

GROUP

## TRANSAXLE

07  
(7000)

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## SECTION 07-01 Transaxle, Automatic—AXODE (AX4S)

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# SECTION 07-01 Transaxle, Automatic—AXODE (AX4S)

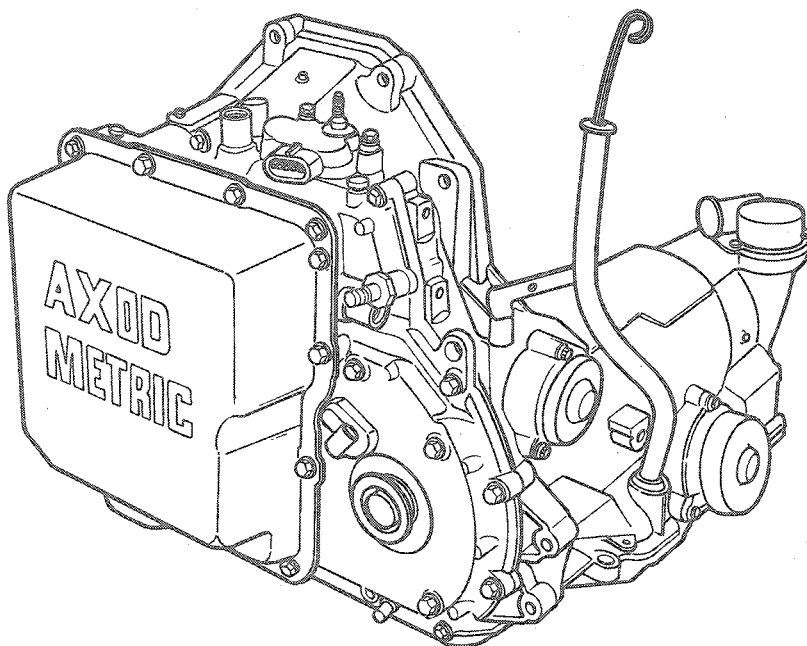
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## VEHICLE APPLICATION

Taurus/Sable.

## DESCRIPTION AND OPERATION

The AXODE (AX4S) automatic overdrive transaxle is a fully automatic transaxle with four forward speeds and REVERSE, NEUTRAL and PARK.



D8827-A

The AXODE (AX4S) has two planetary gearsets and a combination planetary / differential gearset. Four multiple plate clutches, two band assemblies and two one-way clutches act together for proper operation of the planetary gearsets.

## DESCRIPTION AND OPERATION (Continued)

A lockup torque converter is coupled to the engine crankshaft and transmits engine power to the geartrain by means of a drive link assembly (chain) that connects the drive and driven sprockets. The application of the converter clutch is controlled through an electronic control integrated in the powertrain control module (PCM) 12A650. These controls, along with the hydraulic controls in the valve body, operate a piston plate clutch in the torque converter to provide improved fuel economy by eliminating converter slip when applied.

### Main Components and Functions

- **Torque Converter:** Couples the engine to the turbine shaft. Also provides torque multiplication and absorbs engine shock of gear shifting.
- **Piston Plate Clutch and Damper Assembly:** Transmits engine power to the turbine from the converter cover during lockup.
- **Converter Cover:** Transmits power from the engine into the converter. Also, the oil pump driveshaft is splined to the converter cover.
- **Turbine:** Splined to the drive sprocket turbine shaft, and driven by fluid from the impeller.
- **Impeller:** Supplies torque manipulation together with the reactor. Driven by the converter cover.
- **Reactor:** (Also called the stator.) Contains a one-way clutch to hold it stationary only when reaction is required. Also causes hydraulic reaction during torque multiplication.

### Geartrain

- **Forward Clutch:** Locks the driven sprocket to the low one-way clutch.
- **Low One-Way Clutch:** Transmits torque from the driven sprocket to the sun gear of the forward planetary gearset in first gear and provides engine braking in third gear in connection with the forward clutch.
- **Overdrive Band:** Holds the sun gear of the forward planetary gearset stationary in fourth gear (overdrive).
- **Direct Clutch:** Locks the sun gear of the planetary assembly of the forward planetary gearset to the direct one-way clutch in third gear.
- **Direct One-Way Clutch:** Transmits torque from the driven sprocket to the sun gear of the forward planetary gearset in third gear and provides engine braking in manual low in connection with the direct clutch.
- **Intermediate Clutch:** Locks the driven sprocket to the planetary assembly of the forward planetary gearset in second and third gears.

- **Reverse Clutch:** Holds the planetary assembly of the forward planetary gearset and the ring gear of the rear planetary gearset stationary in reverse gear.
- **Planetary Gears:** Two gearsets are used to provide the four forward speeds, plus REVERSE dependent upon clutch and/or band applications.
- **Parking Gear:** Allows the output (axle) shaft to be mechanically locked by the parking pawl anchored in the case.
- **Low-Intermediate Band:** Holds the sun gear of the rear planetary gearset stationary in manual low, first and second gears.
- **Final Drive Sun Gear:** Transfers torque from the transmission output to the final drive planetary assembly.
- **Final Drive Planet:** Drives the differential assembly.
- **Differential Assembly:** Drives the front axle shafts and provides the differential action if driving wheels are turning at different speeds.

### Torque Converter to Geartrain

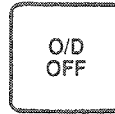
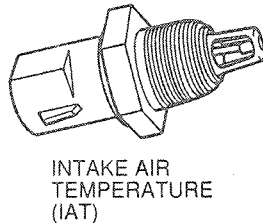
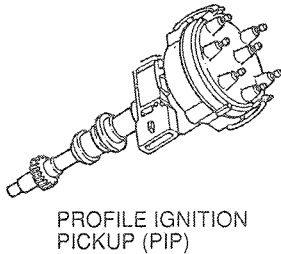
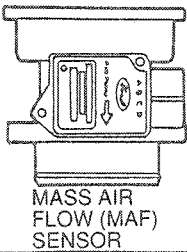
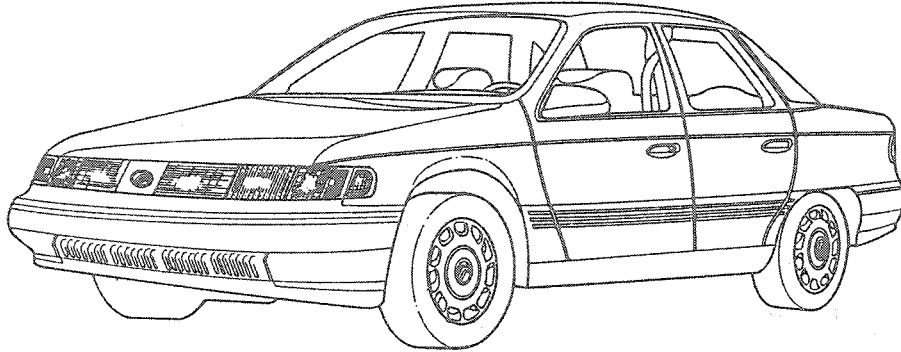
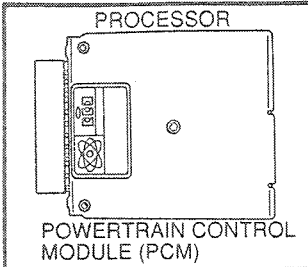
- **Drive Sprocket:** Transmits power from the converter to the drive link assembly (chain).
- **Drive Link Assembly (Chain):** Connects drive and driven sprockets.
- **Driven Sprocket:** Transmits converter power to the geartrain.

### Hydraulic System

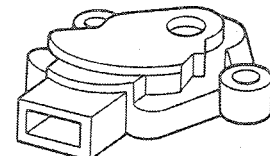
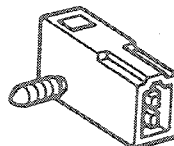
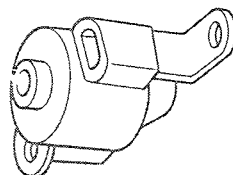
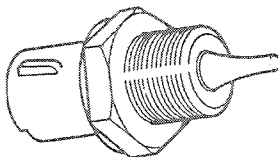
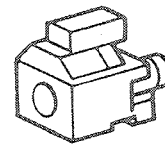
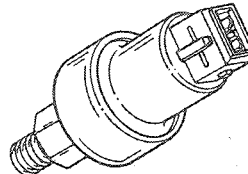
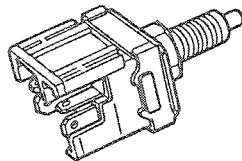
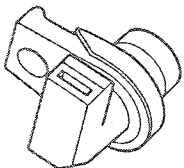
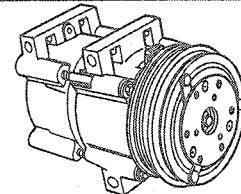
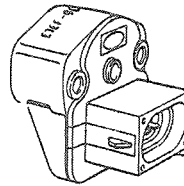
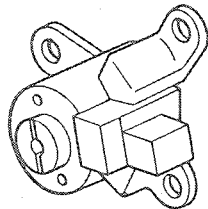
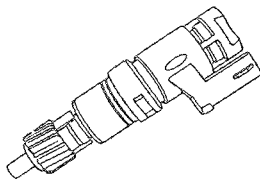
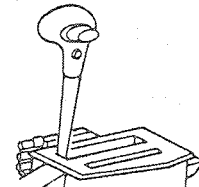
- **Valve Body:** (Main Control Assembly) directs fluid (oil) under pressure to the torque converter, band servos and clutches, to control transaxle operation.
- **Oil Pump:** Provides a supply of fluid (oil) under pressure to operate, lubricate, and cool the transaxle. The oil pump is a variable capacity vane and rotor pump with output flow proportional to demand. It is located within the transaxle control valve and pump assembly.
- **Overdrive Servo:** Applies overdrive band in fourth gear.
- **Low-Intermediate Servo:** Applies low-intermediate band in manual low, first and second gears.
- **Reservoirs:** Two reservoir areas are used to control oil level, dependent upon fluid temperature. Along with the lower oil pan, a fluid reservoir is located in the lower section of the valve body cover. As fluid temperature in the reservoir increases, a thermostatic element closes, retaining fluid in the upper reservoir.

DESCRIPTION AND OPERATION (Continued)

Electrical Component Function  
Component Illustrations



TRANSMISSION CONTROL  
INDICATOR LAMP  
(TCIL) (SHO ONLY)



D11465-A



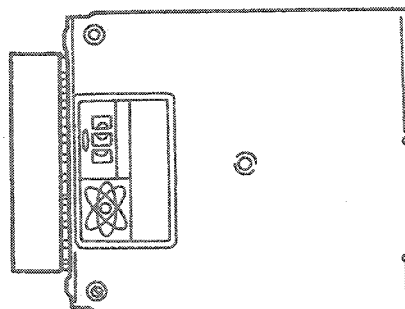
## DESCRIPTION AND OPERATION (Continued)

Abbreviation	Description
ACC	Air Conditioning Clutch
B+	Battery Positive Voltage
BOO	Brake On/Off
CONT	Continuous Codes
DTC	Diagnostic Trouble Code
DVOM	Digital Volt-Ohm Multimeter
ECT	Engine Coolant Temperature
EEC	Electronic Engine Control
EPC	Electronic Pressure Control
FMEM	Failure Mode Effects Management
IAT	Intake Air Temperature
KAM	Keep Alive Memory
KOEO	Key On Engine Off
KOER	Key On Engine Running
MAF	Mass Air Flow Sensor
MLP	Manual Lever Position Sensor
OWC	One-Way Clutch
PCM	Powertrain Control Module
PIP	Profile Ignition Pickup
PSP	Power Steering Pressure Switch
ROM	Read Only Memory
SS1	Shift Solenoid 1
SS2	Shift Solenoid 2
SS3	Shift Solenoid 3
ST	Self-Test
STI	Self-Test Input
STO	Self-Test Output
TCC	Torque Converter Clutch (formerly MCCC/TCC)
TCIL	Transmission Control Indicator Lamp (SHO Only)
TCS	Transmission Control Switch (SHO Only)
TOT	Transmission Oil Temperature
TP	Throttle Position Sensor
TSS	Transmission Speed Sensor
VFS	Variable Force Solenoid
VPWR	Vehicle Power
VSS	Vehicle Speed Sensor
WOT	Wide-Open Throttle

- **Connector and Wiring Assembly:** Provides electrical current flow path from vehicle harness to internal transaxle electrical components and provides oil sealing.

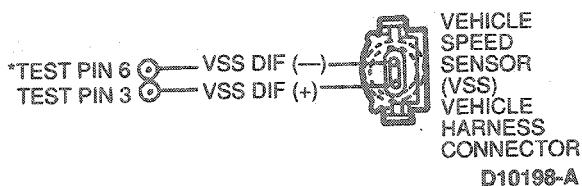
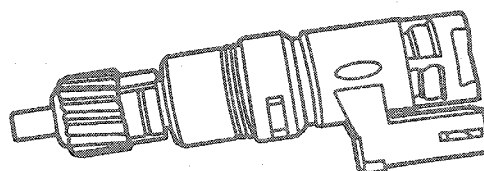
- **Powertrain Control Module (PCM) 12A650:** Controls operation of the AXODE (AX4S) automatic transaxle. Many input sensors provide information to the powertrain control module (PCM). The powertrain control module (PCM) then controls the actuators which affect transaxle operation.

**Diagnostic Trouble Codes (DTC's): 511, 512, 513**



D10130-A

- **Vehicle Speed Sensor (VSS) 9E731:** A magnetic pickup that sends a signal to the powertrain control module (PCM). The VSS signal tells the powertrain control module (PCM) the vehicle speed.



#### Transmission Function:

Shift scheduling and electronic pressure control (EPC) 7H144.

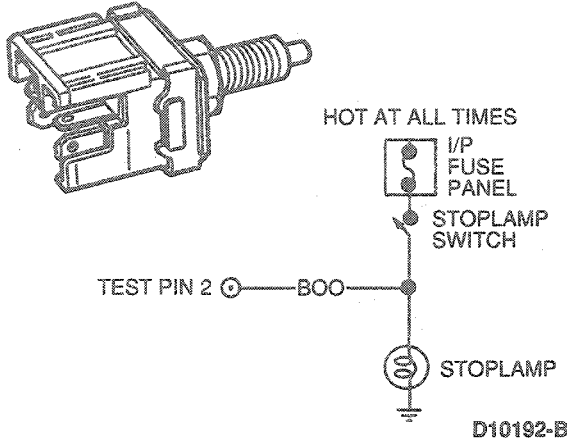
#### Symptoms:

Harsh engagements, firm shift feel, abnormal shift schedule, unexpected downshifts may occur at closed throttle. Torque converter clutch will not engage.

**DTC: 452**

**DESCRIPTION AND OPERATION (Continued)**

- **Brake On/Off (BOO) Switch 13480:** Tells the PCM when the brakes are applied. The switch is closed when the brakes are applied and open when they are released.



**Transmission Function:**

Disengage torque converter clutch when brake is applied.

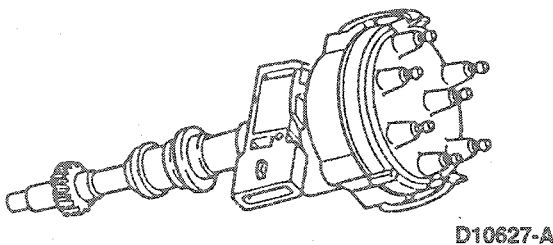
**Symptoms:**

Failed "ON"—torque converter clutch will not engage at less than one-third throttle.

Failed "OFF" or not connected—torque converter clutch will not disengage when brake is applied.

**DTC:** 536

- **Profile Ignition Pulse (PIP):** Tells the powertrain control module (PCM) the engine rpm and the crankshaft position. On gasoline engines, the Profile Ignition Pulse (PIP) signal is produced by a Hall-effect device in the distributor.



**Transmission Function:**

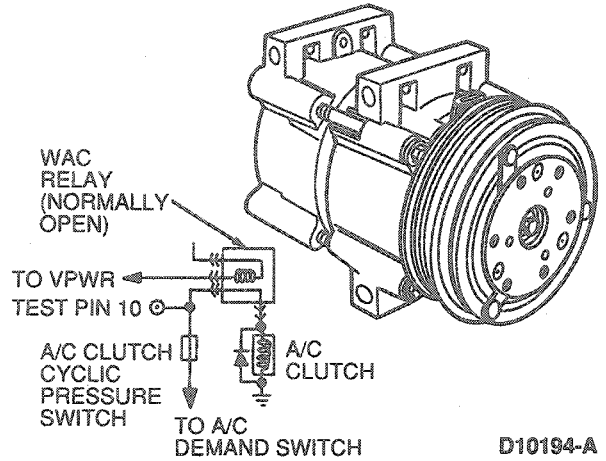
Uses rpm signal in the transmission strategy for torque converter clutch control.

**Symptoms:**

Engine malfunction, no torque converter clutch engagement.

**DTC's:** 211, 212, 213

- **Air Conditioning Clutch (ACC) 2884:** The electro-magnetic clutch is energized when the clutch cycling pressure switch closes. The switch is located on the suction accumulator / drier. The closing of the switch completes the circuit to the clutch and draws it into engagement with the compressor driveshaft.



**Transmission Function:**

Adjust EPC pressure when A/C compressor clutch is engaged to compensate for additional load on the engine.

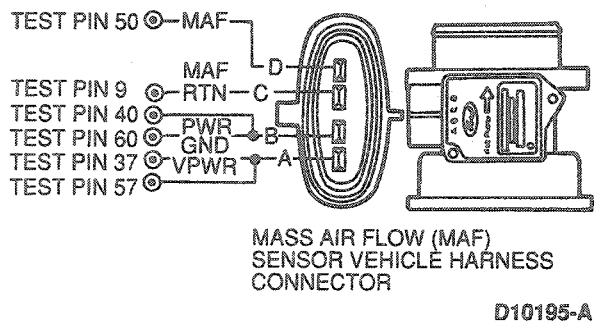
**Symptoms:**

Failed "ON"—EPC pressure slightly low with A/C OFF.

Failed "OFF"—EPC pressure slightly high with A/C ON.

**DTC:** 539

- **Mass Air Flow Sensor (MAF) 12B579:** Directly measures the mass of the air flowing into the engine. The sensor output is a DC (analog) signal ranging from about 0.5 volt to 5.0 volts used by the PCM to calculate the injector pulse width for stoichiometry.



**Transmission Function:**

EPC pressure control, shift and torque converter clutch scheduling.

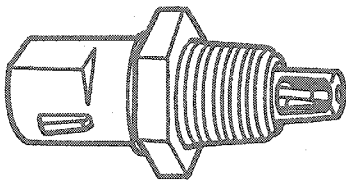
**DESCRIPTION AND OPERATION (Continued)**

**Symptoms:**

High/low EPC pressure, incorrect shift schedule, incorrect converter engagement scheduling and symptoms similar to a throttle position (TP) sensor malfunction.

**DTC's:** 157, 158, 159, 184 and 185

- **Intake Air Temperature (IAT) Sensor 12697:** Provides the Electronic Fuel Injection System with mixture (fuel and air) temperature information. The intake air temperature (IAT) sensor is used both to correct density for airflow calculation and to proportion the cold enrichment fuel flow. This sensor is similar in construction to the Engine Coolant Temperature (ECT) 12A648 sensor, except it is packaged to improve sensor response time. The sensor is threaded into a cylinder runner of the intake manifold or mounted in the air cleaner assembly.



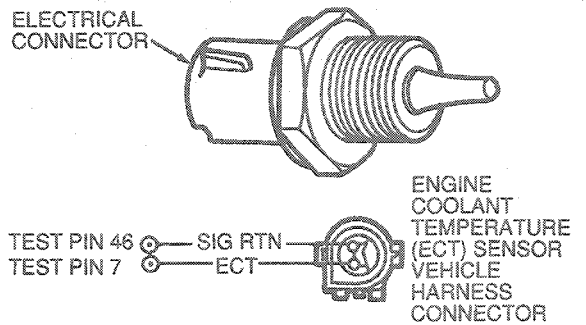
D10155-B

**Transmission Function:** IAT is used in determining EPC pressure.

**Symptoms:** Incorrect EPC pressure either high or low will result in either harsh or soft shifts.

**DTC's:** 114, 112 and 113

- **Engine Coolant Temperature (ECT) Sensor 12A648:** Detects the temperature of engine coolant and supplies the information to the powertrain control module (PCM). The ECT sensor is threaded into the heater outlet fitting or cooling passage on the engine. For engine control applications, the ECT signal is used to modify ignition timing, EGR flow, and air-to-fuel ratio as a function of engine coolant temperature. On electronic instrument cluster applications, the ECT output is used to control a coolant temperature indicator.



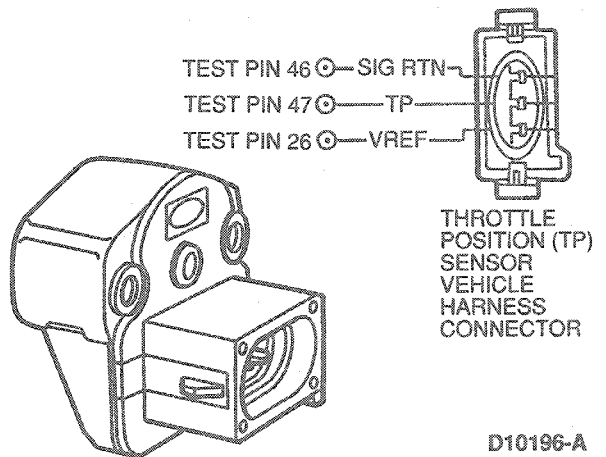
D10147-A

**Transmission Function:** ECT is used to control torque converter clutch operation.

**Symptoms:** Torque converter clutch will always be off, resulting in reduced fuel economy.

**DTC's:** 116, 117 and 118

- **Throttle Position (TP) Sensor 9B989:** Is a potentiometer mounted on the throttle body. The TP sensor detects the position of the throttle plate and sends this information to the PCM as a varying voltage signal. If a malfunction occurs in the TP sensor circuit, the PCM will recognize that the TP sensor signal is out of specification. The PCM will then operate the AXODE (AX4S) transaxle in a high capacity mode to prevent transaxle damage.



D10196-A

**Transmission Function:**

Shift scheduling, EPC pressure control, torque converter clutch control.

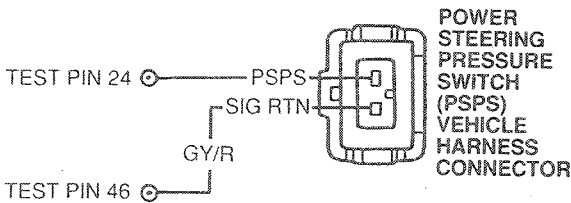
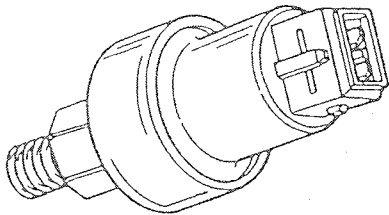
**Symptoms:**

Harsh engagements, firm shift feel, abnormal shift schedule, torque converter clutch does not engage, torque converter clutch cycling.

**DTC's:** 121, 122, 123, 124, 125 and 167

**DESCRIPTION AND OPERATION (Continued)**

- **Power Steering Pressure (PSP) Switch 3N824:** Is used on certain applications to signal the powertrain control module (PCM) when the power steering pressure exceeds a specific limit. Then PCM will adjust idle speed to compensate for this added load on the engine. For transaxle, this increase in engine rpm increases EPC pressure to the transaxle.



(TEST PIN 2 FOR 3.0L SHO-TEST  
PIN 28 FOR 2.5L AXODE, 3.0L AXODE,  
3.8L AXODE, 4.6L AOD)

D10633-A

**Transmission Function:**

Used as an input to the PCM to assist in determining proper EPC pressure during increased engine loads.

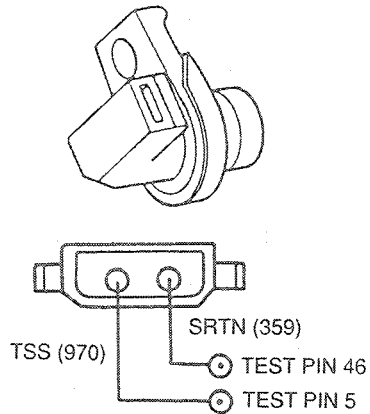
**Symptoms:**

Failed ON—EPC slightly high, firm engagements, firm shifts, harsh coastdown shifts.

Failed OFF—EPC pressure slightly low during increased loading of the vehicle power steering.

DTC's: 519, 521

- **Transmission Speed Sensor (TSS) 7M101:** is a magnetic pickup that sends a signal to the powertrain control module (PCM) that indicates transaxle turbine shaft input speed.



D10634-A

**Transmission Function:**

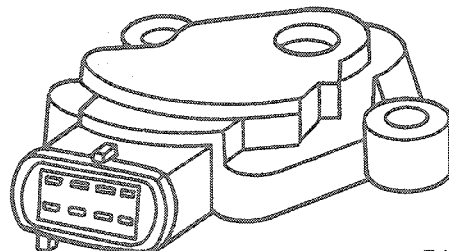
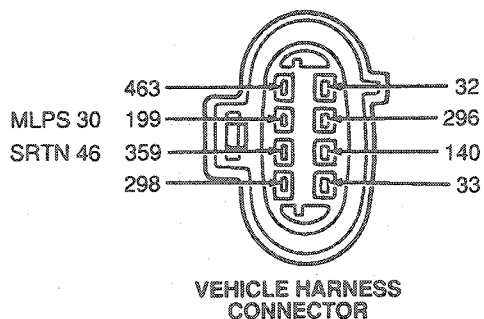
Provides converter turbine speed information for torque converter clutch (TCC) strategy. Also used in determining static pressure settings.

**Symptoms:**

Increased engine rpm on engagements, harsh shifts (converter engaged).

DTC: 639

- **Manual Lever Position (MLP) 7A247:** The powertrain control module (PCM) sends a voltage signal to the manual lever position (MLP) sensor. The MLP sensor incorporates a series of step-down resistors which act as a voltage divider. The PCM monitors this voltage which corresponds to the position of the manual lever. The MLP is located on the outside of the transaxle at the manual lever.



D10635-A

**Transmission Function:**

Determine desired gear and EPC pressure.

**DESCRIPTION AND OPERATION (Continued)**

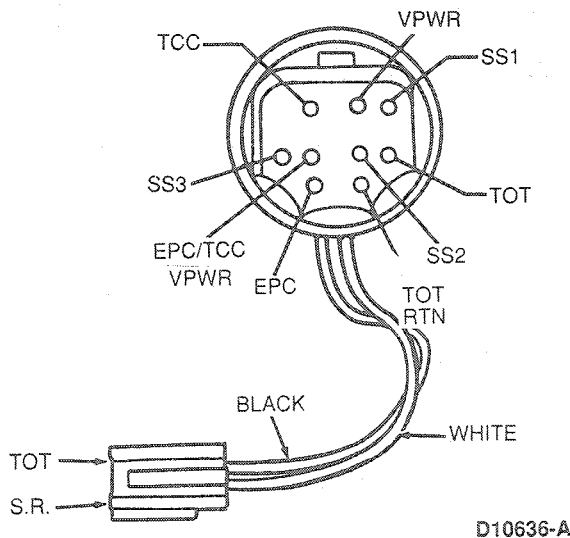
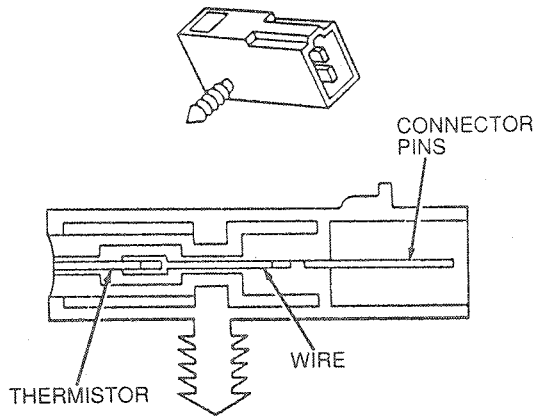
**Symptoms:**

Harsh engagements and firm shift feel. No 3 / 4 shift. May downshift to a lower gear.

DTC's: 634, 522

NOTE: The MLP also contains the Park / Neutral Position Switch and backup lamp circuits.

- **Transmission Oil Temperature (TOT) Switch 7N138:** The Transmission Oil Temperature sensor is located on the transmission main control body. It is a temperature-sensitive device called a thermistor. The resistance value of the TOT will vary with temperature change. The powertrain control module (PCM) monitors the voltage across the TOT to determine the temperature of the transmission oil.



D10636-A

**Transmission Function:**

The powertrain control module (PCM) uses this signal to determine whether a cold start shift schedule is necessary. The cold start shift schedule allows quicker shifts when the transmission fluid temperature is cold. The PCM also inhibits torque converter clutch operation at low transmission fluid temperatures. Corrects EPC pressures for temperature.

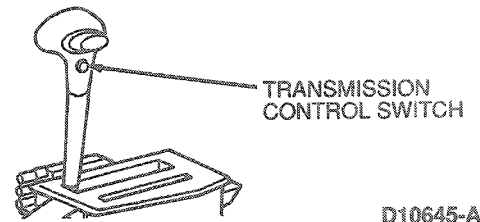
**Symptoms:**

Torque converter clutch engagement and stabilized shift schedules happen too soon after a cold start. Harsh or soft shifts.

DTC's: 636, 637, 638

- **Transmission Control Switch (TCS) 7G484 Transmission Control Indicator Lamp (TCIL) SHO Only:** The transmission control switch (TCS) is a momentary contact switch. When this switch is pressed, a signal is sent to the powertrain control module (PCM). The powertrain control module (PCM) then energizes the transmission control indicator lamp (TCIL) and toggles Solenoid 3 (SS3), applying the forward clutch to provide engine braking and canceling fourth gear operation.

NOTE: TCIL will also flash if the EPC circuit is shorted.



D10645-A

**Sensor:**

Transmission control switch (TCS)

**Transmission Function:**

Disable fourth gear operation.

**Symptoms:**

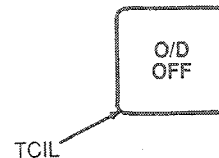
No overdrive cancel when switch is cycled.

DTC: 632, tested during Key On Engine Off (KOEO) On-Board Diagnostic only.

**Actuator:**

Transmission control indicator lamp (TCIL)

**INSTRUMENT PANEL**



D11467-A

**Transmission Function:**

Indicates overdrive cancel mode activated (lamp on) and EPC circuit shorted (lamp flashing).

**Symptoms:**

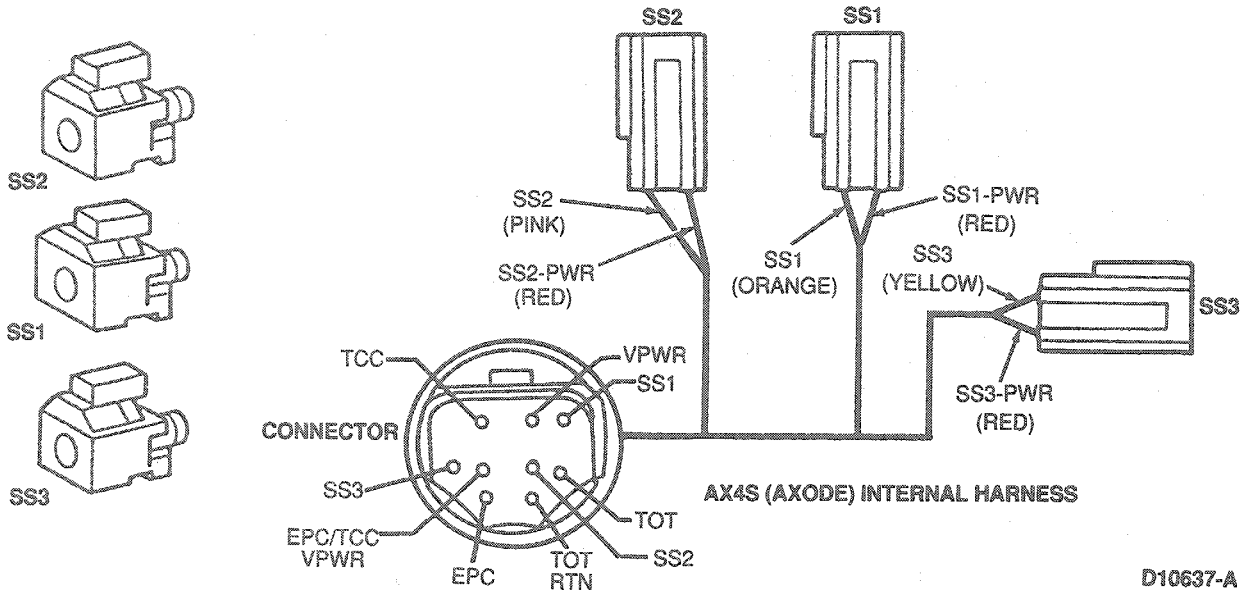
Failed "ON"—Overdrive cancel mode always indicated, no flashing for EPC circuit shorted.

Failed "OFF"—Overdrive cancel mode never indicated, no flashing for EPC circuit shorted.

DTC: 631

DESCRIPTION AND OPERATION (Continued)

- **Shift Solenoid Assemblies (SS1, SS2, SS3):**  
Three ON / OFF solenoids are used for electronic shift scheduling. The three solenoids are located in the main control assembly. The solenoids are two-way, normally open style.



**Transmission Function:**

Solenoids SS1, SS2, and SS3 provide gear selection of 1st through 4th by controlling the pressure of the three shift valves and the forward clutch control valve.

**SS1 Symptoms:**

Improper gear selection depending on failure mode and manual lever position.

Failed "ON"—2nd and 4th gear only.

Failed "OFF"—1st and 3rd gear only.

DTC's: 621, 645, 647, 648

NOTE: DTC 621 is an output circuit check, generated only by electrical conditions.

NOTE: DTC's 645 through 648 may also be generated by some non-electrical transmission hardware condition.

**SS2 Symptoms:**

Improper gear selection depending on failure mode and manual lever position.

Failed "ON"—1st and 2nd gear only.

Failed "OFF"—No 1st gear.

DTC's: 622, 645, 646

NOTE: DTC 622 is an output circuit check, generated only by electrical conditions.

NOTE: DTC's 645 and 646 may also be generated by some non-electrical transmission hardware condition.

**SS3 Symptoms:**

Improper gear selection depending on failure mode and manual lever position.

Failed "ON"—Harsh coastdown shifts.

Failed "OFF"—No 4th gear.

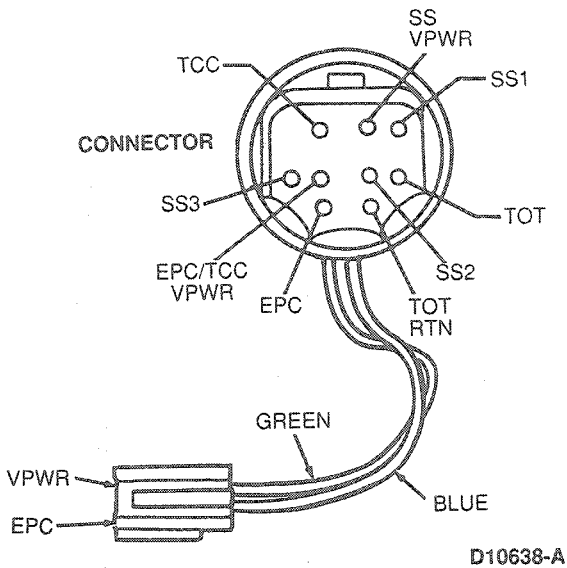
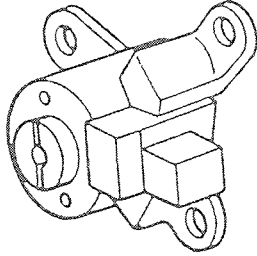
DTC's: 641, 648

NOTE: DTC 641 is an output circuit check, generated only by electrical conditions.

NOTE: DTC 648 may also be generated by some non-electrical transmission hardware condition.

## DESCRIPTION AND OPERATION (Continued)

- **Electronic Pressure Control (EPC) Solenoid:** Regulates transaxle EPC pressure. EPC pressure is used to control line pressure and backout valve function.

**Transmission Function:**

Regulates EPC pressure, backout valve control, line pressure.

**Symptoms:**

Failed "ON"—Failsafe EPC pressure (120 psi), harsh engagements, harsh shifts.

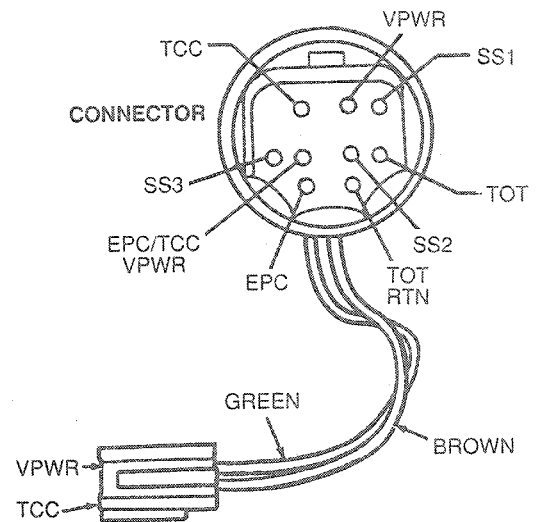
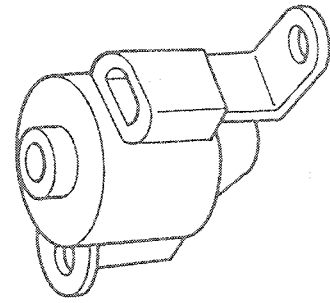
Failed "OFF"—Maximum EPC pressure (90 psi), harsh engagements, harsh shifts.

DTC's: 624, 625

NOTE: DTC's 624 and 625 are output circuit checks, generated only by electrical conditions.

- **Torque Converter Clutch (TCC) 7G136**

**Solenoid:** Is used in the transaxle control system to control the application, modulation and release of the torque converter clutch.

**Transmission Function:**

Used to engage the torque converter clutch.

**Symptoms:**

Failed "ON"—engine runs rough / vehicle shudder, engine stalls in DRIVE at low idle speeds (2nd, 3rd, or 4th gear).

Failed "OFF"—converter never engages.

DTC's: 628, 629, 652, 656

NOTE: DTC 652 is an output circuit check, generated only by electrical conditions.

NOTE: DTC's 628, 629 and 656 may also be generated by some non-electrical transmission hardware condition.



DESCRIPTION AND OPERATION (Continued)

SOLENOID APPLICATION CHART—AXODE (AX4S)

GEAR SELECTOR POSITION	POWERTRAIN CONTROL MODULE (PCM) COMMANDED GEAR	AXODE (AX4S) SOLENOIDS			
		ENG BRAKE	SS1	SS2	SS3
P/R/N	P/R/N	NO	OFF <sup>a</sup>	ON <sup>a</sup>	OFF
OD	1	NO	OFF	ON	OFF
OD	2	YES	ON	ON	OFF
OD	3	NO	OFF	OFF	ON
OD	4	YES	ON	OFF	ON
D or 3rd w/OD OFF (SHO)					
1	1	NO	OFF	ON	OFF
2	2	YES	ON	ON	OFF
3	3	YES	OFF	OFF	OFF
SHO ONLY MANUAL	2	YES	ON	ON	OFF
2 <sup>b</sup>	3 <sup>b</sup>	YES	OFF	OFF	OFF
MANUAL 1	1	YES	OFF	ON	OFF
1 <sup>b</sup>	2	YES	OFF	OFF	OFF
1	3	c	c	c	c
1	4	c	c	c	c

a Not contributing to powerflow.

b When a manual pull-in occurs above a calibrated speed the transaxle will downshift from the higher gear until the vehicle speed drops below this calibrated speed.

c Not allowed by hydraulics.

Shift Solenoid Failure "ALWAYS OFF"

Failed OFF due to PCM and /or vehicle wiring concerns, and /or solenoid electrically stuck off and /or hydraulically stuck off.

SS1 ALWAYS OFF	GEAR SELECTOR POSITION			
	OD	D or 3rd w/OD OFF (SHO)	2 SHO	1
PCM GEAR COMMANDED	ACTUAL GEAR OBTAINED			
1	1	1	1	1
2	1	1	1	1
3	3	3	3	
4	3			

SS2 ALWAYS OFF	GEAR SELECTOR POSITION			
	OD	D or 3rd w/OD OFF (SHO)	2 SHO	1
PCM GEAR COMMANDED	ACTUAL GEAR OBTAINED			
1	3	3	3	2
2	2	2	2	2
3	3	3	3	
4	4			

SS3 ALWAYS OFF	GEAR SELECTOR POSITION			
	OD	D or 3rd w/OD OFF (SHO)	2 SHO	1
PCM GEAR COMMANDED	ACTUAL GEAR OBTAINED			
1	1	1	1	1
2	2	2	2	2
3	3	3	3	
4	2			

Shift Solenoid Failure "ALWAYS ON"

Failed ON due to PCM and /or vehicle wiring concerns; solenoid electrically or mechanically stuck on.

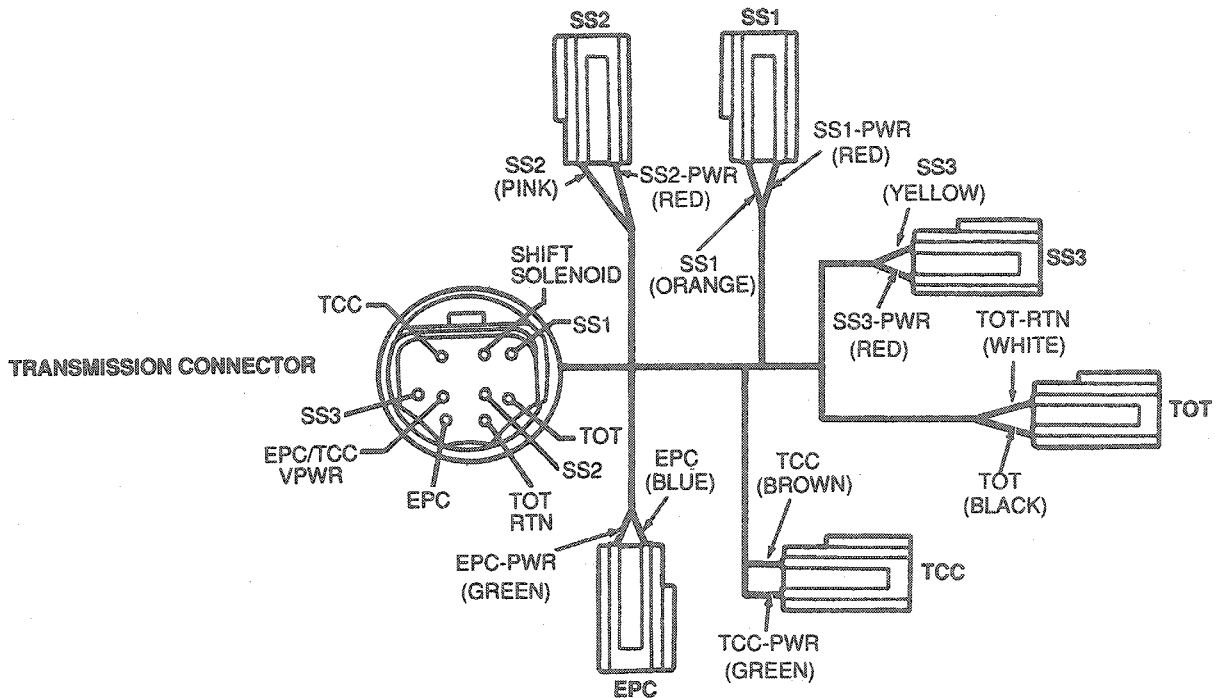
SS1 ALWAYS ON	GEAR SELECTOR POSITION			
	OD	D or 3rd w/OD OFF (SHO)	2 SHO	1
PCM GEAR COMMANDED	ACTUAL GEAR OBTAINED			
1	2	2	2	2
2	2	2	2	2
3	4	2		
4	4			

DESCRIPTION AND OPERATION (Continued)

SS2 ALWAYS ON	GEAR SELECTOR POSITION			
	OD	D or 3rd w/OD OFF (SHO)	2 SHO	1
PCM GEAR COMMANDED	ACTUAL GEAR OBTAINED			
1	1	1	1	1
2	2	2	2	2
3	1	1		
4	2			

SS3 ALWAYS ON	GEAR SELECTOR POSITION			
	OD	D or 3rd w/OD OFF (SHO)	2 SHO	1
PCM GEAR COMMANDED	ACTUAL GEAR OBTAINED			
1	1	1	1	1
2	2	2	2	2
3	3	3		
4	4			

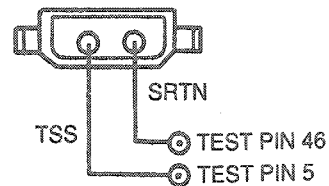
Internal Transmission Connector/Harness Diagram



D11463-A

WIRE COLOR	CIRCUIT DESCRIPTION	PCM TEST PINS
BL	EPC	38
Y	SS3	55
GR	EPC/TCC VPWR	37, 57
BR	TCC	53
W	TOT RETURN	46
BK	TOT	49
PK	SS2	52
O	SS1	51
R	VPWR	37, 57

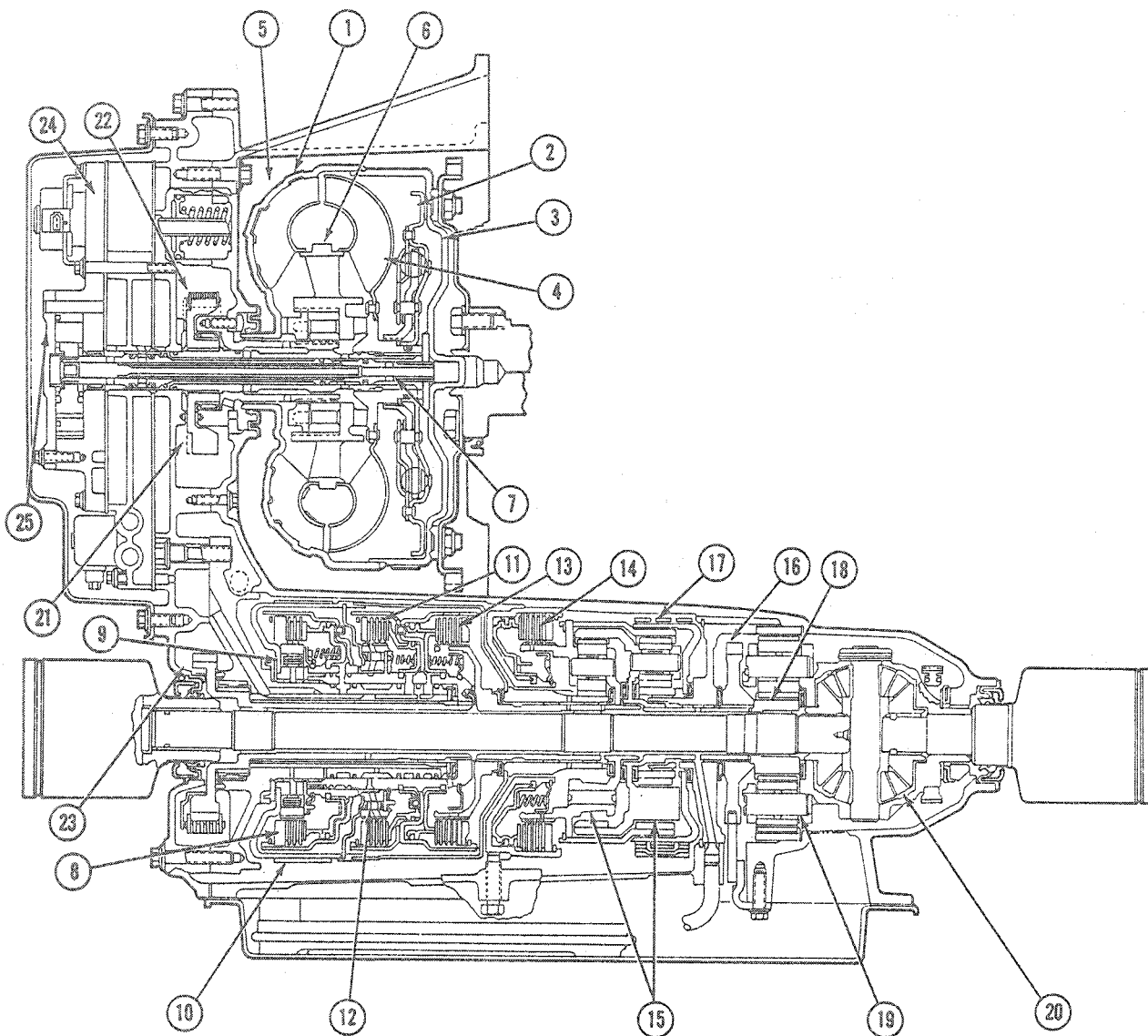
Transmission Speed Sensor Connector



D11464-A

SENSOR	PCM TEST PIN
TSS+	5
TSS-	46

## DESCRIPTION AND OPERATION (Continued)



## ITEM DESCRIPTION

1. TORQUE CONVERTER
2. TORQUE CONVERTER CLUTCH (PISTON PLATE CLUTCH AND DAMPER ASSEMBLY)
3. CONVERTER COVER
4. TURBINE
5. IMPELLER
6. REACTOR
7. OIL PUMP DRIVESHAFT
8. FORWARD CLUTCH
9. LOW ONE-WAY CLUTCH
10. OVERDRIVE BAND
11. DIRECT CLUTCH
12. DIRECT ONE-WAY CLUTCH

## ITEM DESCRIPTION

13. INTERMEDIATE CLUTCH
14. REVERSE CLUTCH
15. PLANETARY GEARS
16. PARKING GEAR
17. LOW/INTERMEDIATE BAND
18. FINAL DRIVE SUN GEAR
19. FINAL DRIVE PLANET
20. DIFFERENTIAL ASSEMBLY
21. DRIVE SPROCKET
22. DRIVE LINK ASSEMBLY (CHAIN)
23. DRIVEN SPROCKET
24. VALVE BODY (MAIN CONTROL ASSEMBLY)
25. OIL PUMP

D6168-D

**DESCRIPTION AND OPERATION (Continued)**

**Downshifts**

Under certain conditions the transaxle will downshift automatically to a lower gear range without moving the shift selector lever. There are three categories of automatic downshifts: coastdown, torque demand and forced or kickdown shifts.

**Coastdown**

The coastdown downshift occurs as the name indicates, when the vehicle is coasting down to a stop.

**Torque Demand**

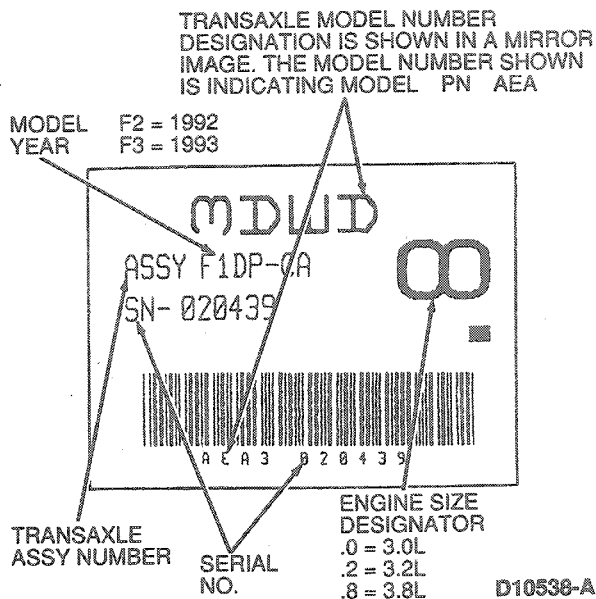
The torque demand downshift occurs (automatically) during part throttle acceleration when the demand for torque is greater than the engine can provide at that gear ratio. The transaxle will disengage the torque converter clutch to provide added acceleration, if applied.

**Kickdown**

For maximum acceleration, the driver can force a downshift by depressing the accelerator pedal to the floor. A forced downshift into second gear is possible below 88 km/h (55 mph). Below approximately 40 km/h (25 mph) a forced kickdown to first gear will occur. For all shift speeds, specifications are subject to variation due to tire size and engine calibration requirements.

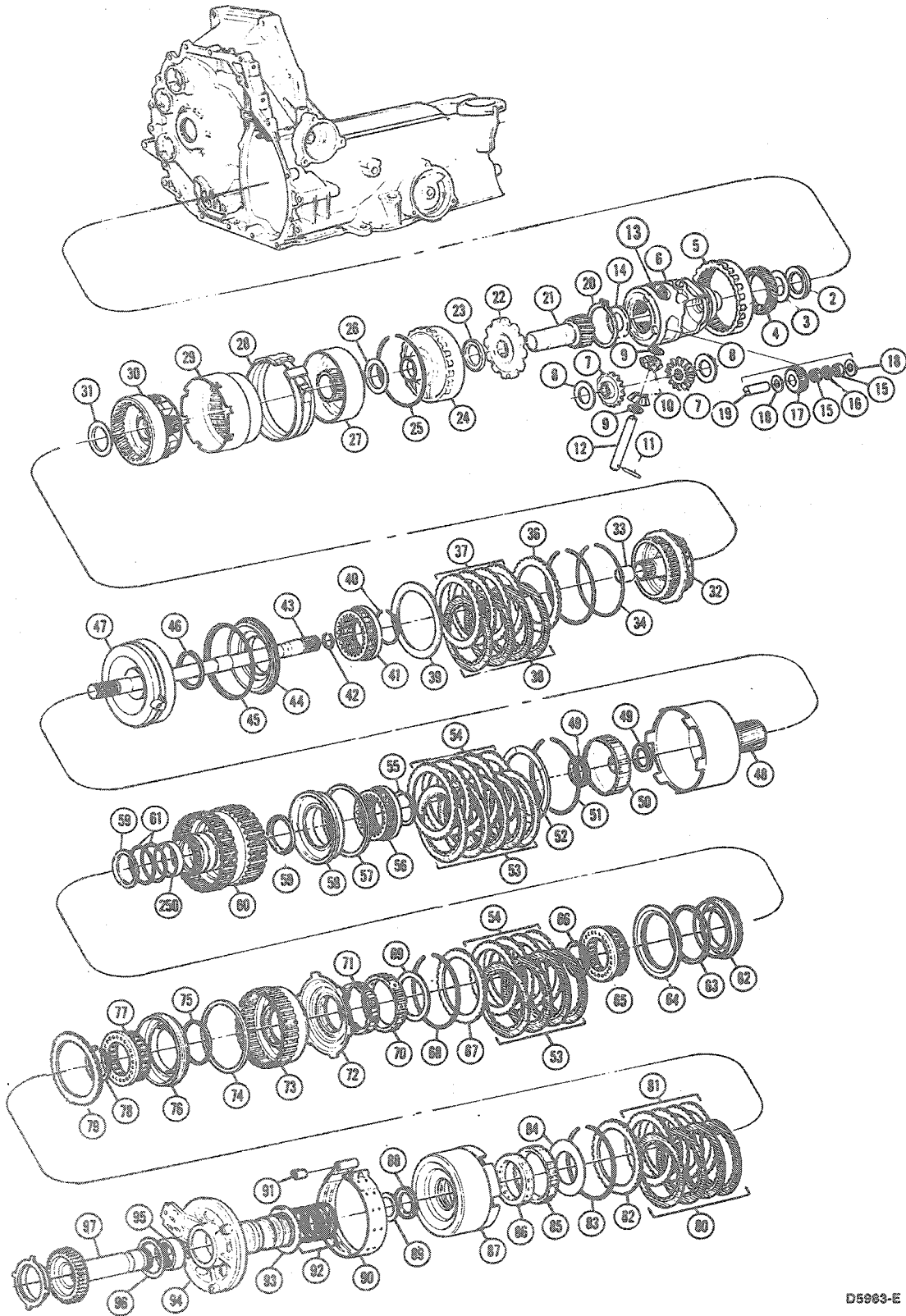
**Identification Tag**

When servicing the automatic transaxle, refer to the identification tag located on top of the converter housing.



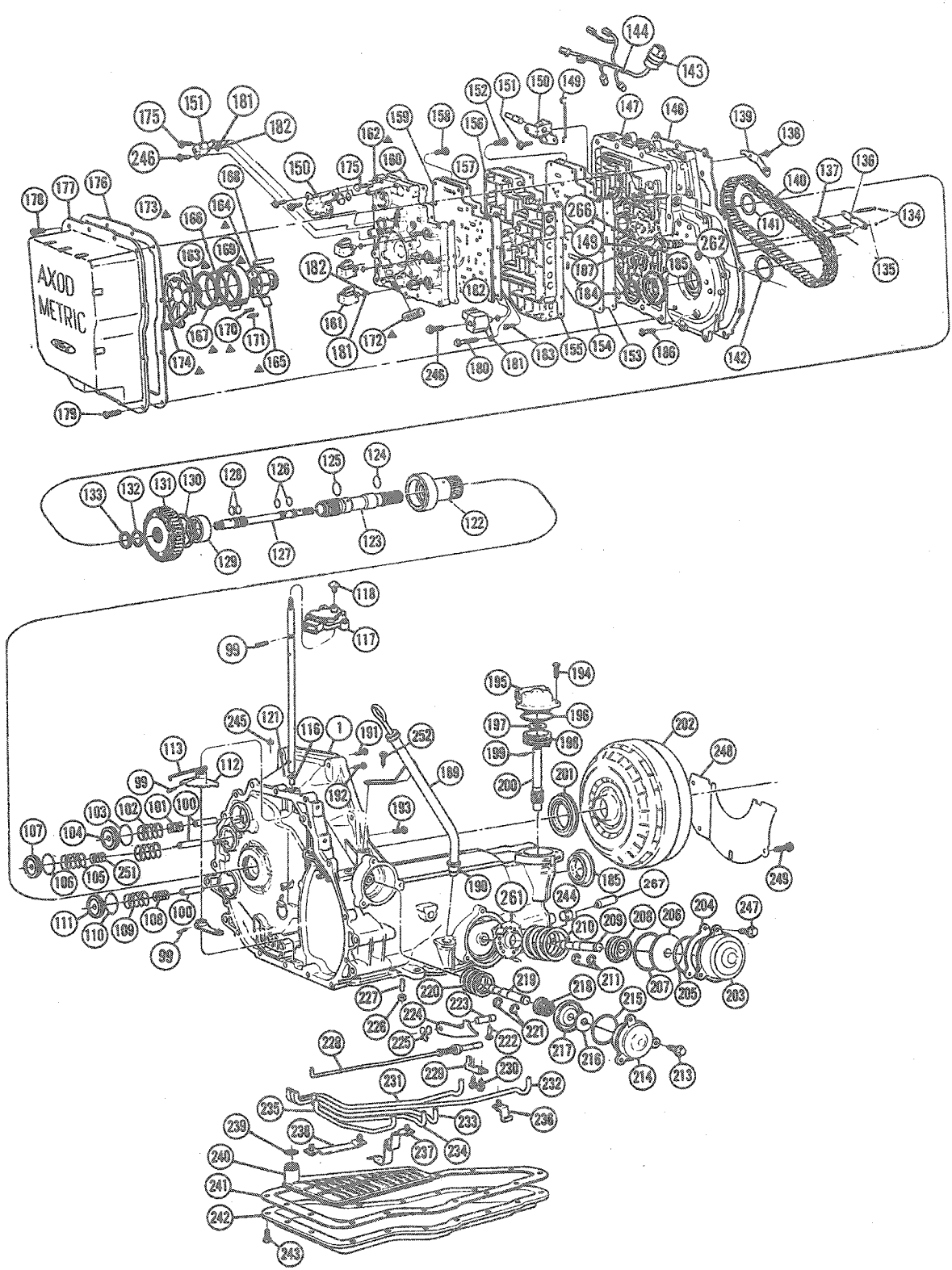
DESCRIPTION AND OPERATION (Continued)

All Except SHO



D5963-E

DESCRIPTION AND OPERATION (Continued)



D5982-H

## DESCRIPTION AND OPERATION (Continued)

Item	Part Number	Description
1	7005	Case Assy
2	7G112	Brg and Race Assy—Diff Carrier Thrust (# 19)
3	7G103	Washer—Diff Carrier Thrust (# 18)—Sel Fit
4	7G237	Gear—Governor Drive
5	7F343	Gear—Final Drive Ring
6	4205	Case—Transaxle Diff Gear
7	4236	Gear—Diff Side (2 Req'd)
8	4228	Washer—Diff Side Gear Thrust (2 Req'd)
9	4230	Washer—RR Axle Diff Pinion Thrust (2 Req'd)
10	4215	Pinion—Rear Axle Diff (2 Req'd)
11	305110-S	Pin—Coiled Spring (Retains Diff Pinion Shaft)
12	4211	Shaft—Diff Pinion
13	7F465	Gear and Diff Case Assy
14	7F404	Brg and Race Assy—Final Drive Carrier (# 17)
15	7G216	Brg—Final Drive Planet Gear Needle (168 Req'd)
16	7G217	Spacer—Final Drive Planetary Gear (4 Req'd)
17	7G214	Gear—Final Drive Planet (4 Req'd)
18	7G215	Washer—Final Drive Planetary Gear Thrust (8 Req'd)
19	7G213	Shaft—Final Drive Pinion (4 Req'd)
20	N803202-S	Ring—77.3 Ret Ext (Retain Pinion Shafts into Carrier)
21	7F342	Gear Assy—Final Drive Sun
22	7A233	Gear—Parking
23	7F405	Brg and Race Assy—Final Drive Gear Thrust (# 16)
24	7A130	Support Assy—Planet Gear
25	N803197-S	Ring—150.7 Ret Int (Used as Rear Support Ret Ring)
26	7G178	Brg and Race Assy—Sun Gear Thrust—RR (# 15)
27	7A626	Gear and Drum Assy—RR Sun
28	7D034	Band Assy—Low and Interm
29	7A153	Gear—Rear Ring
30	7D006	Gear Assy—Planet Rear
31	7G177	Brg and Race Assy—Planet Thrust—Center (# 13)
32	7A398	Planet Assy—Front
33	7G355	Bearing—Frt Plt Gr Carrier
34	7D483	Retainer—Rear Clutch Plate
35	7D483	Ring—153.9 Ret Int (Retain Rev Cl Press Plate to Cyl)—Sel Fit
36	7B066	Plate—Rev Clutch Pressure
37	7B164	Plate Assy—Rev Cl Int Spline (Friction) (4 Req'd)

(Continued)

Item	Part Number	Description
38	7B442	Plate—Rev Cl Ext Spline (Steel) (4 Req'd)
39	7E085	Spring—Rev Clutch Cushion
40	N803048-S	Ring—67.0 Ret Type Su Ext (Ret Rev Cl Spg and Ret To Cyl)
41	7G335	Supt and Spring Assy—Rev Clutch
42	N803200-S	Ring—27.0mm Ret Ext (Ret Diff Carrier Output Shaft)
43	7060	Shaft—Diff Output
44	7D402	Piston—Reverse Clutch
45	7D403	Seal—Rev Clutch Piston—Outer
46	7D404	Seal—Rev Clutch Piston—Inner
47	7F341	Cylinder—Rev Clutch
48	7D064	Gear and Shell Assy—Frt Sun
49	7C096	Brg and Race Assy—Frt Sun Gr Thrust (# 10 and # 11)—(2 Req'd)
50	7B067	Hub—Interm Clutch
51	7D483	Ring P Interm Clutch Plate (Sel Fit)
52	7B066	Plate—Clutch Pressure (Intermediate)
53	7B164	Plate Assy—Cl Int Spline (Used in Interm and Direct Clutch) as Req'd
54	7B442	Plate—Clutch Ext Spline (Used in Interm and Direct Clutch) as Req'd
55	7C122	Ring—72.0 Ret Style Su Ext (Ret Interm Cl Spg and Ret to Cyl)
56	7F222	Supt and Spring Assy—Interm Clutch
57	7F224	Seal—Interm Clutch—Outer
58	7E005	Piston—Interm Clutch
59	7F225	Seal—Interm/Dir Cl Inner (2 Req'd)
60	7G120	Cylinder Assy—Dir/Interm Clutch
61	7G102	Seal—Interm and Dir Cl Hub (2 Req'd)
61	7A262	Piston Assy—Direct Clutch
63	7A548	Seal—Direct Clutch—Outer
64	7G341	Ring—Direct Clutch (Piston)
65	7F235	Supt and Spring Assy—Direct Clutch
66	7C122	Ring—77.0 Ret Style Su Ext (Ret Dir Cl Spg and Ret to Cyl)
67	7B066	Plate—Clutch Pressure (Direct)
68	7D483	Ring—Dir Cl Plate (Sel Fit)
69	7F396	Washer—Dir Clutch Thrust (# 7)
70	7D171	Race—Dir One-Way Cl—Outer

(Continued)



## DESCRIPTION AND OPERATION (Continued)

Item	Part Number	Description
71	7A089	Clutch Assy—Direct One-Way
72	7G156	Race and Bshg Assy—Dir Owc—Inner
73	7A360	Cylinder Valve Assy—Fwd Clutch
74	7F224	Seal—Fwd Clutch—Outer
75	7A548	Seal—Fwd Clutch—Inner
76	7A262	Piston—Forward Clutch
77	7G299	Supt and Spring Assy—Fwd Clutch
78	N803053-S	Ring—85.0 Ret Type Su Ext (Ret Fwd Cl Spg and Ret to Cyl)
79	7E085	Spring—Forward Clutch Wave
80	7B164	Plate Assy—Fwd Cl Int Spline (Friction) as Req'd)
81	7B442	Plate—Fwd Cl Ext Spline (Steel) as Req'd
82	7B066	Plate—Fwd Cl Pressure
83	7D483	Ring—152.26 Ret Int (Fwd) Sel Fit (Ret Fwd Cl Press Plt)
84	7A166	Washer—Fwd Clutch Thrust (#6)
85	7D171	Race—Low Owc—Outer
86	7A089	Clutch Assy—Low One-Way
87	7L669	Drum Assy—Overdrive
88	7F240	Brg and Race Assy—Dir Cl Hub (#9)
89	7G273	Washer—Driven Sprocket Supt Thrust—RR (#8) Sel Fit
90	7F196	Band Assy—Overdrive
91	7D430	Retainer—O/D Band
92	7D019	Seal—Fwd Clutch Cyl (5 Req'd)
93	7D014	Washer—Support Thrust—Frt (#5) Sel Fit
94	7G166	Support Assy—Driven Sprocket
95	7G247	Brg Assy—Driven Sprocket
96	7G115	Washer—Driven Sprocket Thrust (#4)
97	7G132	Sprocket Assy—Driven
98	7A256	Lever Assy—Manual Control
99	7G100	Pin—4mm X 28mm Spg Coiled Std (2-Used as Main Cntl Shft Pin)
100	7G094	Shaft—Shift Accum Piston (3 Req'd)
101	7G326	Spring—1-2 Shift Accum—Inner
102	7G267	Spring—1-2 Shift Accum—Outer
103	7G095	Seal—1-2 Shift Accum—Piston
104	7G133	Piston—1-2 Shift Accum
105	7G266	Spring—3-4 Shift Accum

(Continued)

Item	Part Number	Description
106	7F248	Seal—3-4 Shift Accum—Piston
107	7F287	Piston—3-4 Shift Accum
108	7G301	Spring—Drive Shift Accum—Inner
109	7G300	Spring Drive Shift Accum—Outer
110	7G275	Seal—Drive Shift Accum—Piston
111	7G275	Piston—Drive Shift Accum
112	7A115	Lever Assy—Manual Detent
113	7N049	Rod—Man Control Valve Actu
114	7C493	Shaft—Manual Control
115	7G100	Pin—Shaft Ret (Used as Man Lvr Shaft Ret Pin)
116	7F337	Seal Assy—Man Control Shaft
117	7A247	Sensor Assy—Main Lever Position
118	N804196-S100	Bolt—M6—1.0 X 28 Hex Flg Hd (2-Neut Start Switch to Case)
119	N606024-S36	Bolt—M6—1.0 X 50 Hex Flg Hd (Att Chain Cover to Case)
120	390685-S2	Plug—1/8-27 Hex Hd Spd Fil (5 Req'd—(3) in Chain Cover, (2) in Pump Body)
121	7B148	Tag—Identification
122	7A108	Support Assy—Stator
123	7F213	Shaft—Turbine
124	87022-S94	Seal—O-Ring (Frt Turbine Shaft to Drive Sprkt)
125	7G091	Seal—Turbine Shaft—Rear
126	7G093	Seal—Pump Shaft—Rear (2 Req'd)
127	7B328	Shaft Assy—Oil Pump Drive
128	7G092	Seal—Pump Shaft—Front
129	7G233	Brg Assy—Drive Sprocket
130	7G099	Washer—Drive Sprocket Thrust (#2)
131	7G129	Sprocket Assy—Drive
132	N803178-S	Ring—26.36 Ret Sty Su Ext (Ret Turb Shaft to Drive Sprkt)
133	7G090	Seal—Turbine Shaft—Front (Metal)
134	7G089	Collar—Oil Level Thermo Retain
135	N804184-S	Pin—4mm X 22 Coiled (Locating By-Metal Element (3) Reg)
136	7G191	Transmission Oil Temperature (TOT) Sensor
137	7G190	Plate—Oil Level Thermostat—Valve
138	N605771-S47	Bolt—M6 X 1.0 14 Hex Flg Hd (Att Det Spring Assy to Chain Cover)
139	7E332	Spring Assy—Main Vlv Detent

(Continued)

## DESCRIPTION AND OPERATION (Continued)

Item	Part Number	Description
140	7G249	Chain Assy—Drive
141	7G099	Washer—Drive Sprocket Thrust (# 1)
142	7G096	Washer—Chain Cover Thrust (#3)
143	7G276	Bulkhead Assy—Wiring Conn
144	N802927-S	Seal—17.12 X 2.62 O-Ring (Wire Harness to Case)
145	7034	Vent Assy—Case
146	7G303	Gasket—Chain Cover
147	7G188	Cover Assy—Chain
148	7D273	Conn Assy—5/16 Tube X 1/4 Ex Pipe Plug (2 Req'd)
149	7M101	Sensor Assy—Transmission Speed
150	7H144	Solenoid Assy—Pressure Reg
151	7G136	Solenoid Assy—By-Pass Clutch Control
152	N804129-S	Screw—M6 X 1.0 X 14 Pan Hd (2-Att Vlv Bdy Sep Plt to Vlv Bdy)
153	7C155	Gasket—Control Assy
154	7A008	Plate Assy—Valve Body Sep
155	7D100	Gasket—Cntl Vlv Body Sep Plate
156	7A100	Control Assy—Main
157	7A136	Gasket—Pump Assy
158	N605771-S	Screw—M6 X 1.0 X 14 Pan Hd Torx T-30 (2—Pump Sep Plate to Pump Body)
159	7A142	Plate—Oil Pump Body Sep
160	7G331	Gasket—Oil Pump Body Sep Plate
161	7G484	Solenoid Assy—Switch Control (3 Req'd)
162	7A104	Body Brg and Seal Assy—Oil Pump
163	7G287	Ring—Oil Pump Vane Support (2 Req'd)
164	7A146	Rotor—Oil Pump
165	7G286	Vane—Oil Pump (7 Req'd)
166	7G281	Seal—Oil Pump Bore Ring Side
167	7G282	Support—Oil Pump Bore Ring Side Seal
168	N803499-S	Pin—8mm X 37.7 Straight Hrdn
169	7R194	Ring—Oil Pump Body
170	7G284	Support—Oil Pump Bore Ring Radial Seal
171	7G283	Seal—Oil Pump Bore Ring Radial
172	7G285	Spring—Oil Pump Bore Ring
173	7G187	Cover and Sleeve Assy—Oil Pump

(Continued)

Item	Part Number	Description
174	N605892-S2	Bolt—M6 X 1.0 X 20 Hex Fig Pit (6 Req'd) Att Pump Cover to Pump Body
175	N606026-S	Bolt—Hex Fig Hd (22-Att Pump Body and Main Contr to Chain Cover)
176	7F396	Gasket—Main Control Cover
177	7G004	Cover—Main Control
178	N605789-S2	Bolt—M8-35.0 Hex Fig Hd (11-Att Chain Cover to Case)
179	N605903-S2	Bolt—M8-1.25 X 25 Hex Fig Hd (12-Att Main Ctl Cvr to Chn Cvr.)
180	N606022-S	Bolt—M6-1.00 X 40 Hex Fig Hd (3-Att Vlv Bdy to Chn Cvr and Sol Assy)
181	N605861-S	Seal—15.6 X 1.78 O-Ring
182	N805860-S	Seal—6.07 X 1.79 O-Ring (Bypass Solenoid Seal)
183	7G308	Screen Assy—Bypass Clutch Solenoid
184	N804139-S	Circle Clip—Output Shaft Retainer (Retains CV Joint)
185	F1177	Seal Assy—Diff (2 Req'd)
186	N606042-S100	Bolt—M8-1.25 X 45 Hex Fig Hd (2-Att Vlv Bdy to Chn Cvr and Sol Assy)
187	N803807-S	Bolt—M10-1.5- X 45 Hex (Att Chain Cover to Driven Support)
188	7A020	Indicator Assy—Oil Level
189	7A228	Tube Assy—Oil Filter
190	7N243	Grommet—Oil Filter
191	N605789-S2	Bolt—M10-1.50 X 45 Hex (Att Chain Cover to Driven Support)
192	N803727-S36	Bolt—M6 X 1.00 X 30 Hex Fig Hd (4-Att Case to Chain Cover)
193	N802996-S	Screw—M6-1.0 X 20 Pan Hd (6-Att Case to Stator Support)
194	N605892-S2	Bolt—(2-Governor Cover to Case)
195	7A301	Cover—Governor
196	N803201-S	Seal—63.2 X 1.80 O-Ring (Used as Gov Cover Seal)
197	7G173	Brg and Race Assy—Gov Thrust
198	17285	Gear—Speedo Drive (7TLH)
199	N804123-S2	Pin—3.3 X 22 Spg Slot Hvy (Used as Speedo Gear Drive Pin)
200	7G176	Gear and Shaft Assy—Gov Driven
201	7F401	Seal Assy—Conv Imp Hub
202	7902	Converter Assy—10-1/4
203	7D027	Cover—Low/Interm Band Servo
204	7D026	Gasket—Low/Interm Band Servo

(Continued)

## DESCRIPTION AND OPERATION (Continued)

Item	Part Number	Description
205	7D040	Seal—Low/Interm Servo Piston Cover
206	7D022	Piston—Low/Interm Band Servo
207	7D025	Seal—Low/Interm Band Servo Piston
208	7G150	Retainer and Spring Assy—Low/Interm Servo
209	7D190	Rod—Low/Interm Servo Piston (Sel Fit)
210	7D028	Spring—Low/Interm Servo Piston
211	N804195-S6	Ring—1mm Ret Type Rb Ext (2-Att L/I Servo Piston)
212	7G085	Seal Assy—PR Lube Transfer Tube
213	N605892-S2	Bolt—(3-Att O/D Servo Cover to Case)
214	7D027	Cover—O/D Band Servo
215	7D024	Seal—O.D Servo Cover
216	7G280	Retainer—O/D Servo Piston
217	7F200	Piston and Seal Assy—O/D Servo
218	7G279	Retainer and Cushion Spring Assy—O/D Servo
219	7F203	Rod—O/D Servo Piston (Sel. Fit)
220	7F201	Spring—O/D Servo Return
221	97413-S	Ring—Ret. Ext Rod O/D Servo (2 Used on O/D Servo Rod)
222	7G100	Pin—Shaft Retainer (Used as Park Pawl Shaft Return Pin)
223	7D071	Shaft—Park Pawl
224	7A441	Pawl—Parking Brake
225	7D070	Spring—Park Pawl Return
226	N804647-S	Screw—M12 X 1.75mm Set Hd. Scket. (Rev. Cl. Assy Locator Bit.)
227	N620015-S	Nut—M12 X 1.75 Hex (Rev. Cl. Assy Locator Bolt)
228	7A232	Rod Assy—Park Pawl Actuating
229	7G101	Abutment—Park Pawl Actuating
230	N605787-S52	Bolt—M8-1.25 X 25 Hex Fig. Hd. (2-Att. Abutment Assy to Case)
231	7G084	Tube—Rear Lube Oil Transfer
232	7G086	Tube—Differential Lube
233	7G087	Tube—Servo Apply Oil Transfer
234	7G088	Tube—Servo Rel. Oil Transfer
235	7G199	Tube—Rev. Cl. Apply Oil Transfer

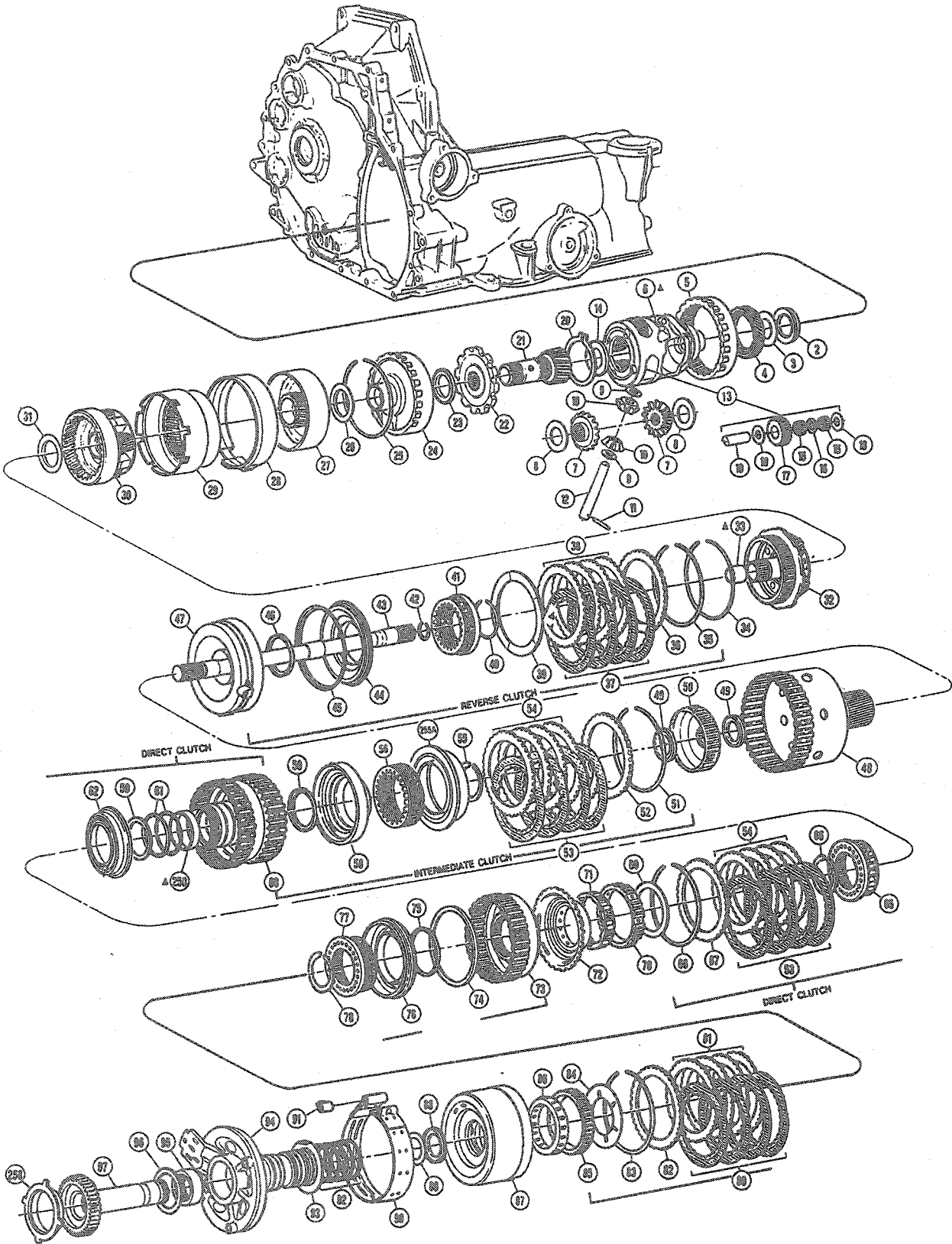
Item	Part Number	Description
236	7G353	Brkt. Assy—Tube Support—Gov. Feed
237	7G353	Brkt. Assy—Tube Support—Rev. Clutch
238	7G353	Brkt. Assy—Tube Support Main
239	7A469	Seal—(Used on Oil Filter)
240	7A098	Filter Assy—Oil
241	7A191	Gasket—Oil Pan
242	7A194	Pan Oil
243	N605903-S2	Bolt—M8-1/25 X 14 Hex Fig. Hd. (17-Att Oil Pan to Case)
244	N802947-S	Plug—13.9mm Cup
245	373907-S2	Nut—1/4 Spring (Retain I.D. Tag)
246	N605771-S2	Bolt—M6 X 1.0 X 14 Hex Fig. Hd. (Att Solenoid Assy to Viv. Body)
247	N605892-S2	Bolt—(3-Att L/I Servo Cover to Case)
248	7986	Cover—Conv. Hsg. Lower
249	N605771-S	Bolt—(Att. Conv. Hsg. Cur. to Case)
250	7G123	Bushing—Dir/Interm. Clutch Cylinder
251	7F288	Spring—3-4 Shift Accum-Inner
252	N605890-S2	Bolt—M6—1.0 X 14 Hex Fig. Htd. (Att Filter Tube to Case)
253	N803727-S	Bolt—M6—1.0 X 28 (2 Att—Oil Pump Assy to Main Control)
254	N80551-S101	Stud—M8—1.25—1.25 X 7.96 Hex Hd. Shoulder
255	7E085	Spring Fwd Clutch Wave (3.8L only)
256	7L027	Ceramic Magnet Case
257	7G358	Spring 1-2 Shift Accum Center (3.8L only)
258	7H150	Wheel-Driven Sprocket Speed Sensor
259	7H162	Screen—Case Intermediate Circuit
260	7H141	Sensor—Oil Temperature
261	7G151	Retainer—L/I Servo Return Spring
262	N805862-S100	Seal—14.0 X 1.78 O-Ring (2 Req'd)
263	N805863-S	Seal—25.12 X 1.78 O-Ring
264	N805864-S	Seal—12.42 X 1.78 O-Ring
265	N806238	Ret—Clip Trans Cooler Tube
266	N80262-S101	Bolt—M6—1.0 X 20 Hex Fig Hd (ATT 7M101 To Chain Cover)
267	N806944-S1036	Stud—M10—1.5 X 60.5

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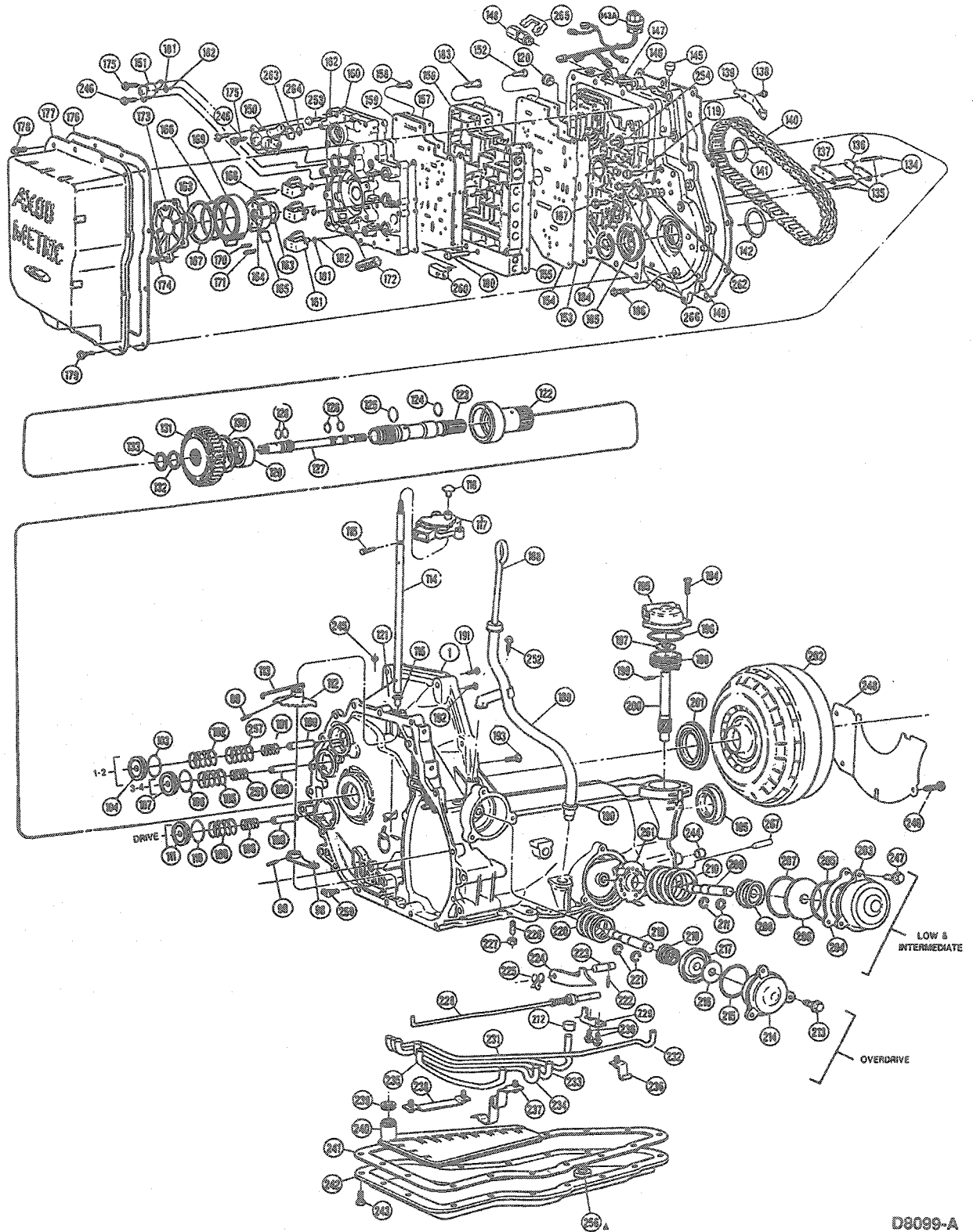
DESCRIPTION AND OPERATION (Continued)

SHO Only



D10661-A

DESCRIPTION AND OPERATION (Continued)



D8099-A

## DESCRIPTION AND OPERATION (Continued)

Item	Part Number	Description
1	7005	Case Assy
2	7G112	Brg and Race Assy—Diff Carrier Thrust (# 19)
3	7G103	Washer—Diff Carrier Thrust (# 18)—Sel Fit
4	7G237	Gear—Governor Drive
5	7G334	Gear—Final Drive Ring
6	4205	Case—Transaxle Diff Gear
7	4236	Gear—Diff Side (2 Req'd)
8	4228	Washer—Diff Side Gear Thrust (2 Req'd)
9	4230	Washer—RR Axle Diff Pinion Thrust (2 Req'd)
10	4215	Pinion—Rear Axle Diff (2 Req'd)
11	67847-S	Pin—Coiled Spring (Retains Diff Pinion Shaft)
12	4211	Shaft—Diff Pinion
13	4207	Gear and Diff Case Assy
14	7G107	Brg and Race Assy—Final Drive Carrier (# 17)
15	7G216	Brg—Final Drive Planet Gear Needle (168 Req'd)
16	7G217	Spacer—Final Drive Planetary Gear (4 Req'd)
17	7G214	Gear—Final Drive Planet (4 Req'd)
18	7G215	Washer—Final Drive Planetary Gear Thrust (8 Req'd)
19	7G213	Shaft—Final Drive Pinion (4 Req'd)
20	N803202-S	Ring—77.3 Ret Ext (Retain Pinion Shafts into Carrier)
21	7G193	Gear Assy—Final Drive Sun
22	7A233	Gear—Parking
23	7G106	Brg and Race Assy—Final Drive Gear Thrust (# 16)
24	7A130	Support Assy—Planet Rear
25	N803197-S	Ring—150.7 Ret Int (Used as Rear Support Ret Ring)
26	7G178	Brg and Race Assy—Sun Gear Thrust—RR (# 15)
27	7B459	Gear and Drum Assy—RR Sun
28	7D034	Band Assy—Low and Interm
29	7G211	Gear—Rear Ring
30	7G224	Gear Assy—Planet Rear
31	7G177	Brg and Race Assy—Planet Thrust—Center (# 13)
32	7G218	Planet Assy—Front
33	7G355	Bearing—Assy Frt Plt Gr Carrier
34	7D483	Retainer—Rear Clutch Plate (Ret Front Planet Assy)
35	N803049-52S	Ring—153.9 Ret Int (Retain Rev Cl Press Plate to Cyl)—Sel Fit
36	7D406	Plate—Rev Clutch Pressure

(Continued)

Item	Part Number	Description
37	7E312	Plate Assy—Rev Cl Int Spline (Friction) (4 Req'd)
38	7E315	Plate—Rev Cl Ext Spline (Steel) (4 Req'd)
39	7F154	Spring—Rev Clutch Cushion
40	N803048-S	Ring—67.0 Ret Type Su Ext (Ret Rev Cl Spg and Ret To Cyl)
41	7G335	Supt and Spring Assy—Rev Clutch
42	N803200-S	Ring—27.0mm Ret Ext (Ret Diff Carrier Output Shaft)
43	7G251	Shaft—Diff Output
44	7D402	Piston—Reverse Clutch
45	7D403	Seal—Rev Clutch Piston—Outer
46	7D404	Seal—Rev Clutch Piston—Inner
47	7F341	Cylinder—Rev Clutch
48	7G304	Gear and Shell Assy—Frt Sun
49	7G239	Brg and Race Assy—Frt Sun Gr Thrust (# 10 and # 11)—(2 Req'd)
50	7F221	Hub—Interm Clutch
51	7G346	Ring—Interm Clutch Plate (Sel Fit)
52	7B455	Plate—Clutch Pressure (Interm)
53	7B164	Plate Assy—Cl Int Spline (Used in Interm and Direct Clutch) as Req'd (Friction)
54	7E314	Plate—Clutch Ext Spline (Used in Interm and Direct Clutch) as Req'd (Steel)
55	N803175-S	Ring—72.0 Ret Style Su Ext (Ret Interm Cl Spg and Ret to Cyl)
56	7G297	Supt and Spring Assy—Interm Clutch
57		
58	7E005	Piston—Interm Clutch
59	7G240	Seal—Interm/Dir Cl Inner (2 Req'd)
60	7H069	Cylinder and Valve Assy—Dir/Interm Clutch
61	7G102	Seal—Interm and Dir Cl Hub (2 Req'd)
62	7F254	Piston Assy—Direct Clutch
63		
64		
65	7G298	Supt and Spring Assy—Direct Clutch
66	N803176-S	Ring—77.0 Ret Style Su Ext (Ret Dir Cl Spg and Ret to Cyl)
67	7B455	Plate—Clutch Pressure (Direct)
68	7G347 7G367	Ring—Dir Cl Plate (Sel Fit) (Ret Dir Cl Press Plate to Cyl) Ring—152.26 Ret Int

(Continued)

## DESCRIPTION AND OPERATION (Continued)

Item	Part Number	Description
69	7G116	Washer—Dir Clutch Thrust (#7)
70	7G125	Race—Dir One-Way Cl—Outer
71	7G158	Clutch Assy—Direct One-Way
72	7G156	Race and Bshg Assy—Dir Owc—Inner
73	7H011	Cylinder and Valve Assy—Fwd Clutch
74	7G243	Seal—Fwd Clutch—Outer
75	7G242	Seal—Fwd Clutch—Inner
76	7L140	Piston—Forward Clutch
77	7G299	Supt and Spring Assy—Fwd Clutch
78	N803053-S	Ring—85.0 Ret Type Su Ext (Ret Fwd Cl Spg and Ret to Cyl)
79	—	—
80	7E311	Plate Assy—Fwd Cl Int Spline (Friction) as Req'd
81	7E314	Plate—Fwd Cl Ext Spline (Steel) as Req'd
82	7B066	Plate—Fwd Cl Pressure
83	7G367	Ring—152.26 Ret Int (Fwd) Sel Fit (Ret Fwd Cl Press Plt)
84	7D076	Washer—Fwd Clutch Thrust (#6)
85	7G205	Race—Low Owc—Outer
86	7G206	Clutch Assy—Low One-Way
87	7G207	Drum Assy—Overdrive
88	7G128	Brg and Race Assy—Dir Cl Hub (#9)
89	7G273	Washer—Driven Sprocket Supt Thrust—RR (#8) Sel Fit
90	7F196	Band Assy—Overdrive
91	7G343	Retainer—O/D Band
92	7D019	Seal—Fwd Clutch Cyl (5 Req'd)
93	7D014	Washer—Support Thrust—Frt (#5) Sel Fit
94	7G166	Support Assy—Driven Sprocket
95	7G247	Brg Assy—Driven Sprocket
96	7G115	Washer—Driven Sprocket Thrust (#4)
97	7G405	Sprocket Wheel and Bearing Assy—Driven
98	7A256	Lever Assy—Manual Control
99	7G100	Pin—4mm X 28mm Spg Coiled Std (2-Used as Main Cntl Shft Pin)
100	7G094	Shaft—Shift Accum Piston (3 Req'd)
101	7G326	Spring—1-2 Shift Accum—Inner
102	7G267	Spring—1-2 Shift Accum—Outer

(Continued)

Item	Part Number	Description
103	7G095	Seal—1-2 Shift Accum—Piston
104	7G133	Piston—1-2 Shift Accum
105	7G266	Spring—3-4 Shift Accum
106	7F248	Seal—3-4 Shift Accum—Piston
107	7F246	Piston—3-4 Shift Accum
108	7G301	Spring—Drive Shift Accum—Inner
109	7G300	Spring Drive Shift Accum—Outer
110	7G275	Seal—Drive Shift Accum—Piston
111	7G274	Piston—Drive Shift Accum
112	7A115	Lever Assy—Manual Detent
113	7N049	Rod—Man Control Valve Actuator
114	7C493	Shaft—Manual Control
115	7G100	Pin—4mm X 28mm Spg Coiled Std (Main Lvr Shaft Ret Pin)—(2 Req'd)
116	7F337	Seal Assy—Man Control Shaft
117	7F293	Sensor Assy—Main Lever Position
118	N804196-S101	Bolt—M6—1.0 X 28 Hex Fig Hd (Sensor Assy to Case)
119	N606024-S2536	Bolt—M6—1.0 X 50 Hex Fig Hd (Att Chain Cover to Case)
120	390685-S2	Plug—1/8-27 Hex Hd Spcl Fil (5 Req'd—(3) in Chain Cover, (2) in Pump Body)
121	7B148	Tag—Identification
122	7N825	Support Assy—Stator
123	7F213	Shaft—Turbine
124	87022-S94	Seal—O-Ring (Frt Turbine Shaft to Seal)
125	7G091	Seal—Turbine Shaft—Rear
126	7G093	Seal—Pump Shaft—Rear (2 Req'd)
127	7R190	Shaft Assy—Oil Pump Drive
128	7G092	Seal—Pump Shaft—Front
129	7G233	Brg Assy—Drive Sprocket
130	7G099	Washer—Drive Sprocket Thrust (#2)
131	7G129	Sprocket Assy—Drive
132	N803178-S	Ring—26.36 Ret Sty Su Ext (Ret Turb Shaft to Drive Sprkt)
133	7G090	Seal—Turbine Shaft—Front (Metal)
134	7G089	Collar—Oil Level Thermo Retain
135	N804184-S	Pin—4mm X 22 Coiled (Locating By-Metal Element (3) Reg)
136	7G191	Element—Oil Level Thermostatic
137	7G190	Plate—Oil Level Thermostat—Valve

(Continued)



## DESCRIPTION AND OPERATION (Continued)

Item	Part Number	Description
138	N605890-S2	Bolt—M6 X 1.0—14 Hex Flg Hd (Att Det Spring Assy to Chain Cover)
139	7E332	Spring Assy—Main Vlv Detent
140	7G249	Chain Assy—Drive
141	7G099	Washer—Drive Sprocket Thrust (#1)
142	7G096	Washer—Chain Cover Thrust (#3)
143	—	—
143A	7G276	Bulkhead Assy—Wiring Conn (Top)
144	—	—
145	7034	Vent Assy—Case
146	7G303	Gasket—Chain Cover
147	7G188	Cover Assy—Chain
148	N806239-S101	Conn Assy—5/16 Tube X 1/4 Ex Pipe Push Connect (2 Req'd)
149	7M101	Sensor Assy—Transmission Speed
150	7H144	Solenoid Assy—Pressure Reg
151	7G136	Solenoid Assy—By-Pass Clutch Control
152	N804129-S	Screw—M6 X 1.0 X 14 Pan Hd (2-Att Vlv Bdy Sep Plt to Vlv Bdy)
153	7C155	Gasket—Control Assy
154	7G348	Plate Assy—Valve Body Sep
155	7D100	Gasket—Cntl Vlv Body Sep Plate
156	7A100	Control Assy—Main
157	7A136	Gasket—Pump Assy
158	N804129-S	Screw—M6 X 1.0 X 14 Pan Hd Torx T-30 (2—Pump Sep Plate to Pump Body)
159	7A142	Plate—Oil Pump Body Sep
160	7G331	Gasket—Oil Pump Body Sep Plate
161	7G484	Solenoid Assy—Shift Control (3 Req'd)
162	7A104	Body Brg and Seal Assy—Oil Pump
163	7G287	Ring—Oil Pump Vane Support (2 Req'd)
164	7A146	Rotor—Oil Pump
165	7G286	Vane—Oil Pump (7 Req'd)
166	7G281	Seal—Oil Pump Bore Ring Side
167	7G282	Support—Oil Pump Bore Ring Side Seal
168	N803499-S	Pin—8mm X 37.7 Straight Hrdn
169	7R194	Ring—Oil Pump Body
170	7G284	Support—Oil Pump Bore Ring Radial Seal

(Continued)

Item	Part Number	Description
171	7G283	Seal—Oil Pump Bore Ring Radial
172	7G285	Spring—Oil Pump Bore Ring
173	7G187	Cover and Sleeve Assy—Oil Pump
174	N605892-S2	Bolt—M6 X 1.0 X 20 Hex Flg Plt (6 Req'd) Att Pump Cover to Pump Body
175	N606026-S	Bolt—Hex Flg Hd (22-Att Pump Body and Main Contr to Chain Cover)
176	7F396	Gasket—Main Control Cover
177	7F395	Cover—Main Control
178	N605789-S36	Bolt—M8 x 1.25 x 35.0 Hex Flg Hd (12-Att Chain Cover to Case)
179	N605903-S101	Bolt—M8-1.25 X 14 Hex Flg Hd (12-Att Main Ctl Cvr to Chn Cvr)
180	N606022-S	Bolt—M6—1.0 X 40 Hex Flg Hd (3-Att Vlv Bdy to Chn Cvr)
181	N805861-S	Seal—15.6 X 1.78 O-Ring
182	N805860-S	Seal—6.07 X 1.79 O-Ring
183	7G308	Screen Assy—Bypass Clutch Solenoid (2 Req'd)
184	N804139-ST	Circle Clip—Output Shaft Retainer (Retains CV Joint)
185	1177	Seal Assy—Diff (2 Req'd)
186	N606042-S100	Bolt—M8—1.25 X 45 Hex Flg Hd (2-Att Chain Cover to Driven Supt)
187	N803807-S	Bolt—M10—1.5- X 43 Hex (Att Chain Cover to Driven Support)
188	7A020	Indicator Assy—Oil Level
189	7A228	Tube Assy—Oil Filler
190	7N243	Grommet—Oil Filler
191	N605789-S2	Bolt—M8 X 35.0 Hex Flg Hd (5-Att Case to Chain Cover)
192	N803727-S36	Bolt—M6 X 1.00 X 28 Hex Flg Hd (4-Att Case to Chain Cover)
193	N802996-S	Screw—M6-1.0 X 20 Pan Hd (6-Att Case to Stator Support)
194	N605892-S36	Bolt—(2-Governor Cover to Case)
195	7A301	Cover—Governor
196	N803201-S	Seal—63.2 X 1.80 O-Ring (Used as Gov Cover Seal)
197	7G173	Brg and Race Assy—Gov Thrust
198	17285	Gear—Speedo Drive (7TLH)
199	N804123-S2	Pin—3.3 X 22 Spg Slot Hvy (Used as Speedo Gear Drive Pin)
200	7G176	Gear and Shaft Assy—Gov Driven
201	7F401	Seal Assy—Conv Imp Hub
202	7902	Converter Assy—10-1/4

(Continued)

## DESCRIPTION AND OPERATION (Continued)

Item	Part Number	Description
203	7D027	Cover—Low / Interm Band Servo
204	7D026	Gasket—Low / Interm Band Servo
205	7F427	Seal—Low / Interm Servo Piston Cover
206	7D022	Piston—Low / Interm Band Servo
207	7G152	Seal—Low / Interm Band Servo Piston
208	7G150	Retainer and Spring Assy—Low / Interm Servo
209	7D023	Rod—Low / Interm Servo Piston (Sel Fit)
210	7D028	Spring—Low / Interm Servo Piston
211	N804195-S	Ring—11mm Ret Type Rb Ext (2-Att L / I Servo Piston)
212	7G085	Seal Assy—RR Lube Transfer Tube
213	N605892-S36	Bolt—(3-Att O / D Servo Cover to Case)
214	7F204	Cover—O / D Band Servo
215	7G185	Seal—O / D Servo Cover
216	7G280	Retainer—O / D Servo Piston
217	7G244	Piston and Seal Assy—O / D Servo
218	7G279	Retainer and Cushion Spring Assy—O / D Servo
219	7F203	Rod—O / D Servo Piston (Sel Fit)
220	7F201	Spring—O / D Servo Return
221	97413-S	Ring—Ret Ext Rod O / D Servo (2 Used on O / D Servo Rod)
222	7G100	Pin—Shaft Retainer (Used as Park Pawl Shaft Return Pin)
223	7D071	Shaft—Park Pawl
224	7A441	Pawl—Parking Brake
225	7D070	Spring—Park Pawl Return
226	N804647-S	Screw—M12 X 1.75mm—51.0 Set Hd. Scket. (Rev Cl Assy Locator Bit)
227	N620015-S	Nut—M12 X 1.75 Hex (Rev Cl Assy Locator Bolt)
228	7D410	Rod Assy—Park Pawl Actuating
229	7G101	Abutment—Park Pawl Actuating
230	N605787-S	Bolt—M8-1.25 X 25 Hex Flg Hd (2-Att. Abutment Assy to Case)
231	7G084	Tube—Rear Lube Oil Transfer
232	7G086	Tube—Gov Feed Oil Transfer
233	7G087	Tube—Servo Apply Oil Transfer

(Continued)

Item	Part Number	Description
234	7G088	Tube—Servo Rel Oil Transfer
235	7G199	Tube—Rev Cl Apply Oil Transfer
236	7G353	Brkt Assy—Tube Support—Gov Feed
237	7G353	Brkt Assy—Tube Support—Rev Clutch
238	7G353	Brkt. Assy—Tube Support Main
239	7Z302	Seal—(Used on Oil Filter)
240	7G186	Filter Assy—Oil
241	7A191	Gasket—Oil Pan
242	7A194	Pan Assy—Oil
243	N605903-S36	Bolt—M8-1/25 X 14 Hex Flg Hd (17-Att Oil Pan to Case)
244	N802947-S	Plug—13.9mm Cup
245	373907-S2	Nut—1/4 Spring (Retain I.D. Tag)
246	N605771-S2	Bolt—M6—1.0 X 14 Hex Flg Hd (2-Att 7H144 and 7G136 to Pump Body)
247	N605892-S36	Bolt—(3-Att L / I Servo Cover to Case)
248	7986	Cover—Conv Hsg Lower (Typical)
249	N605771-S	(M6 X 6 X 1Y) 2.8L Bolt (Att Conv Hsg Cvr to Case)
250	7G123	Bushing—Dir / Interm Clutch Cylinder
251	7F288	Spring—3-4 Shift Accum—Inner
252	N605890-S36	Bolt—M6—1.0 X 14 Hex Flg Hd (Att Filler Tube to Case)
253	N803727-S	Bolt—M6—1.0 X 28 (2 Att Oil Pump Assy to Main Control)
254	N805551-S101	Stud—M8—1.25—1.25 X 7.96 Hex Hd. Shoulder
255	—	—
255A	7H185	Piston Assy—Intermediate Clutch Balance
256	7L027	Ceramic Magnet Case
257	7G358	Spring—1-2 Shift Accum Center
258	7H150	Wheel-Driven Sprocket Speed Sensor
259	7H162	Screen—Case Intermediate Circuit
260	7H141	Sensor—Oil Temperature
261	7G151	Retainer—L / I Servo Return Spring
262	N805862-S100	Seal—14.0 X 1.78 O-Ring (2 Req'd)
263	N805863-S	Seal—25.12 X 1.78 O-Ring
264	N805864-S	Seal—12.42 X 1.78 O-Ring
265	N806238	Ret—Clip Trans Cooler Tube
266	N802626-S101	Bolt—M6—1.0 X 20 Hex Flg Hd (Att 7M101 to Chain Cover)

(Continued)

## DESCRIPTION AND OPERATION (Continued)

Item	Part Number	Description
267	N806944-S 1036	Stud—M10 X 1.5 X 60.5 Pilot

TD 10861A

## DIAGNOSIS AND TESTING

The following diagnosis sequence is a proven method for troubleshooting the AXODE (AX4S) transaxle. DO NOT attempt short cuts or assume the critical checks and adjustments have already been performed.

This diagnosis covers electronic and hydraulic/mechanical concerns from the transaxle connector to internal transaxle components. Refer to the Powertrain Control/Emissions Diagnosis Manual<sup>1</sup> for electronic concerns from the transaxle connector through the vehicle electronic system.

**Required Equipment:**

- Powertrain Control/Emissions Diagnosis Manual<sup>1</sup>
- Rotunda SUPER STAR II Tester 007-0041A or equivalent
- Rotunda Transmission Tester 007-00085 or equivalent
- Rotunda Digital Volt-Ohmmeter 014-00407 or equivalent
- MLP Tester D89T-70010-A or equivalent
- Gear Position Sensor Adjuster T91P-70010-A or equivalent

**AXODE (AX4S) Diagnostic Sequence**

1. Determine customer concern relative to vehicle usage.
  - Hot or cold vehicle operating temperature
  - Hot or cold ambient temperatures
  - Type of terrain
  - Vehicle loaded/unloaded
  - City or highway driving
2. Fluid level and condition check. Check for contamination or burnt smell. Check for leaks.
3. Road test vehicle to confirm customer concern.
4. Inspect vehicle for non-Ford approved add-on devices such as: cellular phones, speed controls, CB radio, linear boosters, back up alarm signals, computers etc., that if not installed properly will affect EEC-IV system or transaxle function. Pay particular attention to add-on wiring splices.
5. Check shift linkage for proper adjustment.
6. After road test with vehicle at normal operating temperature perform a EEC-IV On-Board Diagnostics Quick Test using SUPER STAR II Tester 007-0041A or equivalent as outlined in Section 5A of the Powertrain Control/Emissions Diagnosis Manual<sup>1</sup>.

7. Service all diagnostic trouble codes (DTC's) as outlined in the Powertrain Control/Emissions Diagnosis Manual<sup>1</sup>. Service all non-transaxle codes first before servicing any transaxle codes. If any transaxle diagnostic trouble codes are still present or if referred to this Section after performing the pinpoint tests outlined in the Powertrain Control/Emissions Diagnosis Manual,<sup>1</sup> refer to the Pinpoint Test Index in this Section to determine the appropriate pinpoint test required to diagnose the diagnostic trouble code.
8. If transaxle continuous codes are set during Quick Test, perform the Drive Cycle Test as outlined in this Section.
9. If no transaxle codes are set during Quick Test, use Rotunda Transmission Tester 007-00085 or equivalent as outlined under Transmission Tester Instructions to isolate the condition to the transaxle or to the vehicle harness and powertrain control module (PCM).

**Diagnostic Hydraulic/Mechanical Chart Instructions**

The AXODE (AX4S) Hydraulic/Mechanical charts are used to separate electrical from mechanical causes or concerns.

Refer to the following guidelines:

1. Define major concern.
2. Eliminate possible causes in the electrical cause/concern column 200 numbers.
3. Eliminate possible causes in the hydraulic/mechanical cause/concern column 300 numbers.

NOTE: The items listed under the main headings are arranged in order of disassembly.

**Preliminary Diagnostics**

- Check Fluid Level/Condition
- Vehicle at Normal Operating Temperature
- Visual Inspection of Harness Connections/Wiring
- Was On-Board Diagnostic Run?
- Check for Leaks
- Check for Electronic Add-On Items
- Check for Vehicle Modifications
- Check Shift Linkage for Proper Adjustment

<sup>1</sup> Can be purchased as a separate item.

## DIAGNOSIS AND TESTING (Continued)

- Validate Customer Concern
  - Upshift
  - Downshift
  - Coasting
  - Engagement
  - Noise / Vibration
    - \*RPM Dependent
    - \*Vehicle Speed Dependent
    - \*Shift Dependent
    - \*Gear Dependent

## DIAGNOSTIC ROUTINES INDEX

TITLE	ROUTINES	
	ELECTRICAL <sup>1</sup>	MECHANICAL HYDRAULIC
<b>Engagement Concerns</b>		
No Forward	201	301
No Reverse	202	302
Harsh Reverse	203	303
Harsh Forward	204	304
Delayed / Soft Reverse	205	305
Delayed / Soft Forward	206	306
<b>Shift Concerns</b>		
Some / All Shifts Missing	210	310
<b>Timing Concerns</b>		
—Early / Late	211	311
—Erratic	212	312
<b>Feel</b>		
—Soft / Slipping	213	313
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No First Gear, Engages in Higher Gear	215	315
No Manual First Gear	216	316
No Manual Second Gear	217	317
<b>Converter Operation Concerns</b>		
Converter: No Apply	240	340
Converter: Always Applied / Stalls Vehicle	241	341
Converter: Cycling / Shudder / Chatter	242	342
<b>Other Concerns</b>		
No Engine Braking in 3rd Gear With OD Cancel "ON"—SHO Only	249	349
No Engine Braking in 1st Gear, Manual 1st Position	250	350
Shift Lever Efforts High	251	351
External Leaks	252	352
Poor Vehicle Acceleration	253	353
Noise / Vibration - Forward or Reverse	254	354
Engine will not Crank	255	355
No Park Range	256	356
Overheating	257	357
<b>Reference</b>		
Control Pressure Test and Diagnostic Pressure Chart		401

1 Perform Electrical Routine first.

TD11447A

## DIAGNOSIS AND TESTING (Continued)

## No Forward Engagements

Possible Component	Reference/Action
<b>201 — ELECTRICAL ROUTINE</b>	
No Electrical Concerns	
<b>301 — HYDRAULIC/MECHANICAL ROUTINE</b>	
<b>Fluid</b> —Improper level, low	—Adjust fluid to proper level.
<b>Halfshafts</b> —Worn, damaged, misassembled	—Inspect for damage. Service as required.
<b>Shift Linkage</b> —Damaged, misadjusted	—Inspect and service as required. Adjust linkage as outlined. After servicing linkage, verify MLP sensor is properly adjusted. Refer to Transaxle, Assembly.
<b>Improper Pressures</b> —Low Forward Clutch pressure, Low Line pressure Low Intermediate Clutch pressure Low EPC pressure	—Check pressure at line and EPC taps. Refer to Pressure Chart for specification. If pressures are low, check the following possible components: oil filter and seal assembly, main controls, pump assembly, forward clutch assembly, low intermediate servo and intermediate clutch assembly.
<b>Oil Filter and Seal Assembly</b> —Plugged, damaged —Filter seal damaged	—Replace filter and seal assembly.
<b>Main Controls</b> —Forward Clutch Pressure Tap Plug—damaged, loose or missing —Bolts not tightened to specifications —Gaskets—damaged, off location —Pump shaft—broken —3-4 Shift Valve, Main Regulator Valve, Forward Clutch Control Valve, Manual Valve, 2-3 Servo Regulator Valve—stuck, damaged	—Inspect. Service as required. —Retighten bolts to specifications. —Inspect gasket for damage. Replace as required. —Service/replace as required. —Inspect. Service as required.
<b>Pump Assembly</b> —Bolts not tightened to specification —Gaskets damaged, off location —Porosity/cross leaks and ball missing or leaking —Components damaged	—Retighten bolts to specification. —Inspect for damage. Replace as required. —Inspect for porosity and leaks. Replace as required. —Inspect for damage. Replace as required.
<b>Support Assembly—Driven Sprocket</b> —Bolts not tightened to specifications  —Seals—missing, damaged —Seal grooves damaged	—Retighten bolts to specifications. Use sealant on 2 external chain cover bolts. —Inspect seals. Replace as required. —Inspect for damage. Service as required.
<b>Forward Clutch Assembly</b> —Seals, Piston —Check balls  —Piston cracked —Friction Elements—Damaged or worn	—Inspect seals for damage and replace as required. —Inspect for mislocation, poor seating damage. Replace cylinder as required. —Inspect piston. Replace as required. —Check for abnormal wear, damage. Replace as required.
<b>Low One-Way Clutch Assembly (Planetary)</b> —Worn, damaged or misassembled	—Inspect for damage. Service as required.
<b>Low Intermediate Servo Assembly</b> —Seals, Piston —Oil Tubes, Band, Anchor Pins—worn, damaged, loose, leaking —Apply Rod—incorrect length	—Inspect. Replace as required. —Inspect. Service as required. —Refer to the appropriate car Service Manual for proper service details.
<b>Output Shaft</b>	

(Continued)

## DIAGNOSIS AND TESTING (Continued)

## No Forward Engagements (Cont'd)

Possible Component	Reference/Action
—Splines damaged	—Inspect for damage. Service as required.
<b>With Manual Lever in 2nd Position (SHO Only)</b> <b>Intermediate Clutch Assembly</b>	
—Piston, seal damaged, worn	—Inspect for damage. Service as required.
—Friction Elements damaged, worn	—Inspect for damage. Service as required.

TD10618A

## No Reverse Engagement

Possible Component	Reference/Action
<b>202 — ELECTRICAL ROUTINE</b>	
No Electrical Concerns	
<b>302 — HYDRAULIC/MECHANICAL ROUTINE</b>	
<b>Fluid</b>	
—Improper level	—Adjust fluid to proper level.
<b>Halfshafts</b>	
—Worn, damaged, misassembled	—Inspect for damage. Service as required.
<b>Shift Linkage</b>	
—Damaged or misadjusted	—Inspect and service as required. Adjust linkage as outlined. After servicing linkage, verify that the MLP sensor is properly adjusted. Refer to Transaxle, Assembly.
<b>Improper Pressures</b>	
—Low Reverse Clutch pressure, Low Line pressure Low Forward Clutch pressure Low EPC pressure	—Check pressure at line and EPC taps. Refer to Pressure Chart for specifications. If pressures are low, check the following possible components: oil filter and seal assembly, main control, pump assembly, reverse clutch assembly.
<b>Oil Filter and seal assembly</b>	
—Plugged or damaged	—Replace filter and seal assembly.
<b>Main Controls</b>	
—Forward Clutch Pressure Tap Plug—damaged, loose, missing	—Inspect. Service as required.
—Bolts not tightened to specification.	—Retighten bolts to specification.
—Gasket—damaged, off location	—Inspect for damage. Replace as required.
—Pump Shaft—broken	—Inspect. Service/replace as required.
—Forward Clutch Control Valve, Manual Valve, Main Regulator Valve, Springs—stuck, damaged	—Inspect for damage. Service as required.
<b>Pump Assembly</b>	
—Bolts not tightened to specification.	—Retighten bolts to specification.
—Gasket damaged, off location	—Inspect for damage and replace as required.
—Porosity / cross leaks / ball missing or leaking, plugged hole	—Replace pump assembly.
—Components damaged	—Inspect for damage and replace as required.
<b>Support Assembly—Driven Sprocket</b>	
—Bolts not tightened to specification	—Retighten bolts to specification. Use sealant on two external chain cover bolts.
—Seals missing or damaged	—Inspect seals. Replace as required.
—Seal grooves damaged	—Inspect for damage. Service as required.
<b>Forward Clutch Assembly</b>	
—Seals, Piston	—Inspect seals for damage. Replace as required.
—Check Balls	—Inspect for mislocation, poor seating, and damage. Replace cylinder as required.
—Piston—cracked	—Inspect piston. Replace as required.
—Friction Elements—worn, damaged	—Check for abnormal wear, damage. Replace as required.
<b>Low One-Way Clutch Assembly (Planetary)</b>	
—Worn, damaged, misassembled	—Inspect for damage. Service as required.
<b>Reverse Clutch Assembly</b>	

(Continued)

## DIAGNOSIS AND TESTING (Continued)

## No Reverse Engagement (Cont'd)

Possible Component	Reference/Action
<ul style="list-style-type: none"> <li>—Seals, Piston</li> <li>—Check Ball</li> <li>—Friction Elements damaged or worn</li> <li>—Reverse Apply Tube leaking or improperly installed</li> </ul>	<ul style="list-style-type: none"> <li>—Inspect for damage. Service as required.</li> <li>—Inspect. Service as required.</li> </ul>
<b>Output Shaft</b> <ul style="list-style-type: none"> <li>—Splines damaged.</li> </ul>	<ul style="list-style-type: none"> <li>—Inspect for damage. Service as required.</li> </ul>

TD10619A

## Harsh Reverse Engagement

Possible Component	Reference/Action
<b>203 — ELECTRICAL ROUTINE</b>	
<b>Powertrain Control System</b> <ul style="list-style-type: none"> <li>—Electrical Inputs/Outputs, Vehicle Wiring Harnesses, Powertrain Control Module (PCM), EPC Solenoid, TOT, TSS, MLP</li> </ul>	<ul style="list-style-type: none"> <li>—Run On-Board Diagnostic.</li> <li>—Refer to Powertrain Control/Emissions Diagnosis Manual<sup>2</sup> for diagnosis. Perform Service Manual Pinpoint Tests A, B, D and F using the Transmission Tester (007-00085) and the MLP Tester (D89T-70010-A) as outlined. Service as required. Clear codes. Road Test and rerun On-Board Diagnostic.</li> </ul>
<b>303 — HYDRAULIC/MECHANICAL ROUTINE</b>	
<b>Fluid</b> <ul style="list-style-type: none"> <li>—Improper level</li> <li>—Condition</li> </ul>	<ul style="list-style-type: none"> <li>—Adjust fluid to proper level.</li> <li>—Inspect as outlined under Fluid Condition Check.</li> </ul>
<b>Shift Linkage</b> <ul style="list-style-type: none"> <li>—Damaged or misadjusted</li> </ul>	<ul style="list-style-type: none"> <li>—Inspect and service as required. Adjust linkage as outlined. After servicing linkage, verify that the MLP sensor is properly adjusted. Refer to Transaxle, Assembly.</li> </ul>
<b>Improper Pressures</b> <ul style="list-style-type: none"> <li>—High Line pressure</li> <li>—High EPC pressure</li> </ul>	<ul style="list-style-type: none"> <li>—Check pressure at line and EPC pressure taps. Refer to Pressure Chart for specifications. If high, check the following possible components: Main Controls, Oil Filter and Seal Assembly.</li> </ul>
<b>Oil Filter and Seal Assembly</b> <ul style="list-style-type: none"> <li>—Plugged or damaged</li> <li>—Filter Seal damaged</li> </ul>	<ul style="list-style-type: none"> <li>—Replace filter and seal assembly.</li> </ul>
<b>Main Controls</b> <ul style="list-style-type: none"> <li>—Bolts not tightened to specification</li> <li>—Gasket—damaged, off location</li> <li>—B1 Check Ball, Pressure Failsafe Valve, Manual Valve, Main Regulator Valve—stuck, damage</li> </ul>	<ul style="list-style-type: none"> <li>—Retighten bolts to specification.</li> <li>—Inspect for damage. Replace as required.</li> <li>—Inspect for damage. Service as required.</li> </ul>
<b>Pump Assembly</b> <ul style="list-style-type: none"> <li>—Bolts not tightened to specification</li> <li>—Gasket damaged, off location</li> <li>—Porosity/cross leaks</li> <li>—Components damaged</li> </ul>	<ul style="list-style-type: none"> <li>—Retighten bolts to specification.</li> <li>—Inspect for damage and replace as required.</li> <li>—Replace pump assembly.</li> <li>—Inspect for damage and replace as required.</li> </ul>
<b>Reverse Clutch Assembly</b> <ul style="list-style-type: none"> <li>—Seals, Piston</li> <li>—Friction Elements damaged, worn</li> <li>—Return spring piston damaged, worn</li> <li>—Reverse Apply Tube leaking or improperly installed</li> </ul>	<ul style="list-style-type: none"> <li>—Inspect for damage. Service as required.</li> </ul>

TD10620A

2 Can be purchased as a separate item.



## DIAGNOSIS AND TESTING (Continued)

## Harsh Forward Engagement

Possible Component	Reference/Action
<b>204 — ELECTRICAL ROUTINE</b>	
<b>Powertrain Control System</b> —Electrical Inputs/Outputs, Vehicle Wiring Harnesses, Powertrain Control Module (PCM), EPC Solenoid, TOT, TSS, MLP	—Run On-Board Diagnostic. —Refer to Powertrain Control/Emissions Diagnosis Manual <sup>3</sup> for diagnosis. Perform Service Manual Pinpoint Tests A, B, D and F using the Transmission Tester (007-00085) and the MLP Tester (D89T-700 10-A) as outlined. Service as required. Clear codes. Road Test and rerun On-Board Diagnostic.
<b>304 — HYDRAULIC/MECHANICAL ROUTINE</b>	
<b>Fluid</b> —Improper level —Condition	—Adjust fluid to proper level. —Inspect as outlined under Fluid Condition Check.
<b>Shift Linkage</b> —Damaged, misadjusted	—Inspect. Service as required. Adjust linkage as outlined. After servicing linkage, verify that the MLP sensor is properly adjusted. Refer to Service Manual for procedures.
<b>Improper Pressures</b> —High Forward Clutch pressure, —High Line pressure, —High EPC pressure	—Check pressure at line, EPC and forward clutch pressure taps. Refer to Pressure Chart for specifications. If pressures are high, check the following possible components: Main Controls, Pump Assembly.
<b>Main Controls</b> —Bolts not tightened to specification —Gaskets—damaged, off location —Main Regulator Valve, Backout Valve, Pressure Failsafe Valve —EPC Solenoid—stuck, damaged —2-3 Servo Regulator, Engagement Valve, B3 or B2 Check Ball—missing, damaged	—Retighten to specification. —inspect for damage. Replace as required. —inspect. Service as required. —inspect for damage and contamination. Service as required. —inspect for damage and contamination. Service as required.
<b>Pump Assembly</b> —Bolts not tightened to specification —Porosity/cross leaks —Gaskets damaged, off location	—Retighten bolts to specification. —inspect for porosity/leaks. Replace pump. —inspect for damage and replace as required.
<b>Low Intermediate Servo</b> —Seals, Piston —Oil Tubes—damaged, loose, leaking, misassembled —Band, Anchor Pins —Apply Rod—incorrect length	—inspect for damage. Replace as required.  —Refer to the appropriate car Service Manual for proper procedures.
<b>Neutral-to-Drive Accumulator</b> —Piston stuck, seals or springs—damaged, missing	—Check for damage. Replace as required.
<b>Forward Clutch Assembly</b> —Check Ball  —Friction Element damaged or worn —Spring, Forward Clutch Wave damaged —Forward Clutch Return Spring damaged	—inspect for mislocation, poor seating, damage. Replace forward clutch cylinder. —Check for wear or damage, replace as required. —Check for damage, replace as required. —Check for damage, replace as required.
<b>Low Intermediate Band/Drum</b> —Friction Elements—damaged, worn —Drum damaged	—Check for damage. Replace as required.
<b>With Manual Lever in 2nd Position (SHO Only)</b> <b>Intermediate Clutch Assembly</b> —Friction Elements damaged, worn —Return Spring damaged	—inspect for damage. Service as required. —inspect for damage. Service as required.

TD10621A

3 Can be purchased as a separate item.

## DIAGNOSIS AND TESTING (Continued)

## Delayed / Soft Reverse Engagement

Possible Component	Reference / Action
<b>205 — ELECTRICAL ROUTINE</b>	
<b>Powertrain Control System</b> —Electrical Inputs / Outputs, Vehicle Wiring Harnesses, Powertrain Control Module (PCM), EPC Solenoid, TOT Sensor	—Run On-Board Diagnostic. Refer to Powertrain Control / Emissions Diagnosis Manual <sup>4</sup> for diagnosis. Perform Service Manual Pinpoint Tests B and E using the Transmission Tester (007-00085) as outlined. Service as required. Clear codes. Road Test and rerun On-Board Diagnostic.
<b>305 — HYDRAULIC/MECHANICAL ROUTINE</b>	
<b>Fluid</b> —Improper level —Condition	—Adjust fluid to proper level. —Inspect as outlined under Fluid Condition Check.
<b>Shift Linkage</b> —Damaged, misadjusted	—Inspect and service as required. Adjust linkage as outlined. After servicing linkage, verify that the MLP sensor is properly adjusted. Refer to Transaxle, Assembly.
<b>Improper Pressures</b> —Low Reverse Clutch pressure —Low Line pressure —Low EPC pressure	—Check pressure at line and EPC taps. Refer to Pressure Chart for specifications. If pressures are low, check the following possible components: Main Controls, Pump Assembly, Reverse Clutch Assembly.
<b>Oil Filter and Seal Assembly</b> —Plugged or damaged —Filter Seal damaged	—Replace filter and seal assembly.
<b>Main Controls</b> —Bolts not tightened to specification —Gaskets—damaged, off location —Seals, Manual Valve, Main Regulator Valve, B5 Check Ball, Converter Drain Back Valve, Springs—missing, damaged or misassembled —EPC Solenoid stuck, damaged —Failsafe Valve (Zero EPC Pressure Only) stuck, damaged	—Retighten bolts to specification. —Inspect for damage. Replace as required. —Inspect for damage. Service as required.  —Inspect for damage. Service as required. —Inspect for damage. Service as required.
<b>Pump Assembly</b> —Bolts not tightened to specification —Porosity / cross leaks / ball missing or leaking —Gaskets damaged, off location —Components damaged	—Retighten bolts to specification. —Replace pump assembly. —Inspect for damage and replace as required. —Inspect for damage and replace as required.
<b>Support Assembly—Driven Sprocket</b> —Bolts not tightened to specification  —Seals missing or damaged —Seal grooves damaged	—Retighten bolts to specification. Use sealant on two external chain cover bolts. —Inspect seals. Replace as required. —Inspect for damage. Service as required.
<b>Forward Clutch Assembly</b> —Seals, Piston —Check Ball  —Piston cracked —Friction Elements—damaged, worn	—Inspect seals for damage. Service as required. —Inspect for mislocation, poor seating and damage. Replace cylinder as required. —Inspect piston. Replace as required. —Check for abnormal wear, damage. Replace as required.
<b>Neutral-to-Drive Accumulator</b> —Piston, Seals damaged	—Inspect for damage. Service as required.
<b>Reverse Clutch Assembly</b> —Seals, Piston —Check Ball —Friction Elements damaged or worn —Return Spring and Piston damaged or worn —Feed Tube leaking or improperly installed	—Inspect for damage. Service as required.   —Inspect. Service as required.

TD 10622A

4 Can be purchased as a separate item.

## DIAGNOSIS AND TESTING (Continued)

## Delayed/Soft Forward Engagement

Possible Component	Reference/Action
<b>206 — ELECTRICAL ROUTINE</b>	
<b>Powertrain Control System</b> —Electrical Inputs/Outputs, Vehicle Wiring Harnesses, Powertrain Control Module (PCM), EPC Solenoid, TOT Sensor	—Run On-Board Diagnostic. Refer to Powertrain Control/Emissions Diagnosis Manual <sup>5</sup> for diagnosis. Perform Service Manual Pinpoint Tests B and E using the Transmission Tester (007-00085) as outlined. Service as required. Clear codes. Road Test and rerun On-Board Diagnostic.
<b>306 — HYDRAULIC/MECHANICAL ROUTINE</b>	
<b>Fluid</b> —Improper level —Condition	—Adjust fluid to proper level. —Inspect as outlined under Fluid Condition Check.
<b>Shift Linkage</b> —Damaged, misadjusted	—Inspect and service as required. Adjust linkage as outlined. After servicing linkage, verify that the MLP sensor is properly adjusted. Refer to Transaxle, Assembly.
<b>Improper Pressures</b> —Low Forward Clutch pressure —Low Line pressure —Low EPC pressure	—Check pressure at line and EPC taps. Refer to Pressure Chart for specifications. If pressures are low, check the following possible components: Oil Filter and Seal Assembly, Main Controls and Pump Assembly.
<b>Oil Filter and Seal Assembly</b> —Plugged or damaged —Filter Seal damaged	—Replace filter and seal assembly.
<b>Main Controls</b> —Bolts not tightened to specification —Gaskets—damaged, off location —3-4 Shift Valve, Backout Valve, Main Regulator Valve, Manual Valve, 2-3 Servo Regulator Valve, Engagement Valve, B5 Check Ball—stuck, damaged, missing —EPC Solenoid—stuck, damaged —Pressure Failsafe Valve stuck or damaged	—Retighten bolts to specification. —Inspect for damage. Replace. —Inspect. Service as required.  —Inspect for damage and contamination. Service as required. —Inspect for damage. Service as required.
<b>Pump Assembly</b> —Bolts not tightened to specification —Porosity/cross leaks —Gaskets damaged, off location —Components damaged	—Retighten bolts to specification. —Inspect for porosity and leaks. Replace as required. —Inspect for damage and replace as required. —Inspect for damage and replace as required.
<b>Low Intermediate Servo Assembly</b> —Seals, Piston —Oil Tubes—damaged, loose, leaking —Band, Anchor Pins—damaged —Apply Rod—incorrect length	—Inspect seals and piston for damage. Replace as required. —Inspect for damage. Service as required. —Inspect for damage. Service as required. —Refer to the appropriate car Service Manual for proper service procedures.
<b>Neutral-to-Drive Accumulator</b> —Seals, Bore—damaged, stuck	—Inspect for damage. Replace.
<b>Support Assembly—Driven Sprocket</b> —Bolts not tightened to specification  —Seals missing or damaged —Seal grooves damaged	—Retighten bolts to specification. Use sealant on two external chain cover bolts —Inspect seals. Replace as required. —Inspect for damage. Service as required.
<b>Forward Clutch Assembly</b> —Seals, Piston, front support —Check Balls  —Friction Elements—damaged or worn	—Inspect seals for damage and replace as required. —Inspect for incorrect location, poor seating damage. Replace cylinder as required. —Check for abnormal wear or damage. Replace as required.
<b>Low Intermediate Band/Drum</b>	

(Continued)

5 Can be purchased as a separate item.

## DIAGNOSIS AND TESTING (Continued)

## Delayed/Soft Forward Engagement (Cont'd)

Possible Component	Reference/Action
—Friction Elements—damaged, worn —Drum damaged	—Inspect for damage. Service as required.
<b>With Manual Lever in 2nd Position (SHO Only)</b> <b>Intermediate Clutch Assembly</b> —Piston, Seals damaged —Friction Elements—damaged, worn	—Inspect for damage. Service as required. —Inspect for damage. Service as required.

TD10623A

## Some or All Shifts Missing

Possible Component	Reference/Action														
<b>210 — ELECTRICAL ROUTINE</b>															
<b>Powertrain Control System</b> —Electrical Inputs/Outputs, Vehicle Wiring Harnesses, Powertrain Control Module (PCM), Shift Solenoids, MLP Sensor	—Run On-Board Diagnostic. Refer to Powertrain Control/Emissions Diagnosis Manual <sup>6</sup> for diagnosis. Perform Service Manual Pinpoint Tests A and D using the Transmission Tester (007-00085) and the MLP Tester (D89T-70010-A) as outlined. Service as required. Clear codes. Road Test and rerun On-Board Diagnostic.														
<b>310 — HYDRAULIC/MECHANICAL ROUTINE</b>															
<b>Fluid</b> —improper level —Condition	—Adjust fluid to proper level. —Inspect as outlined under Fluid Condition Check.														
<b>Shift Linkage</b> —Damaged, misadjusted	—Inspect and service as required. Adjust linkage as outlined. After servicing linkage, verify that the MLP sensor is properly adjusted. Refer to Transaxle, Assembly.														
<b>Vehicle Speed Input</b> —Speedometer Gear—DRIVE—damaged —Speedometer Gear—DRIVEN—Gear and Shaft Assembly —Differential Assembly—damaged or missing —Speedometer DRIVE GEAR—damaged	—Refer to Service Manual for teardown information on these gears. Also refer to the appropriate shift routines as noted below.														
Go to Reference/Action	—For additional diagnosis, refer to the appropriate shift routine(s) chart:														
	<table border="1"> <thead> <tr> <th>Shift</th> <th>Routine</th> </tr> </thead> <tbody> <tr> <td>1-2</td> <td>220/320</td> </tr> <tr> <td>2-3</td> <td>221/321</td> </tr> <tr> <td>3-4</td> <td>222/322</td> </tr> <tr> <td>4-3</td> <td>223/323</td> </tr> <tr> <td>3-2</td> <td>224/324</td> </tr> <tr> <td>2-1</td> <td>225/325</td> </tr> </tbody> </table>	Shift	Routine	1-2	220/320	2-3	221/321	3-4	222/322	4-3	223/323	3-2	224/324	2-1	225/325
Shift	Routine														
1-2	220/320														
2-3	221/321														
3-4	222/322														
4-3	223/323														
3-2	224/324														
2-1	225/325														

CD8088-A

TD10624A

## Timing — Early/Late

Possible Component	Reference/Action
<b>211 — ELECTRICAL ROUTINE</b>	
<b>Powertrain Control System</b> —Electrical Inputs/Outputs, Vehicle Wiring Harnesses, Powertrain Control Module (PCM), Shift Solenoids, TOT	—Run On-Board Diagnostic. —Refer to Powertrain Control/Emissions Diagnosis Manual <sup>6</sup> for diagnosis. Perform Service Manual Pinpoint Tests A and B using the Transmission Tester (007-00085) as outlined. Service as required. Clear codes. Road Test and rerun On-Board Diagnostic.
<b>311 — HYDRAULIC/MECHANICAL ROUTINE</b>	
<b>Other</b>	

(Continued)

6 Can be purchased as a separate item.

**DIAGNOSIS AND TESTING (Continued)**

**Timing — Early/Late (Cont'd)**

Possible Component	Reference/Action														
<ul style="list-style-type: none"> <li>—Tire size change</li> <li>—Chain ratio change</li> <li>—Speedometer Gear</li> </ul>	<ul style="list-style-type: none"> <li>—Refer to the specification decal and verify vehicle has original equipment. Changes in tire size and chain ratio will affect shift timing.</li> </ul>														
<b>Fluid</b> <ul style="list-style-type: none"> <li>—Improper level</li> </ul>	<ul style="list-style-type: none"> <li>—Adjust fluid to proper level.</li> </ul>														
<b>Main Controls</b> <ul style="list-style-type: none"> <li>—Bolts not tightened to specification</li> <li>—Gaskets—damaged, off location</li> <li>—Valves, Accumulators, Seals, Springs, Clips—damaged, missing, misassembled</li> </ul>	<ul style="list-style-type: none"> <li>—Retighten bolts to specification.</li> <li>—Inspect for damage. Replace.</li> <li>—Inspect for damage and contamination. Service as required.</li> <li>—Refer to the appropriate shift for further diagnosis:</li> </ul> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Shift</th> <th>Routine</th> </tr> </thead> <tbody> <tr> <td>1-2</td> <td>220/320</td> </tr> <tr> <td>2-3</td> <td>221/321</td> </tr> <tr> <td>3-4</td> <td>222/322</td> </tr> <tr> <td>4-3</td> <td>223/323</td> </tr> <tr> <td>3-2</td> <td>224/324</td> </tr> <tr> <td>2-1</td> <td>225/325</td> </tr> </tbody> </table> <p style="text-align: right;">CD8088-A</p>	Shift	Routine	1-2	220/320	2-3	221/321	3-4	222/322	4-3	223/323	3-2	224/324	2-1	225/325
Shift	Routine														
1-2	220/320														
2-3	221/321														
3-4	222/322														
4-3	223/323														
3-2	224/324														
2-1	225/325														

TD10625A

**Timing Erratic**

Possible Component	Reference/Action
<b>212 — ELECTRICAL ROUTINE</b>	
<b>Powertrain Control System</b> <ul style="list-style-type: none"> <li>—Electrical Inputs / Outputs, Vehicle Wiring Harnesses, Powertrain Control Module (PCM), Shift Solenoids, MLP, TCC, TSS and TOT Sensor</li> </ul>	<ul style="list-style-type: none"> <li>—Run On-Board Diagnostic.</li> <li>—Refer to Powertrain Control / Emissions Diagnosis Manual<sup>7</sup> for diagnosis. Perform Service Manual Pinpoint Tests A, B, C, D and F using the Transmission Tester (007-00085) and the MLP Tester (D89T-70010-A) as outlined. Service as required. Clear codes. Road Test and rerun On-Board Diagnostic.</li> </ul>
<b>312 — HYDRAULIC/MECHANICAL ROUTINE</b>	
<b>Fluid</b> <ul style="list-style-type: none"> <li>—Improper level</li> </ul>	<ul style="list-style-type: none"> <li>—Adjust fluid to proper level.</li> </ul>
<b>Main Control</b> <ul style="list-style-type: none"> <li>—Bolts not tightened to specifications</li> <li>—Gaskets—damaged, off location</li> <li>—Valves, Accumulators, Seals, Clips, Intermediate Clutch Shuttle Valve—stuck, damaged</li> </ul>	<ul style="list-style-type: none"> <li>—Retighten bolts to specifications.</li> <li>—Inspect for damage. Replace as required</li> <li>—Inspect for damage. Service as required.</li> </ul>
<b>Vehicle Speed Input</b> <ul style="list-style-type: none"> <li>—Speedometer Gear—DRIVE—damaged</li> <li>—Speedometer Gear—DRIVEN—Gear and Shaft Assembly</li> <li>—Differential Assembly—damaged or missing</li> </ul>	<ul style="list-style-type: none"> <li>—Refer to Service Manual for teardown information on these gears. Also refer to the appropriate shift routines as noted below.</li> </ul>

(Continued)

<sup>7</sup> Can be purchased as a separate item.

**DIAGNOSIS AND TESTING (Continued)**

**Timing Erratic (Cont'd)**

Possible Component	Reference / Action
—Speedometer DRIVE GEAR—damaged	
<b>Torque Converter Clutch (TCC)</b>	—Refer to Routine 342, converter cycling.
For Diagnosis related to a specific shift	—Refer to the appropriate shift routine(s) for additional diagnosis.

Shift	Routine
1-2	220/320
2-3	221/321
3-4	222/322
4-3	223/323
3-2	224/324
2-1	225/325

CD8088-A

TD10612A

**Feel — Soft/Slipping**

Possible Component	Reference / Action
<b>213 — ELECTRICAL ROUTINE</b>	
<b>Powertrain Control System</b> —Electrical Inputs / Outputs, Vehicle Wiring Harnesses, Powertrain Control Module (PCM), EPC Solenoid, TOT	—Run On-Board Diagnostic. —Refer to Powertrain Control/Emissions Diagnosis Manual <sup>8</sup> for diagnosis. Perform Service Manual Pinpoint Tests B and E using the Transmission Tester (007-00085) as outlined. Service as required. Clear codes. Road Test and rerun On-Board Diagnostic.
<b>313 — HYDRAULIC/MECHANICAL ROUTINE</b>	
<b>Fluid</b> —Improper level —Condition	—Adjust fluid to proper level. —Inspect as outlined under Fluid Condition Check.
<b>Shift Linkage</b> —Damaged, misadjusted	—Inspect. Service as required. Adjust linkage as outlined in Service Manual. After servicing linkage, verify that the MLP sensor is properly adjusted. Refer to Service Manual for procedures.
<b>Improper Pressures</b> —Low Line pressure —Low EPC pressure	—Check pressures at line and EPC taps. Refer to Hydraulic Pressure Chart for specifications. If pressures are low or all shifts are soft / slipping, go to Main Control. If pressures are OK and a specific shift is soft / slipping, refer to the appropriate routine(s) for additional diagnosis.

Shift	Routine
1-2	220/320
2-3	221/321
3-4	222/322
4-3	223/323
3-2	224/324
2-1	225/325

CD8088-A

<b>Main Controls</b> —Bolts not tightened to specifications —Gaskets—damaged, off location	—Retighten bolts to specifications. —Inspect for damage. Service as required.
--------------------------------------------------------------------------------------------------	----------------------------------------------------------------------------------

(Continued)

8 Can be purchased as a separate item.

**DIAGNOSIS AND TESTING (Continued)**

**Feel — Soft/Slipping (Cont'd)**

Possible Component	Reference/Action
—1-2 Cap Mod Valve, Accumulator/Regulator Valve, Main Regulator Valve, 2-3 Servo Regulator Valve, Check Balls, 3-2 Shift Timing Valve, Clips, Springs—damaged, misassembled, missing —EPC Solenoid—stuck/damaged —Pressure Failsafe Valve (Zero EPC Pressure Only) stuck, damaged	—Inspect. Service as required.  —Inspect for damage and contamination. Service as required. —Inspect for damage. Service as required.

TD10613A

**Feel — Harsh**

Possible Component	Reference/Action														
<b>214 — ELECTRICAL ROUTINE</b>															
<b>Powertrain Control System</b> —Electrical Inputs/Outputs, Vehicle Wiring Harnesses, Powertrain Control Module (PCM), EPC Solenoid, TOT, MLP Sensor and Shift Solenoid No. 3	—Run On-Board Diagnostic. —Refer to Powertrain Control/Emissions Diagnosis Manual <sup>9</sup> for diagnosis. Perform Service Manual Pinpoint Tests A, B, D and E using the Transmission Tester (007-00085) and MLP Tester (D89T-70010-A) as outlined. Service as required. Clear codes. Road Test and rerun On-Board Diagnostic.														
<b>314 — HYDRAULIC/MECHANICAL ROUTINE</b>															
<b>Fluid</b> —Improper level	—Adjust fluid to proper level.														
<b>Improper Pressures</b> —High Line pressure —High EPC pressure	—Check pressures at line and EPC taps. Refer to Pressure Chart for specifications. If pressures are high or all shifts are harsh, go to Main Controls.  If pressures are OK and a specific shift is harsh, refer to the appropriate shift routine in the following chart:														
	<table border="1"> <thead> <tr> <th>Shift</th> <th>Routine</th> </tr> </thead> <tbody> <tr> <td>1-2</td> <td>220/320</td> </tr> <tr> <td>2-3</td> <td>221/321</td> </tr> <tr> <td>3-4</td> <td>222/322</td> </tr> <tr> <td>4-3</td> <td>223/323</td> </tr> <tr> <td>3-2</td> <td>224/324</td> </tr> <tr> <td>2-1</td> <td>225/325</td> </tr> </tbody> </table>	Shift	Routine	1-2	220/320	2-3	221/321	3-4	222/322	4-3	223/323	3-2	224/324	2-1	225/325
Shift	Routine														
1-2	220/320														
2-3	221/321														
3-4	222/322														
4-3	223/323														
3-2	224/324														
2-1	225/325														
<b>Main Controls</b> —Bolts not tightened to specifications —Gaskets—damaged, off location —1-2 Cap. Mod. Valve, Accumulator Regulator Valve, Main Regulator Valve, 2-3 Servo Regulator Valve, 3-2 Timing Valve, Springs, Clips, Check Balls—stuck, damaged, misassembled —EPC Solenoid, Shift Solenoid 3—stuck or damaged	—Retighten bolts to specifications. —Inspect for damage. Replace as required. —Inspect. Service as required.  —Inspect for damage, contamination. Service as required.														

CD8088-A

TD11426A

**No 1st Gear, Engages in Higher Gear**

Possible Component	Reference/Action
<b>215 — ELECTRICAL ROUTINE</b>	
<b>Powertrain Control System</b> —Electrical Inputs/Outputs, Vehicle Wiring Harnesses, Powertrain Control Module (PCM), Shift Solenoids, MLP Sensor	—Run On-Board Diagnostic. —Refer to Powertrain Control/Emissions Diagnosis Manual <sup>9</sup> for diagnosis. Perform Service Manual Pinpoint Tests A and D using the Transmission Tester (007-00085) and the MLP Tester (D89T-70010-A) as outlined. Service as required. Clear codes. Road Test and rerun On-Board Diagnostic.

(Continued)

9 Can be purchased as a separate item.



## DIAGNOSIS AND TESTING (Continued)

## No 1st Gear, Engages in Higher Gear (Cont'd)

Possible Component	Reference/Action
<b>315 — HYDRAULIC/MECHANICAL ROUTINE</b>	
<b>Shift Linkage</b> —Damaged or misadjusted	—Inspect and service as required. Adjust linkage as outlined. After servicing linkage, verify that the MLP sensor is properly adjusted. Refer to Transaxle, Assembly.
<b>Main Controls</b> —Bolts not tightened to specifications —Gaskets—damaged, off location —Shift Valves, Intermediate Clutch Shuttle Valve, Forward Clutch Control Valve, Springs, Clips—stuck, damaged, misassembled	—Retighten bolts to specifications. —Inspect for damage. Replace as required. —Inspect. Service as required.
For diagnosis related to a specific gear, use the Transmission Tester to determine gear.	Refer to the following routines: <b>Shift 1-2, Routine 220/320</b> <b>Shift 2-3, Routine 221/321</b> <b>Shift 3-4, Routine 222/322</b>
<b>Mechanical</b> —Bands, clutches or seals damaged or worn	—Refer to Transaxle, Disassembly and Assembly.

TD11427A

## No Manual 1st Gear

Possible Component	Reference/Action
<b>216 — ELECTRICAL ROUTINE</b>	
<b>Powertrain Control System</b> —Electrical Inputs/Outputs, Vehicle Wiring Harnesses, Powertrain Control Module (PCM) and Shift Solenoids	—Run On-Board Diagnostic. —Refer to Powertrain Control/Emissions Diagnosis Manual <sup>10</sup> for diagnosis. Perform Service Manual Pinpoint Test A using the Transmission Tester (007-00085) as outlined. Service as required. Clear codes. Road Test and rerun On-Board Diagnostic.
<b>316 — HYDRAULIC/MECHANICAL ROUTINE</b>	
<b>Shift Linkage</b> —Damaged or misadjusted	—Inspect and service as required. Adjust linkage as outlined. After servicing linkage, verify that the MLP sensor is properly adjusted. Refer to Transaxle, Assembly.
<b>Improper Pressures</b> —Low Direct Clutch pressure —Low Line pressure —Low EPC pressure	—Check pressure at line and EPC pressure taps. Refer to Pressure Chart for specifications. If pressures are low, check the following possible components: Main Controls, Support Assembly, Driven Sprocket, Direct Clutch Assembly.
<b>Main Controls</b> —Bolts not tightened to specifications —Gaskets—damaged, off location —Manual Valve, Manual Low Relief Valve and Spring, Springs, Clips—stuck, damaged, missing	—Retighten bolts to specifications. —Inspect for damage. Replace as required. —Inspect for damage. Service as required.
<b>Support Assembly—Driven Sprocket</b> —Bolts not tightened to specifications  —Seals missing or damaged —Seal grooves damaged	—Retighten bolts to specifications. Use sealant on two external chain cover bolts. —Inspect seals. Replace as required. —Inspect for damage. Service as required.
<b>Direct Clutch</b> —Check Ball, Piston, Piston Seals, Plates —Friction Elements—damaged, worn	—Inspect for damage. Service as required. —Inspect for damage. Service as required.

TD11428A

<sup>10</sup> Can be purchased as a separate item.

## DIAGNOSIS AND TESTING (Continued)

## No Manual 2nd Gear (SHO ONLY)

Possible Component	Reference / Action
<b>217 — ELECTRICAL ROUTINE</b>	
<b>Powertrain Control System</b> —Electrical Inputs / Outputs, Vehicle Wiring Harnesses, Powertrain Control Module (PCM) and Shift Solenoids	—Run On-Board Diagnostic. —Refer to Powertrain Control / Emissions Diagnosis Manual <sup>11</sup> for diagnosis. Perform Service Manual Pinpoint Test A using the Transmission Tester (007-00085) as outlined. Service as required. Clear codes. Road Test and rerun On-Board Diagnostic.
<b>317 — HYDRAULIC / MECHANICAL ROUTINE</b>	
<b>Shift Linkage / Cable, MLP Sensor</b> —Shift Linkage / Cable, MLP Sensor—damaged, misadjusted	—Inspect for damage. Service as required. Adjust linkage as outlined. After servicing the linkage, verify that the MLP sensor is properly adjusted.
<b>Main Controls</b> —Bolts not tightened to specifications —Gaskets—damaged, off location —Shift Valves, Forward Clutch Control Valve damaged, stuck or misassembled. —Shift Solenoids damaged, stuck	—Retighten bolts to specifications. —Inspect for damage. Replace gaskets. —Inspect for damage. Service as required. —Perform Pinpoint Test A.
<b>Forward Clutch Assembly</b> —Return Spring, Piston, Seals, Friction Elements, Check Ball—stuck, damaged, misassembled	—Inspect for damage. Service as required.
<b>Low Intermediate Servo</b> —Spring, Bore, Piston damaged or missing —Incorrect Servo Apply Rod length	—Inspect for damage. Service as required. —Inspect using Service Manual procedures. Service as required.
<b>Support Assembly—Drive Sprocket</b> —Seals damaged, missing or holes blocked	—Inspect for damage. Service as required.
<b>Low One-Way Clutch Assembly</b> —Not Overrunning, damaged	—Inspect for damage. Service as required.
<b>Low Intermediate Band</b> —Damaged, worn, burnt or misassembled	—Inspect for damage. Service as required.

TD10641A

## Shift Concern: 1-2 Shift

Possible Component	Reference / Action
<b>220 — ELECTRICAL ROUTINE</b>	
<b>Powertrain Control System</b> —Electrical Inputs / Outputs, Vehicle Wiring Harnesses, Powertrain Control Module (PCM), Shift Solenoids, MLP, TOT and EPC	—Run On-Board Diagnostic. —Refer to Powertrain Control / Emissions Diagnosis Manual <sup>11</sup> for diagnosis. Perform Service Manual Pinpoint Tests A, B, D and E using the Transmission Tester (007-00085) and MLP Tester (D89T-70010-A) as outlined. Service as required. Clear codes. Road Test and rerun On-Board Diagnostic.
<b>320 — HYDRAULIC / MECHANICAL ROUTINE</b>	
<b>Shift Linkage</b> —Damaged or misadjusted	—Inspect and service as required. Adjust linkage as outlined. After servicing linkage, verify that the MLP sensor is properly adjusted. Refer to Transaxle, Assembly.
<b>Speedometer Gear—Drive</b> —Damaged	—Inspect for damage. Service as required.
<b>Speedometer Gear—Driven</b> —Damaged	—Inspect for damage. Service as required.
<b>Improper Pressures</b> —Intermediate Clutch pressure —Line pressure —EPC pressure	—Check pressure at line, EPC and intermediate clutch taps. Refer to Pressure Chart for specifications. If not OK, check Main Controls.

(Continued)

<sup>11</sup> Can be purchased as a separate item.

## DIAGNOSIS AND TESTING (Continued)

## Shift Concern: 1-2 Shift (Cont'd)

Possible Component	Reference/Action
<b>Main Controls</b> —Bolts not tightened to specification. —Gaskets—damaged, off location —Intermediate Clutch Tap—loose, missing —1-2 Shift Valve, Accumulator Regulator Valve, 1-2 Cap. Mod. Valve, Main Regulator Valve, Intermediate Shuttle Valve, Springs, B10 Check Ball, Clips—loose, missing, stuck, misassembled —SS1 Malfunction	—Retighten bolts to specification. —Inspect for damage. Replace as required. —Inspect. Service as required. —Inspect. Service as required. —Activate solenoid using Transmission Tester. If solenoid operation cannot be felt when placing hand on solenoid, replace solenoid. Inspect O-rings for damage. Service as required.
<b>1-2 Accumulator Assembly</b> —Piston Seals, Springs—damaged, missing	—Inspect for damage. Service as required.
<b>Support Assembly—Driven Sprocket</b> —Seals—damaged, missing —Holes blocked	—Inspect for damage, missing or blockage. Service as required.
<b>Pump</b> —Porosity/cross leak —Gasket damaged, off location —Components damaged	—Inspect and replace as required. —Inspect for damage. Replace as required. —Inspect for damage or missing ball. Replace pump assembly if required.
<b>Low One-Way Clutch Assembly</b> —Not overrunning, damaged	—Inspect for damage. Replace as required.
<b>Intermediate Clutch Assembly</b> —Seals—damaged —Piston—damaged —Friction—damaged, worn —Check Ball—missing, damaged	—Inspect for damage. Replace as required. —Inspect for damage. Replace as required. —Inspect for damage. Replace as required. —Inspect for damage. Service or replace as required.
<b>Front Planet Carrier</b> —Damaged	—Inspect for weld damage. Service as required.
<b>Differential Assembly</b> —Damaged or missing	—Inspect for damage. Service as required.
<b>Speedometer Drive Gear</b> —Damaged or missing	—Inspect for damage. Service as required.

TD11429A

## Shift Concern: 2-3 Shift

Possible Component	Reference/Action
<b>221 — ELECTRICAL ROUTINE</b>	
<b>Powertrain Control System</b> —Electrical Inputs/Outputs, Vehicle Wiring Harnesses, Powertrain Control Module (PCM), Shift Solenoids, TOT, EPC	—Run On-Board Diagnostic. —Refer to Powertrain Control/Emissions Diagnosis Manual <sup>12</sup> for diagnosis. Perform Service Manual Pinpoint Tests A, B and E using the Transmission Tester (007-00085) and MLP Tester (D89T-70010-A) as outlined. Service as required. Clear codes. Road Test and rerun On-Board Diagnostic.
<b>321 — HYDRAULIC/MECHANICAL ROUTINE</b>	
<b>Shift Linkage</b> —Damaged or misadjusted	—Inspect and service as required. Adjust linkage as outlined. After servicing linkage, verify that the MLP sensor is properly adjusted. Refer to Transaxle, Assembly.
<b>Speedometer Gear — Drive</b> —Damaged	—Inspect for damage. Service as required.
<b>Speedometer Gear — Driven</b> —Damaged	—Inspect for damage. Service as required.

(Continued)

<sup>12</sup> Can be purchased as a separate item.

## DIAGNOSIS AND TESTING (Continued)

## Shift Concern: 2-3 Shift (Cont'd)

Possible Component	Reference/Action
<b>Improper Pressures</b> —Direct Clutch pressure, EPC pressure	—Check pressure at EPC and line taps. Refer to Pressure Chart for specifications. If not OK, check the Main Controls.
<b>Main Controls</b> —Bolts not tightened to specification —Gaskets—damaged, off location —1-2 Shift Valve, 2-3 Shift Valve, 2-3 Servo Regulator Valve/Spring—stuck, damaged —B3, B8, B9, B10, B11 Check Balls—damaged, missing —SS1, SS2, SS3 Malfunction	—Retighten bolts to specification. —Inspect for damage. Replace as required. —Inspect. Service as required.  —Inspect for damage. Service as required. —Activate solenoid using transmission tester. If solenoid operation cannot be felt when placing hand on solenoid, replace solenoid. Inspect O-rings for damage. Service as required.
<b>Low Intermediate Servo Assembly</b> —Wrong Apply Rod, Servo Bore or Piston damaged, Piston Seals damaged or missing, Return Spring or Retaining Clip missing, broken	—Inspect for damage. Service as required.
<b>Support Assembly—Driven Sprocket</b> —Seals—damaged, missing, holes blocked	—Inspect for damage. Service as required.
<b>Direct One-Way Clutch</b> —Not holding, damaged	—Inspect for damage. Replace as required.
<b>Direct Clutch Assembly</b> —Seals —Piston —Friction damaged or worn —Check Ball not seating —Return Spring Assembly	—Inspect for damage. Replace as required. —Inspect for damage. Replace as required. —Inspect for damage. Replace as required. —Inspect for damage. Replace as required. —Inspect for damage. Replace as required.
<b>Case</b> —Servo Release Passage blocked —Servo Release Tube—leaking, loose	—Inspect for damage. Replace case if damaged.
<b>Direct/Intermediate Clutch Hub</b> —Seals damaged, missing or holes blocked	—Inspect for damage. Service as required.
<b>Speedometer Drive Gear</b> —Damaged	—Inspect for damage. Service as required.

TD11430A

## Shift Concern: 3-4 Shift

Possible Component	Reference/Action
<b>222 — ELECTRICAL ROUTINE</b>	
<b>Powertrain Control System</b> —Electrical Inputs/Outputs, Vehicle Wiring Harnesses, Powertrain Control Module (PCM), Shift Solenoids, MLP Sensor, EPC Solenoid	—Run On-Board Diagnostic. —Refer to Powertrain Control/Emissions Diagnosis Manual <sup>13</sup> for diagnosis. Perform Service Manual Pinpoint Tests A, D and E using the Transmission Tester (007-00085) and MLP Tester (D89T-700 10-A) as outlined. Service as required. Clear codes. Road Test and rerun On-Board Diagnostic.
<b>322 — HYDRAULIC/MECHANICAL ROUTINE</b>	
<b>Shift Linkage</b> —Damaged or misadjusted	—Inspect and service as required. Adjust linkage as outlined. After servicing linkage, verify that the MLP sensor is properly adjusted. Refer to Transaxle, Assembly.
<b>Speedometer Gear—Drive</b> —Damaged	—Inspect for damage. Service as required.
<b>Speedometer Gear—Driven</b> —Damaged	—Inspect for damage. Service as required.
<b>Overdrive Servo Assembly</b>	

(Continued)

13 Can be purchased as a separate item.

## DIAGNOSIS AND TESTING (Continued)

## Shift Concern: 3-4 Shift (Cont'd)

Possible Component	Reference/Action
—Wrong Apply Rod —Servo Bore or Piston damaged —Piston Seals—damaged, missing —Return Spring Retaining Clip—missing, broken	—Inspect. Replace if incorrect. —Inspect for damage. Service as required. —Inspect for damage. Service as required. —Inspect for damage. Service as required.
<b>Main Controls</b> —Bolts not tightened to specification —Gaskets—damaged, off location —3-4 Shift Valve, 1-2 Shift Valve, Accumulator Regulator Valve, Forward Clutch Control Valve—stuck, damaged —SS1 Malfunction  —EPC Solenoid stuck, damaged —B4, B11 Check Balls	—Retighten bolts to specification. —Inspect for damage. Replace as required. —Inspect. Service as required.  —Activate solenoid using transmission tester. If solenoid operation cannot be felt when placing hand on solenoid, replace solenoid. Inspect O-rings for damage. Service as required. —Inspect for damage. Service as required. —Inspect for damage. Replace as required.
<b>3-4 Accumulator Assembly</b> —Accumulator Piston—stuck, damaged —Piston Seals—missing, damaged —Springs—missing, damaged, holes blocked	—Inspect for damage. Service as required. —Inspect for damage. Service as required. —Inspect for damage. Service as required.
<b>Support Assembly—Driven Sprocket</b> —Seals—damaged, missing, holes blocked	—Inspect for damage, missing or blockage. Service as required.
<b>OD Band</b> —OD Band—damaged, worn, misassembled —Direct One-Way Clutch Assembly damaged	—Inspect for damage. Replace as required. —Inspect for damage. Replace as required.
<b>Forward Clutch Assembly</b> —Return Spring/Piston damaged	—Inspect for damage. Replace as required.
<b>Differential Assembly</b> —Damaged or missing	—Inspect for damage. Service as required.
<b>Speedometer Drive Gear</b> —Damaged	—Inspect for damage. Service as required.

TD11431A

## Shift Concern: 4-3 Shift

Possible Component	Reference/Action
<b>223 — ELECTRICAL ROUTINE</b>	
<b>Powertrain Control System</b> —Electrical Inputs/Outputs, Vehicle Wiring Harnesses, Powertrain Control Module (PCM), Shift Solenoids, MLP sensor, TSS, EPC Solenoid	—Run On-Board Diagnostic. —Refer to Powertrain Control/Emissions Diagnosis Manual <sup>14</sup> for diagnosis. Perform Service Manual Pinpoint Tests A, D, E and F using the Transmission Tester (007-00085) and MLP Tester (D89T-70010-A) as outlined. Service as required. Clear codes. Road Test and rerun On-Board Diagnostic.
<b>323 — HYDRAULIC/MECHANICAL ROUTINE</b>	
<b>Speedometer Gear—Drive</b> —Damaged	—Inspect for damage. Service as required.
<b>Speedometer Gear—Driven</b> —Damaged	—Inspect for damage. Service as required.
<b>Main Controls</b> —Bolts not tightened to specification —Gaskets—damaged, off location —1-2 Shift Valve, 3-4 Shift Valve, Accumulator Regulator Valve—stuck, damaged —SS1 Malfunction	—Retighten bolts to specification. —Inspect for damage. Replace as required. —Inspect. Service as required.  —Activate solenoid using transmission tester. If solenoid operation cannot be felt when placing hand on solenoid, replace solenoid. Inspect O-rings for damage. Service as required.

(Continued)

14. Can be purchased as a separate item.

## DIAGNOSIS AND TESTING (Continued)

## Shift Concern: 4-3 Shift (Cont'd)

Possible Component	Reference/Action
—EPC Solenoid—stuck, damaged —Servo Cover, Seal, Rod and Piston Cushion Spring—damaged —B4, B11 Check Balls—damaged, missing	—Inspect for damage. Perform Pinpoint Test E. —Inspect for damage. Service as required. —Inspect for damage. Service as required.
<b>OD Band</b> —OD Band—damaged, worn, misassembled —Direct One-Way Clutch Assembly damaged	—Inspect for damage. Replace as required. —Inspect for damage. Service as required.
<b>Overdrive Servo Assembly</b> —Apply Rod wrong —Servo Bore or Piston damaged —Piston Seals—damaged, missing —Return Spring Retaining Clip—missing, broken	—Inspect Rod as outlined. —Inspect for damage. Service as required. —Inspect for damage. Service as required. —Inspect for damage. Service as required.
<b>Torque Converter Clutch</b> —Not releasing	—See Converter Always Applied Diagnostic Routine 241/341.
<b>Differential Assembly</b> —Damaged	—Inspect for damage. Service as required.
<b>Speedometer Drive Gear</b> —Wrong or missing	—Inspect for damage. Service as required.

TD11432A

## Shift Concern: 3-2 Shift

Possible Component	Reference/Action
<b>224 — ELECTRICAL ROUTINE</b>	
<b>Powertrain Control System</b> —Electrical Inputs / Outputs, Vehicle Wiring Harnesses, Powertrain Control Module (PCM), Shift Solenoids, MLP Sensor	—Run On-Board Diagnostic. —Refer to Powertrain Control/Emissions Diagnosis Manual <sup>15</sup> for diagnosis. Perform Service Manual Pinpoint Tests A and D using the Transmission Tester (007-00085) and MLP Tester (D89T-70010-A) as outlined. Service as required. Clear codes. Road Test and rerun On-Board Diagnostic.
<b>324 — HYDRAULIC/MECHANICAL ROUTINE</b>	
<b>Improper Pressures</b> —Direct Clutch —EPC pressure —Forward Clutch —Line pressure	—Check pressure at line, direct clutch and EPC taps. Refer to Pressure Chart for specification; if not within specification, check Main Controls.
<b>Speedometer Gear—Drive</b> —Damaged	—Inspect for damage. Service as required.
<b>Speedometer Gear—Driven</b> —Damaged	—Inspect for damage. Service as required.
<b>Main Controls</b> —Bolts not tightened to specification —Gaskets—damaged, off location —3-2 Shift Timing Valve, Backout Valve, Forward Clutch Control, 1-2, 2-3 Shift Valves—stuck, damaged —3-2 Shift Timing Spring Clip—damaged, missing  —B5 Check Ball —SS1, SS2 or SS3 Malfunction	—Retighten bolts to specification. —Inspect for damage. Replace as required. —Inspect. Service as required.  —Inspect for damage. Service as required. Refer to TSB 91-19-8 for information. —Inspect. Service as required. —Activate solenoid using transmission tester. If solenoid operation cannot be felt when placing hand on solenoid, replace solenoid. Inspect O-rings for damage. Service as required.
<b>Low/Intermediate Servo Assembly</b> —Spring, Bore, Piston—damaged, missing —Incorrect Servo Apply Rod length	—Inspect for damage. Replace as required. —Inspect using procedures in Servo Manual. Service as required.
<b>Support Assembly—Driven Sprocket</b>	

(Continued)

<sup>15</sup> Can be purchased as a separate item.

## DIAGNOSIS AND TESTING (Continued)

## Shift Concern: 3-2 Shift (Cont'd)

Possible Component	Reference / Action
—Seals—damaged, missing, holes blocked	—Inspect for damage, missing or blockage. Service as required.
<b>Low One-Way Clutch Assembly</b> —Not Overrunning—damaged	—Inspect for damage. Replace as required.
<b>Forward Clutch Assembly</b> —Return Spring damaged —Friction Elements damaged —Seals/Piston damaged —Check Ball damaged, stuck or missing	—Inspect for damage. Service as required. —Inspect for damage. Service as required. —Inspect for damage. Service as required. —Inspect for damage. Service as required.
<b>Direct Clutch Assembly</b> —Return Spring damaged —Return Spring Retaining Ring out of position —Check Ball not functioning	—Inspect for damage. Replace as required. —Inspect for damage. Replace as required. —Inspect for damage. Replace as required.
<b>Low/Intermediate Band</b> —Damaged, worn, burnt, misassembled	—Inspect for damage. Replace as required.
<b>Differential Assembly</b> —Damaged	—Inspect for damage. Service as required.
<b>Speedometer Drive Gear</b> —Damaged	—Inspect for damage. Service as required.

TD11433A

## Shift Concern: 2-1 Shift (Automatic)

Possible Component	Reference / Action
<b>225 — ELECTRICAL ROUTINE</b>	
<b>Powertrain Control System</b> —Electrical Inputs/Outputs, Vehicle Wiring Harnesses, Powertrain Control Module (PCM), Shift Solenoids, MLP Sensor	—Run On-Board Diagnostic. —Refer to Powertrain Control/Emissions Diagnosis Manual <sup>16</sup> for diagnosis. Perform Service Manual Pinpoint Tests A and D using the Transmission Tester (007-00085) and MLP Tester (D89T-70010-A) as outlined. Service as required. Clear codes. Road Test and rerun On-Board Diagnostic.
<b>325 — HYDRAULIC/MECHANICAL ROUTINE</b>	
<b>Speedometer Gear—Drive</b> —Damaged	—Inspect for damage. Service as required.
<b>Speedometer Gear—Driven</b> —Damaged	—Inspect for damage. Service as required.
<b>Main Controls</b> —Bolts not tightened to specification —Gaskets—damaged, off location —1-2 Shift Valve, Backout Valve, Intermediate Clutch Shuttle Valve, Main Regulator Valve —SS1 Malfunction  —B10 Check Ball—missing, damaged	—Retighten bolts to specification. —Inspect for damage. Replace as required. —Inspect. Service as required.  —Activate solenoid using transmission tester. If solenoid operation cannot be felt when placing hand on solenoid, replace solenoid. Inspect O-rings for damage. Service as required. —Inspect for damage. Service as required.
<b>Intermediate Clutch Assembly</b> —Return Spring—damaged, misassembled —Friction—damaged, worn —Check Ball damaged	—Inspect for damage. Replace as required. —Inspect for damage. Replace as required. —Inspect. Service as required.
<b>Low One-Way Clutch Assembly</b> —Not Holding, damaged	—inspect for damage. Replace as required.

(Continued)

<sup>16</sup> Can be purchased as a separate item.



## DIAGNOSIS AND TESTING (Continued)

## Shift Concern: 2-1 Shift (Automatic) (Cont'd)

Possible Component	Reference / Action
Differential Assembly —Damaged	—Inspect for damage. Service as required.
Speedometer Drive Gear —Damaged	—Inspect for damage. Service as required.

TD11434A

## Converter: No Apply

Possible Component	Reference / Action
<b>240 — ELECTRICAL ROUTINE</b>	
<b>Powertrain Control System</b> —Electrical Inputs / Outputs, Vehicle Wiring Harnesses, Powertrain Control Module (PCM), TOT, TSS, MLP, TCC	—Run On-Board Diagnostic. —Refer to Powertrain Control / Emissions Diagnosis Manual <sup>17</sup> for diagnosis. Perform Service Manual Pinpoint Tests B, C, D and F using the Transmission Tester (007-00085) and MLP Tester (D89T-70010-A) as outlined. Service as required. Clear codes. Road Test and rerun On-Board Diagnostic.
<b>340 — HYDRAULIC / MECHANICAL ROUTINE</b>	
<b>Improper Pressures</b> —Low Line pressure, Low EPC	—Check pressure at line and EPC taps. Refer to Pressure Chart for specifications. —If low, check main controls.
<b>Main Controls</b> —Bolts not tightened to specification —Gaskets—damaged, off location —Valve Body Pilot Sleeve—damaged, misaligned. Manual Valve, Bypass Clutch Control Valve and/or Plunger, Converter Regulator Valve, Springs, Solenoid Regulator Valve—stuck, damaged —TCC Solenoid Malfunction	—Retighten bolts to specification. —Inspect gaskets. Service as required. —Inspect. Service as required.  —Activate solenoid using transmission tester. If solenoid operation cannot be felt when placing hand on solenoid, replace solenoid. Inspect O-rings for damage. Service as required.
<b>Turbine Shaft</b> —Seals—damaged, missing	—Inspect for damage. Replace as required.
<b>Pump Shaft</b> —Seals—damaged, missing	—Inspect seals for damage. Service as required
<b>Converter</b> —Leakage, Friction Material, Internal Seals	—Inspect and replace as required.

TD11435A

## Converter: Always Applied / Stalls Vehicle

Possible Component	Reference / Action
<b>241 — ELECTRICAL ROUTINE</b>	
<b>Powertrain Control System</b> —Electrical Inputs / Outputs, Vehicle Wiring Harnesses, Powertrain Control Module (PCM), TOT, TSS, TCC	—Run On-Board Diagnostic. —Refer to Powertrain Control / Emissions Diagnosis Manual <sup>17</sup> for diagnosis. Perform Service Manual Pinpoint Tests B, C and F using the Transmission Tester (007-00085) as outlined. Service as required. Clear codes. Road Test and rerun On-Board Diagnostic.
<b>341 — HYDRAULIC / MECHANICAL ROUTINE</b>	
<b>Main Controls</b> —Bolts not tightened to specification —Gaskets—damaged, off location —Bypass Clutch Control Valve or Plunger—stuck, damaged	—Retighten bolts to specification. —Inspect gaskets. Service as required. —Inspect. Service as required.

(Continued)

17 Can be purchased as a separate item.

## DIAGNOSIS AND TESTING (Continued)

## Converter: Always Applied/Stalls Vehicle (Cont'd)

Possible Component	Reference/Action
—TCC Solenoid Malfunction	—Activate solenoid using transmission tester. If solenoid operation cannot be felt when placing hand on solenoid, replace solenoid.
<b>Converter</b> —End clearance (No) —Piston Plate damaged/stuck to cover	—Inspect and replace as required. —If cover is heat stained, replace converter.

TD11436A

## Converter: Cycling/Shudder/Chatter

Possible Component	Reference/Action
<b>242 — ELECTRICAL ROUTINE</b>	
<b>Powertrain Control System</b> —Electrical Inputs/Outputs, Vehicle Wiring Harnesses, Powertrain Control Module (PCM), TCC, MLP Sensor	—Run On-Board Diagnostic. —Refer to Powertrain Control/Emissions Diagnosis Manual <sup>18</sup> for diagnosis. Perform Service Manual Pinpoint Tests C and D using the Transmission Tester (007-00085) and MLP Tester (D89T-70010-A) as outlined. Service as required. Clear codes. Road Test and rerun On-Board Diagnostic.
<b>342 — HYDRAULIC/MECHANICAL ROUTINE</b>	
<b>Fluid Condition</b>	—Inspect fluid condition. If burnt, drain fluid and converter. Replace fluid and filter assembly. Bring vehicle to normal operating temperature. Perform drive cycle as outlined. Perform On-Board Diagnostic. If condition still exists, continue diagnostics.
<b>Improper Pressures</b> —Low Line pressure, Low EPC	—Check pressure at line and EPC taps. Refer to Pressure Chart for specification. —If not OK, check the Main Controls.
<b>Main Controls</b> —Bolts not tightened to specification —Gaskets—damaged, off location —Valve Body Pilot Sleeve—damaged, misaligned Manual Valve, Bypass Clutch Control Valve and Plunger, Converter Regulator Valve—stuck, damaged —TCC Solenoid Malfunction	—Retighten bolts to specification. —Inspect for damage. Replace as required. —Inspect. Service as required.  —Activate solenoid using transmission tester. If solenoid operation cannot be felt when placing hand on solenoid, replace solenoid. Inspect O-rings for damage. Service as required.
<b>Turbine Shaft</b> —Seals—damaged, missing	—Inspect for damage. Replace as required.
<b>Pump Shaft</b> —Seals—damaged, missing	—Inspect seals for damage. Service as required.
<b>Converter</b> —End Clearance—excessive —Leakage, Friction Materials, Internal Seals	—Inspect as outlined. Replace as required. —Inspect as outlined. Replace as required.

TD11446A

## No Engine Braking in 3rd Gear (OD Position) With OD Cancelled—SHO Only

Possible Component	Reference/Action
<b>249—ELECTRICAL ROUTINE</b>	
<b>Powertrain Control System</b> —Electrical Inputs/Outputs, Vehicle Wiring Harnesses, Powertrain Control Module (PCM), Shift Solenoid No. 3 (SS-3)	—Run On-Board Diagnostic. —Refer to Powertrain Control/Emissions Diagnosis Manual <sup>18</sup> for diagnosis. Perform Service Manual Pinpoint Test A using the Transmission Tester (007-00085) as outlined. Service as required. Clear codes. Road Test and rerun On-Board Diagnostic.

(Continued)

## DIAGNOSIS AND TESTING (Continued)

## No Engine Braking in 3rd Gear (OD Position) With OD Cancelled—SHO Only (Cont'd)

Possible Component	Reference / Action
<b>349—HYDRAULIC/MECHANICAL ROUTINE</b>	
<b>Shift Linkage Cable</b> —MLP Sensor—damaged, misadjusted	—Inspect for damage. Service as required. Adjust linkage as outlined. After servicing the linkage, verify that the MLP sensor is properly adjusted.
<b>Improper Pressures</b> —Forward Clutch Pressure, Line Pressure	—Check pressure at line tap. Refer to pressure chart No. 401 for specifications. If not OK, check the following components: Main Controls and Forward Clutch Assembly.
<b>Main Controls</b> —Bolts not tightened to specification —Gaskets—damaged, off location —Shift Valves, Forward Clutch Control Valve damaged, stuck or misassembled. —SS-3 damaged, stuck	—Retighten bolts to specification. —Inspect for damage. Replace gaskets. —Inspect for damage. Service as required. —Perform Pinpoint Test A.
<b>Forward Clutch Assembly</b> —Return Spring, Piston, Seals, Friction Elements, Check Ball—stuck, damaged, misassembled	—Inspect for damage. Service as required.
<b>Low One-Way Clutch Assembly</b> —Not Overrunning, damaged	—Inspect for damage. Service as required.

TD10642A

## No Engine Braking in 1st Gear, Manual 1st Position

Possible Component	Reference / Action
<b>250 — ELECTRICAL ROUTINE</b>	
No Electrical Concerns	
<b>350 — HYDRAULIC/MECHANICAL ROUTINE</b>	
<b>Shift Linkage</b> —Damaged or misadjusted	—Inspect and service as required. Adjust linkage as outlined. After servicing linkage, verify that the MLP sensor is properly adjusted. Refer to Transaxle, Assembly.
<b>Improper Pressures</b> —Direct Clutch pressure	—Check pressure at direct clutch tap. Refer to pressure chart 401 for specifications. If not OK, check Main Controls and Direct Clutch Assembly.
<b>Main Controls</b> —Bolts not tightened to specification —Gaskets—damaged, off location —Manual Low Relief Valve, 1-2 Shift Valve, Pull-In Valve—stuck, damaged or misassembled	—Retighten bolts to specification. —Inspect for damage. Replace as required. —Inspect. Clean or service as required.
<b>Direct Clutch Assembly</b> —Refer to Routine 321	—Inspect. Service or replace as required.
<b>Direct One-Way Clutch</b> —Damaged	—Inspect for damage. Service as required.

TD11437A

## Shift Efforts High

Possible Component	Reference / Action
<b>251 — ELECTRICAL ROUTINE</b>	
No Electrical Concerns	
<b>351 — HYDRAULIC/MECHANICAL ROUTINE</b>	
<b>Shift Linkage</b>	

(Continued)

## DIAGNOSIS AND TESTING (Continued)

## Shift Efforts High (Cont'd)

Possible Component	Reference/Action
—Damaged or misadjusted	—Inspect and service as required. Adjust linkage as outlined. After servicing linkage, verify that the MLP sensor is properly adjusted. Refer to Transaxle, Assembly.
<b>Manual Lever</b> —Retaining Pin damaged, Nut loose, Detent Spring-bent, damaged or Park Mechanism damaged	—Inspect and service as required.
<b>Main Control</b> —Manual Valve stuck —Bolts not tightened to specification	—Inspect and service or replace as necessary. —Retighten bolts to specification.
<b>Brake Shift Interlock</b>	—Refer to Section 07-05.

TD11438A

## External Leaks

Possible Component	Reference/Action
<b>252 — ELECTRICAL ROUTINE</b>	
<b>Engine Components</b> —Vehicle Speed Sensor, Seals	—Inspect and service as required.
<b>Transmission Components</b> —Transmission Connector, TSS Seals	—Inspect and service as required.
<b>352 — HYDRAULIC/MECHANICAL ROUTINE</b>	
<b>Seals/Gaskets</b> —Converter, TSS, Oil Pans, Extension Housing—Gasket/Seal, Manual Lever, Fluid Level Indicator, Servo Covers, Halfshaft Axles	—Locate source and service as required.
<b>Other</b> —Cooler Fitting, Pressure Taps, Transaxle Connectors, Speedometer Cover, Cooler Lines, Case Porosity, Case Cracked —Vent blocked or damaged	—Locate source and service as required. —Check vent for damage or blockage; service as required.

TD11439A

## Poor Vehicle Acceleration

Possible Component	Reference/Action
<b>253 — ELECTRICAL ROUTINE</b>	
<b>Powertrain Control System</b> —Electrical Inputs/Outputs, Vehicle Wiring Harnesses, Powertrain Control Module (PCM), TCC Solenoid	—Run On-Board Diagnostic. —Refer to Powertrain Control/Emissions Diagnosis Manual <sup>19</sup> for diagnosis. Perform Service Manual Pinpoint Test C using the Transmission Tester (007-00085) as outlined. Service as required. Clear codes. Road Test and rerun On-Board Diagnostic.
<b>353 — HYDRAULIC/MECHANICAL ROUTINE</b>	
Verify proper shift scheduling and engagements	—Go to the appropriate Diagnostic Routines.
Torque converter clutch always applied	—Go to Routine 341.
<b>Torque Converter One-Way Clutch</b> —Damaged	—Replace converter if damaged.

TD11440A

## Noise/Vibration — Forward/Reverse

Possible Component	Reference/Action
<b>254 — ELECTRICAL ROUTINE</b>	
No Electrical Concerns	
<b>354 — HYDRAULIC/MECHANICAL ROUTINE</b>	
<b>For Noises/Vibrations That Change With Engine Speed:</b>	

(Continued)

<sup>19</sup> Can be purchased as a separate item.