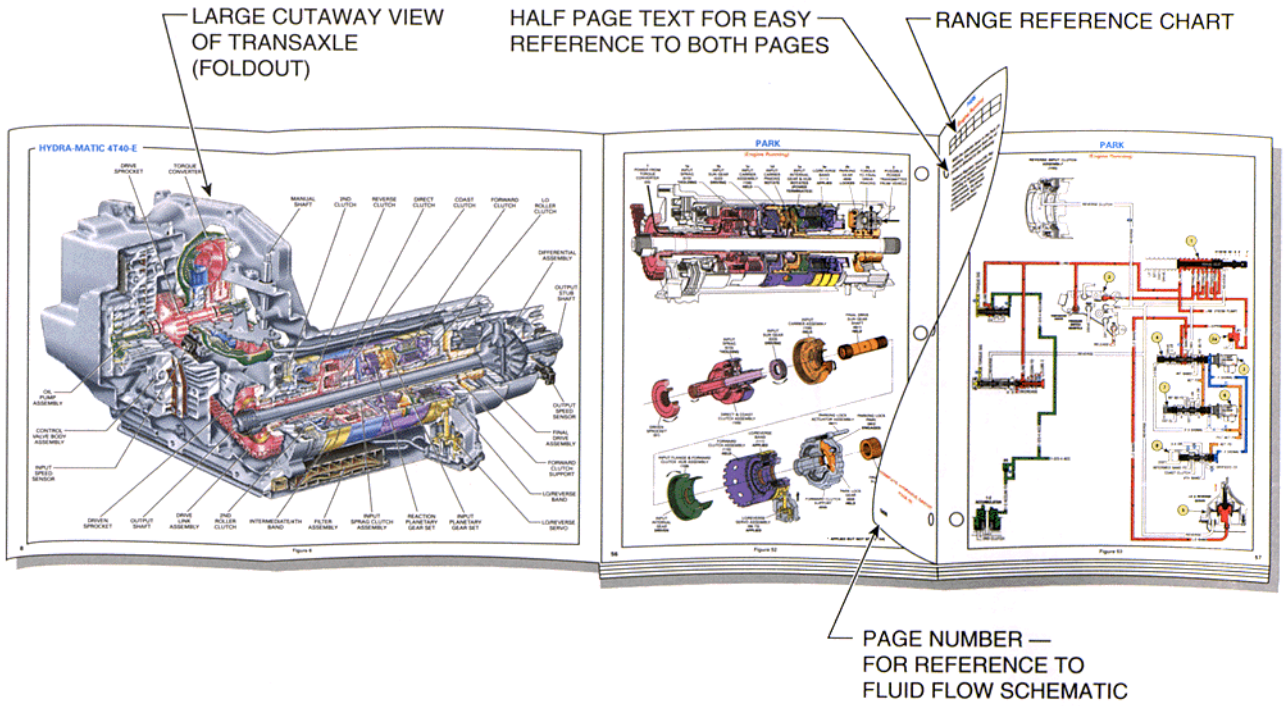
# HOW TO USE THIS BOOK



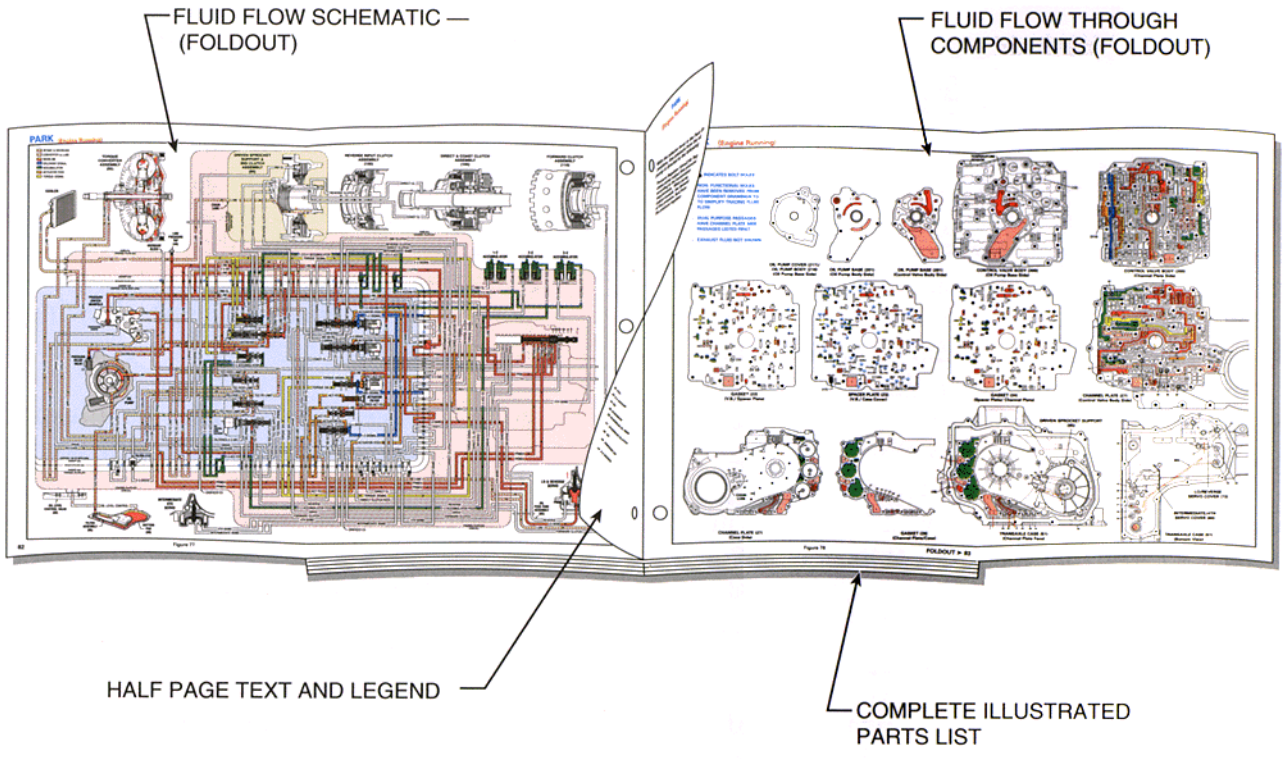
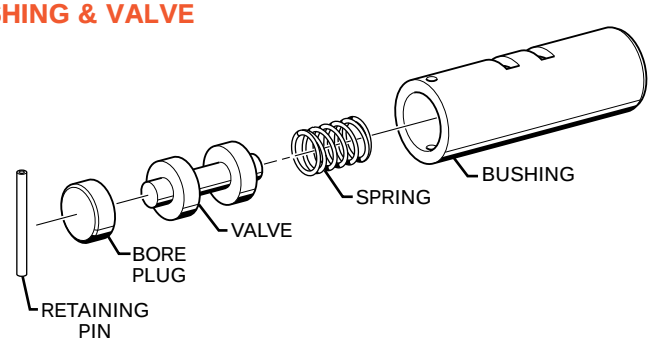
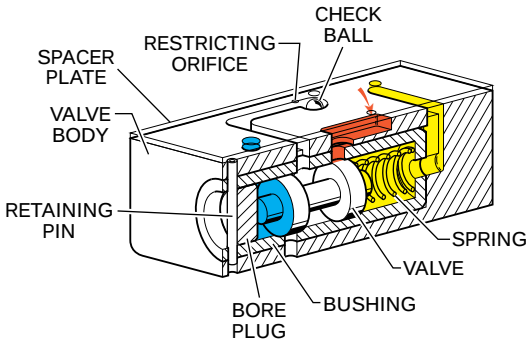



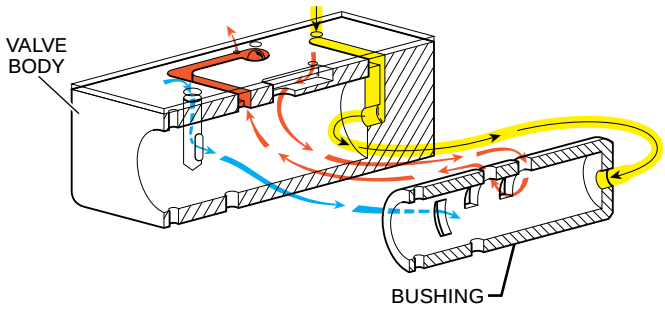

Figure 1

## TYPICAL BUSHING & VALVE

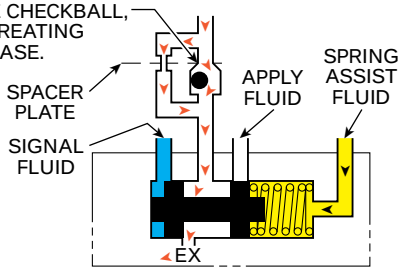
**NOTE: NOT ALL VALVES ARE USED WITH A BUSHING**



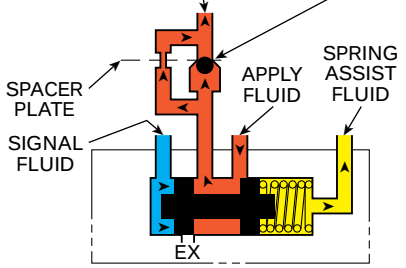

EXHAUST FROM THE APPLY COMPONENT UNSEATS THE CHECKBALL, THEREFORE CREATING A QUICK RELEASE.




WITH SIGNAL FLUID PRESSURE EQUAL TO OR LESS THAN SPRING AND SPRING ASSIST FLUID PRESSURE THE VALVE REMAINS IN CLOSED POSITION.

TO APPLY COMPONENT

APPLY FLUID SEATS THE CHECKBALL FORCING FLUID THROUGH AN ORIFICE IN THE SPACER PLATE, WHICH CREATES A SLOWER APPLY.

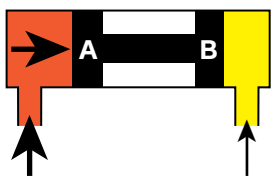



WITH SIGNAL FLUID PRESSURE GREATER THAN SPRING AND SPRING ASSIST FLUID PRESSURE THE VALVE MOVES OVER.

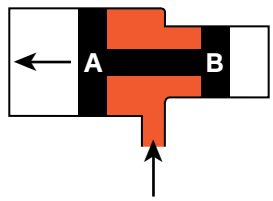
Figure 4

## FLUID PRESSURES

- INTAKE & DECREASE
- CONVERTER & LUBE
- MAINLINE
- SOLENOID SIGNAL
- ACCUMULATOR
- ACUATOR FEED
- TORQUE SIGNAL
- EXHAUST
- DIRECTION OF FLOW




WITH EQUAL SURFACE AREAS ON EACH END OF THE VALVE, BUT FLUID PRESSURE "A" BEING GREATER THAN FLUID PRESSURE "B", THE VALVE WILL MOVE TO THE RIGHT.




WITH THE SAME FLUID PRESSURE ACTING ON BOTH SURFACE "A" AND SURFACE "B" THE VALVE WILL MOVE TO THE LEFT. THIS IS DUE TO THE LARGER SURFACE AREA OF "A" THAN "B".

Figure 5

## Driven Sprocket Support

Along with being the housing for the 2nd clutch and a support for the driven sprocket, the driven sprocket support acts as a stationary fluid routing component, delivering fluid to rotating components. This is accomplished through a series of passages and seals within the sprocket support, the reverse clutch assembly and the direct and coast clutch assembly.

**Reverse Clutch Fluid Passage**
Reverse clutch fluid flows through the driven sprocket support, exits through a hole, between the oil seal rings (403), and enters the reverse clutch housing to apply the reverse clutch.

**Lube 1 Fluid Passages**
Lube 1 fluid travels through the driven sprocket support and exits through a hole to lubricate bushings and parts in this region of the transaxle.

Lube 1 fluid also travels through another passage in the driven sprocket support to a hole, between the first and second oil seal rings (500), in the input housing shaft. This fluid lubricates the bushings in this area of the transaxle (see Lubrication Points page 104).

**Direct Clutch Apply Fluid**
Direct clutch apply fluid travels through the driven sprocket support to a hole in the input shaft, between the 2nd and 3rd oil seal rings (500), and into the direct clutch housing to apply the piston.

**Coast Clutch Apply Fluid**
This fluid travels through the driven sprocket support to a hole in the input shaft, between the 3rd and 4th oil seal rings (500), and on to the coast clutch to apply the piston.

Worn or improperly installed oil seal rings can greatly affect the apply force and lubrication capabilities of the fluid in the transaxle.

Damaged or leaking seals (500) can cause no third gear/slips in third, or no coast clutch apply/slipping in all manual ranges.

Porosity or leaking 2nd clutch piston seals can cause no second/slips in second.

Damaged or leaking seals (403) can cause no reverse gear/slips in reverse.

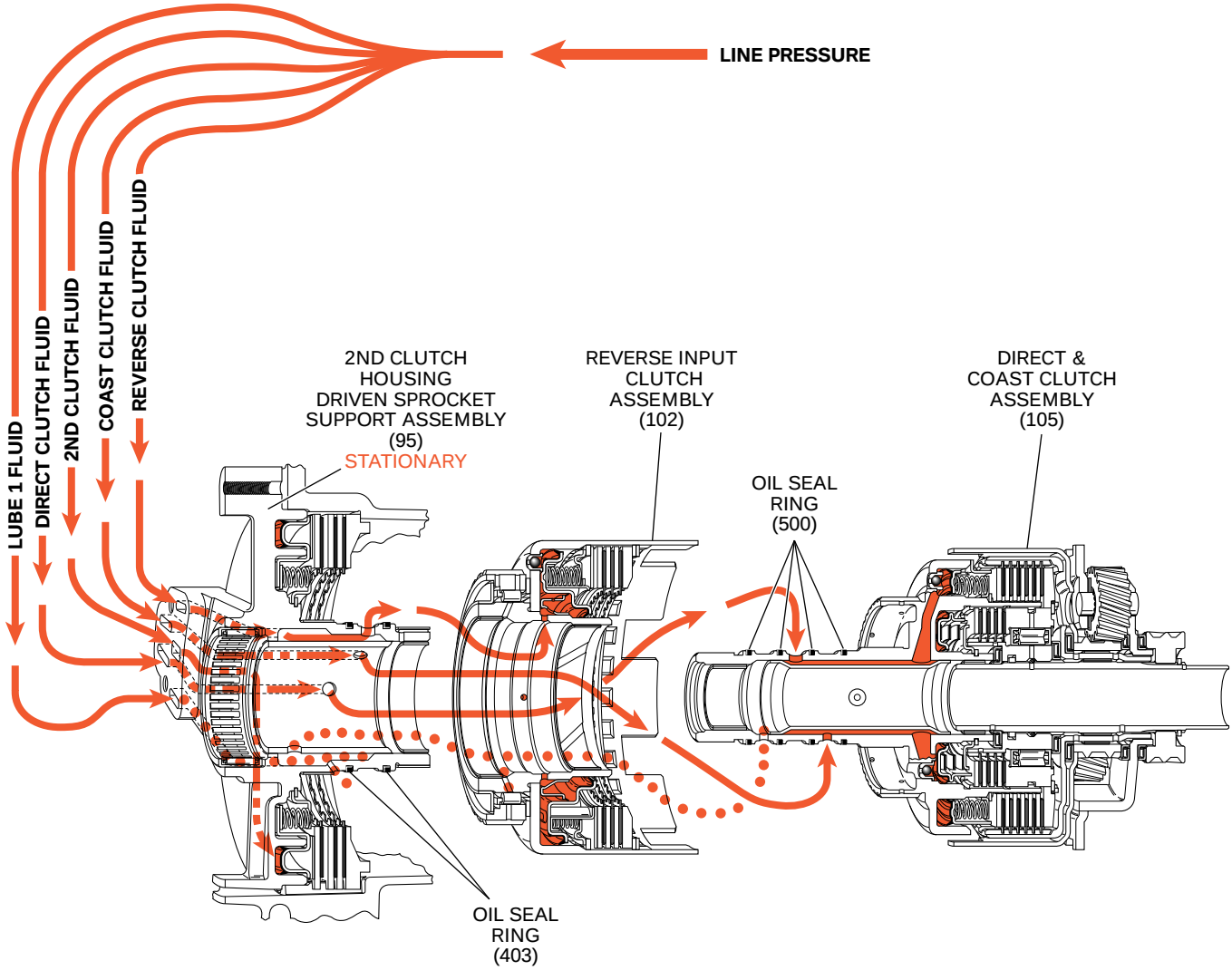



Figure 16

# HYDRAULIC CONTROL COMPONENTS

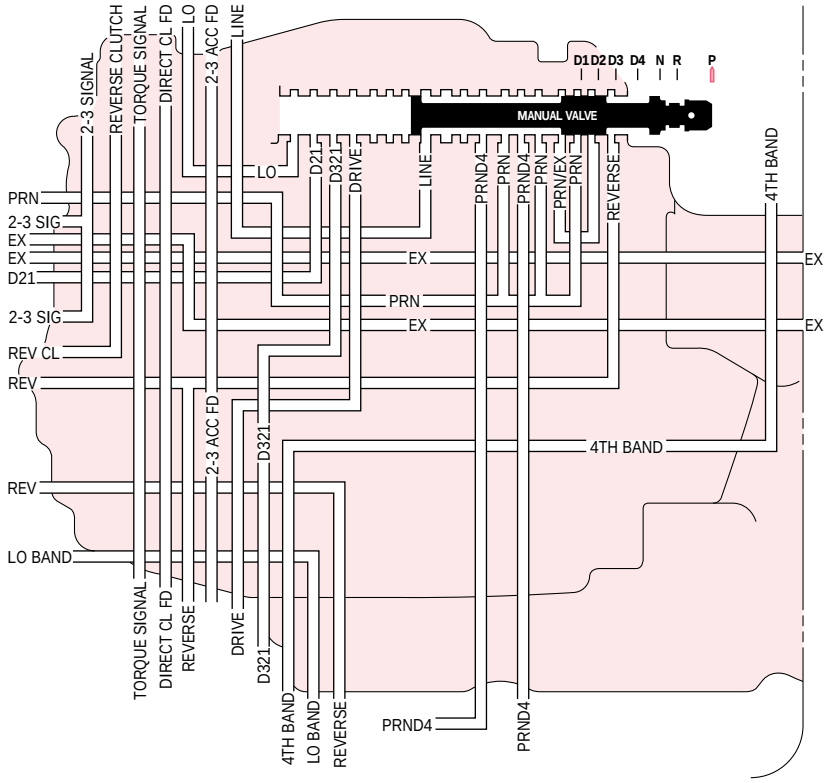
## VALVES LOCATED IN THE CHANNEL PLATE

**MANUAL VALVE (404):**
The manual valve (800) is fed by line pressure from the pressure regulator valve and is mechanically linked to the gear selector lever. When a gear range is selected, the manual valve directs line pressure into the various circuits by opening and closing feed passages. The circuits that are fed by the manual valve are: Reverse, PRN, PRN/EX, PRND4, Drive, D321, D21 and Lo.

### Manual Valve Related Diagnostic Tips

Stuck, misaligned or damaged valve and linkage could cause:

- No reverse or slips in reverse
- No first gear or slips in first gear
- No fourth gear or slips in fourth gear
- No Park
- No engine compression braking in all manual ranges
- Drives in neutral
- No gear selections
- Shift indicator indicates wrong gear selection



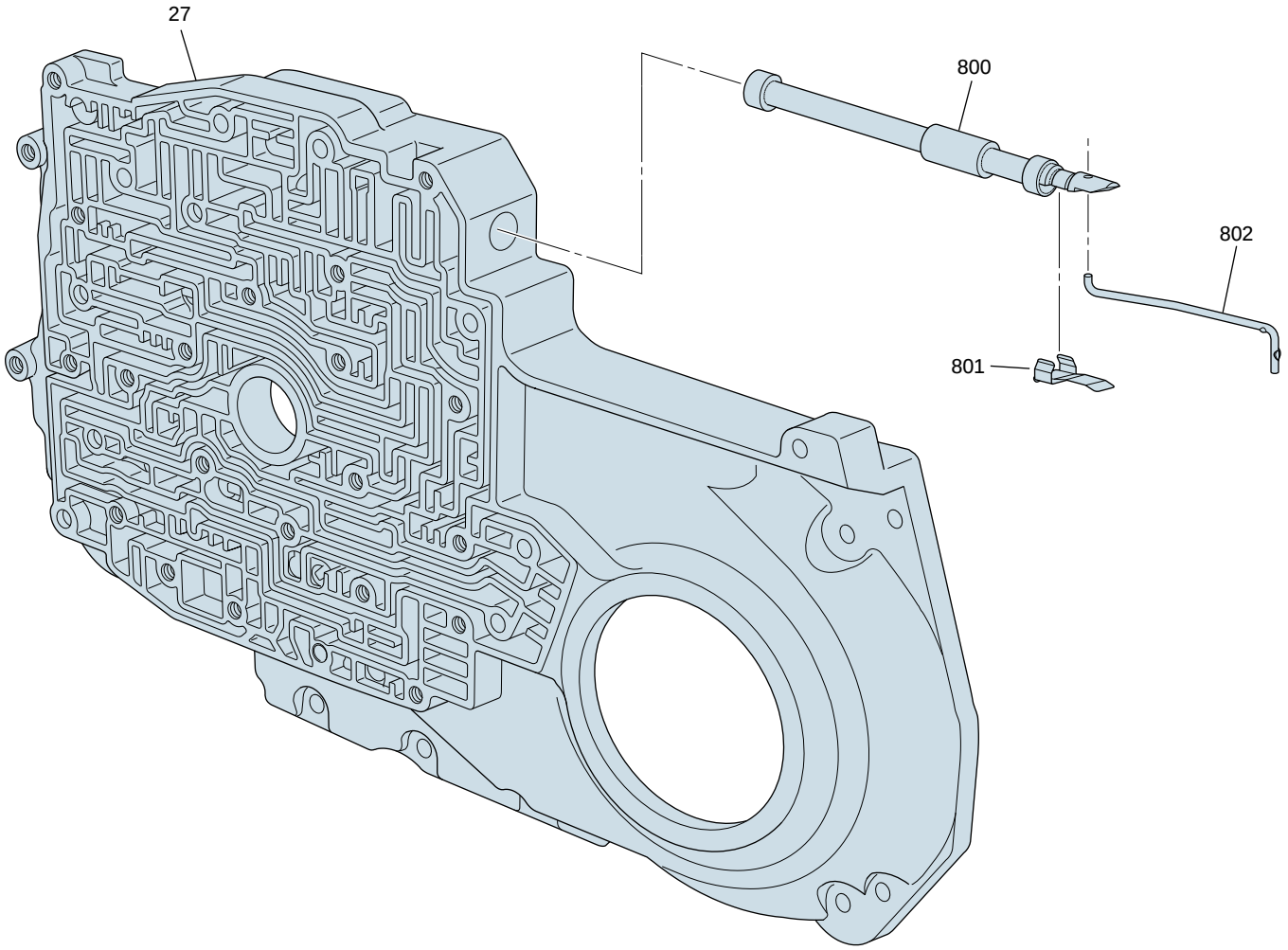
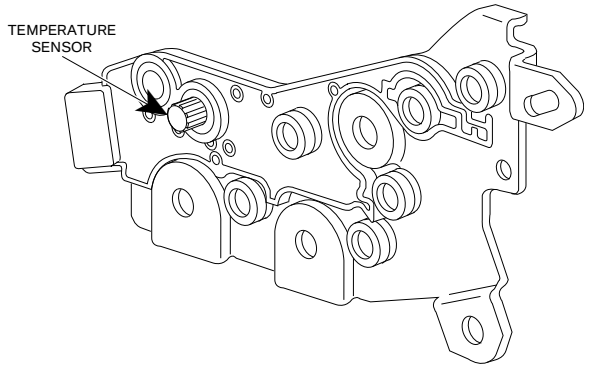




Figure 35




**Transaxle Fluid Temperature Sensor**

The temperature sensor is a negative temperature coefficient thermistor (temperature sensitive resistor) that provides information to the PCM regarding transmission fluid temperature. The temperature sensor is integrated in the pressure switch assembly (PSA) which is bolted to the valve body. The sensor monitors pressurized main line fluid from the inside of the valve body to determine the operating temperature of the transaxle fluid. The sensor, similar to each of the PSA fluid pressure switches, uses an o-ring seal to maintain fluid pressure in the valve body.

The internal electrical resistance of the sensor varies in relation to the operating temperature of the transmission fluid (see chart). The PCM sends a 5 volt reference signal to the temperature sensor and measures the voltage drop in the electrical circuit. A lower fluid temperature creates a higher resistance in the temperature sensor, thereby measuring a higher voltage signal.
The PCM measures this voltage as another input to help control line pressure, shift schedules and TCC apply. When transaxle fluid temperature reaches 140°C (284°F) the PCM enters “hot mode”. Above this temperature the PCM modifies transmission shift schedules and TCC apply in an attempt to reduce fluid temperature by reducing transmission heat generation. During hot mode the PCM applies the TCC more often in Third and Fourth gears (TCC is also applied in 2nd gear in some models). Also, the PCM will perform 2-3 and 3-4 shifts earlier to help reduce fluid heat generation.

Transmission Fluid Temperature Sensor Circuit Low Input will set a DTC P0712 and the PCM will command the following default actions:

- DTC P0712 will be stored in PCM history.
- Freeze shift adapts.
- Transaxle will assume a default temperature.

Transmission Fluid Temperature Sensor Circuit High Input will set a DTC P0713 and the PCM will command the following default actions:

- DTC P0713 will be stored in PCM history.
- Freeze shift adapts.
- Transaxle will assume a default temperature.

Transmission Fluid Over Temperature will set a DTC P1812 and the PCM will command the following default actions:

- DTC P1812 will be stored in PCM history.
- Freeze shift adapts.

**TRANSAXLE SENSOR – TEMPERATURE TO RESISTANCE TO VOLTAGE (approximate)**

| °C | R low (ohms) | R high (ohms) |
|---|---|---|
| 0 | 7987 | 10859 |
| 10 | 4934 | 6407 |
| 20 | 3106 | 3923 |
| 30 | 1991 | 2483 |
| 40 | 1307 | 1611 |
| 50 | 878 | 1067 |
| 60 | 605 | 728 |
| 70 | 425 | 507 |
| 80 | 304 | 359 |
| 90 | 221 | 259 |
| 100 | 163 | 190 |

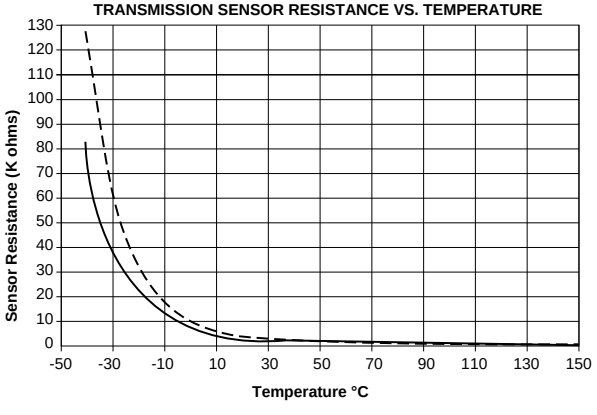



Figure 44

# OPERATING CONDITIONS

## RANGE REFERENCE CHART

| | | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **RANGE** | **GEAR** | **SHIFT "A" SOL** | **SHIFT "B" SOL** | **2ND CLUTCH** | **2ND ROLLER CLUTCH** | **INT/4TH BAND** | **REVERSE CLUTCH** | **COAST CLUTCH** | **INPUT SPRAG** | **DIRECT CLUTCH** | **FORWARD CLUTCH** | **LO/REV. BAND** | **LO ROLLER CLUTCH** |
| **PARK** | N | ON | OFF | | | | | | HOLDING* | | | APPLIED | |
| **REV** | R | ON | OFF | | | | APPLIED | | | | | APPLIED | |
| **NEU** | N | ON | OFF | | | | | | HOLDING* | | | APPLIED | |
| (D) | 1st | ON | OFF | | | | | | HOLDING | | APPLIED | | HOLDING |
| | 2nd | OFF | OFF | APPLIED | HOLDING | | | | HOLDING | | APPLIED | | OVER-RUNNING |
| | 3rd | OFF | ON | APPLIED* | OVER-RUNNING | | | | HOLDING | APPLIED | APPLIED | | OVER-RUNNING |
| | 4th | ON | ON | APPLIED* | | APPLIED | | | OVER-RUNNING | APPLIED | APPLIED* | | OVER-RUNNING |
| 3 | 1st | ON | OFF | | | | | APPLIED | HOLDING | | APPLIED | | HOLDING |
| | 2nd | OFF | OFF | APPLIED | HOLDING | | | APPLIED | HOLDING | | APPLIED | | OVER-RUNNING |
| | 3rd | OFF | ON | APPLIED* | OVER-RUNNING | | | APPLIED | HOLDING | APPLIED | APPLIED | | OVER-RUNNING |
| 2 | 1st | ON | OFF | | | | | APPLIED | HOLDING | | APPLIED | | HOLDING |
| | 2nd | OFF | OFF | APPLIED | HOLDING | APPLIED | | APPLIED | HOLDING | | APPLIED | | OVER-RUNNING |
| | 3rd** | OFF | ON | APPLIED* | OVER-RUNNING | | | APPLIED | HOLDING | APPLIED | APPLIED | | OVER-RUNNING |
| 1 | 1st | ON | OFF | | | | | APPLIED | HOLDING | | APPLIED | APPLIED | HOLDING |
| | 2nd*** | OFF | OFF | APPLIED | HOLDING | APPLIED | | APPLIED | HOLDING | | APPLIED | | OVER-RUNNING |
| | 3rd** | OFF | ON | APPLIED* | OVER-RUNNING | | | APPLIED | HOLDING | APPLIED | APPLIED | | OVER-RUNNING |

ON = SOLENOID ENERGIZED
OFF = SOLENOID DE-ENERGIZED
* = APPLIED WITH NO LOAD.
** = MANUAL FIRST AND SECOND – THIRD GEAR IS ONLY AVAILABLE ABOVE APPROXIMATELY 100 km/h (62 mph).
*** = MANUAL FIRST – SECOND GEAR IS ONLY AVAILABLE ABOVE APPROXIMATELY 60 km/h (37 mph).
NOTE: MANUAL FIRST – THIRD GEAR IS ALSO POSSIBLE AT HIGH VEHICLE SPEED AS A SAFETY FEATURE.

EXPECTED OPERATING CONDITION IF COMPONENT IN COLUMN NUMBER IS INOPERATIVE:

| COLUMN # | CONDITION |
|---|---|
| 1 | NO 2ND GEAR IN (D) OR 3 RANGE. |
| 2 | NO 2ND GEAR IN (D) OR 3 RANGE. |
| 4 | NO REVERSE GEAR – ALL DRIVE RANGES OK. |
| 7 | NO 3RD OR 4TH GEAR. |
| 3 | NO 4TH GEAR OR MANUAL 2ND ENGINE BRAKING. |
| 6 | NO 1ST, 2ND OR 3RD GEAR.<br>MAY SLIP IN MANUAL RANGES UNDER MODERATE TO HEAVY ACCELERATION. |
| 8 | NO DRIVE IN ANY FORWARD RANGES - 1ST, 2ND OR 3RD GEAR.<br>MAY SLIP IN 1 RANGE - 1ST GEAR UNDER UNDER MODERATE TO HEAVY ACCELERATION. |
| 5 | NO ENGINE BRAKING IN MANUAL 1ST, MANUAL 2ND, MANUAL 3RD. |
| 9 | NO REVERSE – NO ENGINE BRAKING IN MANUAL 1ST. |
| 10 | NO DRIVE IN (D), 3 OR 2. |



Figure 75

# OVERDRIVE RANGE - FOURTH GEAR
## (Torque Converter Clutch Applied)

### NO FOURTH GEAR/SLIPS IN FOURTH

- **Intermediate / 4th Band & Servo**
  - No apply / slipping.
  - Servo Piston (77) – Broken, binding.
  - Servo Piston Seals (78, 79) – Leaking.
  - Servo Pin (76) and Springs (75, 68) – Binding, broken.
  - Servo Cover (80) – Broken, loose, leaking.
  - Band (100) – Broken, worn, out of position.
  - Case (51) – Cracked at band seat.
- **Band Apply Fluid Routing**
  - Valve Body, Gaskets & Spacer Plate; Channel Plate; Case – Porosity, misaligned, loose, fluid restriction, fluid leak across channels.
- **1-2 Shift Solenoid (305)**
  - Stuck “OFF”, leaking.
- **3-4 Shift Valve (319)**
  - Stuck in downshifted position.
- **Manual Valve (800)**
  - Misaligned (in Manual Third).
- **3-4 Accumulator**
  - Leak at piston seal.
  - Channel plate / case porosity.
- **3-4 Accumulator Valve (323)**
  - Stuck.
- **Line Pressure**
  - Low (See PARK page 82A).
- **Direct Clutch**
  - Low capacity will cause failure in Fourth gear.
- **PSA**
  - Malfunction (Hydraulic or Electrical)

### HARSH SHIFT

- **Line Pressure**
  - High (See PARK page 82A).
- **Accumulator**
  - Spring broken or piston binding; no accumulation
  - Accumulator valve stuck.

### NO TCC APPLY OR RELEASE

- **See 4-3 downshift page 96A.**

| SHIFT "A" SOL | SHIFT "B" SOL | 2ND CLUTCH | 2ND ROLLER CLUTCH | INT/4TH BAND | REVERSE CLUTCH | COAST CLUTCH | INPUT SPRAG | DIRECT CLUTCH | FORWARD CLUTCH | LO/REV. BAND | LO ROLLER CLUTCH |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ON | ON | APPLIED | | APPLIED | | | OVER-RUNNING | APPLIED | APPLIED + | | OVER-RUNNING |

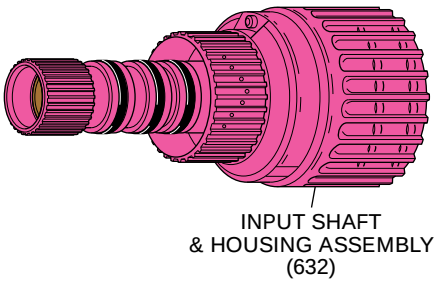
**3RD CLUTCH:**
The 3rd clutch assembly (639-649), located inside the input shaft & housing assembly (632), is applied or "ON" during Third and Fourth Gear Ranges as well as Manual Third and Manual First Gear Ranges.

**3RD CLUTCH APPLY:**
To apply the 3rd clutch, 3rd clutch/lo-1st fluid is fed through the driven sprocket support (609) and into the input shaft & housing assembly (632). A feed hole in the input shaft allows 3rd clutch/lo-1st fluid to enter between the 3rd clutch piston housing (639) and 3rd clutch piston & seal assembly (642). Fluid pressure seats the retainer & ball assembly and moves the piston to compress the 3rd clutch spring guide & retainer (643). The piston continues to move until it contacts and holds the 3rd clutch (waved) plate (645) and 3rd clutch plate assemblies (646-647) against the backing plate (648). The 3rd clutch (waved) plate (645) is used to cushion the apply of the 3rd clutch.

When fully applied, the 3rd clutch provides the power to the gear sets (672 & 675) through: the 3rd clutch (waved) plate (645) and external teeth on the 3rd clutch plate assemblies (646) splined into the input shaft & housing assembly (632); and, the internal teeth on the 3rd clutch plate assemblies (647) splined to the 3rd sprag clutch (outer) race (653).

**3RD CLUTCH RELEASE:**
To release the 3rd clutch assembly (639-649), 3rd clutch/lo-1st fluid pressure exhausts through the apply passages in the input shaft & housing assembly (632) and driven sprocket support (609). In the absence of fluid pressure, the 3rd clutch spring guide & retainer (643) moves the 3rd clutch piston & seal assembly (642) and releases the 3rd clutch (waved) plate (645) and 3rd clutch plate assemblies (646-647) from contact with the backing plate (648).

During the release of the 3rd clutch/lo-1st fluid, the retainer & ball assembly, located in the 3rd clutch piston & seal assembly (642), unseats. Centrifugal force, resulting from the rotation of the 3rd clutch piston & seal assembly (642), unseats the checkball and forces residual 3rd clutch/lo-1st fluid through the unseated retainer & ball assembly. If this fluid did not completely exhaust from behind the piston, there could be a partial apply, or drag, of the 3rd clutch plates.



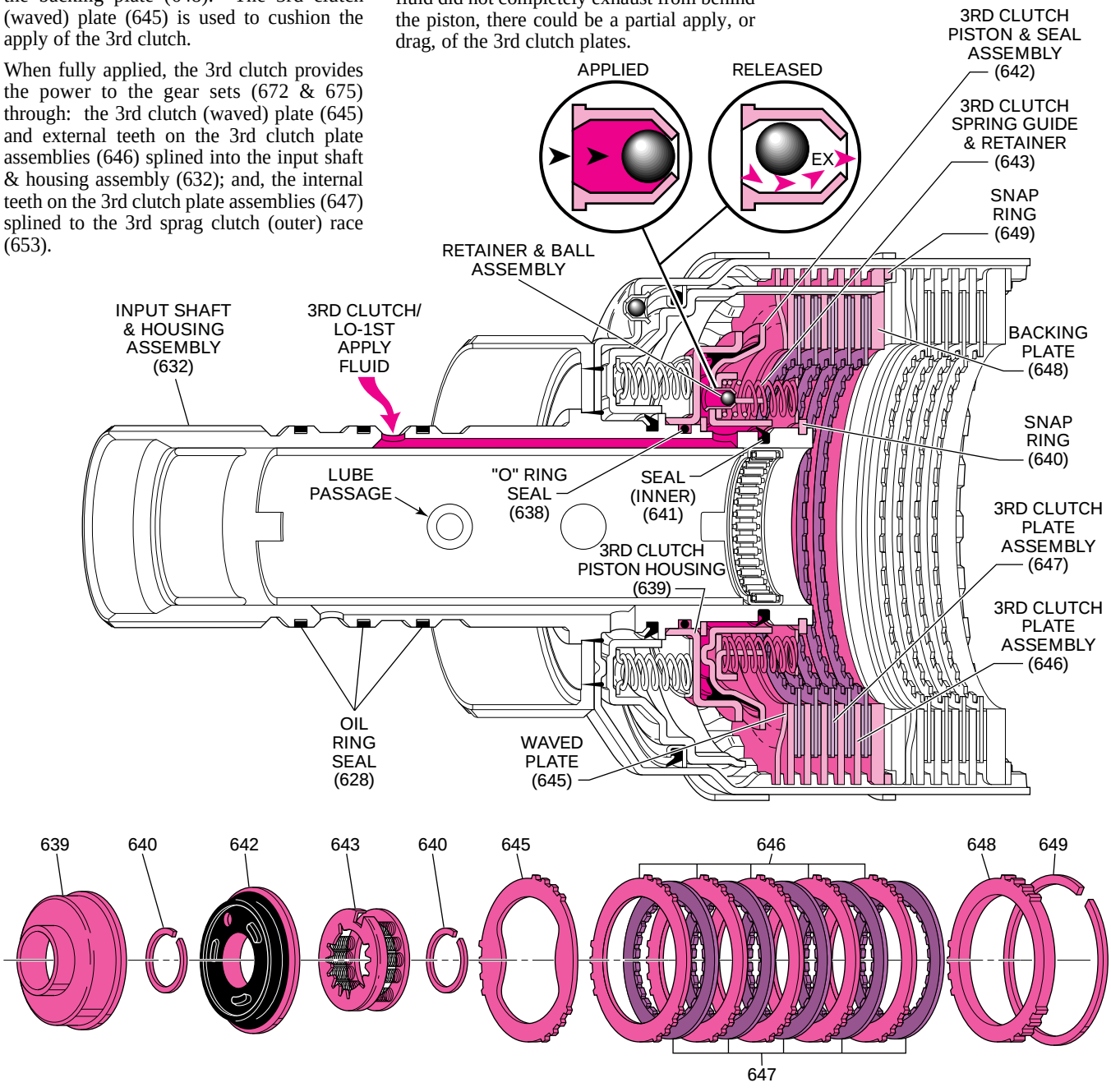




Figure 20

# NEUTRAL

## Engine Running

When the gear selector lever is moved to Neutral (N), the hydraulic system operates in the same manner as it does in Park (P) range. If Neutral (N) is selected after the vehicle was operating in Reverse (R), the following changes in the hydraulic system would occur:

- An exhaust port opens at the manual valve (404) allowing fluid in the reverse circuit to exhaust
- Force from the reverse servo return spring (49) releases the reverse band (615) forcing reverse servo fluid back to the #5 checkball (372)
- The #5 checkball (372) is forced off its seat allowing reverse servo fluid to enter the reverse fluid passage
- Reverse fluid is then sent to the manual valve (404) where it exhausts.

COMPLETE HYDRAULIC CIRCUIT
Page 80



NEUTRAL

Engine Running

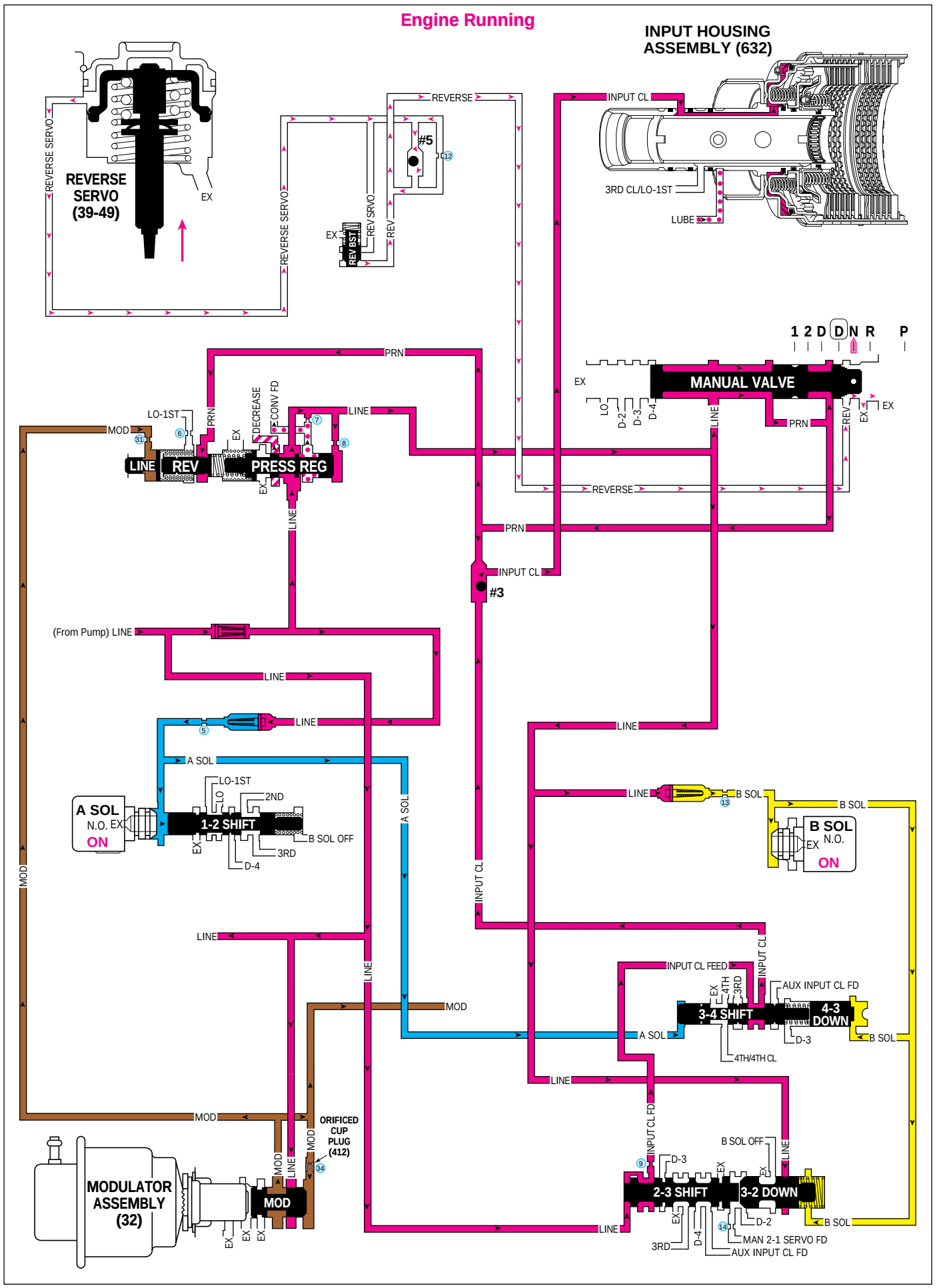



Figure 52

# REVERSE

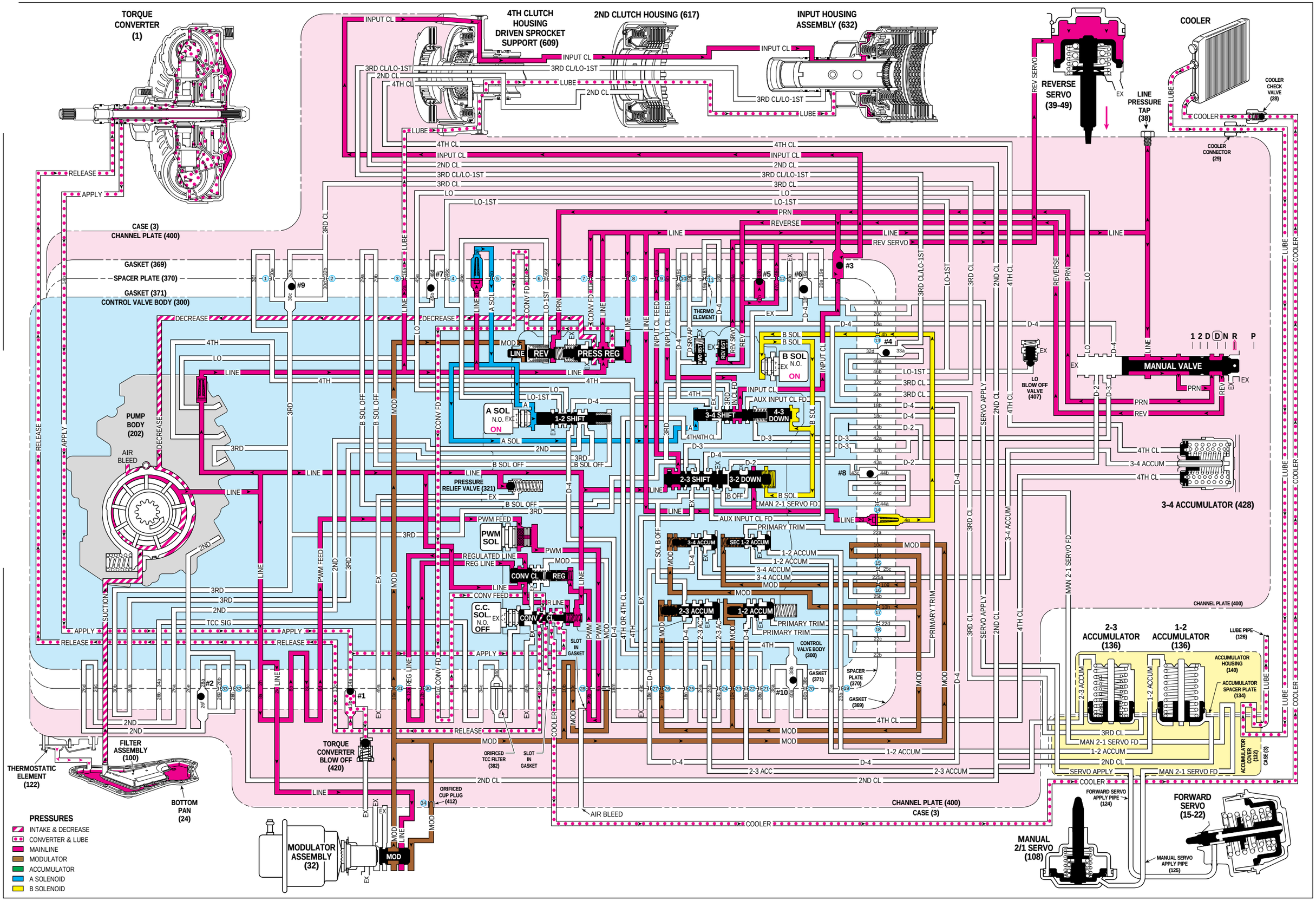
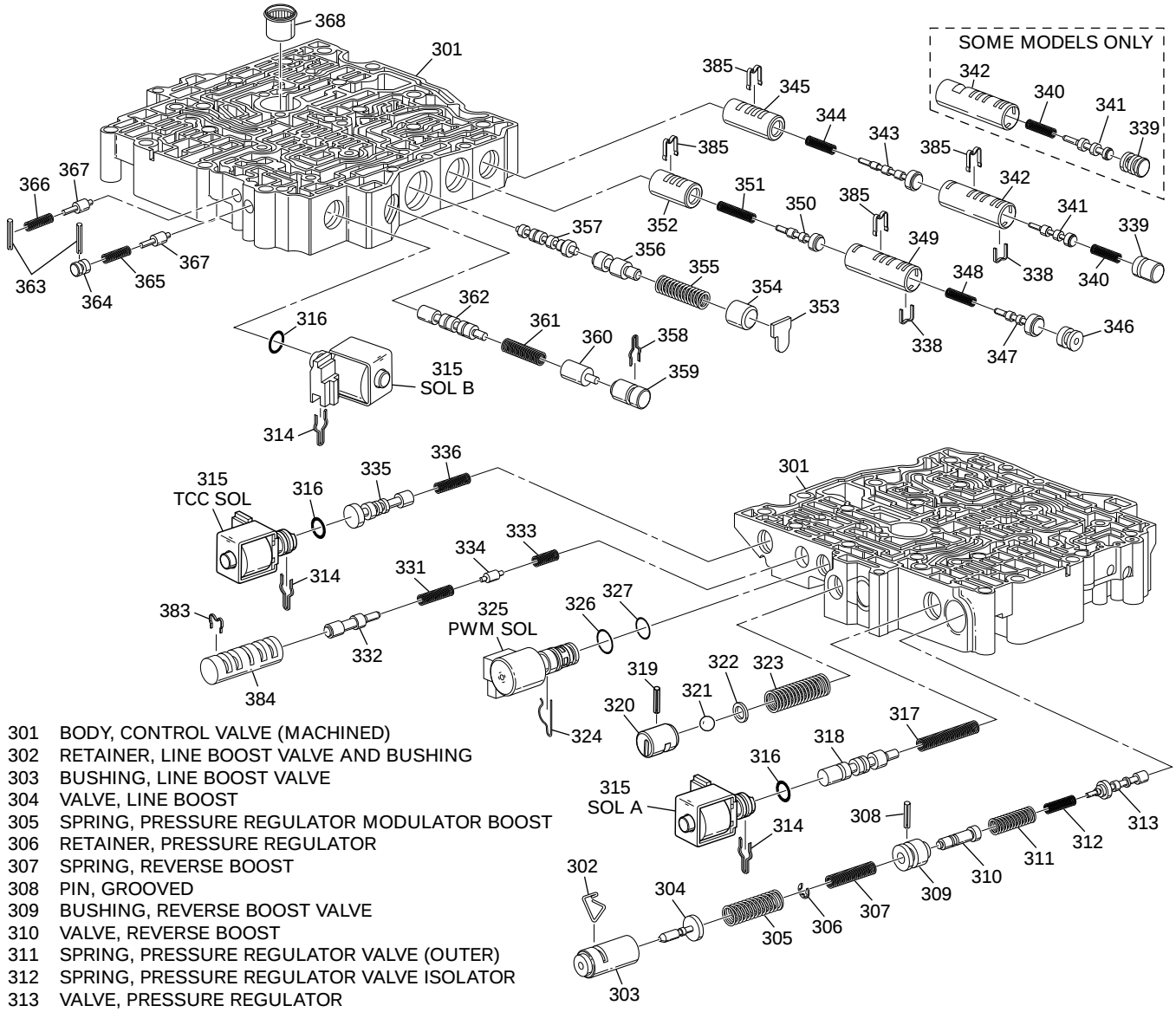



Figure 75

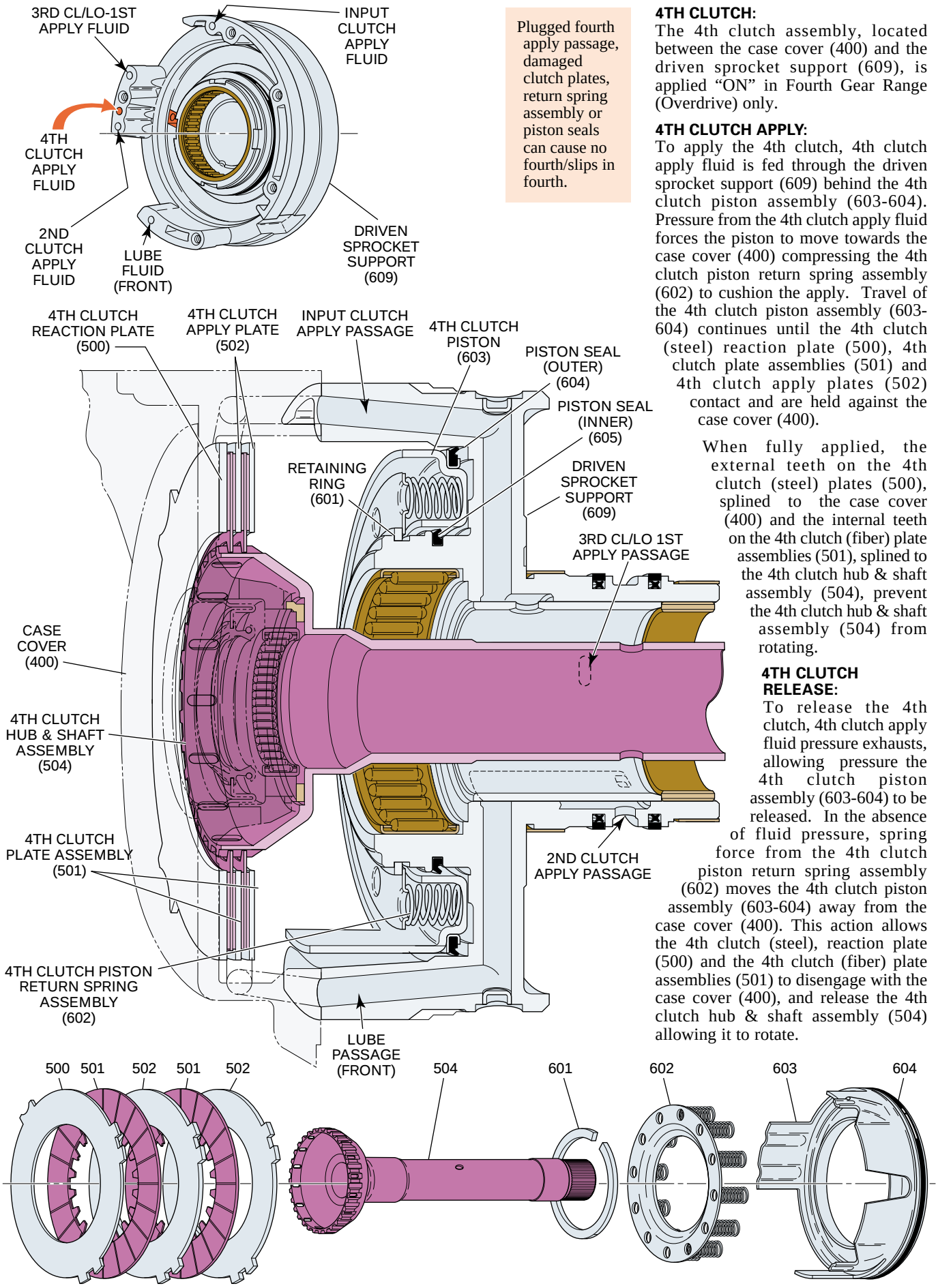
# CONTROL VALVE BODY ASSEMBLY




301 BODY, CONTROL VALVE (MACHINED)
302 RETAINER, LINE BOOST VALVE AND BUSHING
303 BUSHING, LINE BOOST VALVE
304 VALVE, LINE BOOST
305 SPRING, PRESSURE REGULATOR MODULATOR BOOST
306 RETAINER, PRESSURE REGULATOR
307 SPRING, REVERSE BOOST
308 PIN, GROOVED
309 BUSHING, REVERSE BOOST VALVE
310 VALVE, REVERSE BOOST
311 SPRING, PRESSURE REGULATOR VALVE (OUTER)
312 SPRING, PRESSURE REGULATOR VALVE ISOLATOR
313 VALVE, PRESSURE REGULATOR
314 RETAINER, SPRING CLIP
315 SOLENOID ASSEMBLY
316 SEAL, O-RING
317 SPRING, 1-2 SHIFT VALVE
318 VALVE, 1-2 SHIFT
319 PIN, COILED SPRING
320 BUSHING, PUMP PRESSURE RELIEF
321 BALL, 0.375 DIA.
322 SEAT, SPRING
323 SPRING, PUMP PRESSURE RELIEF
324 RETAINER, SOLENOID (3-4 SHIFT)
325 SOLENOID ASSEMBLY, PWM
326 O-RING, PWM SOLENOID
327 O-RING, PWM SOLENOID
331 SPRING, ISOLATOR
332 VALVE, CONVERTER CLUTCH REGULATOR
333 SPRING, CONVERTER CLUTCH REGULATOR
334 VALVE, ISOLATOR
335 VALVE, CONVERTER CLUTCH
336 SPRING, CONVERTER CLUTCH
338 RETAINER, 1-2 ACCUMULATOR PLUG (PRIMARY AND SECONDARY)
339 PLUG, 1-2 ACCUMULATOR (PRIMARY)
340 SPRING, 1-2 ACCUMULATOR VALVE (PRIMARY)
341 VALVE, 1-2 ACCUMULATOR
342 BUSHING, 1-2 ACCUMULATOR VALVE (PRIMARY)
343 VALVE, 2-3 ACCUMULATOR
344 SPRING, 2-3 ACCUMULATOR VALVE
345 BUSHING, 2-3 ACCUMULATOR VALVE
346 PLUG, 1-2 ACCUMULATOR (SECONDARY)
347 VALVE, 1-2 ACCUMULATOR (SECONDARY)
348 SPRING, 1-2 ACCUMULATOR VALVE (SECONDARY)
349 BUSHING, 1-2 ACCUMULATOR (SECONDARY)
350 VALVE, 3-4 ACCUMULATOR
351 SPRING, 3-4 ACCUMULATOR VALVE
352 BUSHING, 3-4 ACCUMULATOR VALVE
353 RETAINER, 2-3 SHIFT
354 PLUG, BORE (2-3 SHIFT)
355 SPRING, 3-2 DOWNSHIFT VALVE
356 VALVE, 3-2 MANUAL DOWNSHIFT
357 VALVE, 2-3 SHIFT
358 RETAINER, SPRING CLIP
359 PLUG, BORE (3-4 SHIFT)
360 VALVE, 4-3 MANUAL DOWNSHIFT
361 SPRING, 4-3 MANUAL DOWNSHIFT
362 VALVE, 3-4 SHIFT
363 PIN, COILED SPRING
364 PLUG, BORE (REVERSE BOOST)
365 SPRING, SERVO BOOST VALVE (REVERSE)
366 SPRING, SERVO BOOST VALVE (FORWARD)
367 VALVE, SERVO BOOST (FORWARD AND REVERSE)
368 BEARING AND SLEEVE, OIL PUMP DRIVE
383 RETAINER, CONVERTER CLUTCH REGULATOR
384 BUSHING, CONVERTER CLUTCH REGULATOR
385 RETAINER, ACCUMULATOR BUSHING ASSEMBLY (2-3 AND 1-2 SECONDARY AND PRIMARY)

Figure 105

# APPLY COMPONENTS




Plugged fourth apply passage, damaged clutch plates, return spring assembly or piston seals can cause no fourth/slips in fourth.

**4TH CLUTCH:**
The 4th clutch assembly, located between the case cover (400) and the driven sprocket support (609), is applied "ON" in Fourth Gear Range (Overdrive) only.

**4TH CLUTCH APPLY:**
To apply the 4th clutch, 4th clutch apply fluid is fed through the driven sprocket support (609) behind the 4th clutch piston assembly (603-604). Pressure from the 4th clutch apply fluid forces the piston to move towards the case cover (400) compressing the 4th clutch piston return spring assembly (602) to cushion the apply. Travel of the 4th clutch piston assembly (603-604) continues until the 4th clutch (steel) reaction plate (500), 4th clutch plate assemblies (501) and 4th clutch apply plates (502) contact and are held against the case cover (400).

When fully applied, the external teeth on the 4th clutch (steel) plates (500), splined to the case cover (400) and the internal teeth on the 4th clutch (fiber) plate assemblies (501), splined to the 4th clutch hub & shaft assembly (504), prevent the 4th clutch hub & shaft assembly (504) from rotating.

**4TH CLUTCH RELEASE:**
To release the 4th clutch, 4th clutch apply fluid pressure exhausts, allowing pressure the 4th clutch piston assembly (603-604) to be released. In the absence of fluid pressure, spring force from the 4th clutch piston return spring assembly (602) moves the 4th clutch piston assembly (603-604) away from the case cover (400). This action allows the 4th clutch (steel), reaction plate (500) and the 4th clutch (fiber) plate assemblies (501) to disengage with the case cover (400), and release the 4th clutch hub & shaft assembly (504) allowing it to rotate.

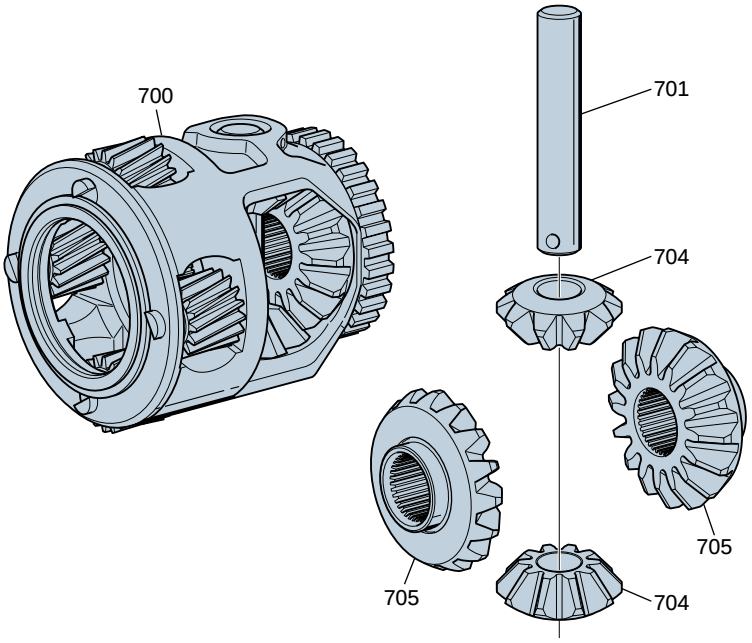
Figure 17

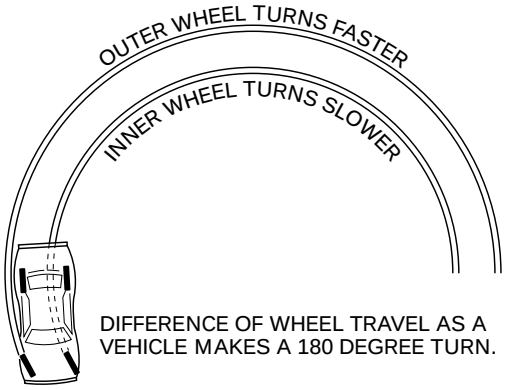
# DIFFERENTIAL COMPONENTS

**DIFFERENTIAL CARRIER ASSEMBLY:**
The (final drive) differential carrier assembly (700) provides the means for allowing one driving wheel to travel faster than the other when the vehicle is going around corners or curves. (The wheel on the outside of the curve has to turn faster.) The differential carrier assembly (700) consists of: a differential and final drive carrier assembly; four bevelled gears; and, a differential pinion shaft (701). Two bevelled gears, the differential side gears (705), are splined to the axle shafts (the left hand axle shaft is splined to the output shaft (510) which connects with the side gear). The other two bevelled gears, the differential pinion gears (704), act as idlers to transfer the power from the differential carrier (700) to the differential side gears (705). The differential pinion gears (704) also balance the power load between the differential side gears (705) while allowing unequal axle rotation speeds when the vehicle is in a curve.

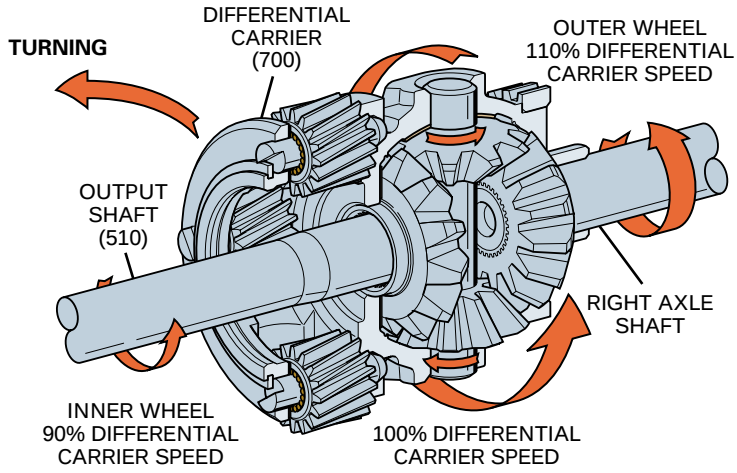
A noise condition, usually a hum (under light throttle or turns), will be associated with a final drive/differential condition.

Final drive/differential failure can cause loss of drive.

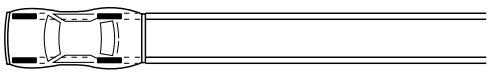



DIFFERENCE OF WHEEL TRAVEL AS A VEHICLE MAKES A 180 DEGREE TURN.




When the vehicle is driven in a straight line, the differential pinion gears (704), differential side gears (705) and differential carrier (700) rotate as a fixed unit. The end result is both axle shafts rotate in the same direction as engine rotation for all forward gear ranges.



BOTH WHEELS TURNING AT SAME SPEED

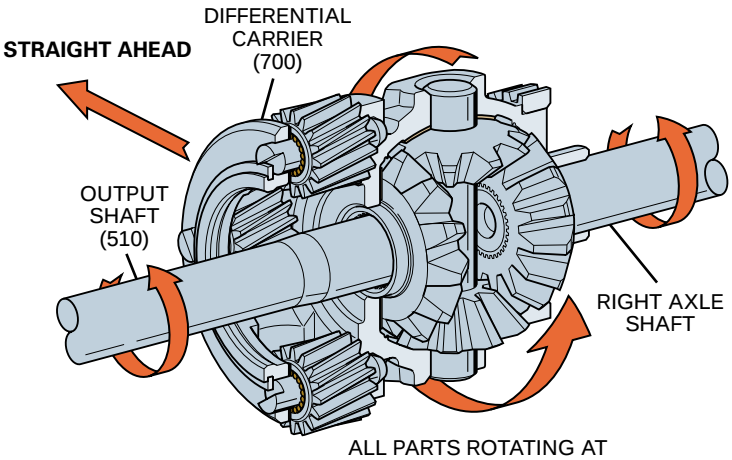



Figure 31

# ELECTRICAL COMPONENTS

The Hydra-matic 4T65-E transaxle incorporates electronic controls that utilize a Powertrain Control Module (PCM). The PCM gathers vehicle operating information from a variety of sensors and control components located throughout the powertrain (engine and transaxle). The PCM then processes this information for proper control of the following:

- transaxle shift points - through the use of shift solenoids
- transaxle shift feel - by adjusting line pressure through the use of a pressure control solenoid
- Torque converter clutch (TCC) apply and release feel - through the use of a TCC control solenoid

Electronic control of these transaxle operating characteristics provides for consistent and precise shift points based on the operating conditions of both the engine and transaxle.

## FAIL-SAFE MODE

"Fail-safe mode" is an operating condition where the transaxle will partially function if a portion of the electronic control system becomes disabled. For example, if the wiring harness becomes disconnected, the PCM commands the fail-safe mode causing some transaxle electrical components to "default" to OFF. While the transaxle is operating in the fail-safe mode example given, the following operating changes occur:

- the pressure control solenoid is OFF, allowing line pressure to increase to its maximum pressure in order to prevent clutch or band slippage
- the TCC control solenoid is OFF, preventing TCC apply
- the shift solenoids are OFF, allowing the vehicle to be driven in third gear.

When both shift solenoids are OFF, the transaxle will operate in third gear regardless of the forward gear selected (i.e. Overdrive, 3, 2, or 1). However, the transaxle will operate in Reverse, if selected, as well as Park and Neutral. (The fail-safe mode described above is only one of the operating modes associated with this transaxle. Refer to the appropriate Service Repair Manual when diagnosing these conditions.)

*NOTE: This section of the book contains "general" information about electrical components that provide input information to the PCM. Since this "input" information may vary from carline to carline, it is important that the appropriate General Motors Service Manual is used during repair or diagnosis of this transaxle.*

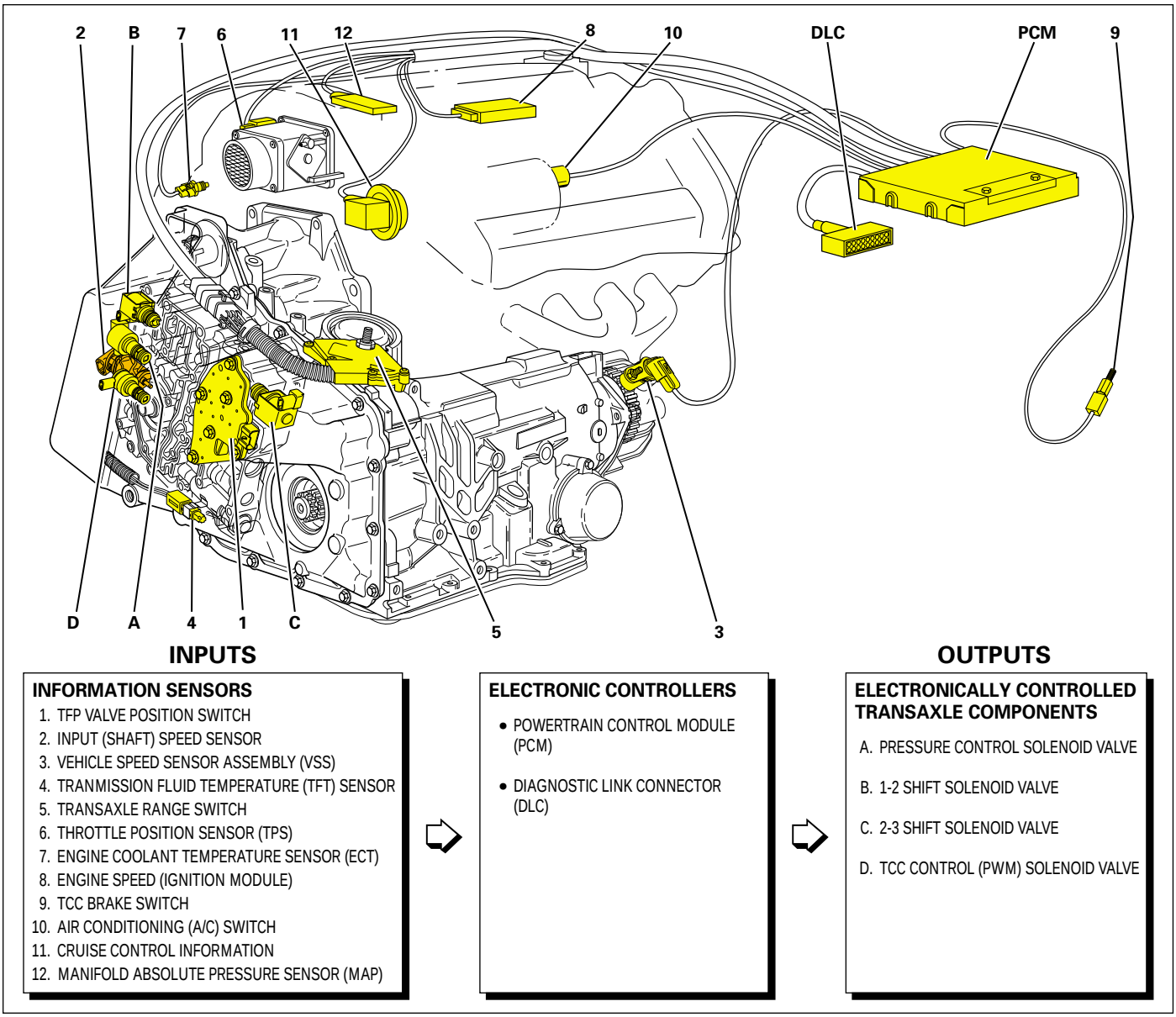
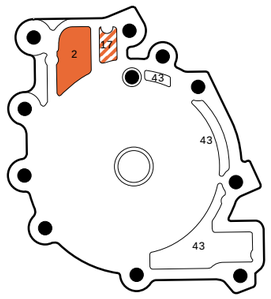
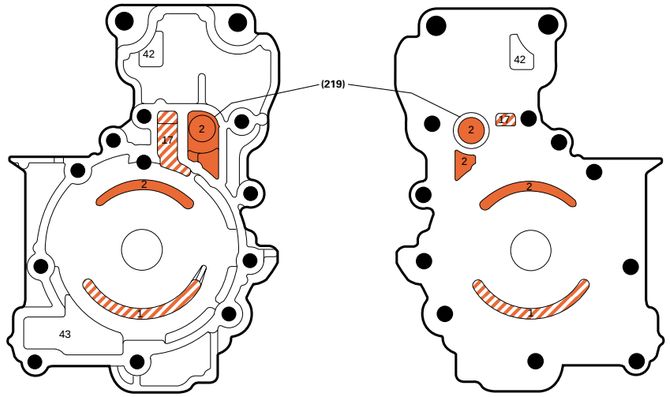



Figure 42

# NEUTRAL (Engine Running)

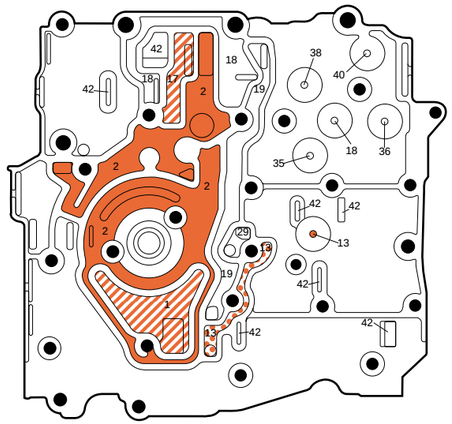


PUMP COVER (201)
(Oil Pump Body Side)

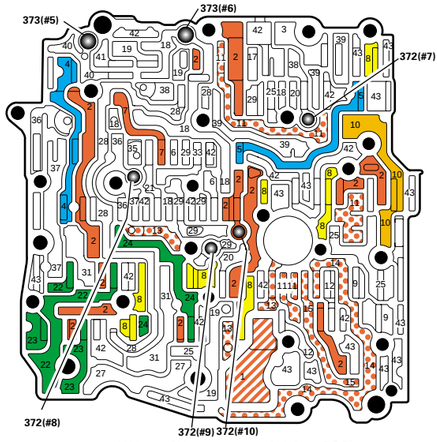



OIL PUMP BODY (202)
(Pump Cover Side)

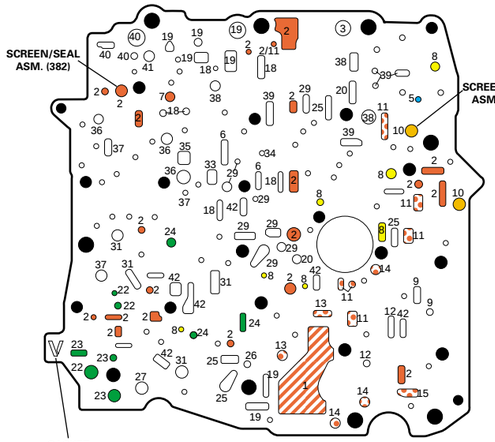
OIL PUMP BODY (202)
(Control Valve Body Side)



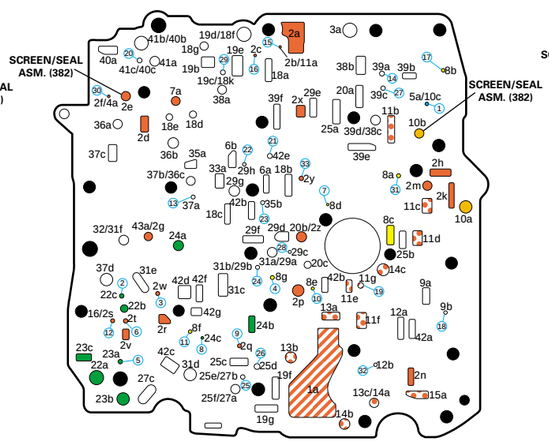
CONTROL VALVE BODY (300)
(Oil Pump Body Side)



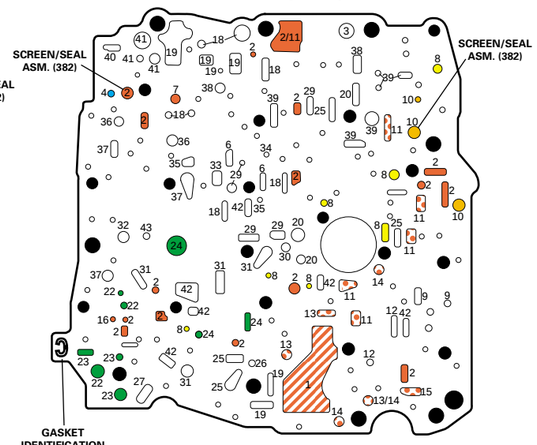

CONTROL VALVE BODY (300)
(Case Cover Side)



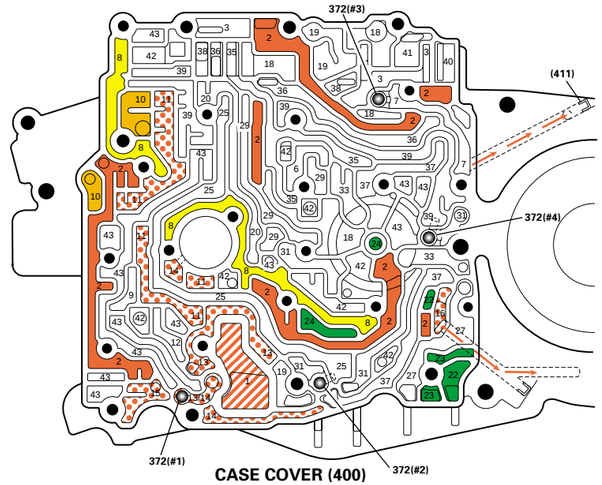

GASKET(371)
(Control Valve Body/Spacer Plate)




SPACER PLATE (370)



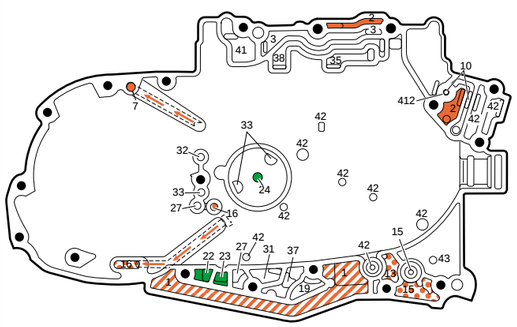

GASKET(369)
(Spacer Plate/Channel Plate)



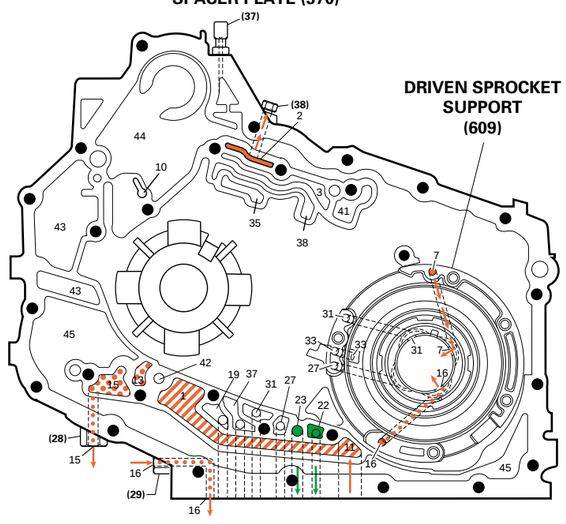

CASE COVER (400)
(Control Valve Body Side)

NOTE:

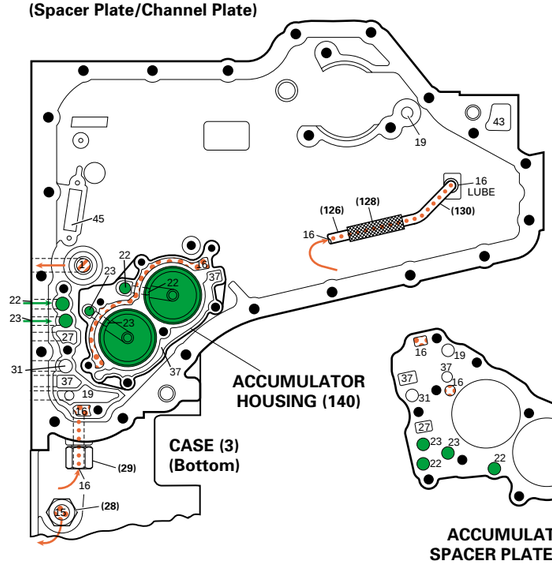
- ● INDICATES BOLT HOLES
- NON FUNCTIONAL HOLES HAVE BEEN REMOVED FROM COMPONENT DRAWINGS TO SIMPLIFY TRACING FLUID FLOW.
- DUAL PURPOSE PASSAGES HAVE CHANNEL PLATE SIDE NUMBERS LISTED FIRST
- EXHAUST FLUID NOT SHOWN



CASE COVER (400)
(Case Side)

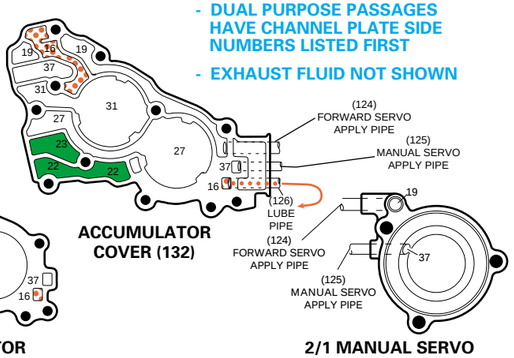



CASE (3)
(Case Cover Face)






ACCUMULATOR SPACER PLATE (134)




ACCUMULATOR COVER (132)

2/1 MANUAL SERVO BODY COVER (104)

Figure 82

FOLDOUT ➤ 87