, A4AF2,A4AF3 and A4BF2 is shown in Figure 1. The ATF Temperature Sensor location for the F4A40/50 series is shown in Figure 2.

SERVICE INFORMATION:

Transmission Fluid Temperature Sensor For 1995-2005 Accent; 1996-2000 Elantra; 1996-2000 Tiburon A4A/B Series.....46386-22600
Transmission Fluid Temperature Sensor For 1999-2005 Sonata; 2001-2005 Elantra; 2001-2005 Santa Fe; 2001-2005 XG300/350; 2003-2005 Tiburon; 2005 Tucson F4A40/50 Series 46386-39050

Transtec

Wesco
B & W

ATF TEMPERATURE LOCATIONS

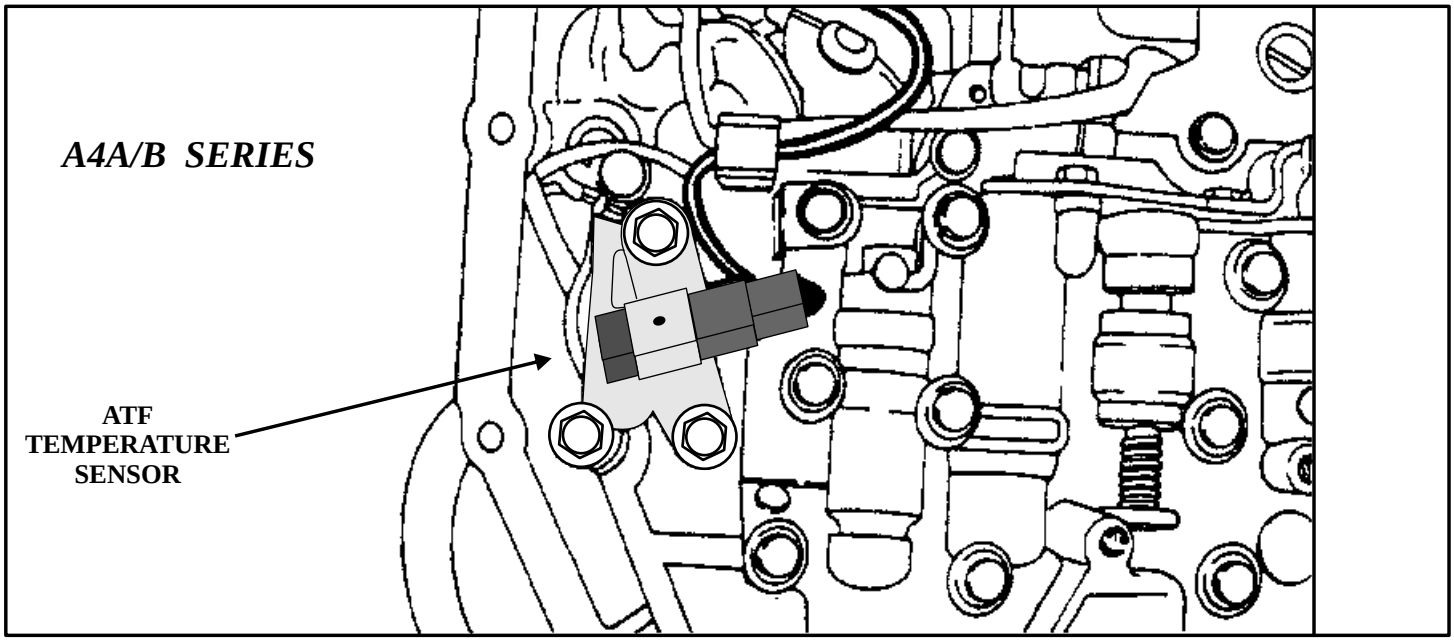


Figure 1

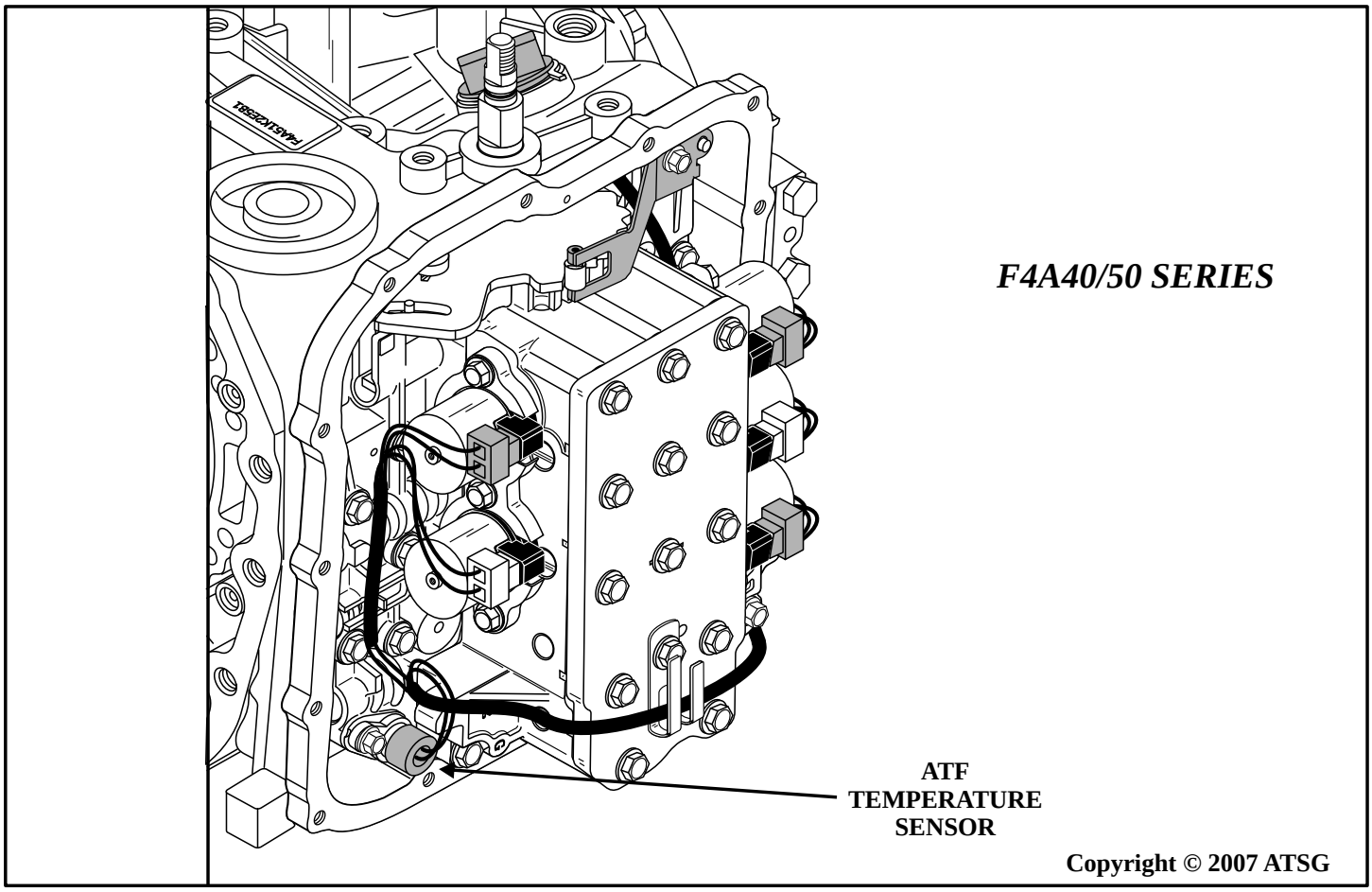


Figure 2

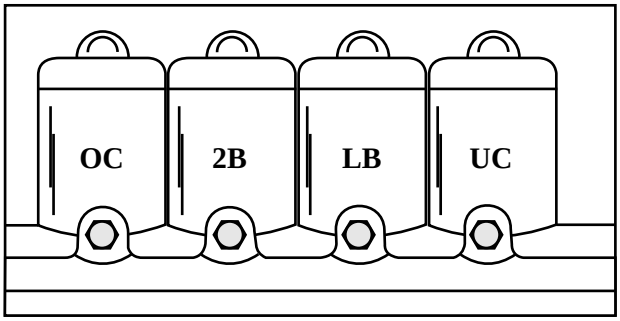
MITSUBISHI R4A51/V4A51
POOR SHIFT QUALITY / 2-3 FLARE

COMPLAINT: Vehicles equipped with the R4A51/V4A51 series transmissions, may exhibit poor shift quality or a flared 2-3 upshift, after overhaul typically after a planetary failure.

CAUSE: The cause may be that the Pressure Regulator Spring may be losing it's tension or is shrinking from the extreme heat of the planetary failure. ***Note: The planetary failure is usually due to Torque Converter Clutch failure clogging the cooler causing a loss of lubrication.***

CORRECTION: To correct this condition, first verify what the base pressures are on the Underdrive clutch and the Low Reverse Brake in the Drive Position, as shown in Figure 1. If the Pressure is below 147-152 in both ports, remove the valve body and inspect the pressure regulator valve for sticking in it's bore. If it is free, refer to the specs in Figure 2 to verify the specs of the spring. If the spring is below 1.760, " the adjustment, as shown in Figure 3 will have to be turned counterclockwise to increase the Base Line Pressure and replace the pressure regulator valve spring if necessary.

PRESSURE SPECIFICATIONS



LINE PRESSURE TEST SPECIFICATIONS

PRESSURES (PSI) MEASURED AT 2500 RPM				
Gear	***Underdrive Clutch***	***Second Brake***	***Overdrive Clutch***	***Low/Rev Brake***
Park				***37-50***
Reverse				***184-256***
Neutral				***37-50***
"D"-1st	***147-152***			***147-152***
"D"-2nd	***147-152***	***147-152***		
"D"-3rd	***113-127***		***113-127***	
"D"-4th		***113-127***	***113-127***	

Figure 1

PRESSURE REGULATOR VALVE COMPONENTS

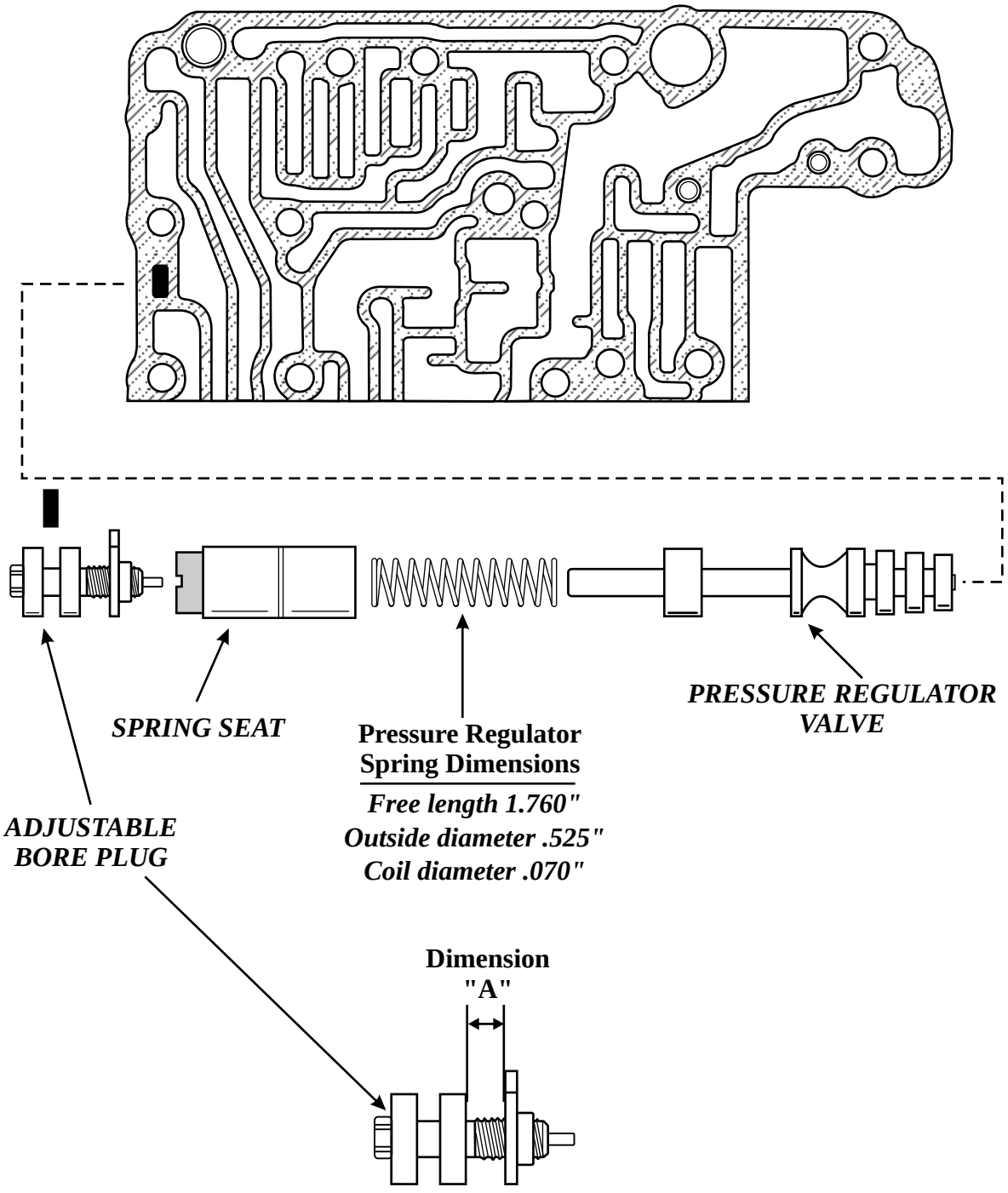
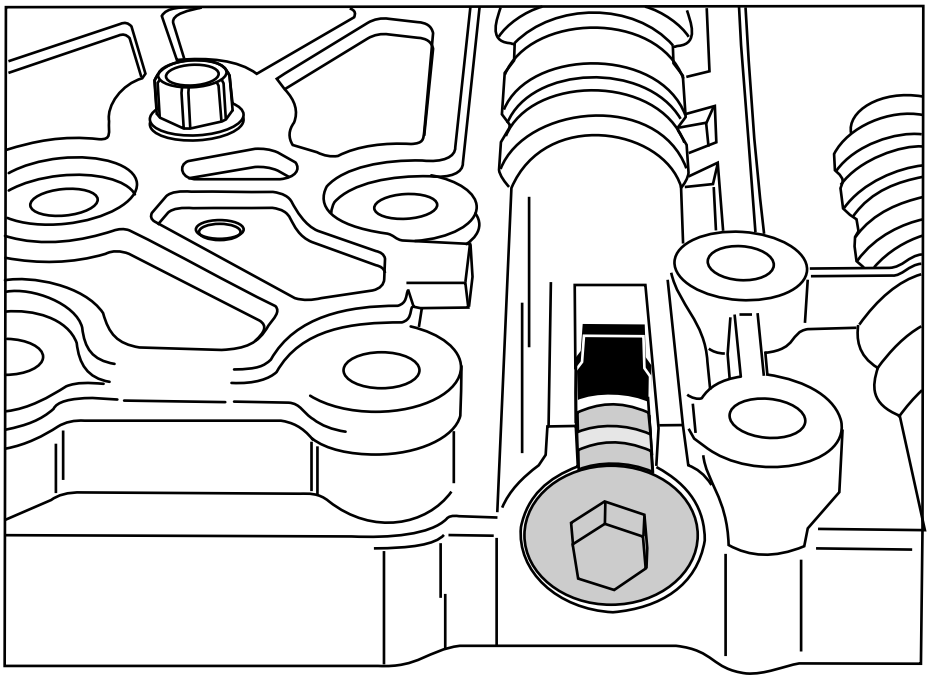


Figure 2

PRESSURE REGULATOR VALVE ADJUSTMENT



TURNING THIS PLUG COUNTER CLOCKWISE WILL INCREASE PRESSURE

Figure 3

HYUNDAI

FALSE SOLENOID CODES

COMPLAINT: The vehicle has the "MIL" on with no apparent driveability complaints and the A4BF1 transmission is NOT in limp mode. However, when the TCM is scanned for codes, P0743, TCC Solenoid circuit fault and P0747, Pressure Control Solenoid "A" circuit fault are stored.
Solenoid circuit checks revealed no problems, and system voltage and TCM power and ground checks also indicated no faults. The TCM was not considered for replacement as the transmission was not in limp.
NOTE: Although this was a 1997 Hyundai Tiburon, this could conceivably occur with virtually any vehicle.

CAUSE: A spare "known good" set of solenoids were connected to the vehicle harness and ground was provided for the solenoids directly to the negative battery cable.
The codes were cleared and did not return. As a test these "known good" solenoids were installed into the transmission and the codes immediately returned.

CORRECTION: A cable was attached directly to the negative battery cable at the battery, Refer to Figure1, with the other end attached to the transmission case, Refer to Figure 2.
Obviously there is a ground problem somewhere in this vehicle, but finding it would have consumed too much time.

Many thanks to Dominick Pietrantonio from AC Transmission in Addison, IL for making this bulletin possible and for supplying the photos.

FALSE SOLENOID CODES

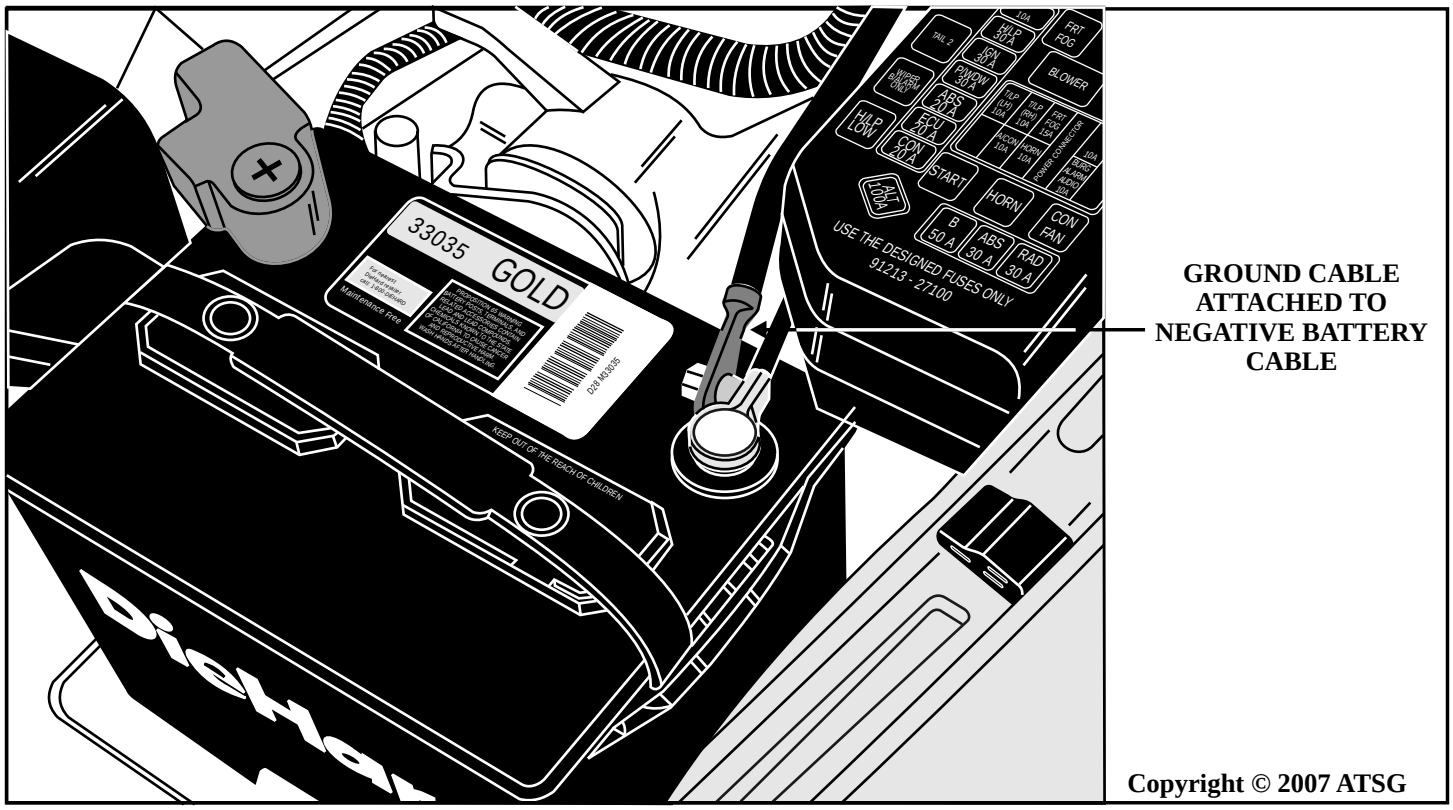


Figure 1

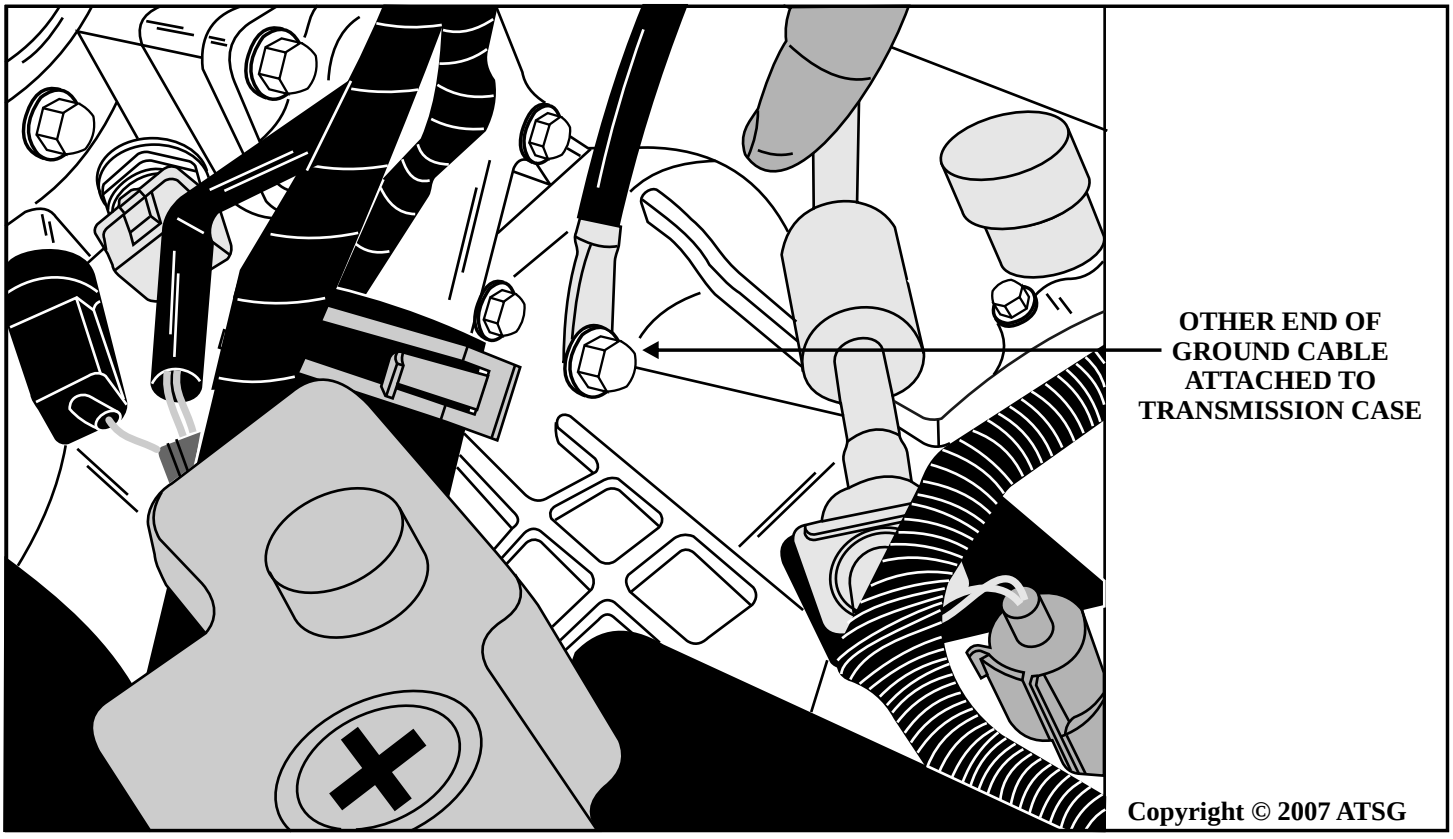


Figure 2

TOYOTA 540-E 540-H
NO REVERSE NO ENGINE BRAKING

COMPLAINT: Before or after overhaul, Toyota vehicles equipped with the 540H or 540-E transaxle, may exhibit a no reverse condition as well as no engine braking when selecting Manual 2 or Manual 1.

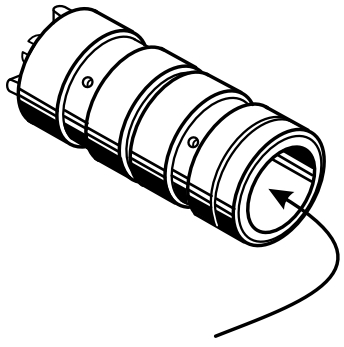
CAUSE: The cause may be, the inner o-ring in the Overdrive Direct Clutch Piston is blown out causing a leak in the O.D. Direct Clutch circuit. The reason for the piston seal blow out may be excessive wear in the Pressure Regulator Boost sleeve, causing high pressure in the Reverse circuit, bowing the piston in the center and blowing the piston seal out. ***NOTE: ATSG has also had complaints with some after market filters having defective cork gaskets causing numerous holes in the spacer plate to be plugged causing very high pressure and the same failure.***

CORRECTION: To correct this condition, replace the boost sleeve with a replacement from Toyota or Sonnax, See Figures 1 and 3. Renew the piston seals in the O.D. Direct drum as shown in Figure 2. Verify that the piston is not warped by checking with a straight edge, also shown in Figure 2.

SERVICE INFORMATION:

540H BOOST SLEEVE (Toyota number).....35417-32031
540-E BOOST SLEEVE (Toyota number).....35417-32021
3.0L SONNAX BOOST VALVE AND SLEEVE (High ratio).....89031-01K
2.5L SONNAX BOOST VALVE AND SLEEVE (Low ratio).....89031-02K

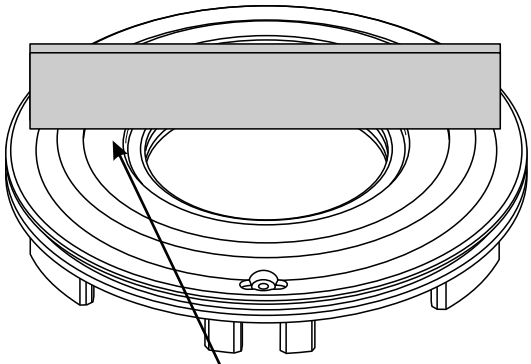
540-E BOOST SLEEVE



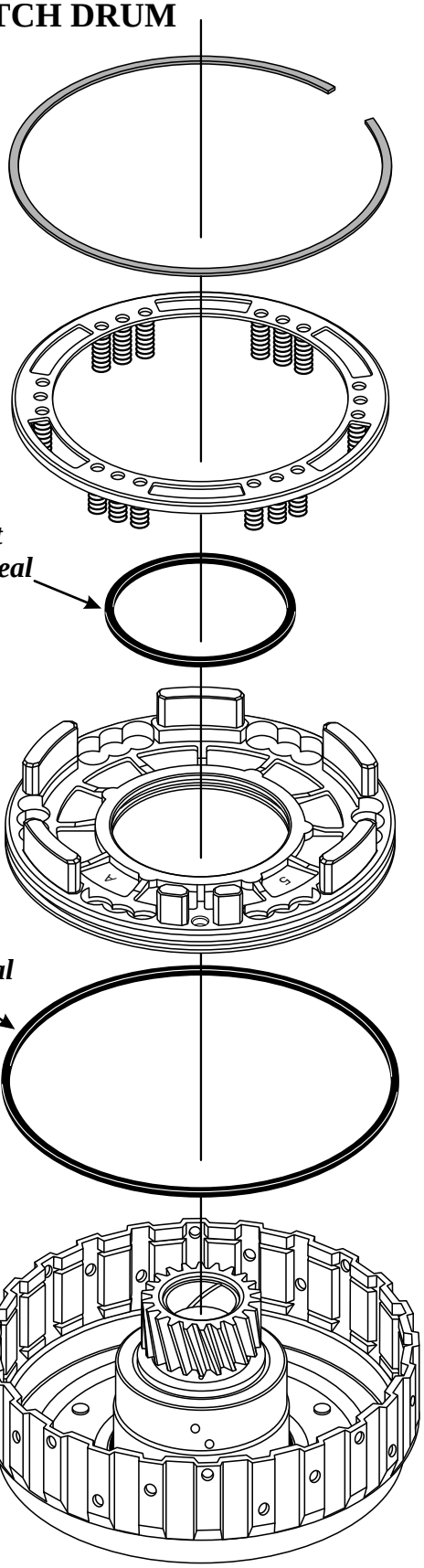
INSPECT FOR WEAR INSIDE OF SLEEVE

OVERDRIVE DIRECT CLUTCH DRUM

OVERDRIVE DIRECT CLUTCH PISTONCHECK



Ensure piston is flat with straight edge

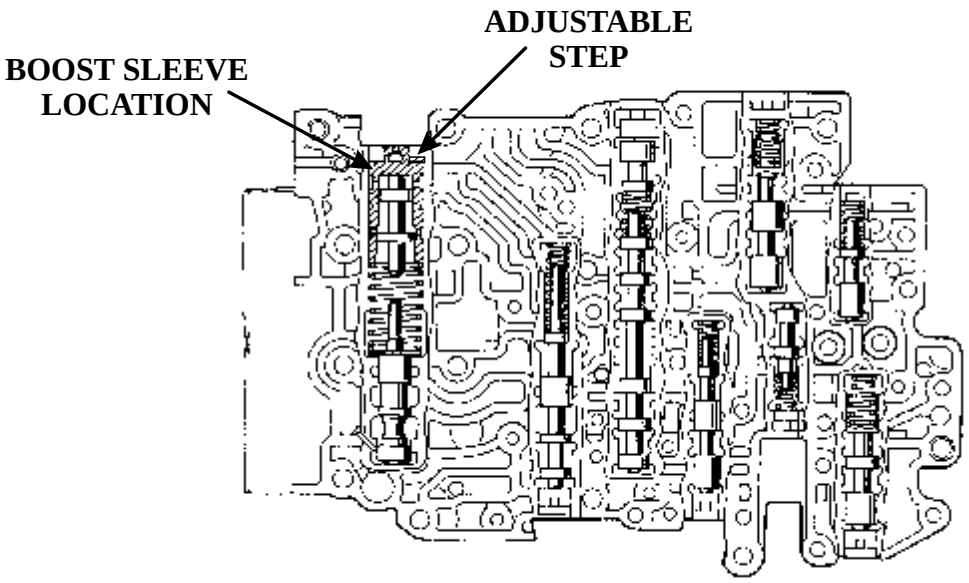


O.D. Direct inner piston seal

O.D. Direct outer piston seal

Figure 2

540-E LOWER VALVE BODY



NOTE: THE BOOST SLEEVE ON A540E HAS AN ADJUSTABLE STEP. ENSURE THAT THE RETAINER IS IN THE SAME LOCATION AS BEFORE DISASSEMBLY.

Figure 3

TOYOTA/LEXUS U SERIES TRANSAXLES

REPEATED DIRECT CLUTCH FAILURE

COMPLAINT: The vehicle comes in slipping badly in third gear, upon dis-assembly the direct clutch, (See Figure 1), is found to be severely damaged. During the after overhaul road test, the technician notices a shift shuttle on the 2-3 shift followed by a bind-up which results in an extremely harsh shift.
By monitoring the shift solenoids, the technician can see that when the shift occurs, shift solenoid 1 is being turned on and off, matching the shift shuttle complaint. At this time the transmission begins to flare on the 2-3 shift.
Back at the shop the technician removes the rear cover, and sure enough, the direct clutches are burnt.

The technician believes that the PCM needs to have a shift adapt relearn. The relearn is performed at the dealer, (only some vehicles can manually relearn the shift adapts). When driven by the technician, the 2-3 shift still shuttles, binds up and has a brutal 2-3 shift.

CAUSE: The cause of all these complaints is a faulty PCM.

CORRECTION: The PCM will require programming and replacement., Refer to Figure 2).

NOTE (1) ***There are times when a shift adapt relearn procedure , either through a reflash by the dealer or a battery disconnect and road test will have the 2-3 shift feel at an acceptable level, but these cases are rare.***

NOTE (2) ***All PCMs for 2004-06 Toyota and Scion vehicles must have the VIN programmed into the computer. Failure to do so will result in a P0630 stored in memory as well as the "Check Engine" lamp illuminated. If a donor computer is used, the same results will occur do to a VIN number mismatch.***
A common problem seen with this transmission that could also result in direct clutch failure is wearing of the ring lands on the rear cover as well as ring grooving of the direct clutch drum sealing ring area.
Should this occur and the rear cover requires replacement, be advised that a Toyota rear cover will NOT interchange with a Lexus rear cover.
There is a raised boss on the inside of the Lexus cover that would interfere with the clutch apply pipes located there as shown in Figure 3.

SERVICE INFORMATION:
It has been discovered by various technicians at ATSG, that by disconnecting the TPS, (Refer to Figure 4), the above complaints disappear as the PCM will revert to a preset shift pattern. This helps to confirm that the PCM is in fact faulty.

Special Note: Another apparent incident that seems to make the above complaints disappear is disconnecting the Output Speed Sensor.
It seems that the rather small connector that plugs into the sensor requires a considerable amount of force to make a good connection. The location of the sensor is difficult to get to as well as see. This may result in the connector to be partially plugged into the sensor, temporarily making the above complaints disappear.

Special thanks to Dominick Pietrantonio from AC Transmission in Addison, IL., John Parmenter of Centereach Transmissions in Centereach, N.Y. and Trent of Transmart in Bend, OR. for sharing their knowledge and experiences which were instrumental in the compilation of this bulletin.

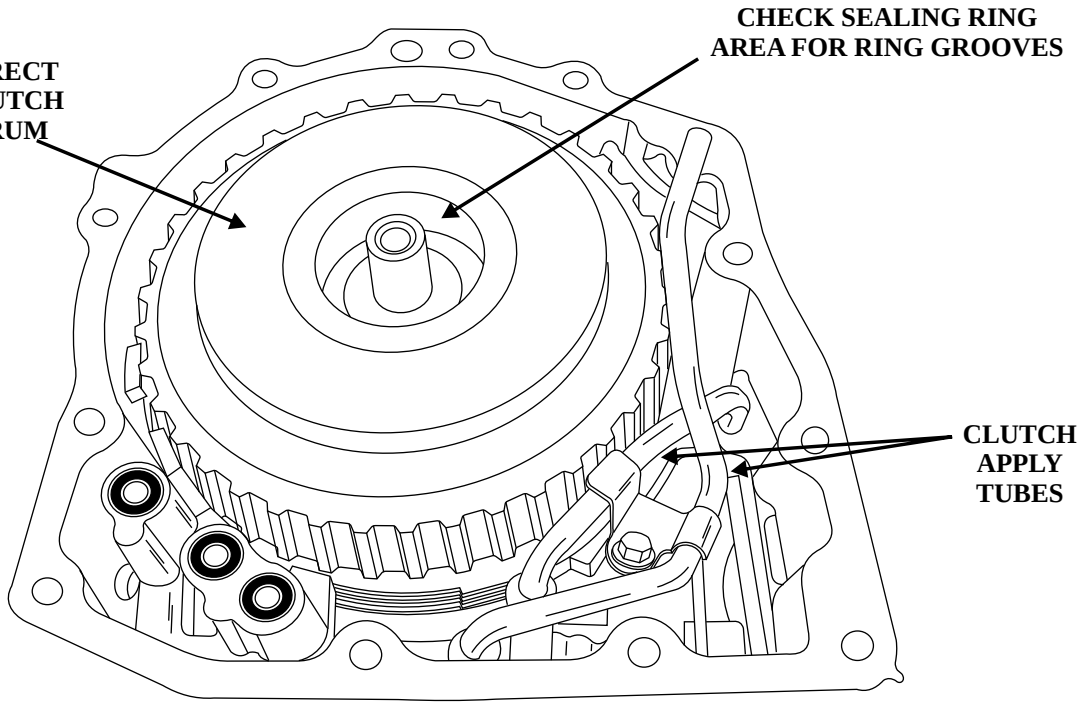


Figure 1

PCM LOCATION & REMOVAL

THE NEW PCM MUST BE PROGRAMMED TO FUNCTION

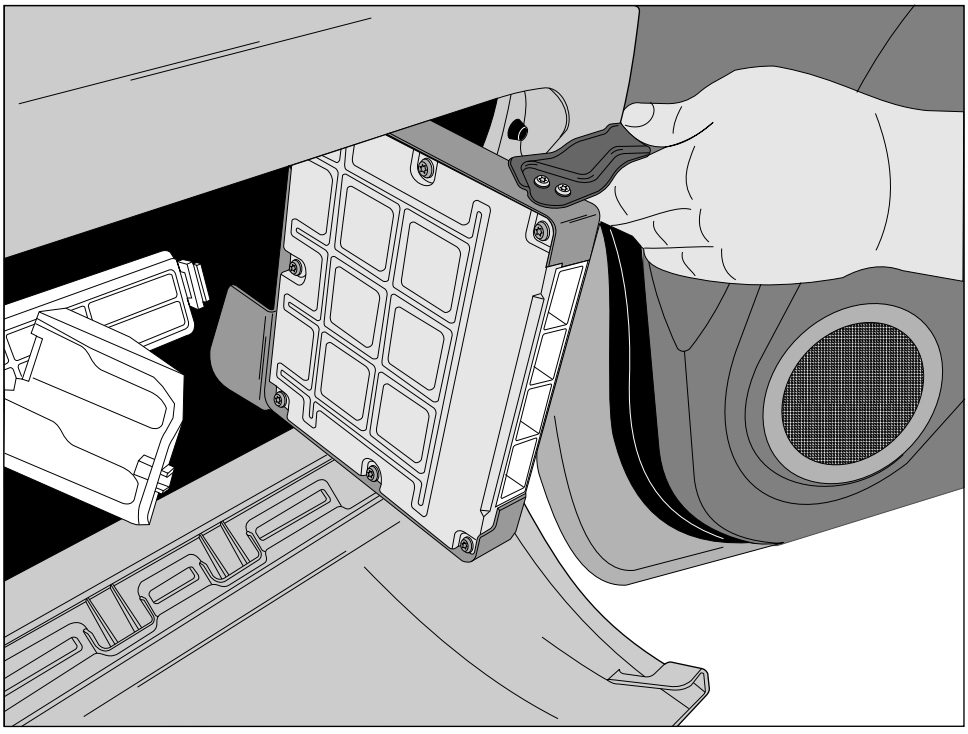


Figure 2

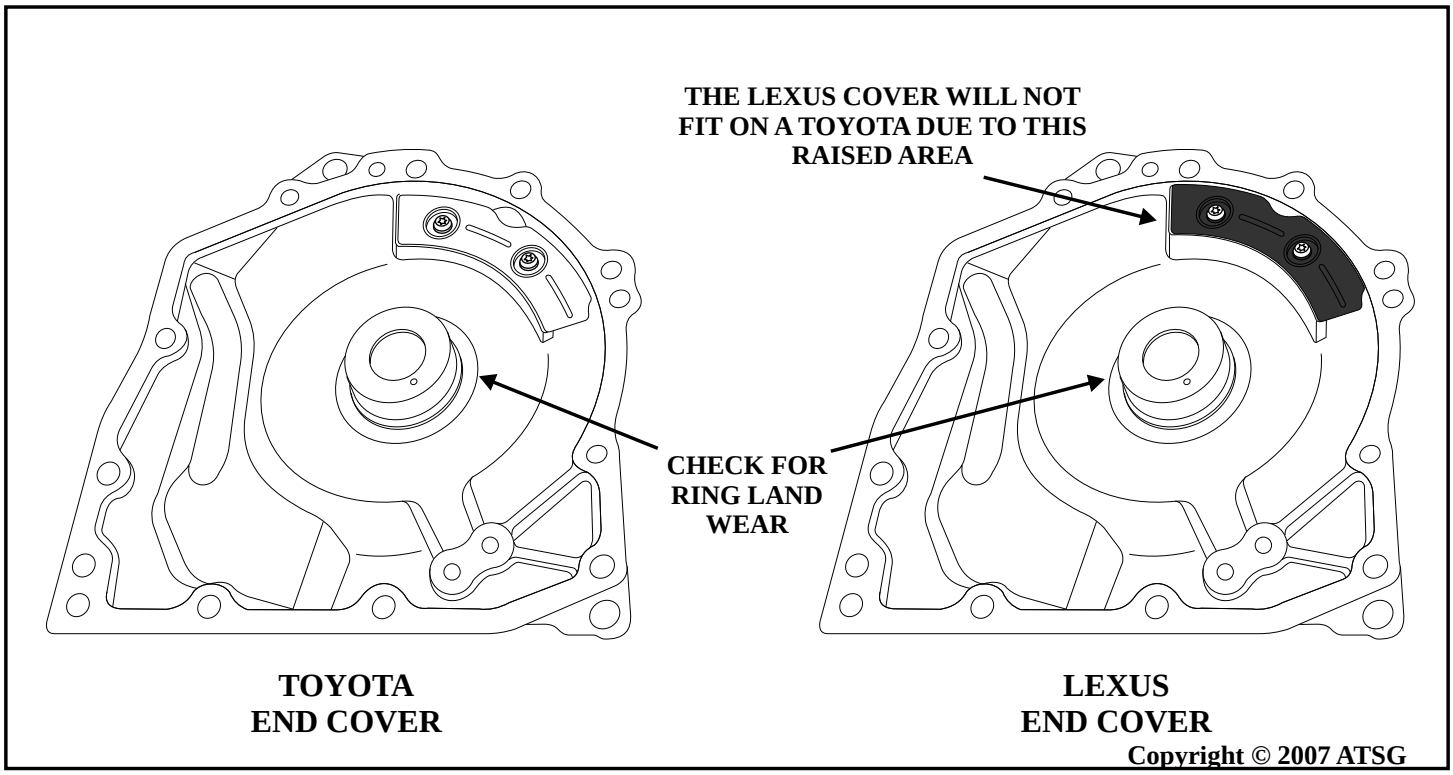


Figure 3

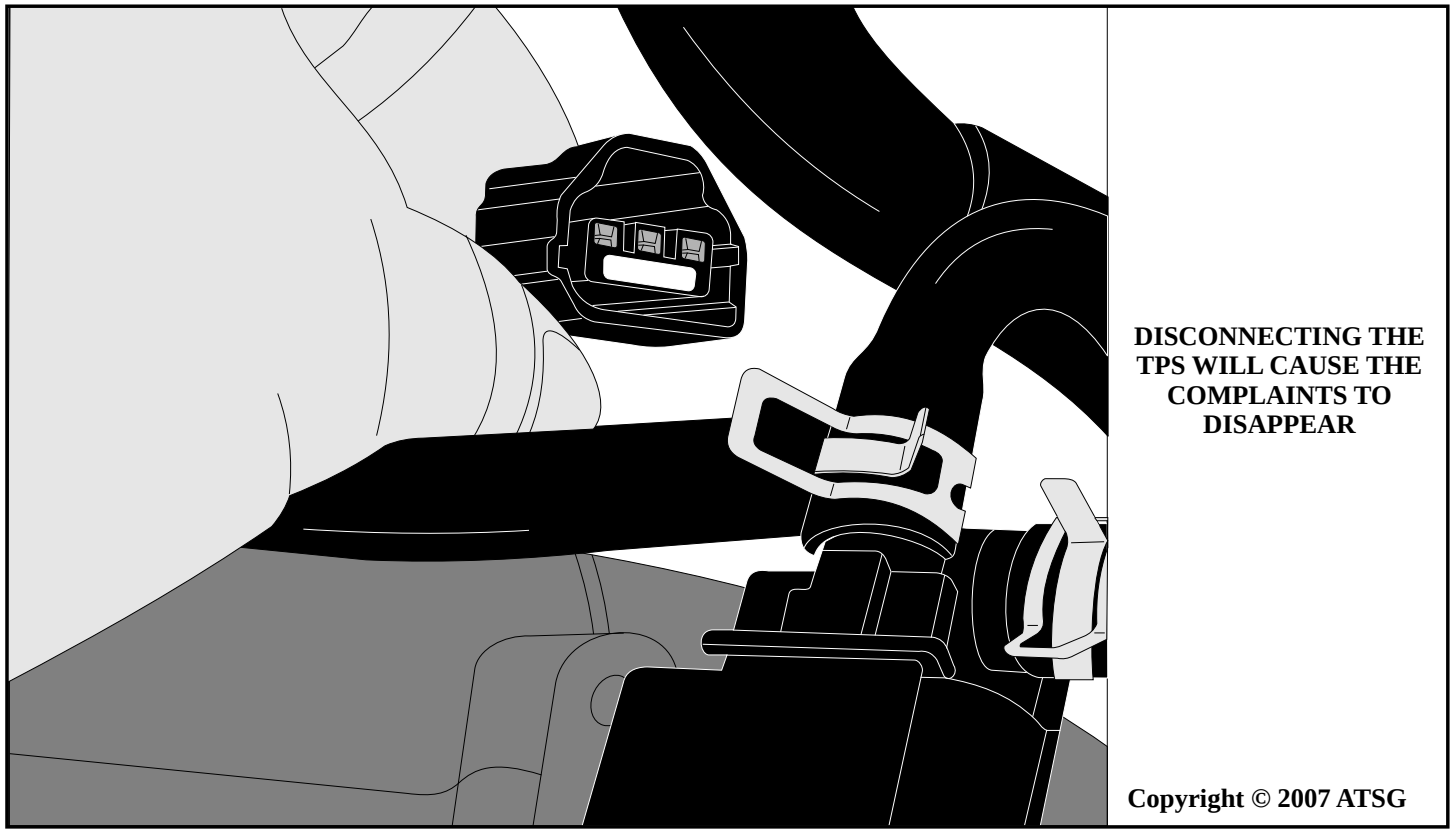


Figure 4

TOYOTA A340 SERIES TRANSMISSIONS

2000 & LATER CHECKBALL LOCATIONS

Check ball locations on 2000 and later vehicles using the A340E, F or H series of transmissions is at best, one of the most difficult issues in the transmission industry today. The main reason for this is the checkball locations vary between vehicle models, model years, engine size, and whether it is 2WD or 4WD, this one being the most difficult. Because of constant demand for this information, we at ATSG are going expand upon this in formation with one condition, if in using this material, you find a variation that is not illustrated here, we hope you will let us know as soon as possible so that we may keep this information as accurate as possible for the good of the industry.

Refer to Figure 1 for Valve Body Identification for Upper Valve Body, Casting # 8938 Without TV Cable.
Refer to Figure 2 for Checkball Locations for Upper Valve Body, Casting # 8938 Without TV Cable.
Refer to Figure 3 for Small Parts Locations for Lower Valve Body, Casting # 8938 Without TV Cable.
Refer to Figure 4 for Valve Body Identification for Upper Valve Body, Casting # 8934 Without TV Cable.
Refer to Figure 5 for Checkball Locations for Upper Valve Body, Casting # 8934 Without TV Cable.
Refer to Figure 6 for Small Parts Locations for Lower Valve Body, Casting # 8934 Without TV Cable.
Refer to Figure 7 for Valve Body Identification for Upper Valve Body, Casting # 8935 Without TV Cable.
Refer to Figure 8 for Checkball Locations for Upper Valve Body, Casting # 8935 Without TV Cable.
Refer to Figure 9 for Small Parts Locations for Lower Valve Body, Casting # 8935 Without TV Cable
Refer to Figure 10 for Valve Body Identification for Upper Valve Body, Casting # 8938 With TV Cable.
Refer to Figure 11 for Checkball Locations for Upper Valve Body, Casting # 8938 With TV Cable.
Refer to Figure 12 for Small Parts Locations for Lower Valve Body, Casting # 8938 With TV Cable.

Many thanks to Paul Tinges at Hardparts For Transmissions for his invaluable help in cataloging these valve bodies.

A special thanks to John Mathews from Coastal Transmissions in Hinesville, Ga., for all the transmission fluid that ran down his arms in helping to determining checkball locations and their effect.

UPPER VALVE BODY CASTING NUMBER 8938
4 SOLENOIDS, 1 ACCUMULATOR, NO TV CABLE

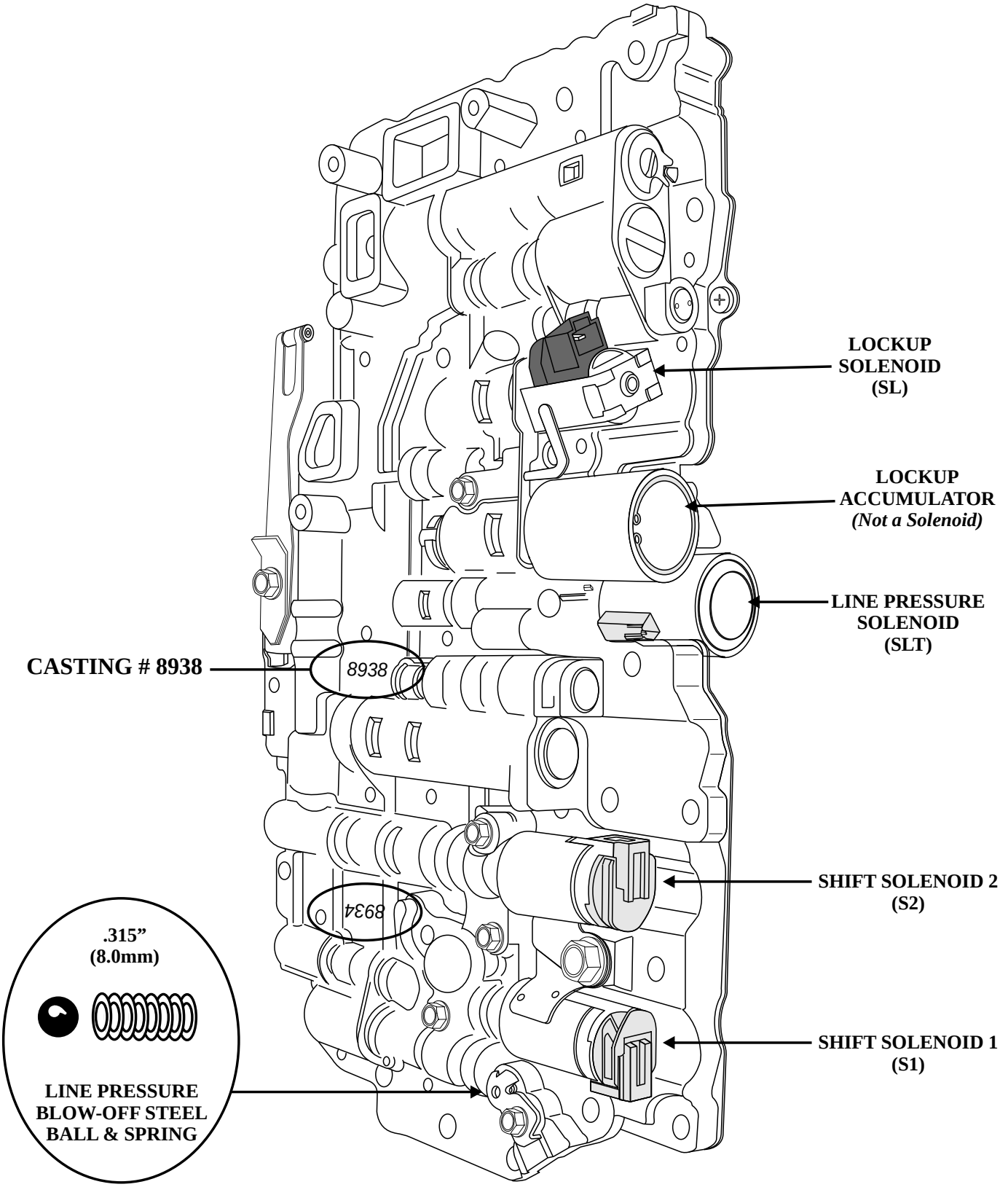


Figure 1

Jaggi
B & W

UPPER VALVE BODY

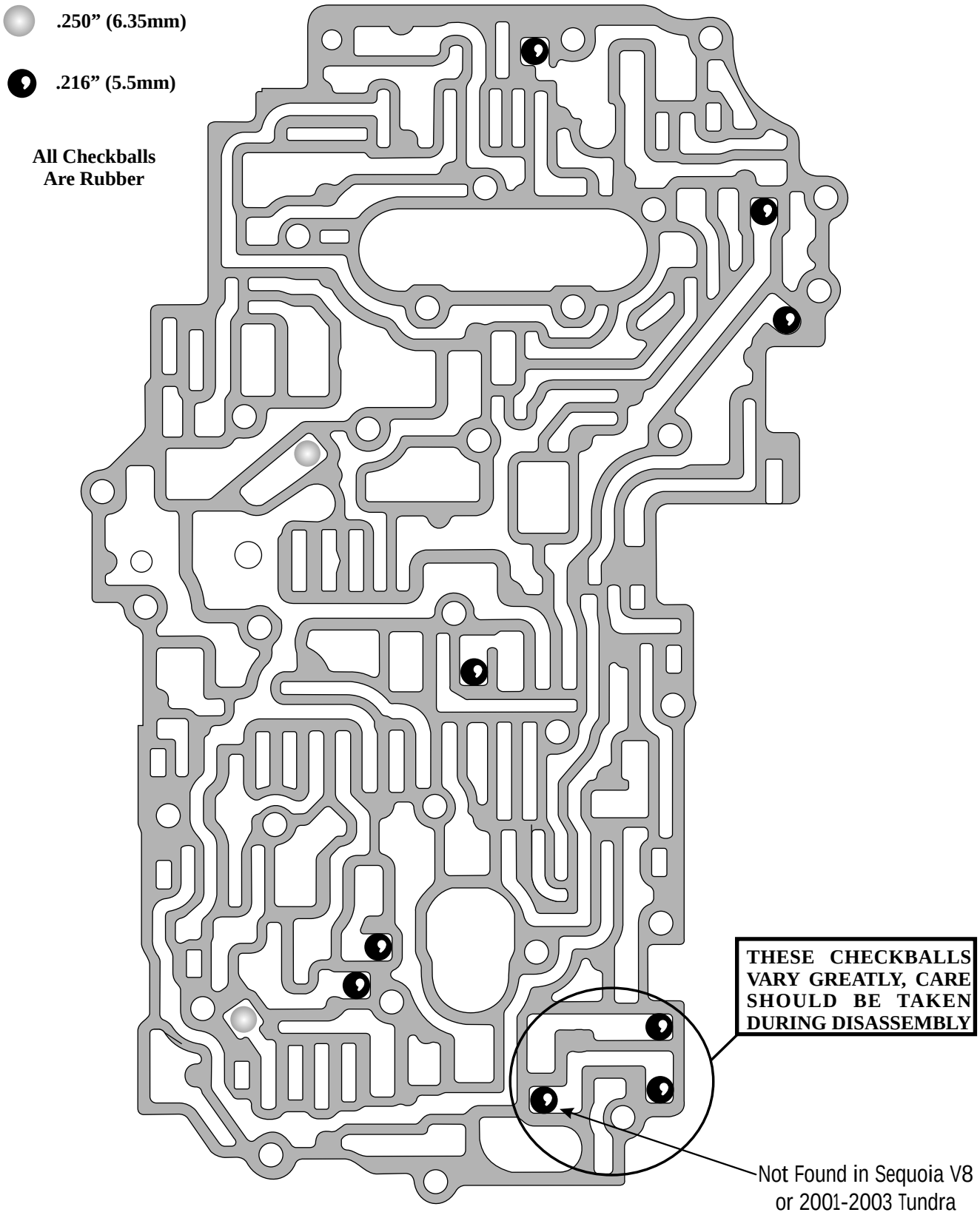


Figure 2

LOWER VALVE BODY

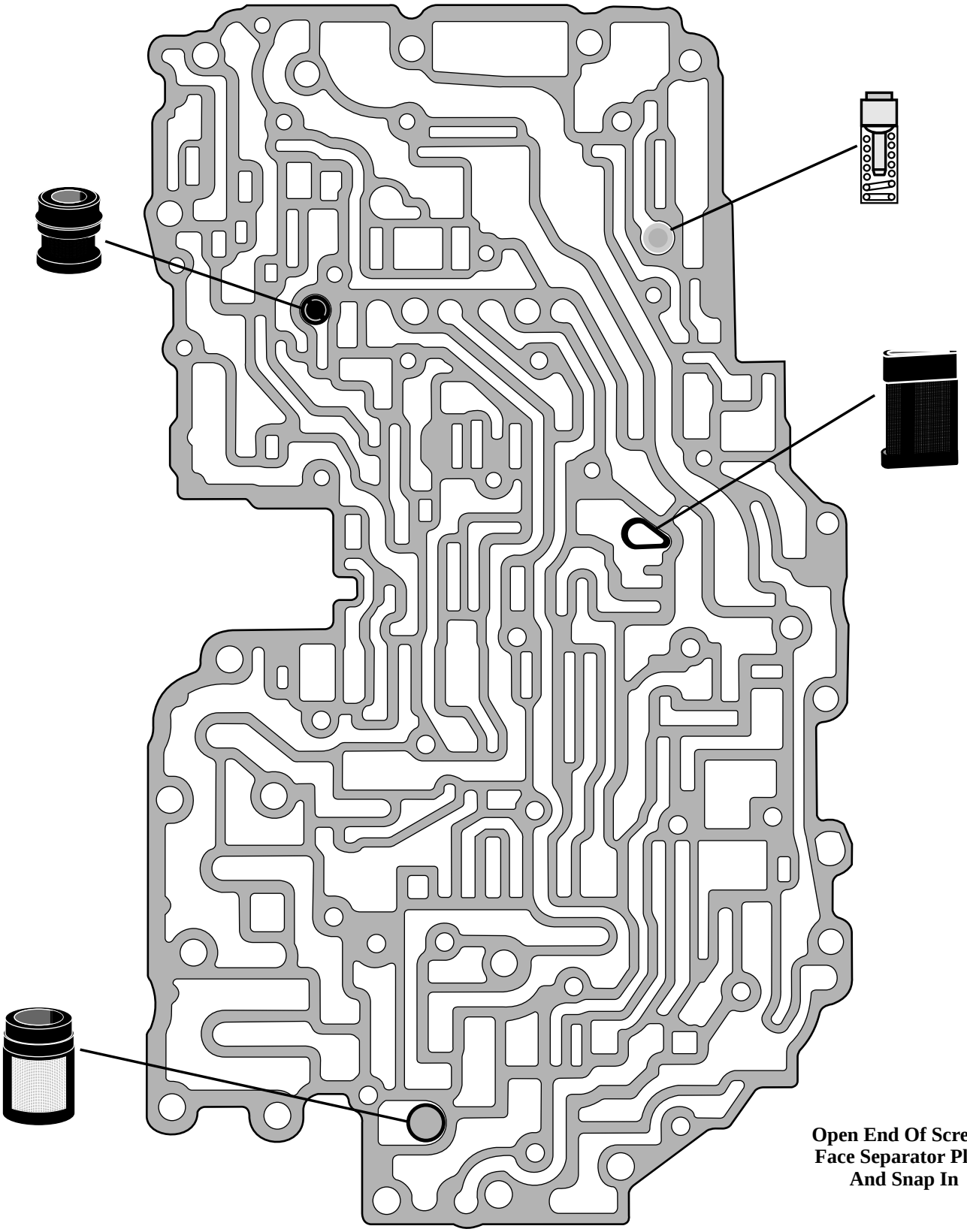


Figure 3

UPPER VALVE BODY CASTING NUMBER 8934
5 SOLENOIDS, LINE PRESSURE BLOW-OFF BALL, NO TV CABLE

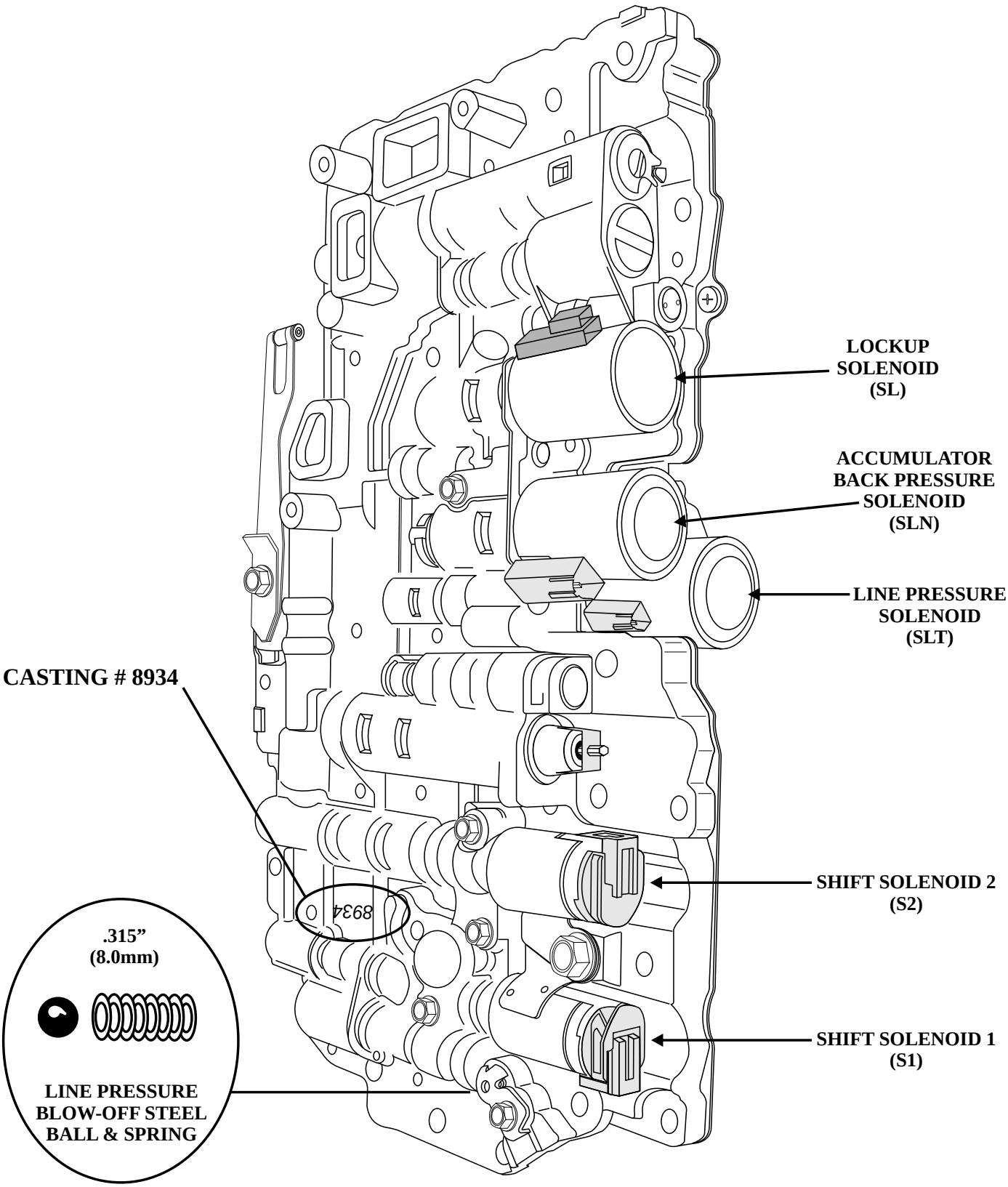


Figure 4

UPPER VALVE BODY

.250" (6.35mm)

.216" (5.5mm)

All Checkballs Are Rubber

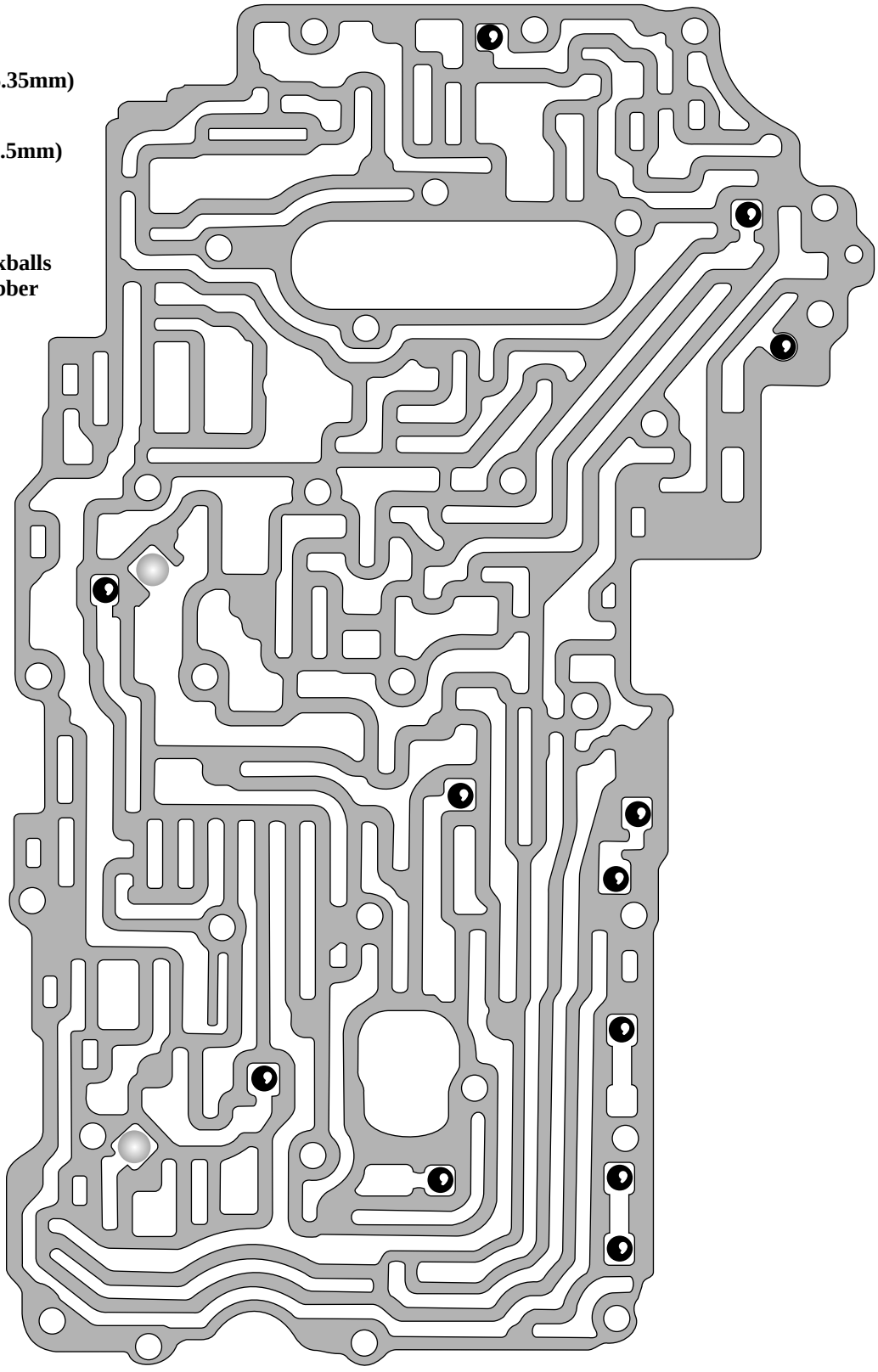


Figure 5

LOWER VALVE BODY

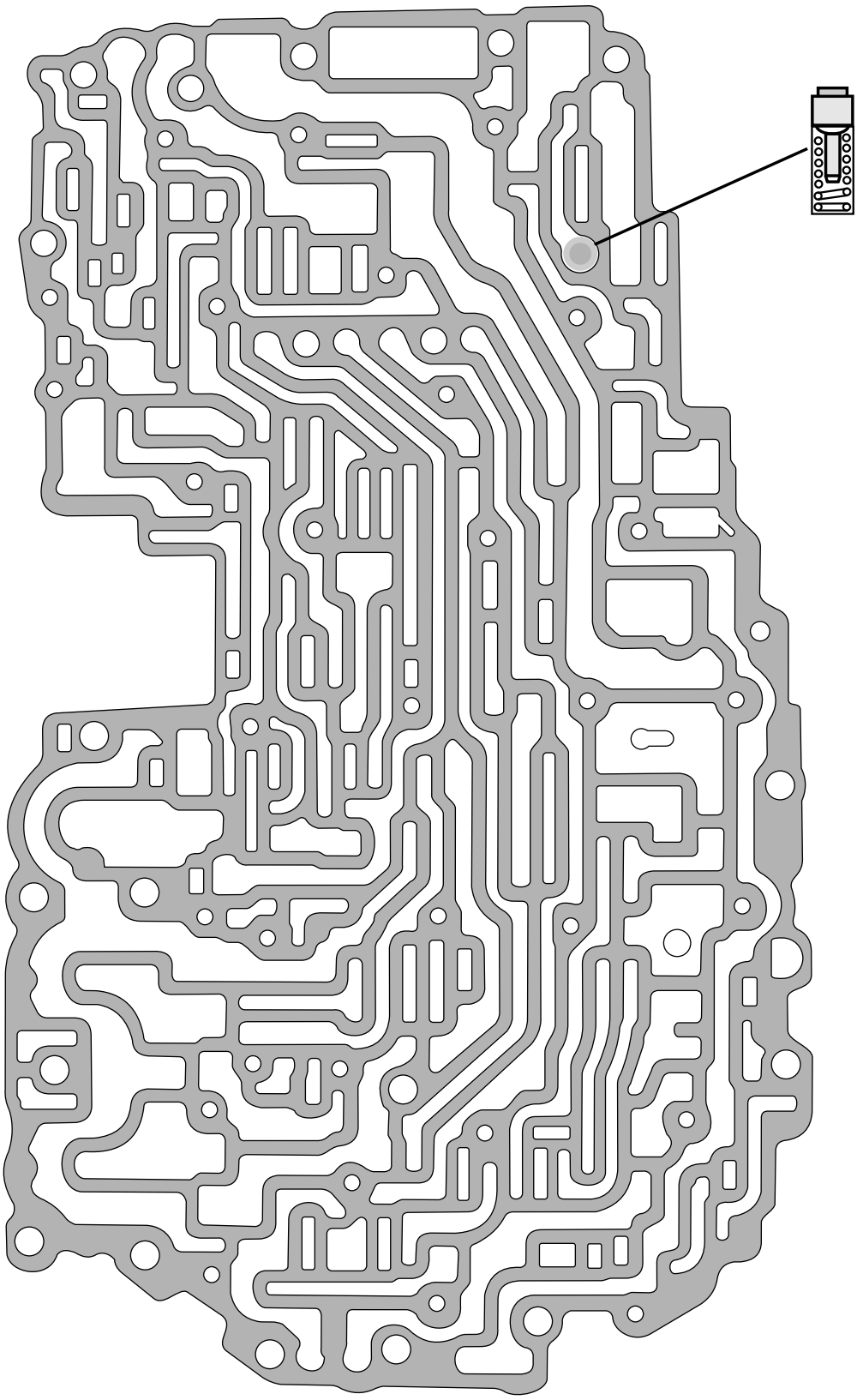


Figure 6

UPPER VALVE BODY CASTING NUMBER 8935
4 SOLENOIDS, 1 ACCUMULATOR, LINE PRESSURE BLOW-OFF BALL, NO TV CABLE

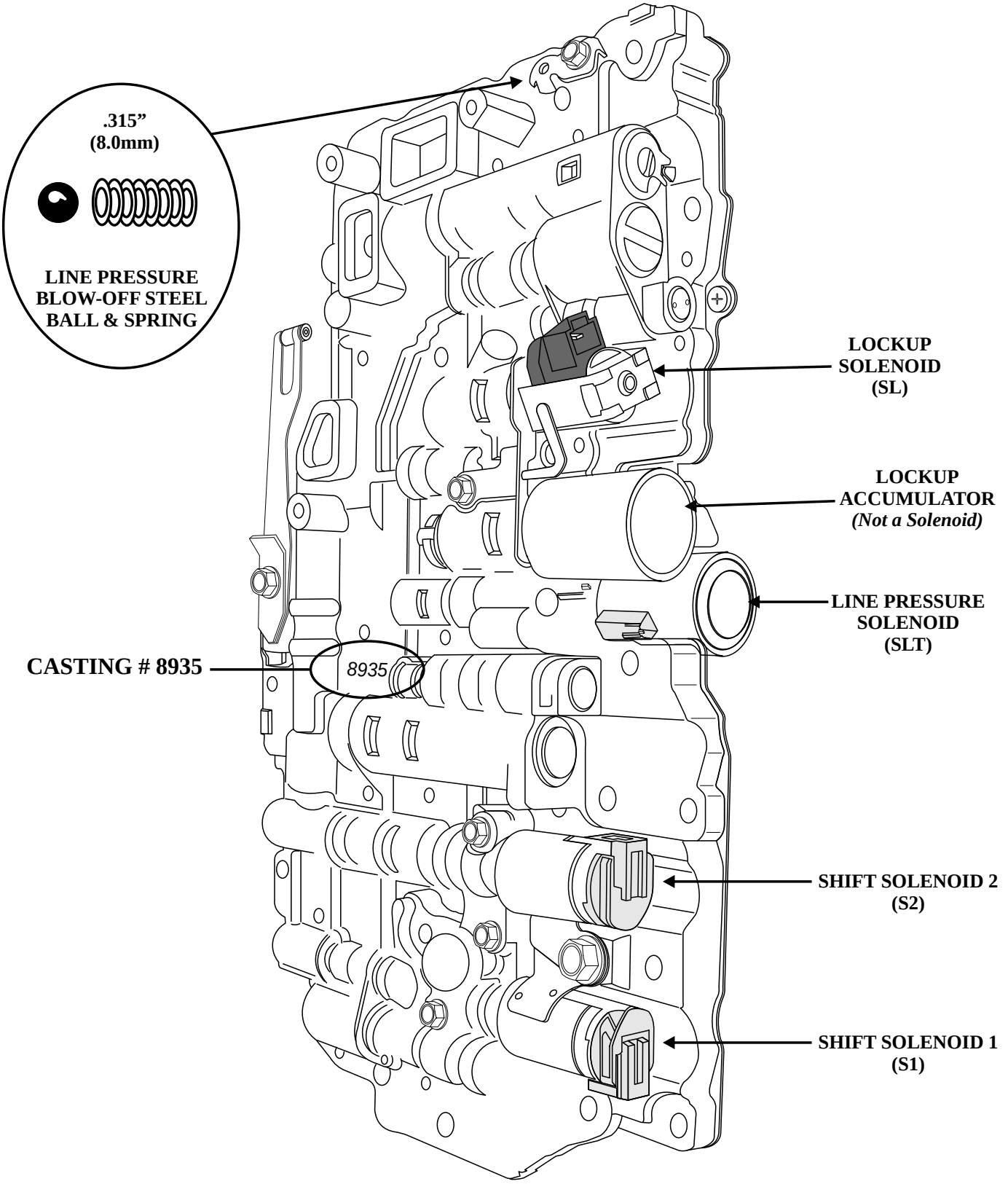


Figure 7

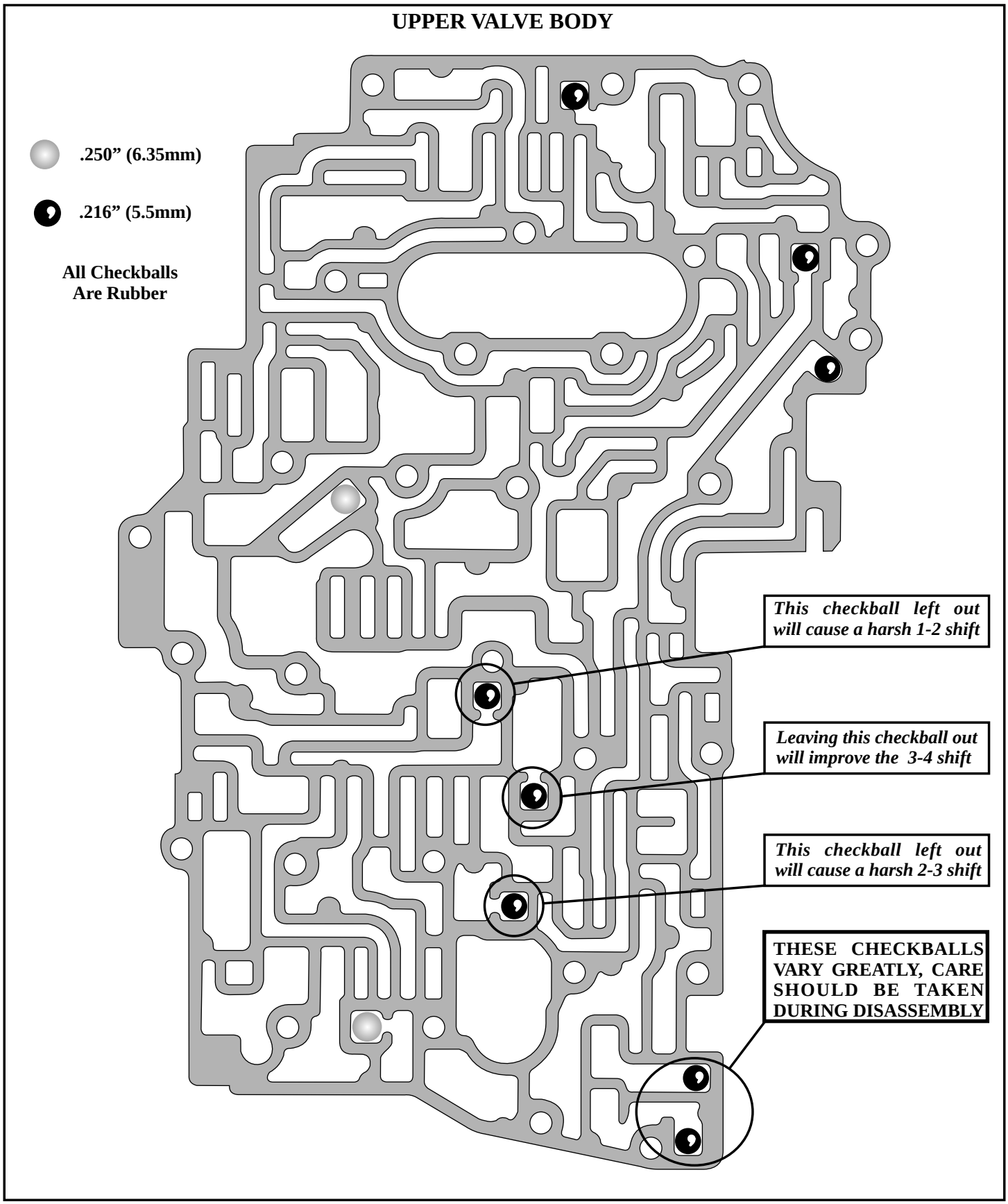

UPPER VALVE BODY
.250" (6.35mm)
.216" (5.5mm)
All Checkballs Are Rubber
This checkball left out will cause a harsh 1-2 shift
Leaving this checkball out will improve the 3-4 shift
This checkball left out will cause a harsh 2-3 shift
THESE CHECKBALLS VARY GREATLY, CARE SHOULD BE TAKEN DURING DISASSEMBLY

Figure 8

LOWER VALVE BODY

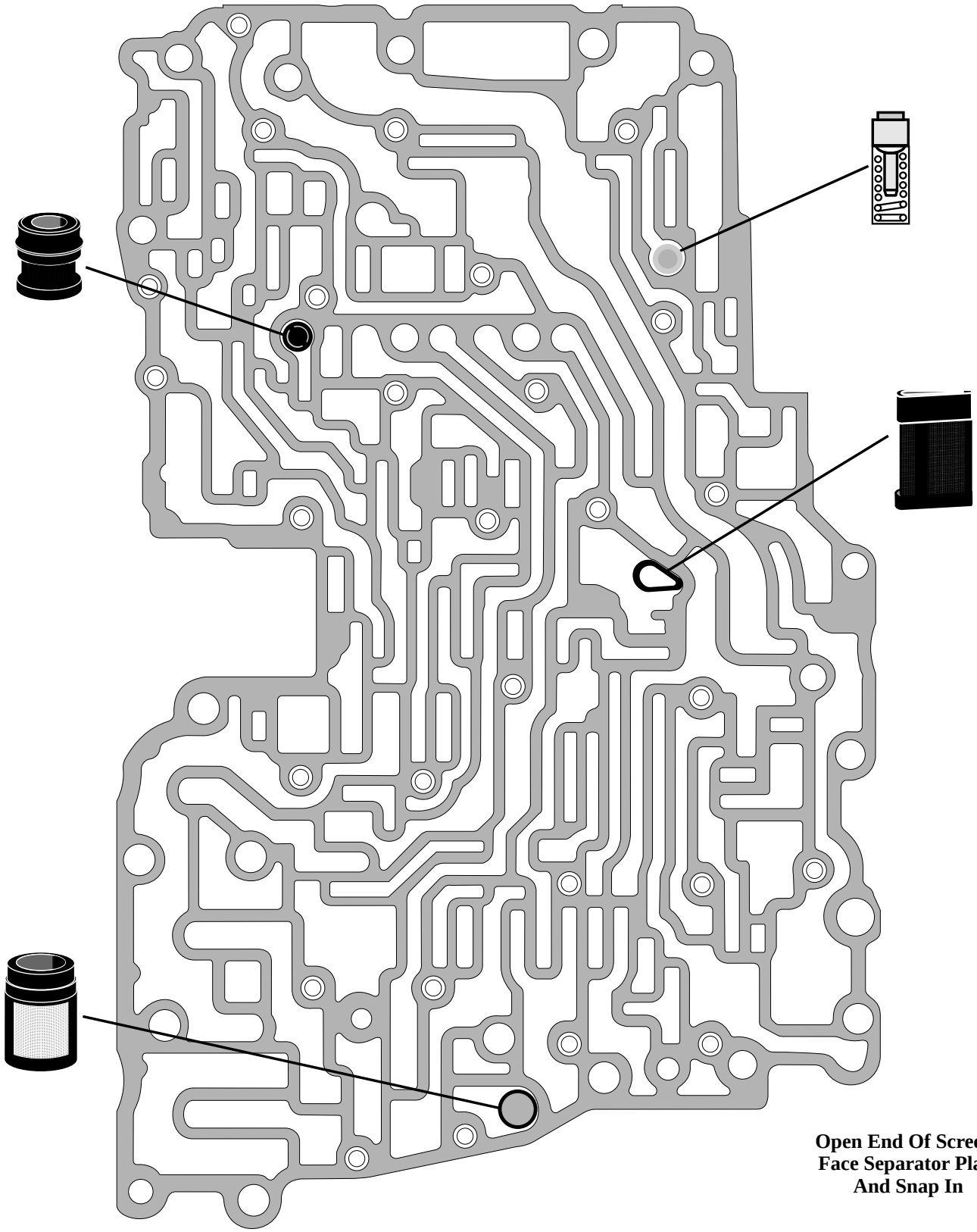


Figure 9

TD

UPPER VALVE BODY CASTING NUMBER 8938
3 SOLENOIDS, TV ADJUSTMENT SCREW, LINE BLOW-OFF BALL, TV CABLE

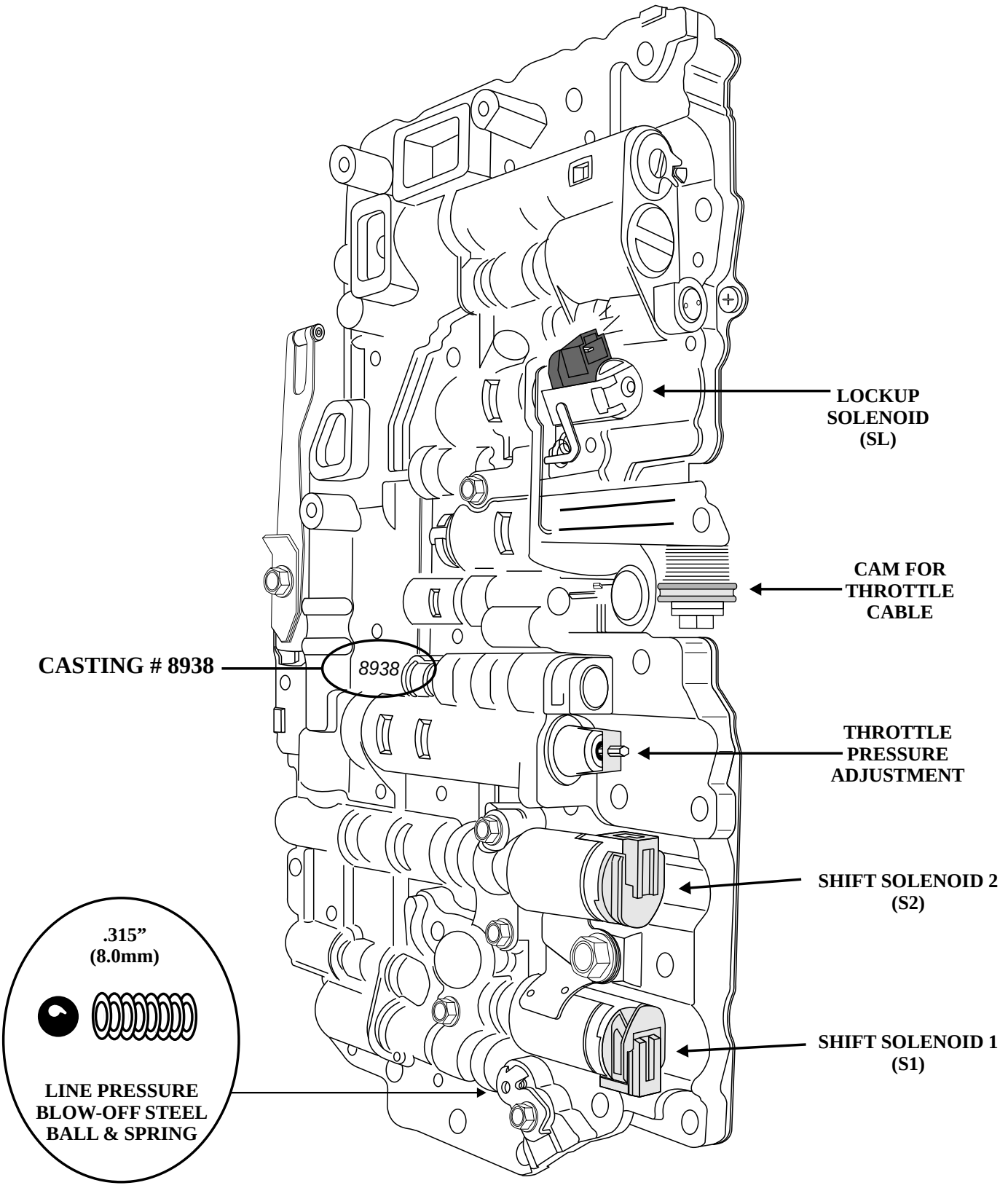


Figure 10

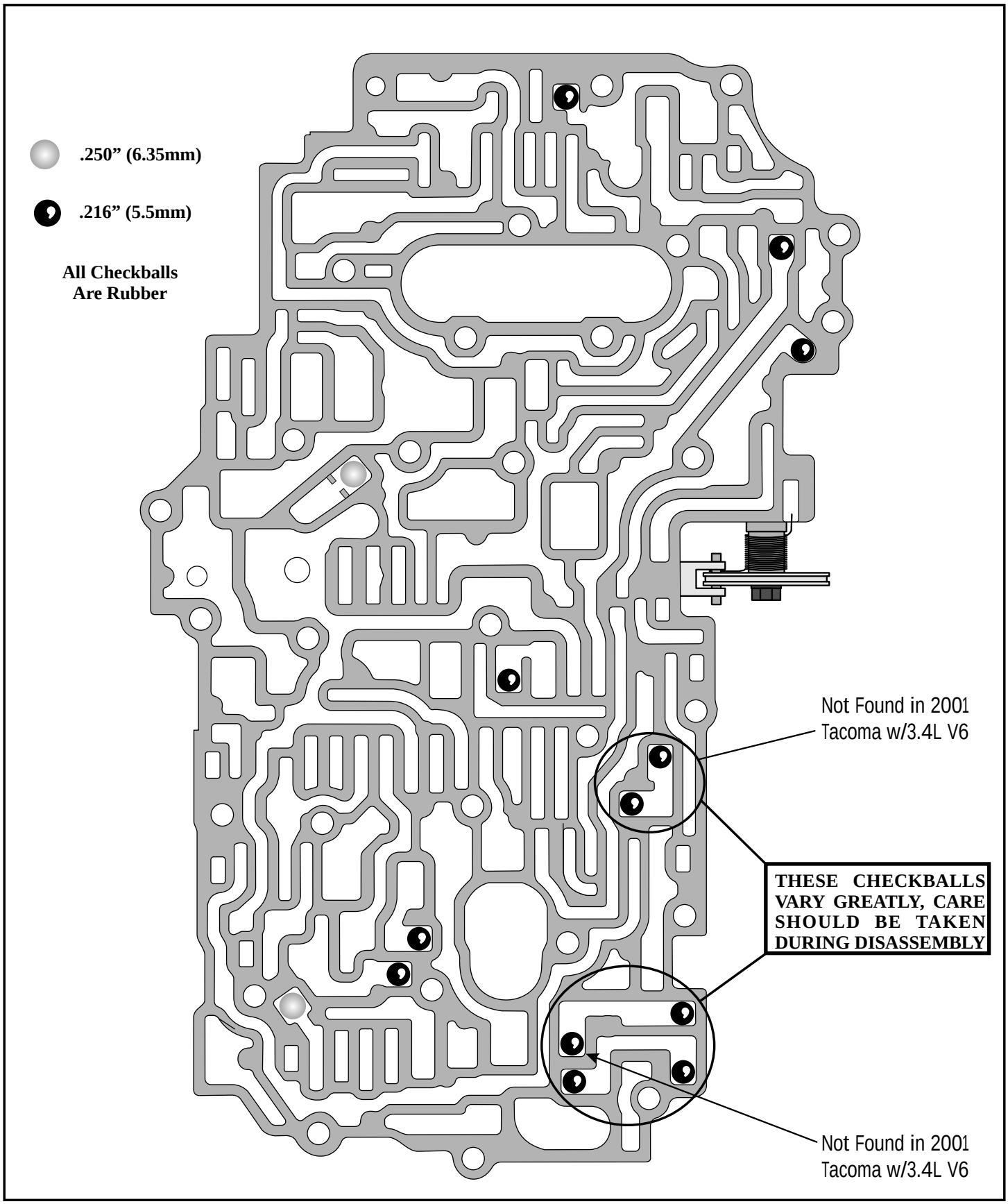

.250" (6.35mm)
.216" (5.5mm)
All Checkballs Are Rubber
Not Found in 2001 Tacoma w/3.4L V6
THESE CHECKBALLS VARY GREATLY, CARE SHOULD BE TAKEN DURING DISASSEMBLY
Not Found in 2001 Tacoma w/3.4L V6

Figure 11

European Exchange

European Exchange

LOWER VALVE BODY

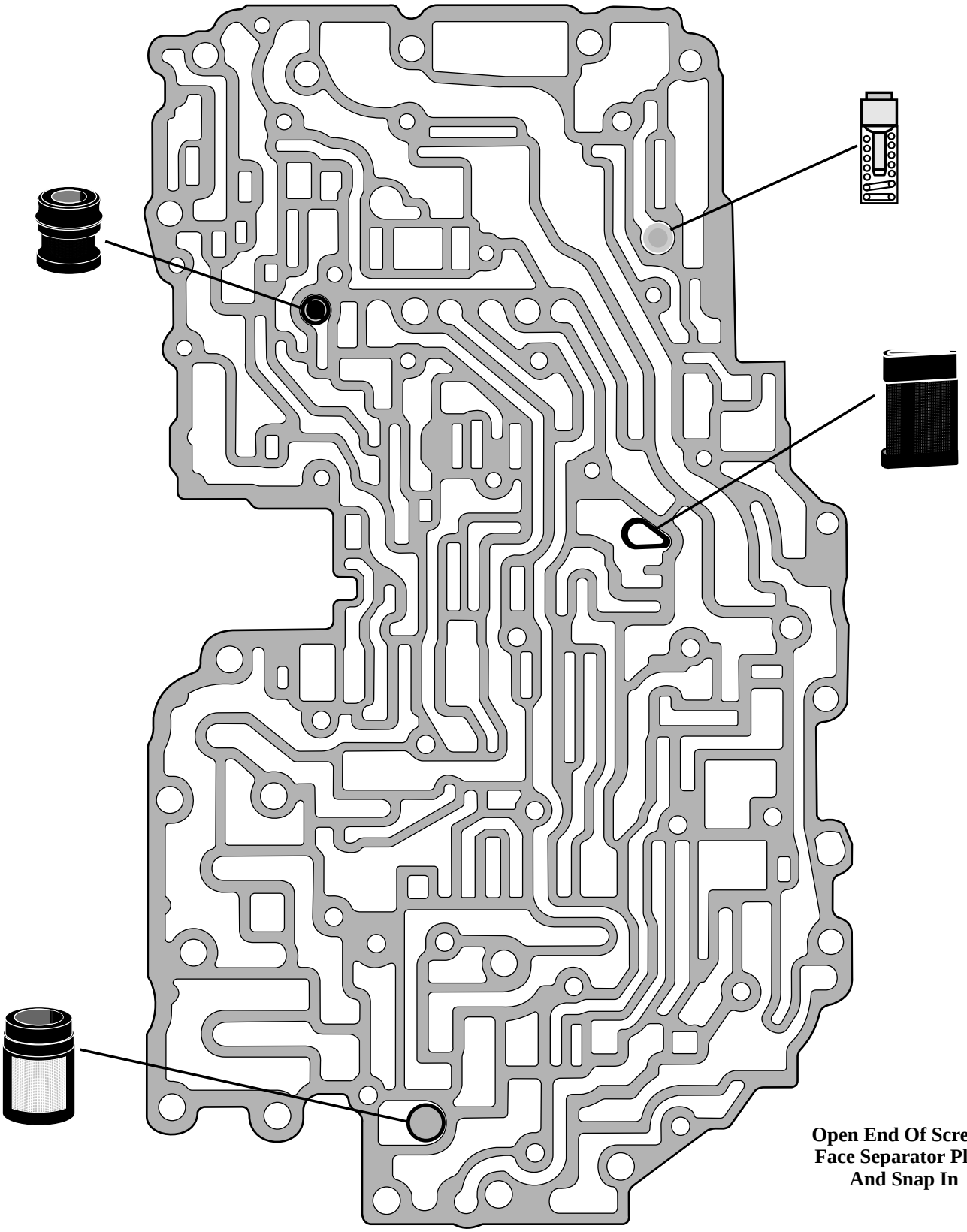


Figure 12

ISUZU 4L30E

SOLENOID CODES STORED WITH FAILSAFE

COMPLAINT: The vehicle comes in for a fluid change, after the fluid change is completed, the transmission is in failsafe, in some instances the TCM is found to be faulty. ***None of these complaints existed before the fluid change.***

CAUSE: The internal wire harness in the main valve body area, where the filter is located, is encased in a plastic conduit which hardens over a period of time, (Refer to Figure 1).
When the filter is replaced, it can be pushed up against the wire harness, See Figure 2, causing the conduit to break up in sections. This can expose a wire splice in the internal harness causing it to come into contact with the valve body resulting in a short to ground, See Figure 3, causing the above complaints.

CORRECTION: The type of failure that will occur depends on the year of the vehicle. 1990 to 1993 vehicles were equipped with a Bosch TCM which controlled the solenoids on the power side. A short causes solenoid codes to store and a failsafe condition.
1994 and later vehicles are equipped with a Delco TCM which control the solenoids on the ground side. In addition to solenoid codes and failsafe, a short here will more than likely destroy the solenoid driver which will require TCM replacement.

SERVICE INFORMATION:
As a side note, this transmission is also in some BMW models as well as the Cadillac Catera. The solenoids in these vehicles are controlled on the ground side. Therefore it is possible to have the same TCM failure.

Many thanks to Ed Lee for his suggestions which enhanced this bulletin.

Superflow Technology Group

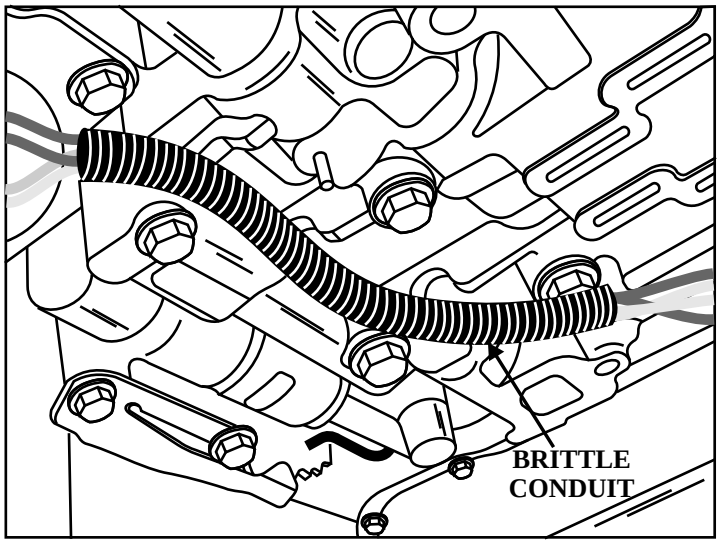


Figure 1

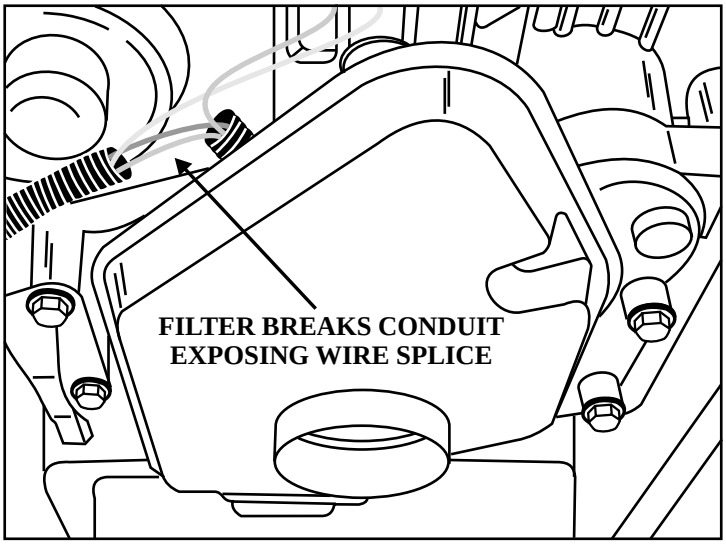


Figure 2

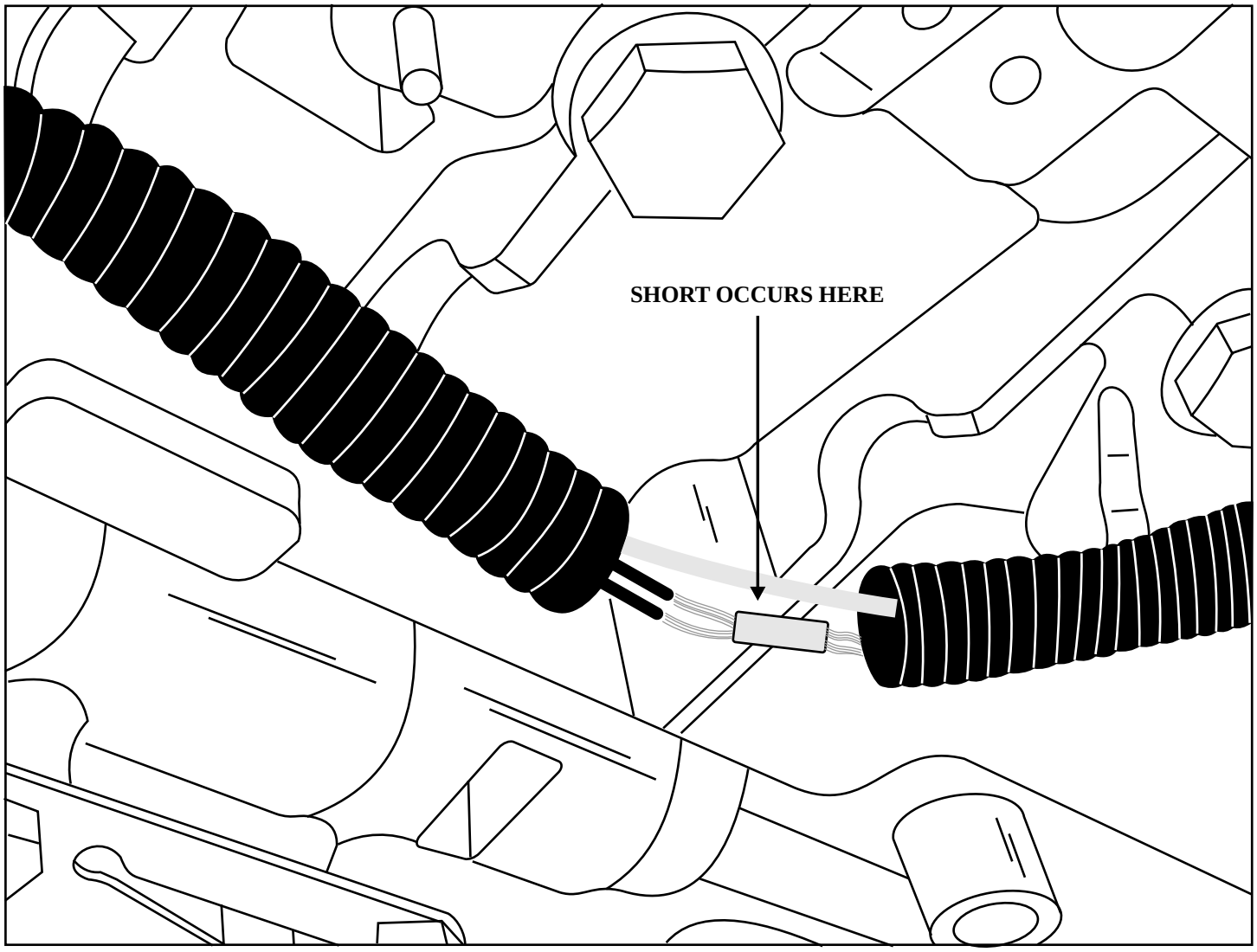


Figure 3

ISUZU & BMW
4L30-E
PARTIAL ENGINE STALL / TORQUE CONVERTER FAILURE

COMPLAINT: After overhaul, 2000 and up vehicles equipped with the 4L30-E transmissions, may exhibit a partial stalling condition when the vehicle is placed into gear, or discoloring and/or premature torque converter failure, with an eventual P1870 code, TCC slip.

CAUSE: The Cause may be, that during bushing installation, a THM 350 bushing was used and was placed too deep into the bellhousing, as shown in Figure 1. When this happens, and the Torque Converter Clutch is commanded "Off, " the bushing will partially block the passage that is connected "To Cooler", which will act as a cooler restriction, creating the partial engine stall. See Figure 3 For a partial hydraulic circuit diagram of TCC OFF. When the Torque Converter Clutch is commanded "On," the "Converter Apply circuit" is restricted creating low apply pressure and premature Torque Converter Failure as well as discoloring of the Torque Converter. Refer to Figure 4 for a partial hydraulic circuit of TCC ON. Refer to Figures 1 and 2 to see the dimensional difference between the Sonnax bushing and the THM 350 bushing and to identify the previously mentioned passage in the bellhousing. One other cause may be a partially stuck Converter Clutch Control Valve, as shown in Figure 5.
NOTE: The hydraulic circuit diagrams and pump references are for the 4 valve pump versions, Passport, Rodeo and Catera do not have this version pump.

CORRECTION: Replace the bushing with the Sonnax Bellhousing bushing or when using a THM 350 bushing use a die grinder to remove the excess material to ensure no restrictions in the passage shown in Figures 1 and 2.
Refer to Figure 5 and ensure the Converter Clutch Control Valve is not sticking in the pump.

SERVICE INFORMATION:

SONNAX BELLHOUSING BUSHING.....54253-01

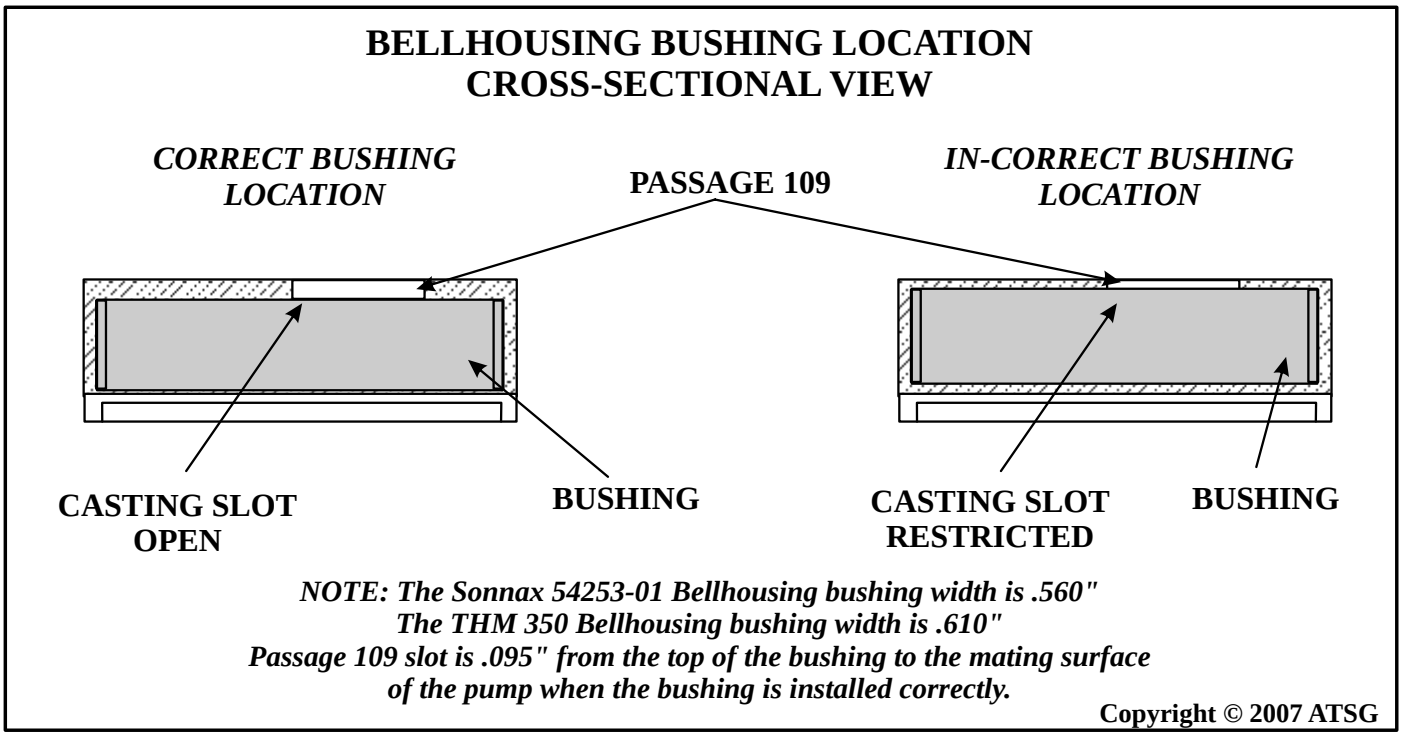


Figure 1

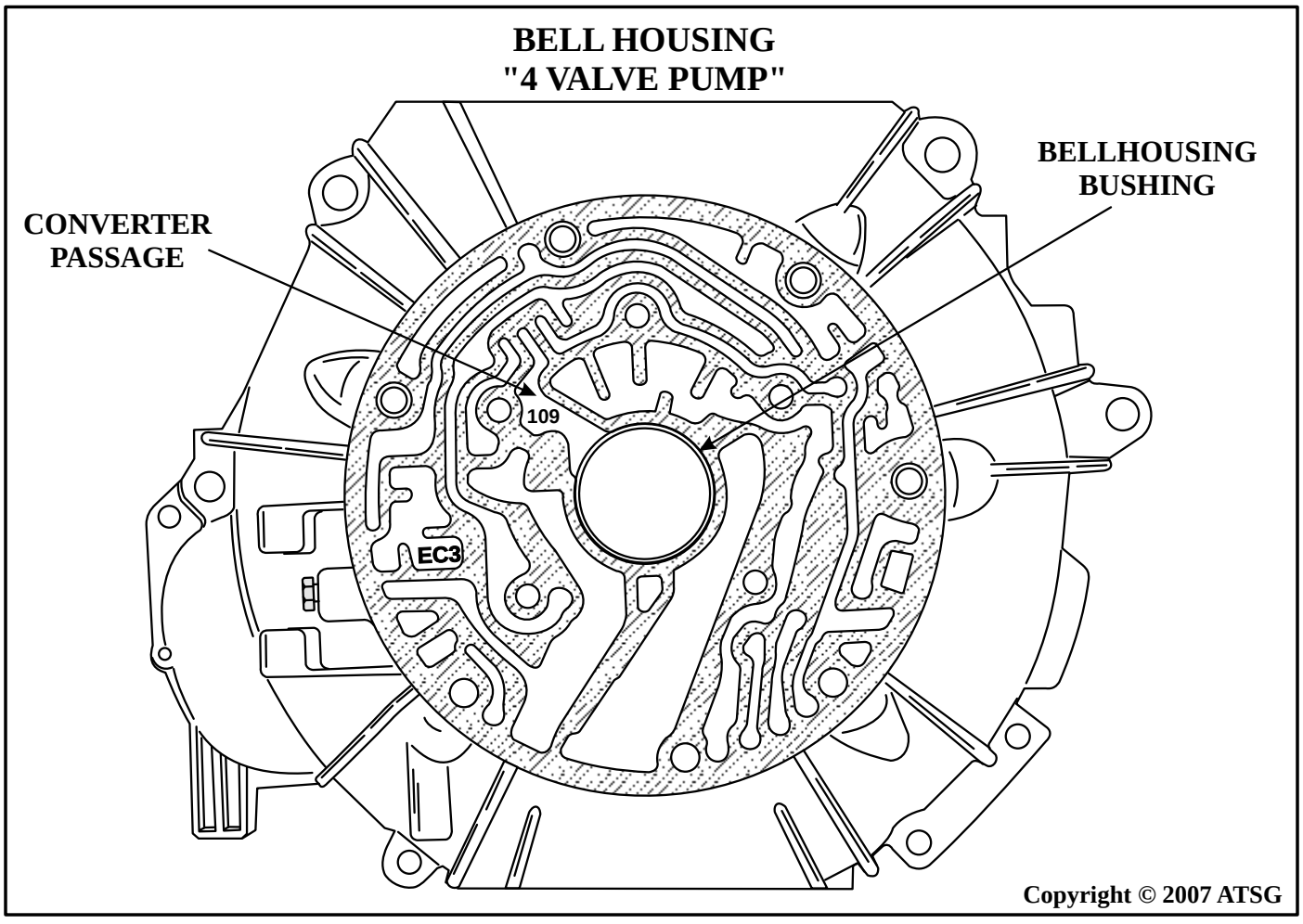


Figure 2

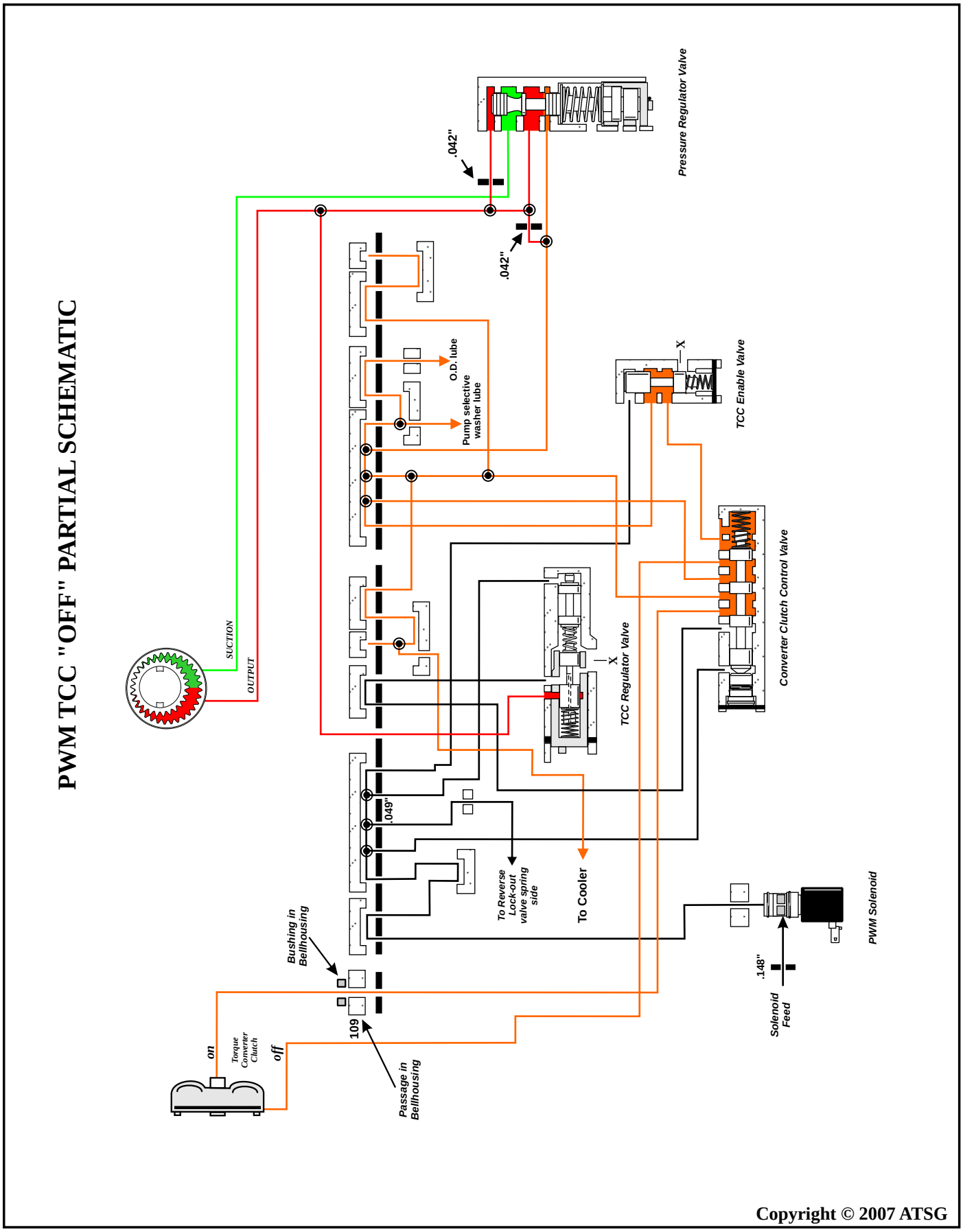

PWM TCC "OFF" PARTIAL SCHEMATIC
Pressure Regulator Valve
.042"
.042"
O.D. lube
Pump selective washer lube
X
TCC Enable Valve
Converter Clutch Control Valve
X
TCC Regulator Valve
SUCTION
OUTPUT
.049"
To Reverse Lock-out valve spring side
To Cooler
PWM Solenoid
.148"
Solenoid Feed
Bushing in Bellhousing
109
Passage in Bellhousing
on
Torque Converter Clutch
off
Copyright © 2007 ATSG

Figure 3

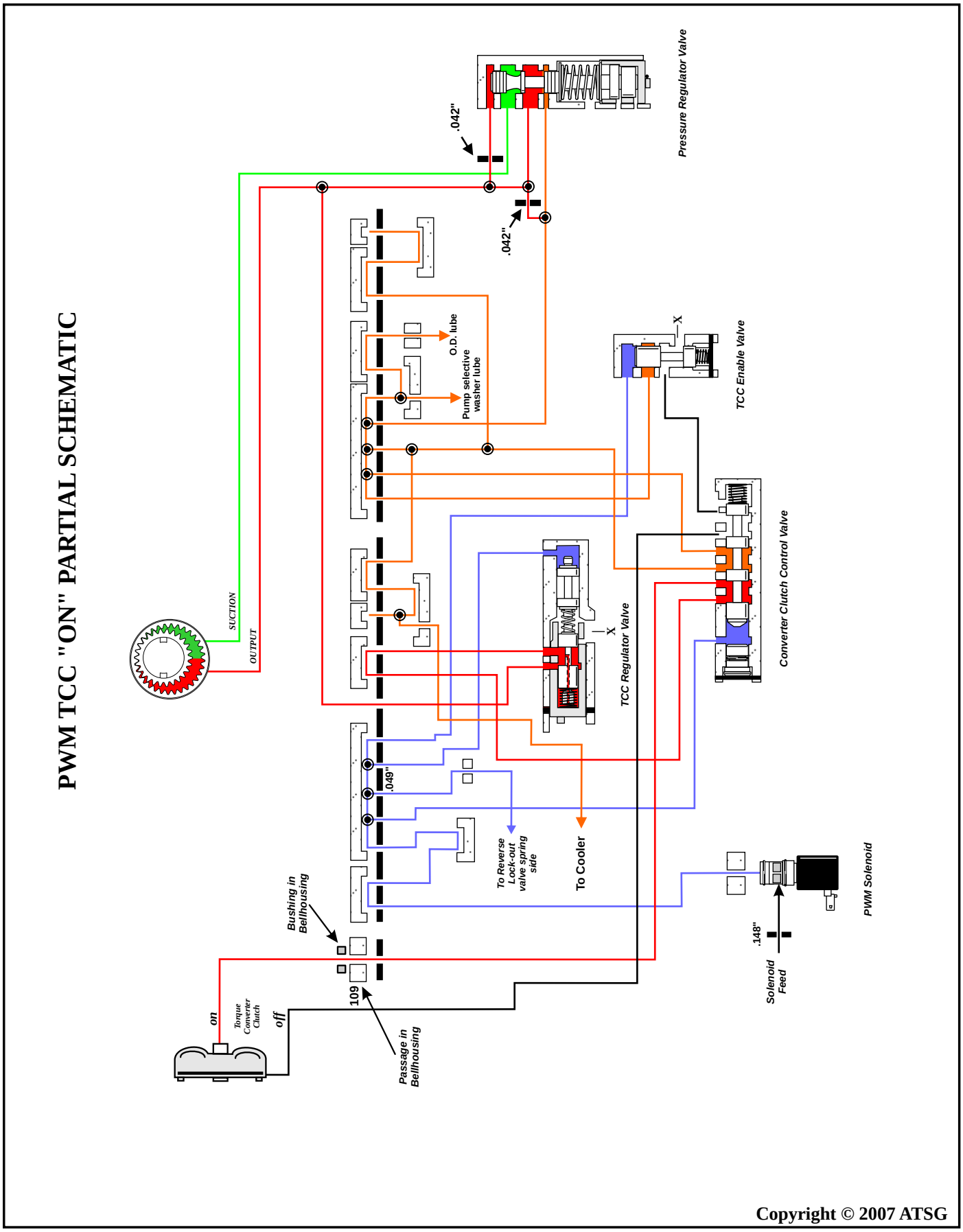
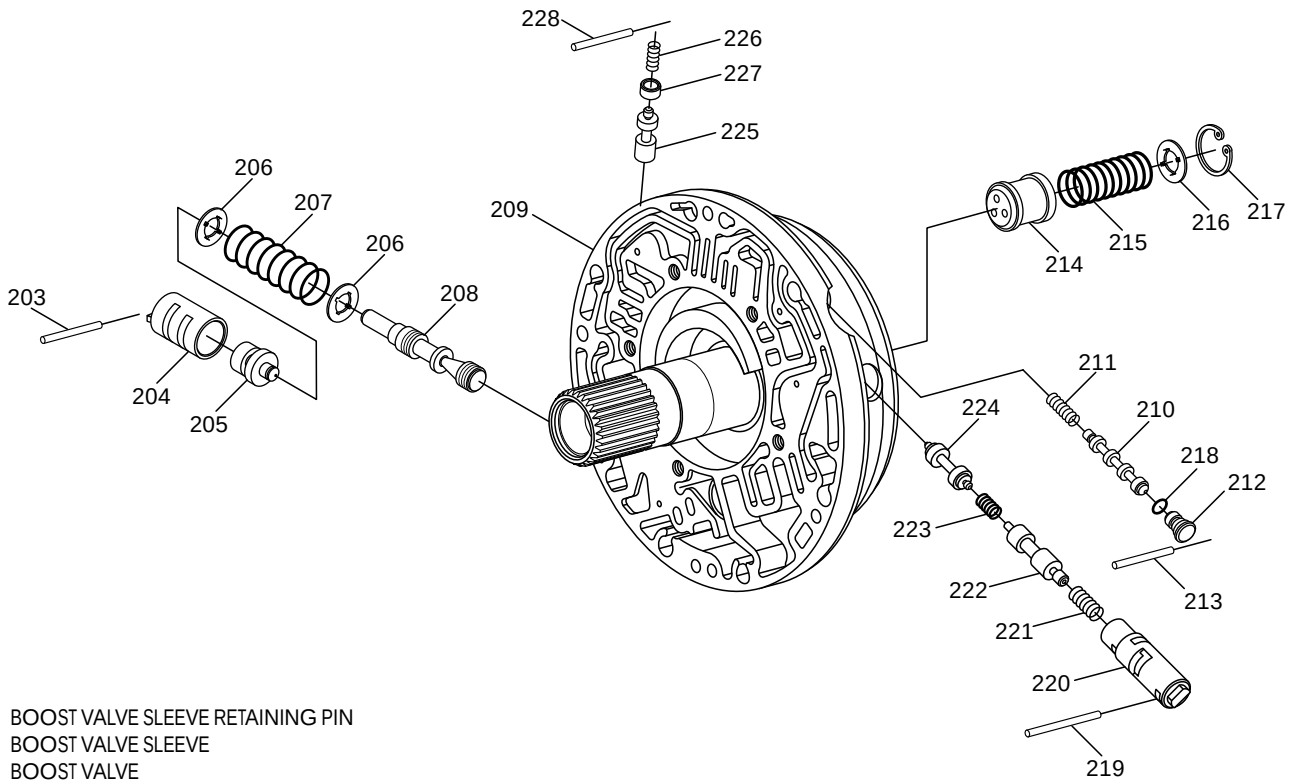

PWM TCC "ON" PARTIAL SCHEMATIC
Pressure Regulator Valve
.042"
.042"
O.D. lube
Pump selective washer lube
TCC Enable Valve
X
Converter Clutch Control Valve
TCC Regulator Valve
X
SUCTION
OUTPUT
.049"
To Reverse Lock-out valve spring side
To Cooler
PWM Solenoid
.148"
Solenoid Feed
Bushing in Bellhousing
109
Passage in Bellhousing
on
Torque Converter Clutch
off
Copyright © 2007 ATSG

Figure 4

EXPLODED VIEW
"4 VALVE PUMP"



203 BOOST VALVE SLEEVE RETAINING PIN
204 BOOST VALVE SLEEVE
205 BOOST VALVE
206 PRESSURE REGULATOR VALVE SPRING SEAT (2)
207 PRESSURE REGULATOR VALVE SPRING
208 PRESSURE REGULATOR VALVE
209 OIL PUMP ASSEMBLY
210 CONVERTER CLUTCH CONTROL VALVE
211 CONVERTER CLUTCH CONTROL VALVE SPRING
212 CONVERTER CLUTCH CONTROL VALVE BORE PLUG
213 TCC CONTROL VALVE BORE PLUG RETAINING PIN
214 THROTTLE SIGNAL ACCUMULATOR PISTON
215 THROTTLE SIGNAL ACCUMULATOR PISTON SPRING
216 THROTTLE SIGNAL ACCUMULATOR SPRING SEAT
217 THROTTLE SIGNAL ACCUMULATOR SNAP RING
218 TCC CONTROL VALVE BORE PLUG "O" RING
219 TCC REGULATOR VALVE SLEEVE RETAINING PIN
220 TCC REGULATOR VALVE SLEEVE
221 TCC REGULATOR VALVE SPRING
222 TCC REGULATOR VALVE
223 TCC ISOLATOR VALVE SPRING
224 TCC ISOLATOR VALVE
225 TCC ENABLE VALVE
226 TCC ENABLE VALVE SPRING
227 TCC ENABLE VALVE SLEEVE
228 TCC ENABLE VALVE RETAINING PIN

NOTE: Some valve nomenclature is ATSG interpretations by valve function. Some manuals list all of the TCC related valves by the same name.

Figure 5

SUBARU 4EAT - PHASE II TRANSAXLE

TECHNICIANS INFORMATION

The 4EAT Phase II was introduced for the 1999 model year. Although it has many similarities to the previous design 4EAT, there are definitive differences that put this transaxle in its own category. When this transaxle is behind a 4 cylinder application it will have an external spin-on filter as seen in Figure 1. When behind 6 cylinder applications, the external filter is found in the left front fender well.
One of the more significant changes which took place in the 2001 model year is the way the transfer clutch is controlled, a new type of control system called Variable Torque distribution (VDT) is used for a smoother operation of the transfer clutch and better control over the All-Wheel Drive system in reference to front to rear torque distribution.
The pressure service ports are identified in Figure 1 as well as line and transfer clutch pressure charts. The Transfer Clutch is checked in two ways, AWD Mode and FWD Mode. The same underhood fuse receptacle is present in the Phase-II equipped vehicle to allow full electrical release of the transfer clutch for testing purposes. This unit still uses a two sump system, one for the transmission and one for the differential. The transmission filler tube and dipstick are located on the left side of the transmission, while the differential fill and oil level gauge is located on the top right of the final drive housing. The transmission requires 9.8 to 10.1 quarts of Dexron IIE or Dexron III ATF while the differential requires 1.3 quarts of GL-5 gear oil.

In Figure 2 is the clutch application chart for the Phase-II unit which shows that there are differences between the previous design 4EAT and the Phase-II model. The 2-4 Brake replaces the previous 2-4 band and there is no longer an overrunning clutch or a forward sprag.
An area that can cause converter drainback is the input shaft shown in Figure 3. There is a plastic plug inside the shaft that separates converter fill and lube circuits. It is held in place by a retaining pin, if this plug were missing you would have drainback, if it were melted you could have lube problems or converter fill issues. Converter clutch problems could generate enough heat to melt this plug.
Another lube passage that should be inspected as shown in Figure 4, is in the pump cover. Under the lube orifice is a spring loaded ball that could get jammed with debris which will block the lube passage causing front gear train failure. There is also a spring loaded ball under the front cooler line, which if left out would also cause drainback problems, or even worse if it were stuck closed, catastrophic transmission failure.
Valve body check ball locations are shown in Figure 5, and in Figure 6 a hydraulic schematic is illustrated in order to see where these check balls are in their respective circuits. In Figure 7 air check passages are shown.

Figure 8 shows the Low/Reverse "Leaf Spring" and in Figure 9 the Low/Reverse "Leaf Spring" is shown in its correct location. Figure 10 shows the 2/4 Clutch "Leaf Spring" and in Figure 11 the 2/4 Clutch "Leaf Spring" is shown in its correct location.

Because this transmission uses eight solenoids, solenoid identification can be troublesome. The internal transmission components which include seven of the eight solenoids are identified in Figure 12. Also shown in Figure 12 is the transmission pass through connector which contains the ground eyelet for all eight solenoids as well as the Transmission Control Module. This is illustrated in Figure 13 which shows case connector terminal functions as well as resistance values. The wire diagram in Figure 14 shows the general outlay of the transmission control system as well as how the solenoids and TCM are commonly grounded.

Solenoid function for all but the Transfer Clutch Solenoid can be seen in Figure 15. Transfer Clutch Solenoid function can be seen in Figure 16.

continued...

SUBARU 4EAT - PHASE II TECHNICIANS INFORMATION

continued...
The design of the Transfer Clutch Solenoid has also changed, the previous as well as the current design solenoid can be seen in Figure 17. The diagrams in Figure 18 illustrate the hydraulic differences between the current and previous solenoid and transfer clutch valve bodies.
The transfer clutch valve body spacer plate ***did not change***, however the valve body passages did which are illustrated in Figure 19.The transfer clutch valve was also redesigned which is shown in Figure 20. These transfer clutch control components were redesigned to reduce what Subaru calls oil pressure vibration.

The following diagnostic information that has been issued by Subaru:

Delayed engagement or shudder felt when shifting into Reverse or Drive.
Normal operation takes 1.5 seconds to engage an internal clutch or clutches. When the driver shifts into Reverse or Drive and applies the accelerator too quickly, delayed movement or a shudder/judder will be felt. To determine if there is an internal problem perform a TIME LAG TEST. If the average is less than 1.5 seconds the unit is operating normally. If it is more than 1.5 seconds, then an internal problem exists.

Shock felt during light acceleration when the converter clutch is applied.
When the driver tries to lightly accelerate the vehicle when driving at a constant speed in 4th gear and lock up is engaged, they may feel a slight shock through the body of the vehicle. The slight shock is from the small clearances in the drive train gears, axle spline, etc. If the lockup clutch is not engaged, then the shock is absorbed by the fluid coupling in the torque converter. Under certain conditions, this same shock can also be felt when activating cruise control.

Transmission delays downshifting during low to medium throttle.
The driver wants to accelerate and starts applying the throttle, but the transmission will not downshift to a lower gear ratio until almost full throttle.

The TCM's normal shift logic (shift map) that controls gear selection is trying to keep the transmission in the highest gear possible for fuel economy. It directly corresponds to throttle opening, vehicle speed, engine speed and gear selection. The TCM not only monitors the position of the TPS, it also monitors how fast it was depressed.

Depending on vehicle speed, if the accelerator pedal is slowly pushed down even to the floor, the TCM may not downshift the transmission. If, however, the TPS is depressed quickly, it will certainly downshift into whatever gear the TCM deems appropriate.

1. Gives the driver some ability to operate their vehicle based on power or economy.

2. Another consideration is in regard to shift change from one clutch to another. If a clutch is turned on or off too soon it would cause a harsh shift and could also cause premature wearing of the clutches. So this logic is chosen to provide a balance of shift feel and wear characteristics.

3. Fluid temperature is also a consideration. Cooler thicker fluid takes longer to move through a given passage than warmer fluid.

SUBARU 4EAT - PHASE II TECHNICIANS INFORMATION

continued...

2nd to 3rd shift flare after vehicle is parked.

After the vehicle is parked and sits typically overnight, when it is started and the transmission up- shifts into third gear for the first time, the RPM's may flare slightly. This can be an intermittent condition depending on how the vehicle is positioned when parked, temperature of the transmission when parked and ambient temperature. The shift flare occurs because the hydraulic circuit for the high clutch in the transmission occasionally drains. When the transmission up shifts for the first time into 3rd gear, the hydraulic circuit must fill before it will apply the high clutch. The time needed to fill the circuit slightly delays the apply causing the flare. The transmission will function normally for the rest of the driving cycle.

Click noise when transmission shifts from 2nd to 3rd

When the transmission shifts from 2nd to 3rd gear under light acceleration, a click can be heard fro under the vehicle. Most customers will only notice this noise when they have a driver's window opened and are driving close to some structure that will reflect the noise back to the vehicle. The noise occurs when the 2-4 brake is released during a 2nd to 3rd gear up shift. At this time, the steel clutch plates generate a metallic clicking noise against the case grooves

SUBARU 4EAT - PHASE II TRANSAXLE

Refer to Figure 1 for Pressure Port Identification and Line and Transfer Clutch Pressure Charts

Refer to Figure 2 for Clutch Application Chart

Refer to Figure 3 for Input Shaft and Lube Plug Information

Refer to Figure 4 for Pump Check Valve Information

Refer to Figure 5 for Valve Body Check Ball Locations

Refer to Figure 6 for Hydraulic Schematic Showing Check Ball Function

Refer to Figure 7 for Air Check/Case Oil Passage Identification

Refer to Figure 8 for Low/Reverse "Leaf Spring" Identification

Refer to Figure 9 for Low/Reverse "Leaf Spring" Location

Refer to Figure 10 for 2/4 Clutch "Leaf Spring" Identification

Refer to Figure 11 for 2/4 Clutch "Leaf Spring" Location

Refer to Figure 12 for Solenoid Identification and Pass Through Connector Information

Refer to Figure 13 for Transmission Connector Terminal Identification and Internal Component Resistance Specifications

Refer to Figure 14 for Transmission Control System Electrical Schematic

Refer to Figure 15 for Explanations of Solenoid Function

Refer to Figure 16 for An Explanation of Transfer Clutch Solenoid Function

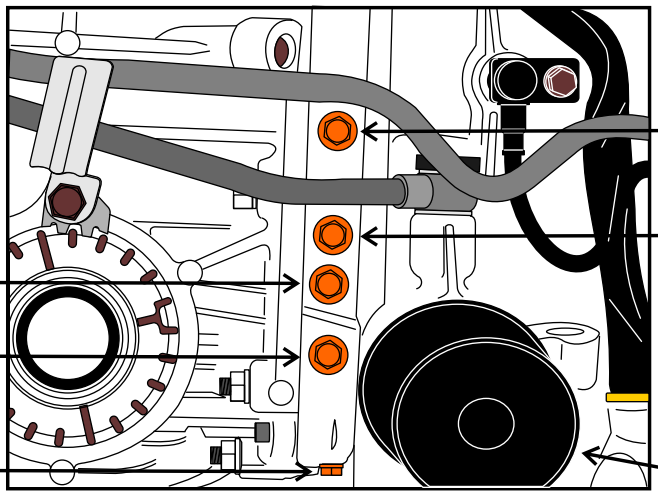
Refer to Figure 17 for Transfer Clutch Solenoid Design Changes

Refer to Figure 18 for Transfer Clutch Operational Differences

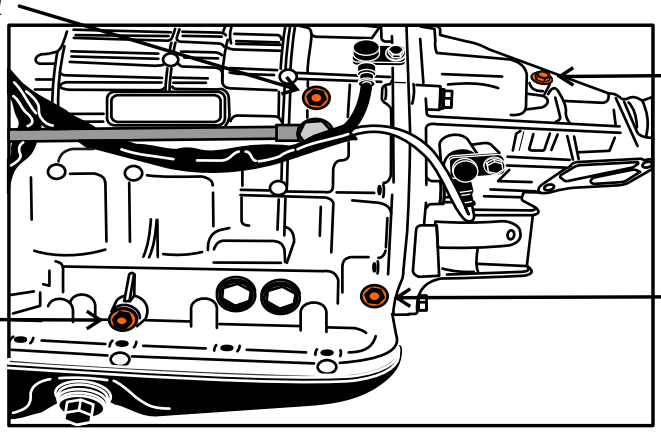
Refer to Figure 19 for Transfer Clutch Valve Body Differences

Refer to Figure 20 for Transfer Clutch Valve Design Changes

SERVICE PORT ID & PRESSURE CHECKS



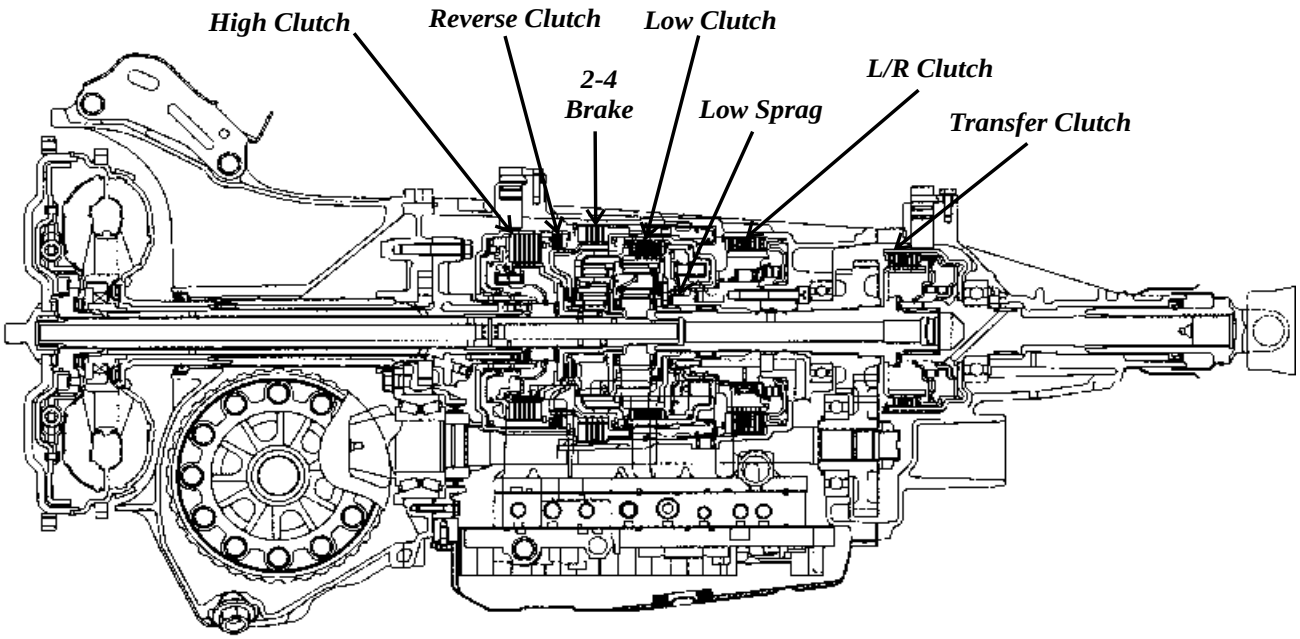
Standard Line Pressure Chart			
Range Position	**Approximate Duty Cycle %**	**Idle (psi)**	**Stall (psi)**
2	**5**		**164-189**
R	**5**		**220-249**
D	**95**	**44-60**	



Standard Transfer Clutch Pressure Chart		
Duty Ratio (%)	**AWD Mode (psi)**	**FWD Mode (psi)**
5	**138-158**	———
60	**33-43**	———
95	———	**0**

Figure 1

CLUTCH APPLICATION CHART



		High Clutch	Rev. Clutch	2-4 Brake	Low Clutch	Low Sprag	L/R Clutch	Transfer Clutch
P/N								○
Rev			●				●	○
Drive	1st				●	●		○
	2nd			●	●			○
	3rdº	●			●			○
	4th*	●		●				○
3	1st				●	●		○
	2nd			●	●			○
	3rd	●			●			○
2	1st				●	●		○
	2nd			●	●			○
L	1st				●		●	○

● **APPLIED**
○ **PWM**

4th Gear is prohibited until the Transmission Fluid Temperature has reached 12º C (53.6º F)

º Failsafe is 3rd Gear

Note: There are driving conditions where the TCM forces the transmission to 3rd gear during ABS operation and will resume normal shifting when ABS is turned off.

Figure 2

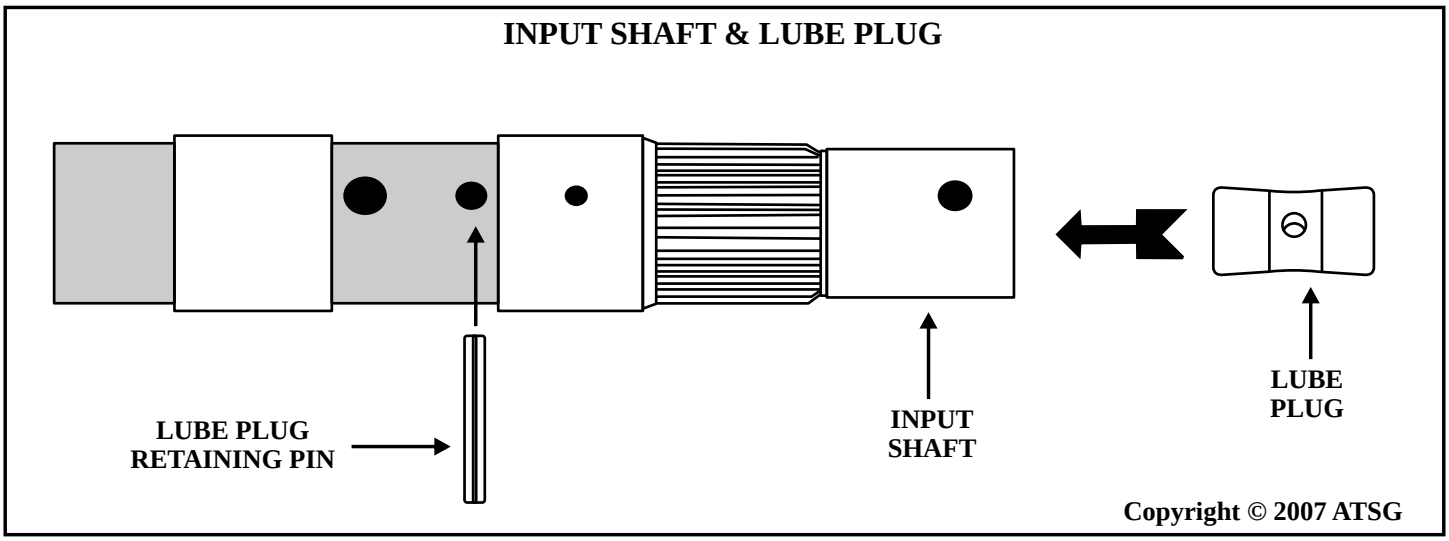


Figure 3

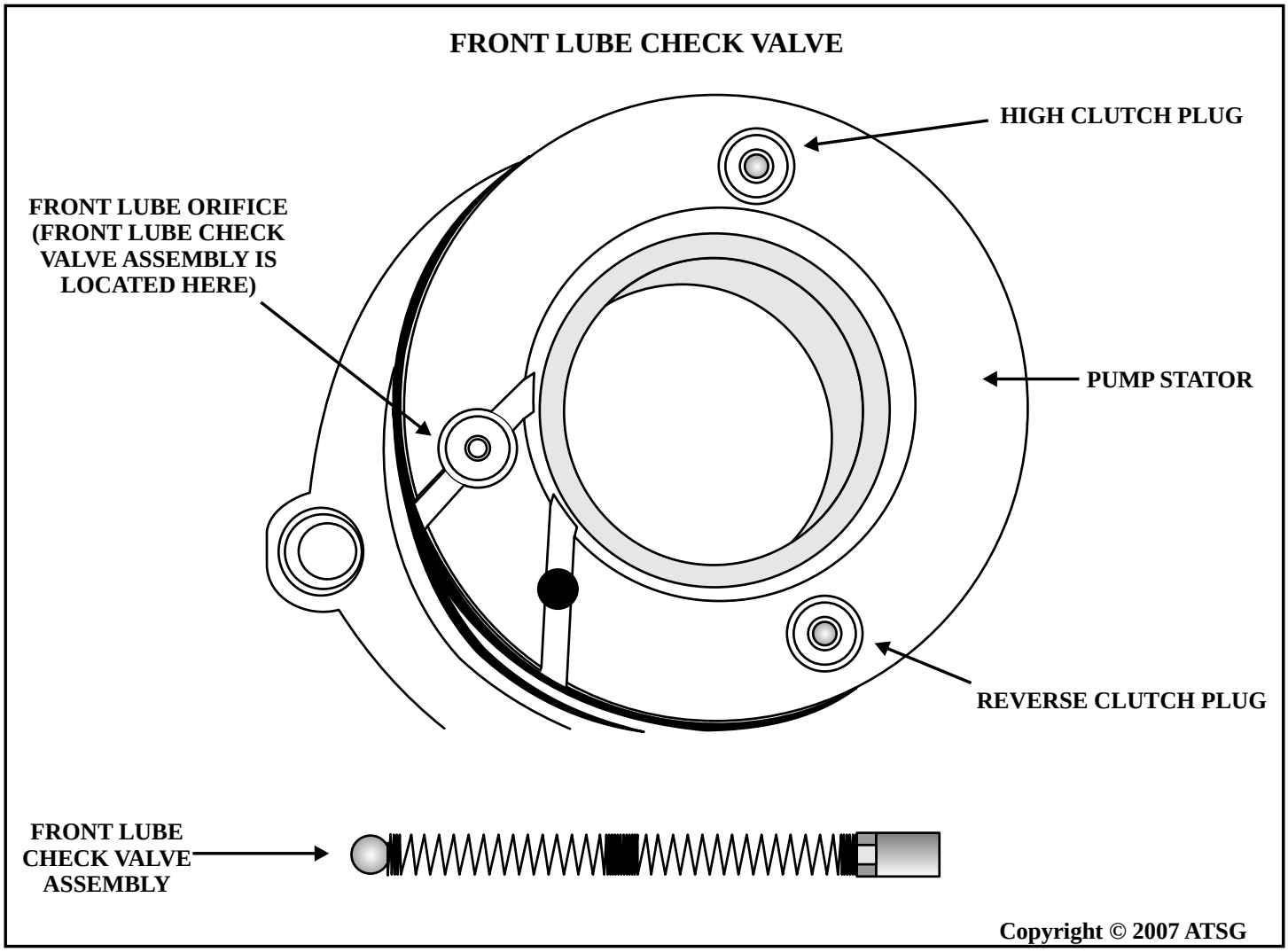
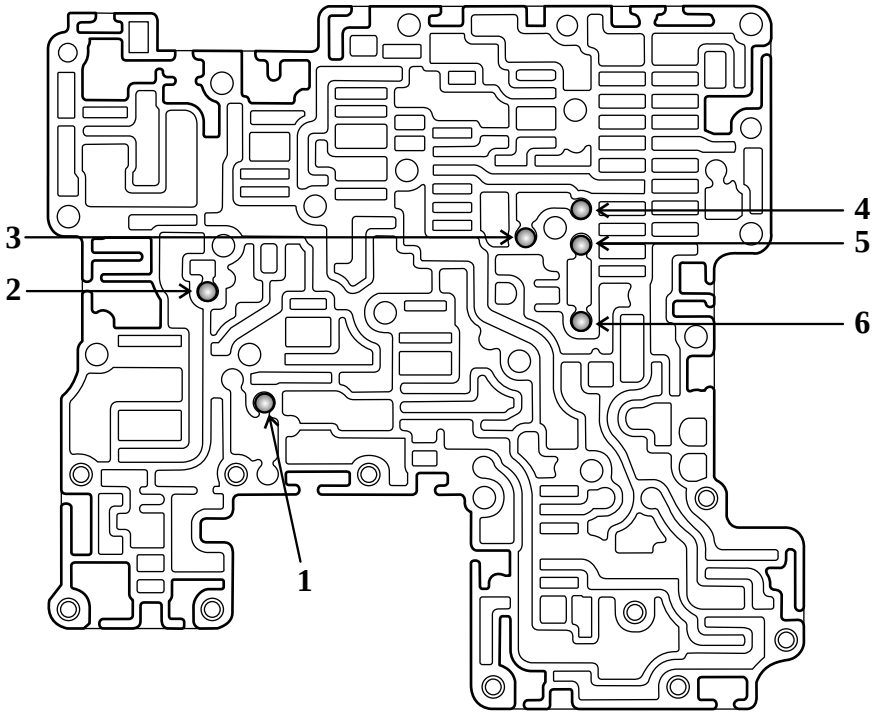


Figure 4

VALVE BODY CHECK BALL LOCATIONS

MIDDLE VALVE BODY



UPPER VALVE BODY

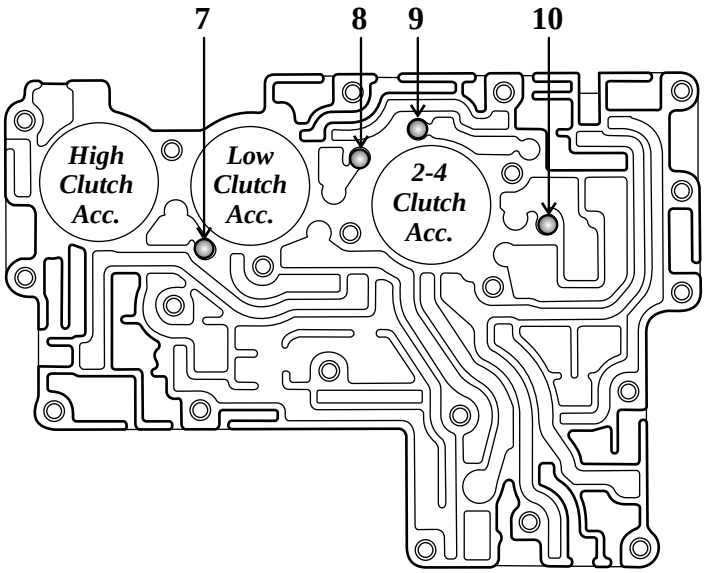


Figure 5

HYDRAULIC CHECK BALL FUNCTION SCHEMATIC

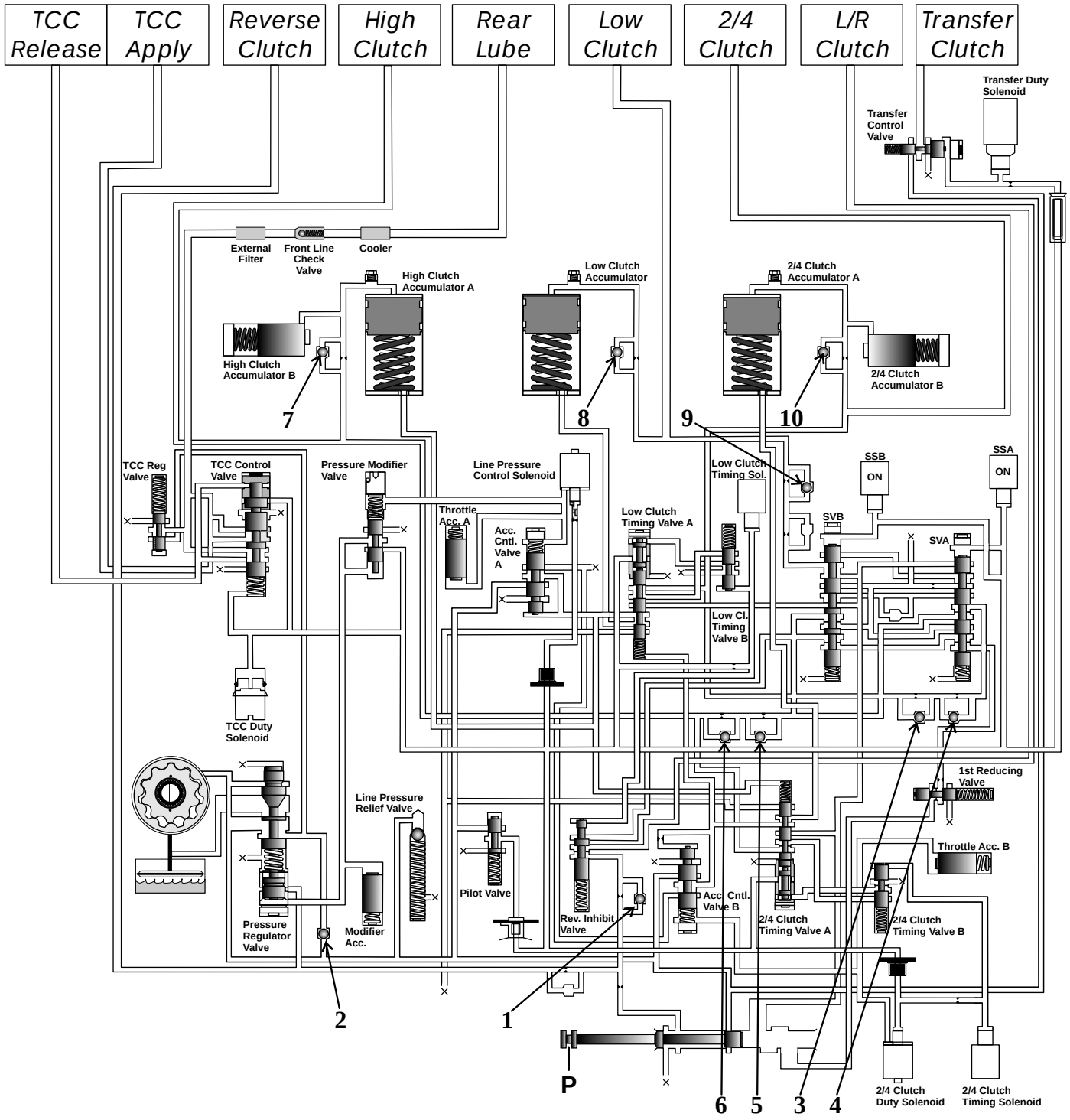


Figure 6

CASE AIR CHECK/OIL PASSAGE IDENTIFICATION

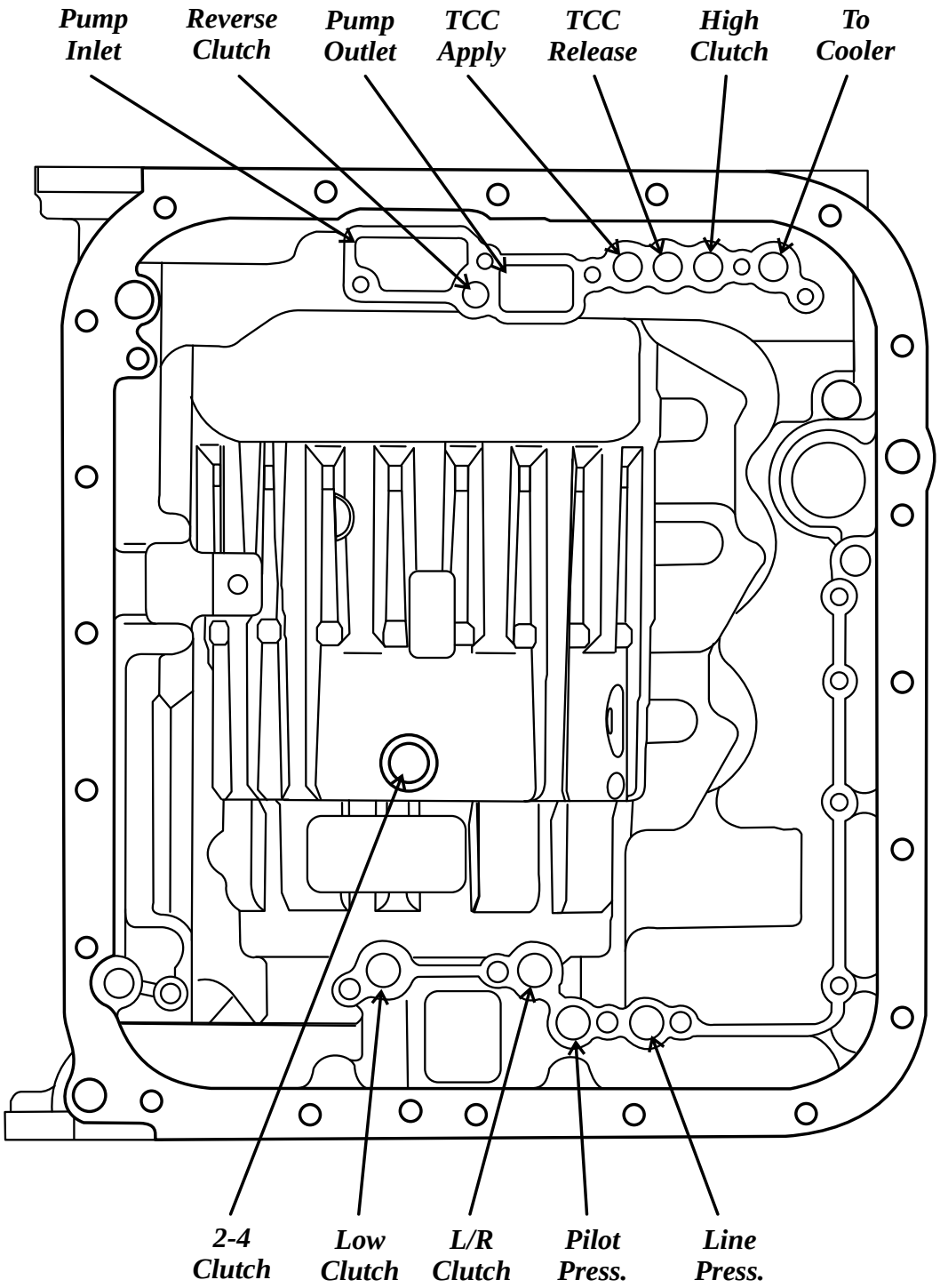


Figure 7

LOW/REVERSE "LEAF SPRING"

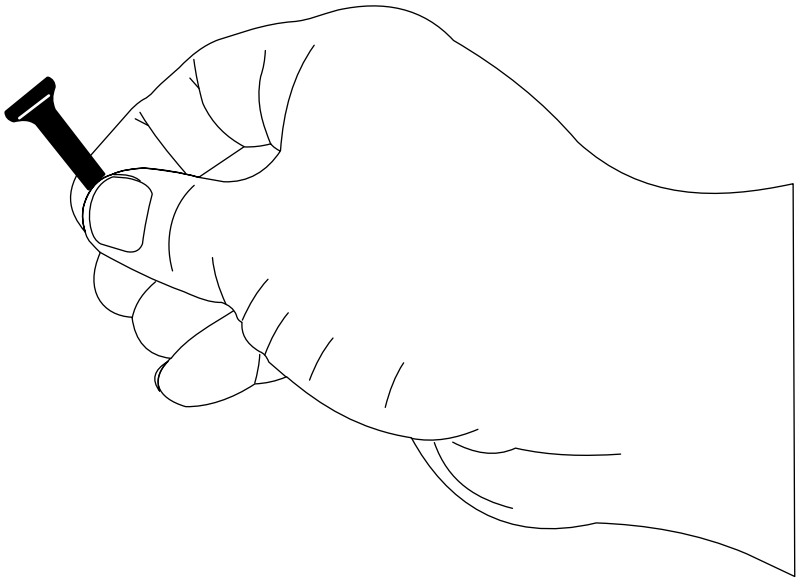


Figure 8

LOW/REVERSE "LEAF SPRING" LOCATION

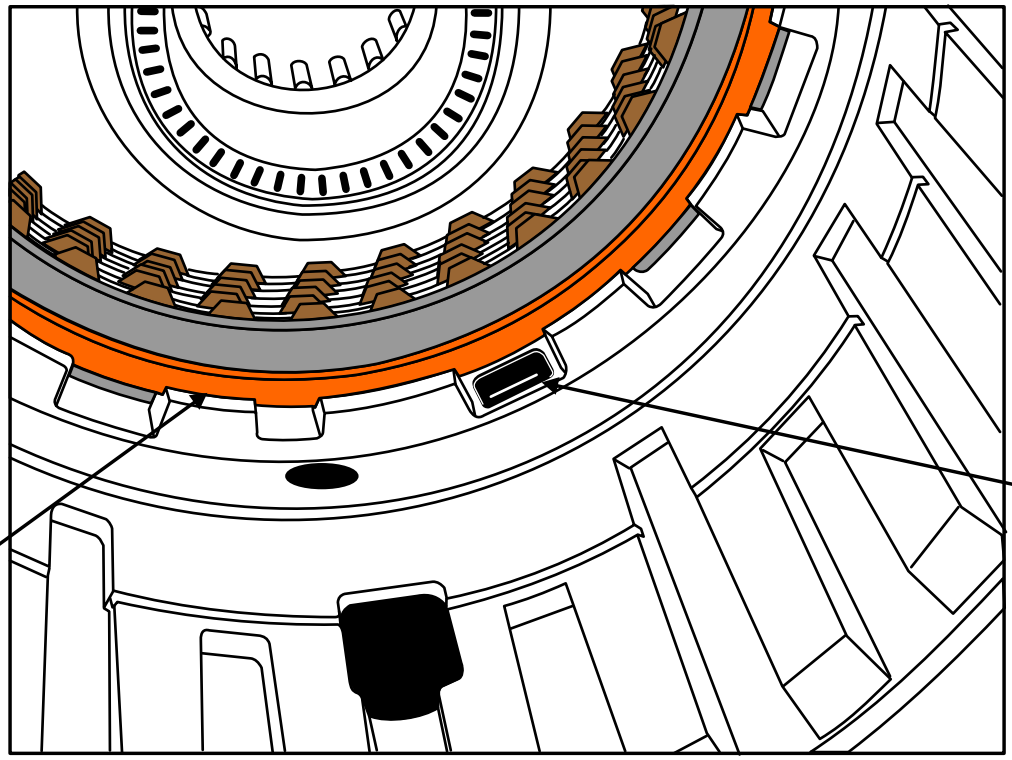


Figure 9

2/4 CLUTCH "LEAF SPRING"

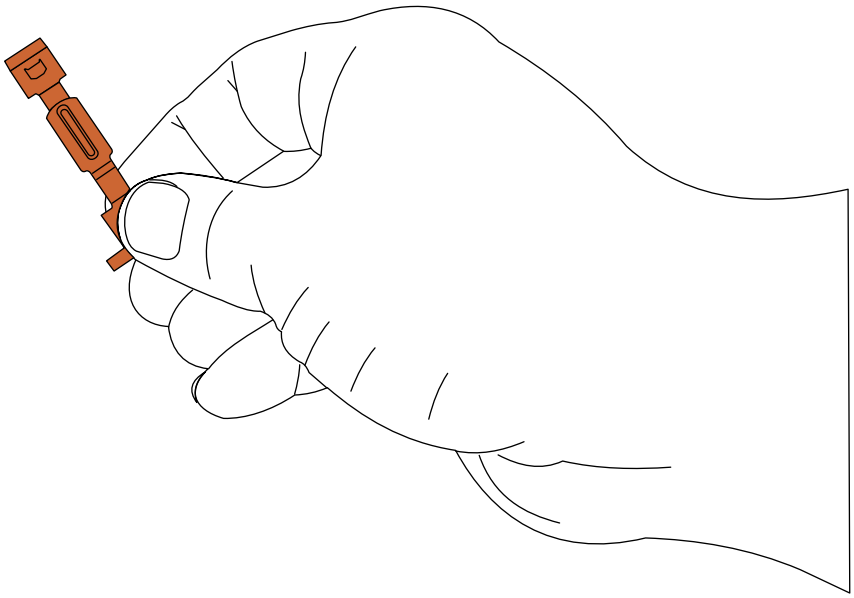


Figure 10

2/4 CLUTCH "LEAF SPRING" LOCATION

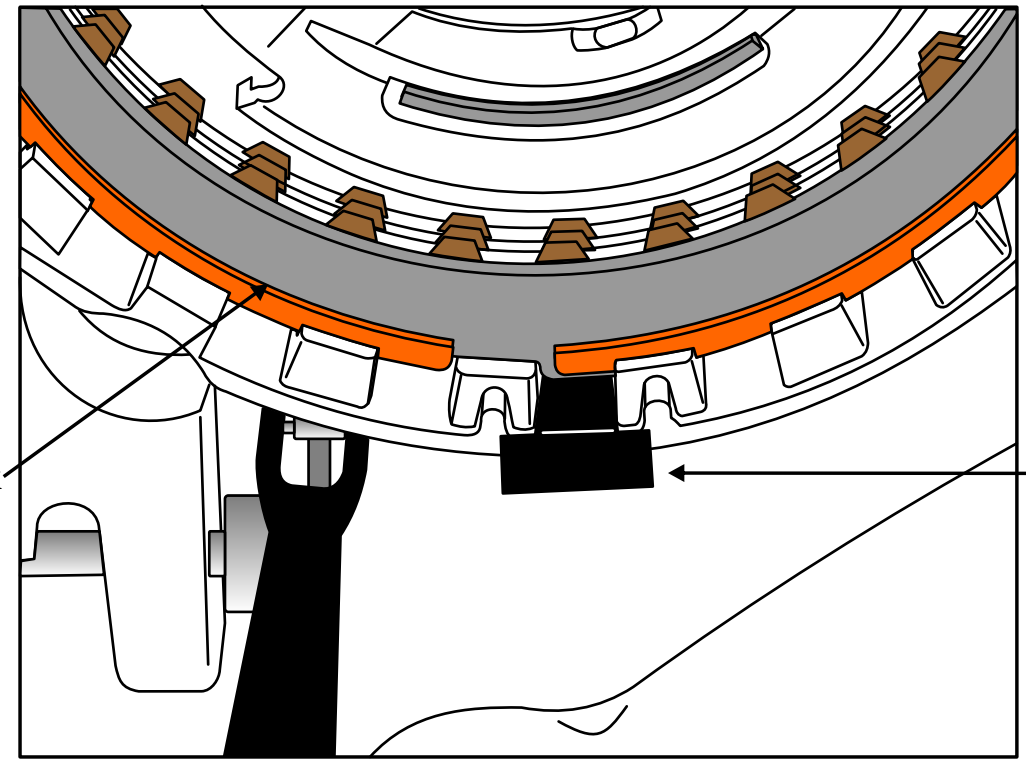


Figure 11

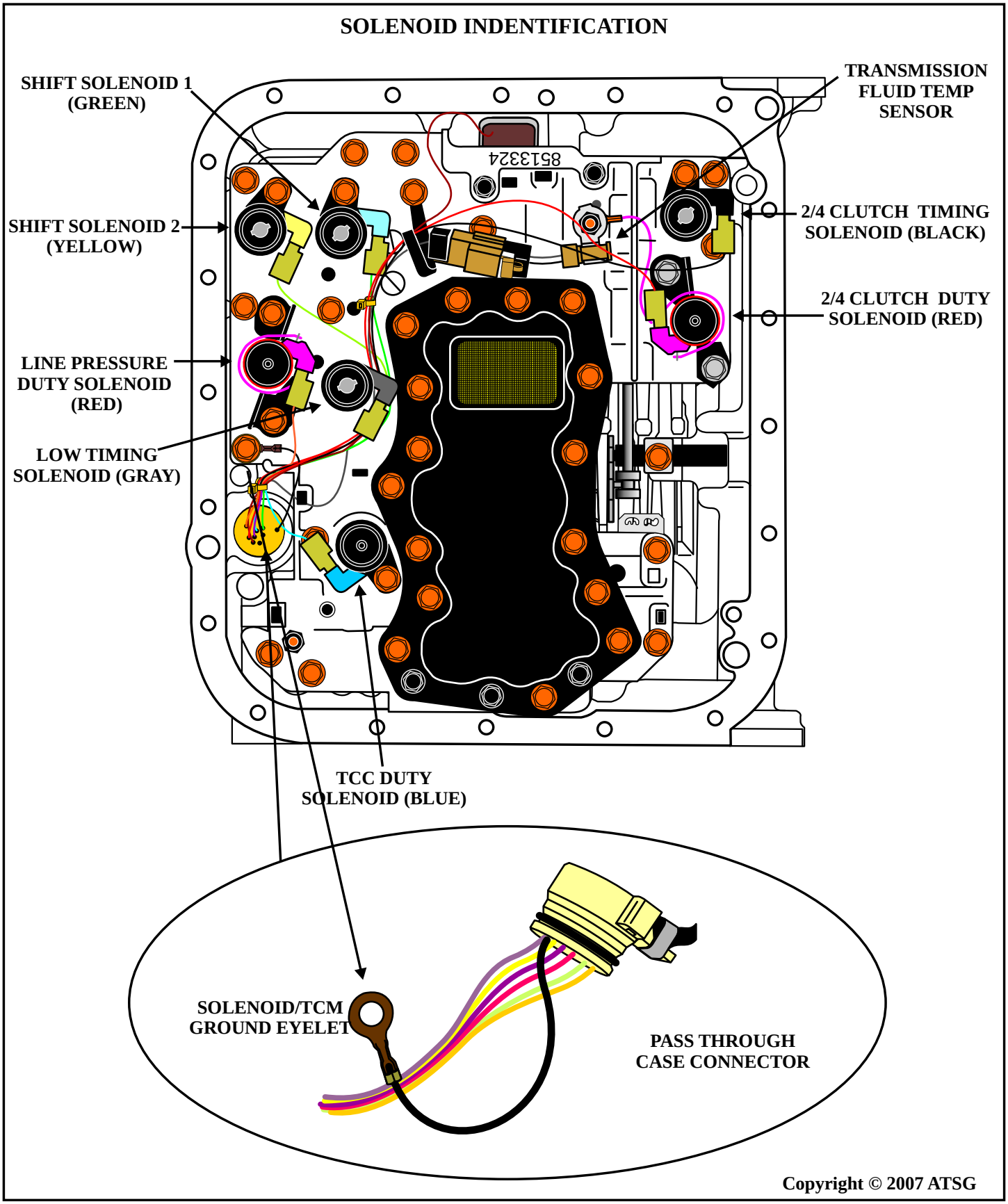
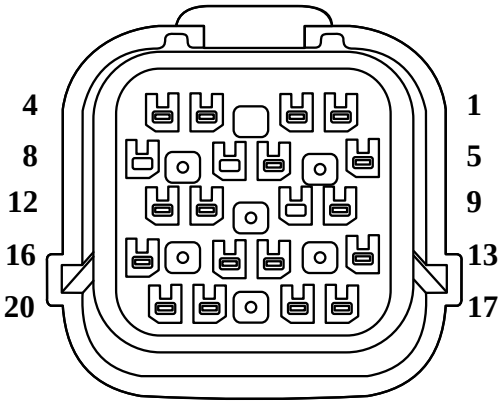

SOLENOID INDENTIFICATION
SHIFT SOLENOID 1 (GREEN)
TRANSMISSION FLUID TEMP SENSOR
SHIFT SOLENOID 2 (YELLOW)
2/4 CLUTCH TIMING SOLENOID (BLACK)
2/4 CLUTCH DUTY SOLENOID (RED)
LINE PRESSURE DUTY SOLENOID (RED)
LOW TIMING SOLENOID (GRAY)
TCC DUTY SOLENOID (BLUE)
SOLENOID/TCM GROUND EYELET
PASS THROUGH CASE CONNECTOR
Copyright © 2007 ATSG

Figure 12

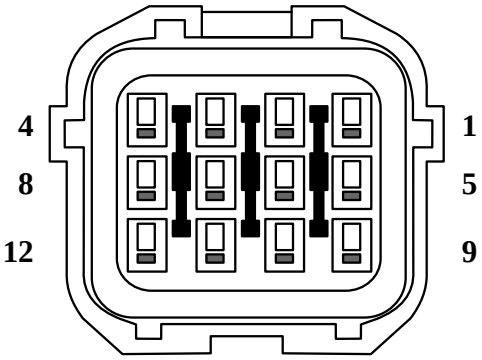
Hard Parts
For Transmissions
B & W

TRANSMISSION CASE CONNECTOR TERMINAL IDENTIFICATION

Transmission Solenoid and Sensor Bulk Head Connector



Inhibitor Switch Bulk Head Transmission Connector



Transmission Solenoid and Sensor Test Table

Part Name	Terminal	Resistance
VSS 1	19 - 20	450 - 650
VSS 2	17 - 18	450 - 650
TFT	11 - 12	2,100 - 2,900 20ºC (68ºF) 275 - 375 80ºC (176ºF)
TSS	14 - 15	450 - 650
SS1	1 - 16	10 - 16
SS2	2 - 16	10 - 16
Duty A Line Pressure	5 - 16	2.0 - 4.5
Duty B Lock-Up	13 - 16	10 - 17
Duty C Transfer Clutch	6 - 16	10 - 17
Duty D 2-4 Clutch	9 - 16	2.0 - 4.5
Low Timing Solenoid	3 - 16	10 - 16
2-4 Timing Solenoid	4 - 16	10 - 16

Inhibitor Switch Test Table

	Position	Pin Number
Signal Sent to TCM	P	4 - 3
	R	4 - 2
	N	4 - 1
	D	4 - 8
	3	4 - 7
	2	4 - 6
	1	4 - 5
Ignition/Start Circuit	P/N	12 - 11
Back-up light circuit	R	10 - 9

Figure 13

Typical Transmission to TCM Wiring Schematic Without VDC and Sport Shift

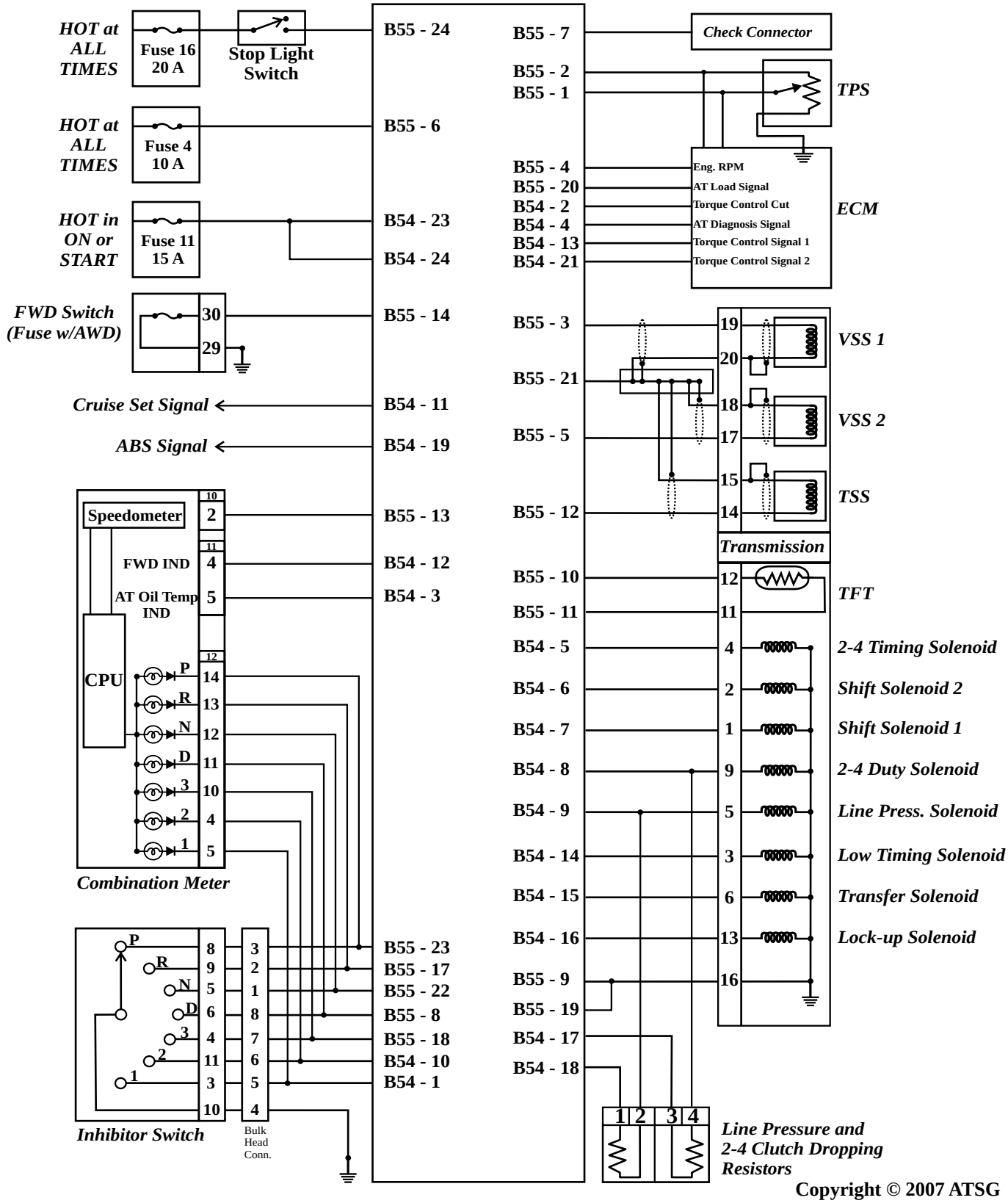
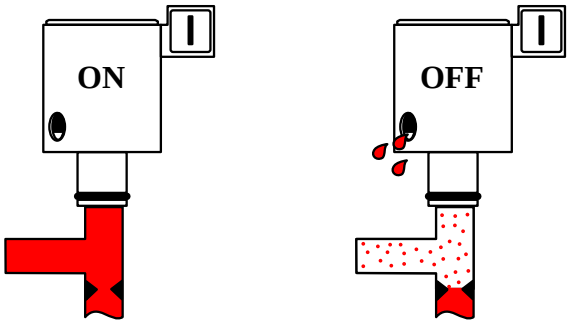


Figure 14

Automatic Transmission Service Group

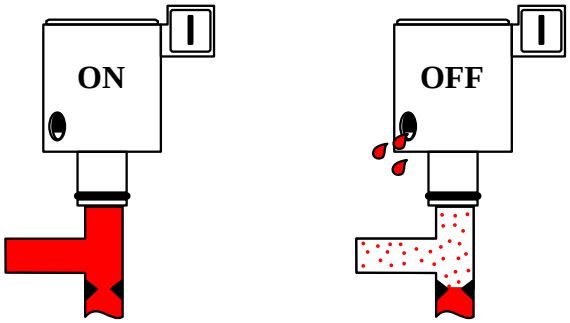
SOLENOID FUNCTION

Shift Solenoids A & B (1 & 2) Function



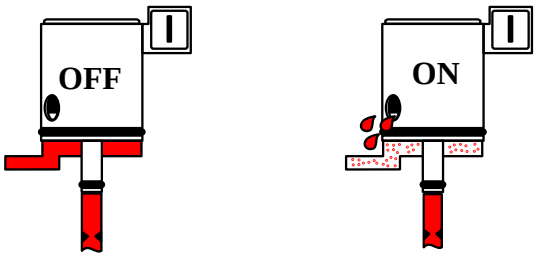
Both shift solenoids A (Green) and B (Yellow) are normally open. When they are energized they hold pressure and stroke their respective valve.

Low and 2-4 Clutch Timing Solenoid Function



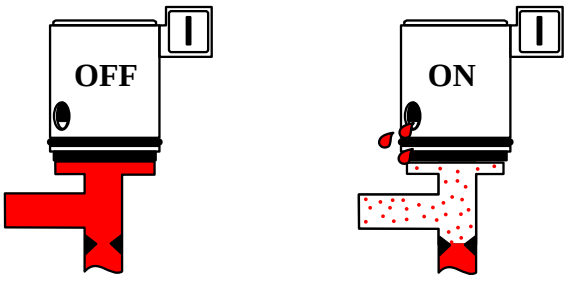
Both the Low (Gray) and 2-4 Clutch (Black) Timing solenoids are normally open. When they are energized they hold pressure and stroke their respective valve.

Line Pressure Control Solenoid and 2-4 Clutch Duty Pressure Solenoid Function



Both the Line Pressure Control Solenoid and the 2-4 Clutch Duty Solenoid (RED) are normally applied solenoids. The on/off time of the pulse width determines how much pressure is allowed to stroke their respective valve.

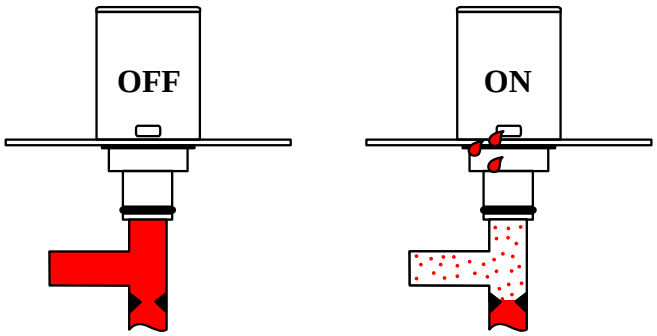
TCC Duty Solenoid Function



The TCC Duty Solenoid (Blue) is a normally applied solenoid. When the solenoid is off it holds pressure and assists the Torque Converter Control Valve spring in keeping the valve closed preventing TCC apply. When it is pulsed on, it exhaust the spring assist pressure and modifier pressure strokes the TCC control valve for converter clutch apply.

Figure 15

Duty Solenoid C (Transfer Clutch)Function

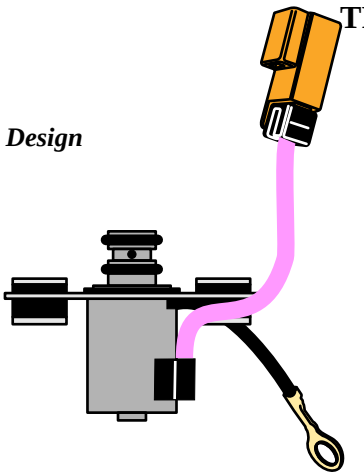


Duty solenoid C (Transfer Clutch Solenoid) is a normally applied solenoid. When the solenoid is off it holds pressure to stroke the Transfer Clutch Control Valve. When it is pulsed on, it exhausts the pressure and spring pressure closes the valve.

Figure 16

TRANSFER CLUTCH SOLENOID

Updated Design



Previous Design

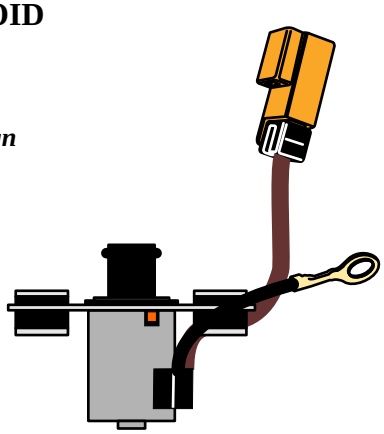
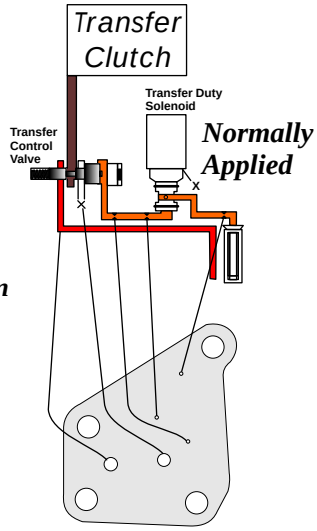


Figure 17

TRANSFER CLUTCH OPERATION

Updated Design



All 3 orifices measure .80mm (0.031")

Previous Design

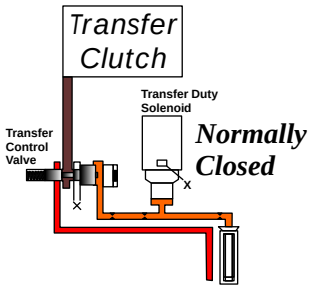


Figure 18

TRANSFER CLUTCH VALVE BODY

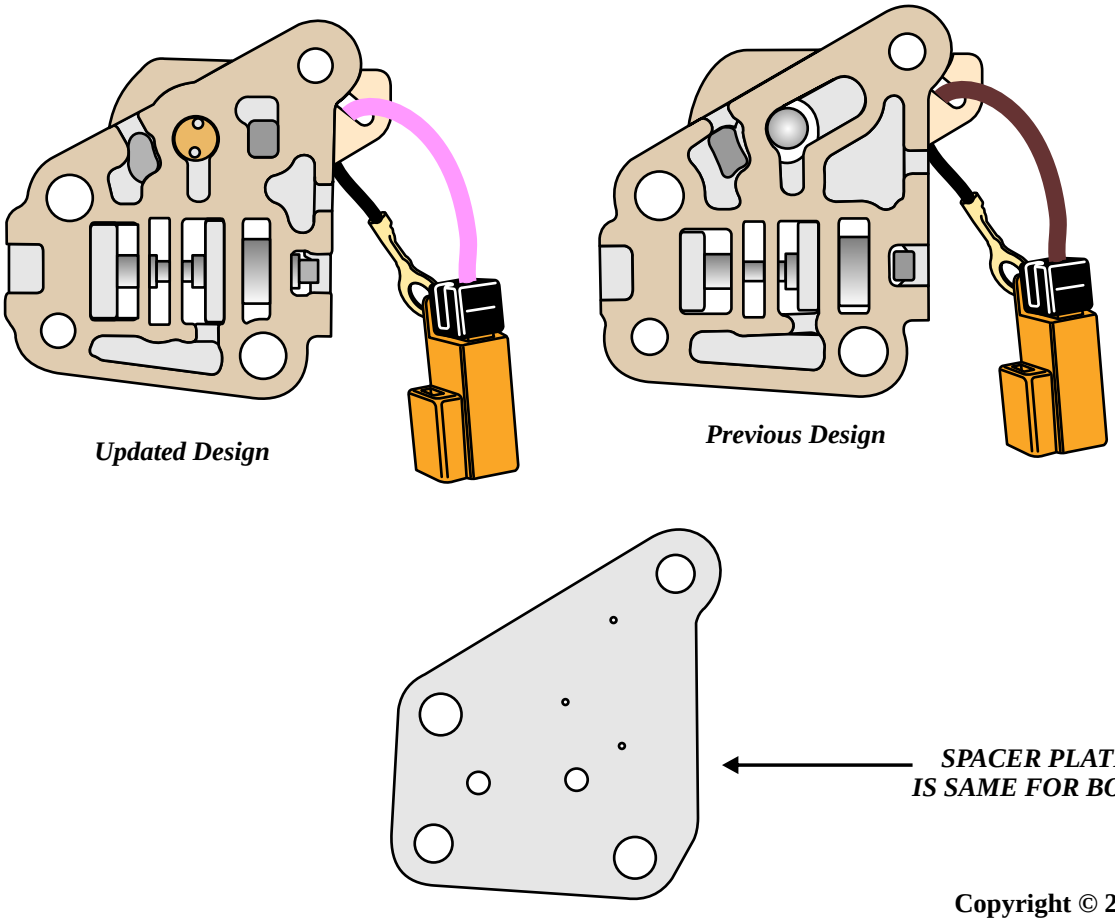


Figure 19

TRANSFER CLUTCH CONTROL VALVE

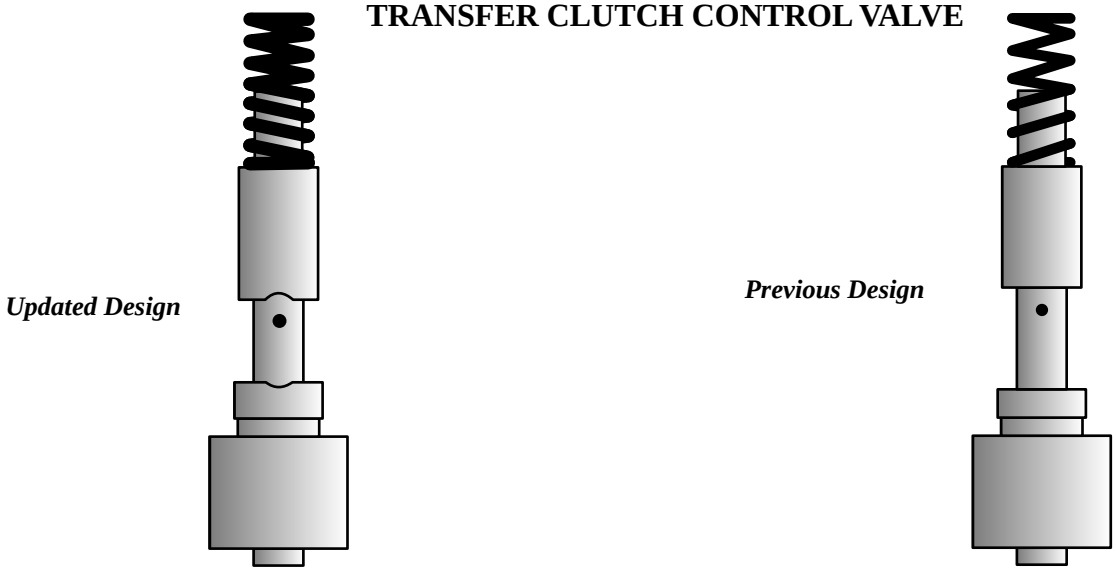


Figure 20

SUBARU 4EAT PHASE II

ERRATIC TRANSMISSION OPERATION

COMPLAINT: Multiple solenoid codes with erratic transmission operation which will be commanded by the TCM.

CAUSE: Referring to the wire diagram in Figure 1, the ground circuit for the TCM can be seen as it is located inside the transmission which is also ground for the internal solenoids.
The physical ground point can be seen in Figure 2. It is a typical wire/eyelet which a valve body bolt goes through. the ground wire then travels through the case connector at terminal 16 as shown in Figure 3, and then continues to terminals 9 and 19 at the TCM where it serves as ground for the TCM as well.

CORRECTION: Make certain this ground is in good condition as well as tight to insure it is a good ground. Since it serves as ground for both the transmission solenoids as well as the TCM, a variety of complaints could arise as a result of this ground being faulty.

Typical Transmission to TCM Wiring Schematic Without VDC and Sport Shift

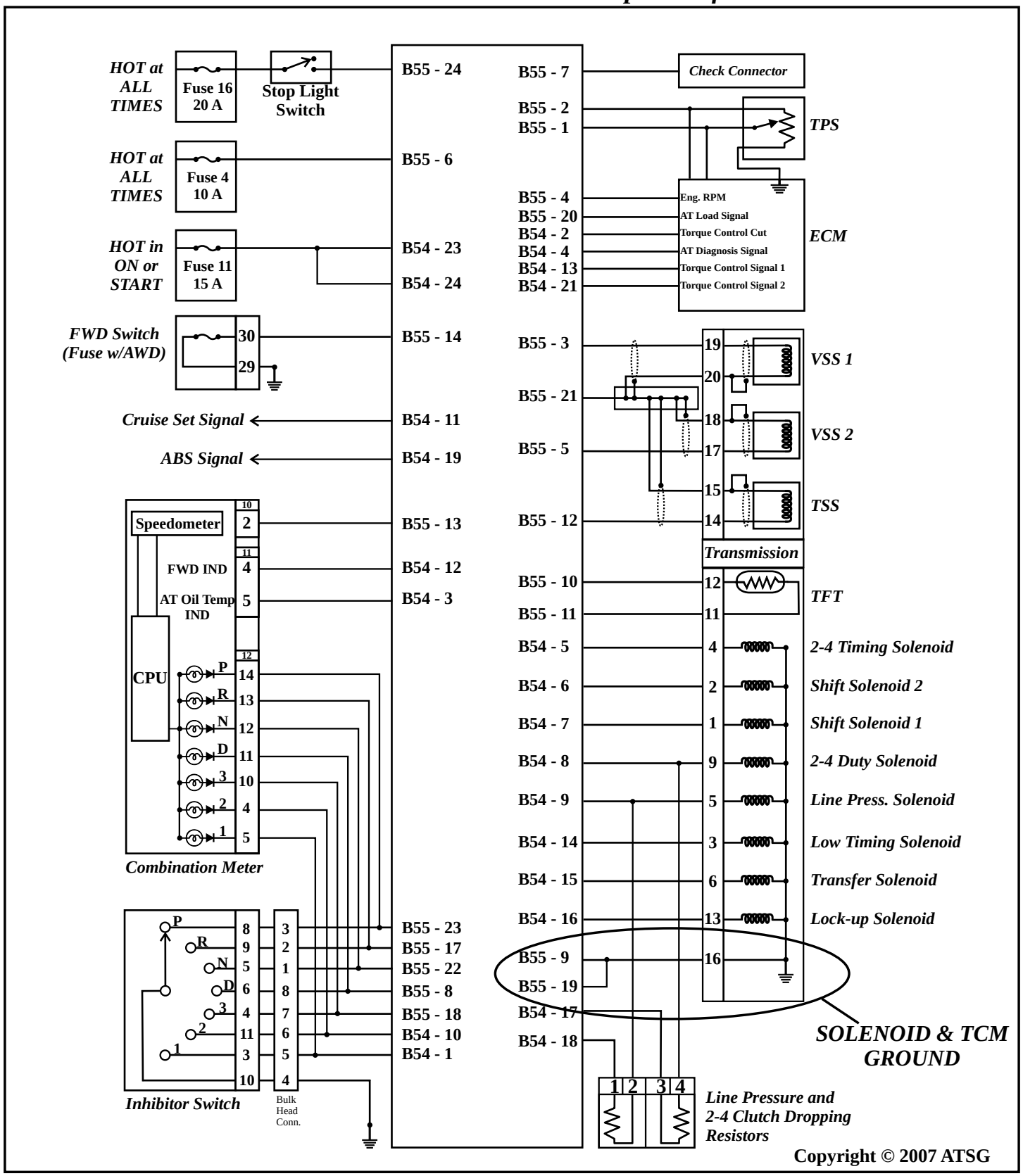


Figure 1

SOLENOID & TCM GROUND LOCATION

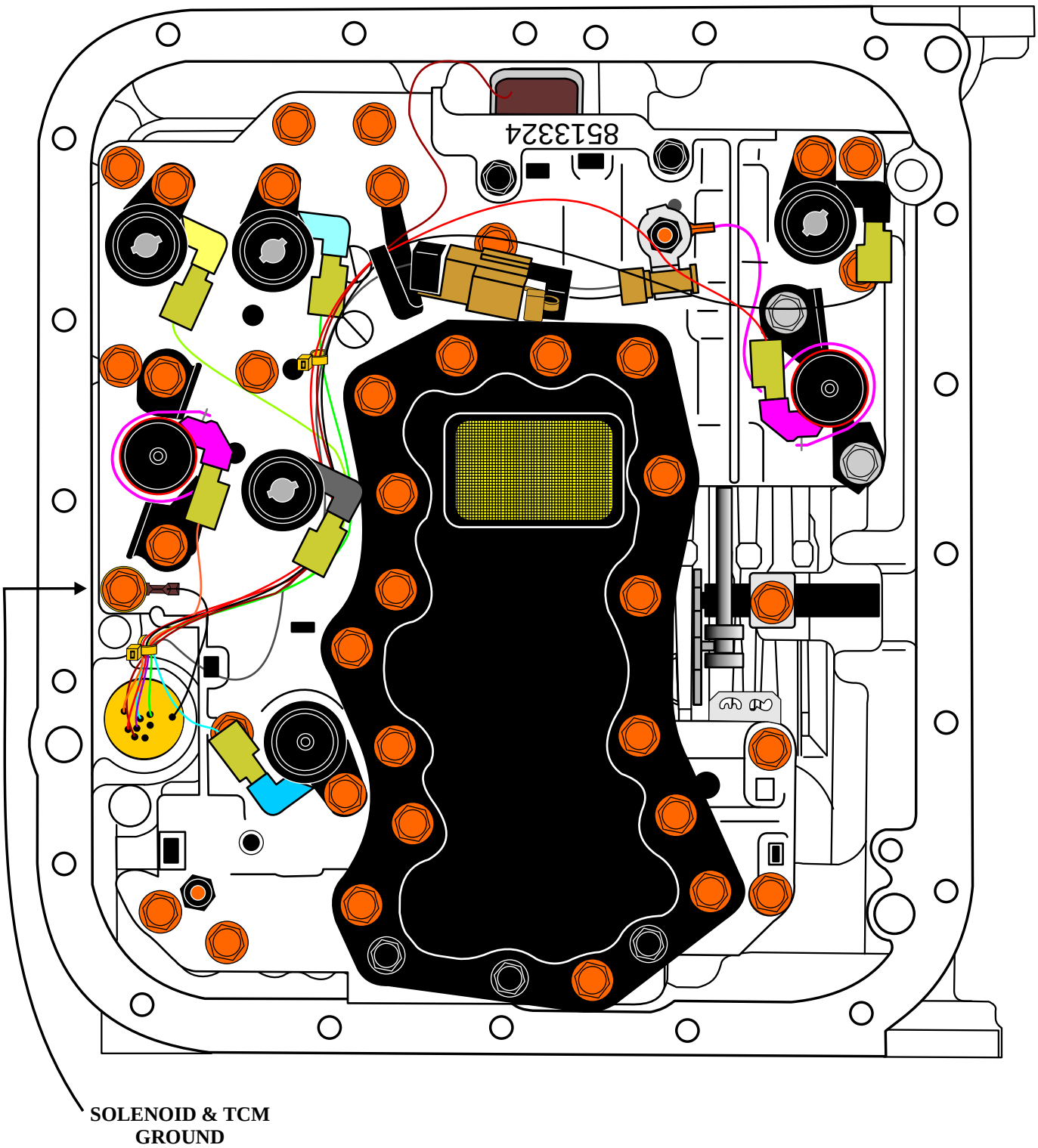
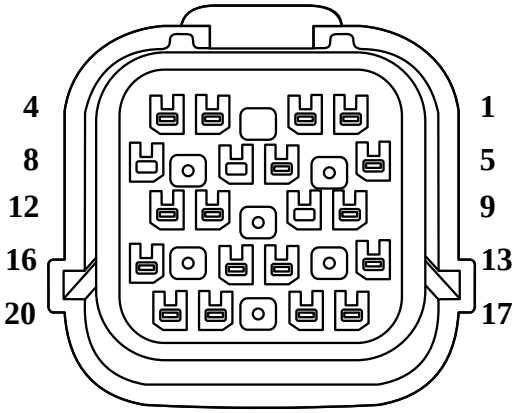


Figure 2

Transmission Solenoid and Sensor Bulk Head Connector



Transmission Solenoid and Sensor Test Table

Part Name	Terminal	Resistance
VSS 1	19 - 20	450 - 650
VSS 2	17 - 18	450 - 650
TFT	11 - 12	2,100 - 2,900 20ºC (68ºF) 275 - 375 80ºC (176ºF)
TSS	14 - 15	450 - 650
SS1	1 - 16	10 - 16
SS2	2 - 16	10 - 16
Duty A Line Pressure	5 - 16	2.0 - 4.5
Duty B Lock-Up	13 - 16	10 - 17
Duty C Transfer Clutch	6 - 16	10 - 17
Duty D 2-4 Clutch	9 - 16	2.0 - 4.5
Low Timing Solenoid	3 - 16	10 - 16
2-4 Timing Solenoid	4 - 16	10 - 16

Terminal 16 is the ground circuit for all solenoids as well as the TCM.

Figure 3

MERCEDES 722.6
GEAR RATIO ERRORS

COMPLAINT: After overhaul, vehicles equipped with the 722.6 transmission may exhibit multiple gear ratio errors and/or limp mode.

CAUSE: The cause may be, during overhaul the wrong planetary assemblies were used, creating incorrect gear ratios based on the programing in the vehicles computer.

CORRECTION: Verify the correct part numbers , by VIN number, for the planetary assemblies thru the dealer as ratios may change by engine size, differential ratio and engine performance . Refer to Figure 1 for a cross-sectional view of this transmission to locate the front, center and rear planetary assemblies . Refer to Figures 2 and 3 for individual charts on common tooth counts on typical V-8 models, typical V-6 models and a chart for Sprinter and Freightliner models. ***Note: Notice that there are V-8 models that have different ratios, be carefull! Due to the many different models there are open spaces available in the charts, for your input.***

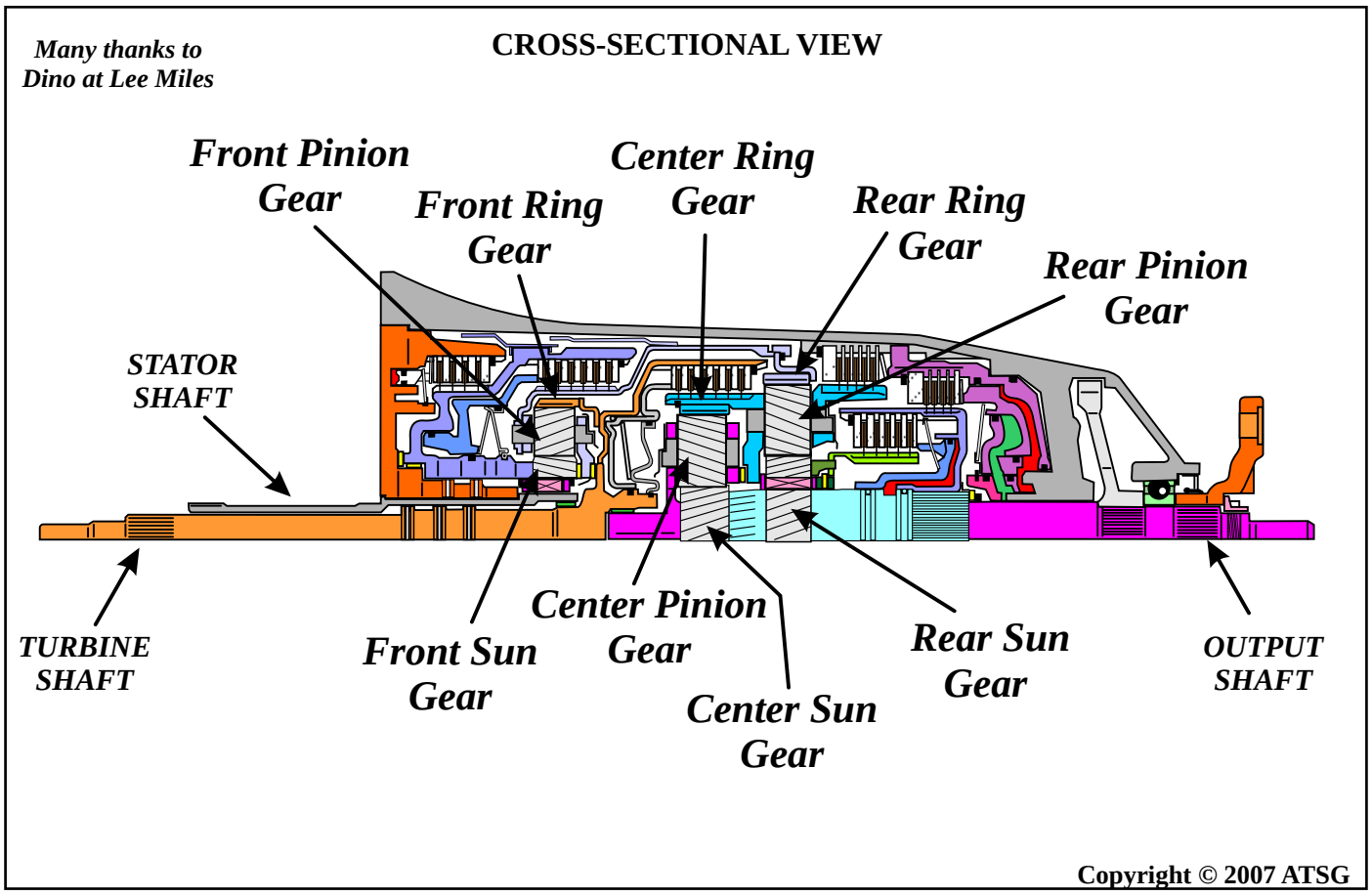


Figure 1

PLANETARY TOOTH COUNTS CHART "A"		
Front Planetary Figure 4	*Center Planetary Figure 5*	*Rear Planetary Figure 6*
Ring gear 90T *Planetary Pinion 16T* *Sun gear 58T*	*Ring gear 74T* *Planetary Pinion 22T* *Sun gear 30T*	*Ring gear 108T* *Planetary Pinion 24T* *Sun gear 60T*

KNOWN VEHICLE APPLICATIONS

YEAR	VEHICLE MODEL	ENGINE SIZE	TRANS I.D.
02	FREIGHTLINER	2.7L 5 CYLINDER DIESEL	722.681
05	DODGE SPRINTER	2.7L 5 CYLINDER DIESEL	722.681
01	S 430	4.3 V-8	722.632

PLANETARY TOOTH COUNTS CHART "B" TYPICAL V-8 MODELS		
Front Planetary Figure 4	*Center Planetary Figure 5*	*Rear Planetary Figure 6*
Ring gear 78T *Planetary Pinion 14T* *Sun gear 50T*	*Ring gear 74T* *Planetary Pinion 22T* *Sun gear 30T*	*Ring gear 90T* *Planetary Pinion 19T* *Sun gear 50T*

KNOWN VEHICLE APPLICATIONS

YEAR	VEHICLE MODEL	ENGINE SIZE	TRANS I.D.
98	E 430	4.3 V-8	722.623
98	CL 500	5.0 V-8	722.620
00	S 500	5.0 V-8	722.633

Note: Chart A and B both have 4.3 V-8 models that have two complete different ratios that are not interchangeable

Figure 2

PLANETARY TOOTH COUNTS CHART "C" TYPICAL 6 CYLINDER MODELS			
Front Planetary Figure 4		*Center Planetary Figure 5*	*Rear Planetary Figure 6*
Ring gear 78T *Planetary Pinion 14T* *Sun gear 50T*		*Ring gear 70T* *Planetary Pinion 18T* *Sun gear 34T*	*Ring gear 87T* *Planetary Pinion 16T* *Sun gear 54T*
KNOWN VEHICLE APPLICATIONS			
YEAR	**VEHICLE MODEL**	**ENGINE SIZE**	**TRANS I.D.**
97	**E 320**	**3.2 Liter 6**	**722.605**
97	**C 280**	**2.8 Liter 6**	**722.604**
98	**E 320**	**3.2 Liter 6 (12 plug)**	**722.607**
99	**C 280**	**2.8 Liter 6**	**722.606**

Figure 3

FRONT PLANETARY ASSEMBLY

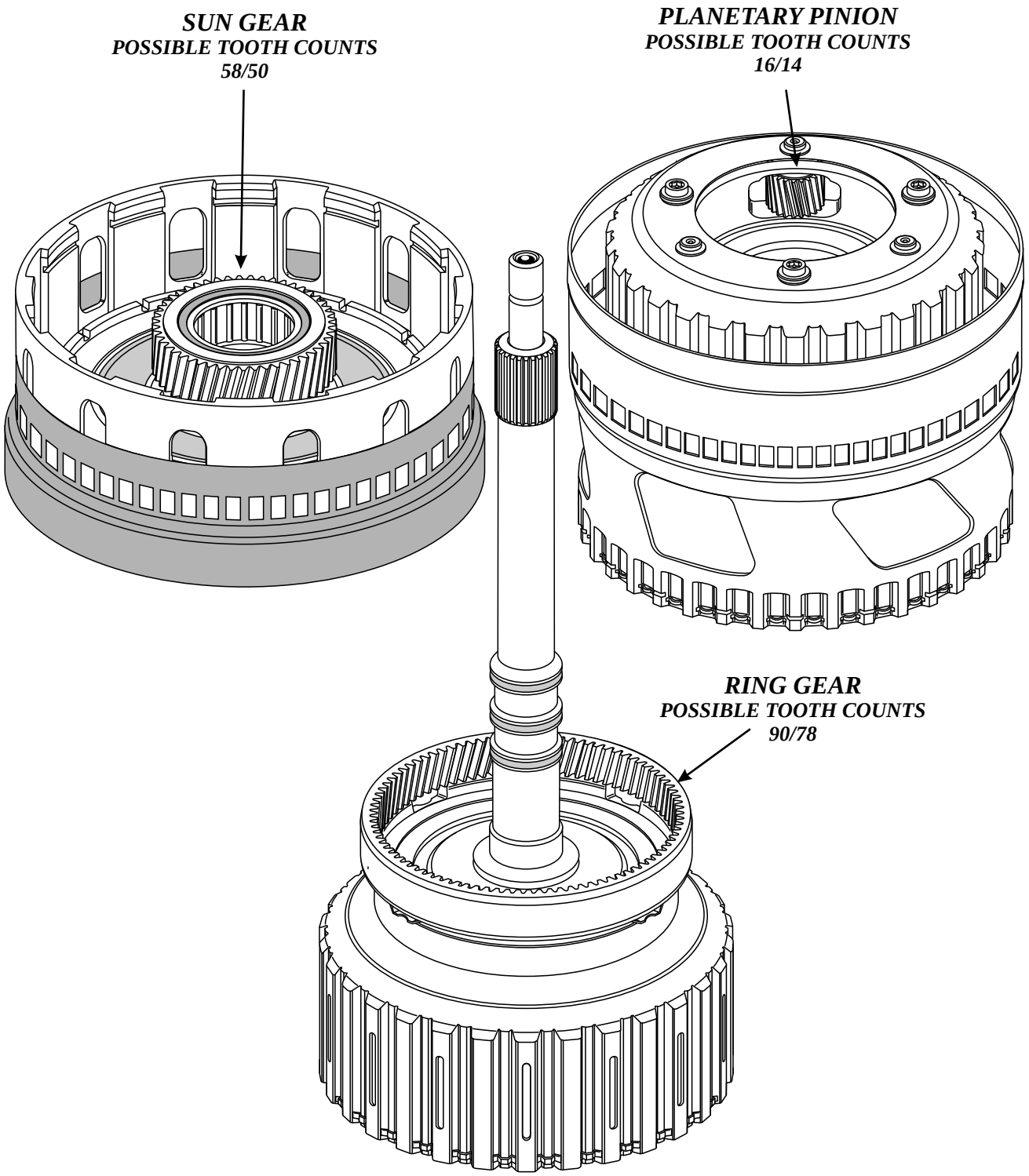


Figure 4

CENTER PLANETARY ASSEMBLY

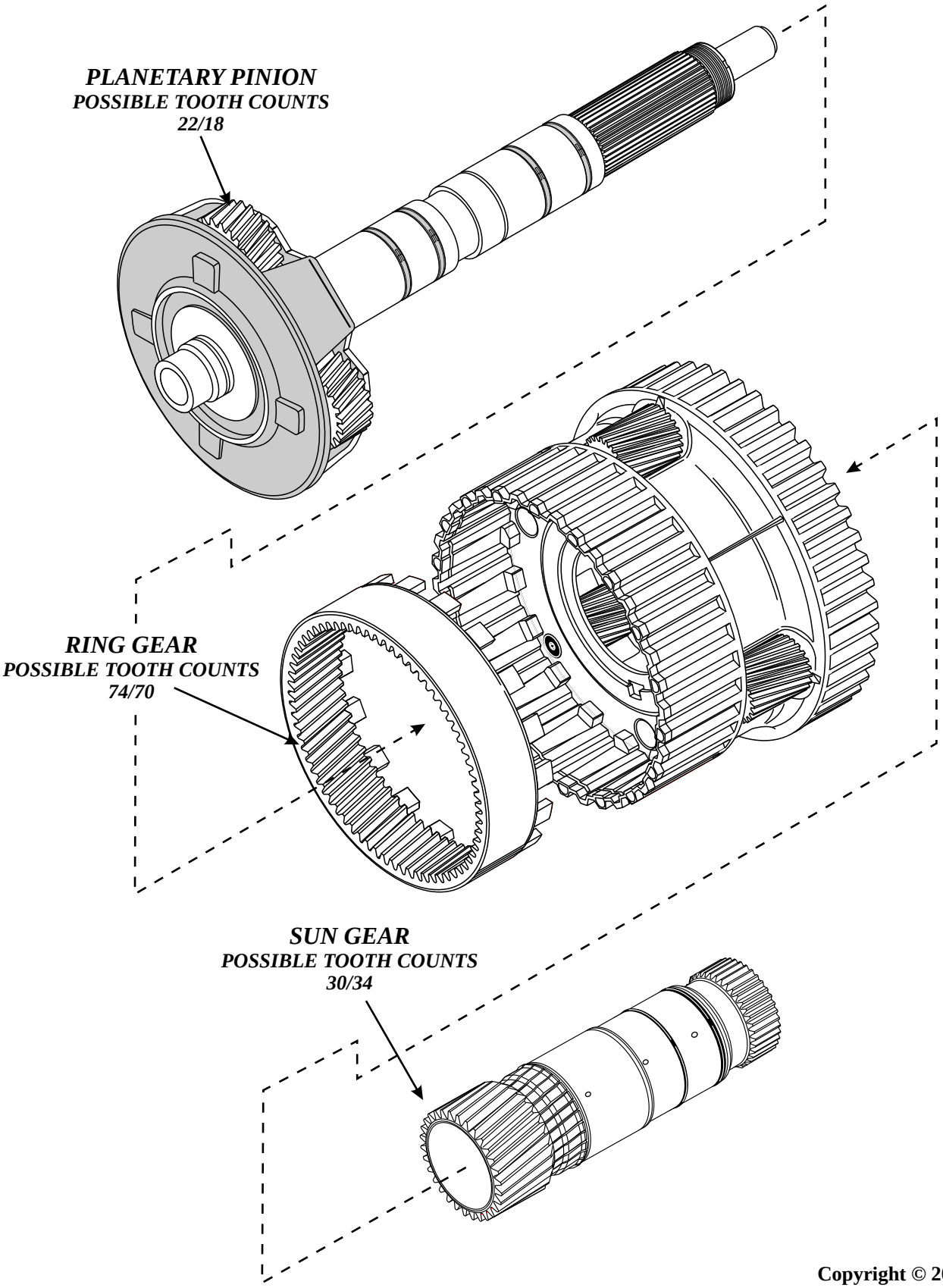


Figure 5

REAR PLANETARY ASSEMBLY

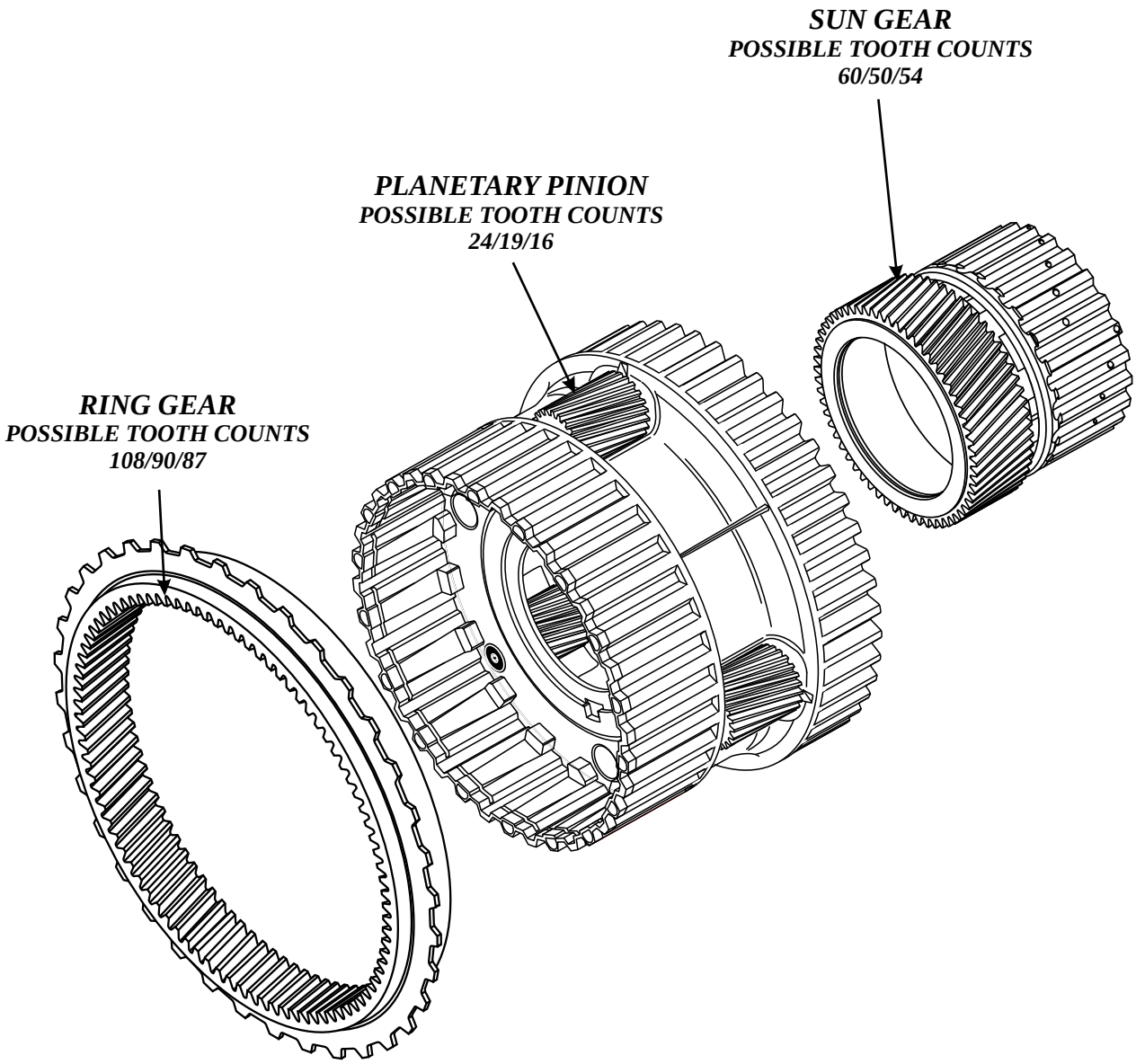


Figure 6

BMW ZF5HP24

BUZZING OR DRONING NOISE FROM BELL HOUSING

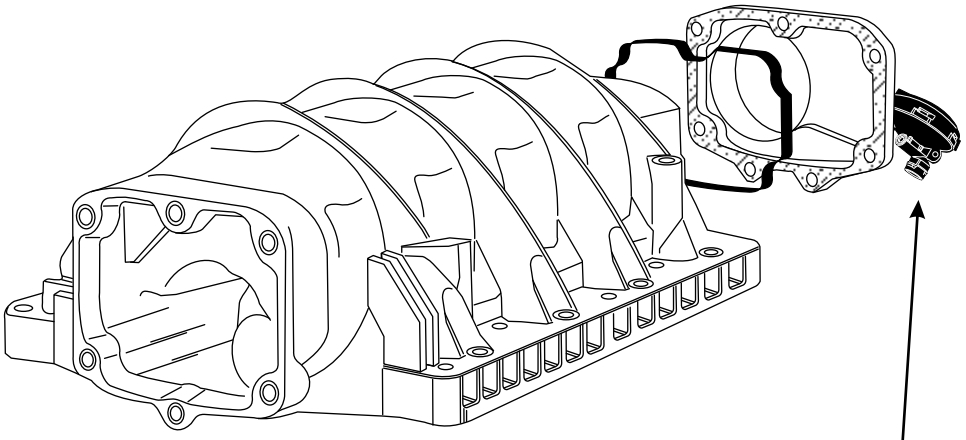
COMPLAINT: Some V-8 BMW models equipped with the ZF5HP24 transmission may exhibit a buzzing or droning noise coming from the bell housing area of the transmission. This noise may sound like a pressure inbalance from the volume control valve in the pump or may even sound like a torque converter that is about to fail.

CAUSE: The cause of this problem is typically a valve resonance coming from the oil separator which happens to be located at the back of the intake plenum, right above the bell housing. It can be compared to the noise we have had on the 4EAT in the Ford Escort with the dirty PCV valve. TESTING: To verify if this is the problem with this vehicle, start the engine and wait for the noise to start, remove the oil filler cap and see if the resonance goes away. If it does the oil separator will need to be replaced.

CORRECTION: To correct this condition refer to Figure 1 to locate the oil separator and replace it. Due to the part number differences for the different models, you will need to contact your local dealer for the replacement part number.

Special thanks to Dino at Lee Miles

INTAKE PLENUM



OIL SEPARATOR

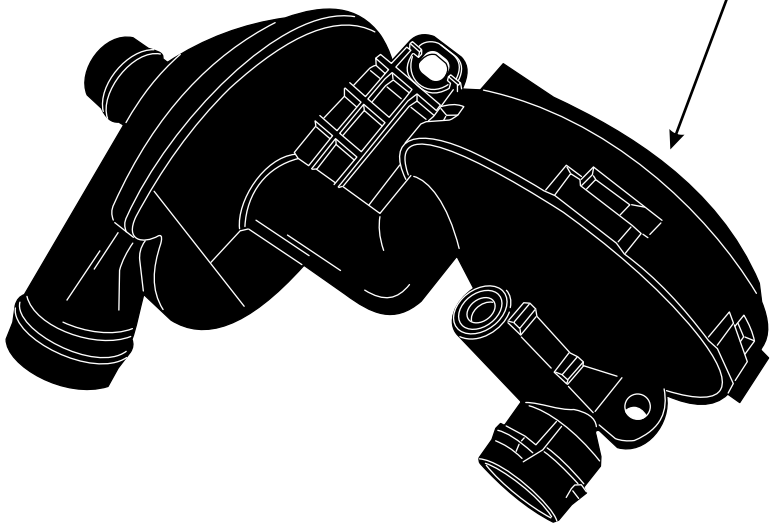


Figure 1

ZF5HP24

DELAY OR SLIPPING FORWARD AND/OR REVERSE/ 5-4 KICK-DOWN FLARE

COMPLAINT: ZF5HP24 transmissions may exhibit a slipping or delayed engagement into reverse and or drive before and after overhaul. A flare on a kick down shift to 4th may also occur.

CAUSE: Inside the lower rear valve body there are two hard plastic damper pistons (Figure 3), one for the A clutch and the other for the C clutch. The A clutch is used for forward while the C clutch is used for reverse (Figure 2). The original design has a center pedestal at the bottom of the piston which punches out over time causing a leak in their respective circuits (Figure 1). Damage to the A or C clutch may occur and if the valve body is not disassembled during the re-build, the original complaint will remain.

In a past ATSG seminar (2003) we have noted that the EDS 5 solenoid pressure circuit has a rubber damper (bladder) in the channel plate that ruptures causing a dumping to neutral on medium to heavy throttle take off and/or a neutralizing during a 5-4 kick-down shift (Figure 4). Many kits come through with a new bladder to be used when rebuilding the unit.

CORRECTION: The punched out piston will need to be replaced. There is now an updated piston which eliminates the original bottom center pedestal stop (Figure 1). The new design piston has a split pedestal which has been increased slightly in thickness and diameter. The original ZF part number remains the same when ordering from an authorized ZF distributor for all models except Audi. They have an aluminum version that resembles the first design. Both the updated hard plastic design split pedestal stop and the aluminum single center pedestal stop damper pistons are dimensionally the same and will interchange. The major difference is price. The aluminum wholesales at approximately $ 27.00 while the hard plastic wholesales at approximately $ 4.00.

SERVICE INFORMATION:

Updated Damper Piston.....ZF Part # 1058-327- 017
Audi Aluminum Piston.....ZF Part # 1058-327-087

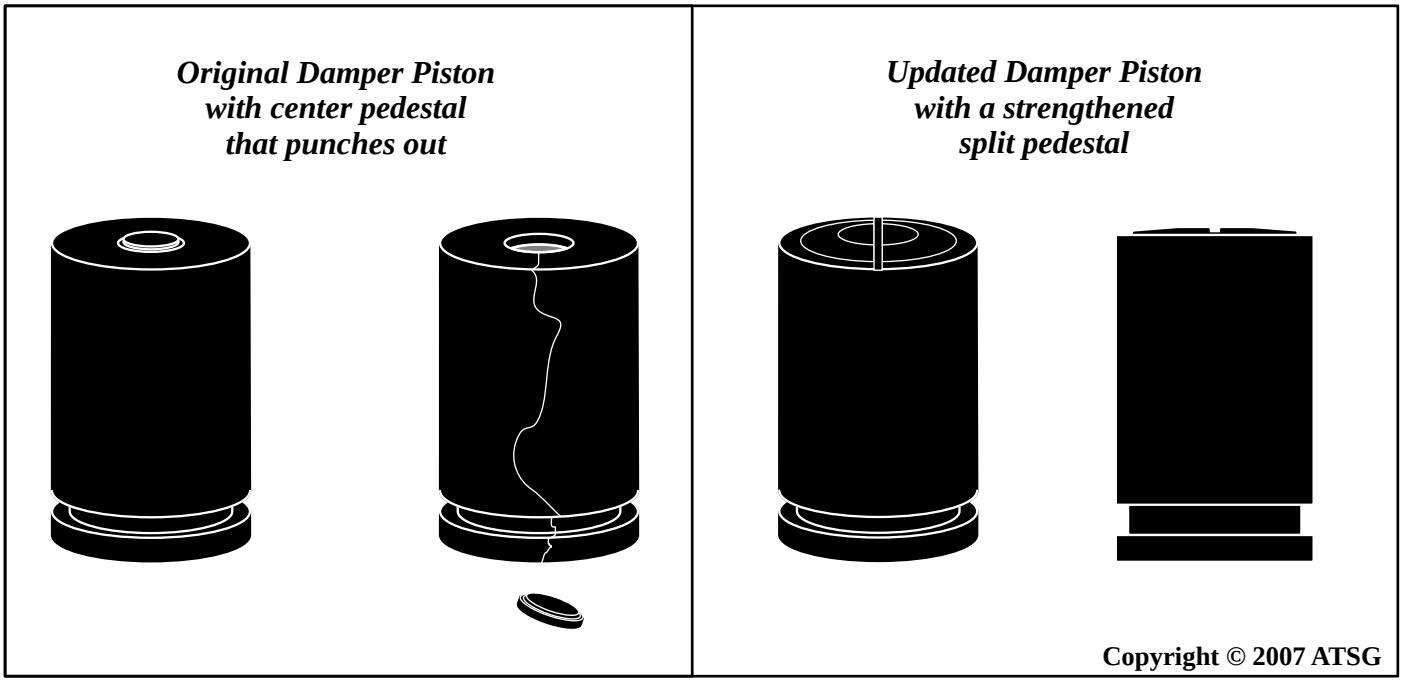
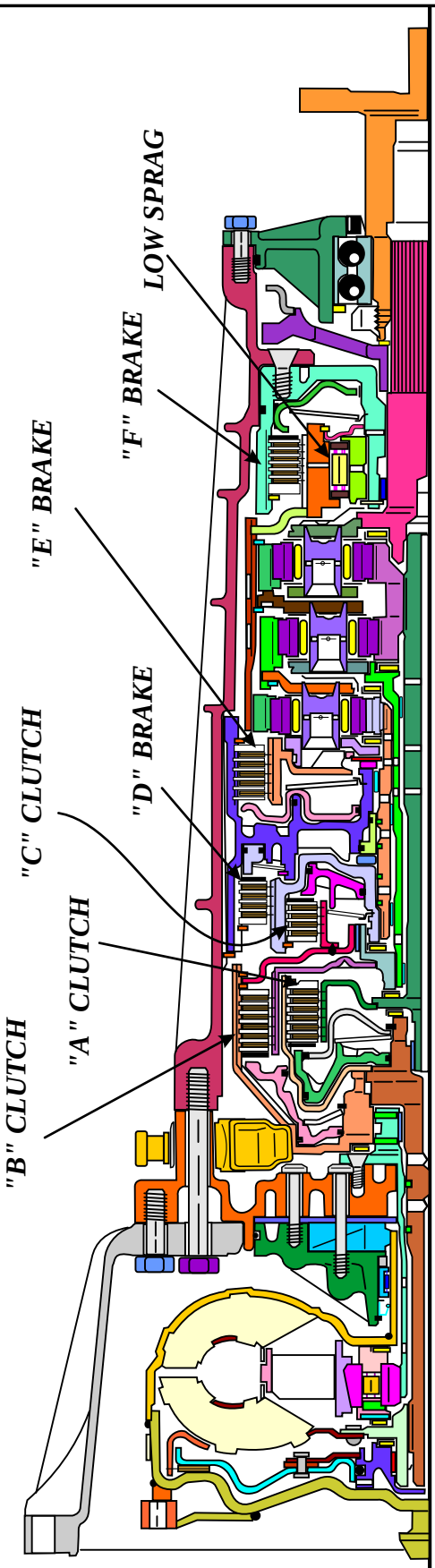


Figure 1

ZF-5HP-24

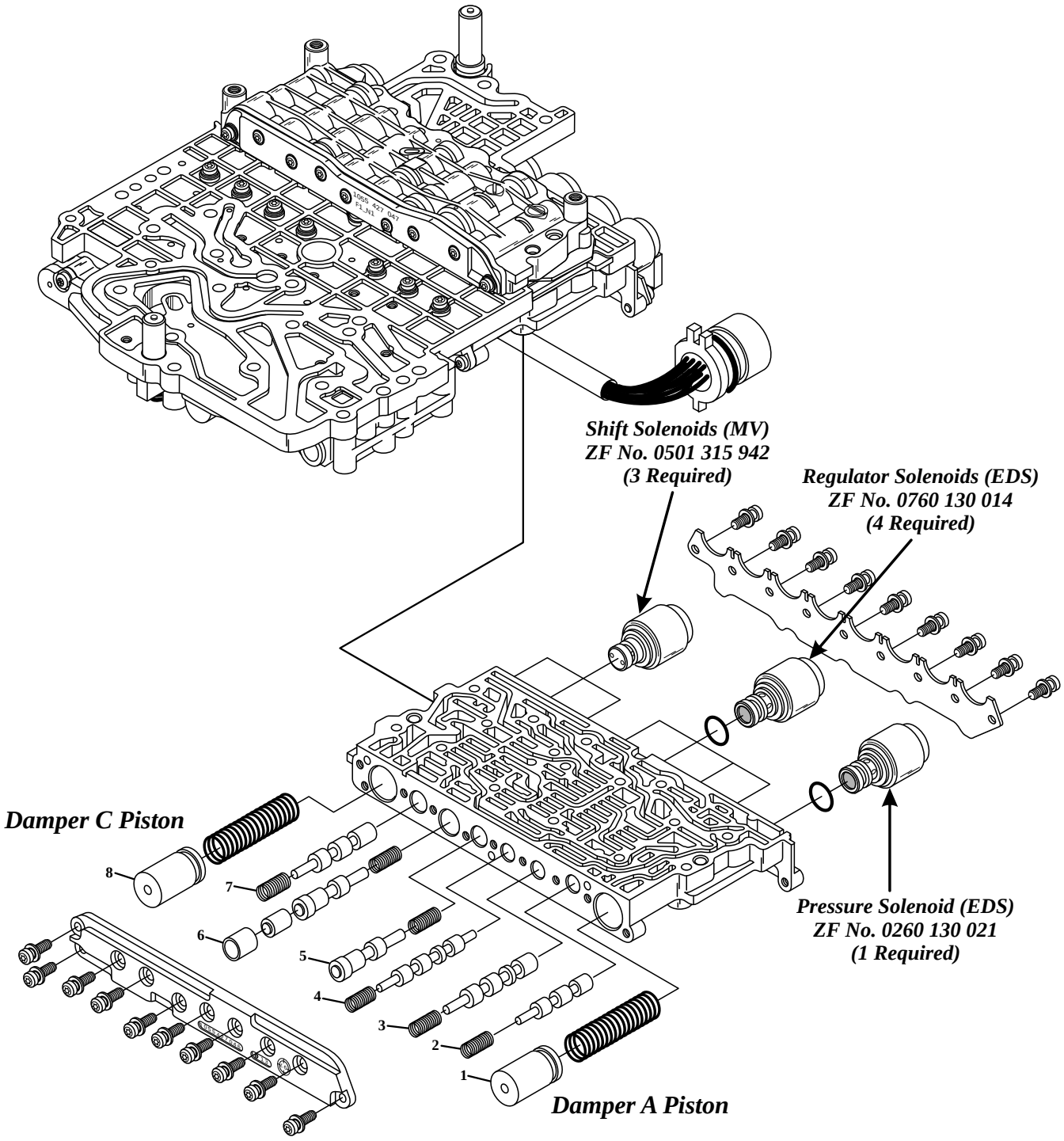


APPLICATION CHART

GEAR	"A" CLUT	"B" CLUT	"C" CLUT	"D" BRAK	"E" BRAK	"F" BRAK	LOW SPRAG	GEAR RATIO
PARK						ON		
REV			ON			ON		4.10:1
NEUT						ON		
D-1ST	ON						HOLD	3.57:1
D-2ND	ON				ON			2.20:1
D-3RD	ON			ON				1.51:1
D-4TH	ON	ON						1.00:1
D-5TH		ON		ON				0.80:1
M-1	ON					ON	HOLD	3.57:1

Figure 2

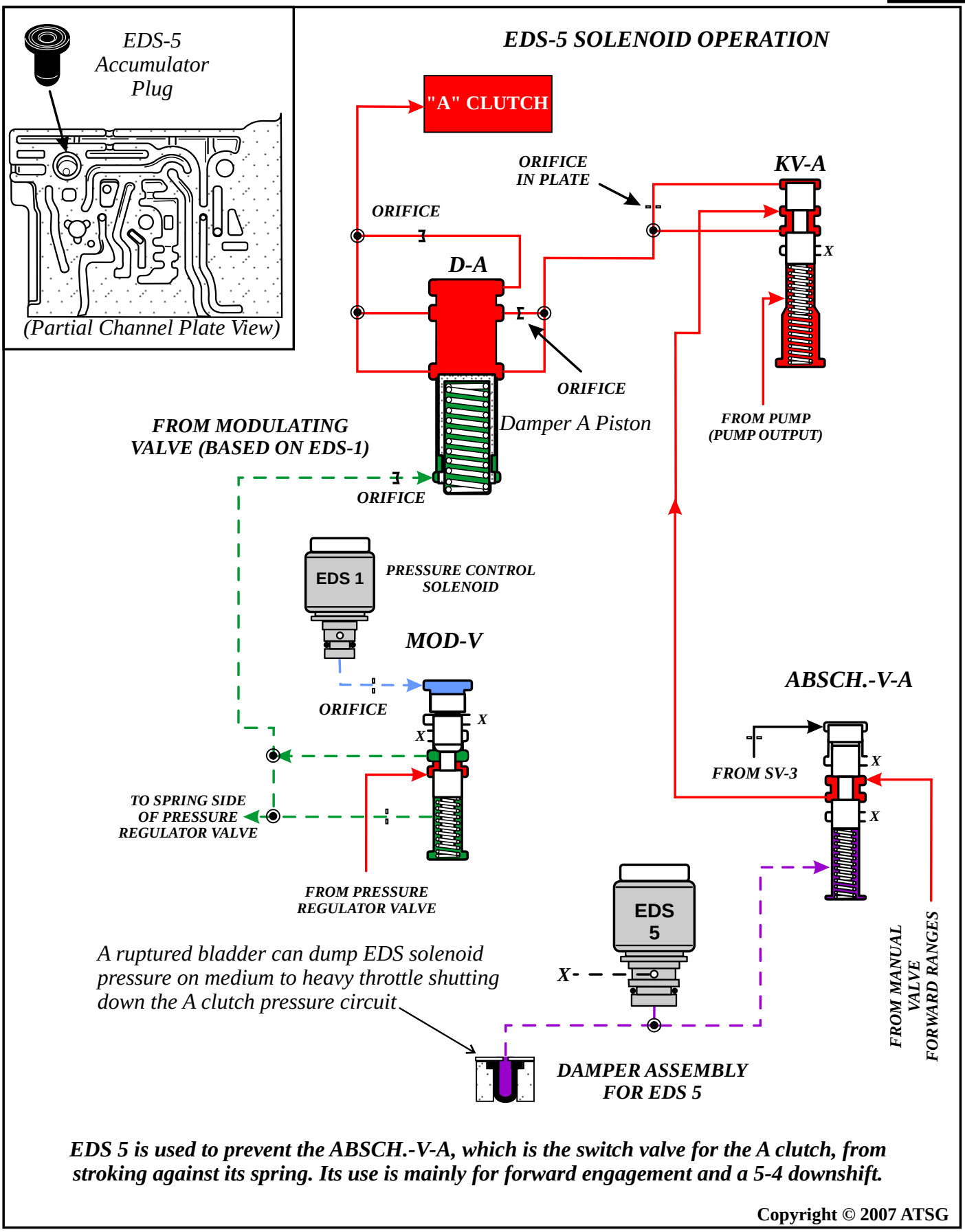
ZF-5HP-24 LOWER REAR VALVE BODY



1. "A" Clutch Accumulator Line-Up (D-A).
2. Shift Valve Number 1 (SV-1).
3. Shift Valve Number 2 (SV-2).
4. Shift Valve Number 3 (SV-3).
5. Switch Valve For "D" Clutch (ABSCH-V-D).
6. Clutch Valve "D" Line-Up (KV-D).
7. Reverse Gear Valve Line-Up (RG-V).
8. "C" Clutch Accumulator Line-Up (D-C).

Figure 3

Lory's Transmission Parts



EDS 5 is used to prevent the ABSCH.-V-A, which is the switch valve for the A clutch, from stroking against its spring. Its use is mainly for forward engagement and a 5-4 downshift.

Figure 4

AVI

Raybestos

TTXE

Techpak