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THM 4L30-E

*Updated
July, 2003*

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AUTOMATIC TRANSMISSION SERVICE GROUP

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INTRODUCTION

THM 4L30-E

*Updated
July, 2003*

This booklet contains the general description and the procedures necessary to repair, overhaul, or service the Hydra-matic 4L30-E transmission that is currently found in the Opel Omega, Opel Senator, BMW, and the Isuzu Trooper/Rodeo. This transmission is a completely electronic controlled, 4 speed, rear wheel drive unit.

Gear ratios are as follows:

	<i>Opel/BMW</i>	<i>Trooper/Rodeo</i>
<i>1st Gear</i>	<i>2.40</i>	<i>2.86</i>
<i>2nd Gear</i>	<i>1.48</i>	<i>1.62</i>
<i>3rd Gear</i>	<i>1.00</i>	<i>1.00</i>
<i>4th Gear</i>	<i>0.72</i>	<i>0.72</i>
<i>Reverse</i>	<i>2.00</i>	<i>2.00</i>

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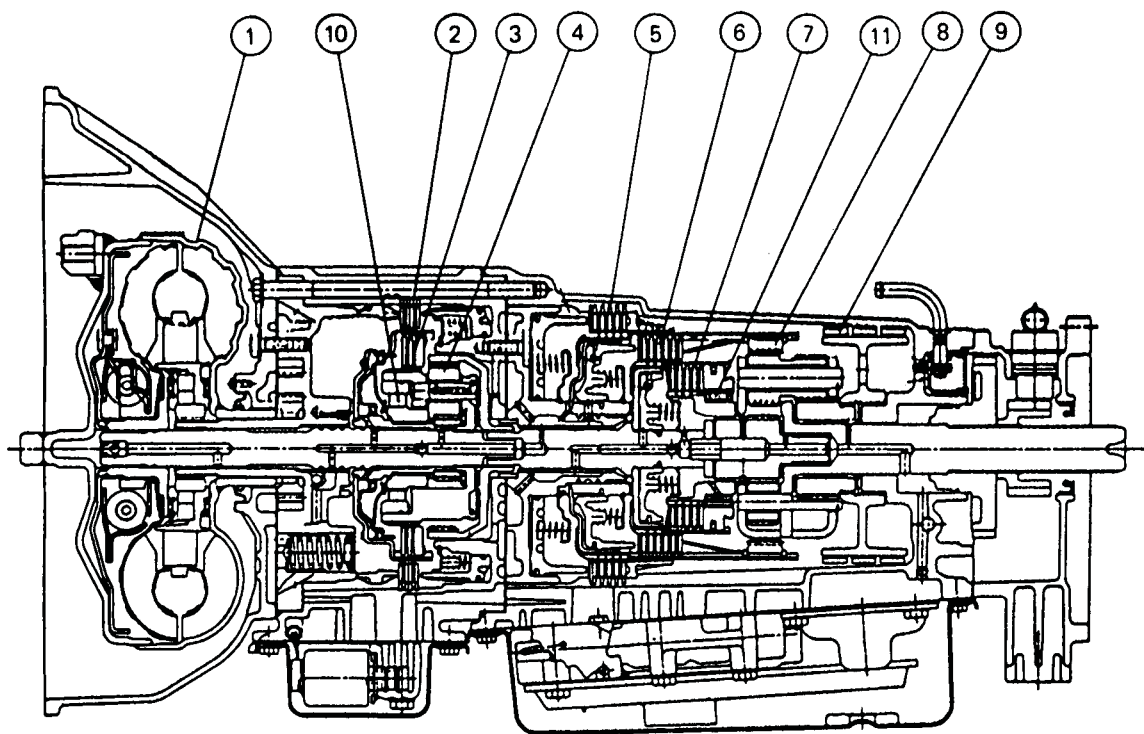


Technical Service Information

POWER FLOW CHART

RANGE	GEAR	OVERUN CLUTCH	1-2 BAND	2ND CLUTCH	3RD CLUTCH	4TH CLUTCH	REV CLUTCH	OVERUN ROLLER	LOW SPRAG	1-2/3-4 SOL	2-3 SOL
P/N		ON								OFF	ON
DRIVE	1ST	ON	ON					HOLD	HOLD	OFF	ON
	2ND	ON	ON	ON				HOLD		ON	ON
	3RD	ON		ON	ON			HOLD		ON	OFF
	4TH			ON	ON	ON				OFF	OFF
M/3	1ST	ON	ON					HOLD	HOLD	OFF	ON
	2ND	ON	ON	ON				HOLD		ON	ON
	3RD	ON		ON	ON			HOLD		ON	OFF
M/2	1ST	ON	ON					HOLD	HOLD	OFF	ON
	2ND	ON	ON	ON				HOLD		ON	ON
M/1	1ST	ON	ON		ON			HOLD	HOLD	OFF	ON
REV	---	ON					ON	HOLD	HOLD	OFF	ON

CROSS SECTION



- | | |
|----------------------------------|----------------------------------|
| 1. TORQUE CONVERTER CLUTCH (TCC) | 7. THIRD CLUTCH (C3) |
| 2. FOURTH CLUTCH (C4) | 8. RAVINGNEAUX PLANETARY GEARSET |
| 3. OVERRUN CLUTCH (OC) | 9. 1-2 BRAKE BAND (B) |
| 4. OVERDRIVE UNIT | 10. OVERRUN ROLLER CLUTCH (OFW) |
| 5. REVERSE CLUTCH (RC) | 11. LOW SPRAG (PFW) |
| 6. SECOND CLUTCH (C2) | |

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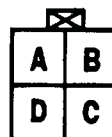
1. SHIFT CONTROL

The transmission is shifted according to the shift pattern selected by the driver. The Mode Switch (Located on Transmission Case) senses the selector lever position and relays this information to the TCM (Transmission Control Module).

The shift pattern is controlled electronically with 2 shift solenoids, that are located on the main case valve body, and receive a 12V signal from the TCM. The TCM will vary shift speeds as it is constantly monitoring numerous electronic signals from various operational sensors. The 2 Shift Solenoids are, the 1-2/3-4 Shift Solenoid and the 2-3 Shift Solenoid, and the solenoid pattern is as follows:

GEAR \ SOLENOID	1-2 / 3-4 SHIFT SOLENOID	2-3 SHIFT SOLENOID
1ST GEAR	OFF	ON
2ND GEAR	ON	ON
3RD GEAR	ON	OFF
4TH GEAR	OFF	OFF

VIEW LOOKING INTO CASE CONNECTOR



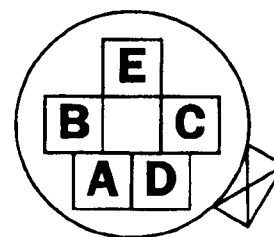
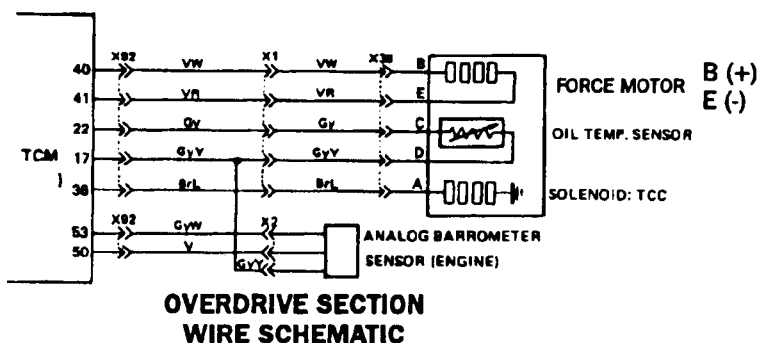
(C) 12 VOLTS FROM TCM

(A) GROUND TO 2-3 SOL. FROM TCM

(D) GROUND TO 1-2/3-4 SOL. FROM TCM

NOTE: 1-2/3-4 SHIFT SOLENOID (NORMALLY CLOSED)
ON = PRESSURE TO SHIFT VALVE

2-3 SHIFT SOLENOID (NORMALLY OPEN)
OFF = PRESSURE TO SHIFT VALVE



VIEW LOOKING INTO CASE CONNECTOR

2. BAND APPLY CONTROL

Band apply is controlled by another solenoid called the Band Apply Solenoid, located on the main case valve body, and is PWM (Pulse Width Modulated) to control garage shift feel and 3-2 downshift feel, and is also controlled by a PWM signal from the TCM, based primarily on TPS and VSS input signals.

3. CONVERTER CLUTCH CONTROL

The torque converter clutch apply/release are controlled by the TCC Solenoid, located on the adapter case valve body, based on various operational sensors supplying information to the TCM. The TCM will send a 12V signal to the TCC Solenoid for converter clutch apply.

4. LINE PRESSURE CONTROL

Line pressure and shift feel are also controlled electronically with the "Force Motor" (Solenoid) located on the adapter case valve body. The Force Motor regulates throttle signal oil fed to the pressure regulator valve to regulate the line pressure for all throttle openings. The TCM uses a duty cycle or variable signal to the Force Motor, based primarily on TPS and VSS input signals.

5. FAIL-SAFE MODE ("LIMP HOME OPERATION")

If a system failure occurs which could affect safety, or damage the transmission under normal operating conditions, the diagnostic system detects the fault and the TCM cancels the ground signal to all shift solenoids on the main case valve body, and the transmission will be in fail-safe operation.

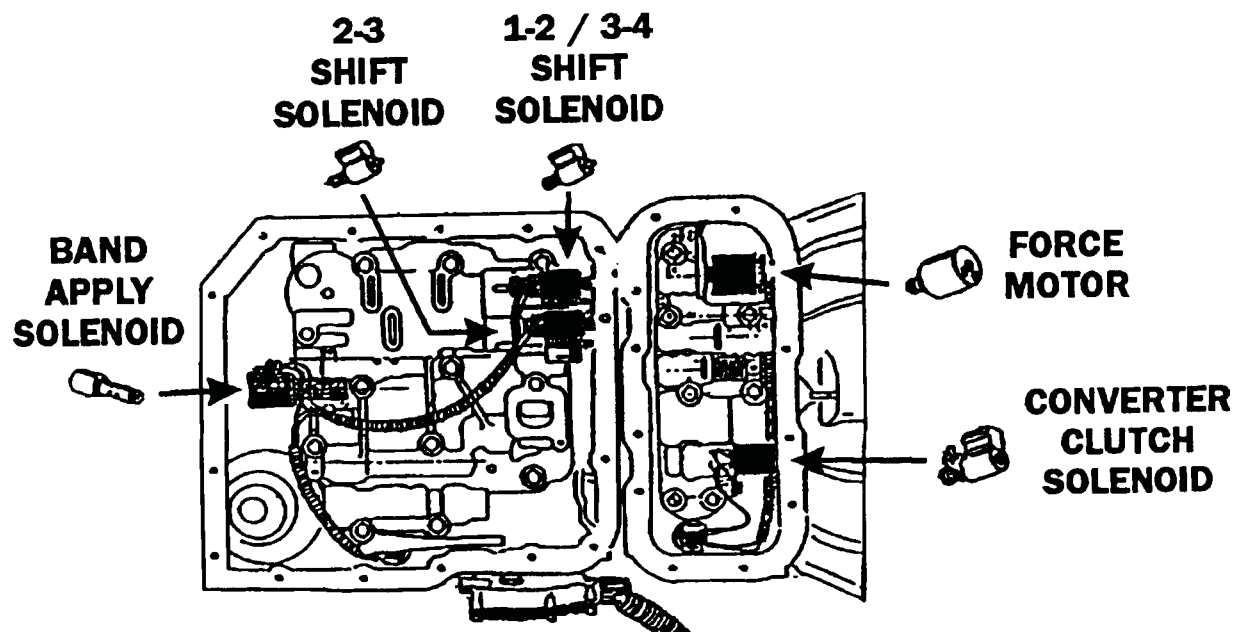
The "CHECK TRANS" light on the dash board display, flashes to alert the driver and the transmission performance is affected as follows:

<u>SELECTOR LEVER</u>	<u>RATIO SELECTED</u>
D	4TH
MANUAL 3	4TH
MANUAL 2	3RD
MANUAL 1	1ST

Shifts will also be much firmer as the voltage to the Force Motor will be reduced resulting in higher line pressure to protect the clutches and band. The fault should be corrected as soon as possible.

SOLENOID LOCATION

Temp Sensor is built into harness





Technical Service Information

7. SHIFT MODE CONTROL (PWR/ECO SWITCH)

1. Selecting the "Economy" drive mode (Power Lamp OFF) will signal the TCM to set normal shift pattern speeds.
2. Selecting the "Power" drive mode (Power Lamp ON) will signal the TCM to set shift pattern speeds higher than the economy mode.
3. However, the "Winter" switch (See Below) prevails over the PWR/ECO switch. The mode automatically resets to "Economy" mode when the winter switch is operated. The "Winter" drive mode is used exclusively for 3rd gear starts, and is operational ONLY in "D" range.

Mode type	SW		LAMP	
	PWR/ECO. SW	WINTER SW	POWER DRIVE LAMP	WINTER DRIVE LAMP
Economy drive mode	OFF	OFF	OFF	OFF
Power drive mode	ON	OFF	ON	OFF
Winter drive mode	ON/OFF	ON	OFF	ON

8. WINTER DRIVE CONTROL (WINTER SWITCH)

The "Winter" drive mode is used when the driver is on snow or ice and is used exclusively for 3rd gear starts. The "Winter" switch will operate when switched ON after the following conditions are satisfied.

1. The selector lever position is "D" range ONLY.
2. Vehicle speed is 6MPH or less.
3. Kickdown switch is OFF (Throttle Released).
4. Throttle opening is at the set value of 7% or less (Closed Throttle).
5. Transmission oil temperature is 248°F or less.

Cancellation of the "Winter" drive mode will occur when ANY of the following conditions are satisfied.

1. Turning off the "Winter" mode switch (Winter Lamp OFF).
2. Moving the selector lever to "P", "3", "2", or "1". Winter drive mode does not get canceled by "D", "N", or "R" manipulation.
3. The ignition key is turned OFF.
4. When vehicle speeds exceed 19 MPH, for 1 second or more.
5. When transmission oil temperature reaches 284°F, or above.

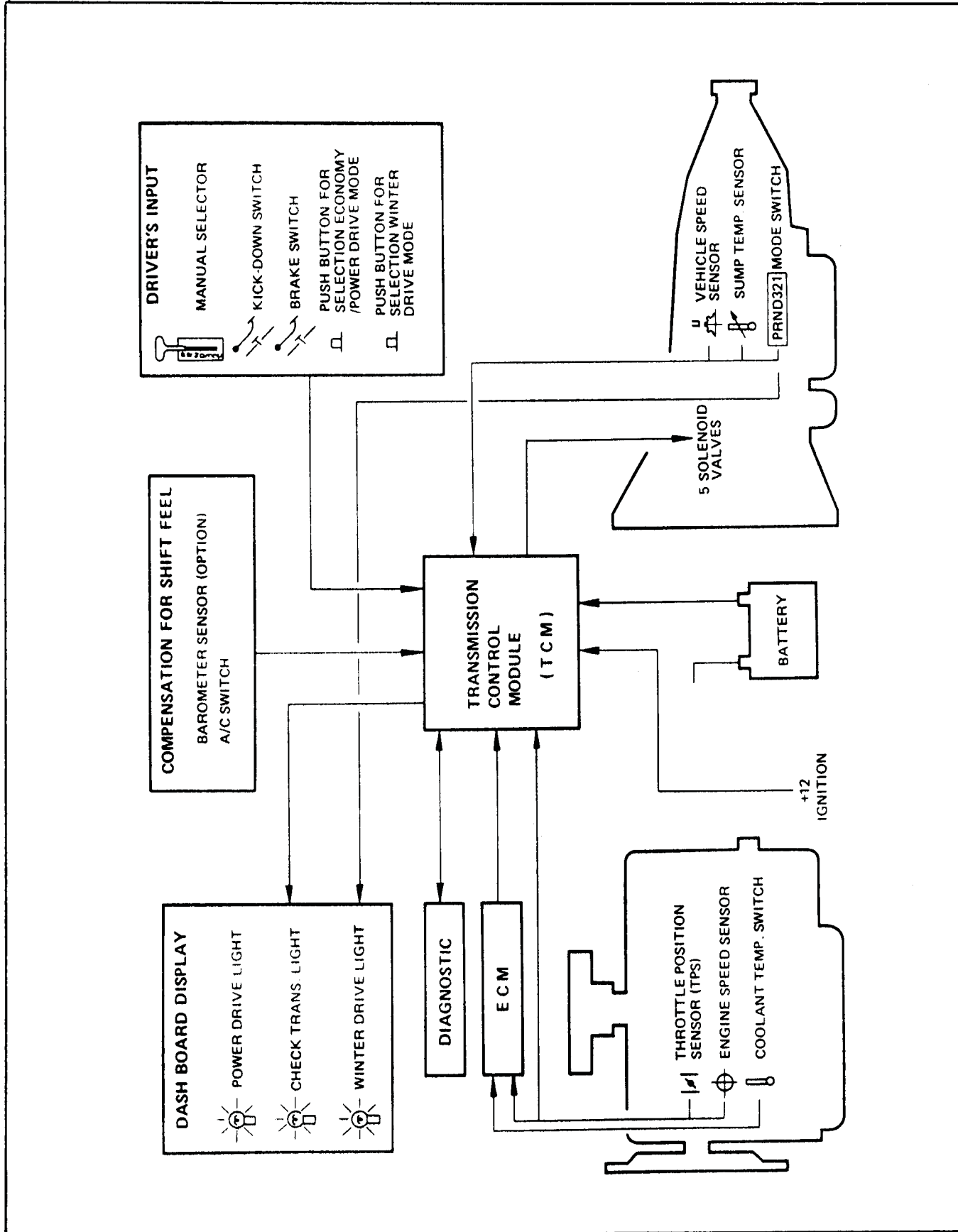


Figure 1

AUTOMATIC TRANSMISSION SERVICE GROUP

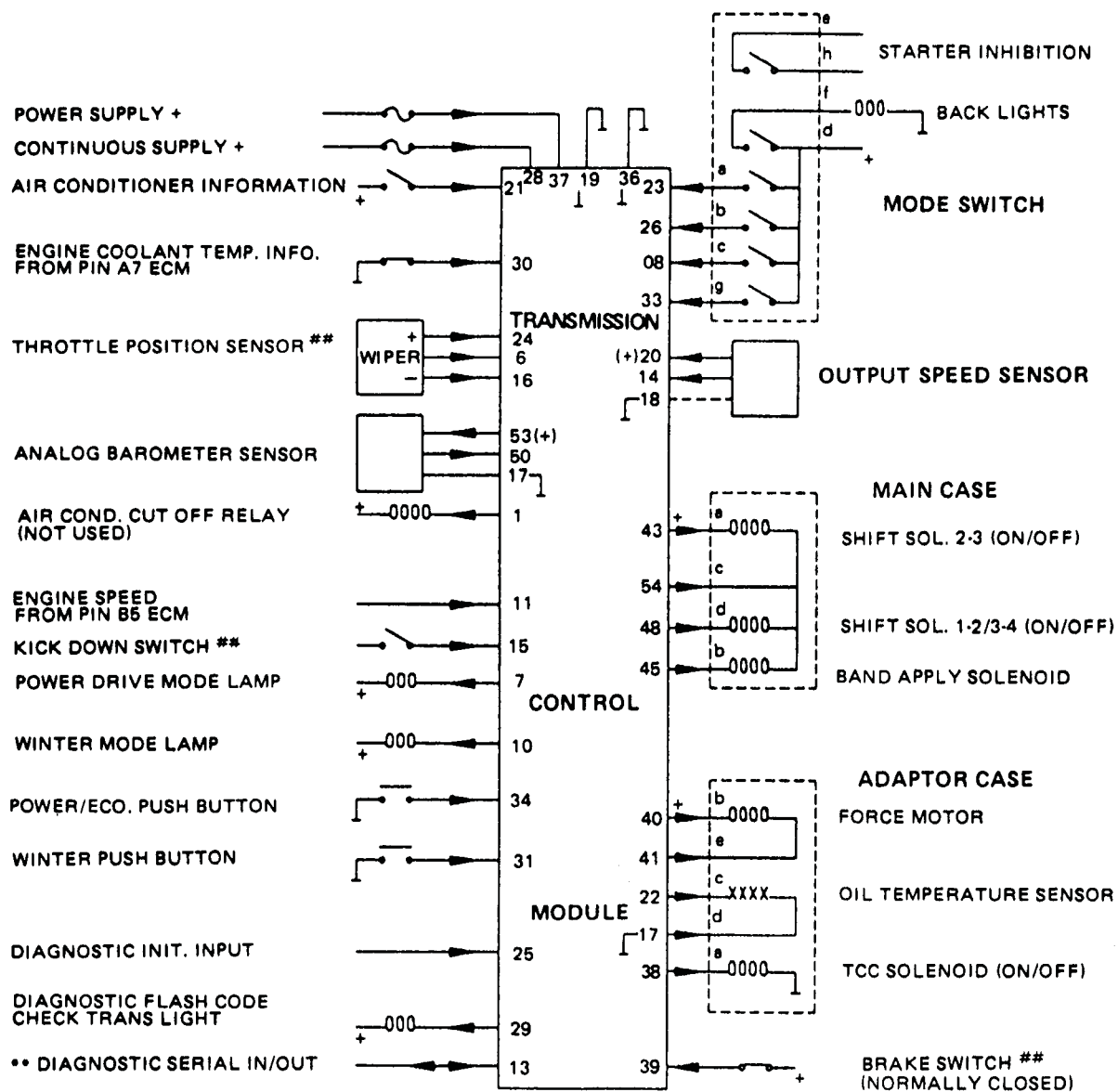
INPUT SIGNAL

Parts		Function
INPUT SIGNAL	Speed sensor (fixed to T/M)	Senses rotation of output shaft and feeds the data to TCM
	Throttle position sensor (fixed to engine)	Senses the extent of throttle valve opening and the speed of the throttle valve lever motion to open the valve and feeds the data to TCM (fed to ECM also)
	Brake SW (fixed to brake pedal)	Senses whether the driver has pressed the brake pedal or not and feeds the information to TCM.
	Kick-down SW (fixed to accelerator pedal)	Senses whether the driver has pushed the accelerator pedal fully or not and feeds the information to TCM.
	Mode SW (fixed to T/M)	Senses the select lever position and the information to TCM.
	Power drive SW (fixed to center consol)	Senses whether the driver has selected the power mode or economy mode and feeds the information to TCM.
	Sump temp. sensor	Senses the T/M oil temperature and feeds the data to TCM.
	Coolant temp. SW	Senses the engine cooling water temperature and feeds the data to TCM (feeds the signal from ECM)
	Engine speed signal	Feeds the signals monitoring engine speed to TCM from IGN module (fed to ECM also)
	Air conditioner information	Senses whether the air conditioner has been switched on or not and feeds the information to TCM
	Self diagnostic input	By monitoring the GND, the location of failure is shown on the T/M monitor lamp("CHECK TRANS") by flashing the code number
	Barometer sensor (option)	Senses the altitude and feeds the data to TCM
	Winter switch (fixed to center consol)	Senses whether the driver has selected the winter mode, and feeds the information to TCM

OUTPUT SIGNAL

OUTPUT SIGNAL	SOLENOID	Shift solenoid 1-2/3-4 2-3	Selects shift point and gear position suited to the vehicle running condition on the basis of TCM output
		Band apply solenoid	Controls oil flow suited to the vehicle running condition on the basis of TCM output
		TCC solenoid	Controls clutch engagement/disengagement suited to the vehicle running condition on the basis of TCM output
		Force motor (Pressure regulator valve)	Adjusts the oil pump delivery pressure to line pressure suited to the vehicle running condition on the basis TCM output
	U	Power drive mode lamp	Informs the driver whether the vehicle is in the power mode or not
		Winter drive mode lamp	Informs the driver whether the vehicle is in the winter mode or not
		T/M monitor lamp ("CHECK TRANS")	Informs the driver of failure in the system. It also displays the self diagnosis code
		Diagnostic 1 connector	When connected with TECH 1 or tester, can communicate the data for function check, etc.

ELECTRONIC CONTROLS AND OPERATION



LEGEND:

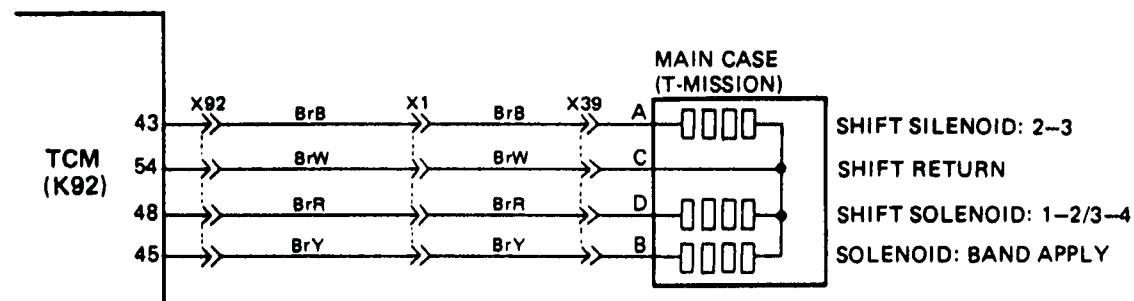
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UNDER CUSTOMER'S RESPONSABILITY
.. COMBINED INPUT/OUTPUT
 1 CONNECTION TO GROUND

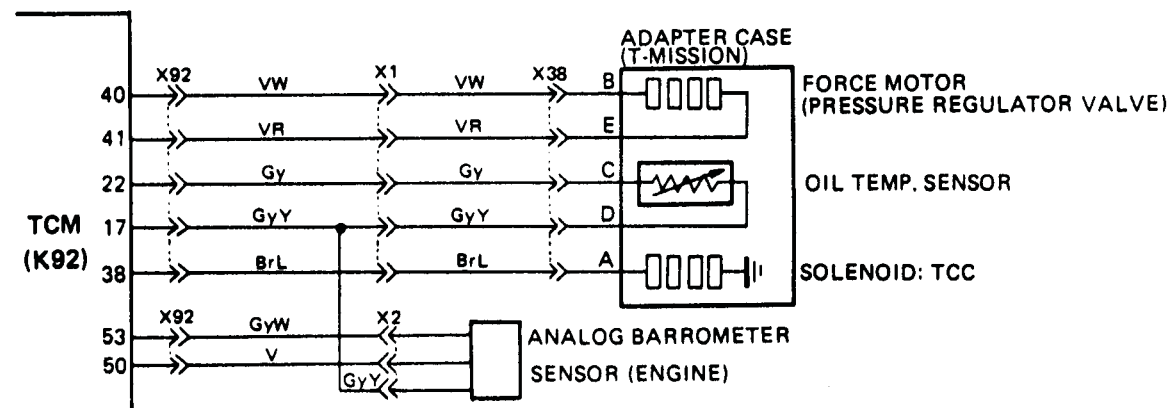
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## Technical Service Information



TCM TERMINAL : 43 SHIFT SOL. 2-3  
54 SHIFT SOL. GROUND  
48 SHIFT SOL. 1-2/3-4  
45 BAND APPLY SOLENOID

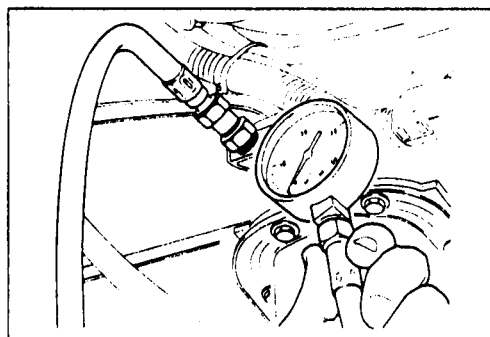
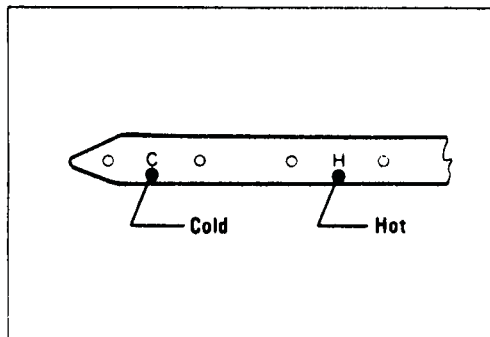


TCM TERMINAL : 40 FORCE MOTOR (+)  
41 FORCE MOTOR (-)  
22 OIL TEMP. SENSOR  
17 ANALOG GROUND  
38 TCC SOLENOID

### SOLENOID SPECIFICATIONS

|                                                   |                           |
|---------------------------------------------------|---------------------------|
| 1-2/3-4 SHIFT SOLENOID .....                      | 17.5-18.5 OHMS RESISTANCE |
| 2-3 SHIFT SOLENOID .....                          | 17.5-18.5 OHMS RESISTANCE |
| CONVERTER CLUTCH SOLENOID .....                   | 17.5-18.5 OHMS RESISTANCE |
| BAND APPLY SOLENOID .....                         | 9.5-10.5 OHMS RESISTANCE  |
| FORCE MOTOR .....                                 | 3.7- 4.7 OHMS RESISTANCE  |
| OUTPUT SPEED SENSOR (PLUS OR MINUS 20 OHMS) ..... | 3000 OHMS RESISTANCE      |

## FLUID LEVEL AND LINE PRESSURE CHECK



Since a large number of mechanical/hydraulic faults are operational faults due to incorrect transmission fluid level, it is important to verify the correct fluid level before proceeding with a line pressure test.

It is especially important for troubleshooting that the line pressure recommended for the function of the transmission be present, so a line pressure check must be carried out after checking transmission fluid level.

Install oil pressure gauge using adapter J-29770-A on the converter housing tap as shown at left. Use the chart below to verify proper line pressure readings.

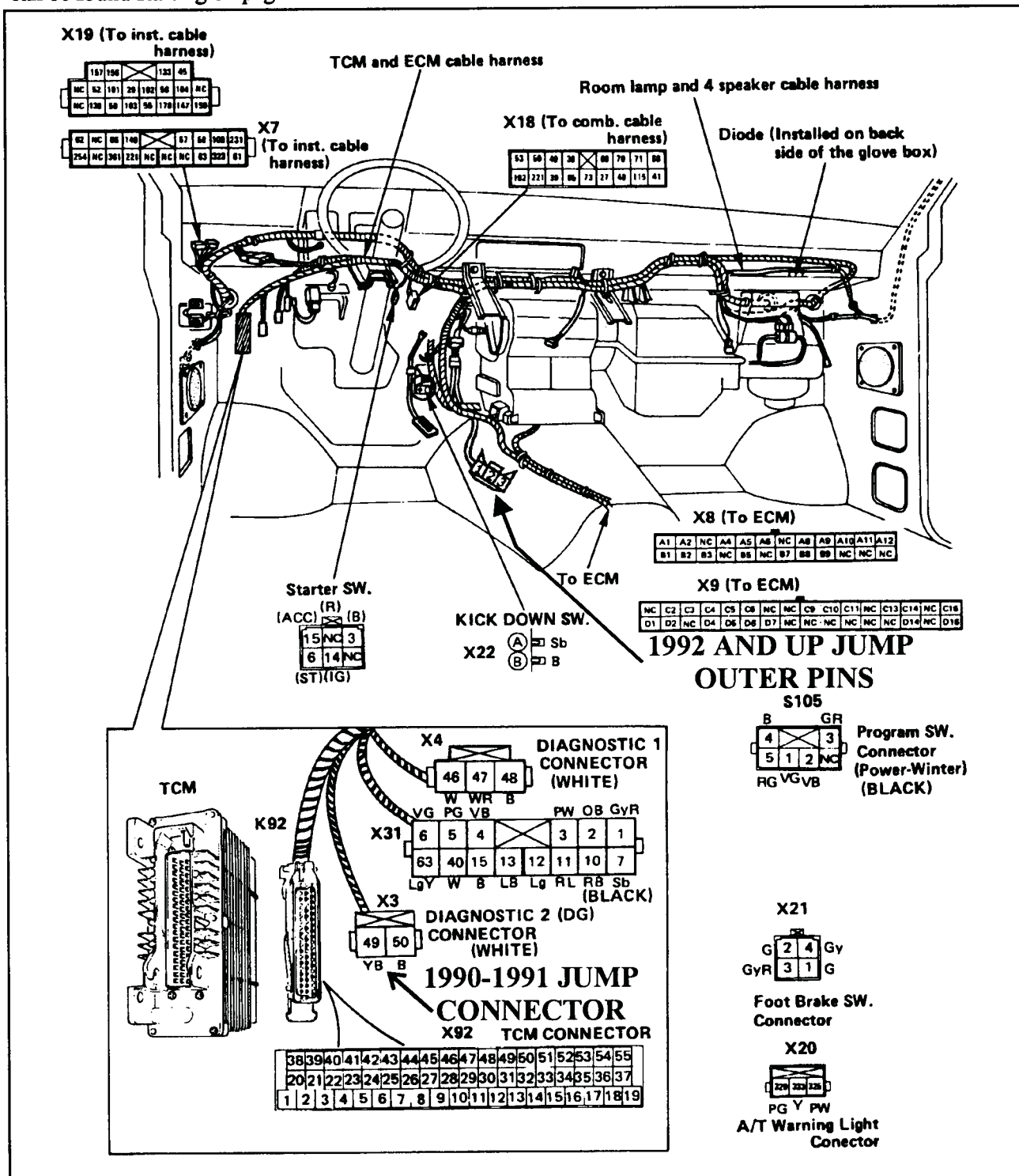
Fully engage the parking brake, and the service brake for all stall speed tests. At engine speeds above 1500 RPM the pressure check should not last longer than 5 seconds to avoid overheating the transmission.

The stall speed on the ISUZU Trooper/Rodeo 2.8L engine will be 2100 RPM, plus or minus 150 RPM. For all other engines check the manufacturers specifications for stall speeds.

| MODE                   | LEVER POSITION | ENGINE SPEED | LINE PRESSURE |                    | FORCE MOTOR CURRENT |
|------------------------|----------------|--------------|---------------|--------------------|---------------------|
|                        |                |              | P.S.I.        | kg/cm <sup>2</sup> |                     |
| NORMAL/POWER           | D,3,2          | IDLE         | 45.9-MIN      | 3.2-MIN            | 0.97A               |
| WINTER                 | D              | IDLE         | 45.9-52.3     | 3.2-3.6            | 0.97A               |
| NORMAL/POWER<br>WINTER | REVERSE        | IDLE         | 57.9-65.8     | 4.0-4.5            | 0.97A               |
| NOMAL/POWER            | D,3,2,1        | STALL SPEED  | 149.4-161.1   | 10.3-11.1          | 0.15A               |
| WINTER                 | D              | STALL SPEED  | 149.4-161.1   | 10.3-11.1          | 0.15A               |
| NORMAL/POWER<br>WINTER | REVERSE        | STALL SPEED  | 186.9-201.5   | 12.9-13.9          | 0.15A               |

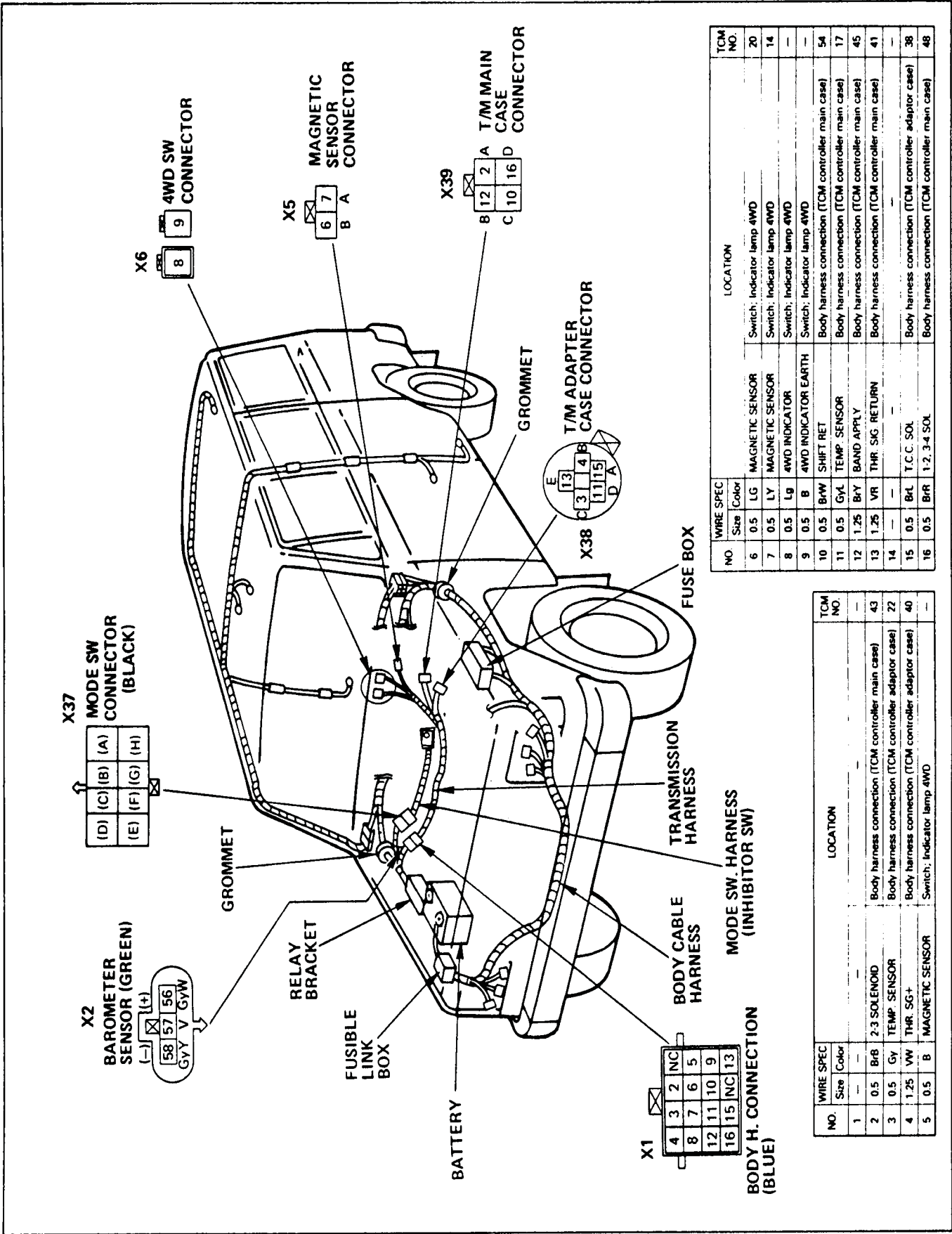
## CODE RETRIEVAL AND CONNECTOR LOCATION

The TCM has a built in diagnostic system that will store trouble codes in the event of a malfunction. Trouble codes that have been stored or are now current can be retrieved by a TECH 1 scanner or by jumping the correct pins at the diagnostic connector. For 1990 and 1991 models, jump across the white two wire connector located under the dash on the left side using a jumper wire (Refer to the inset box in illustration below). On 1992 and later models, jump the outer pins of the three wire connector behind the center console with a jumper wire. Turn the ignition on and watch the "Check Trans" light for flashes. Code interpretations can be found starting on page 105.





Technical Service Information



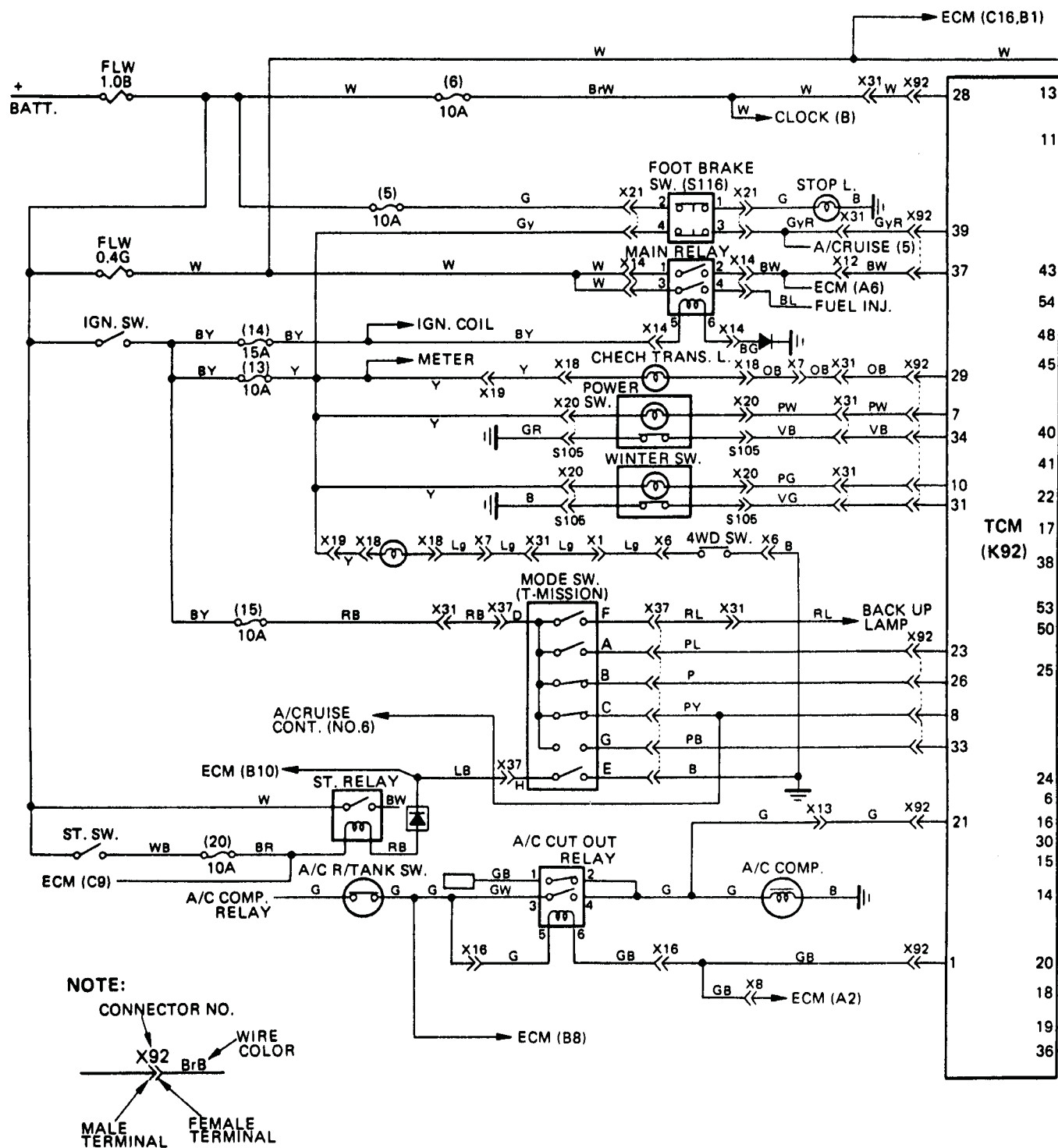
| WIRE SPEC | NO.  | Size | Color               | LOCATION                                              | TCM NO. |
|-----------|------|------|---------------------|-------------------------------------------------------|---------|
| 6         | 0.5  | LG   | MAGNETIC SENSOR     | Switch; Indicator lamp 4WD                            | 20      |
| 7         | 0.5  | LY   | MAGNETIC SENSOR     | Switch; Indicator lamp 4WD                            | 14      |
| 8         | 0.5  | Lg   | 4WD INDICATOR       | Switch; Indicator lamp 4WD                            | —       |
| 9         | 0.5  | B    | 4WD INDICATOR EARTH | Switch; Indicator lamp 4WD                            | —       |
| 10        | 0.5  | BrW  | SHIFT RET           | Body harness connection (TCM controller main case)    | 54      |
| 11        | 0.5  | G4L  | TEMP SENSOR         | Body harness connection (TCM controller main case)    | 17      |
| 12        | 1.25 | BrY  | BAND APPLY          | Body harness connection (TCM controller main case)    | 45      |
| 13        | 1.25 | VR   | THR. SIG. RETURN    | Body harness connection (TCM controller main case)    | 41      |
| 14        | —    | —    | —                   | —                                                     | —       |
| 15        | 0.5  | BrL  | T.C.C. SOL.         | Body harness connection (TCM controller adaptor case) | 38      |
| 16        | 0.5  | BrR  | 1-2, 3-4 SOL.       | Body harness connection (TCM controller main case)    | 48      |

| WIRE SPEC | NO.  | Size | Color           | LOCATION                                              | TCM NO. |
|-----------|------|------|-----------------|-------------------------------------------------------|---------|
| 1         | —    | —    | —               | —                                                     | —       |
| 2         | 0.5  | BrB  | 2-3 SOLENOID    | Body harness connection (TCM controller main case)    | 43      |
| 3         | 0.5  | Gy   | TEMP. SENSOR    | Body harness connection (TCM controller adaptor case) | 22      |
| 4         | 1.25 | VW   | THR. SG+        | Body harness connection (TCM controller adaptor case) | 40      |
| 5         | 0.5  | B    | MAGNETIC SENSOR | Switch; Indicator lamp 4WD                            | —       |

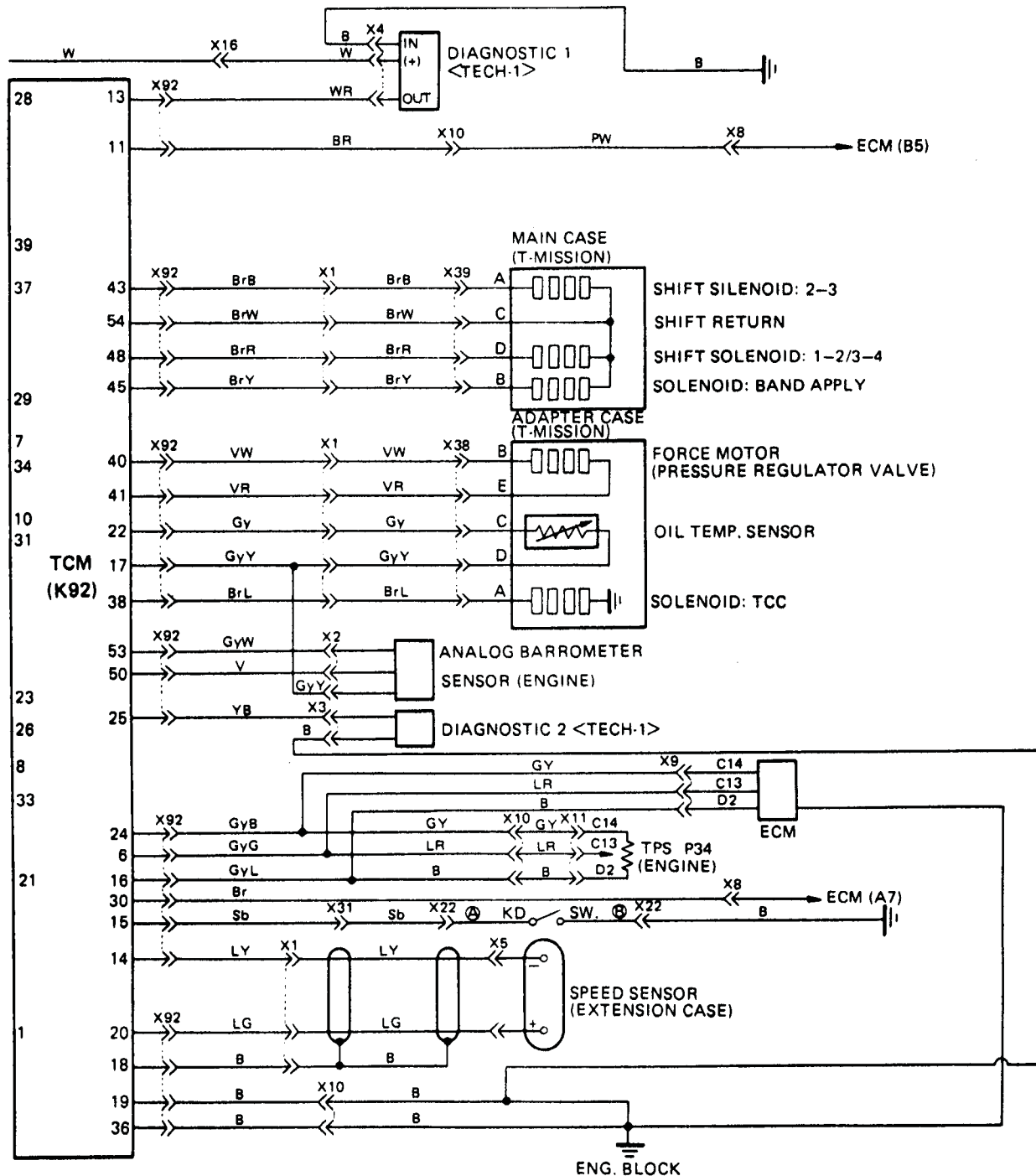


# Technical Service Information

## WIRING DIAGRAM



## AUTOMATIC TRANSMISSION SERVICE GROUP





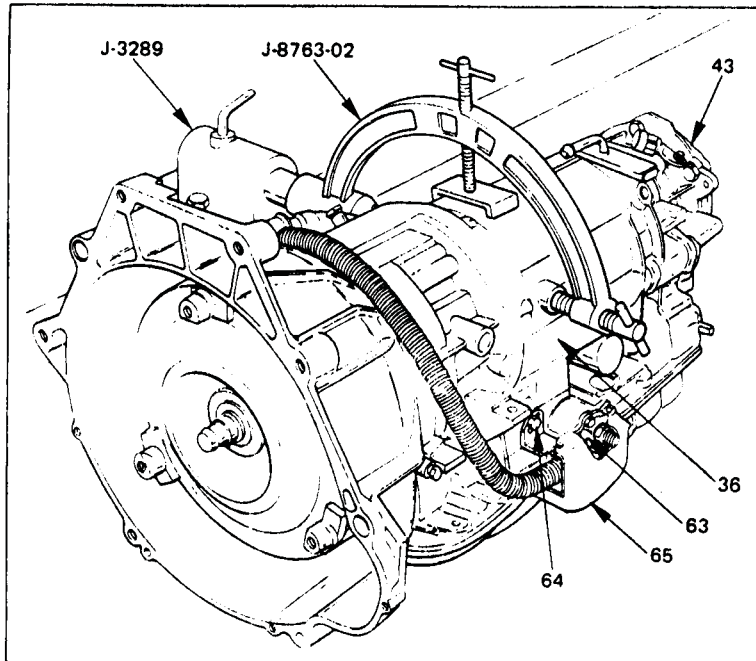


Figure 1

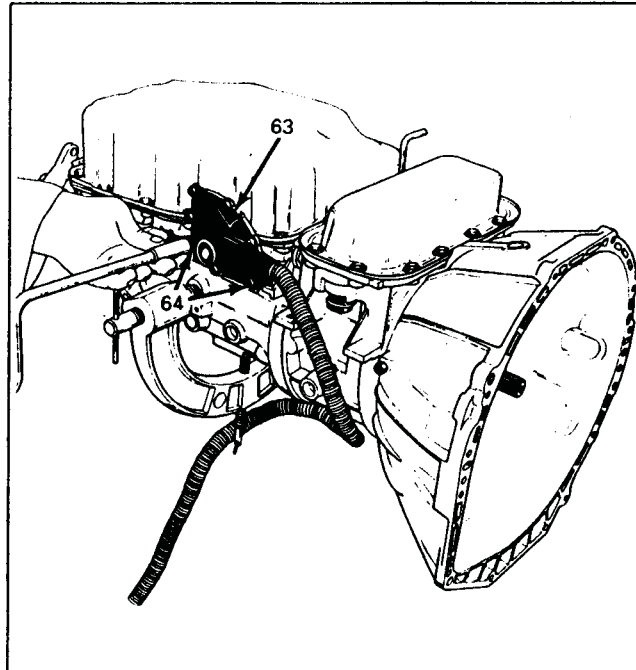


Figure 2

## TRANSMISSION DISASSEMBLY

1. Install holding fixture J-8763-02 on transmission, and install the assembly into bench fixture J-3289, as shown in Figure 1.
2. Remove the torque converter.
3. Remove the "O" ring from the turbine shaft.
4. Remove two 10mm bolts that retains the mode switch, and remove the mode switch (See Figure 2).
5. Turn transmission in fixture so that the oil pans are up (See Figure 3).
6. Remove the 12 adapter case pan bolts using a 10mm socket (See Figure 3).
7. Remove adapter case bottom pan and the gasket (See Figure 4).
8. Disconnect the wiring harness from the adapter case electrical connector using a screwdriver to pry back the locking tab, and pliers to pull the connector from the case (See Figure 5).
9. Disconnect the wiring harness from the Force Motor by pushing down on the connector.
10. Remove the 7 adapter case valve body bolts using a 13mm socket (Figure 6).
11. Remove the adapter case valve body and wiring harness (See Figure 7).

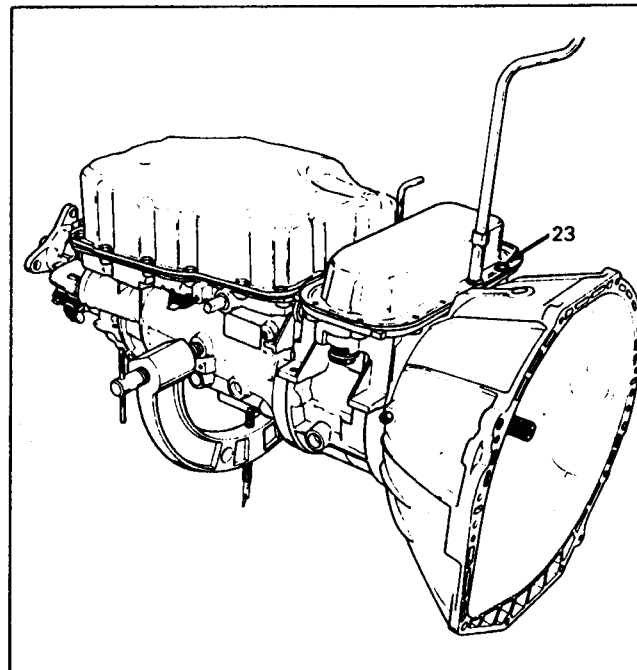


Figure 3

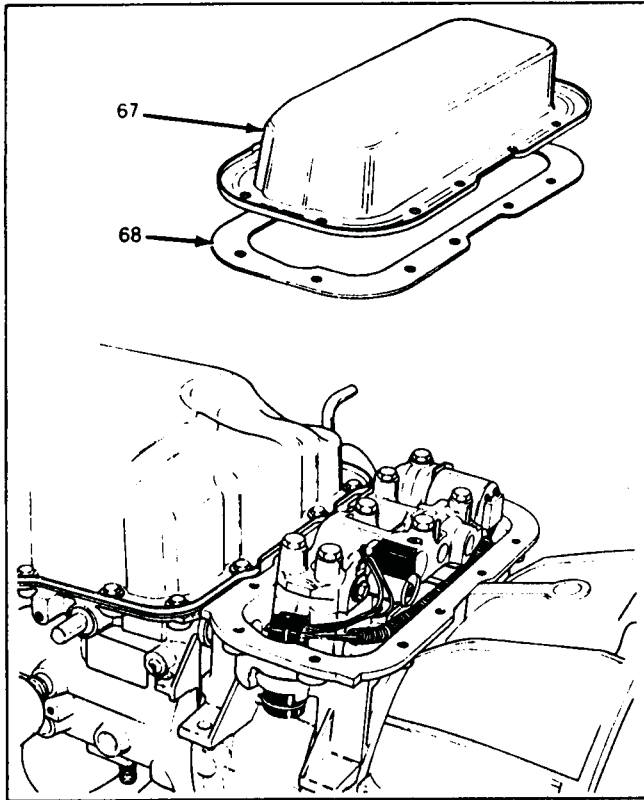


Figure 4

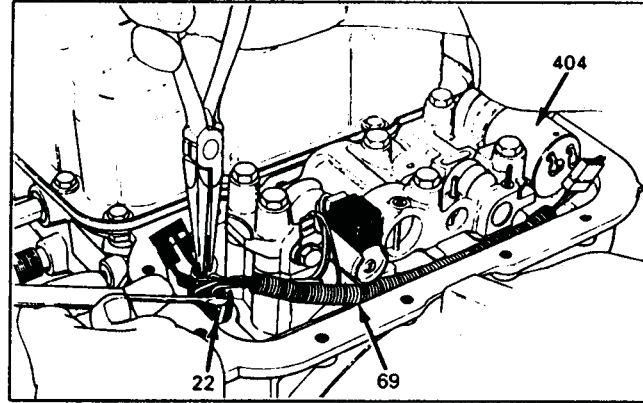


Figure 5

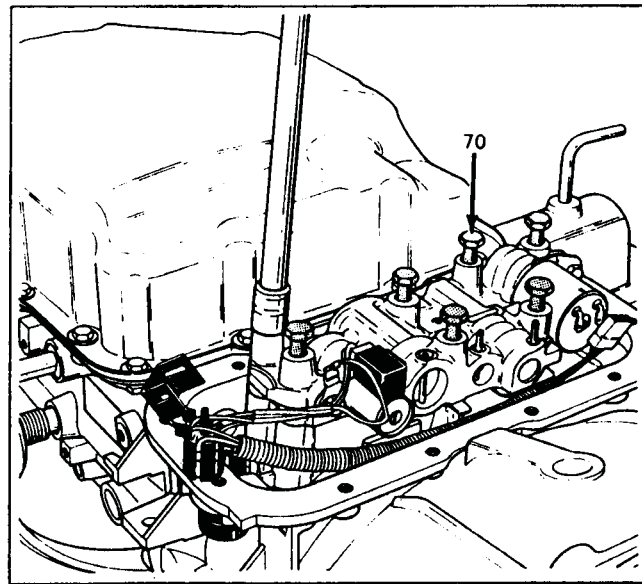


Figure 6

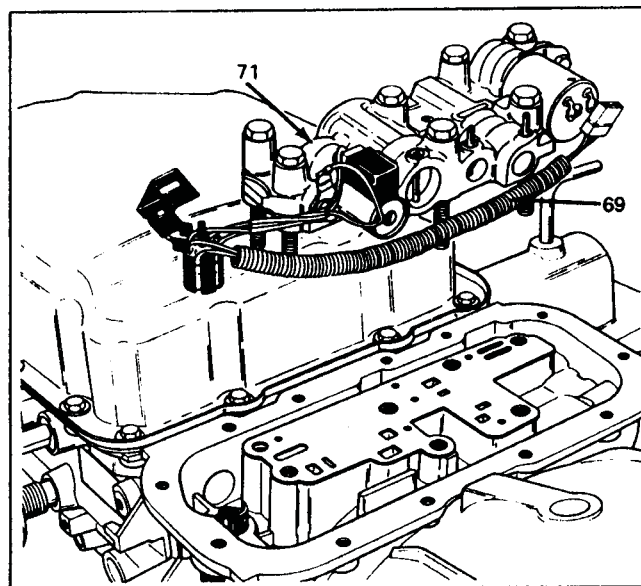


Figure 7

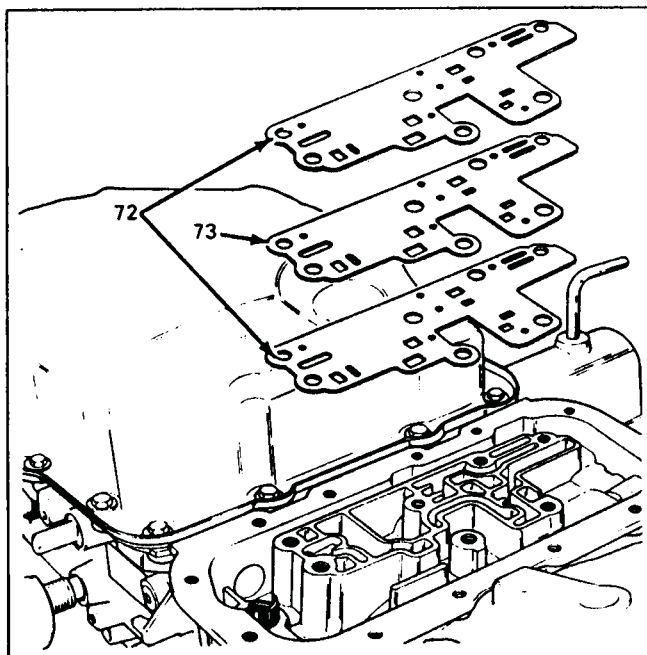


Figure 8

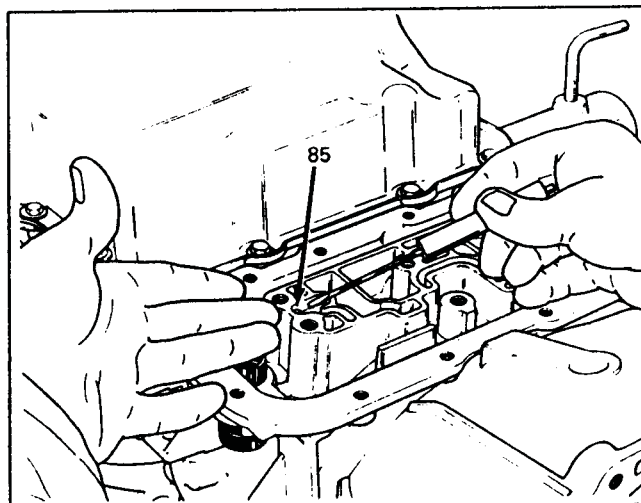


Figure 9

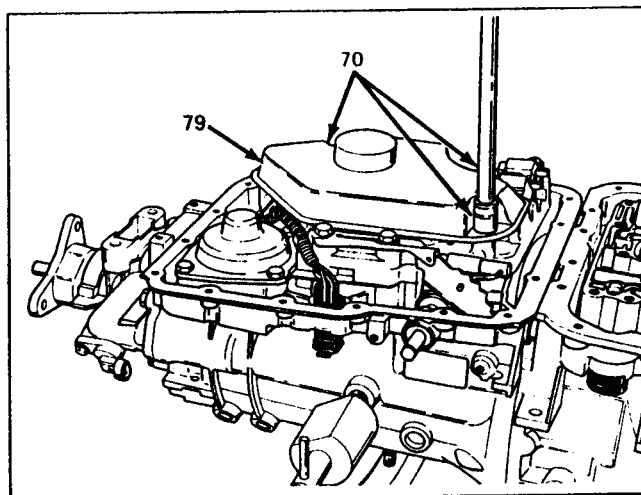


Figure 11

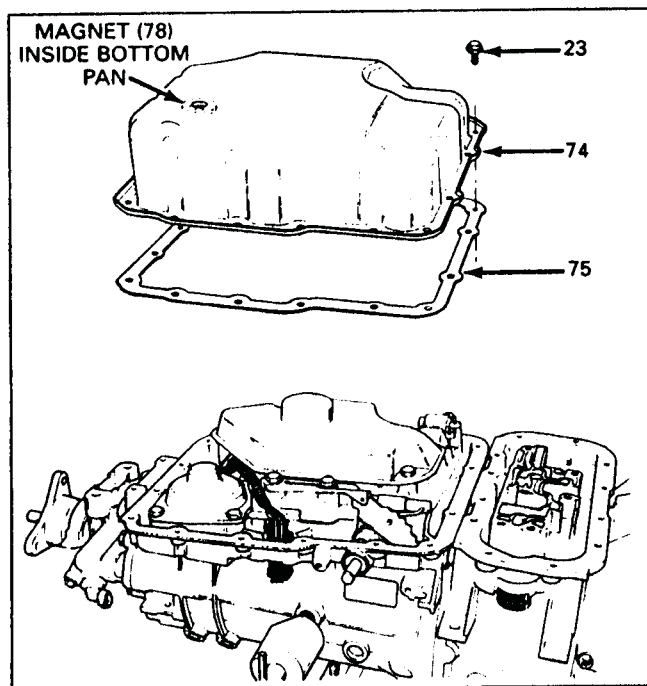


Figure 10

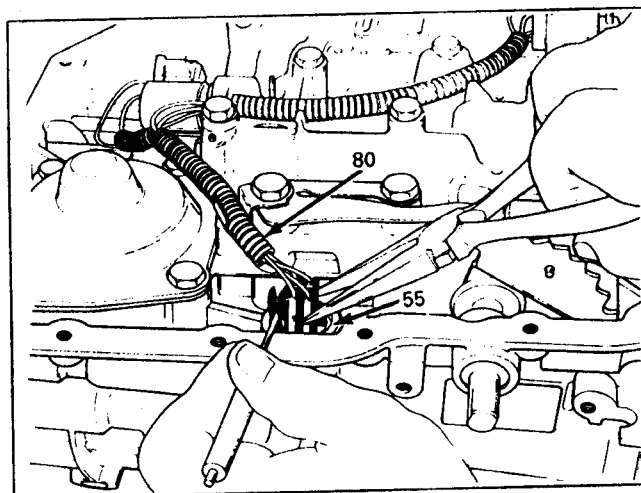


Figure 12

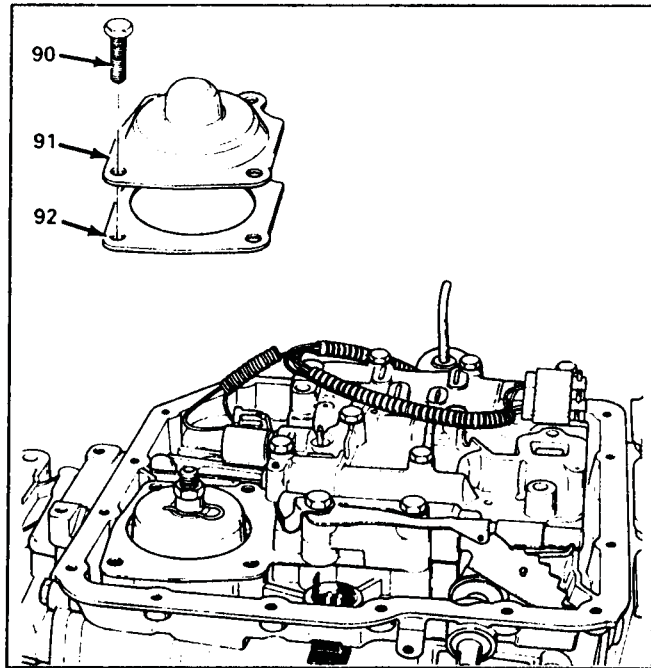


Figure 13

(Continued from Page 16)

12. Remove the adapter case valve body spacer plate and both gaskets as shown in Figure 8.
  13. Remove 1 checkball from adapter case using a screwdriver (See Figure 9).
- NOTE: Some models may have checkball either on spacer plate, or in the case.

## MAIN CASE

1. Remove the 16 main case bottom pan bolts using a 10mm socket as shown in Figure 10.
2. Remove main case bottom pan and the bottom pan gasket (Figure 10).
3. Remove the 3 retaining bolts holding the oil filter to the main case valve body (See Figure 11).
4. Remove the oil filter.
5. Disconnect the wiring harness from the main case connector using a screwdriver to pry back the locking tab, and pliers to pull the plug from the connector, as shown in Figure 12.
6. Remove the 4 servo cover bolts using a 13mm socket as shown in Figure 13.
7. Remove the servo cover and gasket.
8. Remove the manual detent roller and spring assembly, using a 13mm socket, as shown in Figure 14.

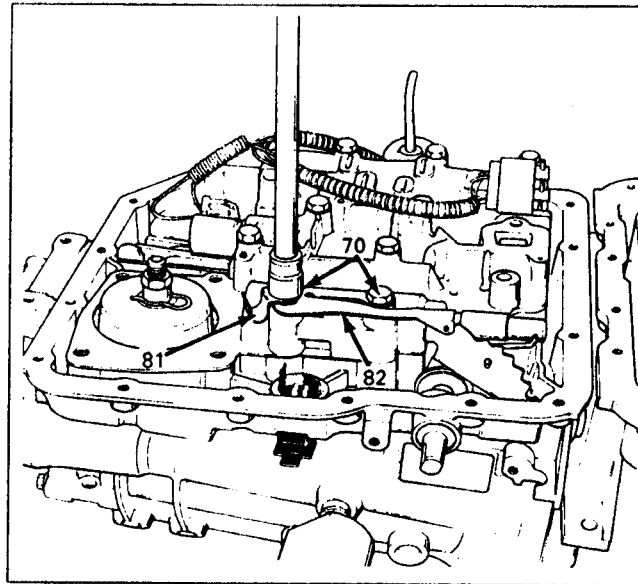


Figure 14

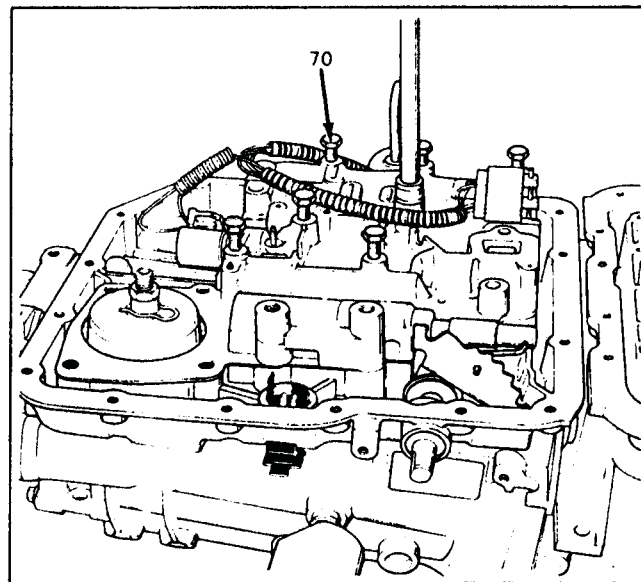


Figure 15

9. Remove the detent roller and spring and wiring harness clip.
10. Remove the 7 remaining valve body bolts, using a 13mm socket as shown in Figure 15.

(Continued on Page 20)

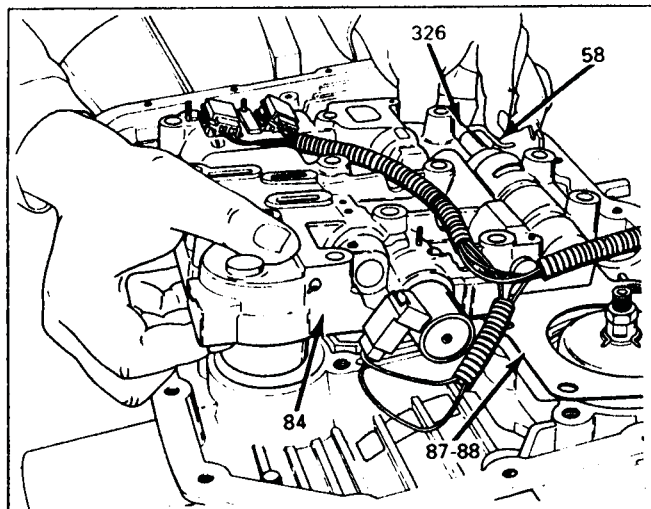


Figure 16

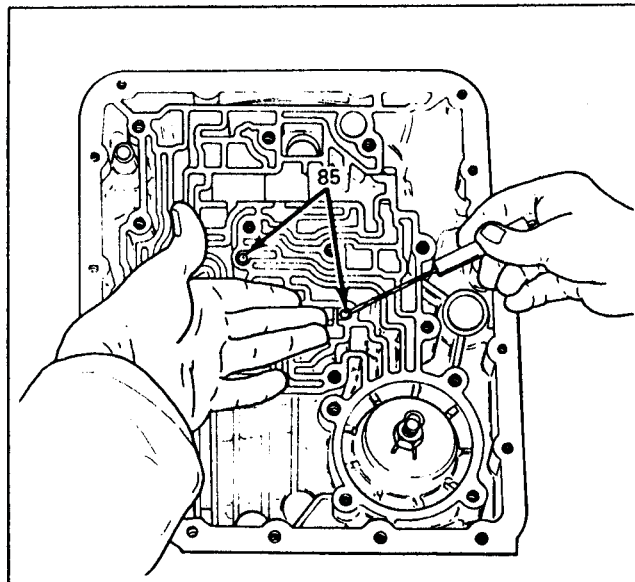


Figure 17

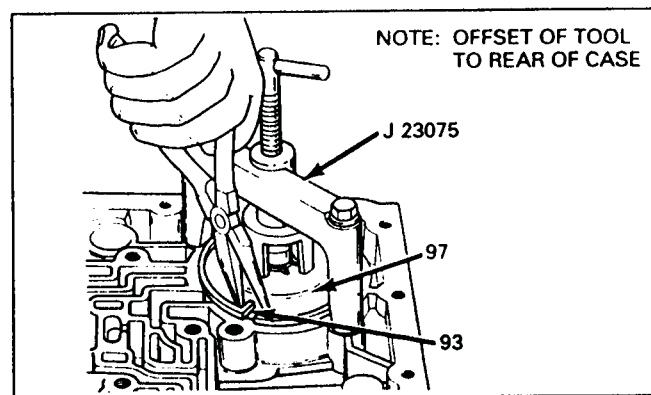


Figure 18

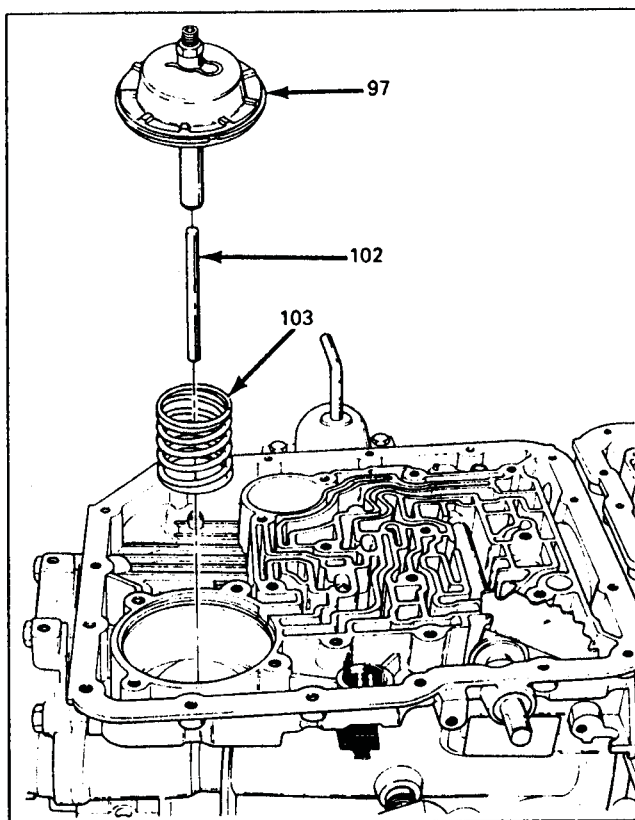


Figure 19

(Continued from Page 19)

11. Remove the main case valve body while holding the manual valve, rotate the valve body assembly to disconnect the manual valve from the link (Figure 16).
12. Remove the main valve body, spacer plate and gaskets.
13. Remove 2 checkballs from the main case using a screwdriver (See Figure 17).
14. Install servo compressor J-23075, as shown in Figure 18.
15. Compress the servo piston by turning the "T" handle clockwise.
16. Remove the servo piston retaining ring using pliers as shown in Figure 18.
17. Slowly release the servo piston turning the "T" handle counterclockwise.
18. Remove the servo piston compressor.

19. Remove the servo piston, servo piston apply pin, and servo piston return spring (See Figure 19).

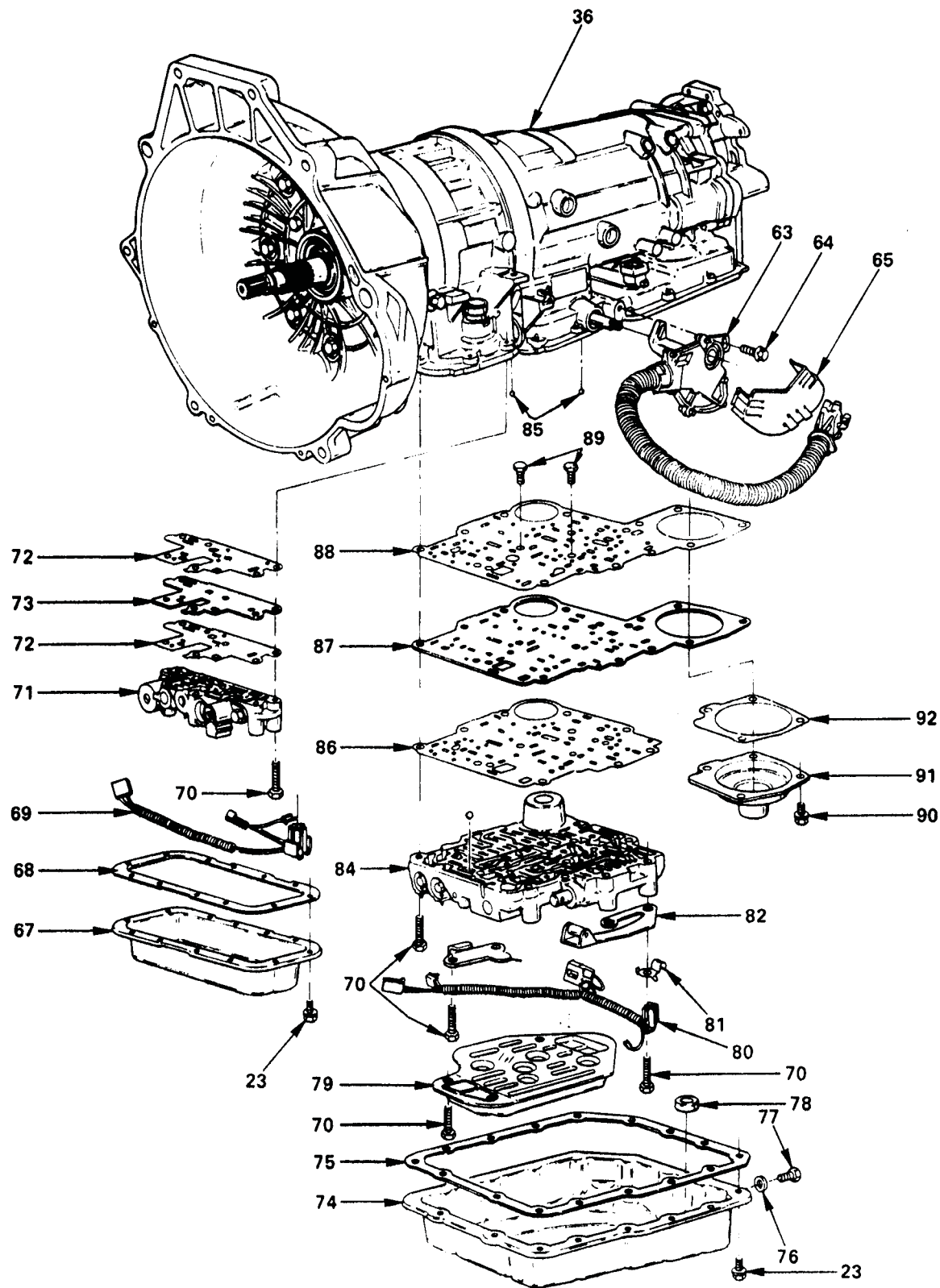




## Technical Service Information

- 23. MAIN OIL PAN AND ADAPTER OIL PAN BOLTS (28).
- 36. TRANSMISSION CASE ASSEMBLY.
- 63. MODE SWITCH (MANUAL LEVER POSITION).
- 64. MODE SWITCH RETAINING BOLTS (10mm).
- 65. MODE SWITCH COVER.
- 67. ADAPTER CASE OIL PAN.
- 68. ADAPTER CASE OIL PAN GASKET.
- 69. ADAPTER CASE WIRING HARNESS AND 5 PIN CASE CONNECTOR.
- 70. VALVE BODY RETAINING BOLTS.
- 71. ADAPTER CASE VALVE BODY ASSEMBLY.
- 72. ADAPTER CASE VALVE BODY GASKET (LOWER).
- 73. ADAPTER CASE VALVE BODY SPACER PLATE.
- 74. MAIN CASE OIL PAN.
- 75. MAIN CASE OIL PAN GASKET.
- 76. MAIN CASE OIL PAN DRAIN PLUG GASKET.
- 77. MAIN CASE OIL PAN DRAIN PLUG.
- 78. MAIN CASE OIL PAN MAGNET.
- 79. MAIN OIL PAN FILTER ASSEMBLY.
- 80. MAIN CASE WIRING HARNESS AND 4 PIN CASE CONNECTOR.
- 81. WIRING HARNESS RETAINING CLIP.
- 84. MAIN CASE VALVE BODY ASSEMBLY.
- 85. MAIN CASE CHECKBALLS.
- 86. MAIN CASE VALVE BODY TO SPACER PLATE GASKET.
- 87. MAIN CASE VALVE BODY SPACER PLATE.
- 88. MAIN CASE VALVE BODY SPACER PLATE TO CASE GASKET.
- 89. MAIN CASE VALVE BODY SPACER PLATE RETAINING BOLTS.
- 90. 1-2 BAND SERVO COVER BOLTS (4).
- 91. 1-2 BAND SERVO COVER.
- 92. 1-2 BAND SERVO COVER GASKET.
- 104. ADAPTER CASE VALVE BODY GASKET (UPPER).

Legend for Figure 20



LEGEND IS FOUND ON PAGE 21.

Figure 20  
AUTOMATIC TRANSMISSION SERVICE GROUP



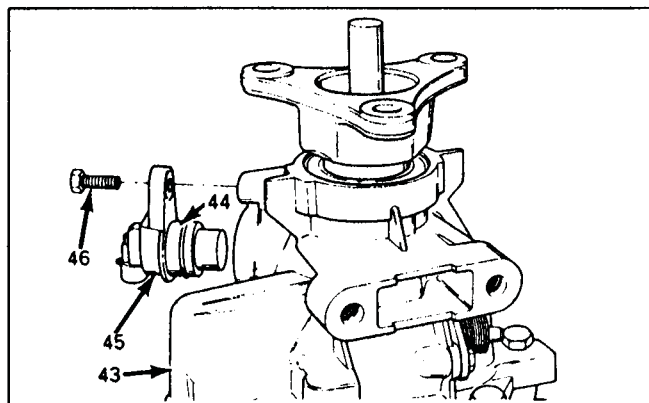


Figure 21

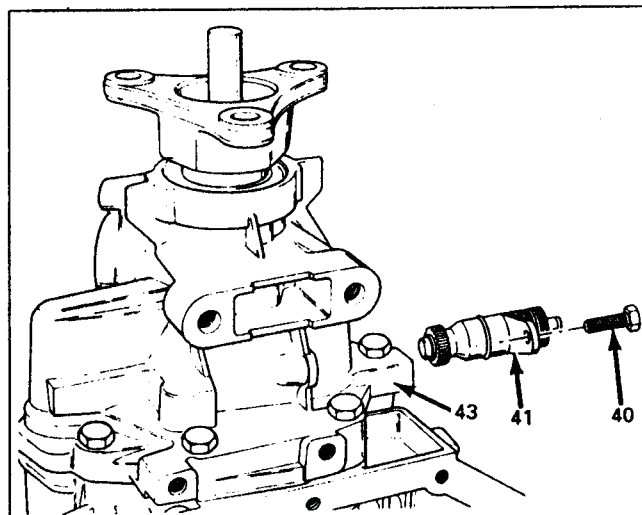


Figure 22

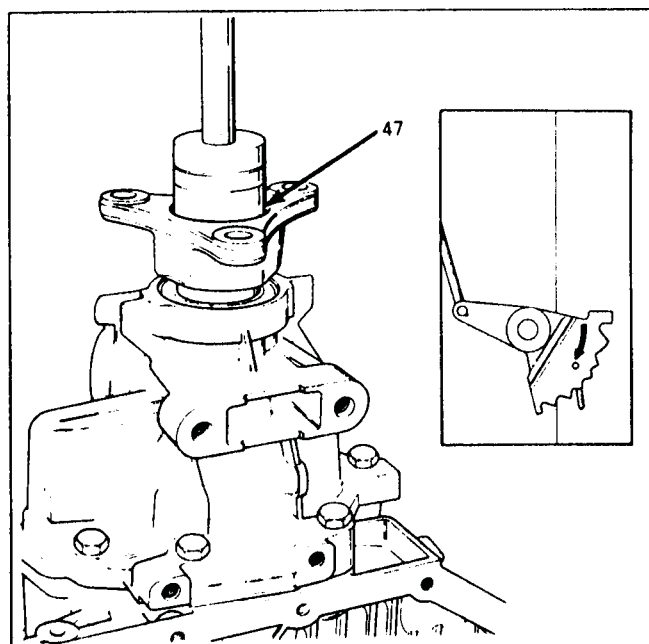


Figure 23

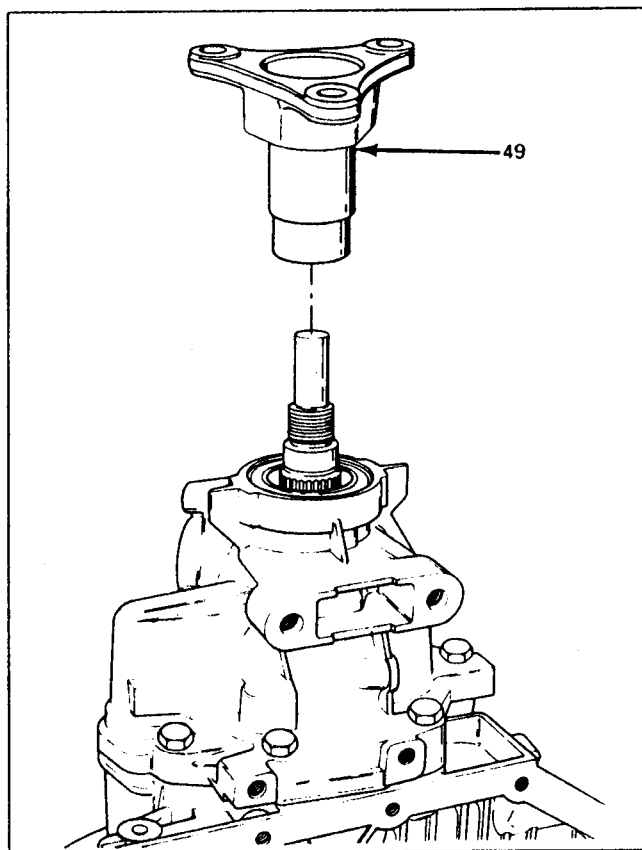


Figure 24

## EXTENSION HOUSING

1. Rotate the transmission to a vertical position with the extension housing up, as shown in Figure 23.
2. Remove the 10mm bolt retaining the output speed sensor (See Figure 21).
3. Remove the output speed sensor using a rotating motion while pulling out. (See Figure 21).
4. Remove the 10mm bolt retaining the speed driven gear assembly, and remove the assembly from extension housing (See Figure 22).
5. Remove the output shaft drive flange nut, using a 1-1/2" socket, as shown in Figure 23.

6. Place the selector lever in the park (Most Downward) position. This will lock the output shaft to keep it from turning while the nut is removed.
7. Remove the drive flange as shown in Figure 24.

(Continued on Page 24)

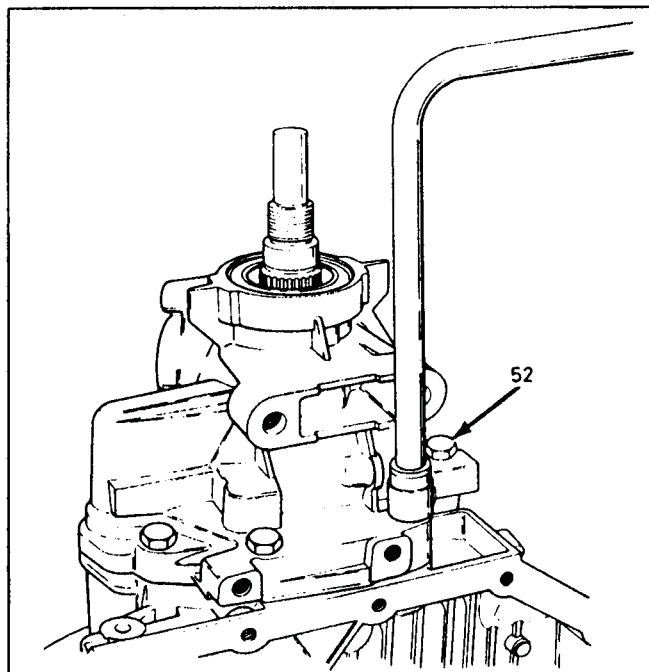


Figure 25

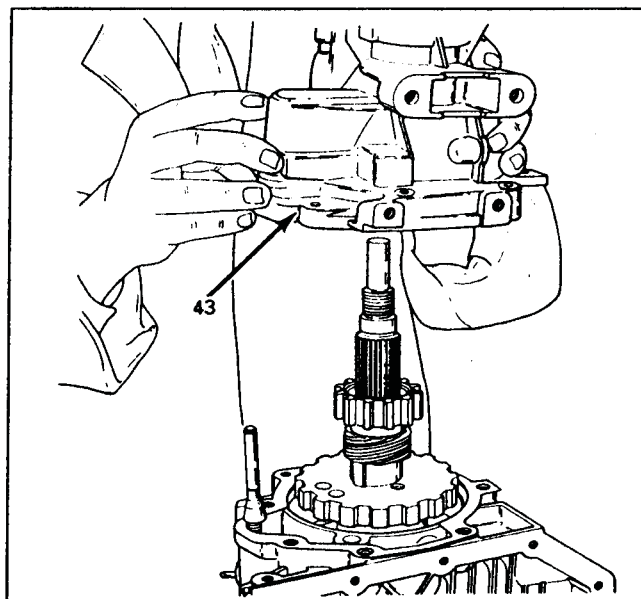


Figure 26

(Continued from Page 23).

8. Remove seven extension housing bolts as shown in Figure 25.
9. Remove the extension housing as shown in Figure 26.

NOTE: The 4 wheel drive version is shown in Figure 29.

10. Remove the speed sensor rotor, speedo drive gear (If Used), and extension housing gasket (See Figure 27).
11. Remove the parking lock wheel from the output shaft (See Figure 28).
12. The 4 wheel drive version is similar to this procedure, and is shown in Figure 29.

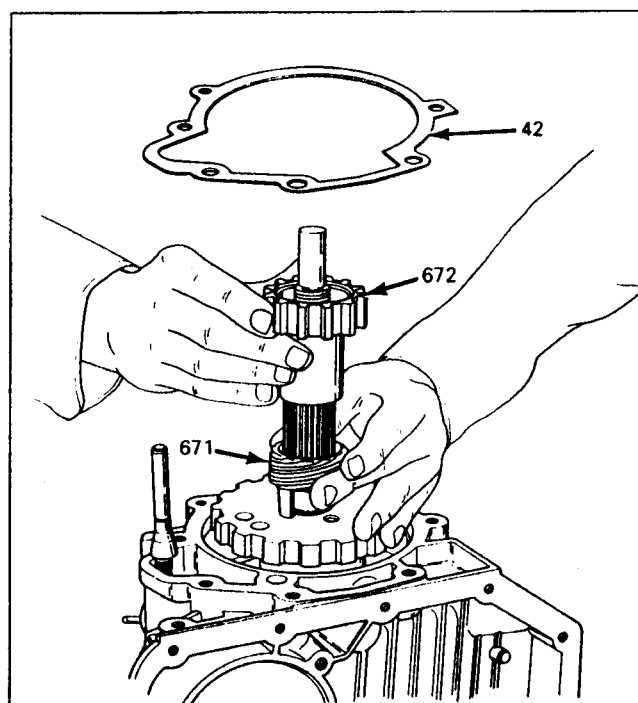


Figure 27

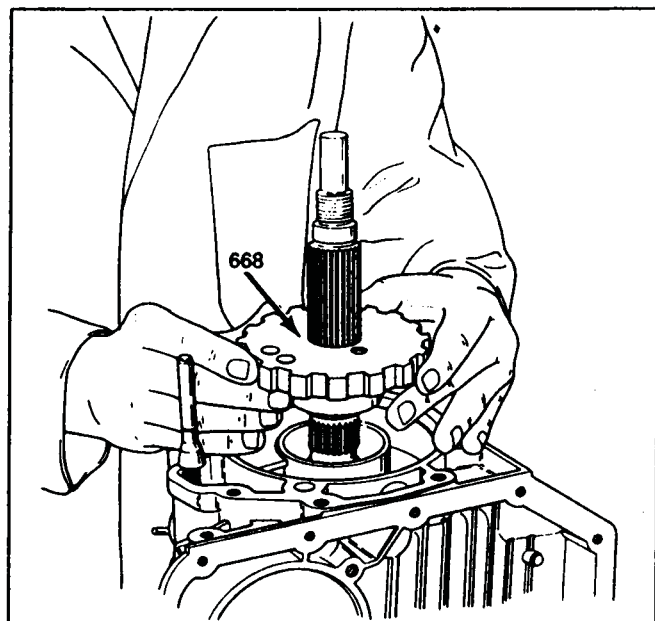


Figure 28

## FOUR WHEEL DRIVE MODELS

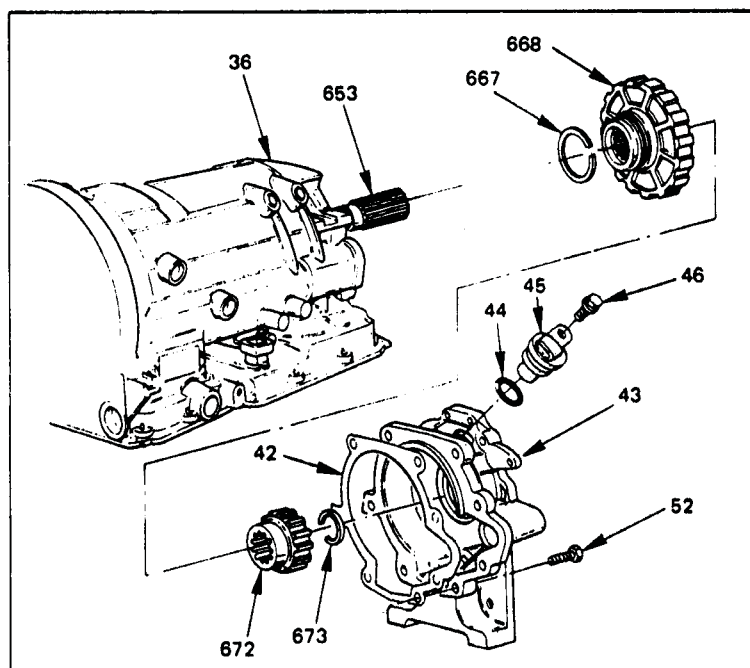


Figure 29

## AUTOMATIC TRANSMISSION SERVICE GROUP

- 4. CONVERTER HOUSING TO CASE BOLTS (7)
- 5. CONVERTER HOUSING TO PUMP BOLTS (5)
- 6. CONVERTER HOUSING.
- 8. PUMP "O" RING SEAL.
- 9. PUMP SPACER PLATE.
- 10. OIL PUMP ASSEMBLY.
- 11. OIL PUMP TO ADAPTER CASE GASKET.
- 12. OIL PUMP TO OVERRUN CLUTCH HOUSING THRUST WASHER (SELECTIVE).
- 505. TURBINE SHAFT "O" RING SEAL.

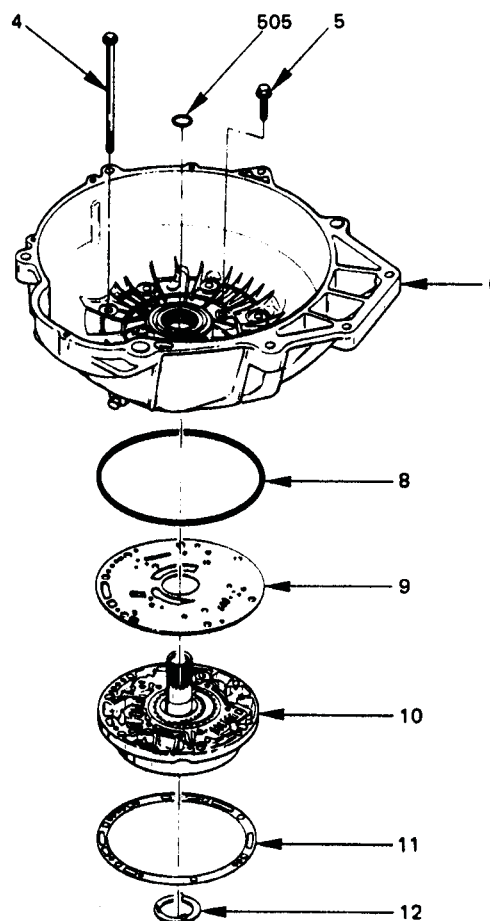


Figure 30

- 501. FOURTH CLUTCH RETAINER.
- 502. FOURTH CLUTCH STEEL PLATES (4)
- 503. FOURTH CLUTCH LINED PLATES (2)
- 506. TURBINE SHAFT.
- 510. OVERRUN CLUTCH HOUSING.
- 527. THRUST BEARING ASSEMBLY.
- 528. OVERDRIVE INTERNAL RING GEAR.
- 529. THRUST WASHER.

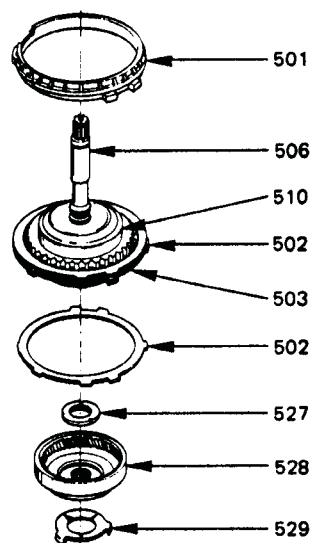


Figure 31

## 36. MAIN TRANSMISSION CASE ASSEMBLY.

- 614. REVERSE CLUTCH WAVE PLATE (1)
- 615. REVERSE CLUTCH STEEL PLATE (5)
- 616. REVERSE CLUTCH LINED PLATE (4)
- 617. REVERSE CLUTCH BACKING PLATE.
- 618. 2ND CLUTCH HOUSING ASSEMBLY.
- 634. 3RD CLUTCH HOUSING ASSEMBLY.
- 651. THRUST BEARING.
- 652. THRUST BEARING RACE.
- 653. PLANETARY CARRIER ASSEMBLY.
- 654. THRUST BEARING RACE.
- 655. THRUST BEARING.
- 656. CAGED NEEDLE BEARING ASSEMBLY.
- 658. REACTION SUN GEAR.
- 659. REACTION SUN GEAR DRUM.
- 664. 1-2 BAND ASSEMBLY.

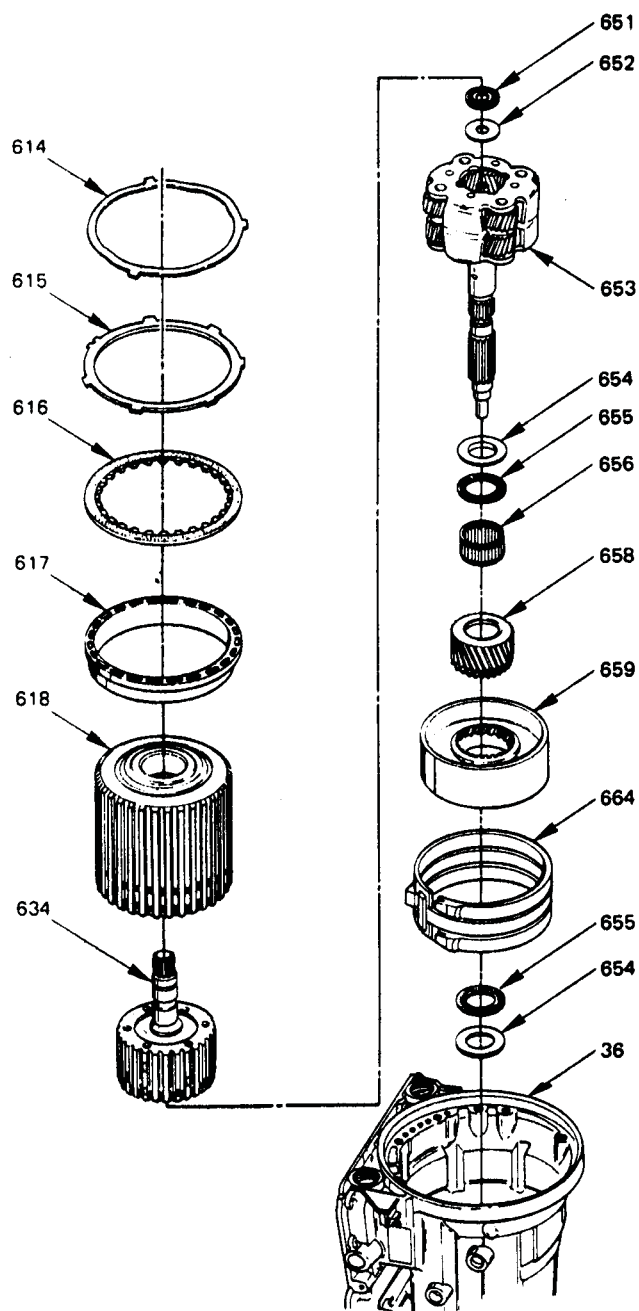


Figure 32

## CONVERTER HOUSING AND INTERNAL PARTS

1. Rotate the transmission 180 degrees to a vertical position with the converter housing up (See Figure 33).
2. Using a 10mm socket, remove bolt securing the filler tube to the adapter case as shown in Figure 33.
3. Install the accumulator cover remover J-38559 to the adapter case as shown in Figure 34.
4. Be certain that the compressing tool is properly installed by aligning locating pin to the hole in the adapter case boss and tightening the wing bolt to the fill tube hole.
5. Turn the wheel on the accumulator cover compressor clockwise and compress the 3-4 accumulator piston cover. (See Figure 34).
6. Using snap ring pliers, remove the snap ring, as shown in Figure 34.
7. Remove the accumulator compressor tool.
8. Install the accumulator cover slide hammer tool J-38552 to the slide hammer J-6125-1B.
9. Position the slide hammer assembly into the bore of the accumulator cover as shown in Figure 35, and turn the cover remover clockwise to expand inside the bore of the accumulator cover. Tighten securely with a wrench.
10. Move the handle of the slide hammer toward the accumulator cover.
11. Swiftly pull the handle back to remove the accumulator cover from the adapter case bore.
12. Turn the 3-4 accumulator cover remover counterclockwise and remove it from the accumulator cover bore.
13. Remove the 3-4 accumulator piston spring, pin, and piston as shown in Figure 35.

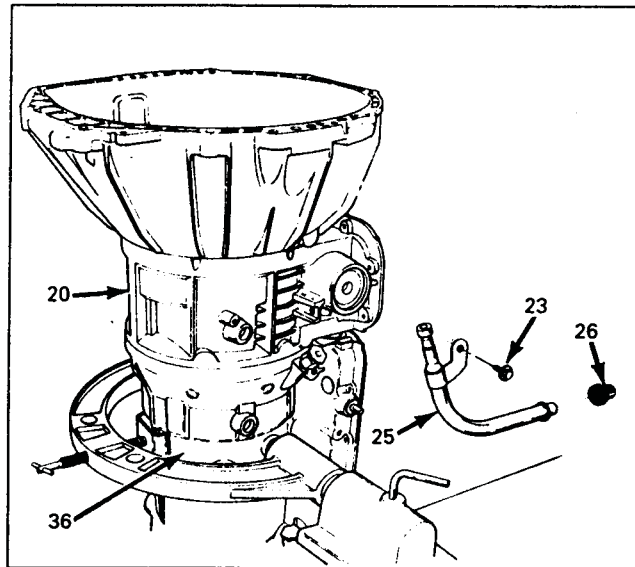


Figure 33

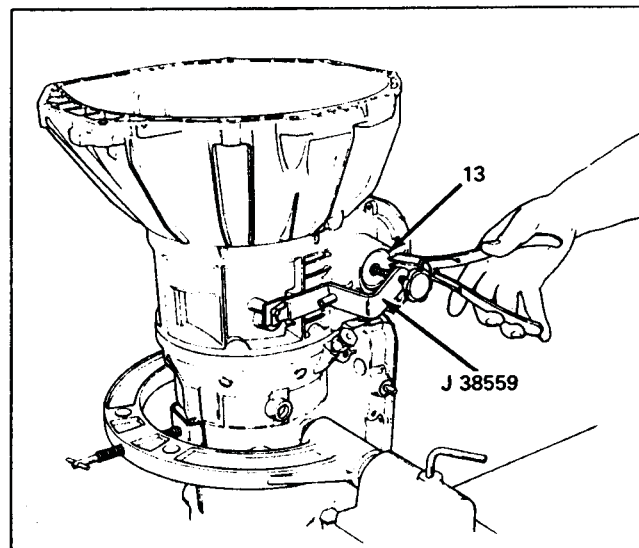


Figure 34

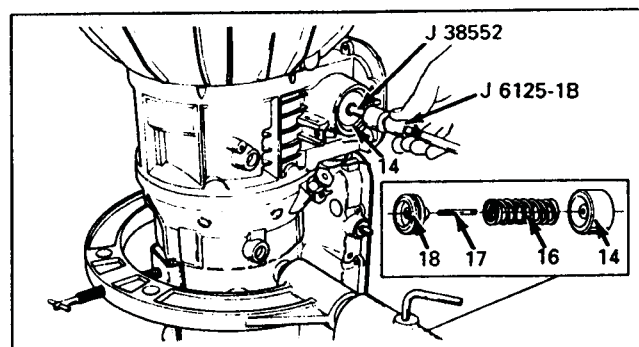


Figure 35

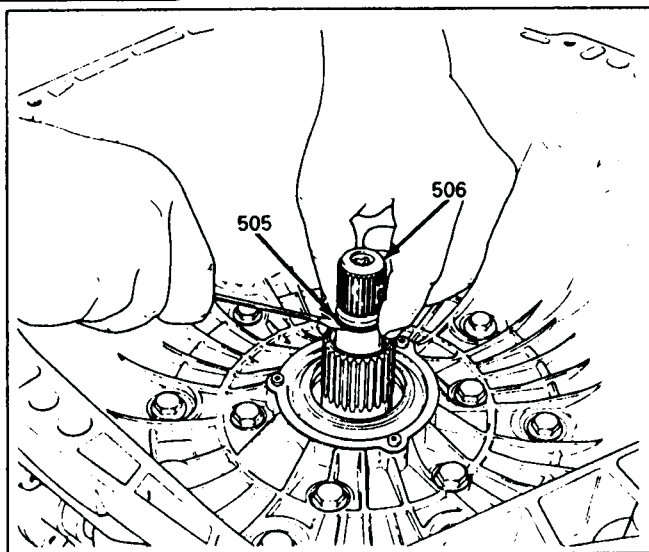


Figure 36

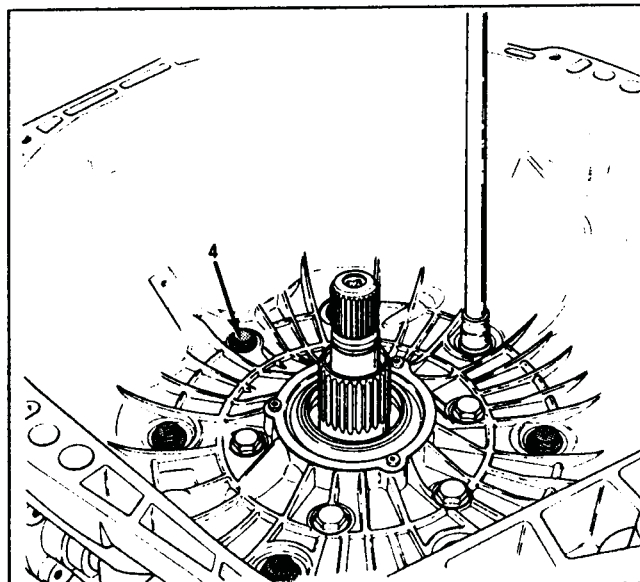


Figure 37

## CONVERTER HOUSING

1. Remove the turbine shaft "O" ring seal, as shown in Figure 36.
2. Loosen but do not remove the 5 pump bolts (Inner Circle) using a 13mm socket.
3. Remove 7 converter housing to main case bolts, using a 13mm socket, as shown in Figure 37.
4. Firmly grasp the converter housing and remove converter housing and the oil pump assembly (See Figure 38).
5. Remove the oil pump to main case gasket, and selective thrust washer. (See Figure 38).

NOTE: Gasket and thrust washer may be stuck to the pump assembly.

6. Lifting from the inside as shown in Figure 39, remove the fourth clutch retainer.

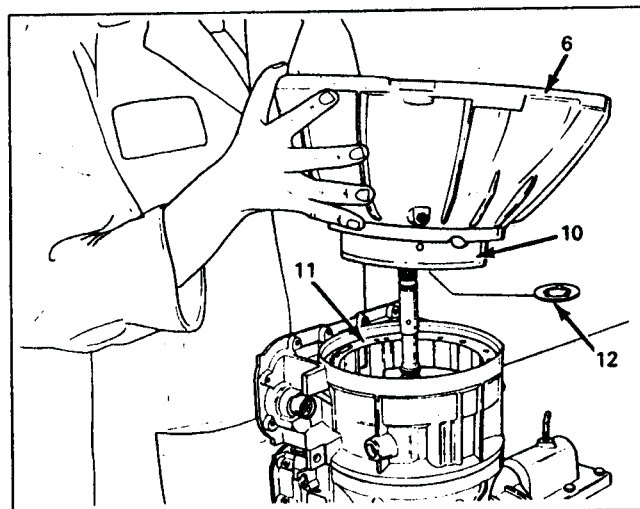


Figure 38

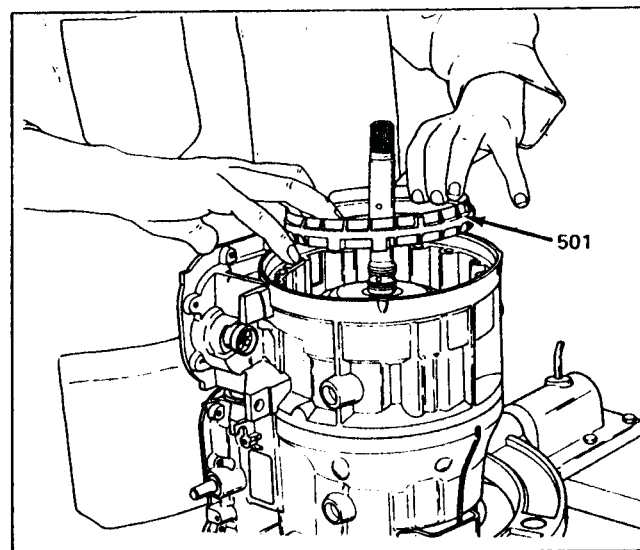


Figure 39

(Continued on Page 30)



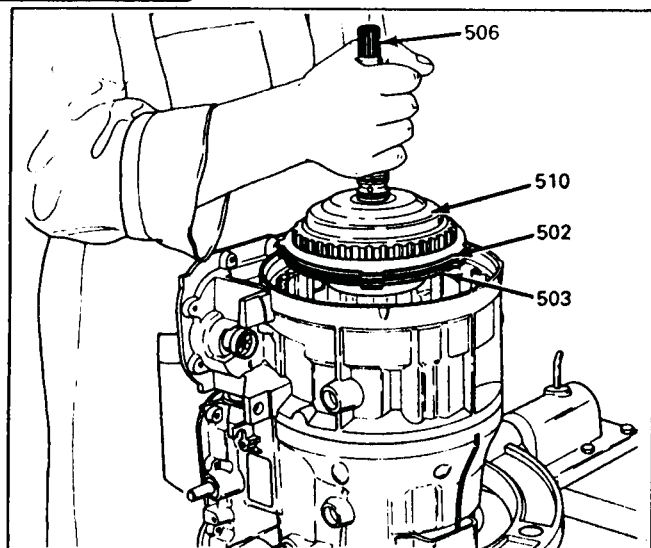


Figure 40

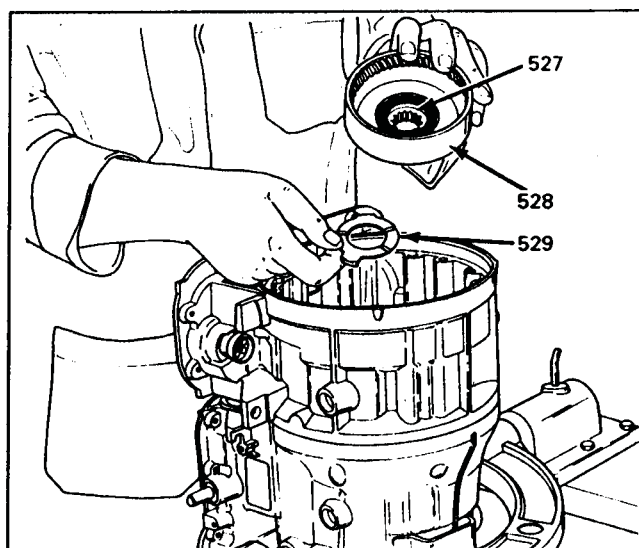


Figure 41

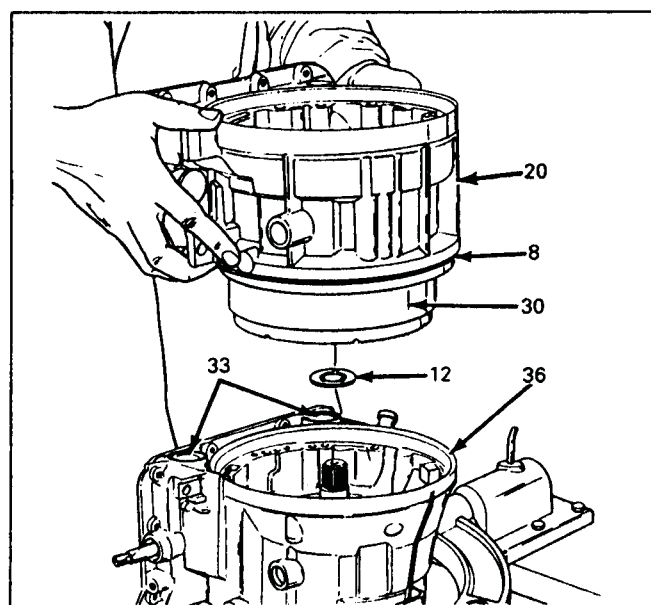


Figure 42

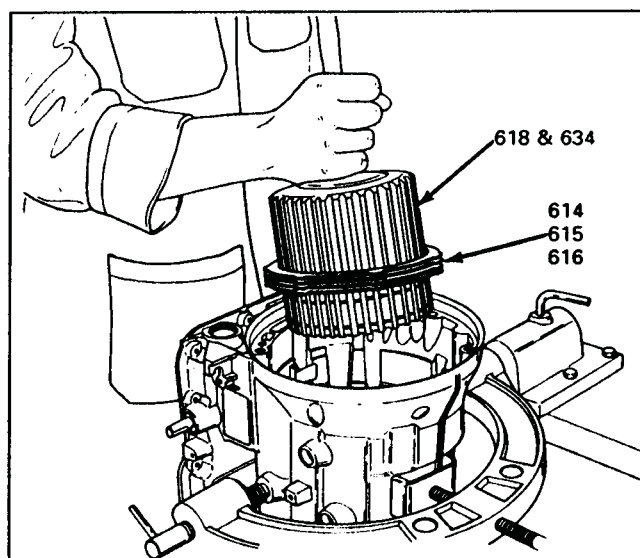


Figure 43

(Continued from Page 29)

7. Firmly grasp the turbine shaft and lift out the overrun clutch housing, and fourth clutch plates, as shown in Figure 40.

NOTE: One steel plate will remain in the case. Remove at this time.

8. Remove the overdrive internal ring gear and thrust washer. A thrust bearing will be retained inside the ring gear (See Figure 41).
9. Grasp the adapter case and remove by lifting it from the main case, as shown in Figure 42.

10. The center support assembly will remain to the adapter case.
11. Two "O" ring seals (33) will remain in the main case, and one "O" ring (8) will remain on the adapter case, as shown in Figure 42.
12. A selective thrust washer may stick to the center support (Figure 42).
13. Grasp the intermediate shaft, twist and remove the second and third clutch assemblies with reverse clutches. (See Figure 43).

NOTE: To ease removal of the second & third clutch housings, hold the output shaft while lifting.

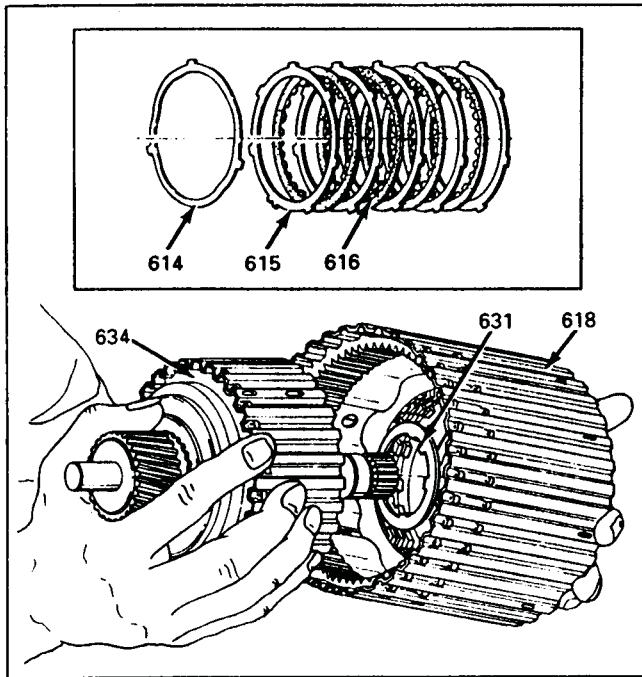


Figure 44

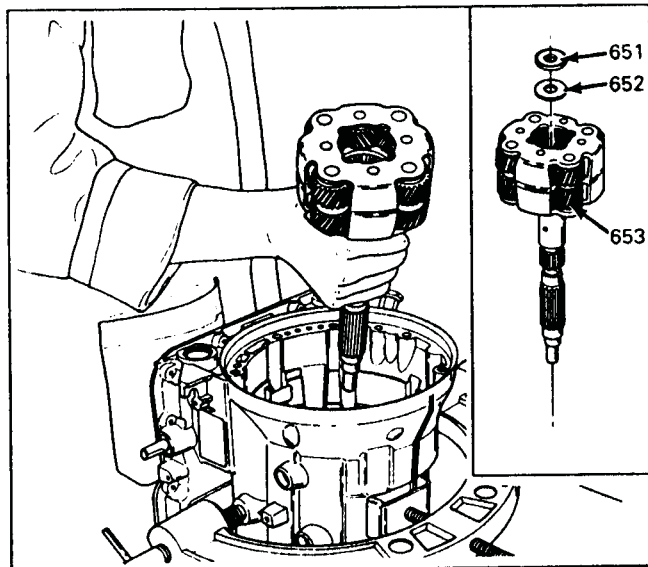


Figure 46

14. Remove the reverse clutch plates from the second clutch housing, separate the second and third clutch housings as shown in Figure 44.
15. Remove the thrust washer (631) from the third clutch housing (Figure 44).
16. Lifting from the inside, as shown in Figure 45, remove the reverse clutch backing plate.
17. Remove the planetary carrier by pushing up on the output shaft with one hand and grasping the carrier with the other (See Figure 46).

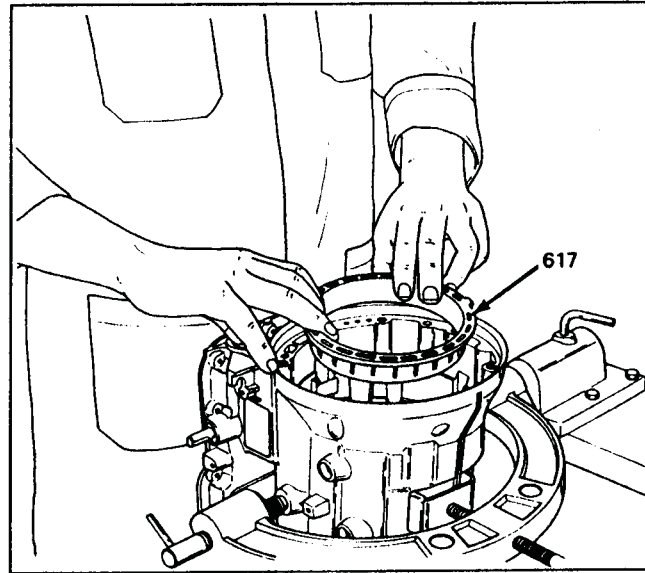


Figure 45

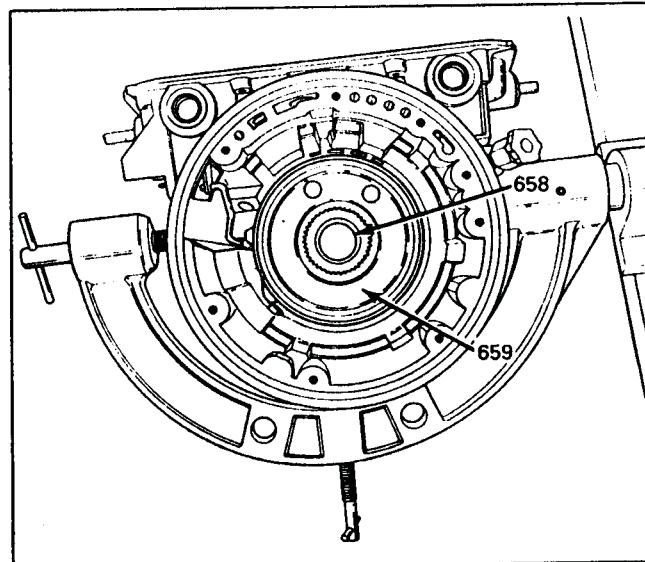


Figure 47

18. Thrust bearing and race will remain in the carrier (See Figure 46).
19. Remove the reaction sun gear by turning slowly while lifting from the brake drum assembly (See Figure 47).

(Continued on Page 32)

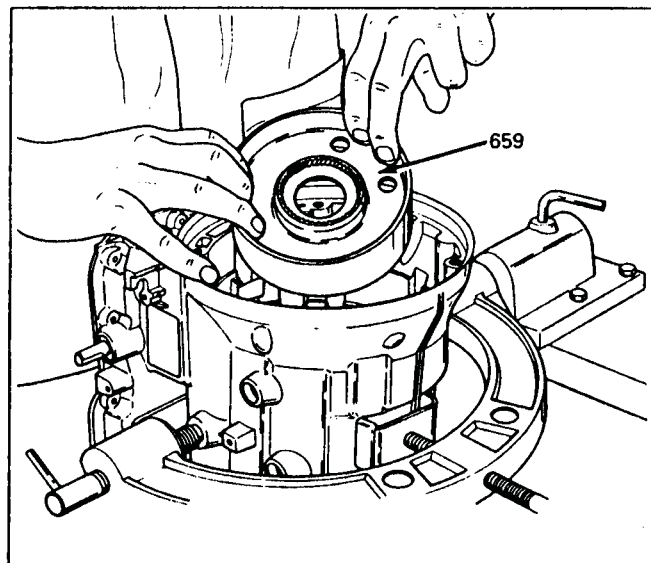


Figure 48

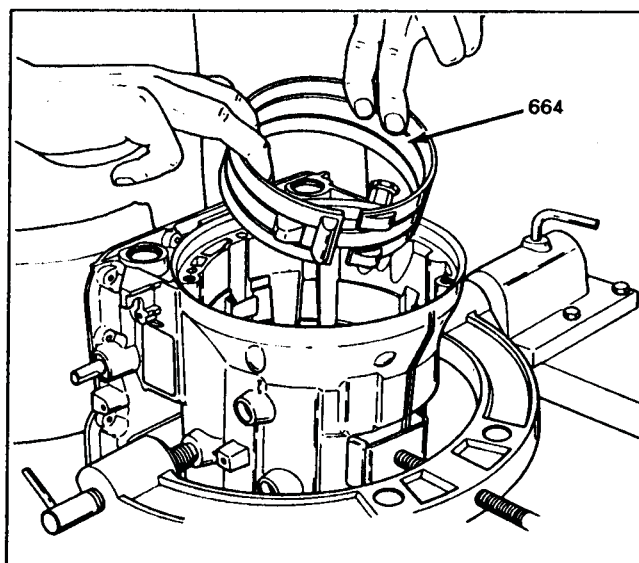


Figure 49

(Continued from Page 31)

20. Remove the 1-2 brake drum, as shown in Figure 48, by lifting from the inside.
21. Remove the 1-2 brake band, as shown in Figure 49.
22. Remove the thrust bearing and race from rear of case as shown Figure 50.
23. If removal of the selector shaft is necessary, insert a wire in center of the roll pin to prevent it from collapsing during removal.
24. Be aware of the pin height, remove the roll pin with diagonal pliers as shown in Figure 51.
25. The rooster comb is retained to the selector shaft with a 17mm nut, and can be removed without removing the selector shaft and roll pin. (See Figure 52).

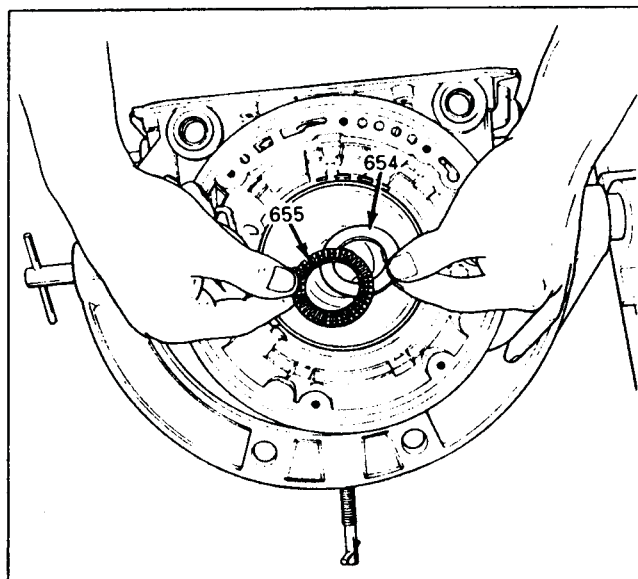


Figure 50

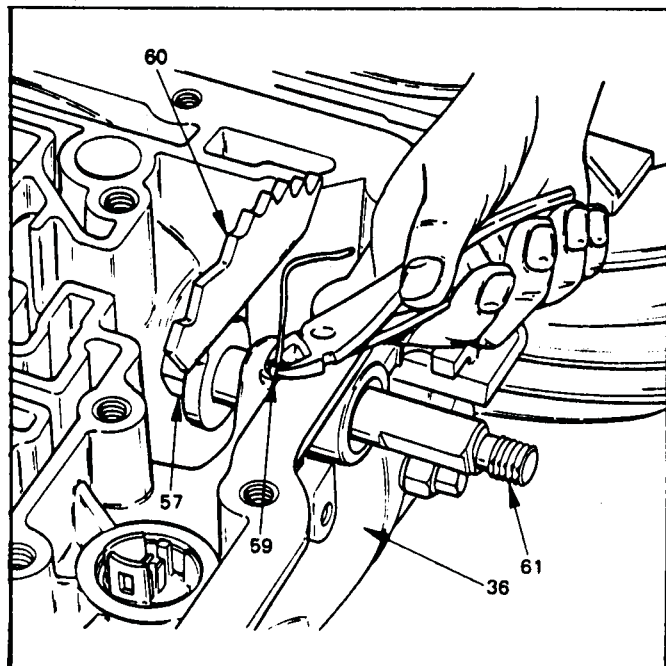


Figure 51

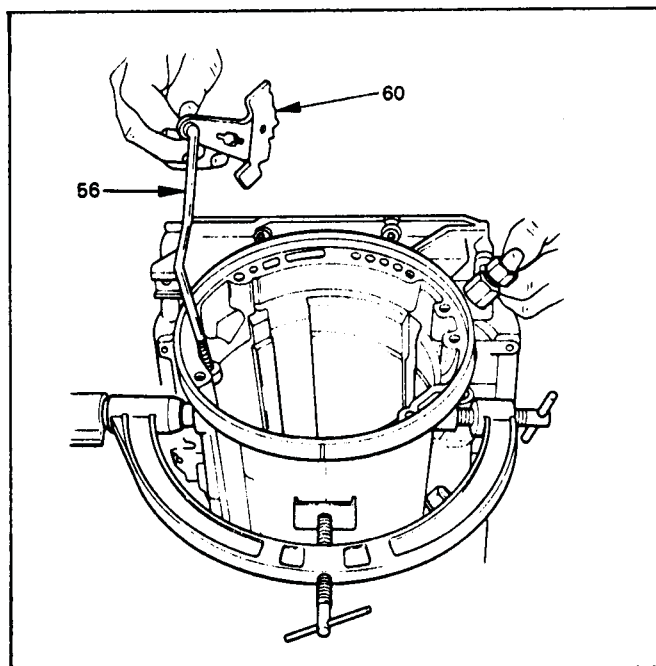
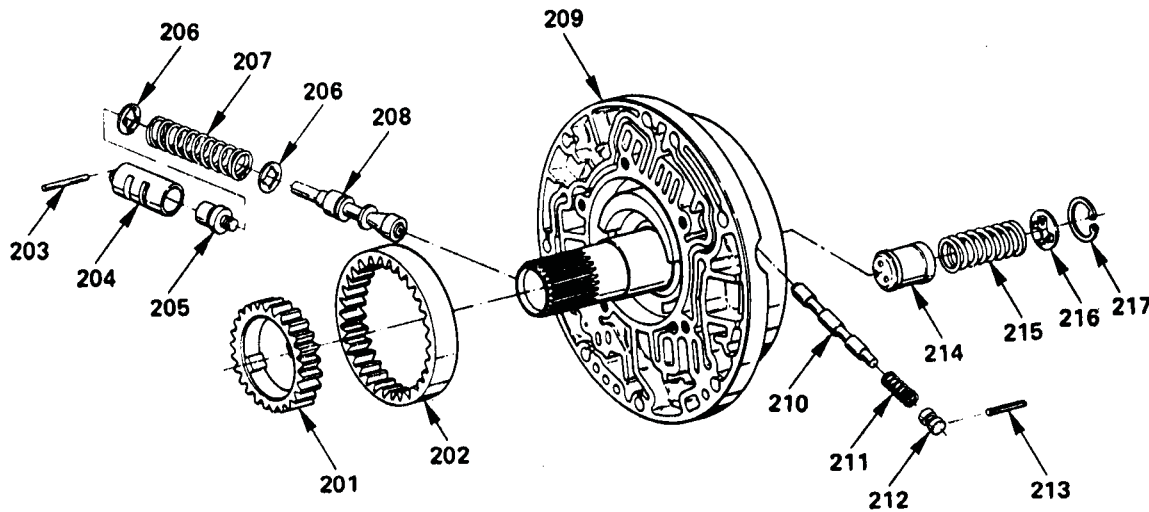


Figure 52



- 201. OIL PUMP INNER GEAR (I.D. DOTS "UP").
- 202. OIL PUMP OUTER GEAR (I.D. DOTS "UP").
- 203. PRESSURE REGULATOR VALVE ROLLED PIN.
- 204. PRESSURE REGULATOR BOOST VALVE SLEEVE.
- 205. PRESSURE REGULATOR BOOST VALVE.
- 206. PRESSURE REGULATOR VALVE SPRING SEATS (2).
- 207. PRESSURE REGULATOR VALVE SPRING.
- 208. PRESSURE REGULATOR VALVE.
- 209. OIL PUMP HOUSING.
- 210. T.C.C. CONTROL VALVE.
- 211. T.C.C. CONTROL VALVE SPRING.
- 212. T.C.C. CONTROL VALVE BORE PLUG.
- 213. T.C.C. BORE PLUG ROLLED PIN.
- 214. THROTTLE SIGNAL ACCUMULATOR PISTON.
- 215. THROTTLE SIGNAL ACCUMULATOR PISTON SPRING.
- 216. THROTTLE SIGNAL ACCUMULATOR SPRING SEAT.
- 217. THROTTLE SIGNAL ACCUMULATOR SNAP RING.

Figure 53

## COMPONENT REBUILD AND ASSEMBLY

### OIL PUMP AND CONVERTER HOUSING

1. Lubricate all oil pump valves and bores with clean transmission fluid.
2. Install all valves into the oil pump using Figure 53 for assembly.
3. Lubricate oil pump gear pocket and both pump gears with transmission fluid.
4. Install driven gear and drive gear into pump pocket with I.D. dots facing "UP".
5. Install oil pump wear plate as shown in Figure 54.
6. Install new front seal in converter housing, and torque retainer bolts to 26 in.lb.
7. Install converter housing onto complete oil pump assembly.
8. Install two short guide pins J-38588, as shown in Figure 55.
9. Start 5 converter housing to pump bolt by hand, but DO NOT tighten.
10. Center converter housing using pump centering tool J-38557, as shown in Figure 55.
11. Torque the pump bolts to 14 ft.lb., using a 13mm socket, in a alternating pattern as shown in Figure 55.
12. Loosen and remove the centering tool and the guide pins.

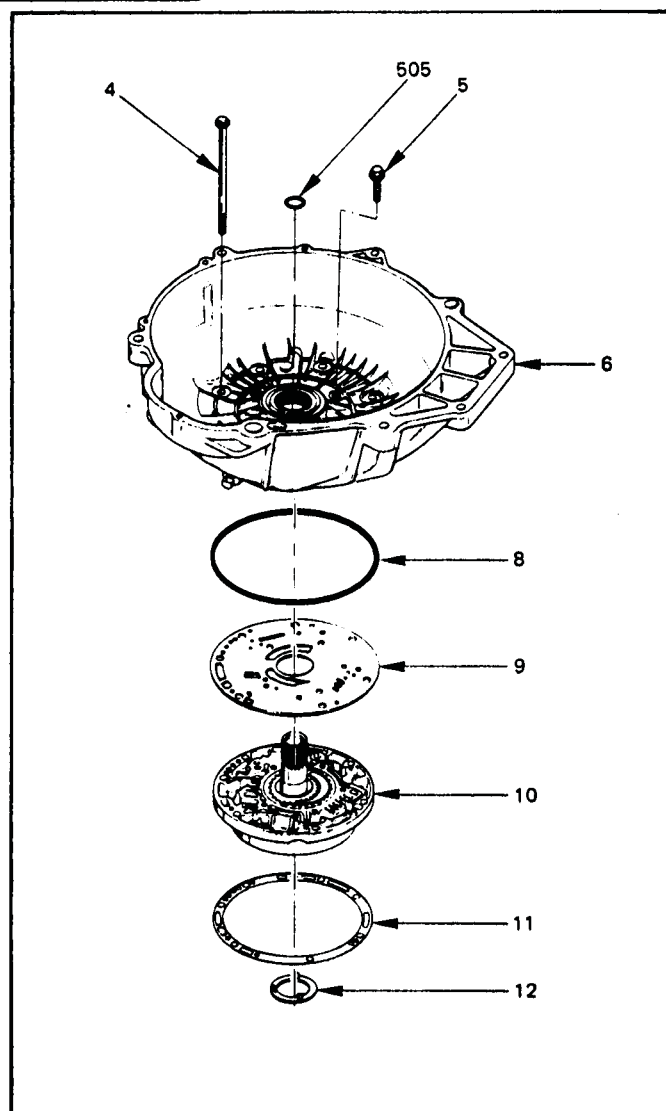


Figure 54

13. Ensure free rotation of pump gears using pump rotation tool J-23082-01, as shown in Figure 56.
14. Install oil pump "O" ring seal, pump to adapter case gasket, and selective thrust washer (See Figure 54).
15. Retain these parts with petrolatum.
16. Set complete assembly aside for later assembly into case.

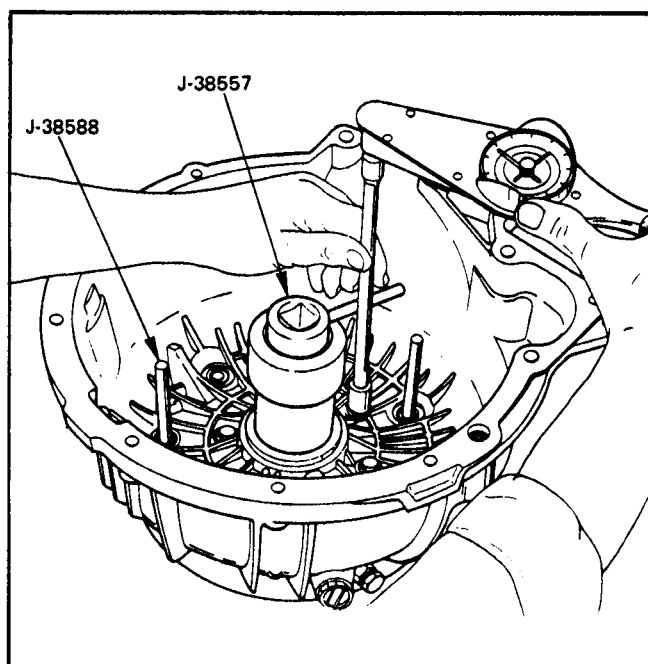


Figure 55

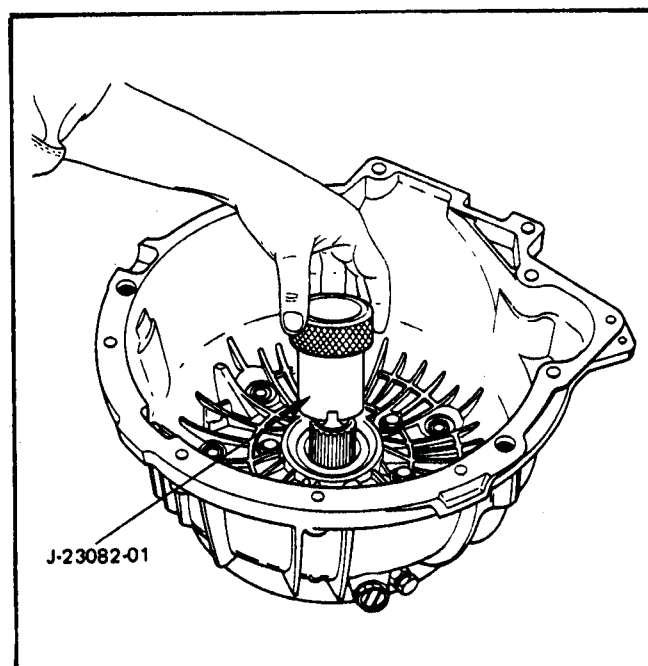


Figure 56



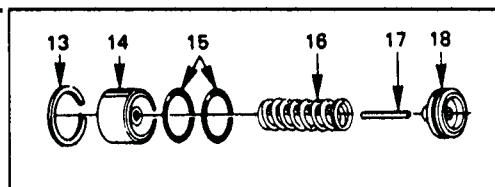
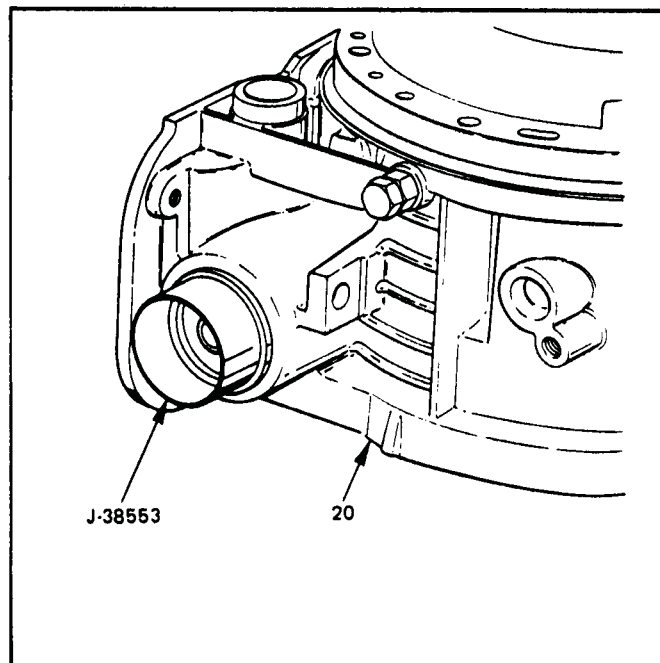


Figure 57

## ADAPTER CASE ASSEMBLY

1. Install new seal on the overdrive accumulator piston.
2. Place installation sleeve J-38553 into adapter case bore as shown in Figure 57.
3. Lubricate piston seal with petrolatum and install through J-38553 in adapter case bore with suitable diameter tube.
4. Remove installation sleeve J-38553.
5. Install accumulator piston pin, spring, cover seals, and cover (See Figure 57).
6. Install compression tool J-38559 as shown in Figure 58, compress accumulator cover, and install snap ring.
7. Remove compression tool J-38559.
8. Install spiral capillary restrictor into overdrive lube channel in the adapter case as shown in Figure 59.
9. Install overrun lockout valve, spring, bore plug, and roll pin as shown in Figure 60.

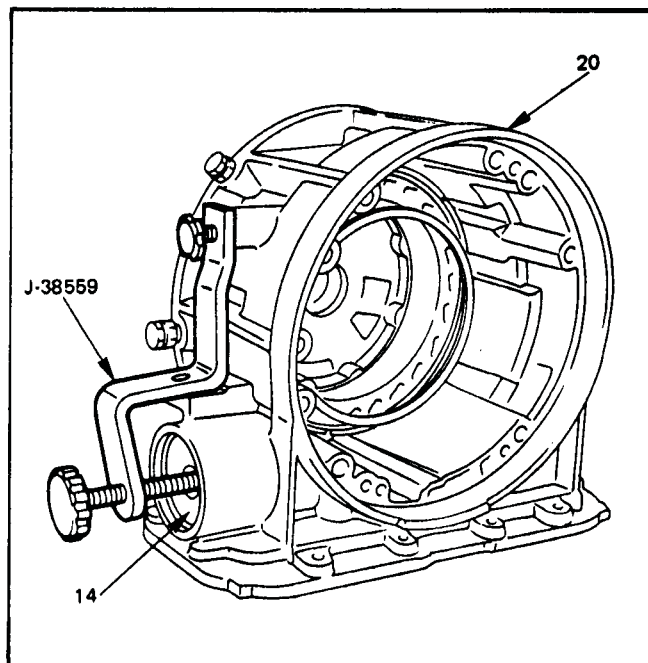


Figure 58

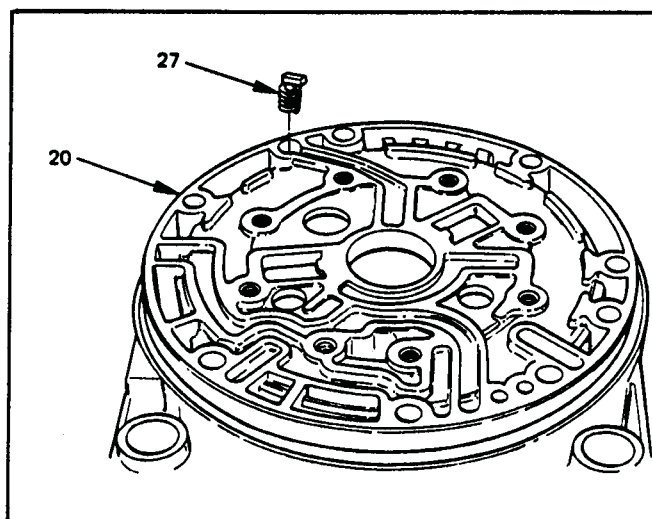


Figure 59

(Continued on Page 38)

## CENTER SUPPORT ASSEMBLY

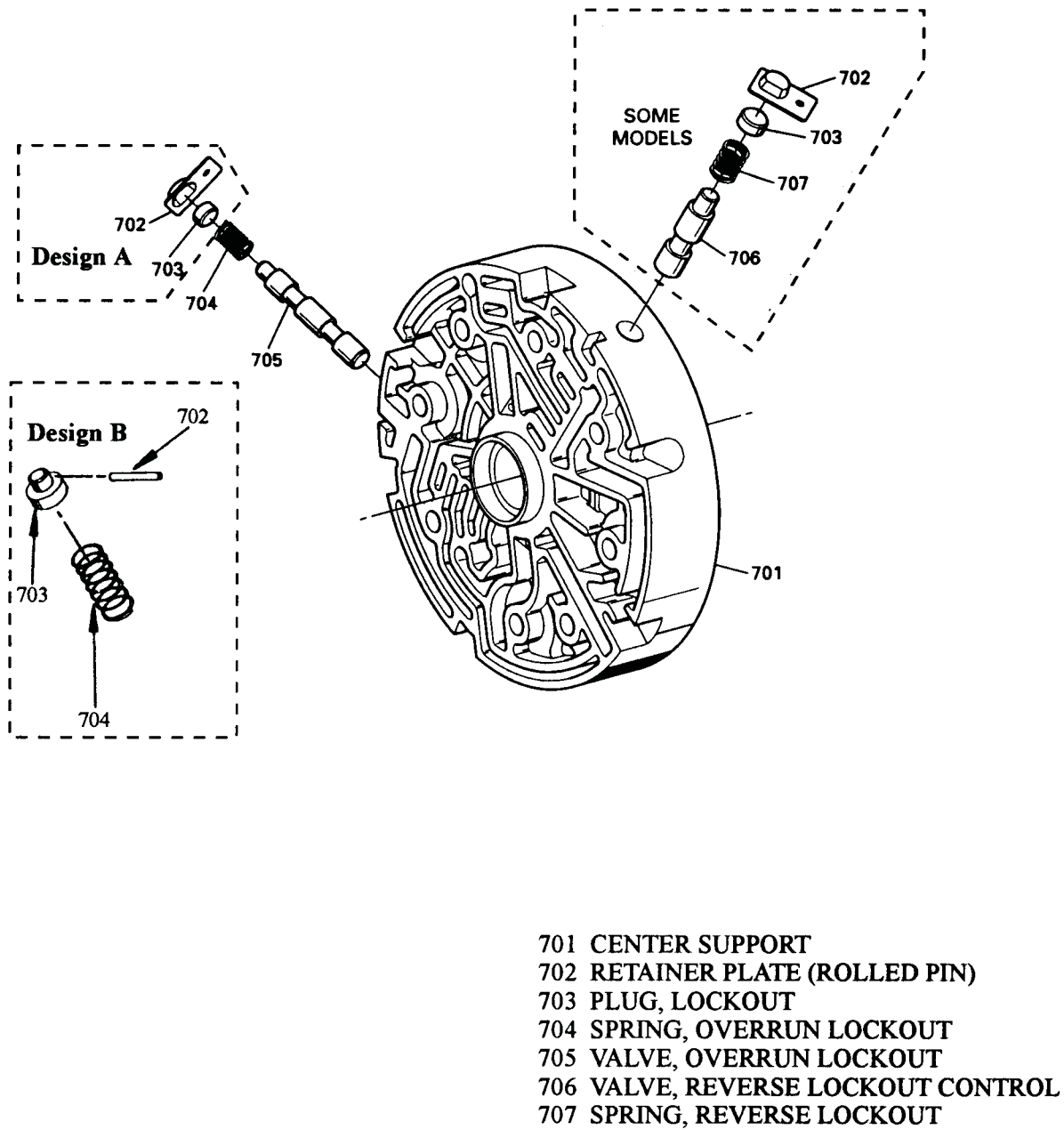


Figure 60

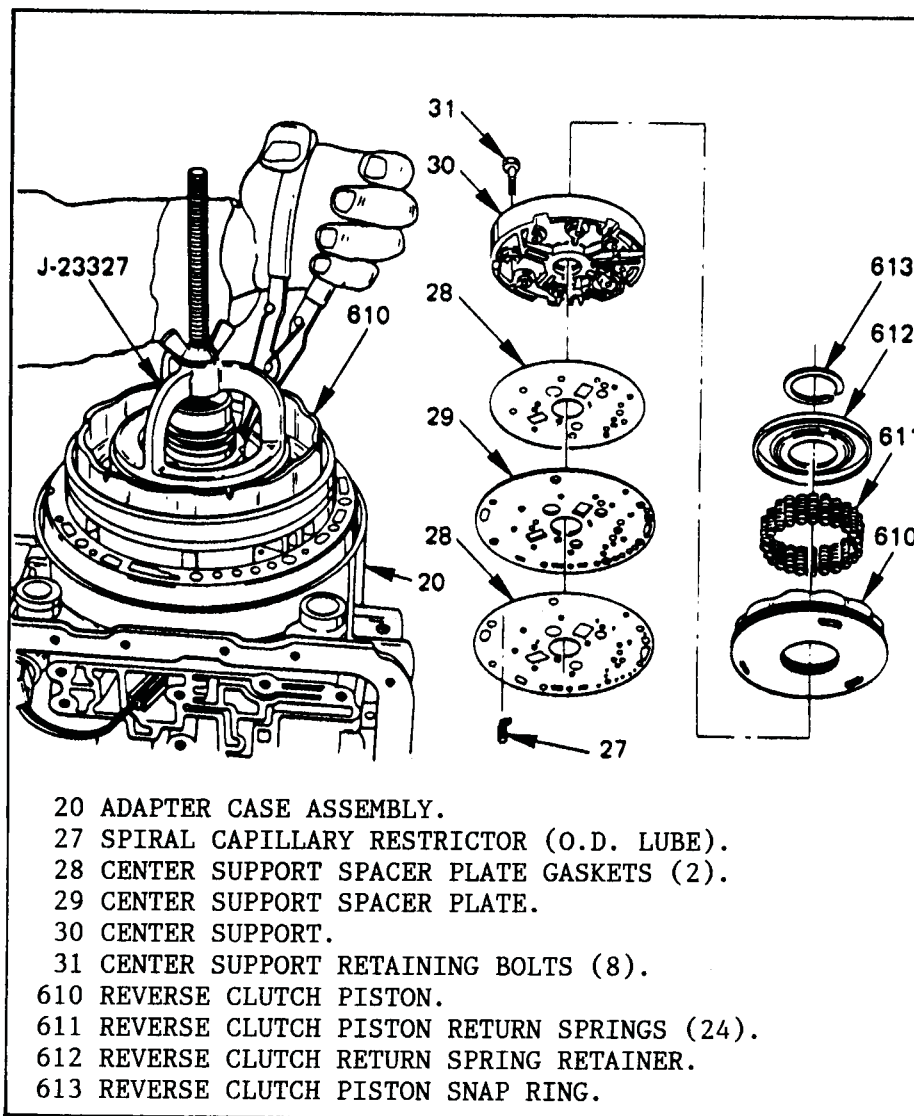


Figure 61

10. Install spacer plate gasket onto the adapter case housing (See Figure 61).
11. Install adapter case spacer plate on top of gasket on housing (Figure 61).
12. Install another spacer plate gasket on top of spacer plate (Figure 61).
13. Install center support onto adapter case housing with seal ring tower up as shown in Figure 61.
14. Install eight 13mm bolts and torque to 18 ft.lbs.
15. Install "O" ring onto adapter case and lubricate with petrolatum.
16. Install new lip seals into reverse piston seal grooves.
17. Install reverse clutch piston into center support (See Figure 61).
18. Install 24 reverse clutch piston return springs into piston, and install spring retainer on top of springs (Figure 61).
19. Install spring compressor J-23327 as shown in Figure 61.
20. Compress return springs and retainer, and install the snap ring.
21. Install selective washer on seal ring tower and retain with petrolatum.
22. Install new sealing rings in the grooves on the center support.
23. Turn adapter case over.
24. Install new seals on the fourth clutch piston and lubricate with petrolatum.
25. Install seal protector J-38554 into the adapter case, and install fourth clutch piston, as shown in Figure 62.

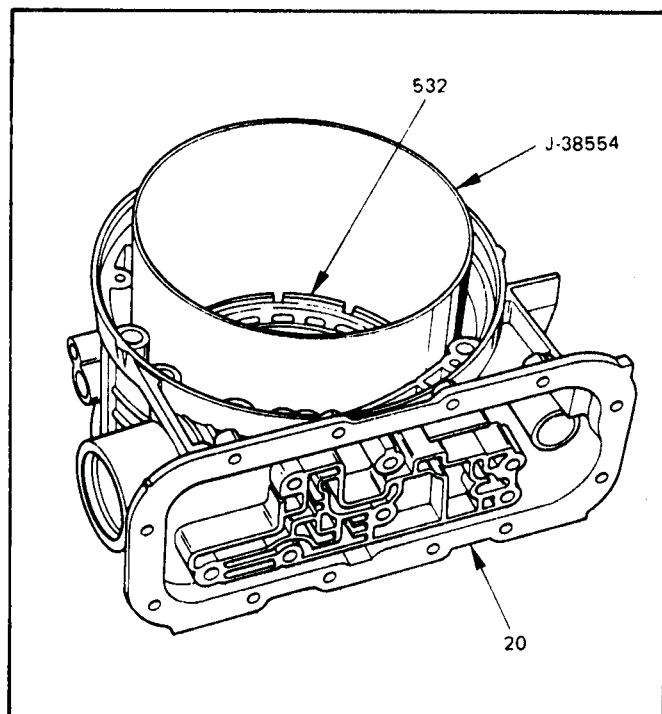


Figure 62

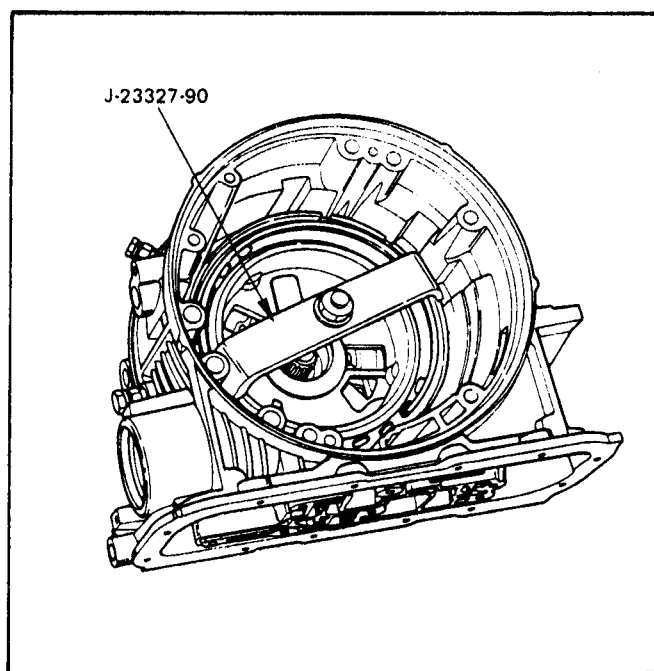


Figure 63

26. Remove seal protector J-38554.
27. Install fourth clutch piston return spring assembly on top of fourth clutch piston.
28. Install spring compressor J-23327-90 as shown in Figure 63.
29. Compress return spring assembly and install snap ring in groove.
30. Remove spring compressor J-23327-90.
31. Set adapter case assembly aside for final assembly.

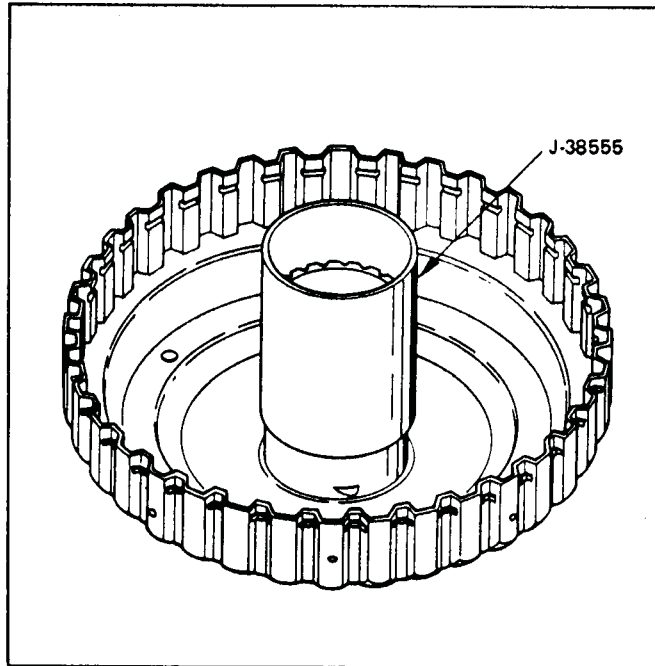


Figure 64

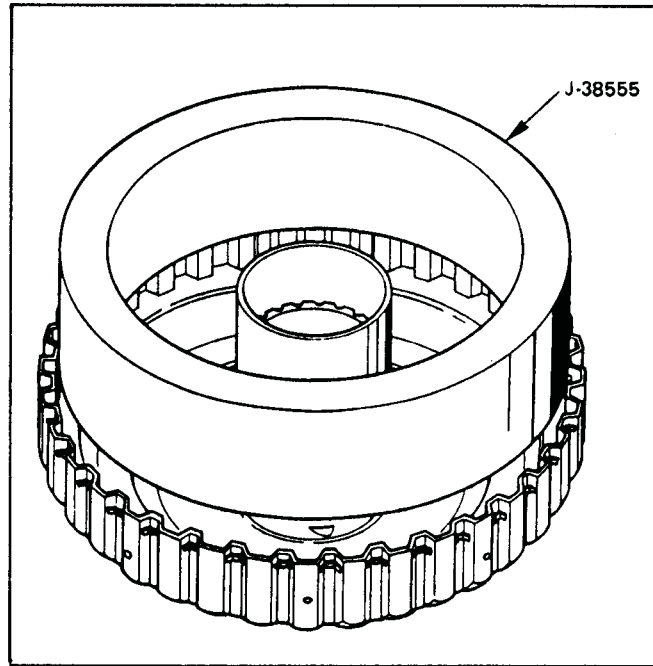


Figure 65

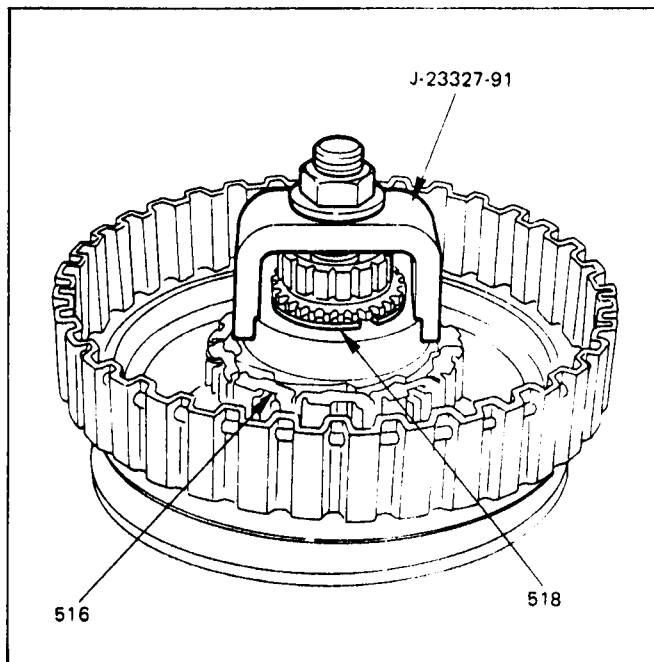


Figure 66

## OVERRUN CLUTCH/OVERDRIVE UNIT

1. Install inner lip seal protector onto overrun clutch housing, as shown in Figure 64.
2. Install inner and outer lip seals on the overrun clutch piston and lube with petrolatum.
3. Pre-install piston into outer lip seal protector, and install overrun clutch piston into housing.
4. Use the outer seal protector while pushing piston into housing (Refer to Figure 65).
5. Remove both seal protectors from the overrun clutch housing.
6. Using Figure 70 for reference, install diaphragm return spring with fingers facing up, and install overrun spring retainer on top of it with the inner lip facing up.
7. Install overrun roller clutch assembly and inner cam (Figure 70).
8. Place snap ring loosely on the hub.
9. Place the entire assembly over J-23327 compressor held in a bench vise, and install adapter J-23327-91 as shown in Figure 66.
10. Compress piston return spring and install snap ring (See Figure 66).
11. Remove spring compressor.
12. Using Figure 70 for reference, install overdrive sun gear with inner groove facing down.
13. Install overrun clutch plates, start with a steel plate, and alternate with lined plate. This clutch pack requires 2 steel plates and 2 lined plates.
14. Install overrun clutch backing plate and overrun clutch snap ring.
15. Check overdrive carrier pinion end-play with feeler gage (Figure 68). Clearance should be .009" - .025".

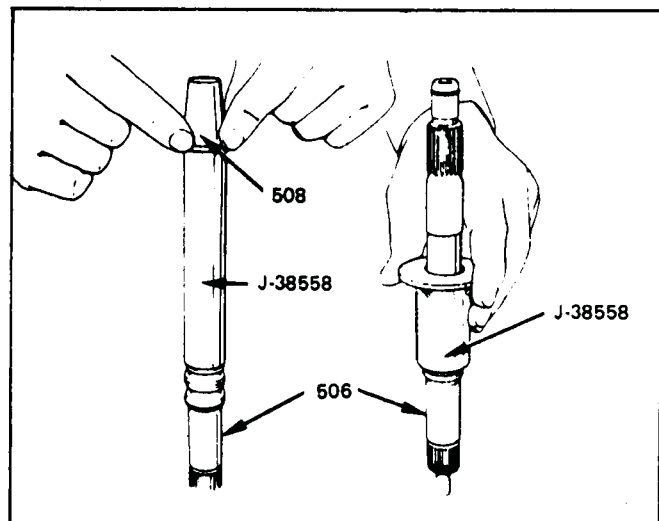


Figure 67

16. Install the overdrive carrier into the housing by rotating counter clockwise direction only, until the roller clutch enters the outer race.
17. While holding the overrun housing, the overdrive carrier should free-wheel counter-clockwise and lock clockwise.
18. Install new sealing rings onto the turbine shaft using the installer and re-sizer tools, as shown in Figure 67.
19. Using the overdrive ring gear as a fixture, install complete overdrive unit on the turbine shaft and install snap ring, as shown in Figure 69.
20. Set completed overdrive unit aside for final assembly.

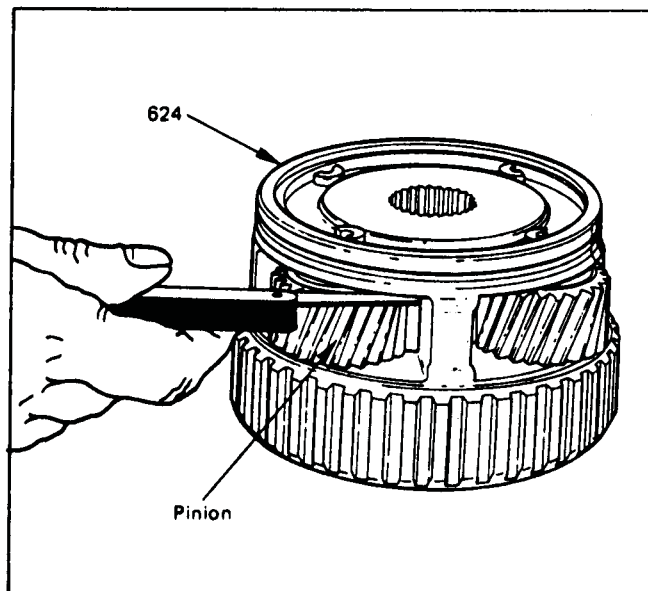


Figure 68

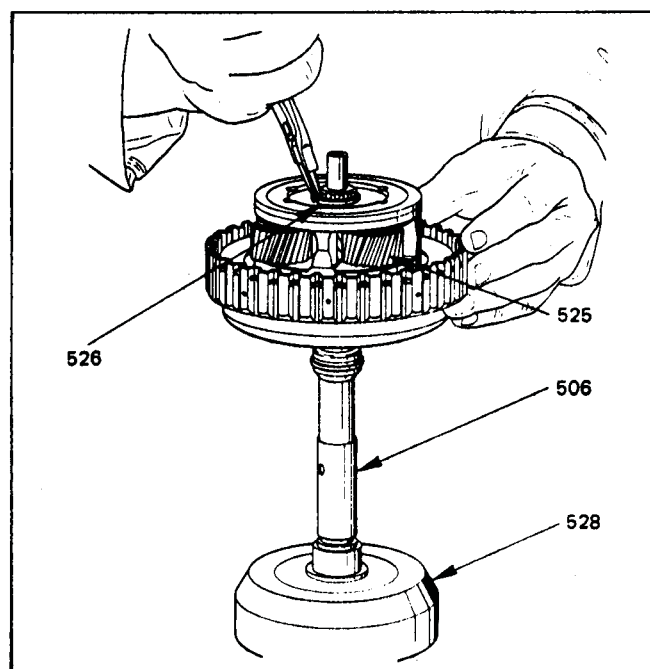


Figure 69



- 501. FOURTH CLUTCH RETAINER.
- 502. FOURTH CLUTCH STEEL PLATES.
- 503. FOURTH CLUTCH FRICTION PLATES.
- 504. TURBINE SHAFT BALL CAPSULE.
- 505. TURBINE SHAFT "O" RING.
- 506. TURBINE SHAFT.
- 508. TURBINE S W T SEALING RINGS (3).
- 510. OVERRUN CLUTCH HOUSING.
- 511. OVERRUN CLUTCH INNER LIP SEAL.
- 512. OVERRUN CLUTCH OUTER LIP SEAL.
- 513. OVERRUN CLUTCH PISTON.
- 514. OVERRUN CLUTCH DIAPHRAGM RETURN SPRING.
- 515. OVERRUN CLUTCH SPRING RETAINER.
- 516. OVERRUN ROLLER CLUTCH.
- 517. OVERRUN ROLLER CLUTCH INNER CAM.
- 518. OVERRUN CLUTCH SNAP RING.
- 519. OVERDRIVE SUN GEAR.
- 520. OVERRUN CLUTCH WAVED PLATE.
- 521. OVERRUN CLUTCH STEEL PLATES.
- 522. OVERRUN CLUTCH FRICTION PLATES.
- 523. OVERRUN CLUTCH BACKING PLATE.
- 524. OVERRUN CLUTCH BACKING PLATE SNAP RING.
- 525. OVERDRIVE CARRIER ASSEMBLY.
- 526. TURBINE SHAFT SNAP RING.
- 527. OVERDRIVE CARRIER/INTERNAL GEAR THRUST BEARING.
- 528. OVERDRIVE INTERNAL RING GEAR.
- 529. OVERDRIVE RING GEAR/ADAPTER CASE THRUST WASHER.
- 530. FOURTH CLUTCH SNAP RING.
- 531. FOURTH CLUTCH RETURN SPRING ASSEMBLY.
- 532. FOURTH CLUTCH PISTON.
- 533. FOURTH CLUTCH INNER LIP SEAL.
- 534. FOURTH CLUTCH OUTER LIP SEAL.

Figure 70 - Legend

## OVERRUN CLUTCH AND OVERDRIVE SECTION

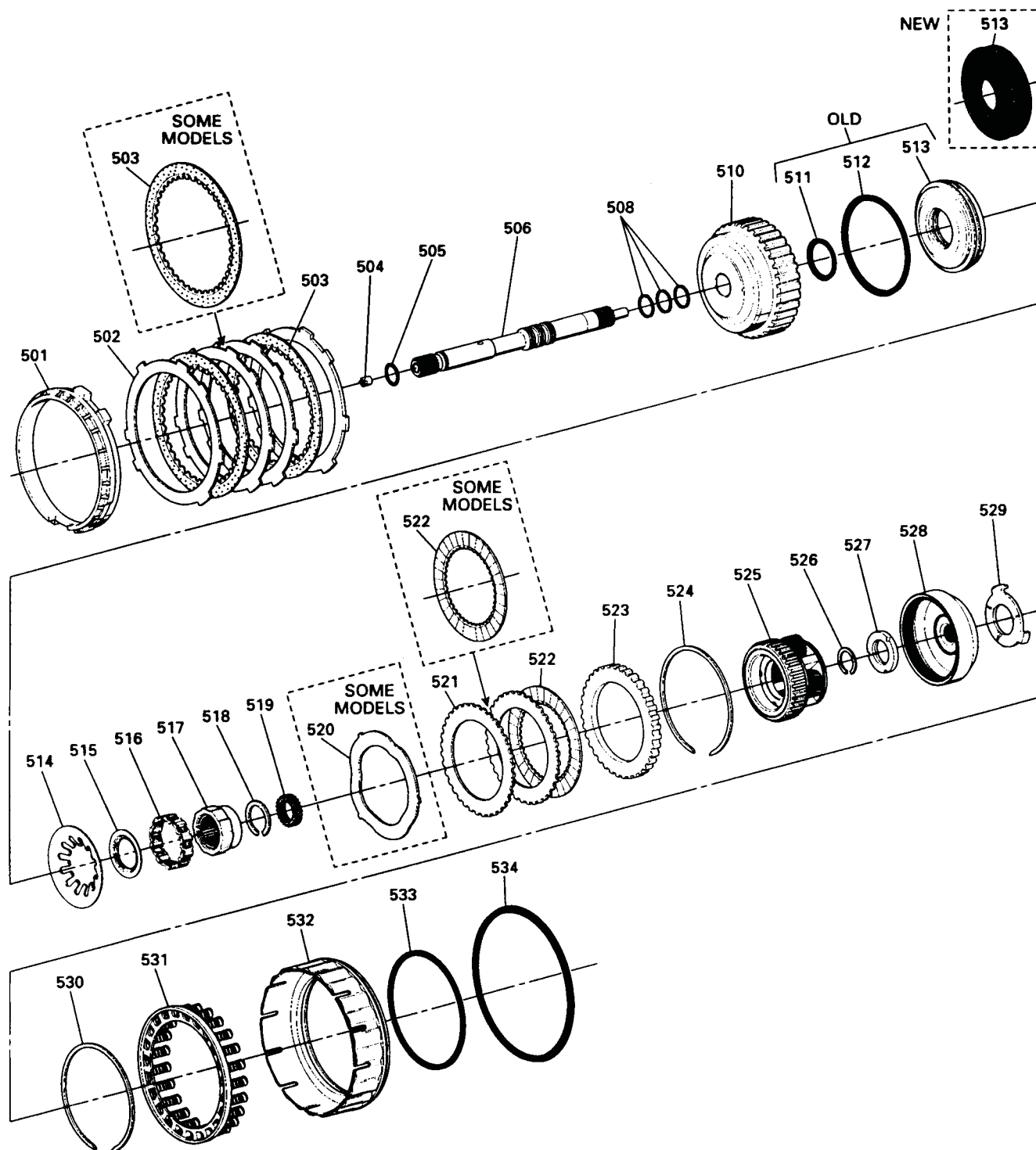


Figure 70

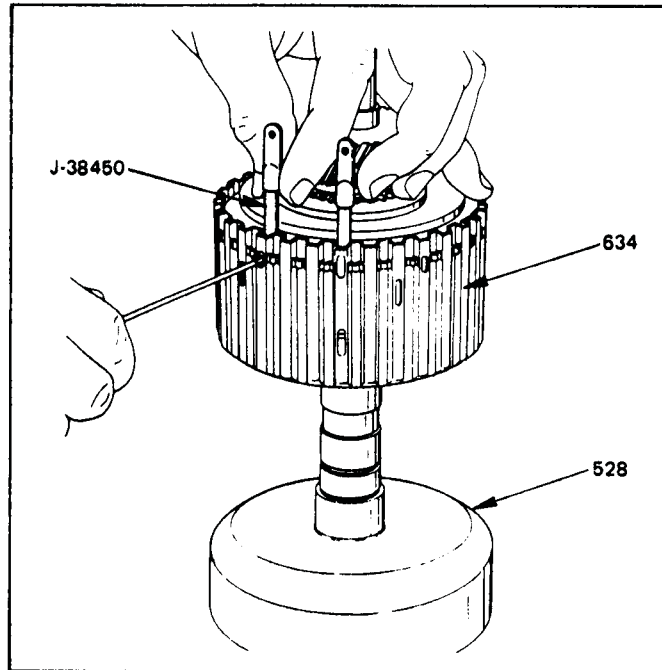


Figure 71

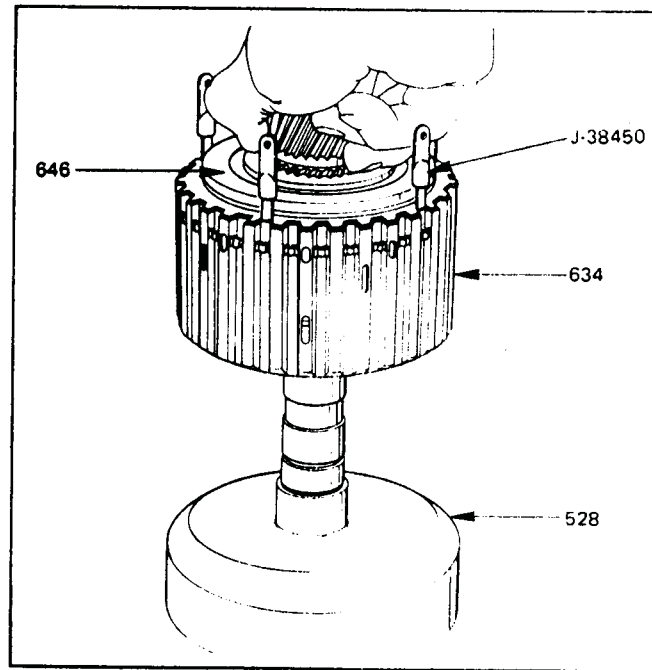


Figure 72

## 3RD CLUTCH HOUSING/LOW SPRAG

### LOW SPRAG REMOVAL

1. Removing the low sprag assembly from the 3rd clutch housing requires the J-38450 low sprag retaining ring tool (6 Pieces), or equivalent.
2. Place the 3rd clutch housing upright using the overdrive ring gear as a fixture, as shown in Figure 71.
3. Locate the end of the snap ring and push near the end using a screwdriver through the side slot, and slide one tool blade between the ring and the housing to hold the ring clear of the groove (See Figure 71).
4. Repeat the process with a second tool blade near the other end of the snap ring (See Figure 71).
5. Repeat the process with a third tool blade opposite the first two, shown in Figure 72.
6. Repeat the process with two more tool blades equally spaced.
7. Pull the input sun gear assembly up until the sprag snap ring clears the snap ring groove in the housing.
8. The remainder of the 3rd clutch housing disassembly is routine, as shown in Figure 73.

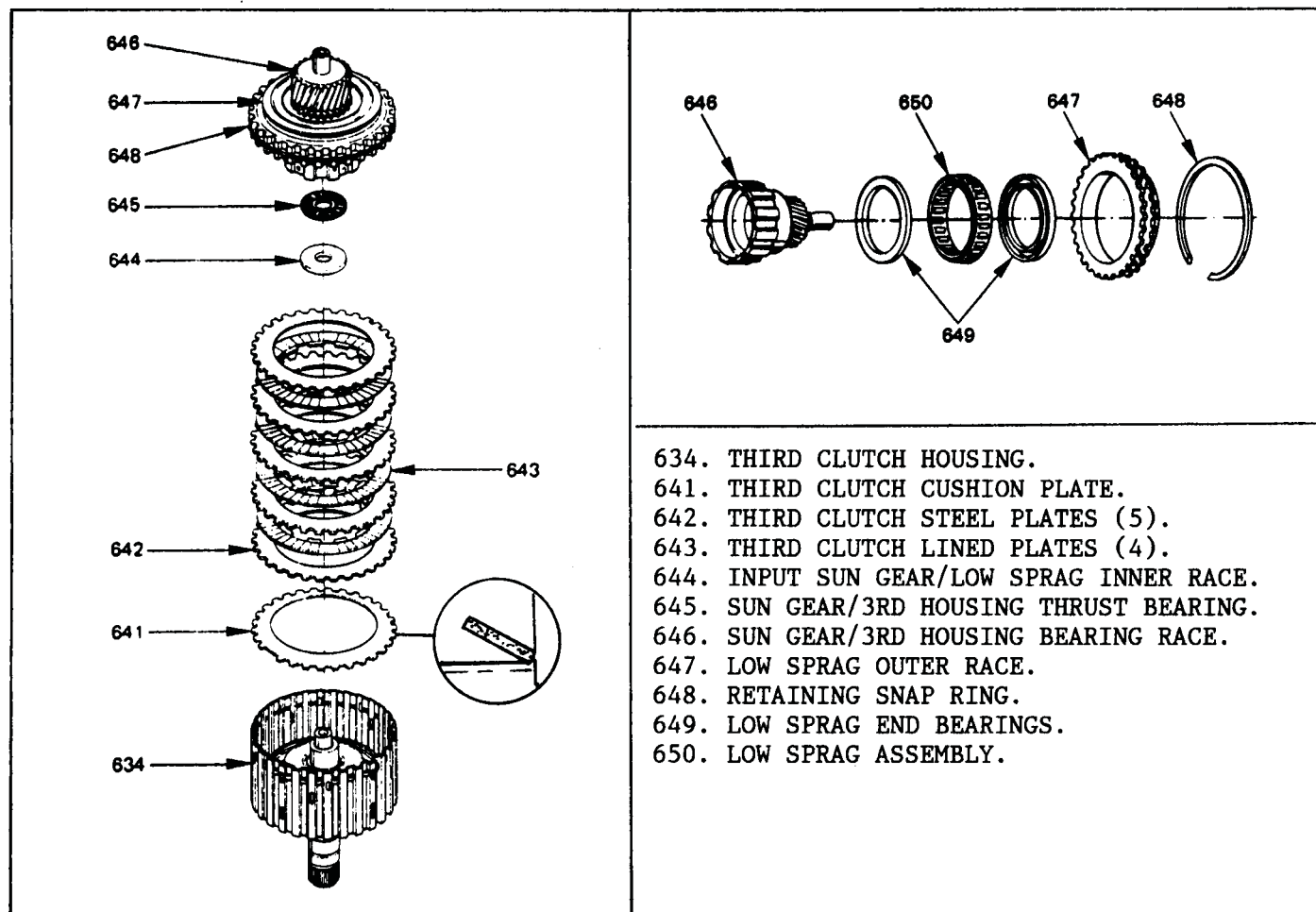


Figure 73

- 634. THIRD CLUTCH HOUSING.
- 641. THIRD CLUTCH CUSHION PLATE.
- 642. THIRD CLUTCH STEEL PLATES (5).
- 643. THIRD CLUTCH LINED PLATES (4).
- 644. INPUT SUN GEAR/LOW SPRAG INNER RACE.
- 645. SUN GEAR/3RD HOUSING THRUST BEARING.
- 646. SUN GEAR/3RD HOUSING BEARING RACE.
- 647. LOW SPRAG OUTER RACE.
- 648. RETAINING SNAP RING.
- 649. LOW SPRAG END BEARINGS.
- 650. LOW SPRAG ASSEMBLY.

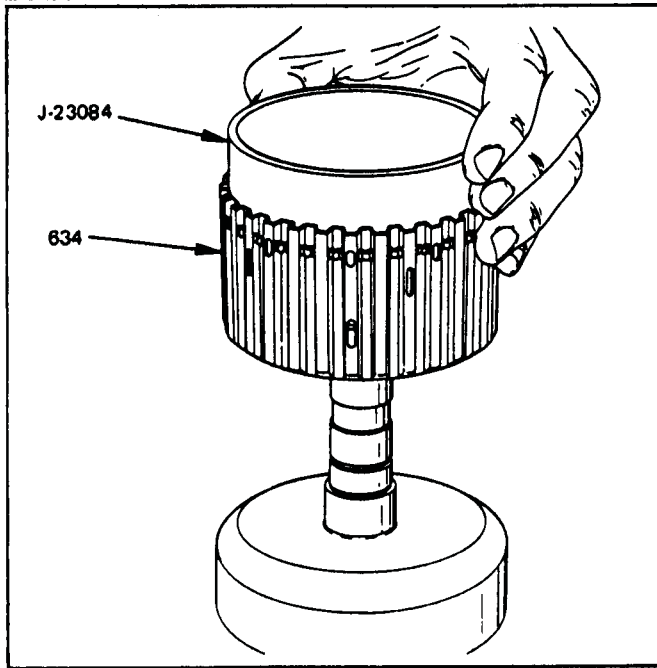


Figure 74

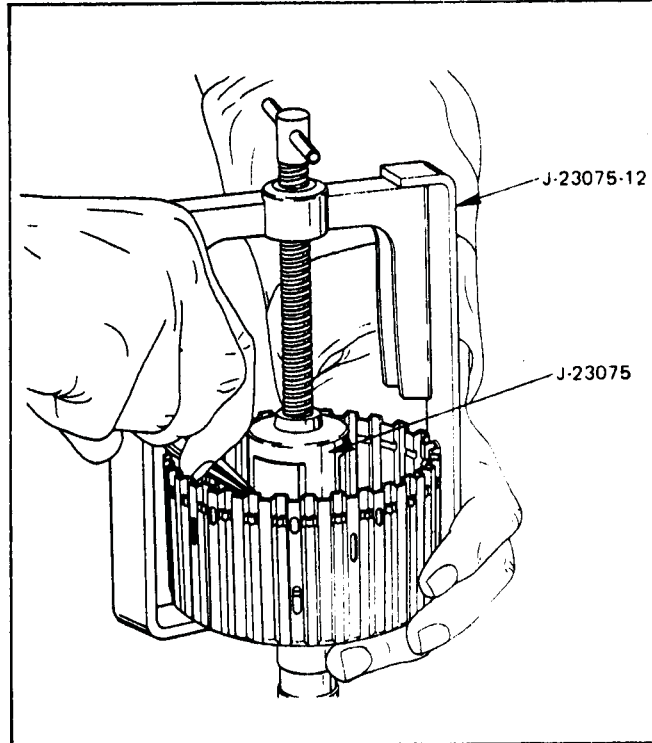


Figure 75

## 3RD CLUTCH HOUSING/LOW SPRAG ASSEMBLY

1. Shake the 3rd clutch piston, listen for checkball movement. Replace the piston if checkball is missing or falls out.
2. Install new outer lip seal on the 3rd clutch piston.
3. Install new inner lip seal on the intermediate shaft.
4. The lip seals must point toward the front of the transmission, lubricate both seals with petrolatum.
5. Install 3rd clutch piston into the housing using J-23084 seal protector as shown in Figure 74.
6. Remove the seal protector.
7. Install twelve 3rd clutch piston return springs.
8. Install return spring retainer, and place snap ring on top of it.
9. Compress the piston return springs using the spring compressor shown in Figure 75, and install snap ring.
10. CAUTION - Do not over-stress springs and do not let the retainer catch in the snap ring groove. This may cause damage to the retainer.
11. Remove the spring compressor.
12. Install the 3rd clutch cushion spring with bevel facing down, as shown in inset in Figure 73.
13. Install 3rd clutch plates into the 3rd clutch housing, beginning with a steel plate first and alternate with a lined plate (See Figure 73).
14. This unit requires 5 steel plates and 4 lined plates, stacked as shown in Figure 73.
15. Install thrust bearing race and the thrust bearing, and retain with some petrolatum (See Figure 73).
16. Install end bearings and sprag assembly onto the sun gear (See Figure 73).
17. NOTE - Flared shoulder of the sprag cage faces the sun gear.
18. Place the sprag outer race over the sun gear assembly. Push down and turn the input sun gear counter-clockwise at the same time.
19. Hold the sun gear in your left hand as shown in Figure 76. If the low sprag is assembled properly, the outer race will free-wheel toward you and lock when turned away from you, as shown in Figure 76.
20. Fully engage the sprag assembly hub splines into the 3rd clutch plates. Simultaneously rotate the outer sprag race to engage into the 3rd clutch housing.

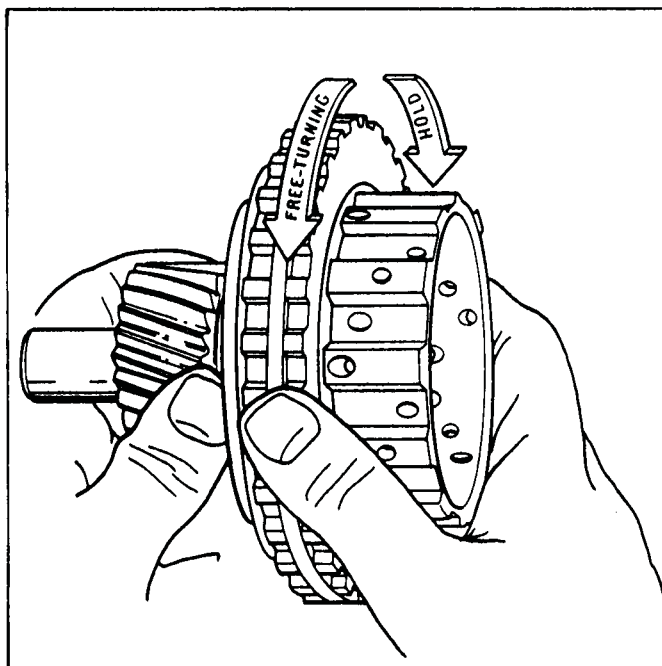


Figure 76

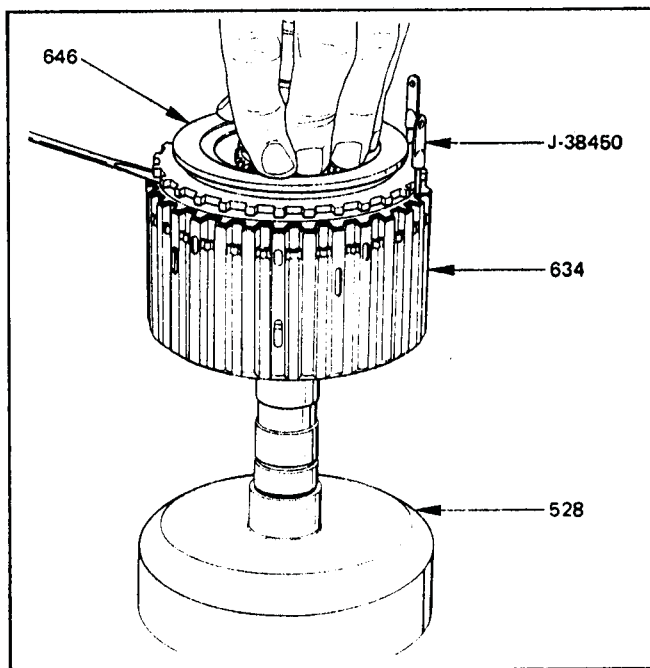


Figure 77

21. Install a tool blade at each end of the snap ring, between the snap ring and the 3rd clutch housing, as shown in Figure 77.
22. Compress the snap ring with a screwdriver opposite the tool blades while pushing down on the outer sprag race as shown in Figure 77.
23. Engage the snap ring into the snap ring groove in 3rd clutch housing.
24. Remove the tool blades, and ensure that snap ring is fully seated.
25. Set 3rd clutch housing assembly aside for final assembly.



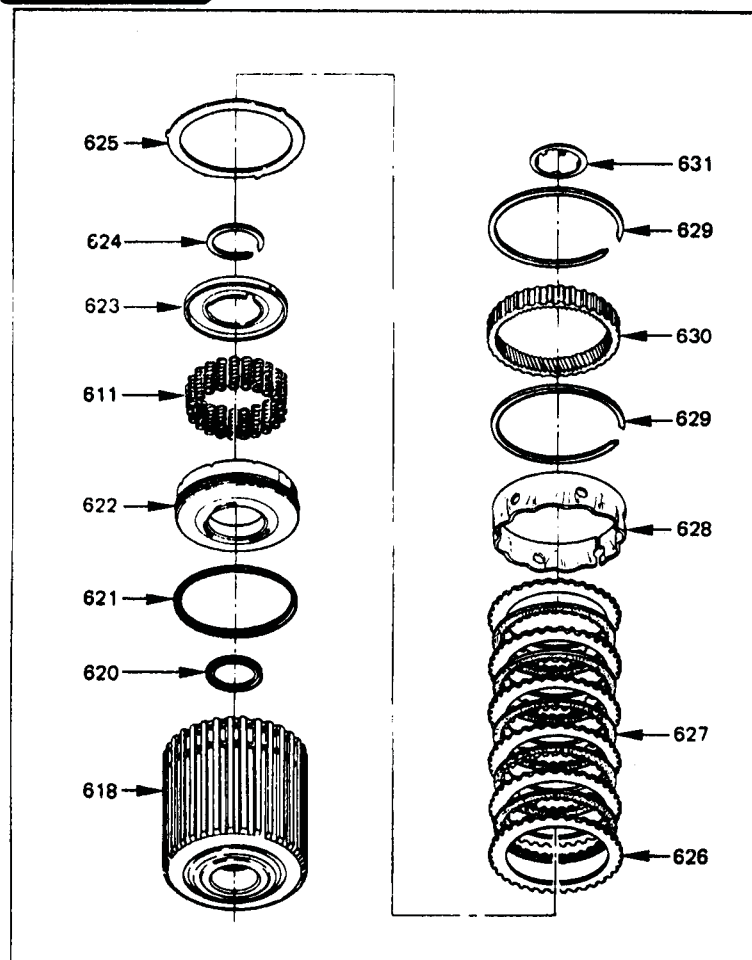


Figure 78

- 611. 2ND CLUTCH PISTON RETURN SPRINGS (22).
- 618. 2ND CLUTCH HOUSING.
- 620. 2ND CLUTCH PISTON INNER LIP SEAL.
- 621. 2ND CLUTCH PISTON OUTER LIP SEAL.
- 622. 2ND CLUTCH PISTON.
- 623. 2ND CLUTCH RETURN SPRING RETAINER.
- 624. 2ND CLUTCH RETAINER SNAP RING.
- 625. 2ND CLUTCH WAVE PLATE (1).
- 626. 2ND CLUTCH STEEL PLATES (6).
- 627. 2ND CLUTCH LINED PLATES (5).
- 628. 2ND CLUTCH SPACER.
- 629. 2ND CLUTCH SNAP RINGS (2).
- 630. PLANETARY INTERNAL RING GEAR.
- 631. 2ND CLUTCH/3RD CLUTCH THRUST WASHER.

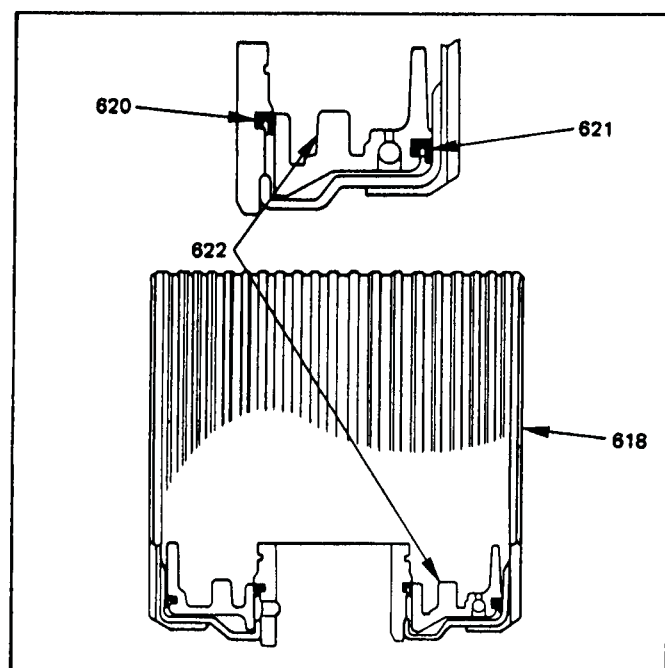


Figure 79

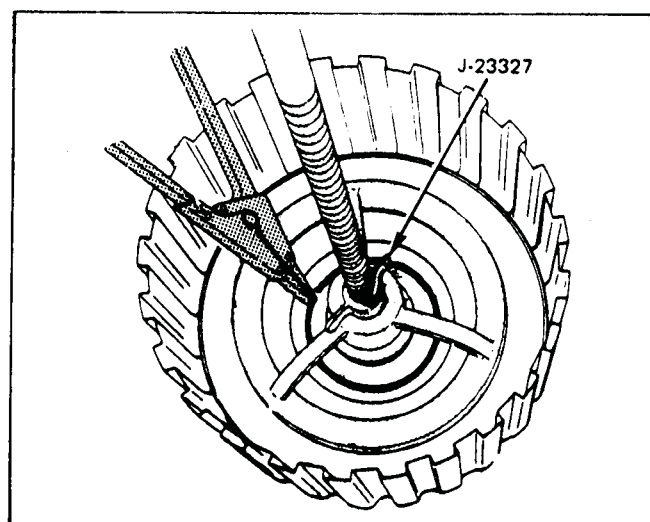


Figure 80

## 2ND CLUTCH HOUSING ASSEMBLY

1. Shake the 2nd clutch piston and listen for checkball movement. Replace the piston if checkball is missing or falls out.
2. Install new inner lip seal into the 2nd clutch housing, with lip facing down, as shown in Figure 79.
3. Install new outer lip seal onto the 2nd clutch piston with lip facing down, as shown in Figure 79.
4. Lubricate both lip seals with petrolatum and install piston into the 2nd clutch housing by rotating and pushing down at the same time.
5. Install 22 2nd clutch return springs on top of the piston (Figure 78).
6. Install return spring retainer on top of return springs, and place snap ring on the retainer.
7. Using J-23327 spring compressor, as shown in Figure 80, compress the return springs.  
NOTE: Do not let the spring retainer catch in snap ring groove.
8. Install the snap ring into snap ring groove as shown in Figure 80.
9. Remove the spring compressor.
10. Install 2nd clutch wave plate on the 2nd clutch piston (See Figure 78).
11. Install 2nd clutch plates beginning with a steel plate and alternating with lined plates (Figure 78).
12. This unit requires 6 steel plates, and 5 lined plates, as shown in Figure 78.
13. Install 2nd clutch spacer, as shown in Figure 78.
14. Install snap ring into groove of the 2nd clutch housing on top of 2nd clutch spacer.
15. Install internal ring gear into 2nd clutch housing on top of snap ring, as shown in Figure 78.
16. Install snap ring into groove of the 2nd clutch housing on top of internal ring gear.
17. Install inside tanged thrust washer, with tangs pointing downward, into the 2nd clutch housing and retain with petrolatum.
18. Install completed 3rd clutch housing assembly into the 2nd clutch housing by rotating back and forth until all clutch plates are engaged, and 3rd clutch housing is fully seated (See Figure 81).
19. Set the completed assembly aside for final assembly process.

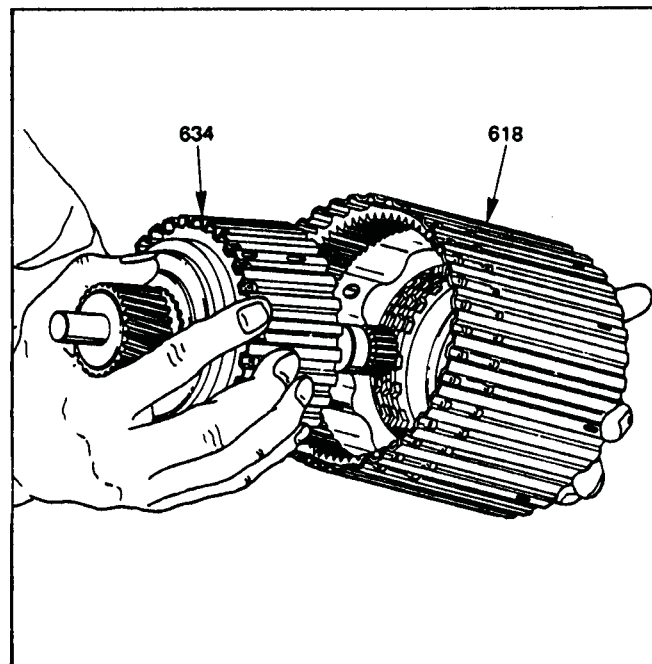


Figure 81

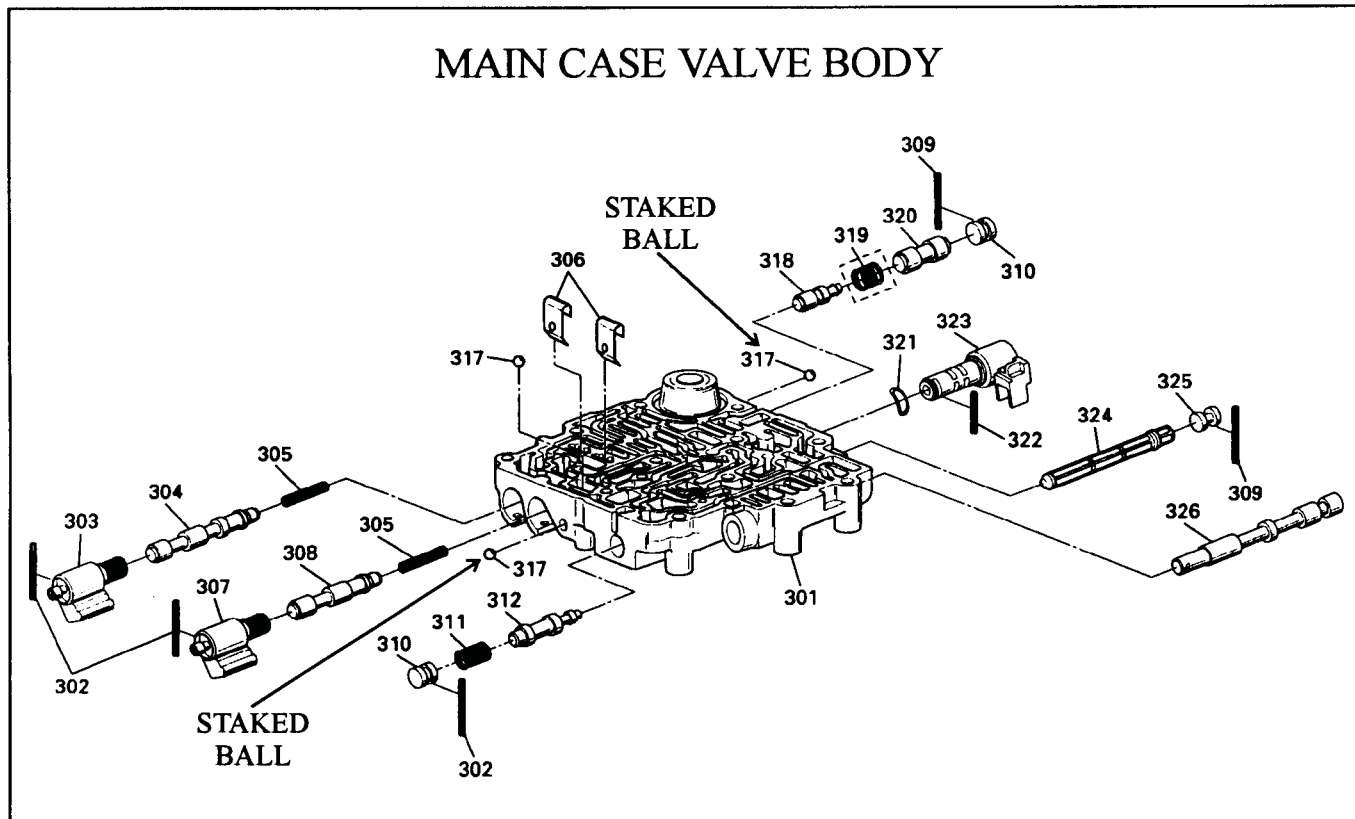


Figure 82

- 301 MAIN CASE VALVE BODY
- 302 ROLLED RETAINING PIN
- 303 1-2/3-4 SHIFT SOLENOID
- 304 1-2/3-4 SHIFT VALVE
- 305 SHIFT VALVE SPRINGS (2)
- 306 SHIFT VALVE SPRING RETAINERS
- 307 2-3 SHIFT SOLENOID
- 308 2-3 SHIFT VALVE
- 309 ROLLED RETAINING PIN
- 310 VALVE BORE PLUG
- 311 LOW PRESSURE CONTROL VALVE SPRING
- 312 LOW PRESSURE CONTROL VALVE
- 317 CHECK BALL
- 318 1-2 ACCUMULATOR CONTROL VALVE
- 319 1-2 ACCUMULATOR CONTROL VALVE SPRING (OPTIONAL)
- 320 1-2 ACCUMULATOR VALVE
- 321 WAVED WASHER
- 322 ROLLED RETAINING PIN
- 323 BAND APPLY (PWM) SOLENOID
- 324 BAND APPLY (PWM) SOLENOID SCREEN
- 325 SOLENOID SCREEN BORE PLUG
- 326 MANUAL VALVE

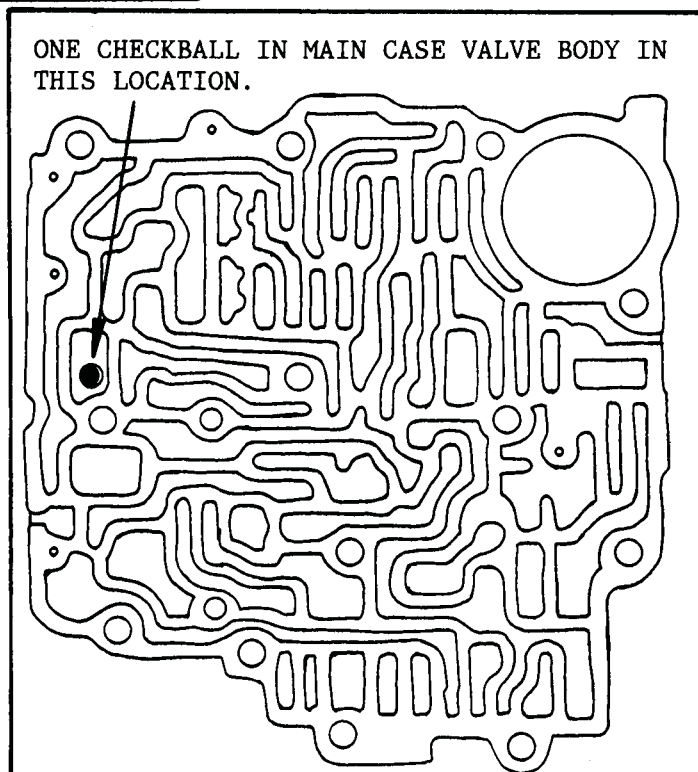


Figure 83

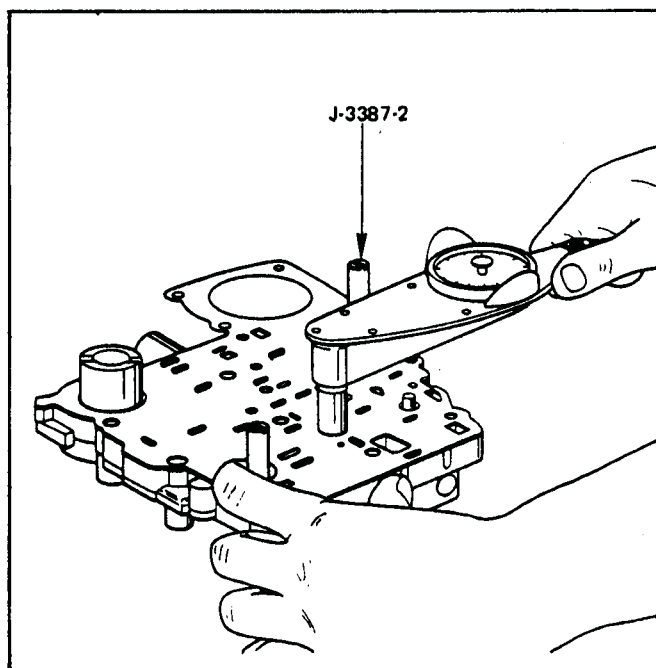
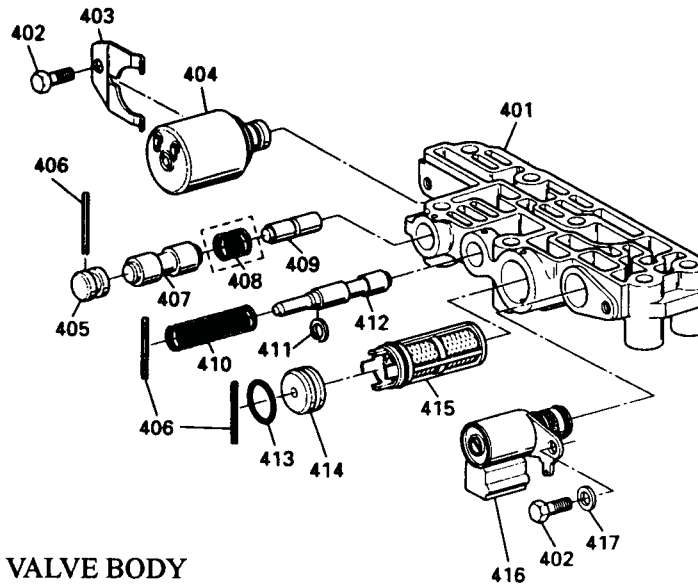


Figure 84

## MAIN CASE VALVE BODY

1. Remove two 11mm retaining bolts and remove spacer plate and valve body gasket from valve body.
2. Remove one checkball with small screwdriver from valve body.
3. Use Figure 82 to disassemble, clean, identify valves and solenoids, and then re-assemble the main case valve body properly.
4. Install new seal on 1-2 accumulator piston and lubricate with petrolatum.
5. Install 1-2 accumulator spring, piston, and pin into main case valve body, as shown in Figure 82.
6. Lubricate all valves with transmission fluid.
7. Install one checkball into valve body location, as shown in Figure 83.
8. Install new valve body to spacer plate gasket and spacer plate.
9. Install 2 guide pins J-3387-2, in the locations shown in Figure 84.
10. Install 2 11mm spacer plate retaining bolts and torque to 9 ft.lb. as shown in Figure 84.
11. Remove guide pins J-3387-2.
12. Set the main case valve body aside for final assembly process.

## ADAPTER CASE VALVE BODY



- 401 ADAPTER CASE VALVE BODY
- 402 11mm BOLT
- 403 FORCE MOTOR RETAINER
- 404 FORCE MOTOR
- 405 3-4 ACCUMULATOR VALVE BORE PLUG
- 406 ROLLED PIN
- 407 3-4 ACCUMULATOR VALVE
- 408 3-4 ACCUMULATOR VALVE SPRING (OPTIONAL)
- 409 3-4 ACCUMULATOR CONTROL VALVE
- 410 FORCE MOTOR FEED LIMIT VALVE SPRING
- 411 FEED LIMIT VALVE SPRING RETAINER RING
- 412 FORCE MOTOR FEED LIMIT VALVE
- 413 BORE PLUG "O" RING SEAL
- 414 FORCE MOTOR SCREEN BORE PLUG
- 415 FORCE MOTOR SCREEN
- 416 TORQUE CONVERTER CLUTCH SOLENOID
- 417 SOLENOID RETAINING BOLT WASHER

Figure 85

### ADAPTER CASE VALVE BODY

1. Use Figure 85 to disassemble and clean. Identify valves and solenoids and properly reassemble the adapter case valve body.
2. Note that there are 2 "O" ring seals on the TCC solenoid, and an "O" ring seal on the Force Motor screen bore plug (See Figure 85).
3. Lubricate all valves with clean transmission fluid.
4. Set adapter case valve body aside for final assembly.

## MAIN INTERNAL COMPONENTS

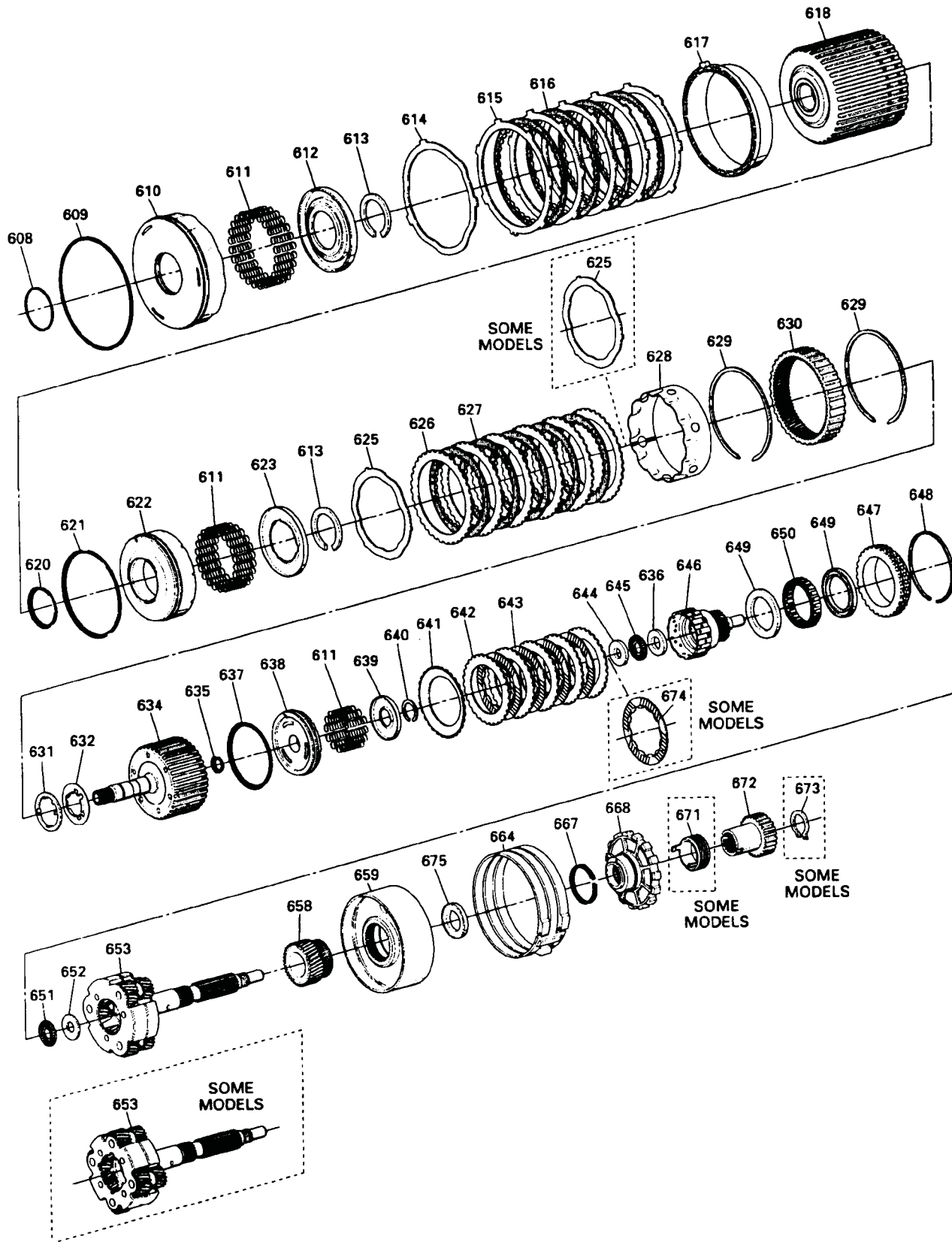


Figure 86

AUTOMATIC TRANSMISSION SERVICE GROUP



|                                              |                                        |
|----------------------------------------------|----------------------------------------|
| 608 SEAL, REVERSE CLUTCH PISTON (INNER)      | 638 PISTON, 3RD CLUTCH                 |
| 609 SEAL, REVERSE CLUTCH PISTON (OUTER)      | 639 SEAT, SPRING/3RD CLUTCH            |
| 610 PISTON, REVERSE CLUTCH                   | 640 RING, RETAINING                    |
| 611 SPRING, PISTON CLUTCH                    | 641 PLATE, SPRING CUSHION/3RD CLUTCH   |
| 612 SEAT, SPRING/REVERSE CLUTCH              | 642 PLATE, 3RD CLUTCH (STEEL)          |
| 613 RING, RETAINING                          | 643 PLATE ASSEMBLY, 3RD CLUTCH (LINED) |
| 614 PLATE, WAVED/REVERSE CLUTCH              | 644 WASHER, THRUST/INPUT SUN           |
| 615 PLATE, REVERSE CLUTCH (STEEL)            | 645 BEARING, INPUT SHAFT/GEAR ASSEMBLY |
| 616 PLATE ASSEMBLY, REVERSE CLUTCH (LINED)   | 646 GEAR ASSEMBLY, INPUT SUN           |
| 617 PLATE, REVERSE CLUTCH PRESSURE/SELECTIVE | 647 RACE ASSEMBLY, SPRAG               |
| 618 DRUM ASSEMBLY, 2ND CLUTCH                | 648 RING, RETAINING/SPRAG              |
| 620 SEAL, 2ND CLUTCH PISTON (INNER)          | 649 RING, RETAINING                    |
| 621 SEAL, 2ND CLUTCH PISTON (OUTER)          | 650 CAGE ASSEMBLY, SPRAG               |
| 622 PISTON, 2ND CLUTCH                       | 651 BEARING, OUTPUT SHAFT/INPUT SUN    |
| 623 SEAT, SPRING/2ND CLUTCH                  | 652 WASHER, OUTPUT SHAFT/INPUT SUN     |
| 625 PLATE, WAVED/2ND CLUTCH                  | 653 CARRIER ASSEMBLY, PLANETARY        |
| 626 PLATE, 2ND CLUTCH (STEEL)                | 658 GEAR, REACTION SUN                 |
| 627 PLATE ASSEMBLY, 2ND CLUTCH (LINED)       | 659 DRUM, REACTION SUN                 |
| 628 SPACER, 2ND CLUTCH                       | 664 BAND ASSEMBLY, BRAKE               |
| 629 RING, RETAINING                          | 667 SEAL, RING/WHEEL PARKING LOCK      |
| 630 GEAR, RING                               | 668 WHEEL, PARKING LOCK                |
| 631 WASHER, THRUST/2ND CLUTCH/3RD CLUTCH     | 671 GEAR, SPEEDO WHEEL                 |
| 632 THRUST WASHER, CLUTCH HUB                | 672 WHEEL, SPEEDO                      |
| 634 DRUM ASSEMBLY, 3RD CLUTCH                | 673 RING, RETAINING                    |
| 635 SEAL, 3RD CLUTCH PISTON (INNER)          | 674 PLATE ASSEMBLY, 3RD CLUTCH (LINED) |
| 636 WASHER, RETAINING                        | 675 BEARING, THRUST ASSEMBLY           |
| 637 SEAL, 3RD CLUTCH PISTON (OUTER)          |                                        |

Figure 86 - Legend

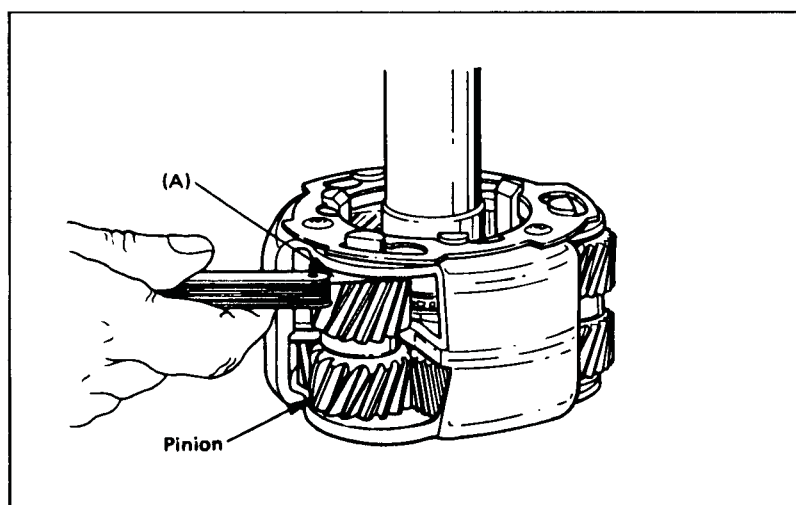


Figure 87

## REAR PLANETARY CARRIER

1. Inspect planetary carrier for any damaged pinions. Also check the bearing surface for any damage.
2. Measure pinion end play clearance with a feeler gauge as shown in Figure 87. Clearance should be .005" - .035". Replace as necessary.
3. Set planetary carrier aside for final assembly process.

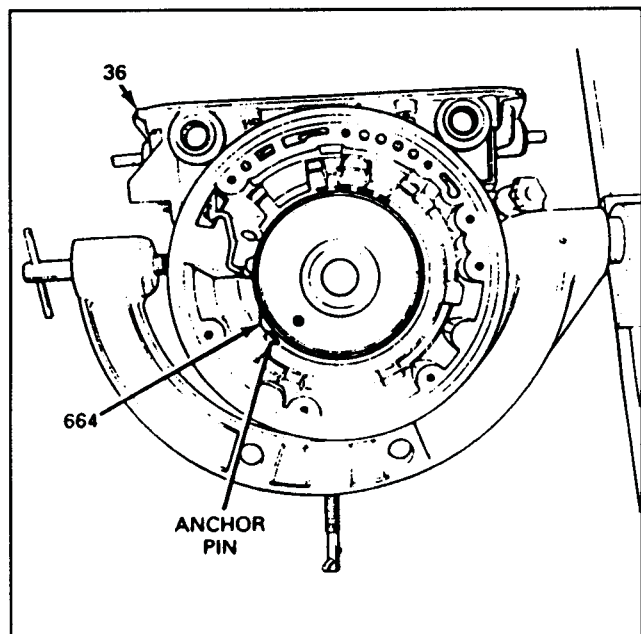


Figure 88

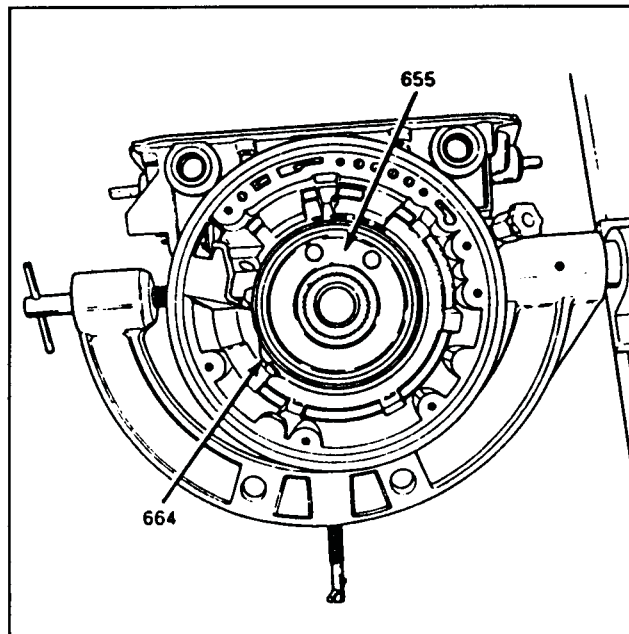


Figure 90

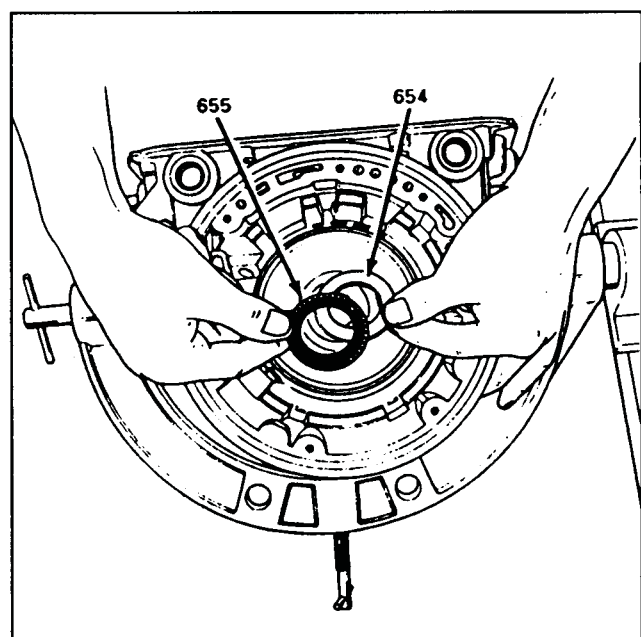


Figure 89

## TRANSMISSION REASSEMBLY

1. Rotate main case to a vertical position, with extension housing end facing down.
2. Install the 1-2 band into the main case, by positioning the band to main case anchor pins, as shown in Figure 88.
3. Be sure to align the servo pin target area with the servo pin bore in the main case.
4. Install the rear thrust bearing race, with the inside lip facing up, in the main case and retain with petrolatum. (See Figure 89).
5. Install the rear thrust bearing on top of the bearing race, and retain with petrolatum (See Figure 89).

6. Grasping the reaction drum from the inside, install the reaction drum inside of the band and seat to the bottom of the case (See Figure 90). Reaction drum must spin freely inside the case.
7. Install the reaction sun gear splining it into the reaction drum, as shown in Figures 91 and 93.
8. Install the thrust bearing race and the thrust bearing inside the planetary carrier, as shown in Figure 92, retain with petrolatum.

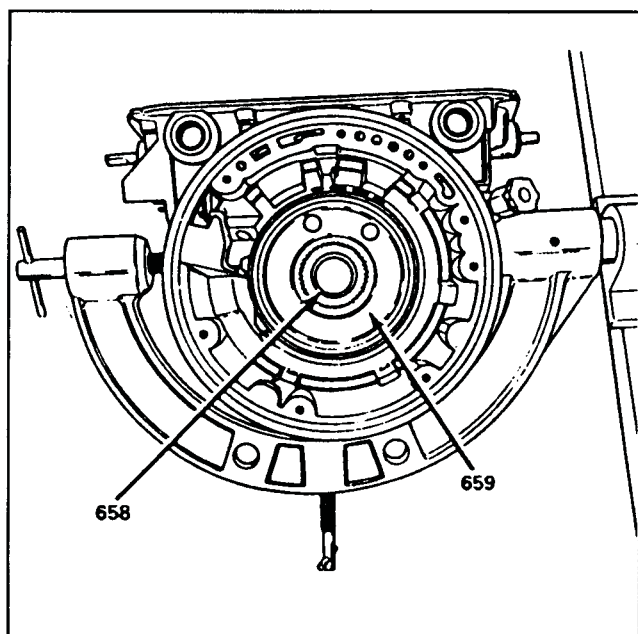


Figure 91

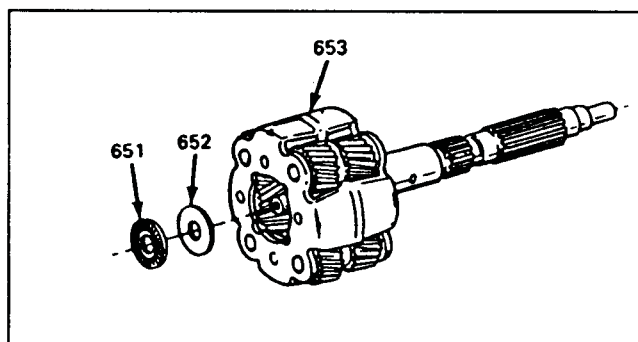


Figure 92

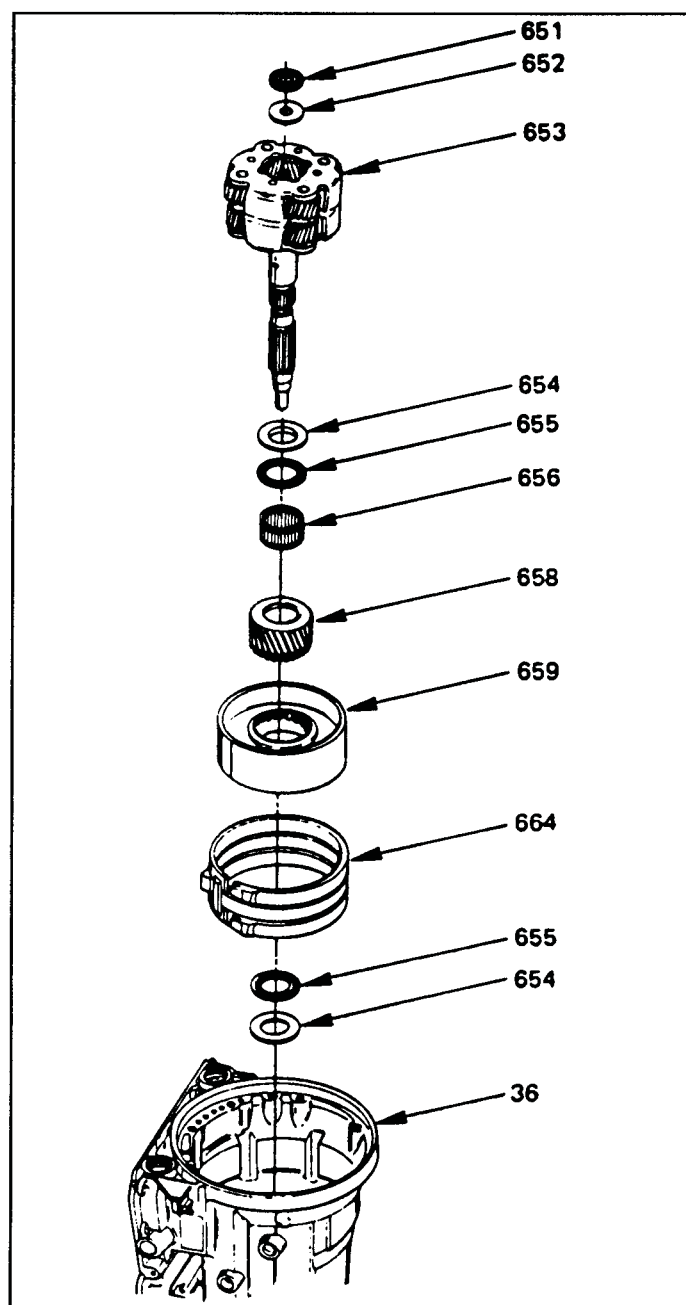


Figure 93

- 36. TRANSMISSION MAIN CASE.
- 651. PLANETARY INNER THRUST BEARING.
- 652. PLANETARY INNER THRUST BEARING RACE.
- 653. PLANETARY CARRIER ASSEMBLY.
- 654. THRUST BEARING RACE (2).
- 655. THRUST BEARING (2).
- 656. CAGED NEEDLE BEARING.
- 658. REACTION SUN GEAR.
- 659. REACTION DRUM.
- 664. 1-2 BAND ASSEMBLY.

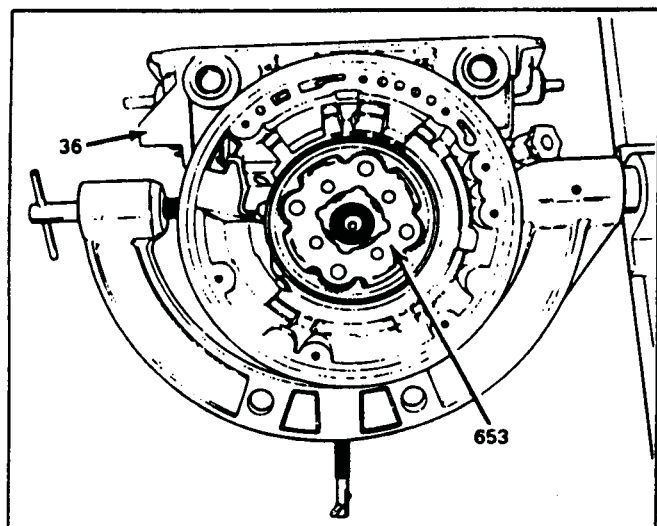


Figure 94

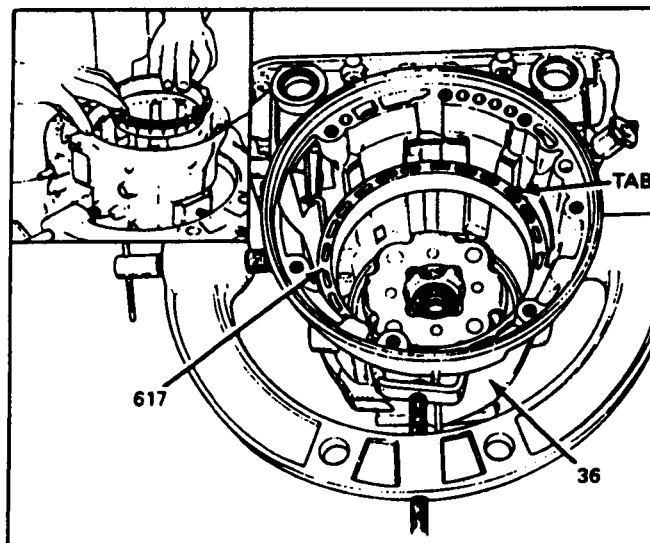
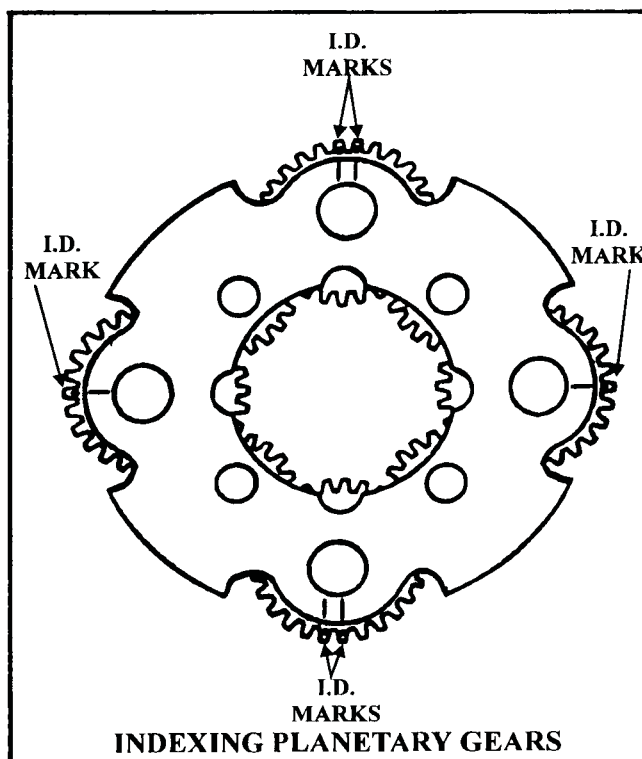


Figure 95

9. Install the planetary carrier placing the output shaft through the reaction sun gear and needle bearing assembly, and carefully lowering the carrier into the main case.
10. Grasp the output shaft from the underside of the case and twist to engage the planetary carrier to the reaction sun gear, as shown in Figure 94.
11. Use care when grasping the planetary carrier. Do not grasp by the gears, as the gears will rotate and cause your fingers to be pinched.
12. Install the reverse clutch backing plate by grasping from the inside and lowering into the main case, as shown in Figure 95.
13. The tab on the backing plate must be to the top and positioned on a step inside the case (See Figure 95).

(Continued on Page 58)



## INDEXING PLANETARY GEARS

PLACE THE PLANETARY CARRIER ON A FLAT WORK SURFACE WITH THE OUTPUT SHAFT POINTING UP. EACH LONG PINION GEAR HAS THREE I.D. MARKS ON IT, ONE I.D. MARK ON ONE SIDE, AND TWO I.D. MARKS ON THE OTHER SIDE. THERE ARE ALSO CORRESPONDING MARKS ON THE CARRIER HOUSING, AS SHOWN ABOVE. ALIGN THE LONG PINION GEAR I.D. MARKS WITH THE CORRESPONDING MARKS ON THE PLANETARY CARRIER, AS SHOWN ABOVE. AFTER ALIGNING THE LONG PINION GEARS, CAREFULLY INSTALL THE REACTION (REAR) SUN GEAR INTO THE LONG PINION GEARS, AND ENSURE THAT THE PINIONS ARE STILL ALIGNED. THE PLANETARY HOUSING AND REACTION (REAR) SUN GEAR ASSEMBLY CAN NOW BE INSTALLED INTO THE CASE, ENSURING THAT THE SPLINES OF THE REAR SUN GEAR ARE ENGAGED INTO THE REACTION DRUM. THIS WILL NOW KEEP THE LONG PINIONS ALIGNED, SO THAT THE PRE-ASSEMBLED 2ND CLUTCH/3RD CLUTCH HOUSINGS WILL ASSEMBLE VERY EASILY.

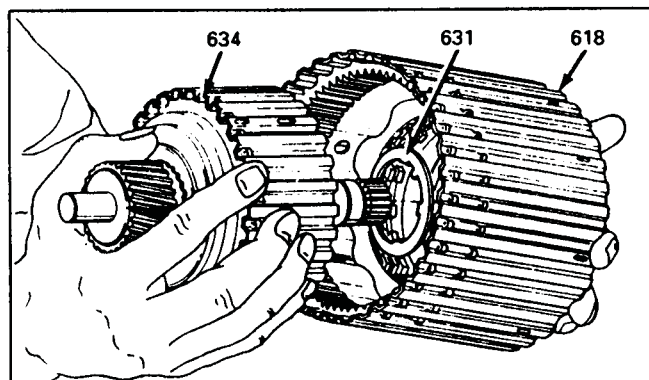


Figure 96

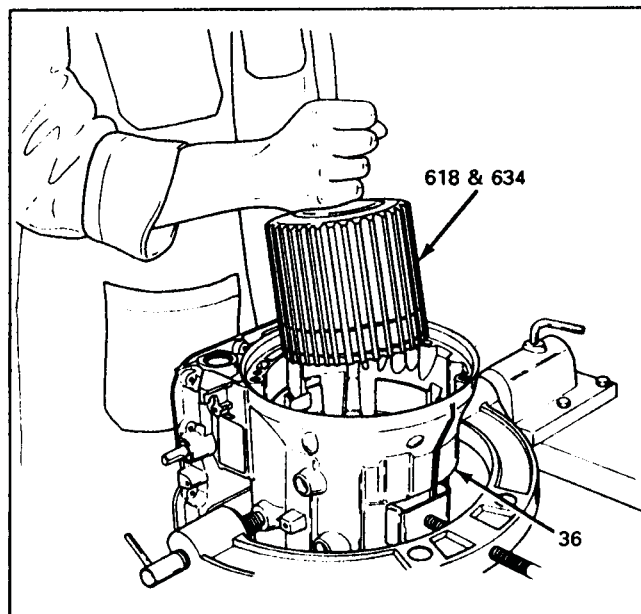


Figure 97

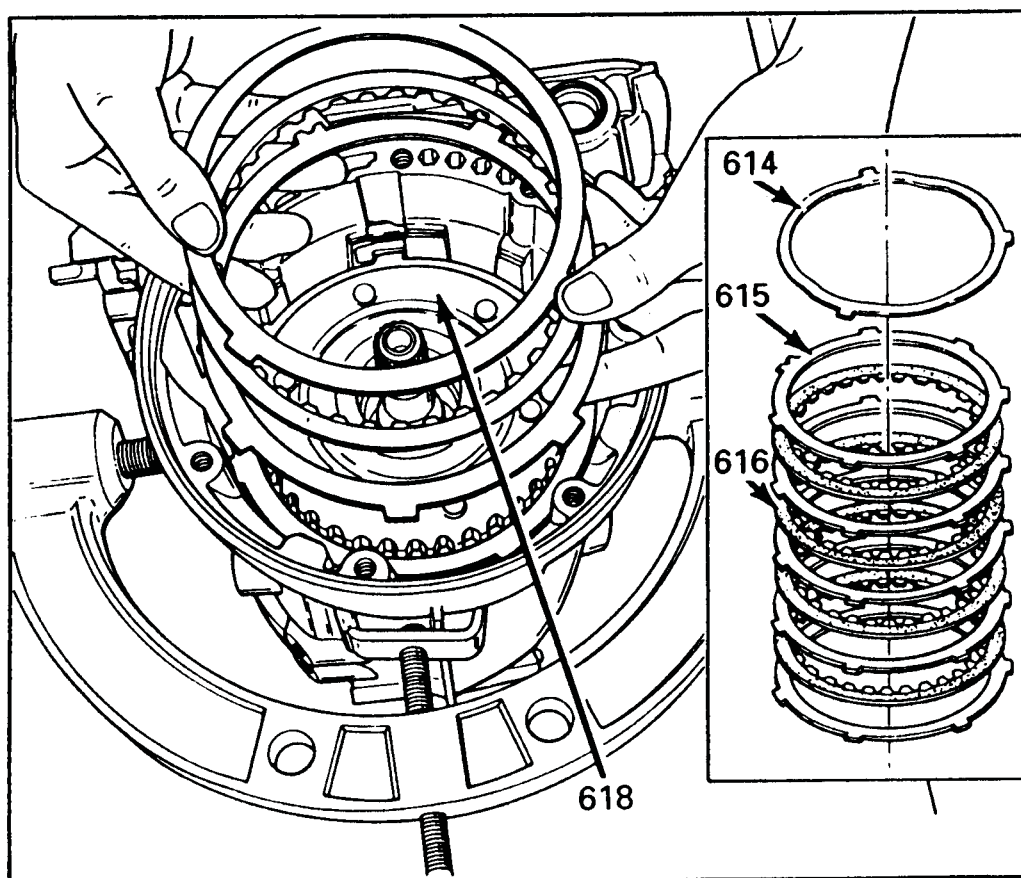


Figure 98



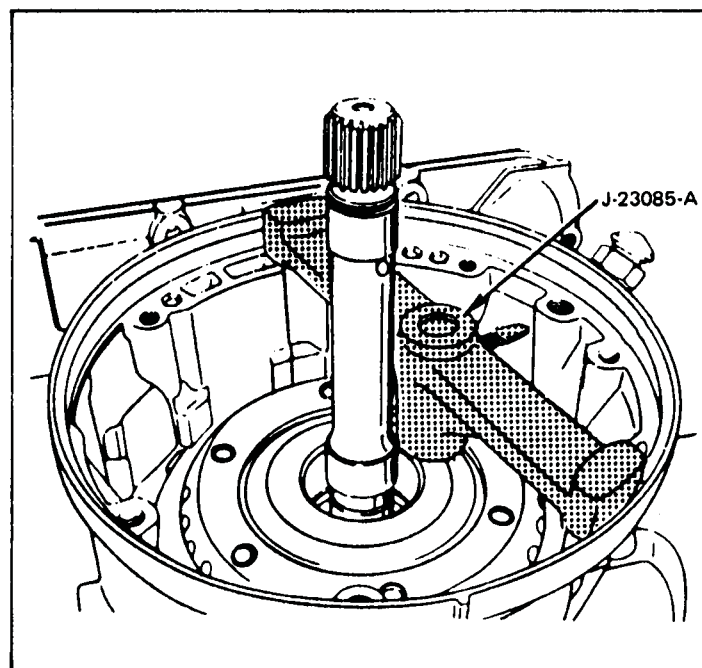


Figure 99

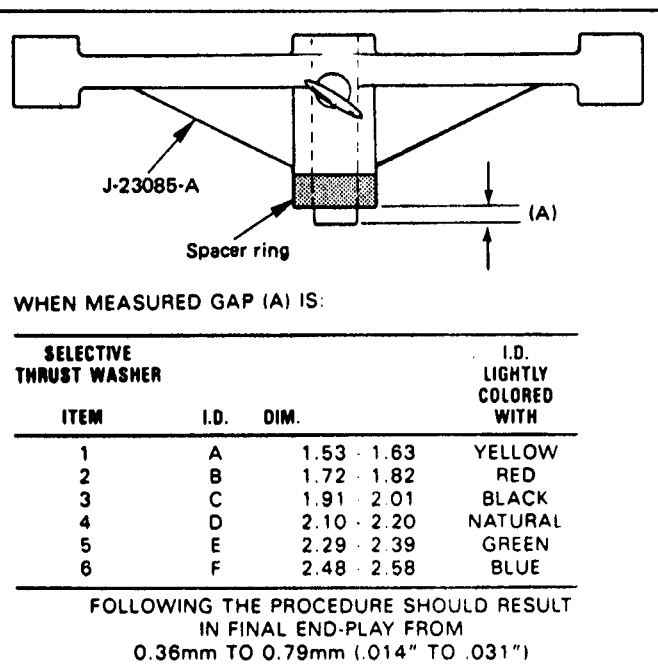


Figure 100

CONTINUED FROM PAGE 57

14. Firmly grasp the intermediate shaft of the pre-assembled second and third clutch housing assemblies, as shown in Figure 97.
15. Lower the 2nd and 3rd clutch housing assemblies into the main case and slowly rotate the intermediate shaft to engage the sun gear into the planetary carrier (See Figure 97).
16. It may be necessary to counter rotate the output shaft at the same time.
17. Install the reverse clutch plates in the main case, beginning with a steel plate and alternating with a lined plate, as shown in Figure 98.
18. This unit requires 4 lined plates and 5 steel plates stacked as shown in Figure 98 inset. You should have a steel plate in last.
19. Install the reverse clutch wave plate on top of the last steel plate, as shown in Figure 98 inset.

Continued on Page 60

## DETERMINE SELECTIVE WASHER THICKNESS

1. Install J-23085-A gaging tool on the main case flange and against the intermediate shaft, as shown in Figure 99.
2. Loosen the thumb screw and position the inner shaft of the gaging tool on the thrust surface of the 2nd clutch housing (See Figure 99).
3. Tighten the thumb screw and remove the gaging tool from main case.
4. Fit the spacer ring on the inner shaft of the tool, as shown in Figure 100.
5. Measure distance (A) as shown in Figure 100.
6. Select appropriate size thrust washer from the chart in Figure 100.



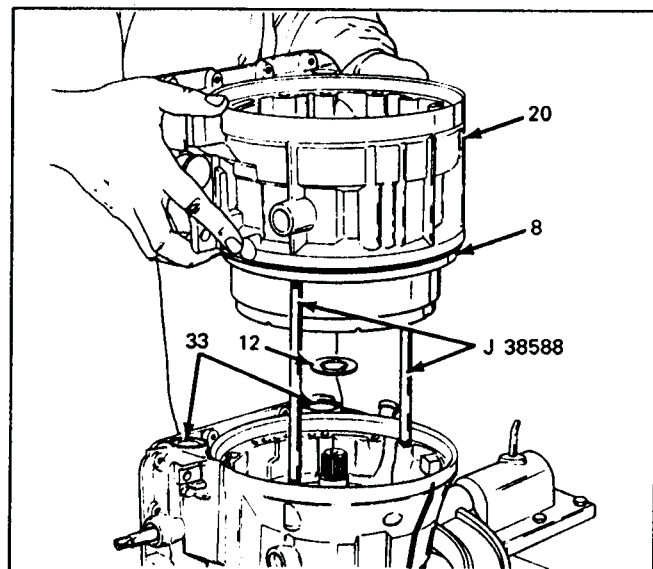


Figure 101

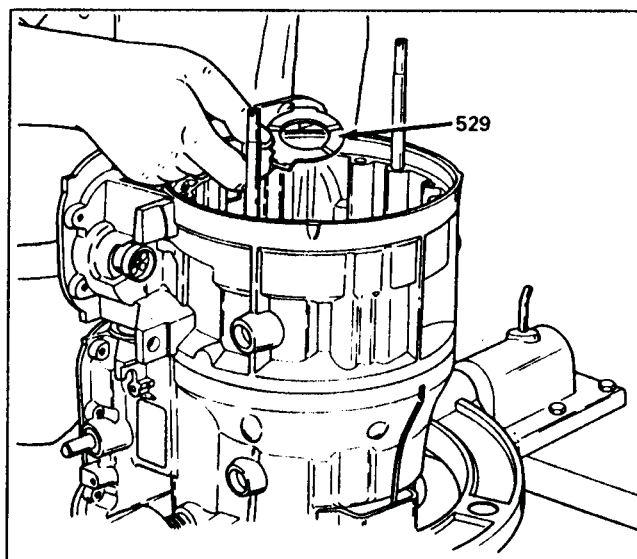


Figure 102

(Continued from Page 59)

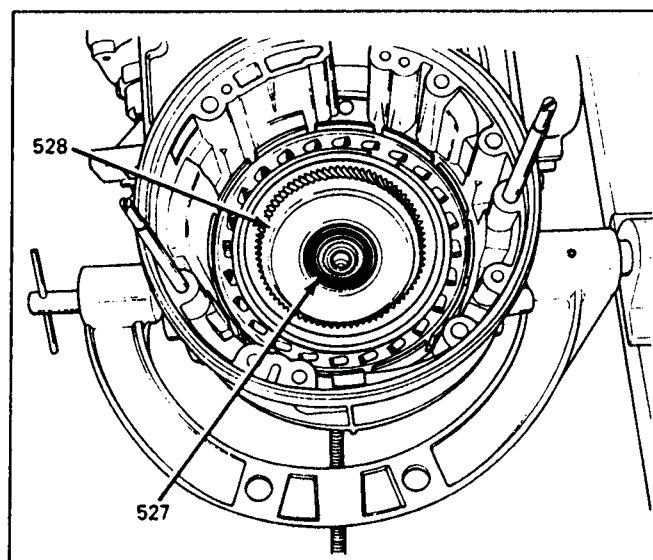


Figure 103

20. Install the pre-selected selective thrust washer onto the pre-assembled adapter case housing, and retain with petrolatum (See Figure 101).
21. Install two guide pins J-38588 into the main case, as shown in Figure 101.
22. Install two "O" rings into the main case in positions shown in Figure 101.
23. Position the pre-assembled adapter case housing over the guide pins and lower onto the main case (Figure 101).
24. Ensure that the adapter case "O" ring, the 2 main case "O" rings, and thrust washer are all still in place.
25. Install thrust washer on the adapter case housing with tabs down, as shown in Figure 102, and retain with petrolatum.
26. Install the overdrive internal ring gear on the intermediate shaft splines as shown in Figure 103.
27. Install ring gear thrust bearing into overdrive internal gear, with black side facing up (See Figure 103).

28. Install the pre-assembled overrun clutch housing assembly by grasping the turbine shaft and lowering the assembly into the overdrive internal gear, as shown in Figure 104.
29. Slowly rotate the turbine shaft so as to engage the overdrive carrier pinions into the overdrive internal gear.
30. Install the fourth clutch plates exactly as shown in Figure 105, over the overrun clutch housing.
31. Install the plates as follows: Steel, Lined, Steel, Steel, Lined, Steel, as shown in Figure 105.
32. The steel plates are installed with the short tang facing towards the valve body.

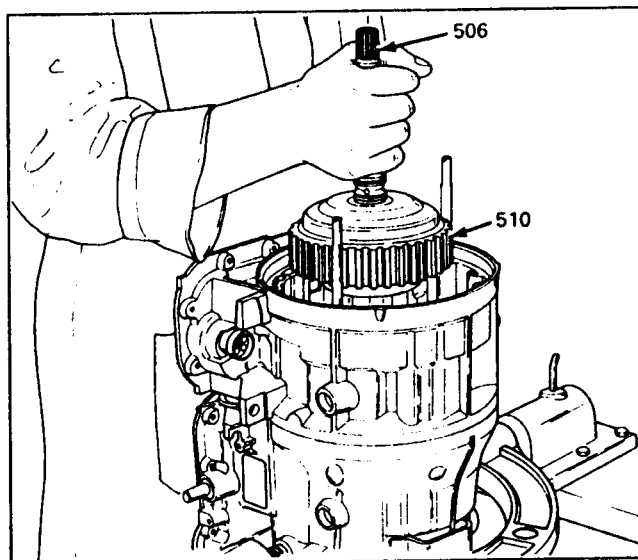


Figure 104

(Continued on Page 62)

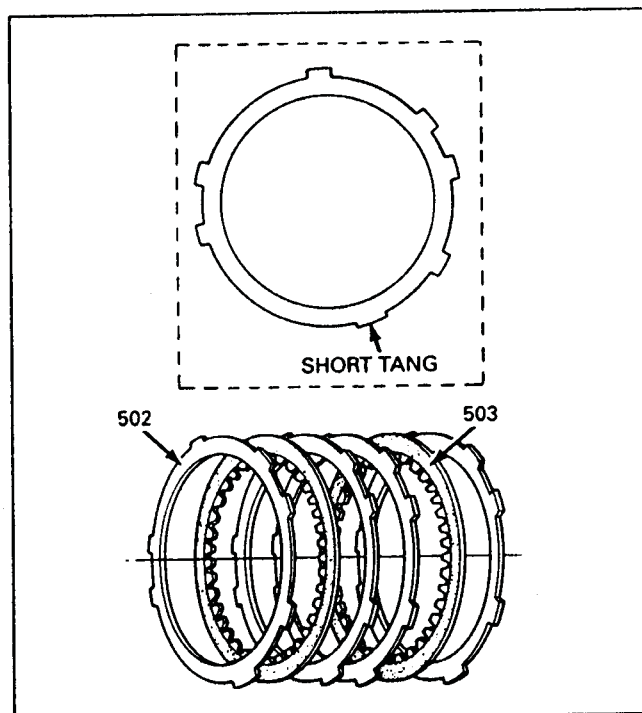


Figure 105

## SELECTIVE THRUST WASHER CHART

| DIM. (A)    | COLOR   | I.D. |
|-------------|---------|------|
| .060"-.064" | YELLOW  | "A"  |
| .067"-.072" | RED     | "B"  |
| .075"-.079" | BLACK   | "C"  |
| .082"-.086" | NATURAL | "D"  |
| .090"-.094" | GREEN   | "E"  |
| .097"-.101" | BLUE    | "F"  |

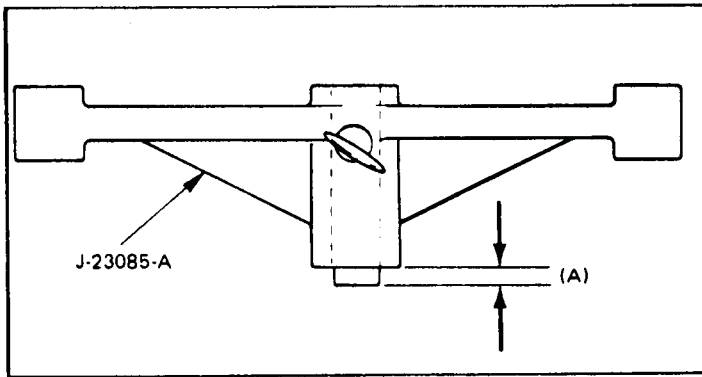


Figure 106

### DETERMINE SELECTIVE WASHER THICKNESS

1. Install J-23085-A gaging tool onto the adapter case flange, as shown in Figure 107.
2. Loosen the thumb screw and position the inner shaft of the gaging tool on the washer surface of the overrun clutch housing, as shown in Figure 107.
3. Tighten the thumb screw and remove the gaging tool from adapter case.
4. Measure distance (A), as shown in Figure 106.
5. Select the appropriate size thrust washer from the chart above.

(Continued from Page 61)

33. Install the fourth clutch retainer, as shown in Figure 108, with the notch facing up and towards the valve body.
34. Install the oil pump to adapter case gasket by placing over guide pins.
35. Install the pre-selected selective thrust washer from above, onto the oil pump assembly with tabs down, retain with petrolatum (See Figure 109).
36. Install the pre-assembled converter housing and oil pump assembly by placing over guide pins J-38588 and seating to the adapter case, as shown in Figure 109.

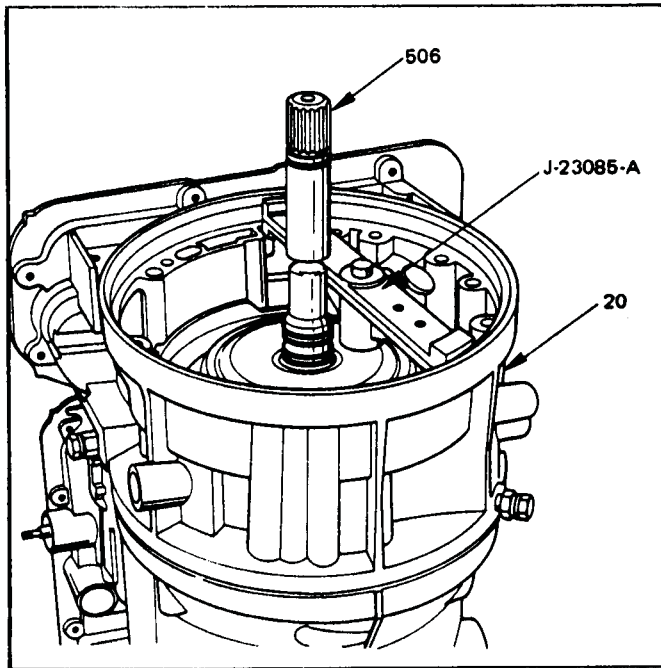


Figure 107

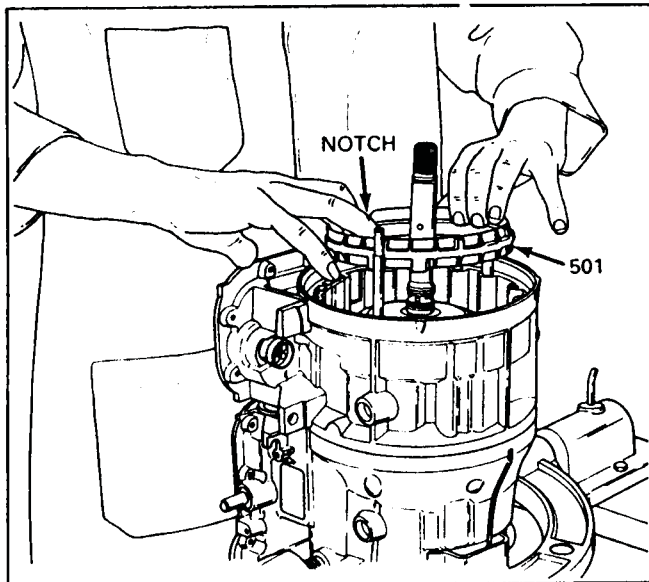


Figure 108

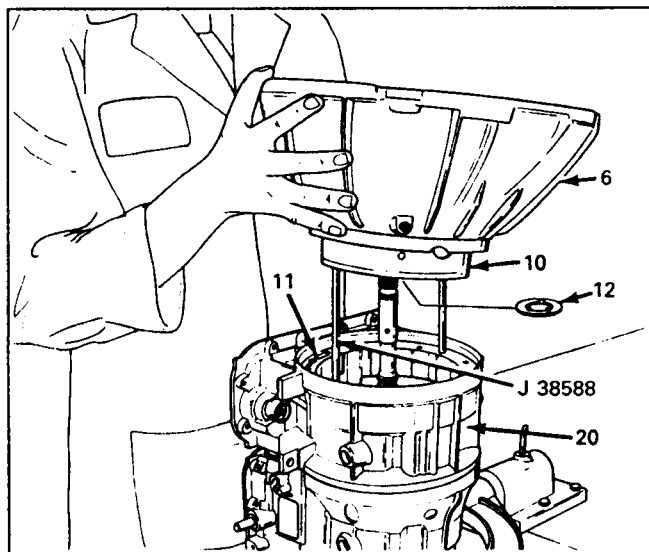


Figure 109

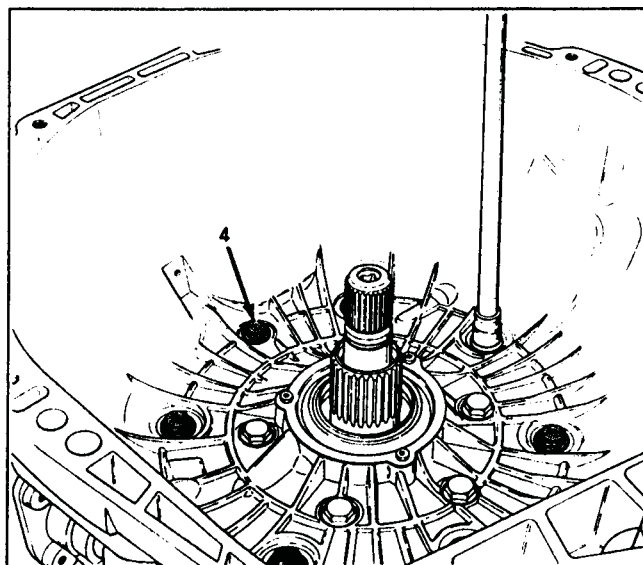


Figure 110

37. Hand start 5 converter housing to main case bolts.
38. Remove the two guide pins, and hand start the two remaining bolts.
39. Using a 13mm socket, torque the seven converter housing bolts to 29 ft.lbs. using an alternating pattern. (See Figure 110).
40. Install the turbine shaft "O" ring on the turbine shaft, as shown Figure 111.

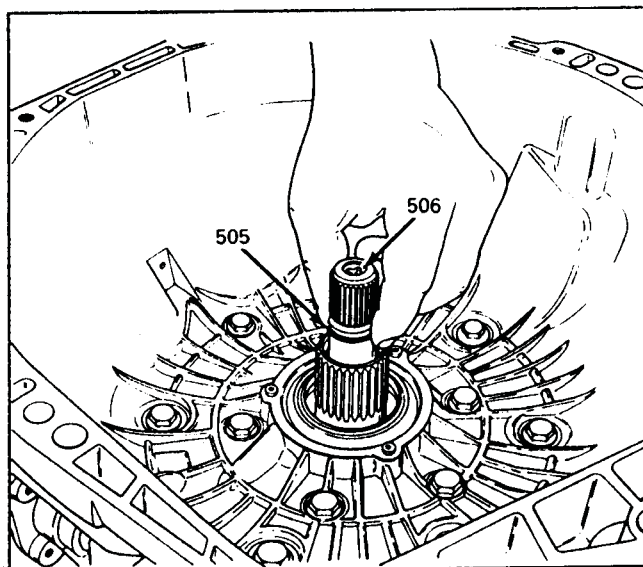


Figure 111

(Continued on Page 64)

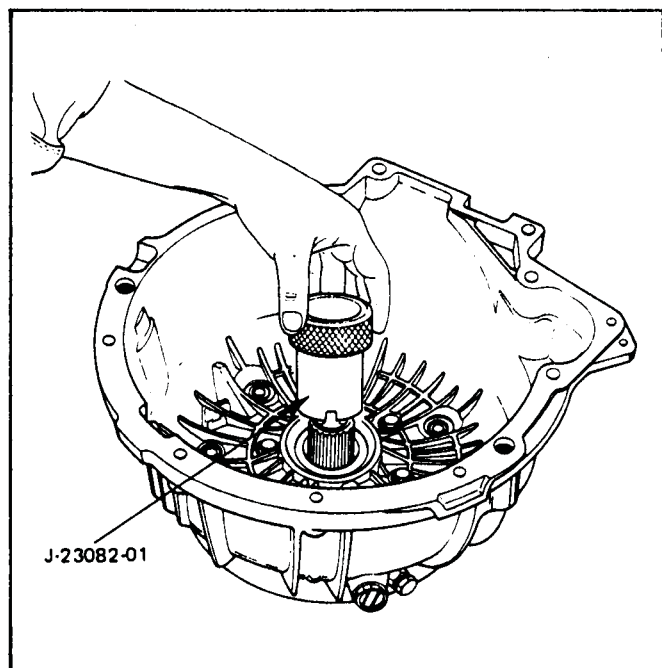


Figure 112

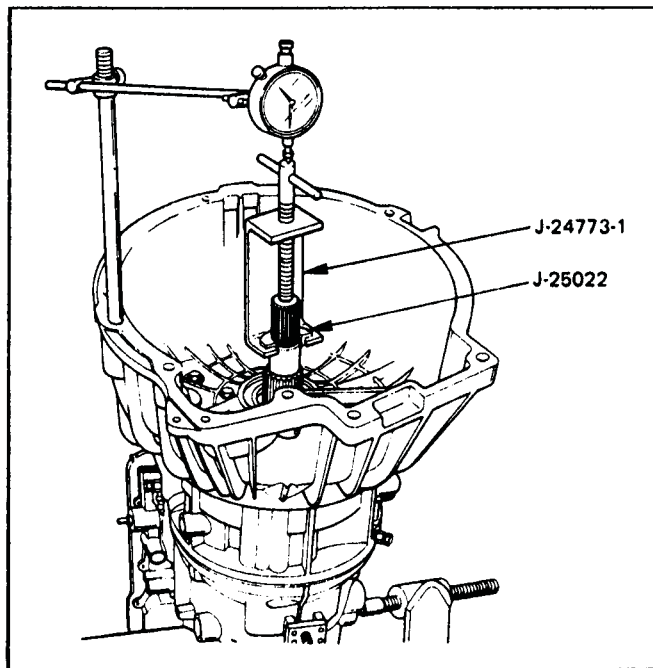


Figure 113

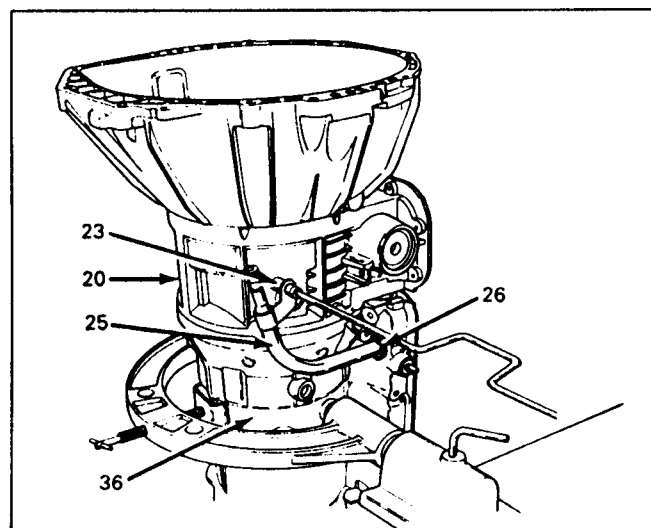


Figure 114

(Continued from Page 63)

41. Once again ensure free rotation of oil pump gears, using pump rotation tool J-23082-01, as shown in Figure 112.
42. Install puller J-24773-1 and adapter J-25022 on turbine shaft, as shown in Figure 113, and tighten "T" handle screw.
43. Position dial indicator on the end of puller, as shown in Figure 113, and set dial indicator to zero.
44. Lift turbine shaft with puller, observe dial indicator reading. End-play should be .005" to .032".
45. Remove dial indicator, puller and the adapter, and re-install turbine shaft "O" ring in groove.
46. If end-play is not correct, repeat the selective washer selection process.
47. Install the fill tube seal into main case, and fill tube into the seal in main case, as shown in Figure 114.

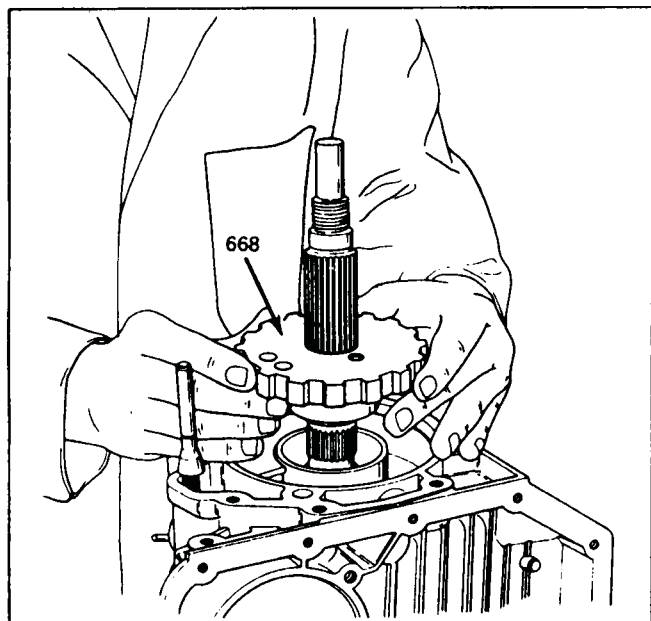


Figure 115

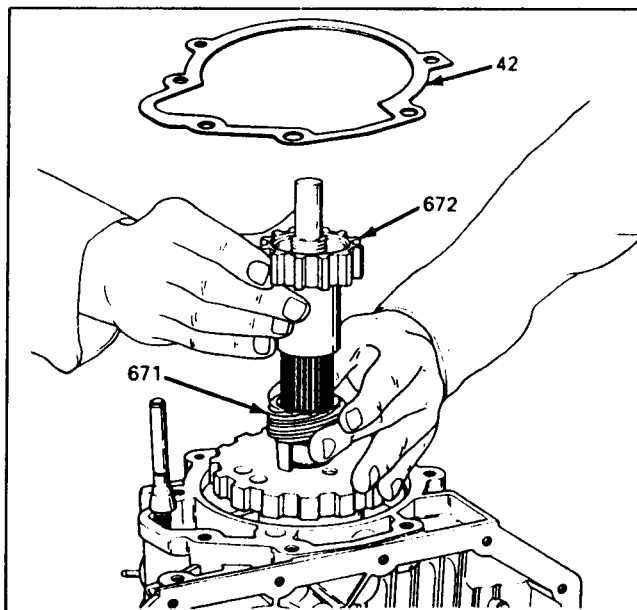


Figure 116

## EXTENSION HOUSING 2 WHEEL DRIVE (FOR 4 WHEEL DRIVE MODELS SEE PAGE 68)

1. Rotate transmission so that the output shaft is facing up (See Figure 115).
2. Install the parking gear, by splining it onto the output shaft, as shown in Figure 115.
3. Install extension housing gasket to the main case, and retain with a small amount of petrolatum (Figure 116).
4. Install speedometer drive gear, as shown in Figure 116. Speedo drive gear is not used on all models.
5. Install speed sensor rotor, as shown in Figure 116.
6. Install extension housing assembly to the main case (See Figure 117).
7. Parking rod must be positioned to the parking pawl and return spring inside the extension housing assembly.

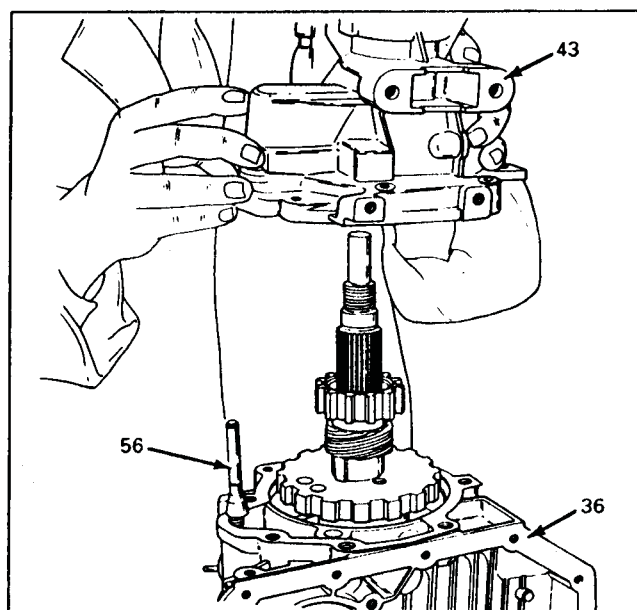


Figure 117

(Continued on Page 66)



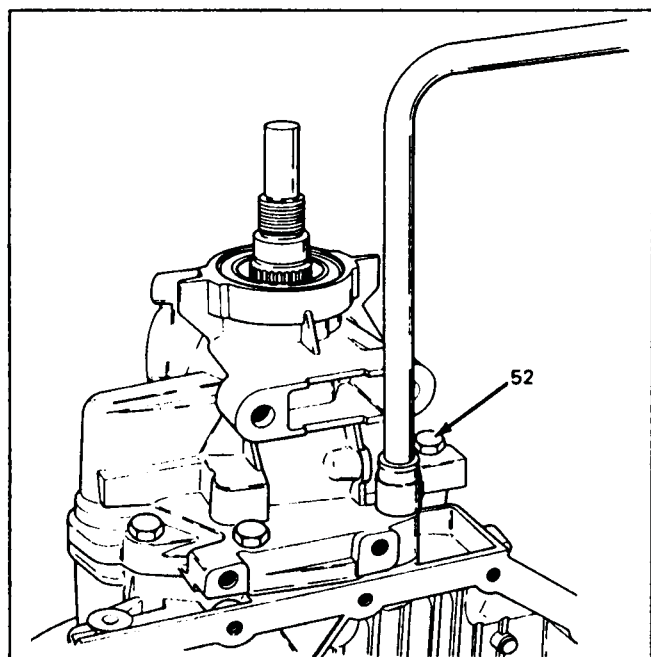


Figure 118

(Continued from Page 65)

8. Install seven extension housing bolts and torque to 23 ft.lbs, using a 14mm socket, as shown in Figure 118.
9. Install the drive flange by splining it onto the output shaft, and hand start the drive flange nut (See Figure 119).
10. Place the selector lever in the park position (Most Downward Position). This will lock the output shaft and prevent it from turning while tightening the drive flange nut (Figure 119).
11. Torque the drive flange nut, using a 1-1/2" socket to 40 ft.lbs, as shown in Figure 119.
12. Install the speedometer driven gear in the extension housing, and secure with 10mm bolt as shown in Figure 120.
13. Install the speed sensor and "O" ring assembly into the extension housing, and secure with 10mm bolt (Figure 121).

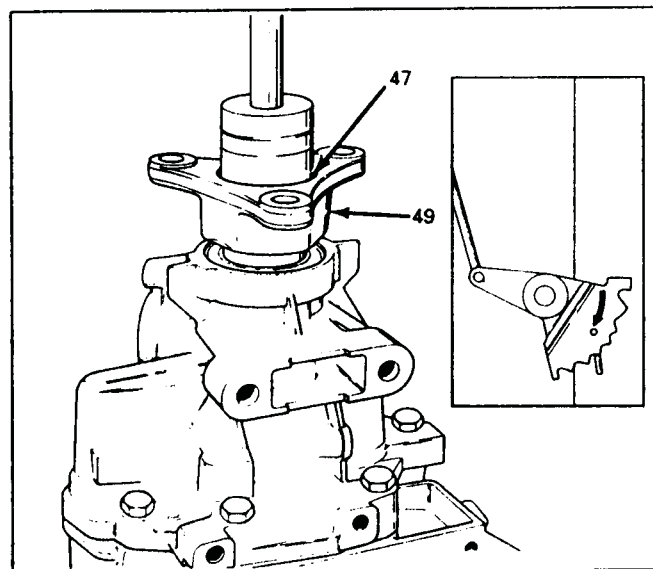


Figure 119

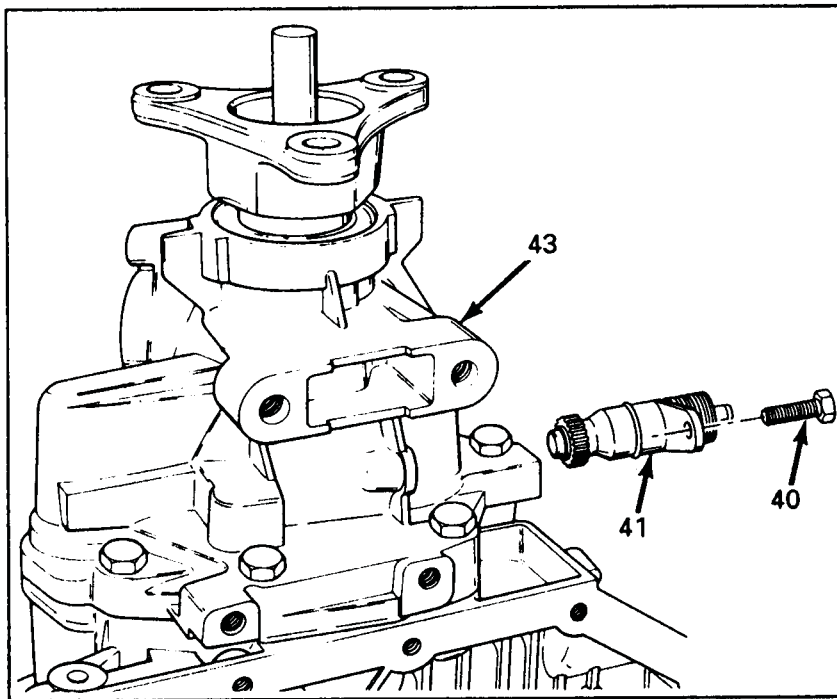


Figure 120

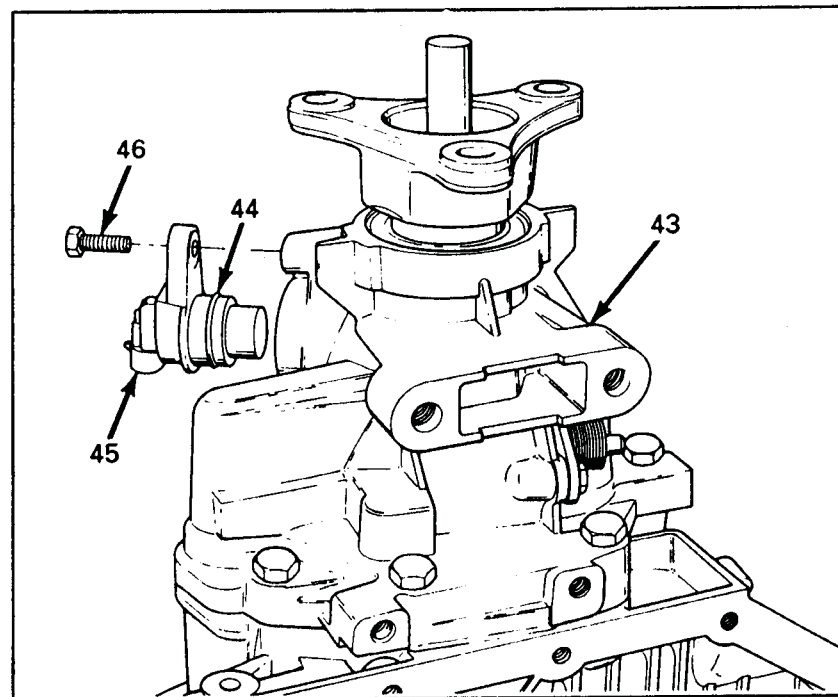
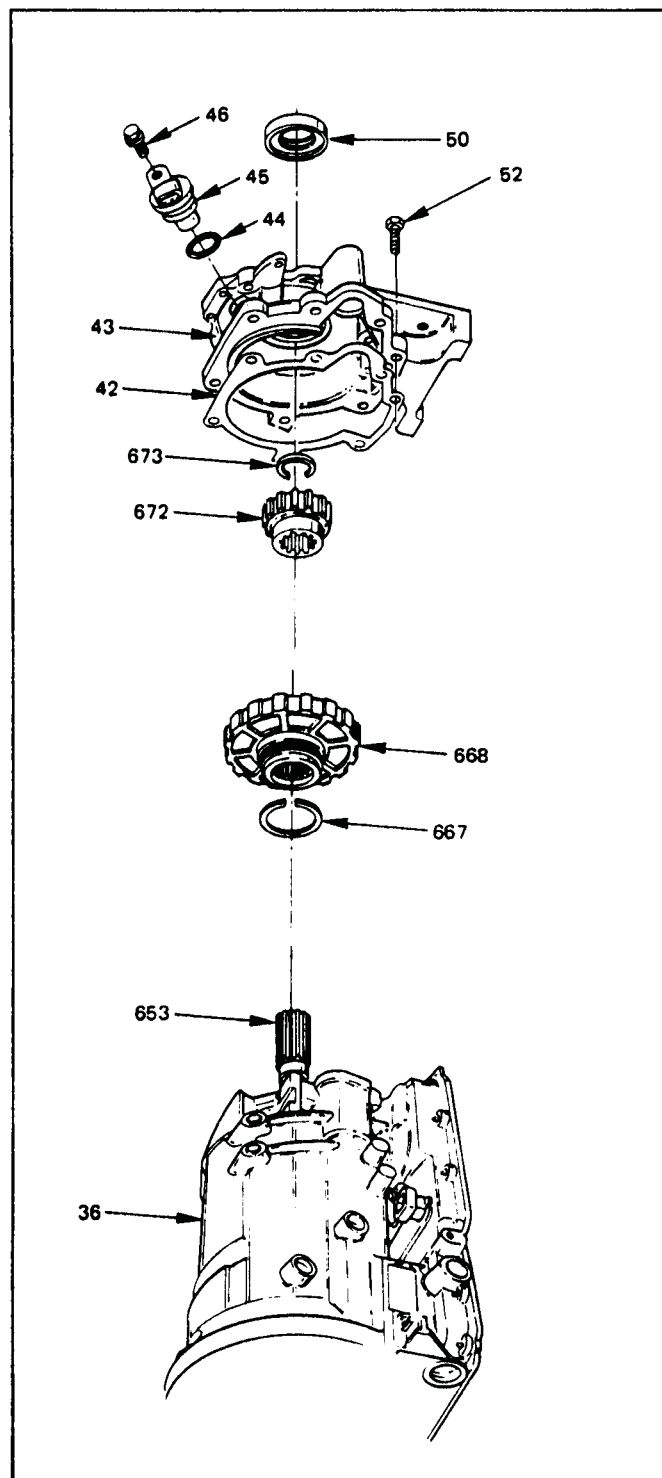


Figure 121

## EXTENSION HOUSING FOR 4 WHEEL DRIVE MODELS



- 36. TRANSMISSION MAIN CASE ASSEMBLY.
- 42. EXTENSION HOUSING GASKET.
- 43. EXTENSION HOUSING 4 WHEEL DRIVE MODELS.
- 44. SPEED SENSOR "O" RING.
- 45. SPEED SENSOR.
- 46. SPEED SENSOR RETAINING BOLT.
- 50. EXTENSION HOUSING SEAL.
- 52. EXTENSION HOUSING BOLTS 8mm TORX (7).
- 653. OUTPUT SHAFT.
- 667. PARKING GEAR SEALING RING.
- 668. PARKING GEAR.
- 672. SPEED SENSOR ROTOR.
- 673. SNAP RING (OUTPUT SHAFT).

Figure 122

## EXTENSION HOUSING 4 WHEEL DRIVE (FOR 2 WHEEL DRIVE MODELS SEE PAGE 65)

1. Install new sealing ring on the park gear (See Figure 122).
2. With transmission in horizontal position, install parking gear by splining on the output shaft (See Figure 122).
3. Install speed sensor rotor and snap ring on output shaft, as shown in Figure 122.
4. Install extension housing gasket onto main case, and retain with a small amount of petrolatum.
5. Install extension housing assembly to the main case (See Figure 122).
6. Parking rod must be positioned to the parking pawl and return spring inside the extension housing assembly.
7. Install seven extension housing bolts and torque to 23 ft.lbs, using a 8mm Torx socket.
8. Install the speed sensor and "O" ring assembly into the extension housing, secure with 10mm bolt (Figure 122).
9. Install dial indicator on output shaft, as shown in Figure 123, and set the indicator to zero.
10. Manually pull output shaft up, observe dial indicator. Rear end-play should be .014" to .031".
11. Remove the dial indicator.

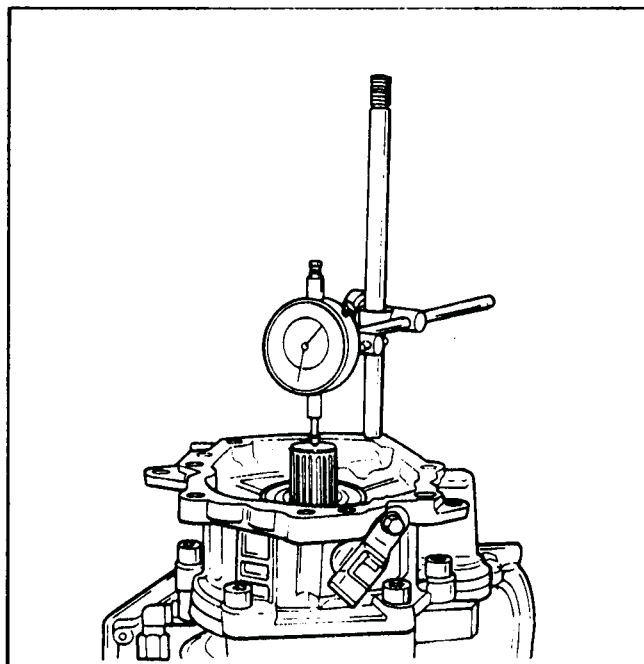


Figure 123

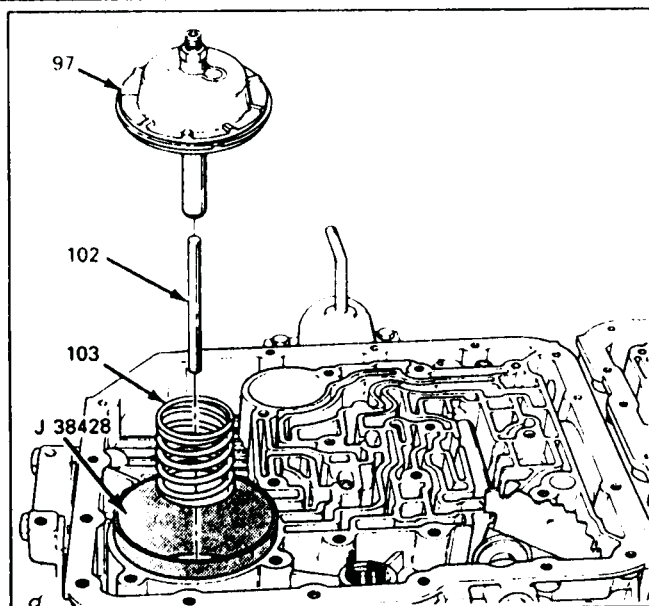


Figure 124

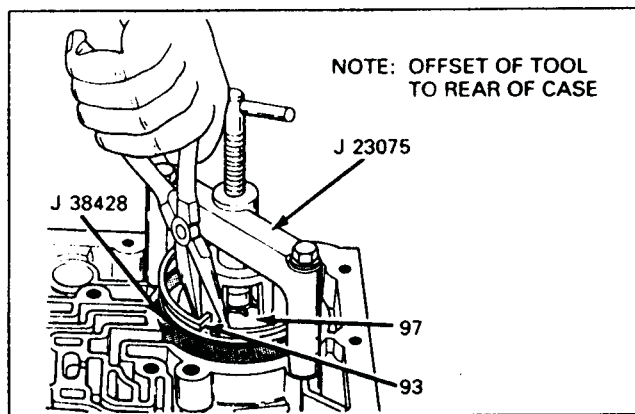


Figure 125

## BOTTOM PAN PARTS

1. Rotate transmission to a horizontal position, with pan side up, as shown in Figure 124.
2. Install new seal on the 1-2 servo piston and lubricate with petrolatum.
3. Ensure that the 1-2 band is correctly positioned, using small screwdriver thru pin bore in case. Rotate the output shaft if necessary.
4. Place servo seal protector J-38428 in case, as shown in Figure 124.
5. Install apply rod into apply pin with the round end towards the 1-2 band.
6. Install servo return spring into case as shown in Figure 124.
7. Install servo piston assembly into the seal protector (See Figure 124).
8. Install compression tool J-23075 with the offset of tool towards rear of case, as shown in Figure 125.
9. Compress the servo piston by turning the "T" handle on the compression tool clockwise (See Figure 125).
10. Using needle nose pliers, install the servo piston retaining ring, as shown in Figure 125.
11. Remove the compression tool from servo.
12. Adjust the 1-2 band by tightening servo adjusting screw to 39 in.lb., and back off exactly 5 complete turns. Torque the adjusting screw lock nut to 13 ft.lb. and ensure that the adjusting screw does not turn in the process.
13. Install two checkballs in transmission case passages as shown in Figure 126.

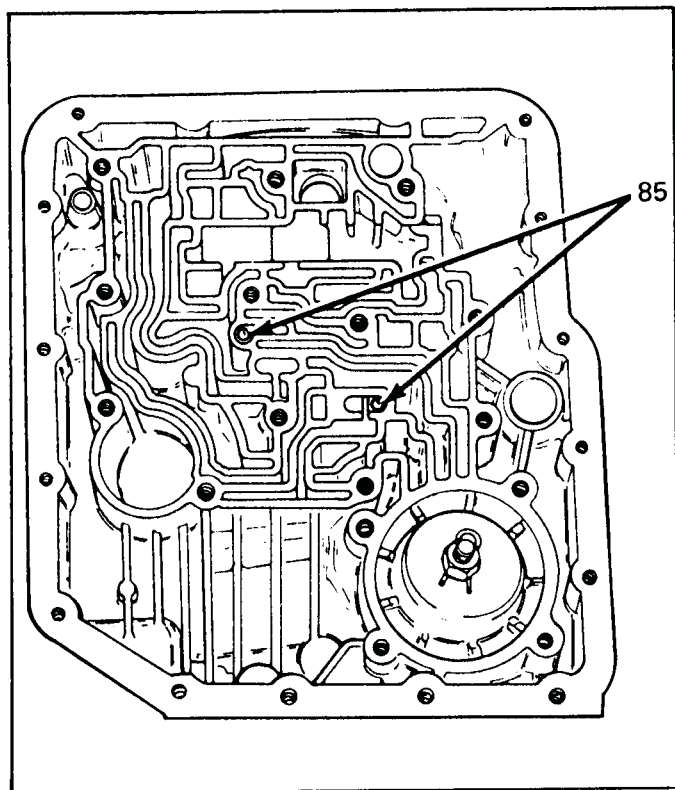


Figure 126

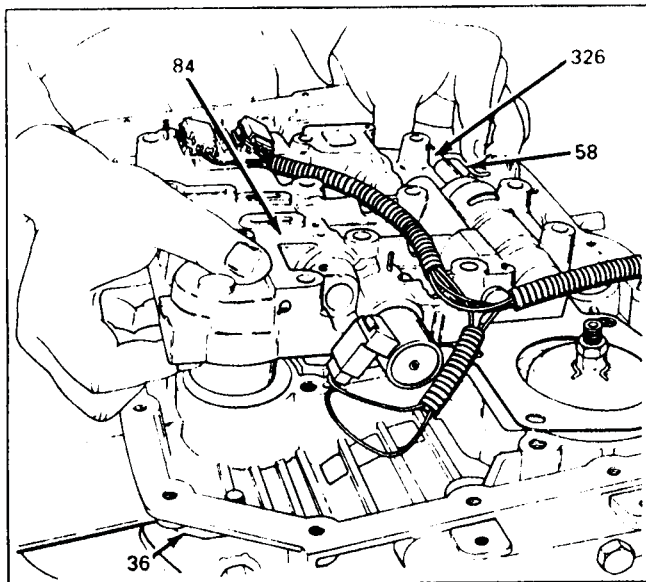


Figure 127

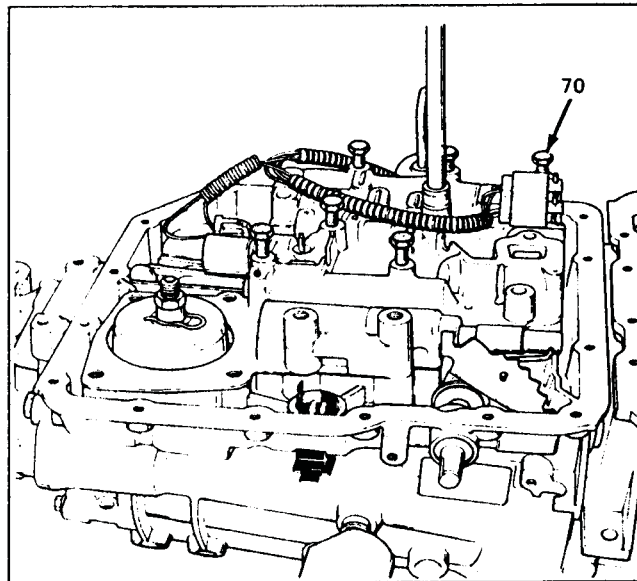


Figure 128

14. Position the pre-assembled main case valve body to the case, as shown in Figure 127, connecting the manual valve link to the manual valve and lowering the main case valve body into place.
15. The short end of the manual valve link goes into the rooster comb and the long end of the link goes into the manual valve.
16. Install seven valve body bolts in the positions shown in Figure 128, and torque to 14 ft.lbs, using a 13mm socket.
17. Install servo cover and gasket as shown in Figure 129, and torque the four bolt to 18 ft.lbs.

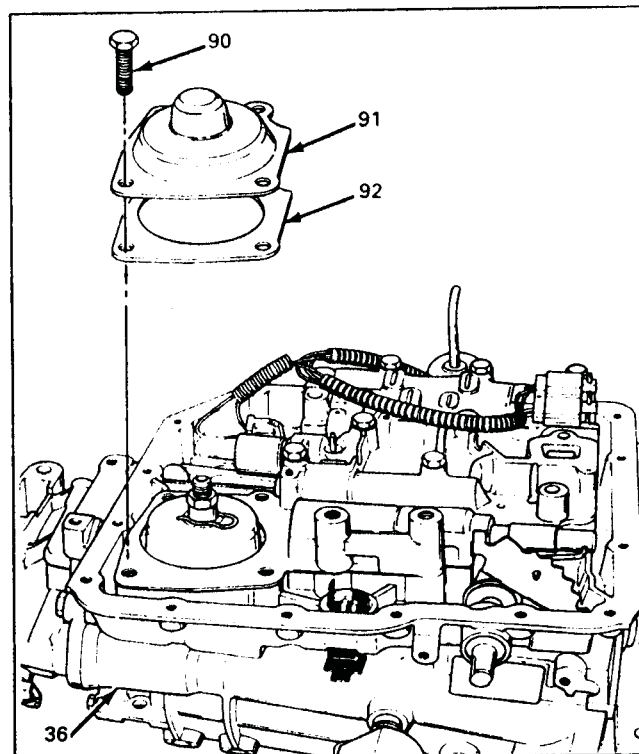


Figure 129

(Continued on Page 72)



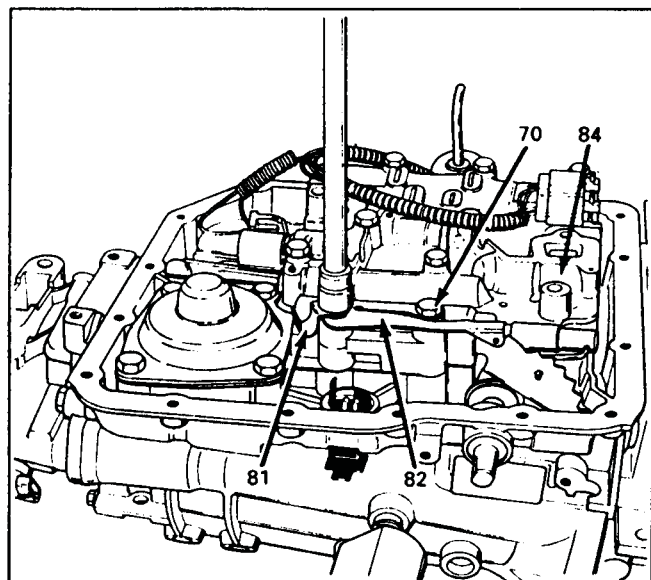


Figure 130

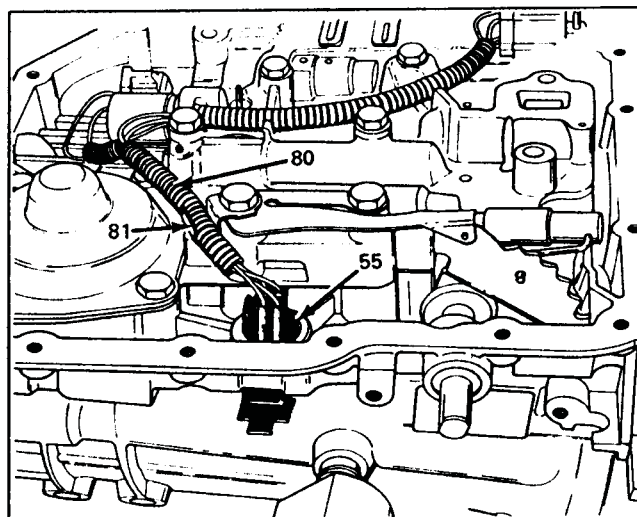


Figure 131

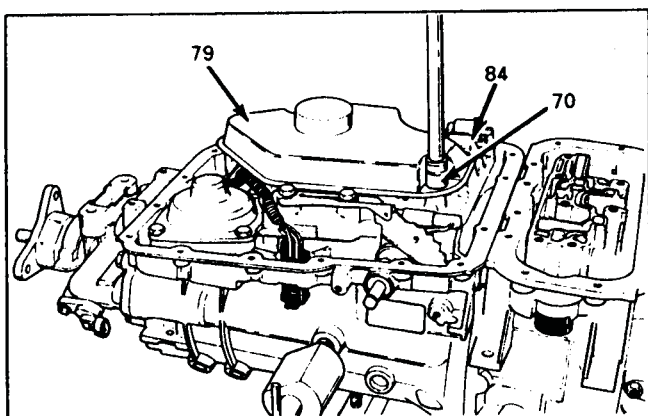


Figure 132

CONTINUED FROM PAGE 71.

18. Install the manual detent roller and spring assembly, and wiring harness clip to the main valve body, as shown in Figure 130, and torque two bolts to 14 ft.lbs. using a 13mm socket.
19. Connect the 4 terminal main case wiring harness assembly to the case electrical connector by snapping into place, as shown in Figure 131.
20. Wiring harness must be routed through and snapped into the wiring harness clip as shown in Figure 131.
21. Install the oil filter to the main case valve body and secure with the three remaining valve body bolts, as shown in Figure 132. Torque the three bolts to 14 ft.lbs. using a 13mm socket.

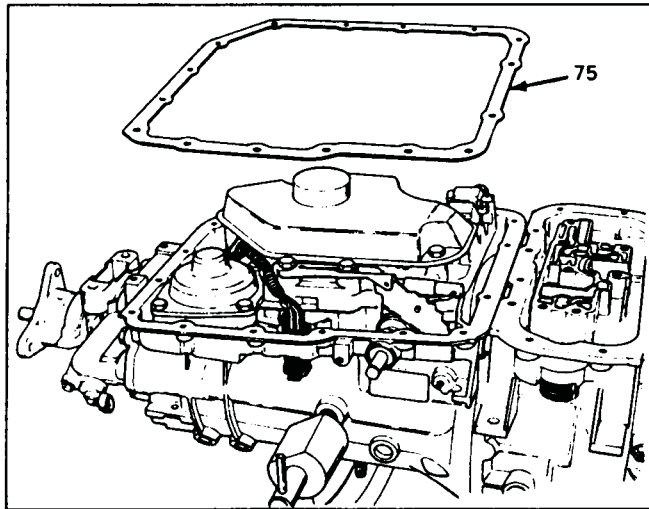


Figure 133

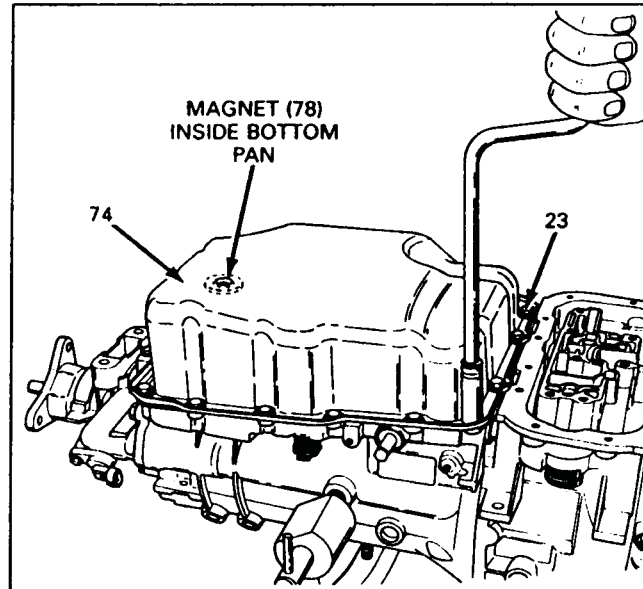


Figure 134

22. Install the bottom pan to main case gasket, as shown in Figure 133.
23. Install the magnet into the bottom pan prior to installation. See Figure 134 for location.
24. Install the main case bottom pan and secure with 16 bottom pan bolts.
25. Torque the 16 bottom pan bolts using a 10mm socket, to 9 ft.lb. as shown in Figure 134.

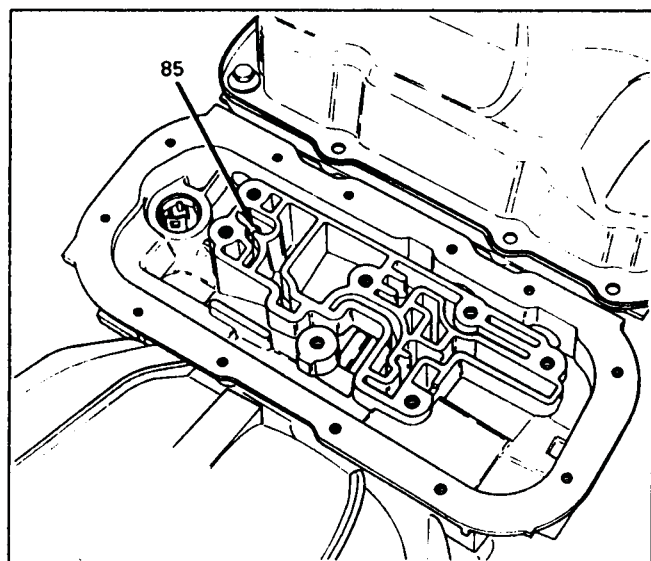


Figure 135

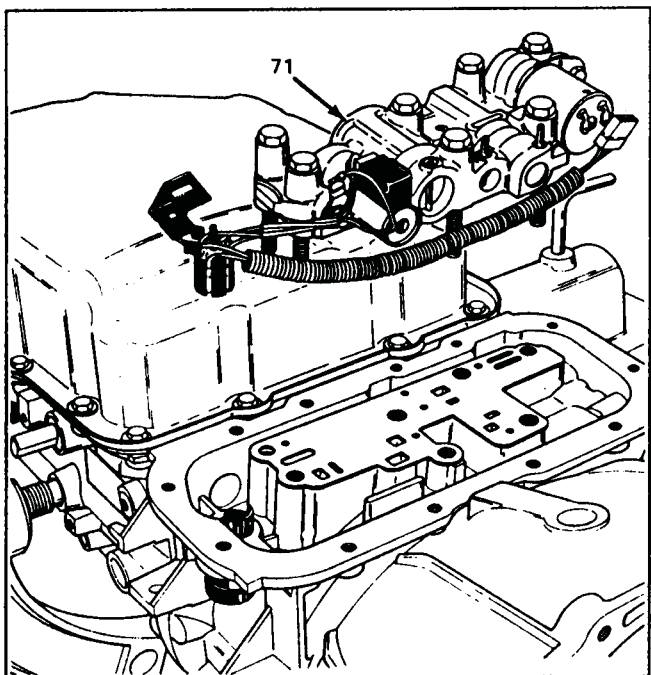


Figure 137

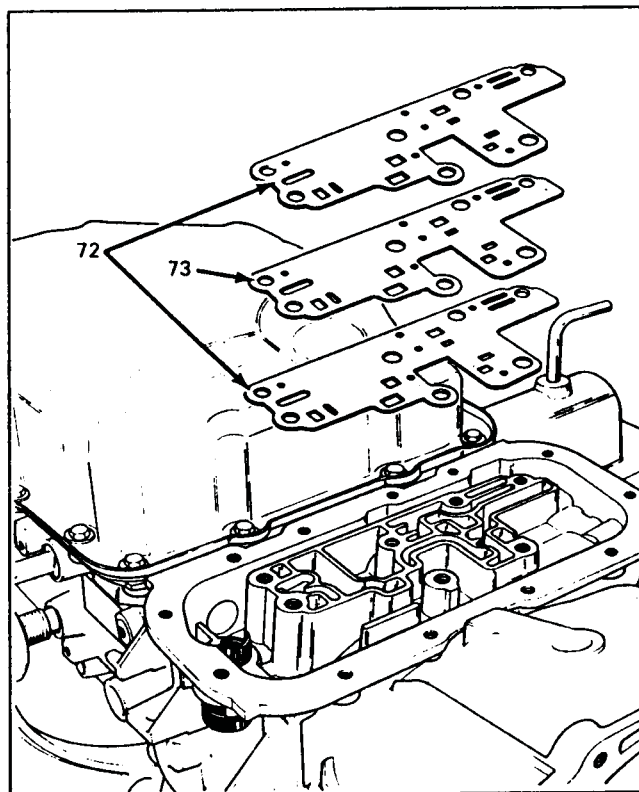


Figure 136

## ADAPTER CASE BOTTOM PAN AND PARTS

1. Some models require a checkball in the adapter case. Install checkball in the case passage, IF SO REQUIRED, as shown in Figure 135.
2. Install the adapter case valve body gaskets and spacer plate as shown in Figure 136.
3. Position the pre-assembled adapter case valve body assembly as shown in Figure 137, and lower into place.
4. Be certain that the adapter case wiring harness is routed under the spacer plate tab (73), as shown in Figure 138, prior to securing adapter case valve body with the seven bolts.

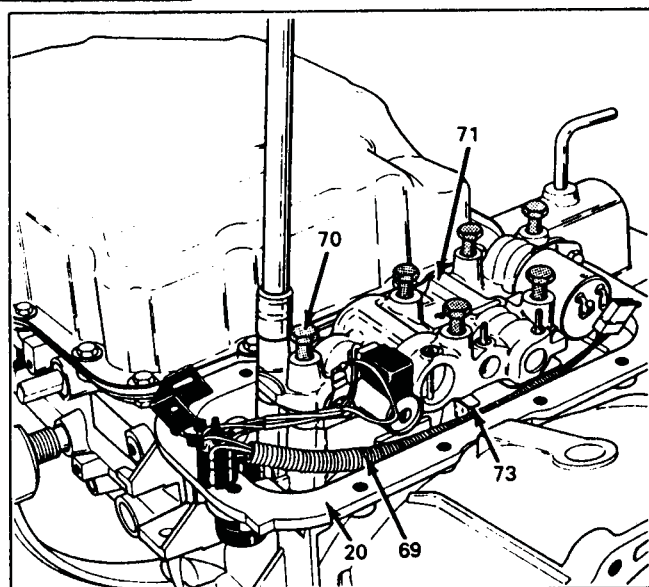


Figure 138

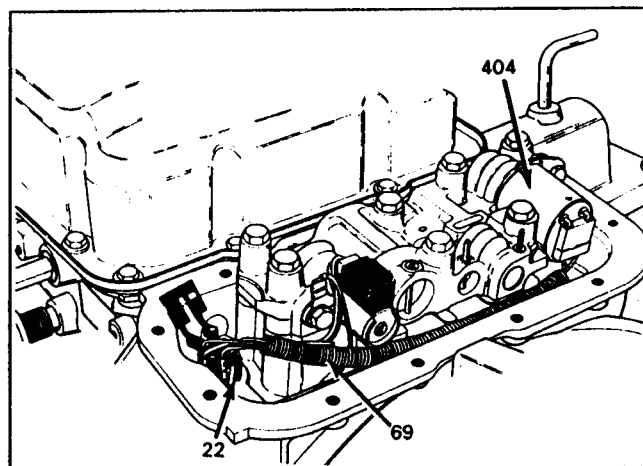


Figure 139

5. Torque the seven adapter case valve body bolts to 14 ft.lb. using 13mm socket as shown in Figure 138.
6. Connect the 5 terminal adapter case wiring harness to the adapter case electrical connector by snapping into place, as shown in Figure 139.
7. Connect the adapter case wiring harness to the force motor solenoid, as shown in Figure 139.
8. Install adapter case bottom pan gasket to adapter case as shown in Figure 140.

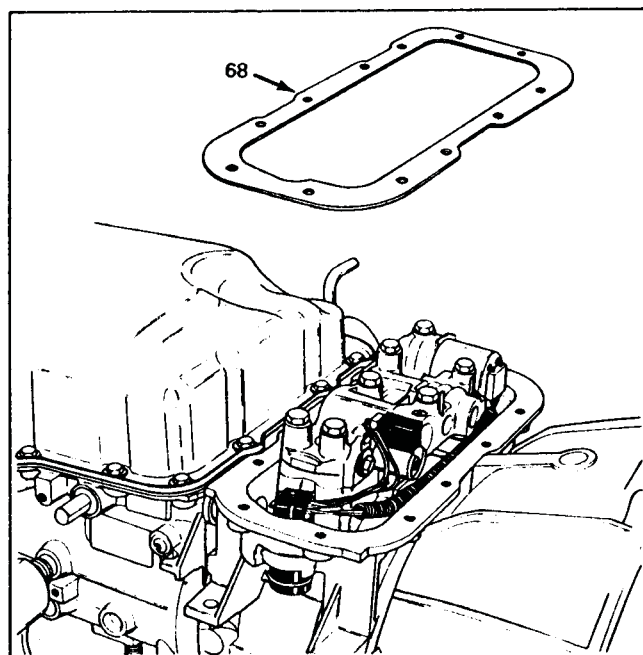


Figure 140

(Continued on Page 76)

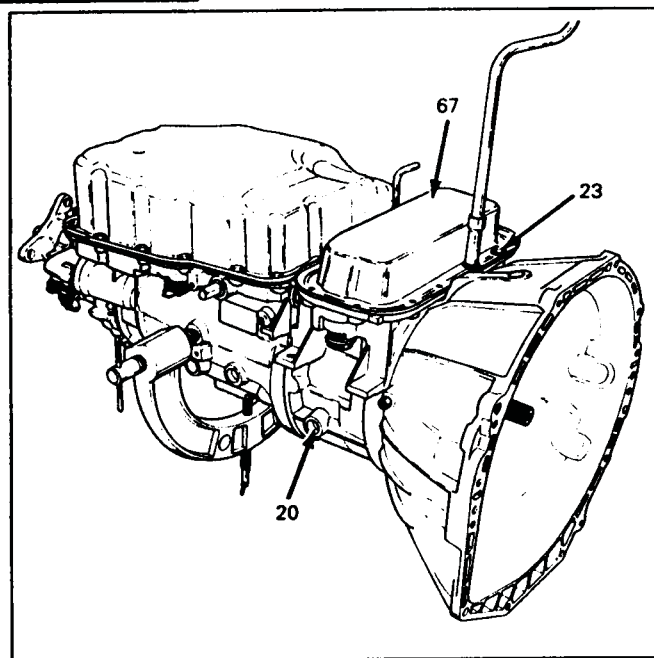


Figure 141

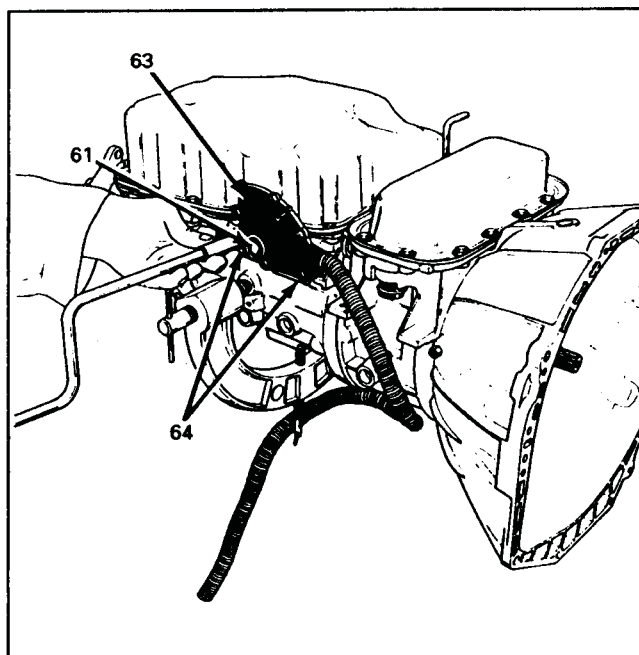


Figure 142

CONTINUED FROM PAGE 75

9. Install the adapter case bottom pan and secure to adapter case with 12 adapter case bottom pan bolts, shown in Figure 141.
10. Torque the 12 adapter case pan bolts using a 10mm socket to 9 ft.lb.
11. Install the mode switch to selector shaft, install mode switch cover and secure with 2 bolts (See Figure 142).
12. Rotate transmission to upright position and install torque converter, as shown in Figure 143.

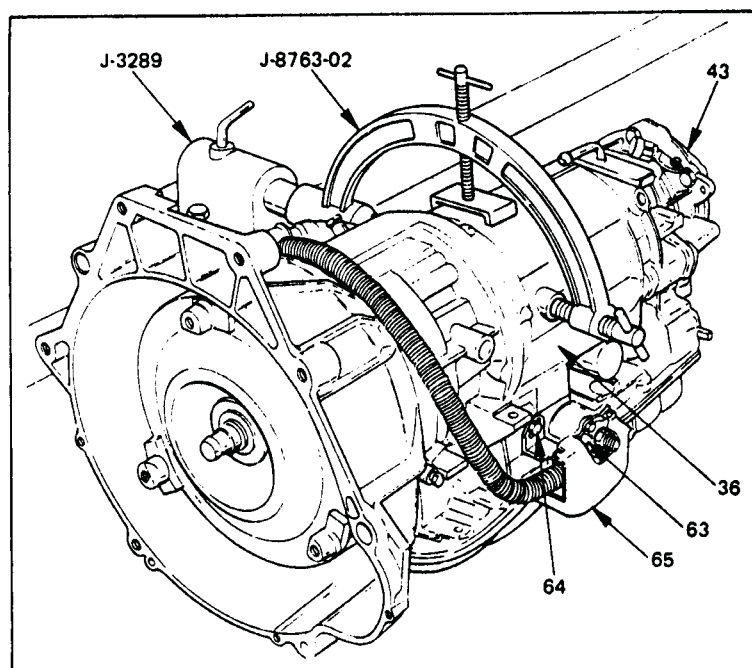


Figure 143

AUTOMATIC TRANSMISSION SERVICE GROUP



## Technical Service Information

### TORQUE SPECIFICATIONS

| DESIGNATION                               | Hex.<br>Size       | No. of<br>screws | Torque<br>kg·m (ft.lb.)    |
|-------------------------------------------|--------------------|------------------|----------------------------|
| Nut-parking lock and range selector lever | 17mm               | 1                | 2.2 (16)                   |
| Screw-center support/adaptor              | 13mm               | 8                | 2.5 (18)                   |
| Screw-oil filler tube                     | 10mm               | 1                | 1.0 (7)                    |
| Screw-convertor housing seal ring         | Torx T20           | 3                | 0.3 (26inlb.)              |
| Screw-convertor housing/pump              | 13mm               | 5                | 2.0 (14)                   |
| Screw-convertor housing/main case         | 13mm               | 7                | 4.0 (29)                   |
| Screw-extension/main case                 | 8mm int.           | 7                | 3.2 (23)                   |
| Screw-speed sensor                        | 10mm               | 1                | 0.9 (7)                    |
| Screw-brake band adjustment<br>lock nut   | 3/16" int<br>9/16" | 1                | 0.45 (39inlb.)<br>1.85(13) |
| Screw-transfer plate / valve body         | 11mm               | 2                | 1.3 (9)                    |
| Screw-valve body / main case              | 13mm               | 7                | 2.0 (14)                   |
| Screw-roller & spring manual detent       | 13mm               | 2                | 2.0 (14)                   |
| Screw-oil filter                          | 13mm               | 3                | 2.0 (14)                   |
| Screw-servo piston cover                  | 13mm               | 4                | 2.5 (18)                   |
| Screw-oil pan main case                   | 10mm               | 16               | 1.2 (9)                    |
| Screw-mode switch & shield                | 10mm               | 2                | 1.3 (9)                    |
| Screw-force motor solenoid                | 11mm               | 1                | 1.0 (7)                    |
| Screw-convertor clutch control solenoid   | 11mm               | 1                | 1.0 (7)                    |
| Screw-valve body adaptor case             | 13mm               | 7                | 2.0 (14)                   |
| Screw-oil pan adaptor case                | 10mm               | 12               | 1.2 (9)                    |

Figure 144



## DATA LIST F0 QUICK CHECK

| Test Step | TECH 1 Display       | Notes                                                                                                                 | Nominal Value                               | Possible Trouble Codes |
|-----------|----------------------|-----------------------------------------------------------------------------------------------------------------------|---------------------------------------------|------------------------|
| 01        | BATTERY VOLTAGE      | Ignition ON                                                                                                           | 9 V < voltage < 16 V                        | 48, 49                 |
| 02        | TORQUE CONTROL       | Not used                                                                                                              | —                                           | —                      |
| 03        | PRESS. REG. SOL.     | Engine at idle speed<br>Parking brake on                                                                              | approx. 700 mA                              | 32, 33                 |
| 04        | CALCULAT. PRESS.     | Selector lever position "D"                                                                                           | 0.2 – 6.0 kg/cm <sup>2</sup> (2.5 – 85 psi) |                        |
| 05        | SOLENOID 1 – 2/3 – 4 | Vehicle travelling at a speed of approx. 50 km/h:32 mph (approx. 70 km/h:44 mph)<br>Selector lever position "2" ("3") | ACTIVE 12 V                                 | 17, 25                 |
| 06        | SOLENOID 2 – 3       | Vehicle travelling at a speed of approx. 10 km/h:6 mph (approx. 30 km/h:18 mph)<br>Selector lever position "1" ("2")  | ACTIVE 12 V                                 | 26, 28                 |
| 07        | BAND APPLY SOL.      | Engine at idle speed<br>Selector lever position "1"                                                                   | ACTIVE                                      | 34, 35                 |
| 08        | BAND APPLY SOL.      | Actuation for 1 sec. every 15 seconds                                                                                 | approx. 51 % DC                             |                        |
| 09        | TCC SOLENOID         | Vehicle travelling at a speed of approx. 80 km/h:50 mph<br>Selector lever position "D"                                | ACTIVE 12 V                                 | 29, 36                 |
| 10        | BRAKE SWITCH         | Ignition ON<br>Actuate brake                                                                                          | ACTIVE 0 V                                  | –                      |

| Test Step | TECH 1 Display   | Notes                                                                                                      | Nominal Value                                                        | Possible Trouble Codes |
|-----------|------------------|------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|------------------------|
| 11        | AT INPUT SPEED   | Engine at idle speed<br>Selector lever position "N"<br>Engine at idle speed<br>Selector lever position "D" | approx. 800 rpm (Below 1000 rpm)<br>approx. 800 rpm (Below 1000 rpm) | 31, 46                 |
| 12        | AT OUTPUT SPEED  | —                                                                                                          | —                                                                    | 39, 46                 |
| 13        | SELECTOR INFORM. | Ignition ON<br>Shift through all selector lever positions                                                  | Dependent on selector lever position:<br>P, R, N, D, 3, 2, 1,        | 56                     |
| 14        | ACTUAL GEAR      | Vehicle travelling at a speed of approx. 100 km/h:62 mph, selector lever position "D"                      | – 4 –                                                                | 41                     |
| 15        | SELECTOR PIN A   | Ignition ON<br>Selector lever position "P"                                                                 | ACTIVE 12 V                                                          | 56                     |
| 16        | SELECTOR PIN B   | Ignition ON<br>Selector lever position "R"                                                                 | ACTIVE 12 V                                                          | 56                     |
| 17        | SELECTOR PIN C   | Ignition ON<br>Selector lever position "D"                                                                 | ACTIVE 12 V                                                          | 56                     |
| 18        | SELECTOR PIN G   | Ignition ON<br>Selector lever position "P"                                                                 | ACTIVE 12 V                                                          | 56                     |



## Technical Service Information

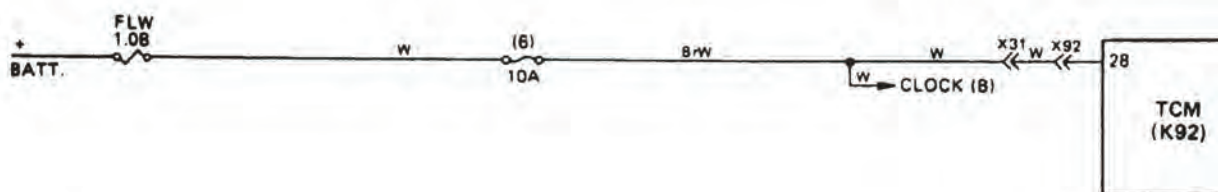
### DATA LIST F0 QUICK CHECK

| Test Step | TECH 1 Display   | Notes                                                                                        | Nominal Value                    | Possible Trouble Codes |
|-----------|------------------|----------------------------------------------------------------------------------------------|----------------------------------|------------------------|
| 19        | TPS SIGNAL       | Ignition ON<br>Throttle valve in idle speed position<br>Throttle valve in full load position | 0.1 V to 0.96 V<br>4.9 V or less | 21, 22                 |
| 20        | KICKDOWN SWITCH  | Ignition ON<br>Depress accelerator to stop                                                   | ACTIVE 0 V                       | 77                     |
| 21        | TPS REF. VOLTAGE | Engine at idle speed                                                                         | 5 V                              | 21, 22                 |
| 22        | A/C INFORMAT.SW. | Not used                                                                                     | —                                | —                      |
| 23        | TRANSM.OIL TEMP  | Engine running                                                                               | approx. 80 °C/176 °F 1.02 V      | 65, 66                 |
| 24        | COOLANT TEMP SW. | Ignition ON                                                                                  | ACTIVE 0 V                       | —                      |
| 25        | WINTER SW. (-D-) | Ignition ON<br>Selector lever position "D"<br>Press "Winter Program" key                     | ACTIVE 0 V                       | —                      |
| 26        | PROGRAM SWITCH   | Ignition ON<br>Hold down tip switch for the<br>"Sport Program"                               | ACTIVE 0 V                       | —                      |

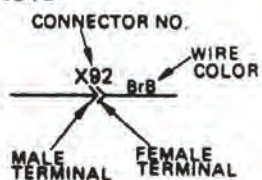


## ELECTRICAL TESTS

| Test Step                                                                                                                                                                                                                                                            | TECH 1 Display  | Notes                 | Nominal Values                                                                                 | Possible Trouble Codes |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|-----------------------|------------------------------------------------------------------------------------------------|------------------------|
| 01                                                                                                                                                                                                                                                                   | BATTERY VOLTAGE | Ignition ON           | 9 V < voltage < 16 V                                                                           | 48, 49                 |
| 02                                                                                                                                                                                                                                                                   | TORQUE CONTROL  | Not used              |                                                                                                |                        |
| <b>Trouble-Shooting:</b><br>• Connect voltmeter to B+ and B- of battery<br>Range: 20 V DC<br><br>• Ignition ON<br><br>• Engine runs<br><br><b>Note:</b> On engines equipped with ECM, the idle speed is automatically increased when the voltage falls below 11.8 V. |                 |                       |                                                                                                |                        |
|                                                                                                                                                                                                                                                                      |                 | <b>Nominal Value:</b> | <b>Cause of Fault:</b>                                                                         |                        |
|                                                                                                                                                                                                                                                                      |                 | > 9.0 V               | • Battery discharged<br>• Contacts corroded<br>• Lead interruption between K 92/Ter. 28 and B+ |                        |
|                                                                                                                                                                                                                                                                      |                 | > 13.0 V              | • Alternator and/or regulator, check                                                           |                        |
|                                                                                                                                                                                                                                                                      |                 | > 16.0 V              | • Alternator and/or regulator, check                                                           |                        |



### NOTE:

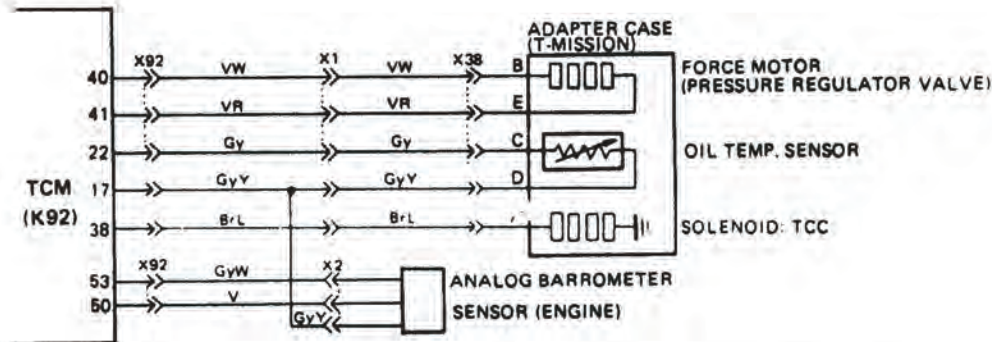


TCM TERMINAL : 28 BATTERY

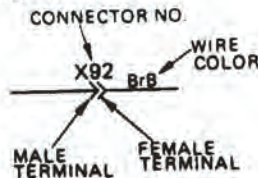
| Test Step | TECH 1 Display   | Notes                                                                   | Nominal Value                         | Possible Trouble Codes |
|-----------|------------------|-------------------------------------------------------------------------|---------------------------------------|------------------------|
| 03        | PRESS. REG. SOL. | Engine at idle speed<br>Parking brake on<br>Selector lever position "D" | approx. 700 mA                        | 32, 33                 |
| 04        | CALCULAT. PRESS. |                                                                         | 0.2—6.0kg/cm <sup>2</sup> (2.8—85psi) |                        |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                              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| <p><b>Trouble-shooting:</b></p> <ul style="list-style-type: none"> <li>● Ignition OFF</li> <li>· Disconnect plug from control unit K 92</li> <li>Connect ohmmeter between X 92/Ter.40 and Ter. 41</li> </ul> <p>If the value is not attained:</p> <p>Disconnect plug X 38 from transmission intermediate housing (Adapter case)</p> <p>Connect ohmmeter between plug K 92/Ter. 40 and X 38/Ter. B</p> <p>Connect ohmmeter between plug K 92/Ter. 41 and X 38/Ter. E</p> <p>Connect ohmmeter between X 38/ Ter. B and ground on transmission</p> <p>Connect ohmmeter between X 38/ Ter. E and ground on transmission</p> | <p><b>Nominal Value:</b></p> <p>3,7 – 4,7 Ω</p><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br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**NOTE:**



**TCM TERMINAL :** 40 FORCE MOTOR (+)  
41 FORCE MOTOR (-)  
22 OIL TEMP. SENSOR  
17 ANALOG GROUND  
38 TCC SOLENOID

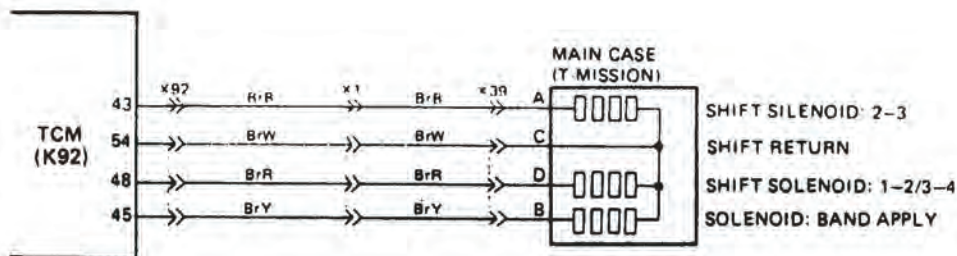


| Test Step | TECH 1 Display       | Notes                                                                                                                 | Nominal Value | Possible Trouble Codes |
|-----------|----------------------|-----------------------------------------------------------------------------------------------------------------------|---------------|------------------------|
| 05        | SOLENOID 1 - 2/3 - 4 | Vehicle travelling at a speed of approx. 50 km/h/32 mph (approx. 70 km/h/44 mph)<br>Selector lever position "2" ("3") | ACTIVE 12 V   | 17, 25                 |

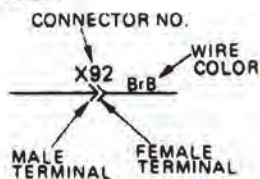
|                                                                                                                                                                                                                                                                                                                                                                                   |  |                                             |                                                                                                                                                                                                               |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|---------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Trouble-shooting:</b>                                                                                                                                                                                                                                                                                                                                                          |  | <b>Nominal Value:</b>                       | <b>Cause of Fault:</b>                                                                                                                                                                                        |
| <ul style="list-style-type: none"> <li>● Ignition OFF</li> <li>Disconnect plug from K 92</li> <li>Connect ohmmeter between X 92/Ter. 48 and Ter. 54</li> </ul>                                                                                                                                                                                                                    |  | 17.5–18.5Ω                                  | <ul style="list-style-type: none"> <li>● Lead interruption</li> <li>● Short circuit in wiring harness to solenoid valve</li> <li>● Solenoid valve defective</li> <li>● Control unit K 92 defective</li> </ul> |
| <p>If the value is not attained:</p> <p>Disconnect plug X 39 from transmission main housing</p> <p>Connect ohmmeter between plug K 92/Ter. 48 and X 39/Ter. D</p> <p>Connect ohmmeter between plug K 92/Ter. 54 and X 39/Ter. C</p> <p>Connect ohmmeter between X 39/Ter. D and ground on transmission</p> <p>Connect ohmmeter between X 39/Ter. C and ground on transmission</p> |  | <p>0 Ω</p> <p>0 Ω</p> <p>∞ Ω</p> <p>∞ Ω</p> | <ul style="list-style-type: none"> <li>● Lead interruption</li> <li>● Lead interruption</li> <li>● Short circuit to ground in main housing</li> <li>● Short circuit to ground in main housing</li> </ul>      |

| Solenoid valve | Gear | 1.  | 2.   | 3.   | 4.  |
|----------------|------|-----|------|------|-----|
| 1 - 2/3 - 4    |      | 0 V | 12 V | 12 V | 0 V |

Note: When the control unit switches to Emergency Program, there is no longer ground to the valves. Despite this, 12 V may be displayed, which does not mean that the respective valves are switched on and "active"



## NOTE:

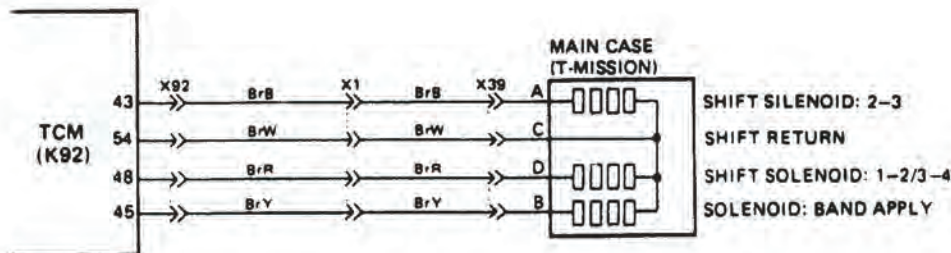


TCM TERMINAL : 43 SHIFT SOL. 2-3  
 54 SHIFT SOL. GROUND  
 48 SHIFT SOL. 1-2/3-4  
 45 BAND APPLY SOLENOID

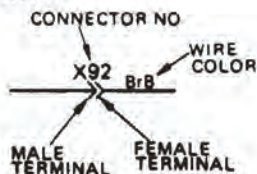
| Test Step                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | TECH 1 Display | Notes                                                                                                                | Nominal Value                                                                                                                                                                                                 | Possible Trouble Codes |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|----------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| 06                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | SOLENOID 2-3   | Vehicle travelling at a speed of approx. 10 km/h:6 mph (approx. 30 km/h:18 mph)<br>Selector lever position "1" ("2") | ACTIVE 12 V                                                                                                                                                                                                   | 26, 28                 |
| <p><b>Trouble-shooting:</b></p> <ul style="list-style-type: none"> <li>● Ignition OFF</li> <li>Disconnect plug from K 92</li> <li>Connect ohmmeter between X 92/Ter.43 and Ter. 54</li> </ul> <p>If the value is not attained:</p> <p>Disconnect plug X 39 from transmission main housing</p> <p>Connect ohmmeter between plug K 92/Ter. 43 and X 39/Ter. A</p> <p>Connect ohmmeter between plug K 92/Ter. 54 and X 39/Ter. C</p> <p>Connect ohmmeter between X 39/Ter. A and ground on transmission</p> <p>Connect ohmmeter between X 39/Ter. C and ground on transmission</p> |                |                                                                                                                      |                                                                                                                                                                                                               |                        |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                | Nominal Value:                                                                                                       | Cause of Fault:                                                                                                                                                                                               |                        |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                | 17.5-18.5Ω                                                                                                           | <ul style="list-style-type: none"> <li>● Lead interruption</li> <li>● Short circuit in wiring harness to solenoid valve</li> <li>● Solenoid valve defective</li> <li>● Control unit K 92 defective</li> </ul> |                        |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                | 0 Ω                                                                                                                  | ● Lead interruption                                                                                                                                                                                           |                        |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                | 0 Ω                                                                                                                  | ● Lead interruption                                                                                                                                                                                           |                        |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                | ∞ Ω                                                                                                                  | ● Short circuit to ground in main housing                                                                                                                                                                     |                        |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                | ∞ Ω                                                                                                                  | ● Short circuit to ground in main housing                                                                                                                                                                     |                        |

| Solenoid valve | Gear | 1    | 2    | 3   | 4   |
|----------------|------|------|------|-----|-----|
| 2-3            |      | 12 V | 12 V | 0 V | 0 V |

Note: When the control unit switches to Emergency Program, there is no longer ground to the valves. Despite this, 12V may be displayed, which does not mean that the respective valves are switched on and "active".



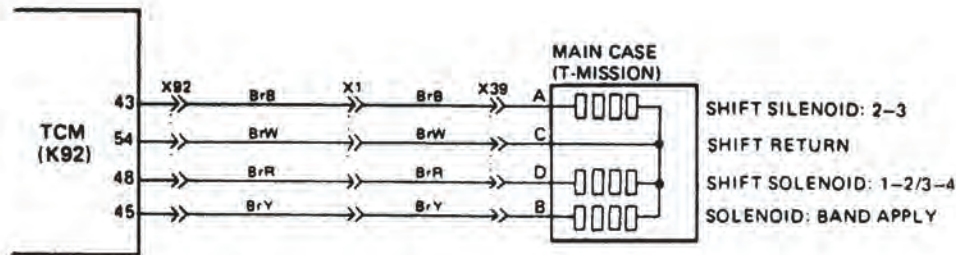
**NOTE:**



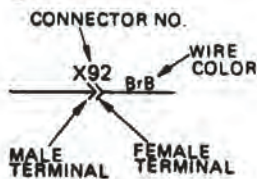
TCM TERMINAL : 43 SHIFT SOL. 2-3  
 54 SHIFT SOL. GROUND  
 48 SHIFT SOL. 1-2/3-4  
 45 BAND APPLY SOLENOID



| Test Step                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | TECH 1 Display                                                           | Notes                                                                                                                                                                                                                                                                                                                                                                                                       | Nominal Value   | Possible Trouble Codes |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                             |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 07                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | BAND APPLY SOL.                                                          | Engine at idle speed<br>Selector lever position "1"                                                                                                                                                                                                                                                                                                                                                         | ACTIVE          | 34, 35                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                             |
| 08                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | BAND APPLY SOL.                                                          | Actuation for 1 sec. every 15 seconds                                                                                                                                                                                                                                                                                                                                                                       | approx. 51 % DC |                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                             |
| <table border="0"> <tr> <td style="vertical-align: top;"> <b>Trouble-shooting:</b><br/><br/> <ul style="list-style-type: none"> <li>● Ignition OFF</li> <li>Disconnect plug from K 92</li> <li>Connect ohmmeter between X 92/Ter. 45 and Ter. 54</li> <li>If the value is not attained:</li> <li>Disconnect plug X 39 from transmission main housing</li> <li>Connect ohmmeter between plug K 92/Ter. 45 and X 39/Ter. B</li> <li>Connect ohmmeter between plug K 92/Ter. 54 and X 39/Ter. C</li> <li>Connect ohmmeter between X 39/Ter. B and ground on transmission</li> <li>Connect ohmmeter between X 39/Ter. C and ground on transmission</li> </ul> </td> <td style="vertical-align: top;"> <b>Nominal Value:</b><br/><br/> 10Ω<br/><br/><br/><br/> 0 Ω<br/> 0 Ω<br/> ∞ Ω<br/> ∞ Ω </td> <td style="vertical-align: top;"> <b>Cause of Fault:</b><br/><br/> <ul style="list-style-type: none"> <li>● Lead interruption</li> <li>● Short circuit in wiring harness to solenoid valve</li> <li>● Solenoid valve defective</li> <li>● Control unit K 92 defective</li> <li>● Lead interruption</li> <li>● Lead interruption</li> <li>● Short circuit to ground in main housing</li> <li>● Short circuit to ground in main housing</li> </ul> </td> </tr> </table> |                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                             |                 |                        | <b>Trouble-shooting:</b><br><br><ul style="list-style-type: none"> <li>● Ignition OFF</li> <li>Disconnect plug from K 92</li> <li>Connect ohmmeter between X 92/Ter. 45 and Ter. 54</li> <li>If the value is not attained:</li> <li>Disconnect plug X 39 from transmission main housing</li> <li>Connect ohmmeter between plug K 92/Ter. 45 and X 39/Ter. B</li> <li>Connect ohmmeter between plug K 92/Ter. 54 and X 39/Ter. C</li> <li>Connect ohmmeter between X 39/Ter. B and ground on transmission</li> <li>Connect ohmmeter between X 39/Ter. C and ground on transmission</li> </ul> | <b>Nominal Value:</b><br><br>10Ω<br><br><br><br>0 Ω<br>0 Ω<br>∞ Ω<br>∞ Ω | <b>Cause of Fault:</b><br><br><ul style="list-style-type: none"> <li>● Lead interruption</li> <li>● Short circuit in wiring harness to solenoid valve</li> <li>● Solenoid valve defective</li> <li>● Control unit K 92 defective</li> <li>● Lead interruption</li> <li>● Lead interruption</li> <li>● Short circuit to ground in main housing</li> <li>● Short circuit to ground in main housing</li> </ul> |
| <b>Trouble-shooting:</b><br><br><ul style="list-style-type: none"> <li>● Ignition OFF</li> <li>Disconnect plug from K 92</li> <li>Connect ohmmeter between X 92/Ter. 45 and Ter. 54</li> <li>If the value is not attained:</li> <li>Disconnect plug X 39 from transmission main housing</li> <li>Connect ohmmeter between plug K 92/Ter. 45 and X 39/Ter. B</li> <li>Connect ohmmeter between plug K 92/Ter. 54 and X 39/Ter. C</li> <li>Connect ohmmeter between X 39/Ter. B and ground on transmission</li> <li>Connect ohmmeter between X 39/Ter. C and ground on transmission</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>Nominal Value:</b><br><br>10Ω<br><br><br><br>0 Ω<br>0 Ω<br>∞ Ω<br>∞ Ω | <b>Cause of Fault:</b><br><br><ul style="list-style-type: none"> <li>● Lead interruption</li> <li>● Short circuit in wiring harness to solenoid valve</li> <li>● Solenoid valve defective</li> <li>● Control unit K 92 defective</li> <li>● Lead interruption</li> <li>● Lead interruption</li> <li>● Short circuit to ground in main housing</li> <li>● Short circuit to ground in main housing</li> </ul> |                 |                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                             |
| <p><b>Note:</b> When the control unit switches to Emergency Program, there is no longer ground to the valves. Despite this, 12 V may be displayed, which does not mean that the respective valves are switched on and "active".</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                             |                 |                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                             |

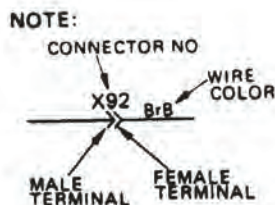
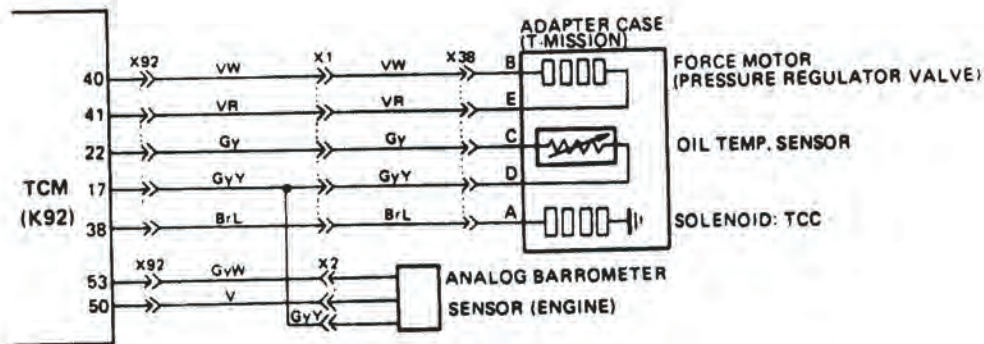


**NOTE:**



TCM TERMINAL : 43 SHIFT SOL. 2-3  
54 SHIFT SOL. GROUND  
48 SHIFT SOL. 1-2/3-4  
45 BAND APPLY SOLENOID

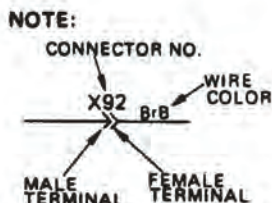
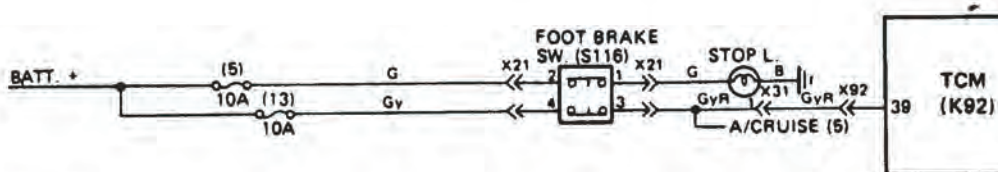
| Test Step                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | TECH 1 Display | Notes                                                                                   | Nominal Value | Possible Trouble Codes |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-----------------------------------------------------------------------------------------|---------------|------------------------|
| 09                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | TCC SOLENOID   | Vehicle travelling at a speed of approx. 80 km/h: 50 mph<br>Selector lever position "D" | ACTIVE 12 V   | 29, 36                 |
| <p><b>Trouble-shooting:</b></p> <ul style="list-style-type: none"> <li>● Ignition OFF</li> <li>Connect ohmmeter between K 92/Ter. 38 and ground on transmission</li> </ul> <p><b>Nominal Value:</b> 17.5–18.5Ω</p> <p><b>Cause of Fault:</b></p> <ul style="list-style-type: none"> <li>● Lead interruption</li> <li>● Short circuit in wiring harness to solenoid valve</li> <li>● Solenoid valve defective</li> <li>● Control unit defective</li> </ul> <p>Disconnect plug X 38 from transmission intermediate housing (Adapter case)</p> <p>Connect ohmmeter between K 92/ Ter. 38 and X 38/Ter. A</p> <p><b>Nominal Value:</b> 0 Ω</p> <p><b>Cause of Fault:</b></p> <ul style="list-style-type: none"> <li>● Lead interruption</li> </ul> <p><b>Note:</b> The solenoid valve for the converter clutch is switched on in third or fourth gear at a speed of approx. 80 km/h:50 mph.</p> |                |                                                                                         |               |                        |



TCM TERMINAL :

- 40 FORCE MOTOR (+)
- 41 FORCE MOTOR (-)
- 22 OIL TEMP. SENSOR
- 17 ANALOG GROUND
- 38 TCC SOLENOID

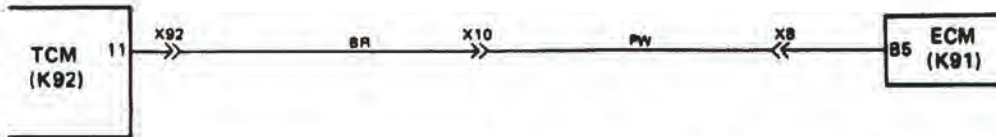
| Test Step                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | TECH 1 Display | Notes                        | Nominal Value | Possible Trouble Codes |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|------------------------------|---------------|------------------------|
| 10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | BRAKE SWITCH   | Ignition ON<br>Actuate brake | ACTIVE 0 V    | —                      |
| <p><b>Trouble-shooting:</b></p> <ul style="list-style-type: none"> <li>● Ignition ON<br/>Brake not actuated</li> </ul> <p><b>Nominal Value:</b></p> <p>INACTIVE 12 V</p> <p><b>Cause of Fault:</b></p> <ul style="list-style-type: none"> <li>● Fuse No.13 defective</li> <li>● Lead interruption between fuse No.13 and brake sw. S116/Ter.4</li> </ul> <p>Bridge brake switch S 116/Ter. 3 and Ter. 4</p> <p>INACTIVE 12 V</p> <p>● Brake light switch defective</p> <p>Bridge brake switch S 116/Ter. 1 and Ter. 2</p> <p>Brake lights illuminate</p> <ul style="list-style-type: none"> <li>● Ignition OFF</li> </ul> <p>Connect ohmmeter between S 116/Ter. 4 and X 31/Ter. 1</p> <p>0 <math>\Omega</math></p> <p>● Lead interruption</p> <p>Disconnect plug from control unit K 92</p> <p>Connect ohmmeter between X 31/Ter. 1 and K 92/Ter. 39</p> <p>0 <math>\Omega</math></p> <p>● Lead interruption</p> |                |                              |               |                        |



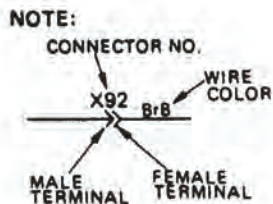
TCM TERMINAL : 39 BRAKE SWITCH



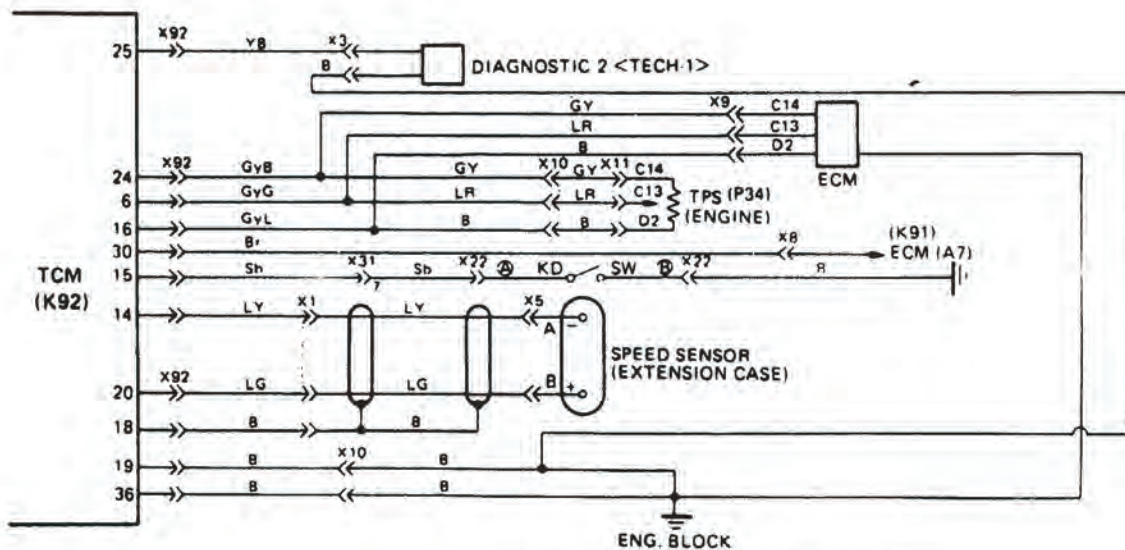
| Test Step                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | TECH 1 Display | Notes                                                                                                      | Nominal Value                                                        | Possible Trouble Codes |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|------------------------|
| 11                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | AT INPUT SPEED | Engine at idle speed<br>Selector lever position "N"<br>Engine at idle speed<br>Selector lever position "D" | approx. 800 rpm (Below 1000 rpm)<br>approx. 800 rpm (Below 1000 rpm) | 31, 46                 |
| <div> <div> <b>Trouble-shooting:</b> <ul style="list-style-type: none"> <li>● Start engine</li> <li>● Engine at idle speed<br/>Selector lever position "N"</li> <li>● Ignition OFF<br/>Disconnect plug from control units K 91(ECM) and K 92(TCM)<br/>Connect ohmmeter between K 91/Ter. 85 and K 92/Ter. 11</li> </ul> </div> <div> <b>Nominal Value:</b><br/><br/>approx 800 rpm<br/>(Below 1000 rpm)<br/><br/><br/><br/><br/><br/><br/><br/><br/>0 Ω         </div> <div> <b>Cause of Fault:</b> <ul style="list-style-type: none"> <li>● Inductive pulse pick-up defective or lead interruption to TCM or TCM defective.</li> <li>● Control unit K 92 defective</li> <li>● Lead interruption</li> </ul> </div> </div> |                |                                                                                                            |                                                                      |                        |



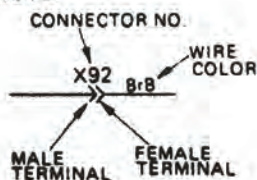
TCM TERMINAL : 11 ENGINE SPEED



| Test Step                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | TECH 1 Display  | Notes | Nominal Value | Possible Trouble Codes |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|-------|---------------|------------------------|
| 12                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | AT OUTPUT SPEED |       |               | 39, 46                 |
| <p><b>Trouble-shooting:</b></p> <ul style="list-style-type: none"> <li>● Ignition OFF</li> <li>Disconnect plug from control unit K 92</li> <li>Connect ohmmeter between K 92/Ter. 20 and Ter. 14 (range 20 <math>\Omega</math>)</li> </ul> <p><b>Nominal Value:</b> 3,000<math>\Omega</math> (at 25°C)</p> <p><b>Cause of Fault:</b></p> <ul style="list-style-type: none"> <li>● Pulse pick-up for output engine speed defective</li> <li>● K 92 defective</li> </ul> <p><b>If the value is not attained:</b></p> <ul style="list-style-type: none"> <li>Disconnect plug from pulse pick-up</li> <li>Connect ohmmeter between plug (pulse pick-up) Ter. A and K 92/Ter. 14 (the same with Ter. B and K 92/Ter. 20)</li> </ul> <p><b>Nominal Value:</b> 0 <math>\Omega</math></p> <p><b>Cause of Fault:</b></p> <ul style="list-style-type: none"> <li>● Lead interruption</li> </ul> |                 |       |               |                        |



**NOTE:**



TCM TERMINAL :

- 25 DIAGNOSTIC
- 24 TPS (+)
- 6 TPS (SIGNAL)
- 16 TPS (-)
- 30 COOLANT TEMP. SIGNAL
- 15 KICKDOWN SW.
- 14 OUTPUT SPEED SENSOR (-)
- 20 OUTPUT SPEED SENSOR (+)
- 18 GROUND
- 19 GROUND
- 36 GROUND



| Test Step | TECH 1 Display  | Notes                                                     | Nominal Value                                                    | Possible Trouble Codes |
|-----------|-----------------|-----------------------------------------------------------|------------------------------------------------------------------|------------------------|
| 13        | SELECTOR INFORM | Ignition ON<br>Shift through all selector lever positions | Dependent on the selector lever position:<br>P, R, N, D, 3, 2, 1 | 56                     |

**Trouble-shooting:**  
Note: In all cases, check first that the selector lever positioning switch is correctly adjusted.

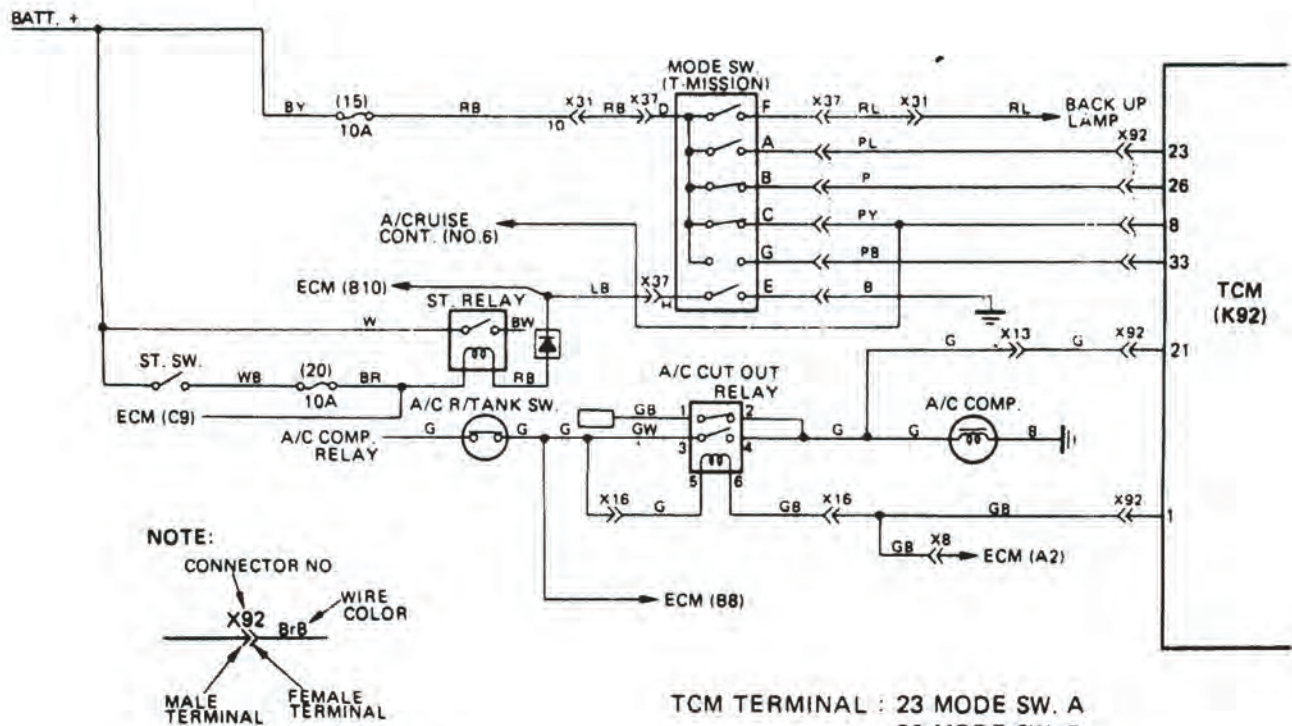
**Nominal Value:**  
P, R, N, D, 3, 2, 1

**Cause of Fault:**

- Ignition ON  
Shift selector lever through selector lever positions P, R, N, D, 3, 2, 1
- Fuse No. 15 defective
- Lead interruption between fuse No. 15 and X 31/Ter. 10
- Lead interruption between X 31/Ter. 10 and X 37/Ter. D
- Shift linkage incorrectly adjusted

**Note:**  
In Test Steps 15 to 18, each cable connection from selector lever position switch to control unit is checked.  
If Trouble Codes 56 is set, a check of Test Steps 15 to 18 cannot be omitted in order to attain a clear allocation of the fault.

|   | D | A | B | C | G | E | H | F |
|---|---|---|---|---|---|---|---|---|
| P | • | • |   |   | • | • | • |   |
| R | • | • | • |   |   |   |   | • |
| N | • |   | • |   | • | • | • |   |
| D | • |   | • | • |   |   |   |   |
| 3 | • | • | • | • | • |   |   |   |
| 2 | • | • |   | • |   |   |   |   |
| 1 | • |   |   | • | • |   |   |   |





| Test Step | TECH 1 Display | Notes                                                                                   | Nominal Value | Possible Trouble Codes |
|-----------|----------------|-----------------------------------------------------------------------------------------|---------------|------------------------|
| 14        | ACTUAL GEAR    | Vehicle travelling at a speed of approx. 100 km/h:62 mph<br>Selector lever position "D" | - 4 -         | 41                     |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                            |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Trouble-shooting:</b><br><br><ul style="list-style-type: none"> <li>● Engine at idle speed<br/>Put selector lever into selector lever position "1"<br/>Engine speed <math>\leq</math> 3500 rpm</li> <li>Selector lever position "D"<br/>"Winter Program" activated</li> <li>Selector lever position "2"<br/>Vehicle travelling at a speed of approx. 40 km/h:25 mph</li> <li>Selector lever position "D"<br/>Vehicle travelling at a speed of approx. 80 km/h:50 mph</li> </ul> | <b>Nominal Value:</b><br><br>1st gear<br><br>3rd gear<br><br>2nd gear<br><br>4th gear | <b>Cause of Fault:</b><br><br><ul style="list-style-type: none"> <li>● Hydraulic fault (see mech./hydraulic checklist, Test Step 05, 06)</li> <li>● Hydraulic fault (see mech./hydraulic checklist, Test Step 05, 14)</li> <li>● Hydraulic fault (see mech./hydraulic checklist, Test Step 05, 11)</li> <li>● Hydraulic fault (see mech./hydraulic checklist, Test Step 05, 11)</li> </ul> |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

| Test Step | TECH 1 Display | Notes                                      | Nominal Value | Possible Trouble Codes |
|-----------|----------------|--------------------------------------------|---------------|------------------------|
| 15        | SELECTOR PIN A | Ignition ON<br>Selector lever position "P" | ACTIVE 12 V   | 56                     |

## Trouble-shooting:

Nominal Value:

Cause of Fault:

Ter. A of the selector lever position switch is checked in this Test Step with the help of TECH 1.

- Ignition ON  
Selector lever position "P"

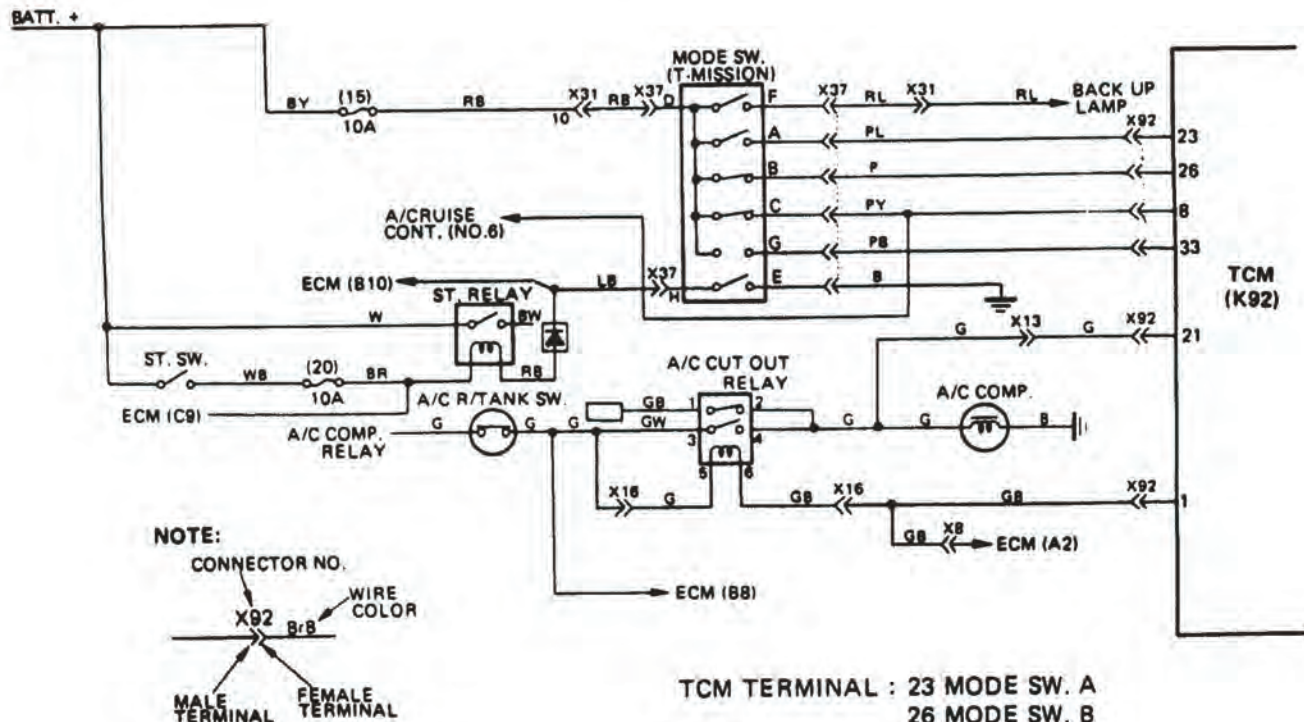
ACTIVE 12 V

- Lead interruption between X 37/Ter. A and selector lever position switch
- Lead interruption between X 37/Ter. A and K 92/Ter. 23
- Selector lever position switch defective

The following values must be displayed for the remaining selector lever positions:

| "R"            | "N"           | "D"           | "3"            | "2"            | "1"             |
|----------------|---------------|---------------|----------------|----------------|-----------------|
| ACTIVE<br>12 V | INACT.<br>0 V | INACT.<br>0 V | ACTIVE<br>12 V | ACTIVE<br>12 V | INACTIVE<br>0 V |

If these values are not attained, the selector lever position switch should be replaced.





| Test Step | TECH 1 Display | Notes                                      | Nominal Value | Possible Trouble Codes |
|-----------|----------------|--------------------------------------------|---------------|------------------------|
| 16        | SELECTOR PIN B | Ignition ON<br>Selector lever position "R" | ACTIVE 12 V   | 56                     |

## Trouble-shooting:

## Nominal Value:

## Cause of Fault:

Ter. B of the selector lever position switch is checked in this Test Step with the help of TECH 1.

### ● Ignition ON

Selector lever position "R"

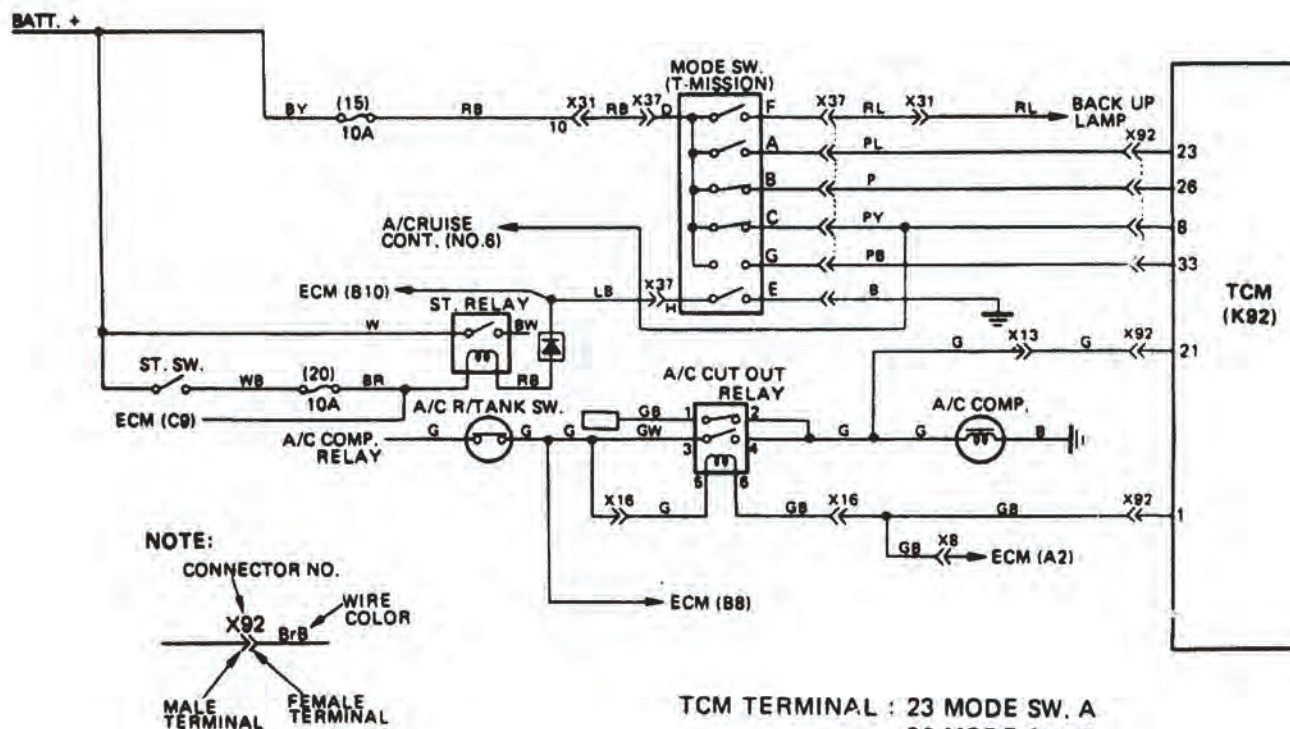
ACTIVE 12 V

- Lead interruption between X 37/Ter. B and selector lever position switch
- Lead interruption between X 37/Ter. B and K 92/Ter. 26
- Selector lever position switch defective

The following values must be displayed for the remaining selector lever positions:

| "P"           | "N"            | "D"            | "3"            | "2"           | "1"             |
|---------------|----------------|----------------|----------------|---------------|-----------------|
| INACT.<br>0 V | ACTIVE<br>12 V | ACTIVE<br>12 V | ACTIVE<br>12 V | INACT.<br>0 V | INACTIVE<br>0 V |

If these values are not attained, the selector lever position switch should be replaced.



TCM TERMINAL : 23 MODE SW. A  
26 MODE SW. B  
8 MODE SW. C  
33 MODE SW. G  
21 AIR CON. SW.  
1 A/C (NOT USED)

| Test Step | TECH 1 Display | Notes                                      | Nominal Value | Possible Trouble Codes |
|-----------|----------------|--------------------------------------------|---------------|------------------------|
| 17        | SELECTOR PIN C | Ignition ON<br>Selector lever position "D" | ACTIVE 12 V   | 56                     |

## Trouble-shooting:

## Nominal Value:

## Cause of Fault:

Ter. C of the selector lever position switch is checked in this Test Step with the help of TECH 1.

- Ignition ON  
Selector lever position "D"

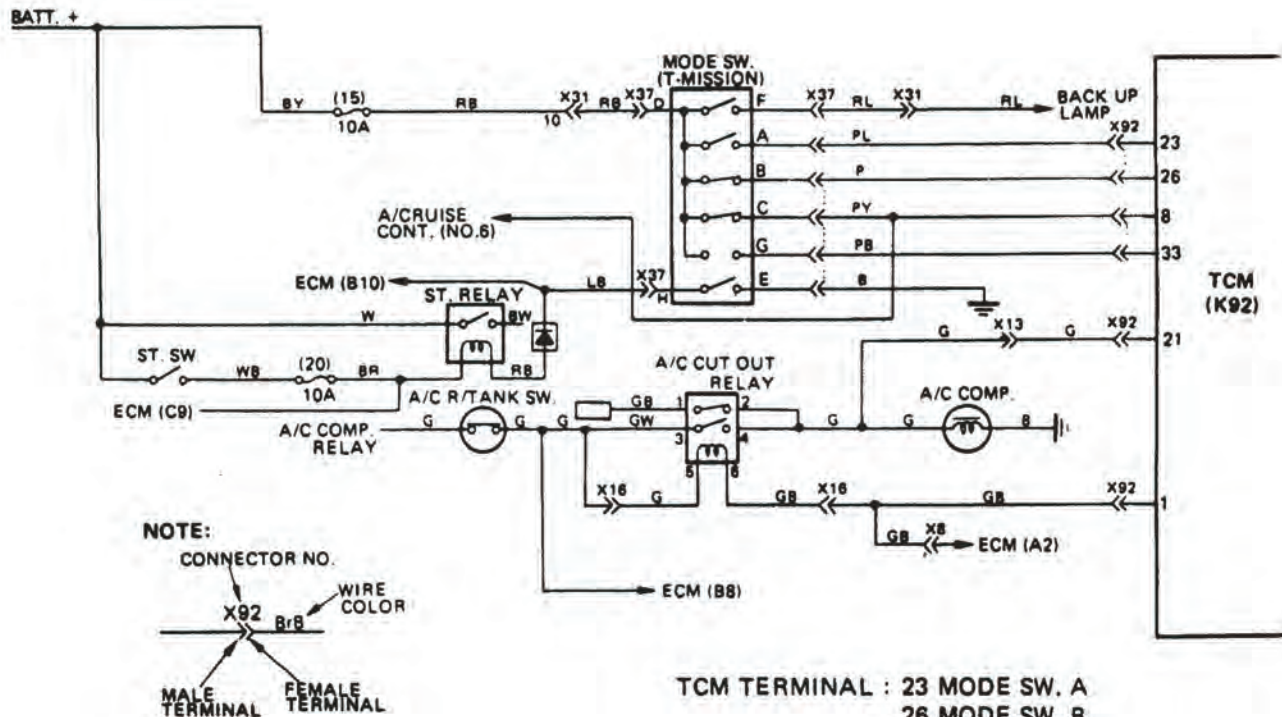
ACTIVE 12 V

- Lead interruption between X 37/Ter. C and selector lever position switch
- Lead interruption between X 37/Ter. C and K 92/Ter. 8
- Selector lever position switch defective

The following values must be displayed for the remaining selector lever positions:

If these values are not attained, the selector lever position switch should be replaced.

| "P"           | "N"           | "R"           | "3"            | "2"            | "1"            |
|---------------|---------------|---------------|----------------|----------------|----------------|
| INACT.<br>0 V | INACT.<br>0 V | INACT.<br>0 V | ACTIVE<br>12 V | ACTIVE<br>12 V | ACTIVE<br>12 V |





| Test Step | TECH 1 Display | Notes                                      | Nominal Value | Possible Trouble Codes |
|-----------|----------------|--------------------------------------------|---------------|------------------------|
| 18        | SELECTOR PIN G | Ignition ON<br>Selector lever position "P" | ACTIVE 12 V   | 56                     |

## Trouble-shooting:

Nominal Value:

Cause of Fault:

Ter. G of the selector lever position switch is checked in this Test Step with the help of TECH 1.

- Ignition ON  
Selector lever position "P"

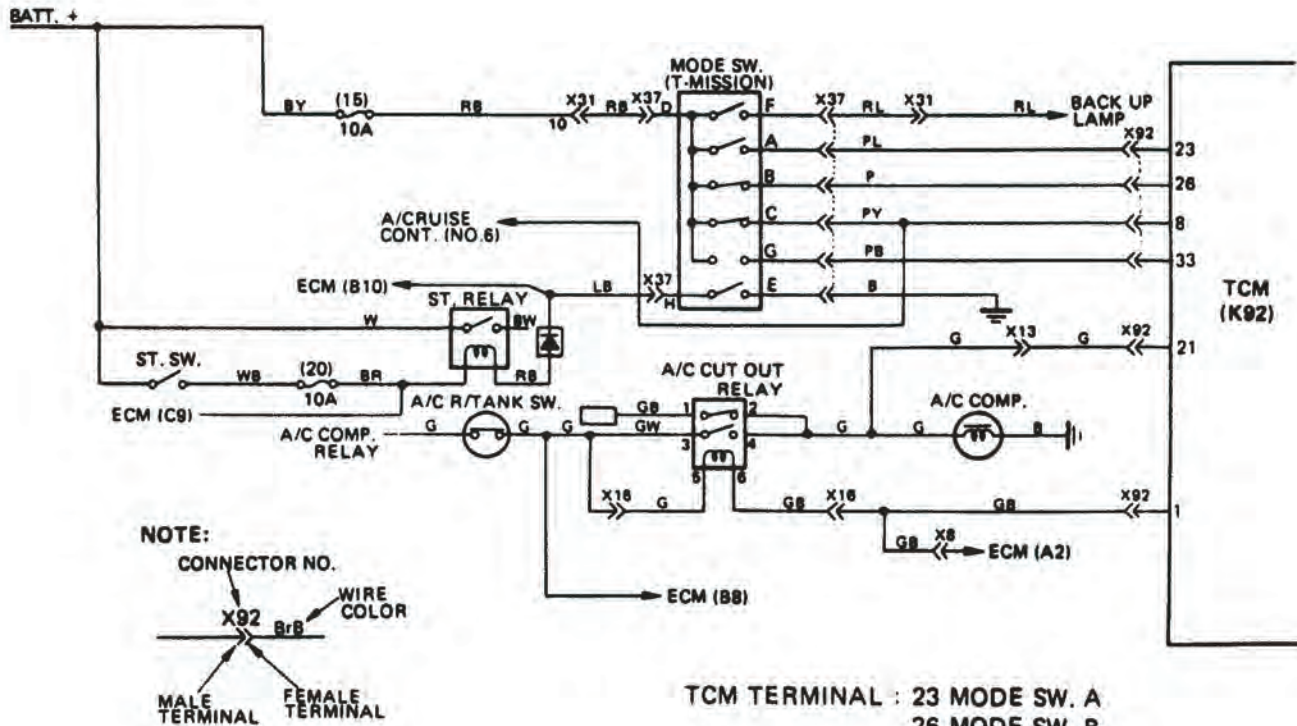
ACTIVE 12 V

- Lead interruption between X 37/Ter. G and selector lever position switch
- Lead interruption between X 37/Ter. G and K 92/Ter. 33
- Selector lever position switch defective

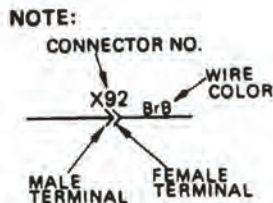
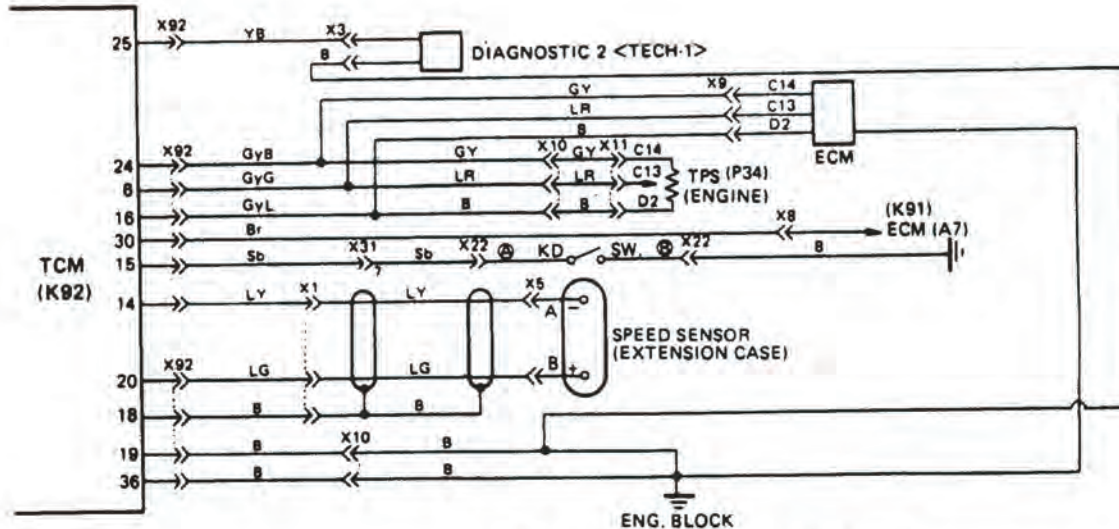
The following values must be displayed for the remaining selector lever positions:

If these values are not attained, the selector lever position switch should be replaced.

| "R"           | "N"            | "D"           | "3"            | "2"           | "1"            |
|---------------|----------------|---------------|----------------|---------------|----------------|
| INACT.<br>0 V | ACTIVE<br>12 V | INACT.<br>0 V | ACTIVE<br>12 V | INACT.<br>0 V | ACTIVE<br>12 V |



| Test Step                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | TECH 1 Display | Notes                                                                                        | Nominal Value                    | Possible Trouble Codes |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|----------------------------------------------------------------------------------------------|----------------------------------|------------------------|
| 19                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | TPS SIGNAL     | Ignition ON<br>Throttle valve in idle speed position<br>Throttle valve in full load position | 0.1 V to 0.96 V<br>4.9 V or less | 21, 22                 |
| <p><b>Trouble-shooting:</b></p> <ul style="list-style-type: none"> <li>Disconnect plug from throttle position sensor P 34</li> <li>Connect voltmeter between plug P34/Ter. D2 and Ter. C14</li> <li>Bridge Ter. D2 and Ter. C13 at P 34</li> </ul> <p><b>Nominal Value:</b></p> <p>4.9–5.1V</p> <p>0.1 V</p> <p><b>Cause of Fault:</b></p> <ul style="list-style-type: none"> <li>Short circuit between signal line Ter. C13 and ground Ter. D2</li> <li>Short circuit to ground on signal line Ter. C13</li> <li>Control unit K 92 defective</li> <li>P 34 defective</li> <li>Lead interruption between K 92/Ter. 6 and P 34/Ter. C13</li> <li>Lead interruption between K 92/Ter. 16 and P 34/Ter. D2</li> </ul> |                |                                                                                              |                                  |                        |

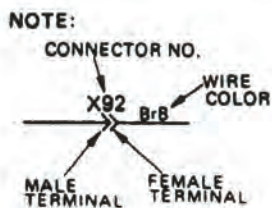
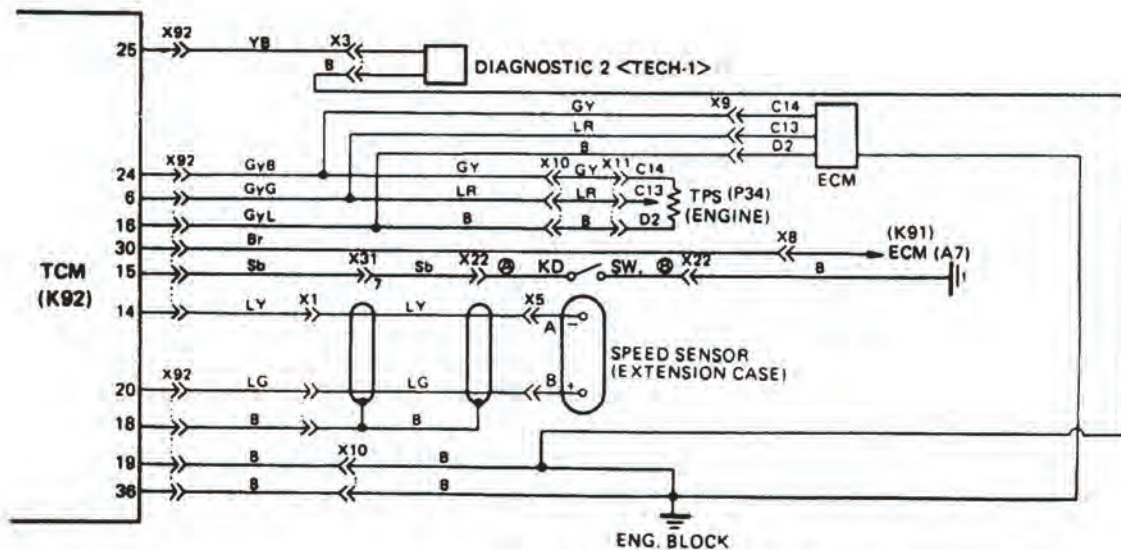


TCM TERMINAL :

- 25 DIAGNOSTIC
- 24 TPS (+)
- 6 TPS (SIGNAL)
- 16 TPS (-)
- 30 COOLANT TEMP. SIGNAL
- 15 KICKDOWN SW.
- 14 OUTPUT SPEED SENSOR (-)
- 20 OUTPUT SPEED SENSOR (+)
- 18 GROUND
- 19 GROUND
- 36 GROUND



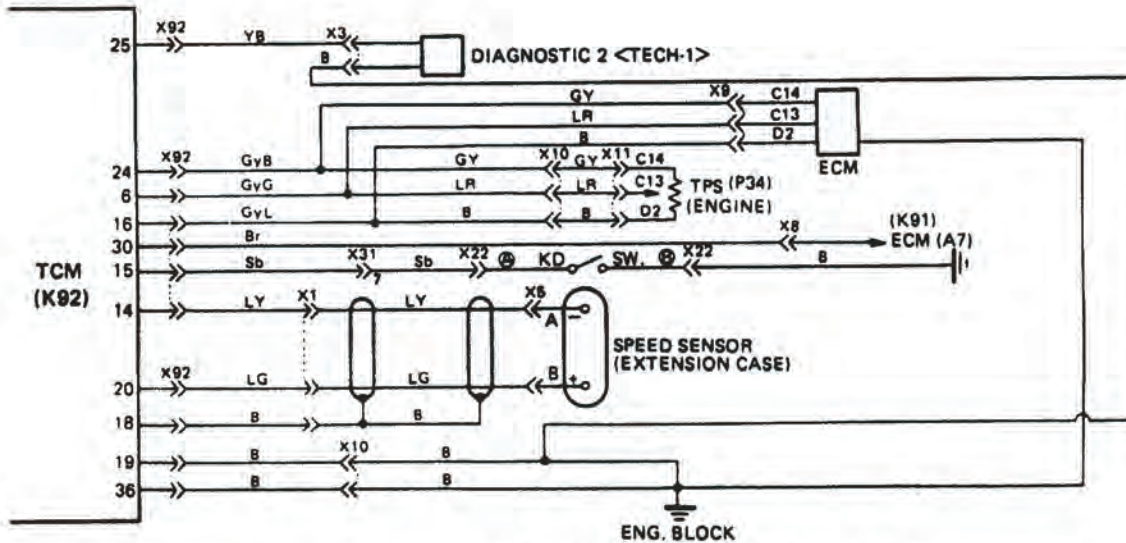
| Test Step                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | TECH 1 Display                                                   | Notes                                                                                                                                                                      | Nominal Value | Possible Trouble Codes |                          |                       |                        |                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                  |                                                                                                                                                                            |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|------------------------|--------------------------|-----------------------|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 20                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | KICKDOWN SWITCH                                                  | Ignition ON<br>Depress accelerator until stop                                                                                                                              | ACTIVE 0 V    | 77                     |                          |                       |                        |                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                  |                                                                                                                                                                            |
| <table border="0"> <tr> <td><b>Trouble-shooting:</b></td><td><b>Nominal Value:</b></td><td><b>Cause of Fault:</b></td></tr> <tr> <td> <ul style="list-style-type: none"> <li>● Ignition ON<br/>Bridge KD switch Ter. A and Ter. B</li> <li>● Ignition OFF<br/>Disconnect plug from control unit K 92<br/>Connect ohmmeter between K 92/Ter. 15 and ground<br/>Connect ohmmeter between X 31/Ter. 7 and ground<br/>Connect ohmmeter between KD switch Ter. B and ground</li> <li>● Check throttle position sensor according to Test Step 21</li> </ul> </td><td>           INACTIVE 12 V<br/><br/>           ACTIVE 0 V<br/><br/>           ∞ Ω<br/><br/>           ∞ Ω<br/><br/>           0 Ω         </td><td> <ul style="list-style-type: none"> <li>● KD switch defective</li> <li>● Short circuit to ground</li> <li>● Short circuit to ground</li> <li>● Lead interruption</li> </ul> </td></tr> </table> |                                                                  |                                                                                                                                                                            |               |                        | <b>Trouble-shooting:</b> | <b>Nominal Value:</b> | <b>Cause of Fault:</b> | <ul style="list-style-type: none"> <li>● Ignition ON<br/>Bridge KD switch Ter. A and Ter. B</li> <li>● Ignition OFF<br/>Disconnect plug from control unit K 92<br/>Connect ohmmeter between K 92/Ter. 15 and ground<br/>Connect ohmmeter between X 31/Ter. 7 and ground<br/>Connect ohmmeter between KD switch Ter. B and ground</li> <li>● Check throttle position sensor according to Test Step 21</li> </ul> | INACTIVE 12 V<br><br>ACTIVE 0 V<br><br>∞ Ω<br><br>∞ Ω<br><br>0 Ω | <ul style="list-style-type: none"> <li>● KD switch defective</li> <li>● Short circuit to ground</li> <li>● Short circuit to ground</li> <li>● Lead interruption</li> </ul> |
| <b>Trouble-shooting:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>Nominal Value:</b>                                            | <b>Cause of Fault:</b>                                                                                                                                                     |               |                        |                          |                       |                        |                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                  |                                                                                                                                                                            |
| <ul style="list-style-type: none"> <li>● Ignition ON<br/>Bridge KD switch Ter. A and Ter. B</li> <li>● Ignition OFF<br/>Disconnect plug from control unit K 92<br/>Connect ohmmeter between K 92/Ter. 15 and ground<br/>Connect ohmmeter between X 31/Ter. 7 and ground<br/>Connect ohmmeter between KD switch Ter. B and ground</li> <li>● Check throttle position sensor according to Test Step 21</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | INACTIVE 12 V<br><br>ACTIVE 0 V<br><br>∞ Ω<br><br>∞ Ω<br><br>0 Ω | <ul style="list-style-type: none"> <li>● KD switch defective</li> <li>● Short circuit to ground</li> <li>● Short circuit to ground</li> <li>● Lead interruption</li> </ul> |               |                        |                          |                       |                        |                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                  |                                                                                                                                                                            |



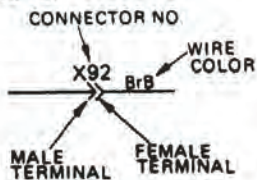
TCM TERMINAL :

- 25 DIAGNOSTIC
- 24 TPS (+)
- 6 TPS (SIGNAL)
- 16 TPS (-)
- 30 COOLANT TEMP. SIGNAL
- 15 KICKDOWN SW.
- 14 OUTPUT SPEED SENSOR (-)
- 20 OUTPUT SPEED SENSOR (+)
- 18 GROUND
- 19 GROUND
- 36 GROUND

| Test Step                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | TECH 1 Display   | Notes                | Nominal Value | Possible Trouble Codes |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|----------------------|---------------|------------------------|
| 21                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | TPS REF. VOLTAGE | Engine at idle speed | 5 V           | 21, 22                 |
| <p><b>Trouble-shooting:</b></p> <ul style="list-style-type: none"> <li>Disconnect plug from throttle valve potentiometer</li> <li>Ignition ON</li> <li>Connect voltmeter between plug P 34/Ter. C14 and ground</li> </ul> <p><b>Nominal Value:</b> 4.9–5.1 V</p> <p><b>Cause of Fault:</b></p> <ul style="list-style-type: none"> <li>Lead interruption between K 92/Ter. 24 and plug P 34/Ter. C14</li> <li>Control unit K 92 defective</li> </ul> <p>● Ignition OFF</p> <p>Connect ohmmeter between plug P 34/Ter. D2 and ground</p> <p><b>Nominal Value:</b> 0 Ω</p> <p><b>Cause of Fault:</b></p> <ul style="list-style-type: none"> <li>Lead interruption between K 92/Ter. 16 and plug P 34/Ter. D2</li> <li>Control unit K 92 defective</li> </ul> |                  |                      |               |                        |



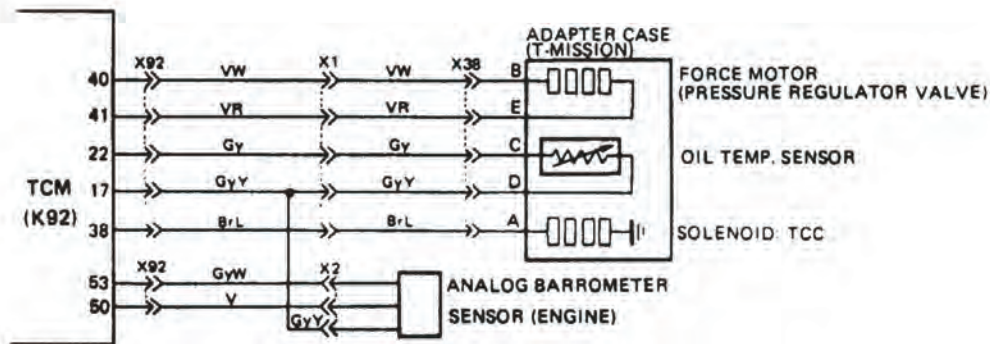
**NOTE:**



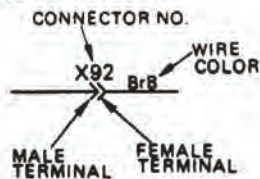
TCM TERMINAL : 25 DIAGNOSTIC  
 24 TPS (+)  
 6 TPS (SIGNAL)  
 16 TPS (-)  
 30 COOLANT TEMP. SIGNAL  
 15 KICKDOWN SW.  
 14 OUTPUT SPEED SENSOR (-)  
 20 OUTPUT SPEED SENSOR (+)  
 18 GROUND  
 19 GROUND  
 36 GROUND



| Test Step                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | TECH 1 Display    | Notes       | Nominal Value               | Possible Trouble Codes |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|-------------|-----------------------------|------------------------|
| 22                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | A/C INFORMAT. SW. | Not used    | _____                       | _____                  |
| 23                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | TRANS. OIL TEMP.  | Engine runs | approx. 80 °C/176 °F 1.02 V | 65, 66                 |
| <p><b>Trouble-shooting:</b></p> <ul style="list-style-type: none"> <li>● Ignition ON</li> <li>Disconnect plug X 38</li> <li>Connect voltmeter between plug X 38/Ter. C and D. (TCM side)</li> <li>Bridge Ter. D and Ter. C at plug X 38</li> </ul> <p><b>Nominal Value:</b></p> <p>5 V</p> <p>to 215 °C/419 °F or 0.01 V</p> <p><b>Cause of Fault:</b></p> <ul style="list-style-type: none"> <li>● Lead interruption between K 92/Ter. 17 and X 38/Ter. D</li> <li>● Lead interruption between K 92/Ter. 22 and X 38/Ter. C</li> <li>● Lead interruption between K 92/Ter. 17 and transmission fluid temperature sensor</li> <li>● Lead interruption between K 92/Ter. 22 and transmission fluid temperature sensor</li> <li>● Short circuit to ground to transmission</li> <li>● Transmission fluid temperature sensor defective</li> <li>● Control unit K 92 defective</li> </ul> |                   |             |                             |                        |

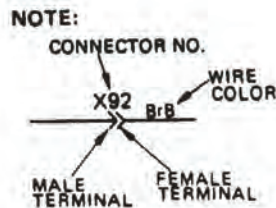
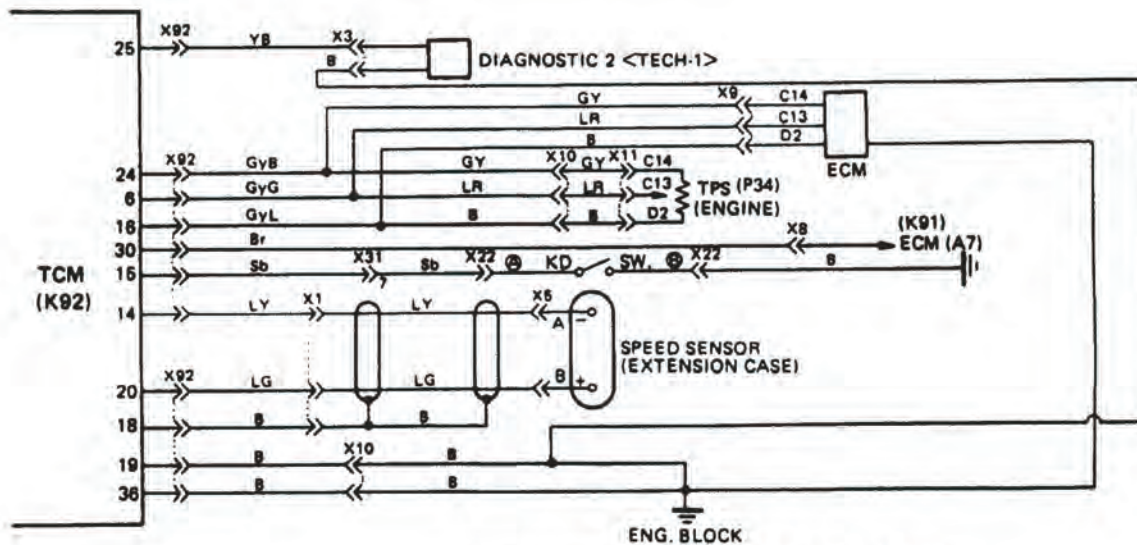


**NOTE:**



TCM TERMINAL : 40 FORCE MOTOR (+)  
 41 FORCE MOTOR (-)  
 22 OIL TEMP. SENSOR  
 17 ANALOG GROUND  
 38 TCC SOLENOID

| Test Step                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | TECH 1 Display    | Notes       | Nominal Value | Possible Trouble Codes |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|-------------|---------------|------------------------|
| 24                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | COOLANT TEMP. SW. | Ignition ON | ACTIVE 0 V    | 23                     |
| <p><b>Trouble-shooting:</b></p> <ul style="list-style-type: none"> <li>● Ignition OFF<br/>Disconnect plug from K 92 (TCM) and K 91 (ECM)<br/>Connect ohmmeter between X 92/Ter. 30 and X 91/Ter. A 7.<br/><b>Nominal Value:</b> 0 <math>\Omega</math></li> <li>● Lead interruption between X 92/Ter. 30 and X 91/Ter. A 7.</li> </ul> <p><b>If the value is not attained:</b><br/>Connect plug X 92 to K 92 (TCM).<br/><b>Ignition ON</b><br/>Connect voltmeter between X 91/Ter. A 7 and ground.<br/><b>Nominal Value:</b> 12 V</p> <ul style="list-style-type: none"> <li>● Control unit K 91 defective</li> <li>● Control unit K 92 defective</li> </ul> |                   |             |               |                        |

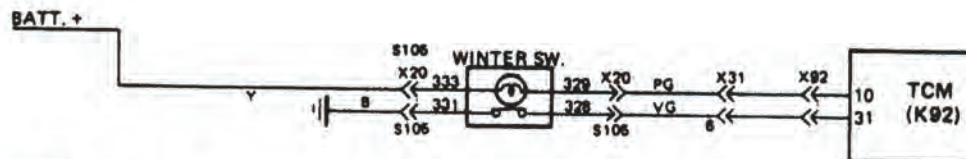


**TCM TERMINAL :**

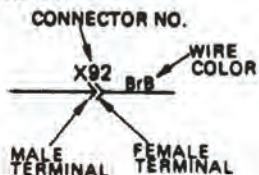
- 25 DIAGNOSTIC
- 24 TPS (+)
- 6 TPS (SIGNAL)
- 16 TPS (-)
- 30 COOLANT TEMP. SIGNAL
- 15 KICKDOWN SW.
- 14 OUTPUT SPEED SENSOR (-)
- 20 OUTPUT SPEED SENSOR (+)
- 18 GROUND
- 19 GROUND
- 36 GROUND



| Test Step                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | TECH 1 Display     | Notes                                                                    | Nominal Value | Possible Trouble Codes |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|--------------------------------------------------------------------------|---------------|------------------------|
| 25                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | WINTER SW. (- D -) | Ignition ON<br>Selector lever position "D"<br>Press "Winter Program" key | ACTIVE 0 V    | —                      |
| <div> <div> <b>Trouble-shooting:</b> <ul style="list-style-type: none"> <li>● Ignition ON<br/>Remove switch S 105<br/>Bridge Ter. 328 and Ter. 331 at switch S 105<br/>If the value is not attained:</li> <li>● Ignition OFF<br/>Connect ohmmeter between S 105/ter. 331 and ground<br/>Connect ohmmeter between S 105/Ter. 328 and X 31/Ter. 6<br/>Disconnect plug from control unit K 92<br/>Connect ohmmeter between X 31/Ter. 6 and X 92/Ter. 31<br/>After checking above<br/>Bridge Ter. 328 and Ter. 331 at switch 105<br/>Checking telltale for the "WINTER"<br/>see Actuator Test Test Step 01</li> </ul> </div> <div> <b>Nominal Value:</b><br/><br/>ACTIVE 0 V<br/><br/>0 Ω<br/><br/>0 Ω<br/><br/>0 Ω<br/><br/>ACTIVE 0 V </div> <div> <b>Cause of Fault:</b> <ul style="list-style-type: none"> <li>● Tip switch defective</li> <li>● Lead interruption between S 105/Ter. 328 and grund</li> <li>● Lead interruption between S 105/Ter. 328 and X 31/Ter. 6</li> <li>● Lead interruption between X 31/Ter. 6 and control unit K 92/Ter. 31</li> <li>● Control unit K 92 defective</li> </ul> </div> </div> |                    |                                                                          |               |                        |

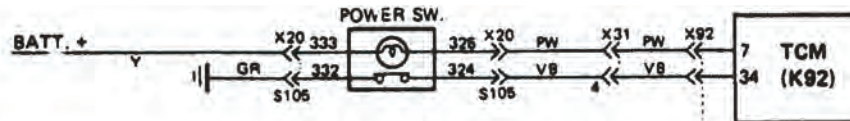


## NOTE:

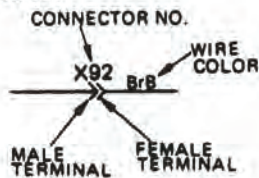


TCM TERMINAL : 10 WATER TEMP.  
31 WINTER SW.

| Test Step                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | TECH 1 Display | Notes                                                    | Nominal Value | Possible Trouble Codes |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|----------------------------------------------------------|---------------|------------------------|
| 26                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | PROGRAM SWITCH | Ignition ON<br>Keep tip switch for the "POWER" depressed | ACTIVE 0 V    | -                      |
| <div> <div> <b>Trouble-shooting:</b> <ul style="list-style-type: none"> <li>● Ignition ON<br/>Remove switch 105<br/>Bridge Ter. 324 and Ter. 332 at plug S 105</li> <li>● Ignition OFF<br/>Connect ohmmeter between S 105/Ter. 332 and ground</li> <li>Disconnect plug from control unit K 92<br/>Connect ohmmeter between S 105/Ter. 324 and X 92/Ter. 34</li> <li>After checking above<br/>Bridge Ter. 324 and Ter. 332 at plug S 105</li> <li>Checking telltale for the "Sport Program" see Actuator Test Test Step</li> </ul> </div> <div> <b>Nominal Value:</b> <p>ACTIVE 0 V</p> <p>0 Ω</p> <p>0 Ω</p> <p>ACTIVE 0 V</p> </div> <div> <b>Cause of Fault:</b><br/>(In case nominal value is not attained)           <ul style="list-style-type: none"> <li>● Tip switch defective</li> <li>● Lead interruption between S 105/Ter. 332 and ground</li> <li>● Lead interruption between S 105/Ter. 324 and X 31/Ter. 4</li> <li>● Lead interruption between X 31/Ter. 4 and X 92/Ter. 34</li> <li>● Control unit K 92 defective</li> </ul> </div> </div> |                |                                                          |               |                        |



**NOTE:**



TCM TERMINAL : 7 POWER DRIVE LIGHT  
34 POWER DRIVE SW.



## DIAGNOSTIC PLUG ALDL AND VOLTAGE SUPPLY, CHECK

| Test Step | Tester                      | Test                                                  |                |        | Notes        | Norm. Value        | Possible Cause of Fault, Trouble-shooting                                                                                                                                       |
|-----------|-----------------------------|-------------------------------------------------------|----------------|--------|--------------|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|           |                             | of                                                    | between        |        |              |                    |                                                                                                                                                                                 |
| 1         | Ohmmeter                    | Diagnostic 1 Plug : ground                            | A (GND)        | Ground | Ignition OFF | approx. 0 $\Omega$ | <ul style="list-style-type: none"> <li>Transfer resistance to grounding point too high.</li> </ul>                                                                              |
| 2         | Voltmeter<br>Range: 20 V DC | Diagnostic 2 Plug : excitation lead                   | B (DIAG)       | Ground | Ignition ON  | > 10.5 V           | <ul style="list-style-type: none"> <li>Battery voltage too low.</li> <li>Lead interruption between X 3/Ter. 49 and K 92/Ter. 25</li> <li>Control unit K 92 defective</li> </ul> |
| 3         | Voltmeter<br>Range: 20 V DC | Battery voltage supply cable : voltage supply Ter. 30 | Cable terminal | Ground | Ignition ON  | > 11.5 V           | <ul style="list-style-type: none"> <li>Battery voltage too low</li> <li>Battery voltage supply cable defective</li> </ul>                                                       |
| 4         | Voltmeter<br>Range: 20 V DC | Diagnostic 1 Plug : data lead                         | M              | Ground | Ignition ON  | > 4.0 V            | <ul style="list-style-type: none"> <li>Battery voltage too low.</li> <li>Lead interruption between X 4/Ter. 47 and K 92/Ter. 13</li> <li>Control unit K 92 defective</li> </ul> |

| Test Step | Tester                      | Test                                                                                                               |         |        | Notes                                                                 | Nominal Value           | Possible Cause of Fault, Trouble-shooting                                                                                                                                                                                                                                                                                                                                                               |
|-----------|-----------------------------|--------------------------------------------------------------------------------------------------------------------|---------|--------|-----------------------------------------------------------------------|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|           |                             | of                                                                                                                 | between |        |                                                                       |                         |                                                                                                                                                                                                                                                                                                                                                                                                         |
| 5         | -                           | "CHECK TRANS." light                                                                                               | -       | -      | Ignition ON                                                           | "CHECK TRANS." light ON | <ul style="list-style-type: none"> <li>Fuse No. 13 defective</li> <li>"CHECK TRANS." light defective</li> <li>Lead interruption between X 18/Ter. 35 (ORN/BLK) and X 7/Ter. 323 (ORN/BLK)</li> <li>Lead interruption between X 7/Ter. 323 (ORN/BLK) and X 31/Ter. 2 (ORN/BLK)</li> <li>Lead interruption between X 31/Ter. 2 (ORN/BLK) and K 92/Ter. 29</li> <li>Control unit K 92 defective</li> </ul> |
| 6         | -                           | TECH 1 Self-Test                                                                                                   | -       | -      | See TECH 1 Operator's Manual                                          | -                       |                                                                                                                                                                                                                                                                                                                                                                                                         |
| 7         | Ohmmeter                    | Note: After Test Steps 7 and 8 any Trouble Codes that may be stored are deleted.<br>Control unit plug K 92: ground |         |        |                                                                       |                         | 19 (36) Ground<br>Ignition OFF<br>Disconnect plug from control unit K 92<br>approx. 0 $\Omega$ <ul style="list-style-type: none"> <li>Transfer resistance to grounding point too high.</li> <li>Lead interruption between K 92/Ter. 19 (36) and grounding point</li> <li>Control unit K 92 defective.</li> </ul>                                                                                        |
| 8         | Voltmeter<br>Range: 20 V DC | Control unit plug K 92: voltage supply Ter. 30                                                                     | 28      | Ground | Ignition OFF<br>Disconnect plug from control unit K 92<br>Ignition ON | > 11.5 V                | <ul style="list-style-type: none"> <li>Battery voltage too low.</li> <li>Lead interruption between K 92/Ter. 28 and Ter. 30</li> <li>Control unit K 92 defective</li> </ul>                                                                                                                                                                                                                             |



## TROUBLE CODE CHART

| Trouble Code | Information Sensor Cause of Fault   | Remedy Data List F0 Test Step | Trouble Code Storage when ...                                                                                                                                                                                                                                                                    |
|--------------|-------------------------------------|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 17           | SOLENOID 1 - 2/3 - 4 VOLTAGE LOW    | 05                            | <ul style="list-style-type: none"> <li>With ignition ON the fault is not recognised.</li> <li>If the fault appears after starting the engine, this can at first be recognised on actuation of the solenoid valve.</li> <li>The Emergency Program is activated on Fault Recognition.</li> </ul>   |
| 21           | THROTTLE POSIT. SENSOR VOLTAGE HIGH | 19<br>21                      | <ul style="list-style-type: none"> <li>The control unit has a reading of &gt; 4.9V.</li> <li>With ignition ON the fault is not recognised.</li> <li>The fault is immediately recognised after starting the engine.</li> <li>The Emergency Program is activated on Fault Recognition.</li> </ul>  |
| 22           | THROTTLE POSIT. SENSOR VOLTAGE LOW  | 19<br>21                      | <ul style="list-style-type: none"> <li>The control unit has a reading of &lt; 60 mV.</li> <li>With ignition ON the fault is not recognised.</li> <li>The fault is immediately recognised after starting the engine.</li> <li>The Emergency Program is activated on Fault Recognition.</li> </ul> |
| 23           | ENGINE COOLANT SWITCH               | 24                            | <ul style="list-style-type: none"> <li>Engine warm.</li> <li>Engine speed &gt; 500 rpm, after 20 min. the TCM reads high voltage.</li> <li>TCC operation allowed.</li> </ul>                                                                                                                     |
| 25           | SOLENOID 1 - 2/3 - 4 VOLTAGE HIGH   | 05                            | <ul style="list-style-type: none"> <li>With ignition ON and after starting the engine, the fault is immediately recognised.</li> <li>The Emergency Program is activated on Fault Recognition.</li> </ul>                                                                                         |
| 26           | SOLENOID 2 - 3 VOLTAGE LOW          | 06                            | <ul style="list-style-type: none"> <li>With ignition ON and after starting the engine, the fault is immediately recognised.</li> <li>The Emergency Program is activated on Fault Recognition.</li> </ul>                                                                                         |

| Trouble Code | Information Sensor Cause of Fault      | Remedy Data List F0 Test Step | Trouble Code Storage when ...                                                                                                                                                                                                                                                                                                 |
|--------------|----------------------------------------|-------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 28           | SOLENOID 2 - 3 VOLTAGE HIGH            | 06                            | <ul style="list-style-type: none"> <li>With ignition ON the fault is not recognised.</li> <li>If the fault appears after starting the engine, this can at first be recognised on actuation of the solenoid valve.</li> <li>The Emergency Program is activated on Fault Recognition.</li> </ul>                                |
| 29           | TCC SOLENOID VOLTAGE LOW               | 09                            | <ul style="list-style-type: none"> <li>With ignition ON the fault is not recognised.</li> <li>If the fault appears after starting the engine, this is first recognised on actuation of the solenoid valve.</li> <li>The Emergency Program is not activated, despite the blink of the "Check trans." warning light.</li> </ul> |
| 31           | NO TRANSMISSION INPUT RPM SIGNAL       | 11                            | <ul style="list-style-type: none"> <li>With ignition ON the fault is not recognised.</li> <li>If the fault appears after starting the engine, it is first recognised with a speed &gt; 30 km/h: 18 mph and a throttle valve position &gt; 12%.</li> <li>The Emergency Program is activated on Fault Recognition.</li> </ul>   |
| 32           | PRESS. REGULATOR SOLENOID VOLTAGE LOW  | 03, 04                        | <ul style="list-style-type: none"> <li>With ignition ON the fault is immediately recognised.</li> <li>The fault appears after starting the engine, it is first recognised.</li> <li>The Emergency Program is activated on Fault Recognition.</li> </ul>                                                                       |
| 33           | PRESS. REGULATOR SOLENOID VOLTAGE HIGH | 03, 04                        | <ul style="list-style-type: none"> <li>With ignition ON the fault is immediately recognised.</li> <li>If the fault appears after starting the engine, it will be recognised.</li> <li>The Emergency Program is activated on Fault Recognition.</li> </ul>                                                                     |



## TROUBLE CODE CHART

| Trouble Code | Information Sensor Cause of Fault | Remedy Data List F0 Test Step | Trouble Code Storage when ...                                                                                                                                                                                                                                                                              |
|--------------|-----------------------------------|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 34           | BAND APPLY SOLENOID VOLTAGE HIGH  | 07, 08                        | <ul style="list-style-type: none"> <li>With ignition ON and after starting the engine, the fault is immediately recognised.</li> <li>The Emergency Program is activated on Fault Recognition.</li> </ul>                                                                                                   |
| 35           | BAND APPLY SOLENOID VOLTAGE LOW   | 07, 08                        | <ul style="list-style-type: none"> <li>With ignition ON the fault is immediately recognised.</li> <li>If the fault appears after starting the engine, this can at first be recognised on actuation of the solenoid valve.</li> <li>The Emergency Program is activated on Fault Recognition.</li> </ul>     |
| 36           | TCC SOLENOID VOLTAGE HIGH         | 09                            | <ul style="list-style-type: none"> <li>With ignition ON the fault is immediately recognised.</li> <li>If the fault appears after starting the engine, it will only be recognised if the converter clutch is not actuated.</li> <li>The Emergency Program is not activated on Fault Recognition.</li> </ul> |
| 39           | NO TRANSMISSION OUTPUT RPM SIGNAL | 12                            | <ul style="list-style-type: none"> <li>The fault can be recognised at an engine speed &gt; 3000 rpm in selector lever positions "1", "2", "3" and "D".</li> <li>The Emergency Program is activated on Fault Recognition.</li> </ul>                                                                        |
| 41           | GEAR ERROR HYDRAULIC FAULT        | 14                            | <ul style="list-style-type: none"> <li>The fault is recognised when the relationship between engine speed and output speed is outside a certain tolerance range.</li> <li>The Emergency Program is activated on Fault Recognition.</li> </ul>                                                              |
| 43           | GROUND CONTROL RELAY CIRCUIT      | 03,04,05,06<br>07,08          | <ul style="list-style-type: none"> <li>With ignition ON the fault is immediately recognised.</li> <li>If the fault appears after starting the engine, it is not recognised.</li> <li>The Emergency Program is activated on Fault Recognition.</li> </ul>                                                   |





| Trouble Code | Information Sensor Cause of Fault    | Remedy Data List F0 Test Step | Trouble Code Storage when ...                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|--------------|--------------------------------------|-------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 46           | DOWN SHIFT FAULT                     | 11, 12                        | <ul style="list-style-type: none"> <li>The fault is recognised if, when down-shifting, the engine speed rises above a certain value.</li> <li>The Emergency Program is activated on Fault Recognition.</li> </ul>                                                                                                                                                                                                                                                                                                 |
| 48           | BATTERY VOLTAGE LOW                  | 01                            | <ul style="list-style-type: none"> <li>With ignition ON and after starting the engine, the fault is immediately recognised, if the battery voltage falls below a value of 9.0 V.</li> <li>The Emergency Program is activated on Fault Recognition.</li> </ul>                                                                                                                                                                                                                                                     |
| 49           | BATTERY VOLTAGE HIGH                 | 01                            | <ul style="list-style-type: none"> <li>With ignition ON and after starting the engine, the fault is immediately recognised, if the battery voltage rises above a value of 16.0 V.</li> </ul>                                                                                                                                                                                                                                                                                                                      |
| 55           | REPLACE TCM                          | -                             | <ul style="list-style-type: none"> <li>With ignition ON and after starting the engine, the fault is recognised after 3 min.</li> <li>The Emergency Program is activated on Fault Recognition.</li> </ul>                                                                                                                                                                                                                                                                                                          |
| 56           | SELECTOR SWITCH WRONG SIGNAL         | 13                            | <ul style="list-style-type: none"> <li>In selector lever position "R" a fault is recognised at a speed <math>v &gt; 100 \text{ km/h}</math>: 62 mph or an output speed <math>n &gt; 3200 \text{ rpm}</math>.</li> <li>In selector lever positions "N" and "P" a fault is recognised with a throttle valve aperture <math>TV &gt; 20 \%</math> and an engine speed <math>n &lt; 3000 \text{ rpm}</math>.</li> <li>On Fault Recognition, the fault is stored and the Emergency Program is not activated.</li> </ul> |
| 65           | AT OIL TEMPERAT. SENSOR VOLTAGE HIGH | 23                            | <ul style="list-style-type: none"> <li>With ignition ON the fault is not recognised.</li> <li>If the fault appears after starting the engine, it is recognised after a time-span of <math>t &gt; 20 \text{ sec}</math>.</li> <li>The "Winter Program" can not be activated.</li> <li>On Fault Recognition, the fault is stored and the Emergency Program is not activated.</li> </ul>                                                                                                                             |





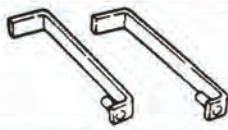






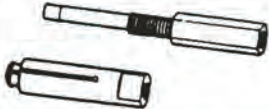
## TROUBLE CODE CHART

| Trouble Code | Information Sensor Cause of Fault   | Remedy Data List F0 Test Step | Trouble Code Storage when ...                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------|-------------------------------------|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 66           | AT OIL TEMPERAT. SENSOR VOLTAGE LOW | 23                            | <ul style="list-style-type: none"> <li>● With Ignition ON the fault is not recognised.</li> <li>● If the fault appears after starting the engine, it is recognised after a time-span of <math>t &gt; 20</math> sec.</li> <li>● The band apply solenoid is turned OFF.</li> <li>● On Fault Recognition the fault is stored and the Emergency Program is not activated.</li> </ul>                                                     |
| 77           | KICKDOWN SWITCH VOLTAGE LOW         | 20                            | <ul style="list-style-type: none"> <li>● With Ignition ON the fault is not recognised.</li> <li>● If the fault appears after starting the engine, it is recognised, if the kickdown function is actuated with a throttle valve aperture TV <math>&lt; 70</math> %.</li> <li>● The kickdown function can not be activated.</li> <li>● On Fault Recognition the fault is stored and the Emergency Program is not activated.</li> </ul> |

## SPECIAL TOOL LIST








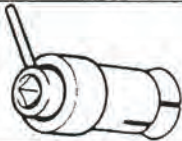


| ITEM NO. | ILLUSTRATION                                                                        | PART NO.  | PARTS NAME                             |
|----------|-------------------------------------------------------------------------------------|-----------|----------------------------------------|
| AT - 31  |  | J-3289-20 | Holding fixture base                   |
| AT - 32  |  | J-29770   | Pressure gauge                         |
| AT - 33  |  | J-24773-1 | End play fixture<br>(Use with J-25022) |
| AT - 34  |  | J-23907   | Slide hammer                           |

## SPECIAL TOOL LIST


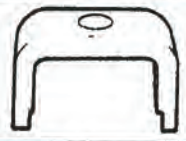
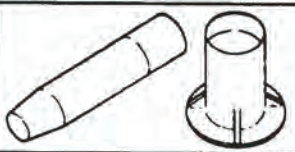
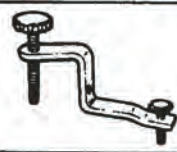

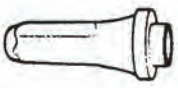




| ITEM NO. | ILLUSTRATION                                                                        | PART NO.   | PARTS NAME                                                   |
|----------|-------------------------------------------------------------------------------------|------------|--------------------------------------------------------------|
| AT - 1   |    | J-23075    | Spring compressor (For servo piston)                         |
| AT - 2   |    | J-38450    | Third clutch snap ring compressor                            |
| AT - 3   |    | J-23075-12 | Third clutch spring compressor adapter<br>(Use with J-23075) |
| AT - 4   |    | J-23084    | Third clutch piston installer                                |
| AT - 5   |  | J-23327    | Third clutch spring compressor                               |
| AT - 6   |  | J-23080-A  | Second clutch piston installer                               |
| AT - 7   |  | J-23085-A  | Selective washer gaging tool                                 |
| AT - 8   |  | J-23327-90 | Fourth clutch spring compressor<br>(Use with J-23327)        |
| AT - 9   |  | J-38553    | 3/4 Accumulator piston fitter                                |
| AT - 10  |  | J-38552    | Cover remover (Use with J-38584)                             |



## SPECIAL TOOL LIST

| ITEM NO. | ILLUSTRATION                                                                        | PART NO.   | PARTS NAME                                         |
|----------|-------------------------------------------------------------------------------------|------------|----------------------------------------------------|
| AT - 11  |    | J-38584    | Slide hammer adapter<br>(Use with J-23907)         |
| AT - 12  |    | J-38554    | Fourth clutch piston fitter                        |
| AT - 13  |    | J-38588    | Guide pins : adapter case to main case             |
| AT - 14  |    | J-38555    | Overrun clutch piston seal installer set           |
| AT - 15  |  | J-3387-2   | Guide pins : oil pump to convertor housing         |
| AT - 16  |  | J-25022    | Turbine shaft puller (Use with J-24773-1)          |
| AT - 17  |  | J-23129    | Oil seal remover<br>(Use with J-23907 and J-38584) |
| AT - 18  |  | J-38557    | Oil pump centering tool                            |
| AT - 19  |  | J-23082-01 | Oil pump rotation tool                             |
| AT - 20  |  | J-25025-B  | Guide pins : valve body to main case               |

## SPECIAL TOOL LIST

| ITEM NO. | ILLUSTRATION                                                                        | PART NO.   | PARTS NAME                                         |
|----------|-------------------------------------------------------------------------------------|------------|----------------------------------------------------|
| AT - 21  |    | J-38428    | Servo piston fitter                                |
| AT - 22  |    | J-23327-91 | Overrun clutch spring compressor                   |
| AT - 23  |    | J-38558    | Turbine shaft seal installer and sizer             |
| AT - 24  |   | J-38559    | 3/4 Accumulator piston cover installer             |
| AT - 25  |  | J-8763-02  | Holding fixture                                    |
| AT - 26  |  | J-38592    | Transfer case oil seal installer (Inside)          |
| AT - 27  |  | J-38593    | Extension housing oil seal installer (Rear output) |
| AT - 28  |  | J-38594    | Transfer case oil seal installer (Front output)    |
| AT - 29  |  | J-36797    | A/T extension housing oil seal installer (Inside)  |
| AT - 30  |  | J-37221    | Companion flange holding tool                      |





## THM 4L30-E

### DIAGNOSTIC TROUBLE CODE RETRIEVAL AND DEFINITION FOR TROOPER, RODEO, ACURA SLX AND PASSPORT "ONLY"

#### ***1990-1991 TROOPER AND 1991-1992 RODEO "ONLY"***

For Trouble code retrieval, locate Diagnostic 2 connector shown in Figure 2 (**White** for Trooper and **Black** for Rodeo). Jump the connector as shown in Figure 2 and refer to Figures 8-10 for code definitions. The "Check Trans" lamp flash patterns for normal operation, and when DTC's are set, are shown in Figure 1.

#### ***1992-1993 TROOPER AND 1993 RODEO "ONLY"***

For Trouble code retrieval, locate Diagnostic 1 connector shown in Figure 3. Jump the connector between terminals 1 and 3, as shown in Figure 3 and refer to Figures 8-10 for code definitions. The "Check Trans" lamp flash patterns for normal operation, and when DTC's are set, are shown in Figure 1.

#### ***1994 TROOPER, RODEO AND PASSPORT "ONLY"***

For Trouble code retrieval, locate Diagnostic 2 connector shown in Figure 4. Jump the connector as shown in Figure 4 and refer to Figures 11 and 12 for code definitions. The "Check Trans" lamp flash patterns for normal operation, and when DTC's are set, are shown in Figure 1.

#### ***1995 TROOPER, RODEO AND PASSPORT "ONLY"***

For Trouble code retrieval, locate Diagnostic 2 connector shown in Figure 5. Jump the connector as shown in Figure 5 and refer to Figures 11 and 12 for code definitions. The "Check Trans" lamp flash patterns for normal operation, and when DTC's are set, are shown in Figure 1.

#### ***1996-1997 TROOPER AND ACURA SLX "ONLY"***

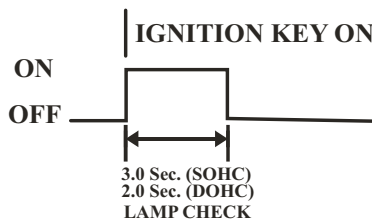
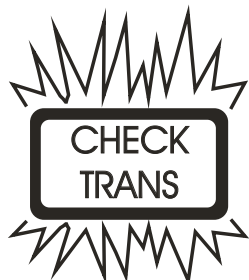
For Trouble code retrieval, locate the 16 pin **OBD-II** connector as shown in Figure 6. Connect a scan tool as this is the only way to retrieve trouble codes. Refer to Figures 13 and 14 for code definitions. The "Check Trans" lamp will be flashing if codes are stored in memory.

#### ***1996-1997 RODEO AND PASSPORT "ONLY"***

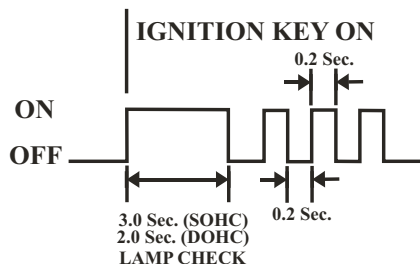
For Trouble code retrieval, locate the 16 pin **OBD-II** connector as shown in Figure 7. Connect a scan tool as this is the only way to retrieve trouble codes. Refer to Figures 13 and 14 for code definitions. The "Check Trans" lamp will be flashing if codes are stored in memory.

## STEP 1

### "NORMAL" CHECK TRANS LIGHT OPERATION



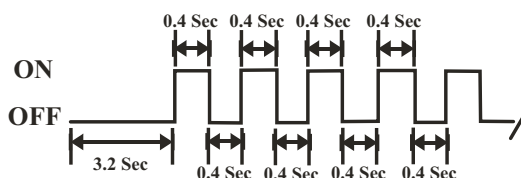
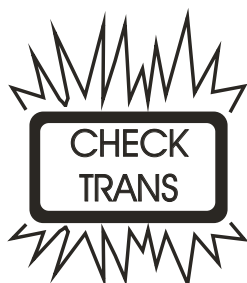
### CHECK TRANS LIGHT OPERATION "WHEN DTC'S ARE SET"



## STEP 2

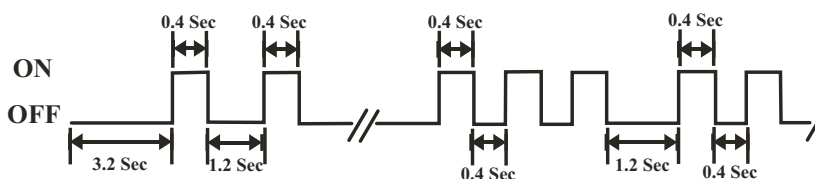
CONNECT JUMPER WIRE TO DIAGNOSTIC  
CONNECTOR FOR YOUR VEHICLE APPLICATION.  
"CHECK TRANS" LIGHT WILL FLASH AS FOLLOWS:

CONTINUOUS EVEN FLASH = "NO CODES"



### DTC 11

### DTC 32

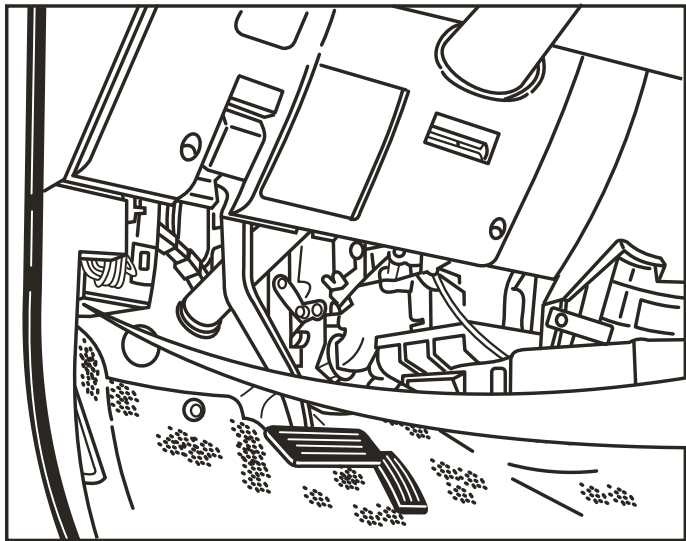


**NOTE: EACH DIAGNOSTIC TROUBLE CODE WILL  
REPEAT 3 TIMES IN NUMERICAL ORDER**

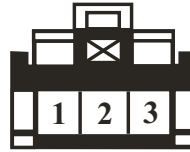
**NOTE: A DTC 12 (NO DISTRIBUTOR REFERENCE) IS NORMAL IF  
TROUBLE CODES ARE ACCESSED WITH THE ENGINE "OFF".**

Figure 1

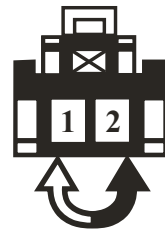
## 90-91 TROOPER AND 91-92 RODEO "ONLY"



**DIAGNOSTIC 1  
CONNECTOR  
(TECH-1 USE ONLY)**



**DIAGNOSTIC 2  
CONNECTOR**



**JUMP TERMINALS 1 & 2 OF DIAGNOSTIC 2  
CONNECTOR FOR CODE RETRIEVAL**

*"White" Connector on Trooper  
"Black" Connector on Rodeo*

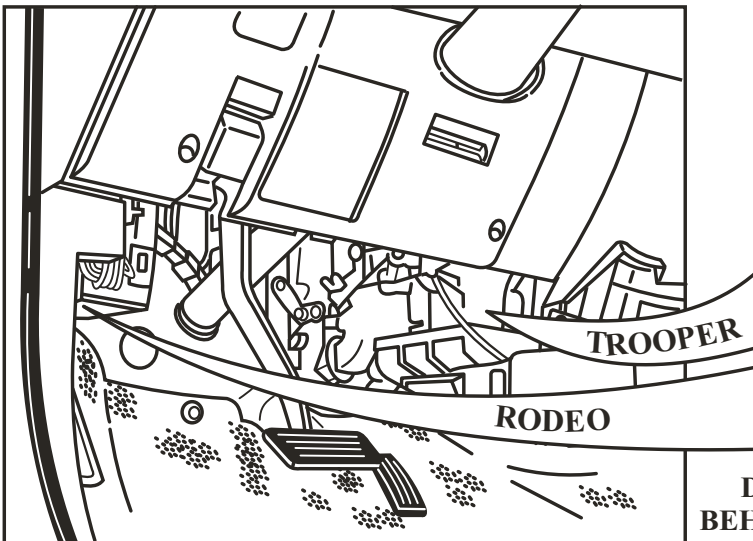
**DIAGNOSTIC CONNECTOR LOCATION IS  
BY THE TCM FOR TROOPER, AND EITHER  
BY THE TCM FOR RODEO, OR TAPED  
NEAR THE LEFT SPEAKER.**

### DIAGNOSTIC 2 WIRE COLORS

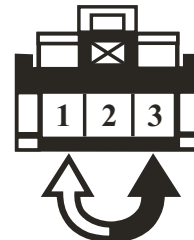
| TERMINAL | WIRE COLOR |
|----------|------------|
| 1        | YEL/BLK    |
| 2        | BLACK      |

Figure 2

## 92-93 TROOPER AND 93 RODEO "ONLY"



**DIAGNOSTIC 1  
CONNECTOR**



**JUMP TERMINALS 1 & 3 OF DIAGNOSTIC 1  
CONNECTOR FOR CODE RETRIEVAL**

**DIAGNOSTIC CONNECTOR LOCATION IS  
BEHIND THE CENTER CONSOLE ON TROOPER  
AND BY THE TCM ON RODEO**

### "TROOPER" DIAGNOSTIC 1 WIRE COLORS

| TERMINAL | WIRE COLOR                |
|----------|---------------------------|
| 1        | YELLOW/BLACK              |
| 2        | WHT/RED (92) WHT/GRN (93) |
| 3        | BLACK/GREEN               |

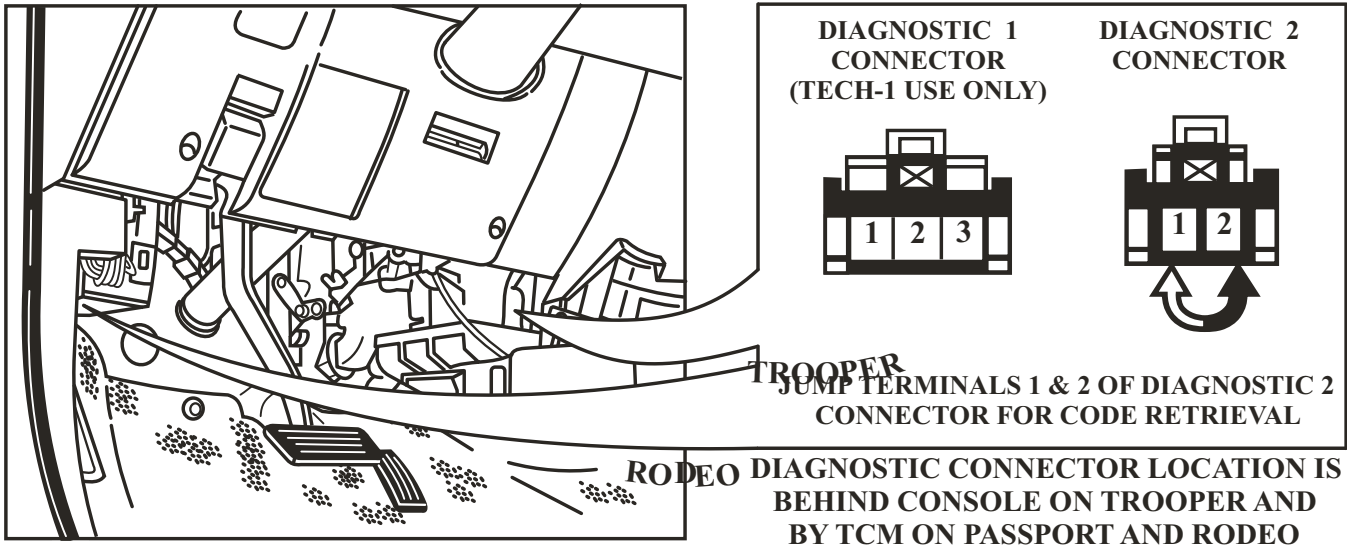
### "RODEO" DIAGNOSTIC 1 WIRE COLORS

| TERMINAL | WIRE COLOR   |
|----------|--------------|
| 1        | YELLOW/BLACK |
| 2        | WHITE/RED    |
| 3        | BLACK        |

Figure 3



## 94 TROOPER, RODEO AND PASSPORT "ONLY"



### TROOPER DIAGNOSTIC 2 WIRE COLORS

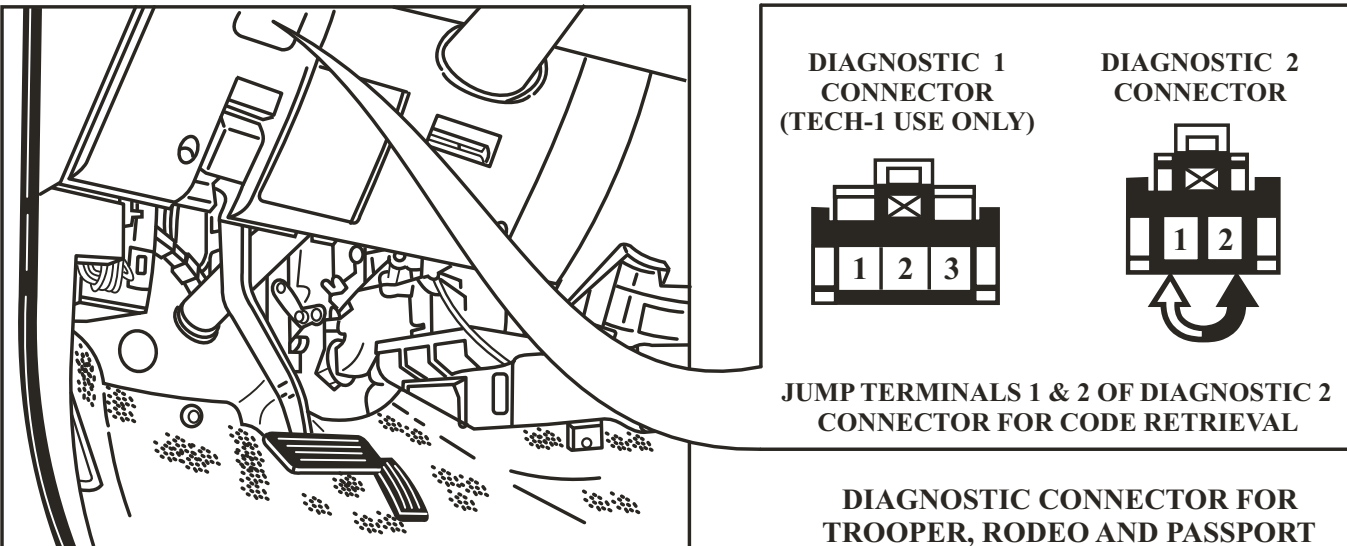
| TERMINAL | WIRE COLOR   |
|----------|--------------|
| 1        | YELLOW/BLACK |
| 2        | BLACK/GREEN  |

### PASSPORT/RODEO DIAGNOSTIC 2 WIRE COLORS

| TERMINAL | WIRE COLOR   |
|----------|--------------|
| 1        | YELLOW/BLACK |
| 2        | BLACK/ORANGE |

Figure 4

## 95 TROOPER, RODEO AND PASSPORT "ONLY"

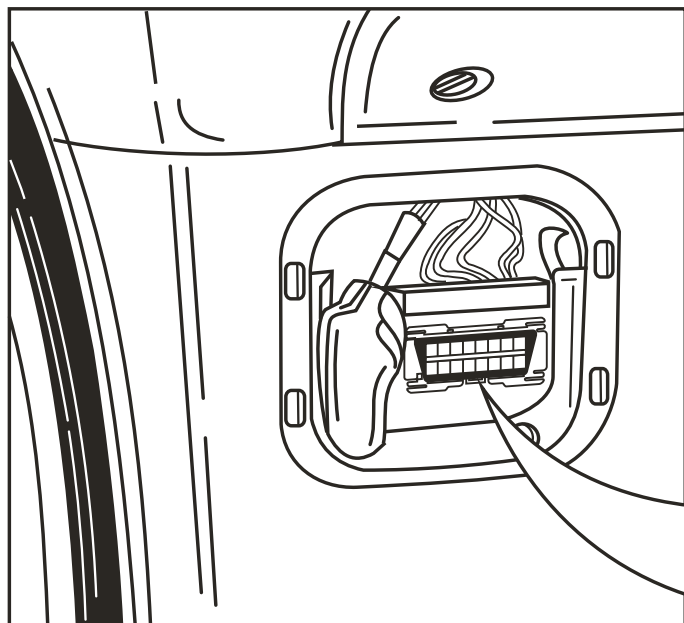


### TROOPER, PASSPORT AND RODEO DIAGNOSTIC 2 WIRE COLORS

| TERMINAL | WIRE COLOR   |
|----------|--------------|
| 1        | YELLOW/BLACK |
| 2        | BLACK/ORANGE |

Figure 5

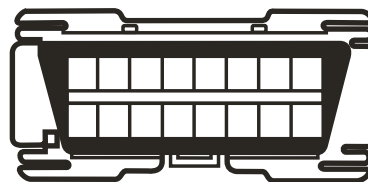
## 96 TROOPER AND ACURA SLX "ONLY"



**DIAGNOSTIC CONNECTOR FOR  
1996 TROOPER AND ACURA SLX  
LOCATED BEHIND ACCESS DOOR  
IN LEFT KICK PANEL**

**SCAN TOOL IS *MANDATORY*  
FOR CODE RETRIEVAL**

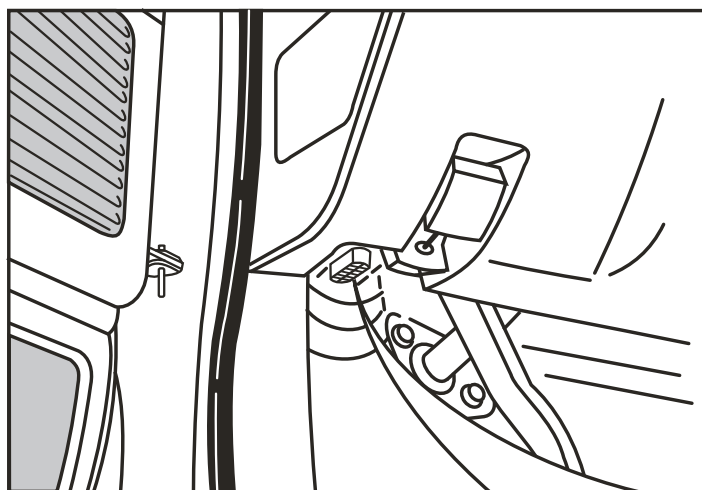
**16-PIN OBD-II CONNECTOR**



**DIAGNOSTIC CONNECTOR FOR  
1997 TROOPER AND ACURA SLX  
LOCATED BEHIND ACCESS DOOR  
ON DASH IN FRONT OF LEFT KNEE**

Figure 6

## 96-97 RODEO AND PASSPORT "ONLY"



**DIAGNOSTIC CONNECTOR FOR  
RODEO AND PASSPORT LOCATED  
UNDER DASH NEAR HOOD RELEASE**

**SCAN TOOL IS *MANDATORY*  
FOR CODE RETRIEVAL**

**16-PIN OBD-II CONNECTOR**



Figure 7



## Technical Service Information

| TROUBLE CODE | 1990-1993 MODELS ONLY                                                                                                                                                                                                                                                                                                                                                   |
|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|              | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                             |
| 17           | <b>1-2/3-4 Shift Solenoid shorted to ground.</b><br>--The TCM sensed low voltage at the solenoid when the solenoid was switched "ON".                                                                                                                                                                                                                                   |
| 21           | <b>Throttle Position Sensor voltage is too high.</b><br>--The TCM read Throttle Position Sensor voltage greater than 4.9 volts.<br>--The Throttle Position Sensor, or wiring, may have been signaling a throttle position value of 100%.                                                                                                                                |
| 22           | <b>Throttle Position Sensor voltage is too low.</b><br>--The TCM read Throttle Position Sensor voltage less than 60 mv.<br>--The Throttle Position Sensor, or wiring, may have been signaling a throttle position value of 0%.                                                                                                                                          |
| 23           | <b>Engine Coolant Switch voltage is too high.</b><br>--The TCM read voltage high from the Engine Coolant Switch when the engine should have been warm (Over 20 minutes running time).<br>--The TCM will not allow torque converter clutch operation.<br>--Under normal operating conditions:<br>Cold = high voltage (Switch Open)<br>Warm = low voltage (Switch Closed) |
| 25           | <b>1-2/3-4 Shift Solenoid is open or shorted to battery voltage.</b><br>--The TCM sensed high voltage at the solenoid when the solenoid was switched "OFF".                                                                                                                                                                                                             |
| 26           | <b>2-3 Shift Solenoid is shorted to ground.</b><br>--The TCM sensed low voltage at the solenoid when the solenoid was switched "ON".                                                                                                                                                                                                                                    |
| 28           | <b>2-3 Shift Solenoid is open or shorted to battery voltage.</b><br>--The TCM sensed high voltage at the solenoid when the solenoid was switched "OFF".                                                                                                                                                                                                                 |
| 29           | <b>TCC Solenoid is shorted to ground.</b><br>--The TCM sensed low voltage at the solenoid when the solenoid was switched "ON".                                                                                                                                                                                                                                          |
| 31           | <b>Engine Speed Sensor circuit is open.</b><br>--The TCM read 0 pulses from the Engine Speed Sensor when the throttle opening was greater than 12 percent and the vehicle speed was greater than 19 mph (30 kp/h).                                                                                                                                                      |
| 32           | <b>Force Motor (EPC) circuit is open.</b><br>--The TCM read a Force Motor current draw less than 95 mA (.095A).                                                                                                                                                                                                                                                         |
| 33           | <b>Force Motor (EPC) circuit is shorted to battery voltage.</b><br>--The TCM read a Force Motor current draw greater than 1.5A..                                                                                                                                                                                                                                        |
| 34           | <b>Band Apply Solenoid is open or shorted to battery voltage.</b><br>--The TCM sensed high voltage at the solenoid when the solenoid was switched "OFF".                                                                                                                                                                                                                |
| 35           | <b>Band Apply Solenoid is shorted to ground.</b><br>--The TCM sensed low voltage at the solenoid when the solenoid was switched "ON".                                                                                                                                                                                                                                   |

Figure 8



## Technical Service Information

| TROUBLE CODE                                                                                                                   | 1990-1993 MODELS ONLY (Continued)<br>DESCRIPTION                                                                                                                                                                                                                                                                                                    |
|--------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 36                                                                                                                             | <b>TCC Solenoid is open or shorted to battery voltage.</b><br>--The TCM sensed high voltage at the solenoid when the solenoid was switched "OFF".                                                                                                                                                                                                   |
| 39                                                                                                                             | <b>Transmission Speed Sensor circuit is open.</b><br>--The TCM read 0 pulses from the Vehicle Speed Sensor when the engine speed was greater than 3000 rpm and the gear selector mode switch identified D, 3, 2, or L.                                                                                                                              |
| 41                                                                                                                             | <b>Gear Error (May store additional codes 17, 25, 26, 28, 31, 39, or 46).</b><br>--When the engine speed was greater than 3500 rpm, the TCM read a vehicle speed which was too high for the corresponding gear.                                                                                                                                     |
| 43                                                                                                                             | <b>Ground Control Solenoid (TCM Internal Relay).</b><br>--The TCM read a change after reset.                                                                                                                                                                                                                                                        |
| 46                                                                                                                             | <b>Downshift Error (May store additional codes 31, or 39).</b><br>--For any downshift (4-3, 3-2, 2-1), the engine rpm was above a predetermined speed.                                                                                                                                                                                              |
| 48                                                                                                                             | <b>Low supply voltage.</b><br>--The TCM read a supply voltage less than 9 volts.                                                                                                                                                                                                                                                                    |
| 49                                                                                                                             | <b>High supply voltage.</b><br>--The TCM read a supply voltage greater than 16 volts.                                                                                                                                                                                                                                                               |
| 55                                                                                                                             | <b>EPROM failure.</b><br>--TCM internal failure. Replace Transmission Control Module (TCM).                                                                                                                                                                                                                                                         |
| 56*                                                                                                                            | <b>Mode Switch position is incorrect, or TPS is open.</b><br>--The TCM read a vehicle speed greater than 62 mph (100 km/h) when the gear selector mode switch identified Reverse.<br>--The TCM read a throttle position greater than 20 percent and engine speed less than 3000 rpm, when the gear selector mode switch identified Park or Neutral. |
| 65                                                                                                                             | <b>Transmission Oil Temperature sensor is open.</b><br>--The "Winter Program" could not be activated.<br>--The TCM read 5 volts.                                                                                                                                                                                                                    |
| 66                                                                                                                             | <b>Transmission Oil Temperature sensor is shorted.</b><br>--The TCM read 0 volts.                                                                                                                                                                                                                                                                   |
| 77                                                                                                                             | <b>Kickdown Switch is shorted, or TPS is open.</b><br>--The TCM read kickdown when the throttle position sensor was less than 70 percent.                                                                                                                                                                                                           |
| 82*                                                                                                                            | <b>Mode Switch is in an undefined state.</b><br>The TCM read a gear selector mode other than R, N, D, 3, 2, or L.                                                                                                                                                                                                                                   |
| <b>* These codes may not set on early Trooper models.</b><br><br><b>FOR "SPECIAL NOTE" ON 1990-1993 MODELS, SEE NEXT PAGE.</b> |                                                                                                                                                                                                                                                                                                                                                     |

Figure 9





# Technical Service Information

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>SPECIAL NOTES FOR<br/>1990-1993 MODELS ONLY</b></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <p><b>1990-1991 MODELS ONLY</b></p> <p><i>NOTE: On 1990-1991 models, equipped with 2.8L engine, the engine coolant temperature must be above 68°F (20°C), for Torque Converter Clutch operation.</i></p> <p><i>NOTE: On 1990-1991 models, equipped with 3.1L engine, the engine coolant temperature must be above 113°F (45°C), for Torque Converter Clutch operation.</i></p>                                                                                                                                                                                                                                                                                                                                                                                                             |
| <p><b>1992-1993 MODELS ONLY</b></p> <p><i>NOTE: On 1992-93 models, if road test is performed with engine coolant temperature less than 158°F (70°C), shift speeds will be delayed during light throttle application and occur at a slightly higher speed.</i></p> <p><i>NOTE: On 1992-1993 models, engine coolant temperature must be greater than 158°F (70°C) for TCC operation. The TCC operates in 2nd gear kickdown when engine coolant temperature is greater than 158°F (70°C). The TCC operates in 2nd, 3rd and 4th gear when transmission fluid temperature is greater than 284°F (140°C). If the transmission oil temperature is above 293°F (145°C), the "CHECK TRANS" light will be constantly ON, (Not Flashing), and goes off again when TOT is below 257°F (125°C).</i></p> |

Figure 10



## Technical Service Information

| TROUBLE<br>CODE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 1994-1995 MODELS ONLY                                                  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | DESCRIPTION                                                            |
| <b>11</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>OUTPUT SPEED SENSOR SIGNAL FAILURE</b>                              |
| <b>13</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>ENGINE SPEED SENSOR SIGNAL FAILURE</b>                              |
| <b>*15</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>TRANSMISSION OIL TEMPERATURE SENSOR OPEN OR SHORTED TO VOLTAGE</b>  |
| <b>*16</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>TRANSMISSION OIL TEMPERATURE SENSOR SHORTED TO GROUND</b>           |
| <b>21</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>THROTTLE POSITION SENSOR OPEN OR SHORTED TO BATTERY VOLTAGE</b>     |
| <b>22</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>THROTTLE POSITION SENSOR SHORTED TO GROUND</b>                      |
| <b>23</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>THROTTLE POSITION SENSOR CIRCUIT OPEN</b>                           |
| <b>25</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>SUPPLY VOLTAGE TOO LOW (LESS THAN 9 VOLTS)</b>                      |
| <b>26</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>SUPPLY VOLTAGE TOO HIGH (GREATER THAN 16 VOLTS)</b>                 |
| <b>31</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>1-2/3-4 SHIFT SOLENOID OPEN OR SHORTED TO GROUND</b>                |
| <b>32</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>2-3 SHIFT SOLENOID OPEN OR SHORTED TO GROUND</b>                    |
| <b>**33</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>TCC SOLENOID CIRCUIT OPEN OR SHORTED TO BATTERY VOLTAGE</b>         |
| <b>34</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>BAND APPLY SOLENOID CIRCUIT OPEN OR SHORTED TO GROUND</b>           |
| <b>35</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>FORCE MOTOR SOLENOID CIRCUIT OPEN OR SHORTED TO GRND OR VOLTAGE</b> |
| <b>36</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>SHIFT SOLENOID CIRCUIT OPEN OR SHORTED TO GROUND</b>                |
| <b>37</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>TORQUE MANAGEMENT SERIAL LINE FAULTY</b>                            |
| <b>41</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>1-2/3-4 SOLENOID CIRCUIT SHORTED TO BATTERY VOLTAGE</b>             |
| <b>42</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>2-3 SHIFT SOLENOID CIRCUIT SHORTED TO BATTERY VOLTAGE</b>           |
| <b>*43</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>TCC SOLENOID CIRCUIT SHORTED TO GROUND</b>                          |
| <b>44</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>BAND APPLY SOLENOID CIRCUIT SHORTED TO BATTERY VOLTAGE</b>          |
| <b>46</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>SHIFT SOLENOID CIRCUIT SHORTED TO BATTERY VOLTAGE</b>               |
| <b>*51</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>ENGINE COOLANT SWITCH SHORTED TO GROUND, VOLTAGE, OR OPEN</b>       |
| <b>*52</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>KICKDOWN ALWAYS ON OR SHORTED TO GROUND</b>                         |
| <b>*53</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>MODE SWITCH IN "P", "N" OR "R" BAD POSITION</b>                     |
| <b>54</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>MODE SWITCH, ILLEGAL POSITION</b>                                   |
| <p><i>* No "CHECK TRANS" light and transmission will not enter "Limp Mode" when DTC is set.</i></p> <p><i>** Flashes "CHECK TRANS" light on instrument panel, but will not enter "Limp Mode" when DTC is set.</i></p>                                                                                                                                                                                                                                                                                      |                                                                        |
| <p><b>NOTE:</b> <i>If road test is performed with engine coolant temperature less than 158°F (70°C), shift speeds will be delayed during light throttle application and occur at a slightly higher speed.</i></p>                                                                                                                                                                                                                                                                                          |                                                                        |
| <p><b>NOTE:</b> <i>Engine coolant temperature must be greater than 158°F (70°C) for TCC operation. The TCC operates in 2nd gear kickdown when engine coolant temperature is greater than 158°F (70°C). The TCC operates in 2nd, 3rd and 4th gear when transmission fluid temperature is greater than 284°F (140°C). If the transmission oil temperature is above 293°F (145°C), the "CHECK TRANS" light will be constantly ON, (Not Flashing), and goes off again when TOT is below 257°F (125°C).</i></p> |                                                                        |
| <b>1994-1995 CODES CONTINUED ON NEXT PAGE</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                        |

Figure 11



# Technical Service Information

| 1994-1995 MODELS ONLY (Continued)                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                     |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|
| TROUBLE CODE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | DESCRIPTION                                         |
| *55                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | BRAKE SWITCH OPEN, OR SHORTED TO GROUND             |
| *56                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | BRAKE SWITCH SHORTED TO BATTERY VOLTAGE             |
| 61                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | GEAR ERROR                                          |
| 62                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | DOWNSHIFT PROTECTION                                |
| 63                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | EPROM CSUM FAILURE                                  |
| *64                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | TCC VALVE STUCK ON (1994 MODELS ONLY)               |
| *65                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | TCC VALVE STUCK OFF (1994 MODELS ONLY)              |
| 82                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | SHIFT OR BAND APPLY SOLENOIDS FAULTY DURING DRIVING |
| <p>* No "CHECK TRANS" light and transmission will not enter "Limp Mode" when DTC is set.</p> <p>** Flashes "CHECK TRANS" light on instrument panel, but will not enter "Limp Mode" when DTC is set.</p>                                                                                                                                                                                                                                                                                             |                                                     |
| <p><b>NOTE:</b> If road test is performed with engine coolant temperature less than 158°F (70°C), shift speeds will be delayed during light throttle application and occur at a slightly higher speed.</p>                                                                                                                                                                                                                                                                                          |                                                     |
| <p><b>NOTE:</b> Engine coolant temperature must be greater than 158°F (70°C) for TCC operation. The TCC operates in 2nd gear kickdown when engine coolant temperature is greater than 158°F (70°C). The TCC operates in 2nd, 3rd and 4th gear when transmission fluid temperature is greater than 284°F (140°C). If the transmission oil temperature is above 293°F (145°C), the "CHECK TRANS" light will be constantly ON, (Not Flashing), and goes off again when TOT is below 257°F (125°C).</p> |                                                     |
| Empty space for additional notes or diagrams                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                     |

Figure 12



## Technical Service Information

| 1996-1997 MODELS ONLY                  |                                                                                                                   |          |              |             |
|----------------------------------------|-------------------------------------------------------------------------------------------------------------------|----------|--------------|-------------|
| TROUBLE CODE                           | DESCRIPTION                                                                                                       | DTC TYPE | CHECK ENGINE | CHECK TRANS |
| P0218                                  | Transmission Fluid Over Temperature                                                                               | D        |              |             |
| P0560                                  | System Voltage Malfunction                                                                                        | D        |              |             |
| P0705                                  | Transmission Range Switch (Mode Switch) Illegal Position                                                          | D        |              |             |
| P0706                                  | Transmission Range Switch (Mode Switch) Performance                                                               | D        |              |             |
| P0711                                  | Transmission Fluid Temperature (TFT) Sensor Circuit -- Range/Performance                                          | D        |              |             |
| P0712                                  | Transmission Fluid Temperature (TFT) Sensor Circuit Low Input                                                     | D        |              |             |
| P0713                                  | Transmission Fluid Temperature (TFT) Sensor Circuit High Input                                                    | D        |              |             |
| P0719                                  | TCC Brake Switch Circuit High (Stuck On)                                                                          | D        |              |             |
| P0722                                  | Transmission Output Speed Sensor (OSS) Low Input                                                                  | A        | ON           | Flash       |
| P0723                                  | Transmission Output Speed Sensor (OSS) Intermittent                                                               | A        | ON           | Flash       |
| P0724                                  | TCC Brake Switch Circuit Low (Stuck Off)                                                                          | D        |              |             |
| P0730                                  | Transmission Incorrect Gear Ratio                                                                                 | C        |              | Flash       |
| P0742                                  | Torque Converter Clutch Circuit (Stuck On)                                                                        | A        | ON           | Flash       |
| P0748                                  | Pressure Control Solenoid (PCS) (Force Motor) Circuit Electrical                                                  | C        |              | Flash       |
| P0751                                  | Shift Solenoid A Performance Without Input Speed                                                                  | B        | ON           | Flash       |
| P0753                                  | Shift Solenoid A Circuit Electrical                                                                               | A        | ON           | Flash       |
| P0756                                  | Shift Solenoid B Performance Without Input Speed                                                                  | B        | ON           | Flash       |
|                                        |                                                                                                                   |          |              |             |
| TYPE                                   | DEFINITION                                                                                                        |          |              |             |
| A                                      | Emission related, turn on MIL (Check Engine) and flashing Check Trans on 1st failure.                             |          |              |             |
| B                                      | Emission related, turn on MIL (Check Engine) and flashing Check Trans after two consecutive trips with a failure. |          |              |             |
| C                                      | Non-emission related, flashing Check Trans on 1st failure.                                                        |          |              |             |
| D                                      | Non-emission related, no warning lamps.                                                                           |          |              |             |
|                                        |                                                                                                                   |          |              |             |
| 1996-1997 CODES CONTINUED ON NEXT PAGE |                                                                                                                   |          |              |             |

Figure 13





## Technical Service Information

| 1996-1997 MODELS ONLY (Continued)                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                   |          |              |             |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|----------|--------------|-------------|
| TROUBLE CODE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | DESCRIPTION                                                                                                       | DTC TYPE | CHECK ENGINE | CHECK TRANS |
| P0758                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Shift Solenoid B Circuit Electrical                                                                               | A        | ON           | Flash       |
| P1790                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | ROM Transmission Side Bad, Check Sum                                                                              | A        | ON           | Flash       |
| P1792                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | EEROM Transmission Side Bad, Check Sum                                                                            | A        | ON           | Flash       |
| P1835                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Kick Down Switch Always ON                                                                                        | D        |              |             |
| P1850                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Band Apply Solenoid Malfunction                                                                                   | D        |              |             |
| P1860                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | TCC/PWM Solenoid Electrical                                                                                       | A        | ON           | Flash       |
| P1870                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Transmission Component Slipping                                                                                   | A        | ON           | Flash       |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                   |          |              |             |
| TYPE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | DEFINITION                                                                                                        |          |              |             |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Emission related, turn on MIL (Check Engine) and flashing Check Trans on 1st failure.                             |          |              |             |
| B                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Emission related, turn on MIL (Check Engine) and flashing Check Trans after two consecutive trips with a failure. |          |              |             |
| C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Non-emission related, flashing Check Trans on 1st failure.                                                        |          |              |             |
| D                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Non-emission related, no warning lamps.                                                                           |          |              |             |
| <i>NOTE: If road test is performed with engine coolant temperature less than 158°F (70°C), shift speeds will be delayed during light throttle application and occur at a slightly higher speed.</i>                                                                                                                                                                                                                                                                                          |                                                                                                                   |          |              |             |
| <i>NOTE: Engine coolant temperature must be greater than 158°F (70°C) for TCC operation. The TCC operates in 2nd gear kickdown when engine coolant temperature is greater than 158°F (70°C). The TCC operates in 2nd, 3rd and 4th gear when transmission fluid temperature is greater than 284°F (140°C). If the transmission oil temperature is above 284°F (140°C), the "CHECK TRANS" light will be constantly ON, (Not Flashing), and goes off again when TOT is below 266°F (130°C).</i> |                                                                                                                   |          |              |             |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                   |          |              |             |

Figure 14