
# 2000

# TECHNICAL SEMINAR

# *Automatic Transmission Rebuilders Association*

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# Program Contents

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## Acknowledgements

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Steve Bodofsky, who designed and laid out our manual, created the slide show, and provided much of the editing for this program.

Dennis Madden
Technical Director

# General Motors Contents

# 4L60E

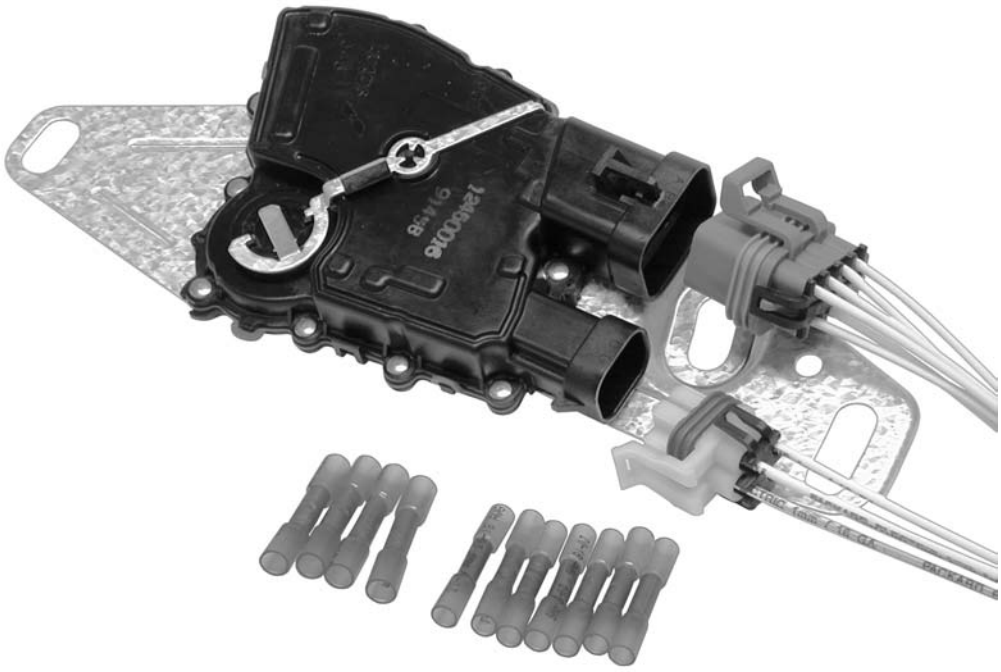
## Neutral Safety Switch Replacement

Very often, the harnesses for the neutral safety switch are melted to the point that you can't remove them without damaging the harness, switch, or both. The switch, and both harness connectors are available separately.

Pay attention to the color and position of the existing wires *before* cutting them; the replacement harness connectors aren't color-coded.

The GM part numbers are:

12450016..... Neutral Safety Switch
15305887..... Large Connector
15305925..... Small Connector

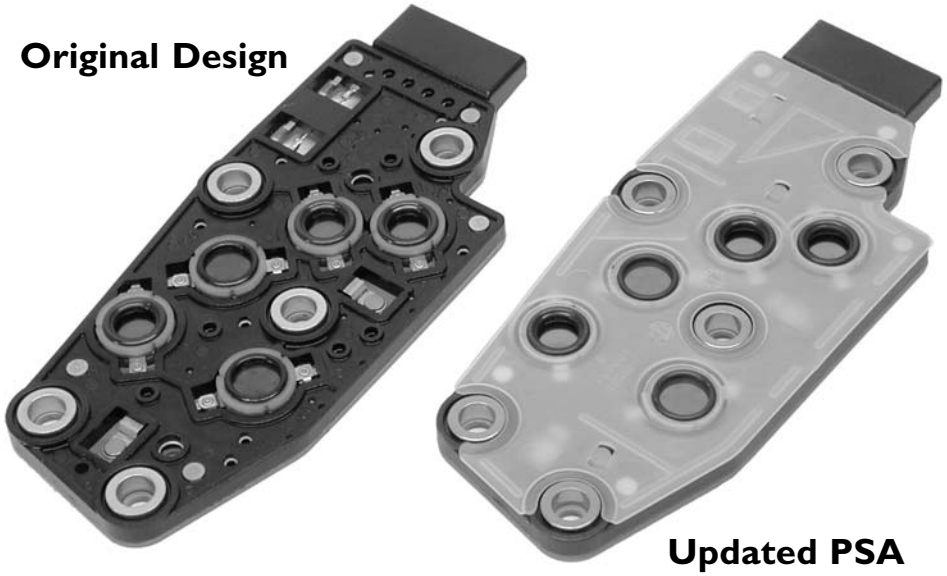


# 4L60E

## New-Design Pressure Switch Assembly; Code P1810

A diagnostic trouble code P1810 refers to a problem with the pressure switch assembly. This can be caused by debris shorting out the switch contacts. GM has introduced a new-design switch assembly that has a plastic shield, to protect the switch contacts from exposure to debris.

The GM part number for the new switch assembly is 24215111.



# 4L60E

## P1870 Sets Regularly or Intermittently

Diagnostic trouble code P1870 (Transmission Component Slipping) is a very common problem on the 4L60E. It sets on all vehicles, and can be difficult to diagnose as it's often intermittent. P1870 will set if:

- TCC is commanded on
- TCC duty cycle is at maximum
- TCC slip RPM is greater than 130 for longer than 7 seconds
- DTCs P0122, P0123, P0502, PO503, P0711, P0712, P0713, P0740, P0753, P0758, P1810, P1860 aren't set.
- VSS is between 30 and 70 MPH (48–112 KPH)
- Speed ratio (engine speed divided by output speed, also known as N/V ratio on some scan tools) is between 0.69 and 0.88
- D4 range is selected
- TP is between 9% and 35%
- TFT is between 68° F and 266° F (20° – 130° C)

The computer reacts to code P1870 by:

- Raising line pressure to maximum
- Freezing shift adapts
- Inhibiting TCC

Any type of slip in 4$^{th}$ gear may lead to code P1870. This means a problem with the 3–4 clutch, 2–4 band or the forward clutch could cause this code. So P1870 isn't just related to the TCC or TCC operation. Other causes for code P1870 include:

- Clutch or servo sealing problems (seals, bushings, shafts, pistons)
- Friction material damage or improper stacking
- TCC or its feed circuit is leaking
- Solenoid problems (hydraulic leakage and low current flow)
- TCC pressure regulator valve side-loading in the bore, causing it to stick intermittently. This results in low TCC apply pressure.

# 4L60E

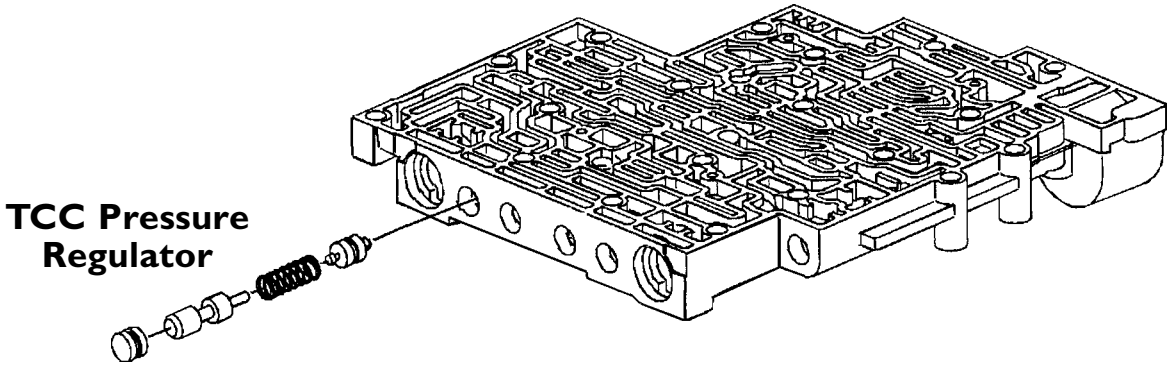
## P1870 Sets Regularly or Intermittently (cont)

To isolate the cause of the P1870 DTC:

Use a scan tool to check whether the TCC slip values are consistent while driving at a steady throttle with the TCC applied. Apply and release the converter several times and check the slip RPM. Slip RPM at steady throttle should range between –10 to +30 for non-Electronically Controlled Capacity Clutch ($EC^3$) torque converter applications and –10 to +60 on $EC^3$ applications.

Watch the slip RPM each time the TCC applies. After the first time the TCC slips too much, pay attention to how often it occurs on each subsequent apply. If there's too much slip on every apply, inspect the TCC hydraulic system for leaks (all TCC seal rings, gaskets, bushings, solenoids, converter. Replace the damaged or faulty components).

If the slip isn't consistent with every TCC apply, check the TCC pressure regulator valve in the valve body for side-loading.



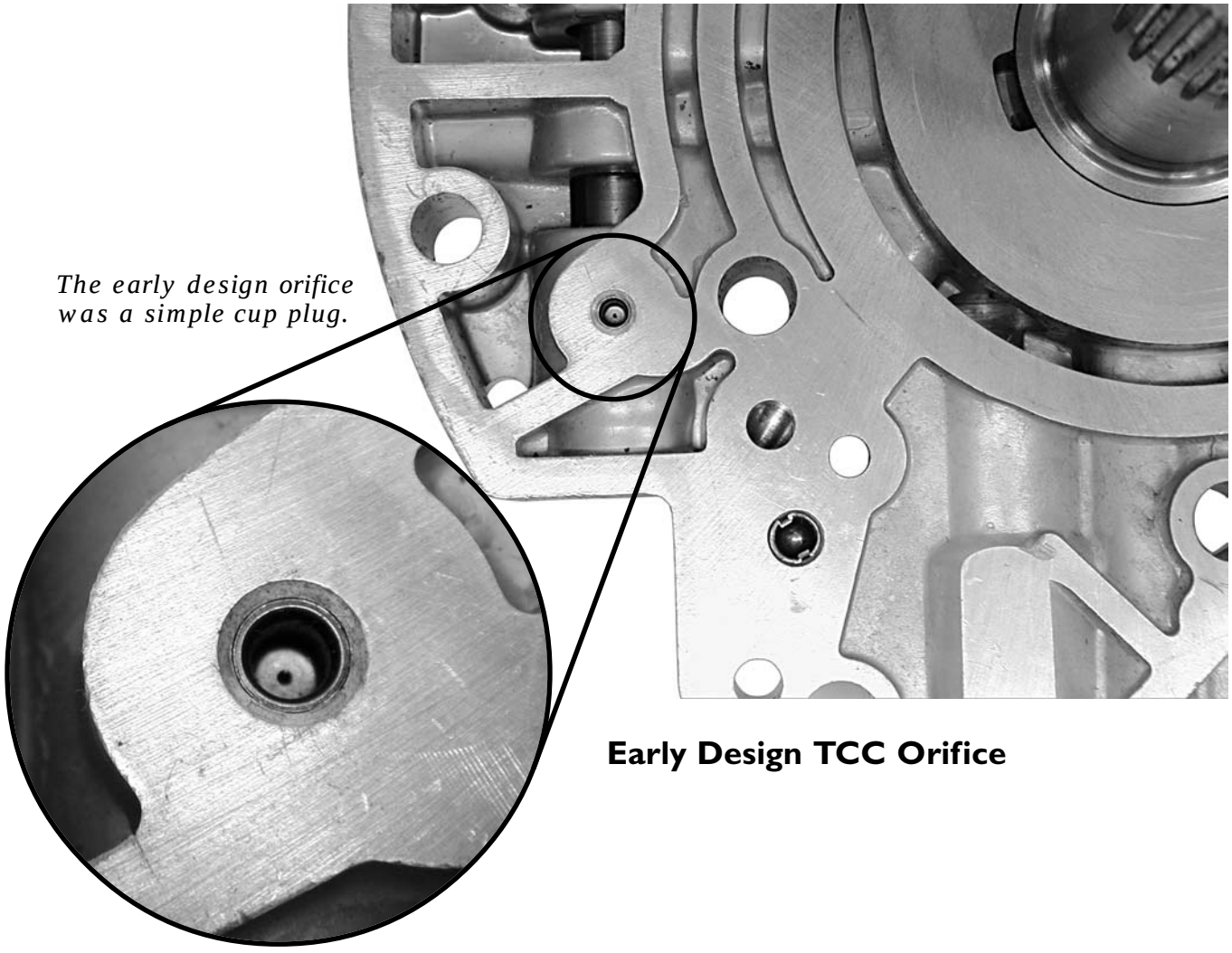

This is a very common problem and very often the valve body bore is worn, allowing the valve to cock in the bore. This reduces the amount of TCC apply pressure, resulting in excessive TCC slip. If a possible side loading occurs, replace the valve body or install a TCC pressure regulator valve kit readily available from many aftermarket companies. GM no longer produces new valve bodies as service parts: All valve bodies are now serviced as remanufactured valve bodies only.

If no damage is present and you are confident a TCC pressure regulator valve side loading isn't present, replace the TCC PWM solenoid.

# 4L60E; 1997-on

## New TCC Orifice

The 1997-and-later stator supports use a new design orifice for TCC solenoid feed. This new orifice consists of a metal housing with a plastic insert.

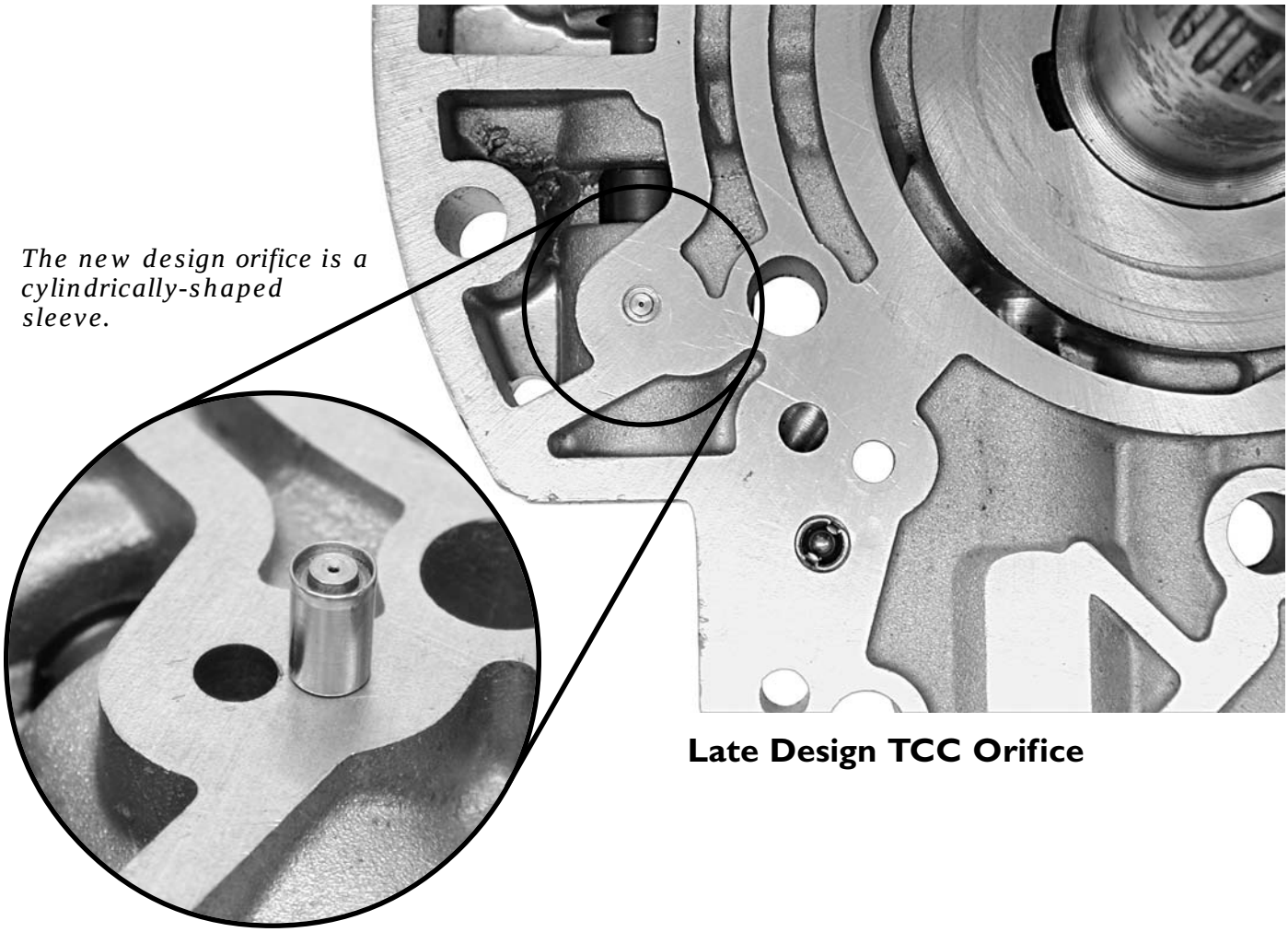



**Early Design TCC Orifice**

# 4L60E; 1997-on

## New TCC Orifice (continued)

*The new design orifice is a cylindrically-shaped sleeve.*



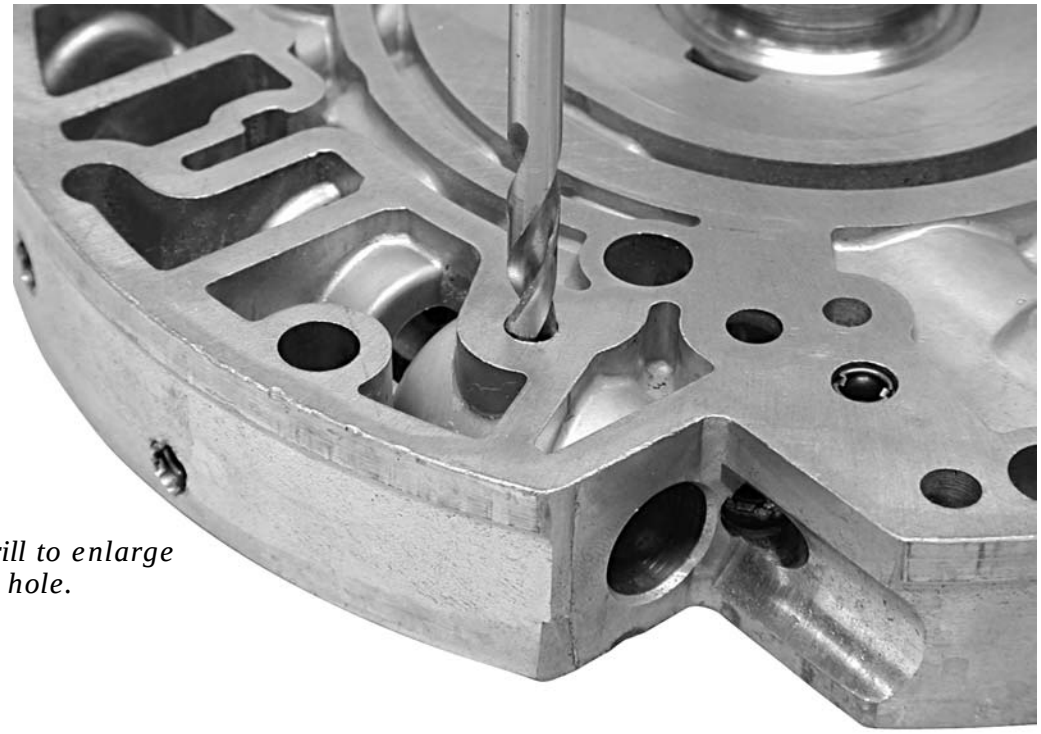
**Late Design TCC Orifice**

Under severe overheating conditions, the plastic insert can melt, clogging the orifice. Currently, the orifice isn't serviced separately, which gives you two choices:

1. You can replace the stator support with an earlier PWM support.
2. You can replace the orifice with an orificed cup plug. The cup plug used in earlier supports is too small for the bore, but you can use a larger plug. To do this you first need to enlarge the existing hole.

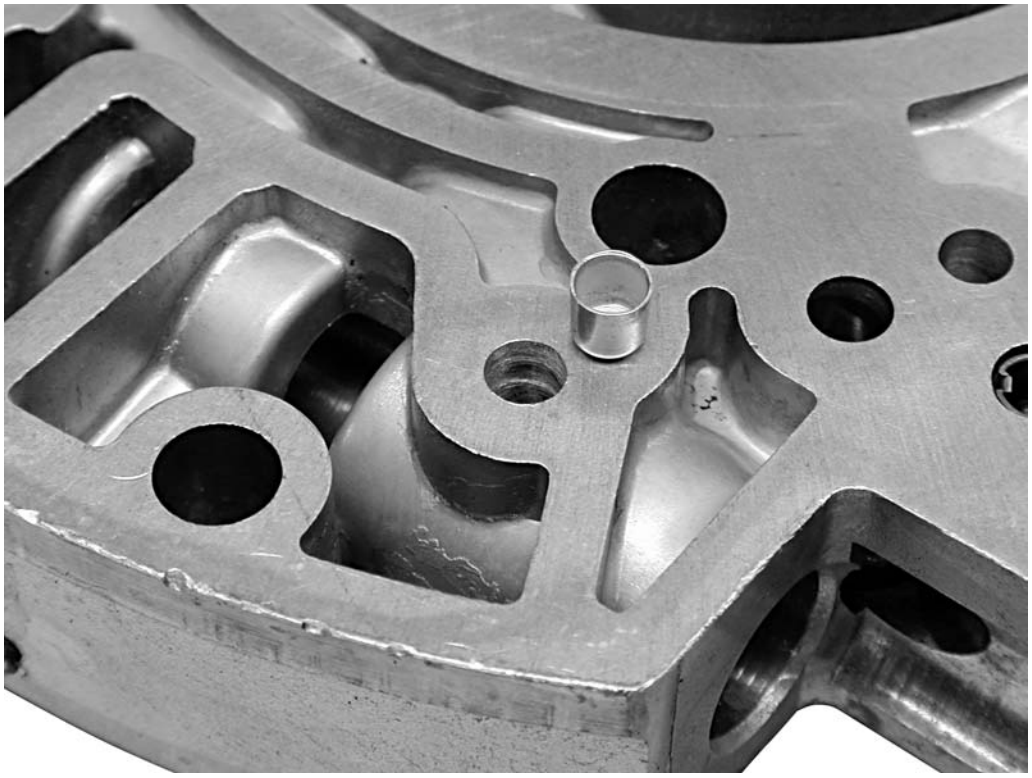
# 4L60E; 1997-on

## New TCC Orifice (continued)



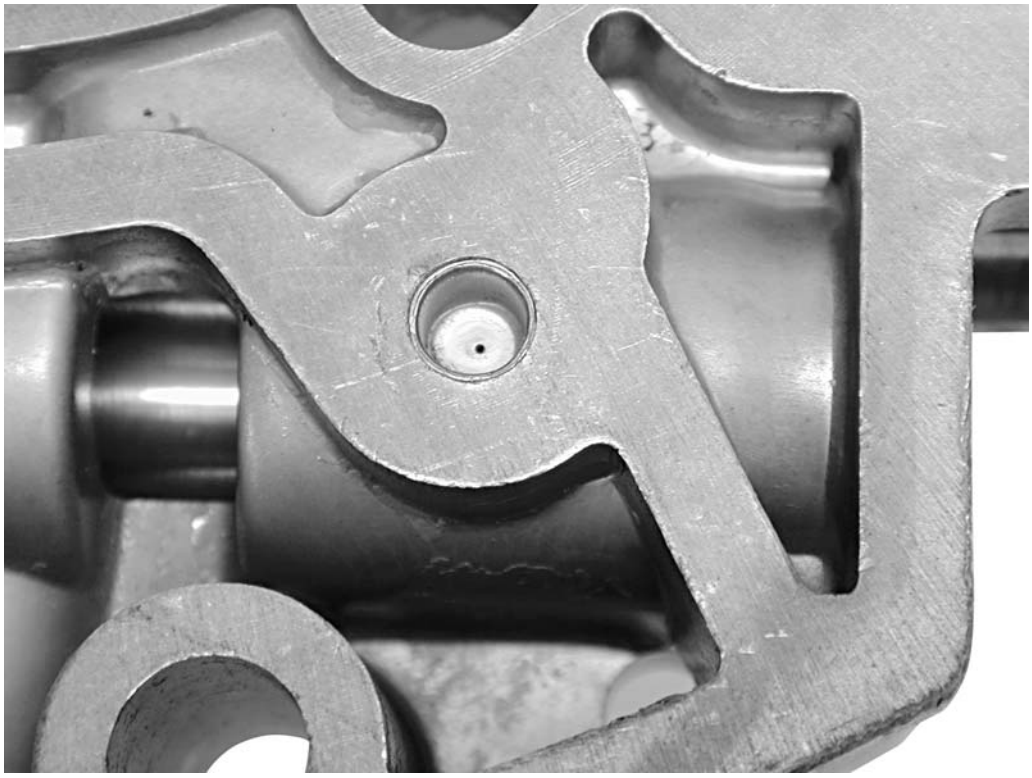
*Use a ¼" drill to enlarge the existing hole.*

*Use part number 8628864 for the new orifice.*



# 4L60E; 1997-on

## New TCC Orifice (continued)



Drive the new orificed plug into the newly drilled hole, just below flush.

**IMPORTANT** The orifice in the new plug is too small. Always enlarge it to 0.028".

# 4L60E

## No 2nd, 4th and Reverse

Many 1997-99 4L60Es may lose reverse, 2nd and 4th gears. This is caused by a change in the manufacturing process for the sun gear reaction shell. During production, the radius of the area attaching the splines on the shell to the shell housing was reduced. This leads to a fatigue failure of the shell.

**Here's how the sun shell should look**

**This is how the sun shell looks when it strips out**

# 4L60E

## No 2nd, 4th and Reverse (continued)

GM increased the radius of this area for added strength. To repair this condition, replace the shell. The part number for the updated shell is the same as the old shell. What's more, GM didn't purge the faulty parts from inventory, so you may not get the updated part when you order it.

The best way to tell if your part is the updated one is by checking the ID stamped inside the shell. The ID consists of a letter and three numbers. If your shell begins with the letters A or B, you have the old-style shell. The updated shells begin with the letter W.

The GM part number for the sun gear shell is 8683439.

# 4L60E/4L80E

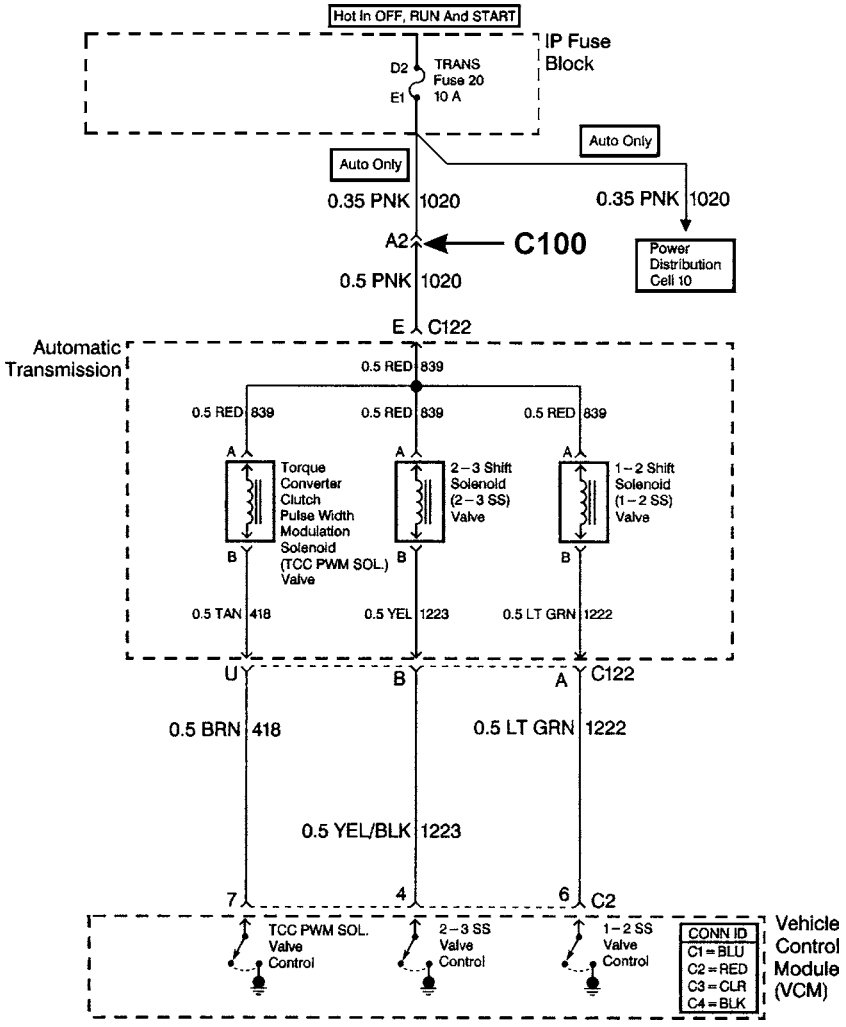
## Possible No Shifts or Codes P0740, P0753, P0758, P0785, P1860

4L60E/4L80E transmissions may exhibit any or all of these trouble codes and driveability problems:

P0740 — TCC Solenoid Electrical Fault
P0753 — 1–2 Solenoid Electrical Fault
P0758 — 2–3 Solenoid Electrical Fault
P0785 — 3–2 Solenoid Electrical Fault
P1860 — TCC PWM Solenoid Electrical Fault

- 4L80E applications fail to shift, or will drop into second gear intermittently. The customer may complain that the "vehicle is going to neutral at higher road speeds."
- 4L60Es fail to shift and may drop or stay in 3rd gear when the shift lever is in the OD position.
- Any or all of these codes may set: P0758, P0785, P1860, P0753, P0740. If the problem is intermittent, the system may not set a code.

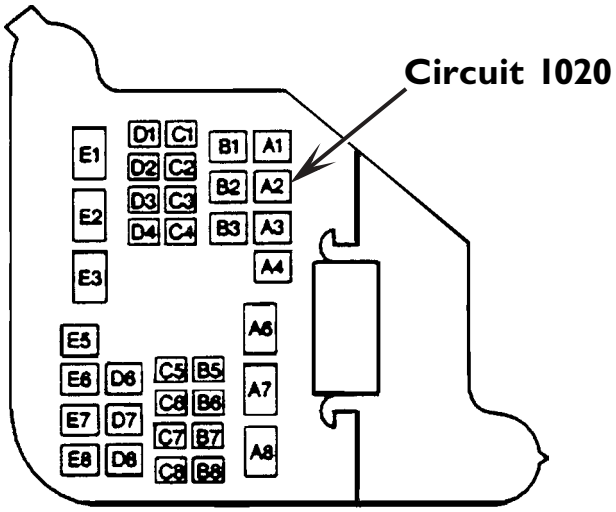
This problem is caused by a poor crimp on one of the terminals for circuit 1020.



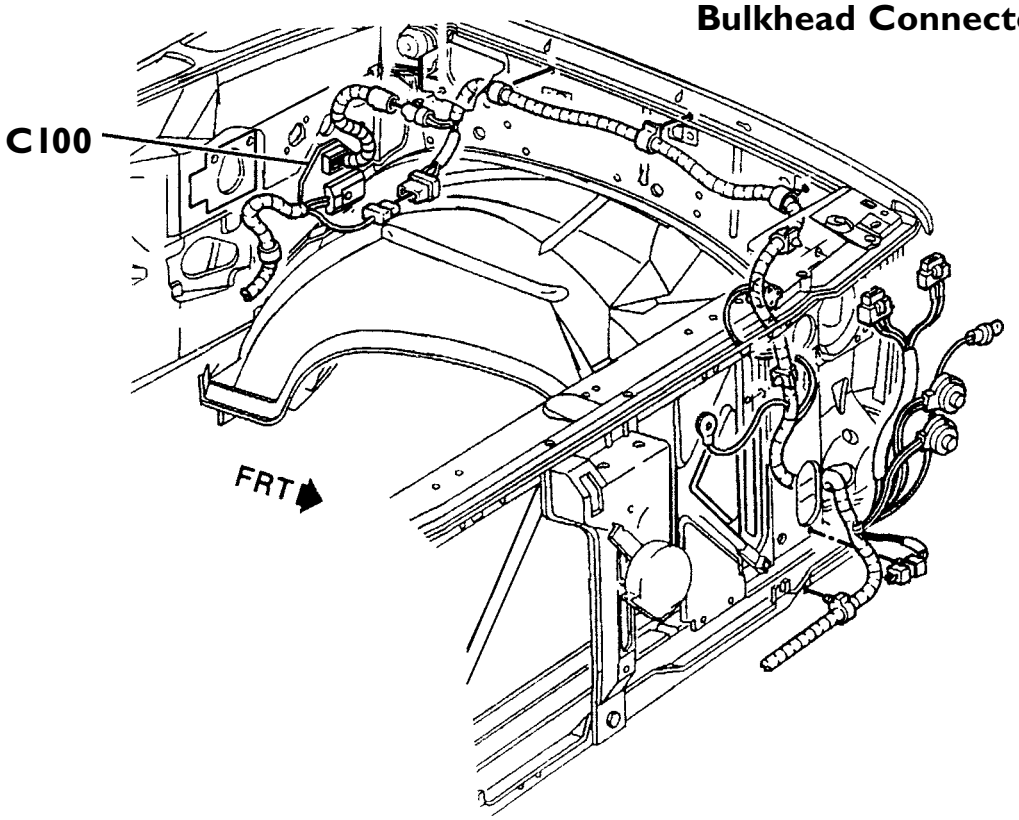
# 4L60E/4L80E

## Possible No Shifts or Codes P0740, P0753, P0758, P0785, P1860 (continued)

Generally the crimp concern is cavity A2 at the bulkhead connector or (C100) on later model applications at connector C2, pins F2 or E2 of the UBEC (Underhood Bussed Electrical Center, used on many trucks.




Bulkhead Connector (C100)



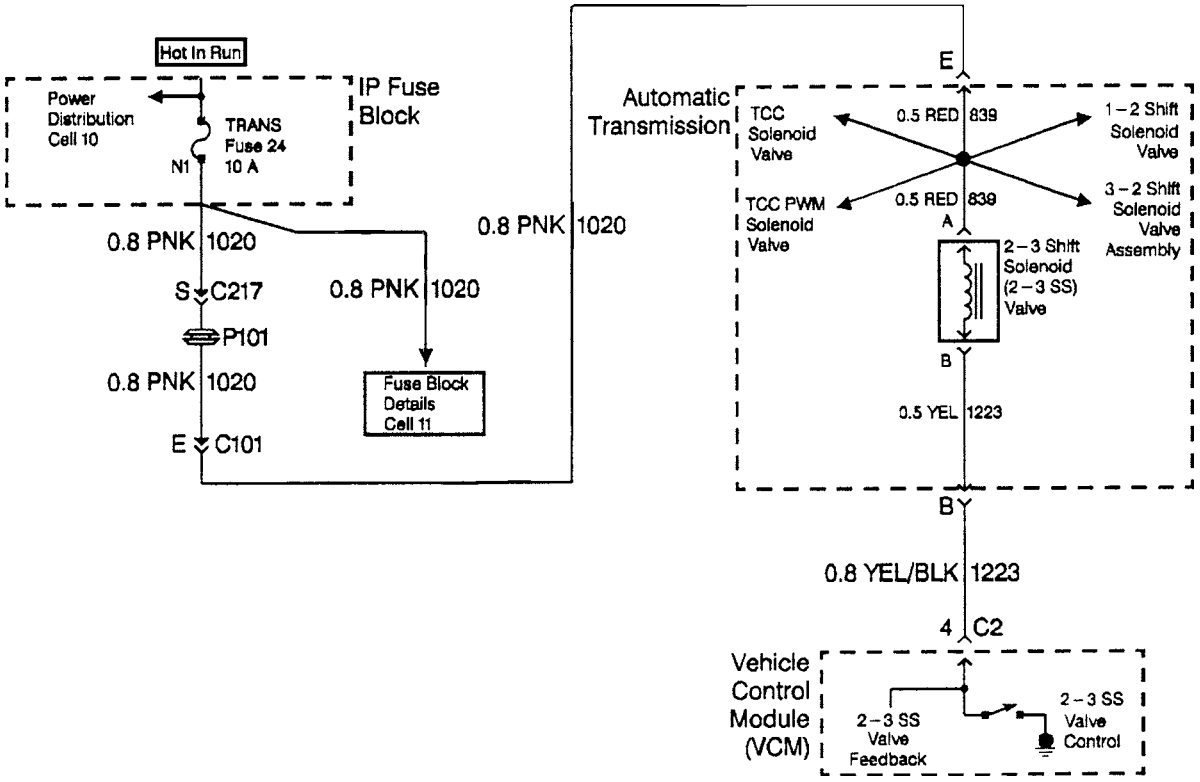
# 4L60E/4L80E

## Possible No Shifts or Codes P0740, P0753, P0758, P0785, P1860 (continued)

On VCM applications, if a code sets for only one or two solenoids or circuits, inspect the weatherpack seal at the VCM. You may find the seal is mispositioned, allowing water into the VCM connector. This may cause severe corrosion, which can degrade solenoid performance and cause codes to set. If corrosion is present, the VCM and the female terminals may require replacement.

The ignition switch is also a common source of any or all of these problems. This holds true for the redesigned, 3-contact ignition switches used on the S-10s.

To isolate this as a possible source of the problem, monitor pin voltage on circuit 1020 when the condition occurs. If the voltage drops below battery voltage, inspect the pins listed or the ignition switch for possible problems. If you find an open in the UBEC, you'll have to replace it, as it is can't be disassembled and reassembled effectively.



# 4L80E

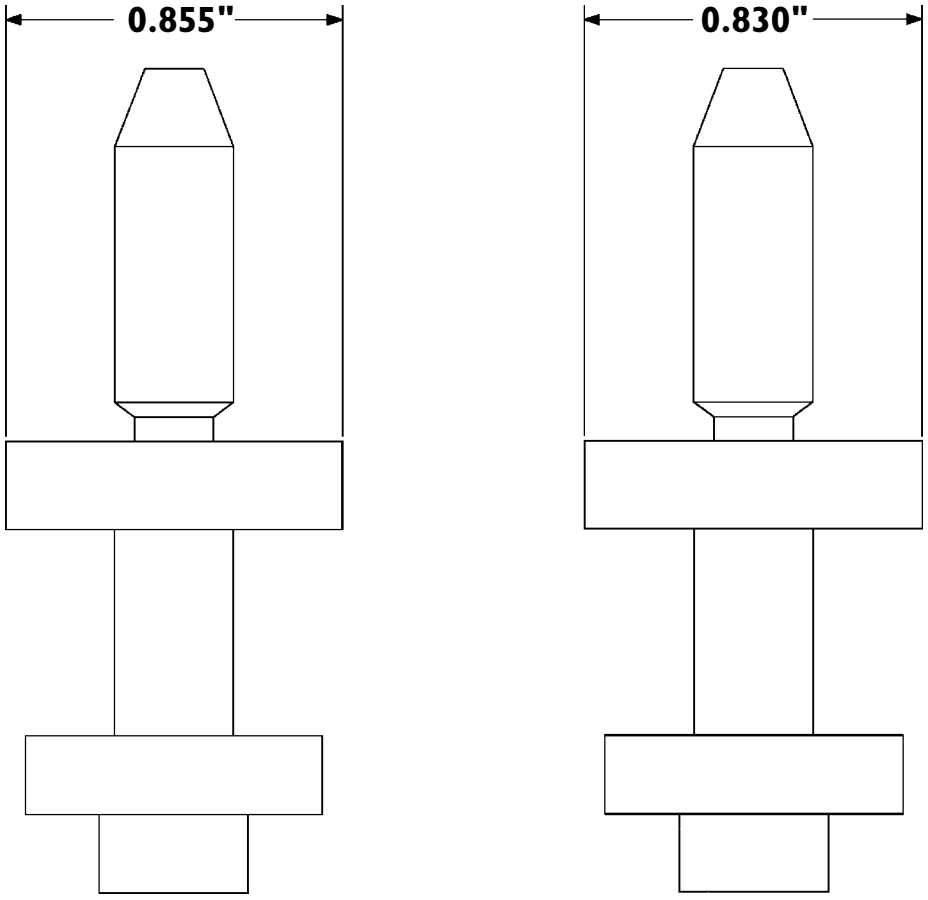
## No Reverse / Slips in Reverse

No reverse or a slip in reverse after a rebuild can be caused by installing a replacement boost valve bushing that doesn't match the original valve.

Some late-model pumps use a smaller boost valve than earlier models. Installing a smaller, late-model boost valve in a larger, early replacement bushing creates a large leak in the reverse apply circuit.

For now, the late-model valves and bushings aren't available separately, so if you have a smaller valve that needs replacement, you'll have to replace the valve-and-bushing assembly with the early set. These early design components are available separately.

Early Valve — 8680549
Early Bushing — 8682856




**Early Valve** **Late Valve**

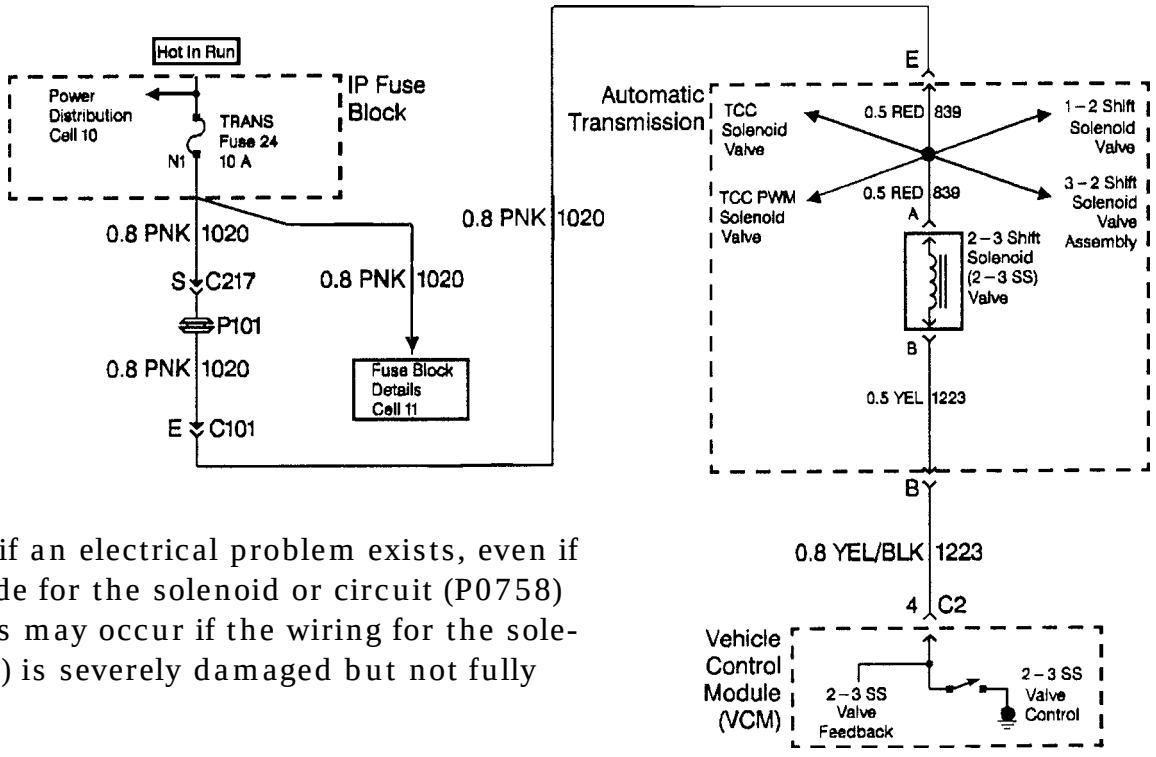
# 4L80E

## Possible P0756, 2–3 Shift Solenoid Performance

Some 4L80E transmissions may intermittently set a P0756 code, which indicates performance problem in the 2–3 shift solenoid.

The parameters for setting a P0756 are:

- No TPS, VSS, TCC, PSM, or shift solenoid codes are set in memory
- VSS greater than 5 MPH
- TPS angle 15–20% and steady
- MAP value is steady between 0–105 kPa
- Calculated engine torque is between 5–450 ft-lbs
- Engine speed is above 450 RPM
- Transmission fluid temperature is between 68°F and 266°F
- The PCM/VCM commands a specific gear and then calculates a range other than the desired ratio has been achieved. The computer monitors N/V ratio (speed ratio; engine speed divided by transmission output speed) and determines the shift didn't occur. If the speed ratio doesn't drop more than 0.3 when the computer commands the shift to 3rd, and the condition exists longer than 1.5 seconds, the computer will set the code.



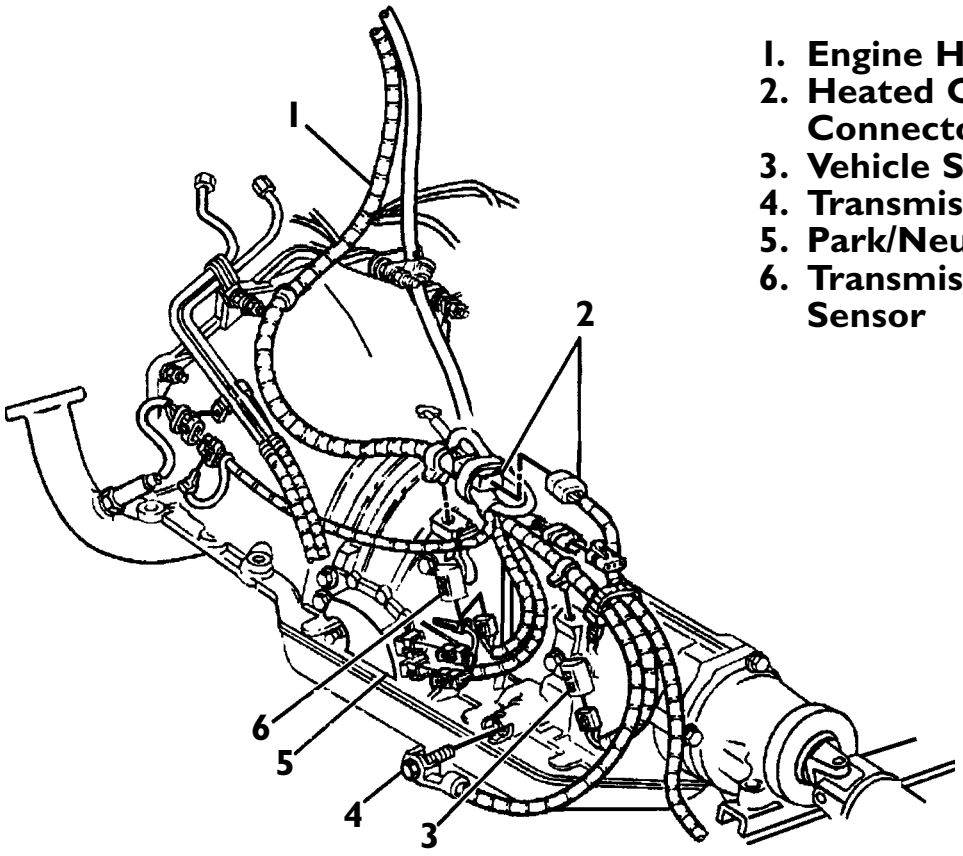

P0756 may set if an electrical problem exists, even if an electrical code for the solenoid or circuit (P0758) doesn't set. This may occur if the wiring for the solenoid (CKT 1223) is severely damaged but not fully severed.

# 4L80E

## Possible P0756, 2–3 Shift Solenoid Perf. (cont)

If there's resistance in the wiring, such as corrosion or a bad connection, current flow through the solenoid will be very low. Low current flow through the solenoid will cause the solenoid to fail hydraulically when the computer energizes it. If the 2-3 solenoid fails to hold pressure, the ratio will be incorrect.

The typical cause for this code is the wiring is incorrectly routed. The harness is designed to be routed over the top of the transmission bell housing. In many cases the harness is incorrectly positioned, allowing it to wedge between the fuel lines and the body. This results in severe damage to the wiring harness, as the pinch weld on the body wears through the conduit and wiring insulation.




1. **Engine Harness**
2. **Heated Oxygen Sensor Connectors**
3. **Vehicle Speed Sensor**
4. **Transmission Connector**
5. **Park/Neutral Position Switch**
6. **Transmission Input Speed Sensor**

If code P0756 is set, inspect the harness, and repair as necessary. If there's no damage to the harness, other possible causes include:

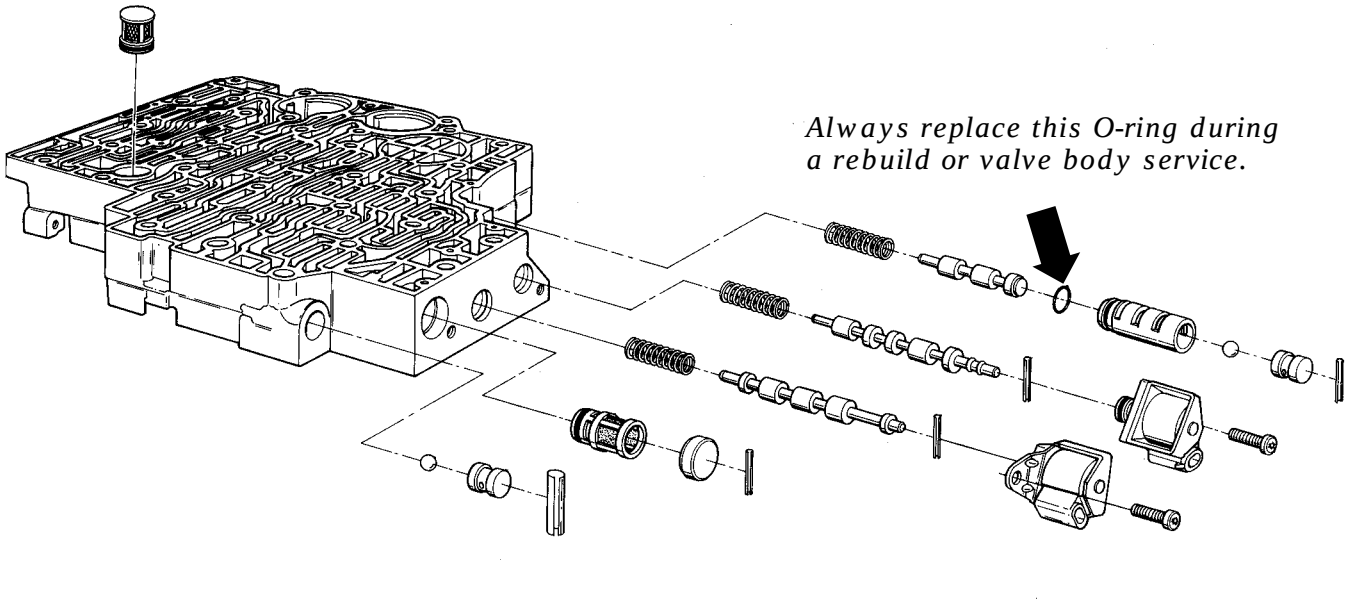
- faulty 2–3 shift solenoid
- sticking 2–3 shift valve
- loss of line pressure feed to the direct clutch
- faulty/damaged direct clutch
- insufficient feed to the solenoid

# 4L80E

## Second Gear Starts

A second gear start complaint (that often goes away when you step on the gas) is often caused by poor shift solenoid A pressure. This can be caused by a leaking shift solenoid or poor feed to the shift solenoid.

One of the often overlooked areas for this leak is the O-ring on the #11 checkball capsule bushing. This bushing is located at the end of the 3–4 shift valve bore, and serves as a seal for solenoid A pressure. Always replace this O-ring during a rebuild or valve body service.



# 4L80E

## Lube Problems; Parts Interchange

In 1997, General Motors altered the lube circuit of the 4L80E. The 1991-through-96 models had two lube circuits, both originating from the return cooler line. The front lube circuit started at the return cooler line, went up to the pump, then flowed toward the rear, providing lubrication for the overdrive section. The rear lube, also originating from the return cooler line, flowed from the output shaft, forward. This circuit lubed everything from the output shaft-to-case bushing to the forward clutch hub.

In 1997, GM broke the lube circuit into three separate sections, each with its own lube source. Front lube now has its own circuit. Rather than using cooler return oil, front lube is provided by a new circuit that uses converter charge oil. Another new circuit is for the rear lube. This new circuit uses oil from the actuator feed limit circuit, and only lubes the case bushing.

Cooler return oil is now solely responsible for lubricating the main gear train; but rather than the oil flowing from the rear all the way to the forward clutch hub, it now flows from the center support, then flows both forward and rearward.

In this section we'll look at all three lube circuits, and compare the earlier components with the revised parts used in the 1997-and-later units. But before we compare these components, you must be aware of the differences in the cases. The later case has a cooler return line that enters the center of the case, rather than at the front. Obviously, the early and late cases are not interchangeable.

## Front Lube Circuit

Front lube is provided through a new circuit that comes from converter charge. This is provided by a slot created in the stator support. Both the pump and stator support were changed to provide for this circuit. Early and late pump assemblies aren't interchangeable. However, the late pump *will* work in an early unit. Also, GM has replacement pumps and stator supports that look very similar to the later parts. Make sure you know what you're using before you install the parts.

# 4L80E

## Lube Problems; Parts Interchange (continued)

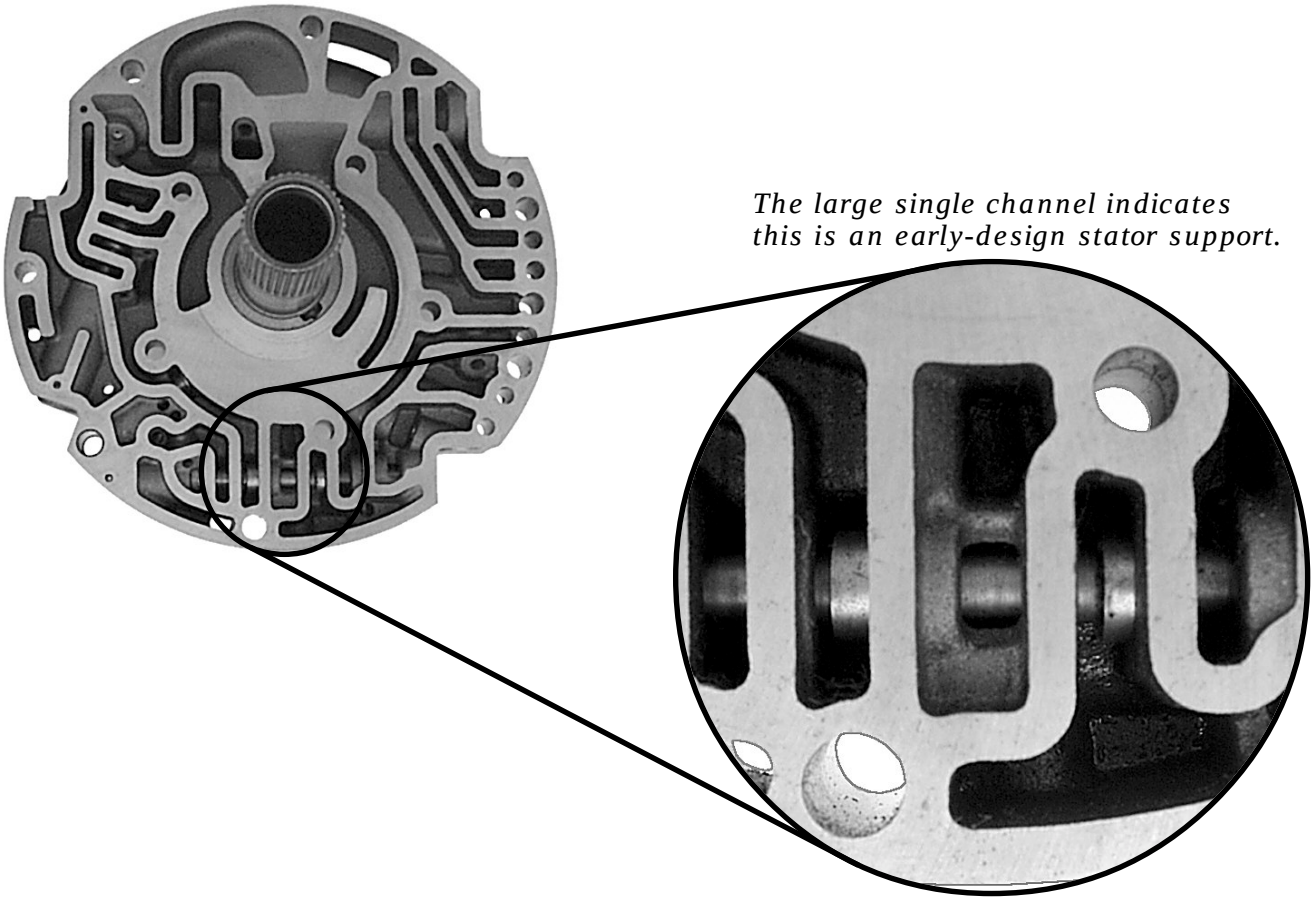
### Front Lube Circuit (continued)

The pump for the 4L80E was changed in 1997 as part of a lube modification. In addition, GM came out with a new pump assembly to replace the early (1991 – 96) pump assembly. This replacement uses the same stator support castings as the late stator support, so never use the casting numbers to identify which stator support you're using.

The difference is in the bathtub: The late stator support is drilled; the early replacement isn't.

Any pump body will work in an early transmission, but it must be bolted to the early-design stator support. Never swap the stator supports between early and late transmissions. Never use an early pump body or stator support in a late transmission.

#### 1991 – 96 (Early) Stator Support

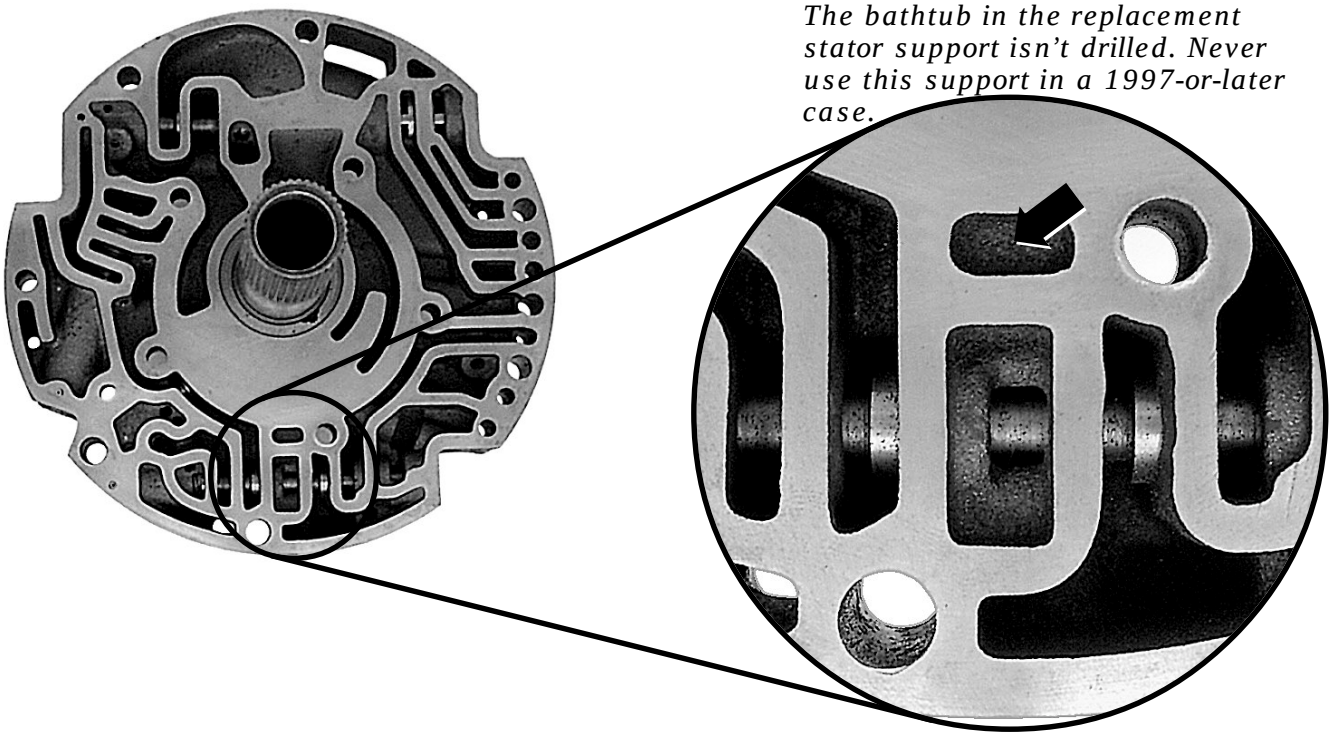


*The large single channel indicates this is an early-design stator support.*

# 4L80E

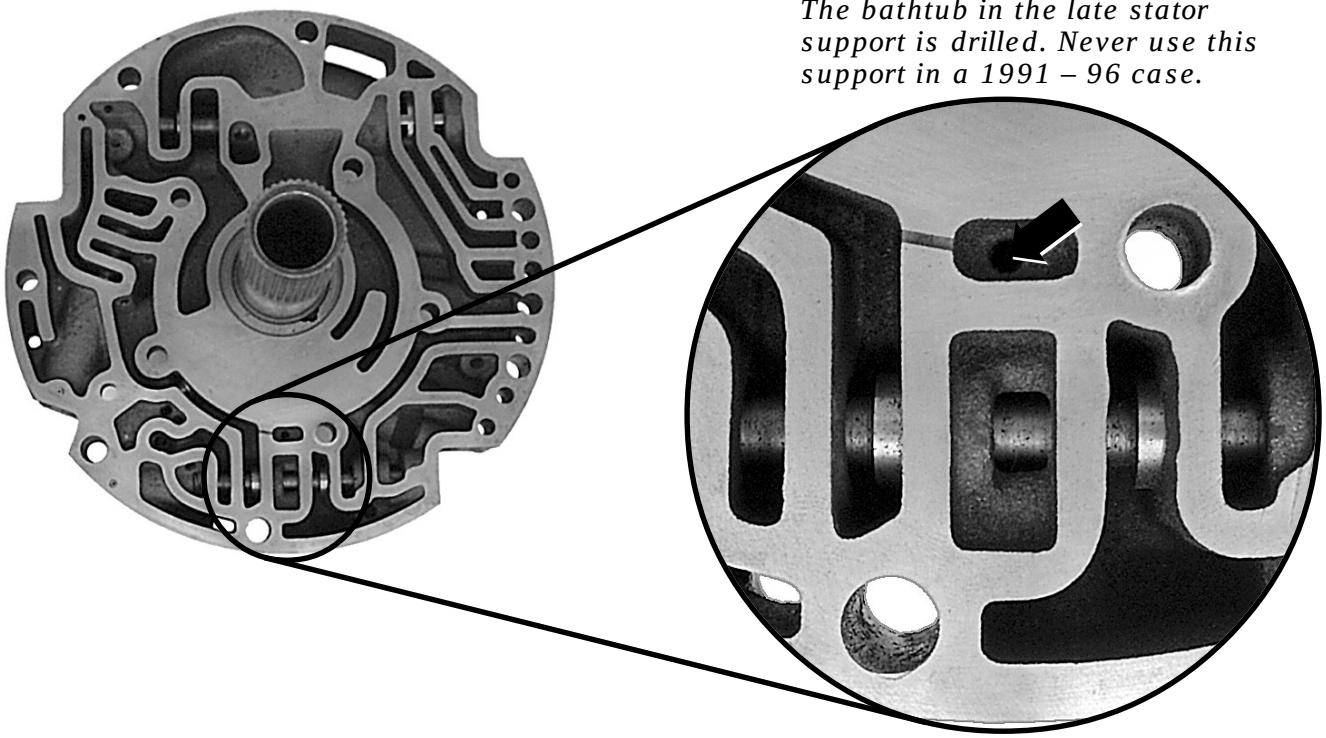
## Lube Problems; Parts Interchange (continued)

### 1991 – 96 Replacement Stator Support



*The bathtub in the replacement stator support isn't drilled. Never use this support in a 1997-or-later case.*

### 1997 – on (Late) Stator Support

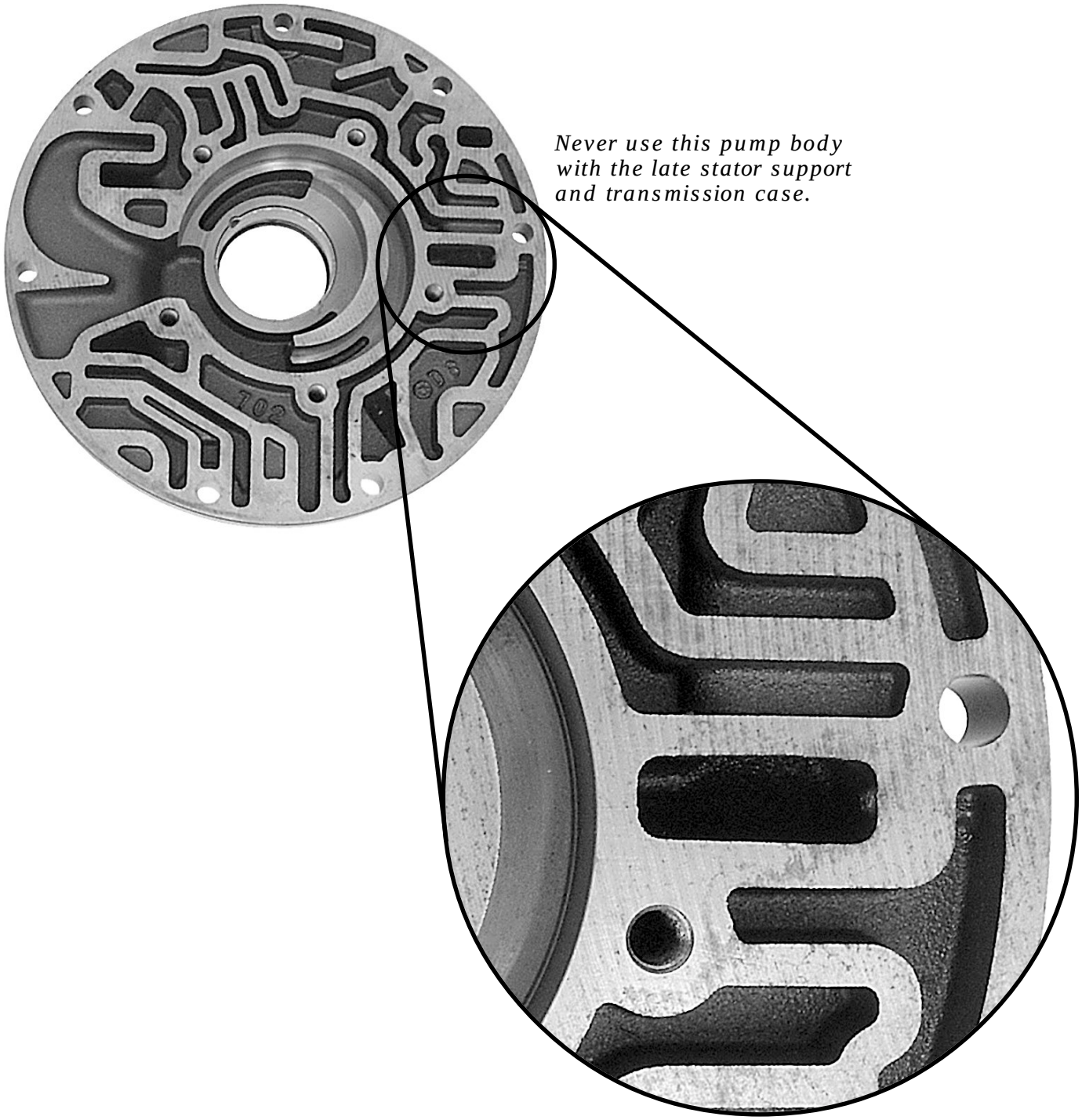


*The bathtub in the late stator support is drilled. Never use this support in a 1991 – 96 case.*

# 4L80E

## Lube Problems; Parts Interchange (continued)

### 1991 – 96 Pump Body

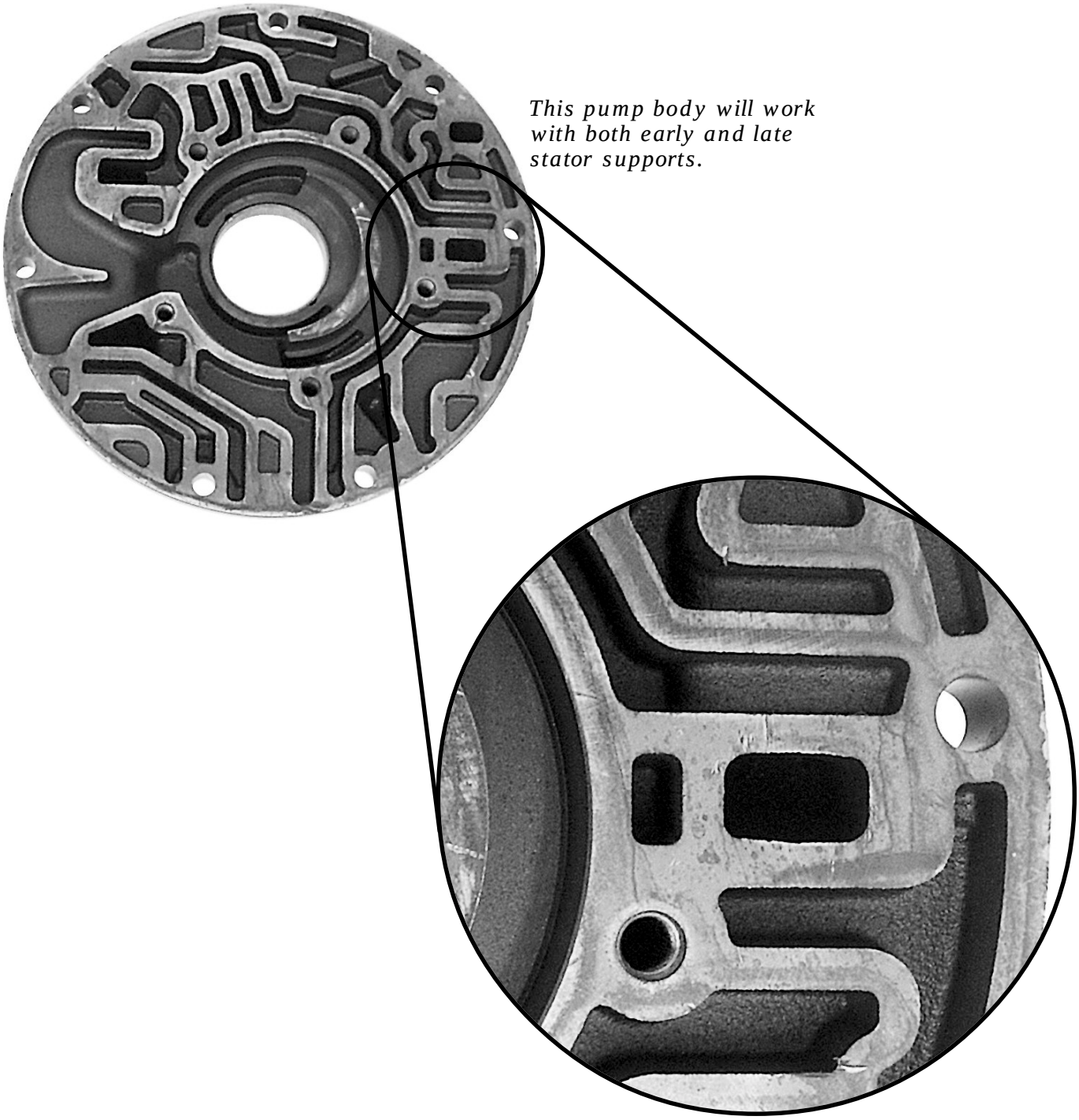


*Never use this pump body with the late stator support and transmission case.*

# 4L80E

## Lube Problems; Parts Interchange (continued)

### 1991 – 96 Replacement and 1997 – on Pump Body



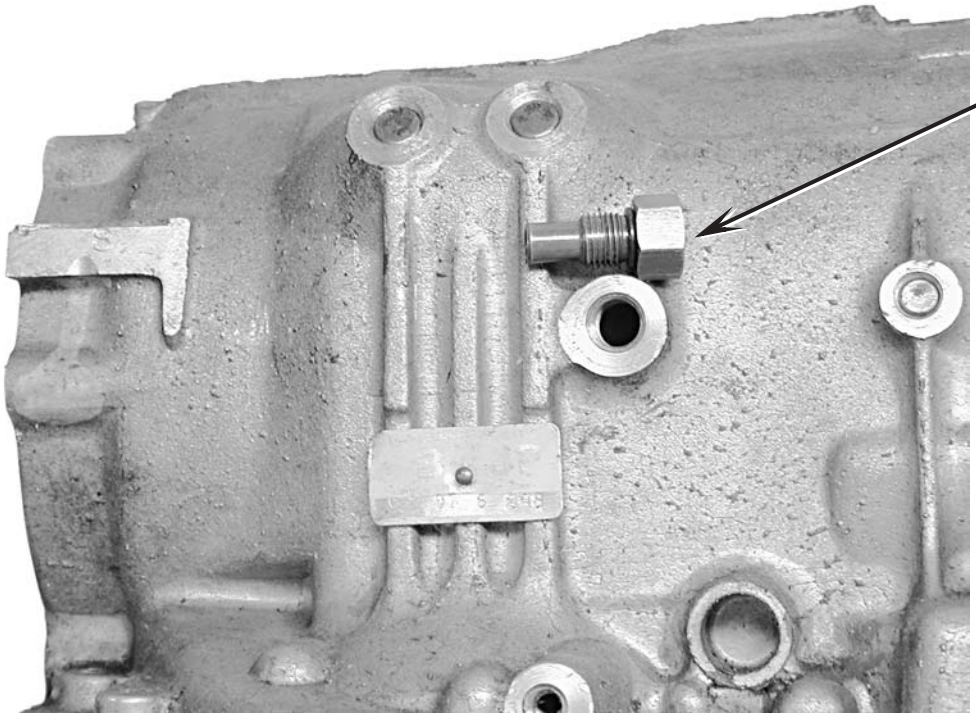
*This pump body will work with both early and late stator supports.*

# 4L80E

## Lube Problems; Parts Interchange (continued)

### Center Lube Circuit

Center lube comes from the cooler return line. It enters the case, directly to the center support. It flows both forward to the forward clutch hub, and rearward to the front of the output shaft.




Here are the parts that were changed, and how they affect the lube circuit:

# 4L80E

## Lube Problems; Parts Interchange (continued)

### Center Support

The center support has a new port that allows oil from the cooler return line to enter the support. Obviously, the early and late supports aren't interchangeable.

**1991 – 1996**

**1997-On**

# 4L80E

## Lube Problems; Parts Interchange (continued)

### Center Support Bushing

The obvious difference between the early and late bushings is their height. However, interchanging these bushings will reduce — or completely block off — lube flow to all sections on the gear train.

# 4L80E

## Lube Problems; Parts Interchange (continued)

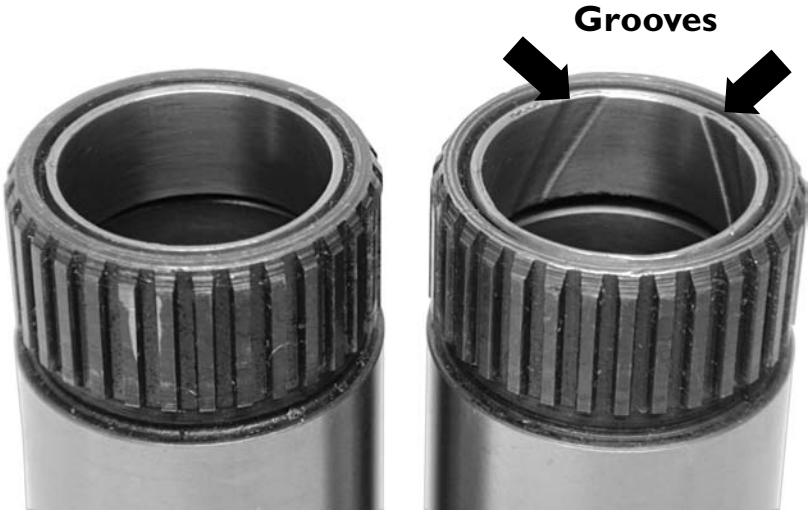
### Sun Gear Tube

The sun gear tube now has a wider groove, which takes oil from the center support and feeds it to the intermediate roller clutch.

1991 – 1996

1997-On

**CAUTION** The early tube uses solid bushings; the late tube uses grooved bushings. Using solid bushings in the late tube will cut off lube oil to the forward clutch hub and the rear ring gear.



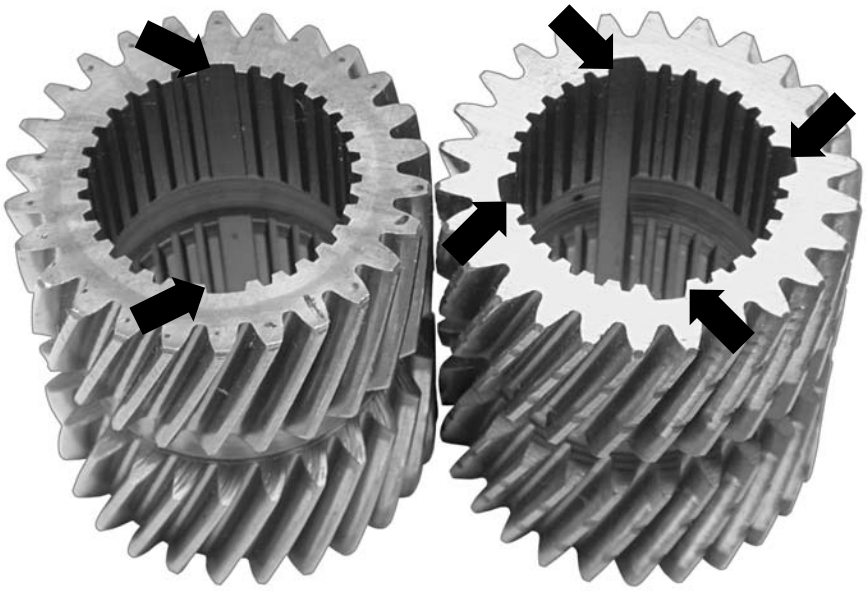

1991 – 1996 1997-On

# 4L80E

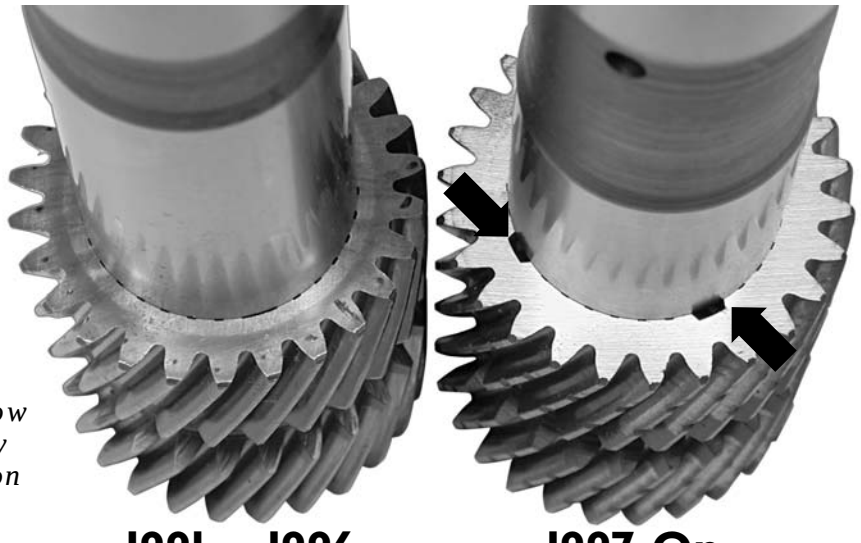
## Lube Problems; Parts Interchange (continued)

### Sun Gear

The late-design sun gear has four lube slots, versus the earlier gear, which had two. At first it seems as though this difference is negligible; however, when you compare how the two gears match up with the sun gear tube you can see that the tube completely cuts off oil flow between the tube and gear. These gears are not interchangeable.



1991 – 1996 1997-On



1991 – 1996 1997-On

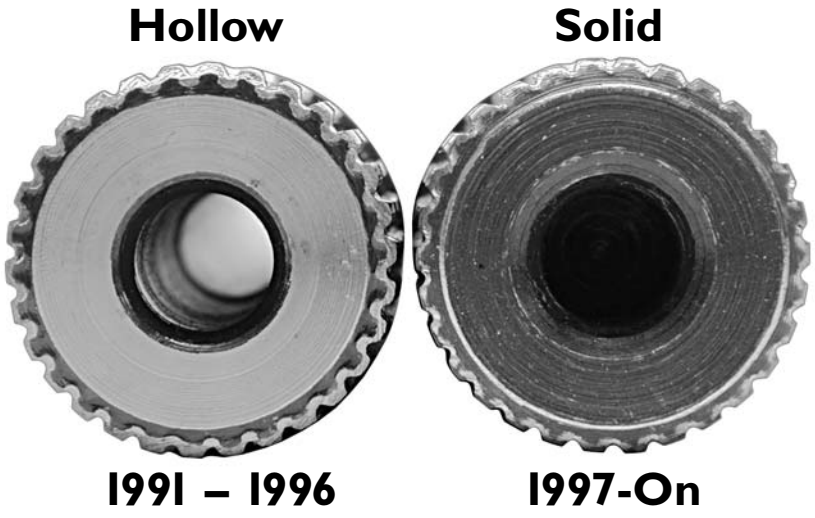
*Notice the tube cuts off all flow through the slots on the early gear; the slots remain open on the late assembly.*

# 4L80E

## Lube Problems; Parts Interchange (continued)

### Rear Ring Gear Shaft

The early shaft is hollow. It allows oil to flow from the output shaft to the forward clutch hub. The late shaft is solid. Using the solid shaft in an early unit will starve the forward clutch hub, center support bushing and intermediate roller clutch. Never interchange these shafts.

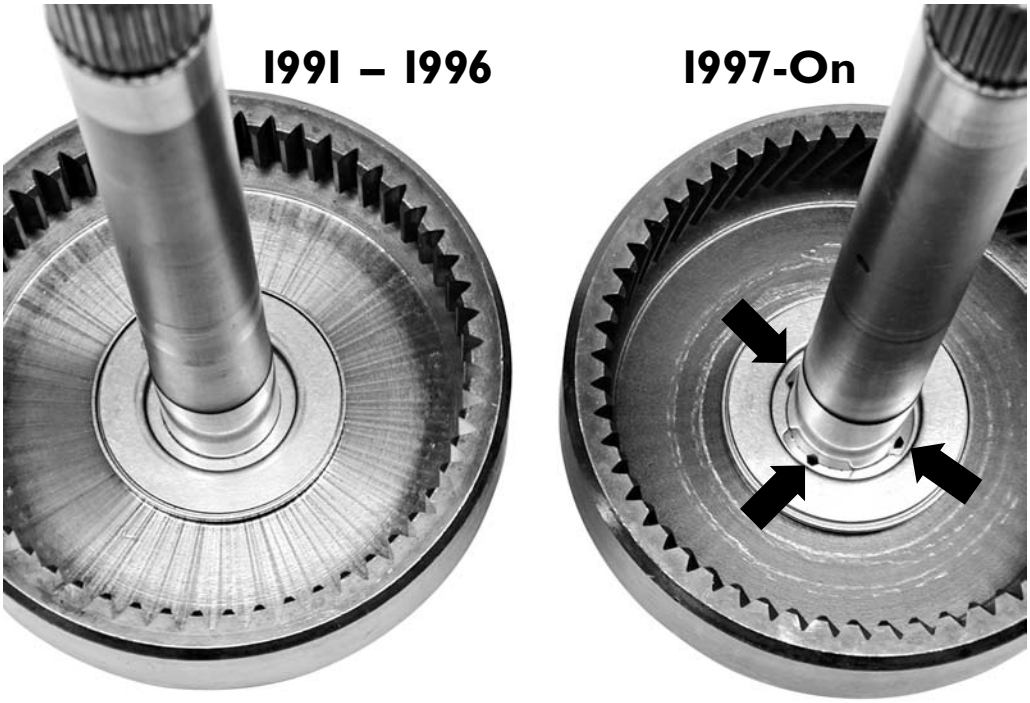



# 4L80E

## Lube Problems; Parts Interchange (continued)

### Rear Ring Gear

The late rear ring gear has four lube slots that allow oil to flow to the bushing in the output shaft. Using the early gear will starve this bushing. Also, the front bearing for this ring gear has notches in it that allows for oil to flow to the notches in the gear. The late bearing will work on all models. The early bearing will only work on early models.

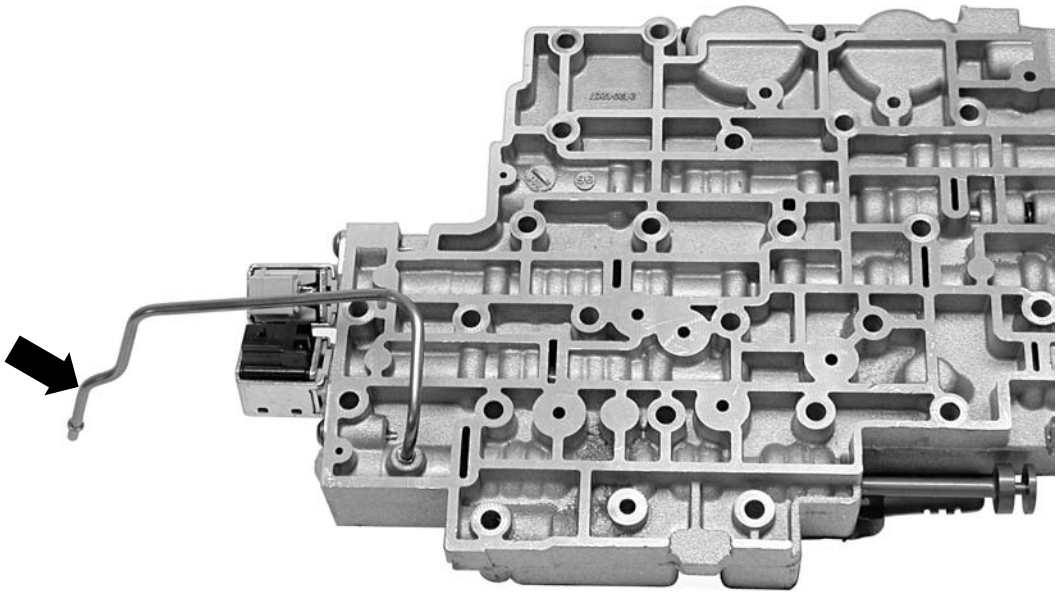



# 4L80E

## Lube Problems; Parts Interchange (continued)

### Rear Lube Circuit

Rear lube comes from the actuator feed limit circuit. It flows from the valve body, through a tube, to the case bushing.

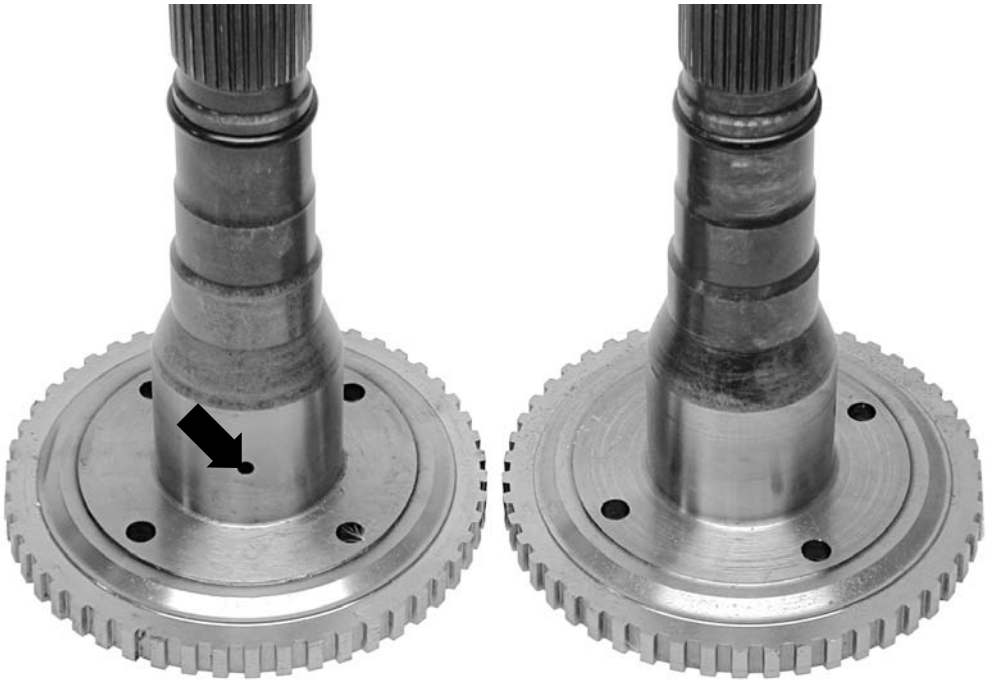


# 4L80E

## Lube Problems; Parts Interchange (continued)

### Output Shaft

The output shaft has a feed hole for gear train lube. The late shaft is solid. Using the late shaft on an early unit will starve the entire gear train of oil. Using the early shaft on a late unit will connect the center and rear lube circuits. These shafts aren't interchangeable.



1991 – 1996 1997-On

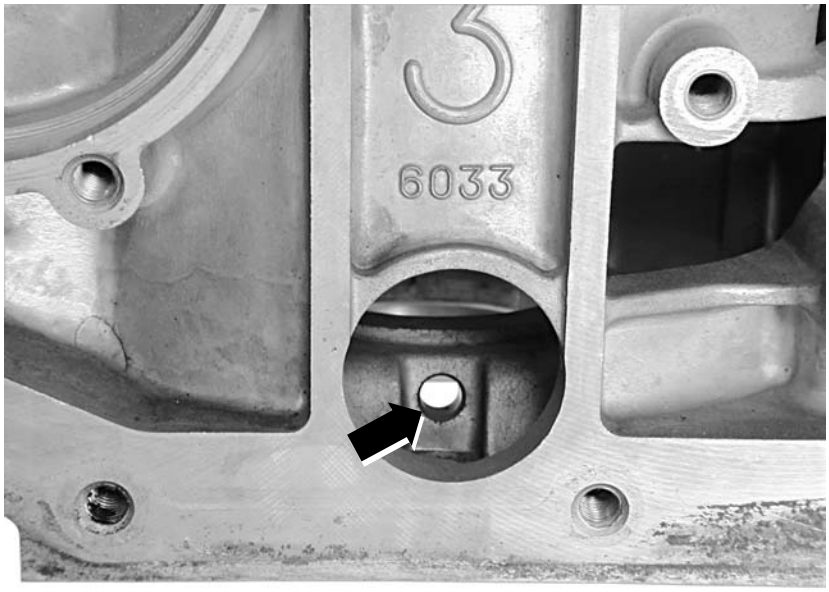
# 4L80E

## Lube Problems; Parts Interchange (continued)

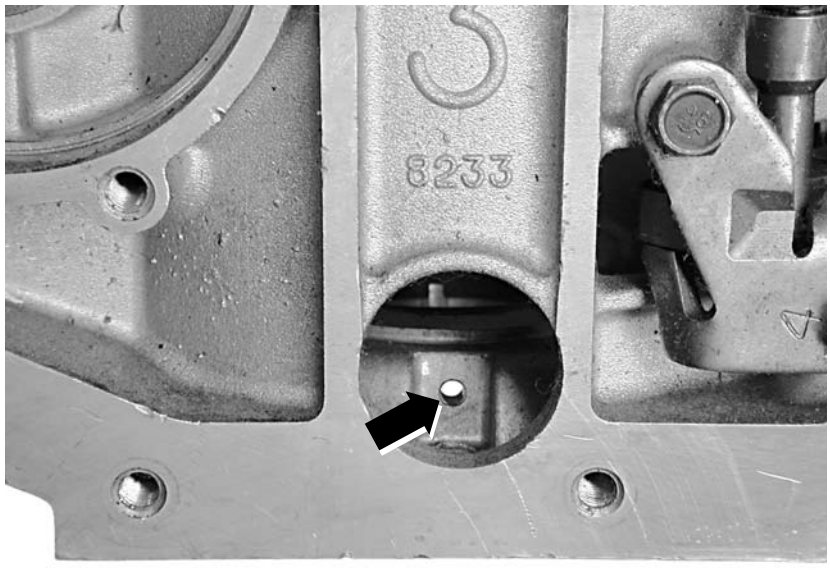
### Case, Valve Body and Separator Plates

The case, valve body and separator plate were also changed. The case and valve body changes are obvious; the separator plate change is somewhat subtle.

These plates are not interchangeable. Interchanging these plates will completely starve some gear train components.




**Early Case with Large Opening for Lube Tube**



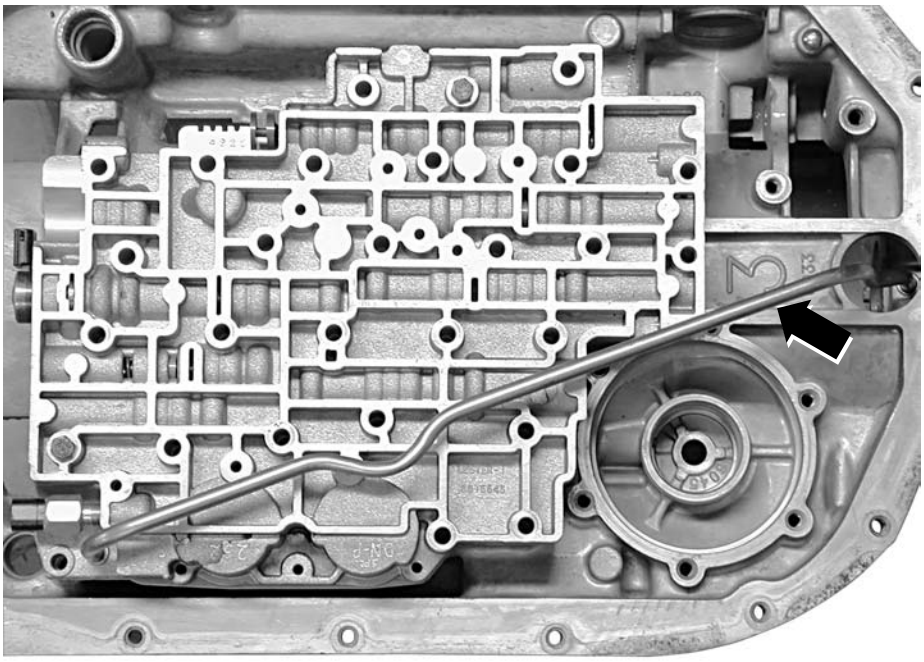

**Late Case with Small Opening for Lube Tube**

# 4L80E

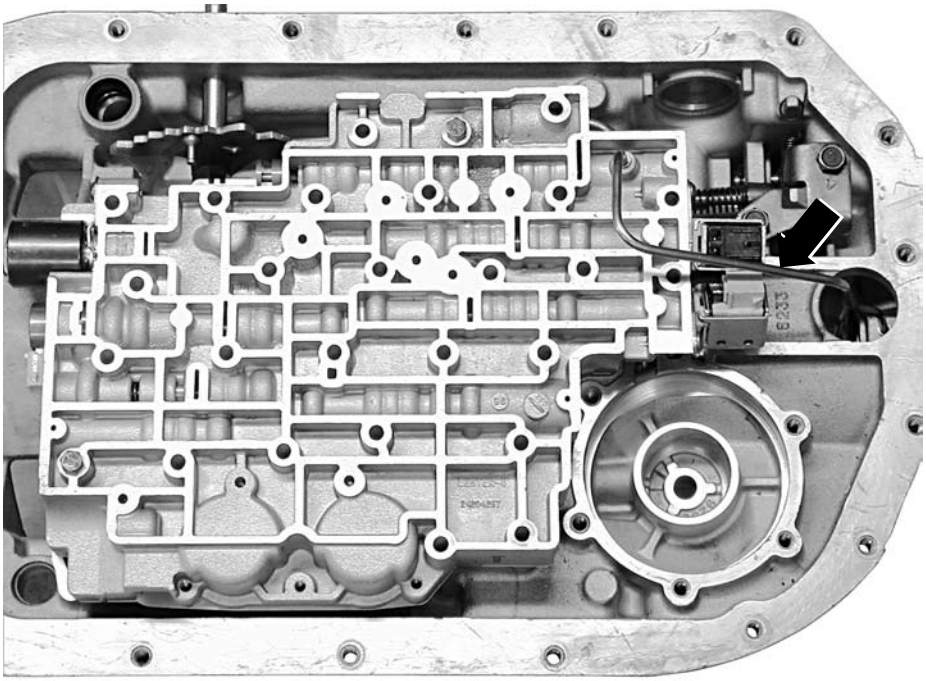
## Lube Problems; Parts Interchange (continued)

### Case, Valve Body and Separator Plates (continued)

**Early Design with the Large Lube Tube**



**Late Design with the Small Lube Tube**



# 4L80E

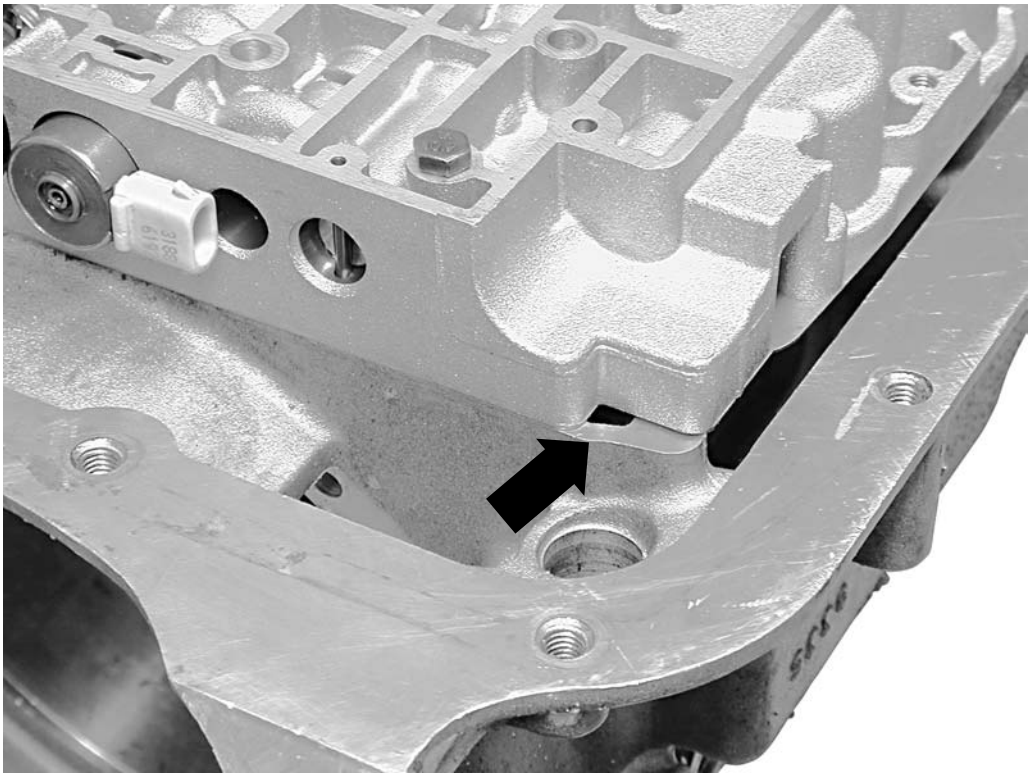
## Lube Problems; Parts Interchange (continued)

### Case, Valve Body and Separator Plates (continued)

You can create a serious mismatch by using the late separator plate with the early valve body and case.

The late separator plate and valve body are notched in the front, exposing a cavity in the case. On the late case, that cavity is void; it serves no purpose. On the early case, that cavity is cooler return, which provides gear train lube oil.

Using the late separator plate with an early valve body and case will dump lube oil into the sump, and starve the gear train.



# 4T40E/4T45E

## Slips in 4th; No 4th; Slips in 3rd and 4th; No 3rd or 4th; Possible DTC P0730

Some 4T40E/4T45E transaxles may experience one of the following problems:

- Slips in 4th or no 4th
- Slips in 3rd and 4th or no 3rd or 4th
- Possible code P0730 set in memory

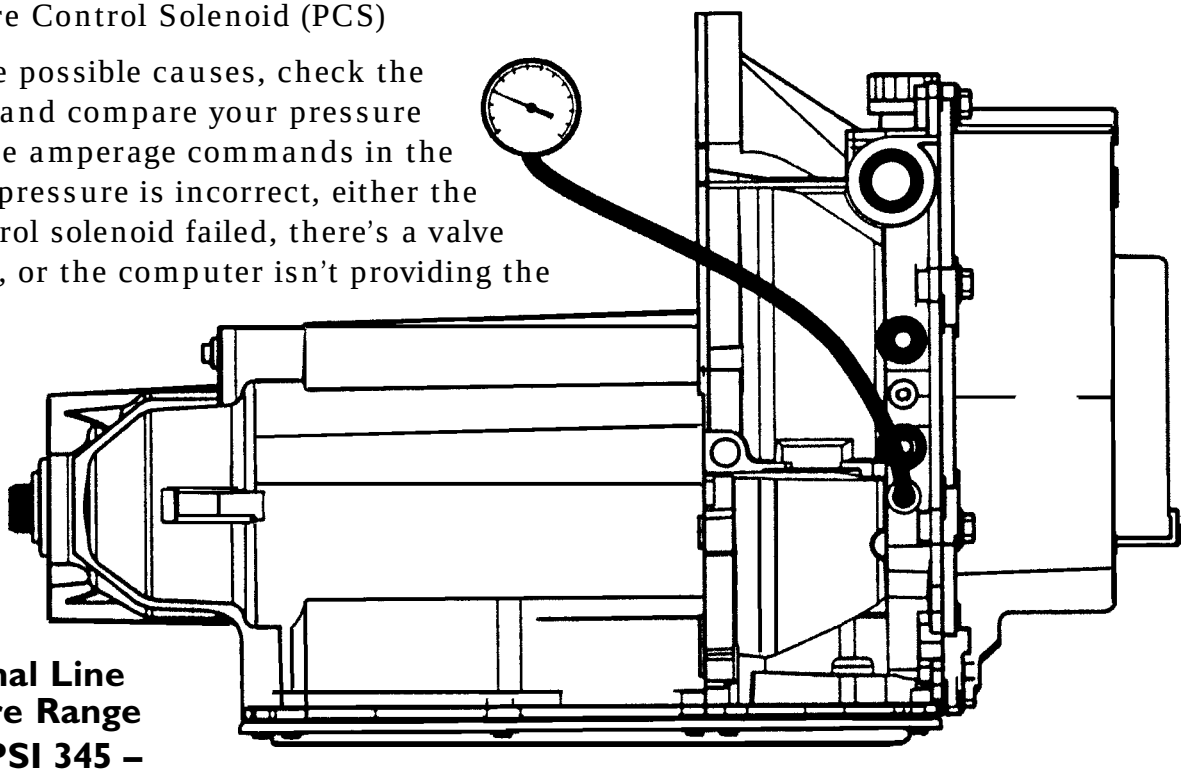
To diagnose this problem, monitor gear ratio on your scan tool. Typically you'll notice an incorrect gear ratio in 4th gear. You should notice this problem in 4th gear before the transaxle develops a ratio error problem in 3rd gear. This is because the torque to the clutches is nearly 100% in 4th but drops to around 60% in 3rd gear.

If the problem has been going on for a while, you'll see incorrect ratios for 3rd and 4th gears. The correct ratio in 3rd gear is between 0.91:1 and 1.07:1, while 4th gear ratio should remain between 0.61:1 and 0.72:1.

The most common causes for this problem are:

- Direct clutch piston seal delamination
- Pressure Control Solenoid (PCS)

To identify the possible causes, check the line pressure and compare your pressure readings to the amperage commands in the tables. If line pressure is incorrect, either the pressure control solenoid failed, there's a valve body problem, or the computer isn't providing the proper signal.



**Nominal Line Pressure Range**

**50 – 160 PSI 345 –**
**58 – 186 PSI 400 –**

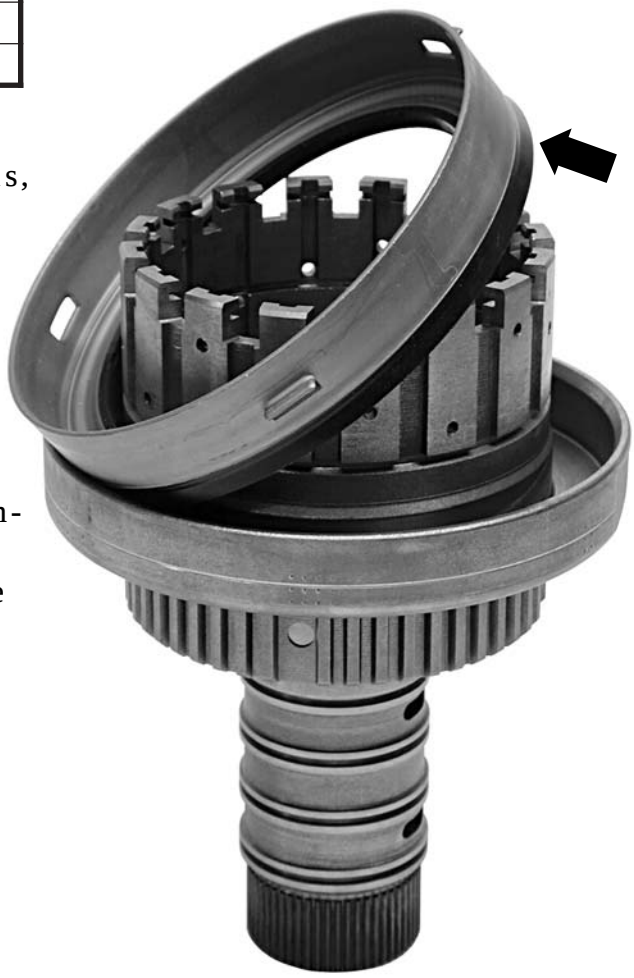
# 4T40E/4T45E

## Slips in 4th; No 4th; Slips in 3rd and 4th; No 3rd or 4th; Possible DTC P0730 (continued)

| Pressure Control Solenoid Current (Amps) | Line Pressure (PSI) |
|---|---|
| 0.00 | 152 – 160 |
| 0.10 | 149 – 151 |
| 0.30 | 141 – 143 |
| 0.50 | 124 – 127 |
| 0.60 | 111 – 115 |
| 0.70 | 97 – 101 |
| 0.80 | 81 – 84 |
| 0.90 | 64 – 67 |
| 0.95 | 56 – 58 |
| 1.00 | 50 – 51 |
| 1.05 | 50 |
| 1.10 | 50 |

If line pressure readings are within specifications, inspect the direct clutch piston for possible seal delamination. If chunks of the seal are missing or if cracks are developing in the seal rubber, the seal is delaminating. The seal used in the direct clutch is a molded design; that is, the piston and seal are a one-piece assembly.

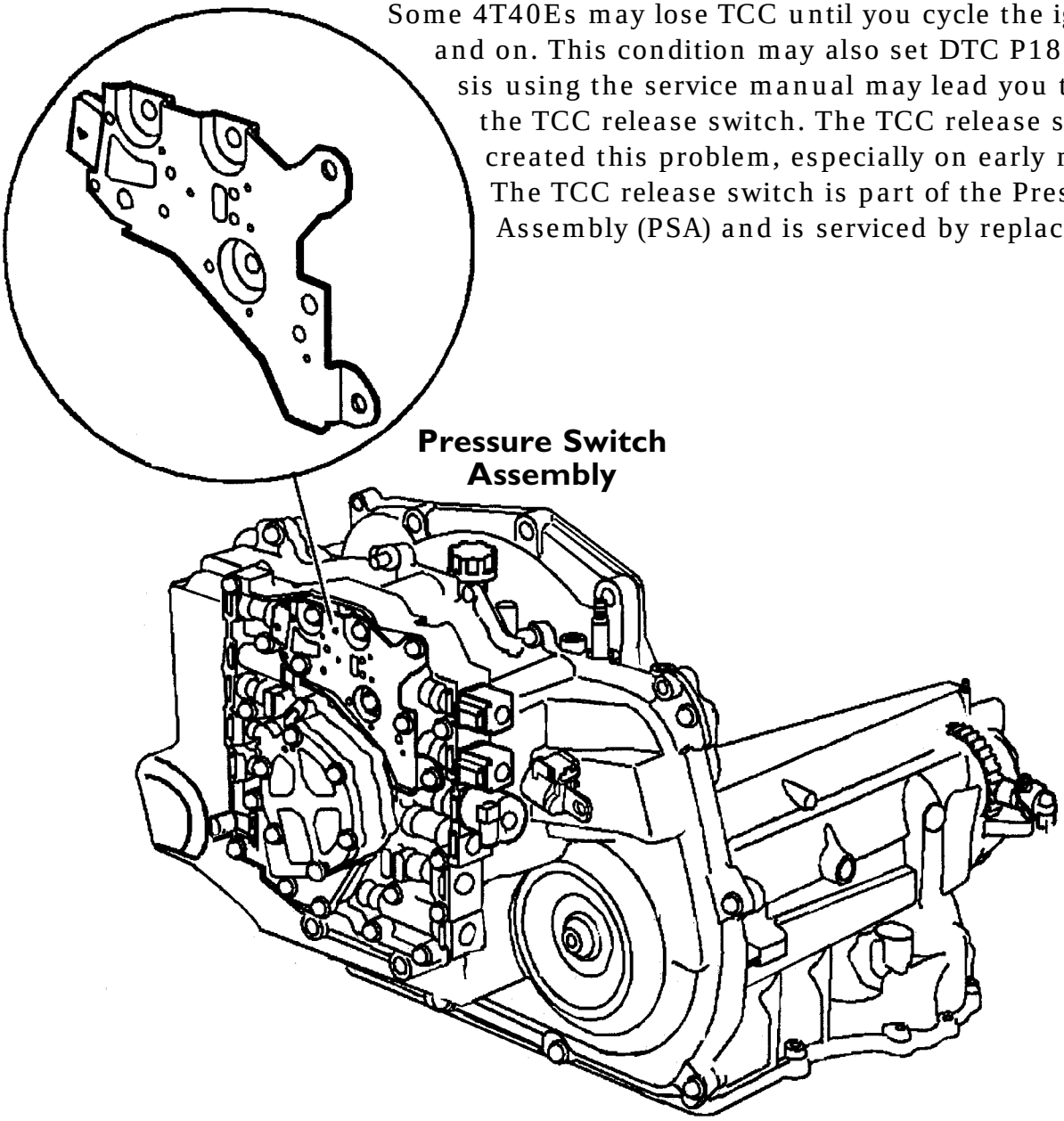
An upgraded molded piston has been released. You can identify the new piston by the part number molded into the rubber of the seal. Updated pistons have number 24205044 molded into the seal.



# 4T40E

## Intermittent Loss of TCC

Some 4T40Es may lose TCC until you cycle the ignition off and on. This condition may also set DTC P1887. Diagnosis using the service manual may lead you to replacing the TCC release switch. The TCC release switch has created this problem, especially on early model units. The TCC release switch is part of the Pressure Switch Assembly (PSA) and is serviced by replacing the PSA.




Another possibility is an open or short in the TCC release switch circuit on the PSA. To isolate this problem, use a scan tool and monitor the position of the TCC release switch.

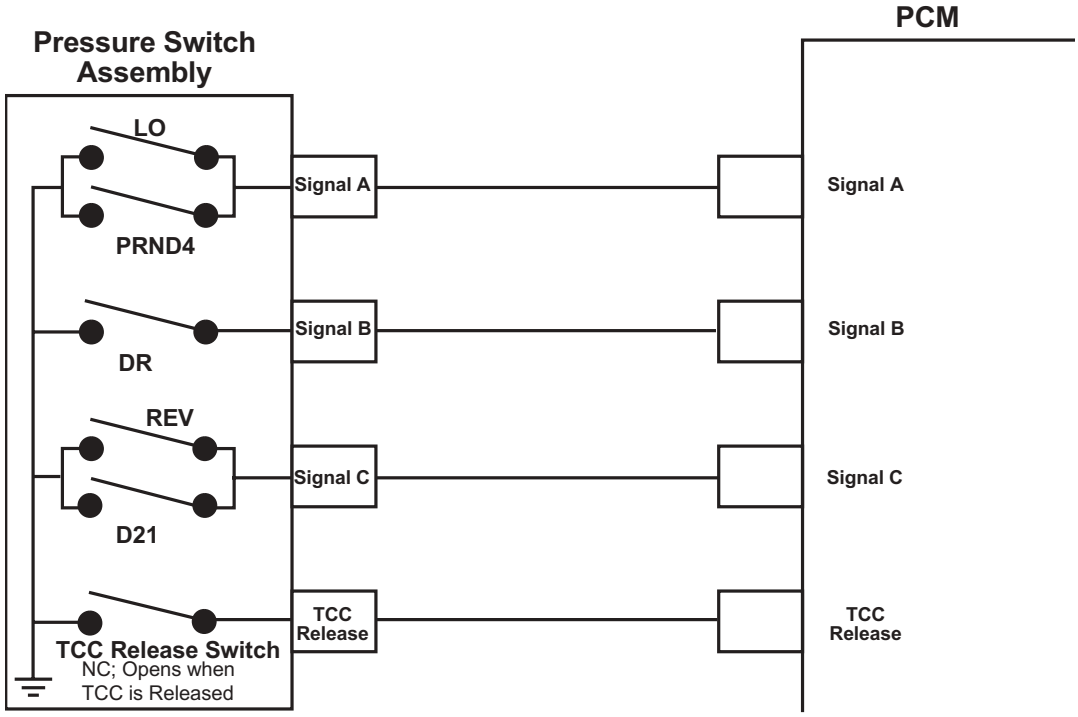
- With the key on, engine off, monitor the TCC release pressure data. TCC release pressure should indicate “NO” when monitoring with key on, engine off. If it indicates “YES,” check the harness for a possible open circuit, wiring damage, or weak terminal pin tension before replacing the switch.

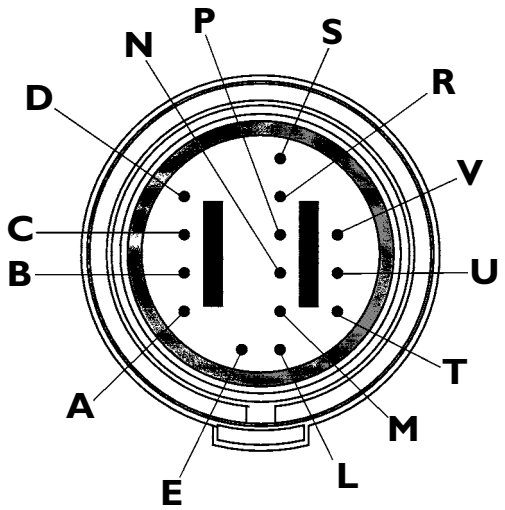
# 4T40E

## Intermittent Loss of TCC (continued)

- Start the engine and monitor the switch status. If the TCC release switch data displays "NO," check the switch wiring for a short to ground. If the wiring is okay, replace the switch. If the switch has already been replaced for this condition, check for a hydraulic problem (gasket, debris) that could prevent pressure from dropping at the switch when the TCC turns off.

The GM part number for the pressure switch assembly is 24200495.




| Pin | Function |
|---|---|
| A | 1-2 Solenoid |
| B | 2-3 Solenoid |
| C | Pressure Control Solenoid (High) |
| D | Pressure Control Solenoid (Low) |
| E | B+ Supply for Shift Solenoids and PWM Solenoid |
| L | TFT (High) |
| M | TFT (Low) |
| N | Pressure Switch Assembly Signal A |
| P | Pressure Switch Assembly Signal B |
| R | Pressure Switch Assembly Signal C |
| S | Input Speed Sensor (High) |
| T | PWM Solenoid |
| U | TCC Release Switch |
| V | Input Speed Sensor (Low) |

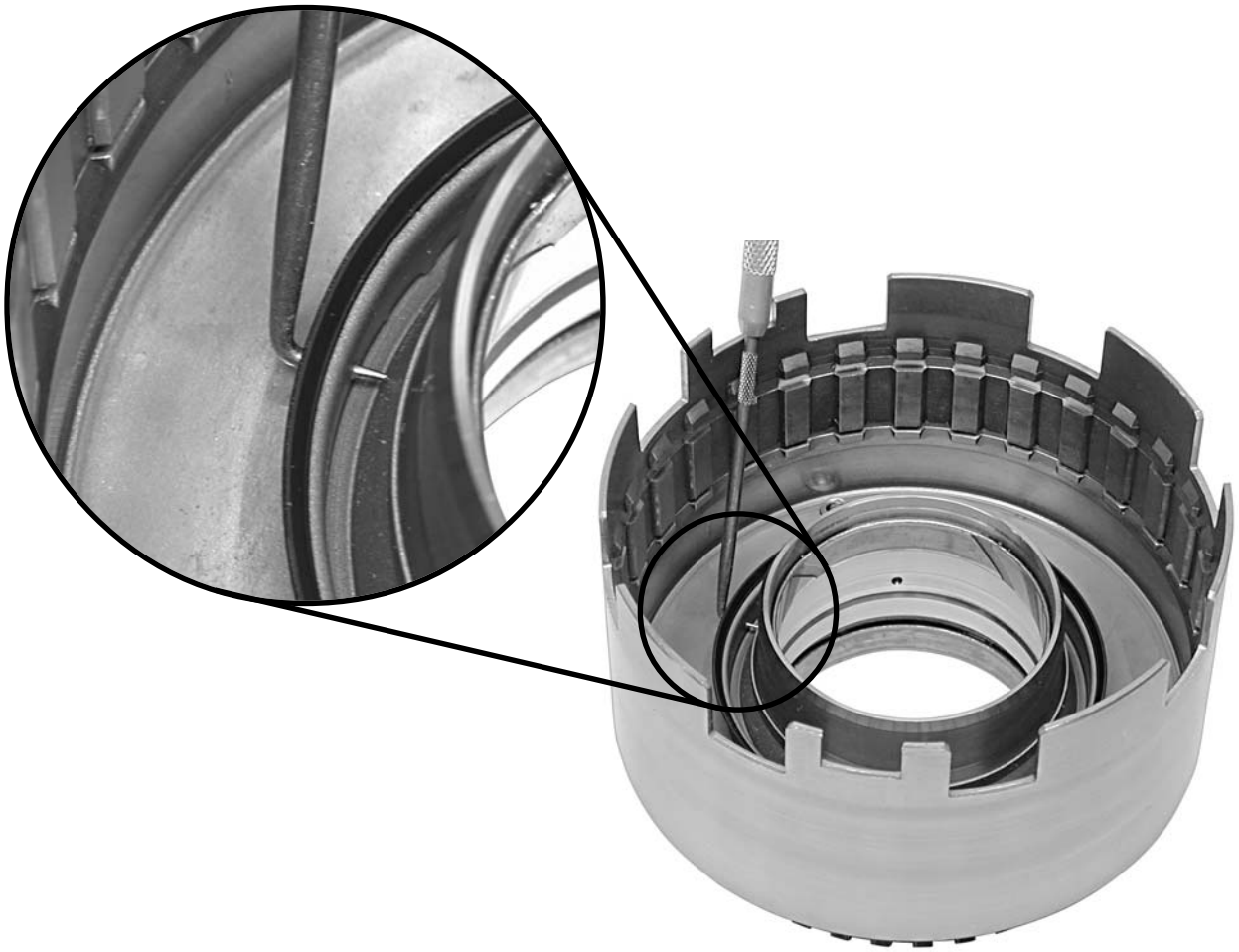
# 4T40E

## Slips in Reverse at Heavy Throttle; Possible Burnt Reverse Clutches

Some 4T40E transaxles may slip in reverse, at mid to high throttle openings. The slip may seem worse when the transaxle is cold. This condition is most common on J-body vehicles (Sunfire, Caviler), though it does occur in other applications.

Check line pressure and the Pressure Control Solenoid (PCS) commanded status before disassembling the unit. If line pressure the PCS commanded and actual amperage readings are correct, check the orifice in the reverse input clutch center retainer and seal assembly. Make sure it isn't plugged, incorrectly sized, or missing. The orifice should be about 0.055" in diameter.

A problem at this orifice will prevent the reverse clutch from applying all the way, which can lead to slipping and cause the clutches to fail. The slip is caused by a reduced clutch clamping load as the outer diameter of the piston isn't being supplied with enough pressure. The GM part number for the retainer and seal assembly is 24205041.

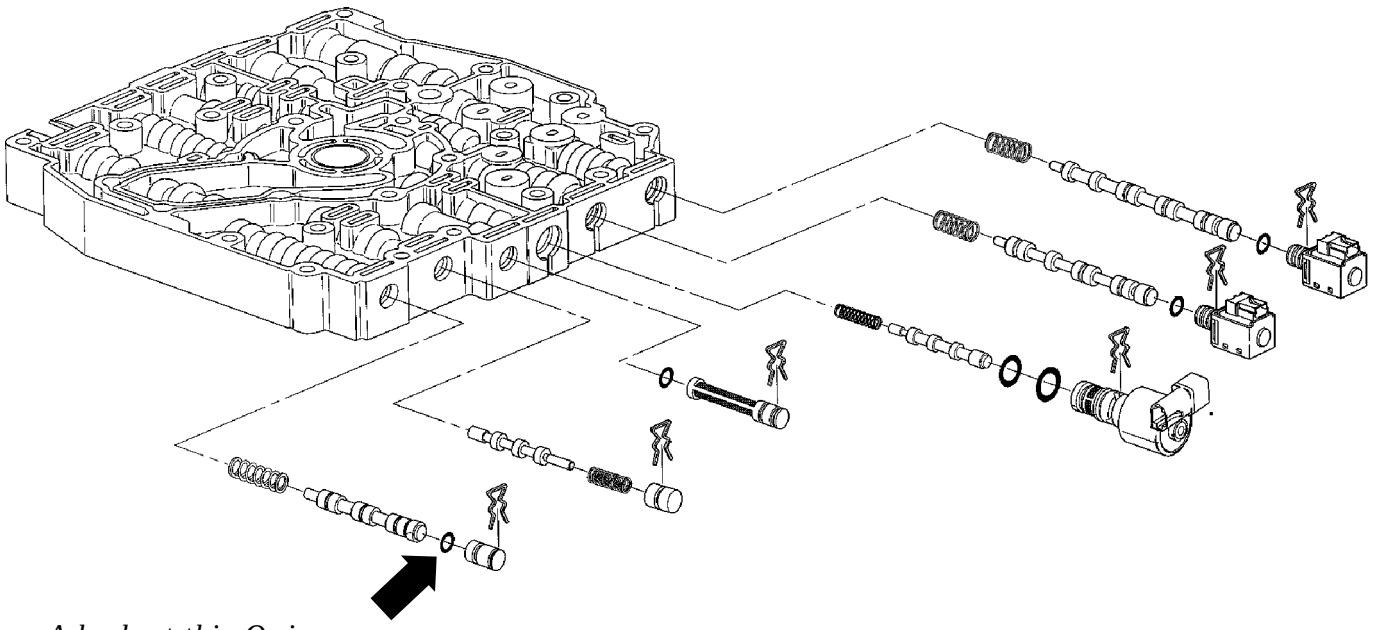


# 4T40E

## Second Gear Starts

A second gear start complaint (that often goes away when you step on the gas) is often caused by poor shift solenoid A pressure. This can be caused by a leaking shift solenoid or poor feed to the shift solenoid.

One of the often overlooked areas for this leak is the O-ring on the 3–4 shift valve plug. Always replace this O-ring during a rebuild or valve body service.



*A leak at this O-ring can cause 2nd gear starts.*

# 4T40E/4T45E

## 1st Gear Only

A common problem on 97-and-later 4T40E/4T45E applications is a lack of 2nd, 3rd, 4th and reverse gears. This is caused by a broken weld on the reaction sun gear and shell assembly. Typically the friction weld attaching the sun gear to the shell breaks, allowing the sun gear to turn free of the shell. To repair, replace the shell with an updated version. The GM part number for the revised shell is 24204471.


**DIAGNOSTIC TIP** Here's an easy way to confirm whether the shell is broken:

- Remove the pan, and then remove intermediate/4th servo assembly.
- Take the unit out of park.
- Use a long screwdriver or rod to push up on the band, locking the shell in place.

If the shell is broken, you'll be able to turn both drive wheels backward at the same time. If the shell is okay, the drive wheels will lock when you try to turn them both backward at the same time. However, both wheels will turn forward, regardless of the condition of the shell.

# 4T40E/4T45E

## No Movement Forward or Reverse; Possible Noise that Follows RPM

This resembles the problem faced several years ago on the 3T40: Generally the customer comes out one morning, puts the car into gear, and it won't move forward or backward. In many instances, the transaxle may exhibit a grinding/rattling type noise.

This problem is usually caused by a shattered or broken pump rotor, caused by one of these conditions:

- an improper heat-treating process during manufacturing.
- the spacer on the pump drive shaft came apart and got into the pump rotor.

To repair this problem, clean the unit thoroughly and install a new pump assembly. Both of these failures have been addressed in the service pumps available.

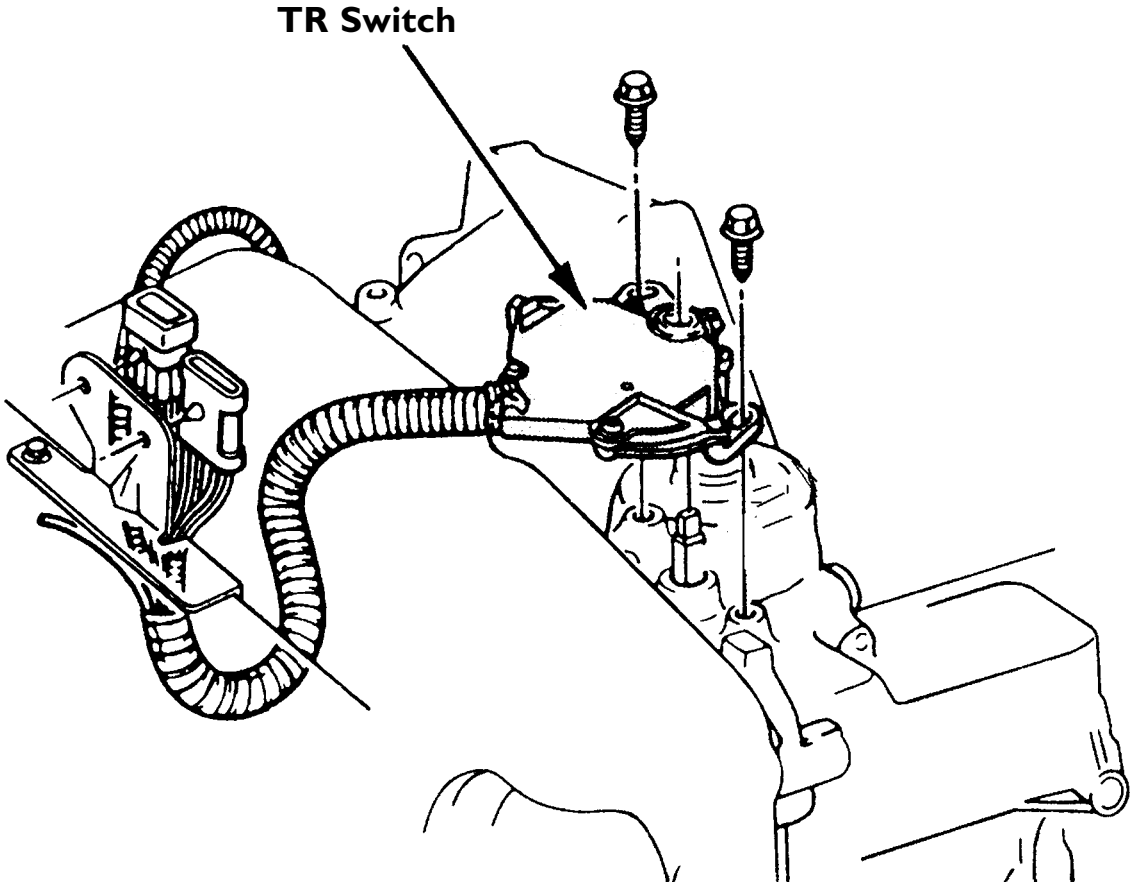
**IMPORTANT** Another cause for a broken shaft or rotor is high line pressure — always check line pressure before delivering the vehicle.

# 4T60E

## Intermittent No 4th and Possibly No TCC; Possible DTC 31, 91, E91 or P0705

Some applications may experience an intermittent loss of TCC and possibly 4th gear; code 31, 91, E91, P0705 may be stored in memory, depending on the year and model of the vehicle. These codes indicate a misadjusted Transmission Range (TR) switch.

On many applications, no code will set; codes aren't available for TR switch failures on some vehicles. In that case the computer will inhibit 4th gear as long as it believes the shifter is in D range instead of OD. The PCM programming is designed to inhibit TCC when the code sets. Most shops won't be able to duplicate this condition.



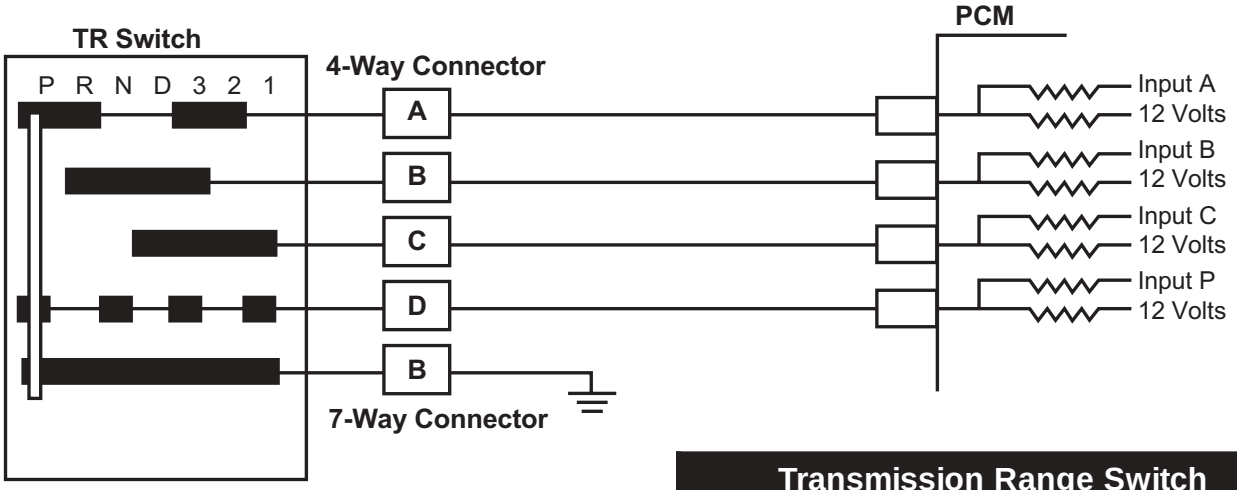
# 4T60E

## Intermittent No 4th and Possibly No TCC; Possible DTC 3I, 9I, E9I or P0705 (continued)

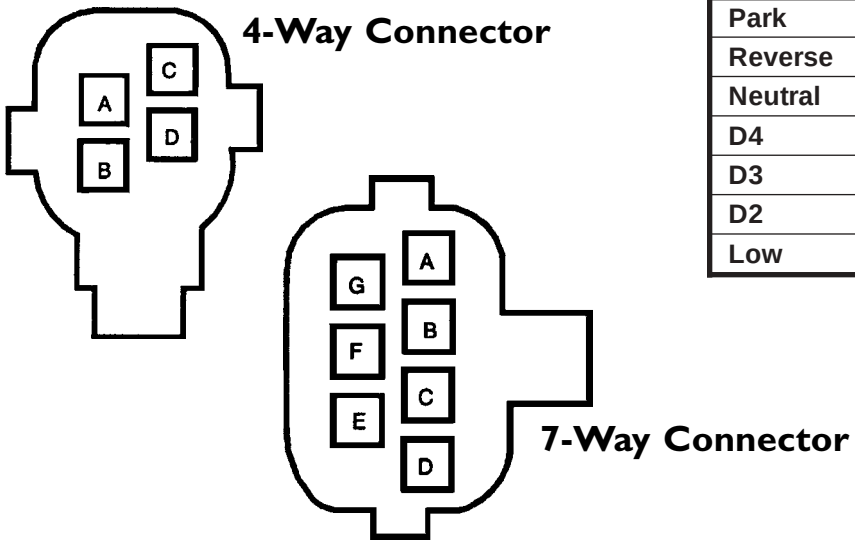
This intermittent problem can be due to a misadjusted TR switch; but it may occur if the driver rests his hand on the shift lever. To identify the source of the problem, monitor the TR switch scan data while applying slight pressure to the shift lever. The correct scan data display for OD range is: A = HI, B = LO, C = LO, P = HI

On Cadillacs, the values may be listed as binary code values where a HI is represented by 1, and low is 0.

If the scan data indicates LO/LO/LO/LO, adjust the sensor and recheck the scan values. If the scan values remain LO/LO/LO/LO, inspect the wiring. If you don't find any problems in the wiring, replace the TR switch.




| Transmission Range Switch | | | | |
|---|---|---|---|---|
| **Range** | **A** | **B** | **C** | **P** |
| **Park** | Lo | Hi | Hi | Lo |
| **Reverse** | Lo | Lo | Hi | Hi |
| **Neutral** | Hi | Lo | Hi | Lo |
| **D4** | Hi | Lo | Lo | Hi |
| **D3** | Lo | Lo | Lo | Lo |
| **D2** | Lo | Hi | Lo | Hi |
| **Low** | Hi | Hi | Lo | Lo |



# 4T60, 4T60E

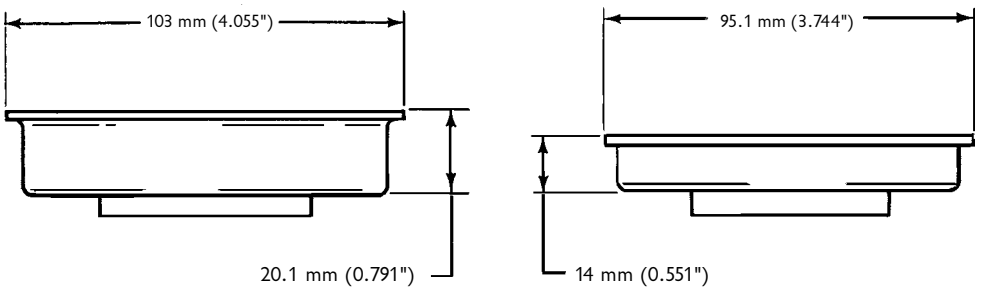
## Binds on the 1–2 Shift

A bindup during the 1–2 shift, which then goes away in 3rd and 4th is caused by a 3rd clutch that is applied all the time, or applies anytime the input clutch is applied. This can be caused by cross leaks, such as the input clutch drum sealing rings in the driven sprocket support, or any number of areas in the valve body or channel casting.

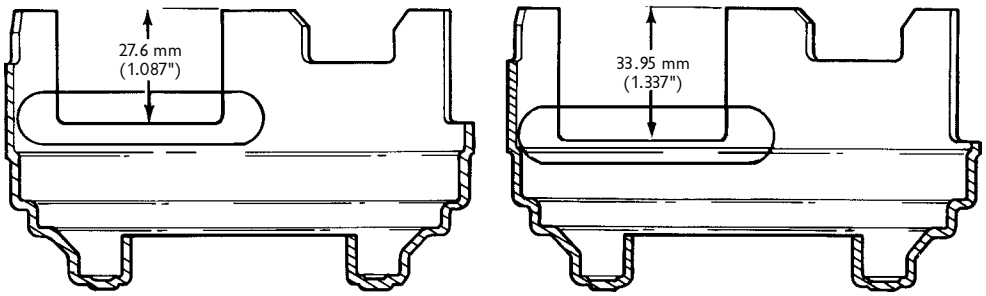
One of the more common causes is a mismatch between the type of input clutch piston and 3rd clutch piston used. If you use 10-plate 3rd clutch components with an input clutch piston designed for 8-clutch 3rd clutch components, the input clutch piston will interfere with the 3rd clutches, causing the 3rd clutch to apply anytime the input clutch is applied.

Use the illustrations below to identify the parts. Always make sure that the 3rd clutch rotates freely when you air check the input clutch.

**3rd Clutch Piston**




**Input Clutch Piston**




**Clutch Stacked Properly**

**Clutch Stacked Improperly**

# 4T60E/4T65E

## Intermittent Delayed Engagement or Neutral while Driving

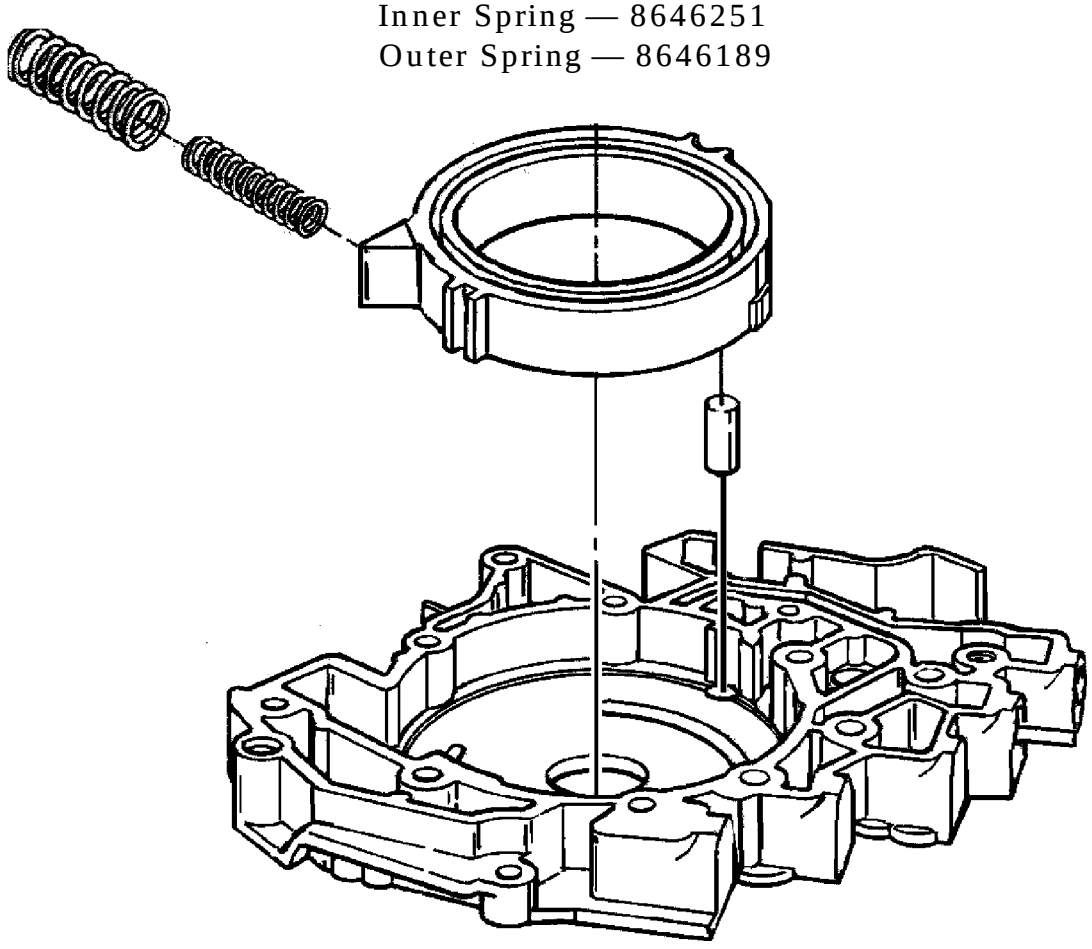
Some 4T60Es and 4T65Es may experience a delayed engagement when you first place the shift lever into gear. This complaint is similar to having a rolled input clutch seal (a common cause of delayed engagement on these applications).

In addition, the transaxle may seem to go into neutral while driving. This problem may be caused by a broken pump priming spring or springs. This allows oil pressure to intermittently drop to minimum pressure, allowing the clutch or band to release.

Testing this problem can be difficult. Before you tear into the trans to check the spring, always check any external components that could be responsible. Make sure the modulator valve moves freely in the bore, and the modulator is in good shape. If you're working on a 4T65E, verify the computer signal for line rise. The easiest way to check it is with a scan tool.

If the primary springs are broken, replace them. The GM part numbers for the springs are:

Inner Spring — 8646251
Outer Spring — 8646189

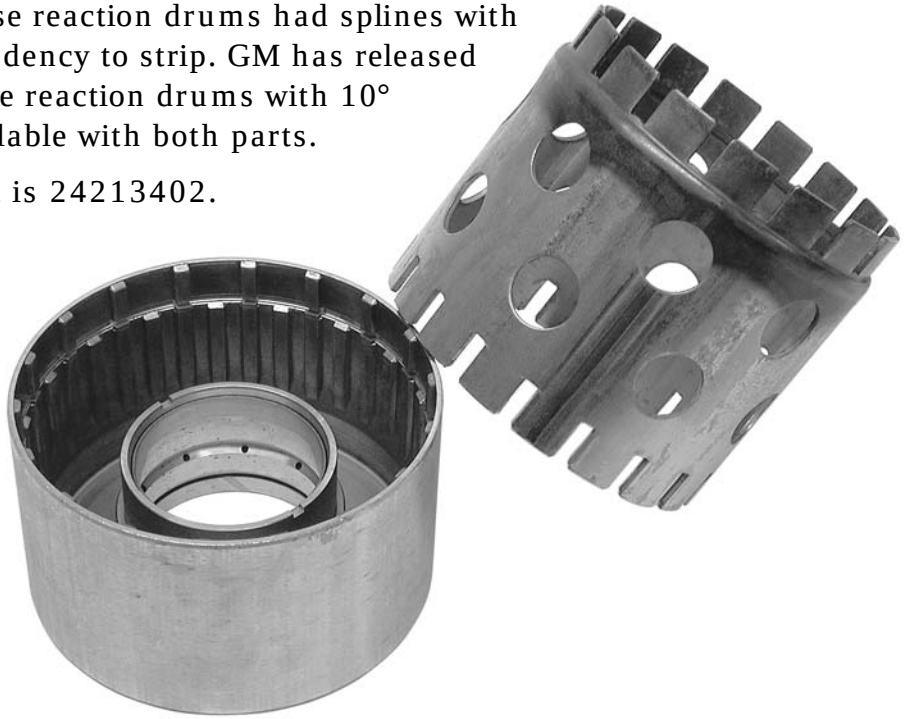


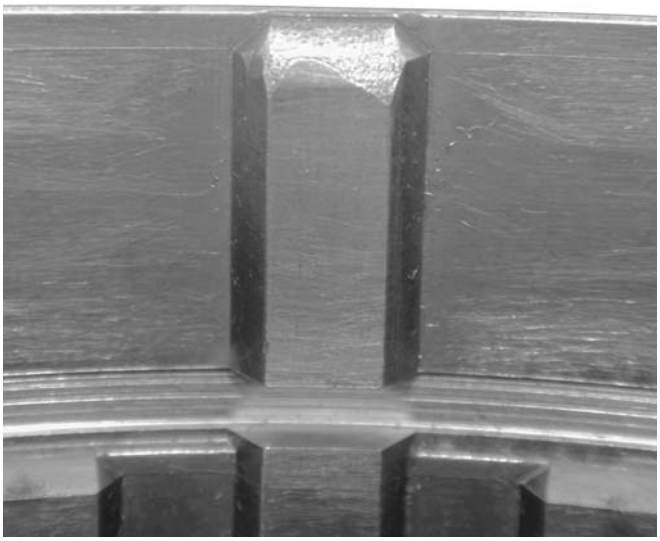
# 4T65E

## Reverse Reaction Drum Breaking

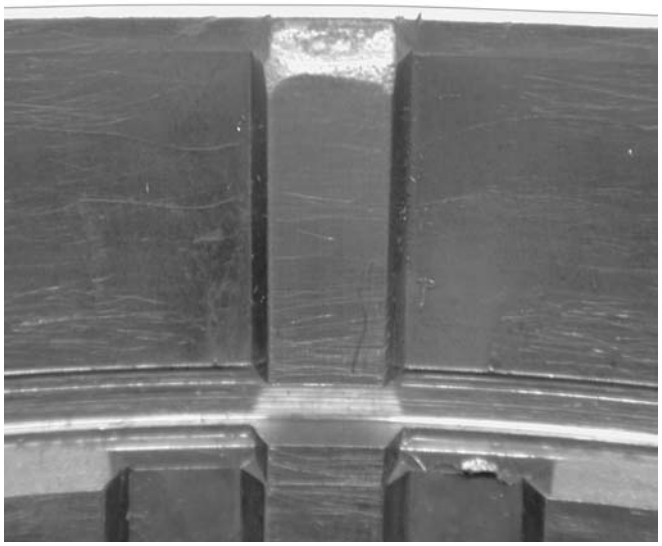
The original 2nd clutch and reverse reaction drums had splines with 25° sides; these drums had a tendency to strip. GM has released new-design 2nd clutch and reverse reaction drums with 10° sides on the splines. A kit is available with both parts.

The GM part number for the kit is 24213402.





**Original Drum with 25° Splines**



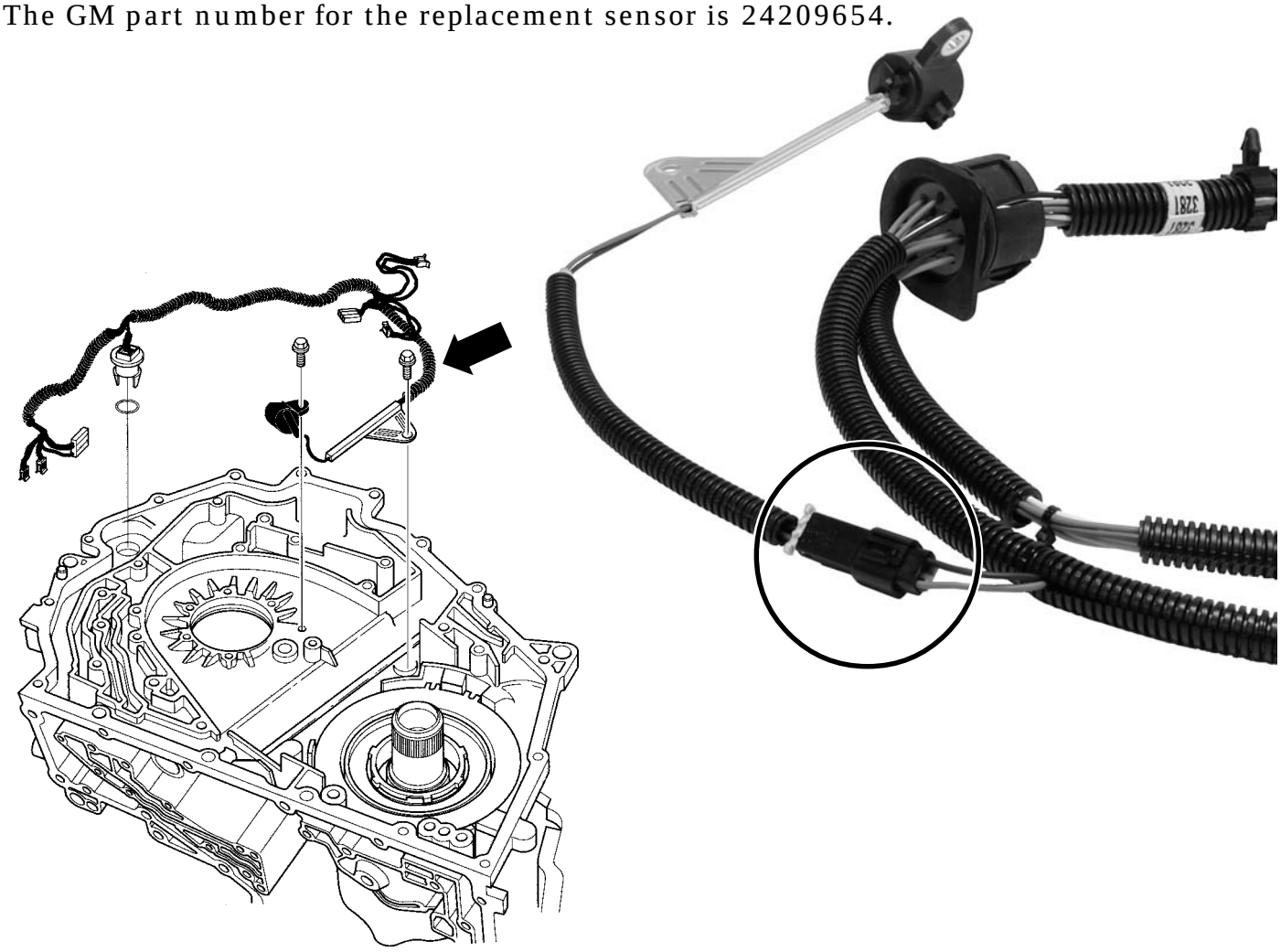
**Updated Drum with 10° Splines**

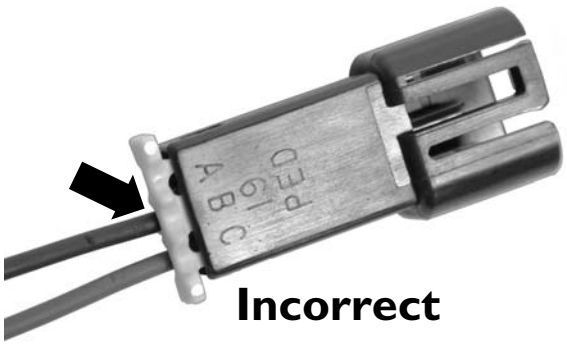
# 4T80E

## Turbine Speed Sensor Failure

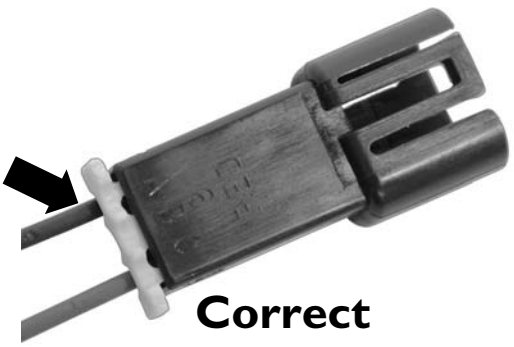
It's a good idea to replace the turbine speed sensor on every 4T80 rebuild. But don't be surprised to find the wires on the replacement sensor are out of position. Always check to make sure that the sensor wires are indexed into locations A and C.

The GM part number for the replacement sensor is 24209654.





Incorrect

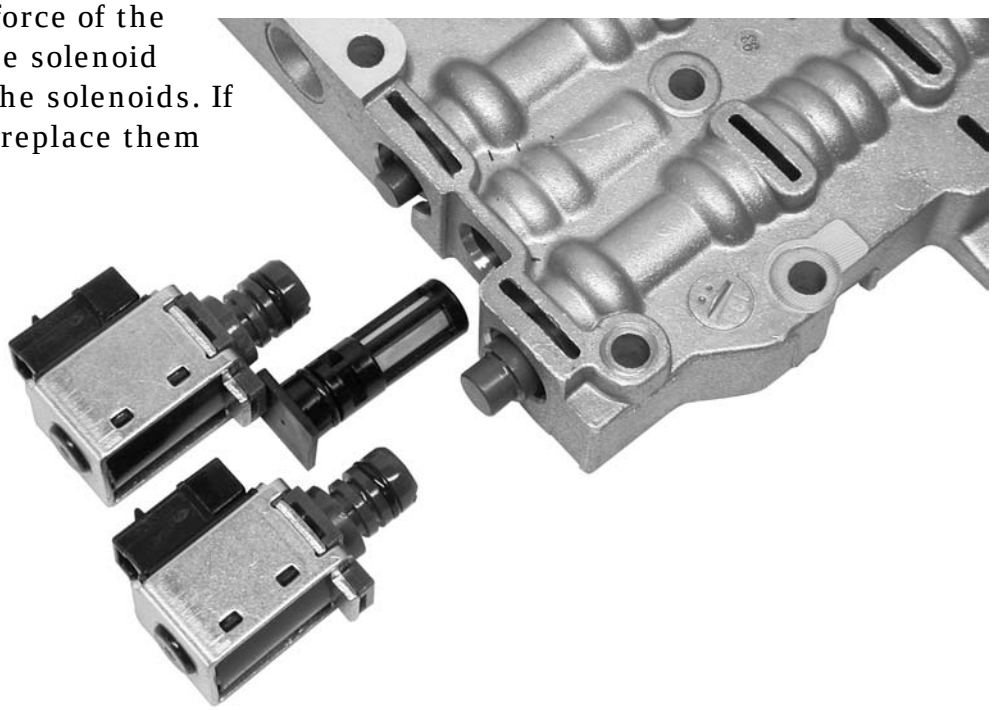


Correct

# 4T80E

## Second Gear Starts

A second gear start (that usually goes away when you step on the gas) is often caused by poor pressure at shift solenoid A. This can be caused a leaking shift solenoid, or poor feed to the solenoid. Early solenoids were designed to hold the pressure control solenoid feed screen in place. The force of the screen pushing against the solenoid had a tendency to break the solenoids. If you have the early setup, replace them with the upgrade kit.

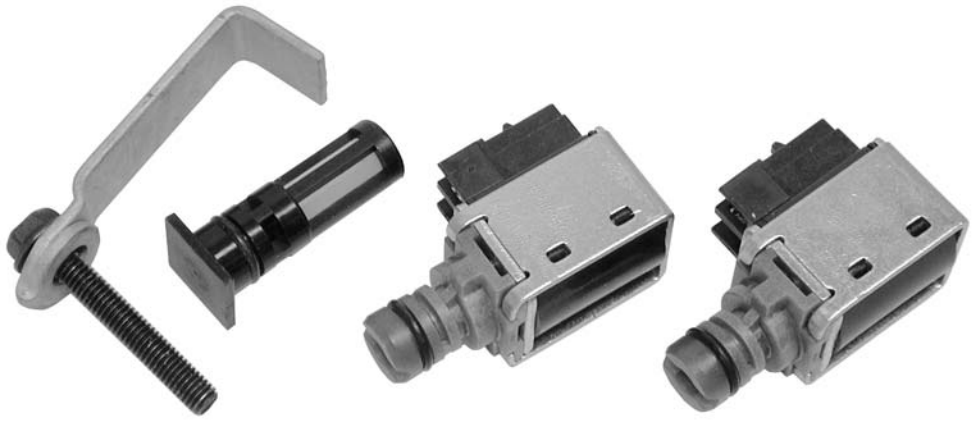


The later solenoid setup used a separate bracket to hold the screen in place.

The GM part number for the solenoid update kit is 24211355.

If you already have the later solenoid setup, the GM part number for the solenoids is 24207662.

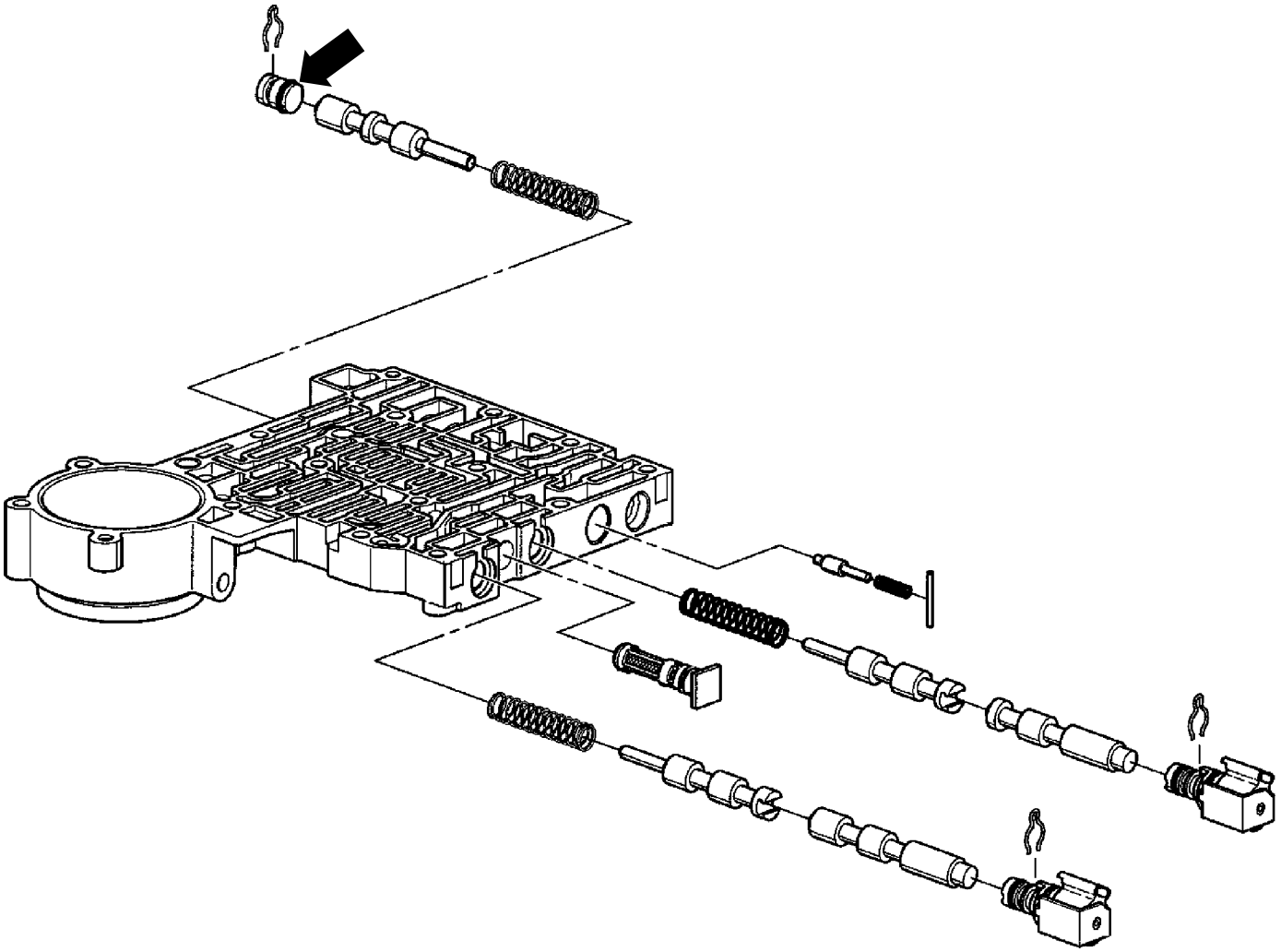
The GM part number for the screen is 8680389.



# 4T80E

## Second Gear Starts (continued)

Another source for solenoid A leaks is the 3–4 shift valve plug. The 3–4 shift valve plug has an O-ring that seals solenoid A pressure. Replace this O-ring on every rebuild.

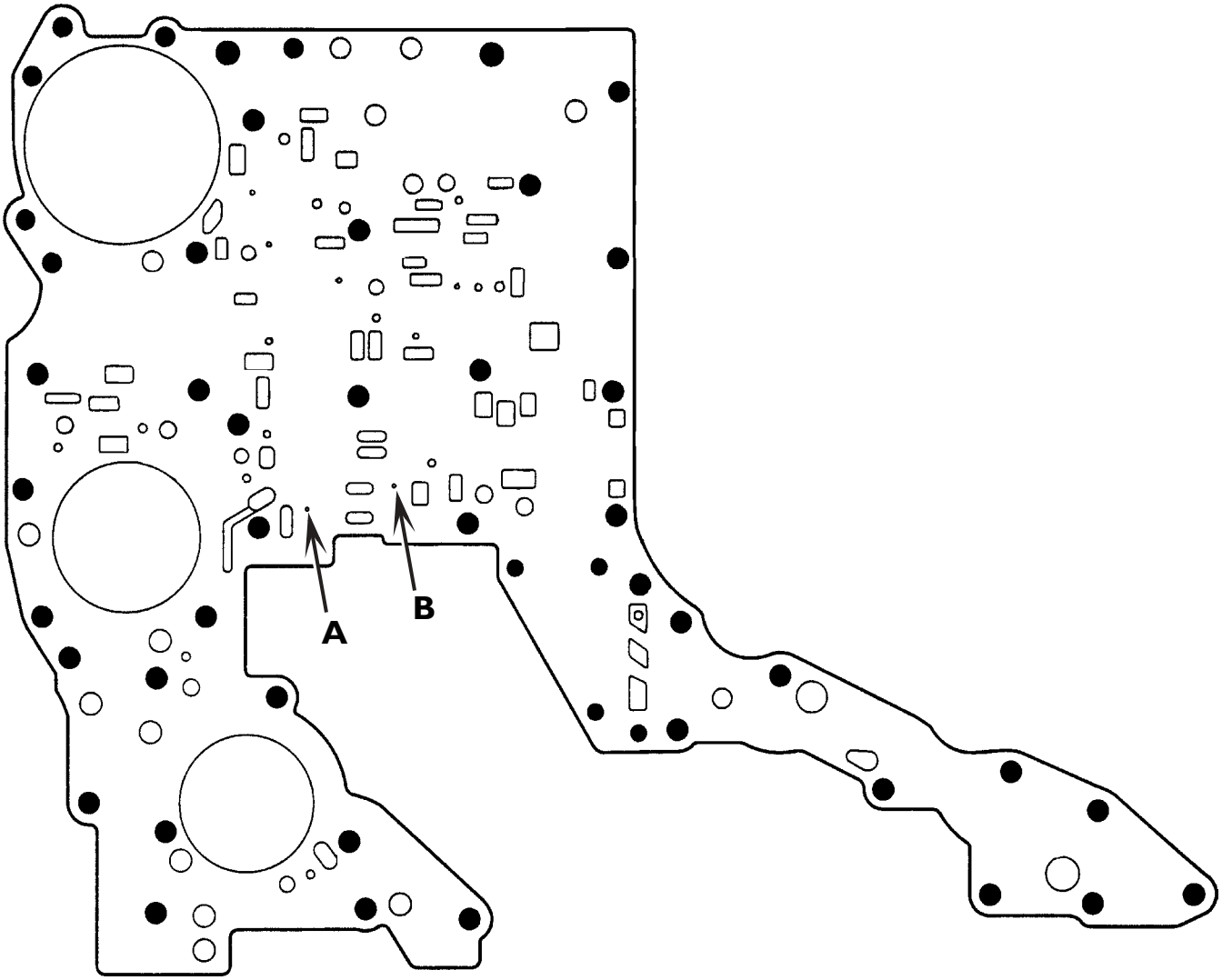


# 4T80E

## Second Gear Starts (continued)

Another measure you can take to correct second gear starts is to enlarge the feed orifice for solenoid A to 0.035".

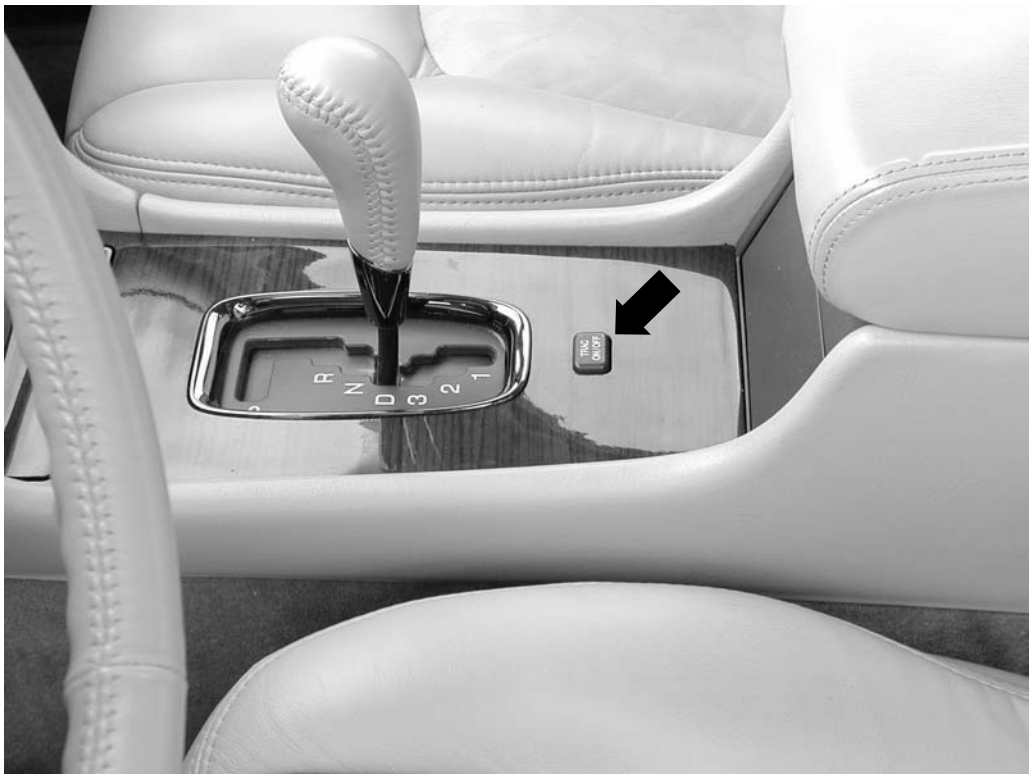
**CAUTION** This isn't a rebuild procedure; only modify the plate if the other repairs don't fix the problem.



# 4T80E

## Second Gear Starts (continued)

A simple cause of a second gear start complaint is having the traction control disabled. Cadillac programs a second gear start whenever the traction control is off. Cycle the traction control switch and look for the words “Traction Ready.” If you see this, the traction control system is functioning properly, and isn’t the cause of your second gear starts.

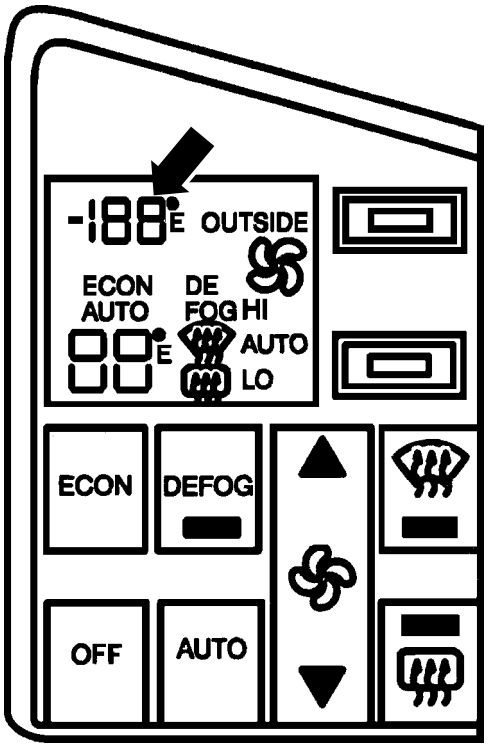


# 4T80E

## 1993–95 Cadillacs ATF Indicator Reset

1993-and-later Cadillacs have an "ATF Life" telltale that shows when the transmission should be serviced. This usually sets at about 100,000 miles. The actual display will vary from model to model; however, the key (and problem) is the display has a message that you seemingly can't get rid of.

For 1993 through 1995 models you can reset the ATF life through the self-diagnostic functions in the instrument panel. To do so, follow these steps.




1. Key on, engine off.
2. Press the OFF and WARMER buttons simultaneously on the climate control panel. Allow the display to show if there are any codes before continuing.
3. When the display shows "PCM?" press the HIGH fan button. The display will ask which function you want, beginning with PCM DATA. Press the LOW fan button to select different functions. Continue pressing the LOW fan button until you see PCM OVERRIDE on the display.
4. Press the HIGH fan button. You should see PS00 in the display.
5. Use the HIGH fan button again, to scroll through the parameters (e.g. PS01, PS02 etc.) until you get to PS15.
6. Look at the Climate Control Panel's Temperature display. The number in the display indicates ATF Life.
7. Use the WARMER button to raise ATF life. The display only has two digits. When it reaches 100, it'll display – –.
8. Turn the ignition off; the ATF Life is reset.

For 1996-and-later vehicles, you'll need a scan tool to reset the ATF Life indicator.

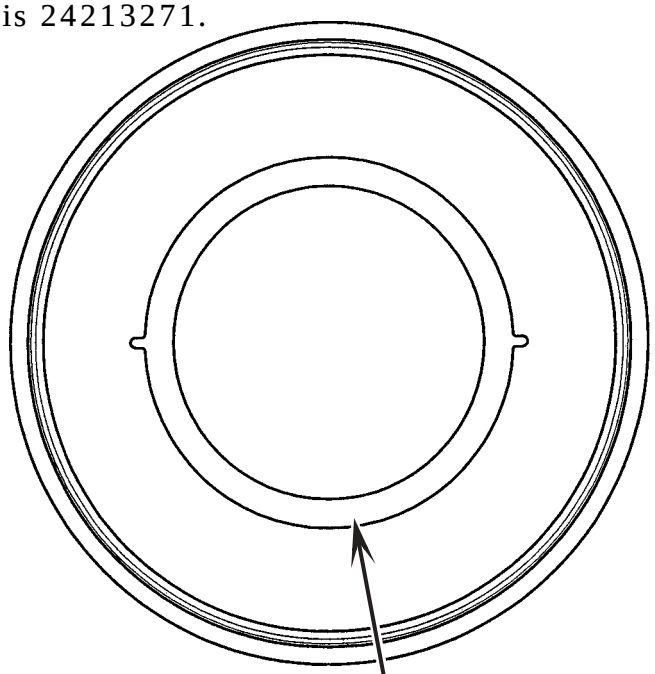
# 4T80E

## Delayed or No Engine Braking In D3, D2, or L

A loss of engine braking can occur if the forward clutch piston inner skirt is too high. These pistons restrict oil flow to the overrun piston, either delaying or preventing engine braking in any forward manual ranges. GM has a revised forward piston that is machined down on the inner skirt to allow for better flow to the overrun piston.

The GM part number for the revised piston is 24213271.

This kit also includes the overrun piston.



This inner skirt was machined down

Forward and Coast Clutch Housing

# GM Front Wheel Drive

## VSS Harness Repair Kit

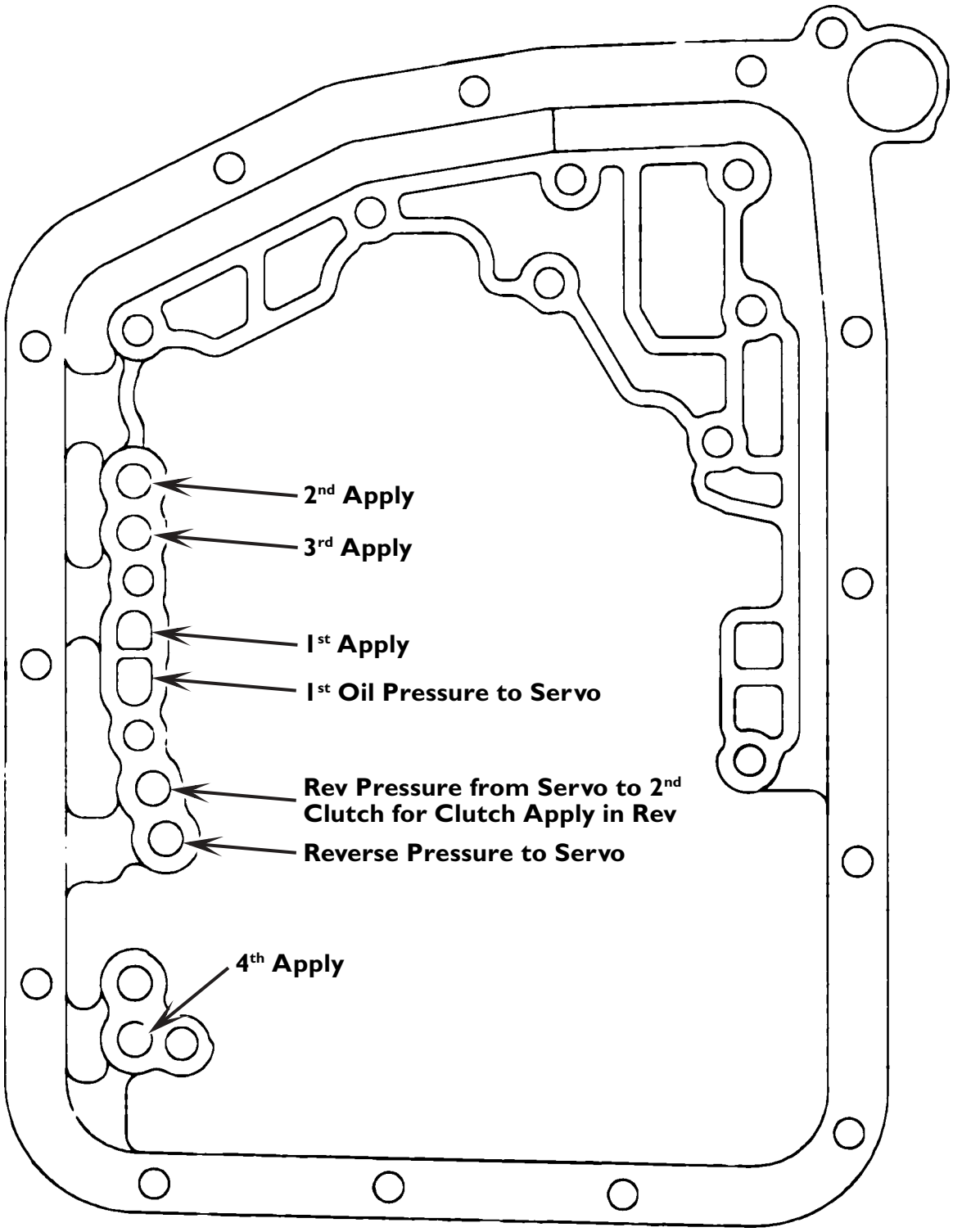
The VSS harness connector will often crack or break while disconnecting the harness during transmission removal. Never reuse a broken harness connector; replace it with a new harness connector.

The GM part number for the harness kit is 12101899.

The kit contains the harness (with wires) and two crimp connectors.

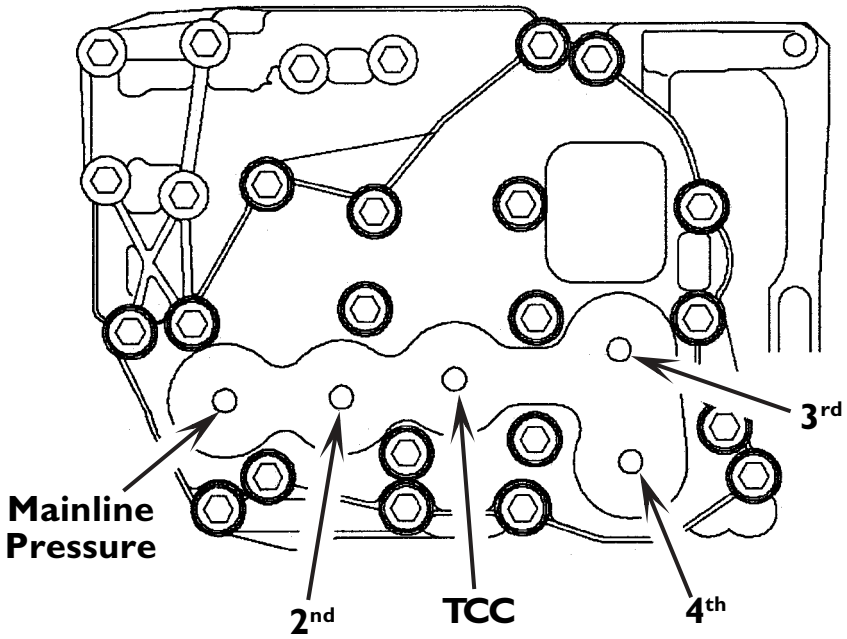
# Saturn TAAT

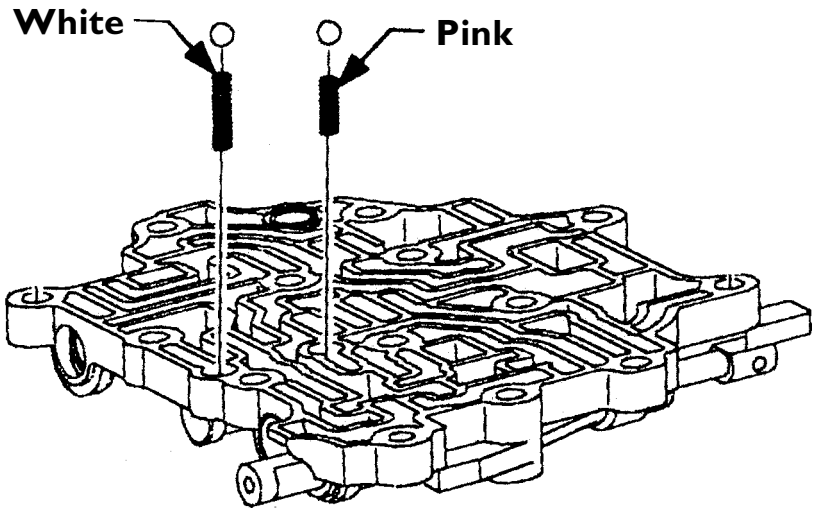
## Air Check Locations



# Saturn TAAT

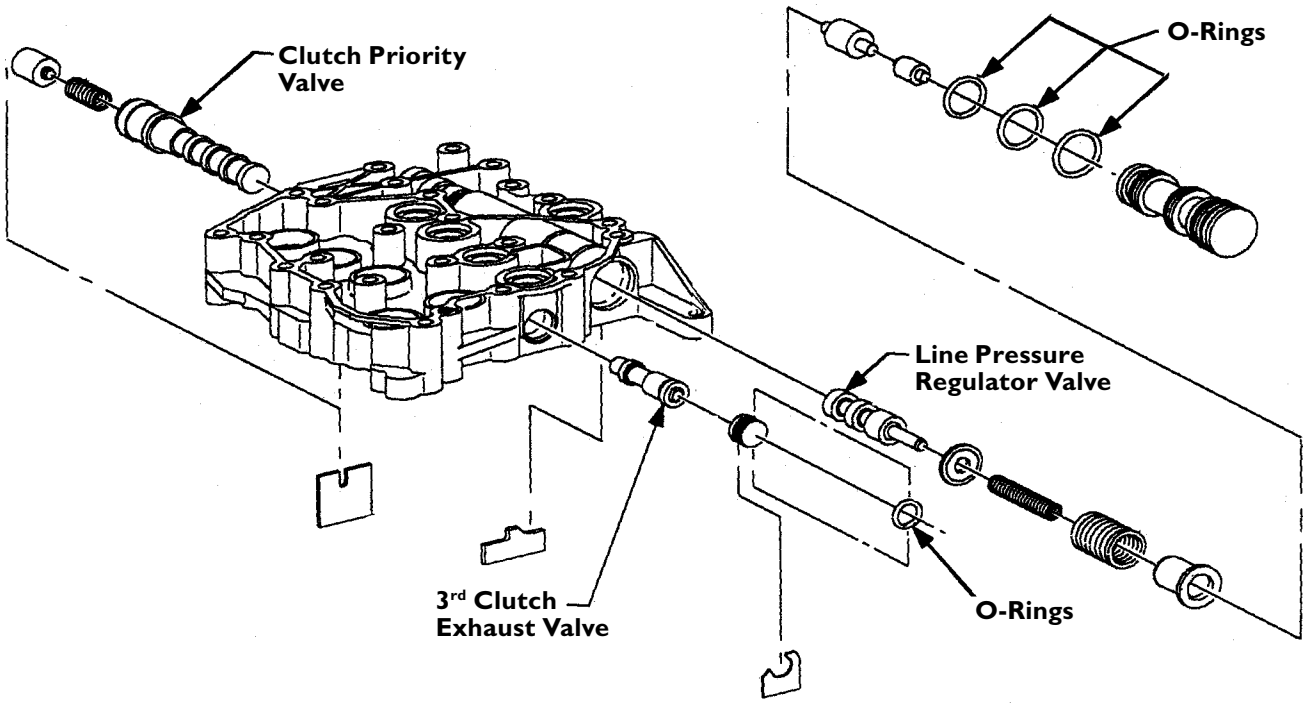
## Valve Body

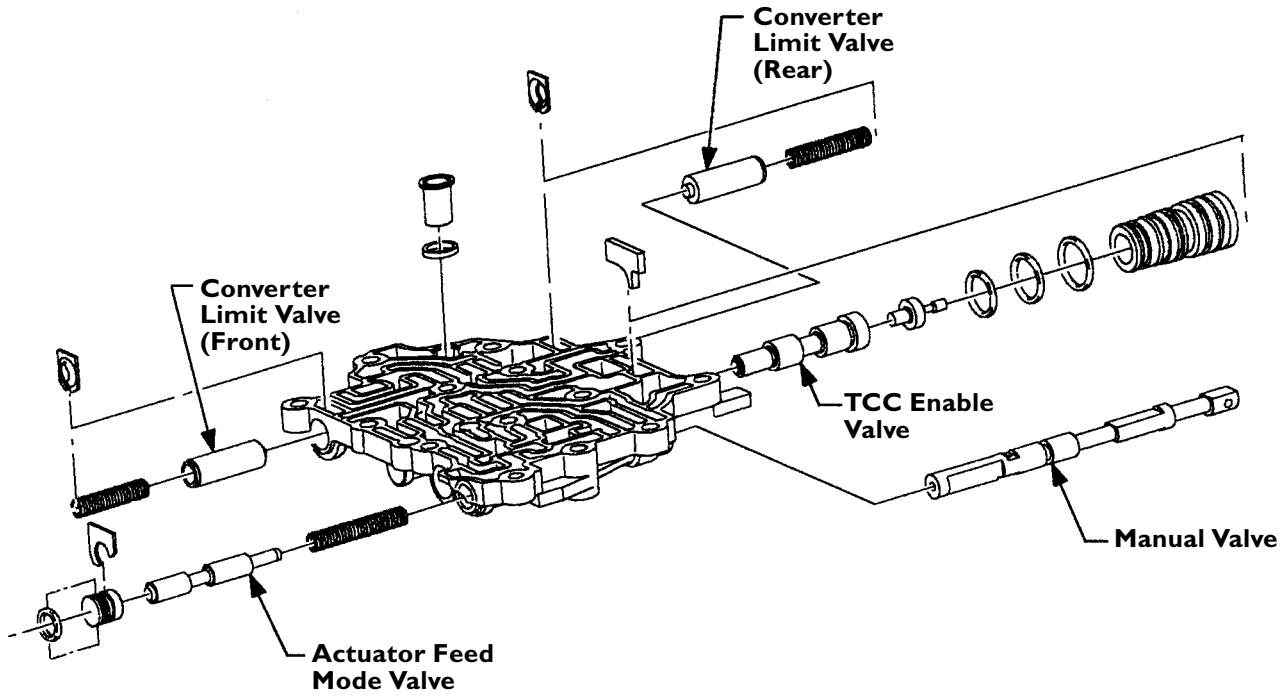


# Saturn TAAT

## Valve Body (continued)



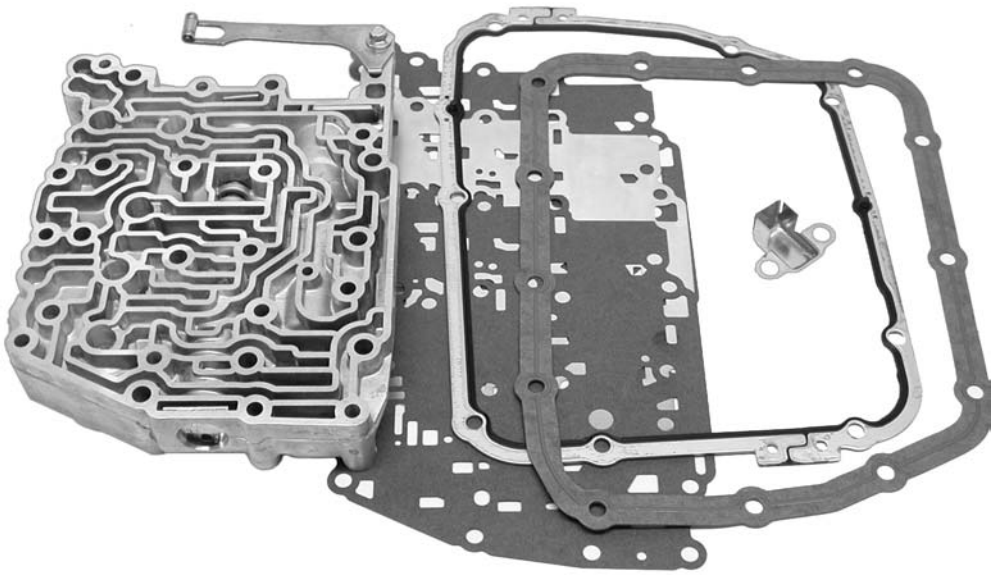
# Saturn TAAT

## Harsh Reverse

A harsh reverse condition is often caused by a worn out pressure regulator bore. Saturn offers a kit that includes the valve body half (with regulator valve) and gaskets.

The Saturn part number for the kit is 21005813.

When the pressure regulator bore wears out, line pressure will go higher than commanded. To verify line pressure, follow the procedures on page 62.



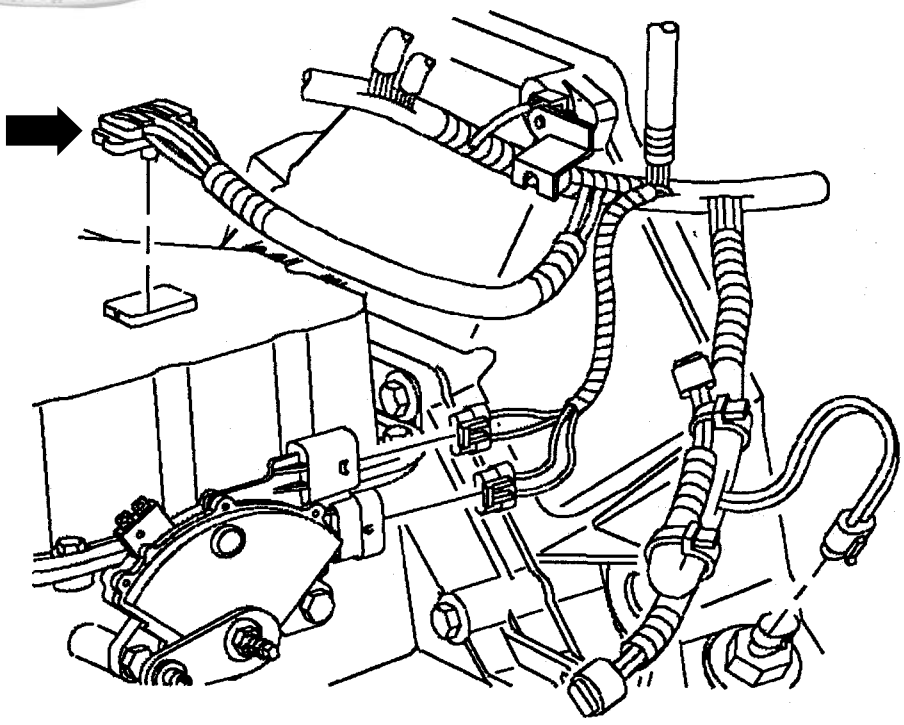
# Saturn TAAT

## Solenoid Harness Kit

Poor connections at the solenoid harness connector can cause many problems including wrong gear starts and harsh shifts. In some cases no DTCs will set.

Saturn offers a solenoid harness connector repair kit for replacing this connector. The Saturn part number for the kit is 12116563.

Always stager the splices about ½" apart, beginning with the first splice, which you should start about 1" from the connector.

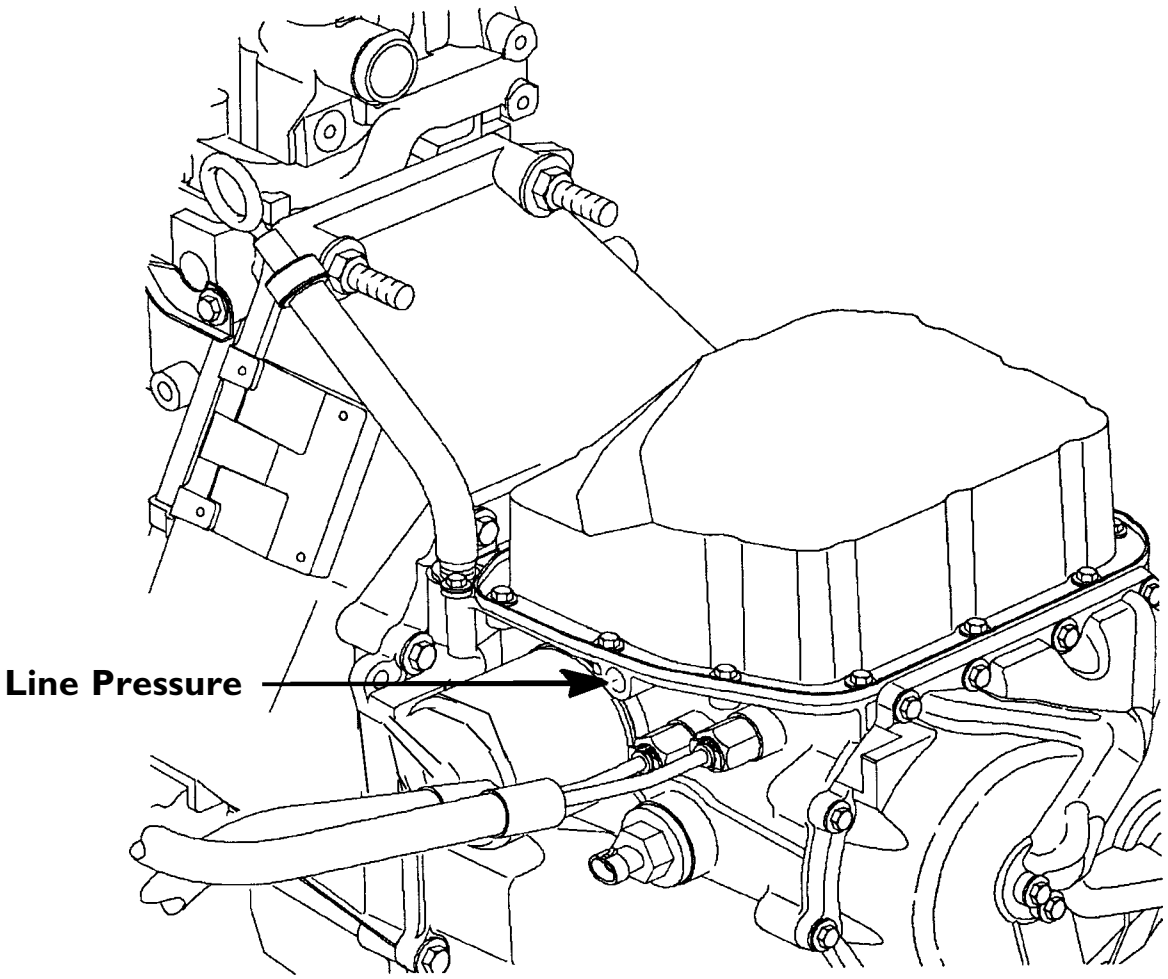


# Saturn TAAT

## Pressure Testing

Normal line pressure in park ranges from a minimum of 58–72 PSI at an idle to a maximum of 175-245 PSI. There are two methods you can use to check line pressure: The first is the easiest and is for checking minimum and maximum pressures. Here's how:

- Connect a pressure gauge to the line pressure port.

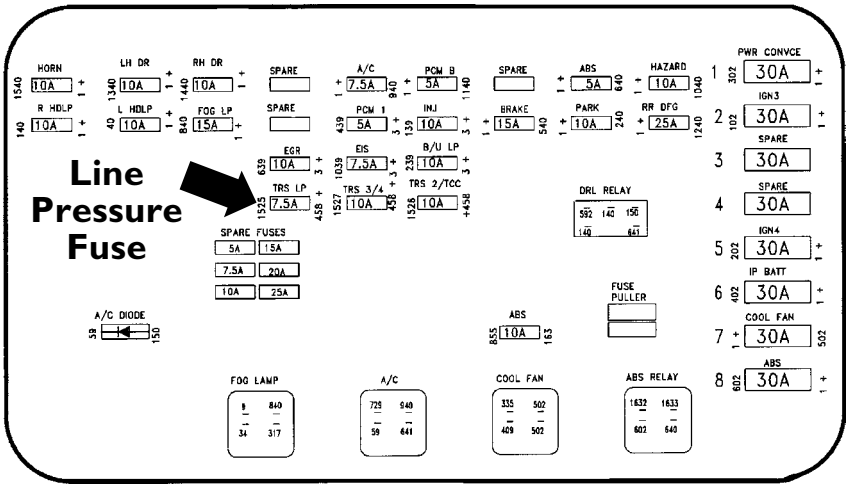



- With the engine idling and the transmission in park you should have between 58 and 72 PSI.

# Saturn TAAT

## Pressure Testing (continued)

- Remove the line pressure solenoid fuse, located in the fuse block in the engine compartment.




When you remove the fuse, line pressure should rise to between 175 and 245 PSI. You may need to raise engine RPM a bit to achieve maximum pressure.

The second method for checking line pressure is by commanding pressure rise with a scan tool and verifying the results with a pressure gauge. Begin this test by connecting your scan tool to the diagnostic connector. Don't start the engine yet.

- Scroll through the menu until you get to "Special Tests."
- Select "Line Pressure."
- The scan tool will prompt you to start the engine.
- Select "Run."

The test will begin. All functions are automatic. The test will set the engine to 1500 RPM. It will then command line pressure from 396 kPa to 1518 kPa, in 100 kPa increments. As it does, verify that line pressure rises on your pressure gauge. Use the chart to convert kPa to PSI.

| Command Line Pressure | | Gauge Readings Should Be: | |
|---|---|---|---|
| kPa | PSI | kPa | PSI |
| 396 | 57 | 400 – 500 | 58 – 72 |
| 498 | 72 | 425 – 550 | 61 – 80 |
| 600 | 87 | 500 – 675 | 72 – 98 |
| 702 | 102 | 600 – 800 | 87 – 116 |
| 804 | 117 | 700 – 925 | 101 – 134 |
| 906 | 131 | 800 – 1050 | 116 – 152 |
| 1008 | 146 | 900 – 1175 | 130 – 170 |
| 1110 | 161 | 1000 – 1300 | 145 – 188 |
| 1212 | 175 | 1100 – 1400 | 159 – 203 |
| 1314 | 191 | 1200 – 1500 | 174 – 218 |
| 1416 | 205 | 1300 – 1650 | 188 – 240 |
| 1518 | 220 | 1500 – 1850 | 218 – 268 |

# Saturn TAAT

## Second Design Shift Solenoids

Beginning with 1997 models, Saturn began using a second design solenoid for the 2nd/Reverse, 3rd and 4th clutch. The second design solenoid has a screen on the feed side and is less likely to fail mechanically. You can use the second design s noid for all past models, but nev use it for the TCC or pressure solenoid locations. For those locations, continue using the first design solenoid.

The Saturn part numbers for these solenoids are:

First Design — 21002509
Second Design — 21003289

First Design

Second Design