GROUP

TRANSAXLE 07

(7000)

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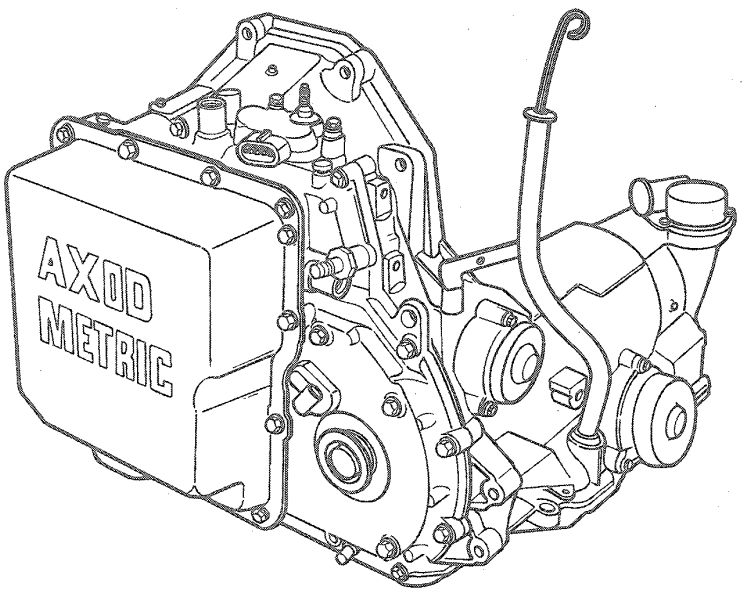
VEHICLE APPLICATION

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.



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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

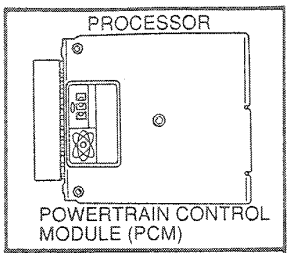
- **Drive Sprocket:** Transmits power from the converter to the drive link assembly (chain).
- **Drive Link Assembly (Chain):** Connects drive and driven sprockets.
- **Driven Sprocket:** Transmits converter power to the geartrain.

Hydraulic System

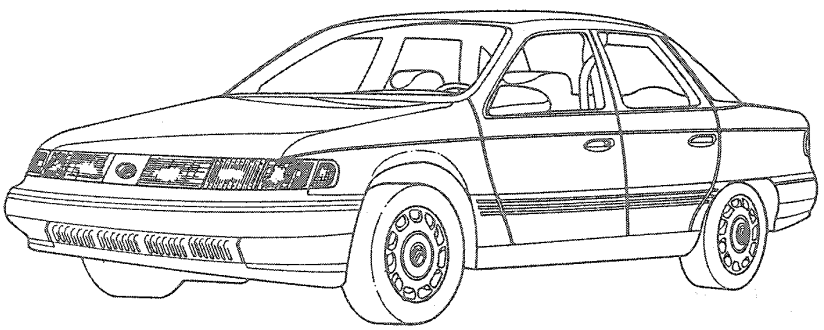
- **Valve Body:** (Main Control Assembly) directs fluid (oil) under pressure to the torque converter, band servos and clutches, to control transaxle operation.
- **Oil Pump:** Provides a supply of fluid (oil) under pressure to operate, lubricate, and cool the transaxle. The oil pump is a variable capacity 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.

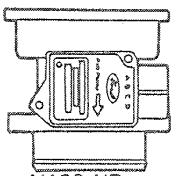
DESCRIPTION AND OPERATION (Continued)

Electrical Component Function
Component Illustrations

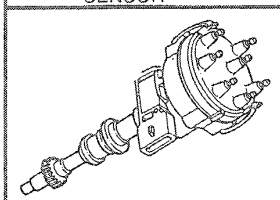


POWERTRAIN CONTROL MODULE (PCM)

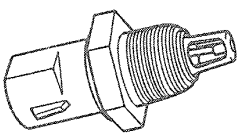




MASS AIR FLOW (MAF) SENSOR

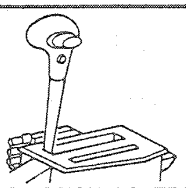


PROFILE IGNITION PICKUP (PIP)

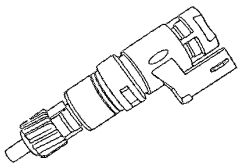


INTAKE AIR TEMPERATURE (IAT)

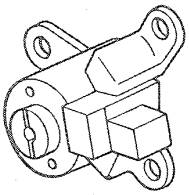
TRANSMISSION CONTROL INDICATOR LAMP (TCIL) (SHO ONLY)



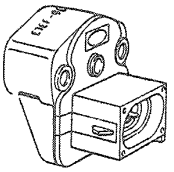
TRANSMISSION CONTROL SWITCH (TCS) (SHO ONLY)



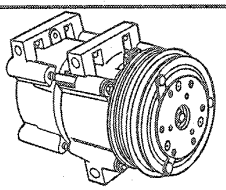
VEHICLE SPEED SENSOR (VSS)



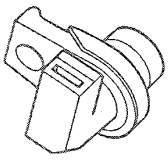
ELECTRONIC PRESSURE CONTROL (EPC)



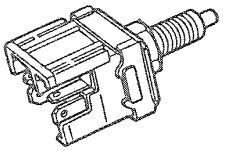
THROTTLE POSITION (TP) SENSOR



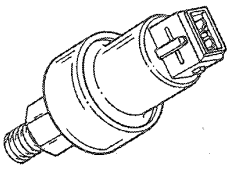
AIR CONDITIONING CLUTCH (ACC)



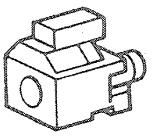
TRANSMISSION SPEED SENSOR (TSS)



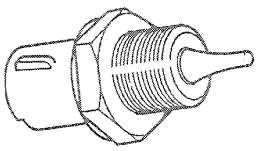
BRAKE ON/OFF (BOO)



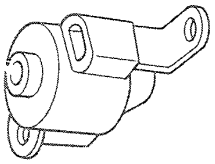
POWER STEERING PRESSURE SWITCH (PSPS)



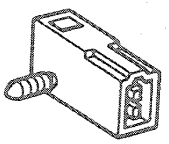
SHIFT SOLENOID (SS1)



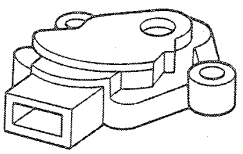
ENGINE COOLANT TEMPERATURE (ECT)



TORQUE CONVERTER CLUTCH (TCC)



TRANSMISSION OIL TEMPERATURE (TOT)



MANUAL LEVER POSITION (MLP) SENSOR

D11465-A

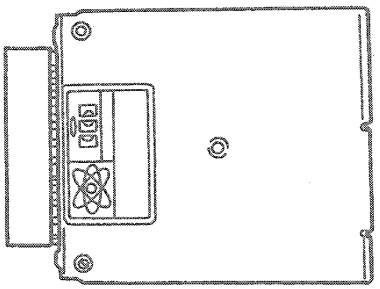
DESCRIPTION AND OPERATION (Continued)

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.

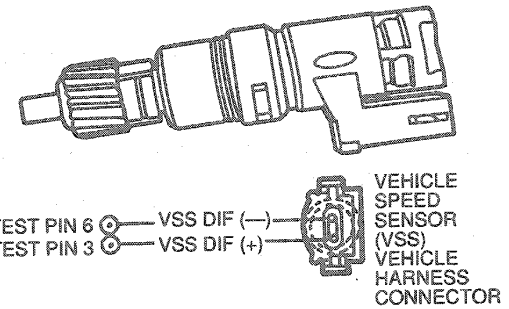
- **Powertrain Control Module (PCM) 12A650:** Controls operation of the AXODE (AX4S) automatic transaxle. Many input sensors provide information to the powertrain control module (PCM). The powertrain control module (PCM) then controls the actuators which affect transaxle operation.

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.



D10198-A

Transmission Function:

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

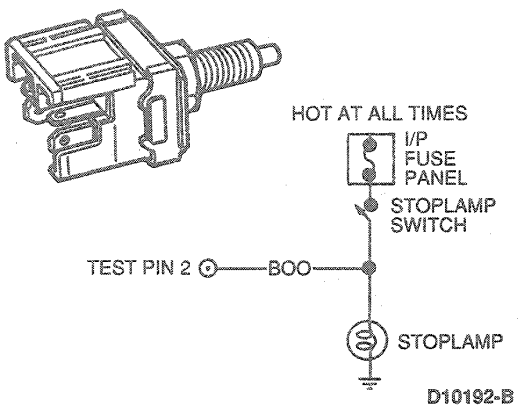
Symptoms:

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.

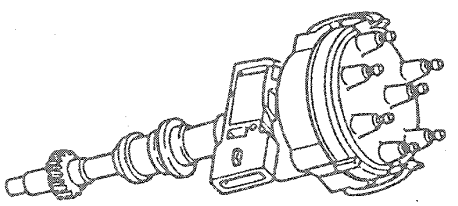
Symptoms:

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:

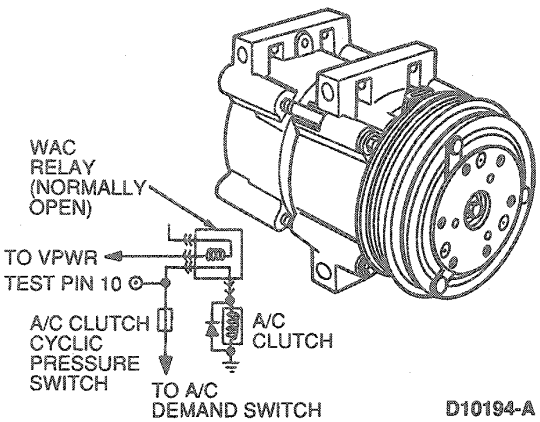
Uses rpm signal in the transmission strategy for torque converter clutch control.

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.

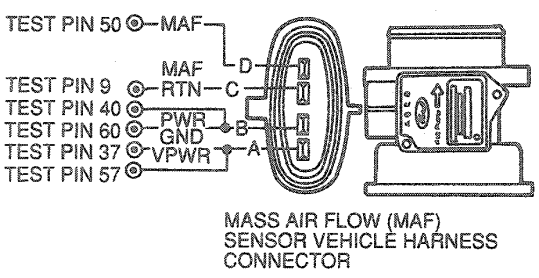
Symptoms:

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.

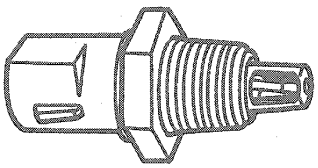
DESCRIPTION AND OPERATION (Continued)

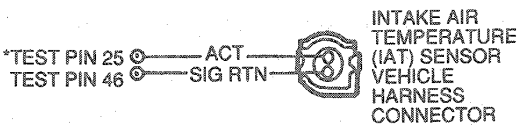
Symptoms:

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.





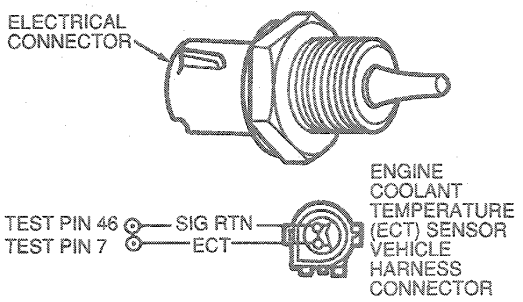
D10155-B

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.



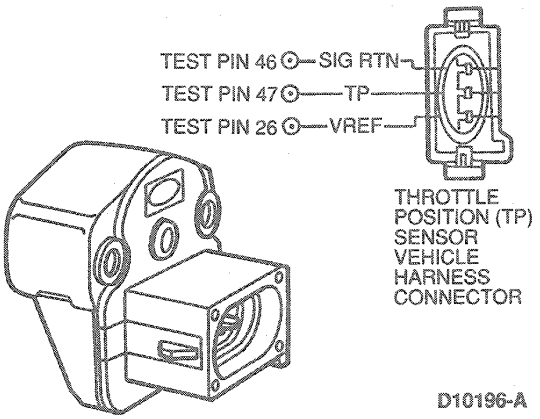
D10147-A

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.

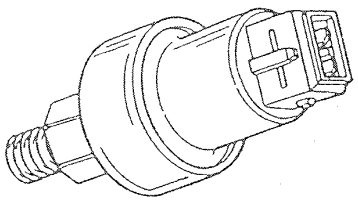
Symptoms:

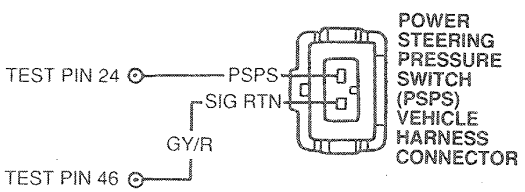
Harsh engagements, firm shift feel, abnormal shift schedule, torque converter clutch does not engage, torque converter clutch cycling.

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.

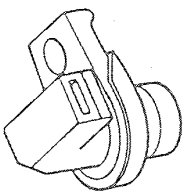
Symptoms:

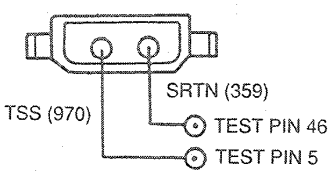
Failed ON—EPC slightly high, firm engagements, firm shifts, harsh coastdown shifts.

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:

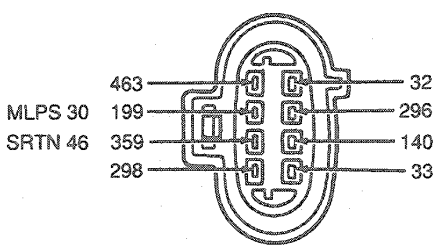
Provides converter turbine speed information for torque converter clutch (TCC) strategy. Also used in determining static pressure settings.

Symptoms:

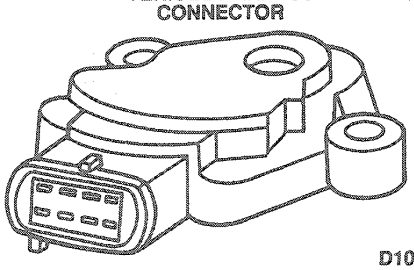
Increased engine rpm on engagements, harsh shifts (converter engaged).

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.



VEHICLE HARNESS CONNECTOR



D10635-A

Transmission Function:

Determine desired gear and EPC pressure.

DESCRIPTION AND OPERATION (Continued)

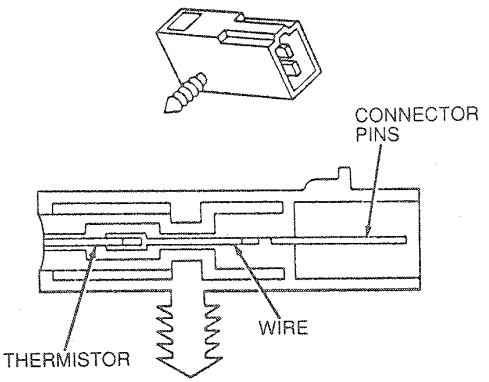
Symptoms:

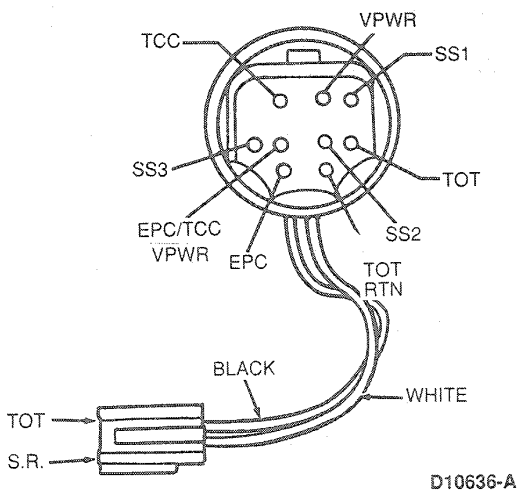
Harsh engagements and firm shift feel. No 3/4 shift. May downshift to a lower gear.

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.

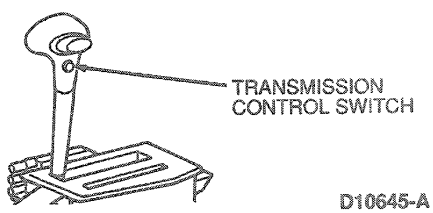
Symptoms:

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.

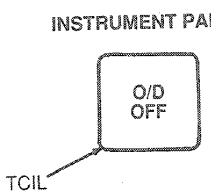
Symptoms:

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)



D11467-A

Transmission Function:

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

Symptoms:

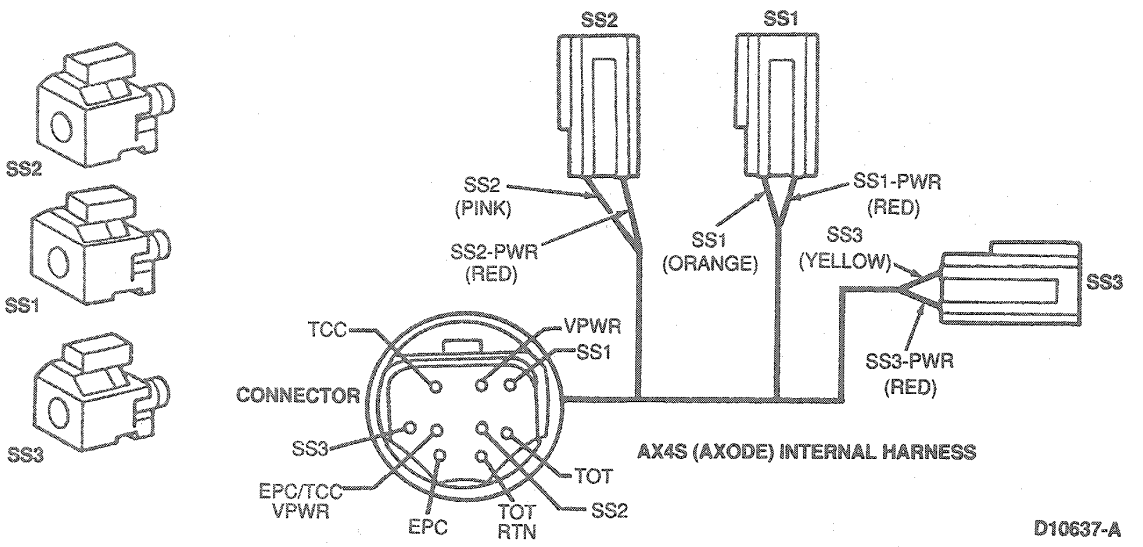
Failed "ON"—Overdrive cancel mode always indicated, no flashing for EPC circuit shorted.

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.

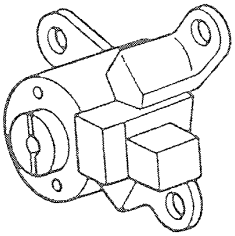
DTC's: 641, 648

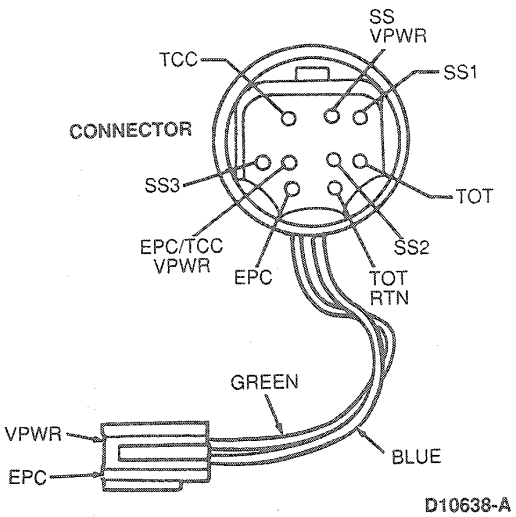
NOTE: DTC 641 is an output circuit check, generated **only** by electrical conditions.

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.





D10638-A

Transmission Function:

Regulates EPC pressure, backout valve control, line pressure.

Symptoms:

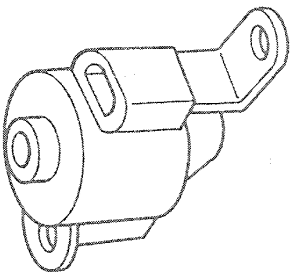
Failed "ON"—Failsafe EPC pressure (120 psi), harsh engagements, harsh shifts.

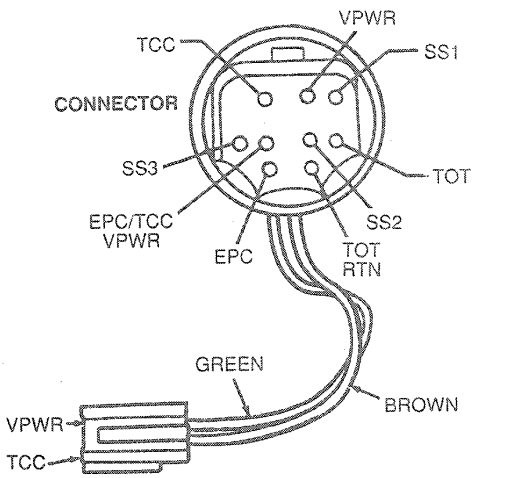
Failed "OFF"— Maximum EPC pressure (90 psi), harsh engagements, harsh shifts.

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.





D10639-A

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[a]	ON[a]	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	2	YES	ON	ON	OFF
2[b]	3[b]	YES	OFF	OFF	OFF
MANUAL 1	1	YES	OFF	ON	OFF
1[B]	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.

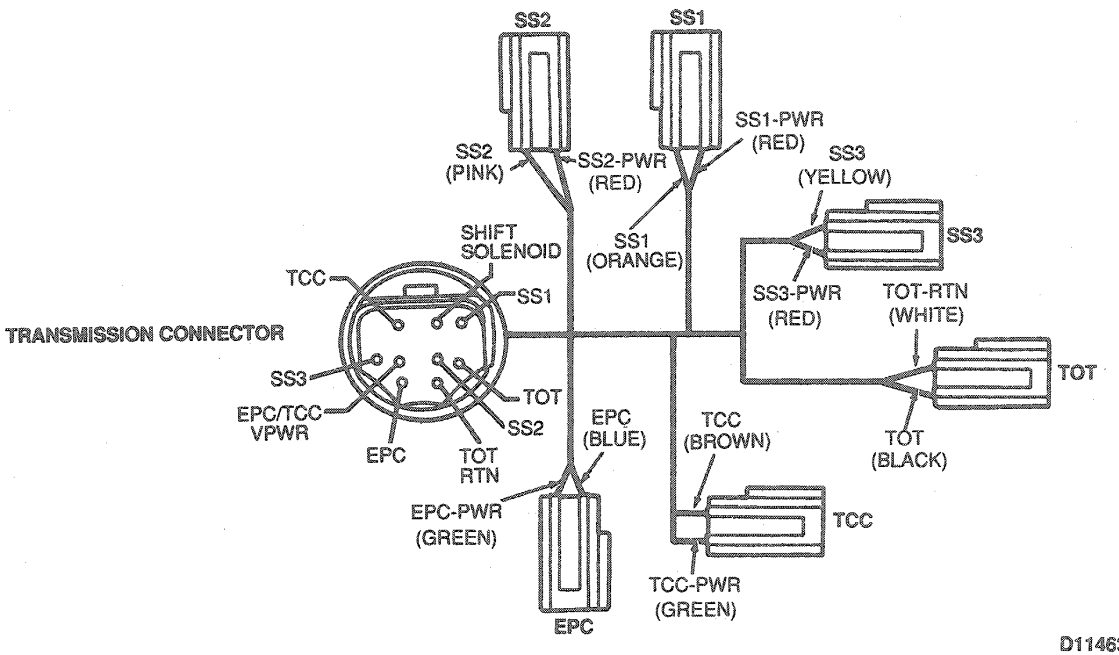
SS1 ALWAYS ON	GEAR SELECTOR POSITION			
	OD	D or 3rd w/OD OFF (SHO)	2 SHO	1
PCM GEAR COMMANDED	ACTUAL GEAR OBTAINED			
1	2	2	2	2
2	2	2	2	2
3	4	2		
4	4			

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			

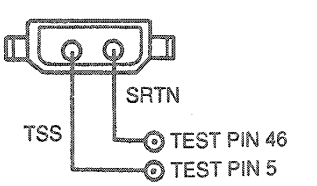
SS3 ALWAYS ON	GEAR SELECTOR POSITION			
	OD	D or 3rd w/OD OFF (SHO)	2 SHO	1
PCM GEAR COMMANDED	ACTUAL GEAR OBTAINED			
1	1	1	1	1
2	2	2	2	2
3	3	3		
4	4			

Internal Transmission Connector/Harness Diagram



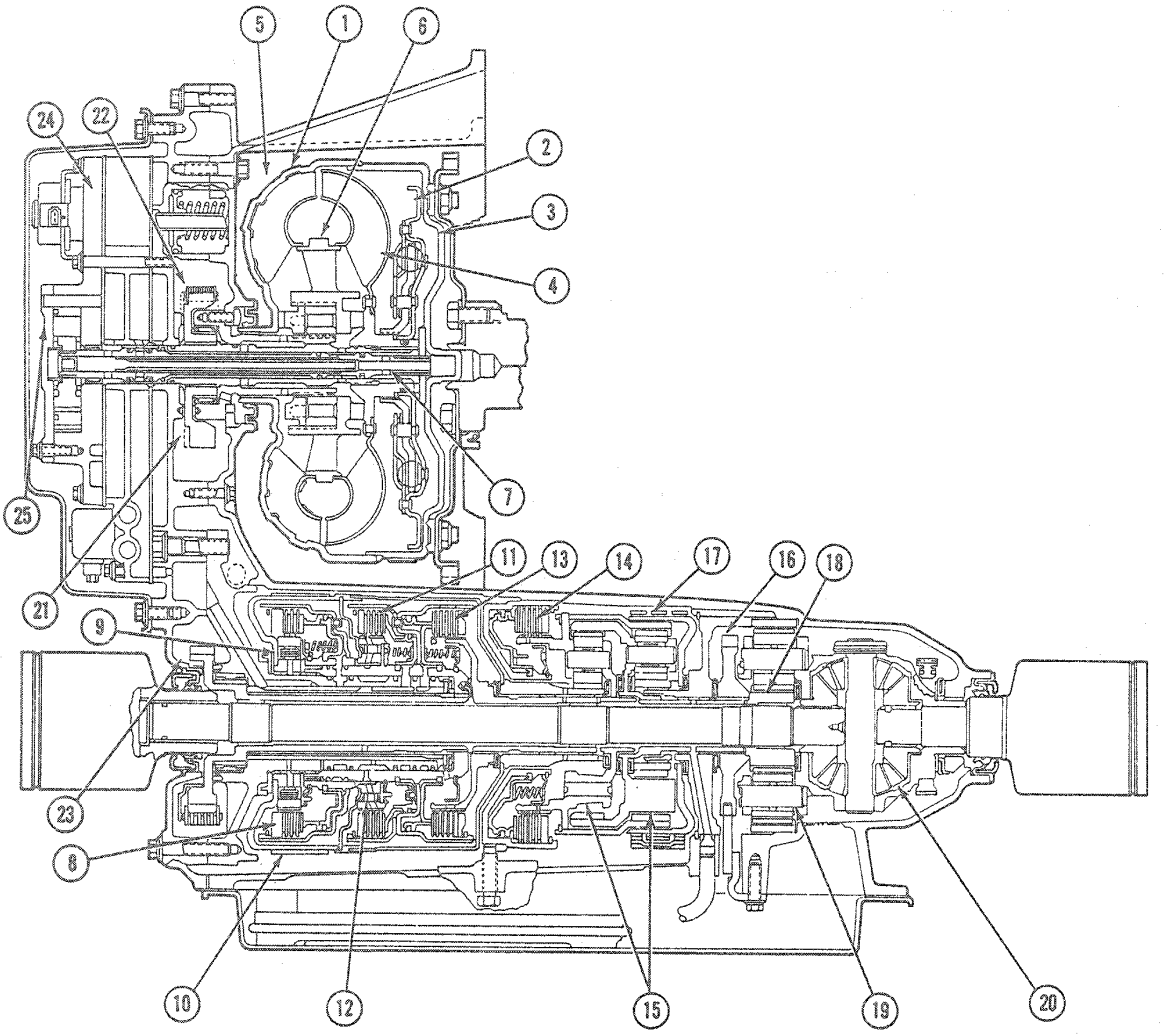
WIRE COLOR	CIRCUIT DESCRIPTION	PCM TEST PINS
BL	EPC	38
Y	SS3	55
GR	EPC/TCC VPWR	37, 57
BR	TCC	53
W	TOT RETURN	46
BK	TOT	49
PK	SS2	52
O	SS1	51
R	VPWR	37, 57

Transmission Speed Sensor Connector



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

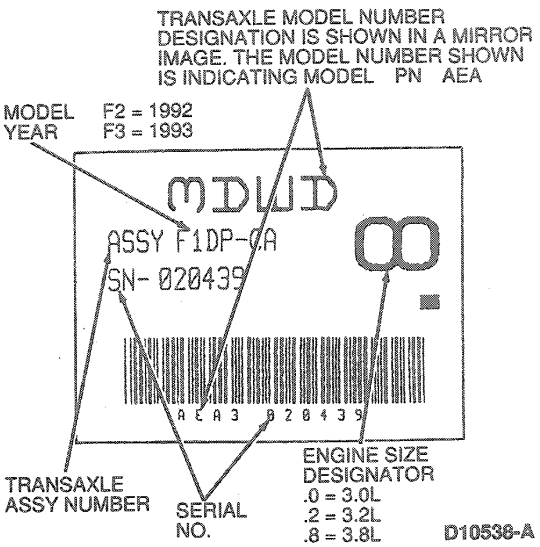
The torque demand downshift occurs (automatically) during part throttle acceleration when the demand for torque is greater than the engine can provide at that gear ratio. The transaxle will disengage the torque converter clutch to provide added acceleration, if applied.

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.

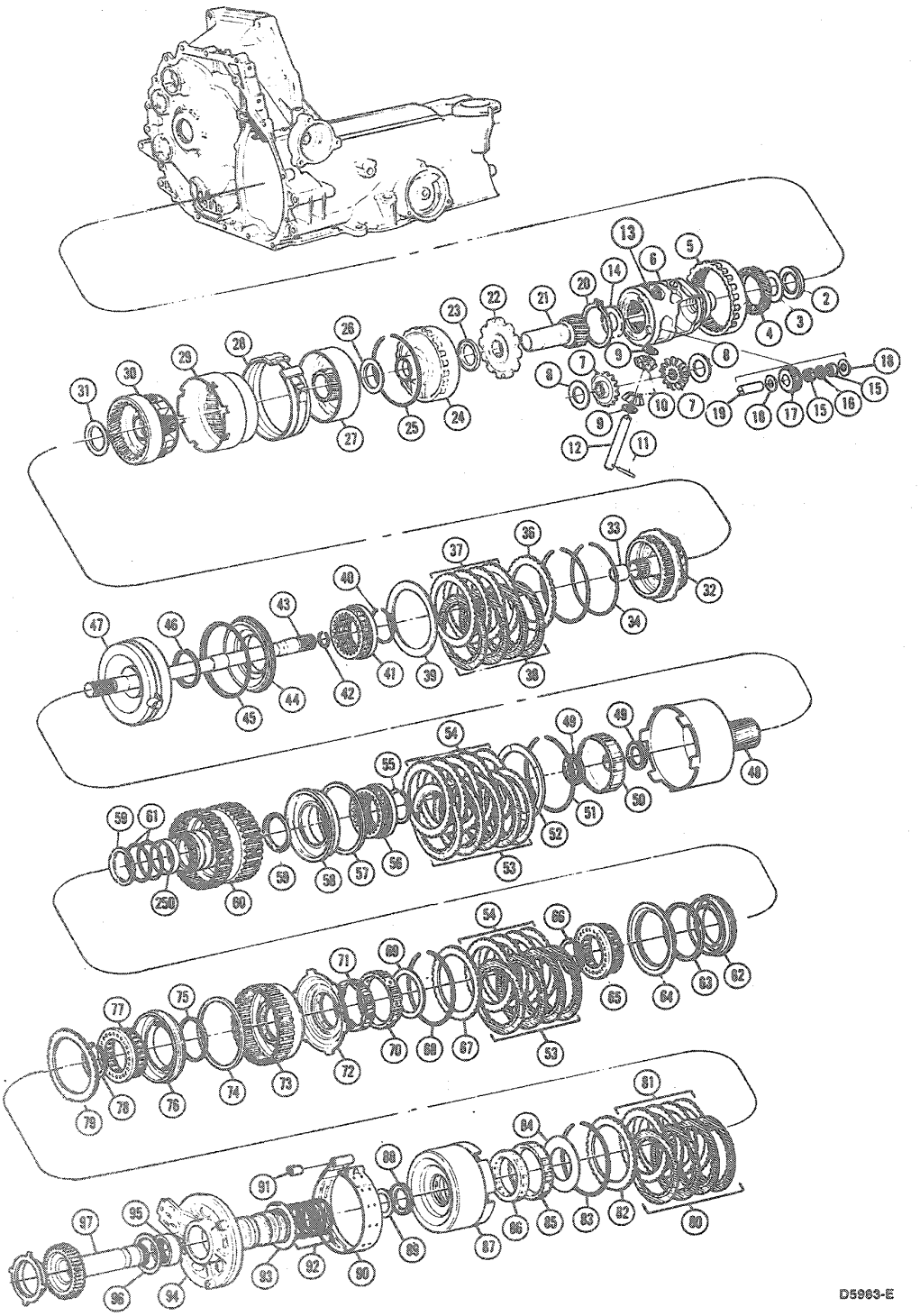
Identification Tag

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

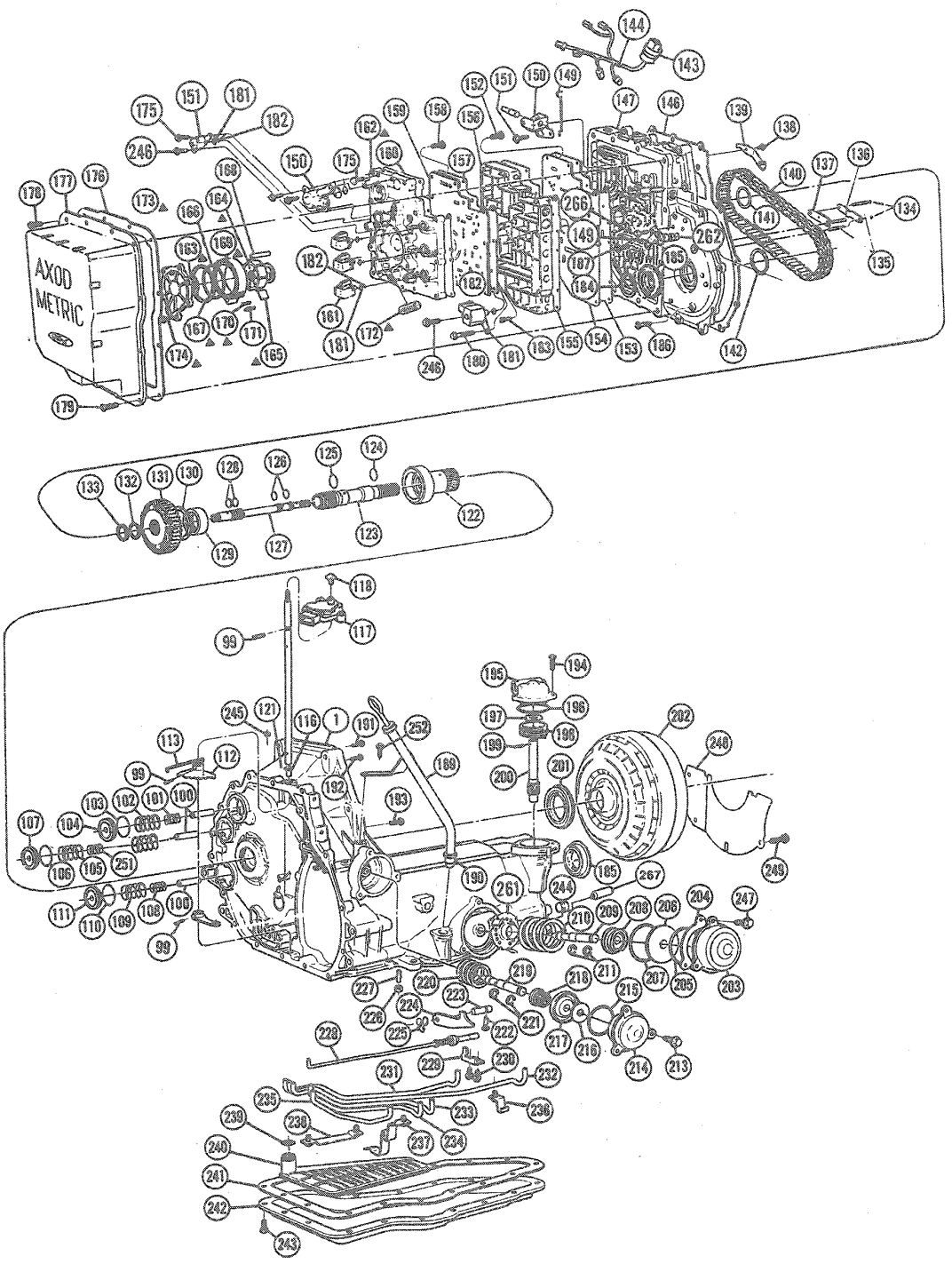


DESCRIPTION AND OPERATION (Continued)

All Except SHO



DESCRIPTION AND OPERATION (Continued)



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 Flg Pit (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	7G004	Cover—Main Control
178	N605789-S2	Bolt—M8-35.0 Hex Flg Hd (11-Att Chain Cover to Case)
179	N605903-S2	Bolt—M8-1.25 X 25 Hex Flg Hd (12-Att Main Ctl Cvr to Chn Cvr.)
180	N606022-S	Bolt—M6-1.00 X 40 Hex Flg 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 Flg 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 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-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—11mm 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 Blt.)
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 Flg. 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
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 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 X 1.0 X 14 Hex Flg. 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 Flg. 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 Flg Hd (ATT 7M101 To Chain Cover)
267	N806944-S1036	Stud—M10—1.5 X 60.5

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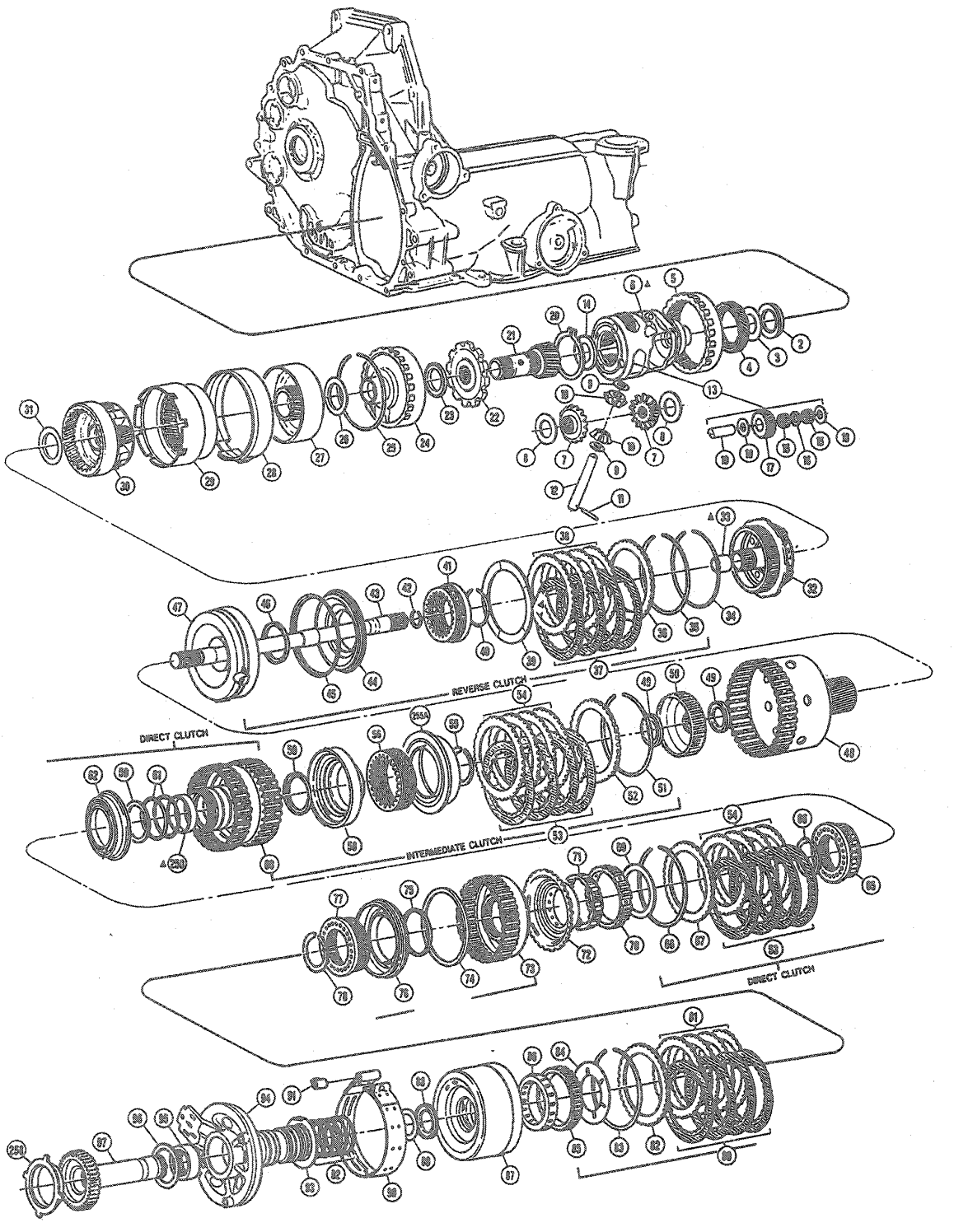
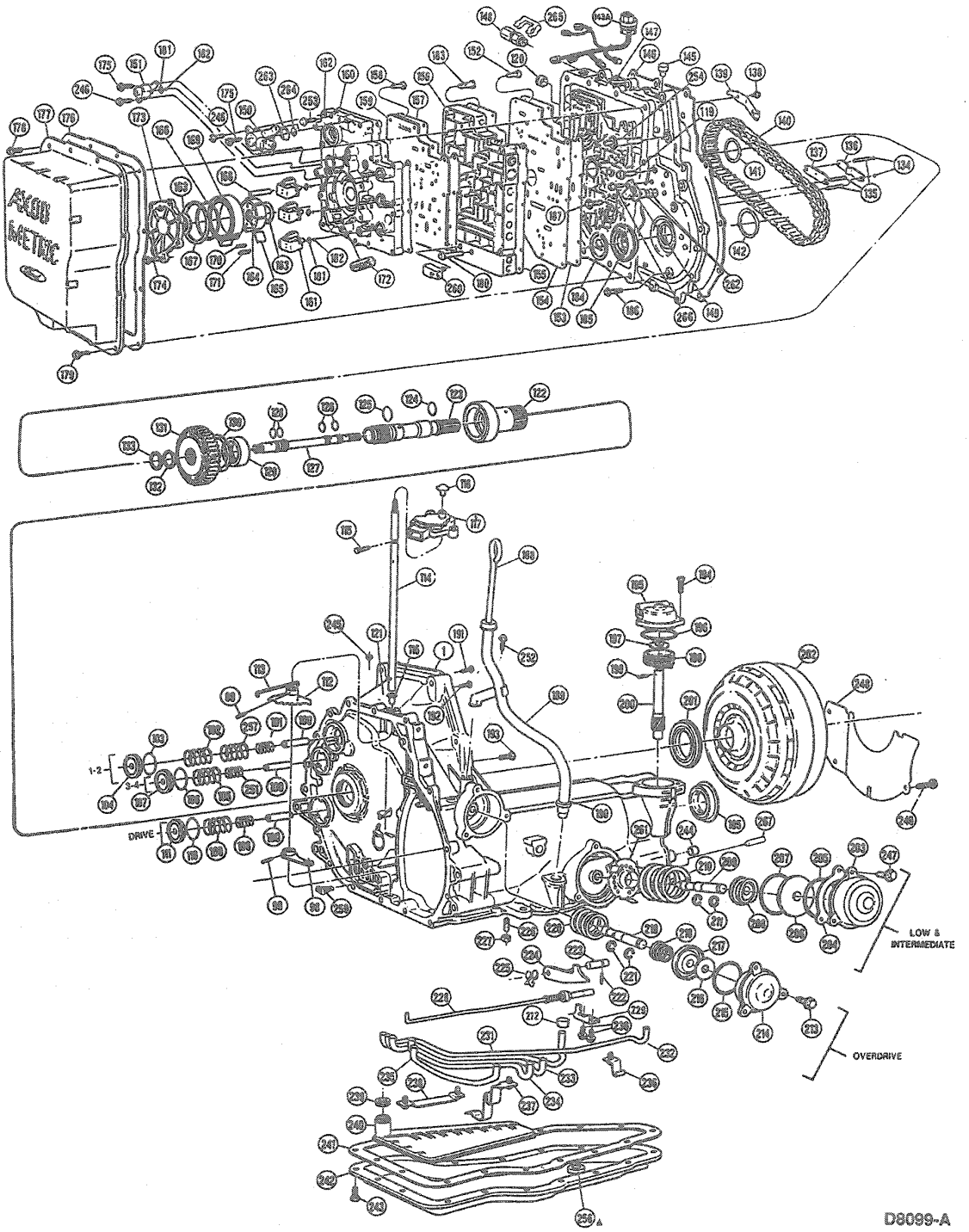
DESCRIPTION AND OPERATION (Continued)

SHO Only



DESCRIPTION AND OPERATION (Continued)



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 Actu
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 Flg Hd (Sensor Assy to Case)
119	N606024-S2536	Bolt—M6—1.0 X 50 Hex Flg 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 Blt)
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-S1036	Stud—M10 X 1.5 X 60.5 Pilot

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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[1] for electronic concerns from the transaxle connector through the vehicle electronic system.

Required Equipment:

- Powertrain Control / Emissions Diagnosis Manual[1]
- 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[1].
7. Service all diagnostic trouble codes (DTC's) as outlined in the Powertrain Control / Emissions Diagnosis Manual[1]. 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,[1] 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

1 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[1]	MECHANICAL HYDRAULIC
Engagement Concerns		
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
Shift Concerns		
Some / All Shifts Missing	210	310
Timing Concerns		
—Early / Late	211	311
—Erratic	212	312
Feel		
—Soft / Slipping	213	313
—Harsh	214	314
No First Gear, Engages in Higher Gear	215	315
No Manual First Gear	216	316
No Manual Second Gear	217	317
Converter Operation Concerns		
Converter: No Apply	240	340
Converter: Always Applied / Stalls Vehicle	241	341
Converter: Cycling / Shudder / Chatter	242	342
Other Concerns		
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
Reference		
Control Pressure Test and Diagnostic Pressure Chart		401

1 Perform Electrical Routine first.

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DIAGNOSIS AND TESTING (Continued)

No Forward Engagements

Possible Component	Reference/Action
201 — ELECTRICAL ROUTINE	
No Electrical Concerns	
301 — HYDRAULIC/MECHANICAL ROUTINE	
Fluid —Improper level, low	—Adjust fluid to proper level.
Halfshafts —Worn, damaged, misassembled	—Inspect for damage. Service as required.
Shift Linkage —Damaged, misadjusted	—Inspect and service as required. Adjust linkage as outlined. After servicing linkage, verify MLP sensor is properly adjusted. Refer to Transaxle, Assembly.
Improper Pressures —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.
Oil Filter and Seal Assembly —Plugged, damaged —Filter seal damaged	—Replace filter and seal assembly.
Main Controls —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.
Pump Assembly —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.
Support Assembly—Driven Sprocket —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.
Forward Clutch Assembly —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.
Low One-Way Clutch Assembly (Planetary) —Worn, damaged or misassembled	—Inspect for damage. Service as required.
Low Intermediate Servo Assembly —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.
Output Shaft	

(Continued)

DIAGNOSIS AND TESTING (Continued)

No Forward Engagements (Cont'd)

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

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No Reverse Engagement

Possible Component	Reference/Action
202 — ELECTRICAL ROUTINE	
No Electrical Concerns	
302 — HYDRAULIC/MECHANICAL ROUTINE	
Fluid —Improper level	—Adjust fluid to proper level.
Halfshafts —Worn, damaged, misassembled	—Inspect for damage. Service as required.
Shift Linkage —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.
Improper Pressures —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.
Oil Filter and seal assembly —Plugged or damaged	—Replace filter and seal assembly.
Main Controls —Forward Clutch Pressure Tap Plug—damaged, loose, missing —Bolts not tightened to specification. —Gasket—damaged, off location —Pump Shaft—broken —Forward Clutch Control Valve, Manual Valve, Main Regulator Valve, Springs—stuck, damaged	—Inspect. Service as required. —Retighten bolts to specification. —Inspect for damage. Replace as required. —Inspect. Service/replace as required. —Inspect for damage. Service as required.
Pump Assembly —Bolts not tightened to specification. —Gasket damaged, off location —Porosity/cross leaks/ball missing or leaking, plugged hole —Components damaged	—Retighten bolts to specification. —Inspect for damage and replace as required. —Replace pump assembly. —Inspect for damage and replace as required.
Support Assembly—Driven Sprocket —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.
Forward Clutch Assembly —Seals, Piston —Check Balls —Piston—cracked —Friction Elements—worn, damaged	—Inspect seals for damage. Replace 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.
Low One-Way Clutch Assembly (Planetary) —Worn, damaged, misassembled	—Inspect for damage. Service as required.
Reverse Clutch Assembly	

(Continued)

DIAGNOSIS AND TESTING (Continued)

No Reverse Engagement (Cont'd)

Possible Component	Reference/Action
—Seals, Piston —Check Ball —Friction Elements damaged or worn —Reverse Apply Tube leaking or improperly installed	—Inspect for damage. Service as required. —Inspect. Service as required.
Output Shaft —Splines damaged.	—Inspect for damage. Service as required.

TD10619A

Harsh Reverse Engagement

Possible Component	Reference/Action
203 — ELECTRICAL ROUTINE	
Powertrain Control System —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[2] 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.
303 — HYDRAULIC/MECHANICAL ROUTINE	
Fluid —Improper level —Condition	—Adjust fluid to proper level. —Inspect as outlined under Fluid Condition Check.
Shift Linkage —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.
Improper Pressures —High Line pressure —High EPC pressure	—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.
Oil Filter and Seal Assembly —Plugged or damaged —Filter Seal damaged	—Replace filter and seal assembly.
Main Controls —Bolts not tightened to specification —Gasket—damaged, off location —B1 Check Ball, Pressure Failsafe Valve, Manual Valve, Main Regulator Valve—stuck, damage	—Retighten bolts to specification. —Inspect for damage. Replace as required. —Inspect for damage. Service as required.
Pump Assembly —Bolts not tightened to specification —Gasket damaged, off location —Porosity/cross leaks —Components damaged	—Retighten bolts to specification. —Inspect for damage and replace as required. —Replace pump assembly. —Inspect for damage and replace as required.
Reverse Clutch Assembly —Seals, Piston —Friction Elements damaged, worn —Return spring piston damaged, worn —Reverse Apply Tube leaking or improperly installed	—Inspect for damage. Service as required.

TD10620A

2 Can be purchased as a separate item.

DIAGNOSIS AND TESTING (Continued)

Harsh Forward Engagement

Possible Component	Reference/Action
204 — ELECTRICAL ROUTINE	
Powertrain Control System —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[3] 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.
304 — HYDRAULIC/MECHANICAL ROUTINE	
Fluid —Improper level —Condition	—Adjust fluid to proper level. —Inspect as outlined under Fluid Condition Check.
Shift Linkage —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.
Improper Pressures —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.
Main Controls —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.
Pump Assembly —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.
Low Intermediate Servo —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.
Neutral-to-Drive Accumulator —Piston stuck, seals or springs—damaged, missing	—Check for damage. Replace as required.
Forward Clutch Assembly —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.
Low Intermediate Band/Drum —Friction Elements—damaged, worn —Drum damaged	—Check for damage. Replace as required.
With Manual Lever in 2nd Position (SHO Only) **Intermediate Clutch Assembly** —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
205 — ELECTRICAL ROUTINE	
Powertrain Control System —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[4] 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.
305 — HYDRAULIC/MECHANICAL ROUTINE	
Fluid —Improper level —Condition	 —Adjust fluid to proper level. —Inspect as outlined under Fluid Condition Check.
Shift Linkage —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.
Improper Pressures —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.
Oil Filter and Seal Assembly —Plugged or damaged —Filter Seal damaged	—Replace filter and seal assembly.
Main Controls —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.
Pump Assembly —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.
Support Assembly—Driven Sprocket —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.
Forward Clutch Assembly —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.
Neutral-to-Drive Accumulator —Piston, Seals damaged	 —Inspect for damage. Service as required.
Reverse Clutch Assembly —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.

TD10622A

4 Can be purchased as a separate item.

DIAGNOSIS AND TESTING (Continued)

Delayed/Soft Forward Engagement

Possible Component	Reference/Action
206 — ELECTRICAL ROUTINE	
Powertrain Control System —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[5] 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.
306 — HYDRAULIC/MECHANICAL ROUTINE	
Fluid —Improper level —Condition	 —Adjust fluid to proper level. —Inspect as outlined under Fluid Condition Check.
Shift Linkage —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.
Improper Pressures —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.
Oil Filter and Seal Assembly —Plugged or damaged —Filter Seal damaged	—Replace filter and seal assembly.
Main Controls —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.
Pump Assembly —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.
Low Intermediate Servo Assembly —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.
Neutral-to-Drive Accumulator —Seals, Bore—damaged, stuck	 —Inspect for damage. Replace.
Support Assembly—Driven Sprocket —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.
Forward Clutch Assembly —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.
Low Intermediate Band/Drum	

(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.
With Manual Lever in 2nd Position (SHO Only) **Intermediate Clutch Assembly** —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
210 — ELECTRICAL ROUTINE	
Powertrain Control System —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[6] 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.
310 — HYDRAULIC/MECHANICAL ROUTINE	
Fluid —improper level —Condition	 —Adjust fluid to proper level. —Inspect as outlined under Fluid Condition Check.
Shift Linkage —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.
Vehicle Speed Input —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: **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
211 — ELECTRICAL ROUTINE	
Powertrain Control System —Electrical Inputs/Outputs, Vehicle Wiring Harnesses, Powertrain Control Module (PCM), Shift Solenoids, TOT	—Run On-Board Diagnostic. —Refer to Powertrain Control/Emissions Diagnosis Manual[6] 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.
311 — HYDRAULIC/MECHANICAL ROUTINE	
Other	

(Continued)

6 Can be purchased as a separate item.

DIAGNOSIS AND TESTING (Continued)

Timing — Early/Late (Cont'd)

Possible Component	Reference/Action
—Tire size change —Chain ratio change —Speedometer Gear	—Refer to the specification decal and verify vehicle has original equipment. Changes in tire size and chain ratio will affect shift timing.
Fluid —Improper level	—Adjust fluid to proper level.
Main Controls —Bolts not tightened to specification —Gaskets—damaged, off location —Valves, Accumulators, Seals, Springs, Clips—damaged, missing, misassembled	—Retighten bolts to specification. —Inspect for damage. Replace. —Inspect for damage and contamination. Service as required. —Refer to the appropriate shift for further 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

TD10625A

Timing Erratic

Possible Component	Reference/Action
212 — ELECTRICAL ROUTINE	
Powertrain Control System —Electrical Inputs/Outputs, Vehicle Wiring Harnesses, Powertrain Control Module (PCM), Shift Solenoids, MLP, TCC, TSS and TOT Sensor	—Run On-Board Diagnostic. —Refer to Powertrain Control/Emissions Diagnosis Manual[7] 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.
312 — HYDRAULIC/MECHANICAL ROUTINE	
Fluid —Improper level	—Adjust fluid to proper level.
Main Control —Bolts not tightened to specifications —Gaskets—damaged, off location —Valves, Accumulators, Seals, Clips, Intermediate Clutch Shuttle Valve—stuck, damaged	—Retighten bolts to specifications. —Inspect for damage. Replace as required —Inspect for damage. Service as required.
Vehicle Speed Input —Speedometer Gear—DRIVE—damaged —Speedometer Gear—DRIVEN—Gear and Shaft Assembly —Differential Assembly—damaged or missing	—Refer to Service Manual for teardown information on these gears. Also refer to the appropriate shift routines as noted below.

(Continued)

7 Can be purchased as a separate item.

DIAGNOSIS AND TESTING (Continued)

Timing Erratic (Cont'd)

Possible Component	Reference/Action
—Speedometer DRIVE GEAR—damaged	
Torque Converter Clutch (TCC)	—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
213 — ELECTRICAL ROUTINE	
Powertrain Control System —Electrical Inputs/Outputs, Vehicle Wiring Harnesses, Powertrain Control Module (PCM), EPC Solenoid, TOT	—Run On-Board Diagnostic. —Refer to Powertrain Control/Emissions Diagnosis Manual[8] 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.
313 — HYDRAULIC/MECHANICAL ROUTINE	
Fluid —improper level —Condition	—Adjust fluid to proper level. —Inspect as outlined under Fluid Condition Check.
Shift Linkage —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.
Improper Pressures —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
Main Controls —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	—Inspect. Service as required.
—EPC Solenoid—stuck damaged	—Inspect for damage and contamination. Service as required.
—Pressure Failsafe Valve (Zero EPC Pressure Only) stuck, damaged	—Inspect for damage. Service as required.

TD10613A

Feel — Harsh

Possible Component	Reference/Action
214 — ELECTRICAL ROUTINE	
Powertrain Control System —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[9] 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.
314 — HYDRAULIC/MECHANICAL ROUTINE	
Fluid —Improper level	—Adjust fluid to proper level.
Improper Pressures —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:
Main Controls —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.

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

TD11426A

No 1st Gear, Engages in Higher Gear

Possible Component	Reference/Action
215 — ELECTRICAL ROUTINE	
Powertrain Control System —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[9] 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
315 — HYDRAULIC/MECHANICAL ROUTINE	
Shift Linkage —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.
Main Controls —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: **Shift** 1-2, **Routine** 220/320 **Shift** 2-3, **Routine** 221/321 **Shift** 3-4, **Routine** 222/322
Mechanical —Bands, clutches or seals damaged or worn	—Refer to Transaxle, Disassembly and Assembly.

TD11427A

No Manual 1st Gear

Possible Component	Reference/Action
216 — ELECTRICAL ROUTINE	
Powertrain Control System —Electrical Inputs/Outputs, Vehicle Wiring Harnesses, Powertrain Control Module (PCM) and Shift Solenoids	—Run On-Board Diagnostic. —Refer to Powertrain Control/Emissions Diagnosis Manual[10] 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.
316 — HYDRAULIC/MECHANICAL ROUTINE	
Shift Linkage —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.
Improper Pressures —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.
Main Controls —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.
Support Assembly—Driven Sprocket —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.
Direct Clutch —Check Ball, Piston, Piston Seals, Plates —Friction Elements—damaged, worn	 —Inspect for damage. Service as required. —Inspect for damage. Service as required.

TD11428A

10 Can be purchased as a separate item.

DIAGNOSIS AND TESTING (Continued)

No Manual 2nd Gear (SHO ONLY)

Possible Component	Reference/Action
217—ELECTRICAL ROUTINE	
Powertrain Control System —Electrical Inputs/Outputs, Vehicle Wiring Harnesses, Powertrain Control Module (PCM) and Shift Solenoids	—Run On-Board Diagnostic. —Refer to Powertrain Control/Emissions Diagnosis Manual[11] 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.
317—HYDRAULIC/MECHANICAL ROUTINE	
Shift Linkage/Cable, MLP Sensor —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.
Main Controls —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.
Forward Clutch Assembly —Return Spring, Piston, Seals, Friction Elements, Check Ball—stuck, damaged, misassembled	—Inspect for damage. Service as required.
Low Intermediate Servo —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.
Support Assembly—Drive Sprocket —Seals damaged, missing or holes blocked	—Inspect for damage. Service as required.
Low One-Way Clutch Assembly —Not Overrunning, damaged	—Inspect for damage. Service as required.
Low Intermediate Band —Damaged, worn, burnt or misassembled	—Inspect for damage. Service as required.

TD10641A

Shift Concern: 1-2 Shift

Possible Component	Reference/Action
220 — ELECTRICAL ROUTINE	
Powertrain Control System —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[11] 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.
320 — HYDRAULIC/MECHANICAL ROUTINE	
Shift Linkage —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.
Speedometer Gear—Drive —Damaged	—Inspect for damage. Service as required.
Speedometer Gear—Driven —Damaged	—Inspect for damage. Service as required.
Improper Pressures —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)

11 Can be purchased as a separate item.

DIAGNOSIS AND TESTING (Continued)

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

Possible Component	Reference/Action
Main Controls	
—Bolts not tightened to specification.	—Retighten bolts to specification.
—Gaskets—damaged, off location	—Inspect for damage. Replace as required.
—Intermediate Clutch Tap—loose, missing	—Inspect. Service as required.
—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	—Inspect. Service as required.
—SS1 Malfunction	—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.
1-2 Accumulator Assembly	
—Piston Seals, Springs-damaged, missing	—Inspect for damage. Service as required.
Support Assembly—Driven Sprocket	
—Seals—damaged, missing	—Inspect for damage, missing or blockage. Service as required.
—Holes blocked	
Pump	
—Porosity/cross leak	—Inspect and replace as required.
—Gasket damaged, off location	—Inspect for damage. Replace as required.
—Components damaged	—Inspect for damage or missing ball. Replace pump assembly if required.
Low One-Way Clutch Assembly	
—Not overrunning, damaged	—Inspect for damage. Replace as required.
Intermediate Clutch Assembly	
—Seals—damaged	—Inspect for damage. Replace as required.
—Piston—damaged	—Inspect for damage. Replace as required.
—Friction—damaged, worn	—Inspect for damage. Replace as required.
—Check Ball—missing, damaged	—Inspect for damage. Service or replace as required.
Front Planet Carrier	
—Damaged	—Inspect for weld damage. Service as required.
Differential Assembly	
—Damaged or missing	—Inspect for damage. Service as required.
Speedometer Drive Gear	
—Damaged or missing	—Inspect for damage. Service as required.

TD11429A

Shift Concern: 2-3 Shift

Possible Component	Reference/Action
221 — ELECTRICAL ROUTINE	
Powertrain Control System	
—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[12] 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.
321 — HYDRAULIC/MECHANICAL ROUTINE	
Shift Linkage	
—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.
Speedometer Gear—Drive	
—Damaged	—Inspect for damage. Service as required.
Speedometer Gear—Driven	
—Damaged	—Inspect for damage. Service as required.

(Continued)

12 Can be purchased as a separate item.

DIAGNOSIS AND TESTING (Continued)

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

Possible Component	Reference/Action
Improper Pressures —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.
Main Controls —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.
Low Intermediate Servo Assembly —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.
Support Assembly—Driven Sprocket —Seals—damaged, missing, holes blocked	—Inspect for damage. Service as required.
Direct One-Way Clutch —Not holding, damaged	—Inspect for damage. Replace as required.
Direct Clutch Assembly —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.
Case —Servo Release Passage blocked —Servo Release Tube—leaking, loose	—Inspect for damage. Replace case if damaged.
Direct/Intermediate Clutch Hub —Seals damaged, missing or holes blocked	—Inspect for damage. Service as required.
Speedometer Drive Gear —Damaged	—Inspect for damage. Service as required.

TD11430A

Shift Concern: 3-4 Shift

Possible Component	Reference/Action
222 — ELECTRICAL ROUTINE	
Powertrain Control System —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[13] for diagnosis. Perform Service Manual Pinpoint Tests A, 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.
322 — HYDRAULIC/MECHANICAL ROUTINE	
Shift Linkage —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.
Speedometer Gear—Drive —Damaged	—Inspect for damage. Service as required.
Speedometer Gear—Driven —Damaged	—Inspect for damage. Service as required.
Overdrive Servo Assembly	

(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	—Inspect. Replace if incorrect.
—Servo Bore or Piston damaged	—Inspect for damage. Service as required.
—Piston Seals—damaged, missing	—Inspect for damage. Service as required.
—Return Spring Retaining Clip—missing, broken	—Inspect for damage. Service as required.
Main Controls	
—Bolts not tightened to specification	—Retighten bolts to specification.
—Gaskets—damaged, off location	—Inspect for damage. Replace as required.
—3-4 Shift Valve, 1-2 Shift Valve, Accumulator Regulator Valve, Forward Clutch Control Valve—stuck, damaged	—Inspect. Service as required.
—SS1 Malfunction	—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.
—EPC Solenoid stuck, damaged	—Inspect for damage. Service as required.
—B4, B11 Check Balls	—Inspect for damage. Replace as required.
3-4 Accumulator Assembly	
—Accumulator Piston—stuck, damaged	—Inspect for damage. Service as required.
—Piston Seals—missing, damaged	—Inspect for damage. Service as required.
—Springs—missing, damaged, holes blocked	—Inspect for damage. Service as required.
Support Assembly—Driven Sprocket	
—Seals—damaged, missing, holes blocked	—Inspect for damage, missing or blockage. Service as required.
OD Band	
—OD Band—damaged, worn, misassembled	—Inspect for damage. Replace as required.
—Direct One-Way Clutch Assembly damaged	—Inspect for damage. Replace as required.
Forward Clutch Assembly	
—Return Spring/Piston damaged	—Inspect for damage. Replace as required.
Differential Assembly	
—Damaged or missing	—Inspect for damage. Service as required.
Speedometer Drive Gear	
—Damaged	—Inspect for damage. Service as required.

TD11431A

Shift Concern: 4-3 Shift

Possible Component	Reference/Action
223 — ELECTRICAL ROUTINE	
Powertrain Control System —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[14] 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.
323 — HYDRAULIC/MECHANICAL ROUTINE	
Speedometer Gear—Drive —Damaged	—Inspect for damage. Service as required.
Speedometer Gear—Driven —Damaged	—Inspect for damage. Service as required.
Main Controls	
—Bolts not tightened to specification	—Retighten bolts to specification.
—Gaskets—damaged, off location	—Inspect for damage. Replace as required.
—1-2 Shift Valve, 3-4 Shift Valve, Accumulator Regulator Valve—stuck, damaged	—Inspect. Service as required.
—SS1 Malfunction	—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	—Inspect for damage. Perform Pinpoint Test E.
—Servo Cover, Seal, Rod and Piston Cushion Spring—damaged	—Inspect for damage. Service as required.
—B4, B11 Check Balls—damaged, missing	—Inspect for damage. Service as required.
OD Band	
—OD Band—damaged, worn, misassembled	—Inspect for damage. Replace as required.
—Direct One-Way Clutch Assembly damaged	—Inspect for damage. Service as required.
Overdrive Servo Assembly	
—Apply Rod wrong	—Inspect Rod as outlined.
—Servo Bore or Piston damaged	—Inspect for damage. Service as required.
—Piston Seals—damaged, missing	—Inspect for damage. Service as required.
—Return Spring Retaining Clip—missing, broken	—Inspect for damage. Service as required.
Torque Converter Clutch	
—Not releasing	—See Converter Always Applied Diagnostic Routine 241/341.
Differential Assembly	
—Damaged	—Inspect for damage. Service as required.
Speedometer Drive Gear	
—Wrong or missing	—Inspect for damage. Service as required.

TD11432A

Shift Concern: 3-2 Shift

Possible Component	Reference/Action
224 — ELECTRICAL ROUTINE	
Powertrain Control System	
—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[15] 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.
324 — HYDRAULIC/MECHANICAL ROUTINE	
Improper Pressures	
—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.
Speedometer Gear—Drive	
—Damaged	—Inspect for damage. Service as required.
Speedometer Gear—Driven	
—Damaged	—Inspect for damage. Service as required.
Main Controls	
—Bolts not tightened to specification	—Retighten bolts to specification.
—Gaskets—damaged, off location	—Inspect for damage. Replace as required.
—3-2 Shift Timing Valve, Backout Valve, Forward Clutch Control, 1-2, 2-3 Shift Valves—stuck, damaged	—Inspect. Service as required.
—3-2 Shift Timing Spring Clip—damaged, missing	—Inspect for damage. Service as required. Refer to TSB 91-19-8 for information.
—B5 Check Ball	—Inspect. Service as required.
—SS1, SS2 or SS3 Malfunction	—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.
Low/Intermediate Servo Assembly	
—Spring, Bore, Piston—damaged, missing	—Inspect for damage. Replace as required.
—Incorrect Servo Apply Rod length	—Inspect using procedures in Servo Manual. Service as required.
Support Assembly—Driven Sprocket	

(Continued)

15 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.
Low One-Way Clutch Assembly	
—Not Overrunning—damaged	—Inspect for damage. Replace as required.
Forward Clutch Assembly	
—Return Spring damaged	—Inspect for damage. Service as required.
—Friction Elements damaged	—Inspect for damage. Service as required.
—Seals/Piston damaged	—Inspect for damage. Service as required.
—Check Ball damaged, stuck or missing	—Inspect for damage. Service as required.
Direct Clutch Assembly	
—Return Spring damaged	—Inspect for damage. Replace as required.
—Return Spring Retaining Ring out of position	—Inspect for damage. Replace as required.
—Check Ball not functioning	—Inspect for damage. Replace as required.
Low/Intermediate Band	
—Damaged, worn, burnt, misassembled	—Inspect for damage. Replace as required.
Differential Assembly	
—Damaged	—Inspect for damage. Service as required.
Speedometer Drive Gear	
—Damaged	—Inspect for damage. Service as required.

TD11433A

Shift Concern: 2-1 Shift (Automatic)

Possible Component	Reference/Action
225 — ELECTRICAL ROUTINE	
Powertrain Control System	
—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[16] 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.
325 — HYDRAULIC/MECHANICAL ROUTINE	
Speedometer Gear—Drive	
—Damaged	—Inspect for damage. Service as required.
Speedometer Gear—Driven	
—Damaged	—Inspect for damage. Service as required.
Main Controls	
—Bolts not tightened to specification	—Retighten bolts to specification.
—Gaskets—damaged, off location	—Inspect for damage. Replace as required.
—1-2 Shift Valve, Backout Valve, Intermediate Clutch Shuttle Valve, Main Regulator Valve	—Inspect. Service as required.
—SS1 Malfunction	—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.
—B10 Check Ball—missing, damaged	—Inspect for damage. Service as required.
Intermediate Clutch Assembly	
—Return Spring—damaged, misassembled	—Inspect for damage. Replace as required.
—Friction—damaged, worn	—Inspect for damage. Replace as required.
—Check Ball damaged	—Inspect. Service as required.
Low One-Way Clutch Assembly	
—Not Holding, damaged	—Inspect for damage. Replace as required.

(Continued)

16 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
240 — ELECTRICAL ROUTINE	
Powertrain Control System —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[17] 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.
340 — HYDRAULIC/MECHANICAL ROUTINE	
Improper Pressures —Low Line pressure, Low EPC	—Check pressure at line and EPC taps. Refer to Pressure Chart for specifications. —If low, check main controls.
Main Controls —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.
Turbine Shaft —Seals—damaged, missing	—Inspect for damage. Replace as required.
Pump Shaft —Seals—damaged, missing	—Inspect seals for damage. Service as required
Converter —Leakage, Friction Material, Internal Seals	—Inspect and replace as required.

TD11435A

Converter: Always Applied/Stalls Vehicle

Possible Component	Reference/Action
241 — ELECTRICAL ROUTINE	
Powertrain Control System —Electrical Inputs/Outputs, Vehicle Wiring Harnesses, Powertrain Control Module (PCM), TOT, TSS, TCC	—Run On-Board Diagnostic. —Refer to Powertrain Control/Emissions Diagnosis Manual[17] 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.
341 — HYDRAULIC/MECHANICAL ROUTINE	
Main Controls —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.
Converter —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
242 — ELECTRICAL ROUTINE	
Powertrain Control System —Electrical Inputs/Outputs, Vehicle Wiring Harnesses, Powertrain Control Module (PCM), TCC, MLP Sensor	—Run On-Board Diagnostic. —Refer to Powertrain Control/Emissions Diagnosis Manual[18] 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.
342 — HYDRAULIC/MECHANICAL ROUTINE	
Fluid Condition	—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.
Improper Pressures —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.
Main Controls —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.
Turbine Shaft —Seals—damaged, missing	—Inspect for damage. Replace as required.
Pump Shaft —Seals—damaged, missing	—Inspect seals for damage. Service as required.
Converter —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
249—ELECTRICAL ROUTINE	
Powertrain Control System —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[18] 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)

18 Can be purchased as a separate item.

DIAGNOSIS AND TESTING (Continued)

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

Possible Component	Reference/Action
349—HYDRAULIC/MECHANICAL ROUTINE	
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.
Improper Pressures —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.
Main Controls —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.
Forward Clutch Assembly —Return Spring, Piston, Seals, Friction Elements, Check Ball—stuck, damaged, misassembled	—Inspect for damage. Service as required.
Low One-Way Clutch Assembly —Not Overrunning, damaged	—Inspect for damage. Service as required.

TD10642A

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

Possible Component	Reference/Action
250 — ELECTRICAL ROUTINE	
No Electrical Concerns	
350 — HYDRAULIC/MECHANICAL ROUTINE	
Shift Linkage —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.
Improper Pressures —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.
Main Controls —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.
Direct Clutch Assembly —Refer to Routine 321	—Inspect. Service or replace as required.
Direct One-Way Clutch —Damaged	—Inspect for damage. Service as required.

TD11437A

Shift Efforts High

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

(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.
Manual Lever —Retaining Pin damaged, Nut loose, Detent Spring-bent, damaged or Park Mechanism damaged	—Inspect and service as required.
Main Control —Manual Valve stuck —Bolts not tightened to specification	—Inspect and service or replace as necessary. —Retighten bolts to specification.
Brake Shift Interlock	—Refer to Section 07-05.

TD11438A

External Leaks

Possible Component	Reference/Action
252 — ELECTRICAL ROUTINE	
Engine Components —Vehicle Speed Sensor, Seals	—Inspect and service as required.
Transmission Components —Transmission Connector, TSS Seals	—Inspect and service as required.
352 — HYDRAULIC/MECHANICAL ROUTINE	
Seals/Gaskets —Converter, TSS, Oil Pans, Extension Housing—Gasket/Seal, Manual Lever, Fluid Level Indicator, Servo Covers, Halfshaft Axles	—Locate source and service as required.
Other —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
253 — ELECTRICAL ROUTINE	
Powertrain Control System —Electrical Inputs/Outputs, Vehicle Wiring Harnesses, Powertrain Control Module (PCM), TCC Solenoid	—Run On-Board Diagnostic. —Refer to Powertrain Control/Emissions Diagnosis Manual[19] 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.
353 — HYDRAULIC/MECHANICAL ROUTINE	
Verify proper shift scheduling and engagements	—Go to the appropriate Diagnostic Routines.
Torque converter clutch always applied	—Go to Routine 341.
Torque Converter One-Way Clutch —Damaged	—Replace converter if damaged.

TD11440A

Noise/Vibration — Forward/Reverse

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

(Continued)

19 Can be purchased as a separate item.

DIAGNOSIS AND TESTING (Continued)

Noise/Vibration — Forward/Reverse (Cont'd)

Possible Component	Reference/Action
—Converter components —Fluid level (low) Pump cavitation —Pump Assembly —Engine drive accessories —Cooler Lines grounding out —Flywheel	—Locate source of disturbance and service as required.
For Noises/Vibrations That Change With Vehicle Speed: —Engine Mounts —loose or damaged —Driveline concerns Halfshaft shudder CV Joints Suspension Modifications —Output/Halfshaft Splines worn or damaged	—Locate source of disturbance and service as required.
Other Noises/Vibrations: —Main Controls Valve resonance —Cooler Lines grounding —ABS Brake System —Power Steering Pump	—Locate source of disturbance and service as required. —Refer to Section 06-09 for ABS diagnosis. —Refer to Section 11-02 for Power Steering Pump diagnosis.

TD11441A

Engine Will Not Crank

Possible Component	Reference/Action
255 — ELECTRICAL ROUTINE	
Powertrain Control System —Electrical Inputs/Outputs, Vehicle Wiring Harnesses, Powertrain Control Module (PCM), MLP Sensor	—Run On-Board Diagnostic. —Refer to Powertrain Control/Emissions Diagnosis Manual[20] for diagnosis. Perform Service Manual Pinpoint Test D using the MLP Tester (D89T-70010-A) as outlined. Service as required. Clear codes. Road Test and rerun On-Board Diagnostic.
355 — HYDRAULIC/MECHANICAL ROUTINE	
Shift Linkage/Cable, MLP Sensor —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.

TD11442A

No Park Range

Possible Component	Reference/Action
256 — ELECTRICAL ROUTINE	
No Electrical Concerns	
356 — HYDRAULIC/MECHANICAL ROUTINE	
Shift Linkage —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.
Park Mechanism —Park Brake Pawl, Parking Pawl Return Spring, Park Rod Guide Cup, Parking Pawl Shaft, Parking Pawl Actuating Rod, Manual Lever, Manual Lever Detent Spring—damaged	—Inspect and service as required.

TD11443A

20 Can be purchased as a separate item.

DIAGNOSIS AND TESTING (Continued)

Transmission Overheating

Possible Component	Reference/Action
257 — ELECTRICAL ROUTINE	
Refer to Electrical Routine 240, Converter —No Apply	—Refer to Electrical Routine 240, Converter - No Apply
357 — HYDRAULIC/MECHANICAL ROUTINE	
Fluid —Improper level —Condition	—Adjust fluid to proper level. —Inspect as outlined under Fluid Condition Check.
Cooler Lines —Damaged, blocked or reversed	—Inspect and service as required.
Auxiliary Cooler —Damaged, blocked or restricted, improperly installed	—Inspect and service as required.
Vehicle Concerns Causing Engine Overheating	—Refer to Section 03-03
Main Controls —Bypass Clutch Control Valve and Plunger, Converter Regulator Valve stuck or damaged	—Inspect and service as required.
Converter —No Apply —Seized Converter One-Way Clutch	—See Routine 240/340 —Inspect. Service as required.
Excessive Towing Loads	—Check GVW
Incorrect Idle or Performance	—Refer to Powertrain Control/Emissions Diagnosis Manual[21].
Improper Clutch or Band Application or Oil Pressure Control System	—Inspect. Service as required.

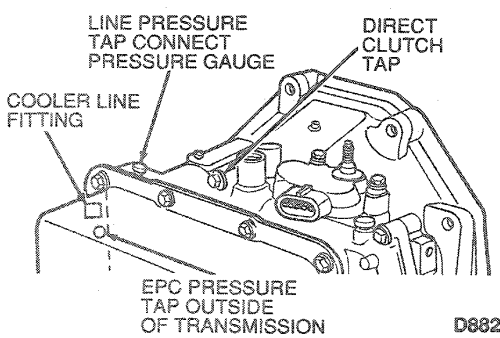
TD11444A

Control Pressure Test

CAUTION: Do not install transmission tester when verifying these pressures.

NOTE: The vehicle harness must be connected to the transaxle to verify these pressures.

1. Refer to Pinpoint Test E.
2. Connect pressure gauge to line pressure tap.



D8828-B

3. Start engine and check line pressure. Refer to the following chart to determine if line pressure is within specification.
4. If line pressure is not within specification, perform air pressure checks and service main control system.
5. If the line pressure is not within specification after mechanical checks and there are no electrical codes, the Electronic Pressure Control (EPC) solenoid may be mechanically malfunctioning. Connect a pressure gauge to EPC pressure tap. Start engine and check EPC pressure. Refer to chart to determine if EPC pressure is within specification. If pressures are not correct, replace EPC solenoid.

401 — Diagnostic Pressure Chart

Gear	EPC	Line	Direct Clutch
	Pressure at Idle kPa (psi)[1]		
P[2]	276-414 (40-60)[2]	896-1034 (130-150)[2]	—

(Continued)

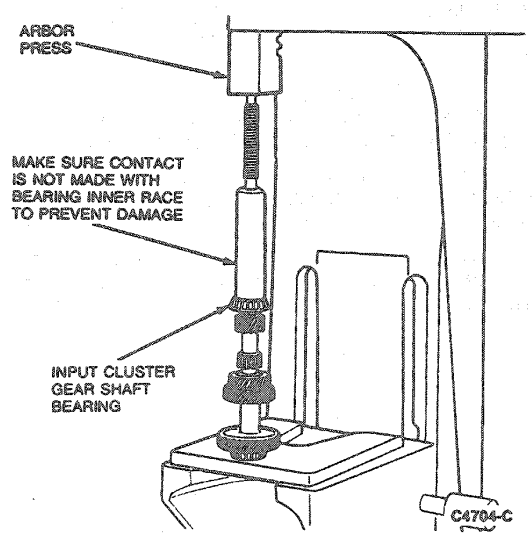
21 Can be purchased as a separate item.

MAJOR SERVICE OPERATIONS (Continued)

Installation

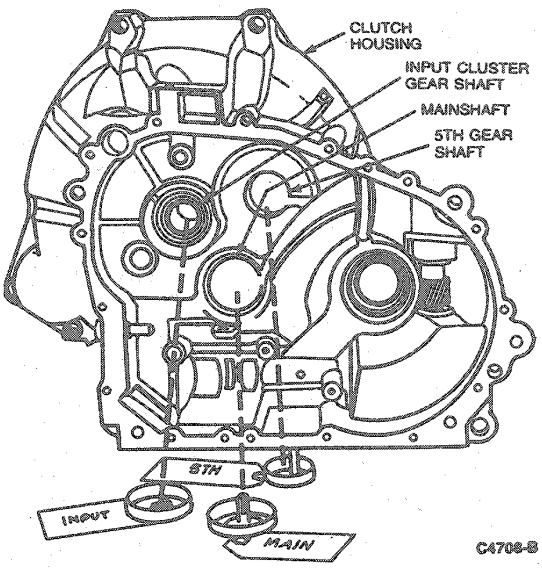
NOTE: Prior to installation of the bearings, thoroughly clean the bearings and inspect their condition. Lightly oil the bearings with Synthetic MERCON ® Multi-Purpose Automatic Transmission Fluid E6AZ-19582-B (ESR-2C163-A2) or equivalent.

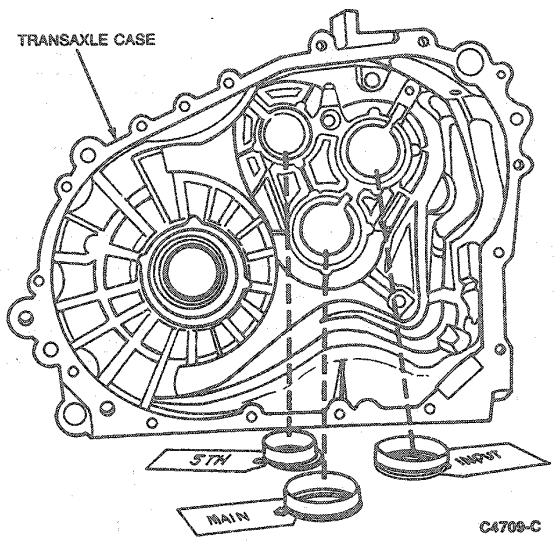
Using Pinion Bearing Cone Remover D79L-4621-A or equivalent and an arbor press, install the bearing on the shaft. Make sure the bearings are pressed on the proper end as labeled during disassembly.



Bearing Cups

The input cluster shaft, the main shaft and the fifth gear driveshaft are supported at each end by tapered roller bearings. The cups supporting the bearings in the case are located as follows: three in the transaxle case and three in the clutch housing.



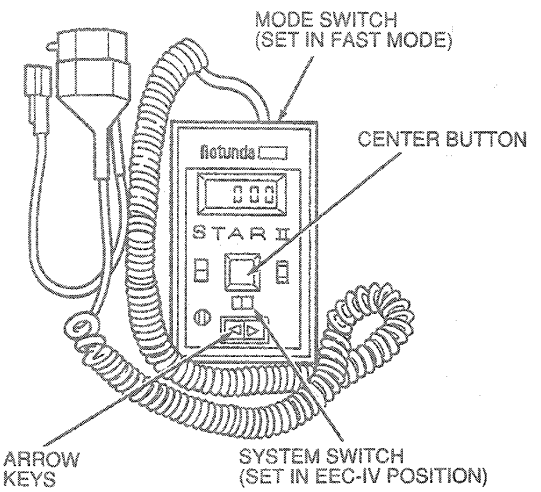


Shims, to preload the tapered roller bearings, are located behind the bearing cups in the transaxle case only. It is important to keep the shim with its matching cup during disassembly. It is equally important to label the bearing cups if they are removed from the case.

After removal of the main shaft bearing and the fifth gear shaft bearing cups from the clutch housing, the funnels can be removed from the bearing cup bores.

DIAGNOSIS AND TESTING (Continued)

Prepare the SUPER STAR II Tester as follows:



D10293-A

- Place system switch in the EEC-IV position.
- Tester in fast mode only (necessary to display three-digit codes).
- Keep tester leads away from any moving parts.
- Deactivate Self-Test by making sure the button in the middle is up. If not, press button once to unlatch.
- Speaker switch on, if desired.
- Turn tester to the ON position.

CAUTION: Do not replace parts based on a code, perform Pinpoint Tests first.

Quick Test 3.0 Key On, Engine Off (KOEO)

Some special considerations for Key On, Engine Off Quick Test include the following:

- The KOEO test provides both "hard" Diagnostic Trouble Codes (DTC's) (present at the time of testing) and continuous memory DTC's.
- Always service the "hard" DTC's first. These are displayed first on the tester.

Performing KOEO Self Test

1. Activate Self-Test by pressing center button on SUPER STAR II Tester (grounding Self-Test Input STI).
2. Turn ignition switch to RUN position.
3. PCM will run Self-Test and then output "hard" DTC's (or Code 111-pass test). "Hard" DTC's are repeated to make it easier to verify sequence. After "hard" DTC's have been repeated (or Code 111 repeated) a single pulse occurs to signal that next set of DTC's will be from continuous test (or Code 111-pass).
4. To display DTC's, unlatch center button and use memory buttons to scroll through codes.

Quick Test 4.0 Continuous Memory Codes (DTC's)

Continuous memory DTC's are from concerns which were detected during normal vehicle operation. These codes are retained for 40 warm up cycles.

After servicing any KOEO or KOER "hard" DTC's and a pass code 111 is received on both, service the continuous memory codes.

Some special considerations for Continuous testing include the following:

- The cause of some Continuous Memory Codes may have been eliminated if KOEO and/or KOER DTC's were serviced. Always re-test and service any DTC's that still remain.
- If DTC's are present, go to the EEC-IV On-Board Diagnostic Diagnostic Trouble Code Description Chart in this Section for service information. Erase DTC's, perform drive cycle, and repeat the Quick Test after completing service on the DTC's.
- If the Continuous test passes (111) and a concern is still present, refer to the Hydraulic/Mechanical charts, Oasis and TSBs for concern diagnostics.

CAUTION: DTC's in continuous memory can be erased by disconnecting the battery or by ungrounding the Self Test Input (STI) while the codes are being displayed during the KOEO Self-Test. This STI is ungrounded by disconnecting the small data link connector or unlatching the Star Tester button. Always write down the DTC's to avoid losing information that can be used to diagnose the customer's complaint.

- Service any non-transmission DTC's first as they can directly affect the operation of the transmission. Repeat the Quick Test and Road Test to verify the correction.

Special Test Modes:

NOTE: The wiggle test may also be entered by "latching" STI; ON, OFF, ON.

1. Wiggle test mode:
   - After all DTC's have been received the wiggle test mode is entered by pressing center button on Star Tester twice. This will unlatch and relatch STI.
   - The wiggle test allows the technician to attempt to re-create an intermittent malfunction. Tap, move and wiggle the suspected sensor and/or wire harness. When a malfunction is detected, the Self Test Output (STO) will be turned on as long as the concern is present. STO ON will cause the SUPER STAR II Tester to sound a continuous tone. The Malfunction Indicator Lamp (MIL) will also illuminate.

DIAGNOSIS AND TESTING (Continued)

2. Output cycling test mode:
   - After all KOEO DTC's have been received, the output test mode is entered. Actuator outputs will turn ON and OFF each time the throttle is depressed to WOT and then returned to closed position.

Quick Test 5.0 Key On Engine Running (KOER)

The Engine Running Self-Test provides "hard" DTC's only.

Some special considerations for Engine Running On-Board Diagnostic include the following:

- After the engine ID code (STO LO flashes), push and release the brake pedal, turn steering wheel one-half turn and release.

  NOTE: For SHO applications, you must also press and release the transmission control switch (TCS).
- If a DTC appears after the KOER test, a malfunction is present. Refer to and look up the DTC on the PCM On-Board Diagnostic Diagnostic Trouble Code Description Chart in this Section for service information.

KOER On-Board Diagnostic:

NOTE: Engine must be warm or DTC 116—ECT out of range will occur.

1. Connect SUPER STAR II Tester (if not already connected) with mode switch set to FAST mode.
2. Start and run engine until engine reaches operating temperature.
3. Turn OFF engine and wait 10 seconds.
4. Activate Self-Test (press center button on SUPER STAR II Tester).
5. Start engine.
   - On-Board Diagnostic begins when the engine ID code is received. (This code consists of the number of cylinders divided by 2 plus an added zero.)

Numbers of Cylinders	Engine ID Code
4	20
6	30
8	40

- After the ID code is entered, the technician must cycle the TCS. Then press and release the service brake pedal to check BOO switch, turn steering wheel one-half turn and release to check PSP switch.
- A single output pulse (10) is sent to signal the technician to quickly press the throttle to wide open and immediately release. SUPER STAR II Tester will display the word DYNAMIC.
- Diagnostic Trouble Codes (DTC's) are then sent.

6. The Engine Running wiggle test is entered automatically upon completion of the KOER Self-Test.

Special Test Mode:

NOTE: The wiggle test may also be entered by "latching" STI; ON, OFF, ON.

1. Wiggle test mode:
   - After all KOER DTC's have been received the wiggle test mode is entered by pressing center button of Star Tester twice. This will unlatch and latch STI.

The wiggle test allows the technician to attempt to re-create an intermittent malfunction. Tap, move and wiggle the suspected sensor and/or wire harness. When a malfunction is detected the STO will be turned on as long as the concern is present. STO ON will cause the STAR Tester to sound a continuous tone. The malfunction indicator lamp (MIL) will also illuminate.

Quick Test 6.0 (Computed Timing Check)

This Quick Test is used to diagnose engine idle concerns only. Any engine concerns or DTC's should be serviced **BEFORE** the transaxle concerns are serviced.

Drive Cycle Test

After performing the Quick Test, use the following Drive Cycle Test for checking AXODE (AX4S) continuous codes:

NOTE: The Drive Cycle Test must be followed exactly.

All Except SHO

1. Record and then erase Quick Test codes.
2. Warm engine to normal operating temperature.
3. Make sure transmission fluid level is correct.
4. With transaxle in OVERDRIVE, moderately accelerate from stop to 80 Km/h (50 mph). This allows the transaxle to shift into fourth gear. Hold speed and throttle opening steady for a minimum of 15 seconds.
5. With transaxle in fourth gear and maintaining steady speed and throttle opening, lightly apply and release brake (to operate stoplamps). Then hold speed and throttle steady for an additional five seconds minimum.
6. Brake to a stop and remain stopped for a minimum of 20 seconds.
7. Repeat Steps 4 through 6 at least five times.
8. Perform Quick Test and record continuous codes.

SHO Only

1. Record and then erase Quick Test codes.
2. Warm engine to normal operating temperature.
3. Make sure transmission fluid level is correct.

DIAGNOSIS AND TESTING (Continued)

4. With transaxle in DRIVE, press TCS (LED lamp should illuminate) and moderately accelerate from stop to 64 Km/h (40 mph). This allows transaxle to shift into third gear. Hold speed and throttle open steady for a minimum of 15 seconds (30 seconds above 4000 ft).
5. Press TCS (LED lamp should turn off) and accelerate from 64 Km/h (40 mph) to 80 Km/h (50 mph). This allows transaxle to shift into fourth gear. Hold speed and throttle position steady for a minimum of 15 seconds.
6. With transaxle in fourth gear and maintaining steady speed and throttle opening, lightly apply and release brake (to operate stoplamps). Then hold speed and throttle steady for an additional five seconds minimum.
7. Brake to a stop and remain stopped for a minimum of 20 seconds.
8. Repeat Steps 4 through 7 at least five times.
9. Perform Quick Test and record continuous codes.

After Self Test

After the Self Test procedures are completed, service all DTC's.

Begin with non-transaxle related DTC's, then service any transaxle related DTC's. Refer to the EEC-IV On-Board Diagnostic Trouble Code Description Chart for information on Condition and Symptoms. This chart will be helpful in referring to the proper manual(s) and to aid in diagnosing internal transaxle concerns and external non-transaxle inputs. The Pinpoint Tests are used in diagnosing electrical concerns of the AXODE (AX4S) transaxle. Make sure that the vehicle wiring harness and the PCM are diagnosed as well. The Powertrain Control/Emissions Diagnosis Manual[23] will aid in diagnosing non-transaxle electronic components. The diagnostic routine hydraulic/mechanical charts will help in diagnosing internal transaxle concerns and external non-transaxle inputs.

NOTE: The vehicle wiring harness, PCM and non-transaxle sensors may affect transaxle operations. Service these concerns first.

Pinpoint Tests

If DTC's are present while performing the On-Board Diagnostic, refer to the EEC-IV On-Board Diagnostic Trouble Code Description Chart for the appropriate service procedure.

NOTE: Prior to entering Pinpoint Tests, refer to any TSBs and Oasis messages for AXODE (AX4S) transaxle concerns.

NOTE: Prior to entering pinpoint tests, the vehicle harness must be checked for continuity and shorts; the PCM must be checked for any concerns. Refer to the Powertrain Control/Emissions Diagnosis Manual[23] for proper procedures.

NOTE: If any non-transaxle DTC's appear, service those codes first. They could affect the electrical operation of the transaxle. Record and erase codes from continuous memory after service has been performed. After servicing any DTC's in the Quick Test, the Quick Test should be repeated.

NOTE: Check PCM wiring harness for proper connections, bent or broken pins, corrosion, loose wires, proper routing, proper seals and their condition. Check the PCM, sensors and actuators for physical damage.

23 Can be purchased as a separate item.

DIAGNOSIS AND TESTING (Continued)

EEC-IV ON-BOARD DIAGNOSTIC TROUBLE CODE DESCRIPTION CHART

THREE DIGIT DTC	COMPONENT	DESCRIPTION	CONDITION	SYMPTOM	ACTION
111	SYSTEM	Pass	No malfunction detected.	Malfunction not detected by PCM.	PC/ED, SM
112 113	IAT IAT	IAT indicates 125°C (254°F) IAT indicates -40°C (-40°F)	Voltage drop across IAT exceeds scale set for temperature 125°C (254°F). Voltage drop across IAT exceeds scale set for temperature -40°C (-40°F).	Incorrect EPC pressure. Either high or low which will result in harsh or soft shifts.	PC/ED
114	IAT	IAT out of on-board diagnostic range	IAT temperature higher or lower than expected during KOEO and KOER.	Rerun on-board diagnostic at normal operating temperature.	PC/ED
116	IAT	ECT out of on-board diagnostic range	ECT temperature higher or lower than expected during KOEO and KOER.	Rerun on-board diagnostic at normal operating temperature.	PC/ED
117	ECT	ECT indicates 125°C (254°F)	ECT temperature higher or lower than expected during KOEO and KOER.	Torque converter clutch will always be off, resulting in low fuel economy.	PC/ED
118	ECT	ECT indicates -40°C (-40°F)			
121	TP	TP voltage high/low for on-board diagnostic.	TP was not in the correct position for on-board diagnostic.	Rerun at appropriate throttle position per application.	PC/ED
122, 123, 124, 125 167	TP TP	TP DTCs	PCM has detected an error. This error may cause a transaxle concern. Refer to the PC/ED Manual for diagnosis.	Harsh engagements, firm shift feel, abnormal shift schedule, torque converter clutch does not engage. Torque converter clutch cycling.	PC/ED
211 212 213	PIP PIP PIP	PIP circuit failure. IDM signal loss. SPOUT circuit open.	Ignition system has a malfunction which may cause a transaxle concern. Refer to the PC/ED Manual for diagnosis.	Engine malfunction, no converter engagement.	PC/ED
157, 158, 159 184, 185	MAF MAF	MAF DTCs	MAF system has a malfunction which may cause a transaxle concern. Refer to PC/ED Manual for diagnosis.	Incorrect shift schedule, high/low EPC pressure. Incorrect converter engagement scheduling. Symptoms similar to a TP failure.	PC/ED
452	VSS	Insufficient input from VSS.	VSS detected a loss of vehicle speed signal during operation.	Harsh engagements, firm shift feel, abnormal shift schedule, unexpected downshift may occur at closed throttle. Torque converter clutch will not engage.	PC/ED
519	PSP	PSP circuit open during KOEO	PSP circuit open.	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.	PC/ED
521	PSP	PSP not changing state KOER.	Operator did not rotate steering wheel during KOER.	Malfunction detected. Rerun on-board diagnostic and rotate steering wheel.	PC/ED
522	MLP	MLP not in PARK.	On-board diagnostic not run in PARK.	Rerun on-board diagnostic in PARK.	D1
634	MLP	MLP out of range.	Indicated voltage drop across MLP exceeds limits established for each position.	Harsh engagements, firm shift feel. No 3/4 shift.	D1

(Continued)

DIAGNOSIS AND TESTING (Continued)

EEC-IV ON-BOARD DIAGNOSTIC TROUBLE CODE DESCRIPTION CHART (Cont'd)

THREE DIGIT DTC	COMPONENT	DESCRIPTION	CONDITION	SYMPTOM	ACTION
536	BOO	Brake not actuated during on-board diagnostic. BOO switch circuit failed.	Brake not cycled during KOER. Brake ON/OFF circuit failure.	Failed ON or not connected—torque converter clutch will not engage at less than 1/3 throttle. Failed OFF—torque converter clutch will not disengage when brake is applied.	PC/ED
539	ACC	A/C switch error	A/C or Defrost ON condition may result from A/C clutch being ON during on-board diagnostic.	Failed ON—EPC pressure slightly low with A/C OFF. Failed OFF—EPC pressure slightly low with A/C ON.	PC/ED
636	TOT	TOT out of on-board diagnostic range.	Transmission not at operating temperature during on-board diagnostic.	Warm vehicle to normal operating temperature.	B1
637	TOT	-40°C (-40°F) indicated TOT sensor circuit open.	Voltage drop across TOT sensor exceeds scale set for temperature -40°C (-40°F) Voltage drop across TOT sensor exceeds scale set for temperature of 157°C (315°F)	Torque converter clutch and stabilized shift schedule may be enabled sooner after cold start. Harsh or soft shifts.	B1
638	TOT	157°C (315°F) indicated TOT sensor circuit grounded.			
639	TSS	Insufficient input from Transmission Speed Sensor.	PCM detected a loss of TSS signal during operation.	Increased engine rpm on engagements, harsh shifts.	F1
624*	EPC	EPC solenoid circuit failure, shorted circuit or output driver.	Voltage through EPC solenoid is checked and compared to a voltage through solenoid after a time delay. An error will be noted if tolerance is exceeded. KOEO and continuous on-board diagnostic.	Short Circuit—Causes failsafe EPC pressure (maximum capacity). Harsh engagements and shifts. Open Circuit—Causes maximum EPC pressure, harsh engagements and shifts.	E1
625*	EPC	Open PCM output driver.			
621*	SS1	SS1 solenoid circuit failure	Solenoid 1 circuit failed to provide voltage drop across solenoid. Circuit open or shorted or PCM drive failure during on-board diagnostic.	Improper gear selection depending on condition mode and manual lever position. See solenoid ON/OFF chart.	A1
622*	SS2	SS2 solenoid circuit failure	Solenoid 2 circuit fails to provide voltage drop across solenoid. Circuit open or shorted or PCM drive failure during on-board diagnostic.	Improper gear selection depending on condition mode and manual lever position. See solenoid ON/OFF chart.	A1
641*	SS3	SS3 solenoid circuit failure	Solenoid 3 circuit fails to provide voltage drop across solenoid. Circuit open or shorted or PCM drive circuit failure during on-board diagnostic.	Improper gear selection depending on condition mode and manual lever position. See solenoid ON/OFF chart.	A1
645**	SS1, SS2, or internal parts	1st gear failure	No 1st gear	Improper gear selection depending on condition mode and manual lever position: see solenoid ON/OFF chart. Shift errors may also be due to other internal transaxle concerns (e.g., stuck valves, damaged friction material).	A1
646**	SS1, SS2, or internal parts	2nd gear failure	No 2nd gear		
647**	SS1, SS3, or internal parts	3rd gear failure	No 3rd gear		
648**	SS1, SS3, or internal parts	4th gear failure	No 4th gear		
628**	TCC	Torque converter clutch engagement error	The PCM picked up an excessive amount of torque converter clutch slippage when converter was scheduled to be engaged during normal vehicle operation.	Failed OFF—converter never engages. Failed ON—engine runs rough/vehicle shudder, engine stalls in DRIVE (2nd, 3rd or 4th) at low idle speeds.	C1

(Continued)

DIAGNOSIS AND TESTING (Continued)

EEC-IV ON-BOARD DIAGNOSTIC TROUBLE CODE DESCRIPTION CHART (Cont'd)

THREE DIGIT DTC	COMPONENT	DESCRIPTION	CONDITION	SYMPTOM	ACTION
652*	TCC	TCC solenoid circuit failure during on-board diagnostic.	TCC solenoid circuit fails to provide voltage drop across solenoid. Circuit open or shorted or PCM drive failure during on-board diagnostic.	Failed ON—engine runs rough / vehicle shudder, engine stalls in DRIVE (2nd, 3rd or 4th) at low idle speeds. (Short circuit). Failed OFF—converter never engages. (Open circuit).	C1
629*	TCC	Torque converter clutch circuit failure	TCC solenoid circuit fails to provide voltage drop across solenoid. Circuit open or shorted or PCM drive circuit failure during on-board diagnostic.	Failed ON—engine runs rough / vehicle shudder, engine stalls in DRIVE (2nd, 3rd or 4th) at low idle speeds. (Short circuit). Failed OFF—converter never engages. (Open circuit).	C1
629**	TCC	Unscheduled engagement	Torque converter clutch engaged when not scheduled.	Engine runs rough / vehicle shudder, engine stalls in DRIVE (2nd, 3rd or 4th) at low idle speeds.	C1
656**	TCC	Continuous slip ERROR	Excessive variations in slip (engine speed surge) across the torque converter clutch detected.	Engine runs rough / vehicle shudders. You may feel a slight sensation of the engine running rough at road loads (approximately 35-40 mph in 3rd gear, 45-50 mph in 4th gear).	C1
631	TCIL	TCIL circuit failure.	TCIL circuit open or shorted.	Failed ON—Overdrive cancel mode always indicated, no flashing for EPC failure. Failed OFF—Overdrive cancel mode never indicated, no flashing for EPC failure.	PC/ED
632	TCS	TCS not changing state.	TCS not cycled during on-board diagnostic / circuit open or shorted.	Rerun on-board diagnostic and cycle switch. No overdrive cancel when switch is cycled.	PC/ED
998*		Failure Mode Effect Management (FMEM) failure.	Failure detected in one or more critical inputs.	PCM enables alternate functions. Check for other DTCs.	PC/ED

*Output circuit check, generated only be electrical symptoms.

**May also be generated by some other non-electric transmission hardware system.

PC/ED—Powertrain Control / Emissions Diagnosis Manual (Can be purchased as a separate item.)

SM—Service Manual A1, B1, C1, D1, E1, F1—Pinpoint tests in this manual.

TD8100A

Rotunda Transmission Tester

Use Rotunda Transmission Tester 007-00085 or equivalent to diagnose electronically controlled transaxles. The following instructions outline the set-up and use of this tester in the pinpoint tests for the AXODE (AX4S).

Tester Jacks

1. **VPWR Pin Jacks (red):** VPWR test points for solenoid circuits.
2. **Solenoid (TCC, EPC) Signal Line Pin Jacks (black):** Signal line test points for solenoid circuits.
3. **BAT+ (red) and BAT- (black) Pin Jacks:** Battery reference points when measuring circuits for shorts.
4. **TOT Pin Jacks:** Test points for TOT sensor.
5. **TSS Pin Jacks:** Test points for TSS sensor.

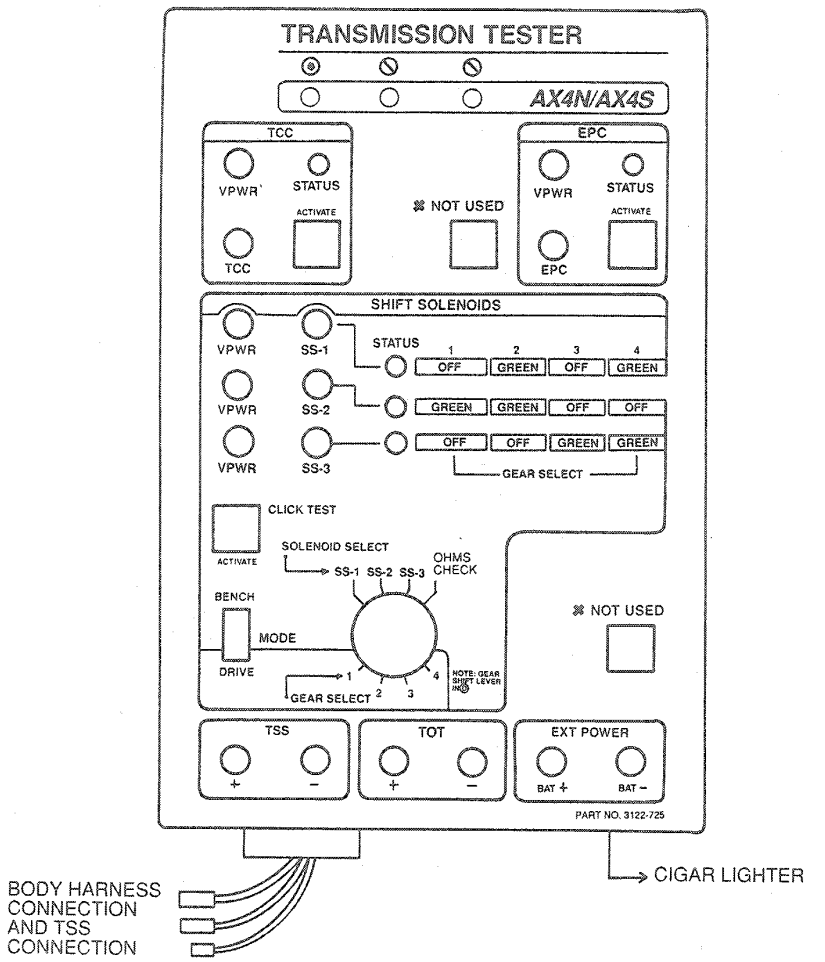
Tester LEDs and Controls

1. **Overlay and Cable Correctly Installed LEDs:** Only LEDs with ◎ symbol and cable correctly match.
2. **Status LEDs:** LED "OFF" when not activated by tester (solenoid not activated, open circuit or signal line short to ground). LED "GREEN" when activated by tester and current draw is correct. LED "RED" when activated by tester and current draw is excessive (short to Battery Positive Voltage (B+)). All LEDs light orange during Self-Test.

DIAGNOSIS AND TESTING (Continued)

3. **Solenoid Activate Buttons:** Energize respective solenoids during click testing and activate selected circuits during DRIVE mode testing.
4. **Bench/Drive Switch:** Selects operating mode, either BENCH or DRIVE.
5. **Solenoid Select/Gear Select Switch:** Has three functions.
   In BENCH MODE: acts as shift solenoid selector for click testing. In DRIVE MODE: acts as forward gear selector in place of vehicle's PCM controlled shifting. Hydraulic safety mechanisms and overrides are built into the transaxle.
   In OHMS CHECK: allows you to measure ohms.

AXODE (AX4S) Overlay



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DIAGNOSIS AND TESTING (Continued)

Transmission Tester Instructions

Using the Transmission Tester

The Rotunda Transmission Tester 007-00085 or equivalent allows a technician to operate the electrical portion of the transaxle independent of the vehicle electronics which allows the technician to determine specific transaxle concerns. The Transmission Tester usage is divided into five steps:

1. Preliminary Testing and Diagnosis
2. Installing the Transmission Tester
3. Static Testing - Engine OFF
4. Dynamic Testing - Engine Running
5. Removing the Transmission Tester and Clearing Diagnostic Trouble Codes (DTCs)

Preliminary Testing and Diagnosis

Before any diagnostic testing is done on a vehicle, some preliminary checks must be performed, as follows. Be sure to note findings, especially any DTC's found, for future reference.

- Check transaxle fluid level and condition.
- Check for add-on items (phones, computers, CB radio, etc).
- Visually inspect wiring harness and connectors.
- Check for vehicle modifications.
- Verify the shift linkage is properly adjusted.
- Verify customer concern.
  - — Upshift, Downshift, Coasting, Engagement, Noise / Vibration
- Vehicle must be at normal operating temperature.
- Perform vehicle On-Board Diagnostic.
- Record all DTC's.
- Service all non-transaxle codes.

Installing the Transmission Tester (Set-Up Procedures)

Installing the transmission tester at the transaxle connector allows separation of the vehicle electronics from transaxle electronics. Disconnecting normal vehicle electronics will set additional DTC's and cause firm shifts. (Disconnecting the transaxle connector defaults transaxle to maximum line pressure).

NOTE: During tester usage, additional DTC's may be set. Therefore, it is important that all codes are erased after servicing the codes. To verify elimination of all codes rerun On-Board Diagnostic.

NOTE: The following manuals should be available to assist in diagnosis of electronically controlled transaxles:

- Powertrain Control / Emissions Diagnosis Manual[24].
- Transmission Tester Manual (provided with tester).

CAUTION: Do not attempt to pry off transaxle connector with a screwdriver. This will damage the connector and could result in transaxle concerns. If you have transmission heat shields, remove them first. Always install heat shields after servicing transaxle.

1. Disconnect vehicle wiring harness at transaxle connector.
2. Turn tester solenoid select switch to the OHMS CHECK position.

   CAUTION: Route interface cables away from any heat sources.
3. Install appropriate overlay onto tester. Connect appropriate interface cable to transmission tester and then to appropriate transaxle connectors.

   CAUTION: Route gauge line away from any heat sources.
4. Install line pressure gauge into line pressure tap on transaxle. Refer to Diagnostic Pressure Chart (Routine 401).
5. Plug transmission tester power supply plug into cigar lighter. At this time, all LEDs should illuminate for a short period and then turn off. This is the tester internal circuit check.
6. Set Bench / Drive switch to BENCH mode.

Static Testing - Engine Off

Static testing procedures allow for shop testing of the transaxle in vehicle or on the bench. Completion of these tests prove out transaxle electronics.

CAUTION: For resistance checks, ensure the tester solenoid select switch is set to the OHMS CHECK position or damage to ohmmeter may result.

Resistance / Continuity Tests

- Refer to the proper Pinpoint Test to be performed based on the DTC's displayed.
- Using Rotunda Digital Volt / Ohmmeter 014-00407 or equivalent and the transmission tester, perform the Pinpoint Tests as indicated based on the DTC's which were displayed.
- Service as indicated by the Pinpoint Tests. Always retest and road test vehicle after any service.

24 Can be purchased as a separate item.

DIAGNOSIS AND TESTING (Continued)

Transaxle Solenoids and Sensors Resistance Tests

- EPC Solenoid
  - — Set ohmmeter to 100-200 ohm range.
  - — Connect positive lead of ohmmeter to the VPWR jack.
  - — Connect negative lead of ohmmeter to the EPC jack.
  - — Record resistance.
  - — Refer to the following charts for values.
  - — If out of specification, perform Pinpoint Test E.

Solenoid	Solenoid Resistance (Ohms)
SS-1	15-25
SS-2	15-25
SS-3	15-25
TCC	0.98-1.6
EPC	3.23-5.5

- Solenoids (SS-1, SS-2, SS-3, TCC)
  - — Set ohmmeter to 100-200 ohm range.
  - — Connect positive lead of ohmmeter to the appropriate VPWR jack for solenoid being tested.
  - — Connect negative lead of ohmmeter to the appropriate solenoid (SS-1, SS-2, SS-3, TCC) jack.
  - — Record resistance.
  - — Refer to the following chart for values.
  - — If out of specification, perform Pinpoint Test A (SS-1, SS-2, SS-3); Perform Pinpoint Test C (TCC).

Solenoid	Solenoid Resistance (Ohms)
SS-1	15-25
SS-2	15-25
SS-3	15-25
TCC	0.98-1.6
EPC	3.23-5.5

- Transmission Oil Temperature (TOT)
  - — Set ohmmeter to 1000 ohm range.
  - — Connect ohmmeter positive lead to +TOT jack.
  - — Connect ohmmeter negative lead to -TOT jack.
  - — Record resistance. Resistance will vary with temperature.
  - — Refer to the following chart for values.
  - — If out of specification, perform Pinpoint Test B.

Temperature		Resistance
°C	°F	Ohms (K)
0-20	32-68	100K-37K
21-40	69-104	37K-16K
41-70	105-158	16K-5K
71-90	159-194	5K-2.7K
91-110	195-230	2.7K-1.5K
110-130	231-266	1.5K-0.8K

- Transmission Speed Sensor (TSS) - AXODE (AX4S)
  - — Set ohmmeter to 1000 ohm range.
  - — Connect positive lead of ohmmeter to +TSS jack.
  - — Connect negative lead of ohmmeter to -TSS jack.
  - — Record resistance.
  - — TSS should be between 100-200 ohms.
  - — If out of specification, perform Pinpoint Test F.

Short to Ground and Solenoid Voltage Tests

NOTE: LED will turn GREEN when solenoid activates and turn OFF when deactivated. LED will turn RED if an activated solenoid / harness is shorted to B+. LED will turn OFF if an activated solenoid / harness is shorted to ground or no continuity (open circuit).

1. Set tester Bench / Drive switch to BENCH mode.
2. Set voltmeter to 20 volt DC range.

   NOTE: TCC solenoid click may or may not be heard.
3. Connect voltmeter positive lead to solenoid signal+(VPWR). Connect voltmeter negative lead to solenoid negative. Depress the appropriate switch.
4. The LED should illuminate, voltage should change and an audible click may be heard. If LED does not illuminate, a short to ground condition exists.
5. Observe and record values.

Dynamic Testing - Engine ON

Dynamic testing is the final step in the transmission tester usage. It allows the transaxle to be proven out electronically and hydraulically.

Transaxle Solenoid Cycling and Drive Test

Preliminary Set Up:

1. Set Bench / Drive switch to DRIVE mode.
2. Rotate tester gear select switch to first gear position.
3. Place vehicle in PARK.
4. Start vehicle.

DIAGNOSIS AND TESTING (Continued)

EPC Solenoid

CAUTION: Do not attempt to hold the EPC switch depressed (minimum line pressure) and stall the transaxle (holding the vehicle with the brake while depressing the throttle with the transaxle in gear) or transaxle damage will result.

5. Observe line pressure. Record value. Line pressure should go to maximum value. If not, refer to Hydraulic / Mechanical Diagnosis and Pinpoint Test E concerning EPC solenoid.
6. Depress EPC switch. Line pressure should drop to a minimum value. Record value. If not, refer to Hydraulic / Mechanical Diagnosis and Pinpoint Test E concerning EPC solenoids.

Engagements

7. Verify that Bench / Drive switch is in DRIVE mode and gear select switch is in first gear position.
8. Depress EPC switch. Line pressure should drop to idle pressure. While holding EPC switch down, shift vehicle from PARK to REVERSE. Does vehicle shift into REVERSE? Shift vehicle from REVERSE to DRIVE. Does vehicle shift into DRIVE? RELEASE the EPC switch, pressure should return to maximum. Repeat engagements. With the EPC switch released, engagements should be **firm**.

Upshift / Downshift

NOTE: Upshifts and downshifts will be **firm** during this procedure.

NOTE: Pressure gauges may be removed from vehicle for these tests.

NOTE: Tests should be performed on the road. If performed on a hoist, the technician may not feel all shifts when engaged.

LEDs will turn GREEN when solenoids are activated and turn OFF when deactivated. Refer to the tester overlay for the proper status / shift sequence of the shift solenoids during upshifts and downshifts.

9. Shift vehicle into Overdrive (⑤) and accelerate to 24 km / h (15 mph). Select second gear by rotating gear select switch to second gear.
   - Did vehicle upshift to second gear?
   - Did appropriate shift solenoids activate / deactivate?
10. Accelerate to 40 km / h (25 mph) and select third gear.
    - Did vehicle upshift to third gear?
    - Did appropriate shift solenoids activate / deactivate?
11. Accelerate to 56-72 km / h (35-45 mph) and select fourth gear.
    - Did vehicle upshift to fourth gear?
    - Did appropriate shift solenoids activate / deactivate?
12. Reverse order to downshift.
    - Does vehicle downshift from fourth to third, third to second and second to first?
    - Did appropriate shift solenoids activate / deactivate?

Torque Converter Engagement

NOTE: Test should be performed on the road. If performed on a hoist, the technician may not feel all shifts when engaged.

CAUTION: Do not depress TCC switch with transaxle in gear and vehicle at a stop. Damage to torque converter clutch may result.

13. Accelerate and shift vehicle into third gear. Hold speed steady and depress the TCC switch.
    - Does converter engage?
    - Does engine rpm drop?
    - Did TCC solenoid activate?

Transmission Speed Sensor Function Check

NOTE: This test may be performed on the hoist or on the road.

14. Set voltmeter to 20 volts AC. Connect voltmeter positive lead to (+) TSS jack. Connect voltmeter negative lead to (-) TSS jack. Slowly accelerate vehicle and monitor voltmeter.
    - Does voltage increase with vehicle speed?

Removing the Transmission Tester and Clearing DTC's

CAUTION: Do not attempt to pry off connectors with a screwdriver. This will damage the connectors and could result in a transaxle concern.

1. Disconnect transmission tester from transaxle connector.
2. Install vehicle wiring harness connector. Verify connection by pulling up on the harness.
3. Install all heat shields that were previously removed.
4. Disconnect transmission tester power lead from cigar lighter.
5. Erase all DTC's using procedures in the Powertrain Control / Emissions Diagnosis Manual[25] (unlatch center button of Star Tester while DTC's are being displayed during KOEO).
6. Rerun On-Board Diagnostics to receive a pass code (111).
7. Verify that the customer concern has been eliminated.

Electrical Diagnosis

Use the following pinpoint tests to diagnose transaxle electrical concerns.

25 Can be purchased as a separate item.

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST A: DIAGNOSTIC TROUBLE CODES: 621, 622 AND 641 SOLENOID CIRCUIT FAILURES; 645, 646, 647 and 648 INCORRECT GEAR RATIO OBTAINED

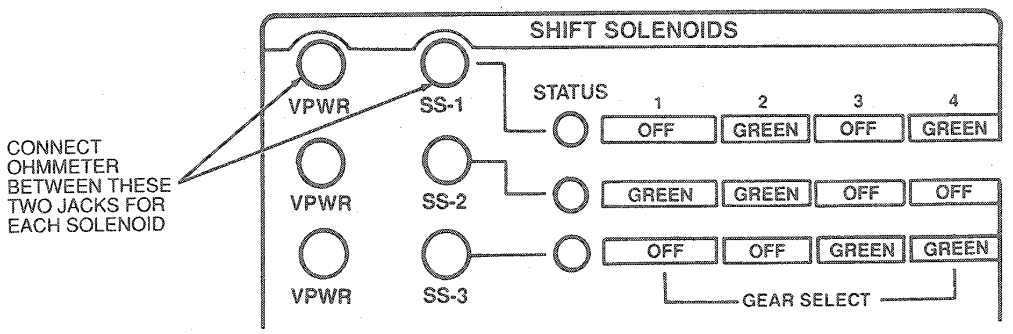
	TEST STEP	RESULT ▶	ACTION TO TAKE
A1	AXODE (AX4S) ELECTRONIC DIAGNOSTICS		
	• The following items must be checked before proceeding: — Check the PCM assembly for proper function. (On-Board Diagnostics) — Check vehicle wiring harness for continuity and shorts to ground. — Make sure all connectors are engaged properly. — Make sure all terminals in connectors are properly seated. — Check all connectors for damage, corrosion, water, bent pins and missing or damaged seals. • **Have items been checked?**	Yes ▶ No ▶	GO to A2. PERFORM checks.
A2	CHECK HARNESS CONNECTIONS		
	• Check that vehicle harness connector is fully engaged on transaxle connector. • Check that transaxle harness connector terminals are fully engaged in connector. • **Are harness/terminals fully engaged?**	Yes ▶ No ▶	GO to A3. SERVICE as required.
A3	TRANSAXLE FUNCTIONAL TEST		
	CAUTION: Do not pry connector. Pull vehicle harness connector. • Disconnect vehicle harness at transaxle. • Install Rotunda Transmission Tester (007-00085) or equivalent to transaxle connector. • Using tests outlined under Transmission Tester Instructions: — Perform Solenoid Function Tests outlined under Tester Instructions. NOTE: LED will turn GREEN when solenoid activates and turn OFF when deactivated. LED will turn RED if an activated solenoid/harness is shorted to B+. LED will remain OFF if an activated solenoid/harness is shorted to ground or no continuity (open circuit). — **Do the solenoids (LED) activate (LED GREEN)?**	Yes ▶ No ▶	GO to A4. GO to A5.
A4	TRANSAXLE DRIVE TEST		
	• Perform Drive Test as outlined under Transmission Tester Instructions. • **Does the vehicle upshift when commanded by the tester?**	Yes ▶ No ▶	REFER to the Powertrain Control/Emissions Diagnosis Manual[26] to DIAGNOSE PCM or vehicle harness concerns. ERASE all codes and perform Drive Cycle Test as outlined in this Section. RERUN On-Board Diagnostics. If DTC's are still present, REFER to Hydraulic/Mechanical Diagnosis charts under Diagnosis By Symptom. GO to A5.

26 Can be purchased as a separate item.

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST A: DIAGNOSTIC TROUBLE CODES: 621, 622 AND 641 SOLENOID CIRCUIT FAILURES; 645, 646, 647 and 648 INCORRECT GEAR RATIO OBTAINED (Continued)

TEST STEP		RESULT ▶	ACTION TO TAKE
A5	CHECK RESISTANCE OF SOLENOID/HARNESS		
	NOTE: Refer to the AXODE (AX4S) Transmission Tester for Terminal Locations. ● Bench/Drive switch in BENCH mode. ● Rotate solenoid select switch to OHMS CHECK position. ● Connect ohmmeter negative lead to SS-1 jack and positive lead to VPWR jack on tester. This is to test SS-1. ● Record resistance. ● Resistance should be 15-25 ohms. ● Connect ohmmeter negative lead to SS-2 jack and positive lead to VPWR jack on tester. This is to test SS-2. ● Record resistance. ● Resistance should be 15-25 ohms. ● Connect ohmmeter negative lead to SS-3 jack and positive lead to VPWR jack on tester. This is to test SS-3. ● Resistance should be 15-25 ohms. ● **Is resistance for all solenoids 15-25 ohms?**	Yes ▶ No ▶	GO to **A6.** Out of specification may be caused by internal harness or solenoid concerns. GO to **A7.**



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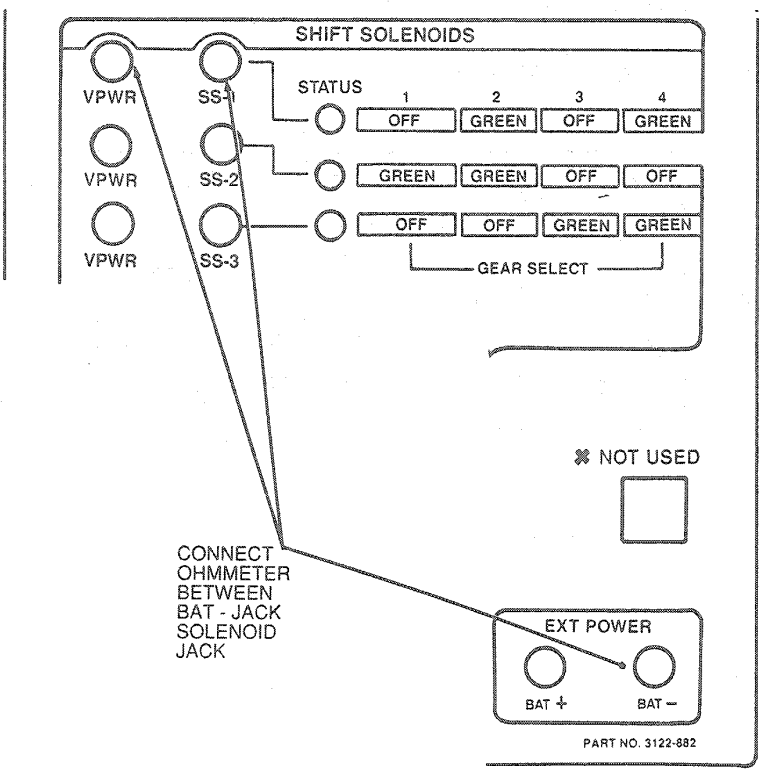
DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST A: DIAGNOSTIC TROUBLE CODES: 621, 622 AND 641 SOLENOID CIRCUIT FAILURES; 645, 646, 647 and 648 INCORRECT GEAR RATIO OBTAINED (Continued)

TEST STEP		RESULT	ACTION TO TAKE
A6	CHECK SOLENOID/HARNESS FOR SHORT TO GROUND		
	• Check each solenoid for continuity between BAT-jack (engine ground) and appropriate jack with an ohmmeter or other low current tester (less than 200 milliamps):	Yes ▶	GO to A7.
		No ▶	GO to Hydraulic/Mechanical Diagnosis as outlined.

Solenoid	Tester Jack
SS-1	SS-1/VPWR
SS-2	SS-2/VPWR
SS-3	SS-3/VPWR

• Connection should show infinite resistance (no continuity).
• **Is there continuity?**



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A7	AXODE (AX4S) INTERNAL ELECTRONIC DIAGNOSTICS		
	• Drain transaxle fluid. • Remove transaxle side pan. • Check that internal harness connectors are fully engaged on the shift solenoids. • Check that internal harness connector terminals are fully seated in the connectors. • Inspect connectors for damage. • **Are connectors OK?**	Yes ▶ No ▶	GO to A8. SERVICE as required.

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST A: DIAGNOSTIC TROUBLE CODES: 621, 622 AND 641 SOLENOID CIRCUIT FAILURES; 645, 646, 647 and 648 INCORRECT GEAR RATIO OBTAINED (Continued)

TEST STEP		RESULT ▶	ACTION TO TAKE
A8	CHECK INTERNAL AXODE (AX4S) HARNESS (CONTINUITY)		
	• Disconnect the internal harness from the solenoid assemblies. **CAUTION: Do not probe into connector terminals, as this will cause a loss of spring tension and possible failure.** • For SS-1, connect positive lead from an ohmmeter to tester jack SS-1 and negative lead at the Orange wire of the SS-1 wire connector. • Record resistance. • **Is resistance less than 0.5 ohm?** • For SS-2, connect positive lead from an ohmmeter to tester jack SS-2 negaive lead at the Pink wire of the SS-2 wire connector. • Record resistance. • **Is resistance less than 0.5 ohm?** • For SS-3, connect positive lead from an ohmmeter to tester SS-3 jack and negative lead at the Yellow wire of the SS-3 wire connector. • Record resistance. • **Is resistance less than 0.5 ohm?** • For SS-1, SS-2, and SS-3 VPWR, connect the positive lead from an ohmmeter to the appropriate lead for VPWR and negative lead to the Red wire for SS-1 VPWR, Red wire for SS-2 VPWR or Red wire for SS-3 VPWR. • Record resistance. • **Is resistance less than 0.5 ohm?**	Yes ▶ No ▶	GO to **A9.** REPLACE internal harness. GO to **A10.**
A9	CHECK INTERNAL AXODE (AX4S) HARNESS (SHORTS TO GROUND)		
	• Check for continuity between BAT- jack (engine ground) and appropriate wire with an ohmmeter or other low current tester (less than 200 milliamps). • Connection should show infinite resistance (no continuity). • **Is there continuity?**	Yes ▶ No ▶	REPLACE internal harness. GO to **A10.** GO to **A10.**
A10	CHECK SOLENOID RESISTANCE AT SOLENOID		
	• Check solenoid resistance by connecting an ohmmeter at the terminals of the solenoid assembly. • Measure and record resistance for each solenoid. (SS-1, SS-2, SS-3) • **Is resistance between 15-25 ohms?**	Yes ▶ No ▶	GO to **A11.** REPLACE shift solenoid.

Solenoid	Signal	VPWR
SS-1	Orange	Red
SS-2	Pink	Red
SS-3	Yellow	Red

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST A: DIAGNOSTIC TROUBLE CODES: 621, 622 AND 641 SOLENOID CIRCUIT FAILURES; 645, 646, 647 and 648 INCORRECT GEAR RATIO OBTAINED (Continued)

TEST STEP		RESULT ▶	ACTION TO TAKE
A11	CHECK SOLENOID FOR SHORT TO GROUND		
	• Check for continuity between engine ground and appropriate shift solenoid terminal with ohmmeter or other low current tester (less than 200 milliamps).	Yes ▶ No ▶	REPLACE shift solenoid. GO to Hydraulic/Mechanical Diagnosis as outlined.

Solenoid	Terminals As Marked On Solenoid
SS-1	+/-
SS-2	+/-
SS-3	+/-

• Connection should show infinite resistance (no continuity).
• **Is there continuity?**

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PINPOINT TEST B: DIAGNOSTIC TROUBLE CODES: 636, 637 and 638 TOT HIGHER/LOWER THAN EXPECTED

TEST STEP		RESULT ▶	ACTION TO TAKE
B1	AXODE (AX4S) ELECTRONIC DIAGNOSTICS		
	NOTE: Transaxle must be at operating temperature. • The following items must be checked before proceeding: — Check the PCM for proper function (On-Board Diagnostics). — Check vehicle wiring harness for continuity and shorts to ground. — Make sure all connectors are engaged properly. — Make sure all terminals in connectors are properly seated. — Check all connectors for damage, corrosion, water, bent pins and missing or damaged seals. • **Have items been checked?**	Yes ▶ No ▶	GO to B2. PERFORM checks.
B2	CHECK HARNESS CONNECTIONS		
	• Check that vehicle harness connector is fully engaged on transaxle connector. • Check that vehicle harness connector terminals are fully engaged in connector. • **Are the harness/terminals fully engaged?**	Yes ▶ No ▶	GO to B3. SERVICE as required.

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST B: DIAGNOSTIC TROUBLE CODES: 636, 637 and 638 TOT HIGHER/LOWER THAN EXPECTED (Continued)

TEST STEP		RESULT ▶	ACTION TO TAKE
B3	CHECK RESISTANCE OF TOT SENSOR		
	NOTE: Be sure tester solenoid select switch is in the OHMS CHECK position or damage to ohmmeter may result. • Vehicle at normal operating temperature. • Disconnect vehicle harness at transaxle. **CAUTION: Do not pry on connector. Pull vehicle harness connector.** • Install Rotunda Transmission tester 007-00085 or equivalent to transaxle connector. • Set Bench / Drive switch to BENCH mode. • Rotate solenoid select switch to OHMS CHECK mode. • Connect ohmmeter negative lead to -TOT jack and positive lead to +TOT jack. • Perform tests 1 and 2. NOTE: While performing Tests 1 and 2 observe resistances. Code 637 is set if resistance value exceeds 869K ohms (OPEN circuit). Code 638 is set if resistance value falls below 597 ohms (SHORT circuit). • **Test 1** • Record resistance. • Resistance should be approximately in the following ranges:	Yes ▶ No ▶	GO to B4. GO to B5.

TRANSMISSION FLUID TEMPERATURE

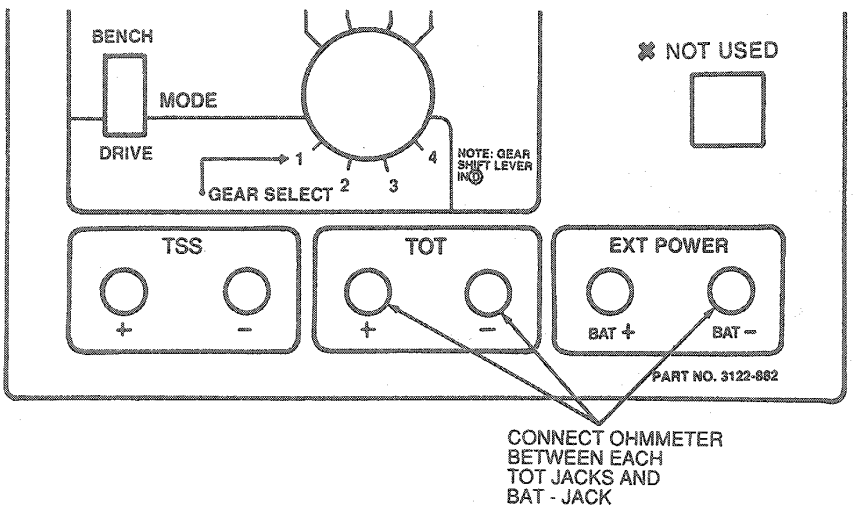
°C	°F	Resistance (Ohms)
0-20	32-58	100K-37K
21-40	59-104	37K-16K
41-70	105-158	16K-5K
71-90	159-194	5K-2.7K
91-110	195-230	2.7K-1.5K
111-130	231-266	1.5K-0.8K

• **Test 2**
• Check for intermittent short or open.
• If resistance was between 0.8K and 100K ohms, perform following test. If transaxle is cold, run transaxle to heat it up. If transaxle is warm, allow transaxle to cool. Check TOT sensor resistance again. Compare resistance with initial resistance. Resistance should decrease if transaxle was heated and should increase if transaxle was allowed to cool. If correct change in resistance occurs, REPEAT On-Board Diagnostics.
• **Is resistance in range?**

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST B: DIAGNOSTIC TROUBLE CODES: 636, 637 and 638 TOT HIGHER/LOWER THAN EXPECTED (Continued)

TEST STEP		RESULT	ACTION TO TAKE
B4	CHECK TOT SENSOR/HARNESS FOR SHORT TO GROUND		
	• Check for continuity between BAT- jack (engine ground) and appropriate jack (-TOT and +TOT) with ohmmeter or other low current tester (less than 200 milliamps). • Connection should show infinite resistance (no continuity). • **Is there continuity?**	Yes ▶ No ▶	GO to **B5.** REPEAT Self-Test. If DTC is still present, REFER to the Powertrain Control/Emissions Diagnosis Manual[27] for PCM and vehicle harness diagnosis.



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B5	AXODE (AX4S) INTERNAL ELECTRONIC DIAGNOSTICS		
	• Drain transaxle fluid. • Remove transaxle side pan. • Check that internal harness connector is fully engaged on the TOT sensor. • Check that internal harness connector terminals are fully seated in the connector. • Inspect the connector for damage. • **Is everything in good condition?**	Yes ▶ No ▶	GO to **B6.** SERVICE as required.
B6	CHECK INTERNAL AXODE (AX4S) HARNESS (CONTINUITY)		
	• Disconnect internal harness from TOT sensor. **CAUTION: Do not probe into the connector terminals.** • Connect positive lead from an ohmmeter to tester +TOT jack and negative lead at Black wire of TOT sensor connector. • Record resistance. Resistance should be less than 0.5 ohm. • Connect positive lead from ohmmeter to tester -TOT jack and negative lead to the White wire of the TOT wire connector. • Record resistance. Resistance should be less than 0.5 ohm. • **Is each resistance less than 0.5 ohm?**	Yes ▶ No ▶	GO to **B7.** REPLACE internal harness. GO to **B8.**

27 Can be purchased as a separate item.

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST B: DIAGNOSTIC TROUBLE CODES: 636, 637 and 638 TOT HIGHER/LOWER THAN EXPECTED (Continued)

TEST STEP		RESULT ▶	ACTION TO TAKE
B7	CHECK INTERNAL AXODE (AX4S) HARNESS (SHORTS TO GROUND)		
	• Check for continuity between BAT- jack (engine ground) and appropriate wire (+TOT and -TOT) with ohmmeter or other low current tester (less than 200 milliamps).	Yes ▶	REPLACE internal harness. GO to **B8.**
		No ▶	GO to **B8.**

Sensor	Wire From Top Connector
TOT+	Black
TOT-	White

• Connection should show infinite resistance (no continuity).
• **Is there continuity?**

B8	CHECK TOT SENSOR RESISTANCE		
	• Check sensor resistance by connecting an ohmmeter at terminals of TOT sensor assembly. • Record resistance. • Resistance should be in range of temperature of vehicle. • Resistance should be approximately in the following ranges:	Yes ▶	GO to **B9.**
		No ▶	REPLACE TOT sensor.

TRANSMISSION FLUID TEMPERATURE

°C	°F	Resistance (Ohms)
0-20	32-58	100K-37K
21-40	59-104	37K-16K
41-70	105-158	16K-5K
71-90	159-194	5K-2.7K
91-110	195-230	2.7K-1.5K
111-130	231-266	1.5K-0.8K

• **Is resistance in range?**

B9	CHECK TOT SENSOR FOR SHORT TO GROUND		
	• Check for continuity between BAT- jack (engine ground) and appropriate terminal on TOT with ohmmeter or other low current tester (less than 200 milliamps).	Yes ▶	REPLACE TOT sensor.
		No ▶	RERUN Self-Test. If DTC is still present, REFER to Powertrain Control/Emissions Diagnosis Manual[28] to diagnose vehicle harness or PCM concerns.

Sensor	Terminal
TOT	+/-

• Connection should show infinite resistance (no continuity).
• **Is there continuity?**

TD10346B

28 Can be purchased as a separate item.

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST C: DIAGNOSTIC TROUBLE CODES 628 TORQUE CONVERTER ERROR DETECTED, 652 TORQUE CONVERTER CLUTCH CIRCUIT FAILURE AND 656 CONTINUOUS SLIP ERROR DETECTED

TEST STEP		RESULT ▶	ACTION TO TAKE
C1	AXODE (AX4S) ELECTRONIC DIAGNOSTICS		
	• The following items must be checked before proceeding: — Check the PCM for proper function (On-Board Diagnostics). — Check vehicle wiring harness for continuity and shorts to ground. — Make sure all connectors are engaged properly. — Make sure all terminals in connectors are properly seated. — Check all connectors for damage, corrosion, water, bent pins and missing or damaged seals. • **Have items been checked?**	Yes ▶ No ▶	GO to **C2.** PERFORM checks.
C2	CHECK HARNESS CONNECTIONS		
	• Check that vehicle harness connector is fully engaged on transaxle connector. • Check that vehicle harness connector terminals are fully engaged in connector. • **Are connector / terminals fully engaged?**	Yes ▶ No ▶	GO to **C3.** SERVICE as required.
C3	TRANSAXLE FUNCTIONAL TEST		
	• Disconnect vehicle harness at transaxle. **CAUTION: Do not pry connector. Pull vehicle harness connector.** • Install tester to transaxle connector. • Using tests outlined under Transmission Tester Instructions. — Perform TCC Solenoid Function Test as outlined. NOTE: LED will turn GREEN when solenoid activates and turns OFF when deactivated. LED will turn RED if an activated solenoid / harness is shorted to B+. LED will remain OFF if an activated solenoid / harness is shorted to ground or no continuity (open circuit). • **Does TCC (LED GREEN) activate when tester switch is depressed?**	Yes ▶ No ▶	GO to **C4.** GO to **C5.**
C4	TRANSAXLE DRIVE TEST		
	• Perform Transaxle Drive Test as outlined. • While in second gear depress the TCC switch. • **Does TCC activate (LED GREEN)? Does engine rpm drop?**	Yes ▶ No ▶	REFER to Powertrain Control / Emissions Diagnosis Manual[29] to diagnose PCM and vehicle harness concerns. GO to **C5.**
C5	CHECK RESISTANCE OF SOLENOID / HARNESS		
	NOTE: Refer to AXODE (AX4S) Transmission Tester for terminal locations. • Set Bench / Drive switch to BENCH mode. • Rotate gear select switch to OHMS CHECK mode. • Connect ohmmeter negative lead to TCC jack and positive lead to VPWR jack on tester. This is to test TCC. • Record resistance. Resistance should be between 0.98-1.6 ohms. • **Is the resistance within specifications?**	Yes ▶ No ▶	GO to **C6.** Internal harness or solenoid may be damaged. GO to **C7.**

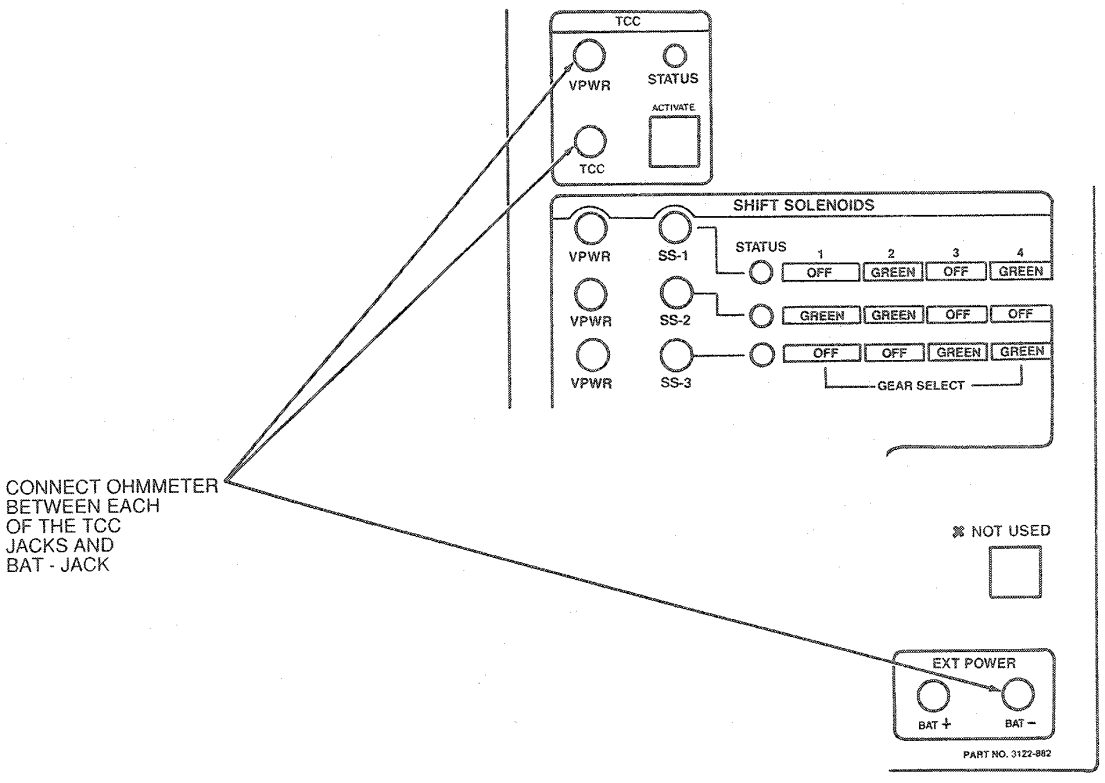
29 Can be purchased as a separate item.

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST C: DIAGNOSTIC TROUBLE CODES 628 TORQUE CONVERTER ERROR DETECTED, 652 TORQUE CONVERTER CLUTCH CIRCUIT FAILURE AND 656 CONTINUOUS SLIP ERROR DETECTED (Continued)

TEST STEP		RESULT	ACTION TO TAKE
C6	CHECK SOLENOID/HARNESS FOR SHORT TO GROUND		
	• Check for continuity between BAT- jack (engine ground) and appropriate jack with an ohmmeter or other low current tester (less than 200 milliamps). • Connection should show infinite resistance (no continuity). • **Is there continuity?**	Yes ▶ No ▶	GO to C7. REFER to Hydraulic/Mechanical Diagnosis as outlined to diagnose torque converter clutch concerns.

Solenoid	Tester Jack
TCC	TCC VPWR



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C7	AXODE (AX4S) INTERNAL ELECTRONIC DIAGNOSTICS		
	• Drain transaxle fluid. • Remove transaxle side pan. • Check that the internal harness connector is fully engaged on the TCC solenoid assembly. • Check that the internal harness connector terminals are fully seated in the connector. • Inspect the connector for damage. • **Are the connector/terminals in good condition?**	Yes ▶ No ▶	GO to C8. SERVICE as required.

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST C: DIAGNOSTIC TROUBLE CODES 628 TORQUE CONVERTER ERROR DETECTED, 652 TORQUE CONVERTER CLUTCH CIRCUIT FAILURE AND 656 CONTINUOUS SLIP ERROR DETECTED (Continued)

TEST STEP		RESULT ▶	ACTION TO TAKE
C8	CHECK INTERNAL AXODE (AX4S) HARNESS (CONTINUITY)		
	• Disconnect the internal harness from the solenoid assembly. (TCC wire connector). **CAUTION: Do not probe into connector terminals.** • Connect positive lead from an ohmmeter to tester TCC jack and the negative lead at the Brown wire at the TCC connector. • Record resistance. Resistance should be less than 0.5 ohm. • Next, connect the positive lead from an ohmmeter to the tester VPWR jack and the negative lead to the Green wire of the TCC connector. • Record resistance. • **Is each resistance less than 0.5 ohm?**	Yes ▶ No ▶	GO to **C9.** REPLACE internal harness. GO to **C10.**
C9	CHECK INTERNAL AXODE (AX4S) HARNESS (SHORTS TO GROUND)		
	• Check for continuity between BAT- jack (engine ground) and the appropriate wire with an ohmmeter or other low current tester (less than 200 milliamps). • Connection should not show continuity (infinite). • **Is there continuity?**	Yes ▶ No ▶	REPLACE internal harness. GO to **C10.** GO to **C10.**
C10	CHECK SOLENOID RESISTANCE		
	• Check solenoid resistance by connecting an ohmmeter to the terminals of the TCC solenoid. • Record resistance. • Resistance should be between 0.98-1.6 ohms. • **Is resistance within specifications?**	Yes ▶ No ▶	GO to **C11.** REPLACE TCC solenoid.
C11	CHECK SOLENOID FOR SHORT TO GROUND		
	• Check for continuity between BAT- jack (engine ground) and each solenoid terminal on the TCC with an ohmmeter or other low current tester (less than 200 milliamps). • Connection should show infinite resistance (no continuity). • **Is there continuity?**	Yes ▶ No ▶	REPLACE TCC solenoid. REFER to Hydraulic / Mechanical Diagnosis as outlined.

Solenoid	Wire
TCC	Brown Green

Solenoid	Terminal
TCC	+ / -

TD10347B

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST D: DIAGNOSTIC TROUBLE CODES: 522 MLP NOT INDICATING PARK FOR TEST; 634 MLP VOLTAGE HIGHER/LOWER THAN EXPECTED

TEST STEP		RESULT	ACTION TO TAKE
D1	AXODE (AX4S) ELECTRONIC DIAGNOSTICS		
	• The following items must be checked before proceeding: — Check the PCM for proper function (On-Board Diagnostics). — Check vehicle wiring harness for continuity and shorts to ground. — Make sure all connectors are engaged properly. — Make sure all terminals in connectors are properly seated. — Check all connectors for damage, corrosion, water, bent pins and missing or damaged seals. • **Have items been checked?**	Yes ▶ No ▶	GO to D2. PERFORM checks.
D2	CHECK HARNESS CONNECTIONS		
	• Check that vehicle harness connector is fully engaged on transaxle manual lever position (MLP) sensor connector. • Check that vehicle harness connector terminals are fully engaged in connector. • **Are connector/terminals fully engaged?**	Yes ▶ No ▶	GO to D3. SERVICE as required.
D3	ADJUST MANUAL LEVER POSITION (MLP) SENSOR		
	• Apply the parking brake. • Place transaxle in NEUTRAL. • Verify manual lever position using Gear Position Sensor Adjuster Tool T91P-70010-A. • **Is sensor adjusted correctly?**	Yes ▶ No ▶	GO to D4. ADJUST sensor as outlined under Transaxle Assembly and REPEAT Self-Test.
D4	CHECK OPERATION OF MANUAL LEVER POSITION SENSOR		
	• Disconnect vehicle harness from MLP sensor. **CAUTION: Do not pry connector. Compress lever and pull out on connector.** • Insert Manual Lever Position Sensor Tester D89T-70010-A or equivalent into the MLP sensor. • Plug ohmmeter into MLP tester. • Using procedures on tester, verify sensor functions in all positions. — Check continuity and resistance in all positions. NOTE: For AXODE (AX4S) the second gear position on the tester has the same resistance as the AXODE (AX4S) in DRIVE (second gear SHO only).	Yes ▶ No ▶	REFER to Powertrain Control/Emissions Diagnosis Manual[30] for diagnosis of PCM and vehicle wiring harness. REPLACE MLP sensor and RERUN Self-Test.

Transaxle Shift Position	Resistance (Ohms) Minimum	Maximum
P	3770	4607
R	1304	1593
N	660	807
OD	361	442
2/D	190	232
1	78	95

• **Is the MLP sensor within specifications?**

TD10292B

30 Can be purchased as a separate item.

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST E: DIAGNOSTIC TROUBLE CODES: 624 AND 625 EPC CIRCUIT FAILURES

TEST STEP		RESULT ▶	ACTION TO TAKE
E1	AXODE (AX4S) ELECTRONIC DIAGNOSTICS		
	• The following items must be checked before proceeding: — Check the PCM for proper function (On-Board Diagnostics). — Check vehicle wiring harness for continuity and shorts to ground. — Make sure all connectors are engaged properly. — Make sure all terminals in connectors are properly seated. — Check all connectors for damage, corrosion, water, bent pins and missing or damaged seals. • **Have items been checked?**	Yes ▶ No ▶	GO to **E2.** PERFORM checks.
E2	CHECK HARNESS CONNECTIONS		
	• Check that vehicle harness connector is fully engaged on transaxle connector. • Check that vehicle harness connector terminals are fully engaged in connector. • **Are connectors / terminals fully engaged?**	Yes ▶ No ▶	GO to **E3.** SERVICE as required.
E3	TRANSAXLE FUNCTIONAL TEST		
	• Disconnect vehicle harness at transaxle connector. **CAUTION: Do not attempt to pry connector. Pull vehicle harness connector.** • Install line pressure gauge at line tap on case. • Install Rotunda Transmission Tester 007-00085 or equivalent to transaxle connector. • Set Bench / Drive switch to DRIVE mode. • Rotate gear selector switch to first gear position. • Using tests outlined under Tester instructions, perform EPC Functional Test. NOTE: LED will turn GREEN when solenoid activates and turn OFF when deactivated. LED will turn RED if activated solenoid / harness is shorted to B+. LED will remain OFF if an activated solenoid / harness is shorted to ground or no continuity (open circuit). • **Does EPC (LED) activate when EPC switch is depressed?** • Observe line pressure on gauge while depressing the EPC switch (engine must be running). • **Does line pressure drop?**	Yes ▶ No ▶	REFER to Powertrain Control / Emissions Diagnosis Manual[31] to diagnose PCM or vehicle harness. GO to **E4.**
E4	CHECK RESISTANCE OF SOLENOID / HARNESS		
	• Set Bench / Drive switch to BENCH mode. • Rotate gear select switch to OHMS CHECK position. • Connect ohmmeter negative lead to EPC jack and positive lead to VPWR jack on tester. This is to test EPC solenoid and harness. • Record resistance. • **Is resistance between 3.23-5.5 ohms?**	Yes ▶ No ▶	GO to **E5.** Internal harness or solenoid may be damaged. GO to **E6.**

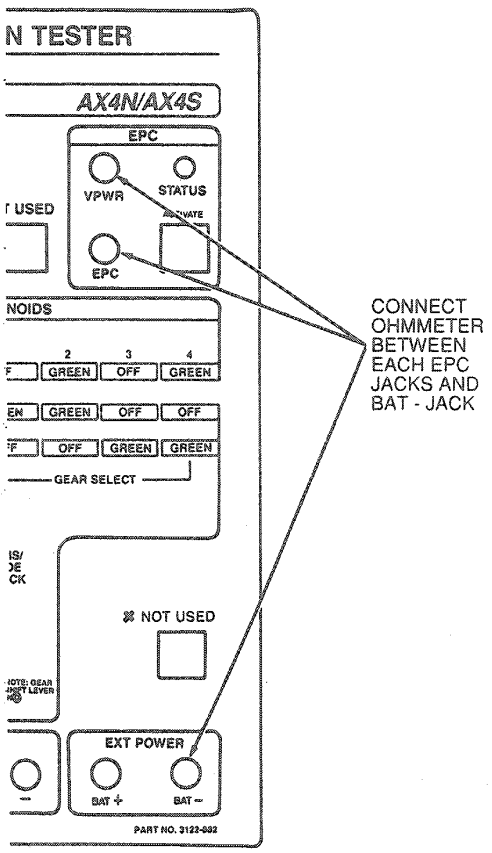
31 Can be purchased as a separate item.

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST E: DIAGNOSTIC TROUBLE CODES: 624 AND 625 EPC CIRCUIT FAILURES (Continued)

TEST STEP		RESULT ▶	ACTION TO TAKE
E5	CHECK SOLENOID/HARNESS FOR SHORT TO GROUND		
	• Check for continuity between BAT- jack (engine ground) and appropriate jack with an ohmmeter or other low current tester (less than 200 milliamps).	Yes ▶ No ▶	GO to E6. REFER to Hydraulic/Mechanical Diagnosis charts as outlined.

Solenoid	Tester Jack
EPC	EPC VPWR



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- Connection should show infinite resistance (no continuity).
- **Is there continuity?**

E6	AXODE (AX4S) INTERNAL ELECTRONIC DIAGNOSTICS		
	• Drain transaxle fluid. • Remove transaxle side pan. • Check that the internal harness connector is fully engaged on the EPC solenoid assembly. • Check that internal harness connector terminals are fully seated in the connector. • Inspect the connector for damage. • **Is everything engaged and in good condition?**	Yes ▶ No ▶	GO to E7. SERVICE as required.

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST E: DIAGNOSTIC TROUBLE CODES: 624 AND 625 EPC CIRCUIT FAILURES (Continued)

TEST STEP		RESULT	ACTION TO TAKE
E7	CHECK INTERNAL AXODE (AX4S) HARNESS (CONTINUITY)		
	• Disconnect internal harness from the EPC solenoid assembly. • Connect the positive lead from ohmmeter to the tester EPC jack and the negative lead at the Blue wire at the EPC connector. • Record resistance. Should be less than 0.5 ohm. • Connect the positive lead from an ohmmeter to the tester VPWR jack and the negative lead at the Green wire at the EPC connector. • Record resistance. • **Is each resistance less than 0.5 ohm?**	Yes ▶ No ▶	GO to E8. REPLACE internal harness. GO to E9.
E8	CHECK INTERNAL AXODE (AX4S) HARNESS (SHORTS TO GROUND)		
	• Check for continuity between BAT- jack (engine ground) and the appropriate wire with an ohmmeter or other low current tester (less than 200 milliamps). • Connection should show infinite resistance (no continuity). • **Is there continuity?**	Yes ▶ No ▶	REPLACE internal harness. GO to E9. GO to E9.
E9	CHECK SOLENOID RESISTANCE		
	• Check solenoid resistance by connecting an ohmmeter at the EPC terminals of the solenoid assembly. • Record resistance. • **Is resistance between 3.23 - 5.5 ohms?**	Yes ▶ No ▶	GO to E10. REPLACE EPC solenoid.
E10	CHECK SOLENOID FOR SHORT TO GROUND		
	• Check for continuity between BAT- jack (engine ground) and each EPC terminal with ohmmeter or other low current tester (less than 200 milliamps). • Connection should show infinite resistance (no continuity). • **Is there continuity?**	Yes ▶ No ▶	REPLACE EPC solenoid. REFER to Hydraulic / Mechanical Diagnosis charts as outlined.

Solenoid	Wire
EPC	Green - Blue+

Solenoid	Terminal
EPC	+/-

TD10348B

PINPOINT TEST F: DIAGNOSTIC TROUBLE CODE: 639 INSUFFICIENT INPUT FOR TRANSMISSION SPEED SENSOR

TEST STEP		RESULT	ACTION TO TAKE
F1	AXODE (AX4S) ELECTRONIC DIAGNOSTICS		
	• The following items must be checked before proceeding: — Check the PCM for proper function (On-Board Diagnostics). — Check the vehicle wiring harness for continuity and shorts to ground. — Make sure all connectors are engaged properly. — Make sure all terminals in connectors are properly seated. — Check all connectors for damage, corrosion, water, bent pins and missing or damaged seals. • **Have items been checked?**	Yes ▶ No ▶	GO to F2. PERFORM checks.

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST F: DIAGNOSTIC TROUBLE CODE: 639 INSUFFICIENT INPUT FOR TRANSMISSION SPEED SENSOR (Continued)

TEST STEP		RESULT	ACTION TO TAKE
F2	CHECK HARNESS CONNECTIONS		
	• Check that vehicle harness connector is fully engaged on transaxle TSS connector. • Check that vehicle harness connector terminals are fully engaged in connector. • **Are connectors/terminals fully engaged?**	Yes ▶ No ▶	GO to F3. SERVICE as required.
F3	TRANSAXLE FUNCTIONAL TEST		
	• Disconnect vehicle harness at TSS sensor. **CAUTION: Do not pry on the connector. Pull vehicle harness connector.** • Connect Rotunda Transmission Tester 007-00085 or equivalent onto TSS sensor. • Connect voltmeter positive lead to +TSS and negative lead to -TSS. Set voltmeter to AC. • Perform TSS Function Test. Monitor voltmeter. • **Does voltage increase with an increase in vehicle speed?**	Yes ▶ No ▶	REFER to the Powertrain Control/Emissions Diagnosis Manual[32] to diagnose vehicle harness or PCM concerns. GO to F4.
F4	CHECK RESISTANCE OF TRANSMISSION SPEED SENSOR (TSS)		
	NOTE: Refer to Transmission Tester for terminal locations. • Connect ohmmeter negative lead to +TSS jack and positive lead to -TSS jack on tester. This is to test TSS sensor. • Record resistance. • **Is resistance between 100-200 ohms?**	Yes ▶ No ▶	GO to F5. REPLACE sensor. RERUN TSS Function Test.

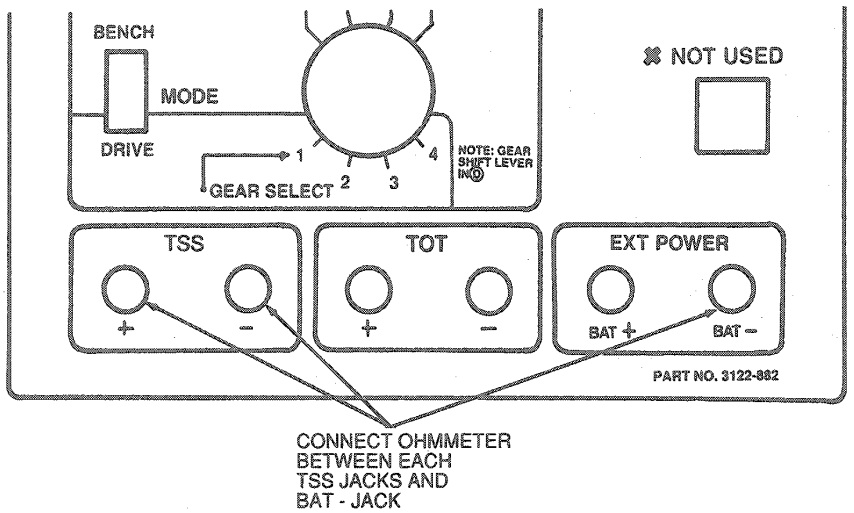
32 Can be purchased as a separate item.

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST F: DIAGNOSTIC TROUBLE CODE: 639 INSUFFICIENT INPUT FOR TRANSMISSION SPEED SENSOR (Continued)

TEST STEP		RESULT	ACTION TO TAKE
F5	CHECK SENSOR FOR SHORT TO GROUND		
	• Check for continuity between BAT- jack (engine ground) and appropriate jack with an ohmmeter or other low current tester (less than 200 milliamps). • Connection should show infinite resistance (no continuity), • **Is there continuity?**	No ▶ Yes ▶	REPLACE TSS sensor. RERUN TSS Function Test. GO to **F6.**

Sensor	Tester Jack
TSS	+TSS -TSS



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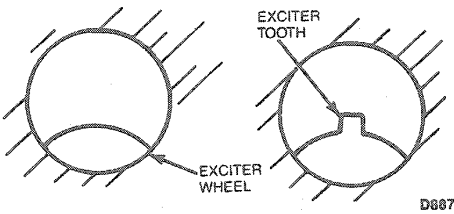
F6	CHECK TSS MAGNETISM		
	• Remove TSS from transaxle. • Place TSS against a metal surface to which a magnet would stick. The TSS should be magnetized and stick to metal surface. • **Does TSS stick?**	Yes ▶ No ▶	GO to **F7.** REPLACE TSS. RERUN TSS Function Test.

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST F: DIAGNOSTIC TROUBLE CODE: 639 INSUFFICIENT INPUT FOR TRANSMISSION SPEED SENSOR (Continued)

TEST STEP		RESULT	ACTION TO TAKE
F7	CHECK EXCITER WHEEL		
	• Remove transmission speed sensor. • With remote starter switch start and stop engine until a tooth of the exciter wheel is visible through the TSS hole. NOTE: Ensure a tooth is visible. The exciter wheel will always be visible through the TSS hole.  D6872-A • Measure the depth of the exciter wheel tooth from the outer edge of the chain cover. Distance should not exceed 20.62mm (0.81 inch). MARK tooth with a marker and REPEAT for all four teeth. • **Is depth within specifications?**	Yes ▶ No ▶	REPLACE TSS. RERUN TSS Function Test. SERVICE or REPLACE exciter wheel as required. RERUN TSS Function Test.

TD10349B

Shift Point Road Test

This test verifies that shift control valves are operating properly.

1. Bring engine and transaxle up to normal operating temperature.
2. Operate vehicle with transaxle selector in ⓓ range.
3. Apply minimum throttle pressure and observe upshift speeds and speed at which torque converter clutch applies.
4. Stop vehicle and move transaxle selector to D range. Repeat Step 3. Transaxle will make all upshifts except 3-4 and torque converter clutch apply should occur above 46 km/h (27 mph).
5. Depress accelerator pedal to floor, wide open throttle (WOT). Transaxle should shift from third to second, or third to first depending on vehicle speed, and torque converter clutch should release.
6. With vehicle speed above 48 km/h (30 mph), move transaxle selector from D range to 1 range (LOW) and remove foot from accelerator pedal. Transaxle should immediately downshift to second gear. When vehicle speed drops below 32 km/h (20 mph), transaxle should downshift into first gear.
7. If transaxle fails to upshift and/or downshift as outlined, refer to Quick Test.

Transaxle Fluid Level Check

CAUTION: Vehicles should not be driven if fluid level is below DO NOT DRIVE hole.

Transaxle—Operating Temperature

The automatic transaxle fluid level can only be established at an operating temperature of 66°C-77°C (150°F-170°F) (dipstick is hot to the touch). The operating temperature may be obtained by driving 24-32km (15-20 miles) of city-type driving with the outside temperature above 10°C (50°F).

Transaxle—Room Temperature

NOTE: The AXODE (AX4S) transaxle cannot have fluid level established at room temperature.

Fluid level can only be checked at room temperature 21°C-35°C (70°F-95°F) (dipstick cool to the touch) to verify that the level is above the DO NOT DRIVE mark. If fluid level is below, then add only enough Synthetic MERCON® Multi-Purpose Automatic Transmission Fluid E6AZ-19582-B (ESR-M2C163-A2) or equivalent to bring the level above the DO NOT DRIVE mark. Operating temperature must be obtained as outlined to establish correct fluid level if any fluid is added during room temperature check.

Dipstick Reading

The fluid level on the dipstick should be within the cross-hatched area at operating temperature. The fluid level on the dipstick should read above the DO NOT DRIVE mark (bottom hole on dipstick) at room temperature.

Check the fluid as follows:

DIAGNOSIS AND TESTING (Continued)

1. With the transaxle in PARK, engine at idle rpm, foot brakes applied and vehicle on level surface, move the transaxle selector lever through each range, allowing time in each range to engage transaxle. Return to PARK, applying parking brake fully and block the wheels. Do not turn off the engine during the fluid level check.
2. Clean all dirt from the transaxle fluid dipstick cap before removing the dipstick from the filler tube.
3. Pull the dipstick out of the tube, wipe it clean and push it all the way back into the tube. Ensure it is fully seated.
4. Pull the dipstick out of the filler tube again and check the fluid level.

   NOTE: The fluid level indication on the dipstick will be different at operating temperature and room temperature. For the correct fluid level reading on the dipstick, follow the appropriate instructions stated previously.

   CAUTION: If vehicle has been operated for an extended period at high speed, or in city traffic in hot weather, or vehicle is being used to tow a trailer, the fluid must cool approximately 30 minutes after engine has been turned off for an accurate reading to be obtained.

   CAUTION: Use of a fluid other than specified could result in transaxle malfunction and/or failure.

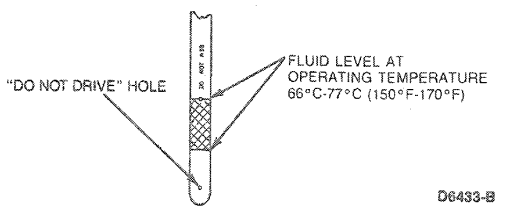
   If necessary, add enough fluid through the filler tube to raise the level to the correct height.

   CAUTION: Do not overfill the transaxle. This will result in foaming, loss of fluid through the vent and possible transaxle malfunction. If overfill occurs, excess fluid must be removed.
5. Install the dipstick, making sure it is fully seated in the tube.

   Overfill can cause the fluid to foam and spill out through the vent, resulting in a transaxle malfunction.

   Underfill can result in transaxle loss of engagement or slipping. This condition is most evident in cold weather or when the vehicle is parked or being driven on a hill.

   If the transaxle fluid level is checked when the fluid is at room temperature, the dipstick could be misread to indicate that fluid should be added. If fluid is added at this time, an overfill condition could result when the fluid reaches operating temperatures of 66°C-77°C (150°F-170°F) (dipstick hot to touch).



Transaxle Fluid Condition Check

1. Perform Transaxle Fluid Level Check as outlined.
2. Observe color and odor of fluid. It should be red, not brown or black. Odor can sometimes indicate an overheating condition or clutch disc or band failure.
3. Use an absorbent white facial tissue to wipe dipstick. Examine stain for evidence of solids (specks of any kind) and for coolant signs (gum or varnish on dipstick).

   If specks are present in the oil or there is evidence of coolant, the transaxle oil pan must be removed for further inspection. If fluid contamination or transaxle failure is confirmed by further evidence of coolant or excessive solids in the oil pan, the transaxle must be disassembled and completely cleaned and serviced. This includes cleaning the torque converter and transaxle cooling system. It would be a waste of time to perform any further checks before cleaning and servicing the transaxle. During disassembly and assembly, all overhaul checks and adjustments of clearances and end play must be made. After the transaxle has been serviced, all diagnosis tests and adjustments listed in the Diagnosis and Testing charts must be completed to ensure that the condition has been corrected.

High or Low Fluid Level

A fluid level that is too high will cause the fluid to become aerated. Aerated fluid will cause low control pressure and the aerated fluid may be forced out the vent.

A fluid level that is too low can affect the operation of the transaxle. Low level may indicate fluid leaks that could cause transaxle damage.

Transaxle Fluid Leakage Checks

Check the vehicle speed sensor (VSS) and speedometer cable connection at the transaxle. Replace the rubber seal if necessary.

Leakage at the oil pan gasket often can be stopped by tightening the attaching bolts to specification. If necessary, replace the gasket.

Check the speedometer gear cover seal.

Check the chain cover-to-case gasket.

DIAGNOSIS AND TESTING (Continued)

Check the bulkhead connectors to chain cover. Replace bulkhead assembly, if necessary.

Check the fluid filler tube connection at the transaxle case. If leakage is found here, install a new grommet.

CAUTION: Do not try to stop the oil leak by increasing the torque beyond specification. This may cause damage to the case threads.

Check the fluid lines and fittings between the transaxle and the cooler in the radiator tank for looseness, wear, or damage. If leakage cannot be stopped by tightening a fluid line tube nut, replace the damaged parts. Refer to Oil Cooler and Steel Lines. When oil is found to be leaking between the case and the cooler line fitting, tighten the fitting to maximum specification. If the leak continues, replace the cooler line fitting and tighten to specification. The same procedure should be followed for oil leaks between the radiator cooler and cooler line fittings.

Check the engine coolant in the radiator. If transaxle fluid is present in the coolant, the cooler in the radiator is probably leaking.

The cooler can be further checked for leaks by disconnecting the lines from the cooler fittings and applying 345-517 kPa (50-75 psi) air pressure to the fittings. Remove the radiator cap to relieve the pressure buildup at the exterior of the oil cooler tank. If the cooler is leaking and/or will not hold pressure, the cooler must be replaced.

If leakage is found at either the throttle control cable grommet or the manual lever shaft, replace either or both seals.

Oil-soluble aniline or fluorescent dyes premixed at the rate of 2.5ml (1/2 teaspoon) of dye powder to 0.23L (1/2 pint) of transmission fluid have proven helpful in locating the source of fluid leakage. Such dyes may be used to determine whether an engine oil or transmission fluid leak is present, or if the fluid in the oil cooler leaks into the engine coolant system. A black light must be used with the fluorescent dye solution.

Check the power steering gear system. The power steering gear system is positioned over the rear of the transaxle and is filled with transmission fluid. Leaks from the power steering gear may pool on the transaxle before dripping onto the ground, thus giving the appearance of a transaxle fluid leak.

Inspect both components carefully before disassembling either. If the power steering system is found to be leaking, refer to Section 11-02. After an engine oil filter change, some residual oil may blow back on the transaxle giving the appearance of transaxle fluid leakage. The area should be cleaned and checked after running the engine.

Oil Cooler Tube Leakage

When fluid leakage is found at the oil cooler, the cooler must be replaced. Refer to Section 03-03.

When one or more of the fluid cooler steel tubes must be replaced, each replacement tube must be fabricated from the same size steel tubing as the original line.

Using the old tube as a guide, bend the new tube as required. Add the necessary fittings and install the tube.

After the fittings have been tightened, add fluid as needed and check for fluid leaks.

Fluid Leakage in Converter Area

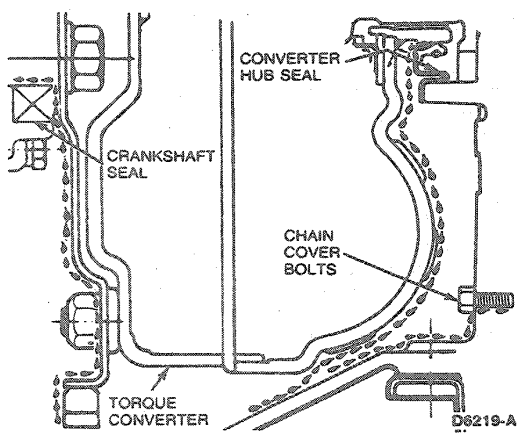
In diagnosing and correcting fluid leaks in the converter area, use the following procedures to locate the exact source of the leakage. Leakage at the front of transaxle, as evidenced by fluid around the converter housing, may have several sources. By careful observation, it is possible in many instances to pinpoint the source of the leak before removing the transaxle from the vehicle. The paths which the fluid can take to reach the bottom of the converter housing are as follows:

1. Fluid leaking by the converter hub seal lip will tend to move along the drive hub and onto the back of the impeller housing. Except in the case of a total seal failure, fluid leakage by the lip of the seal will be deposited on the inside of the converter housing only, near the outside diameter of the housing.
2. Fluid leakage by the outside diameter of the converter hub seal and the case will follow the same path which the leaks by the inside diameter of the seal follow.
3. Fluid leakage from the converter-to-flywheel stud weld will appear at OD of converter on back face of flywheel and in the converter housing only near the flywheel. If a converter-to-flywheel stud leak is suspected, remove converter and pressure check as outlined.
4. Engine oil leaks are sometimes improperly diagnosed as transaxle front pump seal leaks. The following areas of possible leakage should also be checked to determine if engine oil leakage is causing the concern.
   a. Leakage at the rocker arm cover may allow oil to flow over the converter housing or seep down between the converter housing and cylinder block causing oil to be present in or at the bottom of the converter housing.
   b. Oil gallery plug leaks will allow oil to flow down the rear face of the block to the converter housing.
   c. Leakage at the crankshaft seal will work back to the flywheel and then into the converter housing.

DIAGNOSIS AND TESTING (Continued)

5. The following procedures should be used to determine the cause of the leakage before service is made.
   a. Remove the transaxle dipstick and note the color of the fluid. Original factory fill fluid is dyed red to aid in determining if leakage is from the engine or transaxle. Unless a considerable amount of makeup fluid has been added or the fluid has been changed, the red color should assist in pinpointing the leak.
   b. Remove the converter housing cover. Clean off any fluid from the top and bottom of the converter housing, front of the transaxle case and rear face of the engine and oil pan. Clean the converter area by washing with a suitable nonflammable solvent and blow dry with compressed air.
   c. Wash out converter housing and the front of the flywheel. The converter housing may be washed out using cleaning solvent and a squirt-type oil can. Blow all washer areas dry with compressed air.
   d. Start and run the engine until the transaxle reaches its normal operating temperature. Observe the back of the block and top of the converter housing for evidence of fluid leakage. Raise the vehicle on a hoist. Refer to Section 00-02. Run the engine at fast idle, then at engine idle, occasionally shifting to the DRIVE and REVERSE ranges to increase pressure within the transaxle.

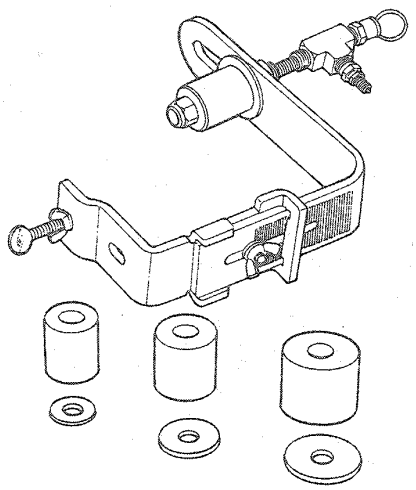
      Observe the front of the flywheel, back of the block (in as far as possible) and inside the converter housing and front of the transaxle case. Run the engine until fluid leakage is evident and the source of leakage can be determined.



Converter Leakage Check

If welds on the torque converter indicate leakage, remove the converter and make the following check.

Assemble Rotunda Torque Converter Leak Test Kit 021-00054 or equivalent to the converter. Test the converter for leaks, following the directions supplied with the Kit.



ROTUNDA TORQUE CONVERTER LEAK TEST KIT 021-00054 D6790-A

NOTE: Prior to performing the following test procedure, the PCM Quick Test should be completed and ALL service codes corrected.

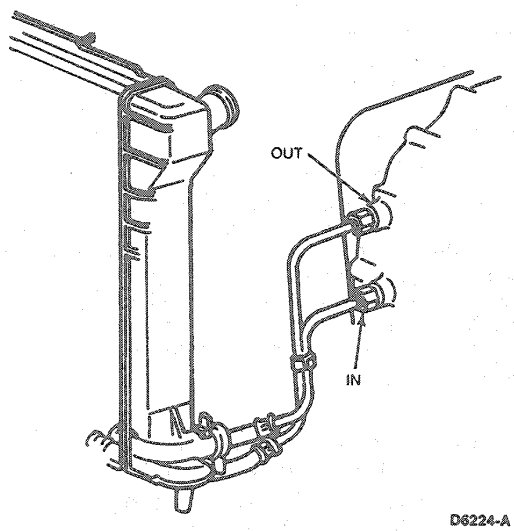
Transaxle Fluid Cooler Flow Test

NOTE: The transaxle linkage adjustment, fluid level and control pressure must be within specification before performing this test. Refer to Section 07-05 for transaxle linkage adjustment.

1. Remove dipstick from filler tube.
2. Place funnel in filler tube.
3. Raise vehicle on a hoist. Refer to Section 00-02.
4. Remove cooler return line (lower fitting) from fitting on transaxle case.
5. Connect a hose to cooler return line. Insert other end of hose into funnel in dipstick tube.
6. Start engine and set idle at 1000 rpm with transaxle in NEUTRAL range.
7. Observe fluid flow at funnel. When fluid flow is solid, the flow should be approximately 0.9 liter (1 qt) in 15-30 seconds.
8. If the flow is not liberal, stop engine. Disconnect hose from cooler return line and connect it to converter-out line fitting (upper fitting) on transaxle case.

DIAGNOSIS AND TESTING (Continued)

9. Repeat Steps 6 and 7. If flow is now liberal, refer to Section 03-03 for Diagnosis of transaxle fluid cooler. If flow is still not liberal, refer to Diagnosis for the following items:
   - Low pump capacity
   - Main circuit system leakage
   - Stuck converter drain valve or converter regulator valve



Stall Test

The stall test checks the operation of the following items:

- Converter one-way clutch
- Forward clutch
- Low one-way clutch
- Reverse clutch
- Low-intermediate band
- Engine performance

NOTE: The stall test should only be performed with the engine and transaxle at normal operating temperatures.

WARNING: APPLY THE SERVICE AND PARKING BRAKES FIRMLY WHILE PERFORMING EACH STALL TEST.

1. Connect tachometer to engine.
2. After testing each of the following ranges (Ⓟ, D, 1, R), move selector lever to N (NEUTRAL) and run engine for about 15 seconds to allow converter to cool before testing next range.

   CAUTION: Do not maintain WOT in any gear range for more than five seconds.

Press accelerator pedal to floor (WOT) in each range. Record rpm reached in each range. Stall speed should be 1881-2211 rpm (3.0L), 2849-3252 rpm (3.2L) SHO, 1791-2097 rpm (3.8L), and 2225-2602 rpm (3.8L) police.

CAUTION: If engine rpm recorded by tachometer exceeds maximum specified rpm, release accelerator pedal immediately. Clutch or band slippage is indicated.

If the stall speeds were too high, refer to the following Stall Speed Chart. If the stall speeds were too low, first check engine tune-up. If engine is OK, remove torque converter and check torque converter reactor one-way clutch for slippage.

STALL SPEED HIGH (SLIP)

Range	Possible Source
Ⓟ, D, 1	• Forward Clutch • Low/Intermediate One-Way Clutch • Low/Intermediate Band or Servo
R	• Forward Clutch • Low/Intermediate One-Way Clutch • Reverse Clutch

Air Pressure Checks

A NO DRIVE condition can exist, even with correct transaxle fluid pressure, because of inoperative clutches or bands. An erratic shift can be located through a series of checks by substituting air pressure for fluid pressure to determine the location of the malfunction.

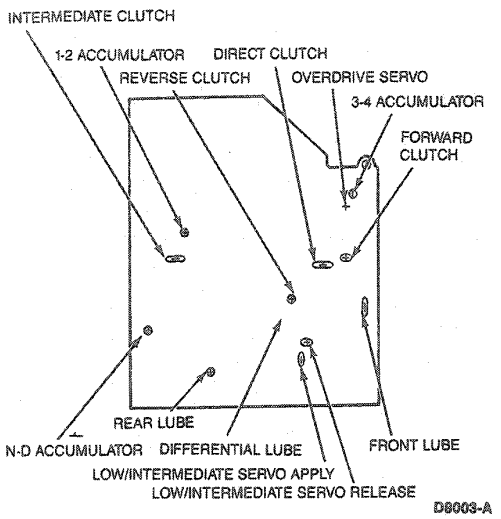
When the selector lever is in a forward gear range (Ⓟ, D, 1), a NO DRIVE condition may be caused by an inoperative forward clutch, low one-way or low/intermediate band. No manual low (1) coast could be caused by an inoperative direct clutch or direct one-way clutch.

Failure to drive in R (REVERSE) could be caused by a malfunction of the reverse clutch, forward clutch or low/intermediate one-way clutch.

1. Drain transaxle fluid and remove oil pan.
2. Remove main control cover. Then remove oil pump and main control assembly.
3. Install air pressure test plate with main control assembly-to-chain cover gasket.

DIAGNOSIS AND TESTING (Continued)

4. The inoperative clutches or bands can be located by introducing air pressure into the various test plate passages as follows:



Forward Clutch

Apply air pressure to forward clutch test port. A dull thud can be heard, or movement of piston felt when clutch piston is applied. If clutch seal(s) is leaking, a hissing sound will be heard.

Overdrive Servo

Apply air pressure to overdrive servo apply test port. Operation of servo is indicated by a tightening of overdrive band around overdrive drum. Because of the cushioning effect of the servo release spring, application of band may not be heard or felt. The servo should hold air pressure without leakage and a dull thud should be heard when air pressure is removed, allowing servo piston to return to release position.

Direct Clutch

Apply air pressure to direct clutch test port. A dull thud can be heard, or movement of piston felt on case as clutch piston is applied. If clutch seal(s) is leaking, a hissing sound will be heard.

Intermediate Clutch

Apply air pressure to intermediate clutch test port. A dull thud can be heard, or movement of piston can be felt on case, as clutch piston is applied. If clutch seal(s) is leaking, a hissing sound will be heard.

Low-Intermediate Servo

Apply air pressure at low-intermediate servo feed test port. The low-intermediate band should tighten around sun gear of rear planetary gearset. Because of the cushioning effect of the servo release spring, application of band may not be heard or felt.

The servo should hold air pressure without leakage and a dull thud should be heard when air pressure is removed, allowing servo piston to return to release position. Apply air pressure to low-intermediate servo release test port while continuing to pressurize the test port. Servo piston should return to the release position. The band should loosen and a dull thud should be heard. Release the feed test port. The release test port should hold pressure without leakage. Any leakage or failure of piston movement requires servo service.

Lube and Rear Lube

Apply air pressure to lube and rear lube test ports. These passages can only be checked for blockage. If either passage holds air pressure, remove service tool plate and check for an obstruction or damage.

1-2, 3-4, and N-D Accumulators

Apply air pressure to each accumulator feed port. Accumulator should apply. Because of the cushioning effect of the accumulator release spring, application of accumulator may not be felt or heard. The accumulator should hold air pressure without leakage and a dull thud should be heard when air pressure is removed, allowing accumulator to return to release position.

Test Results

If the servos do not operate, disassemble, clean and inspect them to locate the source of the trouble.

If air pressure applied to the clutch passages fails to operate a clutch, or operates clutches simultaneously, remove and with air pressure, check the fluid passages in the chain cover, driven sprocket support and clutches to detect obstructions.

If air pressure applied to the accumulator passages fails to operate an accumulator, remove, and with air pressure, check the fluid passages in the chain cover to detect obstructions.

Stator to Impeller Interference Check

Refer to Cleaning and Inspection.

Converter and Oil Cooler

Refer to Cleaning and Inspection.

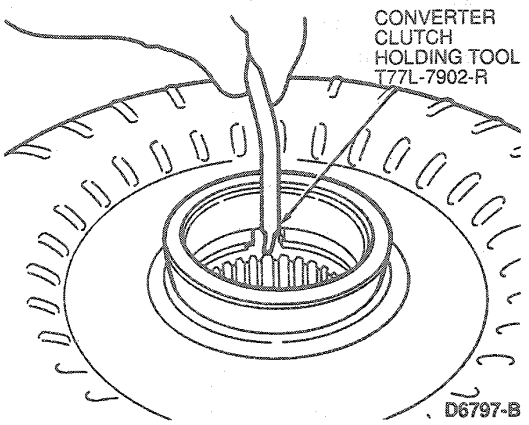
Torque Converter Reactor One-Way Clutch Check

Tools Required:

- Converter Clutch Torquing Tool T76L-7902-C
- Converter Clutch Holding Tool T77L-7902-R

DIAGNOSIS AND TESTING (Continued)

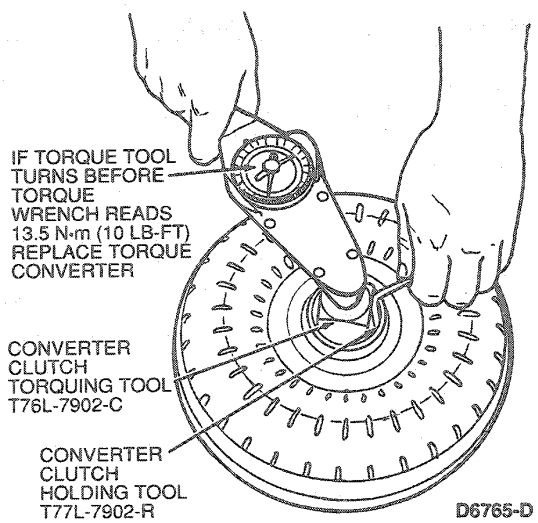
1. Position Converter Clutch Holding Tool T77L-7902-R in thrust washer slot.



2. While holding wire in position, install Converter Clutch Torquing Tool T76L-7902-C in reactor spline.

   Continue holding wire and turn torquing tool counterclockwise with a torque wrench.

   If torquing tool begins to turn before torque wrench reads 13.5 N·m (10 lb-ft), replace converter.

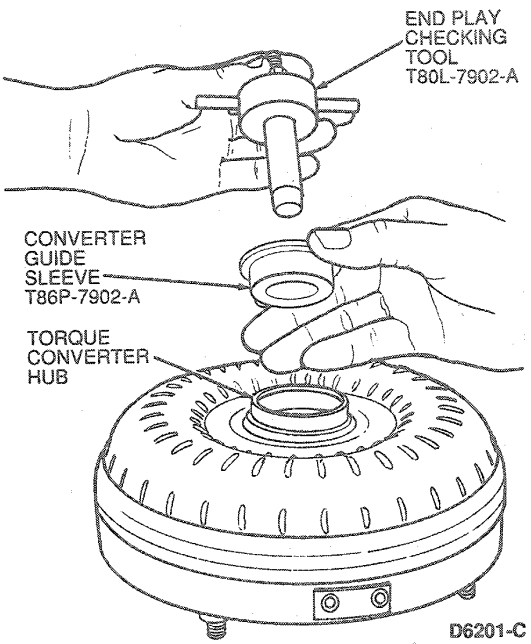


Torque Converter End Play Check

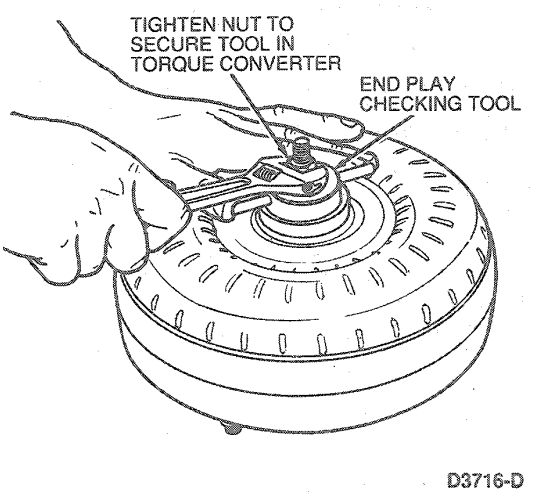
Tools Required:

- End Play Checking Tool T80L-7902-A
- Converter Guide Sleeve T86P-7902-A
- Dial Indicator with Bracketry TOOL-4201-C

1. Position End Play Checking Tool T80L-7902-A and Converter Guide Sleeve T86P-7902-A in torque converter hub.



2. Tighten nut on end play checking tool.

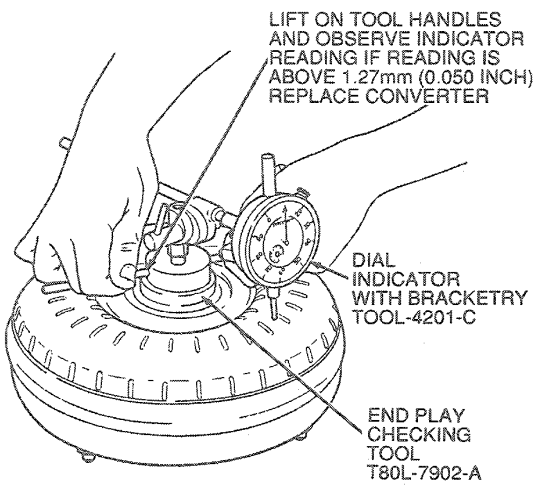


3. Mount Dial Indicator with Bracketry TOOL-4201-C or equivalent on end play checking tool.

   With stylus contacting converter shell and with indicator at zero, lift on checking tool handles.

DIAGNOSIS AND TESTING (Continued)

If indicator reading is above 1.27mm (0.05 inch), replace the converter.



REMOVAL

Transaxle Fluid Drain and Refill

Normal maintenance and lubrication requirements do not necessitate periodic automatic transaxle fluid changes. If a major service, such as a clutch band, bearing, etc., is required in the transaxle, it will have to be removed for service. **At this time the converter, transaxle cooler and cooler lines must be thoroughly flushed to remove any dirt.**

When used under continuous or severe conditions the transaxle and torque converter should be drained and refilled with fluid as specified.

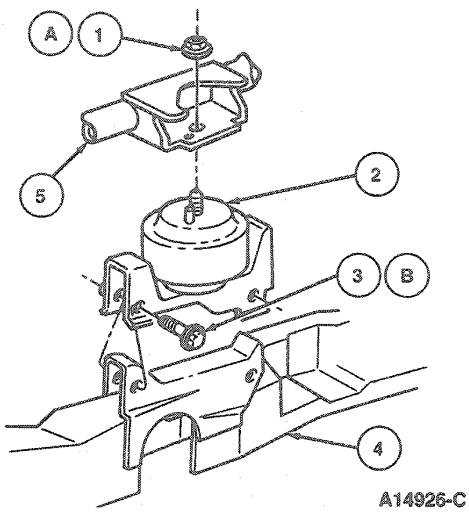
CAUTION: Use of a fluid other than specified could result in transaxle malfunction and/or failure.

Refer to Vehicle Certification Label affixed to left front door lock face panel or door pillar for transaxle code.

When filling a dry transaxle and converter, refer to Specifications for capacity. Check the fluid level.

Procedures for drain and refill, due to in-vehicle service operation, are as follows:

1. Disconnect battery ground cable.
2. Remove battery and battery tray.
3. Secure supply hoses, vacuum lines and wiring away from pump and valve body cover.
4. Remove shift lever.
5. Remove splash shield cover from ABS if equipped.
6. Remove brake reservoir hose from ABS and cap ends to prevent contamination, if equipped.
7. Install engine support equipment as outlined under Transaxle Removal.
8. Remove LH transaxle mount.

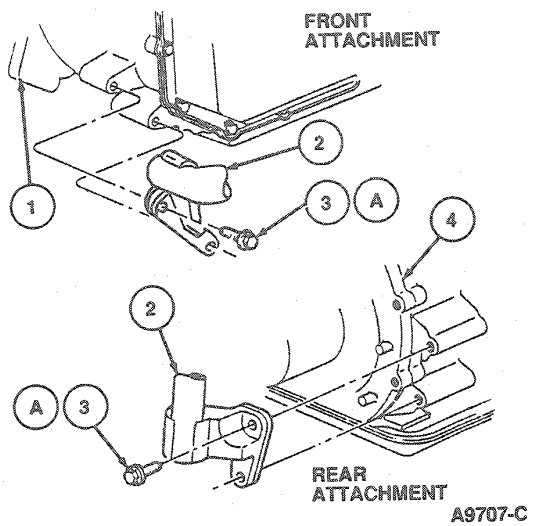


Item	Part Number	Description
1A	N800937-S102	Nut
2	6F063(LH)	Engine Mount Assy
3B	N804749-S100	Bolt (2 Req'd)
4	—	Frame
5	6F065	Support Assy
A		Tighten to 74-102 N·m (55-75 Lb-Ft)
B		Tighten to 81-116 N·m (60-85 Lb-Ft)

TA14926C

9. Remove transaxle side pan upper retaining bolts.
10. Raise vehicle on hoist. Refer to Section 00-02.
11. Remove LH front wheel and tire assembly.
12. Remove inner fender cover and position out of way.
13. Remove rear transaxle mount bolt.
14. Loosen two LH subframe retaining bolts.
15. Remove two engine support mount bolts.
16. Remove four bolts retaining LH engine support and remove support.

REMOVAL (Continued)



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Item	Part Number	Description
1	—	Transaxle
2	6F065	Support Assy
3A	N605922-S102	Bolt (2 Req'd)
4	07002	Transaxle
A		Tighten to 54-75 N·m (40-55 Lb-Ft)

TA9707C

17. Position drain pan and remove remaining transaxle side pan bolts and remove pan.
18. Install a new gasket.
19. Carefully install side pan.
20. Loosely install two upper pan bolts.
21. Verify proper gasket position.
22. Install remaining pan bolts and tighten to 14-16 N·m (10-12 lb-ft).
23. Install LH engine mounts and supports. Refer to Transaxle Removal and Installation.
24. Tighten two LH subframe retaining bolts to specification.
25. Install inner fender cover.
26. Install LH wheel and tire assembly.
27. Remove support from engine and transaxle assembly and lower vehicle.
28. Install radiator sight shield.
29. Remove engine support equipment.
30. Install brake reservoir hose.
31. Position supply hoses, vacuum lines and wiring in position.
32. Install manual lever position sensor.
33. Install remote air cleaner.
34. Install battery tray and battery.
35. Raise vehicle on a hoist or jackstands. Refer to Section 00-02.
36. Place a drain pan under transaxle.
37. Loosen lower pan retaining bolts and drain fluid from transaxle.
38. When fluid has drained to level of pan flange, remove rest of pan bolts working from the RH side and allow it to drop and drain slowly.
39. When all fluid has drained from transaxle, remove and thoroughly clean pan. Discard gasket.
40. Remove and replace filter.
41. Place a new gasket on pan and install pan on transaxle.
42. Remove oil cooler return line at cooler and place a suitable hose on oil return line to divert fluid into drain pan.
43. Lower vehicle.
44. Overfill transaxle with 11.36 litres (12 qts) of specified transmission fluid.
45. Start vehicle and run for four minutes.
46. Shut OFF engine.
47. Raise vehicle.
48. Reconnect cooler line.
49. Add 2.36 litres (2.5 qts) of specified transmission fluid.
50. Start engine and bring up to operating temperature. Check transaxle fluid and add as necessary.

Transaxle

Tools Required:

- CV Joint Puller T86P-3514-A1
- CV Joint Puller Extension T86P-3514-A2
- Cooler Line Disconnect Tool T86P-77265-AH
- Impact Slide Hammer D79P-100-A
- Engine Lifting Eyes D81L-6001-D
- Three Bar Engine Support D88L-6000-A
- Engine Lifting Bracket D89L-6001-A
- Rotunda Subframe Removal Kit 014-00751

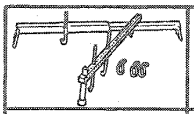
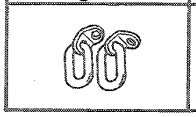
Removal

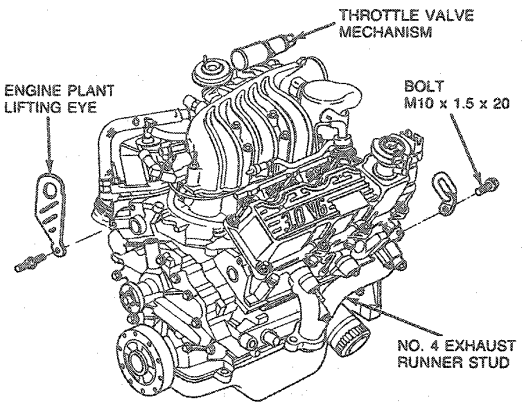
Before beginning the Removal procedure, perform the following preliminary Steps:

1. Position the vehicle on a hoist. Refer to Section 00-02.
2. Place a drain pan under transaxle.
3. Loosen lower pan retaining bolts and drain fluid from transaxle.
4. When fluid has drained to level of pan flange, remove rest of pan bolts working from the RH side and allow it to drop and drain slowly.

REMOVAL (Continued)

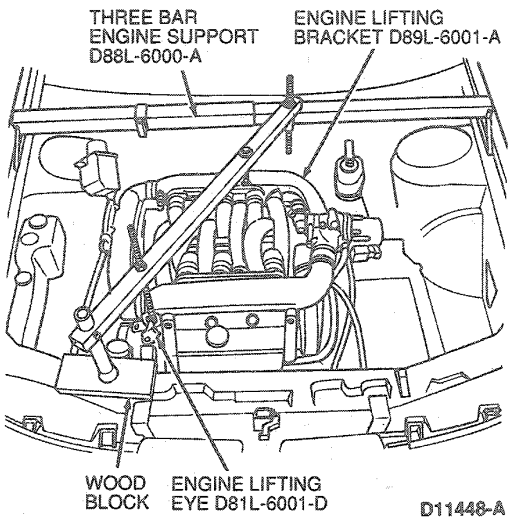
5. When fluid has drained completely reinstall pan bolts.
6. Remove air cleaner assembly, hoses and tubes.
7. Disconnect battery and remove battery.
8. Remove battery tray.
9. Disconnect electrical connectors from engine.
10. Remove bolt retaining main wiring harness bracket.
11. Remove shift lever.
12. On 3.0L install Engine Lifting Eye D81L-6001-D or equivalent to LH rear cylinder with a bolt, M10 x 1.5 x 2.0. The engine plant lifting eye should still be on RH front cylinder. If not, install a second lifting eye as described.

	D88L-6000-A	THREE BAR ENGINE SUPPORT
	D81L-6001-D	ENGINE LIFTING EYES



A9887-E

13. On 3.2L SHO remove bracket on back of engine that retains wiring harness and coolant line and attach Engine Lifting Bracket D89L-6001-A or equivalent and Engine Lifting Eyes D81L-6001-D or equivalent to generator bracket.

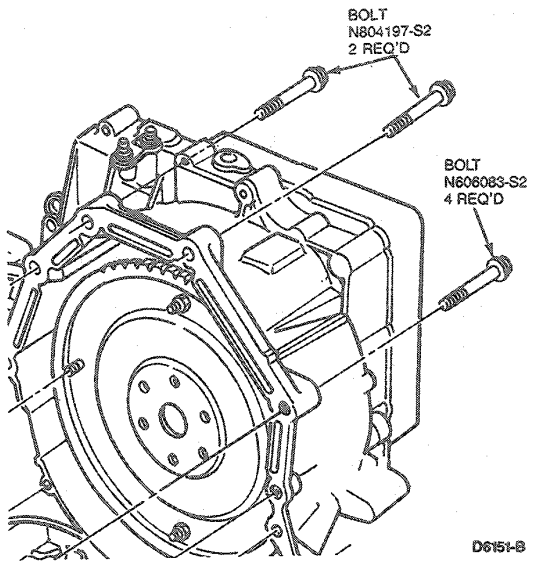


D11448-A

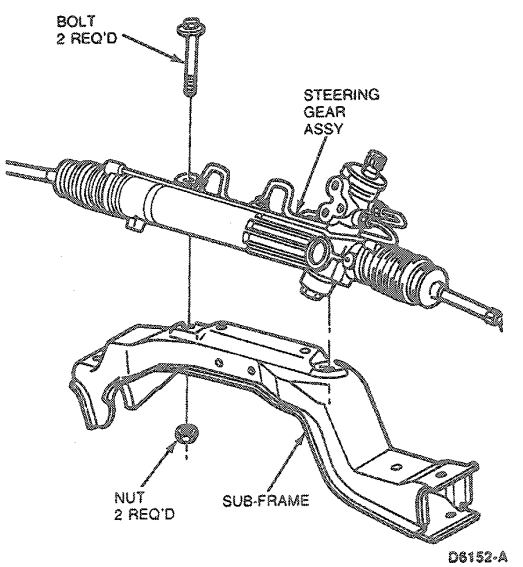
14. On 3.8L install Engine Lifting Eyes to LH front exhaust manifold stud and RH rear exhaust manifold stud.
15. Position Three Bar Engine Support D88L-6000-A or equivalent.
16. Secure wiring harness out of way.
17. Remove radiator sight shield.
18. Position Three Bar Engine Support D88L-6000-A or equivalent.
19. Remove dipstick.
20. Disconnect power steering pump pressure and return line bracket.
21. Remove four 15mm torque converter housing bolts from top of transaxle.
22. Raise vehicle on hoist. Refer to Section 00-02.

REMOVAL (Continued)

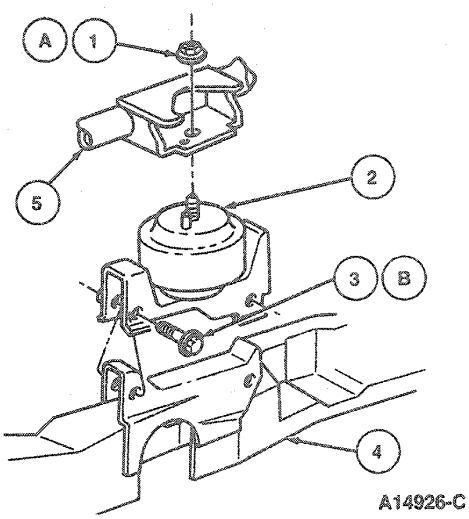
23. Remove front wheel and tire assemblies.



24. Disconnect LH and RH outer tie rod ends.
25. Disconnect brake line support brackets.
26. Remove retaining bolts from front stabilizer bar assembly.
27. Disconnect RH lower arm assembly.
28. Disconnect LH lower arm assembly.
29. Remove retaining nuts from steering gear assembly.



30. Disconnect Heated Oxygen Sensor (HO2S) 9F472.
31. Remove front exhaust pipe, converter assembly and mounting bracket. Refer to Section 09-00.
32. Remove two 15mm bolts from engine mount.

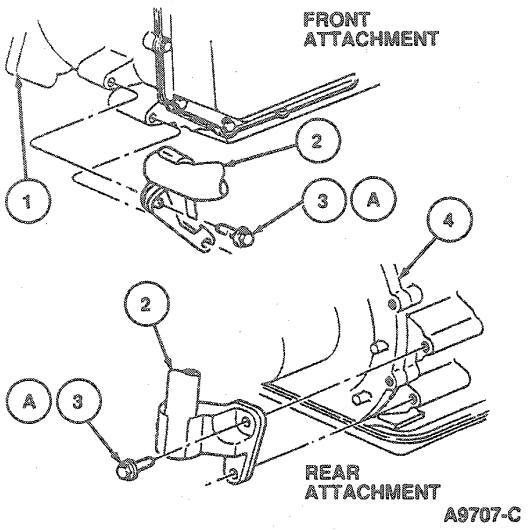


Item	Part Number	Description
1A	N800937-S102	Nut
2	6F063(LH)	Engine Mount Assy
3B	N804749-S100	Bolt (2 Req'd)
4	—	Frame
5	6F065	Support Assy
A		Tighten to 74-102 N·m (55-75 Lb-Ft)
B		Tighten to 81-116 N·m (60-85 Lb-Ft)

TA14926C

33. Remove four 15mm bolts from LH engine support and remove support.

REMOVAL (Continued)



A9707-C

Item	Part Number	Description
1	—	Transaxle
2	6F065	Support Assy
3A	N605922-S102	Bolt (2 Req'd)
4	07002	Transaxle

(Continued)

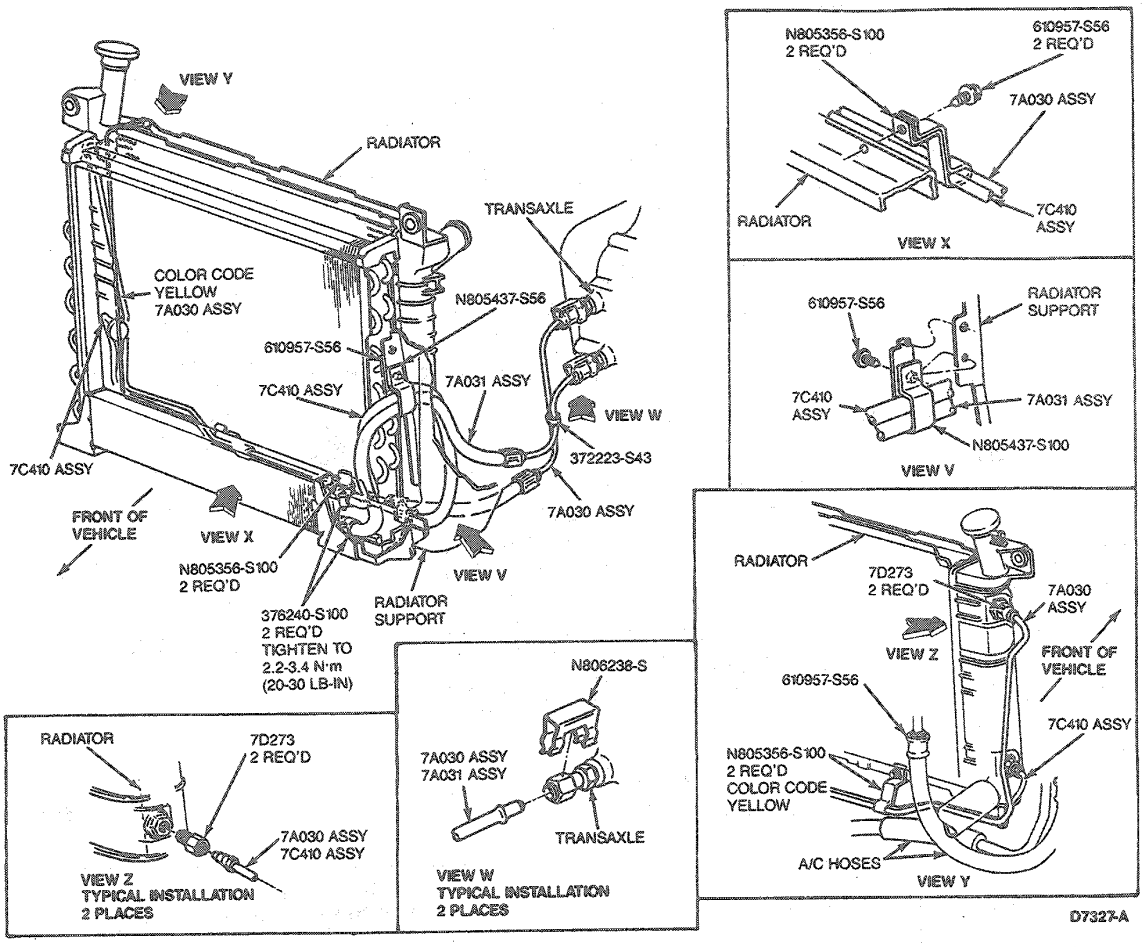
Item	Part Number	Description
A		Tighten to 54-75 N·m (40-55 Lb-Ft)

TA9707C

34. Position Rotunda Subframe Removal Kit 014-00751 or equivalent.
35. Remove power steering gear from subframe, and secure to rear of engine compartment.
36. Remove subframe-to-body retaining bolts and lower subframe.
37. Remove 8mm bolt from dust cover.
38. Remove two starter retaining bolts and position starter out of the way.
39. Remove the dust cover.
40. Rotate engine with 1/2-inch drive ratchet and 7/8-inch deep well socket on crankshaft pulley bolt to align torque converter bolts with starter drive hole. Then, remove four 15mm torque converter-to-flywheel retaining nuts.
41. Remove transaxle cooler line fitting retaining clips.
42. Disconnect transaxle cooler lines using Cooler Line Disconnect Tool T86P-77265-AH.

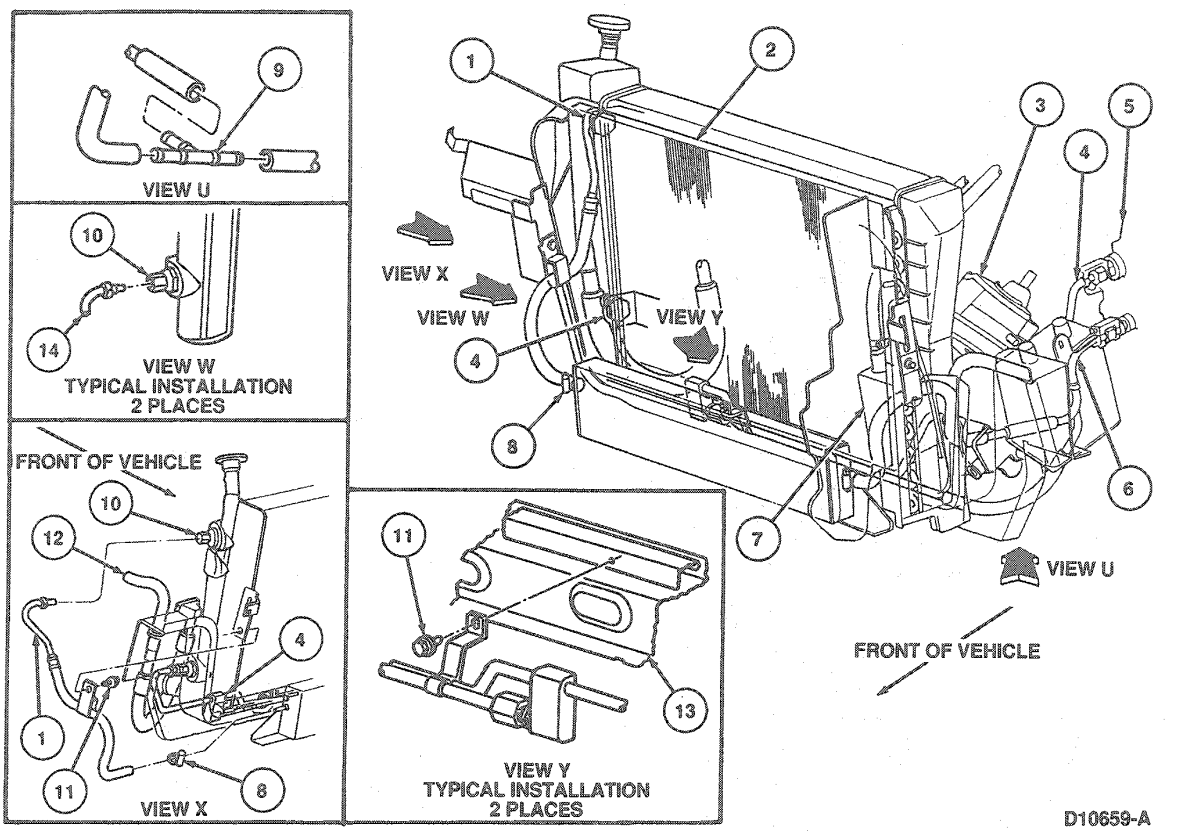
REMOVAL (Continued)

All Except SHO



REMOVAL (Continued)

3.2L SHO



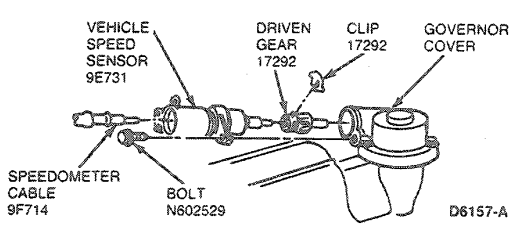
Item	Part Number	Description
1	7C410	Cooler Outlet Assy
2	—	Air Conditioning Condenser
3	9C735	Speed Control Servo
4	7A030	Oil Cooler Inlet Tube Assy
5	—	Transaxle
6	7A031	Oil Cooler Outlet Assy
7	—	Power Steering

Item	Part Number	Description
8	376240	Clamp (2 Req'd)
9	7N485	T-Fitting
10	7D273	Oil Cooler Tube Connector
11	N610957-S56	Screw (2 Req'd)
12	—	Air Conditioning Line
13	—	Body
14	—	Typical Oil Line Connection

(Continued)

TD10659A

43. Remove engine-to-transaxle retaining bolts.
44. Remove speedometer sensor heat shield.
    NOTE: Vehicles with electronic instrument clusters do not use a speedometer cable.
45. Remove vehicle speed sensor (VSS)(9E731) from transaxle.



REMOVAL (Continued)

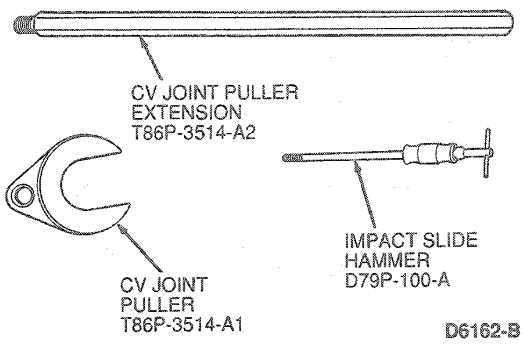
46. Position transaxle jack.

    CAUTION: Make sure puller does not contact transmission speed sensor or damage will result.

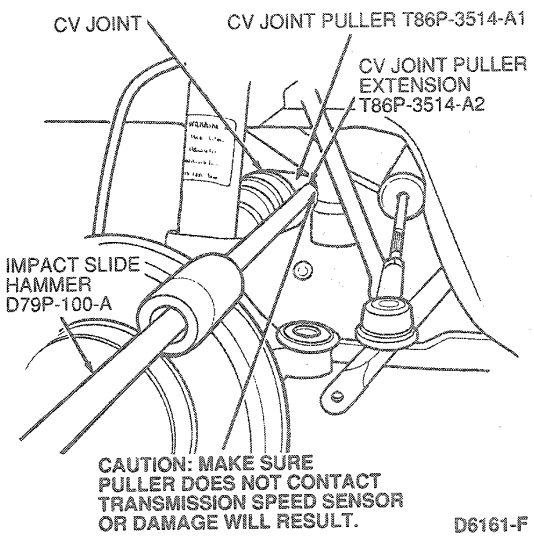
    CAUTION: Do not pry against case.

47. Remove halfshafts as follows:

    - Screw Extension T86P-3514-A2 into CV Joint Puller T86P-3514-A1 and install Impact Slide Hammer D79P-100-A or equivalent into extension.



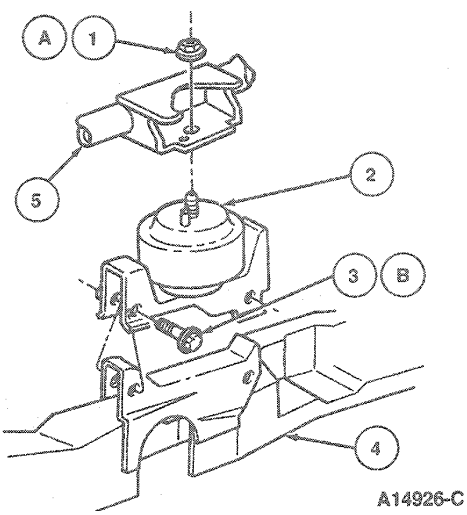
    - Position puller behind CV joint and remove joint.
    - Install shipping plugs.



48. Remove the last two 15mm torque converter housing bolts.
49. Separate transaxle from engine and carefully lower transaxle out of vehicle.

Oil Pump and Main Control Assembly

1. Disconnect battery ground cable.
2. Remove battery and battery tray.
3. Secure supply hoses, vacuum lines and wiring away from pump and valve body cover.
4. Remove shift lever.
5. Remove splash shield cover from ABS if equipped.
6. Remove brake reservoir hose from ABS and cap ends to prevent contamination, if equipped.
7. Install engine support equipment as outlined under transaxle removal.
8. Remove LH transaxle mount.

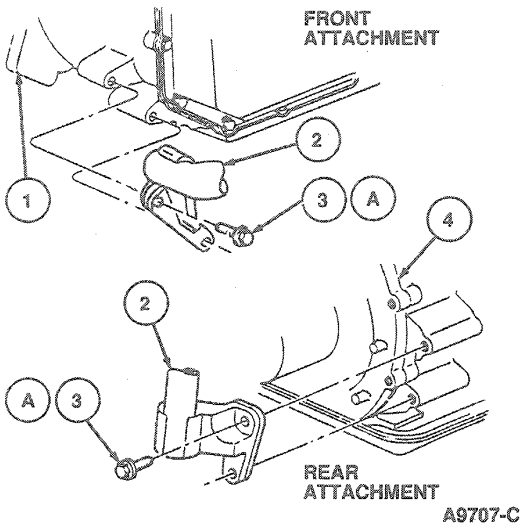


Item	Part Number	Description
1A	N800937-S102	Nut
2	6F063(LH)	Engine Mount Assy
3B	N804749-S100	Bolt (2 Req'd)
4	—	Frame
5	6F065	Support Assy
A		Tighten to 74-102 N·m (55-75 Lb-Ft)
B		Tighten to 81-116 N·m (60-85 Lb-Ft)

TA14926C

9. Remove transaxle side pan upper retaining bolts.
10. Raise vehicle on hoist. Refer to Section 00-02.
11. Remove LH front wheel and tire assembly.
12. Remove inner fender cover and position out of way.
13. Remove rear transaxle mount bolt.
14. Loosen two LH subframe retaining bolts.
15. Remove two engine support mount bolts.
16. Remove four bolts retaining LH engine support and remove support.

REMOVAL (Continued)



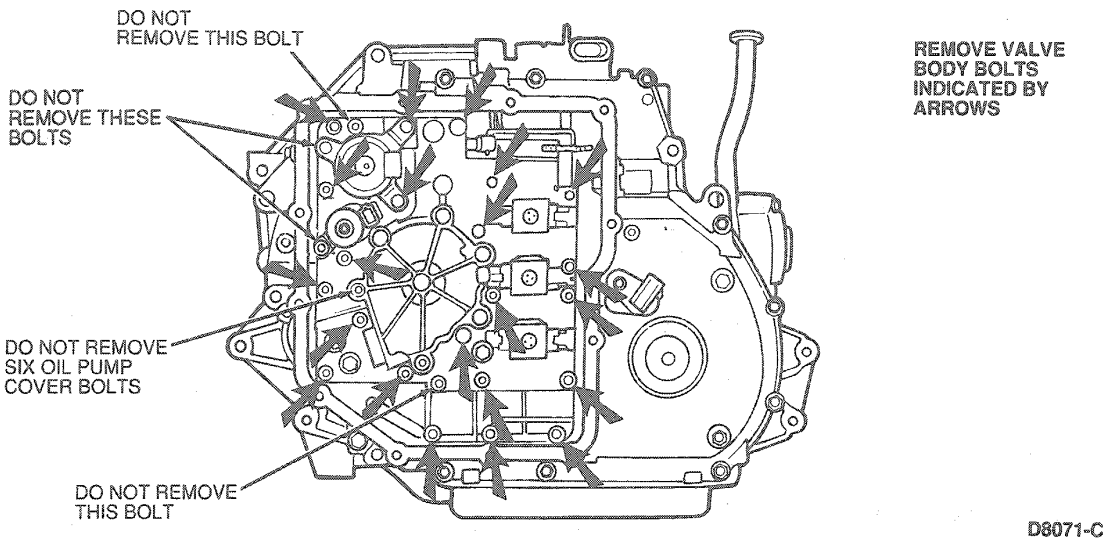
A9707-C

Item	Part Number	Description
1	—	Transaxle
2	6F065	Support Assy
3A	N605922-S102	Bolt (2 Req'd)
4	07002	Transaxle
A		Tighten to 54-75 N·m (40-55 Lb-Ft)

TA9707C

17. Position drain pan and remove remaining transaxle side pan bolts and remove pan.
18. Using a screwdriver, position manual shift shaft in the park position.
19. Disconnect upper bulkhead connector wiring retainer clip from valve body.
20. Disconnect electrical connectors.

    CAUTION: Do not remove oil pump cover bolts.
21. Remove valve body retaining bolts, disengage linkage and remove valve body.



D8071-C

DISASSEMBLY AND ASSEMBLY

Transaxle Disassembly

Tools Required:

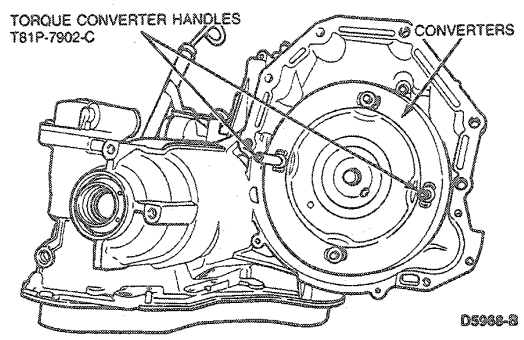
- Impact Slide Hammer T50T-100-A
- Bench Mounted Holding Fixture T57L-500-B
- Impact Slide Hammer T59L-100-B
- O-Ring Remover T71P-19703-C
- Front Cover Seal Remover T74P-6700-A
- Torque Converter Handles T81P-7902-C
- Lube Tube Remover T86P-70001-A
- Stator and Driven Sprocket Bearing Replacer T86P-70043-A
- Front Clutch Loading Tool T86P-70389-A
- Bearing Race Puller T88T-7120-A
- Step Plate Adapter D80L-630-3
- Locknut Pin Remover D81P-3504-N

DISASSEMBLY AND ASSEMBLY (Continued)

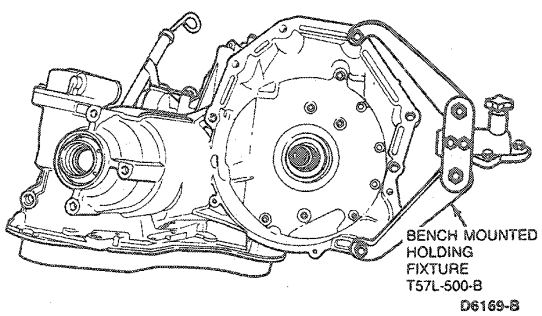
Disassembly

CAUTION: The torque converter is heavy. Be careful not to drop it.

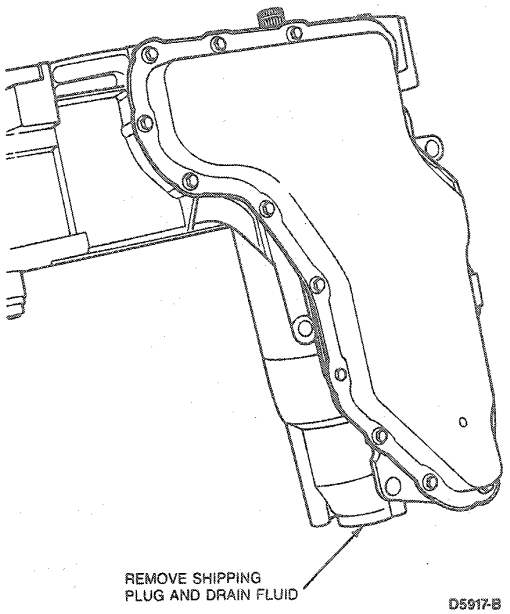
1. Install Torque Converter Handles T81P-7902-C. Remove converter from transaxle.



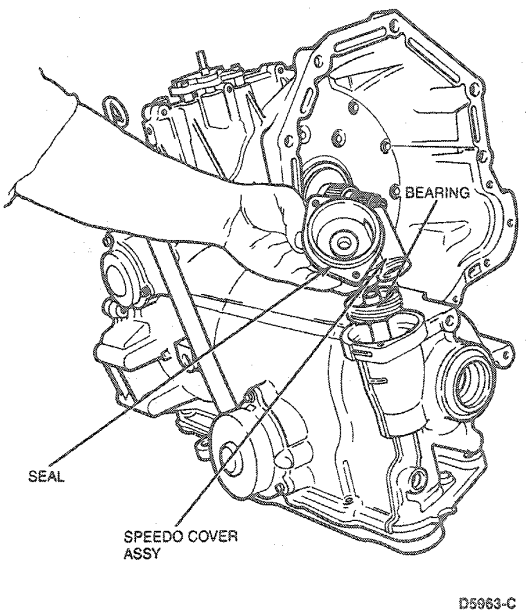
2. Mount transaxle in Bench Mounted Holding Fixture T57L-500-B.



3. Turn transaxle in vertical position. Remove shipping plugs and drain fluid.



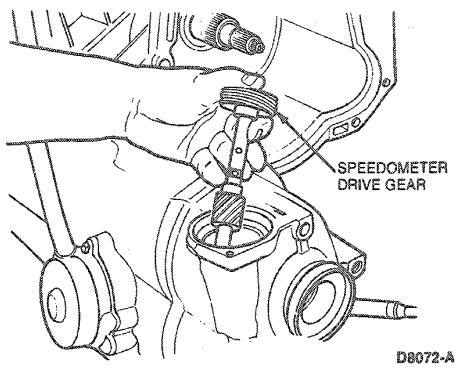
4. Return transaxle to horizontal position.
5. Remove two 8mm speedometer cover bolts, cover and seal. Discard seal. A new one must be installed during assembly.



NOTE: Bearing sits on top of speedometer gear.

DISASSEMBLY AND ASSEMBLY (Continued)

6. Lift speedometer drive gear assembly and bearing out of case.

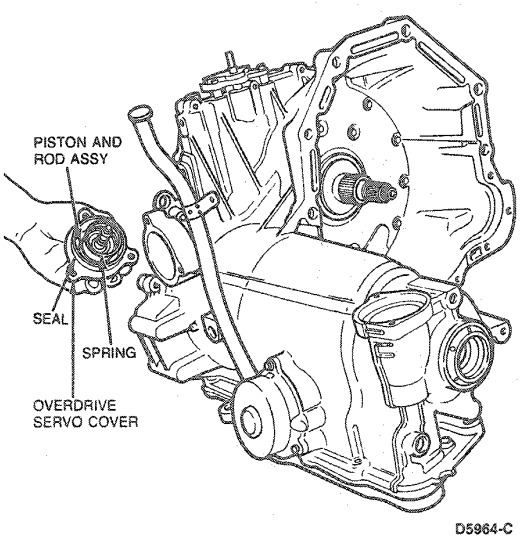


NOTE: Piston assembly and spring may remain in cover.

CAUTION: The servo cover is under spring tension. Care must be taken when removing.

NOTE: Discard O-ring seal on cover.

7. Remove three 8mm overdrive servo cover bolts, cover, piston assembly and spring.

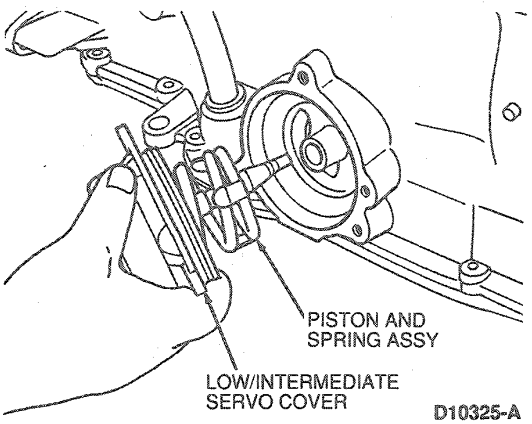


CAUTION: The servo cover is under spring tension. Care must be taken when removing.

8. Remove three 8mm low-intermediate servo cover bolts, cover, piston assembly and spring assembly.

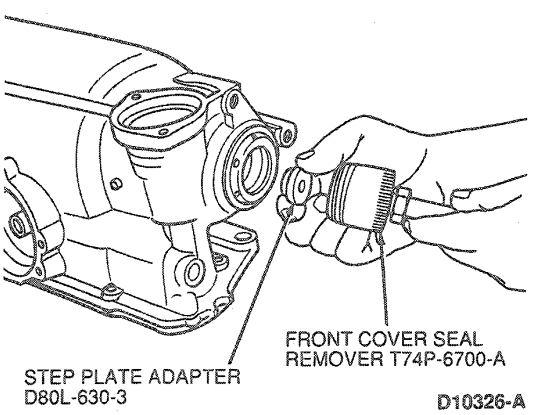
NOTE: Piston assembly and spring may remain in cover.

9. Remove and discard gasket.



NOTE: Output shaft seal is a two-piece construction, outer metal protector and inner rubber seal.

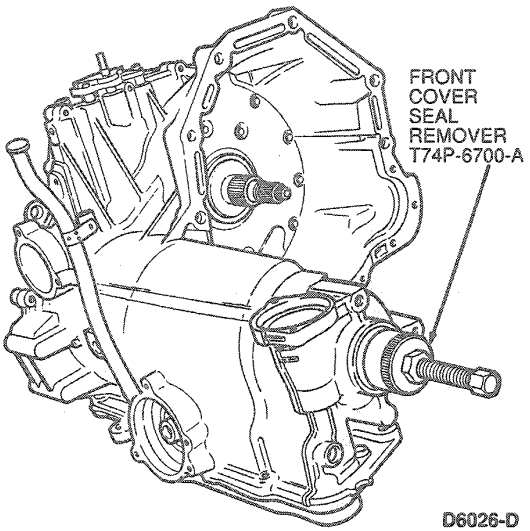
10. Inspect RH output shaft seal and replace if damaged. Remove as follows:
    a. Install Step Plate Adapter D80L-630-3 or equivalent into output shaft opening. Use grease to hold tool in place.

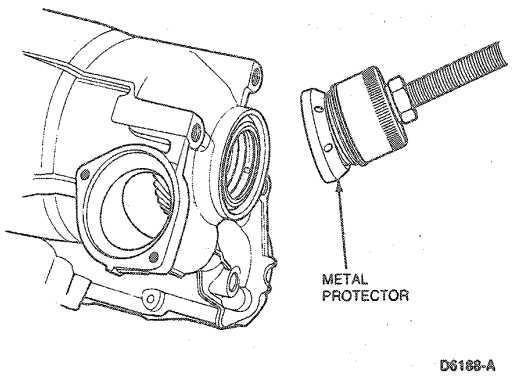


    b. Screw Front Cover Seal Remover T74P-6700-A, into metal seal protector.

DISASSEMBLY AND ASSEMBLY (Continued)

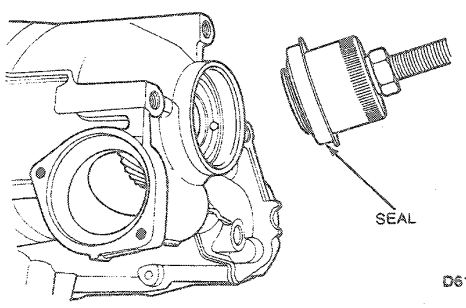
c. Tighten screw on end of tool until metal seal protector is removed.



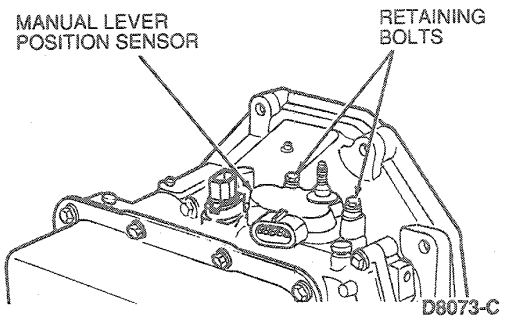


d. Remove metal seal protector from tool, and install tool into seal.

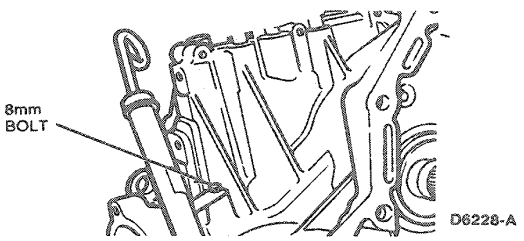
e. Tighten screw on the end of tool until seal is removed.



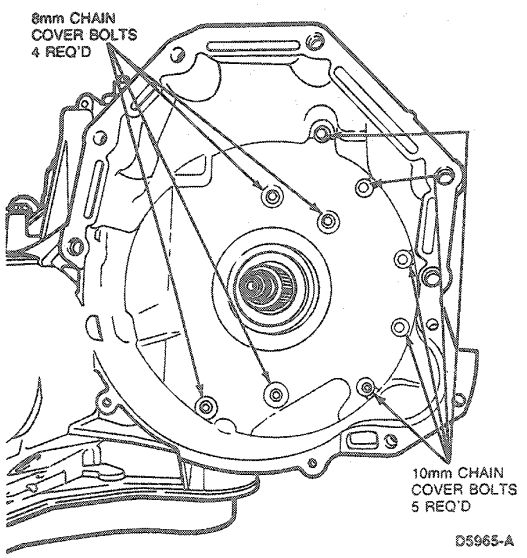
11. Remove two 8mm MLP sensor retaining bolts and remove switch.



12. Remove one 8mm filler tube retaining bolt and pull tube from case.

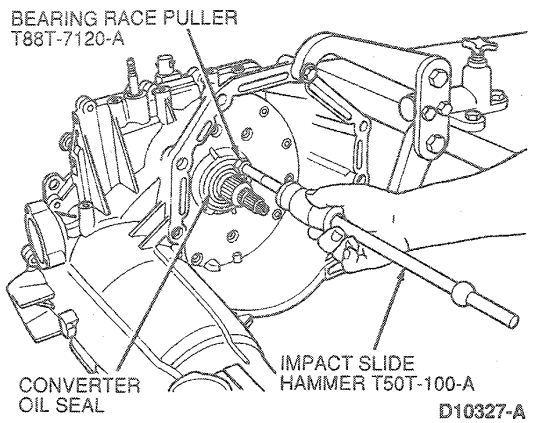


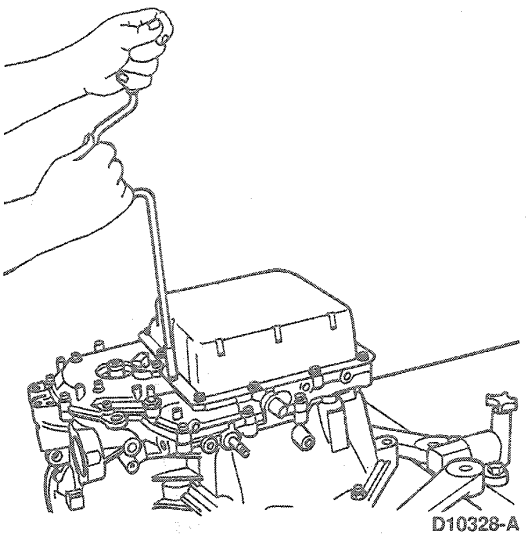
13. Remove five 10mm and four 8mm chain cover bolts from inside torque converter housing.



DISASSEMBLY AND ASSEMBLY (Continued)

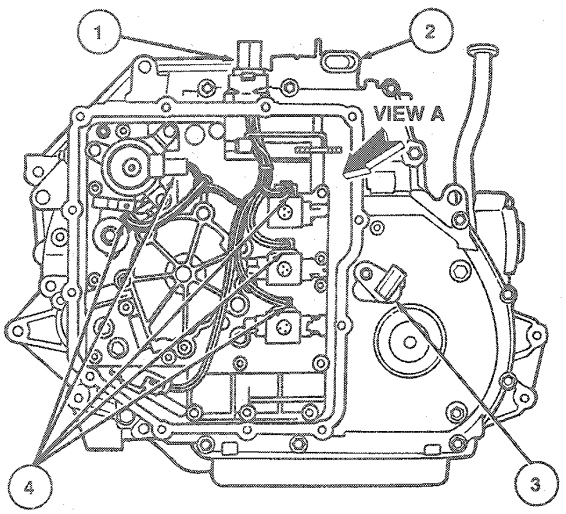
14. Remove converter oil seal using Bearing Race Puller T88T-7120-A and Impact Slide Hammer T50T-100-A.

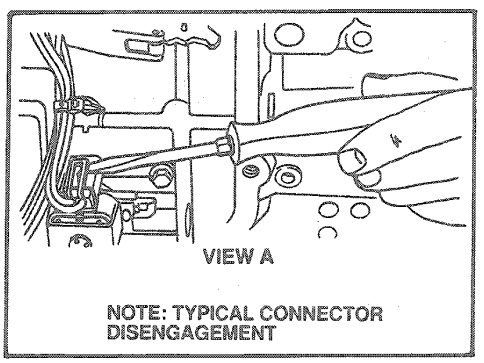




15. Rotate transaxle to vertical position.
16. Remove 12 10mm pump and valve body cover (upper reservoir) bolts. Remove cover and discard gasket.
17. Disconnect electrical connectors from Transmission Oil Temperature (TOT) and solenoids. Remove wire retaining clip from separator plate.

    CAUTION: Use both hands. Do not pull on wires.





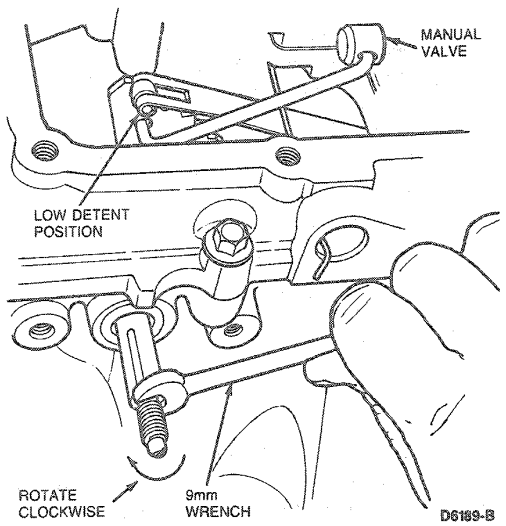
D8074-C

Item	Part Number	Description
1	—	Connector
2	—	Neutral Safety Switch Assy
3	7M101	Transmission Speed Sensor
4	—	Electrical Connectors

TD8074C

DISASSEMBLY AND ASSEMBLY (Continued)

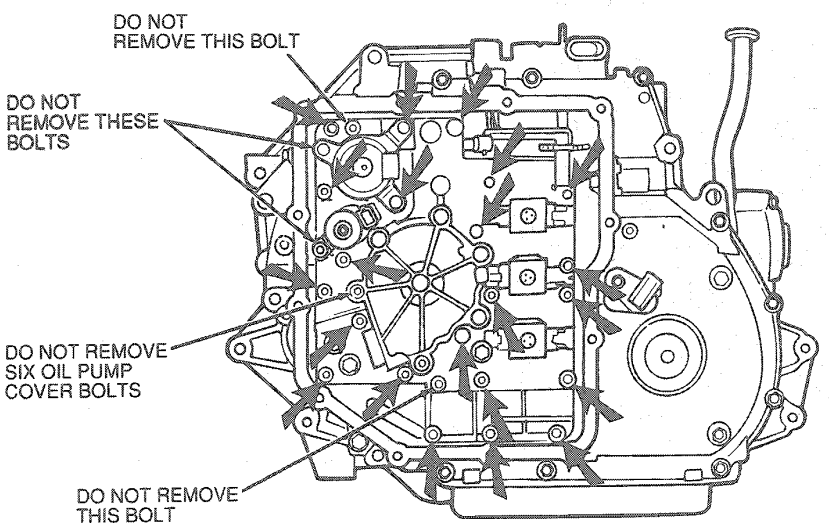
18. Using a 9mm wrench on flats on end of manual shaft, rotate shaft clockwise to position manual linkage in LOW detent (valve positioned all the way in).



CAUTION: Do not remove the two bolts that retain the oil pump and valve body assembly together.

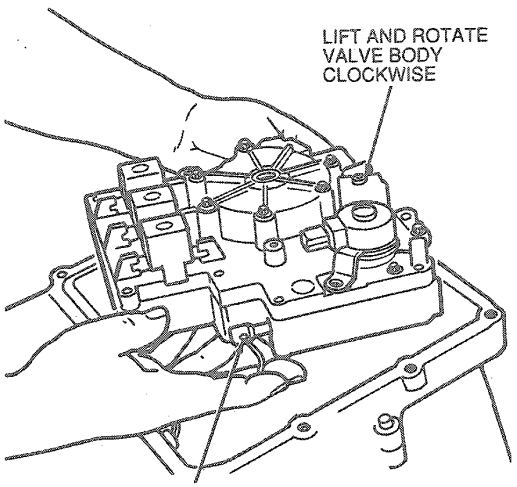
CAUTION: Do not remove oil pump cover bolts.

19. Remove 22 8mm oil pump and valve body assembly retaining bolts. Note length and location of bolts.

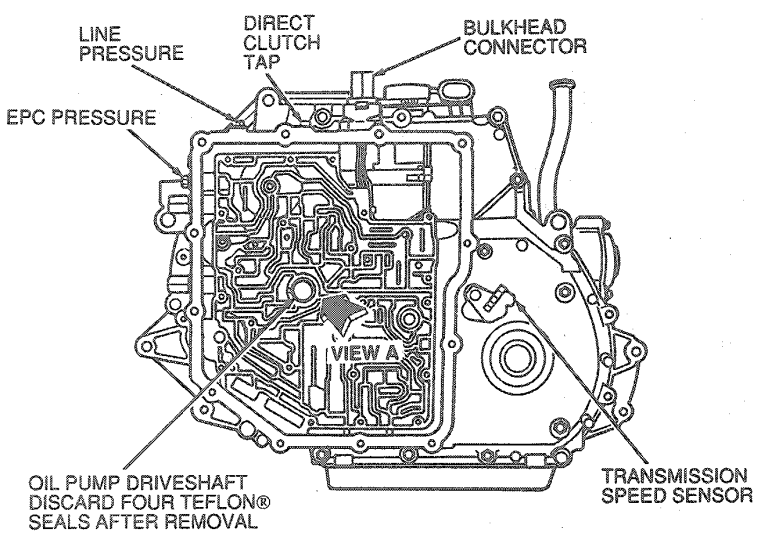


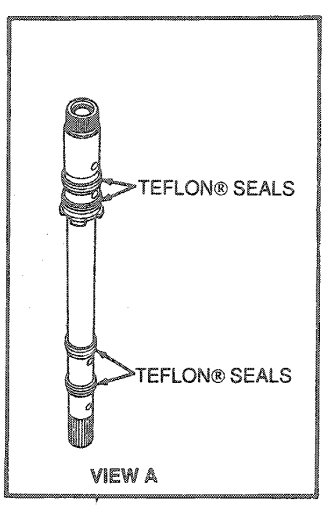
DISASSEMBLY AND ASSEMBLY (Continued)

20. Rotate valve body clockwise. Remove manual valve link from manual valve and remove valve body / pump assembly.



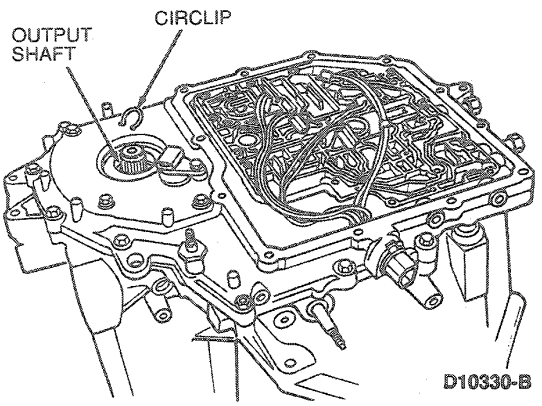
21. Disconnect manual valve link from detent lever.
22. Pull oil pump driveshaft out of case. Remove and discard four Teflon® seals from pump shaft.



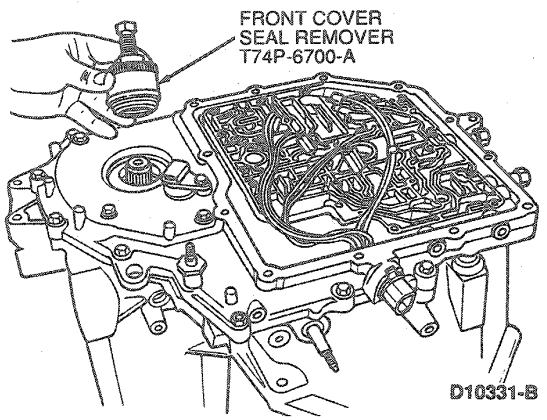


DISASSEMBLY AND ASSEMBLY (Continued)

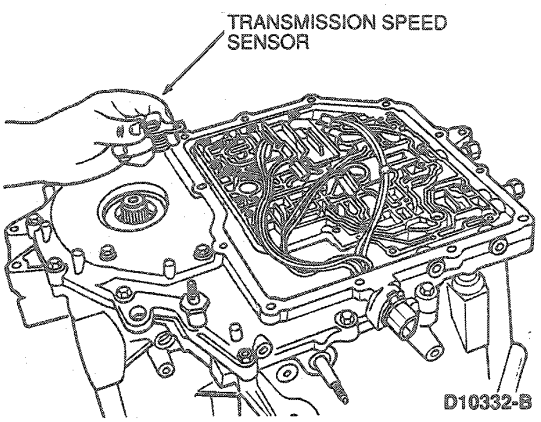
23. Remove and discard output shaft circlip.



24. Remove LH output shaft seal as follows:
    a. Screw Front Cover Seal Remover T74P-6700-A into metal seal protector.
    b. Tighten screw on the end of tool until metal seal protector is removed.
    c. Remove metal seal protector from tool and install tool into seal.
    d. Tighten screw on end of tool until seal is removed.



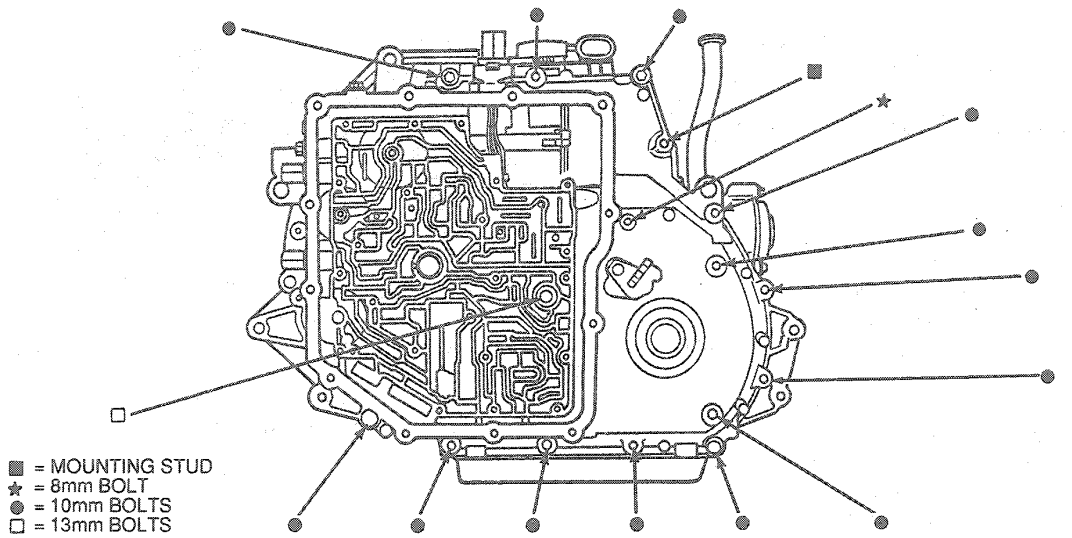
25. Remove 8mm bolt and TSS.



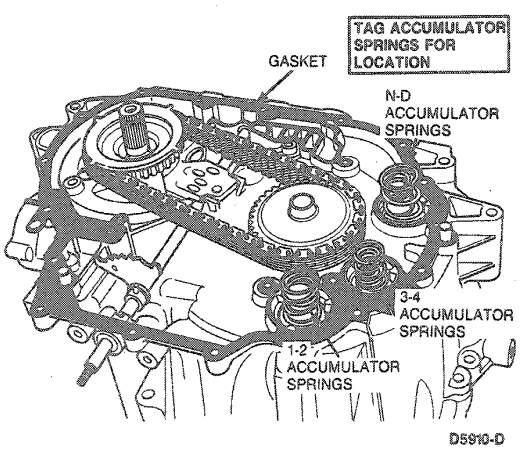
CAUTION: Chain cover is under spring pressure. Use care when removing.

DISASSEMBLY AND ASSEMBLY (Continued)

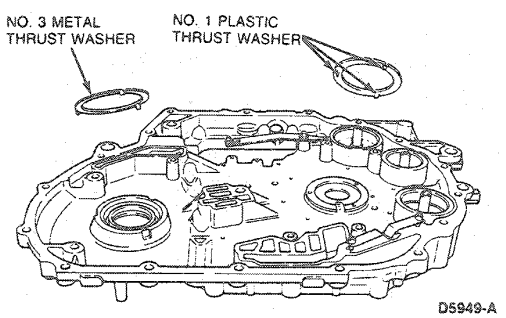
26. Remove 13 10mm, one 13mm, one 8mm bolt, and one 24mm mounting stud. Note length and location of bolts. Start at inside and work out.



27. Remove chain cover and tag accumulator springs to be sure they are installed in their correct positions during assembly.
28. Remove and discard chain cover gasket.

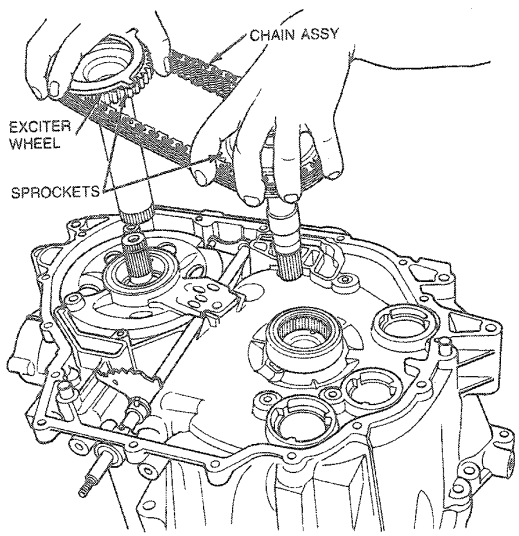


29. Remove No. 1 and No. 3 thrust washers from chain cover.



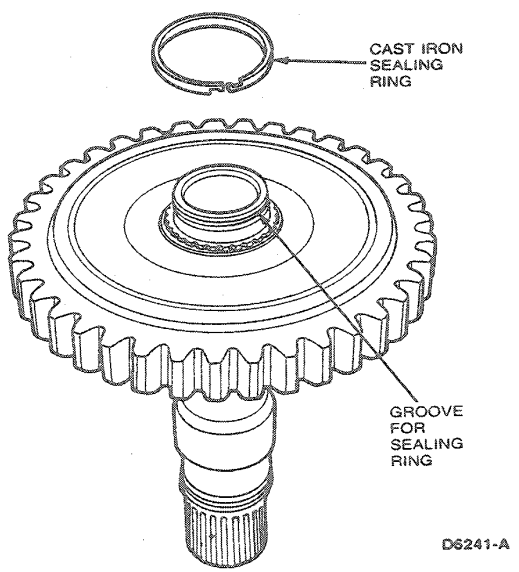
DISASSEMBLY AND ASSEMBLY (Continued)

30. Simultaneously, lift out both sprockets with chain assembly.



D5909-C

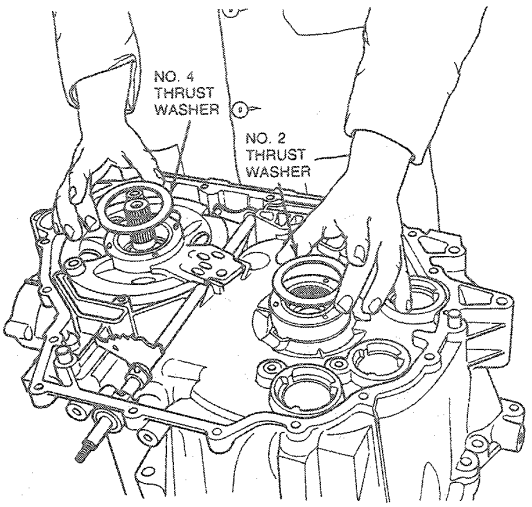
31. Remove cast iron sealing ring from input shaft sprocket.



D6241-A

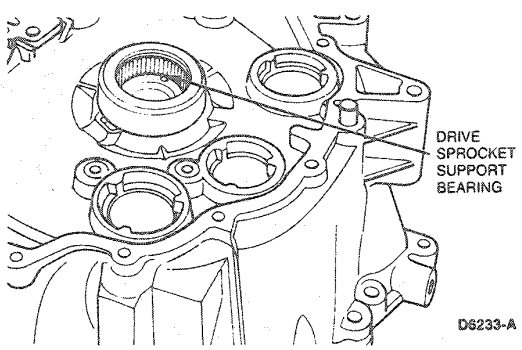
NOTE: Thrust washers may remain on driven sprocket.

32. Remove No. 2 thrust washer from drive sprocket support and No. 4 thrust washer from driven sprocket support.



D5922-B

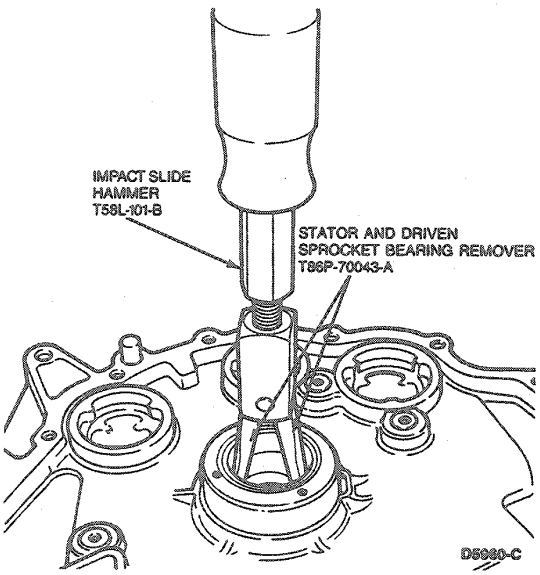
33. Inspect drive sprocket support bearing to determine if it needs to be replaced. If OK, go to Step 35.



D6233-A

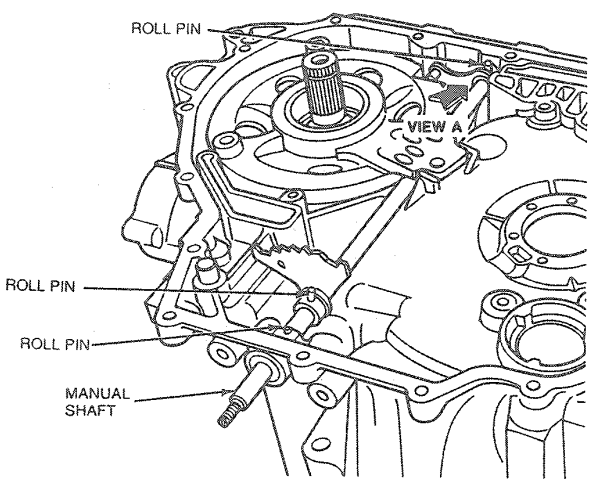
DISASSEMBLY AND ASSEMBLY (Continued)

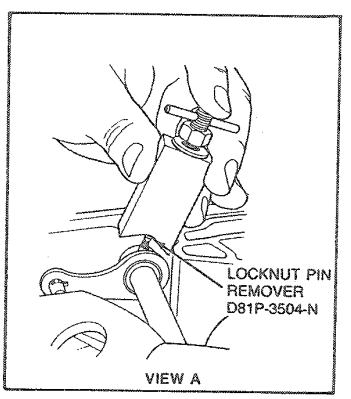
34. If necessary, remove drive sprocket support needle bearing using Impact Slide Hammer T58L-101-B and Stator and Driven Sprocket Bearing Remover T86P-70043-A.



35. Remove and discard three roll-pins from manual shaft using Locknut Pin Remover D81P-3504-N or equivalent.

CAUTION: Use care not to damage any machined surfaces.

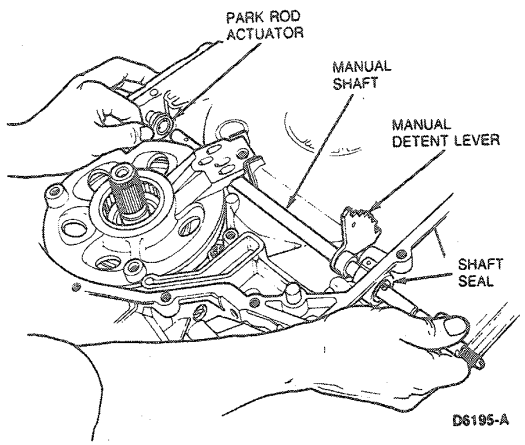


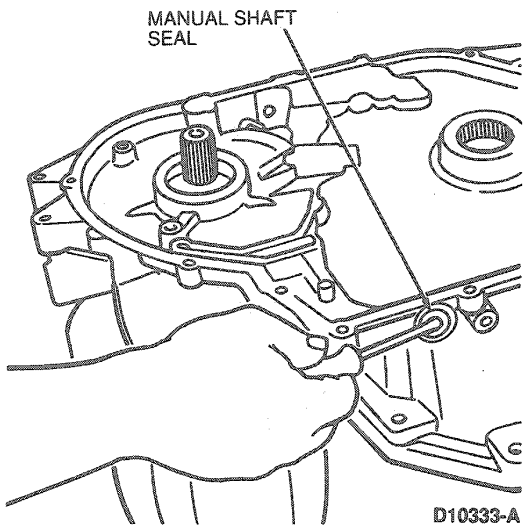


D5921-E

DISASSEMBLY AND ASSEMBLY (Continued)

36. Slide manual linkage shaft out of case. Then, pry seal out of case.

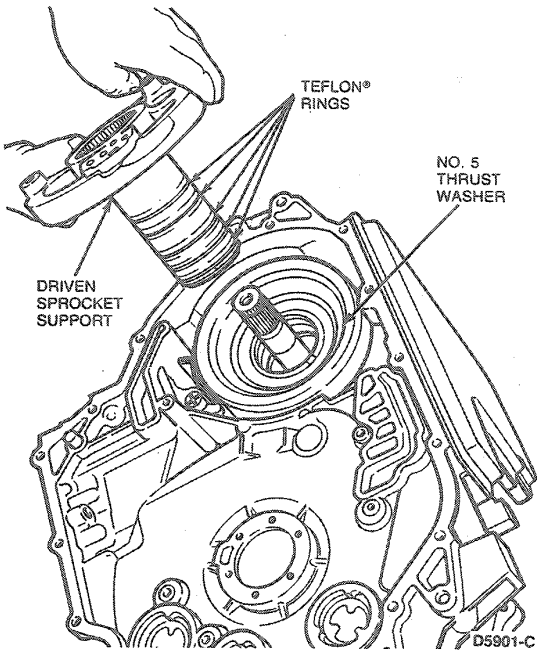




37. Remove driven sprocket support assembly and remove five Teflon® seals from support.

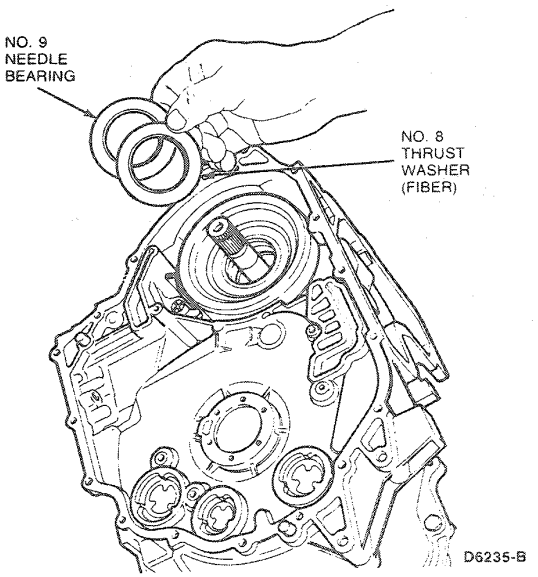
    NOTE: Thrust washer may remain on sprocket support assembly.

38. Remove No. 5 selective thrust washer.



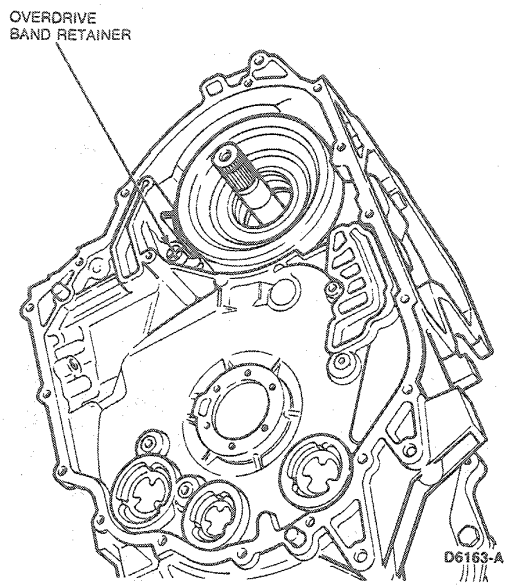
NOTE: Thrust washer and needle bearing may remain on driven sprocket support assembly when it is removed.

39. Using O-Ring Remover T71P-19703-C, remove No. 8 selective thrust washer and No. 9 needle bearing from bottom of cylinder.

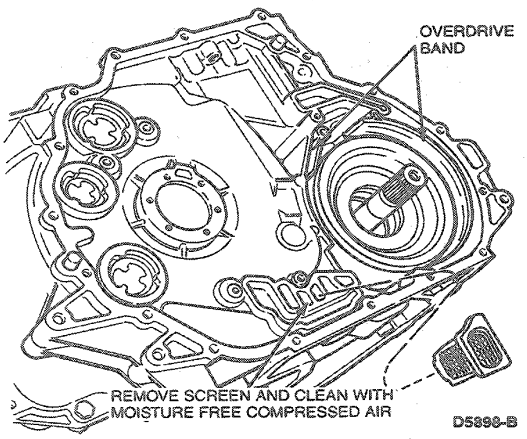


DISASSEMBLY AND ASSEMBLY (Continued)

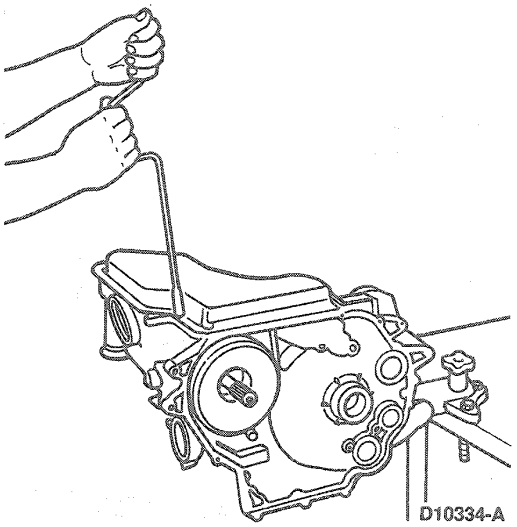
40. Remove plastic overdrive band retainer.



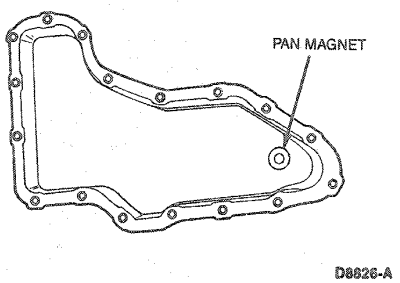
41. Remove overdrive band. Remove screen filter and clean with compressed air.



42. Rotate transaxle to horizontal position with oil pan up.
43. Remove 17 8mm oil pan cover bolts. Remove cover and discard gasket.

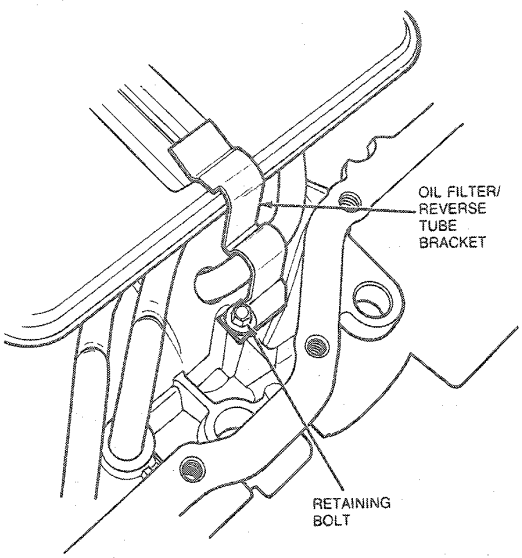


44. Remove magnet from oil pan.



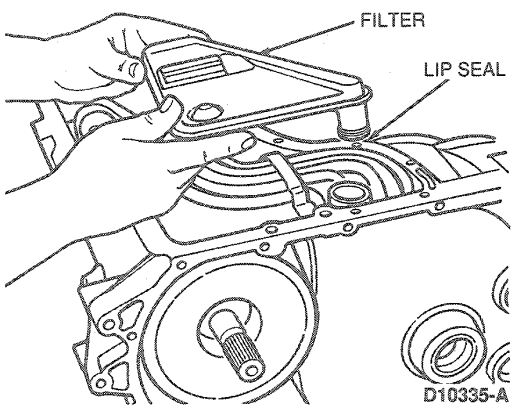
DISASSEMBLY AND ASSEMBLY (Continued)

45. Remove 8mm reverse apply tube / oil filter bracket bolt and bracket.



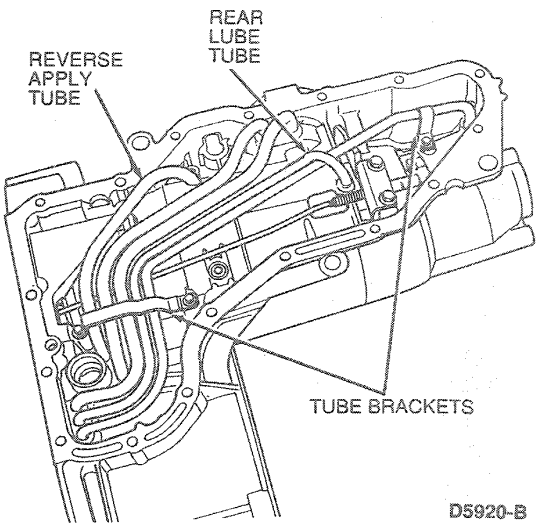
NOTE: Lip seal may stick inside case.

46. Remove oil filter screen and discard lip seal.

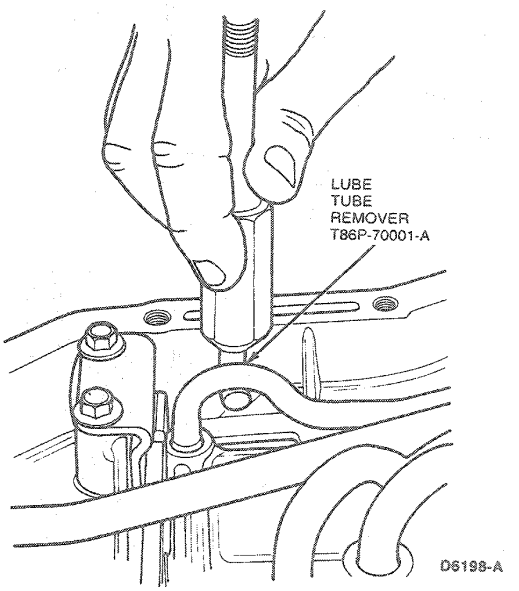


NOTE: For complete transaxle disassembly, the reverse apply tube and rear lube tube **must** be removed prior to removing the reverse clutch, or the differential.

47. Remove 8mm tube bracket bolts and brackets.

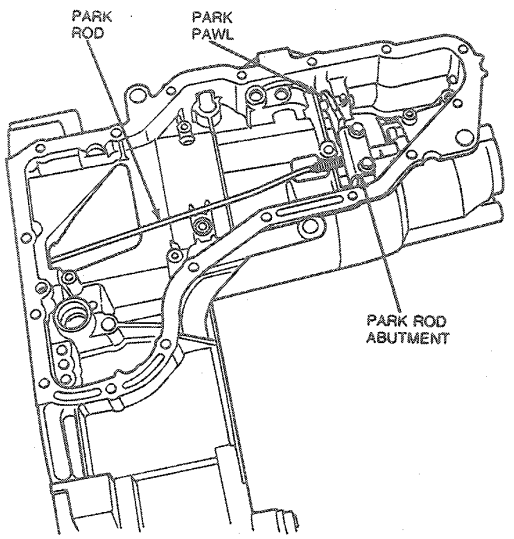


48. Remove lube tubes using Lube Tube Remover T86P-70001-A and Impact Slide Hammer T59L-100-B.

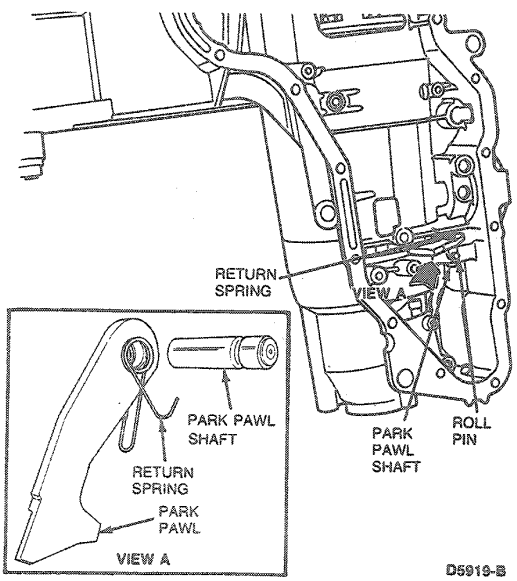


DISASSEMBLY AND ASSEMBLY (Continued)

49. Remove two 8mm park rod abutment bolts. Remove abutment. Remove park rod.

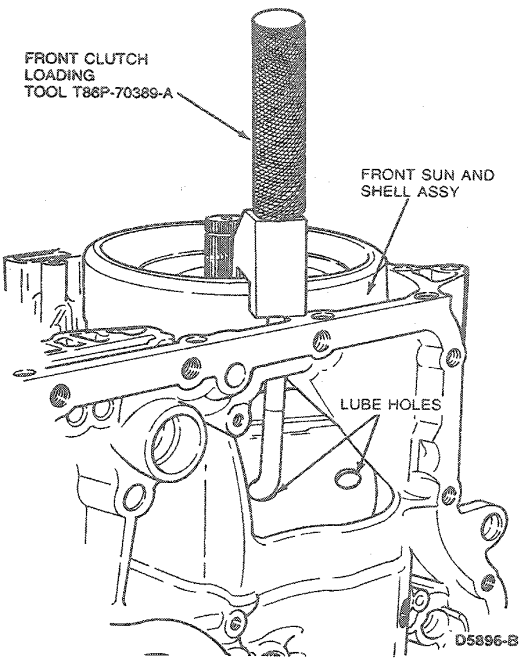


50. Using Locknut Pin Remover D81P-3504-N or equivalent, remove park pawl shaft roll pin.
51. Use magnet to remove park pawl shaft, and remove park pawl and return spring.



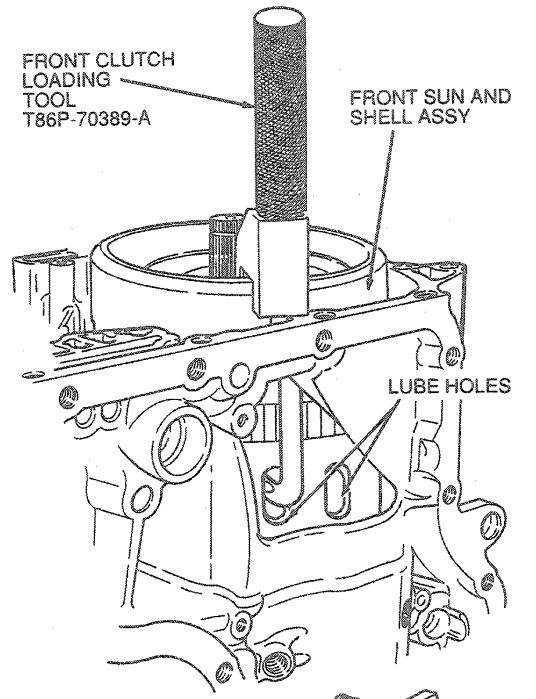
52. Rotate transaxle to vertical position. Using Front Clutch Loading Tool T86P-70389-A, install hook end of tool into one of the six lube holes in front sun and shell assembly. Position notched block over edge of assembly and tighten handle. Do **not** over-tighten handle. Lift assembly out of case.

All Except SHO

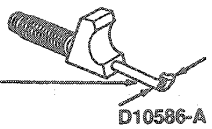


DISASSEMBLY AND ASSEMBLY (Continued)

SHO

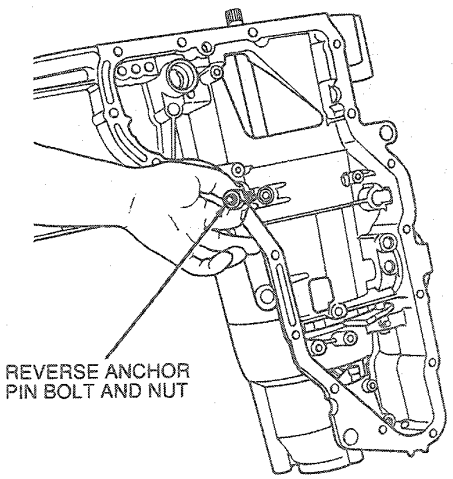


NOTE: MODIFY CLUTCH LOADING TOOL TO FIT LUBE HOLES BY REMOVING 0.50mm (0.02 INCH) OF MATERIAL OFF EACH SIDE OF TOOL.



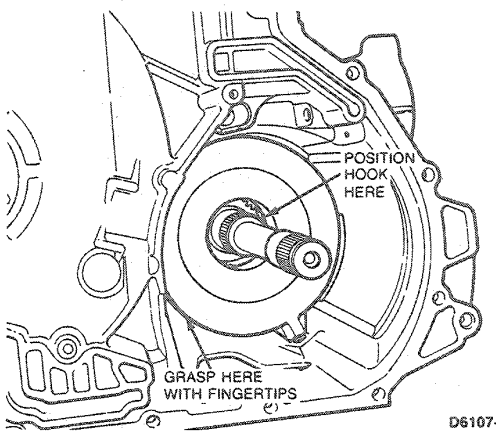
D10586-A

53. Loosen 19mm reverse clutch anchor pin nut and remove 6mm Allen head bolt.



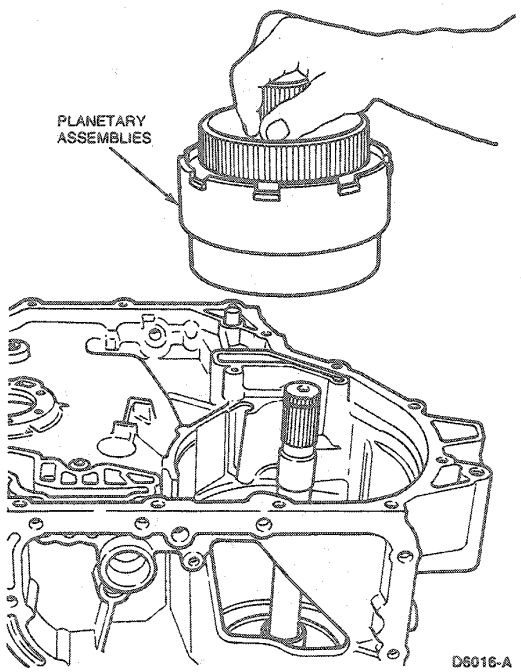
D5902-B

54. Locate hook portion of Front Clutch Loading Tool T86P-70389-A on inner diameter of reverse clutch cylinder. Grasp outer diameter of cylinder with fingertips and slide clutch assembly out of case.



D6107-A

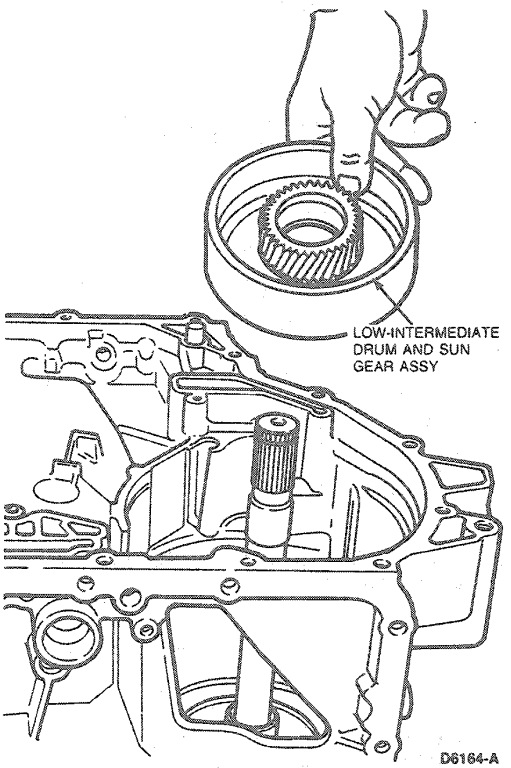
55. Holding the front planetary shaft, lift out both front and rear planetary assembly.



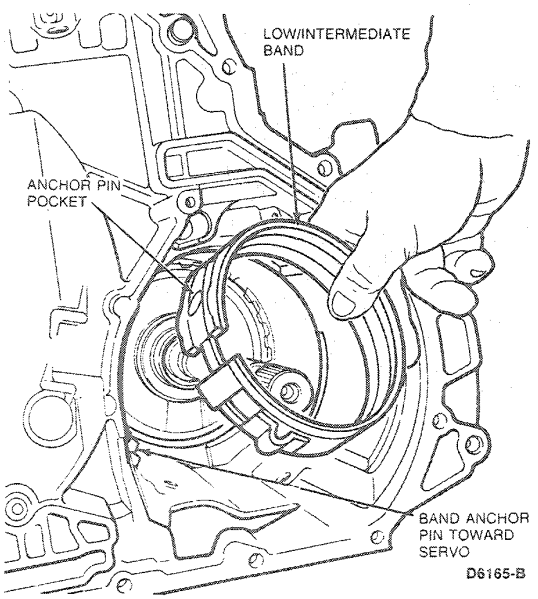
D6016-A

DISASSEMBLY AND ASSEMBLY (Continued)

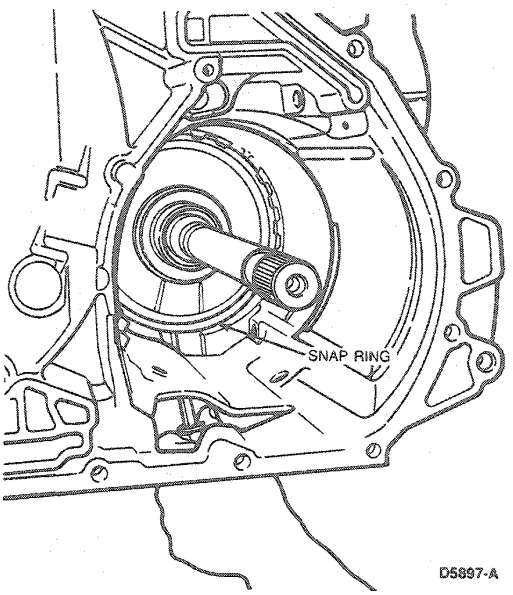
56. Lift out low-intermediate drum and sun gear assembly.



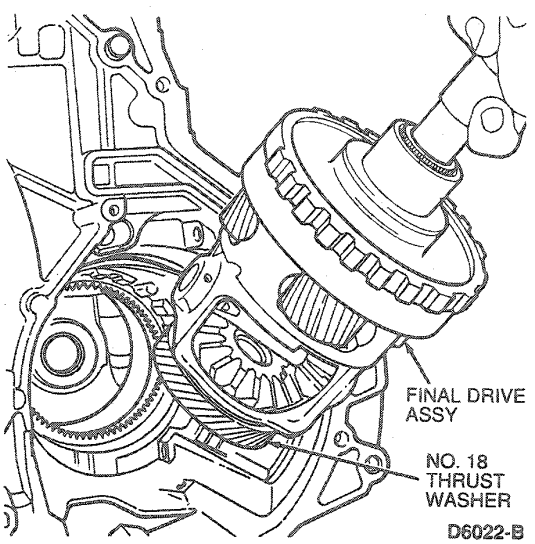
57. Remove low-intermediate band.



58. Remove final drive gear assembly snap ring from case using a screwdriver inserted through side of case.



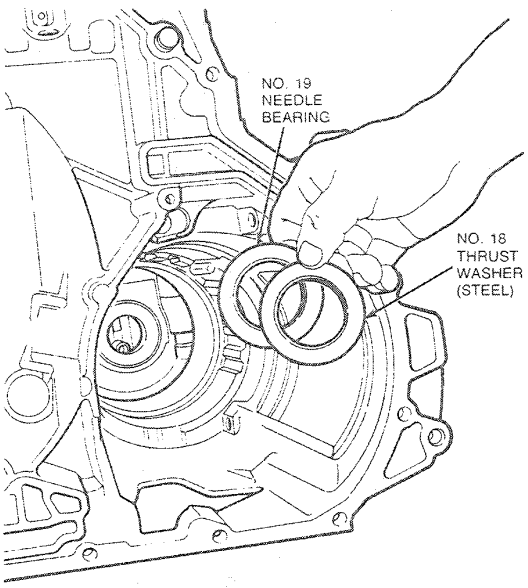
59. Lift out final drive assembly using output shaft.



NOTE: No. 18 thrust washer may remain on the final drive assembly next to speedometer drive gear.

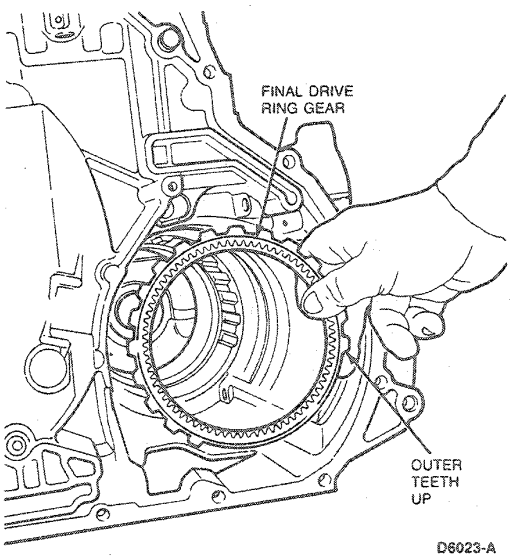
DISASSEMBLY AND ASSEMBLY (Continued)

60. Remove No. 18 thrust washer and No. 19 needle bearing.



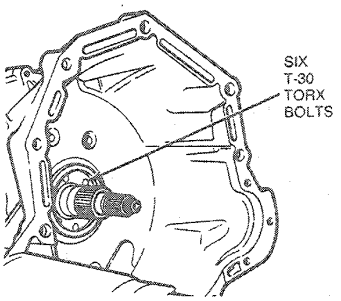
D5899-B

61. Remove final drive ring gear from case.



D6023-A

62. If case replacement is necessary, rotate case 180 degrees and remove six T-30 Torx® bolts attaching support to case.



D6234-A

Subassemblies

Chain Cover

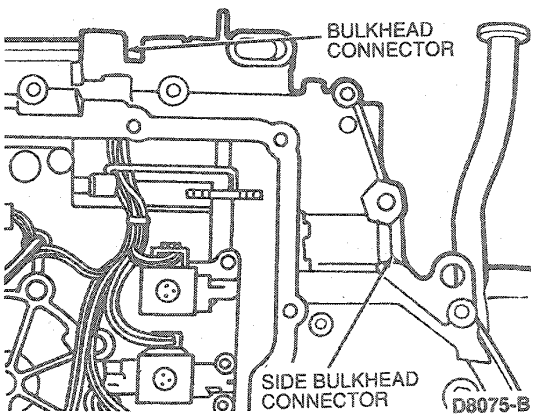
Tools Required:

- Locknut Pin Remover T78P-3504-N
- Lock Ring Pliers T81P-77060-A
- Bimetal Height Gauge T86P-70422-A

Disassembly

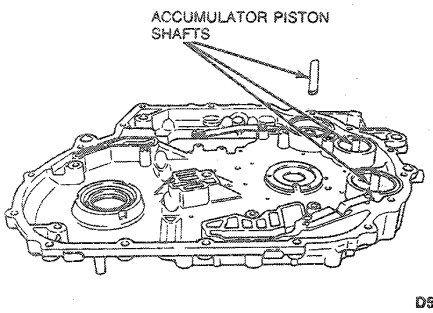
CAUTION: Do not pull on wiring. Pull on connector.

1. If wiring or chain cover replacement is necessary, compress tabs on both sides of connector from inside of chain cover. Remove connector and wiring from chain cover.



DISASSEMBLY AND ASSEMBLY (Continued)

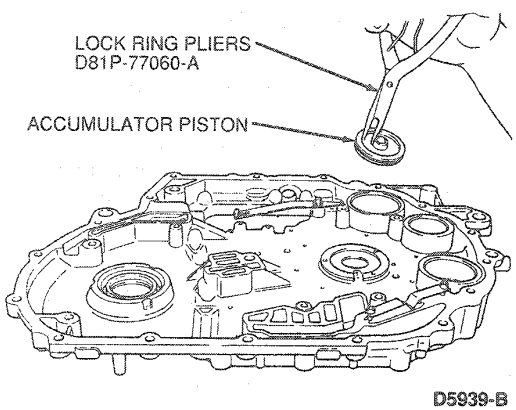
2. Remove three accumulator piston shafts.



CAUTION: Do not use any objects in piston shaft bore for removal or damage to bore may result.

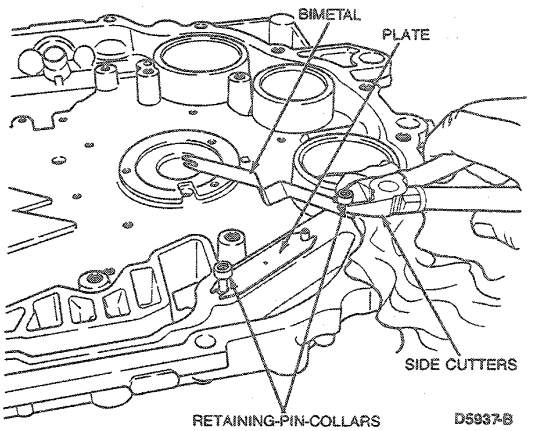
3. Using Lock Ring Pliers D81P-77060-A or equivalent, remove three accumulator pistons.

   Remove seals and O-Ring from pistons.

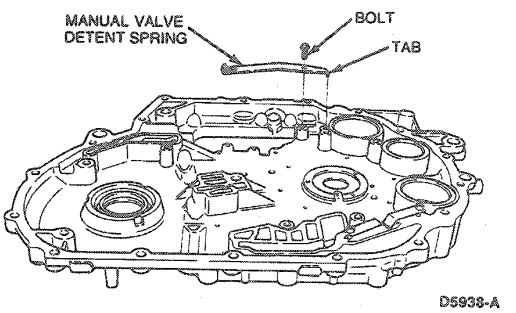


CAUTION: Use care not to damage machined case surfaces or bimetallic strips.

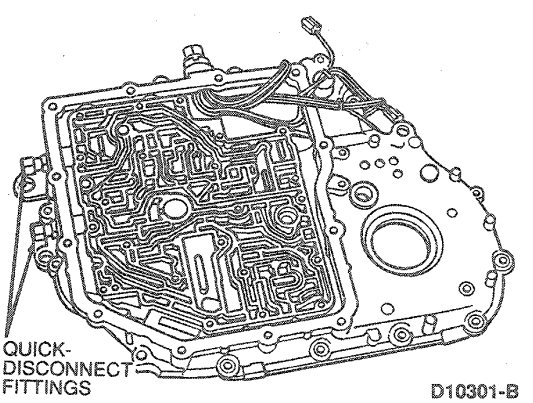
4. Using side cutters, carefully remove bimetal retaining pin collars and remove bimetal and plate.
5. Pull retaining pins from cover, using Locknut Pin Remover T78P-3504-N.



6. Remove 8mm manual valve detent spring bolt and spring.



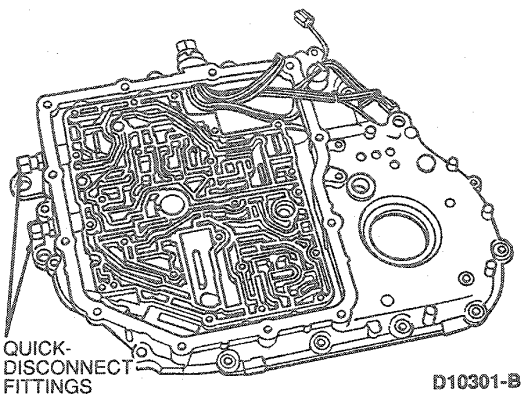
7. Remove quick-connect oil cooler fittings.



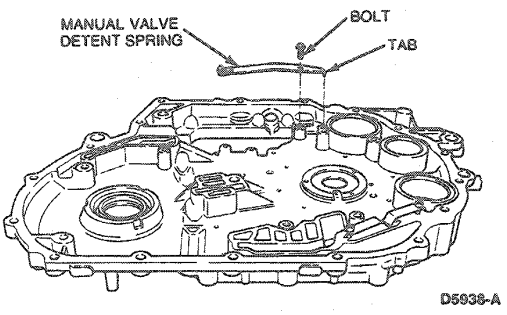
DISASSEMBLY AND ASSEMBLY (Continued)

Assembly

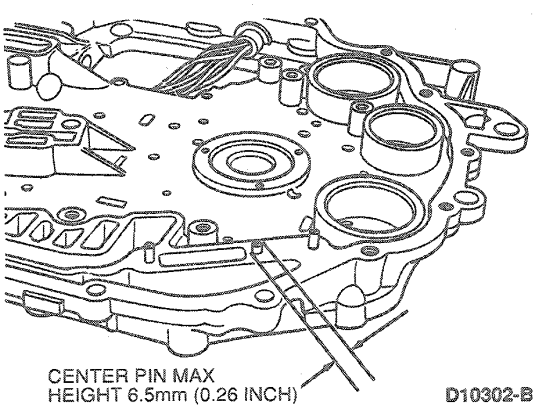
1. Install quick-connect oil cooler fittings.
   NOTE: Use a sealing compound on threads.



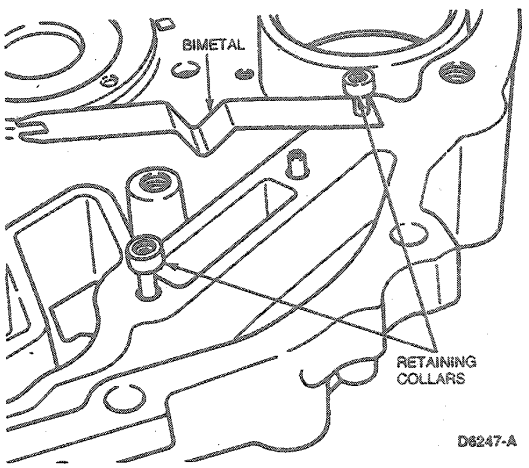
2. Install manual valve detent spring and position tab in locator hole. Tighten bolt to 9-12 N·m (7-9 lb-ft).



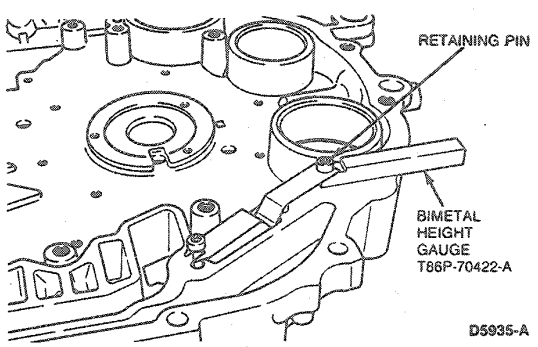
3. Start bimetal retaining pins in cover. Gently tap center pin to bottom of hole.



4. Place end of bimetal with hole over front retaining pin. Install bimetal retaining collars.



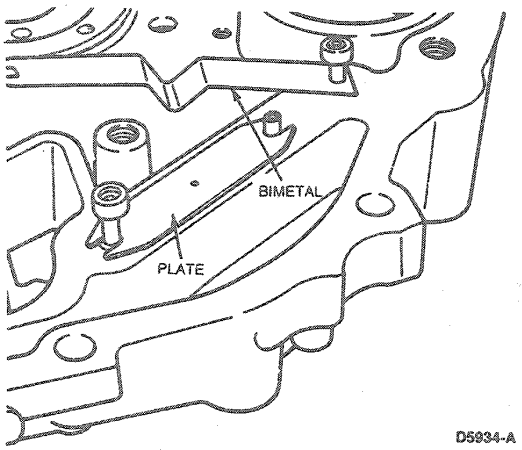
5. Place Bimetal Height Gauge T86P-70422-A against retaining pin and under bimetal.
6. Gently tap retaining collar onto pin until it seats against tool edge.



7. Engage slotted end of bimetal under rear retaining pin and retaining collar and then repeat Steps 5 and 6 for slotted end of bimetal.

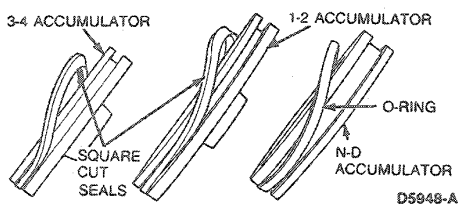
DISASSEMBLY AND ASSEMBLY (Continued)

8. Remove slotted end of bimetal from its pin. Position plate slotted ends onto rear and middle retaining pins. Install slotted end of bimetal under retaining collar.



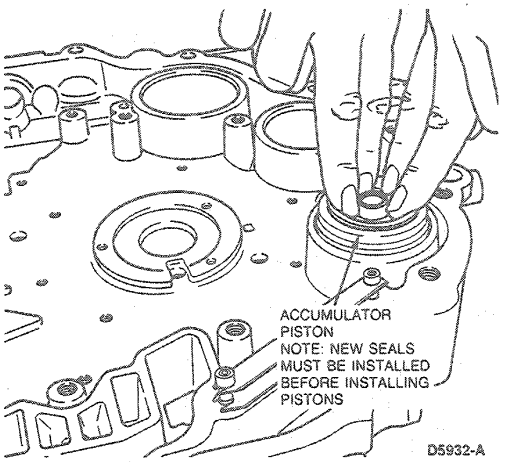
NOTE: Lube seals and O-ring with a light coating of petroleum jelly.

9. Install new seals and O-ring on accumulator pistons.

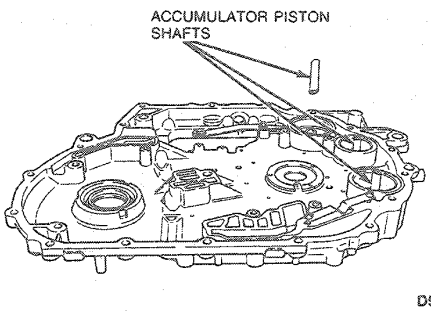


CAUTION: Do not allow pistons to cock in their bores. Seal and bore damage may result.

10. Install accumulator pistons into their proper cylinder.



11. Install three accumulator piston shafts.



12. Install new O-ring on connector.
13. Install new connector by pushing into bore from the outside until a "click" is heard.

Oil Pump and Valve Body Assembly

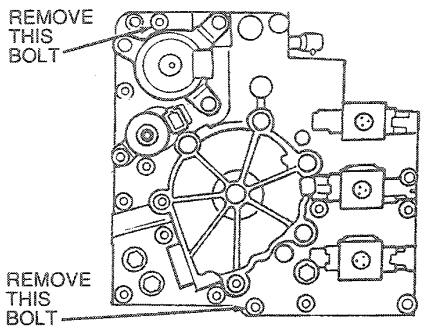
Disassembly and Assembly

Tools Required:

- Valve Body Guide Pin Set T86P-70100-A
- Valve Body Guide Pin T86P-70100-B
- Valve Body Guide Pin T86P-70100-C
- Pump Body Guide Pins T86P-70370-A

DISASSEMBLY AND ASSEMBLY (Continued)

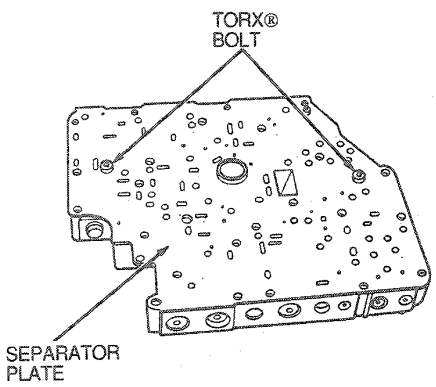
1. Remove two 8mm bolts retaining oil pump to valve body and separate valve body from oil pump. Remove gasket and discard.



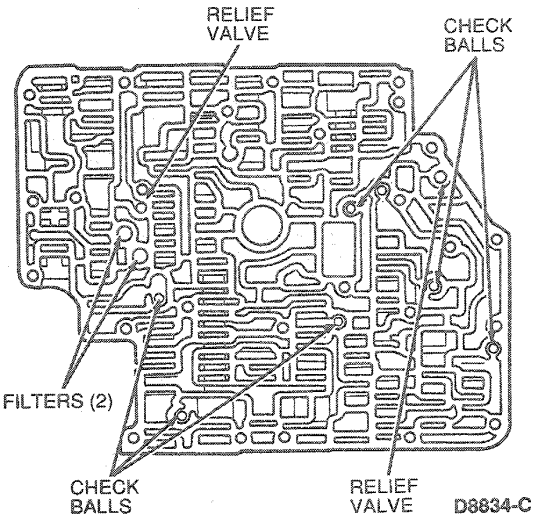
Valve Body

Disassembly

1. Place valve body on bench with separator plate up, and remove two Torx® bolts retaining separator plate to valve body.



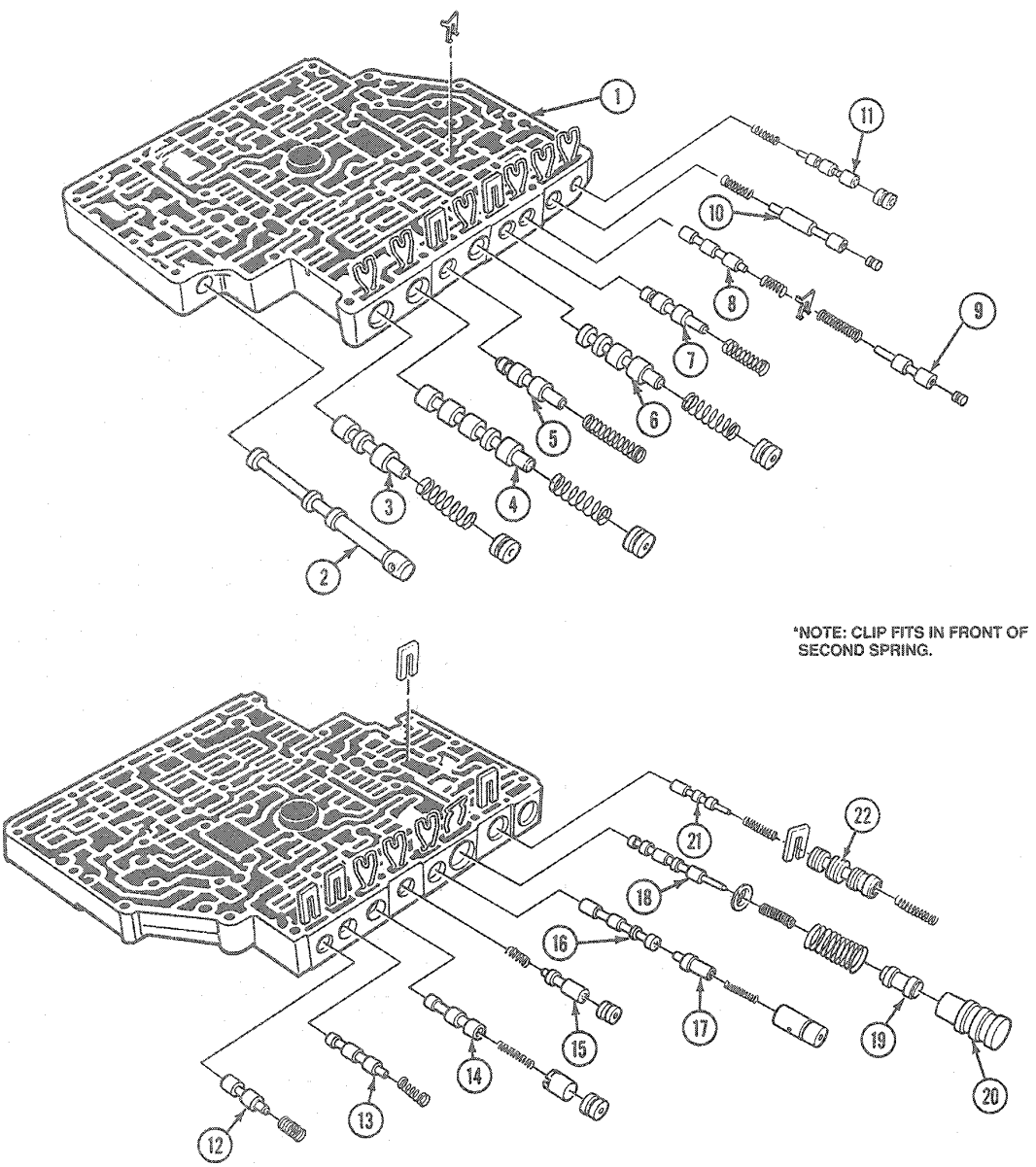
2. Remove separator plate and gasket.
3. Remove six ball checks, two relief valves and two filter screens. Clean filter.



CAUTION: Most valves are aluminum and cannot be removed using a magnet. Remove valves by tapping valve body on palm of hand to slide valves out of bores. It may be necessary to remove valves and springs using a pick. If it is necessary to use a pick, use extreme caution to prevent damaging valves or valve bores.

4. The individual valves and springs are removed by removing retaining clips and bore plugs. Refer to the following illustrations for valve and spring locations. Clean valves, springs and valve body as necessary.
5. Thoroughly clean all parts, except check balls, in clean solvent and blow dry with moisture-free compressed air.
6. Inspect all valve and plug bores for scores. Check all fluid passages for obstructions. Inspect all mating surfaces for burrs and scores. **If needed, use crocus cloth to polish valves and plugs. Avoid rounding the sharp edges of the valves and plugs with the crocus cloth.**
7. Inspect all springs for distortion. Check all valves and plugs for free movement in their respective bores. Valves and plugs, when dry, must fall from their own weight in their respective bores.
8. Roll manual valve on a flat surface to check for bent condition.

DISASSEMBLY AND ASSEMBLY (Continued)



Item	Part Number	Description
1	7A100	Valve Body
2	7C389	Manual Valve Control
3	7D053	2-3 Shift Valve
4	7G182	1-2 Shift Valve
5	7H142	Pull In Valve

(Continued)

Item	Part Number	Description
6	7F259	3-4 Shift Valve
7	7H146	Forward Clutch Valve
8	7D059	3-2 Shift Timing
9	7G482	Pull In Control Valve
10	7G317	Engagement Valve

(Continued)

DISASSEMBLY AND ASSEMBLY (Continued)

Item	Part Number	Description
11	7G180	2-3 Servo Regulator Valve
12	7H166	Pressure Failsafe Valve
13	7G202	Backout Valve
14	7G321	Accumulator Regulator
15	7F185	Capacity Modulator
16	7G179	Bypass Clutch Control Valve

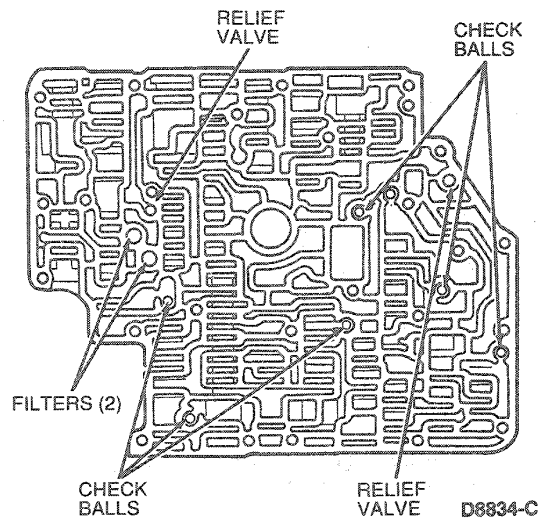
(Continued)

Item	Part Number	Description
17	7G320	Bypass Clutch Control Valve Plunger
18	7C388	Main Regulator
19	7000-26A	Main Regulator Boost
20	7000-26A	Main Regulator Boost
21	7G473	Solenoid Regulator Valve
22	7G307	Converter Regulator Valve

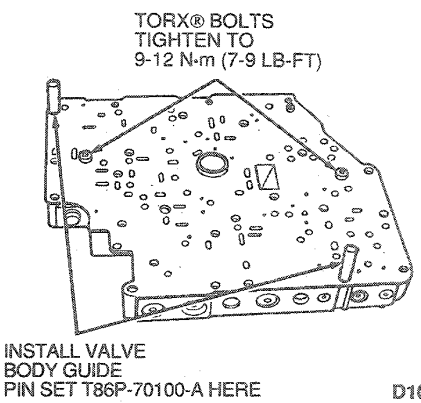
TD8847C

Assembly

1. Assemble valves and springs into valve body.
2. Install checks ball, relief valves and filter screens.



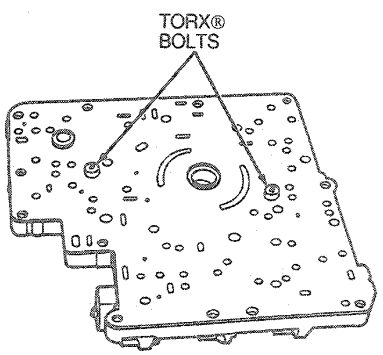
3. Install separator plate with new gasket on valve body.
4. Install Valve Body Guide Pin T86P-70100-A as shown. Install two Torx® bolts in valve body and tighten to 9-12 N·m (7-9 lb-ft). Remove alignment pins.



Oil Pump

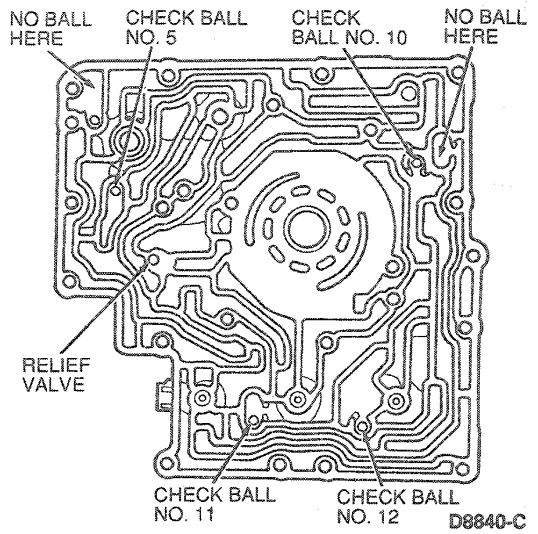
Disassembly

1. Remove two Torx® bolts retaining separator plate to oil pump housing. Remove separator plate and discard gasket.

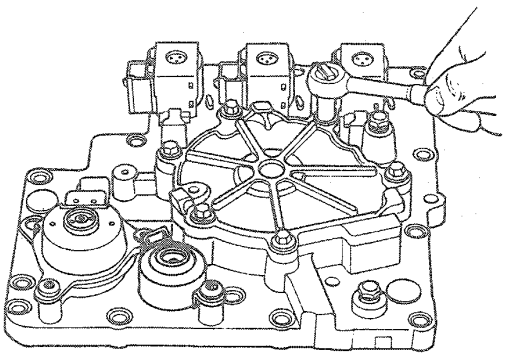


DISASSEMBLY AND ASSEMBLY (Continued)

2. Remove four check balls and one relief valve.



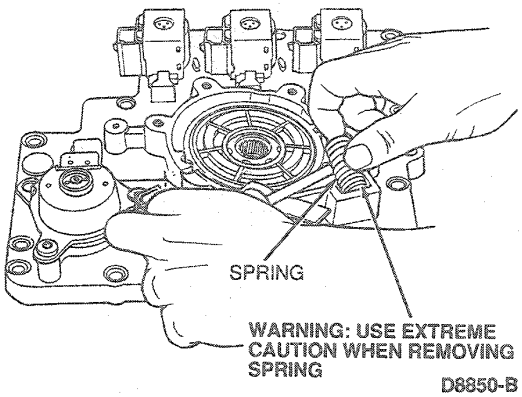
3. Remove six bolts retaining pump cover to pump housing and remove cover.



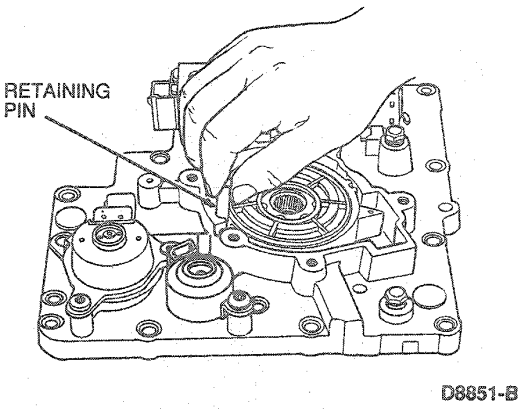
WARNING: USE EXTREME CAUTION WHEN REMOVING SPRING TO PREVENT PERSONAL INJURY.

CAUTION: Place a piece of cardboard or suitable material under screwdriver to prevent damage to housing gasket surface.

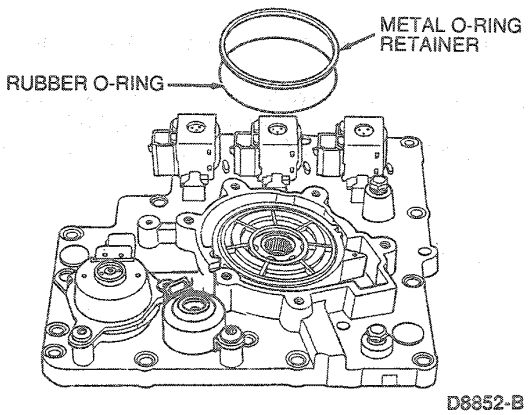
4. Remove bore spring by prying spring out of housing.



5. Remove outside vane support retaining pin.

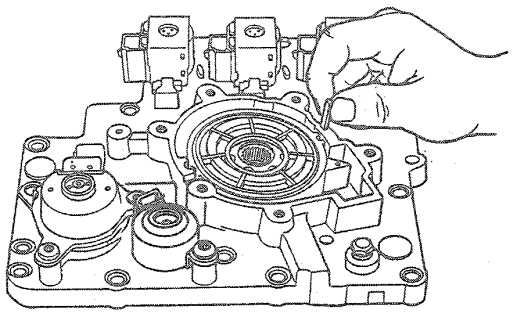


6. Remove metal O-ring retainer and O-ring from outer vane support. Discard O-ring.



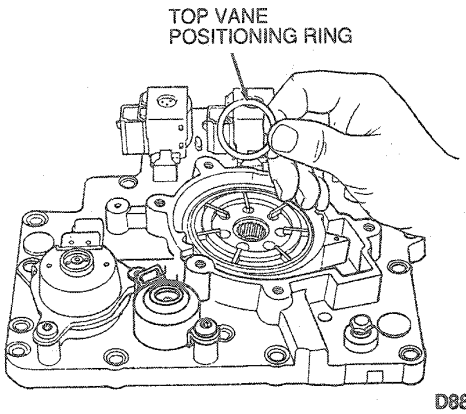
DISASSEMBLY AND ASSEMBLY (Continued)

7. Remove and discard side seal.



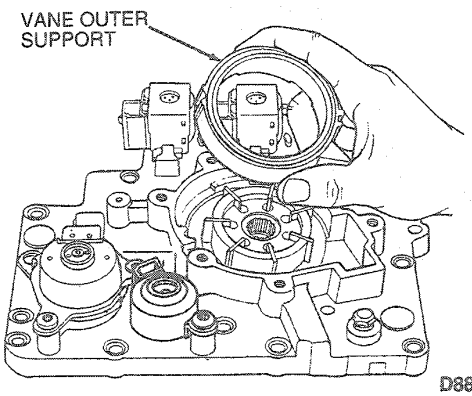
D8853-B

8. Remove side seal support.
9. Remove top vane positioning ring.



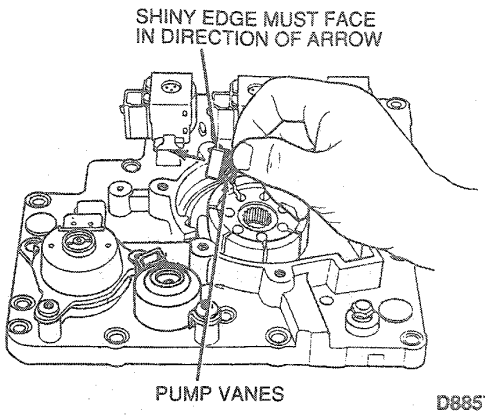
D8855-B

10. Remove outer vane support.



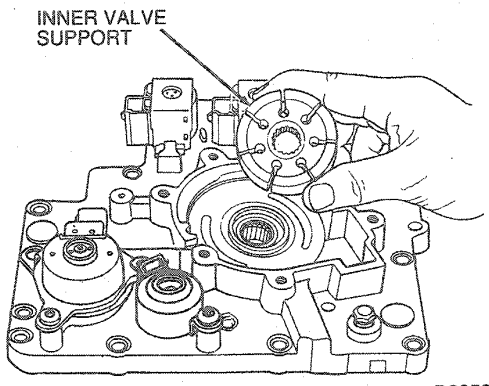
D8856-B

11. Remove seven vanes from rotor.



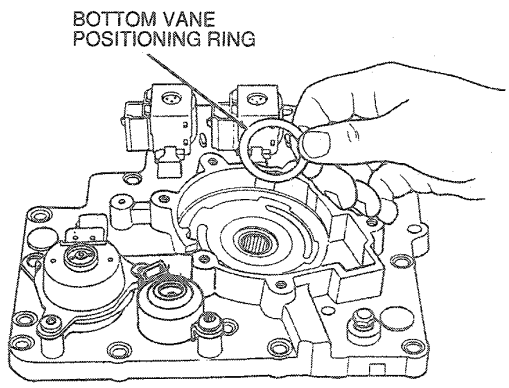
D8857-B

12. Remove inner vane support.



D8858-B

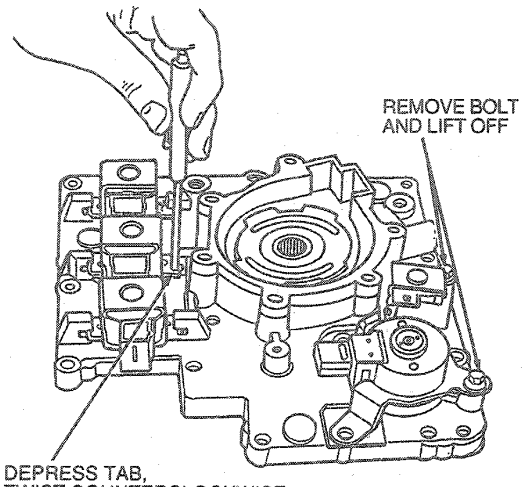
13. Remove bottom vane positioning ring.



D8859-B

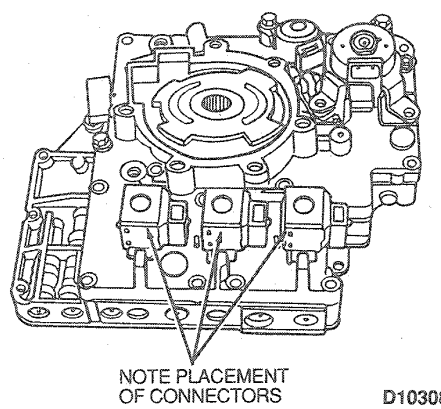
DISASSEMBLY AND ASSEMBLY (Continued)

14. Remove solenoids, one remaining bolt-EPC and one bolt-lock-up. Depress tab and twist off shift solenoids.

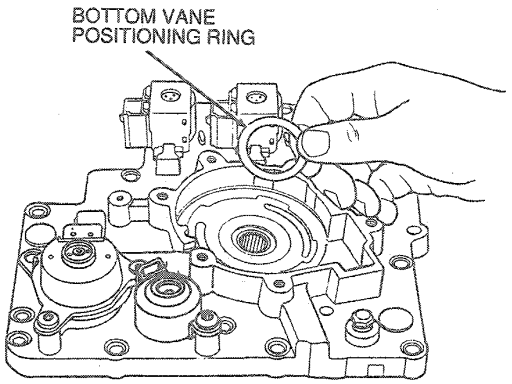


Assembly

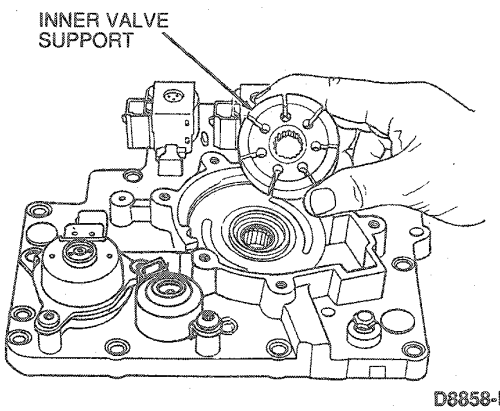
1. Install solenoids. Refer to illustration for proper orientation of shift solenoids.



2. Install bottom vane positioning ring.

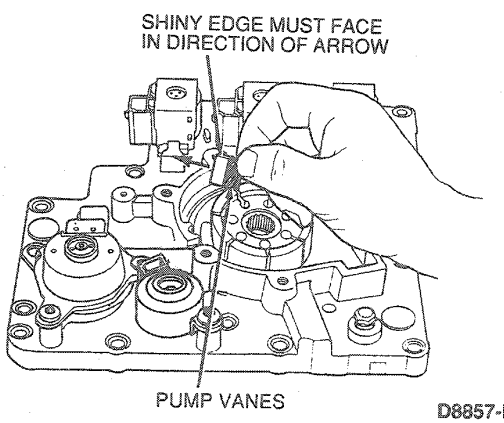


3. Install inner vane support with small inside diameter counter bore facing up.



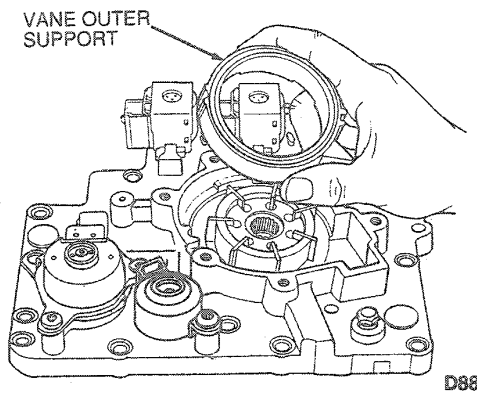
NOTE: Shiny portion of vane blade is installed toward outer vane support.

4. Install seven vanes in inner vane support.



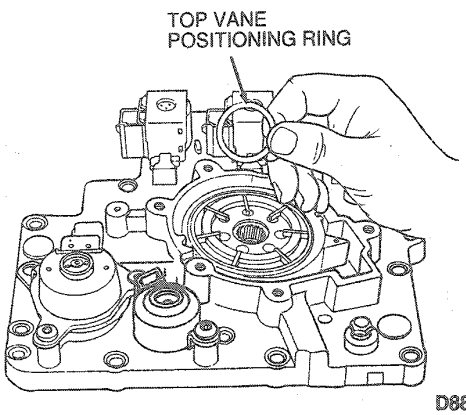
DISASSEMBLY AND ASSEMBLY (Continued)

5. Install outer vane support.



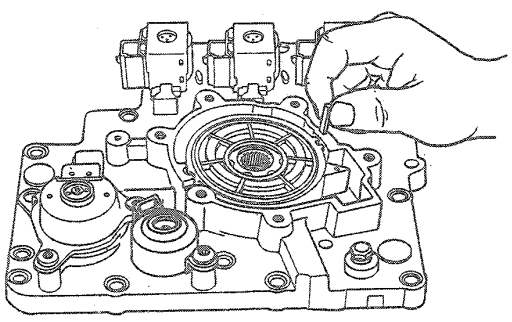
D8856-B

6. Install top vane positioning ring.

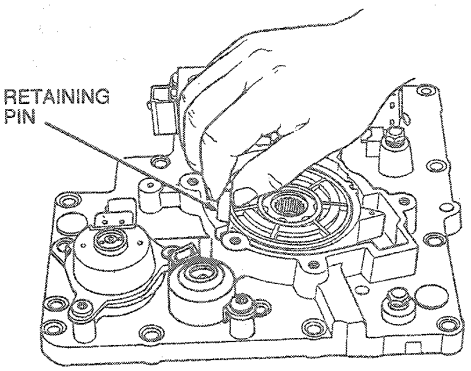


D8855-B

7. Install new side seal support.

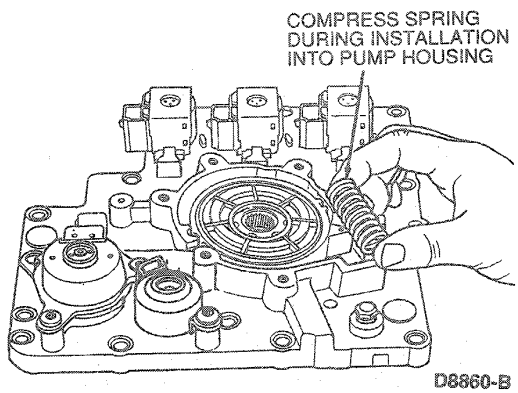

D8853-B

8. Install new side seal.
9. Install outer vane support retaining pin.



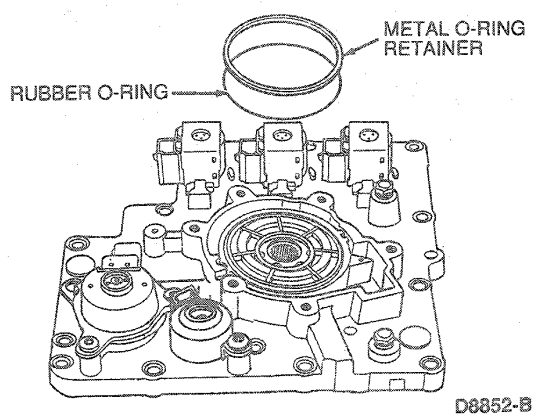
D8851-B

10. Install bore spring between case and tab on outer vane support.



D8860-B

11. Install new O-ring in groove in outer vane support. Then, install metal O-ring retainer.



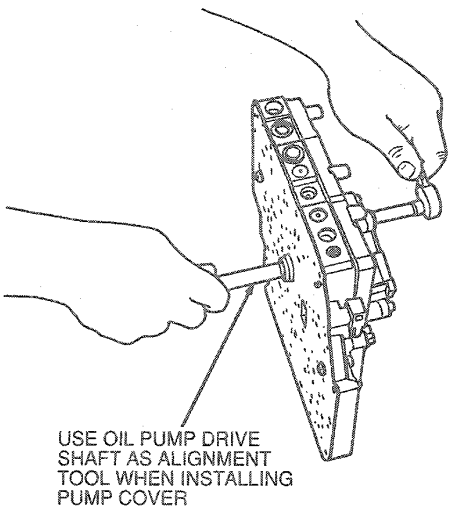
D8852-B

NOTE: Use the oil pump drive shaft to align the pump gears while installing the pump cover.

DISASSEMBLY AND ASSEMBLY (Continued)

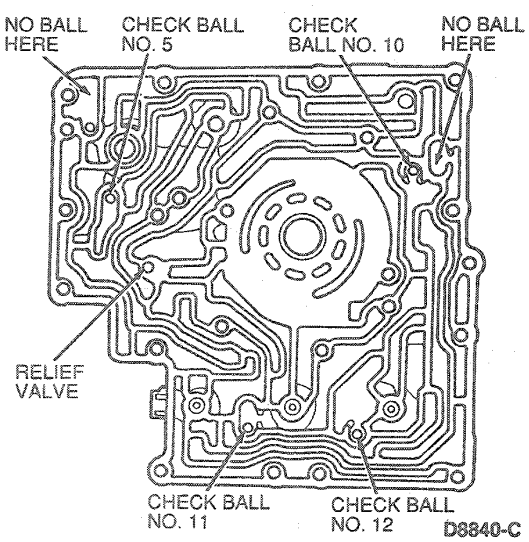
NOTE: Ensure that pivot pin is flush with or below the surface of the valve body side of the oil pump.

12. Install oil pump cover on oil pump housing and install six retaining bolts. Tighten bolts evenly to 9-12 N·m (7-9 lb-ft).



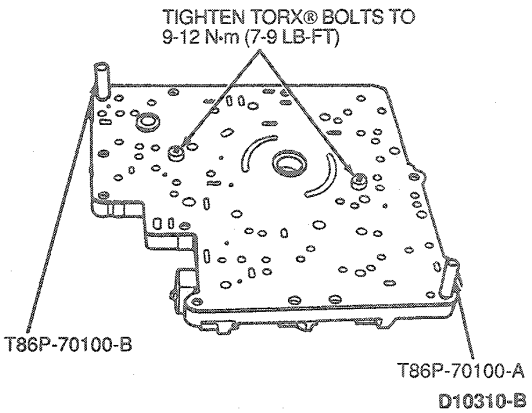
D10309-A

13. Install ball checks and relief valve.



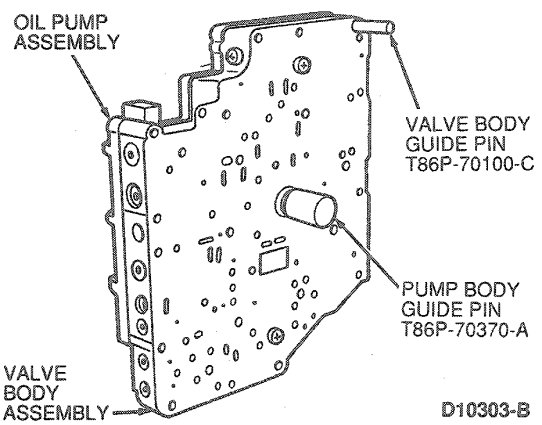
D8840-C

14. Position separator plate on pump housing using a new gasket. Insert Valve Body Guide Pin Set T86P-70100-A and Valve Body Guide Pin T86P-70100-B. Then, install two Torx® bolts. Tighten bolts to 9-12 N·m (7-9 lb-ft). Remove guide pins.



D10310-B

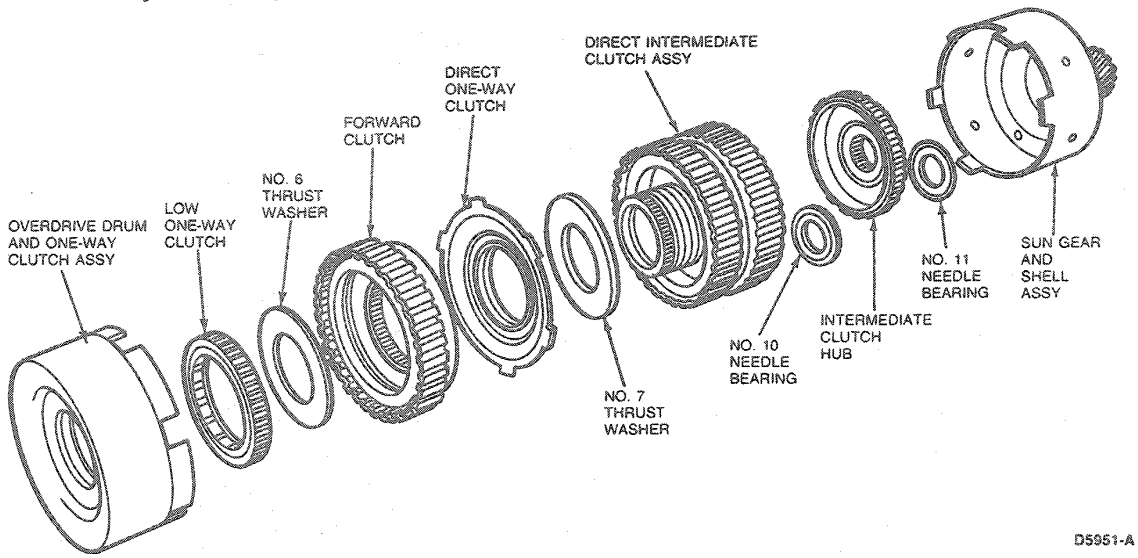
15. Position valve body on oil pump using a new gasket.
16. Insert Pump Body Guide Pins T86P-70370-A and Valve Body Guide Pin T86P-70100-C, as shown. Install two valve body-to-oil pump retaining bolts and tighten to 9-12 N·m (7-9 lb-ft). Remove guide pins.



D10303-B

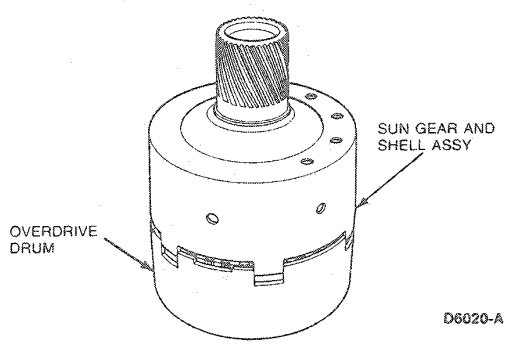
DISASSEMBLY AND ASSEMBLY (Continued)

Shell Assembly—All Except 3.2L SHO

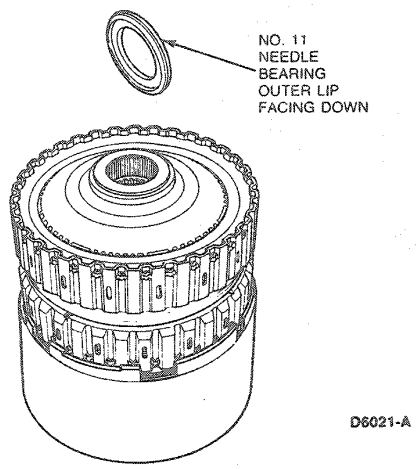


Disassembly

1. Set assembly on overdrive drum.
2. Remove sun gear and shell assembly.

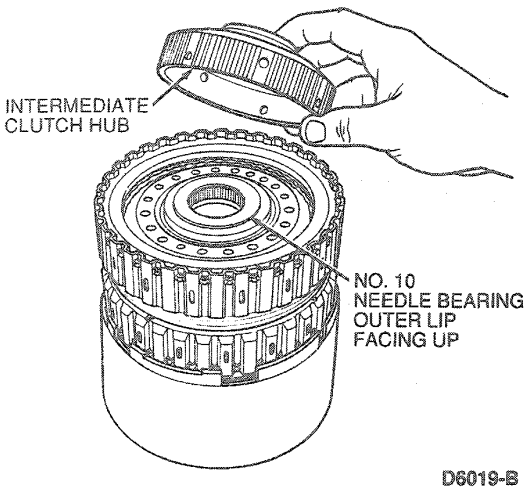


3. Remove No. 11 needle bearing.

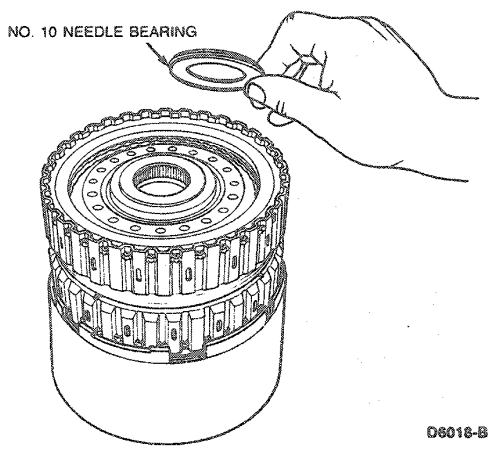


DISASSEMBLY AND ASSEMBLY (Continued)

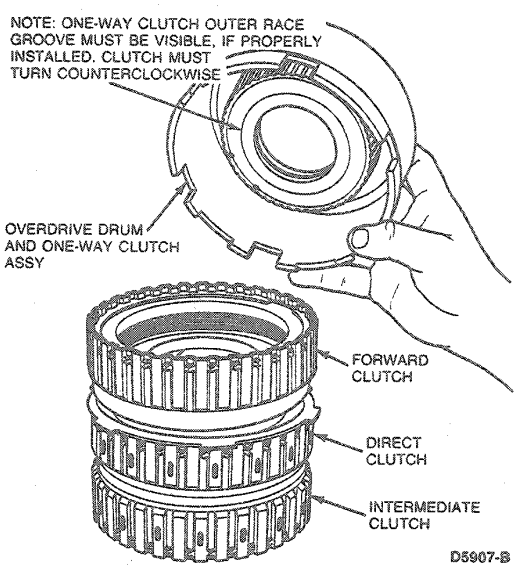
4. Remove intermediate clutch hub.



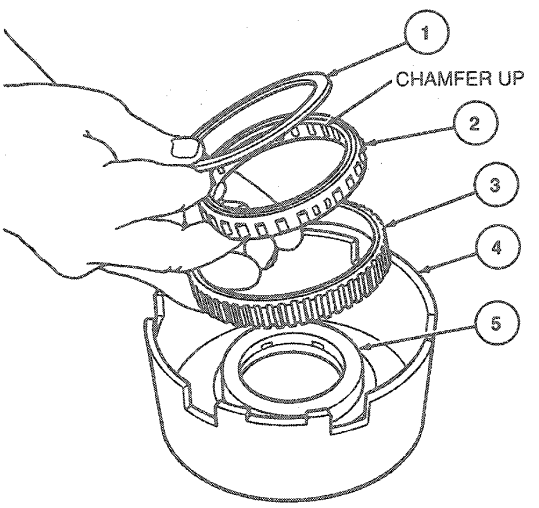
5. Remove No. 10 needle bearing.



6. Turn assembly onto intermediate cylinder hub.
7. Remove overdrive drum and one-way clutch assembly.



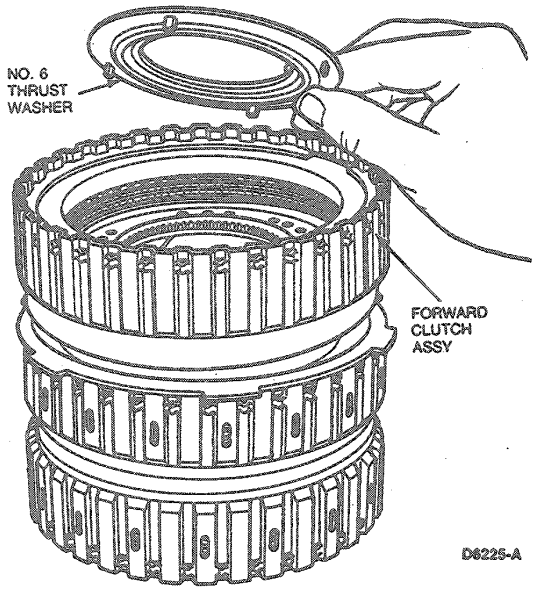
8. Remove one-way clutch outer race, top cap, one-way clutch and bottom cap from drum.



Item	Part Number	Description
1	—	Top Cap
2	—	Overdrive One-Way Clutch
3	—	Outer Race
4	—	Overdrive Drum
5	—	Bottom Cap

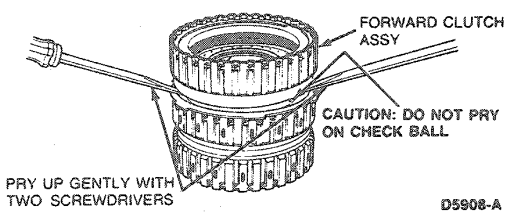
DISASSEMBLY AND ASSEMBLY (Continued)

9. Remove No. 6 thrust washer.

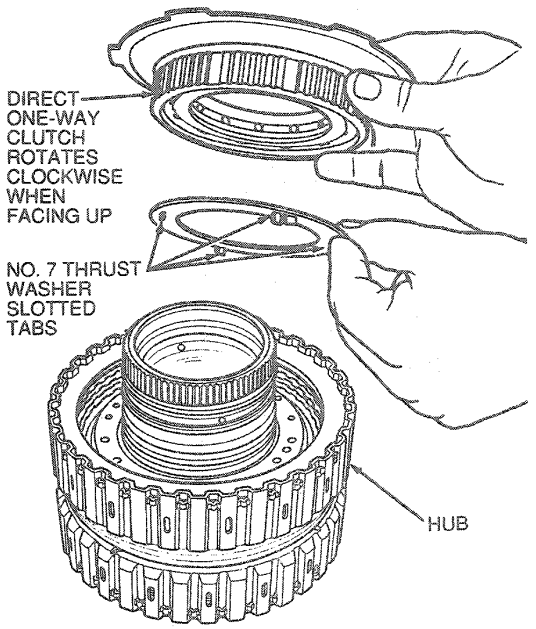


NOTE: Direct clutch hub O-ring seals retain forward clutch on hub. Pry evenly and do not locate screwdriver ends on or near forward clutch check ball.

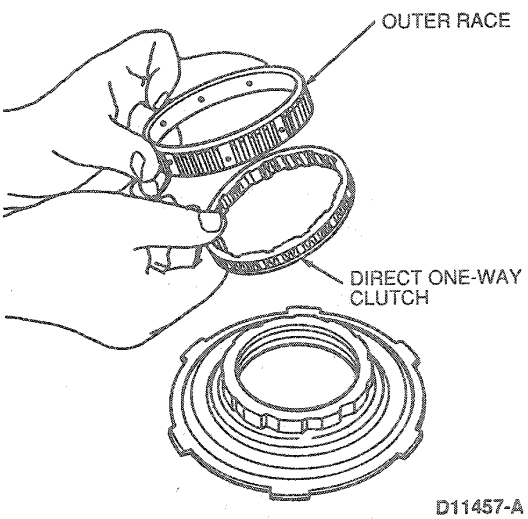
10. Remove forward clutch assembly by prying up on each side with two screwdrivers.



11. Remove direct one-way clutch and No. 7 thrust washer.

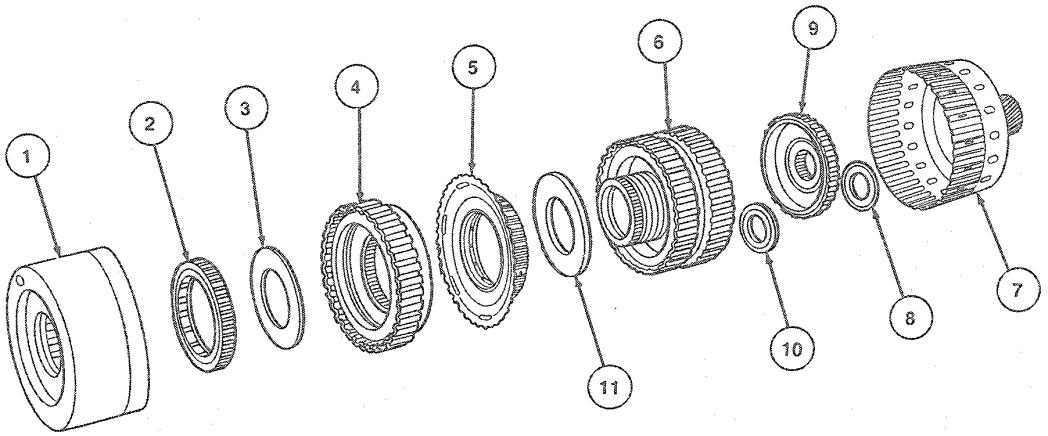


12. Remove direct one-way clutch outer race and one-way clutch.



DISASSEMBLY AND ASSEMBLY (Continued)

Shell Assembly—3.2L SHO



D10589-A

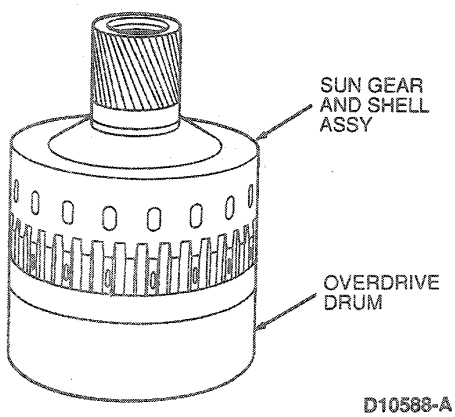
Item	Part Number	Description
1	7L669	Overdrive One-Way Clutch
2	7D171	Low One-Way Clutch
3	7A166	No. 6 Thrust Washer
4	7A360	Forward Clutch
5	7G156	Direct One-Way Clutch

(Continued)

Item	Part Number	Description
6	7G120	Direct Intermediate Clutch Assy
7	7D064	Sun Gear and Shell Assy
8	7C096	No. 11 Needle Bearings
9	7B067	Intermediate Clutch Hub
10	7C096	No. 10 Needle Bearing
11	7F369	No. 7 Thrust Washer

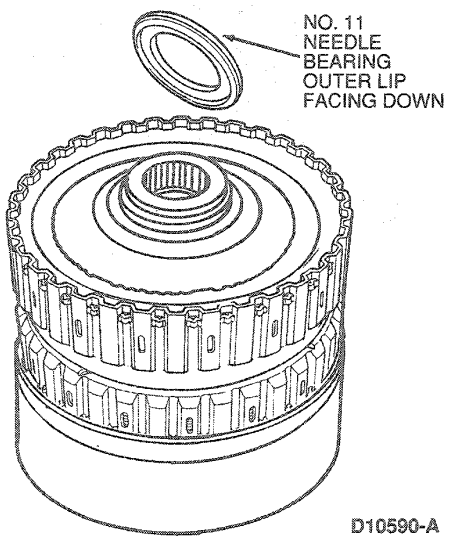
Disassembly

1. Set assembly on overdrive drum.
2. Remove sun gear and shell assembly.



D10588-A

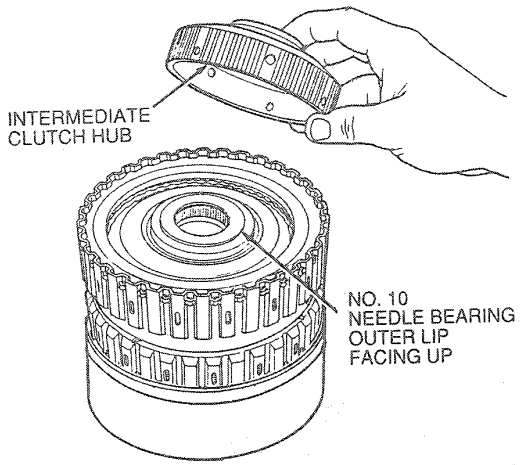
3. Remove No. 11 needle bearing.



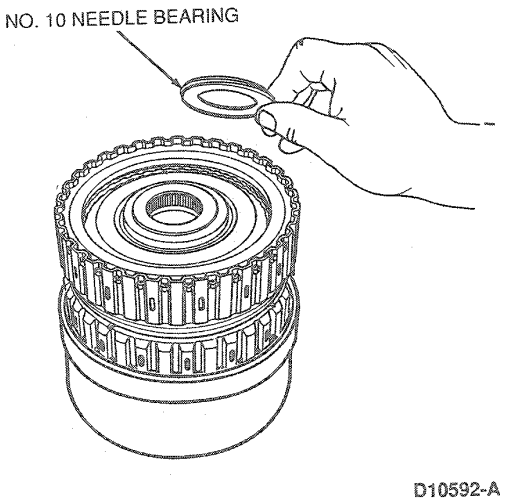
D10590-A

DISASSEMBLY AND ASSEMBLY (Continued)

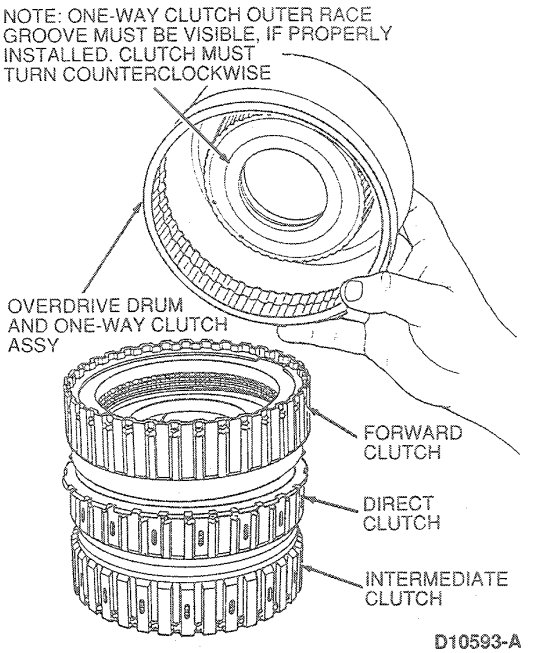
4. Remove intermediate clutch hub.



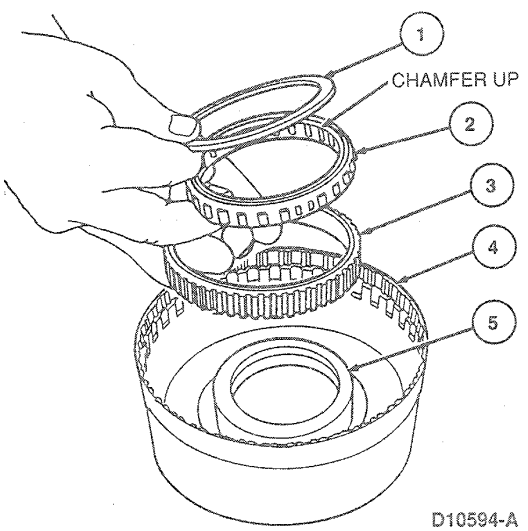
5. Remove No. 10 needle bearing.



6. Turn assembly onto intermediate cylinder hub.
7. Remove overdrive drum and one-way clutch assembly.



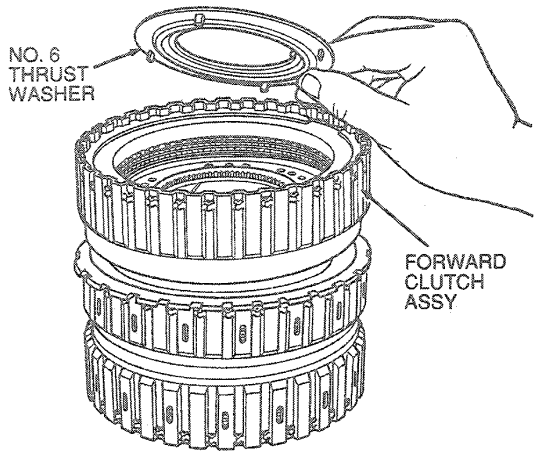
8. Remove one-way clutch outer race, top cap, one-way clutch and bottom cap from drum.



Item	Part Number	Description
1	—	Top Oil Cap (Part of 7D171)
2	7D171	Overdrive One-Way Clutch
3	—	Outer Race (Part of 7D171)
4	7L669	Overdrive Drum
5	—	Bottom Oil Cap (Part of 7D171)

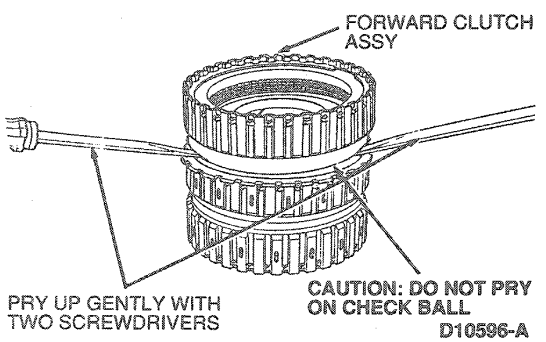
DISASSEMBLY AND ASSEMBLY (Continued)

9. Remove No. 6 thrust washer.

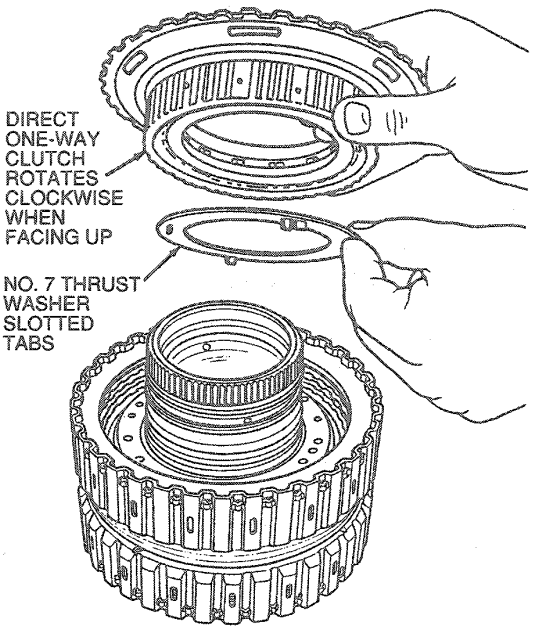


NOTE: Direct clutch hub O-ring seals retain forward clutch on hub. Pry evenly and do not locate screwdriver ends on or near forward clutch check ball.

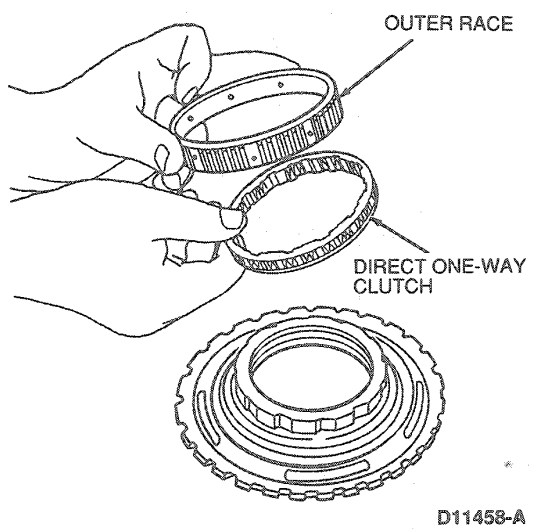
10. Remove forward clutch assembly by prying up on each side with two screwdrivers.



11. Remove direct one-way clutch and No. 7 thrust washer.

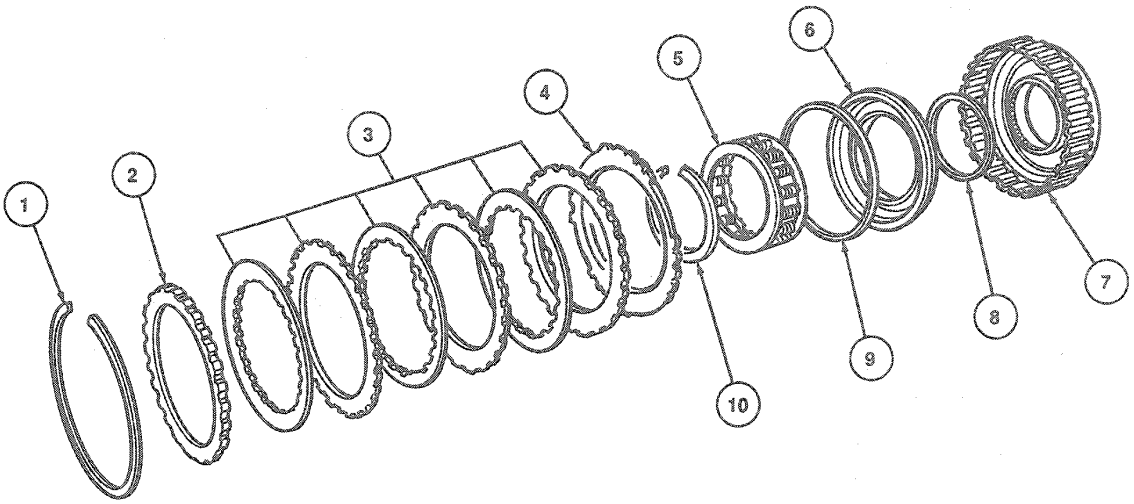


12. Remove direct one-way clutch outer race and one-way clutch.



DISASSEMBLY AND ASSEMBLY (Continued)

Forward Clutch



D8046-A

Item	Part Number	Description
1	7D483	Snap Ring
2	7B066	Pressure Plate
3	—	Clutch Pack
4	7E085	Wave Spring (All Except 3.2L SHO)
5	7G299	Return Spring

(Continued)

Item	Part Number	Description
6	7A262	Piston
7	7A360	Clutch Hub Cylinder
8	7A548	Piston Inner Seal
9	7F224	Piston Outer Seal
10	N803053-S	Snap Ring

TD8046A

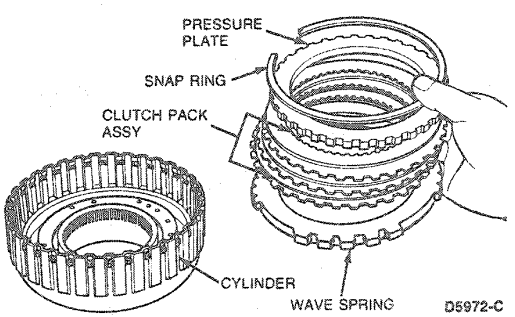
Disassembly

Tools Required:

- Clutch Spring Compressor T65L-77515-A
- Lock Ring Plier D81P-77060-A
- Forward / Intermediate Clutch Seal Outer Lip Protector T86P-70548-A
- Dial Indicator with Bracketry TOOL-4201-C

NOTE: The number of components in clutch pack will vary with application.

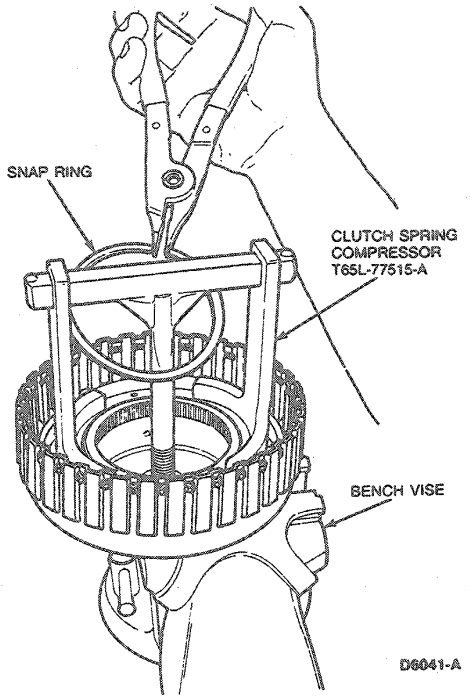
1. Remove snap ring, pressure plate, clutch pack and wave spring (all except 3.2L SHO).

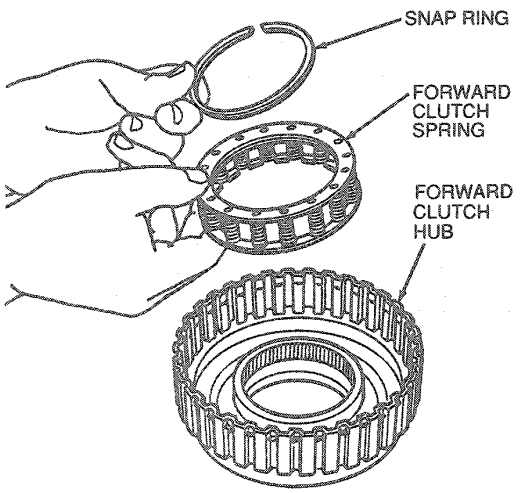


D5972-C

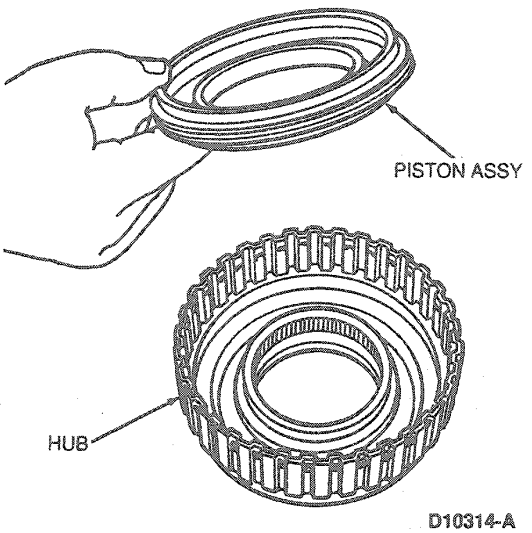
DISASSEMBLY AND ASSEMBLY (Continued)

2. Remove snap ring using Lock Ring Plier D81P-77060-A or equivalent and return spring using Clutch Spring Compressor T65L-77515-A.



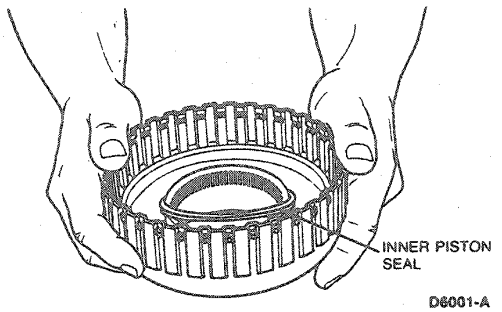


3. Remove piston assembly from hub.

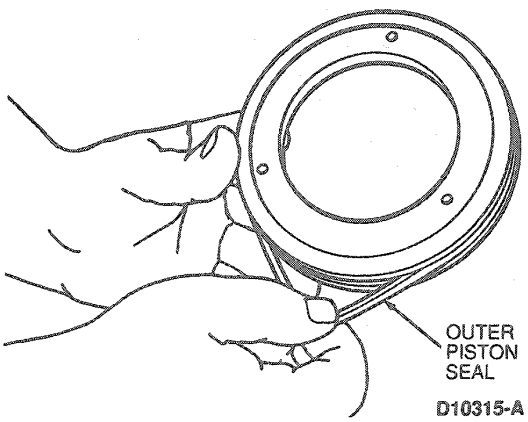


4. Remove piston inner and outer seals.

Inner Piston Seal



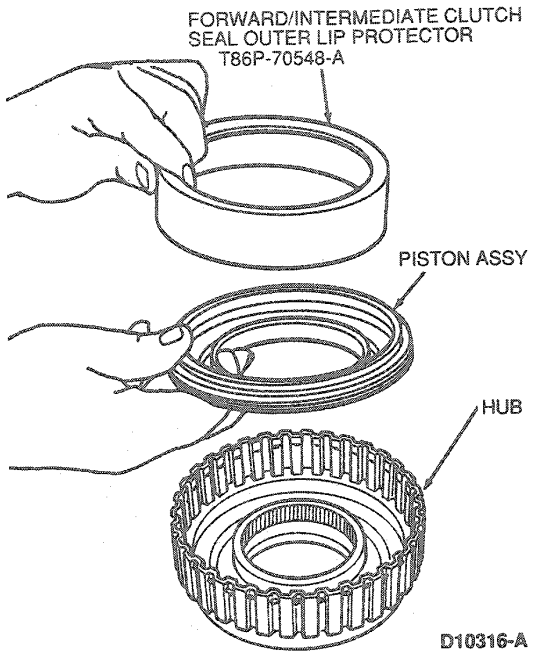
Outer Piston Seal



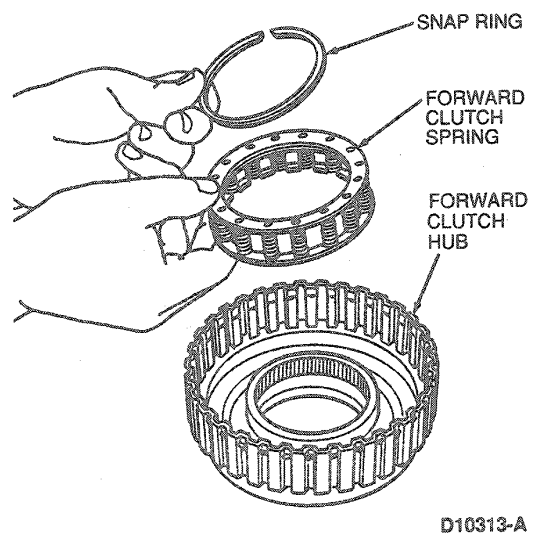
DISASSEMBLY AND ASSEMBLY (Continued)

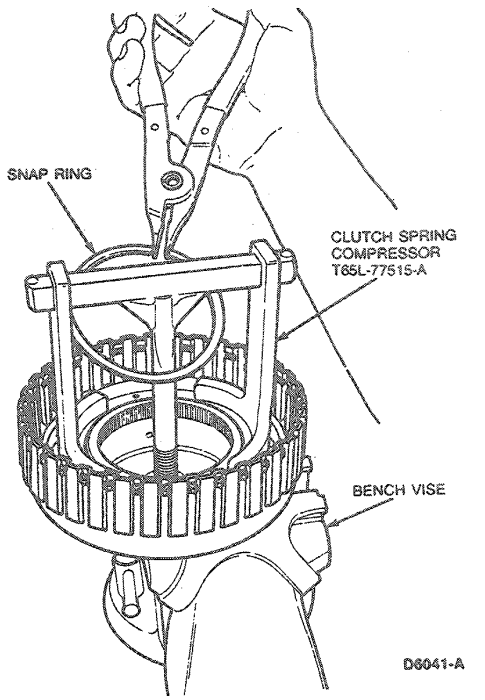
Assembly

1. Install inner and outer piston seals (lip seal facing toward bottom of cylinder) and install piston assembly using Forward / Intermediate Clutch Seal Outer Lip Protector T86P-70548-A.

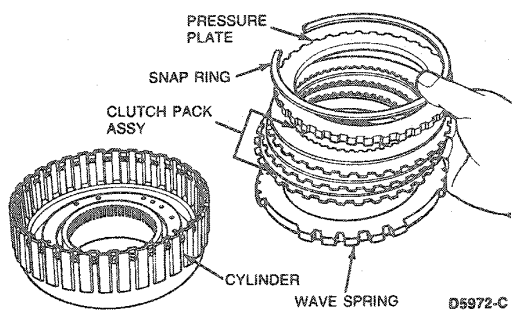


2. Install return spring and snap ring using Clutch Spring Compressor T65L-77515-A.





3. Install wave spring (all except 3.2L SHO), clutch pack, pressure plate and snap ring.

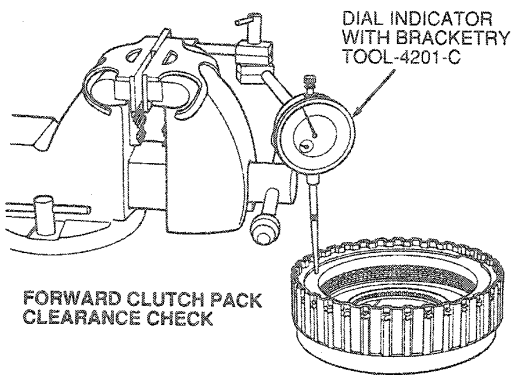


4. Check clutch pack clearance using feeler gauge or Dial Indicator with Bracketry TOOL-4201-C or equivalent. Push downward on the clutch pack firmly. Release pressure and zero dial indicator. Lift pressure plate to the bottom of the snap ring. Note dial indicator reading. Take two readings, 180 degrees apart, and determine the average of the two readings. The clearance should be 1.82-1.37mm (0.072-0.052 inch). If the clearance is not within specification, selective snap rings are available in the following thicknesses:

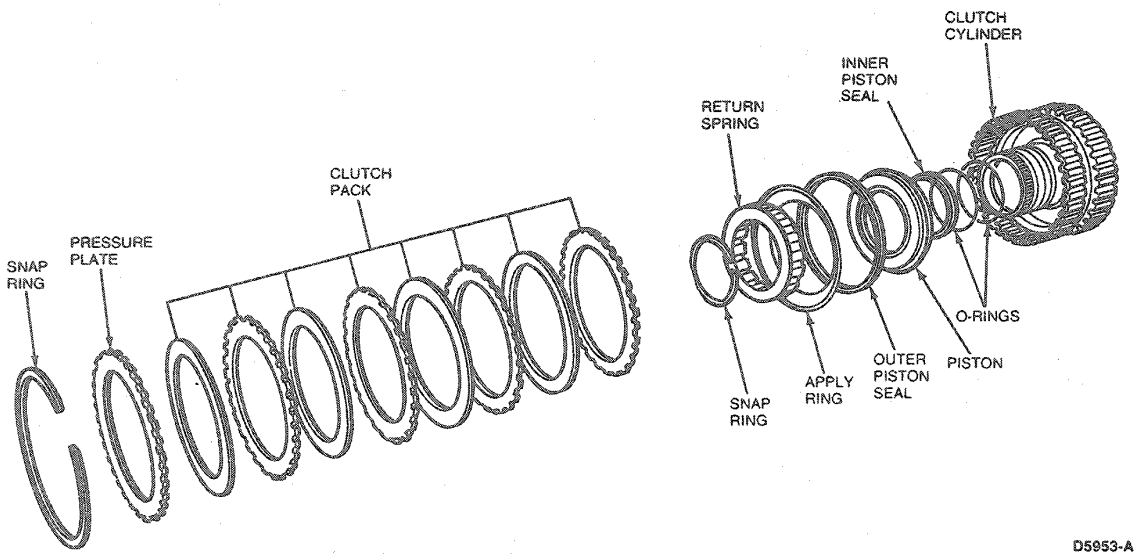
DISASSEMBLY AND ASSEMBLY (Continued)

Selective Snap Rings
1.24-1.34mm (0.049-0.053 inch)
1.60-1.70mm (0.063-0.067 inch)
1.95-2.05mm (0.077-0.081 inch)
2.30-2.40mm (0.091-0.094 inch)
2.65-2.75mm (0.104-0.108 inch)

After installing the correct snap ring, check the clearance.



Direct Clutch—All Except 3.2L SHO



Disassembly

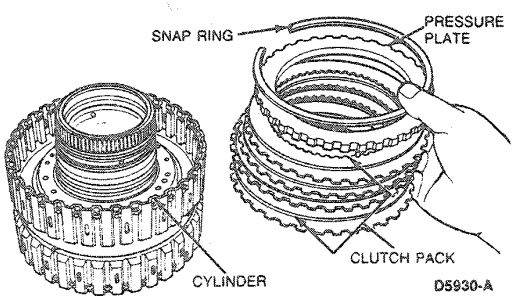
Tools Required:

- Clutch Spring Compressor T65L-77515-A
- Direct Clutch Lip Seal Protector T86P-70234-A
- Dial Indicator with Bracketry TOOL-4201-C

1. Remove O-ring seals.

   NOTE: Number of components in clutch pack will vary with application.

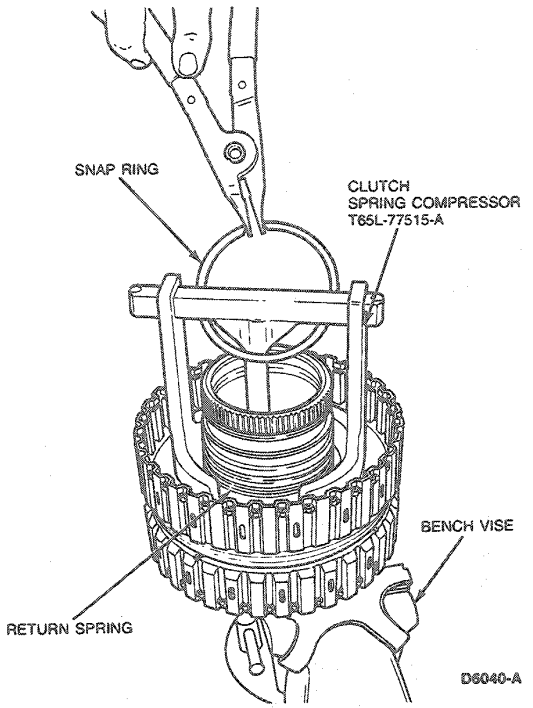
2. Remove snap ring, pressure plate and clutch pack.

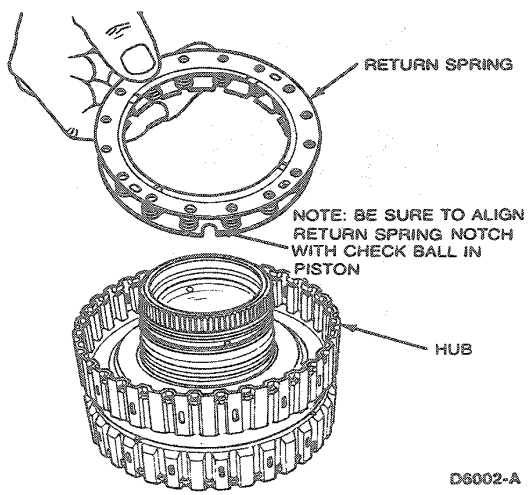


CAUTION: Do not allow tool to bottom out on piston assembly.

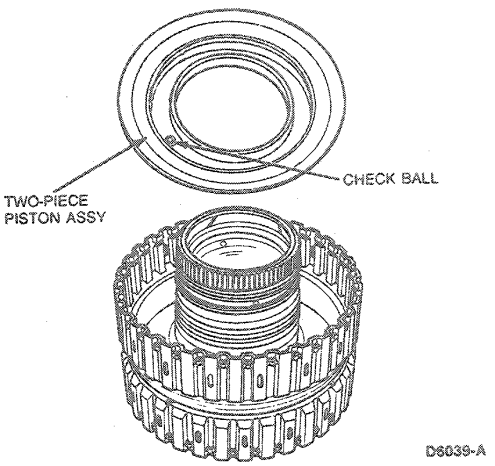
DISASSEMBLY AND ASSEMBLY (Continued)

3. Remove snap ring and return spring using Clutch Spring Compressor T65L-77515-A.

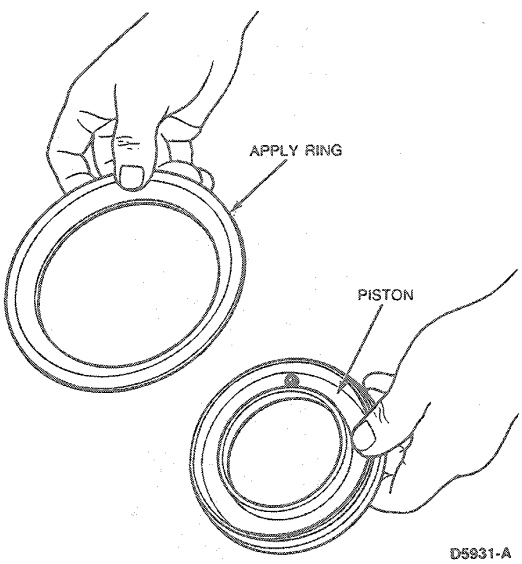




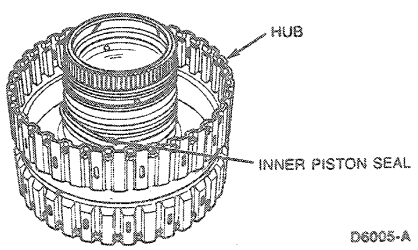
4. Remove two-piece piston assembly.



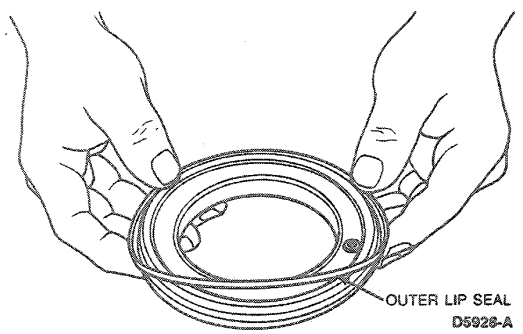
5. Disassemble two-piece piston.



6. Remove piston inner and outer lip seals.

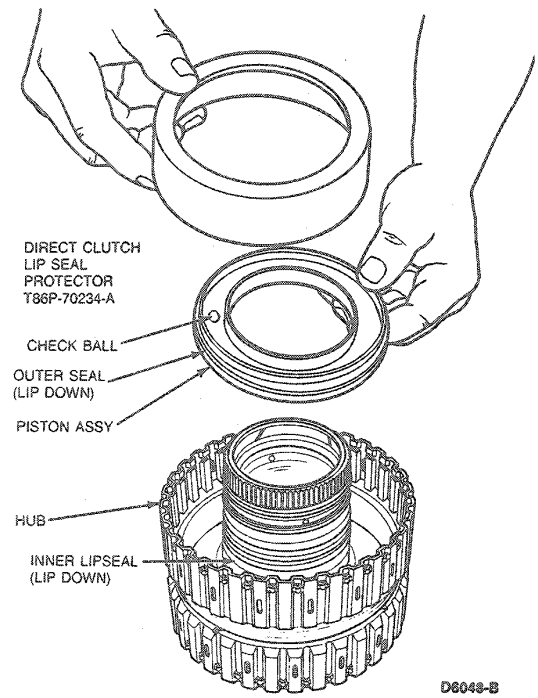


DISASSEMBLY AND ASSEMBLY (Continued)

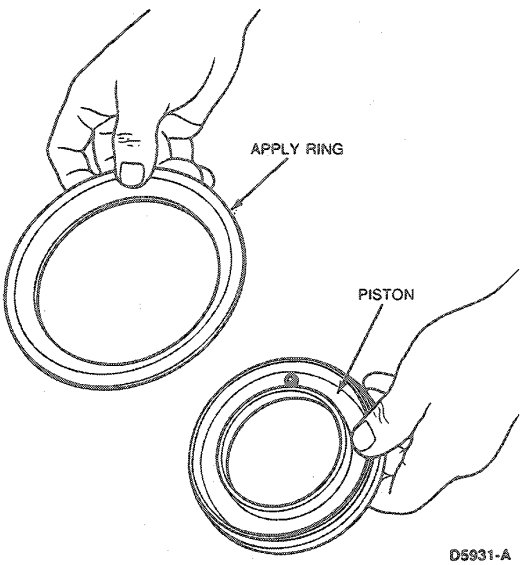


Assembly

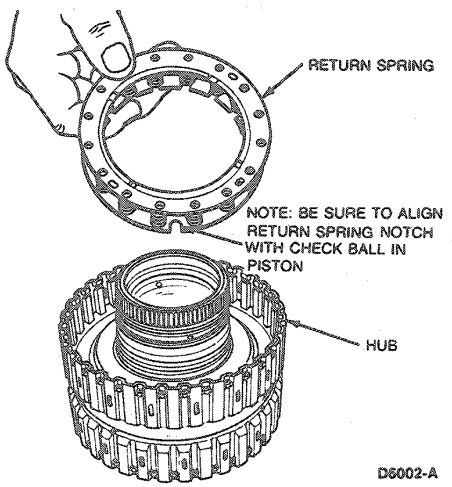
1. Install inner and outer piston lip seals (lip seals facing toward bottom of cylinder) and install into hub using Direct Clutch Lip Seal Protector T86P-70234-A. Be sure piston is seated fully.



2. Install piston apply ring.



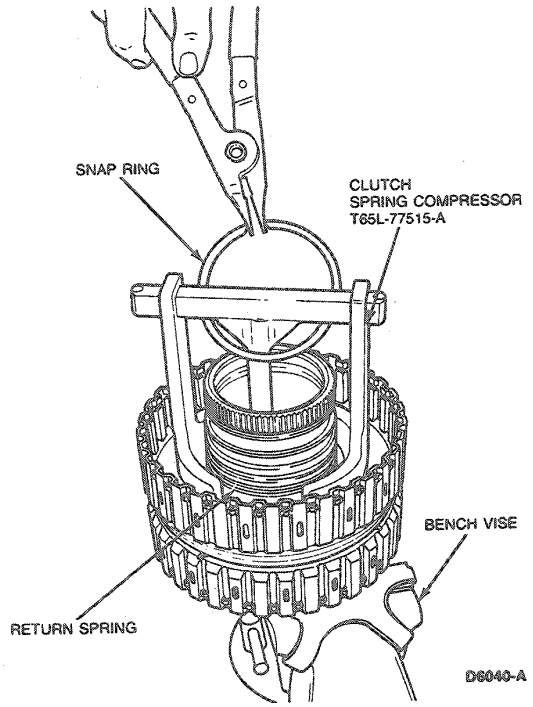
3. Verify free movement of check ball.
4. Install return spring in cylinder aligning return spring notch with check ball in piston.



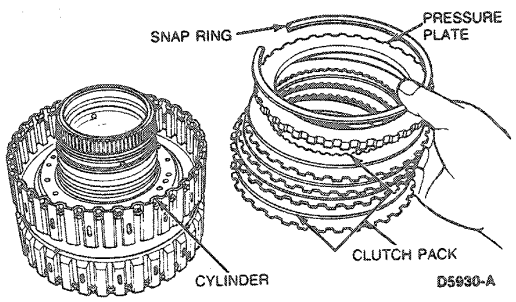
CAUTION: Do not allow tool to bottom out on piston assembly.

DISASSEMBLY AND ASSEMBLY (Continued)

5. Install snap ring using Clutch Spring Compressor T65L-77515-A.



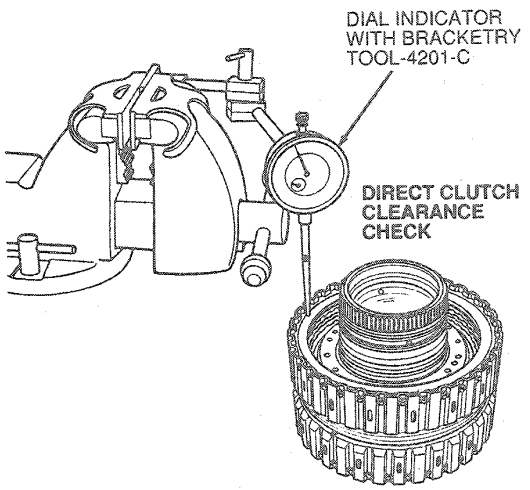
6. Install clutch pack, pressure plate and snap ring into cylinder.



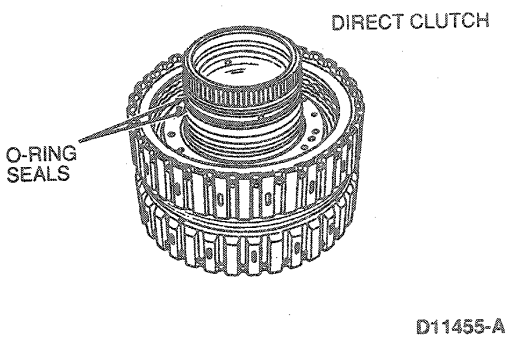
7. Check clutch pack clearance using feeler gauge or Dial Indicator with Bracketry TOOL-4201-C or equivalent. Push firmly downward on the clutch pack. Release pressure and zero dial indicator. Lift pressure plate to the bottom of the snap ring. Note dial indicator reading. Take two readings, 180 degrees apart, and determine the average of the two readings. The clearance should be: 0.78-1.29mm (0.031-0.051 inch). If the clearance is not within specification, selective snap rings are available in the following thicknesses:

Selective Snap Rings
1.24-1.34mm (0.049-0.053 inch)
1.66-1.76mm (0.065-0.069 inch)
2.08-2.18mm (0.082-0.086 inch)
2.50-2.60mm (0.098-0.102 inch)
2.92-3.02mm (0.115-0.119 inch)

After installing the correct snap ring, check the clearance.

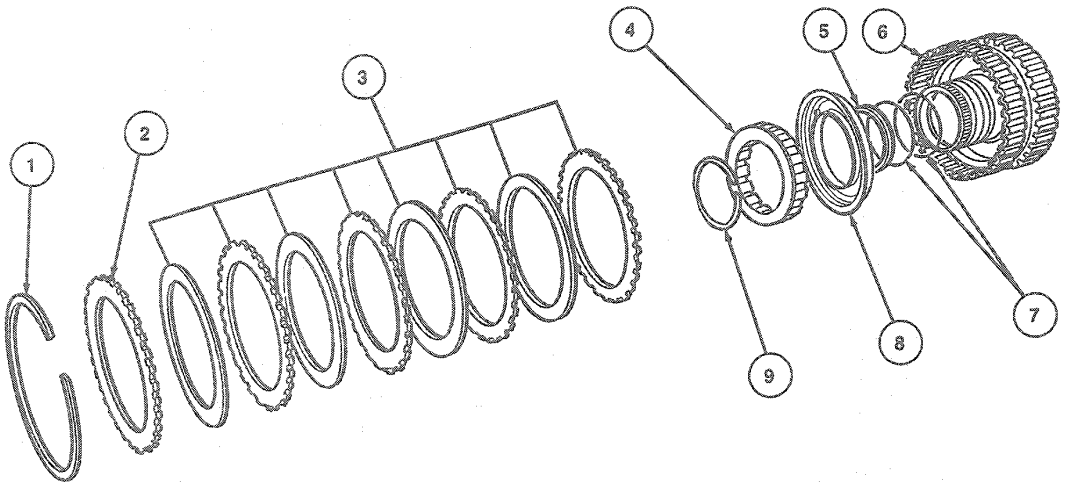


8. Install O-rings.



DISASSEMBLY AND ASSEMBLY (Continued)

Direct Clutch—3.2L SHO



D10599-A

Item	Part Number	Description
1	7D483	Snap Ring
2	7B066	Pressure Plate
3	—	Clutch Pack
4	7F235	Return Spring

(Continued)

Item	Part Number	Description
5	7F225	Inner Piston Seal
6	7G120	Clutch Cylinder
7	7G102	O-Rings
8	7A262	Piston
9	7C122	Snap Ring

Disassembly

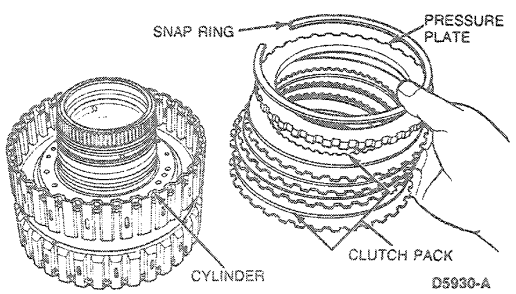
Tools Required:

- Clutch Spring Compressor T65L-77515-A
- Dial Indicator with Bracketry TOOL-4201-C

1. Remove O-ring seals.

   NOTE: Number of components in clutch pack will vary with application.

2. Remove snap ring, pressure plate and clutch pack.

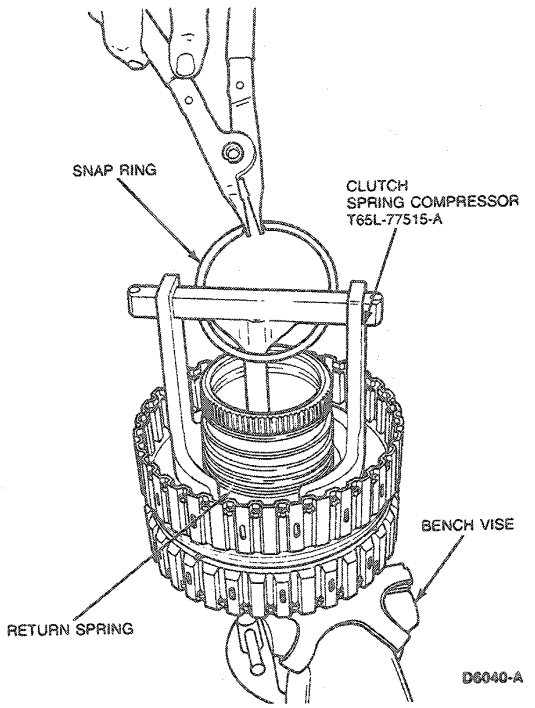


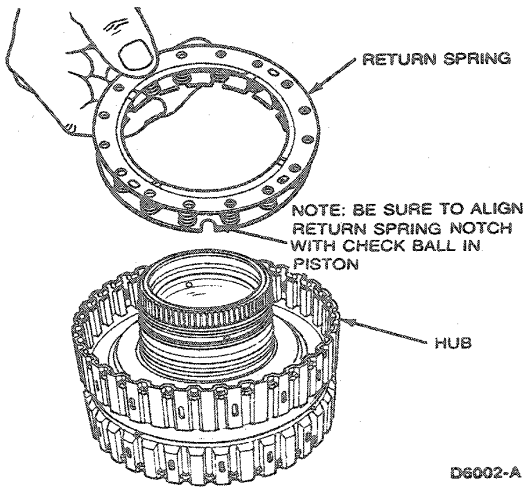
D5930-A

CAUTION: Do not allow tool to bottom out on piston assembly.

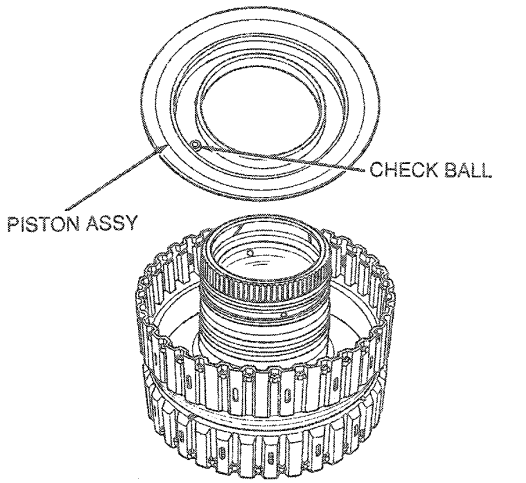
DISASSEMBLY AND ASSEMBLY (Continued)

3. Remove snap ring and return spring using Clutch Spring Compressor T65L-77515-A.

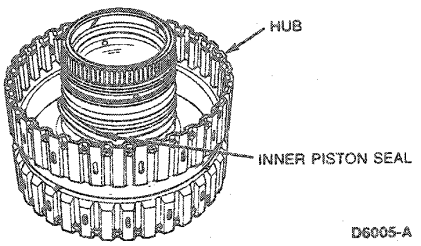




4. Remove two-piece piston assembly.



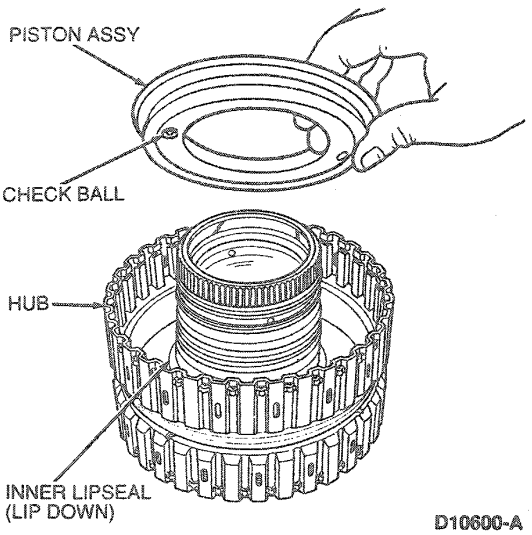
5. Remove piston inner seal.



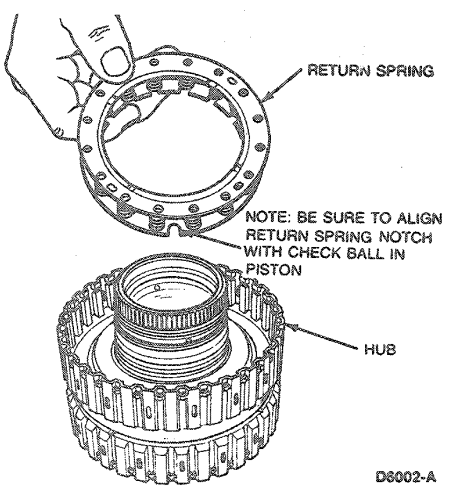
DISASSEMBLY AND ASSEMBLY (Continued)

Assembly

1. Install inner seal (lip seal faces toward bottom of cylinder) and install piston into hub. Be sure piston is seated fully.

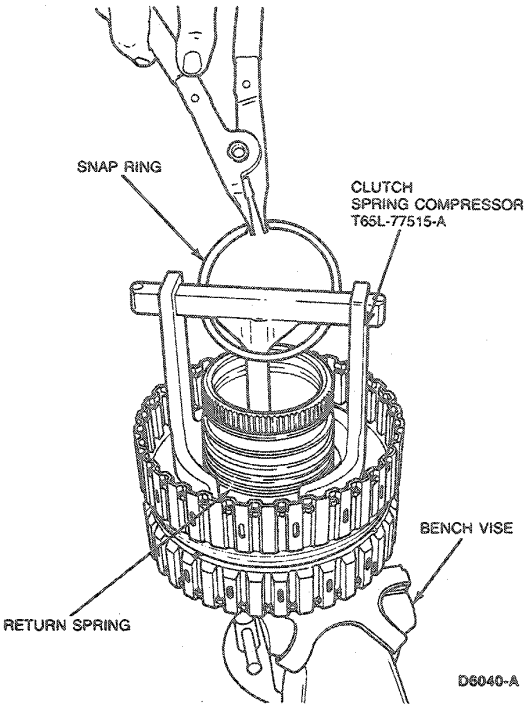


2. Verify free movement of check ball.
3. Install return spring in cylinder aligning return spring notch with check ball in piston.

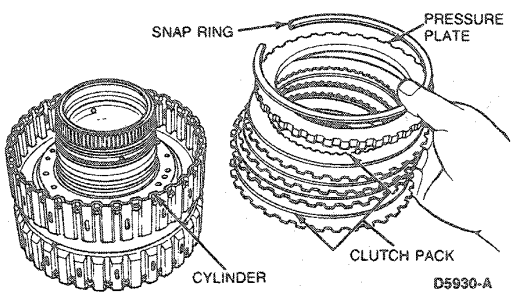


CAUTION: Do not allow tool to bottom out on piston assembly.

4. Install snap ring using Clutch Spring Compressor T65L-77515-A.



5. Install clutch pack, pressure plate and snap ring into cylinder.

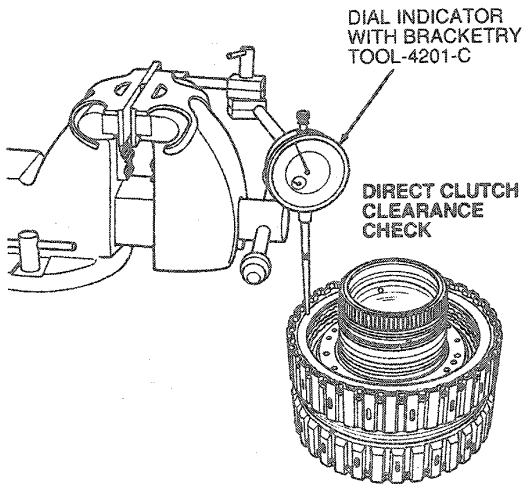


6. Check clutch pack clearance using feeler gauge or Dial Indicator with Bracketry TOOL-4201-C or equivalent. Push firmly downward on the clutch pack. Release pressure and zero dial indicator. Lift pressure plate to the bottom of the snap ring. Note dial indicator reading. Take two readings, 180 degrees apart, and determine the average of the two readings. The clearance should be: 0.78-1.29mm (0.031-0.051 inch). If the clearance is not within specification, selective snap rings are available in the following thicknesses:

DISASSEMBLY AND ASSEMBLY (Continued)

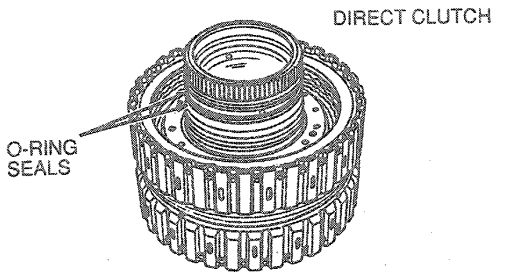
Selective Snap Rings
1.24-1.34mm (0.049-0.053 inch)
1.66-1.76mm (0.065-0.069 inch)
2.08-2.18mm (0.082-0.086 inch)
2.50-2.60mm (0.098-0.102 inch)
2.92-3.02mm (0.115-0.119 inch)

After installing the correct snap ring, check the clearance.



D5903-C

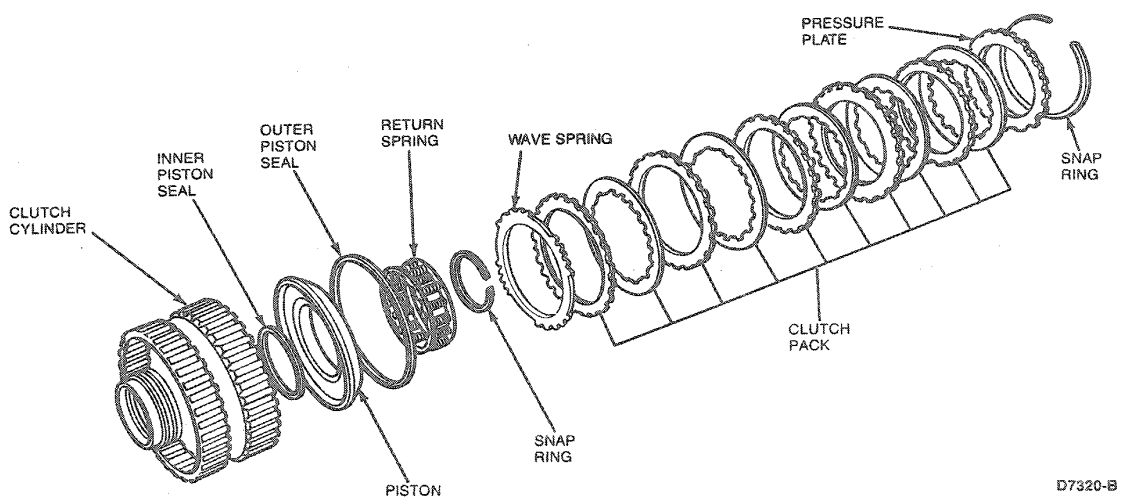
7. Install O-rings.



D11455-A

Intermediate Clutch

All Except 3.2L SHO



D7320-B

DISASSEMBLY AND ASSEMBLY (Continued)

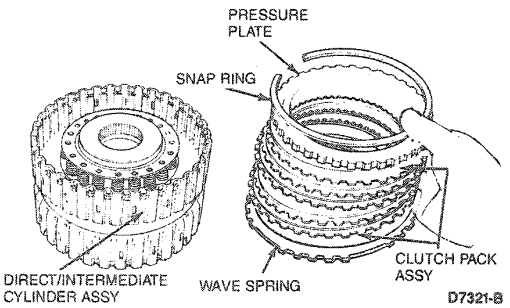
Disassembly

Tools Required:

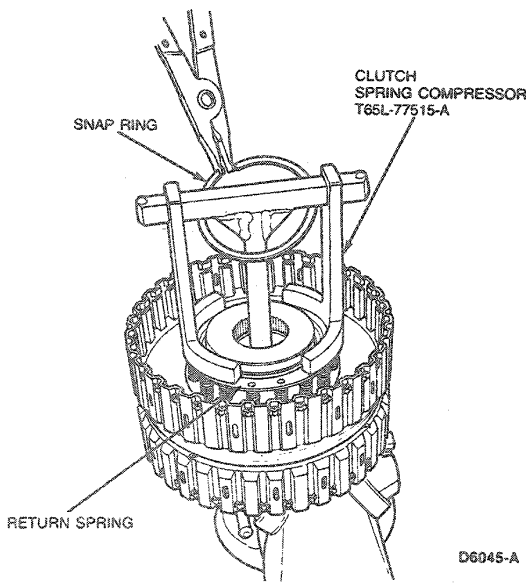
- Clutch Spring Compressor T65L-77515-A
- Forward Intermediate Clutch Seal Outer Lip Protector T86P-70548-A
- Dial Indicator with Bracketry TOOL-4201-C

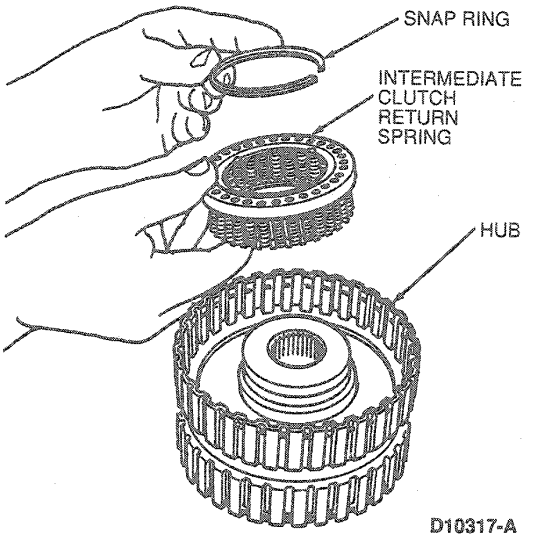
NOTE: Number of components in the clutch pack will vary with application.

1. Remove snap ring, pressure plate and clutch pack assembly.

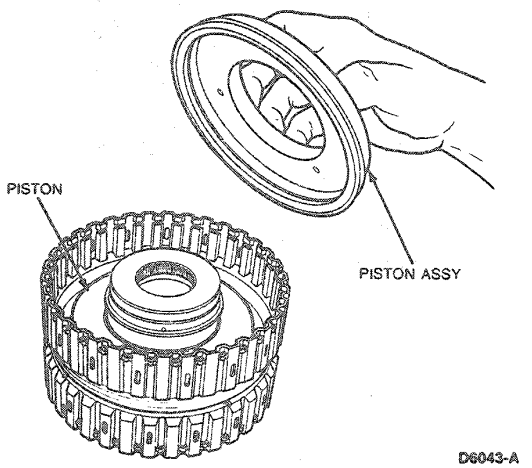


2. Remove snap ring and return spring, using Clutch Spring Compressor T65L-77515-A.

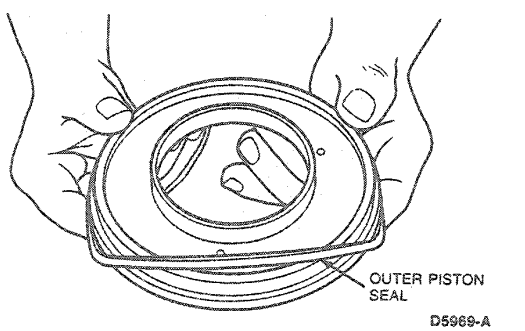




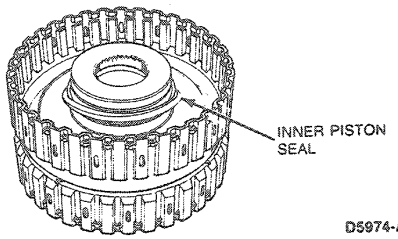
3. Remove piston assembly.



4. Remove piston inner and outer seals.

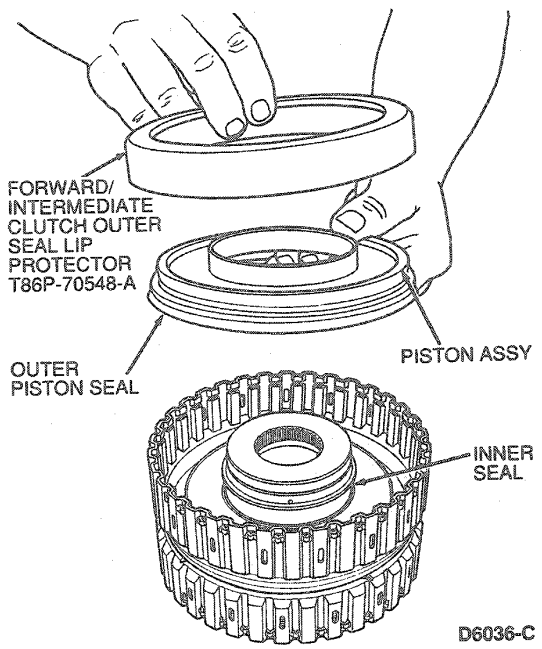


DISASSEMBLY AND ASSEMBLY (Continued)

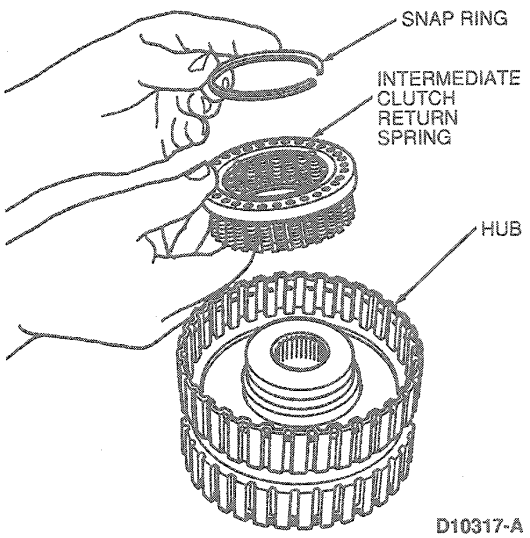


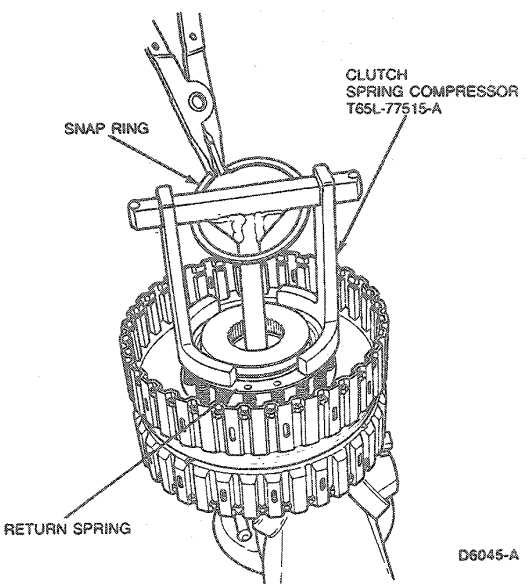
Assembly

1. Check for free movement of check ball in cylinder. Install inner lip seal on cylinder hub and outer piston lip seal (lips facing toward bottom of cylinder) on piston and install piston using Forward / Intermediate Clutch Seal Outer Lip Protector T86P-70548-A.



2. Install snap ring and return spring using Clutch Spring Compressor T65L-77515-A.

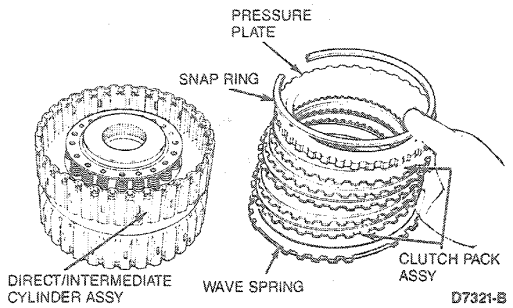




NOTE: Be sure step on pressure plate faces up.

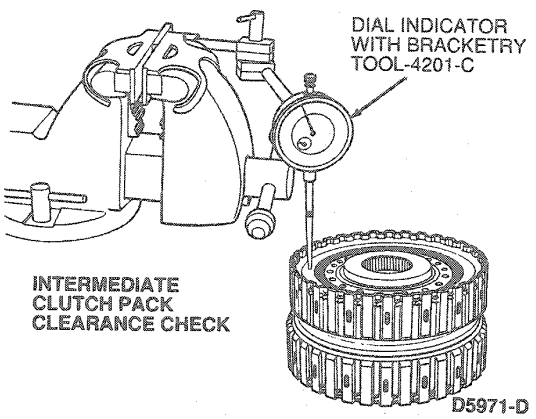
DISASSEMBLY AND ASSEMBLY (Continued)

3. Install clutch pack, pressure plate and snap ring.

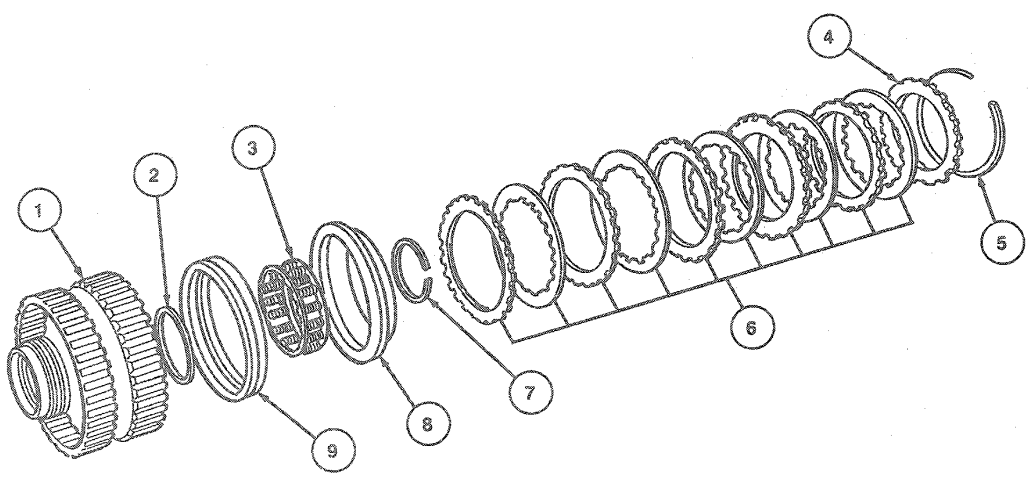


Selective Snap Rings
1.20-1.30mm (0.047-0.051 inch)
1.67-1.77mm (0.066-0.070 inch)
2.14-2.24mm (0.084-0.088 inch)
2.61-2.71mm (0.103-0.107 inch)
3.04-3.14mm (0.120-0.124 inch)

4. Check clutch pack clearance using Dial Indicator with Bracketry TOOL-4201-C or equivalent. Push firmly downward on the clutch pack. Release pressure and zero the dial indicator. Lift pressure plate to the bottom of the snap ring. Note dial indicator reading. Take two readings, 180 degrees apart, and determine the average of the two readings. The clearance should be: (4-Plate) 1.02-1.51mm (0.040-0.059 inch). If the clearance is not within specification, selective snap rings are available in the following thicknesses:



Intermediate Clutch
3.2L SHO



Item	Part Number	Description
1	7G120	Clutch Cylinder
2	7F225	Inner Piston Seal
3	7F222	Return Spring
4	7R066	Pressure Plate

(Continued)

Item	Part Number	Description
5	7D483	Snap Ring
6	—	Clutch Pack
7	7C122	Snap Ring
8	TH185	Return Piston
9	7E005	Piston

DISASSEMBLY AND ASSEMBLY (Continued)

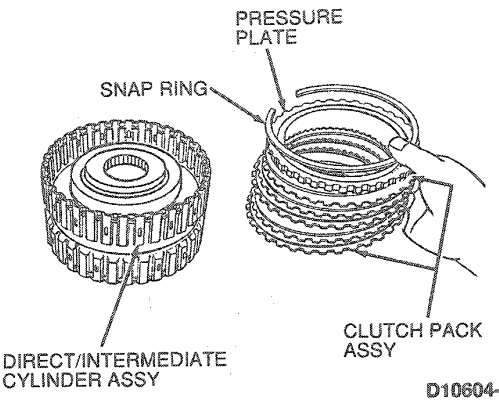
Disassembly

Tools Required:

- Clutch Spring Compressor T65L-77515-A
- Dial Indicator with Bracketry TOOL-4201-C

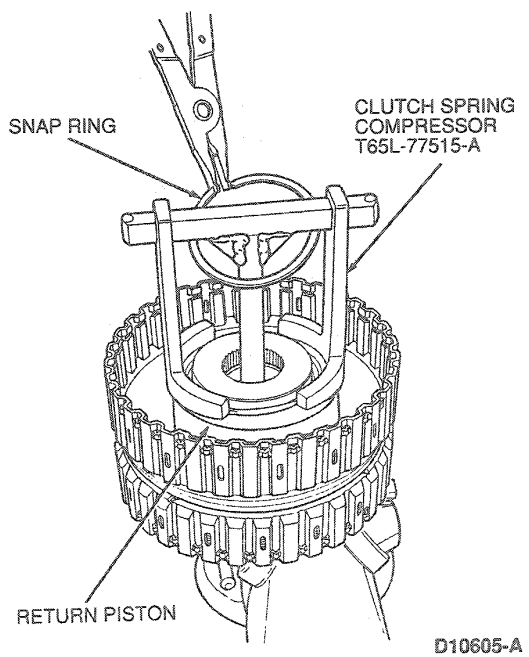
NOTE: Number of components in the clutch pack will vary with application.

1. Remove snap ring, pressure plate and clutch pack assembly.

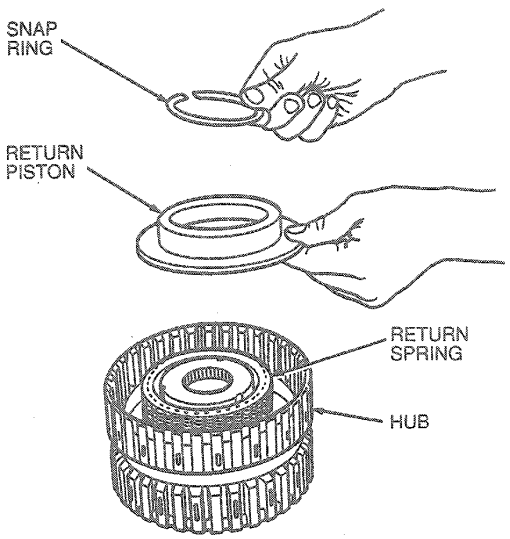


D10604-A

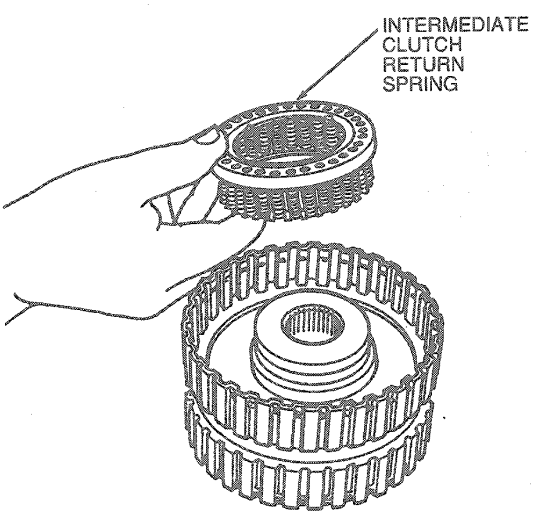
2. Remove snap ring return piston and return spring, using Clutch Spring Compressor T65L-77515-A.



D10605-A



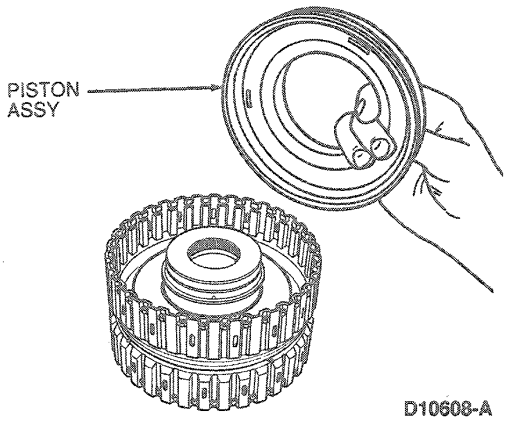
D10606-A



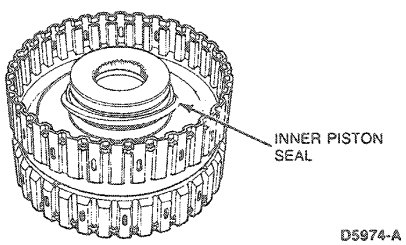
D10607-A

DISASSEMBLY AND ASSEMBLY (Continued)

3. Remove piston assembly.

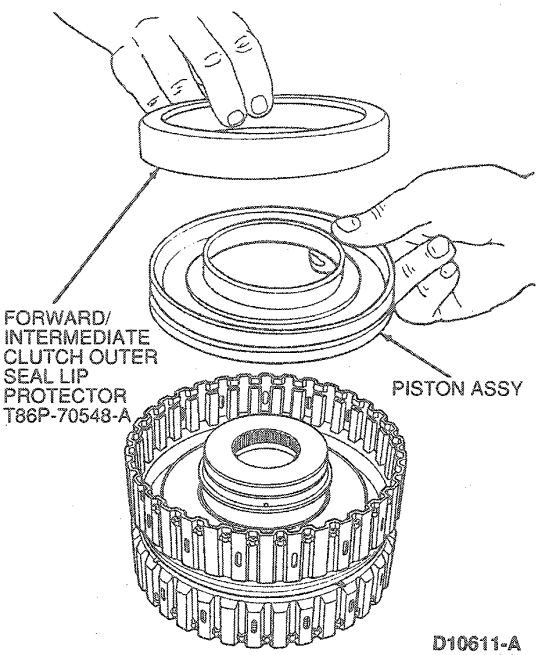


4. Remove piston inner seal.

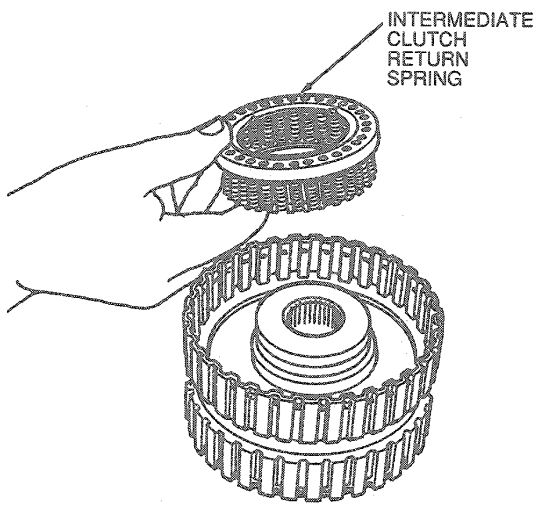


Assembly

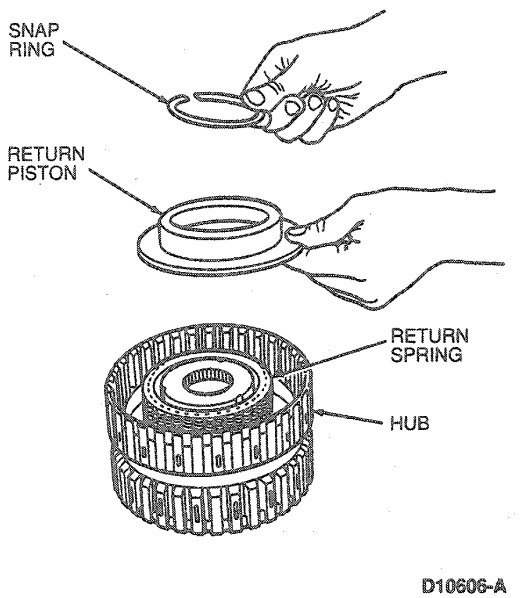
1. Install inner lip seal on cylinder hub (lip facing toward bottom of cylinder). Install piston.

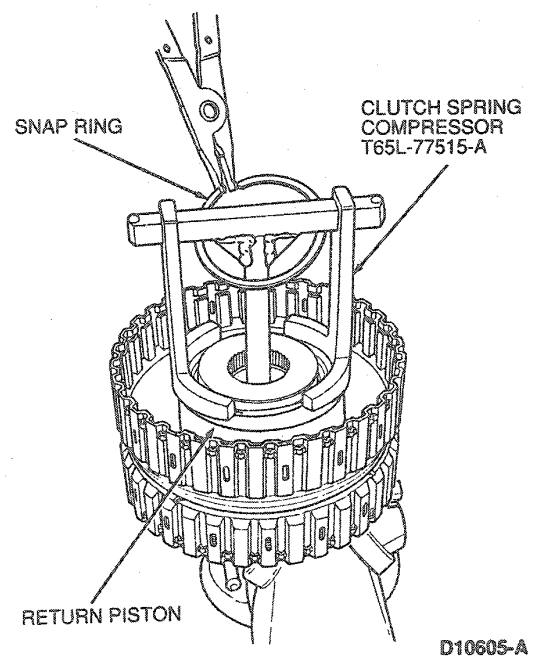


2. Install return spring, return piston and snap ring spring using Clutch Spring Compressor T65L-77515-A.



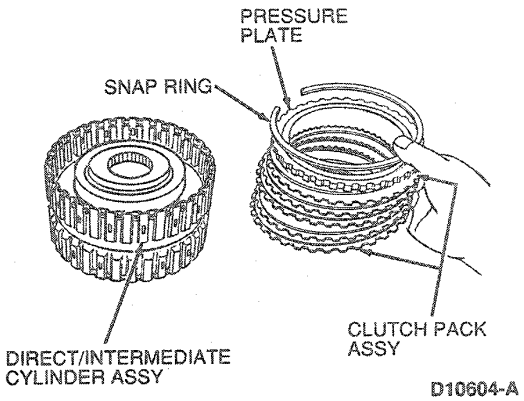
DISASSEMBLY AND ASSEMBLY (Continued)





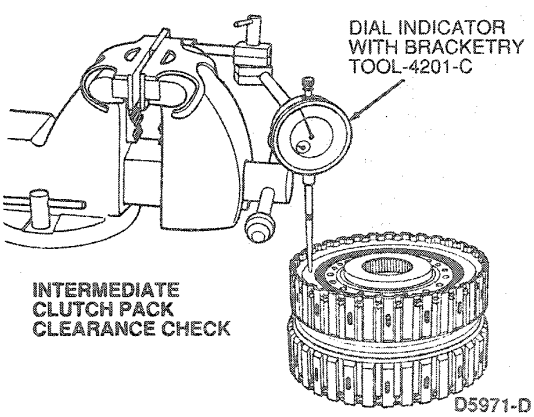
NOTE: Be sure step on pressure plate faces up.

3. Install clutch pack, pressure plate and snap ring.



4. Check clutch pack clearance using Dial Indicator with Bracketry TOOL-4201-C or equivalent. Push firmly downward on the clutch pack. Release pressure and zero the dial indicator. Lift pressure plate to the bottom of the snap ring. Note dial indicator reading. Take two readings, 180 degrees apart, and determine the average of the two readings. The clearance should be: (4-Plate) 1.02-1.51mm (0.040-0.059 inch). If the clearance is not within specification, selective snap rings are available in the following thicknesses:

Selective Snap Rings
1.20-1.30mm (0.047-0.051 inch)
1.67-1.77mm (0.066-0.070 inch)
2.14-2.24mm (0.084-0.088 inch)
2.61-2.71mm (0.103-0.107 inch)
3.04-3.14mm (0.120-0.124 inch)



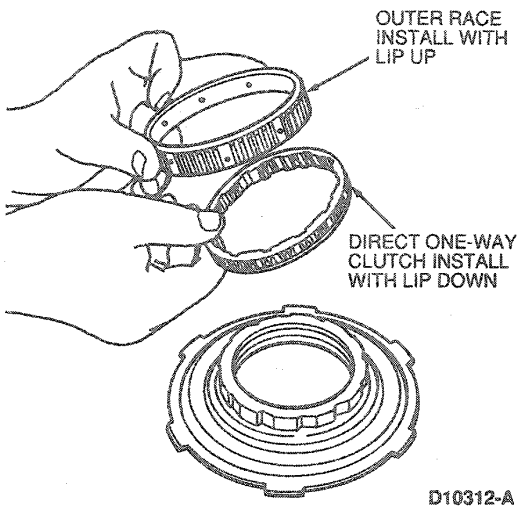
Shell Assembly—All Except 3.2L SHO

Assembly

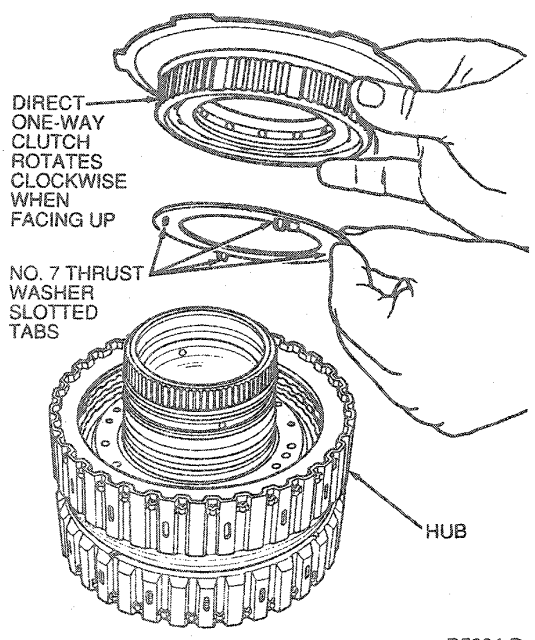
1. Set on intermediate clutch cylinder.
2. Install No. 7 thrust washer into direct clutch being sure tabs are aligned with slots in direct clutch.

DISASSEMBLY AND ASSEMBLY (Continued)

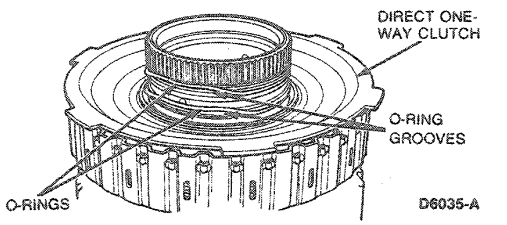
3. Install one-way clutch with lip down and race with lip up.



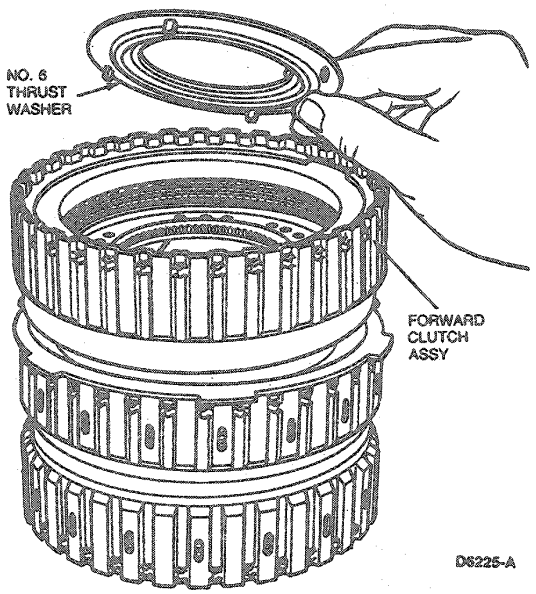
4. Install direct one-way clutch and align onto clutch pack splines.



5. Install two O-ring seals.

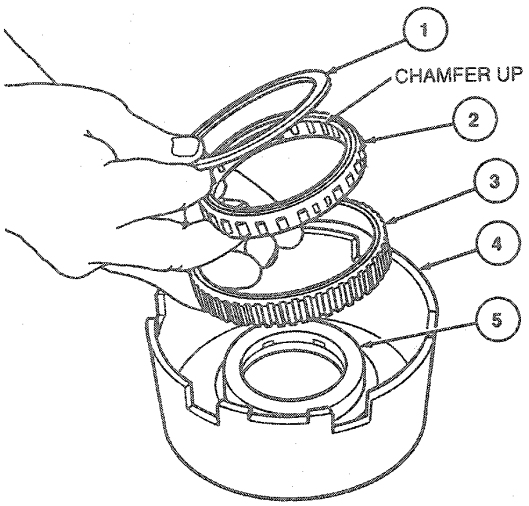


6. Install forward clutch assembly. **Use caution not to damage the O-ring seals on direct clutch hub.**
7. Install No. 6 thrust washer. Be sure oval pegs go into oval holes.



8. Install bottom cap, overdrive one-way clutch with chamfer up, outer race and top cap.

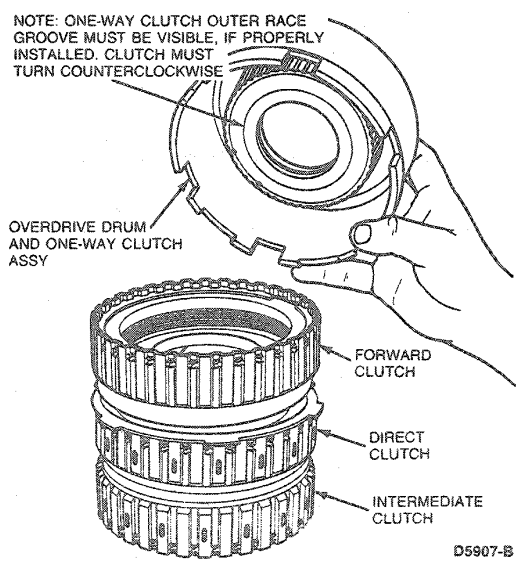
DISASSEMBLY AND ASSEMBLY (Continued)



D10311-A

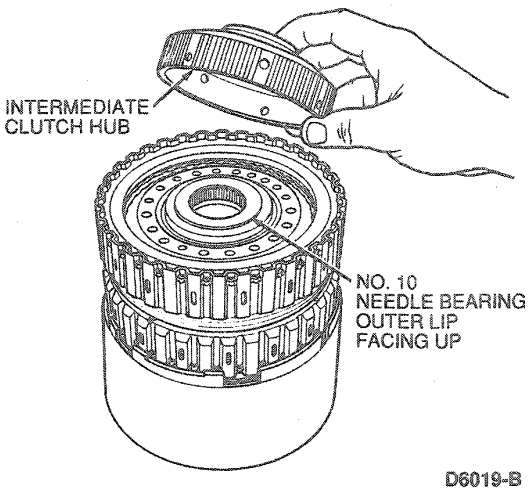
Item	Description
1	Top Cap
2	Overdrive One-Way Clutch
3	Outer Race
4	Overdrive Drum
5	Bottom Cap

9. Install overdrive drum and one-way clutch assembly. Ensure drum is fully seated.



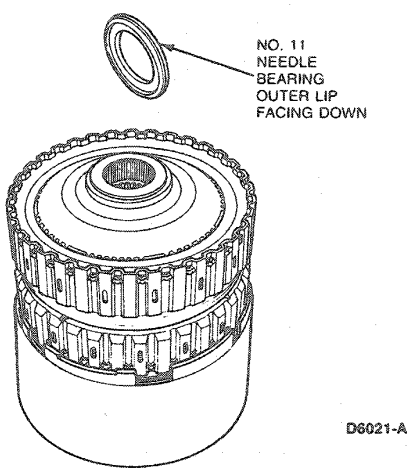
D5907-B

10. Turn assembly over and set on overdrive drum.
11. Install No. 10 needle bearing onto intermediate clutch hub using petroleum jelly to hold in place.
12. Install intermediate clutch hub with No. 10 needle bearing onto overdrive hub. Ensure hub is fully seated.



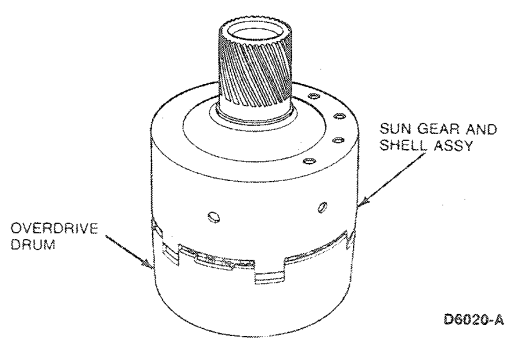
D6019-B

13. Install No. 11 needle bearing with outer lip facing down.



D6021-A

14. Install sun gear and shell assembly.



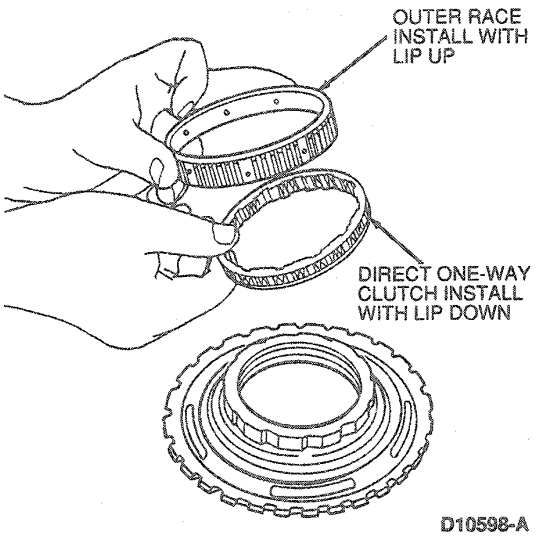
D6020-A

DISASSEMBLY AND ASSEMBLY (Continued)

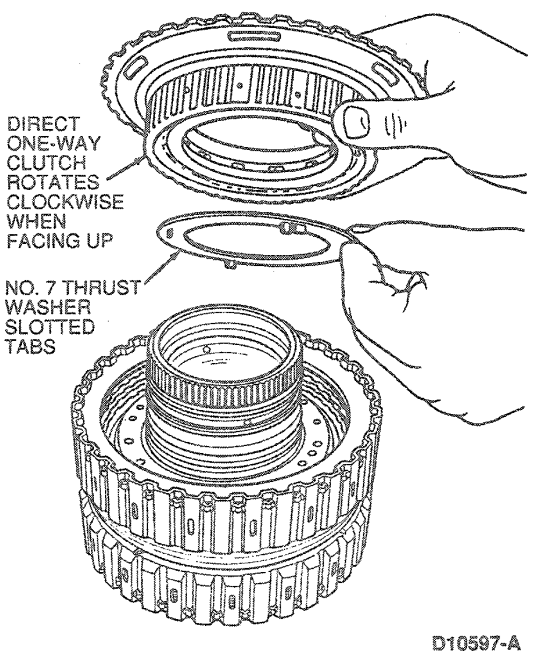
Shell Assembly—3.2L SHO

Assembly

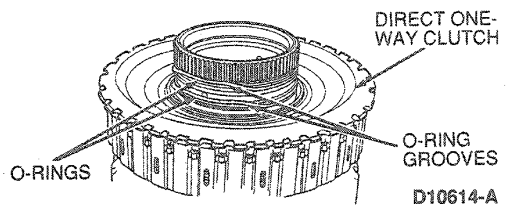
1. Set on intermediate clutch cylinder.
2. Install No. 7 thrust washer into direct clutch being sure tabs are aligned with slots in direct clutch.
3. Install one-way clutch with lip down and race with lip up.



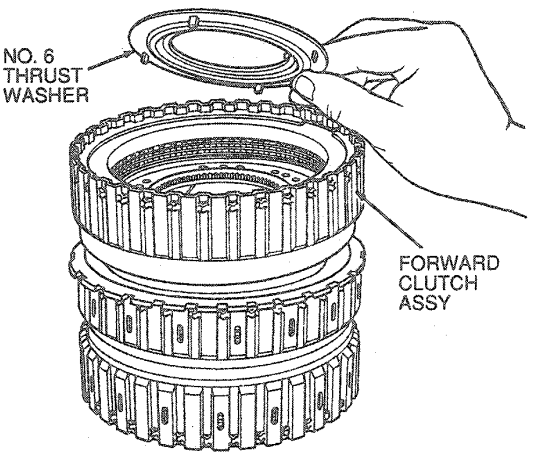
4. Install direct one-way clutch and align onto clutch pack splines.



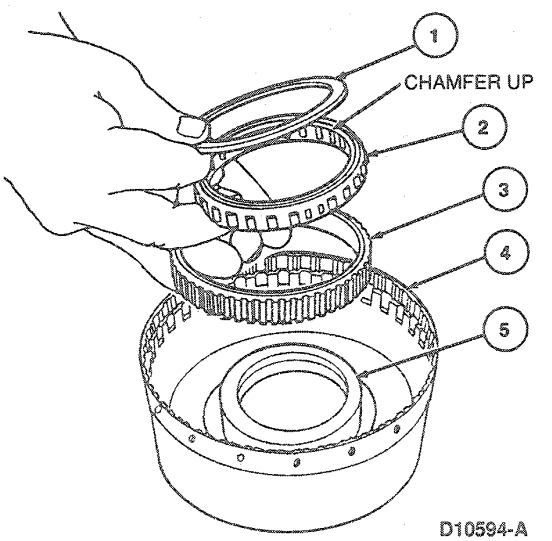
5. Install two O-ring seals.



6. Install forward clutch assembly. **Use caution not to damage the O-ring seals on direct clutch hub.**
7. Install No. 6 thrust washer. Be sure oval pegs go into oval holes.



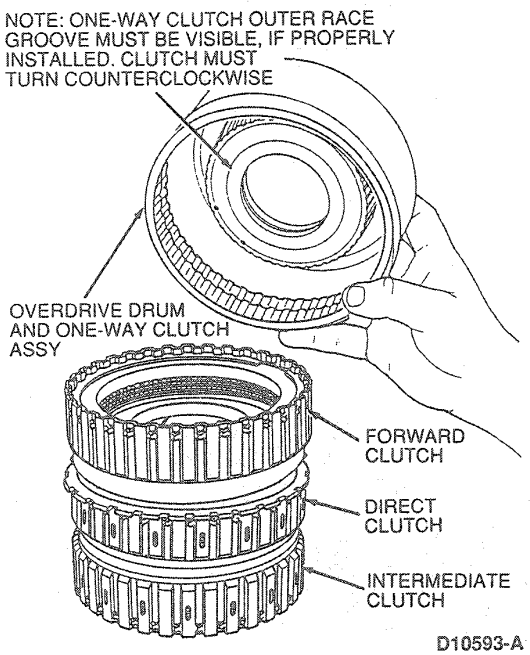
8. Install bottom cap, overdrive one-way clutch with chamfer up, outer race and top cap.



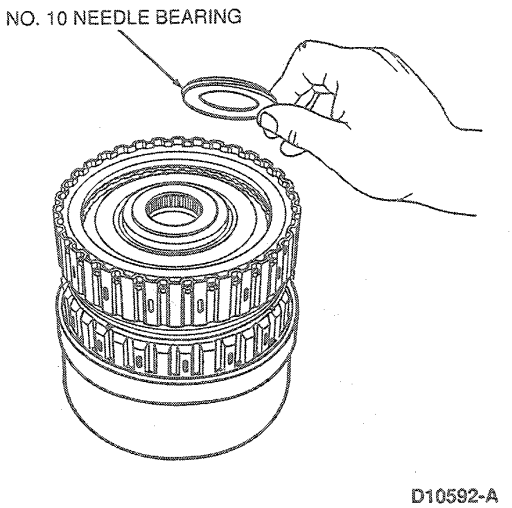
DISASSEMBLY AND ASSEMBLY (Continued)

Item	Part Number	Description
1	—	Top Oil Cap (Part of 7D171)
2	7D171	Overdrive One-Way Clutch
3	—	Outer Race (Part of 7D171)
4	7L669	Overdrive Drum
5	—	Bottom Oil Cap (Part of 7D171)

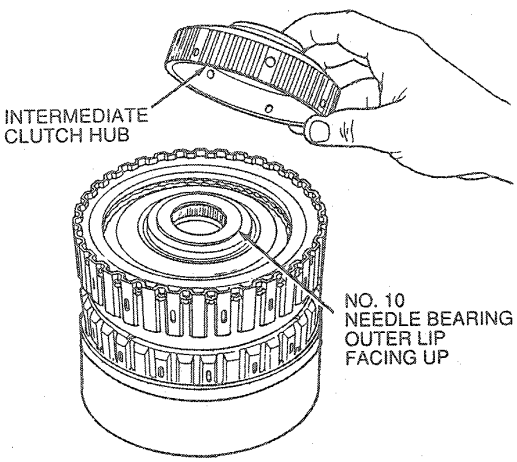
9. Install overdrive drum and one-way clutch assembly. Ensure drum is fully seated.



10. Turn assembly over and set on overdrive drum.
11. Install No. 10 needle bearing onto intermediate clutch hub using petroleum jelly to hold in place.

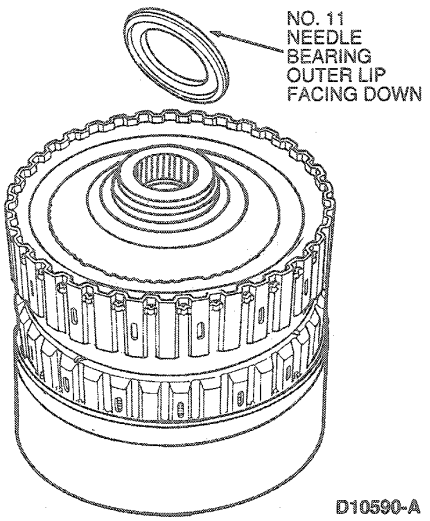


12. Install intermediate clutch hub with No. 10 needle bearing. Ensure hub is fully seated.



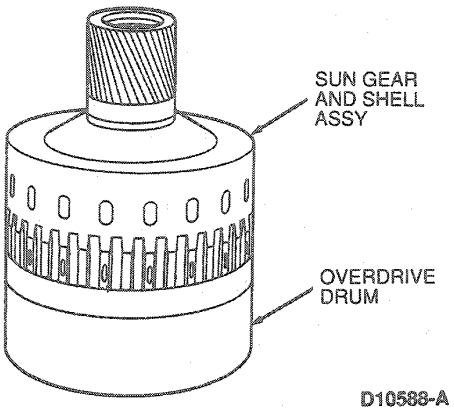
DISASSEMBLY AND ASSEMBLY (Continued)

13. Install No. 11 needle bearing with outer lip facing down.



D10590-A

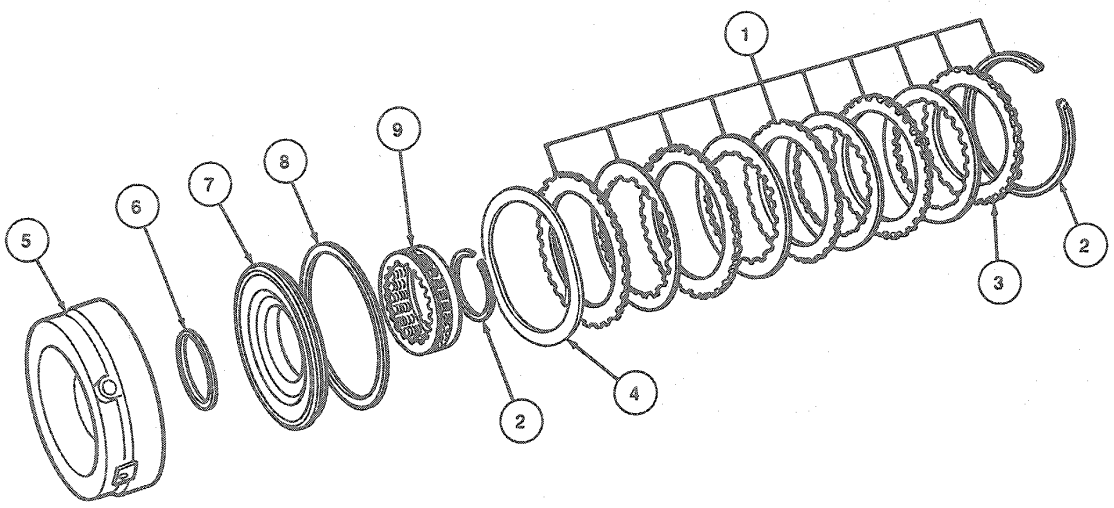
14. Install sun gear and shell assembly.



D10588-A

Reverse Clutch

Disassembled View



D5955-D

Item	Description
1	Clutch Pack
2	Snap Ring
3	Pressure Plate
4	Wave Spring

(Continued)

Item	Description
5	Clutch Cylinder
6	Inner Piston Seal
7	Piston
8	Outer Piston Seal
9	Return Spring

DISASSEMBLY AND ASSEMBLY (Continued)

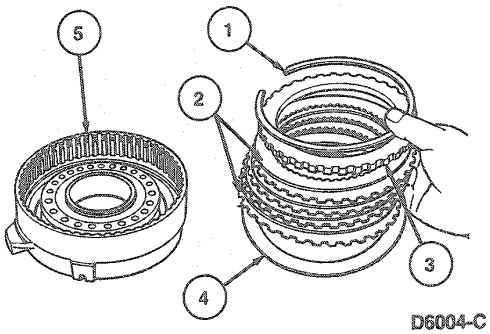
Disassembly

Tools Required:

- Clutch Spring Compressor T65L-77515-A
- Reverse Clutch Outer Lip Seal Protector T86P-70403-A
- Dial Indicator with Bracketry TOOL-4201-C

NOTE: Number of pieces in clutch pack will vary with application.

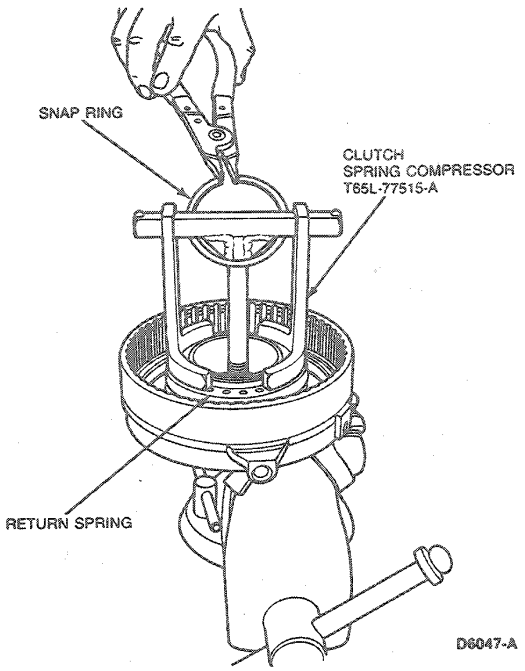
1. Remove snap ring, pressure plate, clutch pack and wave spring.



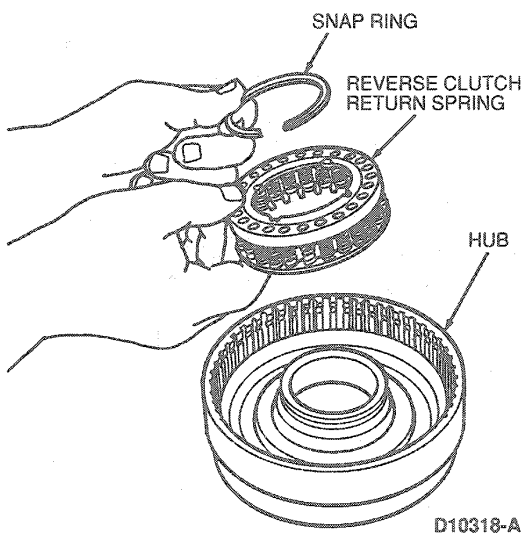
D6004-C

Item	Description
1	Snap Ring
2	Clutch Pack Assy
3	Pressure Plate
4	Wave Spring
5	Cylinder

2. Using Clutch Spring Compressor T65L-77515-A, remove snap ring and return spring.

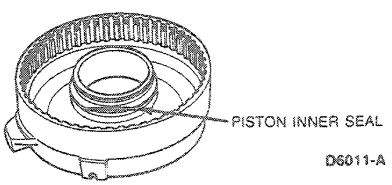


D6047-A



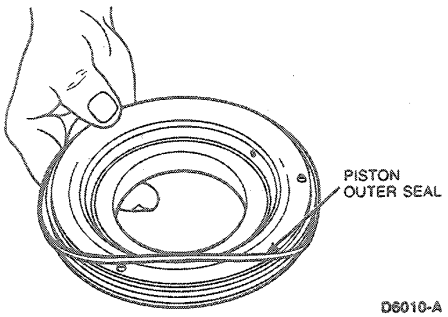
D10318-A

3. Lift out piston and remove piston inner and outer seals.



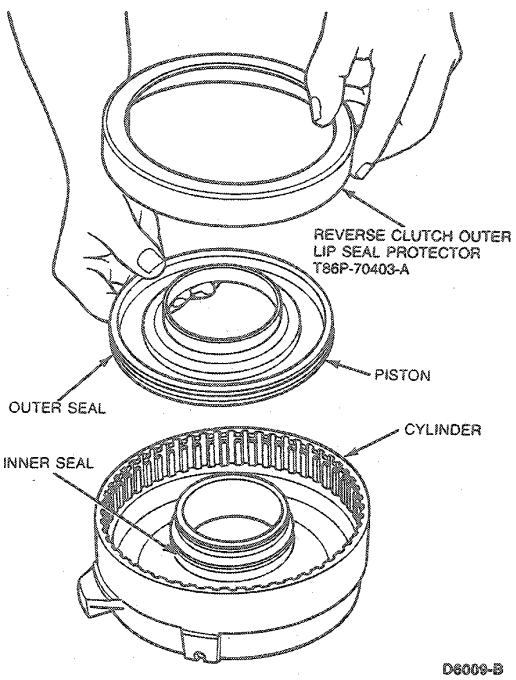
D6011-A

DISASSEMBLY AND ASSEMBLY (Continued)

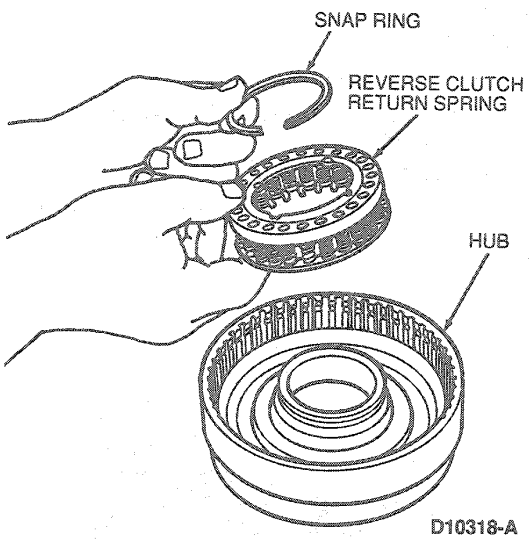


Assembly

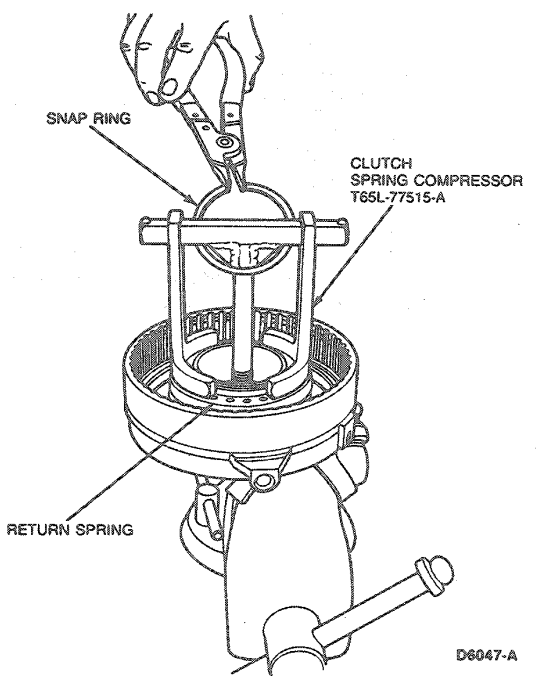
1. Install inner and outer piston lip seals (lips facing toward bottom of cylinder) and install piston using Reverse Clutch Outer Lip Seal Protector T86P-70403-A.



2. Install return spring .

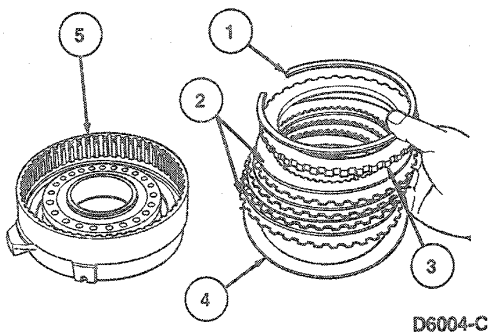


3. Compress return spring using Clutch Spring Compressor T65L-77515-A. Install snap ring.



4. Install wave spring, clutch pack, pressure plate and snap ring.

DISASSEMBLY AND ASSEMBLY (Continued)



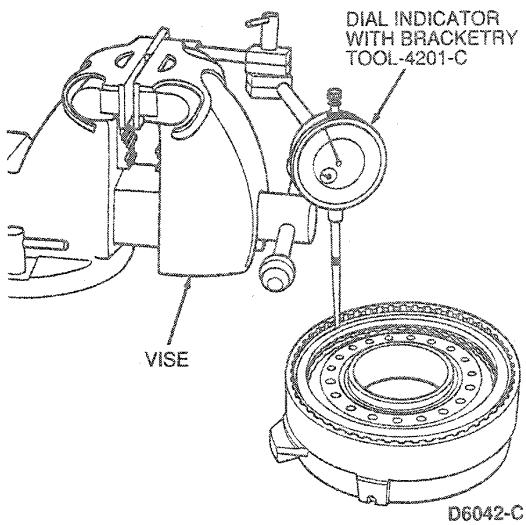
D6004-C

Item	Description
1	Snap Ring
2	Clutch Pack Assy
3	Pressure Plate
4	Wave Spring
5	Cylinder

5. Check clutch pack clearance using feeler gauge or Dial Indicator with Bracketry TOOL-4201-C or equivalent. Push firmly downward on the clutch pack. Release pressure and zero dial indicator. Lift pressure plate to the bottom of the snap ring. Note dial indicator reading. Take two readings, 180 degrees apart, and determine the average of the two readings. The clearance should be: 0.97-1.63mm (0.038-0.064 inch). If the clearance is not within specification, selective snap rings are available in the following thicknesses:

Selective Snap Rings
1.52-1.62mm (0.059-0.064 inch)
1.98-2.08mm (0.078-0.081 inch)
2.45-2.55mm (0.096-0.100 inch)
2.92-3.02mm (0.115-0.118 inch)

After installing the correct snap ring, check the clearance.

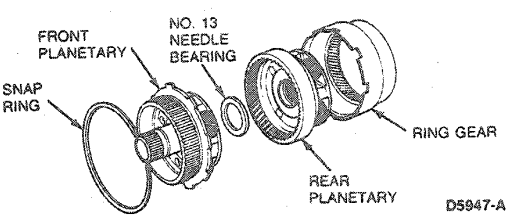


D6042-C

Planetary Assembly

Disassembly

1. Remove snap ring.
2. Remove front planetary.
3. Remove No. 13 needle bearing.
4. Remove rear planetary from shell and ring gear assembly.



D5947-A

Assembly

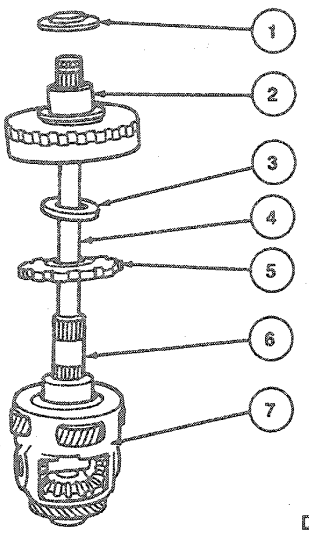
1. Install rear planetary into shell and ring gear assembly.
2. Install No. 13 needle bearing.
3. Install front planetary.
4. Install snap ring.

Differential and Gearset

Disassembly

1. Remove rear planetary support, No. 15 needle bearing, park wheel, No. 16 needle bearing and final drive sun gear by lifting off.

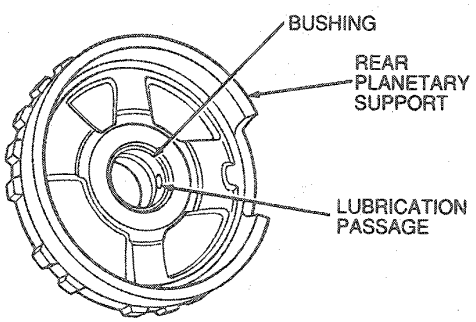
DISASSEMBLY AND ASSEMBLY (Continued)



D10319-A

Item	Description
1	No. 15 Needle Bearing
2	Rear Planetary Support
3	No. 16 Needle Bearing
4	Output Shaft
5	Park Wheel
6	Final Drive Sun Gear
7	Differential Assy

2. Check to be sure hole in bushing in rear planet is aligned with lubrication passage. If not, replace support, as bushing is not serviced.

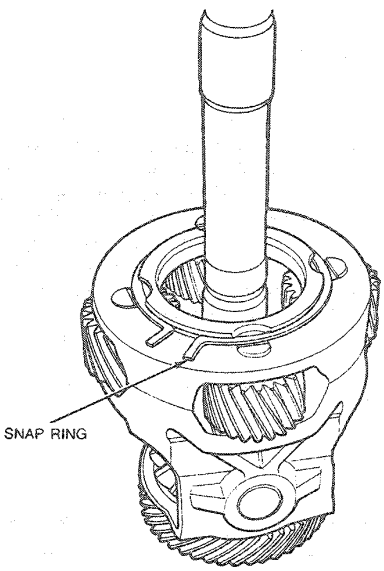


D10320-A

3. Remove seal and discard.

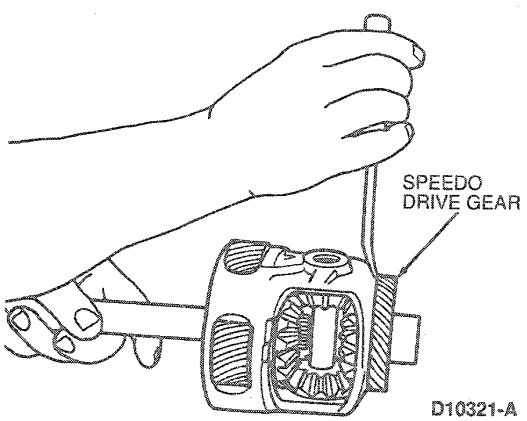
D10587-A

4. Check snap ring to verify that it is fully seated in its groove.



D6204-A

5. If necessary remove speedometer drive gear by gently prying off with a screwdriver.

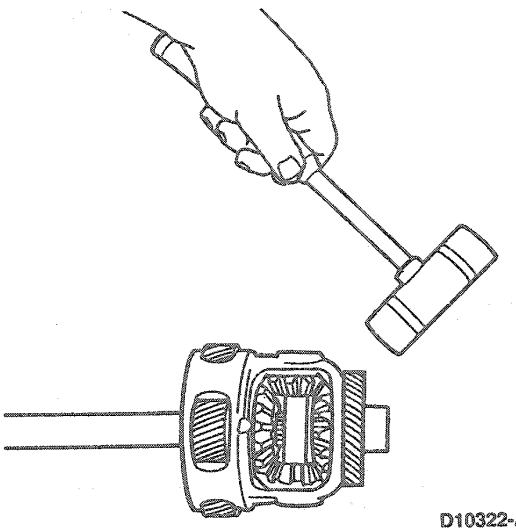


D10321-A

DISASSEMBLY AND ASSEMBLY (Continued)

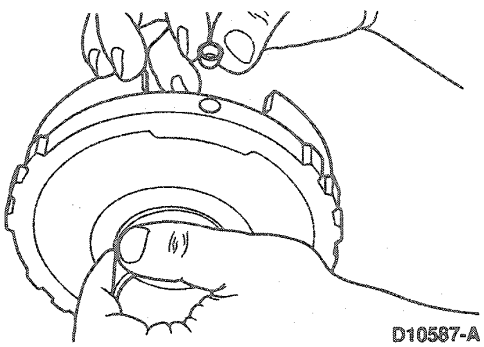
Assembly

1. If removed, position speedometer drive gear and gently tap into place using soft-faced hammer. Be sure gear is fully seated.



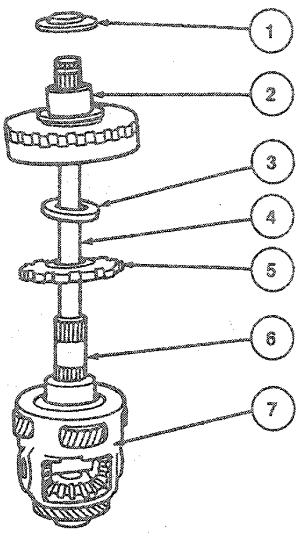
D10322-A

2. Install rear lubrication tube seal in support.



D10587-A

3. Slide final drive sun gear, No. 16 needle bearing, park wheel, No. 15 needle bearing and rear planetary support into place.



D10319-A

Item	Description
1	No. 15 Needle Bearing
2	Rear Planetary Support
3	No. 16 Needle Bearing
4	Output Shaft
5	Park Wheel
6	Final Drive Sun Gear
7	Differential Assy

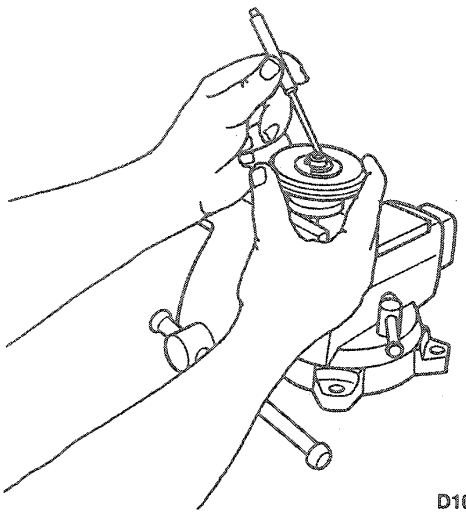
Low-Intermediate Servo

Disassembly

1. Remove spring retainer.
2. Remove piston return spring.
3. Remove servo piston and rod from cover.

DISASSEMBLY AND ASSEMBLY (Continued)

4. Place piston assembly in soft jawed vise, pry off piston rod retaining clips and remove rod and cushion spring.

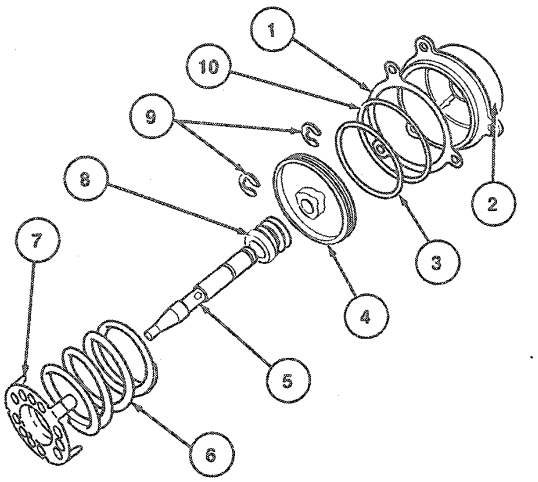


D10323-A

5. Remove servo piston seal.
6. Remove seal and gasket from cover.

Assembly

1. Install front piston rod retaining clip on piston rod.
2. Install cushion spring and piston.
3. Compress assembly and install rear piston rod retaining clip.
4. Install servo piston seal.
5. Install cover seal and gasket.
6. Lubricate piston seals with petroleum jelly.
7. Install assembled piston components into servo cover.
8. Install piston return spring into cover.
9. Install retainer onto spring.



D5946-C

Item	Description
1	Servo Cover Gasket
2	Servo Cover
3	Piston Seals
4	Servo Piston
5	Piston Rod
6	Piston Return Spring
7	Spring Retainer
8	Cushion Spring
9	Piston Retaining Clips
10	Cover Seal

TD5946C

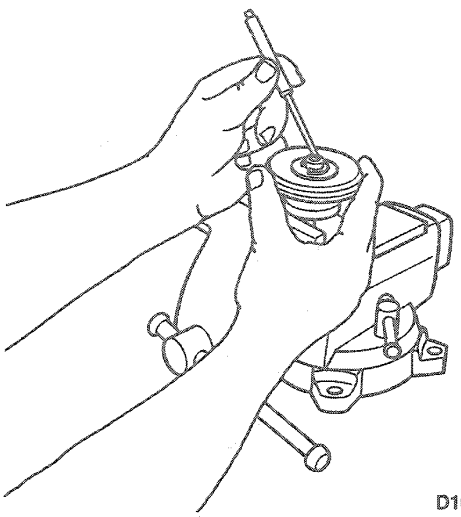
Overdrive Servo

Disassembly

1. Remove return spring.
2. Remove servo piston from cover.

DISASSEMBLY AND ASSEMBLY (Continued)

3. Place piston assembly in soft jawed vise, pry off rear piston rod retaining clip and remove washer.



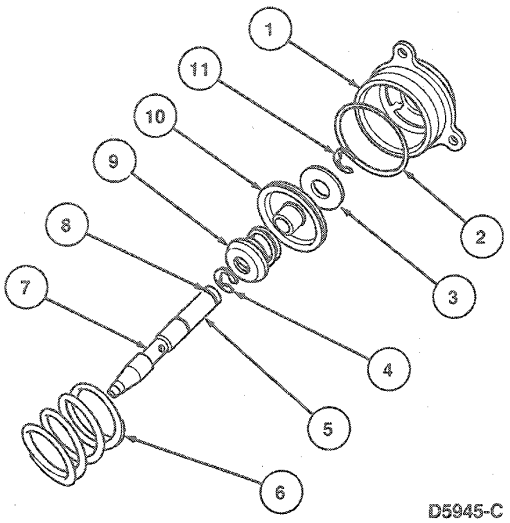
D10323-A

NOTE: Piston and seal are an assembly. If seal is damaged, replace the piston assembly.

4. Remove servo piston and seal.
5. Remove cushion spring.
6. Remove front piston rod retaining clip, if necessary.
7. Remove cover seal.

Assembly

1. Install front piston rod retaining clip on piston rod.
2. Install cushion spring, piston and washer.
3. Compress assembly and install rear piston rod retaining clip.
4. Lubricate piston seal with petroleum jelly.
5. Install cover seal.
6. Install assembled servo components into case cover.



D5945-C

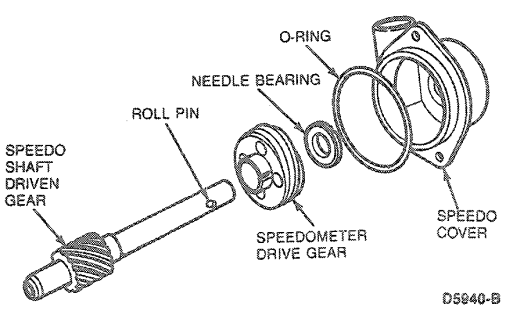
Item	Description
1	Servo Cover
2	Cover Seal
3	Washer
4	Front Retaining Clip
5	Front Groove
6	Piston Return Spring
7	Servo Rod
8	Rear Groove
9	Cushion Spring
10	Servo Piston
11	Rear Retaining Clip

TD5945C

Speedometer Drive Gear Assembly

Disassembly

1. Remove seal and discard.
2. Remove speedometer drive bearing and gear from speedometer shaft.



D5940-B

DISASSEMBLY AND ASSEMBLY (Continued)

Assembly

1. Push speedometer drive gear onto speedo shaft aligning slots in gear with shaft roll pin.
2. Install speedometer drive gear bearing on speedometer drive gear with outer race (black side) facing up.
3. Install new seal on cover.
4. Install two 8mm cover bolts. Tighten to 9-12 N·m (7-9 lb-ft).

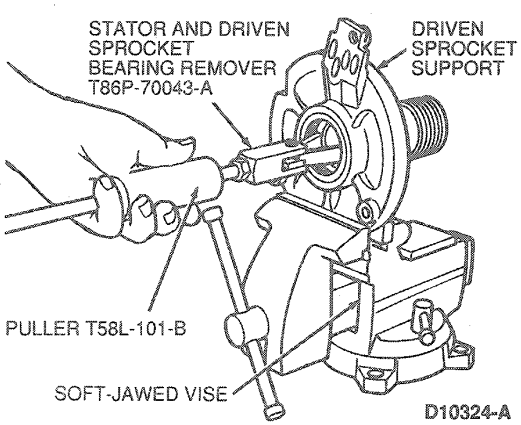
Driven Sprocket Support

Tools Required:

- Puller T58L-101-B
- Stator and Driven Sprocket Bearing Remover T86P-70043-A
- Stator and Driven Sprocket Bearing Replacer T86P-70043-B
- Impact Slide Hammer T50T-100-A

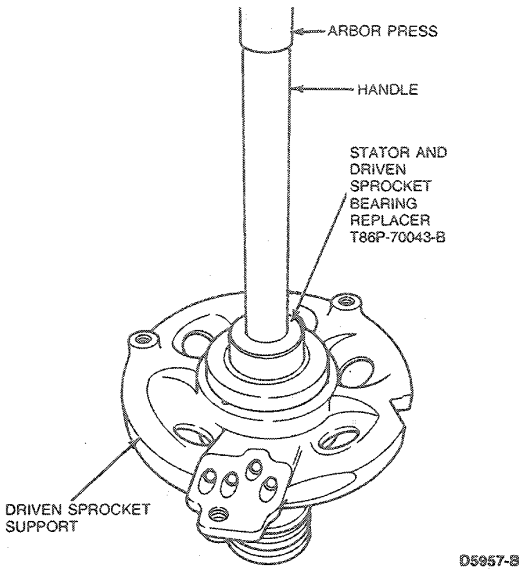
Disassembly

1. Clamp sprocket support vertically in a soft-jawed vise.
2. Remove driven sprocket support needle bearing using Stator and Driven Sprocket Bearing Remover T86P-70043-A, Impact Slide Hammer T50T-100-A and Puller T58L-101-B.



Assembly

1. Press driven sprocket support needle bearing using Stator and Driven Sprocket Bearing Replacer T86P-70043-B.



Transaxle Assembly

Tools Required:

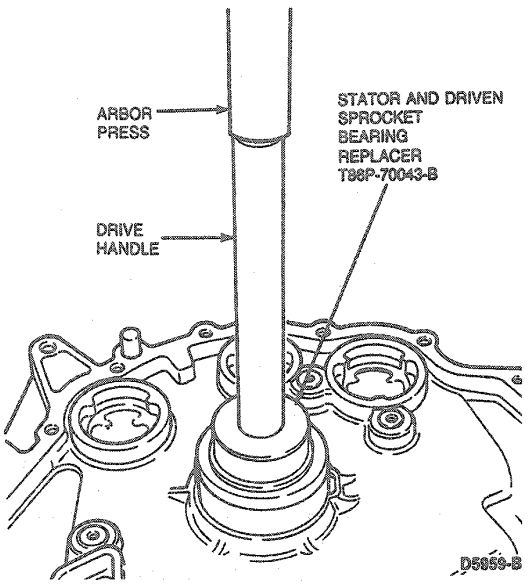
- Output Shaft Seal Replacer T86P-1177-B
- Overdrive Servo Rod Tool T86P-70023-B
- Stator and Driven Sprocket Bearing Replacer T86P-70043-B
- Front Clutch Loading Tool T86P-70389-A
- End Play Tool T87P-70014-AH
- Front Pump Seal Installer T87L-77837-AH
- Transmission Test Plate T91P-7006-A
- Gear Position Sensor Adjuster T91P-70010-A
- Dial Indicator with Bracketry TOOL-4201-C

Assembly

1. Position case in horizontal position.

DISASSEMBLY AND ASSEMBLY (Continued)

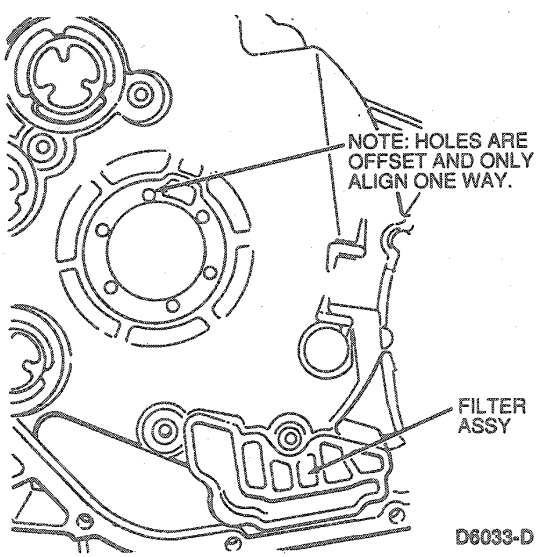
2. If bearing was removed, install drive sprocket support needle bearing using Stator and Driven Sprocket Bearing Replacer T86P-70043-B.



NOTE: Bolt holes are offset. Sprocket support can only be aligned one way. Drain hole points downward.

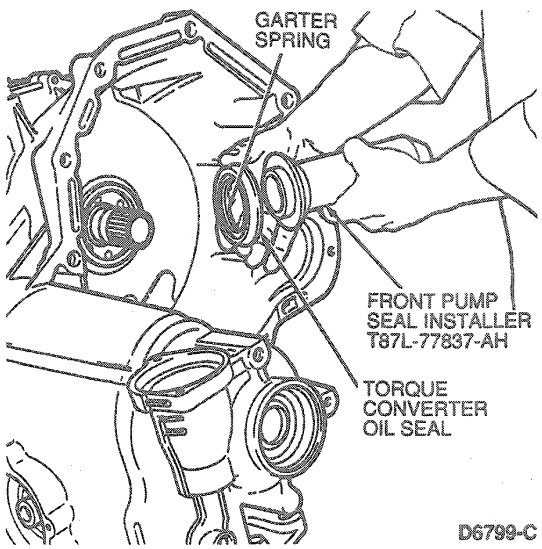
If removed, install drive sprocket support. Install six (T-30) Torx® bolts and tighten to 7-9 N·m (5-7 lb-ft).

3. Clean filter with compressed air and install.



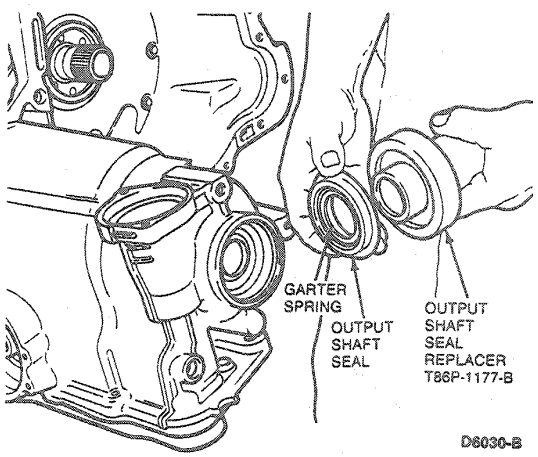
NOTE: After installation, verify presence of garter spring on seal.

4. Install converter oil seal using Front Pump Seal Installer T87L-77837-AH.



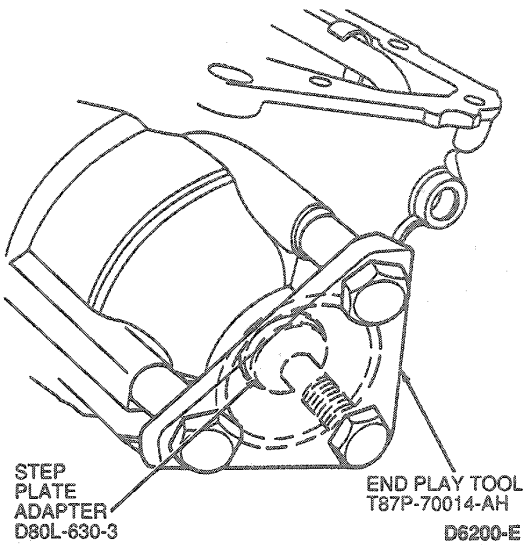
NOTE: After installation, verify presence of garter spring on seal.

5. Install RH output shaft seal using Output Shaft Seal Replacer T86P-1177-B.

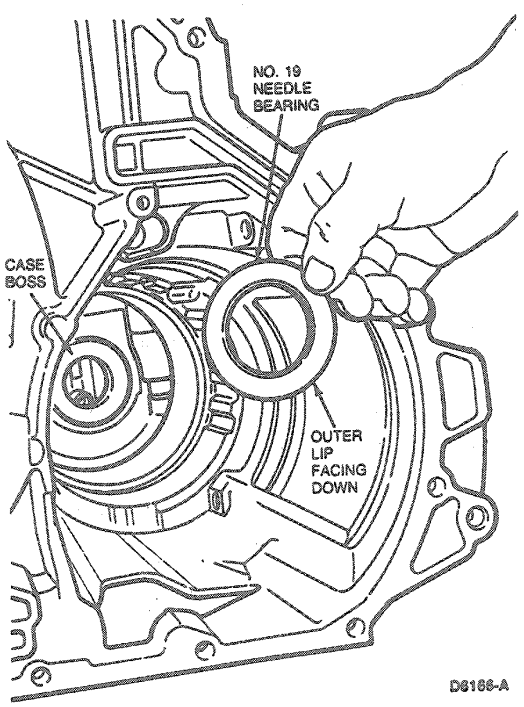


DISASSEMBLY AND ASSEMBLY (Continued)

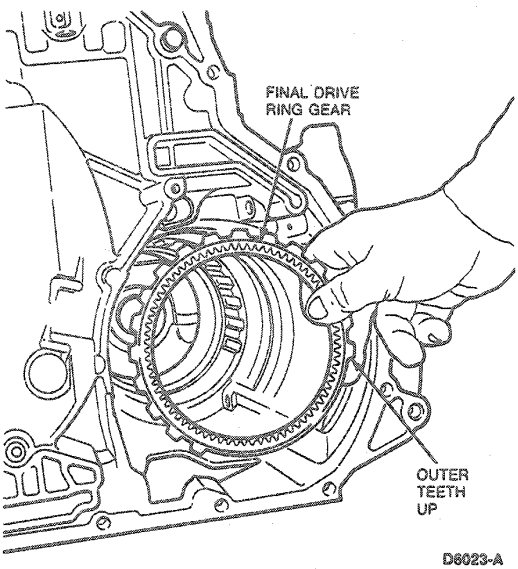
6. Loosely install End Play Tool T87P-70014-AH and two bolts over RH output shaft opening. Tool will be used later to perform selective thrust washer checks.



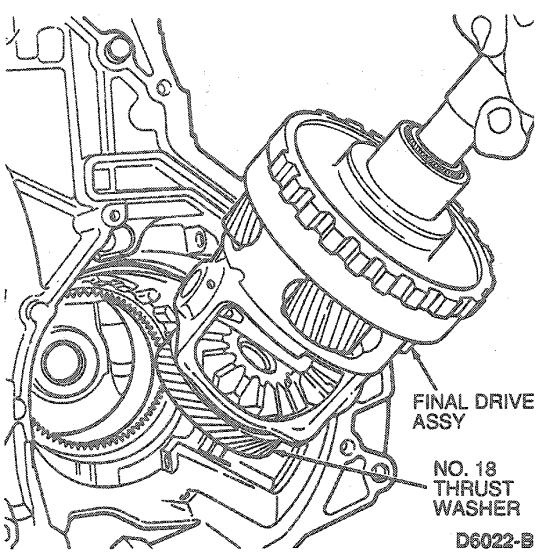
7. Place case in vertical position. Install No. 19 needle bearing over case boss with flat side facing up, outer lip facing down.



8. Install final drive ring gear with external splines up. Using a hammer handle if necessary, tap gently to fully seat into case splines.



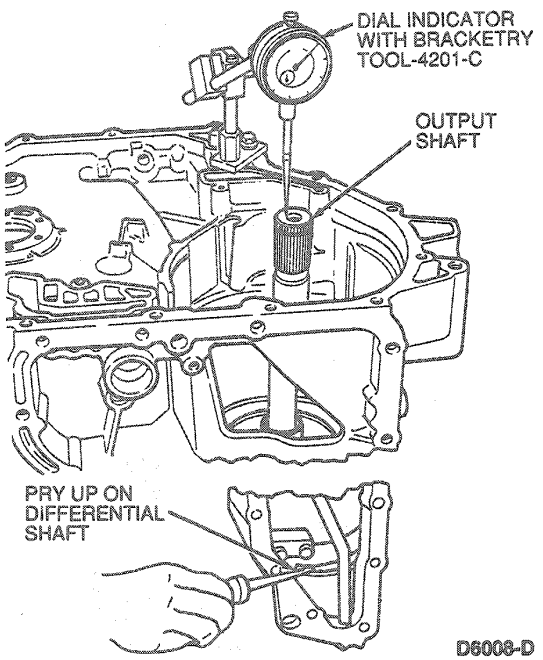
9. Assemble No. 18 thrust washer to differential assembly using petroleum jelly.
10. Lower final drive assembly into case. Use hammer to gently tap into place.



11. Install snap ring and align opening of snap ring with rear lube tube passage.
12. Perform end clearance check for No. 18 selective thrust washer as follows:
    - Place screwdriver under differential case and pry up.
    - Mount Dial Indicator with Bracketry TOOL-4201-C or equivalent with stylus on end of output shaft.

DISASSEMBLY AND ASSEMBLY (Continued)

- Back out screw on tool installed in Step 5 until it no longer touches shaft.
- Zero dial indicator.
- Tighten screw to 4-5 N·m (35-44 lb-in).
- Observe reading on dial indicator.

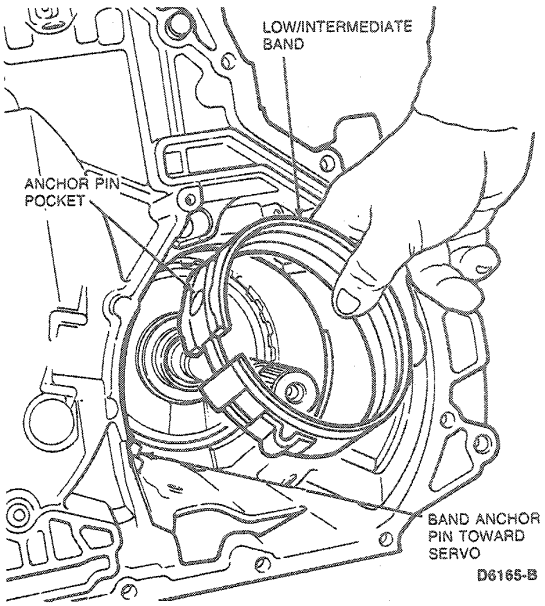


The clearance should be 0.1-0.40mm (0.004-0.016 inch). If the clearance is not within specification, selective thrust washers are available in the following thicknesses:

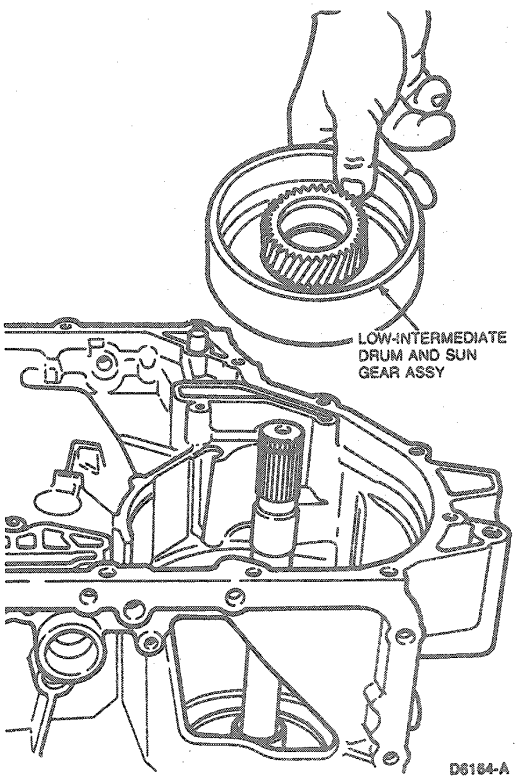
Selective Snap Rings
1.20-1.28mm (0.047-0.050 inch) Red
1.30-1.38mm (0.051-0.054 inch) Green
1.40-1.48mm (0.055-0.058 inch) Blue
1.50-1.58mm (0.059-0.062 inch) Black
1.60-1.68mm (0.062-0.066 inch) White
1.70-1.78mm (0.067-0.070 inch) Brown
1.80-1.88mm (0.071-0.074 inch) Gold

NOTE: After completing end clearance check, back off screw on tool and leave tool in position for No. 5 and No. 8 selective thrust washer clearance check to be performed later.

13. After installing the correct thrust washer, check the clearance.
14. Install low-intermediate band into case and align anchor pin pocket with anchor pin.

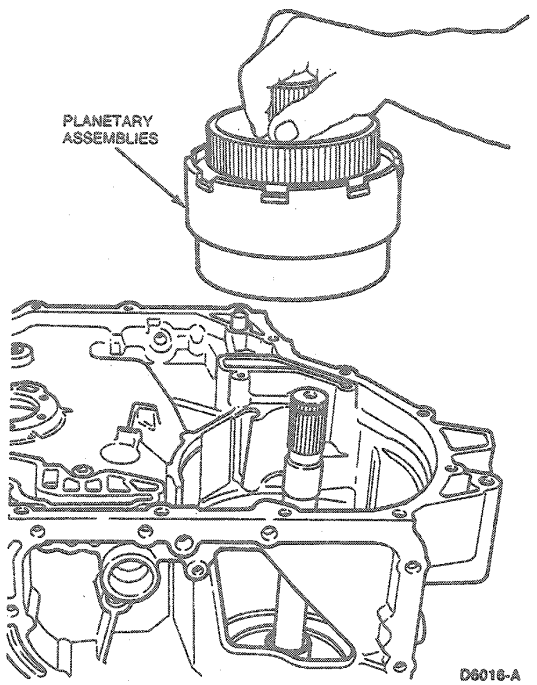


15. Install low-intermediate drum and sun gear.



DISASSEMBLY AND ASSEMBLY (Continued)

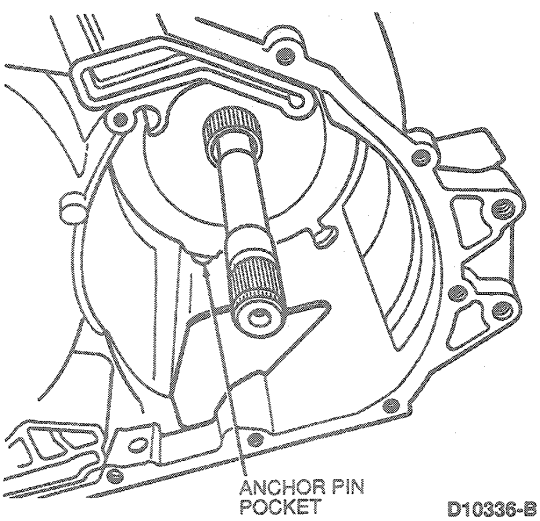
16. Slide planetary assembly over output shaft.

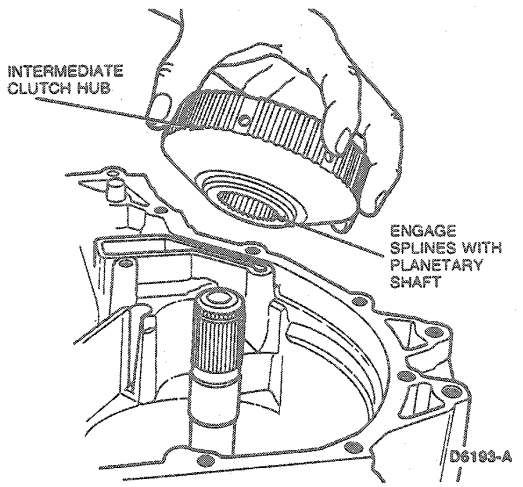


17. Lower reverse clutch into case. Ensure clutch plates have full engagement.

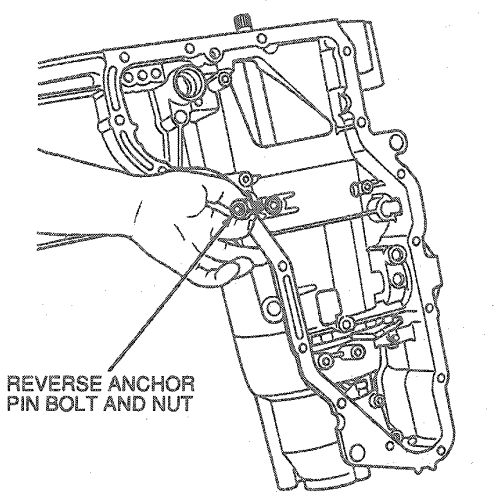
    NOTE: To seat reverse clutch, the intermediate clutch hub can be used as a tool to complete clutch plate engagement. Rotating planet with hub will allow clutch splines to engage.

18. Align clutch cylinder anchor pin pocket with anchor pin case hole.





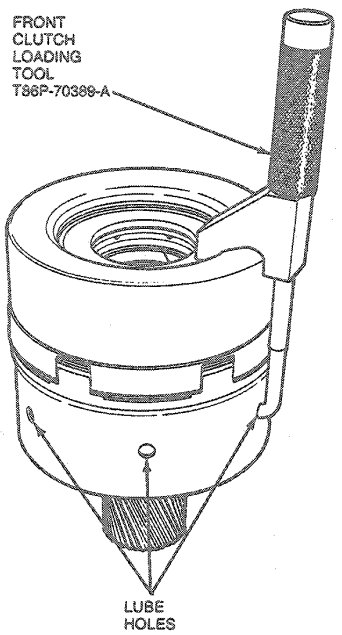
19. Start reverse anchor pin bolt but **do not** tighten at this time.



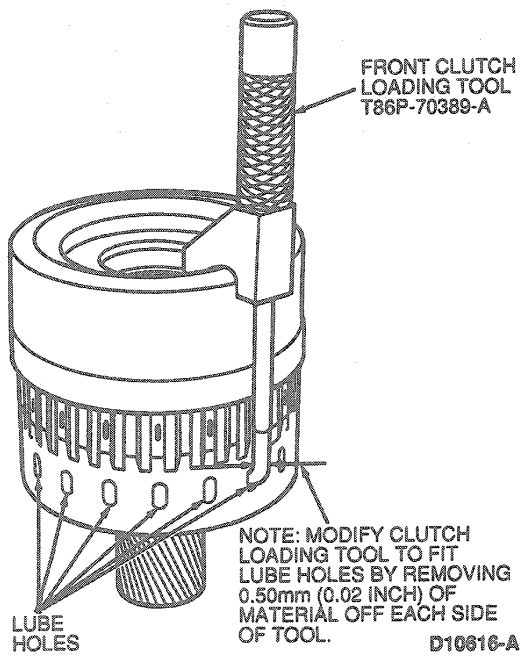
20. Attach Front Clutch Loading Tool T86P-70389-A to forward / intermediate / direct clutch assembly.

DISASSEMBLY AND ASSEMBLY (Continued)

All Except 3.2L SHO



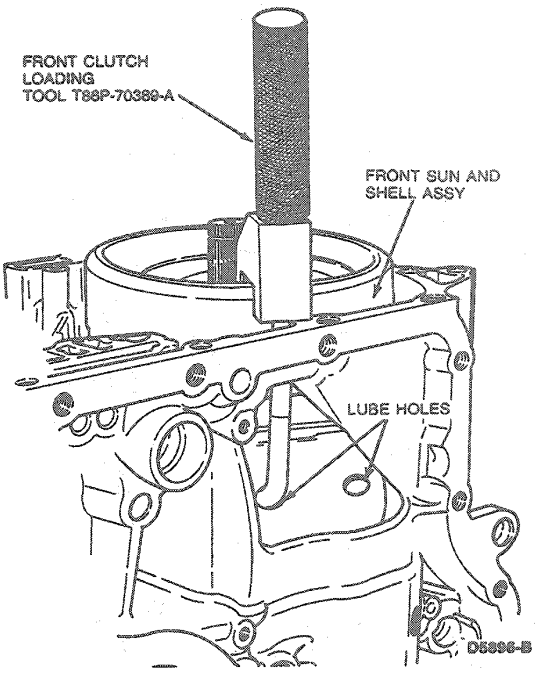
3.2L SHO



21. Lower assembly into case, aligning shell and sun gear splines into forward planetary.

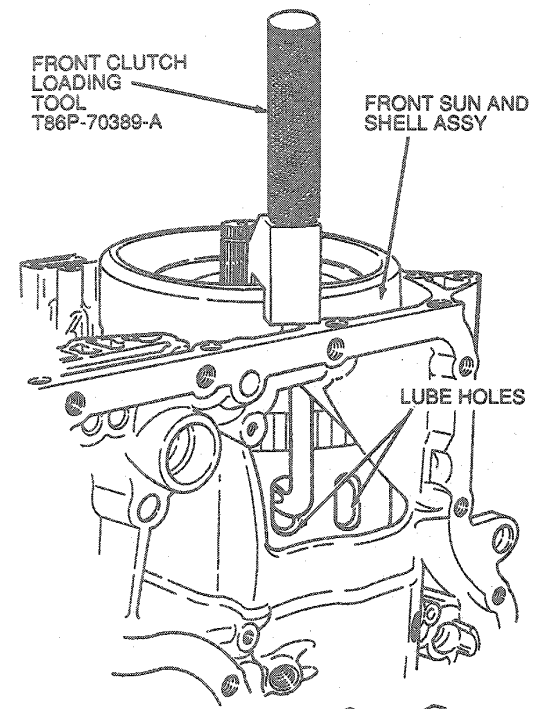
CAUTION: Ensure the assembly is fully seated before removing the tool.

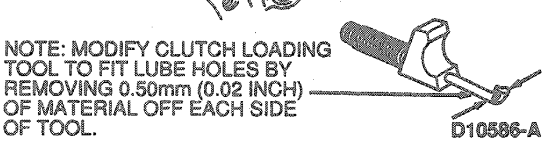
All Except 3.2L SHO



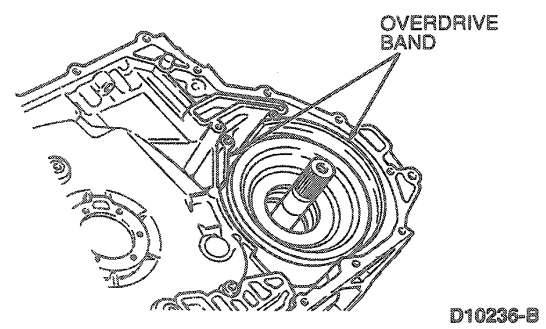
DISASSEMBLY AND ASSEMBLY (Continued)

3.2L SHO

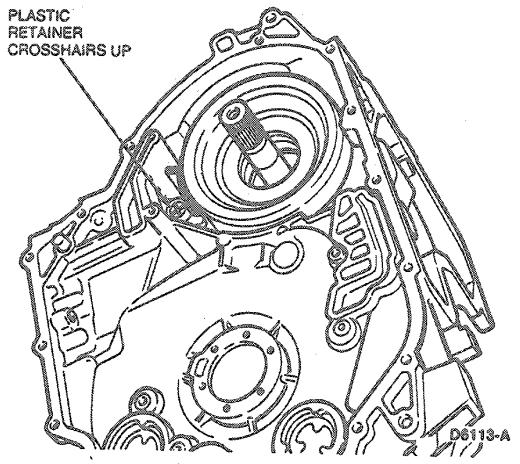




22. Install overdrive band into case.



23. Install plastic retainer with cross hairs facing up.



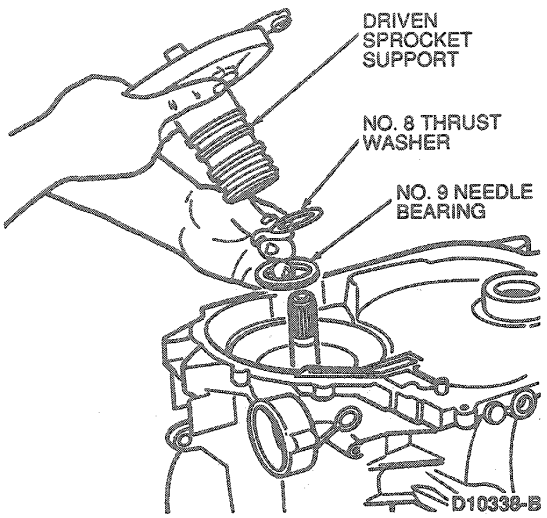
NOTE: Perform Steps 24 through 34 to check the driven sprocket end-play clearance for No. 8 selective thickness thrust washers.

24. Tighten screw on end-play tool previously installed to 4-5 N·m (35-44 lb-in).
25. Ensure that the No. 5 thrust washer is removed from the driven sprocket support.

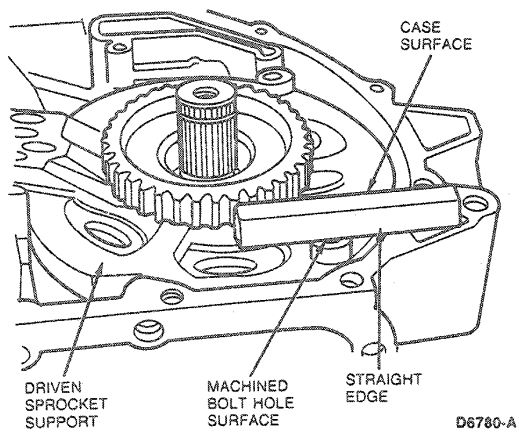
    NOTE: Make sure that all pieces are clean and dry. **Do not** use petroleum jelly for this step.
26. Install No. 8 thrust washer into No. 9 needle bearing.
27. Lower needle bearing / thrust washer assembly over the output shaft and carefully center the assembly.

DISASSEMBLY AND ASSEMBLY (Continued)

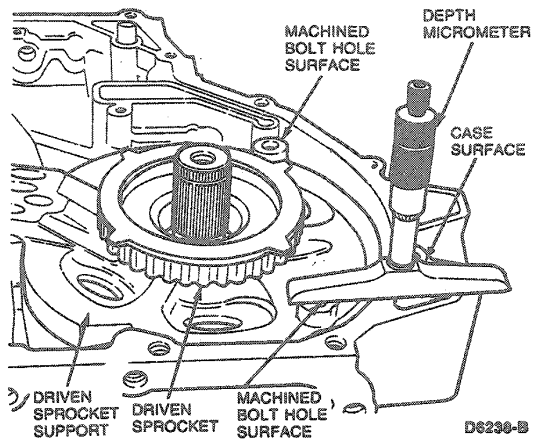
28. Install driven sprocket support making sure it is seated fully. Do not force it. If it is not fully seated, remove support and re-center needle bearing / thrust washer assembly and install support.



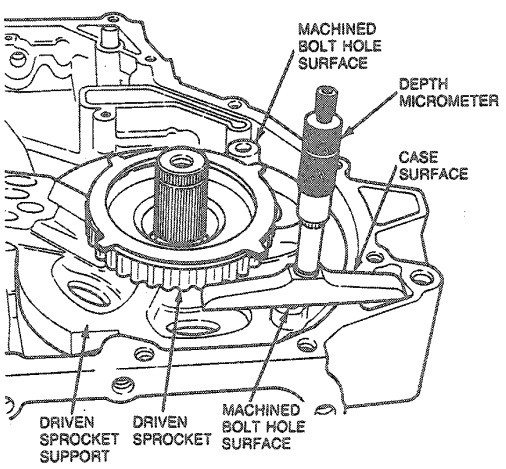
29. Install the driven sprocket.
30. Determine with straight edge or flat block whether machined bolt hole surfaces on support are above or below case machined surface.



31. If support machined bolt hole surfaces are **above** case machined surface, place depth micrometer on machined bolt hole surface of support, centering spindle over machined surface of case. Measure distance to case machined surface at both support bolt hole machined surfaces and determine average from both readings. If reading exceeds 0.21mm (0.008 inch), measure existing washer and refer to No. 8 thrust washer selection chart. Choose a washer that will bring the assembly within specifications.



32. Select correct No. 8 thrust washer, repeat Steps 26 through 29 and record reading; this reading will be used in selecting the No. 5 thrust washer in the following steps. Go to Step 35.
33. If support machined bolt hole surfaces are **below** case machined surface, place and lightly hold depth micrometer on machined surface of case, centering spindle over machined bolt hole surface of support. Measure distance to machined bolt hole surface at both support hole bosses and determine average from both readings. If reading is over 0.46mm (0.018 in) measure existing washer refer to No. 8 thrust washer selection chart. Choose a washer that will bring the assembly within specifications.



DISASSEMBLY AND ASSEMBLY (Continued)

NO. 8 THRUST WASHER SELECTION

Thrust Washer Thickness		Color
mm	Inches	
1.53-1.43	0.060-0.056	Natural
1.78-1.68	0.070-0.066	Dark Green
2.02-1.92	0.079-0.075	Light Blue
2.27-2.17	0.089-0.085	Red

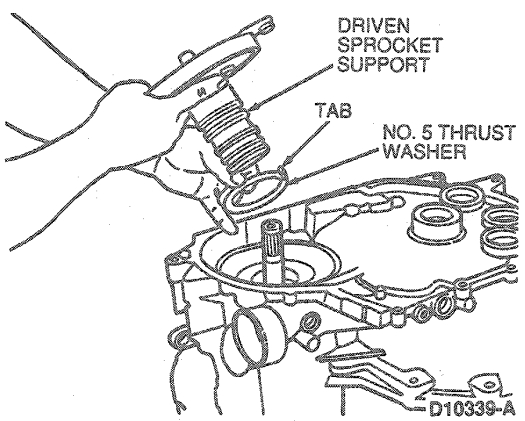
34. Select correct No. 8 thrust washer, repeat Steps 26 through 34 and record reading. This reading will be used in selecting the No. 5 thrust washer in the following steps. Go to Step 35.

    NOTE: Perform the following steps to check the driven sprocket end-play clearance for No. 5 selective thickness thrust washer.

35. Remove driven sprocket, driven sprocket support, and No. 9 and No. 8 needle bearing / thrust washer assembly.

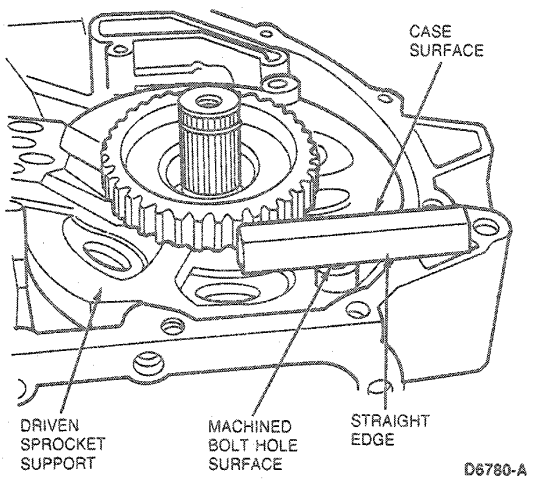
    NOTE: Make sure that all pieces are clean and dry. Use petroleum jelly **on tab only** to hold washer in place for this step.

36. Install No. 5 thrust washer on driven sprocket support, aligning tab on washer with slot in support.



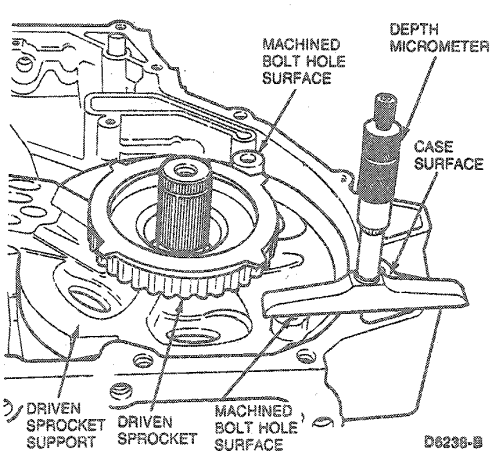
37. Install driven sprocket support and No. 5 thrust washer into case. **Do not** install No. 9 and No. 8 needle bearing / thrust washer assembly at this time. Be sure support is fully seated.

38. Determine with straightedge or flat block whether machined bolt hole surfaces on support are above or below case machined surface.



39. If support machined bolt hole surfaces are **above** case machined surface, place depth micrometer on support bolt hole surface and measure down to case-machined surface. Do this on **both** holes to get an average. Compare this reading to the No. 8 thrust washer reading in Step 32. The difference between the two readings is the No. 5 thrust washer clearance.

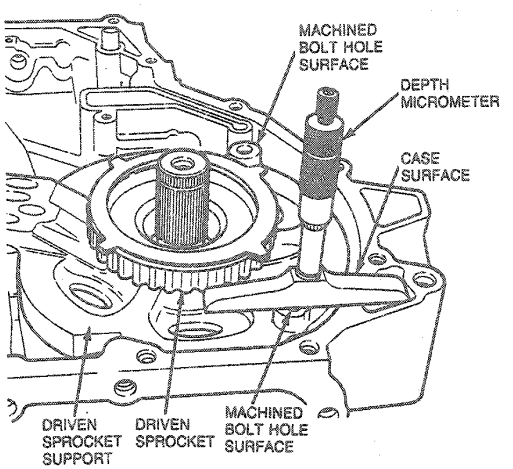
    NOTE: The No. 5 thrust washer reading must always allow the driven sprocket support to be the same height or to set lower in the case than the No. 8 thrust washer reading did. If not, a thinner No. 5 thrust washer must be selected. If the support does set lower in the case, the difference must not be greater than 0.85mm (0.033 inch) or a thicker No. 5 thrust washer must be selected. Refer to No. 5 thrust washer selection chart following Step 41.



DISASSEMBLY AND ASSEMBLY (Continued)

40. If support machined bolt hole surfaces are **below** case machined surface, place depth micrometer on case-machined surface and measure down to machined surface of **both** bolt holes on support to get an average. Compare this reading to the No. 8 thrust washer reading in Step 34. The difference between the two readings is the No. 5 thrust washer clearance.

    NOTE: The No. 5 thrust washer reading must always allow the driven sprocket support to be the same height or to set lower in the case than the No. 8 thrust washer reading did. If not, a thinner No. 5 thrust washer must be selected. If the support does set lower in the case, the difference must not be greater than 0.85mm (0.033 inch) or a thicker No. 5 thrust washer must be selected. Refer to No. 5 thrust washer selection chart following Step 41.

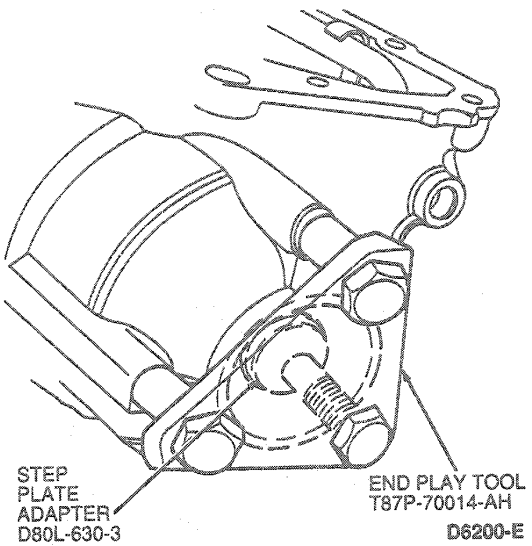


41. Recheck sprocket support clearance after changing selective thrust washers. The No. 5 thrust washer clearance must be between 0.00 and 0.85mm (0.00 and 0.033 inch).

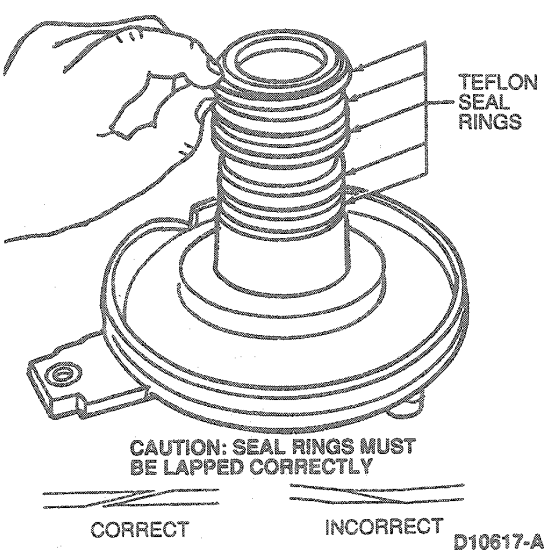
NO. 5 THRUST WASHER SELECTION

Thrust Washer Thickness		Color
mm	Inches	
2.28-2.18	0.090-0.086	Green
2.53-2.43	0.099-0.095	Black
2.77-2.87	0.109-0.105	Natural
3.02-2.92	0.118-0.115	Red

42. Remove tool from bottom of case.

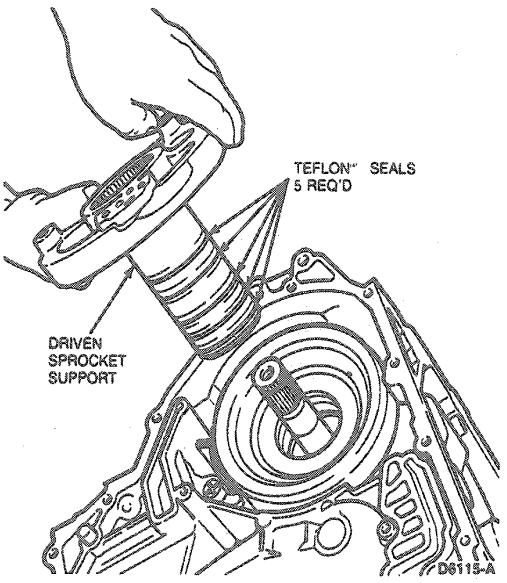


43. Remove driven sprocket support and install No. 9 needle bearing and correct No. 8 and No. 5 thrust washers.
44. Install Teflon® seals on driven sprocket support. Make sure that seals are lapped correctly.



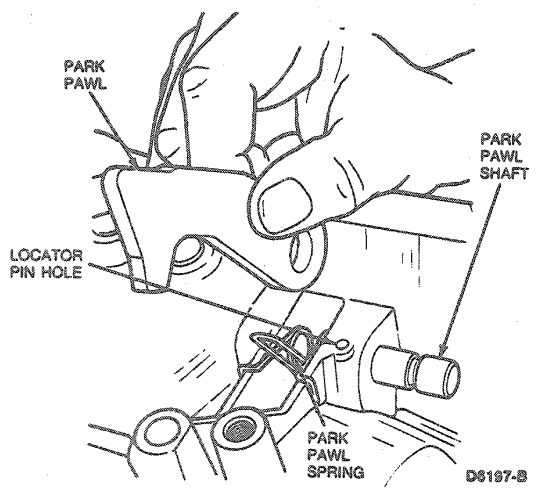
DISASSEMBLY AND ASSEMBLY (Continued)

45. Lower driven sprocket support assembly into case. Make sure support is fully seated and the tab is between the ridges on the case.

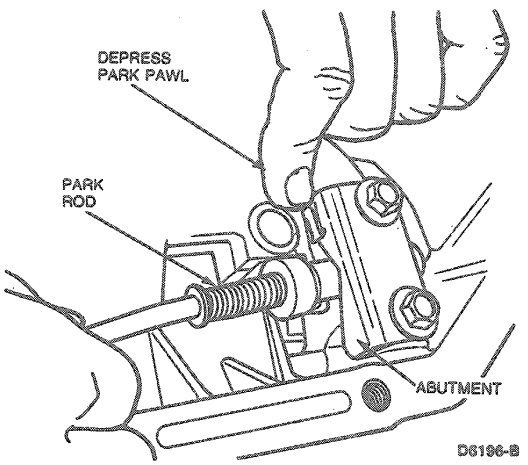


NOTE: Ensure that the park pawl engages the park gear and returns freely.

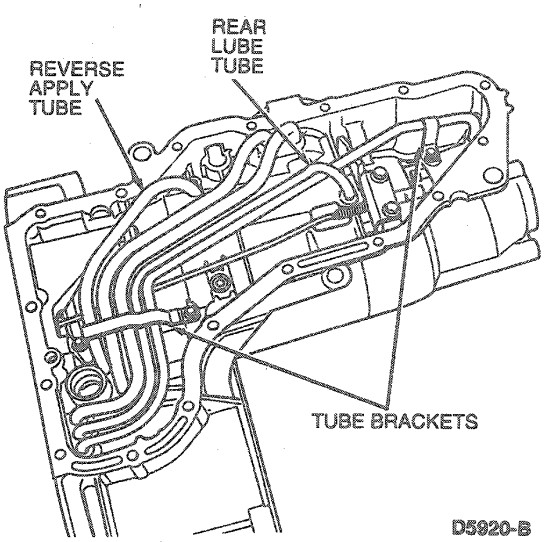
46. Install park pawl, return spring, park pawl shaft and locator pin.



47. Install park rod actuating lever and park rod in case. Install park rod abutment and start abutment bolts. Push in park pawl and locate rod between pawl and abutment.



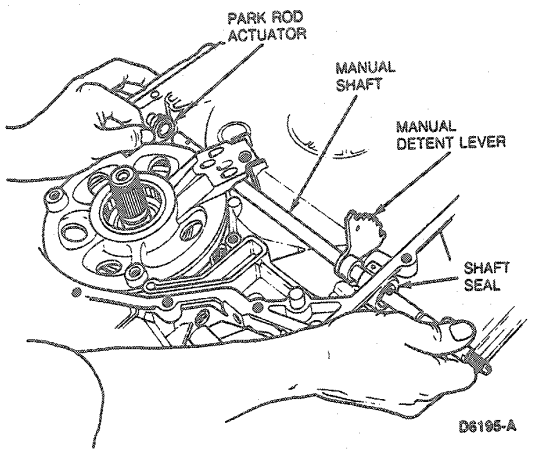
48. Install tubes in position and tap lightly until fully seated. Apply Threadlock 262, E2FZ-19554-B (ESE-M4G204-A3) or equivalent around tube-to-case surface.
49. Install tube retaining brackets.



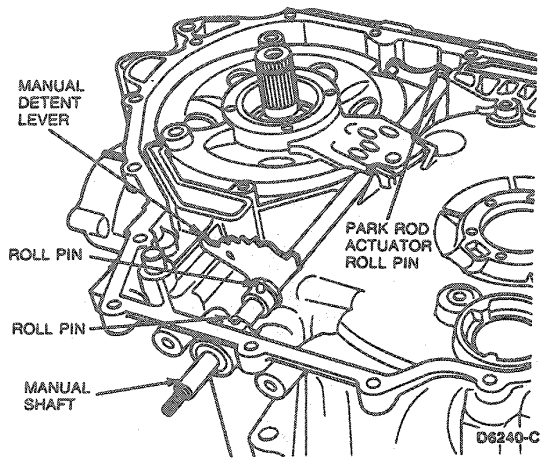
50. Install manual shaft seal by tapping into case.
51. Start manual shaft through seal and slide manual detent lever onto shaft.

DISASSEMBLY AND ASSEMBLY (Continued)

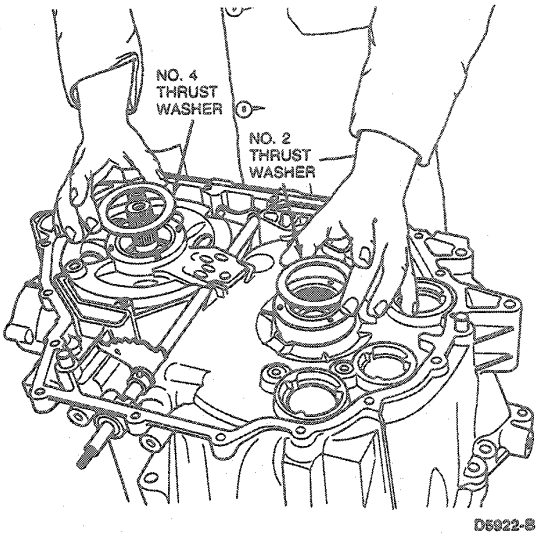
52. Slide manual shaft through park rod actuating lever and tap into case hole.



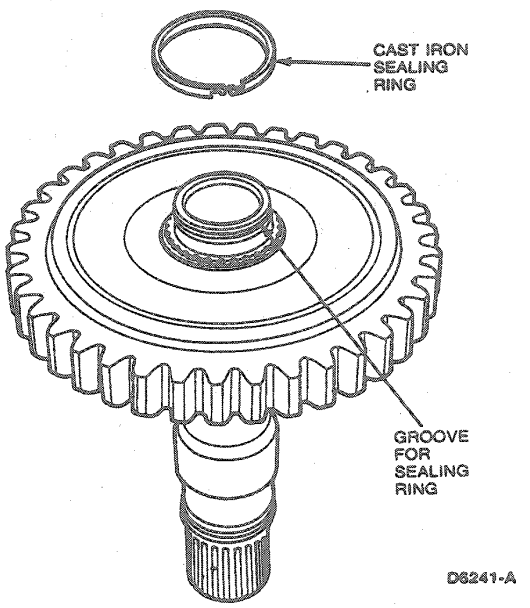
53. Install new manual shaft lock pin through case hole, aligning with groove in shaft.
54. Install new roll pins in detent lever and park rod actuating lever.



55. Install No. 2 and No. 4 tabbed thrust washers onto drive and driven sprocket supports. Align tabs on thrust washers with holes in sprocket supports. Apply grease to washers to help hold in position.



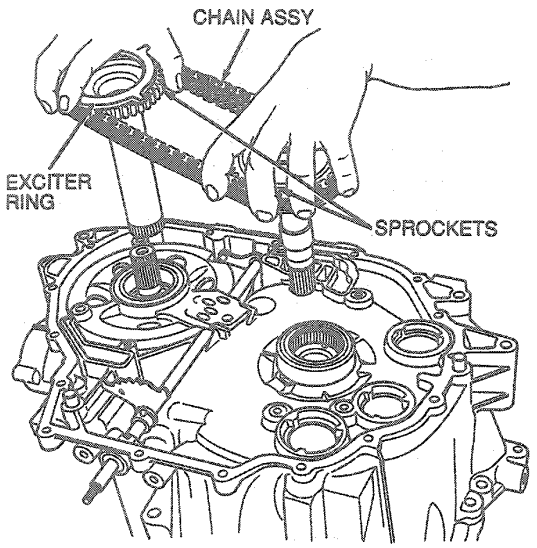
56. Lubricate and install input shaft cast iron sealing ring onto input shaft.



CAUTION: Be careful not to damage or bend tabs on exciter ring. Chain cover may not seat correctly causing a leak.

DISASSEMBLY AND ASSEMBLY (Continued)

57. Install chain on drive and driven sprockets. Lower assembly into sprocket supports simultaneously with chain parallel to case surface, rotating sprockets to ensure that they are fully seated.

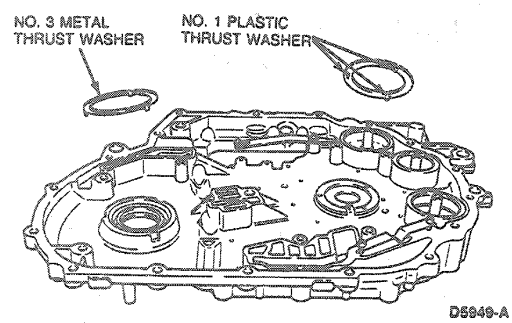


CAUTION: BE CAREFUL NOT TO DAMAGE OR BEND TABS ON EXCITER RING. CHAIN COVER MAY NOT SEAT CORRECTLY CAUSING A LEAK.

D5909-D

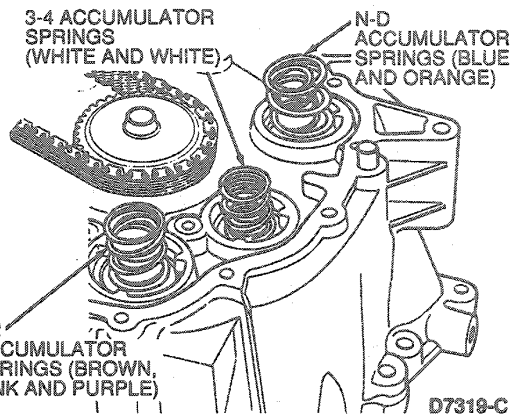
CAUTION: Be careful not to damage or bend tabs on exciter ring. Chain cover may not seat correctly causing a leak.

58. Install No. 1 and No. 3 thrust washers on chain cover. Use petroleum jelly to hold in place. Make sure tabs align with slots in chain cover.



D5949-A

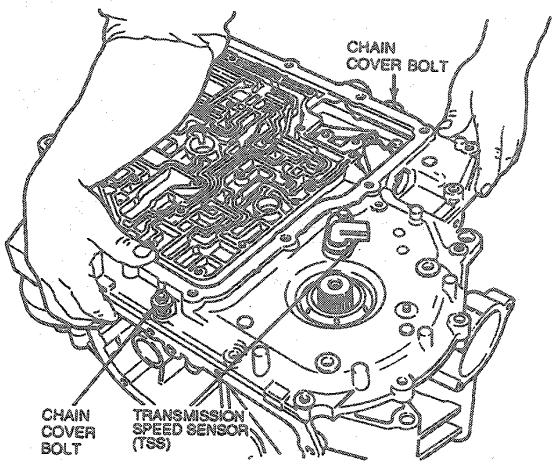
59. Install new chain cover gasket on case.
60. Install accumulator springs in correct position in case.



D7319-C

61. Make sure chain cover alignment pins are on case.
62. Carefully align chain cover input shaft bore with input shaft. Apply gentle downward pressure on chain cover to overcome accumulator spring pressure and start two chain cover bolts. If removed, install transmission speed sensor.

CAUTION: Be extremely careful to prevent damage to the input shaft cast iron sealing ring.

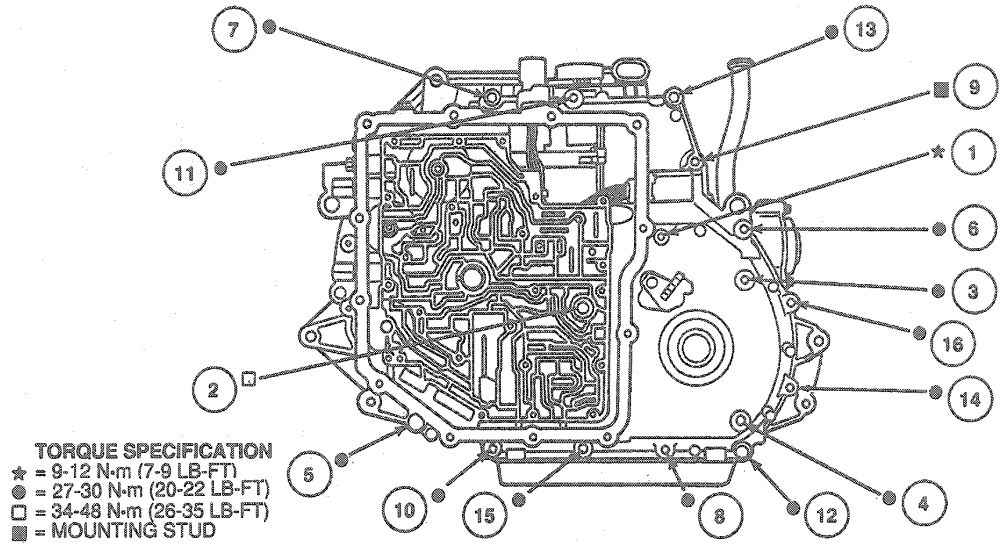


D6172-C

NOTE: After installing chain cover, input shaft should have some end play and should rotate freely. If it will not rotate freely, remove chain cover and inspect cast iron seal for damage.

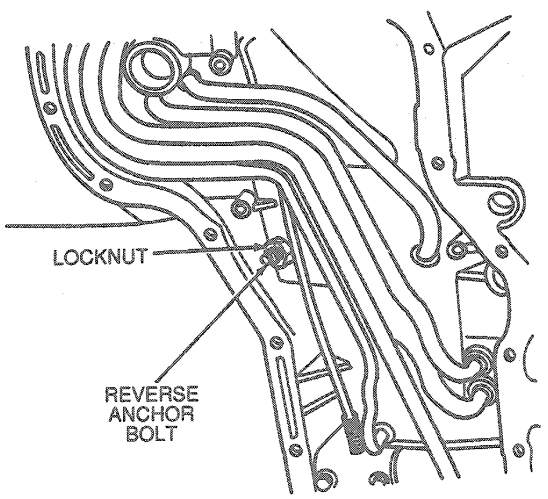
DISASSEMBLY AND ASSEMBLY (Continued)

63. Start remaining chain cover bolts and tighten 10mm bolts to 27-33 N·m (20-26 lb-ft). Tighten 8mm bolt to 9-12 N·m (7-9 lb-ft). Tighten 13mm bolt to 34-48 N·m (26-35 lb-ft). Tighten bolts in sequence shown.



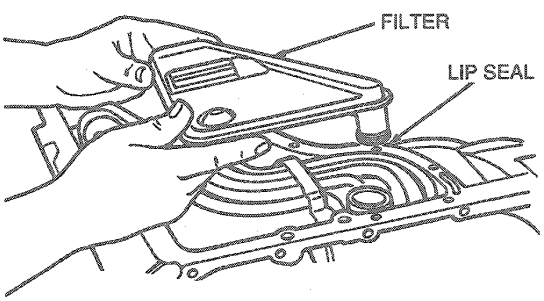
D8646-C

64. Tighten reverse drum 6mm Allen head anchor bolt to 10-12 N·m (7.5-9 lb-ft) and 19mm locknut to 34-47 N·m (26-35 lb-ft).



D11461-A

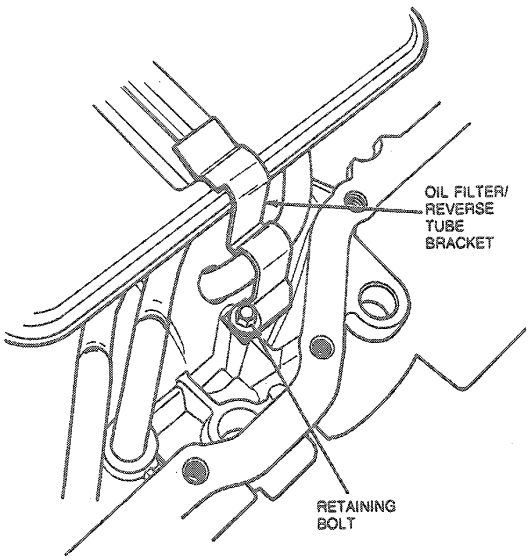
65. Install lip seal onto oil filter and press oil filter into case.



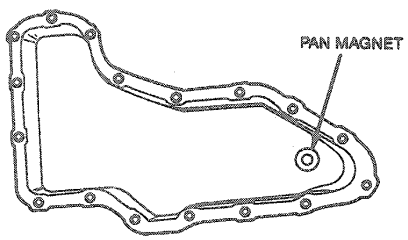
D10335-B

DISASSEMBLY AND ASSEMBLY (Continued)

66. Install reverse apply tube / oil filter bracket.

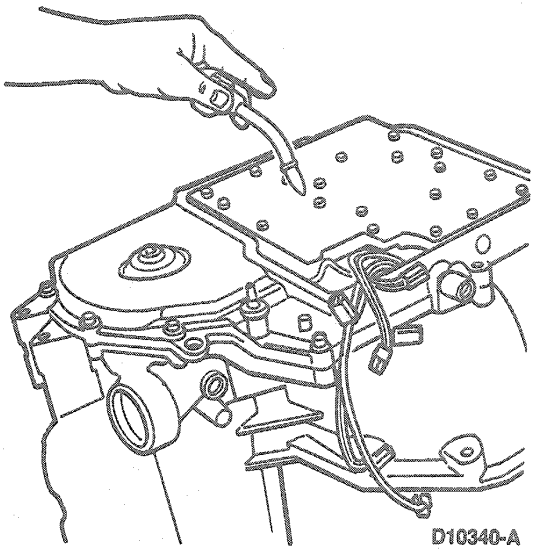


67. Install magnet in oil pan.



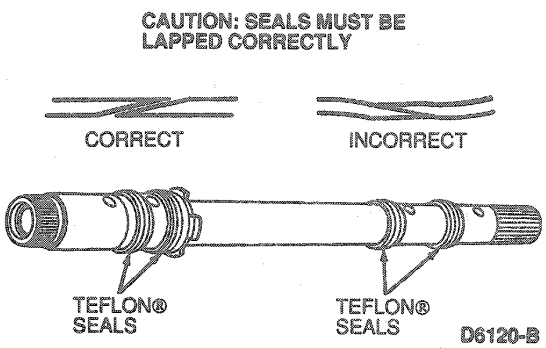
68. Install new oil pan gasket on case and install oil pan. Tighten bolts to 13-15 N·m (8-11 lb-ft).
69. Install output shaft seal and circlip.
70. Perform air pressure checks using AXODE (AX4S) Transmission Test Plate T91P-7006-A. After pressure checks have been performed, remove tool.

    NOTE: When applying regulated 276 kPa (40 psi) air pressure to the appropriate passage, a dull thud should be heard when the clutch or band applies. There should be no hissing sound when clutch or band is applied.



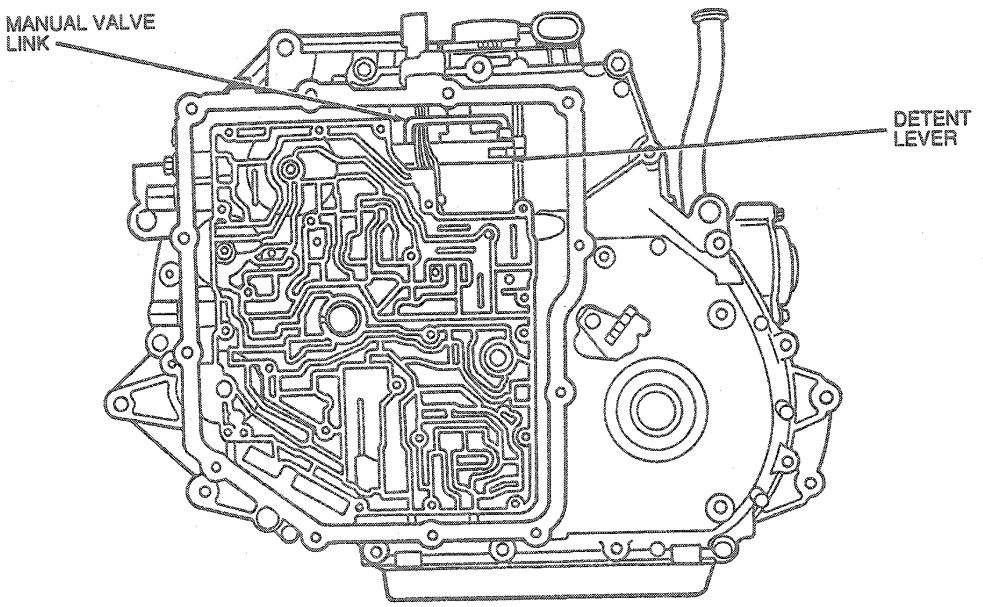
CAUTION: Seals must be lapped correctly or internal leakage will occur.

71. Install four new Teflon® seals on pump driveshaft and install shaft.



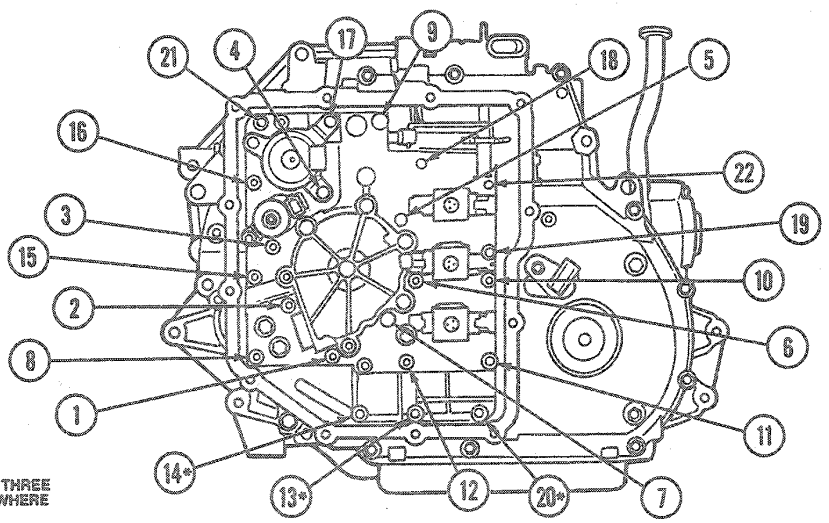
DISASSEMBLY AND ASSEMBLY (Continued)

72. Connect manual valve link to detent lever.



73. Start oil pump and valve body over pump shaft and connect manual valve link to manual valve. Push valve body down until seated.

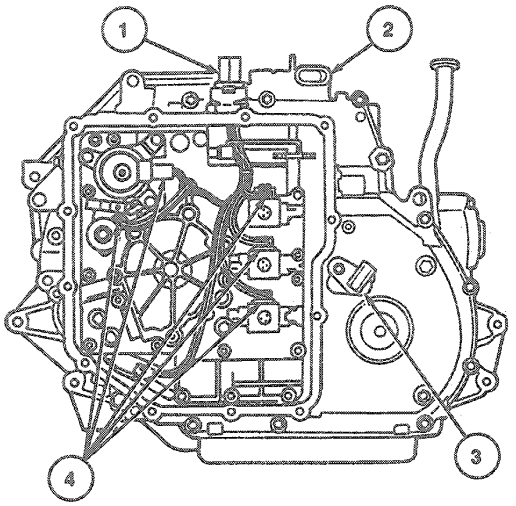
74. Install 22 valve body bolts and tighten in sequence to 9-12 N·m (7-9 lb-ft).



NOTE: Install three short bolts where indicated by*.

75. Install electrical connectors on proper solenoids and sensor until a slight click is felt.

DISASSEMBLY AND ASSEMBLY (Continued)

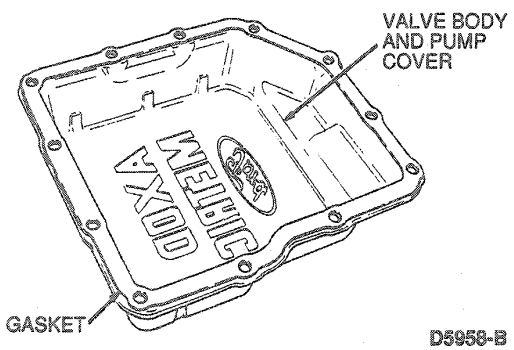


D11456-A

Item	Part Number	Description
1	—	Connector
2	—	Park/Neutral Position Switch Assy
3	7M101	Transmission Speed Sensor
4	—	Electrical Connectors

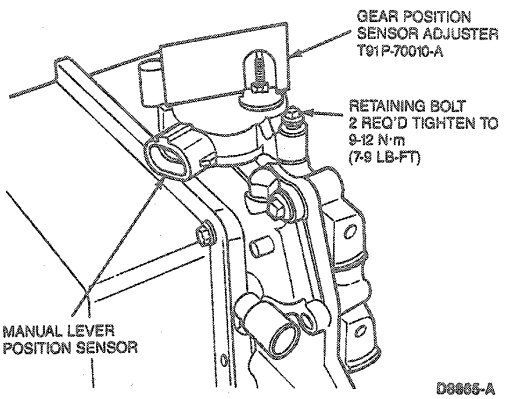
TD11456A

76. Install oil pump and valve body cover gasket onto cover.



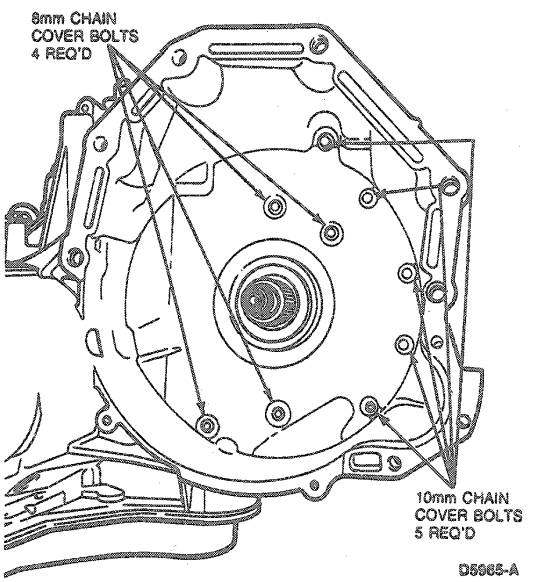
D5958-B

77. Install cover and tighten to 21-25 N·m (15-18 lb-ft).
78. Rotate transaxle to horizontal position.
79. Place gear shift selector in the neutral position.
80. Install manual lever position sensor (MLP) and loosely install two retaining bolts.
81. Align MLP slots using Gear Position Sensor Adjuster T91P-70010-A.
82. Tighten retaining bolts to 9-12 N·m (7-9 lb-ft). Remove tool.



D5965-A

83. Install remaining chain cover bolts in bellhousing and torque bolts to 25-28 N·m (18-21 lb-ft) for 10mm or 9-12 N·m (7-9 lb-ft) for 8mm bolts.

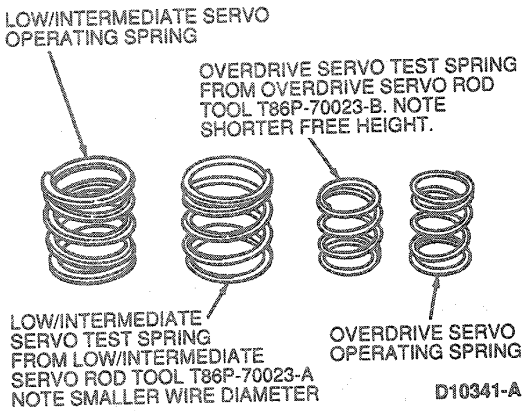


D5965-A

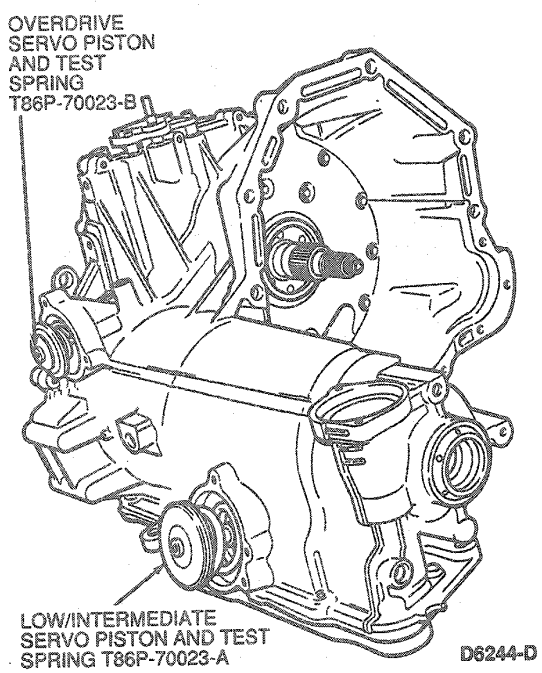
CAUTION: The test spring from the Overdrive Servo Tool is plain in color and has a higher free height than the operational spring. Extreme care must be used not to assemble the transaxle using the test spring.

DISASSEMBLY AND ASSEMBLY (Continued)

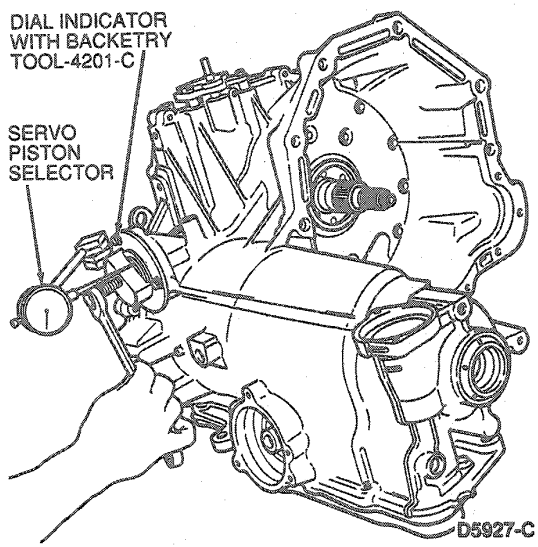
84. Install test spring, from Overdrive Servo Rod Tool T86P-70023-B in transaxle case.



85. Install overdrive servo piston and rod into case.



86. Install Overdrive Servo Rod Tool T86P-70023-B and secure using servo cover bolts. Tighten bolts to 9-12 N·m (7-9 lb-ft).
87. Tighten center screw on tool to 1.13 N·m (10 lb-in).
88. Mount Dial Indicator with Bracketry TOOL-4201-C or equivalent and position stylus through hole in Overdrive Servo Rod Tool. Make certain indicator stylus has contacted servo piston on a flat surface. Do not contact step on piston. Zero dial indicator.



89. Back off center screw until piston movement stops and read dial indicator. The reading should be 1.8-3.8mm (0.070-0.149 inch). If measurement does not meet specifications, refer to overdrive piston rod selection chart to determine which rod to install.

Overdrive Servo Rod Length		Number of Grooves (grooves are at the tip)
mm	Inch	
99.33	3.91	0
98.05	3.86	1
96.78	3.81	2

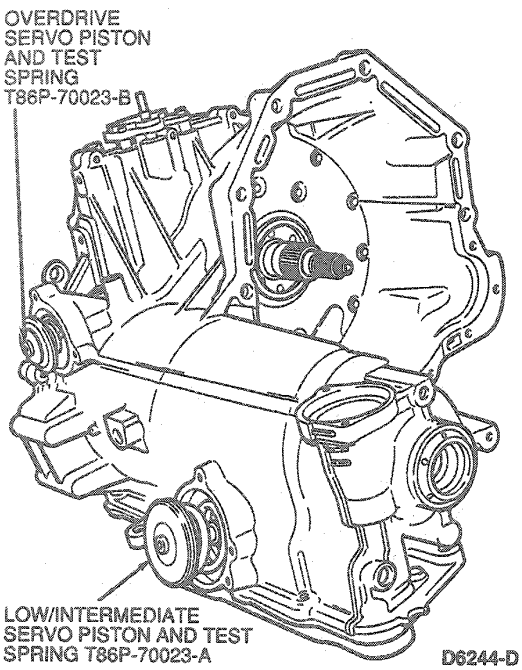
90. Install new piston rod and repeat Steps 85 through 90 to verify amount of piston travel. If within specifications, remove tool and test spring.

CAUTION: The test spring from the Low/Intermediate Servo Tool is plain in color and has a thinner wire diameter than the operational spring. Extreme care must be used not to assemble the transaxle using the test spring.

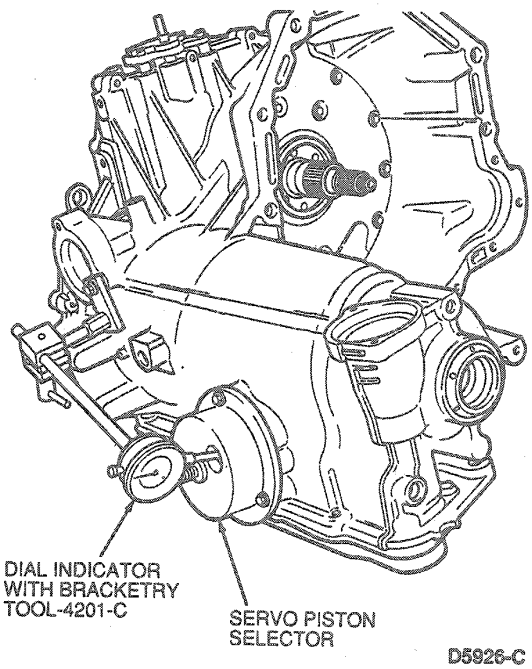
91. Install low/intermediate spring retainer on test spring, from Low/Intermediate Servo Rod Tool T86P-70023-A. Install test spring into transaxle case.

DISASSEMBLY AND ASSEMBLY (Continued)

92. If not done prior, remove seal from low / intermediate servo piston. Install piston and rod into case.



93. Install Low / Intermediate Servo Rod Tool T86P-70023-A and secure using servo cover bolts. Tighten bolts to 9-12 N·m (7-9 lb-ft).
94. Tighten center screw on tool to 3.4 N·m (30 lb-in).
95. Mount Dial Indicator with Bracketry TOOL-4201-C or equivalent and position stylus through hole in Low / Intermediate Servo Rod Tool. Make certain indicator stylus has contacted servo piston on a flat surface. **Do not** contact step on piston. Zero dial indicator.



96. Back off center screw until piston movement stops and read dial indicator. The reading should be 5.5-6.5mm (0.216-0.255 inch). If measurement does not meet specifications, refer to low / intermediate piston rod selection chart to determine which rod to install.

    NOTE: If a new low / intermediate band is installed, reading should be 5-6mm (0.197-0.236 inch).

Low / Intermediate Servo Rod		Number of Grooves (grooves are at the tip)
mm	in	
114.26	4.50	0
113.72	4.48	1
113.18	4.46	2
112.64	4.43	3
112.10	4.41	4

97. Install new piston rod and repeat Steps 92 through 97 to verify amount of piston travel. If within specifications, remove tool and test spring. Remove retainer from test spring.

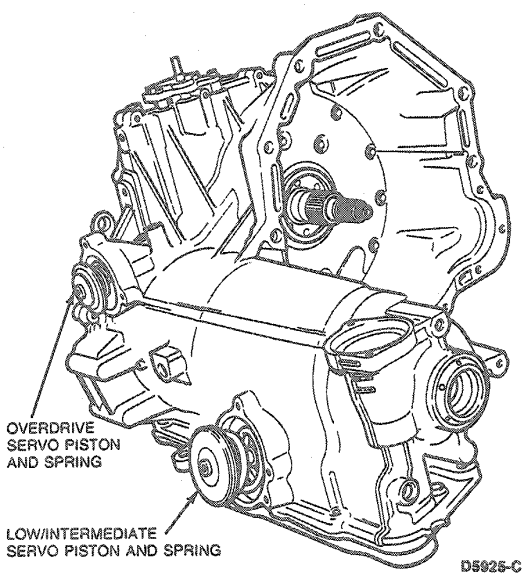
    CAUTION: The test spring from the Low / Intermediate Servo Tool is plain in color and has a thinner wire diameter than the operational spring. Extreme care must be used not to assemble the transaxle using the test spring.

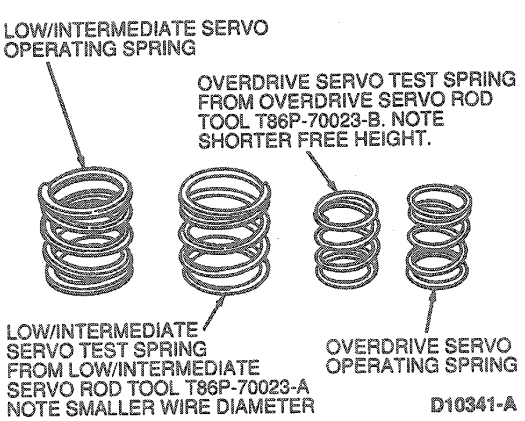
DISASSEMBLY AND ASSEMBLY (Continued)

98. Install seal on low / intermediate servo piston. Install retainer on low / intermediate operating spring.

    CAUTION: The test spring from the Overdrive Servo Tool is plain in color and has a higher free height than the operational spring. Extreme care must be used not to assemble the transaxle using the test spring.

99. Install servo springs and piston assemblies. Make sure that they are fully seated.

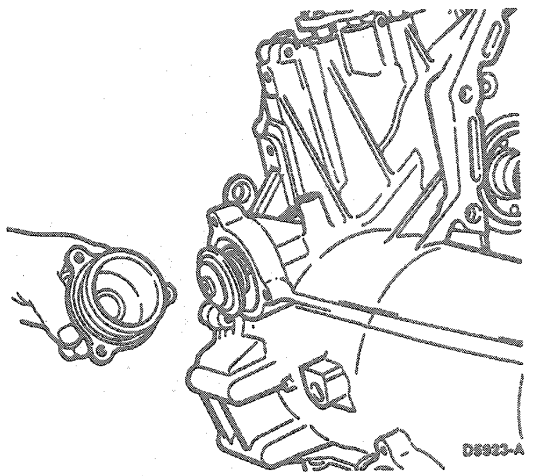


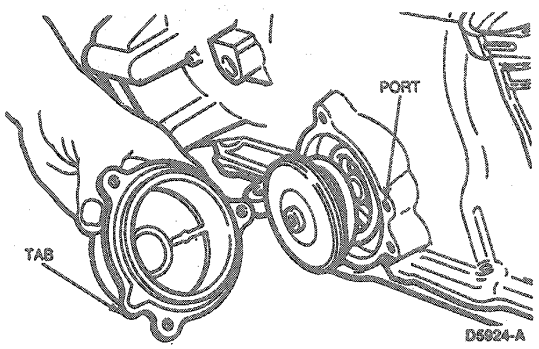


NOTE: Be sure to align tab on low / intermediate servo cover with port on case.

CAUTION: Tighten bolts two or three turns at a time to prevent cocking servo covers.

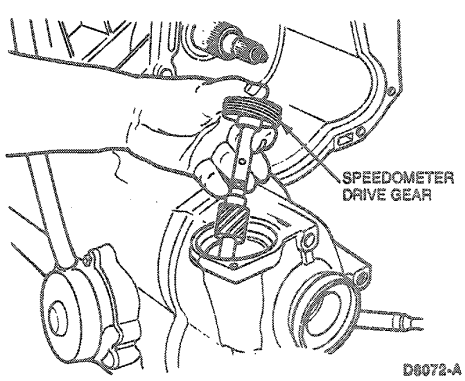
100. Install servo covers for overdrive and low / intermediate servo using new gaskets and seals. Tighten bolts evenly to 9-12 N·m (7-9 lb-ft).



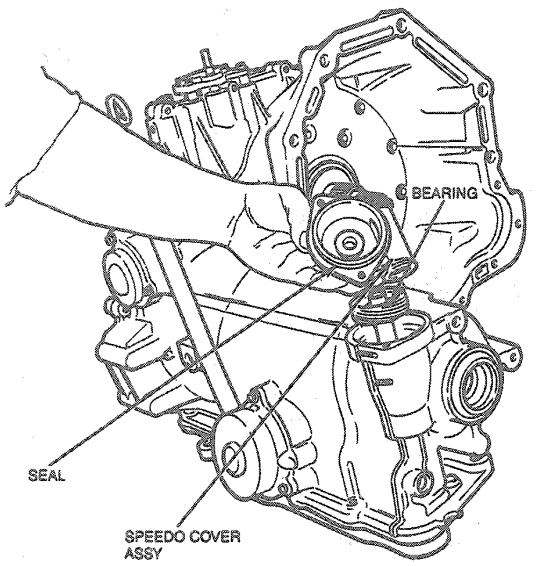


101. Install speedometer driven gear and shaft. Install speedometer drive gear making sure that slots in gear align with roll pin in shaft. Install needle bearing with black side up.

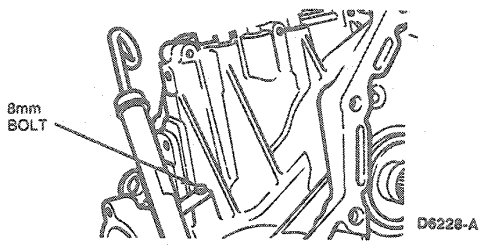
102. Install speedometer cover with new seal. Tighten bolts to 9-12 N·m (7-9 lb-ft).



DISASSEMBLY AND ASSEMBLY (Continued)

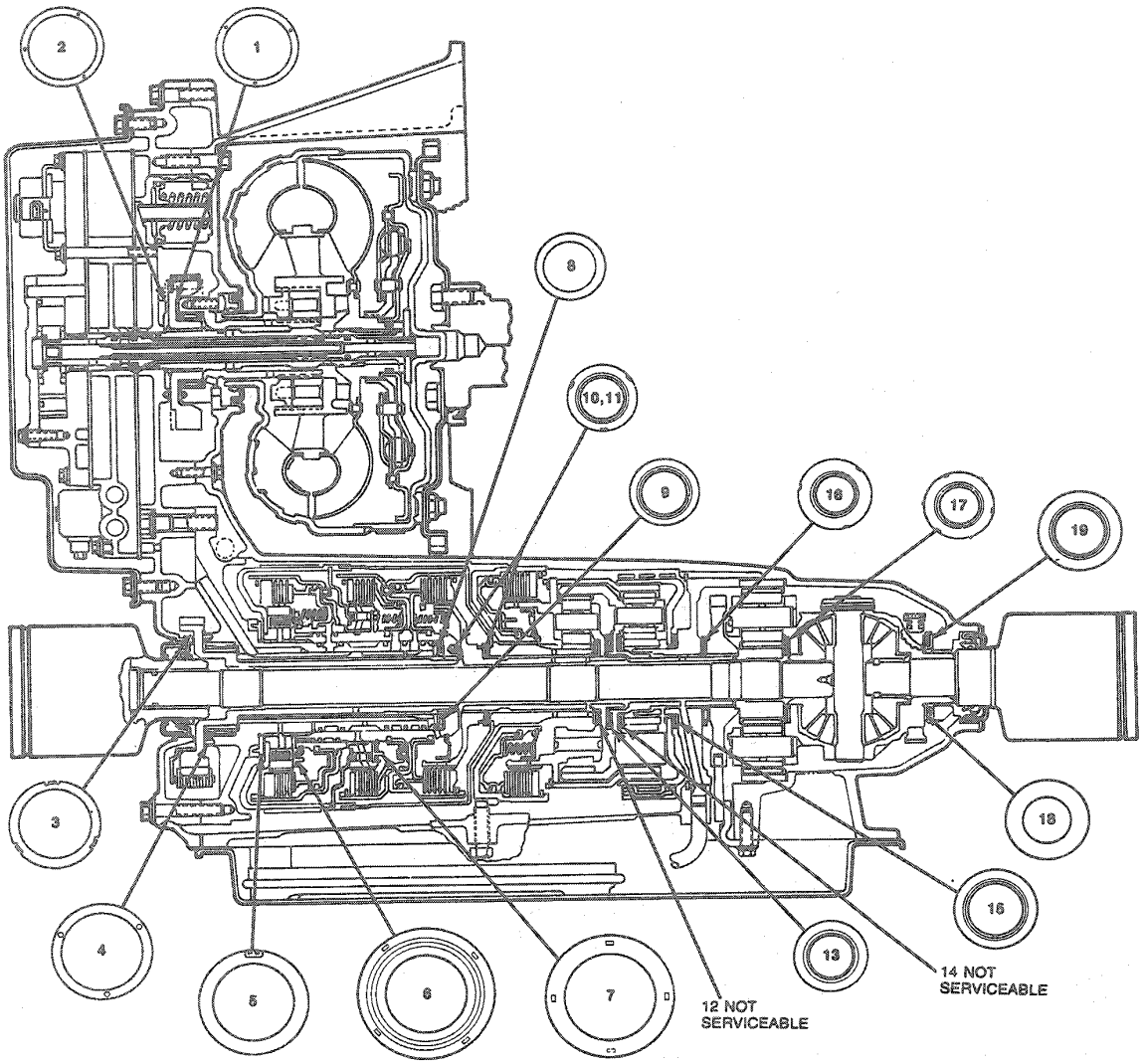


103. Install dipstick seal onto dipstick, then install dipstick into case. Tighten bolt to 9-12 N·m (7-9 lb-ft)



DISASSEMBLY AND ASSEMBLY (Continued)

Thrust Washer and Needle Bearing Location



ITEM	PART NUMBER	DESCRIPTION
1.	7G019	WASHER THRUST (NYLON) (DRIVE SPROCKET/STATOR SUPPORT)
2.	7G019	WASHER THRUST (NYLON) (DRIVE SPROCKET/STATOR SUPPORT)
3.	7G066	WASHER THRUST (STEEL BACKED BRONZE) CASE COVER/DRIVEN SPROCKET)
4.	7G115	WASHER THRUST (NYLON) (DRIVEN SPROCKET/SUPPORT)
5.	7D014	WASHER THRUST (NYLON) (SELECTIVE) (SUPPORT/FORWARD CLUTCH)
6.	7D076	WASHER THRUST (NYLON) (FORWARD CLUTCH O.W.C. RACE)
7.	7G116	WASHER THRUST (NYLON) (DIRECT CLUTCH/DIRECT O.W.C.)
8.	7G273	WASHER THRUST (PHENOLIC) (SELECTIVE) (DRIVEN SPROCKET SUPPORT—REAR)
9.	7G128	BEARING ASSEMBLY (DIRECT CLUTCH HUB)
10.	7G239	BEARING ASSEMBLY (FRONT SUN GEAR)
11.	7G239	BEARING ASSEMBLY (FRONT SUN GEAR)
12.	7G104	NOT SERVICEABLE
13.	7G177	BEARING ASSEMBLY (PLANETARY THRUST—CENTER)
14.	7G105	NOT SERVICEABLE
15.	7G178	BEARING ASSEMBLY (REAR SUN GEAR)
16.	7G106	BEARING ASSEMBLY (FINAL DRIVE GEAR—FRONT)
17.	7G107	BEARING ASSEMBLY (FINAL DRIVE GEAR—REAR)
18.	7G103	WASHER THRUST (STEEL) (SELECTIVE) (DIFFERENTIAL CARRIER)
19.	7G112	BEARING ASSEMBLY (DIFFERENTIAL CARRIER)

D5690-D

INSTALLATION

Oil Pump and Main Control Assembly

Installation

Tools Required:

- Valve Body Guide Pin T86P-70100-C

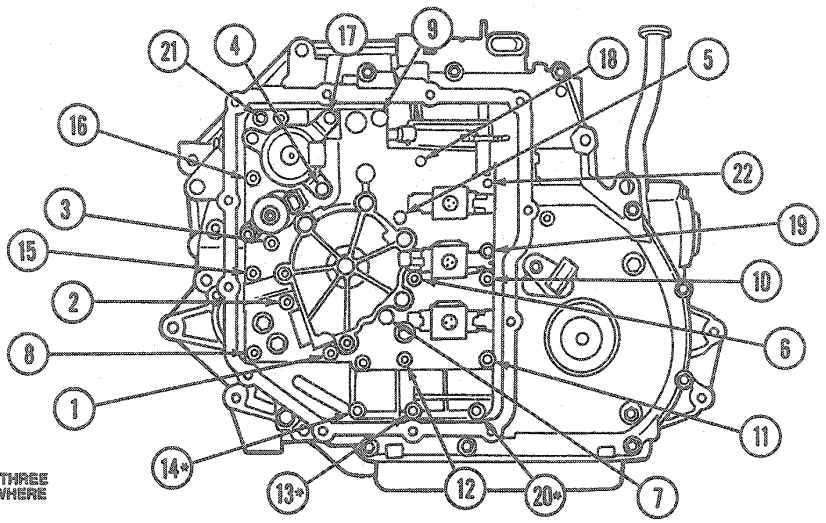
1. Install new pump and valve body-to-chain cover gasket.
2. Slide pump and valve body assembly onto oil pump shaft.
3. Rotate pump and valve body assembly toward dash panel and engage manual valve link with manual valve.
4. Slightly rotate or jiggle pump and valve body assembly to engage splines on oil pump shaft with splines in oil pump rotor. Valve body should slide flush onto chain cover without force.

   NOTE: It may be necessary to rotate engine using 7/8-inch deep well socket on crankshaft pulley to complete engagement of pump shaft to pump.

   NOTE: On vehicles without anti-skid, if full engagement of the pump and valve body assembly is not obtained using the above procedure, the following alternate method may be used:

   - Remove manual valve from valve body.
   - Rotate assembly as necessary to allow full engagement (360 degree rotation possible).
   - After full engagement, return assembly to installed position and install manual valve.

   CAUTION: Do not use retaining bolts to draw pump and valve body into position or damage to components may result.
5. Use Valve Body Guide Pin T86P-70100-C to position valve body and install pump and valve body retaining bolts. Tighten bolts to 9-12 N·m (7-9 lb-ft) in sequence shown.



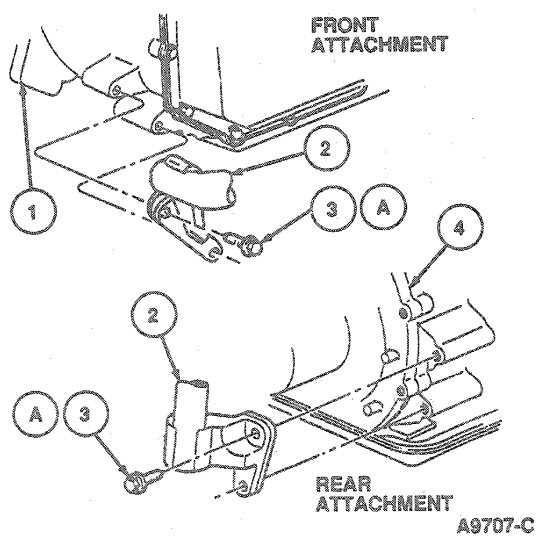
6. Install a new gasket.
7. Connect upper bulkhead connector wiring to valve body.
8. Carefully install side pan.
9. Loosely install two upper pan bolts.
10. Verify proper gasket position.
11. Install remaining pan bolts and tighten to 14-16 N·m (10-12 lb-ft).
12. Install LH engine mounts and supports. Refer to Transaxle Installation.
13. Tighten two LH subframe retaining bolts to specification.
14. Install inner fender cover.
15. Install LH wheel and tire assembly.
16. Remove support from engine and transaxle assembly and lower vehicle.
17. Install radiator sight shield.
18. Remove engine support equipment.
19. Install brake reservoir hose.
20. Position supply hoses, vacuum lines and wiring in position.
21. Install manual lever position sensor.
22. Install remote air cleaner.
23. Install battery tray and battery.
24. Fill transaxle with specified quantity and quality of oil.

INSTALLATION (Continued)

25. Start engine, move transaxle selector lever through all ranges. Check pump and valve body cover for leaks.

Transaxle

1. Place transaxle assembly on jack and raise to engine.
2. Position transaxle to engine and align torque converter bolts to flywheel.
3. Install transaxle housing bolts. Tighten to 55-68 N·m (41-50 lb-ft).
4. Install four torque converter bolts through starter drive hole by rotating engine at the crankshaft pulley bolt with a 7/8 deep well socket and 1/2 drive ratchet. Tighten to 31-53 N·m (23-39 lb-ft).
5. Remove transaxle jack.
6. Install halfshaft assemblies.
7. Tighten vehicle speed sensor. Tighten retaining bolt to 3.4-4.5 N·m (31-39 lb-in).
8. Install transaxle cooler lines. At transaxle, tighten to 24-31 N·m (18-23 lb-ft). At oil cooler, tighten to 11-16 N·m (8-12 lb-ft).
9. Install dust cover. Tighten to 9-12 N·m (7-9 lb-ft).
10. Install starter. Tighten to 41-54 N·m (30-40 lb-ft).
11. Raise subframe and install retaining bolts. Tighten to 75-102 N·m (55-75 lb-ft).
12. Remove subframe removal kit.
13. Install LH engine support. Tighten four bolts to 54-75 N·m (40-55 lb-ft).

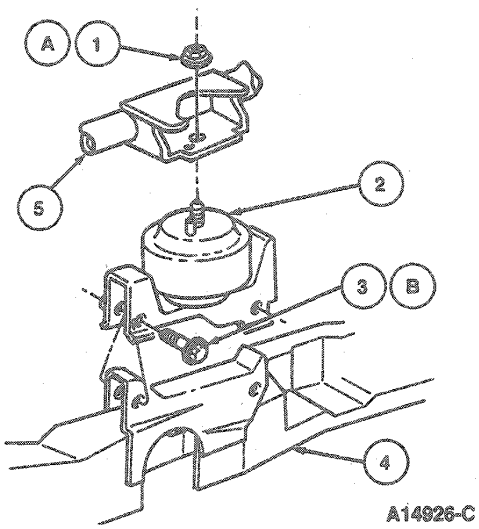


A9707-C

Item	Part Number	Description
1	—	Transaxle
2	6F065	Support Assy
3A	N605922-S102	Bolt (2 Req'd)
4	07002	Transaxle
A		Tighten to 54-75 N·m (40-55 Lb-Ft)

TA9707C

14. Install engine mount and tighten to 81-116 N·m (60-85 lb-ft).



A14926-C

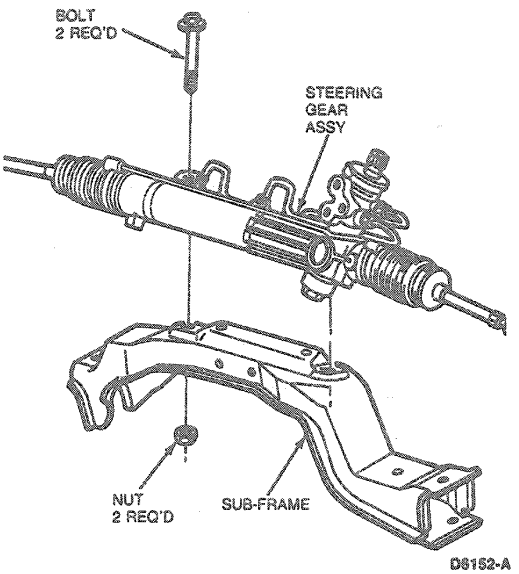
Item	Part Number	Description
1A	N800937-S102	Nut
2	6F063(LH)	Engine Mount Assy
3B	N804749-S100	Bolt (2 Req'd)
4	—	Frame
5	6F065	Support Assy
A		Tighten to 74-102 N·m (55-75 Lb-Ft)
B		Tighten to 81-116 N·m (60-85 Lb-Ft)

TA14926C

15. Install front exhaust pipe, converter assembly and mounting bracket. Refer to Section 09-00.
16. Reconnect heated oxygen sensor (HO2S) 9F472.

INSTALLATION (Continued)

17. Install power steering gear assembly and retaining nuts. Tighten to 115-135 N•m (85-100 lb-ft).



18. Install LH and RH lower arm assembly. Insert a new pinch bolt and nut. Tighten to 53-72 N•m (40-53 lb-ft).
19. Install stabilizer bar retaining bolts. Tighten to 30-40 N•m (23-29 lb-ft).
20. Install brake line support brackets. Tighten to 11 N•m (8 lb-ft).
21. Install RH and LH tie rod retaining nuts. Tighten to 31-47 N•m (23-35 lb-ft). Tighten to minimum specified torque, continue tightening to nearest cotter pin slot and insert cotter pin.
22. Install front wheel and tire assemblies. TIghten lug nuts to 115-142 N•m (85-105 lb-ft).
23. Lower vehicle.
24. Install power steering pump pressure and return line bracket. Tighten to 4.5-5.7 N•m (40-50 lb-in).
25. Remove Three Bar Engine Support D88L-6000-A or equivalent.
26. Install radiator sight shield.
27. Remove engine support equipment.
28. Install shift lever.
29. Install main wiring harness bracket.
30. Install electrical connectors to engine.
31. Install battery tray.
32. Install and connect battery.
33. Install air cleaner assembly, hoses and tubes.
34. Fill transaxle with specified quantity and quality of oil.
35. Start engine, move transaxle selector lever through all ranges. Check for leaks.

CLEANING AND INSPECTION

Transaxle

Clean the parts with suitable solvent and use moisture-free air to dry off all parts and clean out fluid passages.

The composition clutch plates, control valve body-to-screen gasket, bands and synthetic seals should not be cleaned in a vapor degreaser or with any type of detergent solution. To clean these parts, wipe them off with a lint-free cloth. New clutch plates or bands should be soaked in the specified transmission fluid for 15 minutes before being assembled.

Servo

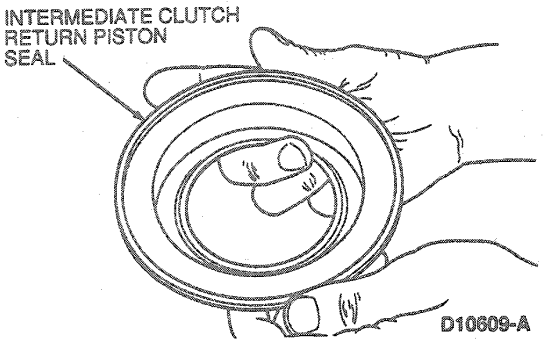
1. Inspect servo body for cracks and piston bore for scores.
2. Check fluid passages for obstructions.
3. Inspect band and struts for distortion. Inspect band ends for cracks.
4. Inspect servo spring for distortion.
5. Inspect band lining for excessive wear and bonding to metal band.
6. Replace damaged seals.

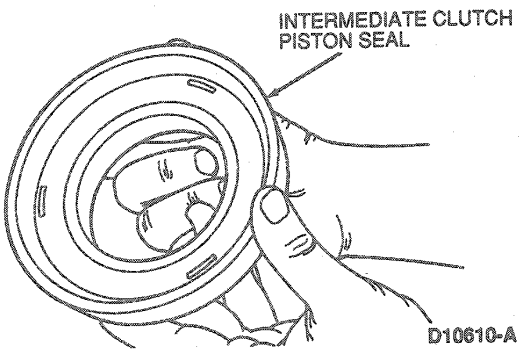
Forward, Direct, Intermediate and Reverse Clutches

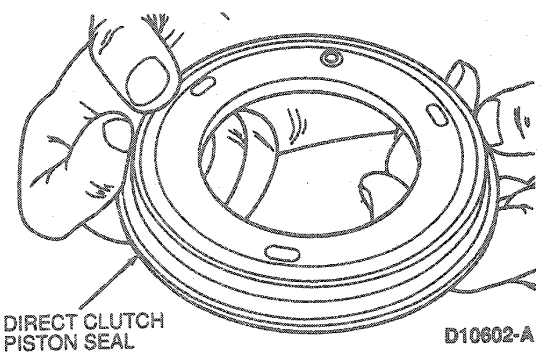
1. Inspect clutch cylinder thrust surfaces, piston bore, and clutch plate serrations for scores or burrs. Minor scores or burrs may be removed with crocus cloth. Replace the clutch cylinder if it is badly scored or damaged.
2. Check fluid passage in clutch cylinder for obstructions. Clean out all fluid passages. Inspect clutch piston for scores and replace if necessary. Inspect check balls for freedom of movement and proper seating.
3. Check clutch release spring for distortion and cracks. Replace spring (including wave spring) if it is distorted or cracked.
4. Inspect composition clutch plates, steel clutch plates, and clutch pressure plate for worn or scored bearing surfaces. Replace all parts that are deeply scored or burned.
5. Check clutch plates for flatness and fit on clutch hub serrations. Discard any plate that does not slide freely on the serrations or that is not flat.
6. Check clutch hub thrust surfaces for scores and clutch hub splines for wear.

CLEANING AND INSPECTION (Continued)

7. On 3.2L SHO inspect intermediate and direct clutch pistons as well as return piston for damage of integral sealing surface. Replace piston assemblies if any damage is observed.







Output Shaft

1. Inspect output shaft bearing surfaces for scores. If excessive clearance or scores are found, replace shaft and inspect components.
2. Check splines on output shaft for wear and replace shaft if splines are excessively worn. Inspect all bushings.

One-Way Clutches

1. Inspect outer and inner races for scores or damaged surface areas where rollers or sprags contact races.
2. Inspect rollers, sprags and springs for excessive wear or damage.
3. Inspect spring and case for bent or damaged spring retainers.

Speedometer Drive Assembly

Inspect drive and driven gears. Replace if teeth are broken, chipped or excessively worn.

Case

Inspect the case for cracks and stripped threads. Inspect the gasket surfaces and mating surfaces for burrs. Check the vent for obstructions and check all fluid passages for obstructions and leakage.

Inspect the case bushing for scores. Check all parking linkage parts for wear or damage.

If the transaxle case thread is damaged, service kits may be purchased from local jobbers. To service a damaged thread, the following procedures should be carefully followed.

1. Drill out damaged threads, **using the same drill size as the thread O.D.** For example, use a 5/16-inch drill for a 5/16 x 18 thread.
2. Select proper special tap and tap the drilled hole. Tap is marked for size of thread being repaired. Thus, the special tap marked 5/16 x 18 will not cut the same thread as a standard 5/16 x 18 tap. It does cut a thread large enough to accommodate the insert, and after the insert is installed the original thread size (5/16 x 18) is restored.
3. Place insert on tool and adjust sleeve to length of insert being used. Press insert against face of tapped hole. Turn tool clockwise and wind insert into hole until insert is one-half turn below face.
4. Working through insert, bend insert tang straight up and down until it breaks off at notch.
5. Improperly installed inserts can be removed with extractor tool. Place extractor tool in insert so that blade rests against top coil one-quarter to one-half turn away from end of coil. Tap tool sharply with a hammer so that blade cuts into insert. Exert downward pressure on tool and turn it counterclockwise until insert is removed.

Planetary Carriers

Individual parts of the planet carriers are not serviceable except for the differential components.

1. Check pins and shafts in planet assemblies for loose fit and/or complete disengagement. Use a **new planet** assembly if either condition exists. Before installing a planet assembly, check shaft welds.
2. Inspect pinion gears for damaged or excessively worn teeth.
3. Check for free rotation of pinion gears.

Thrust Bearings

Wash thrust bearings thoroughly in cleaning solvent. Blow bearings dry with compressed air.

CLEANING AND INSPECTION (Continued)

Ensure that bearings are clean and then lubricate with transmission fluid. Replace any bearings and races which show signs of pitting or roughness.

Stator to Impeller Interference Check

1. Position stator support assembly on a bench with spline end pointing up.
2. Mount a converter on stator support with splines on one-way clutch inner race engaging mating splines of stator support.
3. Hold stator support stationary, and try to rotate torque converter both clockwise and counterclockwise. Converter should rotate freely without any signs of interference or scraping within converter assembly.
4. If there is an indication of scraping, trailing edges of stator blades may be interfering with leading edges of impeller blades. In such cases, replace converter.

Converter and Oil Cooler

Tools Required:

- Rotunda Torque Converter and Oil Cooler Cleaner 014-00028

When internal wear or damage has occurred in the transaxle, metal particles, clutch plate material, or band material may have been carried into the converter and oil cooler. These contaminants are a major cause of recurring transaxle troubles and **MUST** be removed from the system before the transaxle is put back into service.

Whenever a transaxle has been disassembled to replace worn or damaged parts or because the valve body sticks due to foreign material, the converter and oil cooler **MUST** be cleaned by using a mechanically agitated cleaner, such as Rotunda Torque Converter and Oil Cooler Cleaner 014-00028 or equivalent.

The lack of a drain plug in the AXODE (AX4S) converter increases the amount of residual flushing solvent retained in the converter after cleaning. This retained solvent is not acceptable and a method of diluting it is required. The following procedure is to be used after removal of the AXODE (AX4S) torque converter from the cleaning equipment.

1. **Thoroughly drain** remaining solvent through hub.
2. Add 1.9 L (2.0 qt) of clean transmission fluid to converter. Agitate by hand.
3. **Thoroughly drain** solution through converter hub.

SPECIFICATIONS

CLUTCH AND BAND APPLICATION CHART

Gear	Lo-Int Band	Overdrive Band	Forward Clutch	Intermediate Clutch	Direct Clutch	Reverse Clutch	Low One-Way Clutch	Direct One-Way Clutch
1st Gear Manual Low	Applied		Applied		Applied		Applied	Applied
1st Gear (Drive)	Applied		Applied				Applied	
2nd Gear (Drive)	Applied		Applied	Applied			Holding	
3rd Gear (Drive)				Applied	Applied			
4th Gear (Overdrive)		Applied		Applied	Applied			Holding
Reverse (R)			Applied			Applied	Applied	
Neutral (N)			Applied					
Park (P)			Applied					

FLUID CAPACITY

Type	Liters	Quarts
MERCON® Ford Specification E4AZ-19582-B	12.2	12.8

TORQUE SPECIFICATIONS

Description	N·m	Lb-Ft
Separator Plate to Main Control	9-12	7-9
Separator Plate to Pump Body	9-12	7-9

(Continued)

TORQUE SPECIFICATIONS (Cont'd)

Description	N·m	Lb-Ft
Detent Spring to Chain Cover	9-12	7-9
Solenoid to Main Control	9-12	7-9
Low-Intermediate Servo Cover to Case	9-12	7-9
Overdrive Servo Cover to Case	9-12	7-9
Pump Cover to Pump Body	9-12	7-9
Filler Tube to Case	9-12	7-9

(Continued)

SPECIFICATIONS (Continued)

TORQUE SPECIFICATIONS (Cont'd)

Description	N·m	Lb-Ft
Governor Cover to Case	9-12	7-9
Case to Stator Support	7-9	7-9
Oil Pump Assy. to Main Control	9-12	7-9
Park/Neutral Position Switch to Case	9-12	7-9
Valve Body/Solenoid to Chain Cover	9-12	7-9
Bracket Tubes to Case	9-12	7-9
Dust Cover to Case	9-12	7-9
Chain Cover to Case (10 mm) Socket Size	27-30	20-22
Pump Body to Chain Cover	9-12	7-9
Main Control Cover to Chain Cover (Upper Reservoir)	21-25	15-18
Manual Lever to Manual Shaft	16-22	12-16
Park Abutment to Case	27-30	20-22
Chain Cover to Case (10mm) Socket Size	27-30	20-22
Chain Cover to Front Support (10mm) Socket Size	27-30	20-22
Chain Cover to Front Support (13mm) Socket Size	34-48	25-35
Differential Brace to Case	34-48	25-35
Case to Reverse Clutch Screw	10-12	7-9
Case to Reverse Clutch Nut	34-47	25-35
Pressure Tap Plug for Chain Cover and Pump Body	8-12	6-9
Pressure Switch to Pump Body	8-12	6-9
Hose Screws	2.2-3.4	20-30 (Lb-In)
Oil Pan to Case (Lower Reservoir)	13-15	8-11
Speedometer Cover to Case	9-12	7-9
Chain Cover to Case (8mm) Socket Size	9-12	7-9
Case to Chain Cover (10mm) Socket Size	25-28	18-21
Case to Chain Cover (8mm) Socket Size	9-12	7-9
Transaxle to Engine Bolt	55-68	41-50
Stabilizer U-Clamp to Bracket Bolt	30-40	23-29
Brake Hose Routing Clip Bolt	11	8
Tie Rod to Knuckle Bolt[1]	31-47	23-35
Manual Cable Bracket Bolt	14-27	10-20
Starter Bolt	41-54	30-40
Dust Cover Bolt	9-12	7-9
Torque Converter to Flywheel Bolt	31-53	23-39
Vehicle Speed Sensor Bolt	3.4-4.5	31-39 (Lb-In)
Subframe Bolt	75-102	55-75
Lower Control Arm Pinch Bolt Bolt	53-72	40-53
Lug Nuts	115-142	85-105

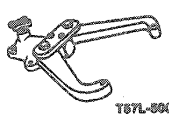
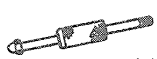
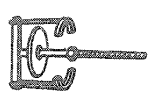
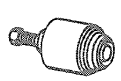
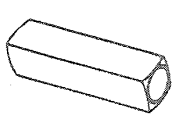
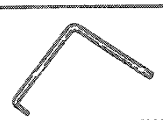
(Continued)

TORQUE SPECIFICATIONS (Cont'd)

Description	N·m	Lb-Ft
Power Steering Line Bracket Bolts	4.5-5.7	40-50 (Lb-In)
Steering Gear Bolts	115-135	85-100
Engine Mount Bolts	81-116	60-85
LH Engine Support Bolts	54-75	40-55
Cooler Line Fitting at Radiator Transaxle Cooler Line Nut	11-16[2] 24-31[2] 16-24	8-12 18-23 12-18
Tube Nut to Connector	16-24	12-18
Threaded Connector to Oil Cooler	11-16	8-12

1 Tighten to minimum specified torque, continue tightening to nearest cotter pin slot.
2 1/4 inch x 18 Straight Pipe Fitting

SPECIAL SERVICE TOOLS

Tool Number/ Description	Illustration
T57L-500-B Bench Mounted Holding Fixture	 T57L-500-B
T58L-101-B Puller	 T58L-101-B
T59L-100-B Impact Slide Hammer	 T59L-100-B
T65L-77515-A Clutch Spring Compressor	 T65L-77515-A
T74P-6700-A Front Cover Seal Remover	 T74P-6700-A
T76L-7902-C One-Way Clutch Torque Tool	 T76L-7902-C
T77L-7902-R Holding Connector Clutch Holding Tool	 T77L-7902-R

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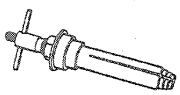
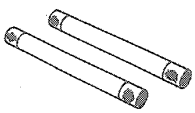
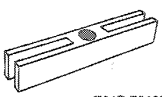
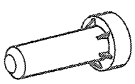
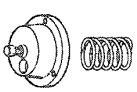
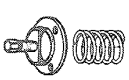
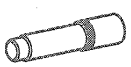
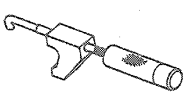
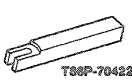
SPECIAL SERVICE TOOLS (Continued)

Tool Number/ Description	Illustration
T80L-7902-A End Play Checking Tool	 T80L-7902-A
T81P-7902-C Torque Converter Handles	 T81P-7902-C
T81P-78103-A Slide Hammer Adapter	 T81P-78103-A
T86P-1177-B Output Shaft Seal Replacer	 T86P-1177-B
T86P-3514-A1 C.V. Joint Puller T86P-3514-A2 Screw Extension	 -A1 -A2 T86P-3514-A
T86P-7902-A Converter Guide Sleeve Tool	 T86P-7902-A
T86P-70001-A Lube Tube Remover Tool	 T86P-70001-A
T86P-70023-A Low/Intermediate Servo Rod Tool	 T86P-70023-A
T86P-70023-B Overdrive Servo Rod Tool	 T86P-70023-B
T86P-70043-A Stator and Driven Sprocket Bearing Remover	 T86P-70043-A

(Continued)

Tool Number/ Description	Illustration
T86P-70043-B Stator and Driven Sprocket Bearing Replacer	 T86P-70043-B
T86P-70100-A Valve Body Guide Pin Set	 T86P-70100-A
T86P-70100-B Valve Body Guide Pin	 T86P-70100-B
T86P-70100-C Valve Body Guide Pin	 T86P-70100-C
T86P-70234-A Direct Clutch Lip Seal Protector	 T86P-70234-A
T86P-70370-A Pump Body Guide Pin	 T86P-70370-A
T86P-70389-A Front Clutch Loading Tool	 T86P-70389-A
T86P-70403-A Reverse Clutch Outer Lip Seal Protector	 T86P-70403-A
T86P-70422-AR Bimetal Height Gauge	 T86P-70422-AR
T86P-70548-A Forward Clutch Seal Lip Protector	 T86P-70548-A
T86P-77265-AH Cooler Line Disconnect Tool	 T86P-77265-AH

(Continued)

SPECIAL SERVICE TOOLS (Continued)

Tool Number/ Description	Illustration
T87P-70014-AH End Play Tool	 T87P-70014-AH
T87L-77837-AH Front Pump Seal Installer	 T87L-77837-AH
T89P-1177-AH Output Shaft Seal Installation	 T89P-1177-AH
T89T-70010-J Manual Lever Position Sensor Tool	 T89T-70010-J
T91P-70010-A Gear Position Sensor Adjuster	 T91P-70010-A
T91P-76085-A Rear Lube Seal Installer	 T91P-76085-A

Tool Number	Description
D79P-100-A	Impact Slide Hammer
D80L-515-S	Puller Screw

(Continued)

Tool Number	Description
D80L-522-A	Gear and Pulley Support Bar
D80L-625-A	Shaft Protector
D80L-630-3	Step Plate Adapter
D81P-3504-N	Locknut Pin Remover
D81L-6001-D	Engine Lifting Eyes
D88L-6000-A	Engine Support Bar
D89T-70100-A	Manual Lever Position Sensor Tester
TOOL-1175-AC	Seal Remover
TOOL-4201-C	Dial Indicator with Bracketry

ROTUNDA EQUIPMENT

Model	Description
007-0041A	SUPER STAR II Tester
007-00085	Transmission Tester
014-00028	Torque Converter and Oil Cooler Cleaner
014-00373	Automatic Transmission Tester Kit
014-00407	Digital Volt Ohmmeter
014-00751	Subframe Removal Kit
021-00054	Torque Converter Leak Test Kit

PARTS CROSS-REFERENCE

Base Part #	Part Name	Old Part Name
9E731	Vehicle Speed Sensor	Speed Sensor

SECTION 07-02 Transaxle, Automatic—Cooling

SUBJECT	PAGE	SUBJECT	PAGE
DIAGNOSIS AND TESTING		SPECIAL SERVICE TOOLS	07-02-3
Oil Cooler Steel Lines	07-02-1	SPECIFICATIONS	07-02-3
Service Procedures	07-02-1	VEHICLE APPLICATION	07-02-1

VEHICLE APPLICATION

Taurus / Sable.

DIAGNOSIS AND TESTING

Oil Cooler Steel Lines

When fluid leakage is found at the oil cooler (in radiator), the cooler must be replaced. Refer to Section 03-03 for oil cooler replacement procedures.

NOTE: The cooler lines that are attached to the transaxle are a push connect design. A special removal tool is required for non-SHO vehicles only. No tool is required for SHO vehicles with automatic transmissions. The cooler lines attached to the radiator use the conventional nut and flare fittings.

When oil cooler steel lines need replacing, each replacement line must be fabricated from the same size steel line as the original (5 / 16 inch OD for all Taurus / Sable except SHO automatic; 3 / 8 inch for Taurus SHO automatic). Using the oil line as a guide, bend the new line as required. Add the necessary fittings and install the line. After the fittings have been tightened to specification, add fluid as necessary and check for leaks.

Service Procedures

Taurus Automatic

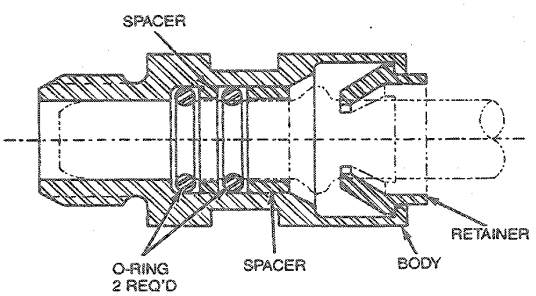
Oil Cooler Steel Lines Using Push Connect Fittings

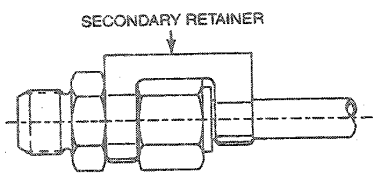
Tools Required:

- Cooler Line Disconnect Tool T86P-77265-AH

NOTE: For description on how to use Cooler Line Disconnect Tool T86P-77265-AH refer to Cooler Line Disconnect Tool Usage.

1. If leakage is noted at the cooler line fitting on the transaxle, remove the cooler line fitting retaining clip. Using Cooler Line Disconnect Tool T86P-77265-AH remove the cooler line.





2. Install angled flare fitting in the transaxle. Tighten fitting to 24-31 N·m (18-22 lb-ft).
3. Cut approximately 76-102mm (3-4 inches) from the existing cooler line.

DIAGNOSIS AND TESTING (Continued)

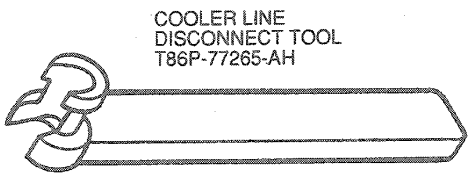
4. Using new cooler line steel tubing (equivalent of SAEJ526 welded low carbon lead / tin coated 5 / 16-inch OD), cut a piece of sufficient length and shape it to connect the existing line to the new flare fitting.
5. Clean all cut ends of both lines with the blade edge of the cutting tool to avoid line restrictions. Clean metal particles from the tube ends.
6. Install flare nut 87944-S8 or equivalent on the transaxle end of the new cooler line section.
7. Connect the new cooler line section to the existing cooler line using a piece of 5 / 16-inch fuel line hose and two worm drive hose clamps. Use a sufficient length of fuel line hose to achieve a 38-51mm (1-1 / 2 to 2 inches) overlap of the ends of the cooler lines.
8. Connect the cooler line to the flare fittings and tighten to 16-24 N·m (12-17 lb-ft).

Cooler Line Disconnect Tool Usage Push Connect Fittings

NOTE: On some applications, it may not be possible to insert the removal tool into the fitting due to vehicle component interference. If this condition exists, the fitting must be removed from the case without disconnecting the cooler line. Turning the fitting without removing the cooler line may damage the internal O-ring of the fitting causing a leak. If the fitting is removed without disconnecting the cooler line first, a replacement angle flared type fitting must be installed. Refer to Oil Cooler Steel Lines service procedures.

For transaxle cooler line service, Cooler Line Disconnect Tool T86P-77265-AH is required. The illustration shows the tool end and its proper position for disassembly of tube from fitting. The purpose of the tool is to spread the duck-bill retainer to disengage the tube bead. The following steps are necessary for use of the tool.

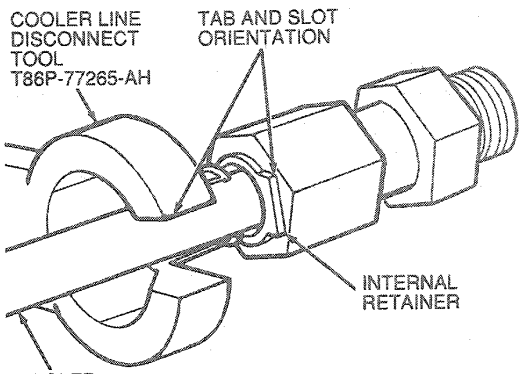
To aid in the use of the tool, remove tube retaining clip, and then clean the road dirt from the fitting before inserting the tool into the fitting. Also, it is important to avoid any contamination of the fitting and transaxle. Dirt in the fitting could cause an O-ring leak.



D6418-B

1. Slide tool over tube.
2. Align opening of tool with one of two tabs on the fitting duck-bill retainer.

Cooler Line Disconnect Tool



D7306-B

3. Firmly insert tool into fitting until it seats against tube bead. (A definite click should be heard.)

   CAUTION: Do not attempt to separate cooler line from fitting by prying with another tool. This will break the plastic insert in fitting and bend the cooler lines at junction to fitting.
4. With thumb held against tool, firmly pull back on tube until it disengages from fitting.

Before assembly of the lines in the fitting, visually inspect the plastic retainer in the fitting for a broken tab. If a tab is broken, the fitting must be replaced. Also visually inspect the cooler lines to ensure they are not bent at the junction of the fitting.

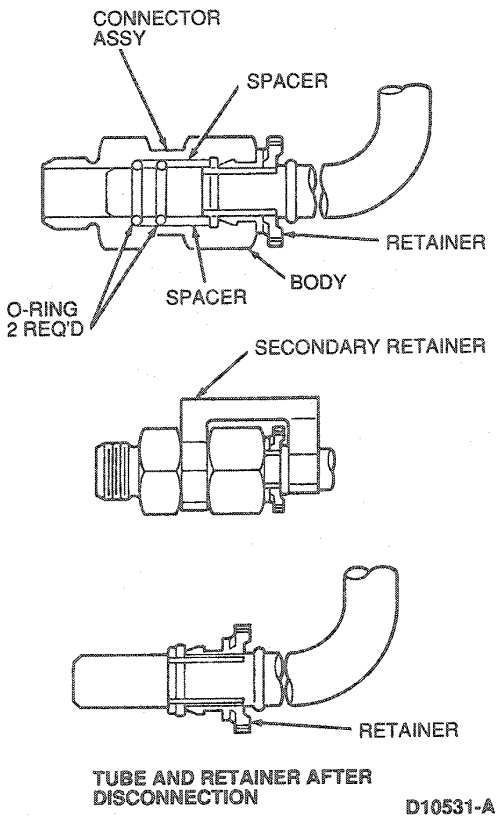
Tube assembly is accomplished by inserting the tube into the fitting until the retainer engages the tube bead. (A definite click should be heard.) Pull back on the tube to ensure full engagement. Install tube retaining clip.

Taurus SHO Automatic

CAUTION: Do not attempt to separate Taurus SHO cooler lines from fitting by prying with a tool.

DIAGNOSIS AND TESTING (Continued)

1. If leakage is noted with the cooler line fitting on the transaxle, remove the cooler line fitting retaining clip. Then, manually squeeze / depress the plastic insert / retainer in the push connect fitting and disconnect the cooler line. No disconnect tool is required to remove the cooler line. Discard the plastic insert / retainer which will remain on the cooler line. Replace the fitting (connector assembly) on the transaxle with a new fitting. Reconnect the cooler line. Tube assembly is accomplished by inserting tube into the fitting until the retainer engages the first tube bead. (A definite click should be heard.) Pull back on the tube to ensure full engagement. Reinstall the fitting retaining clip.



TUBE AND RETAINER AFTER DISCONNECTION D10531-A

2. Install angled flare fitting in the transaxle. Tighten fitting to 24-31 N·m (18-22 lb-ft).
3. Cut approximately 76-102mm (3-4 inches) from the existing cooler line.
4. Using new cooler line steel tubing (equivalent of SAEJ526 welded low carbon lead / tin coated 3 / 8-inch OD), cut a piece of sufficient length and shape it to connect the existing line to the new flare fitting.
5. Clean all cut ends of both lines with the blade edge of the cutting tool to avoid the line restrictions. Clean metal particles from the tube ends.
6. Install flare nut 87944-S8 on the transaxle end of the new cooler line section.
7. Connect the new cooler line section to the existing cooler line section using a piece of 3 / 8-inch fuel line hose and two worm drive hose clamps. Use a sufficient length of fuel line hose to achieve a 38-51mm (1-1 / 2 to 2 inch) overlap of the ends of the cooler lines.
8. Connect the cooler line to the flare fitting and tighten to 16-24 N·m (12-17 lb-ft).

SPECIFICATIONS

TORQUE SPECIFICATIONS

Description	N·m	Lb-Ft
Angled Flare Fittings	24-31	18-22
Flare Fittings	16-24	12-17

SPECIAL SERVICE TOOLS

Tool Number / Description	Illustration
T86P-77265-AH Cooler Line Disconnect Tool	 T86P-77265-AH

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Flywheel	07-03-51
Gears	07-03-51
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VEHICLE APPLICATION

Taurus with 3.0L SHO Engine.

DESCRIPTION

The MTX IV 5-Speed Manual Transaxle is similar in design and function to the MTX III 5-Speed Manual Transaxle. The major differences between the two transaxles are that the MTX-IV has wider gears, larger bearings, a four pinion aluminum differential assembly and a strengthened case.

The transaxle is a front-wheel drive powertrain unit. The transaxle and differential assemblies are housed in a single two-piece aluminum alloy case known as a transaxle. The transaxle is bolted to the back of the engine and is mounted transversely in the vehicle with the engine on the right and the transaxle on the left. Three separate gear shaft assemblies are used; the input cluster gear shaft, the main shaft for first to fourth gears and the fifth gear shaft. Helical cut gears are used in all forward ranges for quiet operation. All five forward gears are synchronized for ease of shifting.

The fifth gear range provides an effective overdrive ratio, which allows the engine to operate at reduced rpm providing reduced engine wear and improved fuel economy.

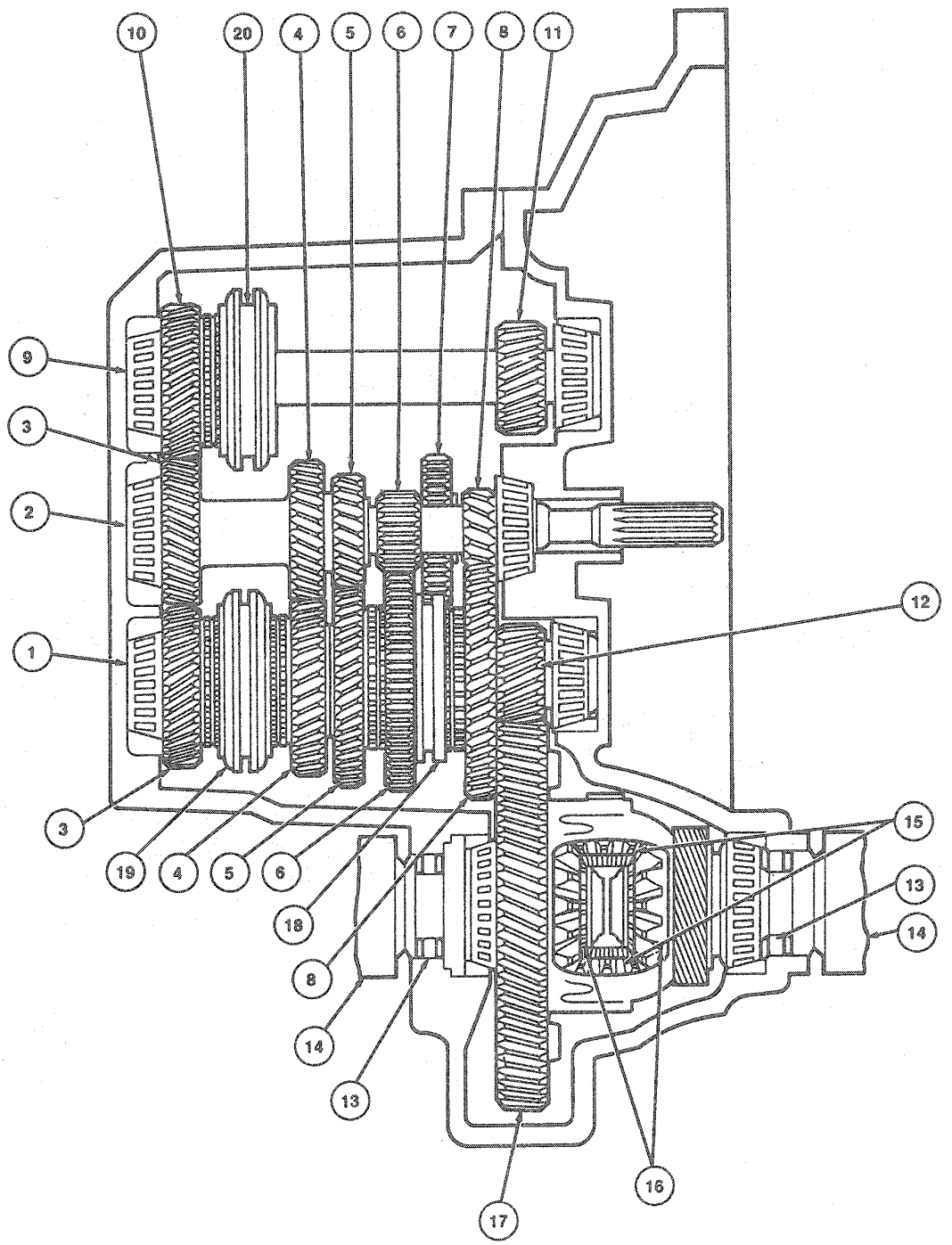
An automatic transmission-type fluid is used as a lubricant to ensure shifting ease under all driving conditions.

The 5-speed MTX IV manual transaxle assembly consists of a transmission and four-pinion differential, transversely mounted side-to-side in the vehicle. The transmission and differential are housed in a two-part lightweight aluminum alloy housing which is bolted to the engine assembly. The four-pinion differential is required due to the high output torque of the 3.0L SHO engine. The four pinion differential assembly is supported by two opposed tapered roller bearings and preload is maintained by means of a selected shim. The inboard constant velocity joints are positively connected with the differential side gears by means of splines and secured in the case with two circlips. The final drive gear is riveted to the two-piece aluminum differential case. Service replacement of the final drive gear or the two-piece aluminum differential case requires that the rivets be drilled and driven out of the case and service nuts and bolts be installed.

DESCRIPTION (Continued)

Torque is transmitted from the engine through the transaxle to the final drive gear. Inside the two-piece case, four differential pinion gears are mounted on three differential pinion shafts which are pinned to the case. Two of the four pinion gears are mounted on one long pinion shaft. The two remaining pinion gears are mounted on short pinion shafts. The three pinion shafts are inserted in a pinion shaft seat, located in the center of the differential case, to maintain proper alignment. The gears are engaged with two side gears to which the stub shafts are splined. As the differential case turns, it rotates the constant velocity joints and the front wheels. When it is necessary for one wheel and shaft to rotate faster than the other, such as in turning a corner, the faster turning side gear causes the pinions to roll on the slower turning side gear to allow the differential action between the two constant velocity joints.

DESCRIPTION (Continued)



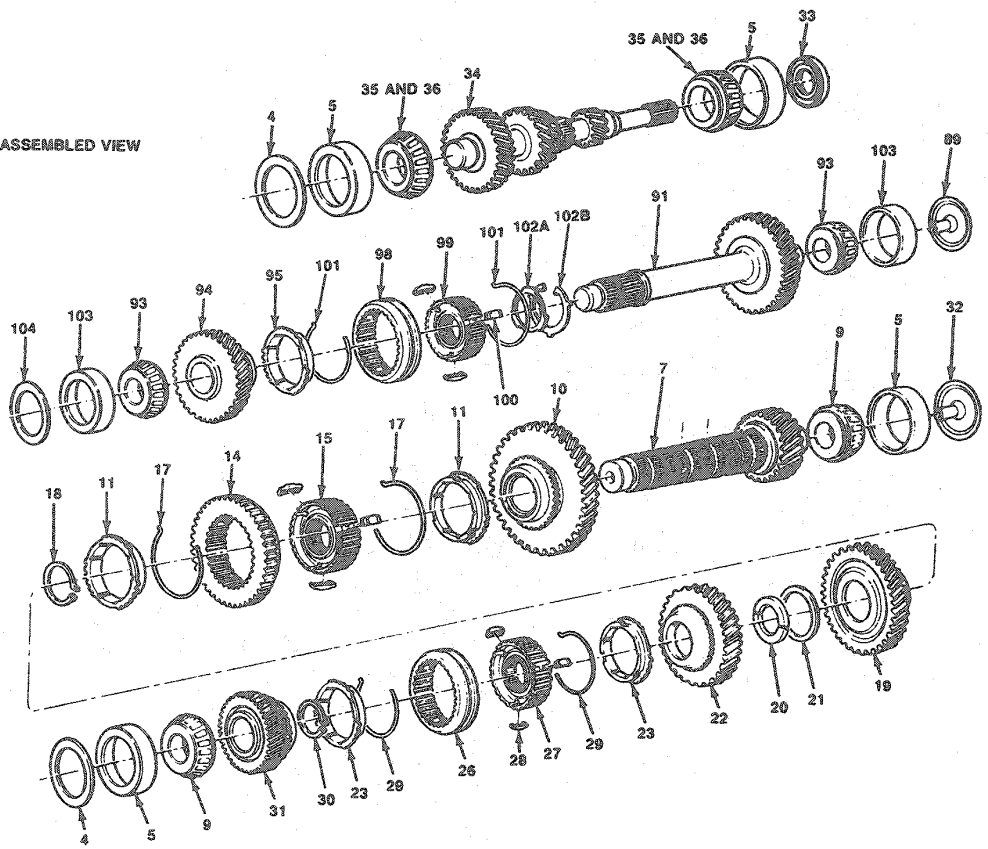
DESCRIPTION (Continued)

Item	Description
1	Mainshaft
2	Input Cluster Gear Shaft
3	4th Speed Gears
4	3rd Speed Gears
5	2nd Speed Gears
6	Reverse Gears
7	Reverse Idler Gear
8	1st Speed Gears
9	5th Speed Gear Shaft

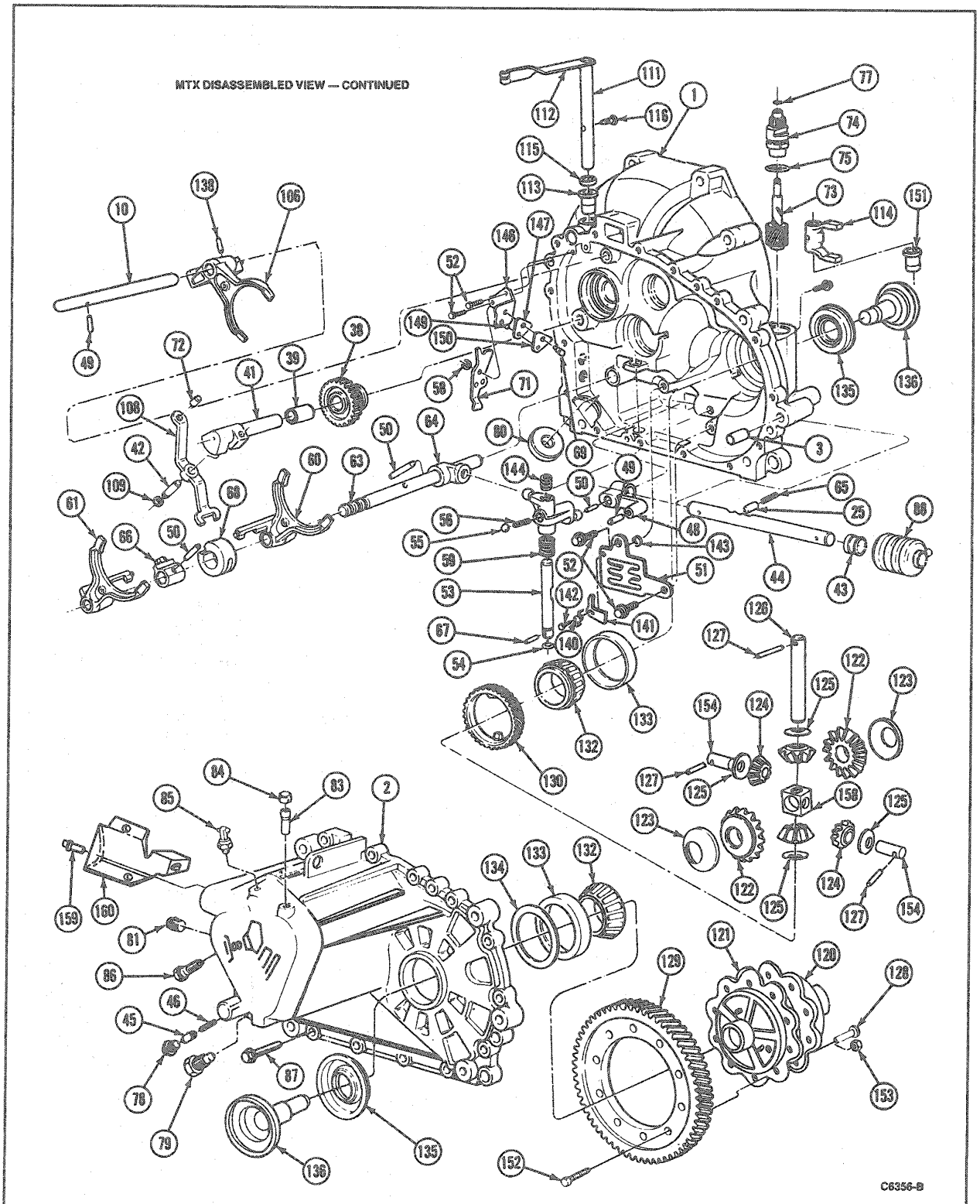
(Continued)

Item	Description
10	5th Speed Gear
11	5th Gear Shaft Pinion Gear
12	Mainshaft Pinion Gear
13	Differential Oil Seals
14	CV Shafts
15	Differential Pinion Gears
16	Differential Side Gears
17	Final Drive Ring Gear
18	1st / 2nd Synchronizer
19	3rd / 4th Synchronizer
20	5th Synchronizer

MTX DISASSEMBLED VIEW



DESCRIPTION (Continued)



DESCRIPTION (Continued)

Item	Part Number	Description
1	7F096	Case—Transaxle Clutch
2	7F097	Case—Transaxle Trans.
3	6397	Dowel—Trans. Case to Clutch Housing (2 Req'd)
4	7L172	Shim—Trans. Bearing Preload (2 Req'd)
5	7F433	Cup—Trans. Bearing (4 Req'd)
6	7C094	Shaft Assy—Trans. Main
7	7061	Shaft—Trans. Main
8	7F431	Bearing Assy—Trans. Tapered Roller (2 Req'd)
9	7F432	Cone & Roller Assy—Trans. Bearing (2 Req'd)
10	7100	Gear—Trans. 1st Speed
11	7107	Ring—Trans. Synchro. Blocking (2 Req'd)
12	7124	Synchronizer Assy—Trans. 1st/2nd
13	7K012	Gear & Hub Assy—Trans. 1st/2nd Sync.
14	7K013	Gear—Trans. Rev. Sliding
15	7C115	Hub—Trans. 1st/2nd Synchro.
16	7C396	Insert—Trans. 1st/2nd Synchro. Hub (3 Req'd)
17	7109	Spring—Trans. Synchro. Retaining (2 Req'd)
18	N661228-S	Ring—35mm Retaining Type SB Ext.
19	7102	Gear—Trans. 2nd Speed
20	7A385	Washer—Trans. 2nd/3rd Thrust (2 Req'd)
21	7A046	Ring—Trans. 2nd/3rd Thrust Washer Ret.
22	7B340	Gear—Trans. 3rd Speed
23	7107	Ring—Trans. Synchro. Blocking (2 Req'd)
22	7B340	Gear—Trans. 3rd Speed
23	7107	Ring—Trans. Synchro. Blocking
24	7B280	Synchronizer Assy—Trans. 3rd/4th
25	7K204	Plunger—Trans. Shift Shaft Detent
26	7106	Sleeve—Trans. 3rd/4th Synchro.
27	7105	Hub—Trans. 3rd/4th Synchro.
28	7K198	Insert—Trans. 3rd/4th Synchro. Hub (3 Req'd)
29	7109	Spring—Trans. Synchro. Retaining (2 Req'd)
30	N661226-S	Ring—32mm Retaining Type SB Ext.
31	7110	Gear—Trans. 4th Speed
32	7L276	Funnel—Trans. Main Shaft
33	7048	Seal Assy.—Trans. Input Shaft Oil

(Continued)

Item	Part Number	Description
34	7017	Shaft—Trans. Input Cluster Gear
35	7F431	Bearing Assy—Trans. Tapered Roller (2 Req'd)
36	7F432	Cone & Roller Assy.—Trans. Bearing (2 Req'd)
37	7141	Gear & Bushing Assy.—Trans. Rev. Idler
38	7142	Gear—Trans. Rev. Idler
39	7143	Bushing—Trans. Rev. Idler Gear
40	7N322	Shaft Assy.—Trans. Rev. Idler Gear
41	7140	Shaft—Trans. Rev. Idler Gear
42	7F111	Pin—Trans. 5th Relay Lever Pivot
43	7288	Seal Assy.—Trans. Shift Shaft Oil
44	7L267	Shaft—Trans. Input Shift
45	7K204	Plunger—Trans. Shift Shaft Detent
46	7C288	Spring—Trans. Shift Shaft Detent
47	7F477	Arm Assy—Trans. Shift Gate Selector
48	7F478	Arm—Trans. Shift Gate Selector
49	7F013	Pin—Trans. Shift Gate Selector (2 Req'd)
50	N646635-S	Pin—5mm X 25.0 Spring Slot Hvy. (3 Req'd)
51	7F476	Plate—Trans. Shift Gate
52	N801087-S	Bolt—M6-1 X 22 Hex. Flange Head (4 Req'd)
53	7C355	Shaft—Trans. Shift Lever
54	N802277-S	Seal—9mm X 2.6 'O' Ring Oil
55	N-802568-S	Ball—10.319mm
56	7L058	Spring—Trans. 5th Rev. Inhibitor
57	7F116	Lever—Trans. Shift
58	N663109-S	Ring—10mm Retaining Type RB Ext.
59	7G046	Spring—Trans. 3rd/4th Shift Bias
60	7C114	Fork—Trans. 1st/2nd Shift
61	7230	Fork—Trans. 3rd/4th Shift
62	7F177	Plate & Spring Assy—Trans.
63	7358	Shaft—Trans. Main Shift Fork Control
64	7K105	Block—Trans. Fork Control Shaft
65	7234	Spring—Trans. Input Shift Shaft
66	7346	Arm—Trans. Shift Fork Selector
67	N646629-S	Pin—5mm X 30.0 Spring
68	7K201	Sleeve—Trans. Shift Fork Interlock

(Continued)

DESCRIPTION (Continued)

Item	Part Number	Description
69	7F111	Pin—Trans. Rev. Relay Lever Pivot
70		
71	7K002	Lever—Trans. Rev. Shift Relay
72	7K218	Pin—Trans. Rev. Shift Relay Lever (2 Req'd)
73	17271	Gear—Trans. Speedo Driven
74	17K288	Retainer—Trans. Speedo. Driven Gear
75	N801061-S	Seal—25mm X 2.6 'O' Ring Oil
76	N801034-S2	Screw—M4-0.7 X 25 Hex. Washer Head
77	N801370-S	Seal—5.16mm X 1.6 'O' Ring Oil
78	7F489	Screw—Trans. Detent Plunger Ret.
79	7F488	Pin—Trans. Fork Interlock Sleeve Ret.
80	7L027	Ceramic Magnet—Trans. Case
81	7N439	Plug—JIS PT 1/2 Sq. Hd.
82	7034	Vent Assy—Trans. Case
83	7035	Body—Trans. Vent
84	7036	Cap—Trans. Vent
85	15520	Switch Assy—Trans. Back-up Lamp
86	N801862-S2	Bolt—M8-1.25 X 33 Hex. Head
87	N605790-S2	Bolt—M8-1.25 X 40 Hex. Flange Head (15 Req'd)
88	7F110	Boot—Trans. Input Shift Shaft
89	7L276	Funnel—Trans. 5th Gear Shaft
90	7C094	Shaft Assembly—Trans. 5th Gear
91	7061	Shaft—Trans. 5th Gear Drive
92	7F431	Bearing Assy—Trans. Tapered Roller (2 Req'd)
93	7F432	Cone & Roller Assy—Trans. Bearing (2 Req'd)
94	7K316	Gear—Trans. 5th Speed
95	7107	Ring—Trans. Synchro. Blocking
96	7124	Synchronizer Assy.—Trans. 5th
98	7106	Sleeve—Trans. 5th Synchro.
99	7105	Hub—Trans. 5th Synchro.
100	7K198	Insert—Trans. 5th Synchro. Hub (3 Req'd)
101	7109	Spring—Trans. 5th Synchro. Ret. (2 Req'd)
102A	7L049	Spacer—Trans. 5th Synchro. Insert Retaining
102B	7G042	Retainer—Trans. 5th Synchro. Insert

(Continued)

Item	Part Number	Description
103	7F433	Cup—Trans. Bearing (2 Req'd)
104	7L172	Shim—Trans. Bearing Preload
105	7358	Shaft—Trans. 5th Shift Fork Control
106	7B297	Fork—Trans. 5th Shift
107	7G043	Lever Assy—Trans. 5th Shift Relay
108	7G044	Lever—Trans. 5th Shift Relay
109	N802832-S	Ring—8mm Retaining Type RB Ext.
110	7503	Shaft Assy—Clutch Release
111	7510	Shaft—Clutch Release
112	7591	Lever—Clutch Release
113	7N620	Bushing—Clutch Release Shaft—Upper
114	7541	Lever—Clutch Release
115	N803859-S	Washer—Flat 17.7 Dia. (Felt)
116	7565	Pin—Clutch Release Lever
117	7F465	Differential and Gear Assy—Transaxle
118	1026	Differential Assy.
119		
120	4205	Case—Diff. Gear RH
121	4206	Case—Diff. Gear LH
122	4236	Gear—Diff. Side (2 Req'd)
123	4228	Washer—Diff. Side Gear Thrust (2 Req'd)
124	4215	Gear—Diff. Pinion (4 Req'd)
125	4230	Washer—Diff. Pinion Gear Thrust (4 Req'd)
126	4211	Shaft—Diff. Pinion Gear
127	N800979-S	Pin—4.75mm X 38.1 Spring
128	N802940-S	Rivet—12mm X 37 Solid Flat Hd. (10 Req'd)
129	7F343	Gear—Trans. Final Drive Ring
130	17285	Gear—Trans Speedo. Drive
131	4220	Bearing Assy—Diff. Tapered Roller (2 Req'd)
132	4221	Cone & Roller Assy—Diff. Bearing (2 Req'd)
133	4222	Cup—Diff. Bearing (2 Req'd)
134	4A451	Shim—Diff. Bearing Preload
135	1177	Seal Assy—Diff. Oil (2 Req'd)
136	Reference	Shipping Plug (2 Req'd)
137	7B148	Tag—Transaxle Service I.D.
138	N646624-S	Pin—5mm X 20.0 Spring Slot Hvy.
139		
140	7E200	Spring—Trans. Shift Gate Plate Pawl
141	7E159	Pawl—Trans. Shift Gate Plate

(Continued)

DESCRIPTION (Continued)

Item	Part Number	Description
142	7E484	Pin—Trans. Rev. Lockout Pawl Pivot
143	N663103-S2	Ring—4mm Ret. Type RB Ext.
144	7B146	Spring—Trans. 5th/Rev. Kick Down
145	7D378	Bracket Assy—Rev. Shift Relay Lever Support
146	7D379	Bracket—Rev. Shift Relay Lever Support
147	7L128	Spring—Trans. Rev. Shift Relay Lever
148	7K423	Shaft Assy—Trans. 5th Shift Fork Control
149	7217	Ball—8.731mm
150	7L128	Spring—Trans. Rev. Shift Relay Lever Ret. Sec.
151	7N620	Bushing—Clutch Release Shaft—Lower
152	N802393-S100	Bolt-Service Replacement (10 Req'd)
153	N802389-S2	Nut-Service Replacement (10 Req'd)
154	4419	Pinion Shaft
158	4420	Pinion Shaft Seat
159	N605800-S2	Bolt—Bracket Mounting
160	7F325	Bracket Assy—Energy

(Continued)

OPERATION

Power Flow

Engine torque is transferred from the clutch to the input cluster gear shaft. The four forward gears on the input cluster gear shaft are in constant mesh with a matching gear on the main shaft. The fourth gear on the input cluster gear shaft is simultaneously meshed with the fifth speed gear on the fifth gear shaft. These meshed gearsets provide the five available forward gear ratios.

Both the main shaft and the fifth gear shaft have a pinion gear, which is constantly engaged with the final drive ring gear on the differential assembly. If one of the gears (first through fourth) on the main shaft is selected, and that gear is locked to the shaft by its shifted synchronizer, then the input cluster shaft gear will drive the main shaft pinion gear; driving the differential final drive ring gear. If the fifth gear is selected the input cluster shaft fourth gear will drive the fifth gear shaft pinion gear; driving the differential final drive ring gear. At this time, the main shaft gears will rotate freely.

The gear ratios are as follows:

1st 3.21:1

2nd 2.09:1

3rd 1.37:1

4th 1.02:1

5th 0.75:1

Rev. 3.14:1

Final 3.74

The fifth gear range provides a ratio, in which, the input speed (rpm) from the engine is less than the transaxle output speed to the differential.

REVERSE is accomplished by moving an idler gear into mesh with the input cluster shaft gear and the reverse sliding gear on the main shaft. The reverse idler gear acts as an idler and reverses the direction of main shaft rotation.

In NEUTRAL, none of the gears on the main shaft or the fifth gear driveshaft are locked to their shafts. No torque from the engine to the input cluster gear shaft is transferred to the differential assembly and to the wheels through the halfshafts.

Shift Controls

External

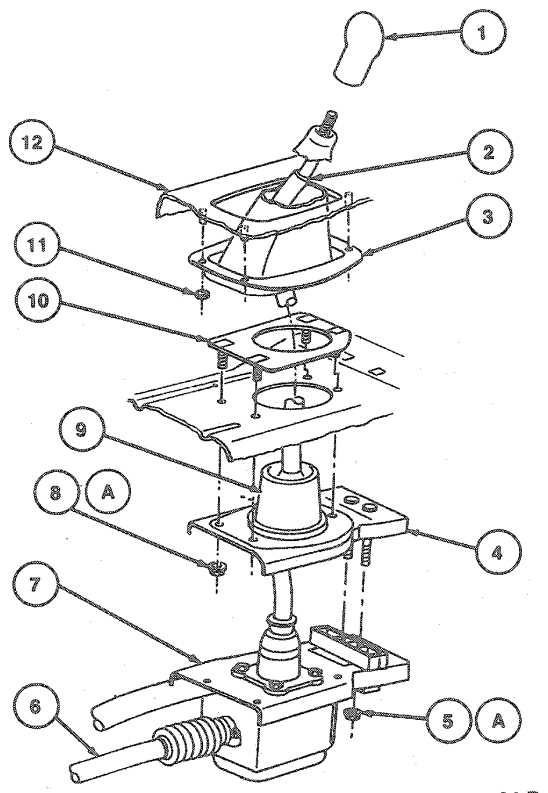
The manual shift mechanism is made up of the following components:

- Control Assembly
- Shift Rod
- Stabilizer Rod
- Gear Shift Lever
- Shift Boot Assembly
- Shift Knob

The external gearshift mechanism consists of a gearshift lever, transaxle shift rod, stabilizer rod and shift housing. The shift rod is attached to the shift shaft.

The shift housing provides a gear shift lever mounting and connection to the shift rod. The housing is bolted to the stabilizer, which is rubber mounted and fitted to the floorpan. On the transaxle end, the stabilizer rod is mounted through a rubber insulator to a boss on the clutch housing. The function of the stabilizer rod is to equalize the movement of the engine with the shift mechanism and prevent the engine movements from causing the gearshift to pull the transaxle out of gear. Rubber boots are provided for protection of the shafts and sound insulation. Adjustment of the external linkage is not necessary.

OPERATION (Continued)



C9694-B

Item	Part Number	Description
1	7K327	Knob Assy
2	7210	Shift Lever
3	7B118	Boot
4	7L238	Lower Mounting Bracket
5A	N801555-S56	Nut (2 Req'd)
6	7202	Shift Rod

(Continued)

Item	Part Number	Description
7	7400	Control Assy
8A	N801555-S56	Nut (4 Req'd)
9	—	Part of Lower Mounting Bracket
10	7L239	Inner Mounting Bracket
11	45043-S2	Spring Nut (4 Req'd)
12	—	Console Body
A		Tighten to 13-17 N-m (115-150 Lb-In)

Internal

Internally, the gear shift mechanism begins with the input shift shaft, which is connected to the external linkage.

Attached to the input shift gate is the shift gate selector arm. The selector arm and its associated selector plate act together to transmit the inward, outward and rotational movements of the input shift shaft to the internal shift lever. The shift lever in turn, transmits these motions to the main shift control shaft, to which the first / second and third / fourth shift forks are attached.

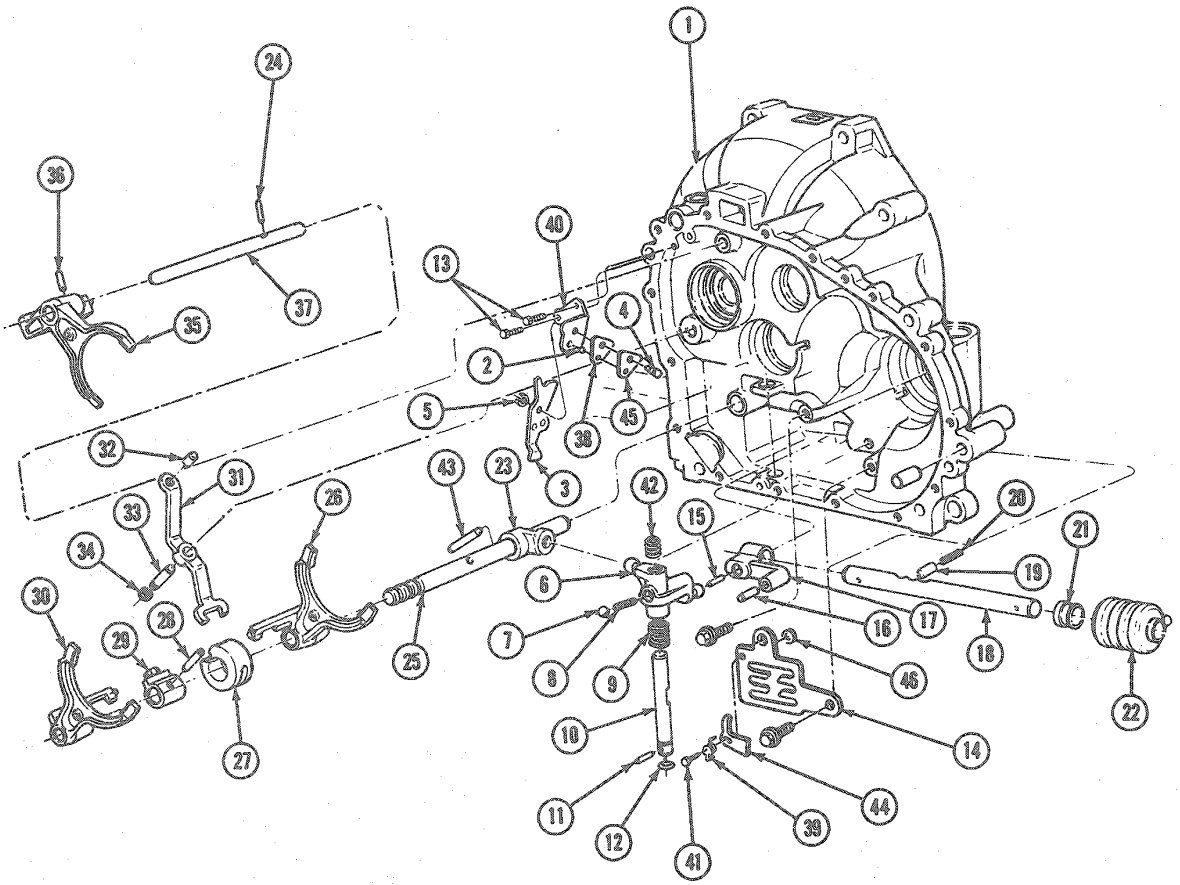
The fifth shift relay lever is connected to a main shift control shaft member and transmits motion to the fifth gear control shaft, to which the fifth shift fork is attached. Movement in one direction actuates fifth gear. In the other direction the reverse shift relay lever is actuated, engaging the reverse idler gear with the input cluster and main shaft reverse sliding gear.

An interlock is provided on the main shift control shaft. The interlock allows the shifting of only one synchronizer at a time. This prevents the engagement of the transaxle in two gears at the same time.

The reverse idler gear is shifted into position when a pin on the fifth gear control shaft engages the reverse relay lever. The pin moves the reverse relay lever which moves the gear on the reverse idler shaft into engagement with the input cluster shaft and main shaft reverse sliding gear.

OPERATION (Continued)

The backup lamp switch is actuated by movement of the fifth gear control shaft.



ITEM	DESCRIPTION
1.	CASE—CLUTCH HOUSING
2.	BALL
3.	LEVER—REVERSE RELAY
4.	PIN—REVERSE RELAY LEVER PIVOT
5.	RING—EXTERNAL RETAINING
6.	LEVER—SHIFT
7.	BALL—10.319mm
8.	SPRING—5TH/REVERSE INHIBITOR
9.	SPRING—3RD/4TH SHIFT BIAS
10.	SHAFT—SHIFT LEVER
11.	PIN—SHIFT LEVER
12.	SEAL—SHIFT LEVER SHAFT
13.	BOLTS—SHIFT GATE ATTACHING
14.	PLATE—SHIFT GATE
15.	ROLL PIN—SELECTOR ARM
16.	PIN—SHIFT GATE SELECTOR
17.	ARM—SHIFT GATE SELECTOR
18.	SHAFT—INPUT SHIFT
19.	PLUNGER—SHIFT SHAFT DETENT
20.	SPRING—SHIFT SHAFT DETENT
21.	SEAL ASSEMBLY—SHIFT SHAFT OIL
22.	BOOT—SHIFT SHAFT
23.	BLOCK—TRANS INPUT FORK CONTROL SHAFT
24.	PIN—SHIFT GATE SELECTOR

ITEM	DESCRIPTION
25.	SHAFT—MAIN SHIFT FORK CONTROL
26.	FORK—1ST/2ND
27.	SLEEVE—FORK INTERLOCK
28.	PIN—SPRING
29.	ARM—FORK SELECTOR
30.	FORK—3RD/4TH
31.	LEVER—5TH SHIFT RELAY
32.	PIN—REVERSE SHIFT RELAY LEVER
33.	PIN—5TH RELAY LEVER PIVOT
34.	RING—EXTERNAL RETAINING
35.	FORK—5TH
36.	SPRING PIN—5TH RETAINING
37.	SHAFT—5TH FORK CONTROL
38.	SPRING—TRANS REVERSE SHIFT RELAY LEVER
39.	SPRING—SHIFT GATE PAWL
40.	BRACKET—REVERSE SHIFT RELAY LEVER SUPPORT
41.	PIN—REVERSE LOCKOUT PAWL PIVOT
42.	SPRING—5TH/REVERSE KICKDOWN
43.	PIN—REVERSE RELAY LEVER ACTUATING
44.	PAWL—SHIFT GATE PLATE
45.	SPRING—TRANS REVERSE SHIFT RELAY LEVER RET. SEC.
46.	C-CLIP

C9358-A

DIAGNOSIS

Transaxle Noise

Gear Rattle is a repetitive metallic impact or rapping noise which occurs on a manual transaxle powertrain when the vehicle is lugging in gear. The rattle noise intensity generally increases with transaxle operating temperature and engine torque, and decreases with increasing vehicle speed. Since the gear ratios have been designed to achieve maximum fuel economy, there may be instances when gear rattle is distinctly noticeable under lugging condition.s This, however, is not detrimental to the engine or transaxle provided that the appropriate gear ratio is selected for the vehicle speed.

NOTE: Replacement of transaxle components will not correct this condition.

Neutral Rollover Rattle has the same characteristics as gear rattle except rollover now occurs with the engine idling, transaxle in neutral and the clutch engaged. The rollover noise intensity increases with transaxle operating temperature and engine torque load resulting from engine driven accessories (air conditioning and alternator). Neutral rollover noise is inherent in manual transaxles and is not detrimental to the engine or transaxle. In vehicles where the engine idle speed is below specification or rough, a harsh clattering noise similar to loose marbles in the transaxle will become audible.

Neutral Rollover Noise caused by engine torsional vibrations, and clutch release bearing noise are sometimes mistaken for bearing noise. Neutral rollover noise will disappear when the transaxle is engaged in gear. Due to a constant running clutch release bearing (used for the self-adjusting clutch mechanism) noise caused by a worn or damaged clutch release bearing will be noticeable with the clutch engaged or disengaged. Release bearing noise can be checked by removing the clutch release cable and sliding the clutch release bearing away from contact with the pressure plate (by movement of the clutch release arm) if the noise is eliminated, then the clutch release bearing is worn or damaged. When concerns of this nature are encountered, it will be necessary to check the vehicle to determine if bearing noise exists. Transaxle service will not eliminate neutral rollover noise or clutch release bearing noise.

TRANSAXLE DIAGNOSIS

CONDITION	POSSIBLE SOURCE	ACTION
• Clicking Noise in Reverse Gear	• Damaged or rough gears. • Damaged linkage preventing complete gear travel.	• Replace damaged gears. • Check for damaged or misaligned shift linkage or other causes of shift linkage travel restrictions.
• Gear Clash into Reverse	• Owner not familiar with manual transaxle shift techniques. • Damaged linkage preventing complete gear travel.	• Instruct customer to refer to Owner Guide on proper shifting and the time-lapse required before a shift into reverse. • Check for damaged or misaligned shift linkage or other causes of shift linkage bind.
• Gears Clash When Shifting From One Forward Gear to Another	• Improper clutch disengagement. • Clutch disc installed improperly with damper springs toward flywheel. • Worn or damaged shift forks, synchro-teeth (usually high mileage phenomenon).	• Refer to Section 08-01. • Refer to Section 08-01. • Check for damage, and service or replace as required.
• Leaks	• False report. (Do not assume that lube on lower case surfaces is from gasket material leakage or seals.) • Slight mist from vent. • Other components leaking. • Excessive amount of lubrication on transaxle — wrong type. • Worn or damaged internal components	• Remove all traces of lube on exposed transaxle surfaces. Operate transaxle and inspect for new leakage. • Normal condition that does not require service. If dripping, check lubricant level. • Identify leaking fluid at engine, power steering, or transaxle. • Check lube level and type. Fill to bottom of filler plug opening. • Remove transaxle clutch housing lower dust cover and inspect for lube inside housing. Inspect for leaks at the shift lever shaft seal, differential seals and input shift shaft seal. Service as required.

DIAGNOSIS (Continued)

TRANSAXLE DIAGNOSIS (Continued)

CONDITION	POSSIBLE SOURCE	ACTION
• Locked in One Gear — It Cannot Be Shifted Out of That Gear	• Damaged external shift mechanism. • Internal shift components worn or damaged. • Synchronizer damaged by burrs which prevent sliding action.	• Check external shift mechanism for damage. Service or replace as required. • Disconnect external shift mechanism and verify problem by trying to shift input shift rail. Remove transaxle. Inspect the problem gear, shift rails and fork and synchronizer assemblies for wear or damage, service or replace as required. • Replace synchronizer assembly.
• Noise in Neutral	• Neutral rollover rattle.	• Refer to Neutral Rollover Rattle.
• Noisy in Forward Gears	• Low lubricant level. • Contact between engine / transaxle and chassis. • Transaxle to engine block bolts loose. • Worn or damaged input / output bearings. Worn or damaged gear teeth (usually high mileage phenomenon). • Gear rattle.	• Fill to bottom of filler plug opening with Synthetic MERCON ® Multi-Purpose Automatic Transmission Fluid E6AZ-19582-B (ESR-M2C163-A2) or equivalent. • Check for contact or for broken engine motor mounts. • Tighten to 46-63 N-m (34-46 Lb-Ft). • Remove transaxle. Inspect bearings and gear teeth for wear or damage. Replace parts as required. • Refer to Gear Rattle.
• Shifts Hard	• Incorrect lubricant. • Sticking blocker ring. • External shift mechanism binding. • Improper clutch disengagement. • Clutch disc installed improperly with damper springs toward flywheel. • Internal damage to synchronizers or shift mechanism.	• Verify that MERCON® Multi-Purpose Automatic Transmission Fluid E6AZ-19582-B (ESR-M2C163-AZ) or equivalent is present. Do not use gear lube or hypoid type lubricants. • Check for proper installation of external shift mechanism. • Refer to Section 08-01. • Refer to 08-01. • Check for damage to internal components.
• Walks Out of Gear	• Damaged linkage preventing complete travel into gear. • Floor shift boot stiff or improperly installed boot. • Floor shift interference between shift handle and console. • Broken / loose engine mounts. • Worn or damaged internal components.	• Check for damaged shift mechanism. • Verify jumpout with boot removed, replace boot if necessary. • Adjust console to eliminate interference. • Check for broken or loose engine mounts and service as required. • Check shift forks, shift rails and shift rail detent system for wear or damaged, synchronizer sliding sleeve and gear clutching teeth for wear or damage. Service or replace as required.

DIAGNOSIS (Continued)

TRANSAXLE DIAGNOSIS (Continued)

CONDITION	POSSIBLE SOURCE	ACTION
• Will Not Shift Into One Gear —All Other Gears OK	• Damaged external shift mechanism. • Floor shift. Interference between shift handle and console or floor cut out. • Restricted travel of internal shift components.	• Check for damaged shift mechanism. Service or replace as necessary. • Adjust console or cut out floor pan to eliminate interference. • Disconnect external shift mechanism and shift the input shift rail through the gears to verify problem. Remove transaxle. Inspect fork system, synchronizer system and gear clutch teeth for restricted travel. Service or replace as required.
• Will Not Shift Into Reverse NOTE: The shift gate plate pawl prevents fifth/reverse shifts.	• Normal blockout due to position of non-synchronized reverse gear components. (Approximately 10 percent occurrence of normal reverse shifting.) • Damaged external shift mechanism. • Worn or damaged internal components.	• This condition is normal to all transaxles and requires only a double clutch procedure to successfully engage reverse. • Check for damaged external shift mechanism. Remove shift mechanism at input shift rail and try shifting into REVERSE at the rail. • Remove transaxle. Check for damaged reverse gear train or shaft components, misaligned reverse relay lever, shift rail and fork system. Check the gear clutching teeth and synchronizer system for restricted travel or damage. Service or replace as required.

SHIFT LINKAGE

CONDITION	POSSIBLE SOURCE	ACTION
• Binding, Sticking Shift Feel—Difficult to Find or Engage Gears, High Shift Efforts	• Worn, damaged, missing bushings in shift rod U-joint. • Bent shift rod, U-joint or multi-piece bracket. • Bent or damaged stabilizer. • Worn, missing stabilizer bushing. • Nuts holding rear mount to lower mounting bracket missing or loose. • Bolt holding stabilizer bar to transaxle case missing or loose. • Nuts holding inner mounting bracket to lower mounting bracket missing or loose. • Bolt, nut and clamp washers loose at shift rod to transaxle connection. • Plastic control housing on shift lever cracked or damaged. • Plastic pivot housing on shift lever damaged, cracked. • Shift lever pivot balls worn or loose. • Rear mount damaged or worn. • Shift lever loose on support assembly. • Shift lever pivot balls worn, loose or broken. • Shift rod sealing boot torn.	• Replace shift rod. • Replace shift rod. • Replace support assembly. • Replace stabilizer bushing. • Tighten or replace nuts. • Tighten or replace bolt. • Tighten or replace nuts. • Tighten or replace bolt, nut and clamp washers. • Replace plastic control housing. • Replace shift lever. • Replace shift lever. • Replace rear mount assembly. • Tighten or replace self-tapping screws. • Replace shift lever assembly. • Replace shift rod assembly.

DIAGNOSIS (Continued)

SHIFT LINKAGE (Continued)

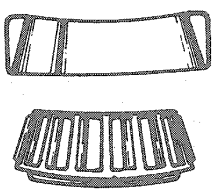
CONDITION	POSSIBLE SOURCE	ACTION
• Excessive Noise, Rattles, Buzz or Tizz	• Worn, damaged, missing bushings in shift rod U-joint.	• Replace shift rod assembly.
	• Worn pivot balls on shift lever.	• Replace shift lever assembly.
	• Loose bolt, nut and clamp washers at shift rod to transaxle connection.	• Tighten or replace bolt, nut and clamp washers.
	• Loose shift lever assembly.	• Tighten or replace self-tapping screws.
	• Loose control housing.	• Tighten self-tapping screws attaching housing to stabilizer assembly.
	• Loose control assembly.	• Tighten or replace nuts holding control assembly to bracket.
	• Loose shift knob causes tizz.	• Thread knob further onto shift lever. If still loose, replace knob assembly.
	• Mounting insulators torn.	• Replace support assembly.
	• Inner shift boot torn, split.	• Replace inner sealing boot.
	• Stabilizer bar bushing worn or split.	• Replace stabilizer bushing.
	• Pivot balls on shift lever chipped, cracked.	• Replace shift lever assembly.
	• Crimp on shift lever improperly placed allows loose pivot ball in pivot housing.	• Replace shift lever.
• Shifter is Inoperative—Cannot Shift Gears	• Bolt, nut and clamp washers loose at clamp to transaxle connection.	• Tighten or replace bolt, nut and clamp washers.
	• Shifter attachment to body weld bolts loose.	• Replace or tighten bolts on body J-nuts.
	• Nuts holding rear mount to lower mounting bracket missing or loose.	• Tighten or replace nuts.
	• Nuts holding rear mounting bracket to lower mounting bracket missing or loose.	• Tighten or replace nuts.
	• Shift rod damaged or bent.	• Replace shift rod.
	• Stabilizer bar is bent.	• Replace support assembly.
	• Rear mount damaged or worn.	• Replace mount assembly.
	• Crimp holding pivot ball tight in pivot housing inadequate.	• Replace shift lever assembly.
• Shift Lever Feels Sloppy or Loose	• Nuts holding rear mount to lower mounting bracket missing or loose.	• Tighten or replace nuts.
	• Nuts holding inner mounting bracket to lower mounting bracket missing or loose.	• Tighten or replace nuts.
	• Bolt holding stabilizer bar to transaxle case missing or loose.	• Tighten or replace bolt.
	• Bolt, nut and clamp washers loose at clamp to transaxle connection.	• Tighten or replace bolt, nut and clamp washers.
	• Stabilizer bar damaged.	• Replace control assembly.
	• Plastic control housing cracked or damaged.	• Replace plastic control housing.
	• Rear mount damaged or worn.	• Replace rear mount.
	• Shift lever retaining screw loose or missing.	• Tighten or replace shift lever retaining screws.
	• Shift lever pivot balls worn or loose.	• Replace shift lever assembly.
	• Shift knob is loose on shift lever.	• Thread knob further onto shift lever. If still loose, replace knob assembly.

DIAGNOSIS (Continued)

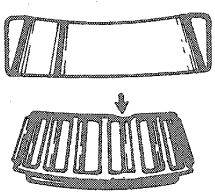
BEARING DIAGNOSIS

CONSIDER THE FOLLOWING FACTORS WHEN DIAGNOSING BEARING CONDITION:

1. GENERAL CONDITION OF ALL PARTS DURING DISASSEMBLY AND INSPECTION.
2. CLASSIFY THE PROBLEM WITH THE AID OF THE ILLUSTRATION.
3. DETERMINE THE CAUSE.
4. MAKE ALL SERVICES FOLLOWING RECOMMENDED PROCEDURES.



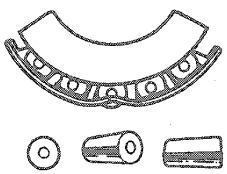
GOOD BEARING



BENT CAGE

CAGE DAMAGE DUE TO IMPROPER HANDLING OR TOOL USAGE.

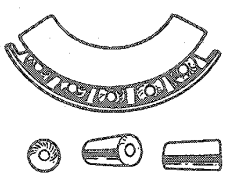
REPLACE BEARING



BENT CAGE

CAGE DAMAGE DUE TO IMPROPER HANDLING OR TOOL USAGE.

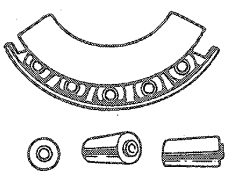
REPLACE BEARING.



GALLING

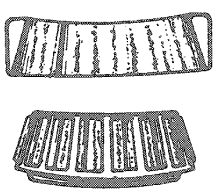
METAL SMEARS ON ROLLER ENDS DUE TO OVERHEAT, LUBRICANT PROBLEM OR OVERLOAD.

REPLACE BEARING — CHECK SEALS AND CHECK FOR PROPER LUBRICATION.



CRACKED INNER RACE

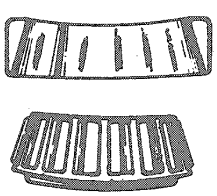
RACE CRACKED DUE TO IMPROPER FIT, COCKING, OR POOR BEARING SEATS.



ETCHING

BEARING SURFACES APPEAR GRAY OR GRAYISH BLACK IN COLOR WITH RELATED ETCHING AWAY OF MATERAIL USUALLY AT ROLLER SPACING.

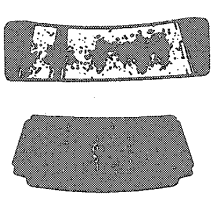
REPLACE BEARINGS — CHECK SEALS AND CHECK FOR PROPER LUBRICATION.



BRINELLING

SURFACE INDENTATIONS IN RACEWAY CAUSED BY ROLLERS EITHER UNDER IMPACT LOADING OR VIBRATION WHILE THE BEARING IS NOT ROTATING.

REPLACE BEARING IF ROUGH OR NOISY.



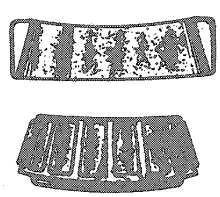
HEAT DISCOLORATION

HEAT DISCOLORATION IS DARK BLUE RESULTING FROM OVERLOAD OR NO LUBRICANT (YELLOW OR BROWN COLOR IS NORMAL).

EXCESSIVE HEAT CAN CAUSE SOFTENING OF RACES OR ROLLERS.

TO CHECK FOR LOSS OF TEMPER ON RACES OR ROLLERS A SIMPLE FILE TEST MAY BE MADE. A FILE DRAWN OVER A TEMPERED PART WILL GRAB AND CUT METAL, WHEREAS, A FILE DRAWN OVER A HARD PART WILL GLIDE READILY WITH NO METAL CUTTING.

REPLACE BEARINGS IF OVER HEATING DAMAGE IS INDICATED. CHECK SEALS AND OTHER PARTS.



FATIGUE SPALLING

FLAKING OF SURFACE METAL RESULTING FROM FATIGUE.

REPLACE BEARING — CLEAN ALL RELATED PARTS.

C4074-C

REMOVAL AND INSTALLATION

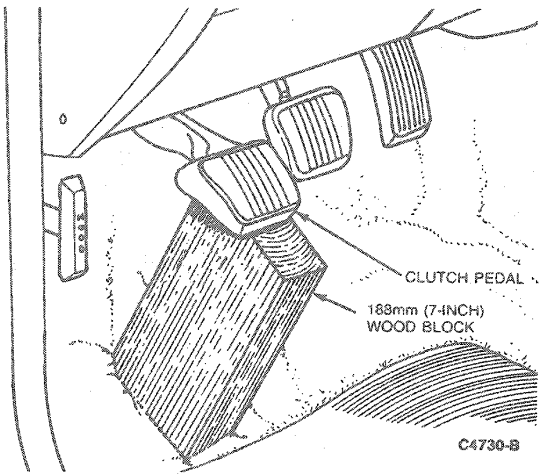
Transaxle

Tools Required:

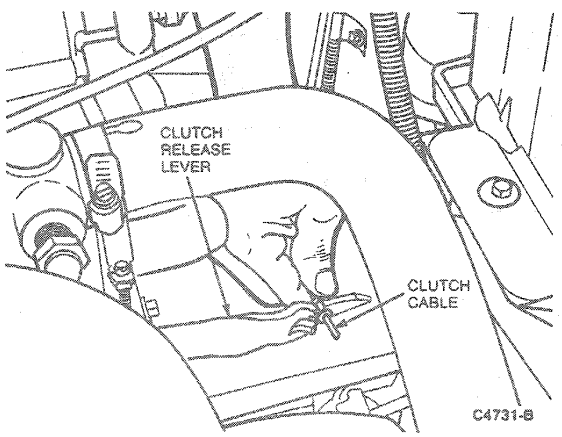
- Transaxle Plugs T81P-1177-B
- Differential Rotator T81P-4026-A
- Halfshaft Remover D83P-4026-A
- Rotunda Hi-Lift Jack 014-00210
- Rotunda Manual Transaxle Adapter 014-00225
- Rotunda Engine Support Bar 014-00750

Removal

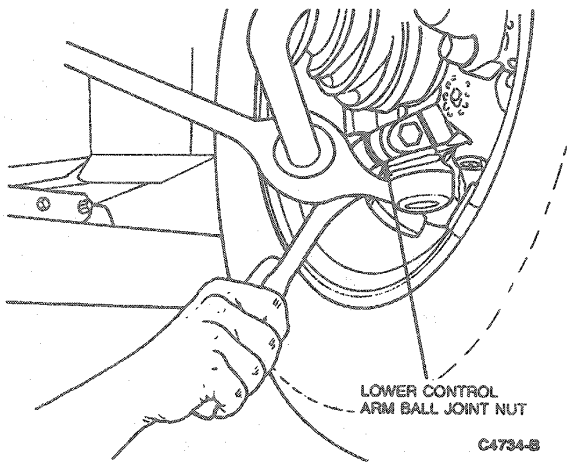
1. Disconnect battery ground cable.
2. Wedge a wood block approximately 188mm (7 inches) in length under the clutch pedal to hold the clutch pedal up slightly beyond its normal position.



3. Remove air cleaner hose.
4. Grasp the clutch cable and pull forward, disconnecting it from the clutch release shaft assembly.

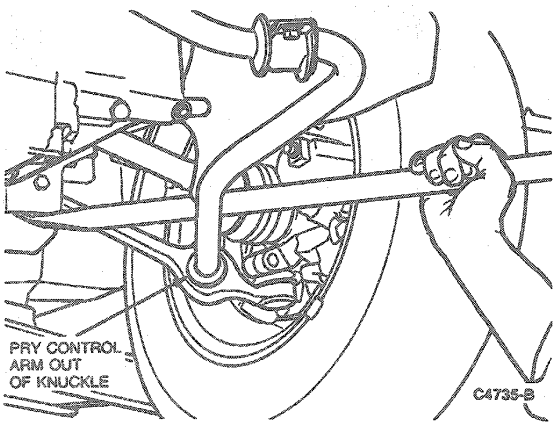


5. Disconnect the clutch cable casing from the rib on top surface of the transaxle case.
6. Install engine lifting eyes.
7. Tie up wiring harness and power steering cooler hoses.
8. Disconnect speedometer cable and speed sensor wire.
9. Support engine using Engine Support Bar 014-00750 or equivalent.
10. Raise vehicle on hoist. Refer to Section 00-02.
11. Remove wheel and tire assemblies.
12. Remove nut and bolt retaining lower control arm ball joint to the steering knuckle assembly. Discard the removed nut and bolt. Repeat procedure on the opposite side.



CAUTION: Exercise care not to damage or cut the ball joint boot. Pry bar must not contact the lower arm.

13. Using Halfshaft Remover D83P-4026-A or equivalent, pry the lower control arm away from knuckle. Repeat procedure on the opposite side.



REMOVAL AND INSTALLATION (Continued)

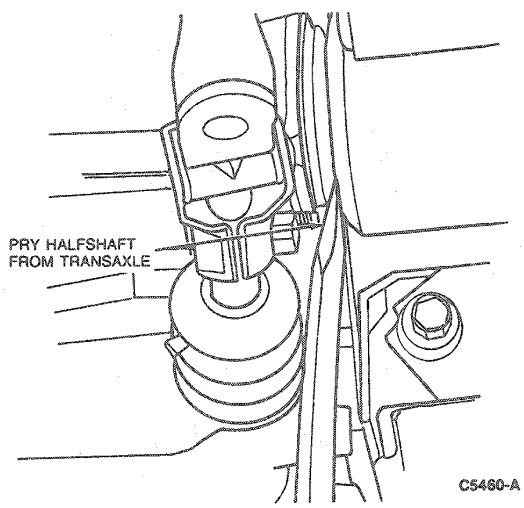
14. Remove upper nut from stabilizer bar and separate the stabilizer from knuckle.
15. Remove tie rod nut and separate tie rod end from knuckle.
16. Disconnect heated oxygen (HO2S) 9F472. sensor.
17. Remove exhaust catalyst assembly.
18. Disconnect power steering cooler from subframe and place out of the way.
19. Disconnect battery cable bracket from subframe.

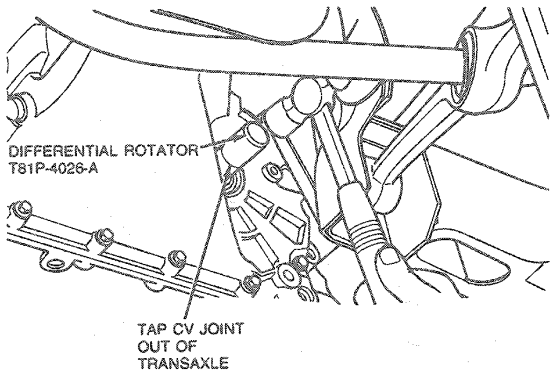
    CAUTION: Use care when using the pry bar for removal of the CV joint assembly, to prevent damage to the differential oil seal. Repeat procedure on the RH side.

    NOTE: Lubricant will drain from the seal at this time. Install Transaxle Plugs T81P-1177-B (two required).
20. Using a large pry bar, pry the LH inboard CV joint assembly from the transaxle.

    NOTE: If the CV joint assembly cannot be pried from the transaxle, insert Differential Rotator T81P-4026-A through LH side and tap the joint out. Tool can be used from either side of transaxle.

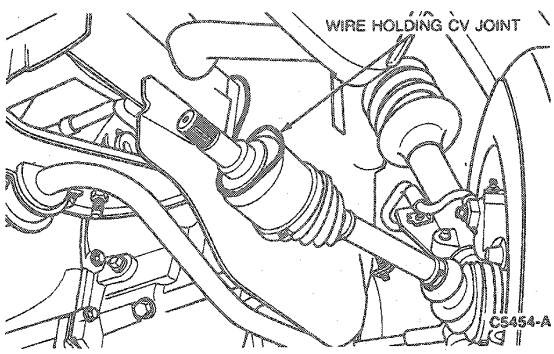
    Remove the inboard CV joint from the transaxle by grasping the LH steering knuckle and swinging the knuckle and halfshaft outward from the transaxle.





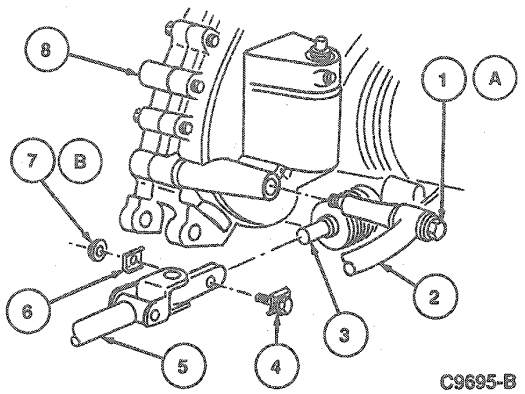
21. Wire the halfshaft assembly in a near level position to prevent damage to the assembly during remaining operations.

    Repeat procedure on the opposite side.



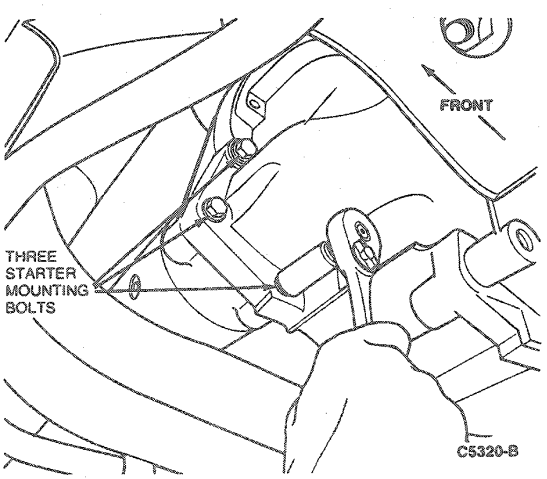
22. Remove retaining bolts from center support bearing and remove RH halfshaft from transaxle.
23. Remove two steering gear retaining nuts from subframe. Support steering gear by wiring up the tie rod ends to the coil springs.
24. Remove transaxle to engine retaining bolts.
25. Remove shift mechanism stabilizer bar-to-transaxle retaining bolt. Remove shift rod-to-shift shaft retaining nut and bolt. Remove rods from transaxle.

REMOVAL AND INSTALLATION (Continued)

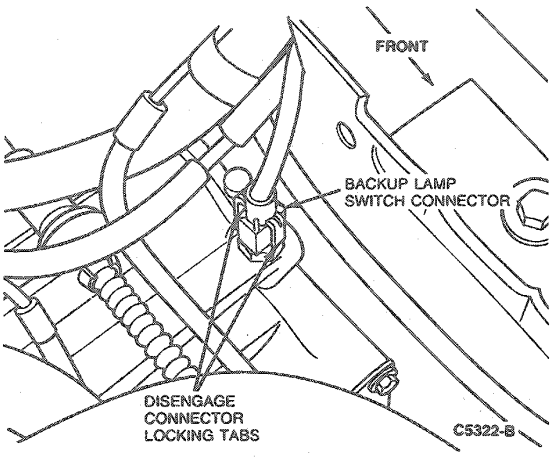


Item	Part Number	Description
1A	N601426	MH M12 X 1.75
2	7400	Stabilizer Shaft
3	7L267	Shift Shaft
4	7K104	Clamp
5	7202	Shift Rod
6	7K105	Clamp
7B	N620480-S2	Nut M6 X 1.00
8	—	Transaxle Assy
A		Tighten to 47-63 N·m (35-46 Lb-Ft)
B		Tighten to 9-12 N·m (80-106 Lb-In)

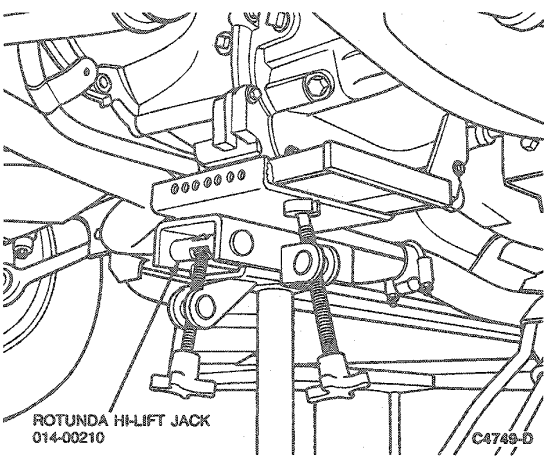
26. Remove engine mount bolts.
27. Position jacks under body mount positions and remove four bolts, lower subframe and position out of the way.
28. Remove starter motor assembly.



29. Remove LH engine vibration dampener lower bracket.
30. Using a small screwdriver, remove the backup lamp switch connector from the transaxle backup lamp switch, located on top of the transaxle.



31. Remove backup lamp switch connector.
32. Position Rotunda Hi-Lift Jack 014-00210 and Rotunda Manual Transaxle Adapter 014-00225, or equivalent, under the transaxle.



33. Lower the transmission jack and transaxle adapter.

    WARNING: THE TRANSAXLE CASE CASTING MAY HAVE SHARP EDGES. WEAR PROTECTIVE GLOVES WHEN HANDLING THE TRANSAXLE ASSEMBLY.

34. Remove the transaxle from the engine and lower it from the vehicle.

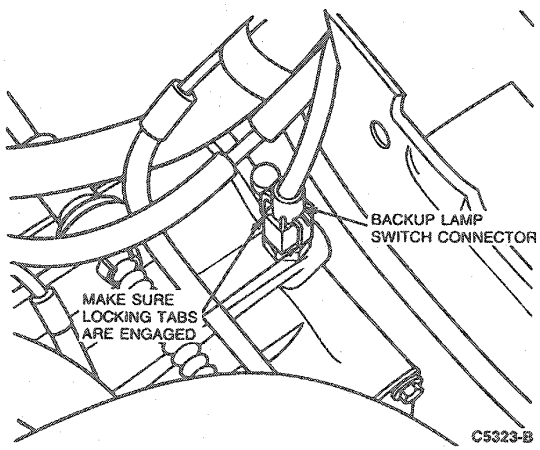
Installation

NOTE: Make sure that the transaxle assembly is flush with the rear face of the engine prior to installation of the retaining bolts.

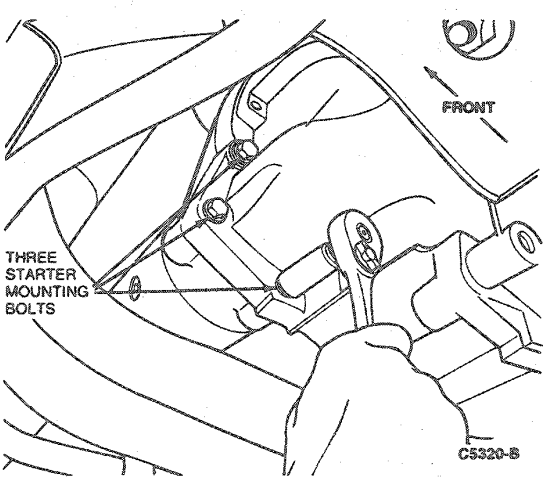
REMOVAL AND INSTALLATION (Continued)

1. Using Rotunda Hi-Lift Jack 014-00210 and Rotunda Manual Transaxle Adapter 014-00225 or equivalent, raise the transaxle into position. Engage the input shaft spline into the clutch disc and work the transaxle onto the dowel sleeves.
2. Install the engine-to-transaxle retaining bolts. Tighten to 46-63 N·m (34-46 lb-ft).

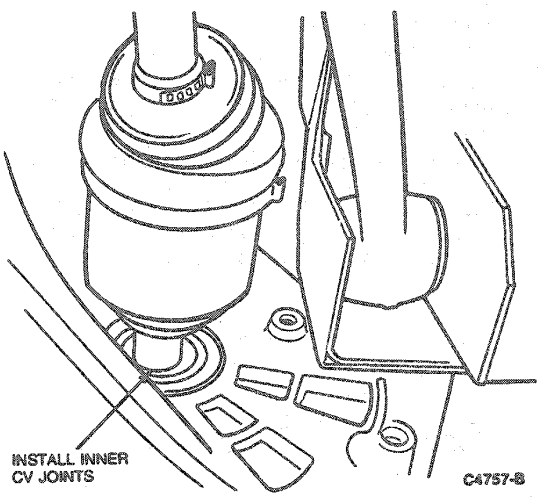
   WARNING: DO NOT ATTEMPT TO START THE ENGINE PRIOR TO INSTALLING THE CV JOINTS. DIFFERENTIAL SIDE GEAR DISLOCATION DAMAGE COULD RESULT.
3. Install backup lamp switch. Tighten to 16-20 N·m (12-15 lb-ft).
4. Connect the backup lamp switch connector.



5. Install starter motor assembly retaining bolts. Tighten to 41-54 N·m (30-40 lb-ft).



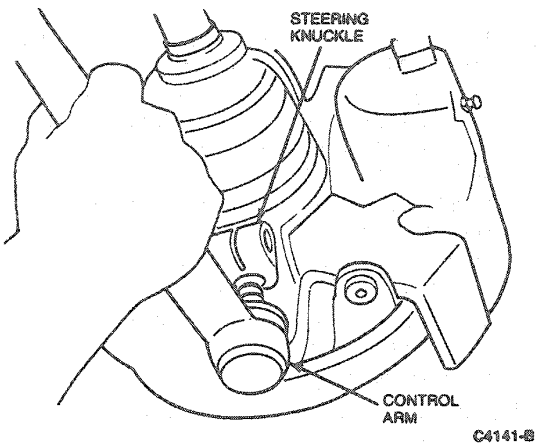
6. Using jacks, position subframe and raise into position. Install four bolts and tighten to 90-115 N·m (65-85 lb-ft).
7. Install LH engine vibration dampener lower bracket.
8. Install engine mount bolts. Tighten to 54-75 N·m (40-55 lb-ft).
9. Connect stabilizer and shift rod to transaxle. Tighten stabilizer bolt to 47-63 N·m (35-46 lb-ft). Tighten shift rod clamp bolt and nut to 9-12 N·m (80-106 lb-in).
10. Install engine-to-transaxle bolts. Tighten to 46-63 N·m (34-46 lb-ft).
11. Install steering gear retaining nuts. Tighten to 115-135 N·m (85-100 lb-ft).
12. Install center support bearing retaining bolts. Tighten to 115-135 N·m (85-100 lb-ft).
13. Install RH halfshaft into transaxle.
14. Install LH inboard CV joint assembly into transaxle.



15. Connect battery cable bracket to subframe.
16. Connect power steering cooler to subframe.
17. Install exhaust catalyst retaining bolts. Tighten to 34-47 N·m (25-34 lb-ft).
18. Connect heated oxygen sensor (HO2S) 9F472.
19. Install tie rod in knuckle and tie rod retaining nut. Tighten to 47-64 N·m (35-47 lb-ft).
20. Position stabilizer bar to knuckle and install nut.

REMOVAL AND INSTALLATION (Continued)

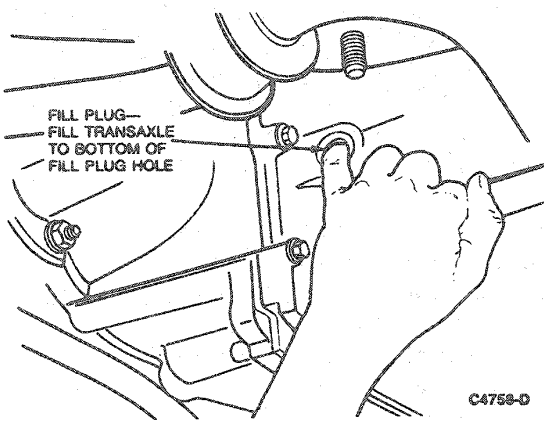
21. Install lower control arm ball joint to steering knuckle assembly. Install a new retaining nut and bolt. Tighten to 50-60 N·m (37-44 lb-ft).



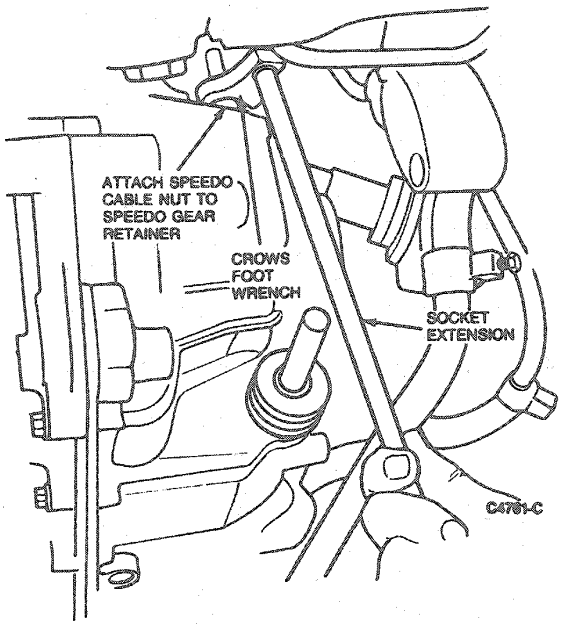
22. Install wheel and tire assembly.

    NOTE: Apply Pipe Sealant with Teflon® D8AZ-19554-A (ESG-M4G194-A) or equivalent to the fill plug threads, in a clockwise direction, prior to installation.

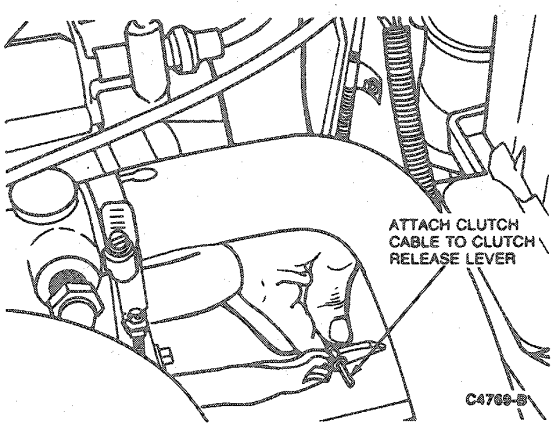
23. Check transaxle fluid level. Add specified amount of Multi-Purpose Automatic Transmission Fluid E6A7-19582-B (ESR-M2C163-A2) as required and install fill plug. Refer to specifications for fluid capacity and torque specifications.



24. Lower vehicle.
25. Remove Engine Support Bar 014-00750 or equivalent.
26. Using a 22mm crowfoot wrench, install speedometer cable. Connect speedometer cable and speed sensor wire.



27. Remove engine lifting eye.
28. Connect clutch cable to transaxle.



29. Install air cleaner hose.
30. Remove wood block from clutch pedal.
31. Connect battery ground cable.
32. Check transaxle for fluid leaks.

Gearset

Tools Required:

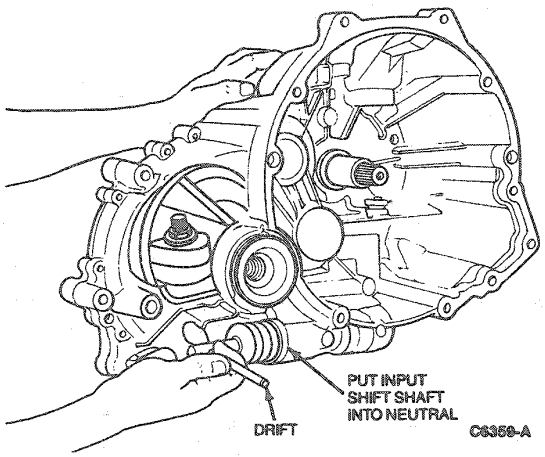
- Transaxle Plugs T81P-1177-B

REMOVAL AND INSTALLATION (Continued)

Removal

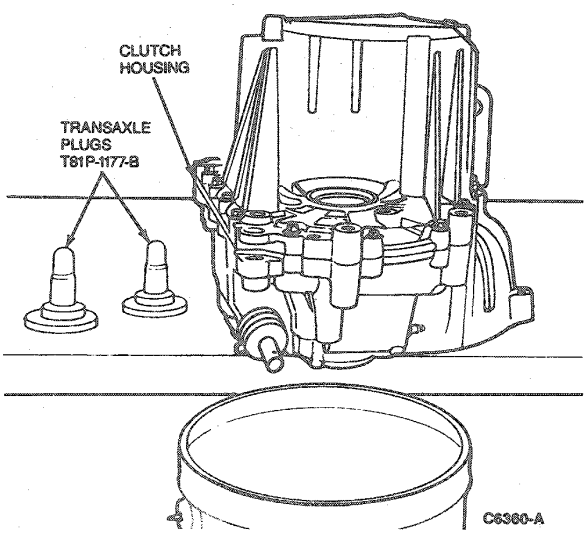
1. Using a drift in the input shift shaft hole, shift the transaxle into NEUTRAL. Pull or push the shaft into the center detent position (NEUTRAL).

   The shift shaft will rotate slightly from side-to-side when positioned in NEUTRAL.

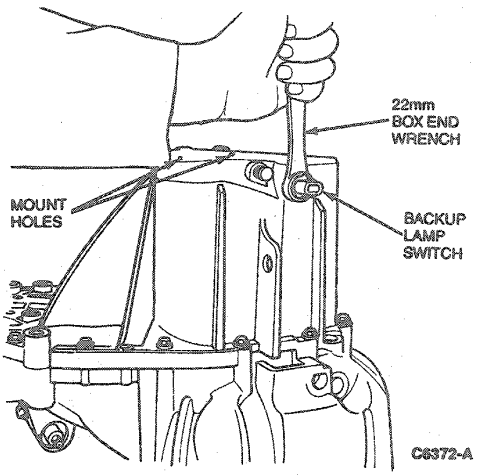


NOTE: Place the transaxle on a bench with the clutch housing face down to aid draining and service.

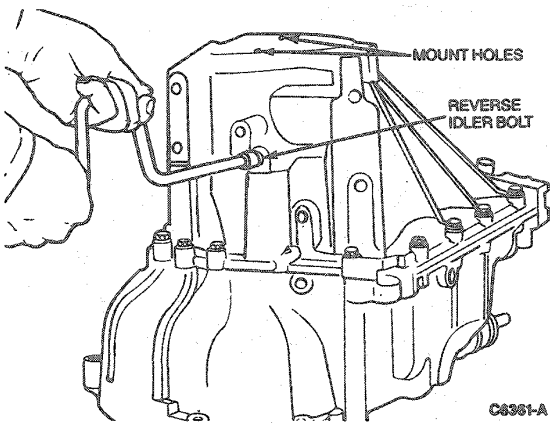
2. Remove the two Transaxle Plugs T81P-1177-B from the transaxle and drain the transmission fluid.



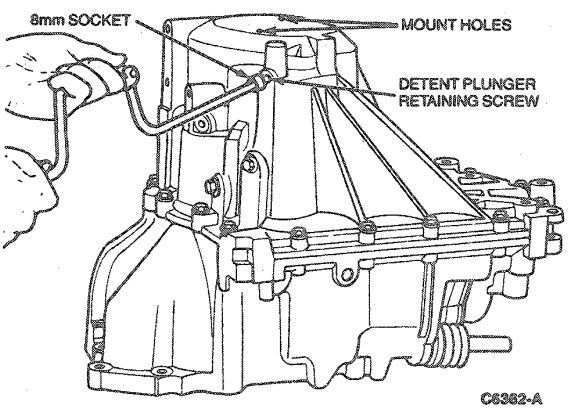
NOTE: If case half is being replaced, use a 22mm box-end wrench to remove the backup lamp switch assembly.



3. Using a 13mm socket wrench, remove the reverse idler shaft retaining bolt.

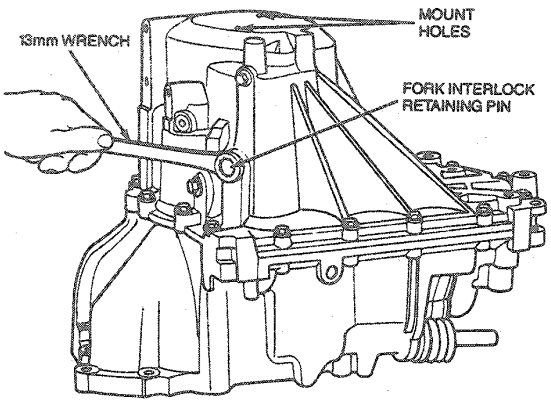


4. Using an 8mm socket wrench, loosen the detent plunger retaining screw in the transaxle case.

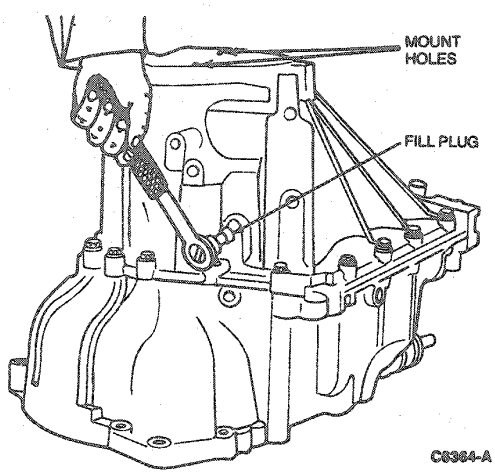


REMOVAL AND INSTALLATION (Continued)

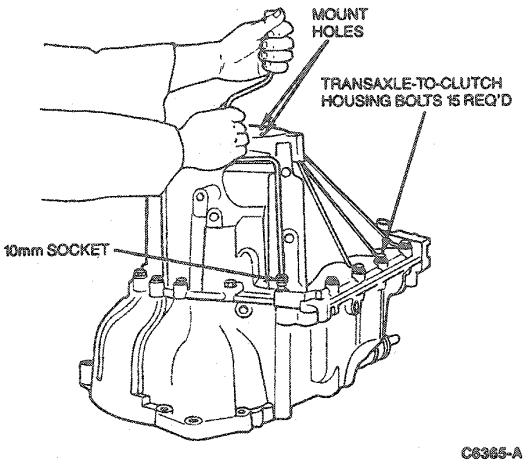
5. Using a 13mm wrench, remove the shift fork interlock sleeve retaining pin.



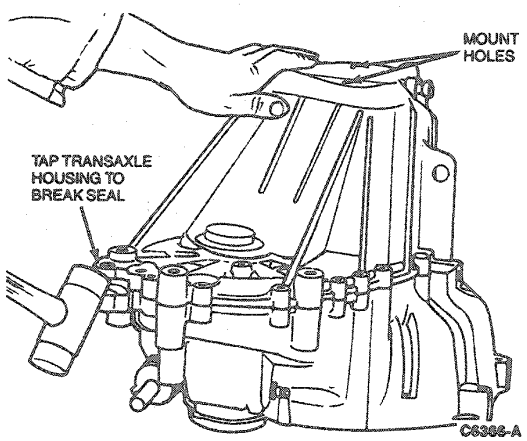
6. Using a 3/8-inch extension bar and ratchet, remove the fill plug.



7. Using a 10mm socket wrench, remove the 15 clutch housing-to-transaxle case retaining bolts.



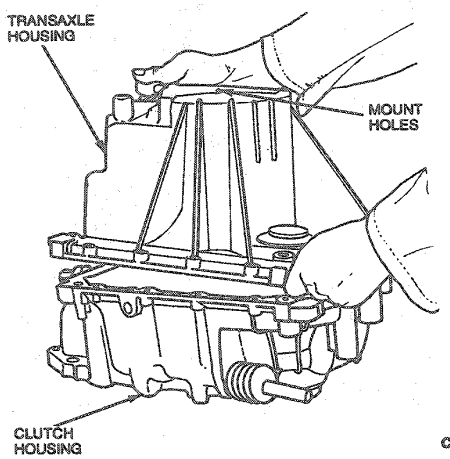
8. Using a plastic tipped hammer, tap the transaxle case to break the seal between the case halves.



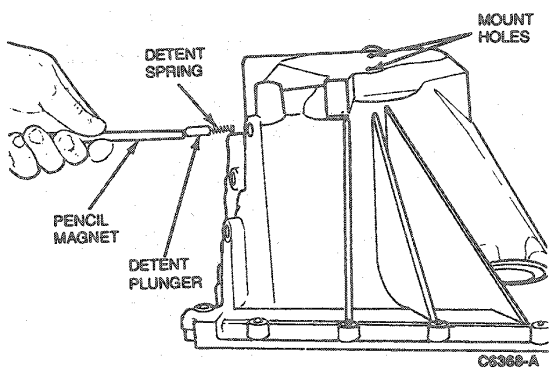
NOTE: Do not insert pry bars or screwdrivers between the case halves.

REMOVAL AND INSTALLATION (Continued)

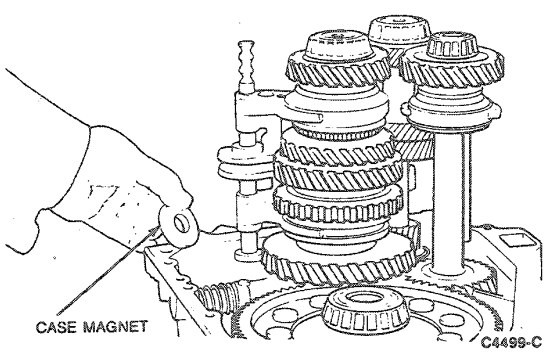
9. Separate the case halves.
   Be careful not to drop the bearing cups or shims from the transaxle case housing.



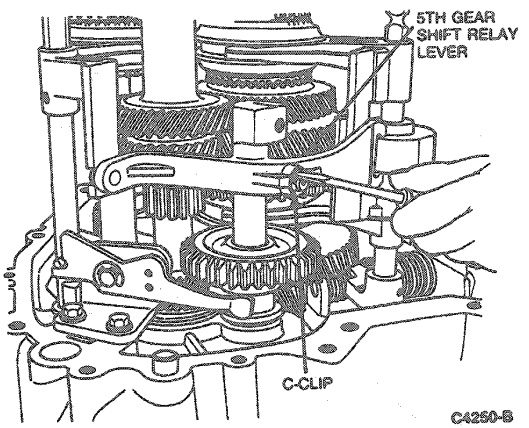
10. Remove the detent plunger retaining screw. Then, using a pencil magnet, remove the detent spring and the detent plunger.



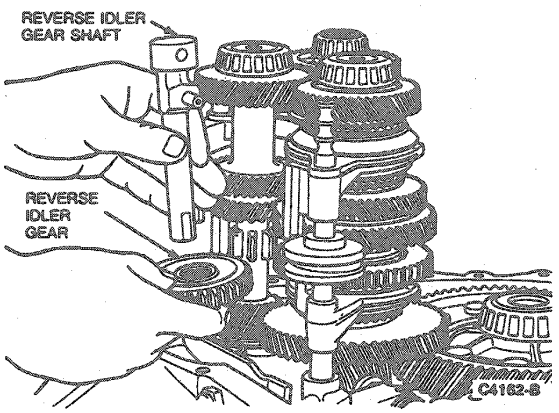
11. Remove the case magnet.



12. Using a small screwdriver, remove the C-clip retaining ring from the fifth gear relay lever pivot pin. Remove the fifth gear shift relay lever.

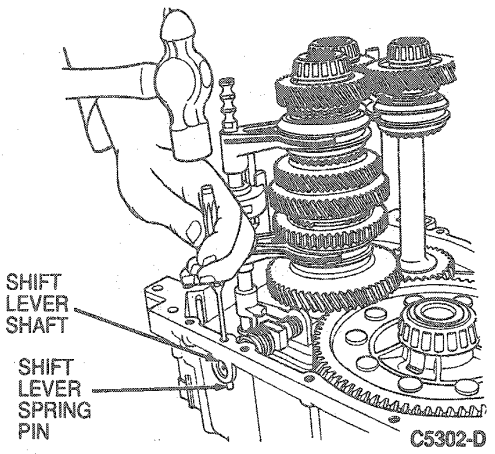


13. Lift the reverse idler shaft and reverse idler gear from the case.



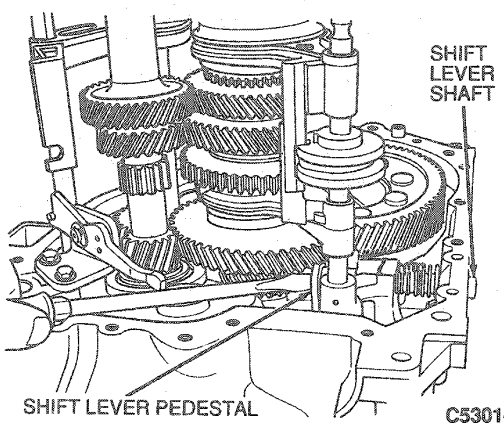
REMOVAL AND INSTALLATION (Continued)

14. Using a 5/32-inch punch, drive the spring pin from the shift lever shaft.

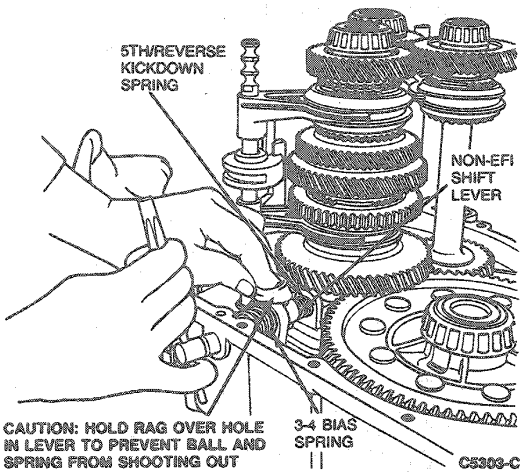


CAUTION: Be careful not to damage main shaft gear teeth or pedestal when prying with the screwdriver.

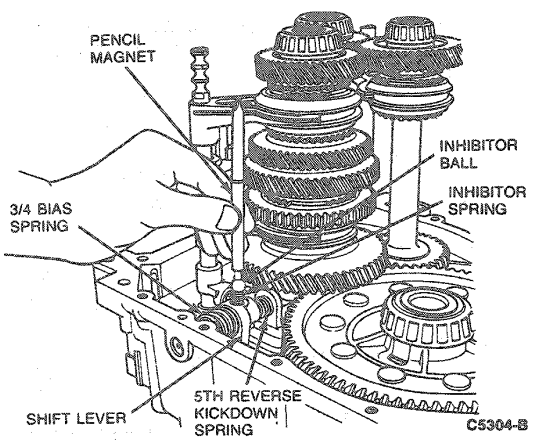
15. Using a screwdriver, gently pry on the shift lever shaft so that the hole in the shaft is exposed.



16. Hold a cloth over the hole in the lever to prevent the ball and spring from shooting out and remove the shift lever shaft.



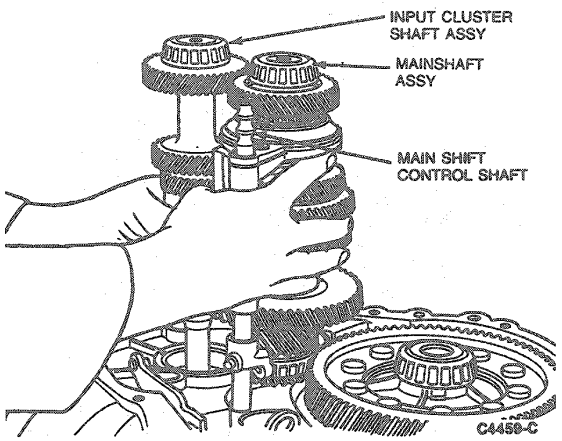
17. Remove the inhibitor ball and spring from the hole in the shift lever using a pencil magnet. Remove the shift lever, fifth/reverse kickdown spring, and 3/4 bias spring.



NOTE: Be careful not to drop bearings or gears (slip fit).

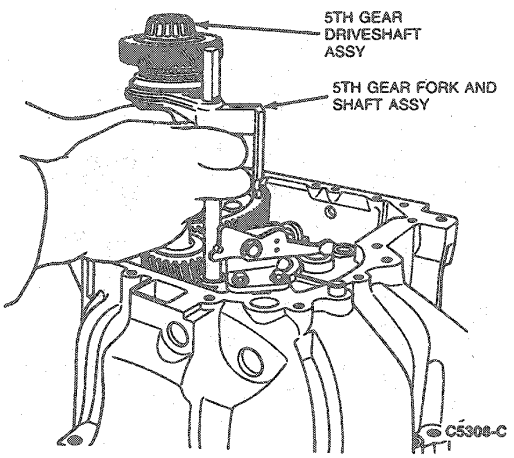
REMOVAL AND INSTALLATION (Continued)

18. Remove the main shaft assembly, input cluster shaft assembly and the main shift control shaft assembly as one unit.

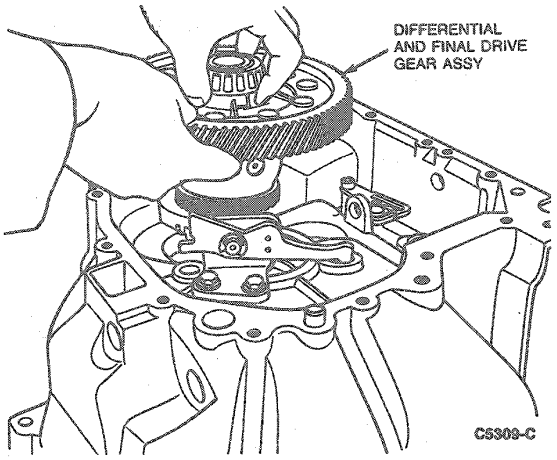


NOTE: Be careful not to drop bearings or gears (slip fit).

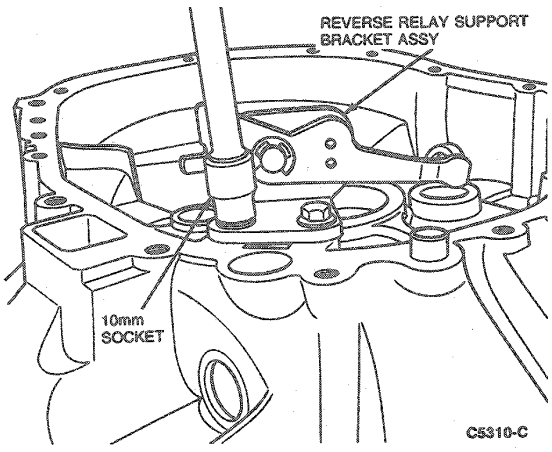
19. Remove the fifth gear shaft assembly and fifth gear fork assembly from their bores in the case.



20. Lift the differential and final drive gear assembly from the clutch housing case.



21. Using a 10mm socket, remove two bolts retaining reverse shift relay lever support bracket assembly.

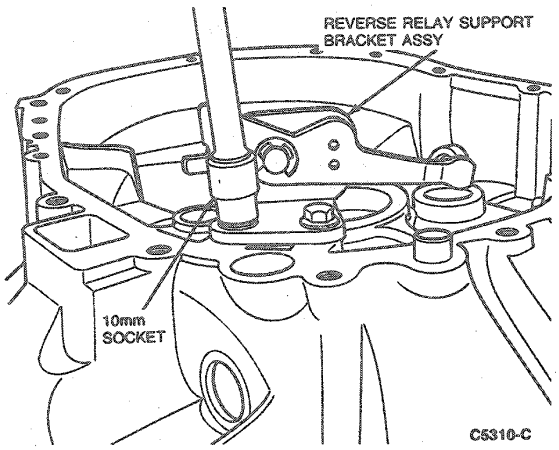


Installation

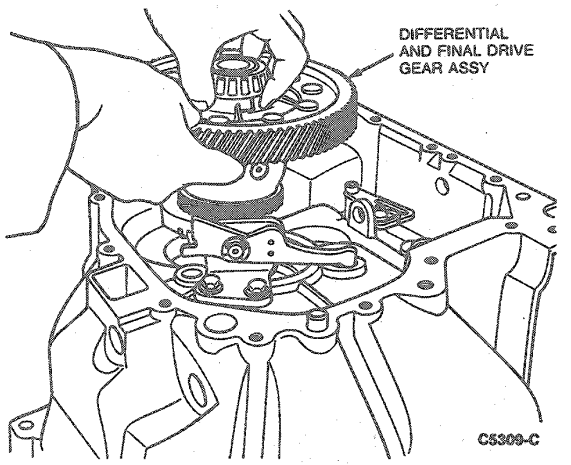
NOTE: Prior to installation, thoroughly clean all parts and inspect their condition. Lightly oil the bores with Synthetic MERCON® Multi-Purpose Automatic Transmission Fluid E6AZ-19582-B (ESR-M2C163-A2) or equivalent.

REMOVAL AND INSTALLATION (Continued)

1. Using a 10mm socket, install reverse relay lever support bracket assembly to the case with two bolts. Tighten bolts to 8-11 N·m (6-8 lb-ft).

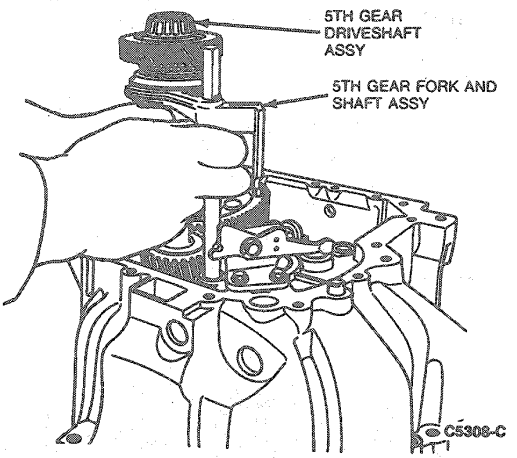


2. Place the differential and the final drive gear assembly into the clutch housing case. Align the differential gears for later installation of the halfshafts.

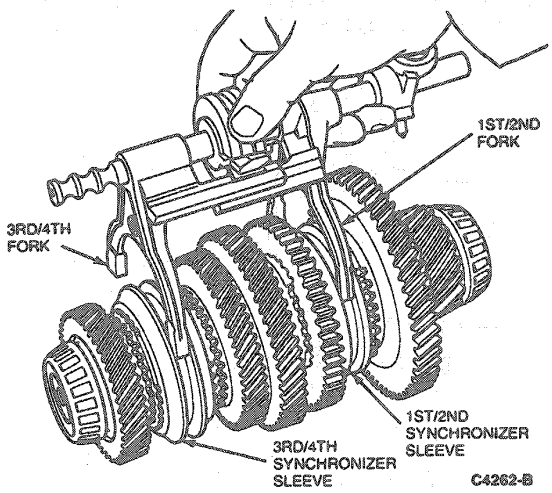


CAUTION: Be careful not to damage the fifth gear shaft oil funnel.

3. Install the fifth gear shaft assembly and the fork shaft assembly in the case.



4. Position the main shift control shaft assembly so that the shift forks engage their respective slots in the synchronizer sleeves on the main shaft assembly.

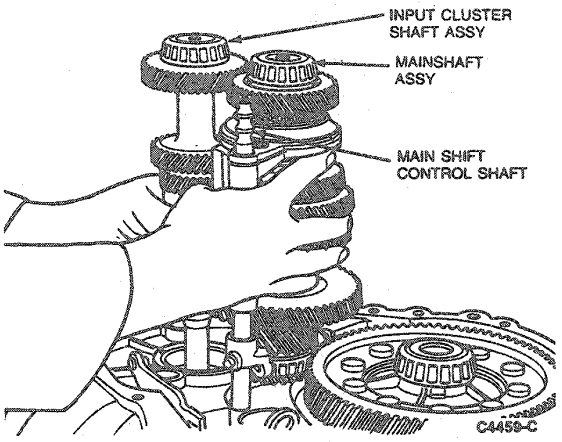


CAUTION: Be careful not to damage the input shaft oil seal or main shaft oil funnel.

NOTE: When performing this operation, care must be taken to avoid movement of the third / fourth synchronizer sleeve. This could result in overtravel of the synchronizing sleeve to hub, allowing inserts to pop out of position.

REMOVAL AND INSTALLATION (Continued)

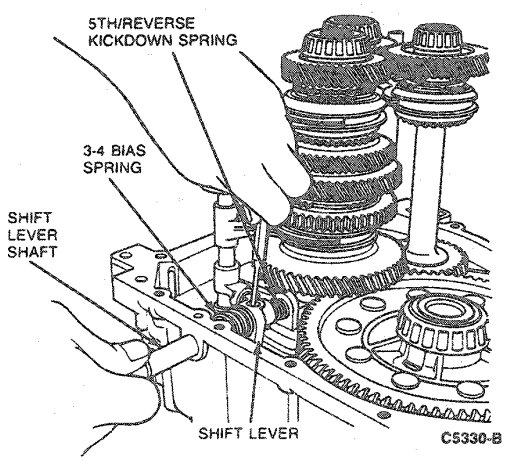
5. Bring the main shaft assembly into mesh with the input cluster shaft assembly. Holding the three shafts (input cluster shaft, main shaft and the main shift control shaft) in their respective working positions, lower them into their bores in the clutch housing case as one unit.



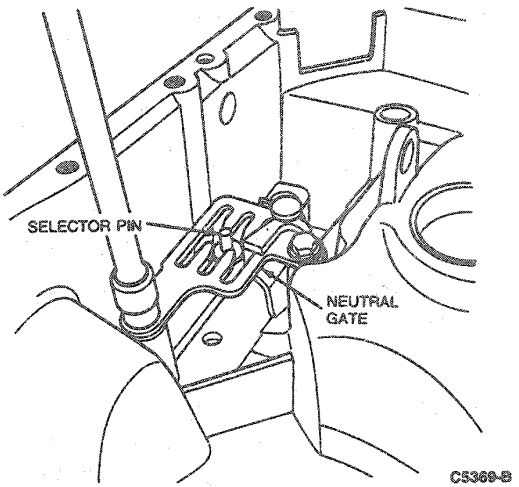
6. Position the shift lever, 3/4 bias spring and fifth/reverse kickdown spring in their working positions (with one shift lever ball located in the socket of the input shift gate selector plate arm assembly and the other in the socket of the main shift control shaft block).

   Install the ball in the fifth and reverse inhibitor shift lever hole.

   Slide the shift lever shaft (notch down) through the shift lever. Then using a small drift, depress the inhibitor ball and spring and tap the shift shaft through the shift lever and the fifth gear kickout spring and then tap into its bore in the clutch housing.

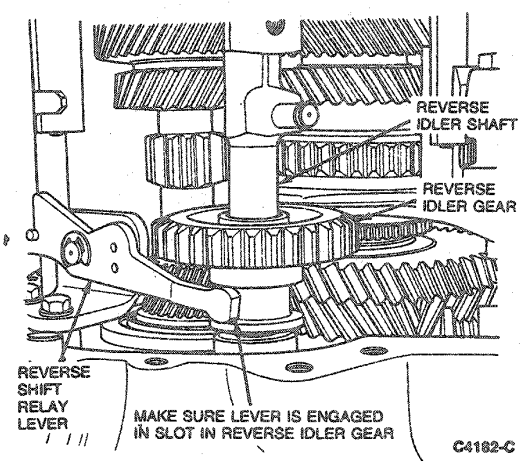


7. Align the shift shaft spring pin hole with the case bore and tap the spring pin in, slightly below the case mating surface.
8. Verify that the selector pin is in the neutral gate of the control selector plate and the finger of the fork selector arm is partially engaged with the first/second fork and partially engaged with the third/fourth fork.



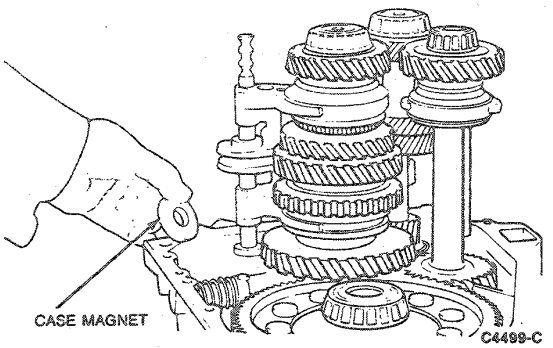
9. Position reverse idler gear over bore in clutch housing while engaging reverse shift relay lever in the slot of the gear. Slide the reverse idler shaft through the gear and into its bore.

   Make sure lever is engaged in slot in gear.

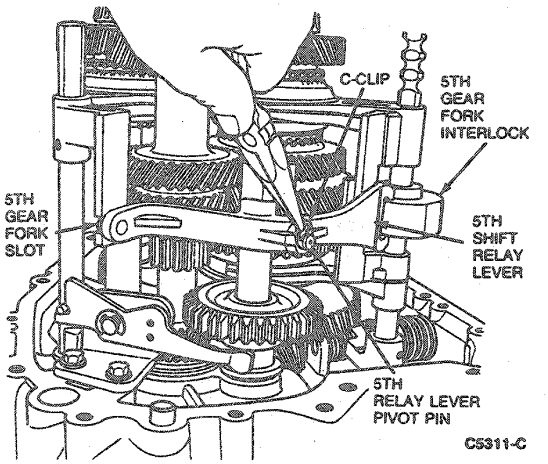


REMOVAL AND INSTALLATION (Continued)

10. Install the magnet in its pocket in the clutch housing case.

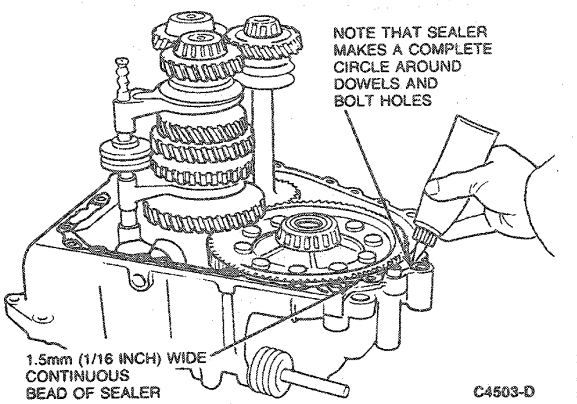


11. Install the fifth shift relay lever onto the reverse idler shaft, aligning it with the fork interlock sleeve and fifth gear fork slot and install the retaining ring (C-clip).



12. Verify that the mating surfaces of the transaxle case and clutch housing are perfectly clean and free of burrs or nicks.

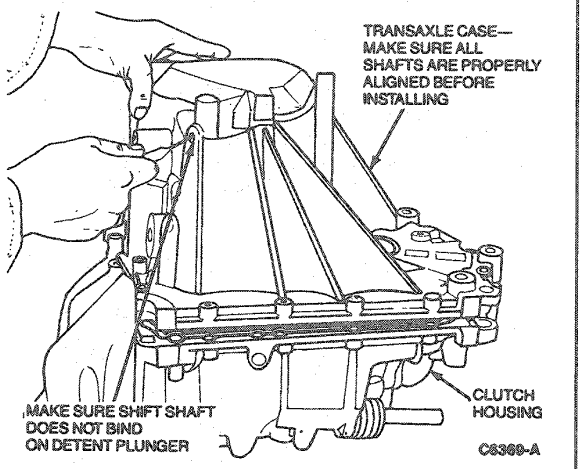
    Apply a 1.5mm (1/16-inch) wide bead of Gasket Eliminator E1FZ-19562-A (ESE-M4G234-A1) or equivalent to the clutch housing.



13. Install the detent spring and plunger in their bore in the case. Carefully lower the transaxle case over the clutch housing, then using a punch, depress the spring and plunger.

    Gently move the transaxle case until the shift control shaft, main shaft, input cluster shaft and fifth gear shaft align with their respective bores in the transaxle case.

14. Gently slide the transaxle case over the dowels and flush onto the clutch housing case. Make sure that the case does not bind on the magnet.



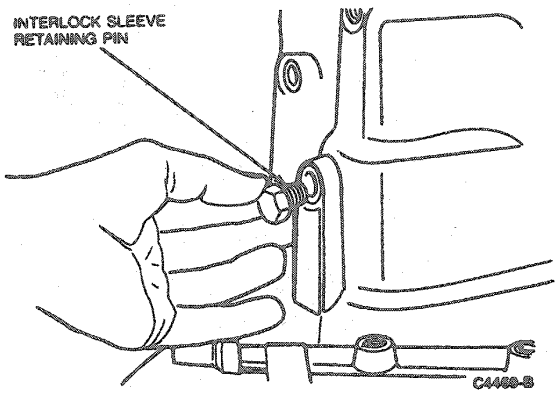
15. Apply Pipe Sealant with Teflon® D8AZ-19554-A (ESG-M4G194-A and ESR-M18P7-A) or equivalent to the threads of the interlock sleeve retaining pin, in a clockwise direction.

    NOTE: If the hole in the case does not align with the slot in the interlock sleeve, remove the case half and check for proper installation of the interlock sleeve.

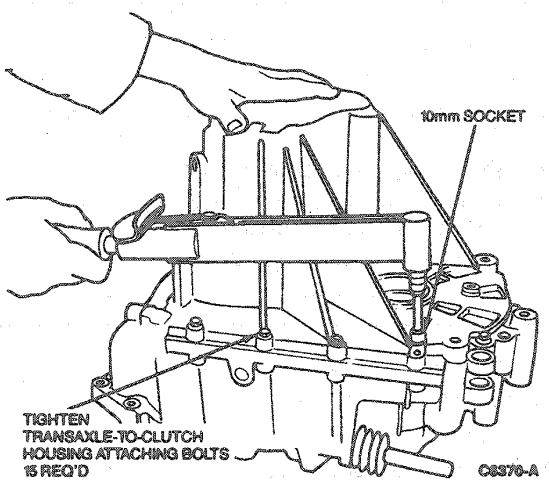
    Use a drift to align the slot in the interlock sleeve with the hole in the transaxle case and install the retaining pin.

REMOVAL AND INSTALLATION (Continued)

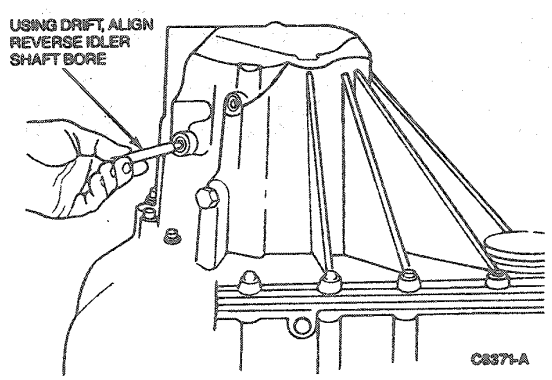
Using a 13mm socket, tighten to 16-20 N·m (12-15 lb-ft).



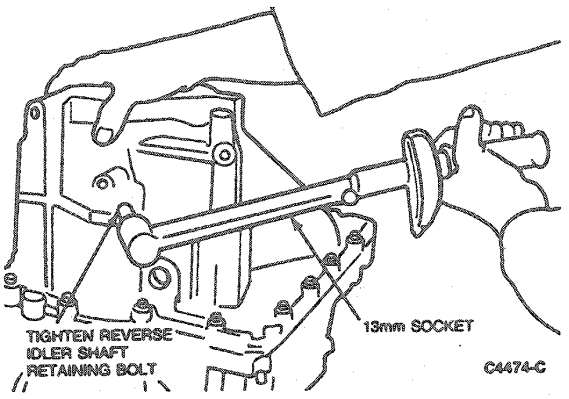
16. Using a 10mm socket and torque wrench, install the 15 transaxle case-to-clutch housing retaining bolts. Tighten to 18-24 N·m (13-17 lb-ft).



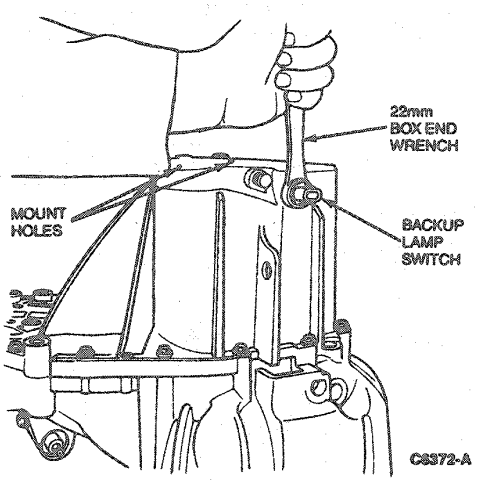
17. Use a drift to align the bore in the reverse idler shaft with the retaining screw hole in the transaxle case.



18. Install the reverse idler shaft retaining bolt. Tighten to 21-27 N·m (16-20 lb-ft).



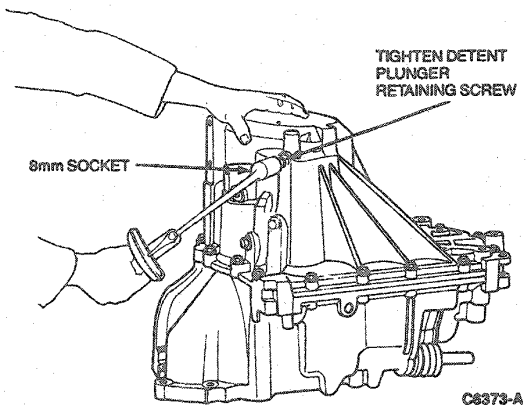
19. Apply Pipe Sealant with Teflon® D8AZ-19554-A (ESG-M4G194-A and ESR-M187P7-A) or equivalent to the threads of the backup lamp switch in a clockwise direction and install. Using a 22mm box-end wrench, tighten to 16-20 N·m (12-15 lb-ft).



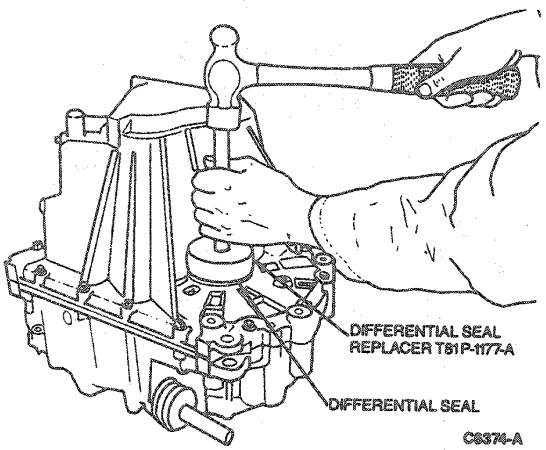
REMOVAL AND INSTALLATION (Continued)

20. Apply Pipe Sealant with Teflon® D8AZ-19554-A (ESG-M4G194-A and ESR-M187P7-A) or equivalent to the threads of the detent plunger retaining screw.

    Install the retaining screw using an 8mm socket and torque wrench. Tighten to 7.5-11 N·m (6-8 lb-ft).



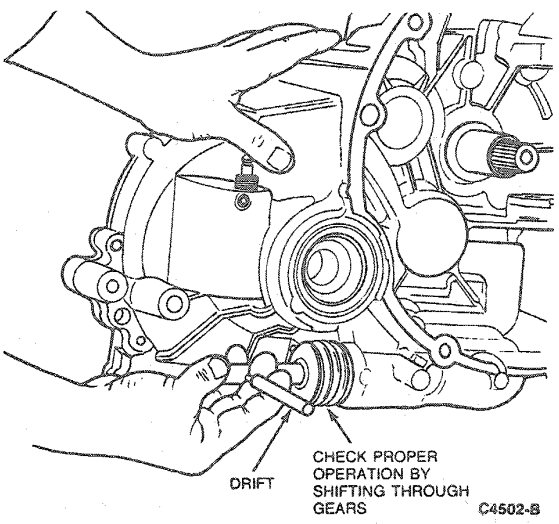
21. Tap the differential seal into the transaxle case with Differential Seal Replacer T81P-1177-A.



    NOTE: Transaxle will not shift directly into REVERSE from fifth gear.

22. Place the transaxle upright and position a drift through the hole in the input shift shaft. Shift the transaxle in and out of all gears to verify proper installation.

    NOTE: Install the transaxle fill plug after the transaxle has been installed in the vehicle and fluid has been added. Apply Pipe Sealant with Teflon® D8AZ-19554-A (ESG-M4G194-A) or equivalent to the fill plug threads, in a clockwise direction, prior to installation. Refer to specifications for fluid capacity and torque specifications.



Flywheel

Removal and Installation

1. Remove pressure plate and disc. Refer to Section 08-01.
2. Remove flywheel retaining bolts.
3. Carefully remove flywheel. Inspect flywheel for damage or wear as outlined.
4. To install, reverse Removal procedure.

Flywheel Ring Gear

Manual-Shift Transaxle

Removal

To replace a damaged or worn ring gear, heat the ring gear with a blow torch on the engine side of the gear, and knock it off the flywheel. Do not hit the flywheel when removing the ring gear.

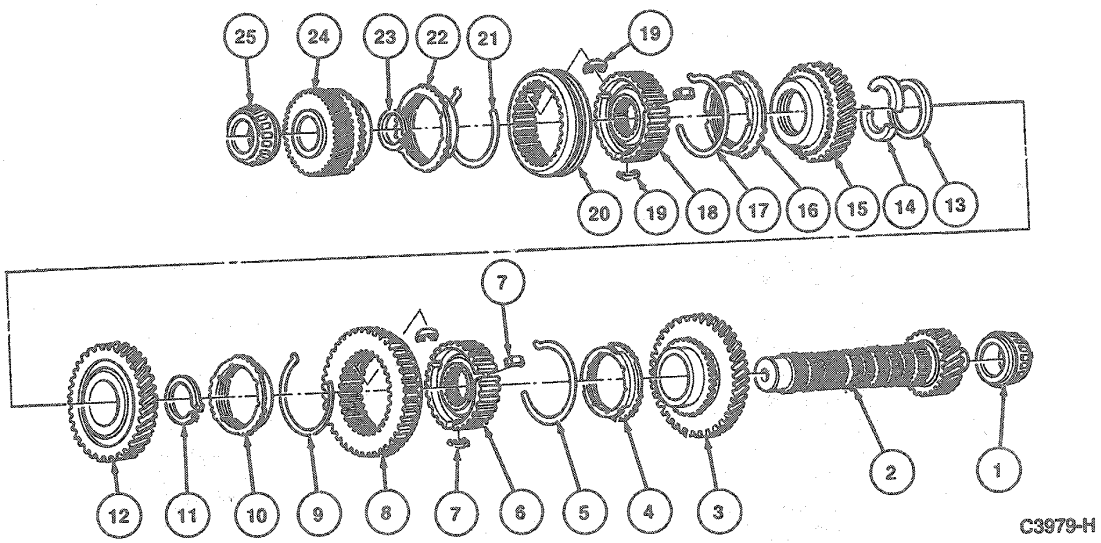
Installation

Heat the new ring gear evenly until the gear expands enough to slip onto the flywheel. Make sure the gear is seated properly against the shoulder. **Do not heat any portion of the gear to a temperature higher than 260°C (500°F). If this limit is exceeded, the temper will be removed from the ring gear teeth.**

DISASSEMBLY AND ASSEMBLY

Main Shaft Assembly

Main Shaft Disassembled View



Item	Part Number	Description
1	7F423	Main Shaft Front Bearing
2	7061	Main Shaft
3	7100	1st Speed Gear
4	7107	Synchro Blocker Ring
5	7109	Synchronizer Ring
6	7C115	1st / 2nd Synchro Hub
7	7C396	1st / 2nd Synchro Hub Insert
8	7K013	Reverse Sliding Gear
9	7109	Synchronizer Spring
10	7107	Synchro Blocker Ring
11	N661228-S	1st / 2nd Synchro Retainer Ring
12	7102	2nd Speed Gear

(Continued)

Item	Part Number	Description
13	7A046	2nd / 3rd Thrust Washer Retaining Ring
14	7A385	2nd / 3rd Gear Thrust Washer
15	7B340	3d Speed Gear
16	7107	Synchro Blocker Ring
17	7109	Synchronizer Spring
18	7105	3d / 4th Synchro Hub
19	7K198	3rd / 4th Synchro Hub Insert
20	7106	3d / 4th Synchro Sleeve
21	7109	Synchronizer Spring
22	7107	Synchro Blocker Ring
23	N661226-S	3rd / 4th Synchro Retainer Ring
24	7110	4th Speed Gear
25	7F432	Main Shaft Rear Bearing

Tools Required:

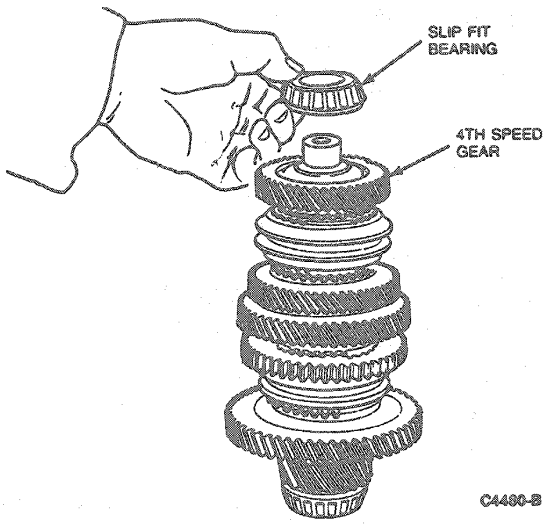
- Pinion Bearing Cone Remover D79L-4621-A

DISASSEMBLY AND ASSEMBLY (Continued)

Disassembly

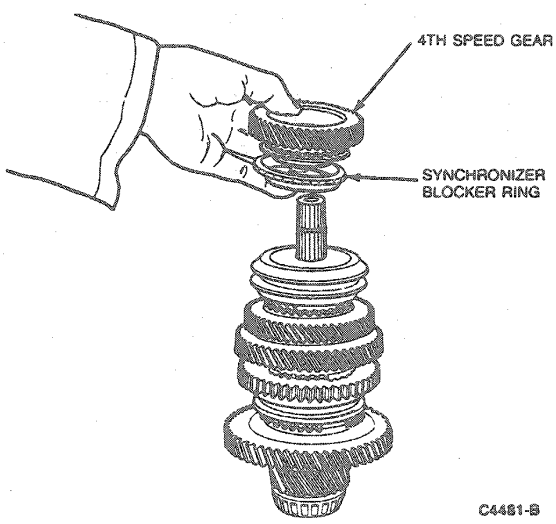
1. Remove the slip fit bearing on the fourth speed gear end of the shaft.

   Label the bearing for proper installation.



   NOTE: Tag blocker ring for proper installation.

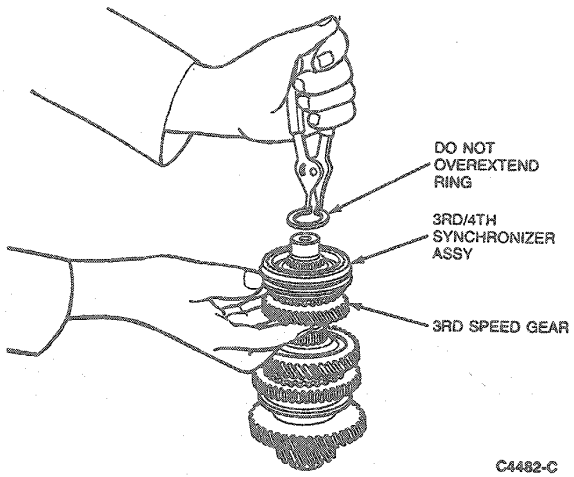
2. Remove the fourth speed gear and synchronizer blocker ring.



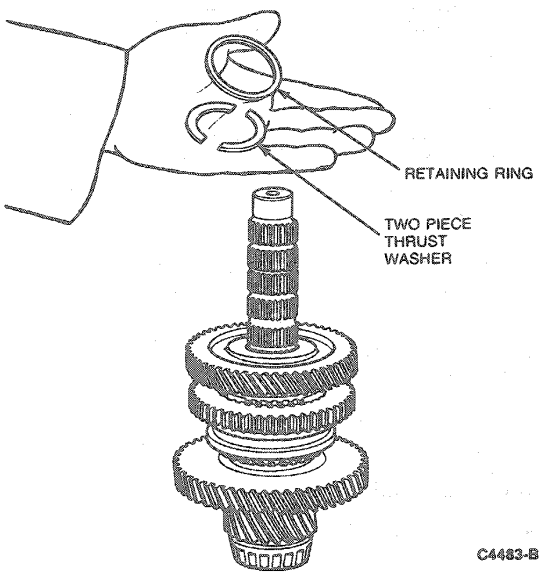
   NOTE: Tag blocker ring for proper installation.

3. Remove the third / fourth synchronizer retaining ring.

   Slide the third / fourth synchronizer assembly, blocker ring and third speed gear from the shaft.



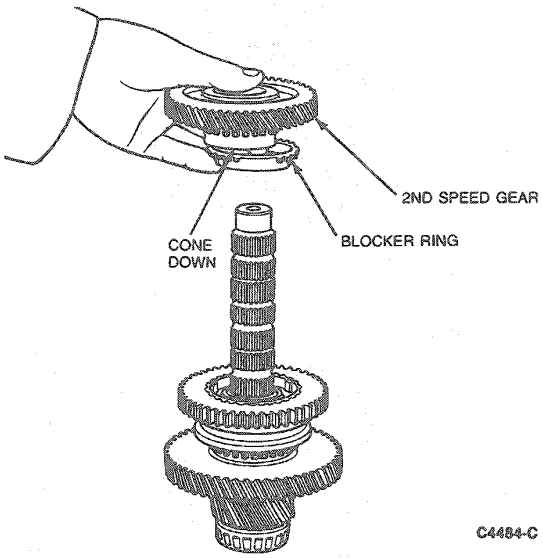
4. Remove the second / third thrust washer retaining ring and the two-piece thrust washer.



   NOTE: Tag blocker ring for proper installation.

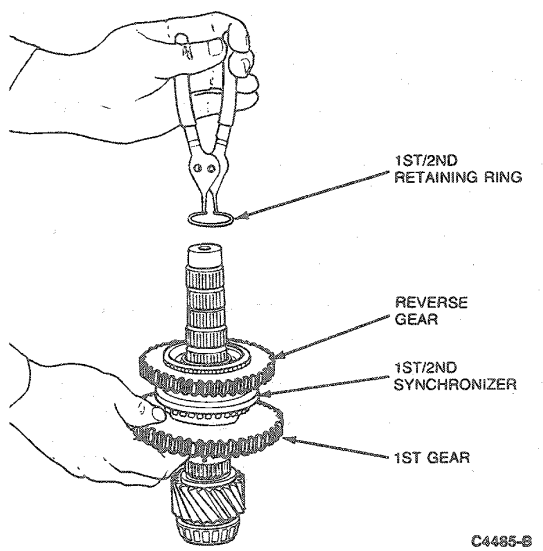
DISASSEMBLY AND ASSEMBLY (Continued)

5. Remove the second speed gear and its blocker ring.



NOTE: Tag blocker ring for proper installation.

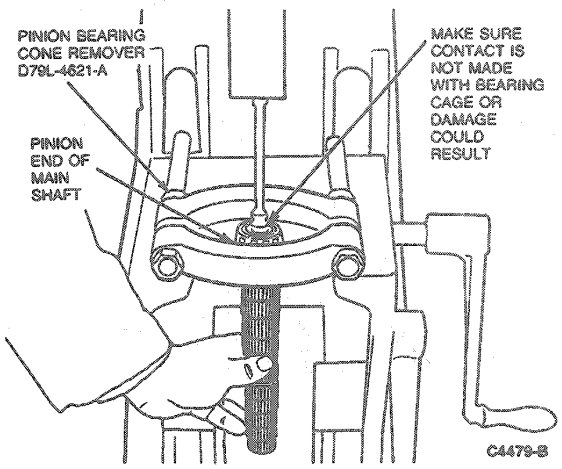
6. Remove the first / second synchronizer retaining ring. Slide the first / second synchronizer assembly, blocker ring and first speed gear off the shaft.



NOTE: This bearing does not have to be removed to disassemble the main shaft, only replace if damaged. Refer to Bearing Diagnosis.

7. Remove the tapered roller bearing from the pinion end of the main shaft using a socket or extension and Pinion Bearing Cone Remover D79L-4621-A or equivalent and an arbor press.

Label the bearing.

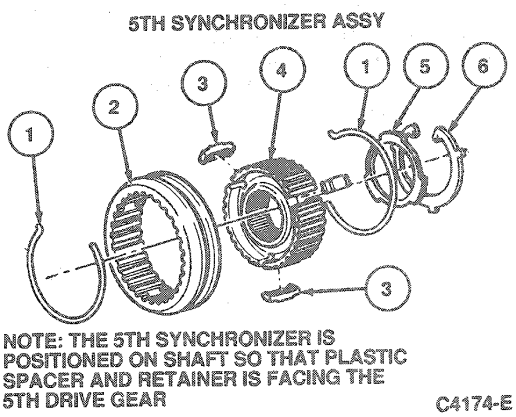


Synchronizer

Disassembly and Assembly

NOTE: Prior to disassembly note position of index marks.

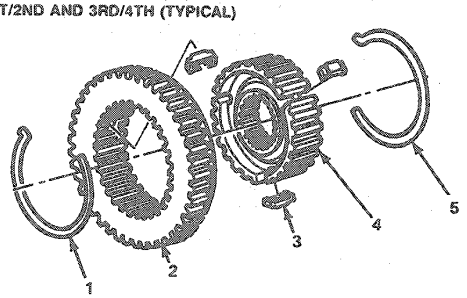
To disassemble the synchronizer assembly, remove the synchronizer springs with a small screwdriver. Do not compress the springs more than necessary. Remove the three hub inserts. Slide the hub and sleeve apart.



DISASSEMBLY AND ASSEMBLY (Continued)

Item	Part Number	Description
1	7109	Synchro Retainer Spring (2 Req'd)
2	7106	Synchronizer Sleeve
3	7K198	Synchro Hub Inserts (3 Req'd)
4	7L172	Synchronizer Hub
5	7L049	Synchro Insert Retaining Spacer
6	7G042	5th Synchro Insert Retainer

SYNCHRONIZER ASSEMBLY
1ST/2ND AND 3RD/4TH (TYPICAL)



LEGEND:

1. SPRING — SYNCHRONIZER RETAINER
2. GEAR AND SYNCHRONIZER SLEEVE
3. INSERTS — SYNCHRONIZER HUB
4. HUB — SYNCHRONIZER
5. SPRING — SYNCHRONIZER RETAINER

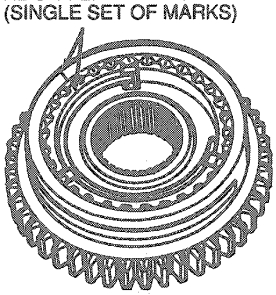
C4072-D

In assembling the synchronizers, some points must be noted:

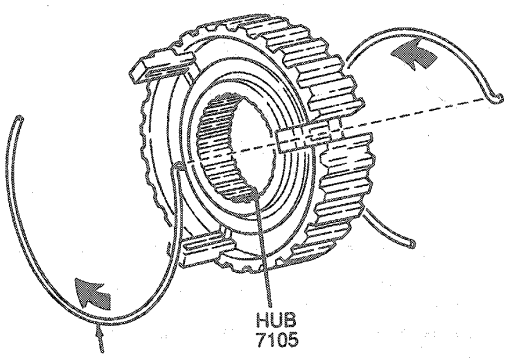
1. Slide the sleeve over the hub. The index marks must be aligned.
2. Place the three inserts into their slots. Place the tab on the synchronizer spring into the groove of one of the inserts and snap the spring into place.

Place the tab of the other spring into the same insert (on the other side of the synchronizer assembly) and rotate the spring in the opposite direction and snap into place as shown.

ALIGNMENT MARKS
(SINGLE SET OF MARKS)



NOTE THE SPRINGS ROTATING AWAY FROM THE SAME INSERT BUT IN OPPOSITE DIRECTIONS



C4073-D

NOTE: When assembling synchronizers, notice that the sleeve and the hub have an extremely close fit and must be held square to prevent jamming. (Do not force the sleeve onto the hub).

Main Shaft Assembly

Tools Required:

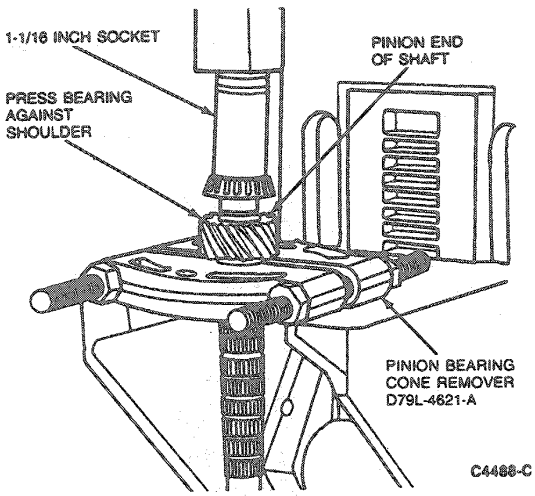
- Pinion Bearing Cone Remover D79L-4621-A

Assembly

NOTE: Prior to assembly of the main shaft, thoroughly clean all parts and inspect their condition. Lightly oil the gear bores and other parts with Synthetic MERCON® Multi-Purpose Automatic Transmission Fluid E6AZ-19582-B (ESR-M2C163-A2) or equivalent.

DISASSEMBLY AND ASSEMBLY (Continued)

1. Install the bearing on the pinion end of the shaft using a 1-1 / 16 inch socket and an arbor press.

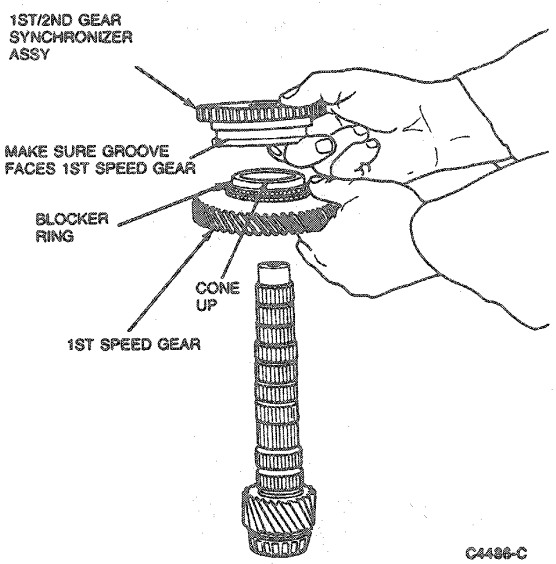


NOTE: When installing the synchronizer, align the three grooves in the first gear blocker ring with the synchronizer inserts. This allows the synchronizer assembly to seat properly in the blocker ring.

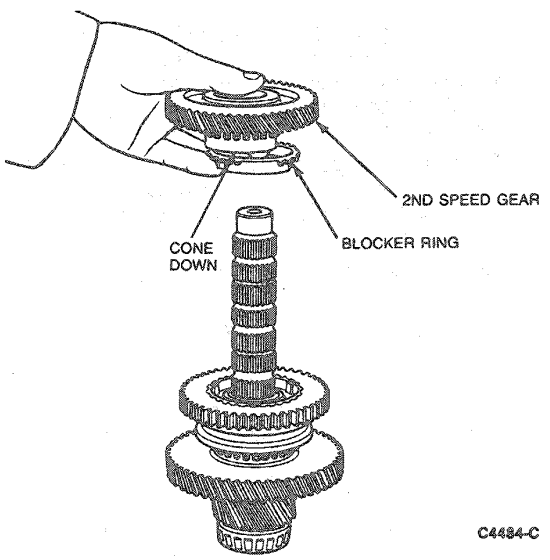
2. Slide the first speed gear and tagged blocker ring onto the main shaft. Slide the first / second synchronizer assembly into place, making sure the shift fork groove on the reverse sliding gear faces the first speed gear.

NOTE: When installing the synchronizer, align the three grooves in the second gear blocker ring with the synchronizer inserts. This allows the synchronizer assembly to seat properly in the blocker ring.

Install the synchronizer retaining ring.

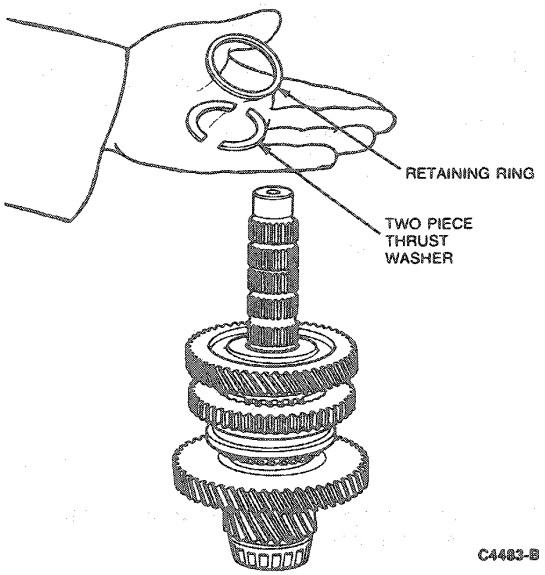


3. Install the tagged second speed blocker ring and the second speed gear.



DISASSEMBLY AND ASSEMBLY (Continued)

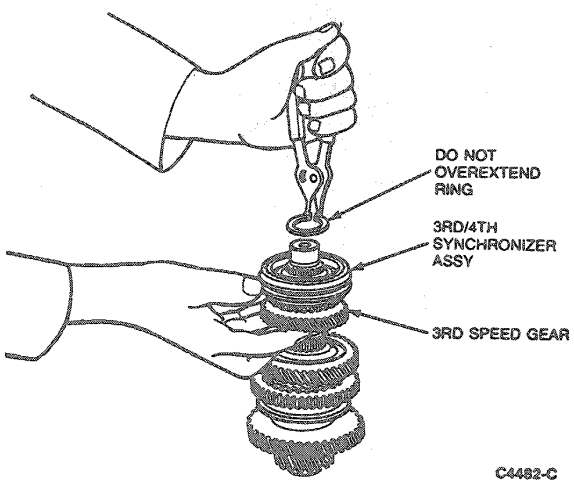
4. Install the thrust washer halves into the groove on the main shaft and then the retaining ring around the thrust washer halves.



NOTE: When installing the synchronizer, align the three grooves in the third gear blocker ring with the synchronizer inserts. This allows the synchronizer assembly to seat properly in the blocker ring.

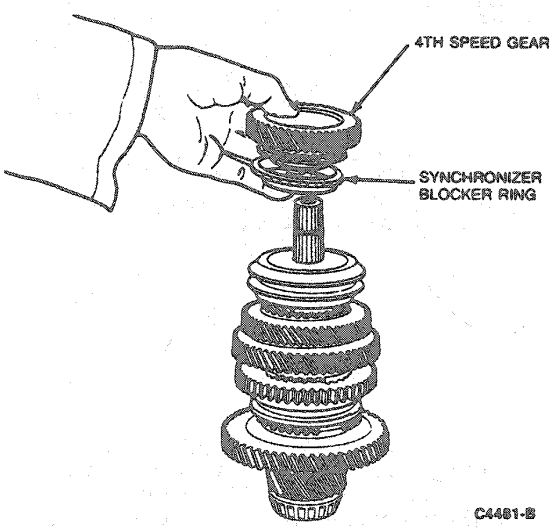
5. Slide the third speed gear onto the shaft followed by the tagged third gear synchronizer blocker ring and the third / fourth gear synchronizer assembly.

Install the synchronizer retaining ring.



NOTE: When installing the synchronizer, align the three grooves in the fourth gear blocker ring with the synchronizer inserts. This allows the synchronizer assembly to seat properly in the blocker ring.

6. Install the tagged fourth gear blocker ring and the fourth speed gear.

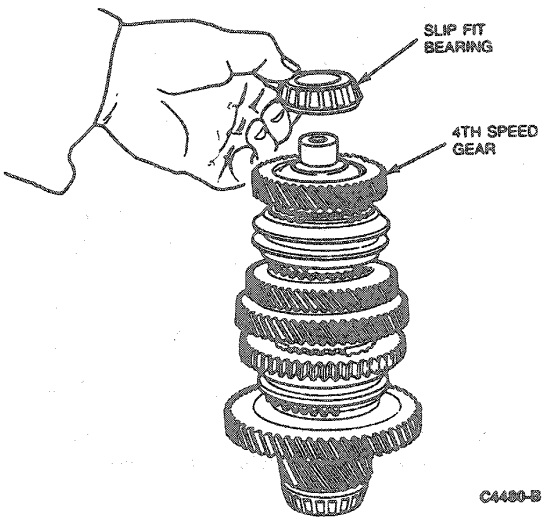


NOTE: Make sure bearings are seated against the shoulder of the main shaft. Position bearings on the proper end, as labeled during disassembly. Rotate each gear on the shaft to check for binding or roughness.

DISASSEMBLY AND ASSEMBLY (Continued)

7. Install the slip fit bearing on the fourth gear end of the shaft. Make sure bearings are placed on the proper end, as labeled during disassembly. Rotate each gear on the shaft to check for binding or roughness.

   NOTE: Make sure that the synchronizer sleeves are in NEUTRAL position.



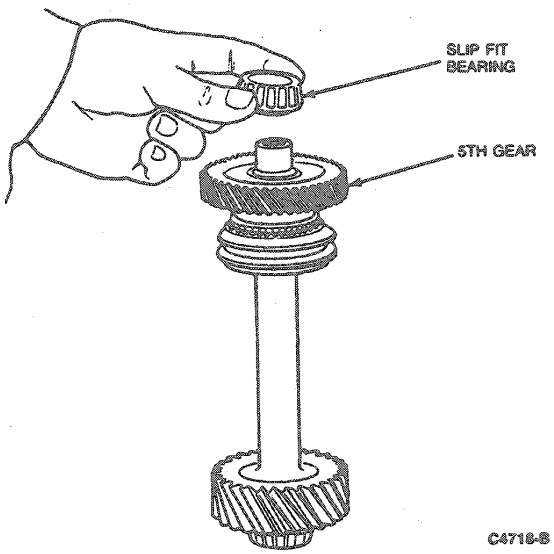
Fifth Gear Shaft Assembly

Tools Required:

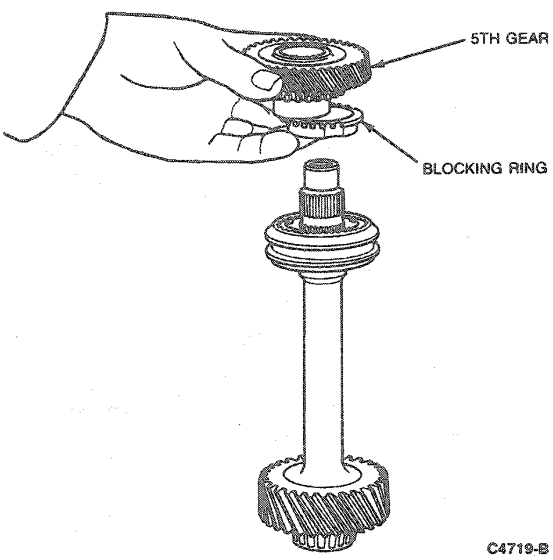
- Pinion Bearing Cone Remover D79L-4621-A

Disassembly

1. Remove the slip fit bearing from the fifth gear end of the shaft and label it for proper installation.

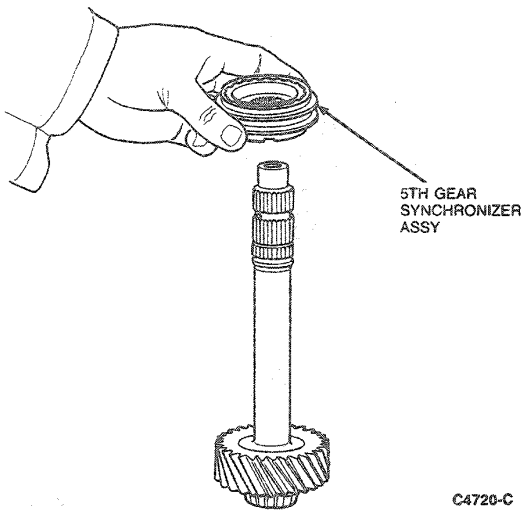


2. Remove the fifth gear and blocking ring.

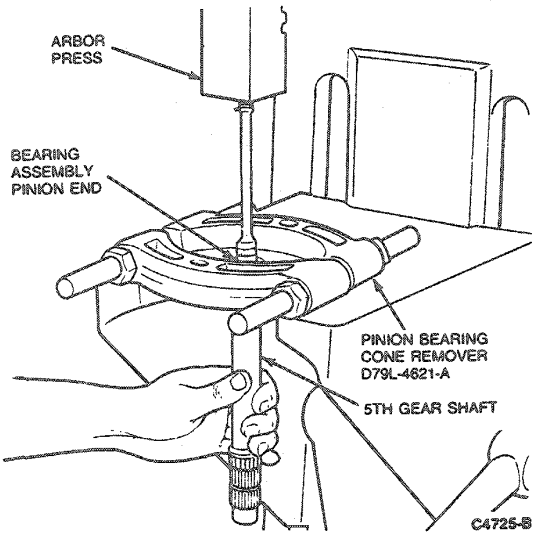


DISASSEMBLY AND ASSEMBLY (Continued)

3. Remove the fifth gear synchronizer assembly.



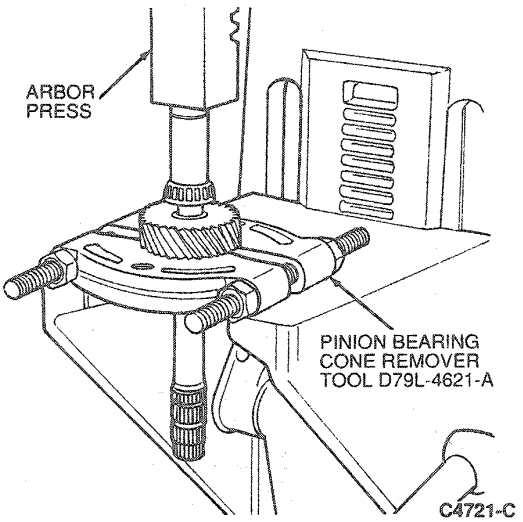
4. Remove the press fit bearing from the pinion end of the shaft, using Pinion Bearing Cone Remover D79L-4621-A or equivalent.



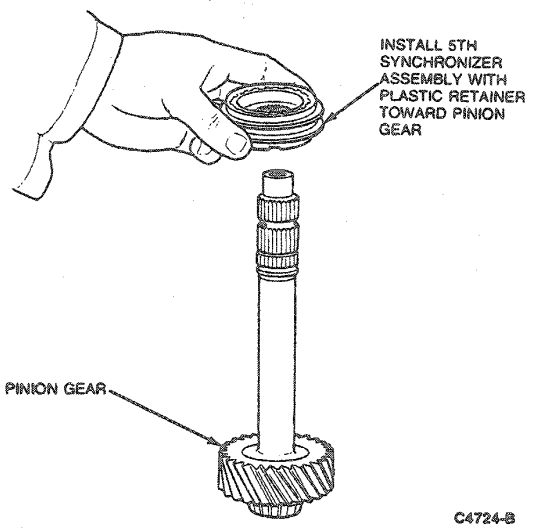
Assembly

NOTE: Prior to assembly, thoroughly clean all parts and inspect their condition. Lightly oil the gear bore with Synthetic MERCON® Multi-Purpose Automatic Transmission Fluid E6AZ-19582-B (ESR-M2C163-A2) or equivalent.

1. Press the bearing onto the pinion gear end of the fifth gear shaft.

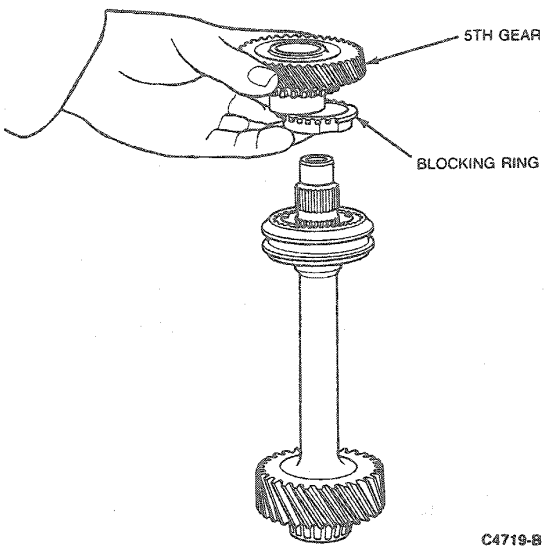


2. Install the fifth synchronizer assembly with the plastic insert retainer facing the pinion gear.

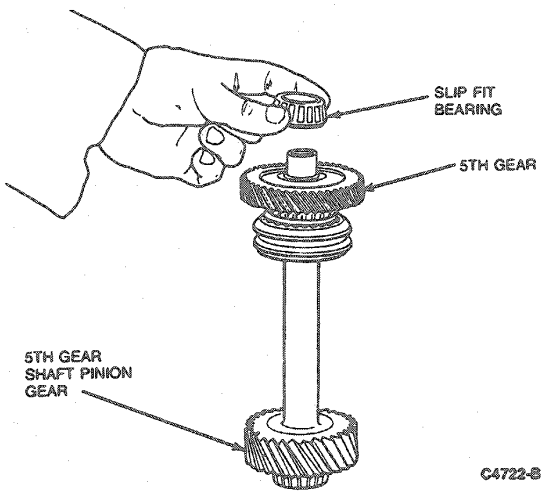


DISASSEMBLY AND ASSEMBLY (Continued)

3. Install the fifth gear and blocking ring.



4. Install the slip fit bearing on the fifth gear end of the shaft.



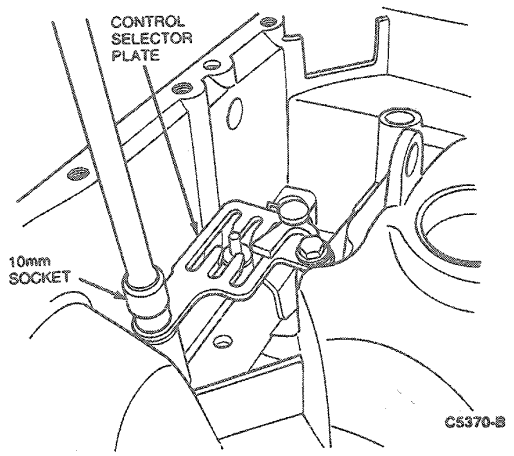
Clutch Housing

Tools Required:

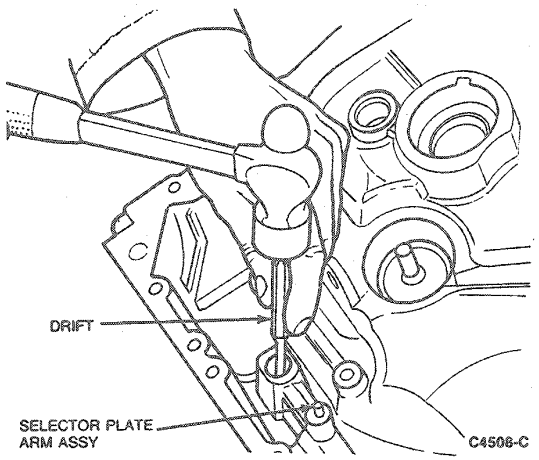
- Impact Slide Hammer T50T-100-A
- Sector Shaft Seal Tool T77F-7288-A

Disassembly

1. Using a 10mm socket wrench, remove the two control selector plate retaining bolts. Remove the plate from the case.



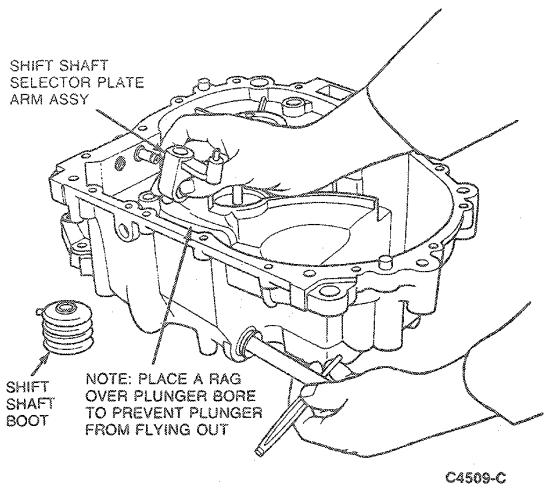
2. With the input shift shaft in the center detent position, using a drift, drive the spring pin through the selector plate arm assembly and through the input shift shaft into the recess in the clutch housing case.



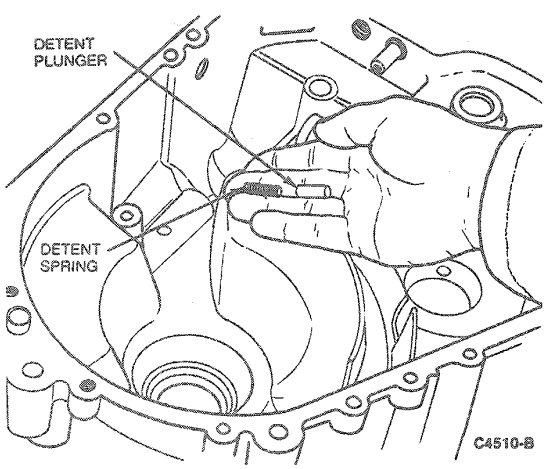
DISASSEMBLY AND ASSEMBLY (Continued)

3. Remove the shift shaft boot. Using a drift, rotate the input shift shaft 90 degrees, depressing the detent plunger from the shaft detent notches inside the housing and pull input shift shaft out.

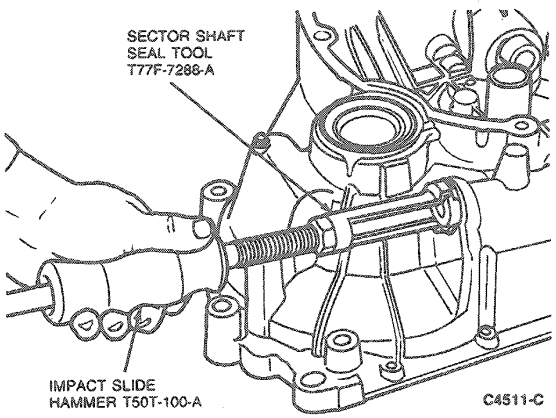
   Remove the input shift shaft selector plate arm assembly and the spring pin.



4. Using a pencil magnet, remove the input shift shaft detent plunge and spring and label for proper installation.



5. Using Sector Shaft Seal Tool T77F-7288-A and Impact Slide Hammer T50T-100-A, remove the transaxle input shift shaft oil seal assembly.

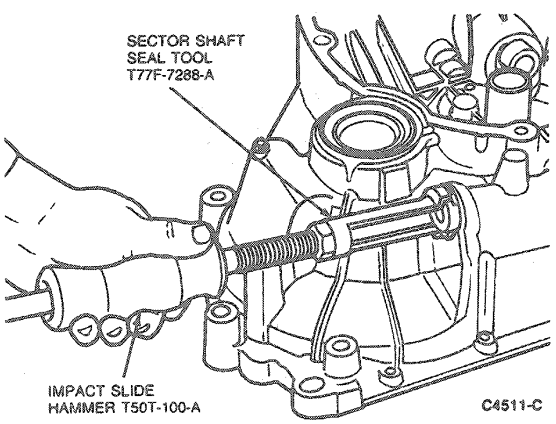


Assembly

NOTE: Prior to assembly, thoroughly clean all parts and inspect their condition. Lightly oil the gear bore with Synthetic MERCON® Multi-Purpose Automatic Transmission Fluid E6AZ-19582-B (ESR-M2C163-A2) or equivalent.

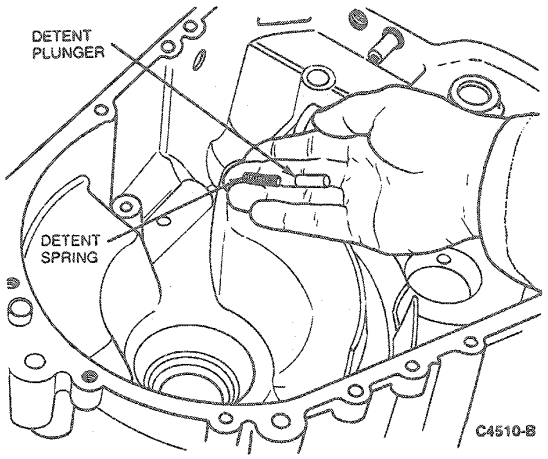
1. Grease the seal lip of a new input shift shaft oil seal.

   Using Sector Shaft Seal Tool T77F-7288-A and Impact Slide Hammer T50T-100-A, install a new input shift shaft oil seal assembly.



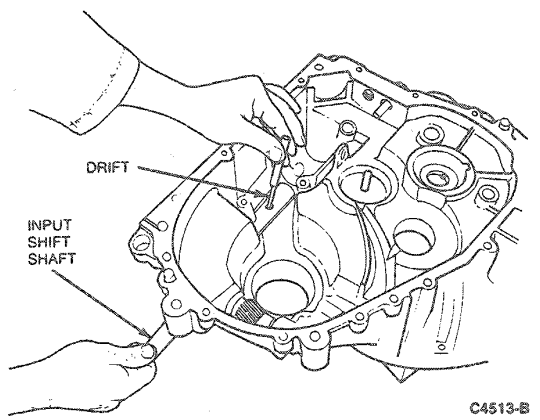
DISASSEMBLY AND ASSEMBLY (Continued)

2. Install the input shift shaft detent spring and plunger in the clutch housing case.



CAUTION: Be careful not to cut the shift shaft oil seal when inserting the shaft.

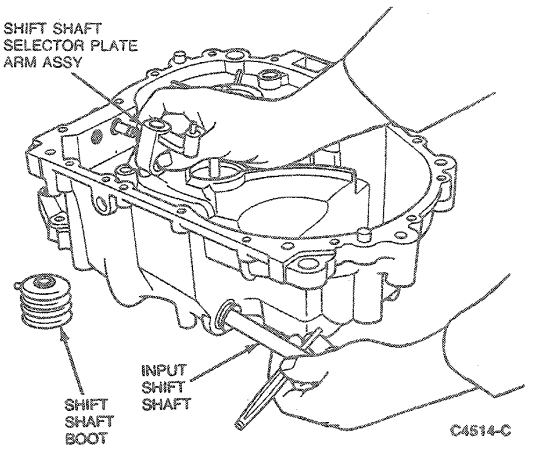
3. Using a small drift, force the spring and plunger down into its bore while sliding the input shift shaft into its bore and over the plunger.



NOTE: Be sure notches in the shift shaft face the detent plunger.

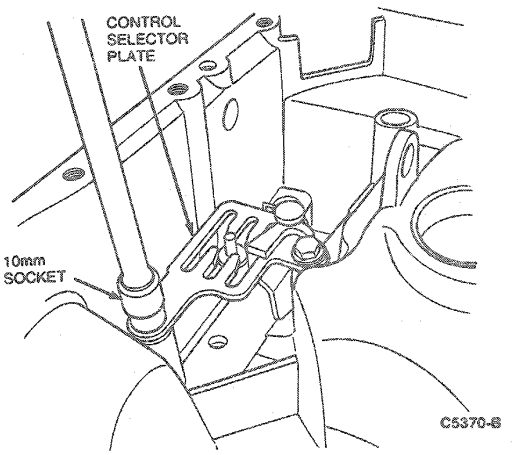
4. Install the selector plate arm in its working position and slide the shaft through the selector plate arm.

   Align the hole in the selector plate arm with the hole in the shaft and install the spring pin. Install the input shift shaft boot.



5. Install the control selector plate. Using a 10mm socket wrench, tighten the retaining bolts to 8-11 N·m (6-8 lb-ft) (pin in selector arm must ride in cutout of gate in the selector plate).

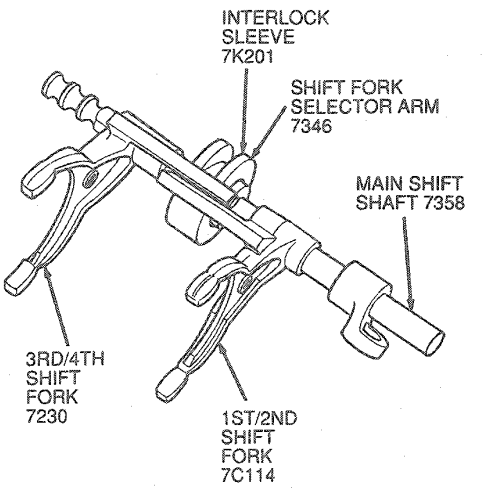
   Move input shift shaft through the selector plate positions to make sure everything works properly.



DISASSEMBLY AND ASSEMBLY (Continued)

Main Shift Control Shaft

Assembled View

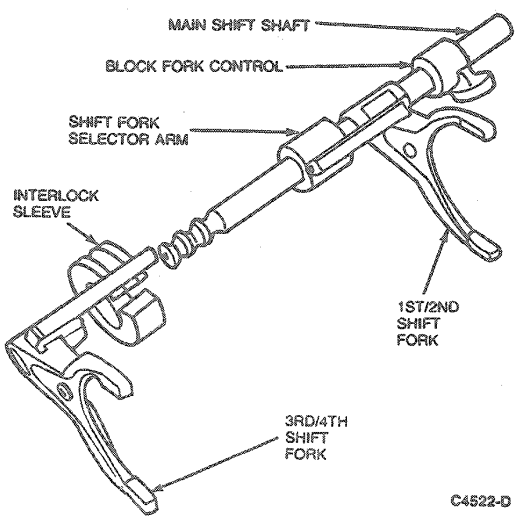


Disassembly

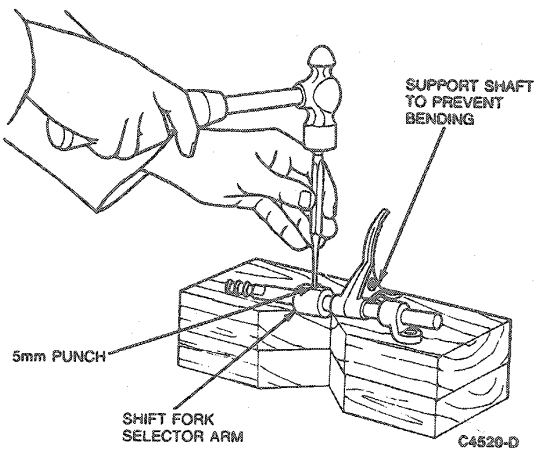
1. Rotate the third / fourth shift fork on the shaft until the notch in the fork is located over the interlock sleeve.

   Rotate the first / second shift fork on the shaft until the notch in the fork is located over the shift fork selector arm finger.

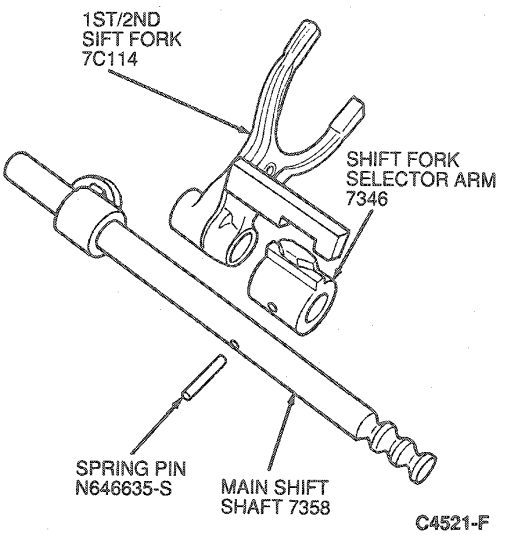
   With the forks in position, slide the third / fourth fork and interlock sleeve off the shaft.



2. Using a 5mm punch, remove the selector arm spring pin.



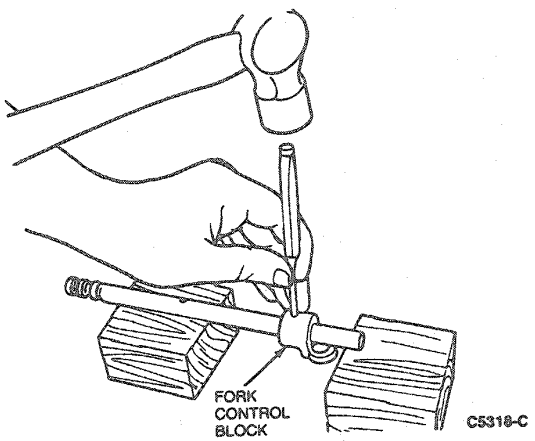
3. Remove the shift fork selector arm and first / second shift fork from the shaft.



DISASSEMBLY AND ASSEMBLY (Continued)

4. Using a 5mm punch, remove the fork control block spring pin.

   Remove the fork control block from the shift control shaft.



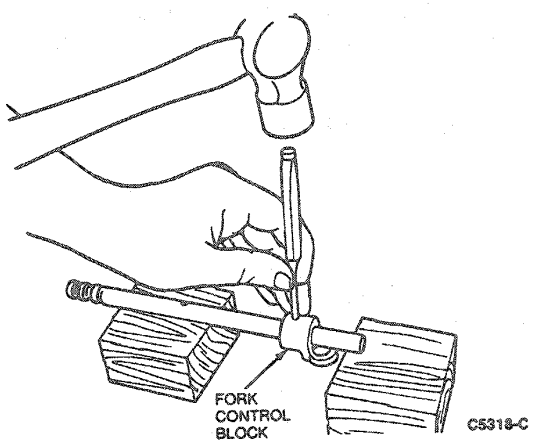
Assembly

NOTE: Prior to assembly, thoroughly clean all parts and inspect their condition. Lightly oil the gear bore with Synthetic MERCON® Multi-Purpose Automatic Transmission Fluid E6AZ-19582-B (ESR-M2C163-A2) or equivalent.

1. Slide fork control block onto the shift control shaft.

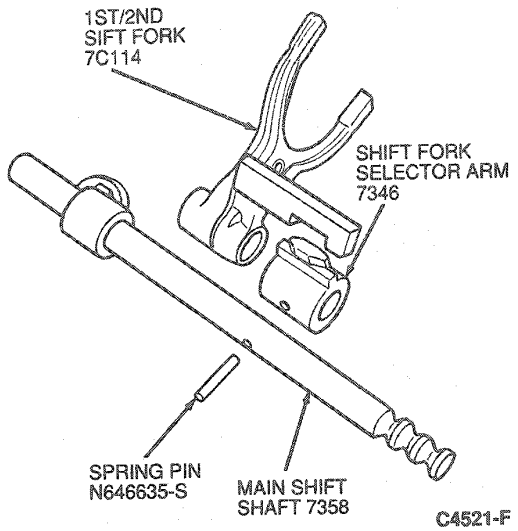
   NOTE: With pin installed in control block, offset must point toward end of shaft.

   Align the hole in the block with the hole in the shaft and install the fork control block spring pin using a 5mm punch.

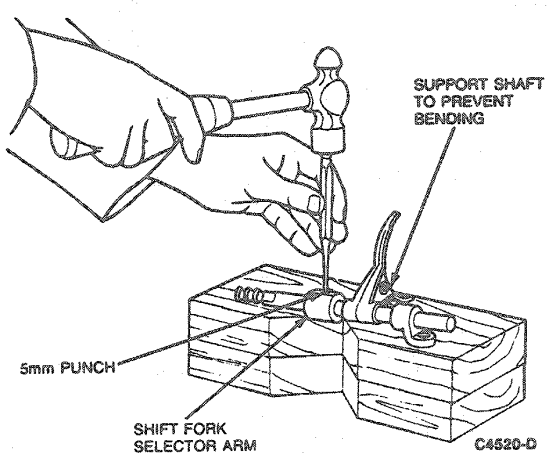


2. Install the first / second shift fork and the selector arm on the shaft.

   NOTE: The first / second shift fork is thinner than the third / fourth shift fork.



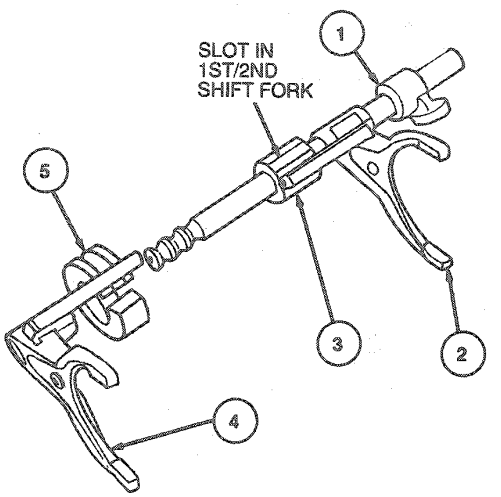
3. Align the hole in the shift fork selector arm with the hole in the shaft and install the spring pin.



4. Position the slot in the first / second fork over the fork selector arm finger.

   Position the slot in the third / fourth fork over the interlock sleeve.

DISASSEMBLY AND ASSEMBLY (Continued)



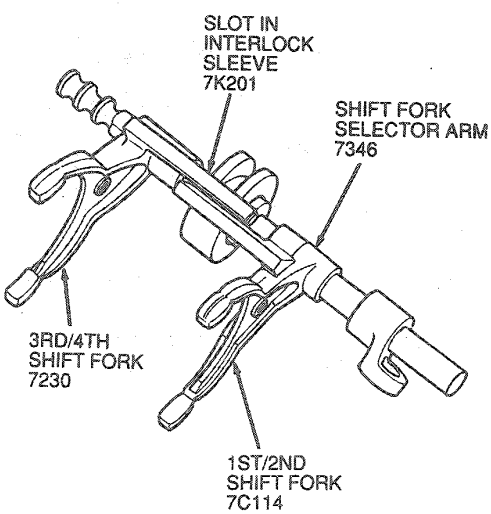
C4525-E

Item	Part Number	Description
1	7K105	Block Fork Control
2	7C114	1st / 2nd Shift Fork
3	7346	Shift Fork Selector Arm
4	7230	3rd / 4th Shift Fork
5	7K201	Interlock Sleeve

NOTE: When assembled, forks should be aligned.

Slide the third / fourth fork and interlock sleeve onto the main shift control shaft.

Align the slot in the interlock sleeve with the finger on the shift fork selector arm and slide the sleeve and third / fourth fork into position.



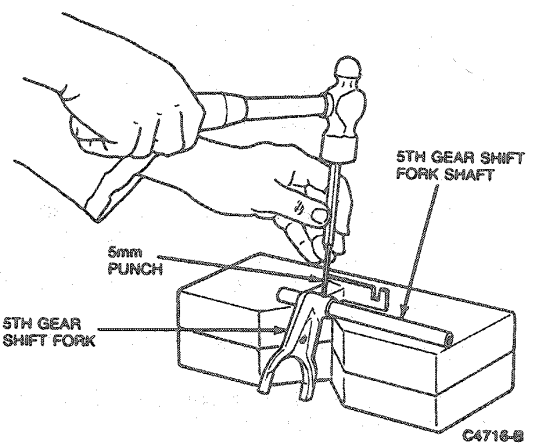
C4701-E

Item	Part Number	Description
1	7K105	Block Fork Control
2	7C114	1st / 2nd Shift Fork
3	7346	Shift Fork Selector Arm
4	7230	3rd / 4th Shift Fork
5	7K201	Interlock Sleeve

Fifth Gear Shift Control

Disassembly

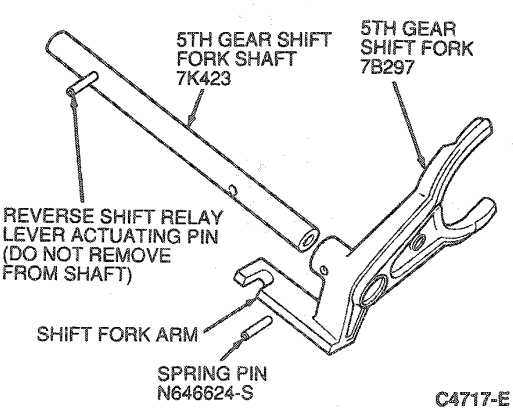
1. Using a 5mm punch, remove the spring pin.
2. Slide the fork from the shaft.



C4716-B

Assembly

1. Holding the shaft with the hole on the left, install the fifth gear shift fork so that the protruding arm is pointing toward the long end of the shaft.
2. Install the spring pin.



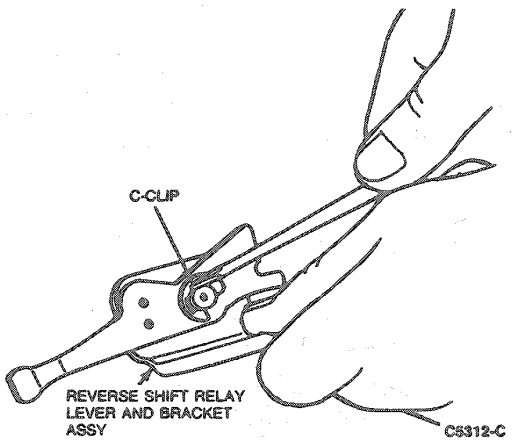
C4717-E

DISASSEMBLY AND ASSEMBLY (Continued)

Reverse Shift Relay Lever and Bracket

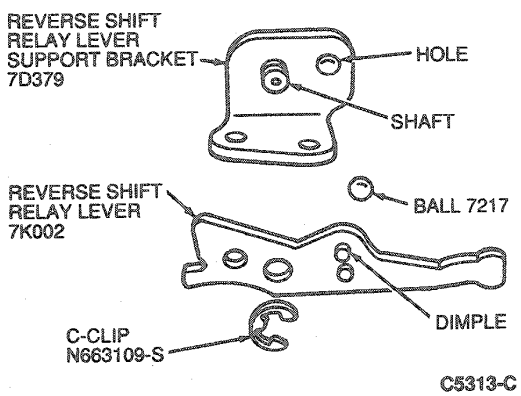
Disassembly

1. Using a small screwdriver, remove the C-clip retaining ring from the reverse shift relay support bracket.



NOTE: DO NOT remove the shaft or springs from the support bracket.

2. Slide the reverse shift relay lever off the support shaft and remove the steel ball and springs between them.



Assembly

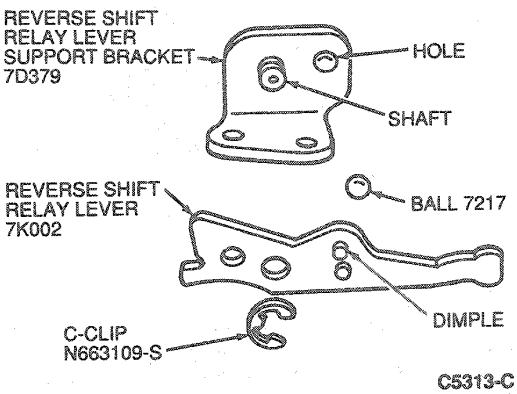
1. Place the ball in the hole in the support bracket.

   NOTE: Make sure the lever is installed so that the bend in the lever is toward the bracket.

2. Slide the reverse relay lever onto the support bracket pin.

   Align the ball with dimples on reverse shift relay lever.

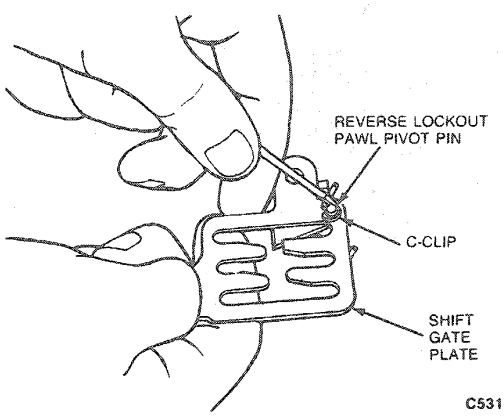
3. Install C-clip onto reverse shift lever support bracket shaft to retain reverse shift relay lever.



Selector Control Plate

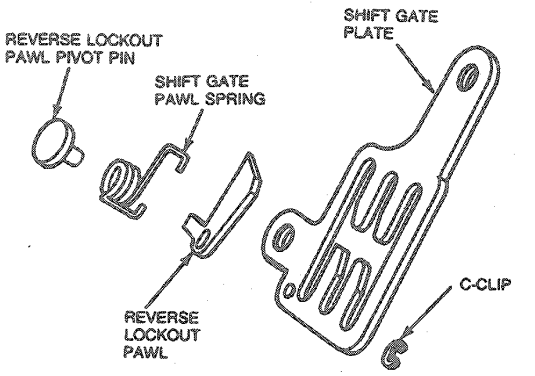
Disassembly

1. Using a small screwdriver, remove C-clip retaining reverse lockout pawl pivot pin to shift gate plate.



DISASSEMBLY AND ASSEMBLY (Continued)

2. Remove reverse lockout pawl, pin and spring from shift gate plate.

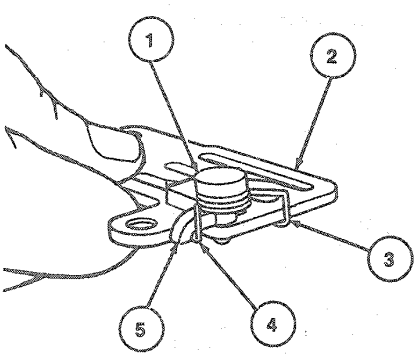


C5315-C

Assembly

NOTE: Make sure the lower (shorter) leg of the spring rests against the reverse lockout pawl and the upper (longer) leg of the spring rests against the shift gate plate. Ensure spring is against shoulder of reverse lockout pivot pin and does not interfere with pin seating against reverse lockout pawl.

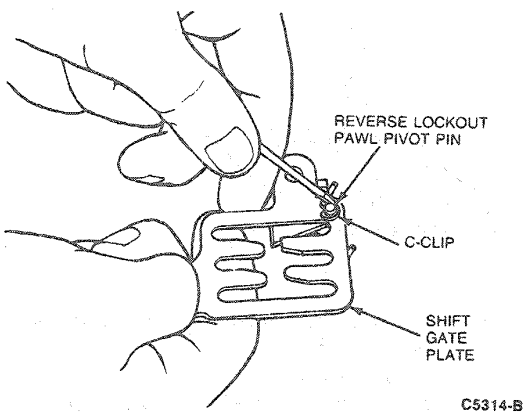
1. Install reverse lockout pawl, pin, and spring.



C5316-D

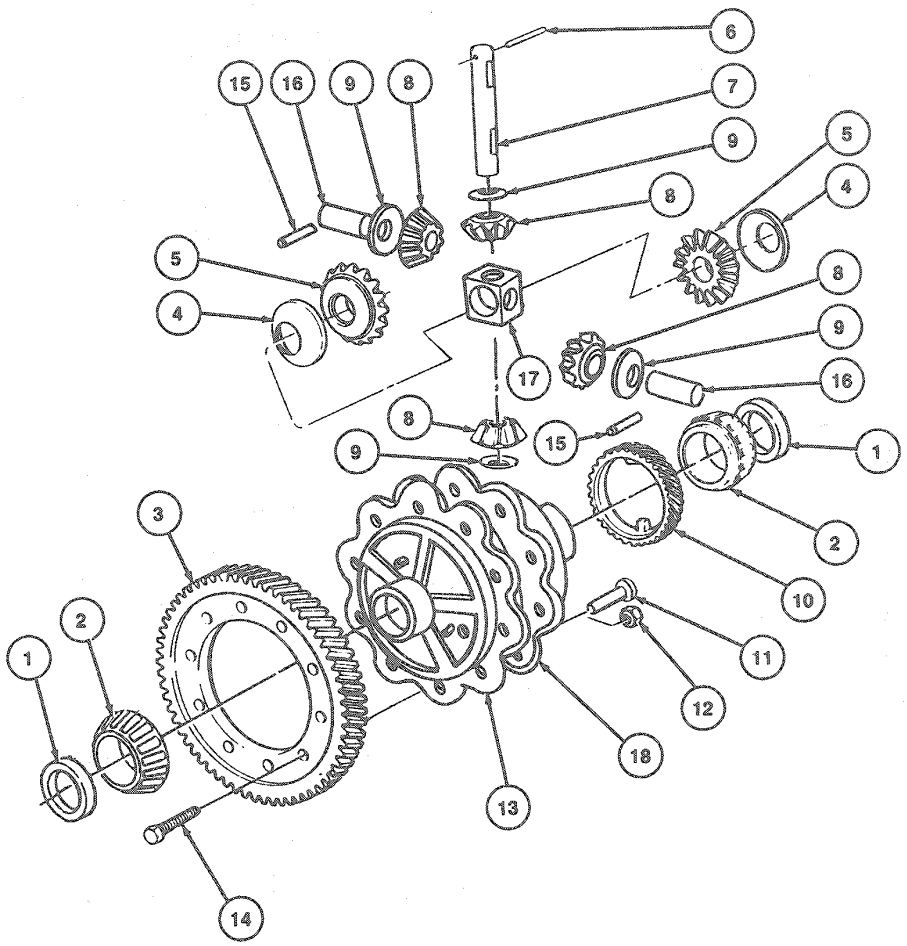
Item	Part Number	Description
1	7E484	Reverse Lockout Pawl Pivot Pin
2	7F476	Shift Gate Plate
3	7E200	Shift Gate Pawl Spring (Upper Longer Leg)
4	7E200	Shift Gate Pawl Spring (Lower Shorter Leg)
5	7E159	Reverse Lockout Pawl

2. Install C-clip to reverse lockout pawl pivot pin.



C5314-B

DISASSEMBLY AND ASSEMBLY (Continued)



E6198-B

Item	Part Number	Description
1	4222	Differential Bearing Cup
2	4221	Diff. Bearing Cone and Roller Assy
3	7F343	Final Drive Ring Gear
4	4228	Diff. Side Gear Thrust Washer (2 Req'd)
5	4236	Differential Side Gear (2 Req'd)
6	N800979-S	Pinion Shaft Retaining Pin
7	4211	Pinion Gear Shaft
8	4215	Pinion Gear (4 Req'd)
9	4230	Thrust Washer (4 Req'd)

(Continued)

Item	Part Number	Description
10	17285	Speedometer Drive Gear
11	N802940-S	Final Drive Gear Attaching Rivet
12	—	Final Drive Gear Attaching Nut (For Service Replacement of Gear Only)
13	4206	LH Differential Gear Case
14	—	Final Drive Gear Attaching Bolt (For Service Replacement of Gear Only)
15	N800979-S	Spring Pin (2 Req'd)
16	4419	Pinion Shaft (2 Req'd)
17	4420	Pinion Shaft Seat
18	4205	RH Differential Gear Case

Tools Required:

- Differential Bearing Cone Remover T57L-4220-A

DISASSEMBLY AND ASSEMBLY (Continued)

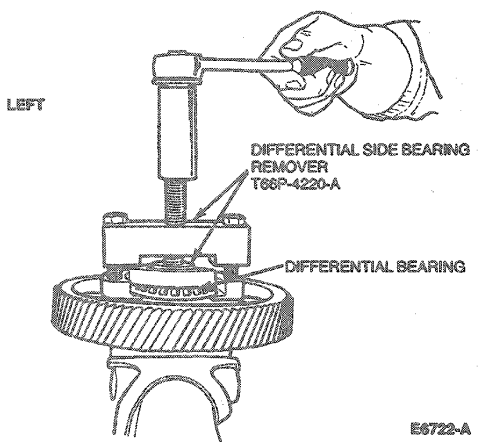
- Differential Side Bearing Remover T66P-4420-A
- Step Plate T81P-4220-A
- Differential Bearing Cone Installer T83P-4220-CH

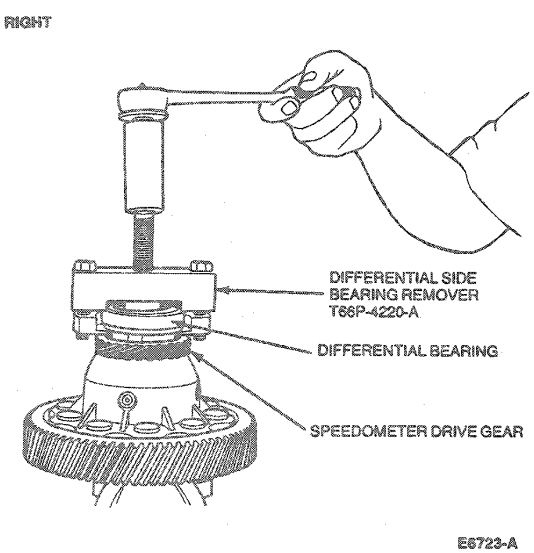
Disassembly

NOTE: Failure to use the bearing cup will result in damage to the bearing.

1. Remove RH differential bearing cup from case and install over RH differential bearing.

   With the bearing cup in position, remove bearing from the speedometer side of differential using Differential Side Bearing Remover and Step Plate T66P-4220-A.





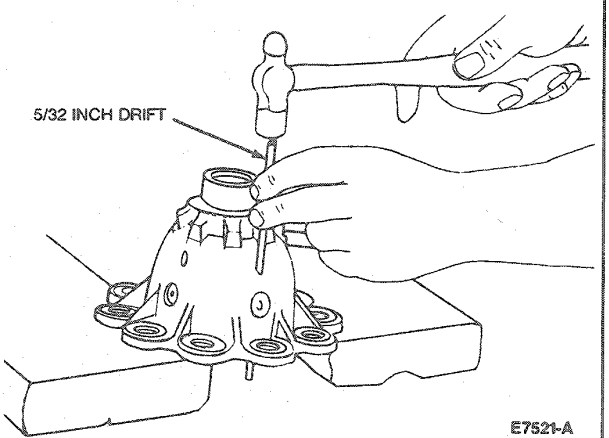
2. Remove speedometer drive gear.

   The speedometer drive gear is plastic and is not pressed onto the differential case.

3. If necessary, remove LH differential roller bearing using Differential Bearing Cone Remover T57L-4220-A and Step Plate T81P-4220-A.

   NOTE: Ensure the speedometer gear has been removed before removing the retaining pins.

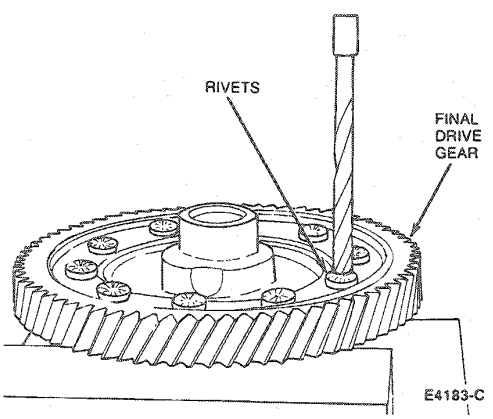
4. Drive out three pinion shaft retaining pins using a 4mm (5/32 inch) drift.



5. Remove final drive gear rivets using a 10mm (3/8 inch) drill.

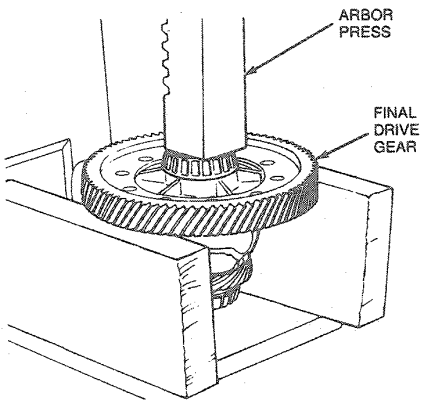
   To prevent distortion of the case, drill the preformed side of the rivet only.

   After drilling, remove head of the rivet using a chisel. Drive remaining rivet shank out using a punch.



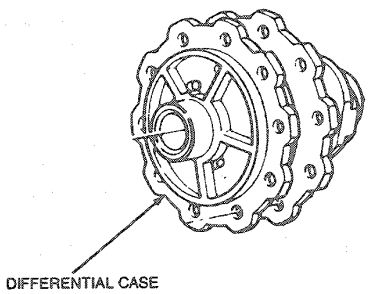
DISASSEMBLY AND ASSEMBLY (Continued)

6. Using an arbor press, remove final drive gear from differential case.



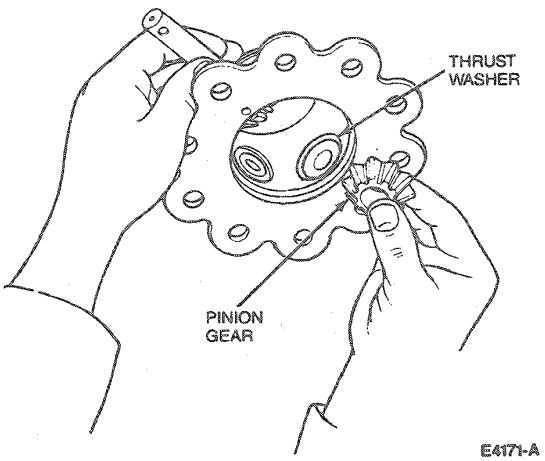
E7522-A

7. Separate differential case halves by lightly tapping the LH side away from RH side using a hammer and drift.



E7523-A

8. Remove LH side gear and thrust washer from case.
9. Using a drift and hammer, gently tap long pinion shaft through pinion shaft seat and pinion gears and remove from case.



E4171-A

10. Remove four pinion gears, pinion thrust washers, pinion gear shaft seat, and RH side gear and side gear thrust washer.

Assembly

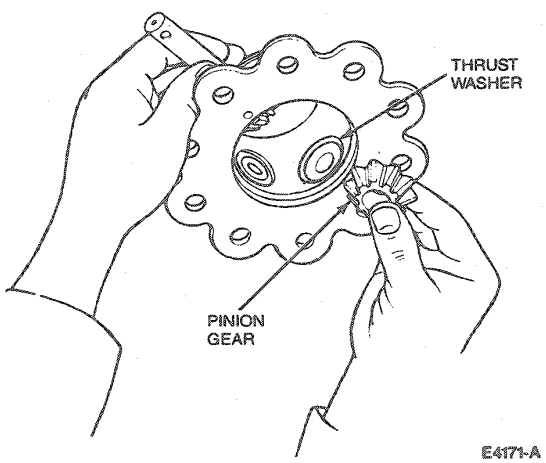
To assemble the differential, reverse the Disassembly procedure except for the following:

1. Lubricate thrust washer and thrust surfaces on the gears and differential case with automatic transmission fluid.
2. If removed, align and press final drive gear onto differential case.

   Install gear retaining bolts and nuts. Tighten bolts to 108-136 N·m (80-100 lb-ft).

   Note direction of bolts.

   Use only nuts and bolts supplied for service.

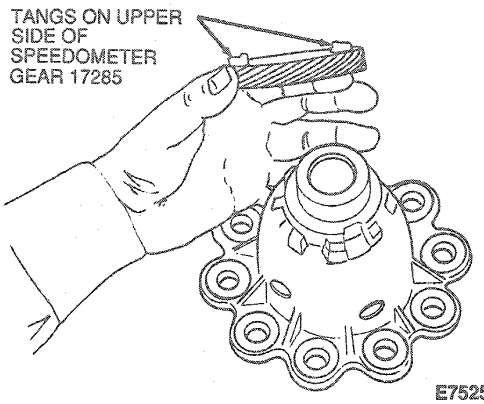


E4171-A

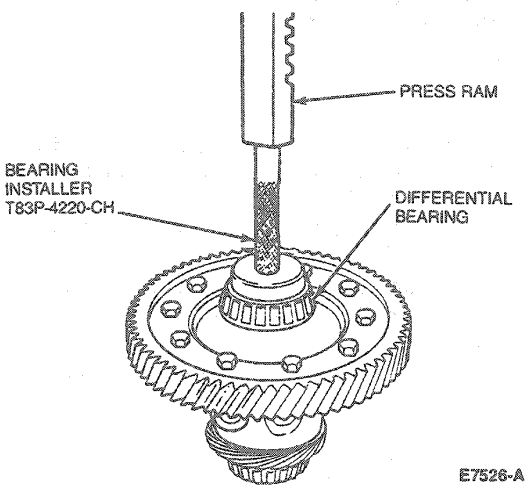
NOTE: Install the speedometer drive gear so that tangs are positioned on upper side of gear.

DISASSEMBLY AND ASSEMBLY (Continued)

3. Install speedometer drive gear.



4. Install differential roller bearings using Differential Bearing Cone Installer T83P-4220-CH.



CLEANING AND INSPECTION

Transaxle Case

Inspection

NOTE: Avoid unnecessary or prolonged exposure of the input and differential seals to any solvents used to clean the transaxle case.

NOTE: Casting imperfections sometimes look like cracks.

1. Inspect the transaxle case and clutch housing case for cracks, worn or damaged bearing bores, damaged threads, or any other damage that could affect the operation of the transaxle.
2. Inspect the transaxle case and clutch housing case mating surfaces for small nicks or burrs that could cause misalignment of the two halves. Remove all small nicks or burrs with a fine stone or file.
3. Inspect the tapered roller bearings. Refer to Bearings Diagnosis.
4. Check the input cluster shaft for chipped teeth, cracks, scores or bent reverse gear teeth.
5. Check the reverse idler gear and reverse sliding gear for chipped, broken or bent teeth. Check the reverse idler gear for bushing damage. Check wear of the reverse idler gear shaft. It is normal for the front of the teeth to show wear; this does not interfere with proper function.
6. Check the teeth, splines and journals of the main shaft for damage.
7. Check all other gears for chipped, broken or worn teeth. Check for eroded clutching teeth and damaged cone surfaces. These clutching teeth will normally show rounding of the points, which does not interfere with normal operation.
8. Check the synchronizer sleeves for free movement on their hubs. Make sure the alignment marks are properly indexed. Check for damaged clutching teeth. (These splines normally show wear at the points, but this does not interfere with synchronizer function). Check for position of insert springs.
9. Inspect the synchronizer blocking rings for wear marks on the teeth and back face, which indicates that the ring was bottoming on the gear face, due to wear of the blocker ring.

Aluminum Transaxle Case Service

If a transaxle case thread is damaged, helicoil service kits may be purchased. To service a damaged thread, the following procedures should be carefully followed:

NOTE: The case threads which retain the following, should not be serviced:

- Fork interlock sleeve retaining pin
- Backup lamp switch
- Detent plunger retainer screw
- Control selector plate

1. Using the same drill size as the thread outside diameter, drill out the damaged threads. For example, use an 8mm drill for an 8mm X 1.5 thread.
2. Select the proper special tap and tap the drilled hole. The tap is marked for the size of the thread being serviced. The special tap marked 8mm X 1.5 will not cut the same thread as a standard 8mm X 1.5 tap. It does cut a thread large enough to accommodate the insert and after the insert is installed, the original thread size (8mm X 1.5) is restored.
3. Select the proper coil inserting tool. These tools are marked with the thread size being serviced. Place the insert on the tool and adjust the sleeve to the length of the insert being used. Press the insert against the face of the tapped hole. Rotate the tool clockwise and wind the insert into the hole until the insert is one-half turn below the face.

CLEANING AND INSPECTION (Continued)

4. Working through the insert, bend the insert tang straight up and down until it breaks off at the notch.
5. Improperly installed inserts can be removed with an extractor tool. Place the extractor tool in the insert so that the blade rests against the top coil, one-quarter to one-half turn away from the end of the coil. Tap the tool sharply with a hammer so that the blade will cut into the insert. Exert downward pressure on the tool and turn it counterclockwise until the insert is removed.

Flywheel

Manual-Shift Transaxle

Tools Required:

- Dial Indicator with Bracketry TOOL-4201-C

Inspection

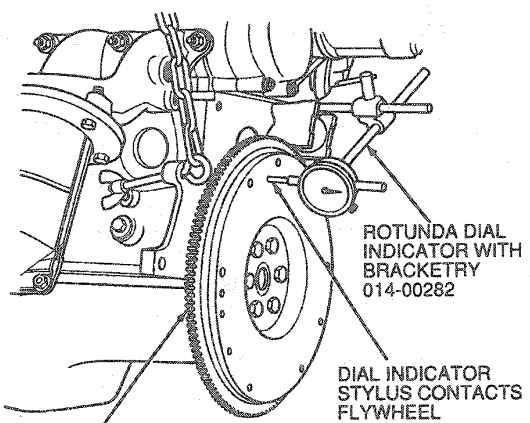
Inspect the flywheel for cracks, heat check, or other damage that would make it unfit for further service. Machine the friction surface of the flywheel if it is scored or worn. If it is necessary to remove more than 1.143mm (0.045 inch) of stock from the original thickness, replace the flywheel.

Inspect the ring gear for worn, chipped or cracked teeth. If the teeth are damaged, replace the ring gear.

With the flywheel installed on the crankshaft, check the flywheel face runout as outlined.

Flywheel Runout

1. Remove spark plugs.
2. Install Dial Indicator with Bracketry TOOL-4201-C or equivalent so indicator points rest on face of ring gear adjacent to gear teeth.



3. Hold flywheel and crankshaft forward or backward as far as possible to prevent crankshaft end play from being indicated as flywheel runout.
4. Set indicator dial on zero mark. Turn flywheel one complete revolution while observing total indicator reading (TIR). If TIR exceeds specification, flywheel and ring gear assembly must be replaced.
5. If clutch face runout exceeds specification, remove flywheel and check for burrs between flywheel and face of crankshaft mounting flange. If no burrs exist, check runout of crankshaft mounting flange. Replace flywheel or machine crankshaft flywheel mounting face sufficiently to true-up the surface. If mounting flange runout exceeds specification, replace it. Refer to Flywheel Ring Gear for replacement procedure.

The differential case assembly should be inspected after it is removed from the transaxle. Thoroughly clean all parts making sure that new solvent is used to clean bearings. Do not spin dry bearings with compressed air. Oil the bearings immediately to prevent corrosion. Avoid directly spraying the differential oil seals with solvent. Carefully wipe the seals clean.

Gears

Examine the pinion and side gears for scoring, excessive wear, nicks and chips. Worn, scored and damaged gears cannot be serviced and must be replaced.

Differential Case

The mating surfaces of the differential case halves should be inspected for any nicks and/or burrs that may prohibit proper assembly. Remove nicks or small burrs.

Ensure the differential bearing journals are smooth. Carefully examine the differential case bearing shoulders, which may have been damaged when the bearings were removed. The bearings will fail if they do not seat firmly against the shoulders. Check the fit (free rotation) of the side gears in their cavities.

Bearing Cups

Check bearing cups for scores, galling or spalling. If the bearing cups are not damaged, do not remove them from the transaxle case or the clutch housing. If the bearing cups must be replaced, remove and install them with the appropriate tools.

CLEANING AND INSPECTION (Continued)

Cone and Roller Assemblies

Bearing rollers must turn without roughness in their cups. Examine the roller ends for step wear. If inspection reveals either a damaged cup or a damaged cone and roller assembly, both parts must be replaced.

MAJOR SERVICE OPERATIONS

Input Cluster Shaft Seal Assembly

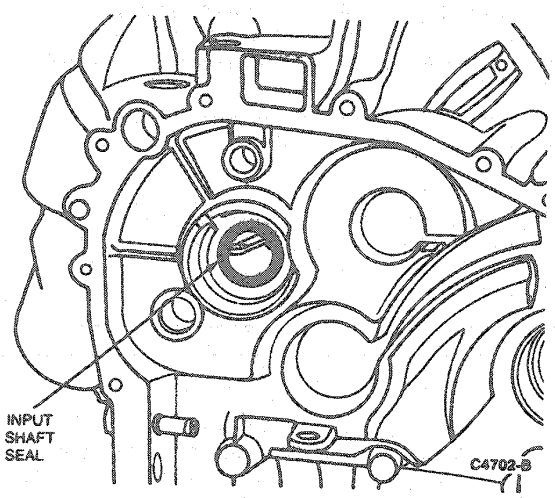
Tools Required:

- Input Shaft Seal Remover T77F-7050-B

Removal

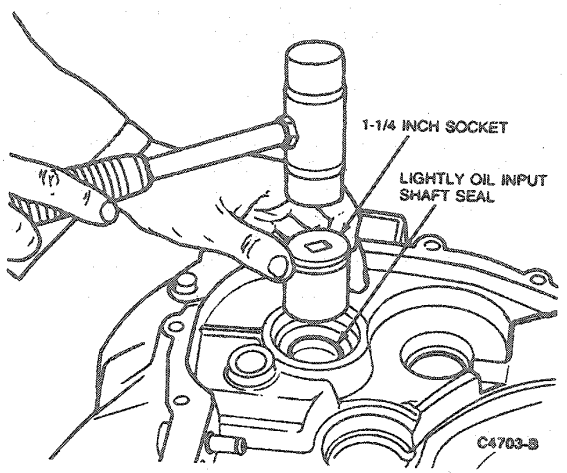
Using Input Shaft Seal Remover T77F-7050-B and a hammer, remove the input shaft seal, working from outside the case.

Position the remover against the seal by placing it in the slot cut in the case.



Installation

To install, lightly oil the input shaft seal and using a 1-1/4 inch socket and hammer, tap into place.



Input Cluster Shaft Bearings

Tools Required:

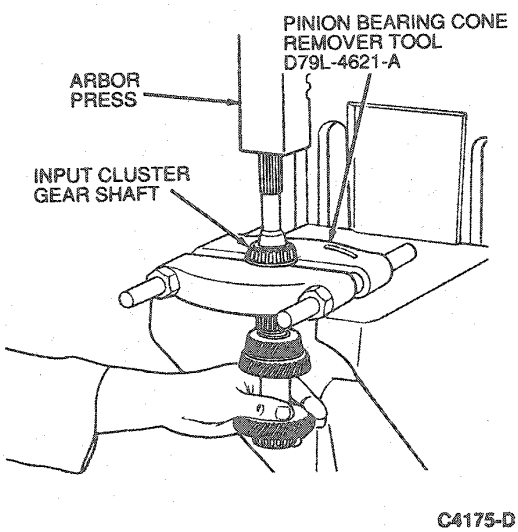
- Pinion Bearing Cone Remover D79L-4621-A

Removal

NOTE: Inspect the bearings and replace them only if worn or damaged.

Remove the bearing cone and roller assemblies using Pinion Bearing Cone Remover D79L-4621-A or equivalent and an arbor press.

NOTE: Label bearings for proper installation.

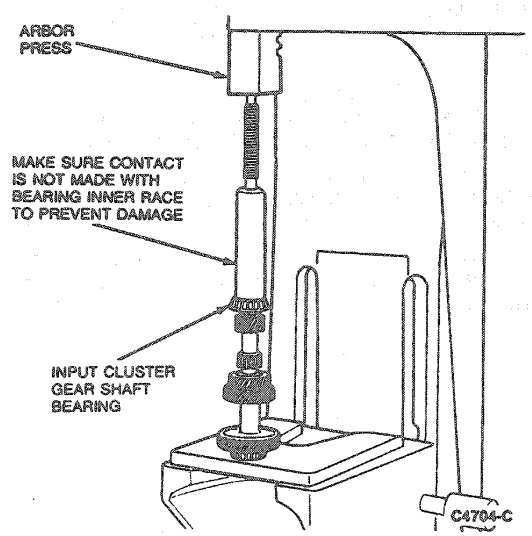


MAJOR SERVICE OPERATIONS (Continued)

Installation

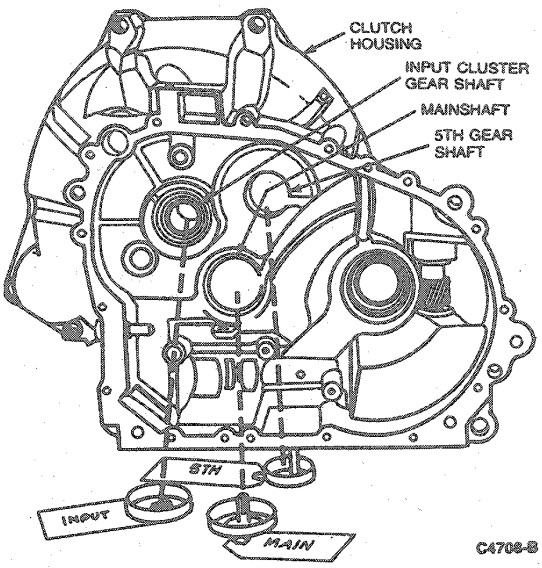
NOTE: Prior to installation of the bearings, thoroughly clean the bearings and inspect their condition. Lightly oil the bearings with Synthetic MERCON ® Multi-Purpose Automatic Transmission Fluid E6AZ-19582-B (ESR-2C163-A2) or equivalent.

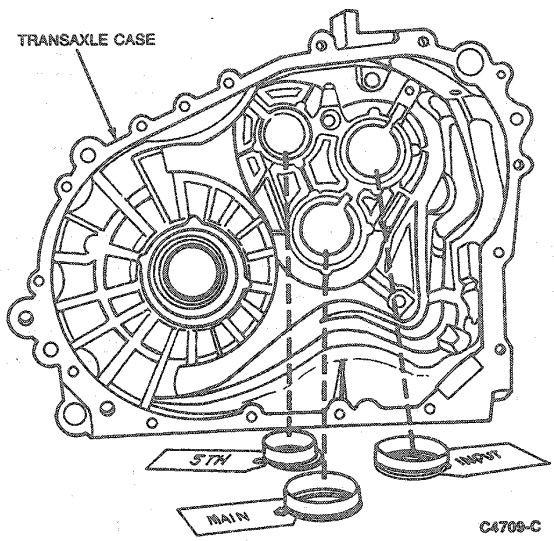
Using Pinion Bearing Cone Remover D79L-4621-A or equivalent and an arbor press, install the bearing on the shaft. Make sure the bearings are pressed on the proper end as labeled during disassembly.



Bearing Cups

The input cluster shaft, the main shaft and the fifth gear driveshaft are supported at each end by tapered roller bearings. The cups supporting the bearings in the case are located as follows: three in the transaxle case and three in the clutch housing.





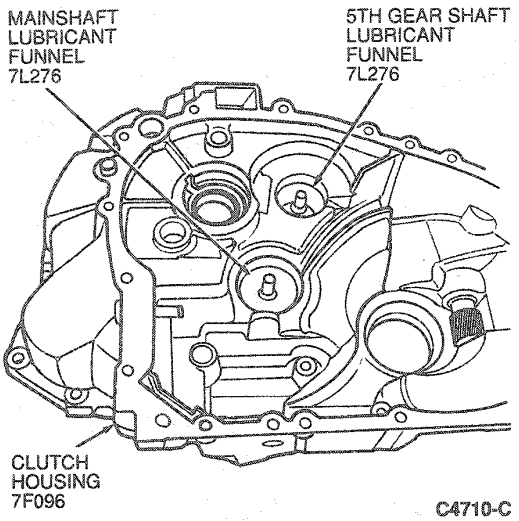
Shims, to preload the tapered roller bearings, are located behind the bearing cups in the transaxle case only. It is important to keep the shim with its matching cup during disassembly. It is equally important to label the bearing cups if they are removed from the case.

After removal of the main shaft bearing and the fifth gear shaft bearing cups from the clutch housing, the funnels can be removed from the bearing cup bores.

MAJOR SERVICE OPERATIONS (Continued)

The funnels direct lubricant to a drilled hole in the center of the main shaft and the fifth gear driveshaft. The lubricant flows through these shafts, where it lubricates the rotating gears.

NOTE: Prior to installation, thoroughly clean the bearing cups, their bores, and the shims and funnels. Inspect the condition of all parts. Lightly grease the bearing cups.



C4710-C

Preload Shims

NOTE: If the bearing cups are removed from the case for any reason, it is very important to keep the bearing cup and its matching shim together. It is also very important to label the bearing cups as they are removed from the transaxle case or clutch housing.

Preload on the input cluster shaft, main shaft and fifth gear driveshaft bearings is maintained by shims. These preload shims are located behind the bearing cups in the transaxle case.

Maintaining the proper bearing cup-to-shim relationship and proper bearing cup labeling will ensure the correct bearing preload when the transaxle is assembled.

A replacement bearing preload shim will be provided for service and should be installed in place of the original shim as outlined in the Service Shim chart.

When servicing requires the use of the service shim (refer to Service Shim chart), discard the original shim. Do not use more than one shim per shaft.

If parts are replaced other than the parts listed in the Service Shim Chart, then the original shims should be reused.

SERVICE SHIM CHART

Parts Replaced	Shims Replaced With Service Shim		
	Input Cluster Shaft	Main Shaft	5th Gear Shaft
1 Input Cluster Bearing	Yes	No	No
2 Input Cluster Bearings	Yes	No	No
1 Input Cluster Bearing 1 Mainshaft Bearing 1 5th Gear Shaft Bearing	Yes	Yes	Yes
2 Input Cluster Bearings 2 Mainshaft Bearings 2 5th Gear Shaft Bearings	Yes	Yes	Yes
1 Mainshaft Bearing	No	Yes	No
2 Mainshaft Bearings	No	Yes	No
1 5th Gear Shaft Bearing	No	No	Yes
2 5th Gear Shaft Bearings	No	No	Yes
Clutch Housing Assembly	Yes	Yes	Yes
Transaxle Case Assembly	Yes	Yes	Yes

NOTE: The shims must be installed only under the bearing cups at the transaxle case end of the three shafts.

NOTE: The use of a nominal thickness service shim eliminates the need for gauging bearing clearances prior to reassembly. While this method produces wider variations of bearing settings than are present in factory assembled units, the extreme possible settings have been tested and found to be acceptable.

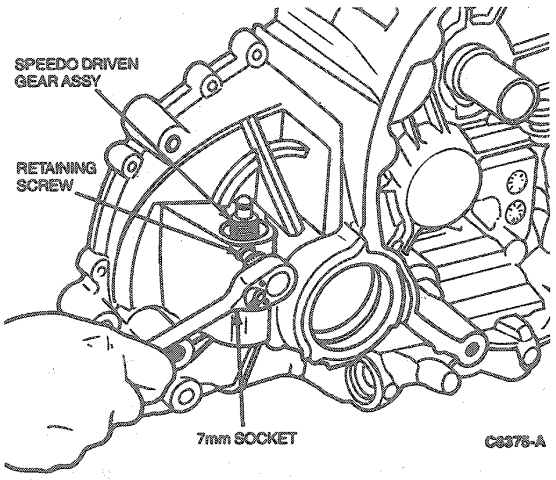
CC4264-A

MAJOR SERVICE OPERATIONS (Continued)

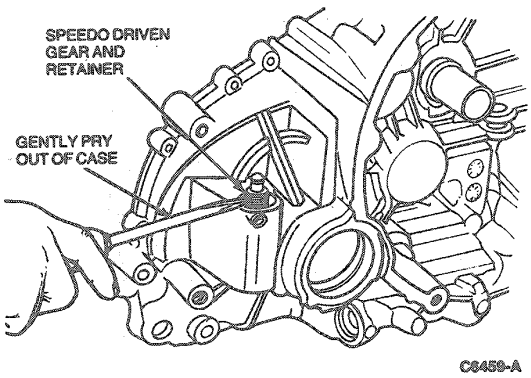
Speedometer Driven Gear

Removal

1. Using a 7mm socket, remove the retaining screw from the speedometer driven gear retainer assembly.



2. Using a screwdriver, pry on the speedometer retainer to remove both the speedometer gear and retainer assembly from the clutch housing case bore.



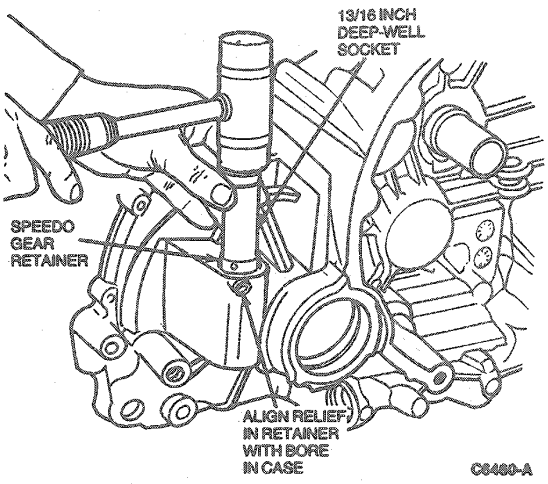
If necessary, carefully pry from the inside of the case on the bottom of the speedometer gear, pushing the speedometer gear and retainer from their bore. Be careful not to make contact with teeth on the speedometer gear.

Installation

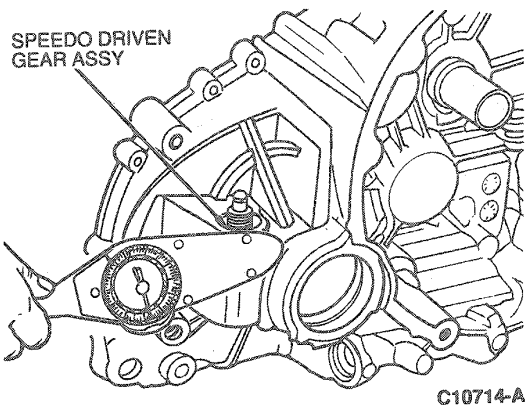
NOTE: Prior to installation, clean all speedometer gear parts and the retainer's bore in the case. Inspect all parts.

1. Lightly grease the (25mm X 2.6mm) O-ring seal on the speedometer driven gear retainer.

   Align the relief in the retainer with the retaining screw bore and using a 13/16-inch deep-well socket, tap the assembly into its bore.



2. Using a 7mm socket and torque wrench, tighten the retaining screw to 2-3 N·m (18-26 lb-in).



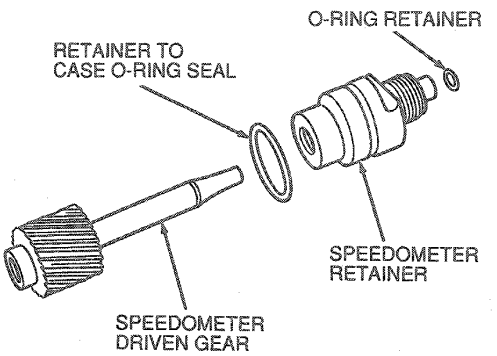
Speedometer Driven Gear

Disassembly and Assembly

1. Carefully remove the O-ring seal from the stem end of the speedometer driven gear.

MAJOR SERVICE OPERATIONS (Continued)

2. Slide the speedometer driven gear from the retainer.

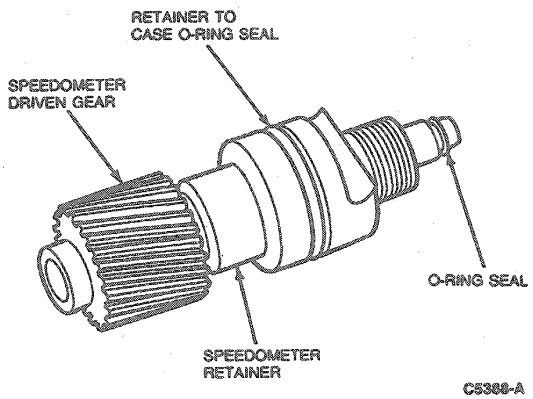


C5390-C

NOTE: Prior to assembly of the speedometer driven gear, clean all parts thoroughly. Inspect all parts and replace if damaged. Lightly grease the O-ring on the retainer.

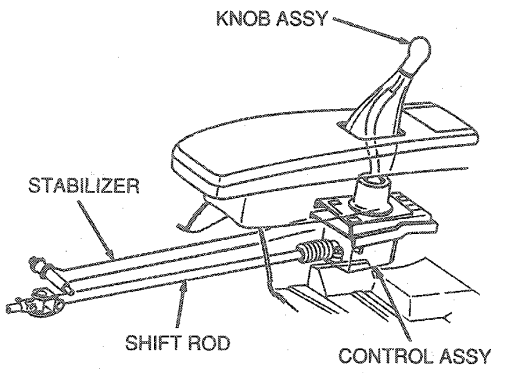
3. Carefully remove the O-ring seal from its groove in the retainer.

To assemble the speedometer driven gear, reverse Removal procedure.



C5389-A

External Gear Shift Linkage

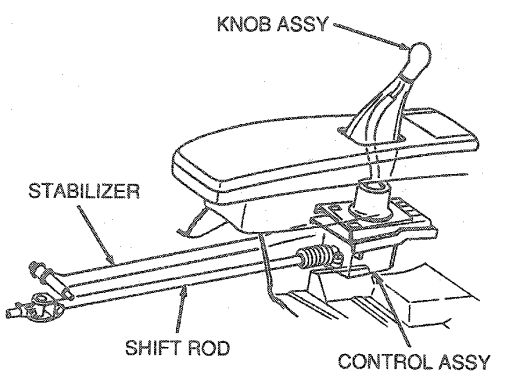


C9696-A

Shift Knob, Boot and Control Assembly

Removal

1. Remove leather wrapped knob by rotating knob counterclockwise.
2. Remove console applique and boot assembly. Slide assembly off shift lever.



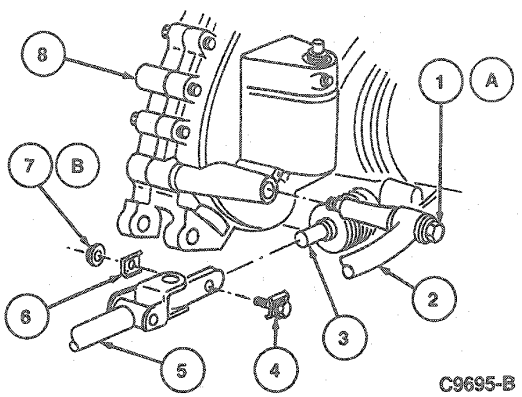
C9696-A

3. Raise vehicle on hoist. Refer to Section 00-02.
4. Remove exhaust resonator pipe to clear control assembly heat shield.
5. Remove shift mechanism stabilizer bar-to-transaxle retaining bolt. Remove shift rod-to-shift shaft retaining nut and bolt. Remove rods from transaxle.
6. Remove two nuts retaining rear mount-to-lower mounting bracket.
7. Pull control assembly down to remove it from vehicle.

MAJOR SERVICE OPERATIONS (Continued)

Installation

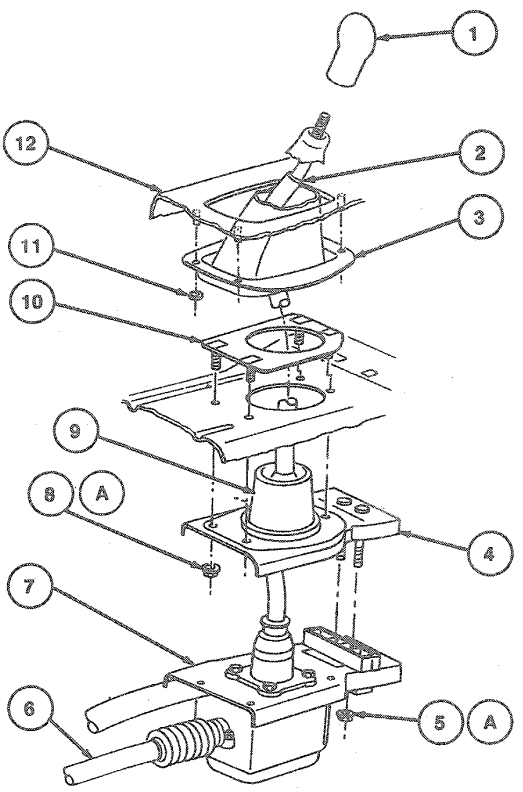
1. Connect stabilizer and shift rod to transaxle. Tighten stabilizer bolt to 47-63 N·m (35-46 lb-ft). Tighten shift rod clamp bolt and nut to 9-12 N·m (80-106 lb-in).



C9695-B

Item	Part Number	Description
1A	N601426	MH M12 X 1.75
2	7400	Stabilizer Shaft
3	7L267	Shift Shaft
4	7K104	Clamp
5	7202	Shift Rod
6	7K105	Clamp
7B	N620480-S2	Nut M6 X 1.00
8	—	Transaxle Assy.
A		Tighten to 47-63 N·m (35-46 Lb-Ft)
B		Tighten to 9-12 N·m (80-106 Lb-In)

2. Lift control assembly into position, insert shift lever through inner boot. Insert lower mounting bracket studs through rear mount. Tighten nuts to 13-17 N·m (115-150 lb-in).



C9694-B

Item	Part Number	Description
1	7K327	Knob Assy
2	7210	Shift Lever
3	7B118	Boot
4	7L238	Lower Mounting Bracket
5A	N801555-S56	Nut (2 Req'd)
6	7202	Shift Rod
7	7400	Control Assy
8A	N801555-S56	Nut (4 Req'd)
9	—	Part of Lower Mounting Bracket
10	7L239	Inner Mounting Bracket
11	45043-S2	Spring Nut (4 Req'd)
12	—	Console Body
A		Tighten to 13-17 N·m (115-150 Lb-In)

3. Lower vehicle. Refer to Section 00-02.
4. Slide console applique and boot assembly over shift lever. Press console applique into place.
5. Install shift knob assembly by turning clockwise until snug, continue turning (minimum of 150 degrees) until shift graphics are aligned forward in vehicle.

MAJOR SERVICE OPERATIONS (Continued)

Mounting Brackets And Inner Boot

Removal

1. Remove shift knob, boot and control assembly as outlined.
2. Remove four nuts retaining lower mounting bracket. Remove bracket and inner boot.
3. Remove console to expose inner mounting bracket. Refer to Section 01-12.
4. Remove inner mounting bracket.

Installation

1. Install inner mounting bracket under carpet. The studs on bracket must be inserted through the holes in the floor pan.
2. Install console. Refer to Section 01-12.
3. Install inner boot and lower mounting bracket as outlined.
4. Install control assembly, boot and knob as outlined.

In-Vehicle Service

Backup Lamp Switch

Removal

1. Disconnect the electrical lead.
2. Using a 22mm wrench, remove the switch.

Installation

1. Apply Pipe Sealant with TEFLON® D8AZ-19554-A (ESG-M4G194-A and ESR-M18P7-A) or equivalent to the threads of the backup lamp switch in a clockwise direction and install.
2. Tighten to 16-20 N·m (12-15 lb-ft).
3. Connect the electrical lead.

Speedometer Cable Retainer and Driven Gear

Removal

1. Clean off top of speedometer cable retainer.
2. With a 7mm wrench, remove the retaining screw.
3. Carefully pull up on the speedometer cable, pulling the cable retainer and the speedometer driven gear assembly from its bore.
4. Unscrew the speedometer cable from the retainer.

Installation

1. Lightly grease the O-ring on the cable retainer.
2. With a 13/16-inch deep-well socket, gently tap the cable retainer and driven gear assembly into its bore while lining the groove in the retainer with the screw hole in the side of the clutch housing case.
3. With a 7mm socket and torque wrench, install the screw. Tighten to 2-3 N·m (18-26 lb-in).

Transaxle Fluid Level Check

Transaxle fluid level checks must be made with the vehicle level and the engine turned off. The fluid level can be checked by removing the fill plug with a 3/8-inch extension and ratchet. The correct fluid will be even with the bottom edge of the filler plug opening. If the fluid is low, add Synthetic MERCON® Multi-Purpose Automatic Transmission Fluid E6AZ-19582-B (ESR-M2C163-A2) or equivalent.

Differential Bearing Preload

Tools Required:

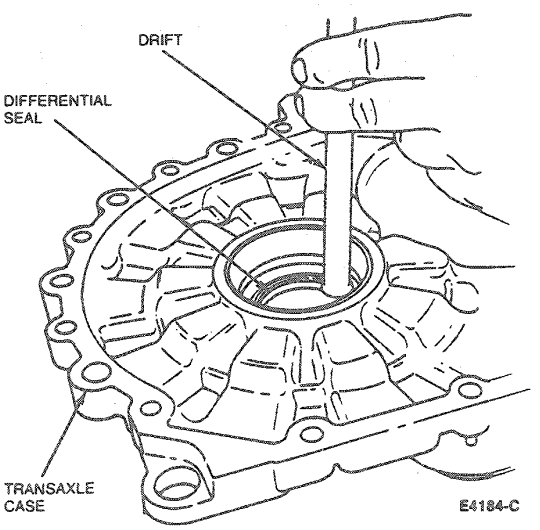
- Differential Bearing Cup Replacer T75T-1225-A
- Draw Bolt T77F-1176-A
- Differential Bearing Cup Replacer T77F-4222-A
- Position Gauge Bar T80L-77003-A
- Differential Seal Replacer T81P-1177-A
- Height Gauge Spacer T81P-4451-B2
- Differential Shim Selection Tool T83P-4451-AH1
- Height Gauge Spacer T83P-4451-AH2

Removal and Installation

NOTE: The differential preload is set during manufacture and need not be checked or adjusted unless one of the following components is replaced:

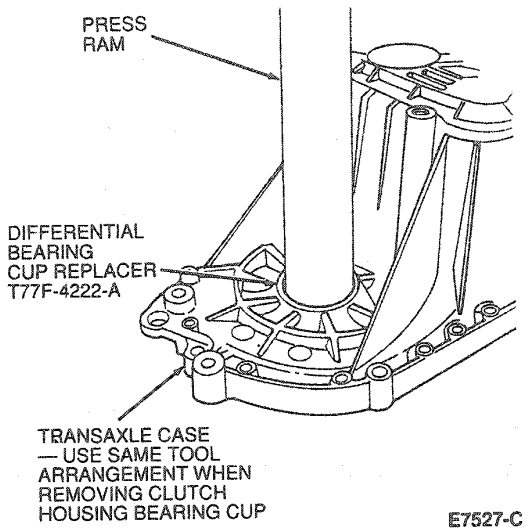
- Transaxle Case
- Differential Case
- Differential Bearings
- Clutch Housing

1. Remove the differential seal from the transaxle case using a drift.

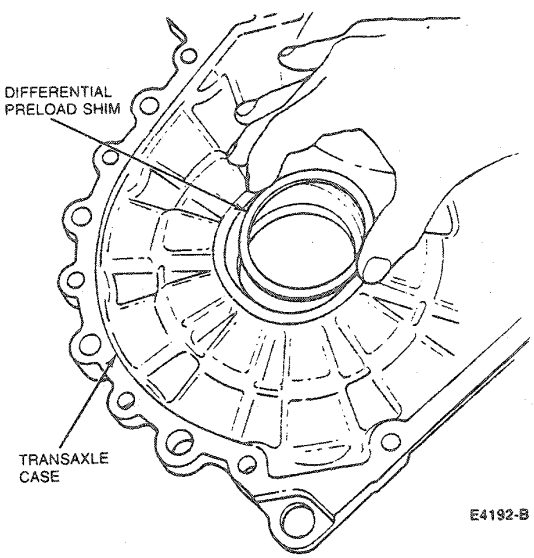


MAJOR SERVICE OPERATIONS (Continued)

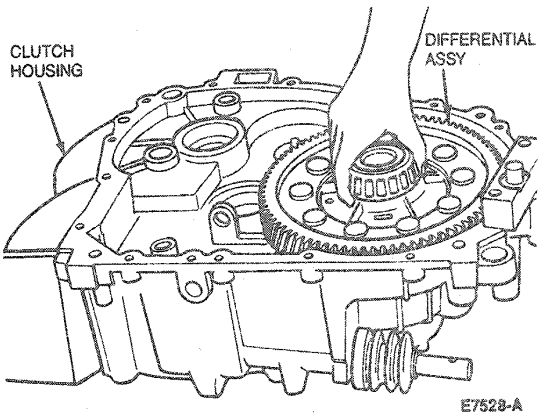
2. Remove the differential bearing cup from the transaxle case using Differential Bearing Cup Replacer T77F-4222-A.



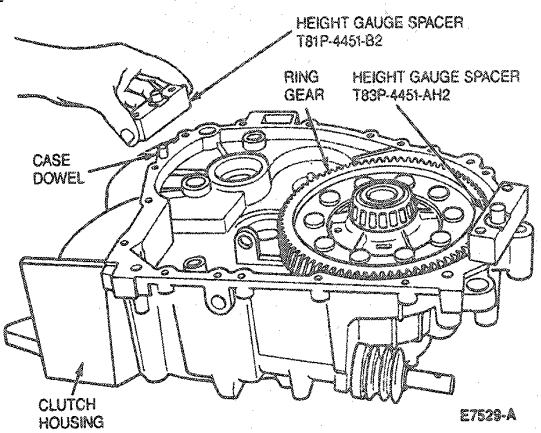
3. Remove the preload shim located under the bearing cup.



4. If removed, install the differential in the clutch housing.

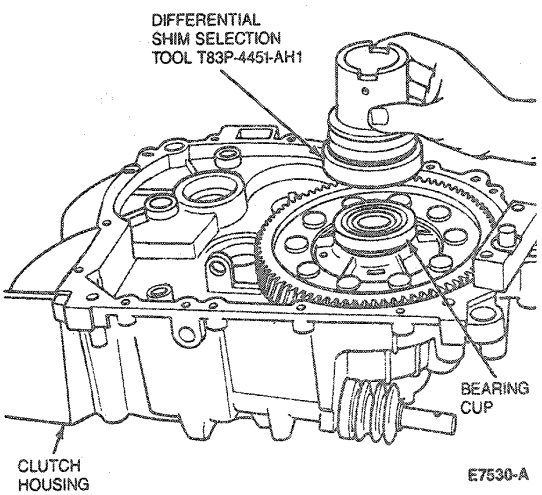


5. Install Height Gauge Spacers T81P-4451-B2 and T83P-4451-AH2 on the clutch housing dowels.



6. Position the bearing cup removed from the transaxle case on the differential bearing.

Install Differential Shim Selection Tool T83P-4451-AH1 over the differential bearing cup.

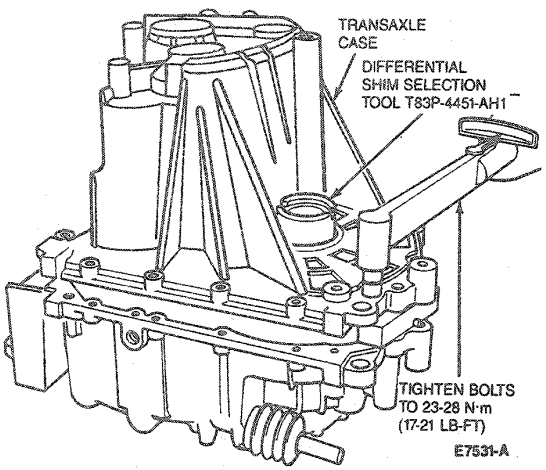


MAJOR SERVICE OPERATIONS (Continued)

7. Position the transaxle case on the height gauge spacer and install the four bolts supplied with the tool.

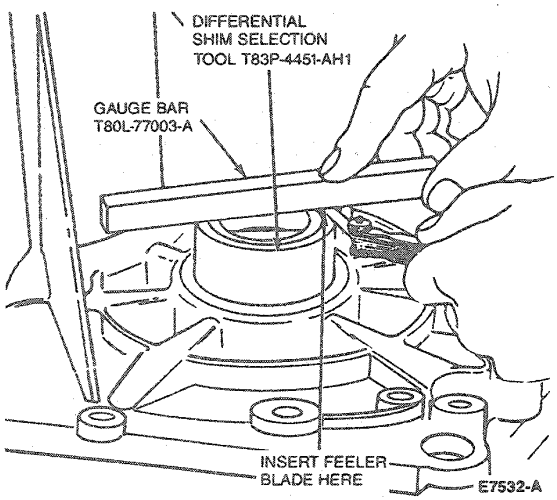
   Tighten the bolts to 23-28 N·m (17-21 lb-ft).

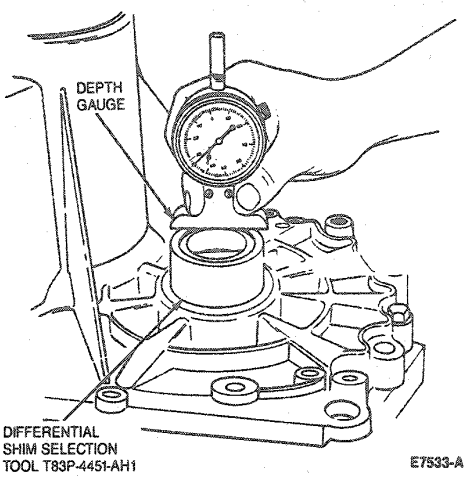
   Rotate the differential several times to ensure seating of the differential bearing.



8. Position Gauge Bar T80L-77003-A across the shim selection tool.

   Using a feeler gauge, measure the gap between the gauge bar and the selector tool gauge surface. This measurement can also be made using a depth micrometer.





EXAMPLE

Obtain measurements from three positions around the tool, and take the average of the readings.

Readings:

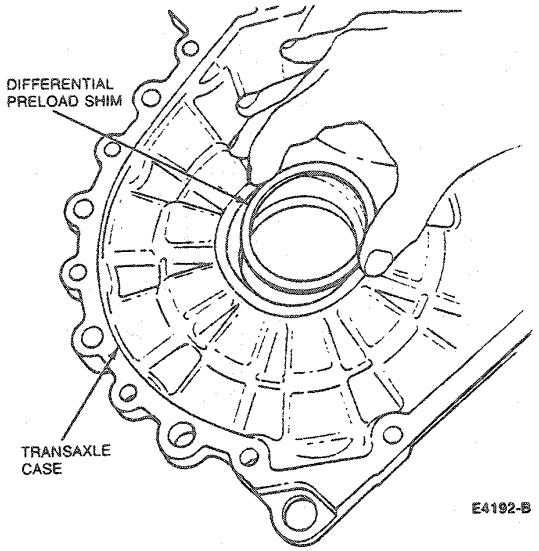
Inches	mm
0.014 inch	0.36mm
0.013 inch	0.33mm
0.015 inch	0.38mm
0.042 inch	1.07mm
Average (shim required)	
Inches	mm
0.042/3mm = 0.014 inch	1.07/3 mm = 0.35mm
Shim Required	
Inches	mm
0.014 inch	0.35mm

NOTE: Shims are available in thicknesses of 0.30mm -1.25mm (0.012-0.049 inch). Refer to Specifications. If the shim required is not on the chart, select the next thinner shim.

Before installing the shim, it should be measured with a micrometer to ensure it is the correct thickness.

MAJOR SERVICE OPERATIONS (Continued)

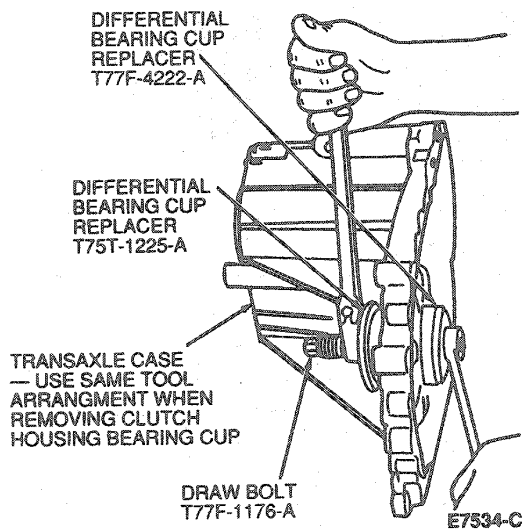
9. Install the shim in the transaxle case.



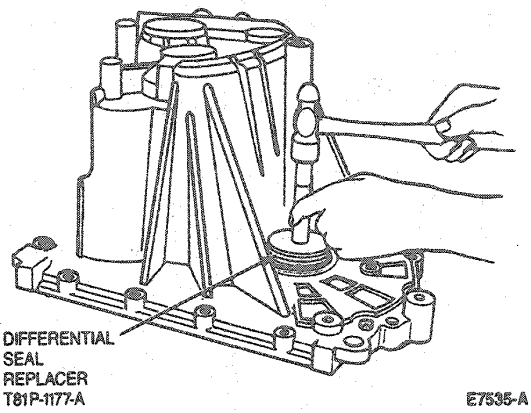
10. Apply a light film of transmission fluid to the bearing bores in the transaxle case and clutch housing.

    Install the bearing cup in the transaxle case, using Draw Bolt T77F-1176-A, Stop Differential Bearing Cup Replacer T75T-1225-A and Bearing Cup Replacer T77F-4222-A.

    Ensure the cup is fully seated against the shim in the transaxle case and against the shoulder in the clutch housing.



11. Install the differential seal using Differential Seal Replacer T81P-1177-A.

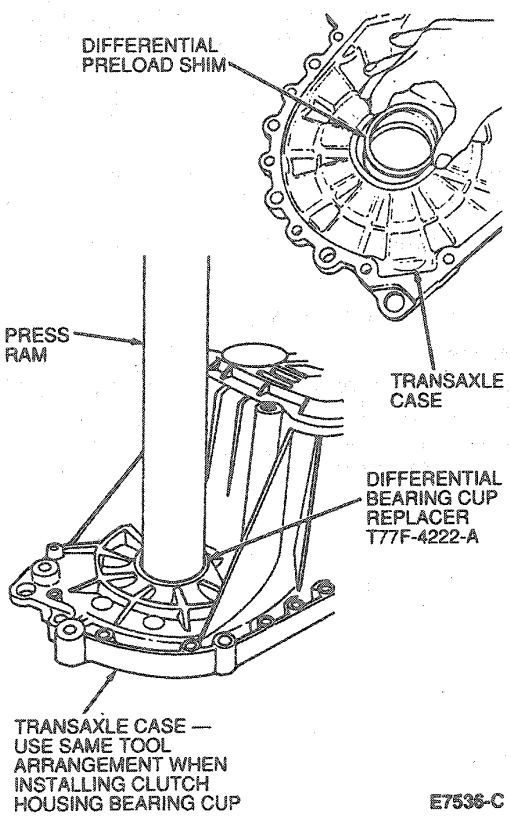


Differential Bearing Cups

NOTE: If the differential bearings and cups are being replaced, the bearing preload must be checked and if necessary, adjusted. After installing the bearings, adjust bearing preload as outlined.

Removal

1. Remove the differential oil seals as outlined.



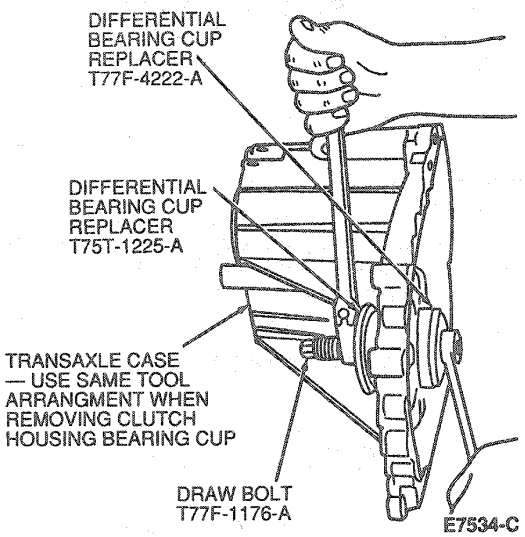
MAJOR SERVICE OPERATIONS (Continued)

2. Remove the bearing cups using Differential Bearing Cup Replacer T77F-4222-A and an arbor press.

   The differential bearing preload shim is located under the transaxle case bearing cup.

Installation

1. Apply a light film of transmission fluid to the bearing bores in the transaxle case.
2. Install the bearing cup using Draw Bolt T77F-1176-A, Differential Bearing T75T-1225-A and Bearing Cup Replacer T77F-4222-A.



Differential Seals

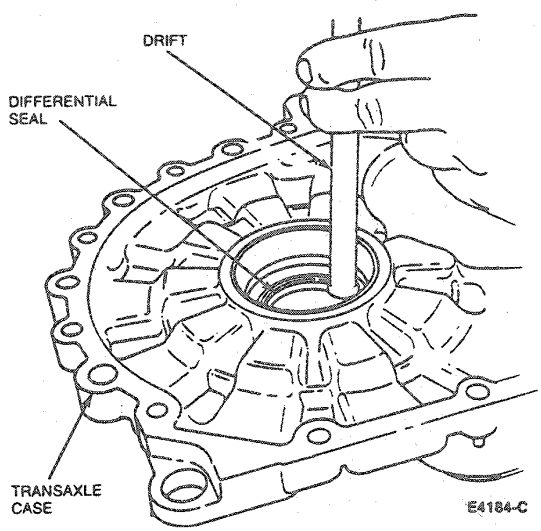
Tools Required:

- Differential Seal Replacer T81P-1177-A

Removal

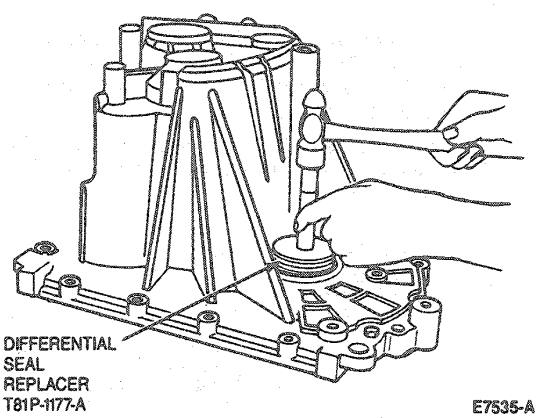
From the inside, remove the seal from the transaxle case using a drift.

NOTE: Repeat the same procedure for differential seal removal from the clutch housing.



Installation

Install the seal using Differential Seal Replacer T81P-1177-A.



SPECIFICATIONS

mm	Inches	mm	Inches
0.30	0.012	0.80	0.032
0.35	0.014	0.85	0.033
0.40	0.016	0.90	0.035
0.45	0.018	0.95	0.037
0.50	0.020	1.00	0.039
0.55	0.022	1.05	0.041
0.60	0.024	1.10	0.043
0.65	0.026	1.15	0.045
0.70	0.028	1.20	0.047
0.75	0.030	1.25	0.049

SPECIFICATIONS (Continued)

The shim is located behind the differential bearing cup in the transmission case.

LUBRICANT CAPACITIES

Type	Level	Capacity	
		Liters	Pints
Synthetic MERCON® Multi-Purpose Automatic Transmission Fluid E6AZ-19582-B (ESR-M2C163-A2)	To Bottom of Filler Hole	2.9	6.1

INSTALLATION OF TRANSAXLE

Description	N·m	Lb-Ft
Transaxle to Engine Bolts	46-63	34-46
Exhaust Catalyst Retaining Bolts	34-47	25-34
Air Manage Valve Bracket Bolt to Transaxle	38-42	28-31
Switch Actuator Bracket Bolt	9-13	7-10
Control Arm to Steering Knuckle	50-60	37-44
Rear Mounting Bolts	47-68	35-50
Transaxle Mounting Stud	52-56	38-41
Front Mount Bracket Bolts	34-47	25-34
Stiffener Brace Bolts	38-51	28-38
Starter Stud Bolts	41-54	30-40
Roll Restrictor Nuts	34-40	25-30
Shift Stabilizer Bar-to-Transaxle Case	47-63	35-46
Engine Mount Bolts	54-75	40-55
Center Support Bearing Bolts	115-135	85-100
Tie Rod Nut	47-64	35-47
Ball Joint Nut	50-60	37-44
Subframe Bolts	90-115	65-85
Steering Gear Nuts	115-135	85-100
Shift Rod to Shaft Clamp Bolt and Nut	9-12	80-106 (Lb-In)

ASSEMBLY OF TRANSAXLE

Description	N·m	Lb-Ft
Transaxle Case-to-Clutch Housing	18-24	13-17
Reverse Idler Shaft-to-Case	21-27	16-20
Fork Interlock Sleeve Pin	16-20	12-15
Detent Plunger Retainer Screw	7.5-11	6-8
Backup Lamp Switch	16-20	12-15
Control Selector Plate	8-11	6-8
Speedo Retaining	2-3	18-26 (Lb-In)
Reverse Shift Relay Lever Bracket	8-11	6-8
Filler Plug	12-20	9-15
Clutch Release Fork to Shaft	40-55	30-41

GEAR RATIOS

Transmission Model	1st	2nd	3rd	4th	5th	Rev.	Final Drive
RBE-AP	3.21	2.09	1.37	1.02	0.75	3.14	3.74

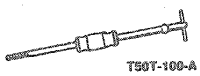
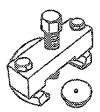
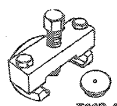
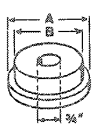
INSTALLATION OF SHIFT CONTROLS

Description	N·m	Lb-In
Shift Rod-to-Shift Shaft Clamp Bolt and Nut	9-12	80-106
Stabilizer-to-Transaxle Assembly Bolt	47-63	35-46 (Lb-Ft)
Lower Mounting Bracket-to-Inner Mounting Bracket Nuts	13-17	115-150
Rear Mount-to-Lower Mounting Bracket Nuts	13-17	115-150

TORQUE SPECIFICATIONS

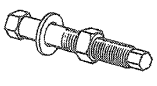
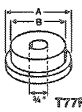
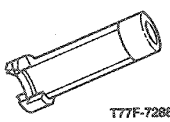
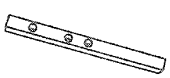
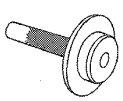
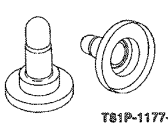
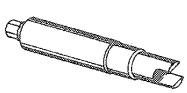
Description	N·m	Lb-Ft
Final Drive Gear to Differential Case Retaining Bolts and Nuts (Service Only)	108-136	80-100
Speedo Cable to Driven Gear	5-8	44-71 (Lb-In)

SPECIAL SERVICE TOOLS

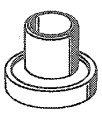
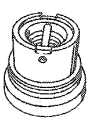
Tool Number / Description	Illustration
T50T-100-A Impact Slide Hammer	 T50T-100-A
T57L-4220-A Differential Bearing Cone Remover	 T57L-4220-A
T66P-4220-A Differential Side Bearing Remover	 T66P-4220-A
T75T-1225-A Differential Bearing Cup Replacer	 T75T-1225-A

(Continued)

SPECIAL SERVICE TOOLS (Continued)

Tool Number/ Description	Illustration
T77F-1176-A Draw Bolt	 T77F-1176-A
T77F-4222-A Differential Bearing Cup Replacer	 T77F-4222-A
T77F-7050-B Input Shall Seal Remover	 T77F-7050-B
T77F-7288-A Sector Shaft Seal Tool	 T77F-7288-A
T80L-77003-A Gauge Bar	 T80L-77003-A
T81P-1177-A Differential Seal Replacer	 T81P-1177-A
T81P-1177-B Transaxle Plugs	 T81P-1177-B
T81P-4026-A Differential Rotator	 T81P-4026-A

(Continued)

Tool Number/ Description	Illustration
T81P-4220-A Stop Plate Differential Bearing Remover	 T81P-4220-A
T81P-4451-B2 Height Gauge Spacer	 T81P-4451-B2
T83P-4220-CH Bearing Installer	 T83P-4220-CH
T83P-4451-AH1 Shim Selector Tool	 T83P-4451-AH1
T83P-4451-AH2 Height Gauge Spacer	 T83P-4451-AH2

Tool Number	Description
D79L-4621-A	Pinion Bearing Cone Remover
D83P-4026-A	Halfshaft Remover
TOOL-4201-C	Dial Indicator with Bracketry

ROTUNDA EQUIPMENT

Model	Description
014-00210	Hi-Lift Jack
014-00225	Manual Transaxle Adapter
014-00750	Engine Support Bar

SECTION 07-05 Transaxle, Automatic—External Controls

SUBJECT	PAGE
ADJUSTMENTS	
Manual Linkage	07-05-8
PRNDL Cable Adjustment	07-05-8
DESCRIPTION AND OPERATION	
Brake-Shift Interlock	07-05-1
Overdrive Lockout	07-05-2
DIAGNOSIS	07-05-2
REMOVAL AND INSTALLATION	
Bezel Assembly	07-05-4
REMOVAL AND INSTALLATION (Cont'd.)	
Floor Shift	07-05-3
Indicator Bulb	07-05-5
Interlock Cable Assembly	07-05-6
Shift Control Cable Assembly	07-05-5
Shift Knob	07-05-3
Shift Lever and Housing Assembly	07-05-5
SPECIFICATIONS	07-05-9
VEHICLE APPLICATION	07-05-1

VEHICLE APPLICATION

Taurus, Taurus SHO / Sable.

DESCRIPTION AND OPERATION

The transaxle shift control linkage consists of a column or floor mounted shifter assembly, a cable connecting the column or shifter to the transaxle shift lever, and on floor shift vehicles an interlock cable connecting the shifter to the steering column lock assembly. The interlock cable locks the floor shift lever in the PARK position when the ignition switch is in the LOCK position. It also requires the floor shift lever to be in the PARK position to turn the ignition switch to the LOCK position.

Brake-Shift Interlock

A shift interlock mechanism is installed on vehicles with an automatic transaxle. This is to prevent shifting the transaxle out of the PARK position unless the brake pedal is depressed. The column shift interlock system is covered in Section 11-04. The floor shift interlock system consists of a solenoid assembly attached to the key interlock assembly, a bracket retaining the solenoid, and the necessary wiring. The solenoid is energized when the ignition switch is turned to the ON position, locking the floor shifter in the PARK position. When the brake pedal is depressed and the stoplamp switch is activated, the shift lock solenoid is deactivated and the floor shifter can be moved out of the PARK position.

DESCRIPTION AND OPERATION (Continued)

Overdrive Lockout

The Taurus SHO floor shifter includes an overdrive lockout switch in the shift knob. The system automatically engages the overdrive mode each time the ignition is turned to RUN. Depressing the overdrive button with the ignition in RUN locks out the overdrive mode. Depressing the button again reverts to the overdrive mode.

DIAGNOSIS

Use the diagnosis chart as an aid in determining possible problem sources and necessary service actions for shift control linkage.

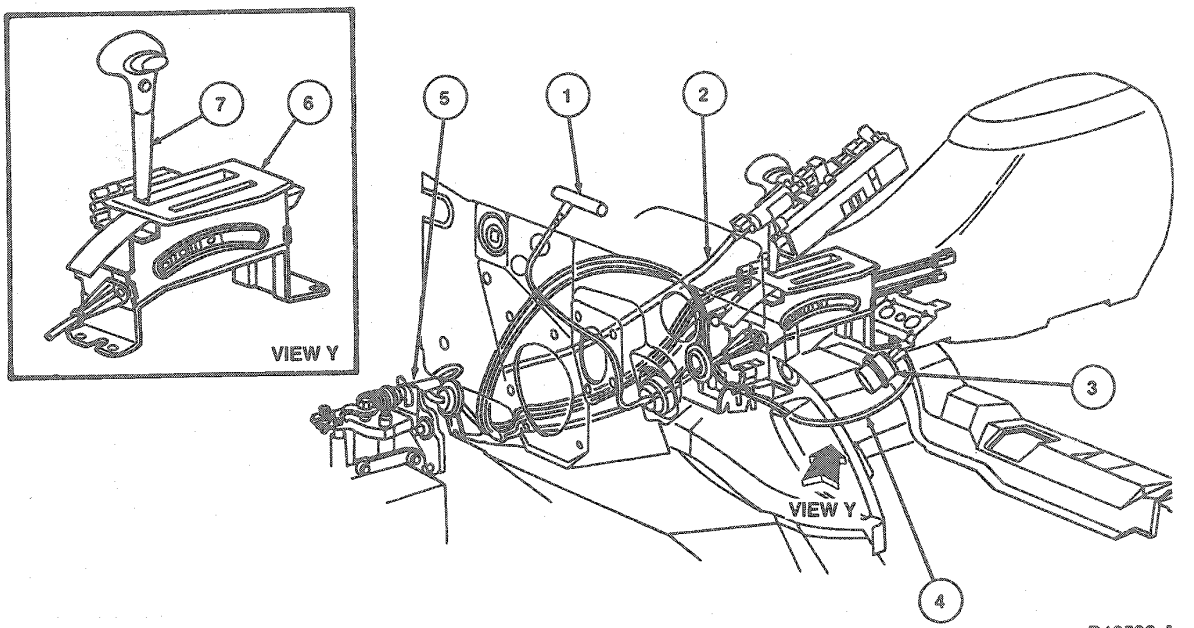
SHIFT CONTROL LINKAGE DIAGNOSIS

CONDITION	POSSIBLE SOURCE	ACTION
• Starter Inoperative in PARK and/or NEUTRAL • Back-up Lamps Not Operating Correctly	• Neutral switch worn or damaged. • Transaxle cable retainer bracket loose at steering column. • Cable is loose at transaxle retainer bracket. • Shift linkage misadjusted.	• Check neutral switch for continuity, proper connection. • Secure bracket by tightening two bolts. • Secure cable in bracket. • Re-adjust shift linkage.
• PRNDL Indicator Does Not Correspond to the Transaxle Gear	• Shift cable retainer bracket is loose at steering column. • PRNDL linkage misadjusted. • Cable is loose at transaxle retainer bracket. • Shift linkage misadjusted.	• Tighten bracket retaining bolts. • Adjust PRNDL linkage at column. • Secure cable in bracket. • Re-adjust shift linkage.
• PRNDL Does Not Illuminate	• Bulb burned out. • Wiring harness damaged.	• Replace bulb. • Install new wiring harness.
• Rattle, Noise, Buzz, etc.	• Shift knob loose. • Selector lever and housing assembly loose. • Cable assembly grommet not secure to dash panel.	• Tighten knob locknut. • Tighten housing attaching bolts. • Secure grommet to dash panel.
• Water Enters Inside the Vehicle	• Cable assembly grommet not secure to dash panel. • Cable assembly grommet torn.	• Secure grommet to dash panel. • Install new cable assembly.
• Difficult to, or Cannot Remove Ignition Key (Floor Shift Only)	• Shifter not fully locked in PARK position. • Shifter not properly adjusted.	• Make sure shifter is locked in PARK position. • Adjust shift linkage.
• Shifter Will Not Release From PARK	• Key interlock cable damaged, restricted.	• Service, replace or remove restriction as necessary.
• Shifter Will Not Release From PARK With Key in ON Position and Brake Pedal Depressed	• Stoplamp switch inoperative. • Shift knob loose or not fully seated. • Interlock cable damaged or restricted.	• Replace switch. • Properly install knob or replace. • Service or replace as necessary.
• Shifter Will Not Release With Key in OFF Position	• Shift knob loose or not fully seated. • Interlock cable damaged or restricted.	• Properly install knob or replace. • Service or replace as necessary.
• Shifter Release From Park (Ignition in LOCK or ACC Position)	• Interlock cable loose at column or shifter.	• Tighten as necessary.
• Shifter Releases From Park (Ignition in RUN Position)	• Interlock cable and solenoid damaged. • Electrical connector loose or disconnected.	• Service as necessary. • Connect electrical connector securely.
• Cannot Engage/Disengage Overdrive Lockout	• O/D switch worn or damaged. • Wire harness damaged. • Loose connections in wire harness.	• Replace switch. • Replace wire harness. • Secure connectors.

REMOVAL AND INSTALLATION

Floor Shift

Transaxle, AX4S



D10532-A

Item	Part Number	Description
1	—	Vacuum Manifold
2	3F719	Key Interlock Cable
3	—	Parking Brake Vacuum Solenoid

Item	Part Number	Description
4	2B653	Vacuum Hose Assy
5	7E395	Transmission Shift Cable
6	7K004	Lever and Housing Assy
7	7H263	Knob Assy

(Continued)

Shift Knob

Taurus/Sable

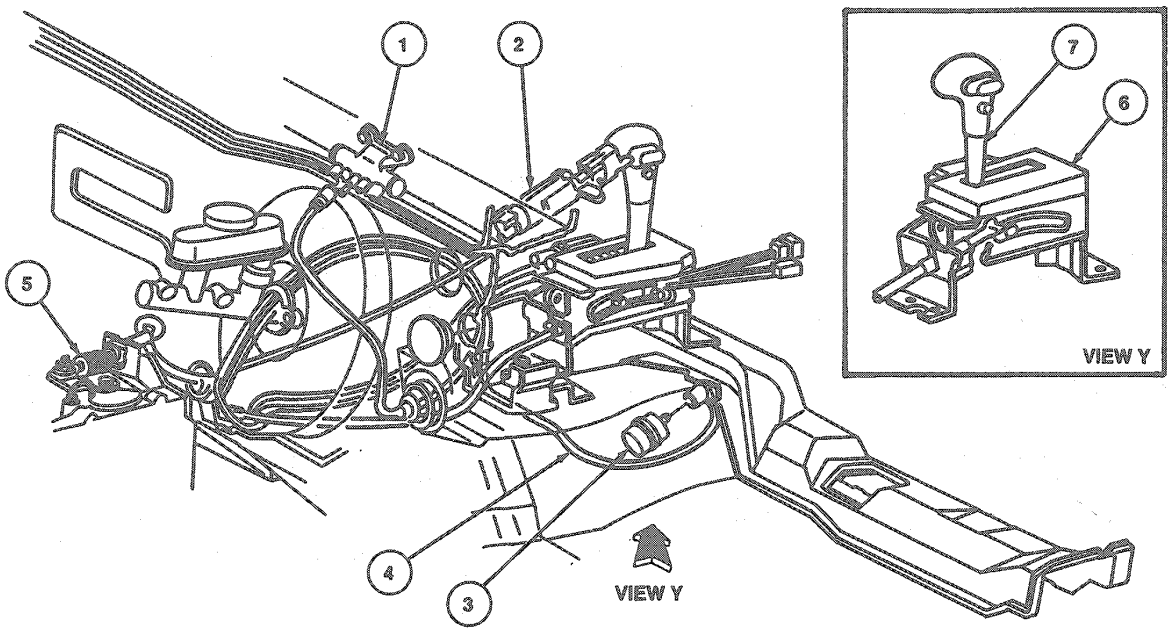
Removal

1. Remove retaining clip from shift knob.
2. Hold shift knob securely and depress release button.
3. Pull up on shift knob.
4. Remove shift knob shroud.

Installation

1. Slide shroud over shift lever.
2. Hold shift knob securely.
3. Firmly and fully press shift knob onto lever assembly.
4. Insert retaining clip.

REMOVAL AND INSTALLATION (Continued)



D10535-A

Item	Part Number	Description
1	—	Vacuum Manifold
2	3F719	Key Interlock Cable
3	—	Parking Brake Vacuum Solenoid

Item	Part Number	Description
4	2B653	Vacuum Hose Assy
5	7E395	Transmission Shift Cable
6	7K004	Lever and Housing Assy
7	7H263	Knob Assy

(Continued)

Taurus SHO

Removal

1. Remove overdrive lockout switch using needle nose pliers.
2. Remove retaining clip from shift knob.
3. Hold shift knob securely and depress release button.
4. Pull up on shift knob.
5. Place the shifter in the 1 position and gently pull the overdrive lockout connector up. Remove shift knob shroud.

Installation

1. Slide shroud over shift lever and overdrive lockout connector and wiring. Push excess wiring through shroud. Gently shift into PARK position to help pull wires through.
2. Slide overdrive lockout connector into shift knob and firmly press shift knob fully onto shaft lever.
3. Insert retaining clip.
4. Press overdrive lockout switch into shift knob.

Bezel Assembly

Removal

1. Remove shift knob as outlined.
2. Remove console assembly. Refer to Section 01-12.
3. Remove three screws from bezel assembly.
4. Lift bezel assembly slightly. Disconnect indicator bulb harness and remove bezel assembly.

Installation

NOTE: Care should be taken to ensure that all sides are properly aligned.

1. Install bezel assembly over shift lever being sure to align the PRNDL indicator driving pin with the PRNDL indicator. Connect indicator bulb harness, and secure bezel assembly to selector housing with three screws.
2. Install console assembly. Refer to Section 01-12.
3. Install shift knob as outlined.
4. Adjust control linkage.

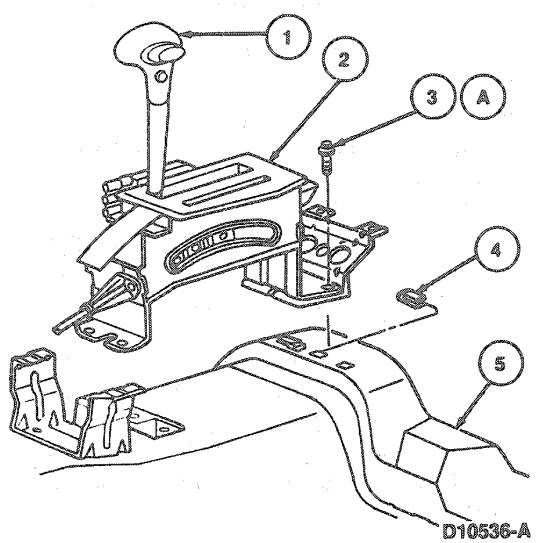
REMOVAL AND INSTALLATION (Continued)

5. Check transaxle operation for all selector lever detent positions.

Shift Lever and Housing Assembly

Removal

1. Remove console assembly. Refer to Section 01-12.
2. Remove shift knob and bezel assembly as outlined.
3. Remove transaxle shift cable retaining screws from lever and housing assembly.
4. Pull the cable from the plastic snap retainer on assembly.
5. Remove key interlock cable retaining screw from shifter housing and slide cable out of shifter interlock cam.



Item	Part Number	Description
1	7H263	Knob Assy
2	7K004	Lever and Housing Assy
3A	N605774-S2	Bolt (4 Req'd)
4	N623332-S2	J-Nut (4 Req'd)
5	—	Floorpan Assy
A		Tighten to 6-8 N·m (5-6 Lb-Ft

6. Remove four bolts retaining lever and housing assembly to floorpan. Remove assembly.

Installation

1. Position control cable assembly into lever and housing assembly and install retaining screws.
2. Snap cable end into plastic snap retainer on the lever housing assembly.
3. Install lever and housing assembly onto floorpan and secure with four bolts. Tighten to 6-8 N·m (5-6 lb-ft).
4. Connect interlock cable to shifter interlock cam. Install cable retaining screw.
5. Position bezel assembly on lever and housing assembly. Secure with four screws.
6. Install console on lever and housing assembly with two screws.
7. Install shift knob as outlined.
8. Adjust control linkage.
9. Check transaxle operation in each selector lever detent position.

Indicator Bulb

Floor Shift

Removal

1. Remove shift knob as outlined.
2. Remove bezel as outlined.
3. Remove bulb assembly from bezel.
4. Remove indicator bulb.

Installation

1. Install indicator bulb onto indicator bulb assembly.
2. Connect light housing to bezel assembly.
3. Install shift bezel.
4. Install shift knob.

Shift Control Cable Assembly

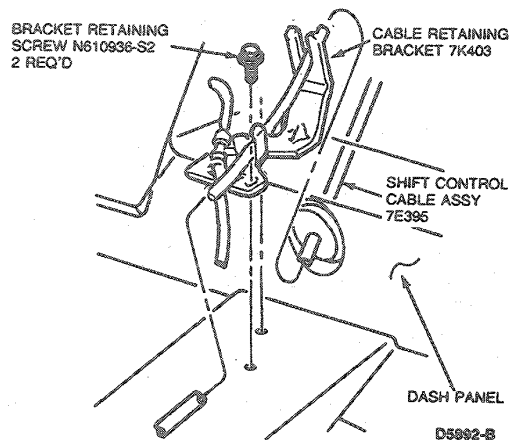
Floor Shift

Removal

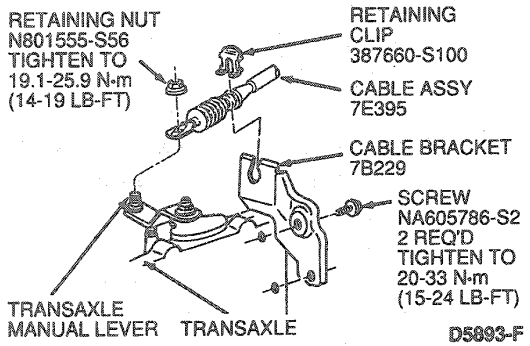
1. Remove console. Disconnect cable and remove shifter assembly as outlined.
2. Pull back carpeting.

REMOVAL AND INSTALLATION (Continued)

3. Remove cable bracket to dash panel retaining screw.



4. Disengage rubber grommet from floorpan by pushing it toward passenger compartment.
5. Remove retaining nut and control cable assembly from transaxle lever.
6. Remove cable retaining clip from cable bracket on transaxle.



7. Remove control cable assembly from bracket.
8. Pull cable through floorpan into passenger compartment.

Installation

1. From inside the passenger compartment, feed round end of control cable assembly through floorpan.
2. Press rubber boot on control cable assembly into body panel opening. Install cable bracket and carpeting.
3. Install bushing and control cable assembly into snap retainer on selector lever and housing assembly shaft.
4. Position control cable assembly in selector lever housing assembly. Install retaining screws.
5. Install shifter assembly as outlined.
6. Place selector lever in OVERDRIVE position against rearward stop. The selector lever must be held in the rearward position while attaching other end of control cable assembly. Position cable into cable bracket on transaxle and install retainer clip.
7. Attach cable to transaxle lever and install retaining nut.
8. Shift transaxle lever into OVERDRIVE position, second detent from full rearward position.
9. Place cable end on transaxle manual lever stud, using care to align flats on stud with slot in cable. Start retaining nut.
10. Make sure selector lever has not moved from OVERDRIVE detent, then tighten nut.
11. Check transaxle operation in each selector lever detent position. Ensure park mechanism and neutral start switch function properly.

Interlock Cable Assembly

Floor Shift

Removal

1. Remove console. Refer to Section 01-12.
2. Remove interlock cable to shifter retaining screw and remove cable from shifter interlock cam.
3. Remove LH lower instrument panel trim. Remove lower steering column shroud.
4. Remove steering column retaining nuts and lower column to floor.
5. Disconnect electrical connector from solenoid.
6. Remove two interlock cable retaining screws from steering column.
7. Remove solenoid from solenoid retainer bracket.
8. Pull cable out from under instrument panel and unhook it from retaining bracket.
9. Roll back carpeting and slide cable out.

Installation

1. Route cable under carpeting. Position cable under A/C plenum bracket and under accelerator pedal.
2. Connect cable to shifter interlock cam and install retaining screw at shifter.
3. Install solenoid into retainer bracket.
4. Install cable to steering column. Install two retaining screws. Tighten to 1.5-2 N·m (14-17 lb-in).
5. Connect electrical connector to solenoid.
6. Position column to support bracket and install retaining nuts. Tighten to 20 N·m (14 lb-ft).
7. Install column shroud and instrument panel trim panel.

REMOVAL AND INSTALLATION (Continued)

8. Check for proper interlock operation. The ignition key should be removeable only with the shifter in PARK. The shifter should be locked in the PARK position with the key removed.

Column Shift

NOTE: Whenever the cable is removed from the cable retaining brackets for any reason, the cable must be replaced.

NOTE: Whenever a steering column, engine or transaxle removal is required, do not remove shift control cable from the retaining brackets. The bracket must be removed with the cable attached.

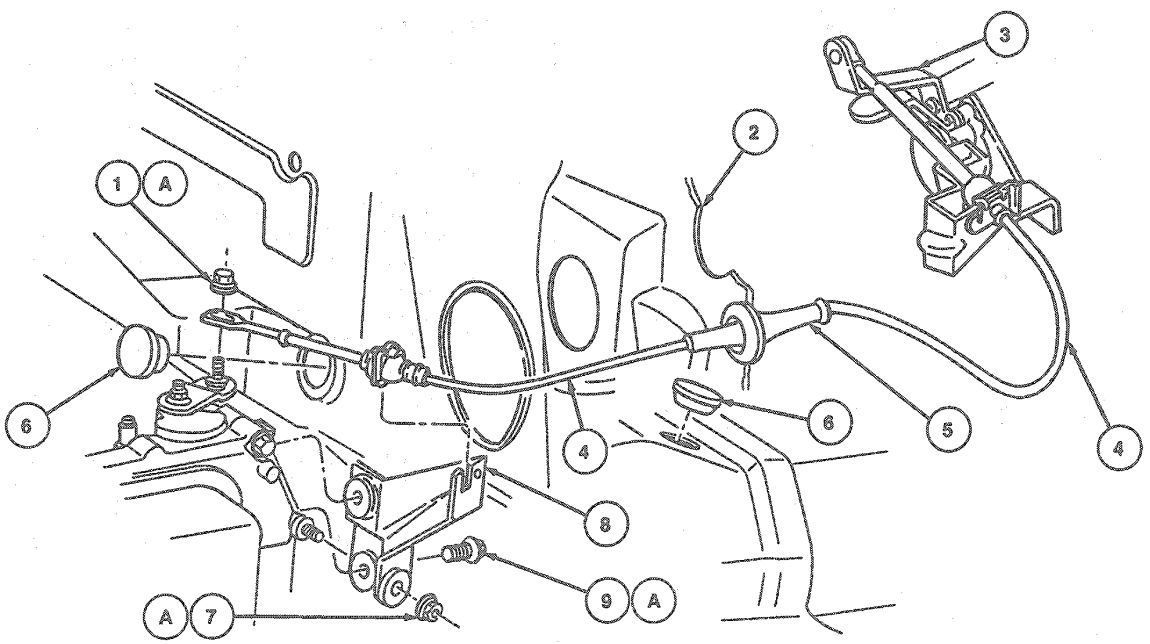
Removal

1. From under the instrument panel, remove shift control cable and retaining bracket from steering column.
2. Remove cable plastic terminal from column selector lever pivot ball, using a screwdriver, by prying between the cable plastic terminal and selector lever.
3. Remove cable retaining clip and remove cable from retaining bracket by carefully lifting the locking tab while pulling up on fitting.
4. From engine compartment, pry cable grommet from dash panel.
5. Remove nut from transaxle manual shift lever stud.
6. Remove cable locking tab and carefully remove cable from retaining bracket.
7. Remove shift cable from cable retaining bracket on transaxle and, from the engine compartment, pull cable through dash panel opening.

Installation

1. From the engine compartment, feed plastic terminal end of cable through opening in dash panel.
2. Press rubber boot on shift control cable into dash panel.
3. From engine compartment, install cable into cable retaining bracket on transaxle and make sure locking tab is in proper location.
4. Place cable on transaxle manual shift lever stud. Install cable retaining nut loosely.
5. From the passenger compartment, install cable-to-steering column retaining bracket onto cable and make sure locking tab is in proper location.
6. Install cable and bracket to steering column with two retaining screws. Tighten to 8-13 N·m (6-9 lb-ft).
7. Snap cable plastic terminal to selector lever pivot ball on steering column.
8. Adjust cable control as outlined.

3.8L and 3.0L Engine



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REMOVAL AND INSTALLATION (Continued)

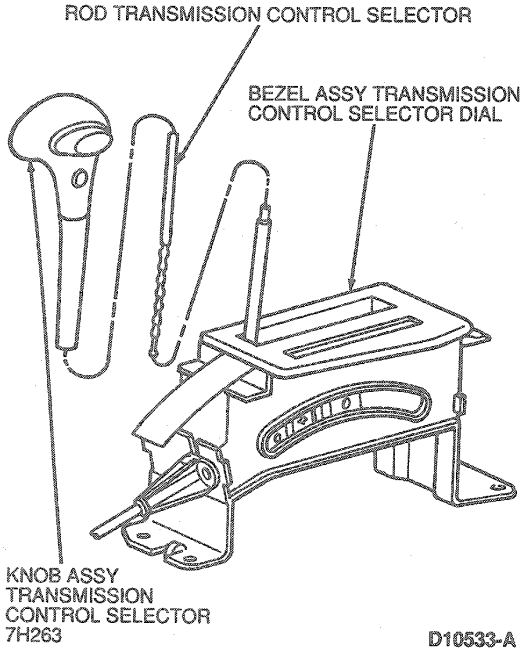
Item	Part Number	Description
1A	N801555-S56	Nut
2	—	Dash Panel
3	—	Steering Column
4	7E395	Cable Assy
5	—	Grommet
6	378377-S	Plug
7A	N803766-S56	Nut
8	7K499	Bracket Assy
9A	N804804-S100	Bolt (2 Req'd)
A		Tighten to 19.1-25.9 N·m (14-19 Lb-Ft)

(Continued)

ADJUSTMENTS

Manual Linkage

The manual linkage adjustments must be performed in the order in which they appear.



Floor Shift

1. Position selector lever in OVERDRIVE position against rearward stop. The floor shift lever must be held in the rearward position using a constant force of 1.4 Kg (3 lb) while linkage is being adjusted.
2. Loosen manual lever-to-control cable retaining nut.
3. Move transaxle manual lever to OVERDRIVE position, second detent from most rearward position.
4. Tighten retaining nut to 19.1-25.9 N·m (14-19 lb-ft).
5. Check operation of transaxle in each selector lever position. Ensure that park and neutral start switch are functioning properly.

Column Shift

1. Place shift lever in D (OVERDRIVE) position. A weight of 1.4 Kg (3 lb) should be hung on the shift lever to ensure the lever is located firmly on the D Overdrive detent.
2. Loosen manual lever-to-control cable retaining nut.
3. Move transaxle manual lever to OVERDRIVE position, second detent from most rearward position.
4. Tighten retaining nut to 19.1-25.9 N·m (14-19 lb-ft). Check operation of transaxle in each selector lever position. Ensure that park and neutral start switch are functioning properly.

PRNDL Cable Adjustment

1. Remove steering column tilt release lever (if so equipped) by turning counterclockwise.
2. Remove ignition lock cylinder. Refer to Section 11-05.
3. Remove upper and lower shrouds.
4. Place shift lever in D (OVERDRIVE) position. A weight of 1.4 Kg (3 lbs) should be hung on the shift lever to ensure the lever is located firmly on the D Overdrive detent.
5. Adjust PRNDL cable (with adjustment wheel on PRNDL cable), until PRNDL pointer is centered on D and calibration dots show no red.
6. Tighten hex head screw to 2.0-3.4 N·m (18-30 lb-in).
7. Cycle shift lever through all of the positions and check that the PRNDL pointer is centered over proper letter or number in each position.
8. Install shrouds with retaining screws. Tighten to 0.7-1.1 N·m (7-9 lb-in).
9. Install ignition lock cylinder. Refer to Section 11-05.
10. Install tilt release lever (if so equipped).

SPECIFICATIONS

TORQUE SPECIFICATIONS

Description	N·m	Lb-Ft
Manual Lever to Control Cable Retaining Nut	19.1-25.9	14-19
Shift Lever and Housing Assembly	6-8	5-6
Control Cable Bracket-to-Column	7-11	5-8
Cable Retaining Bracket-to-Transaxle	20-33	15-24
Column to Support Bracket Nuts	20	14
Release Lever Retaining Screw	4.5-6.5	40-57 (Lb-In)
Column Shrouds Retaining Screws	0.7-1.1	7-9 (Lb-In)
Cable-to-Steering Column Retaining Screws	1.5-2	14-17 (Lb-In)

(Continued)

TORQUE SPECIFICATIONS (Cont'd)

Description	N·m	Lb-Ft
Cable and Bracket-to-Steering Column Retaining Screws	8-13	6-9
Hex Head Screws	2-3.4	18-30 (Lb-In)

LUBRICANT SPECIFICATIONS

Description	Lubricant
Adapter to Pivot Bolt Bushing and Pivot Bolt	ESA-M1C75-B (C1AZ-19590-F)
Lever Assembly Park Pawl	ESA-M1C75-B (C1AZ-19590-F)
Adapter Assembly Park Pawl Slot	ESA-M1C75-B (C1AZ-19590-F)

GROUP

CLUTCH SYSTEM 08

(7000)

SECTION TITLE	PAGE
CLUTCH CONTROLS	08-02-1
CLUTCH/PRESSURE PLATE	08-01-1
CLUTCH SYSTEM—SERVICE	08-00-1

SECTION 08-00 Clutch System—Service

SUBJECT	PAGE
CLEANING AND INSPECTION	
Clutch Disc	08-00-4
Clutch Release Bearing	08-00-4
Pressure Plate and Cover	08-00-5
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DIAGNOSIS	08-00-1
REMOVAL AND INSTALLATION	
Dowels, Engine	08-00-3
VEHICLE APPLICATION	08-00-1

VEHICLE APPLICATION

Taurus With 3.0L SHO Engine.

DESCRIPTION

The primary function of the clutch system is to couple and uncouple engine power to the transaxle upon driver command. For additional information, refer to Sections 08-01 and 08-02.

DIAGNOSIS

CLUTCH DIAGNOSIS

CONDITION	POSSIBLE SOURCE	ACTION
• Chirp or Squeal When Pedal is "Up"	• Insufficient preload on release bearing.	• Service or replace linkage parts (cable, release lever, tension spring, pedal assembly). Lubricate with Premium Long-Life Grease XG-1-C (ESA-M1C75-B) or equivalent all linkage pivot points to clutch release shaft and lower bushings.
• Clutch Chatters During Engagement	• Loose engine mounts, roll restrictor or stiffener brace bolts. • Oil on clutch disc burned or glazed.	• Service as required. Tighten bolts and nuts. Refer to Section 02-03. • Install new clutch disc and correct leak as outlined.

DIAGNOSIS (Continued)

CLUTCH DIAGNOSIS (Continued)

CONDITION	POSSIBLE SOURCE	ACTION
• Clutch Does Not Disengage Properly	• Improper clutch pedal travel. • External linkage worn or damaged. • Clutch components inside clutch housing worn or damaged. • Loose clutch pressure plate bolts.	• Service or replace linkage parts as required. Refer to Section 08-02. • Remove transaxle. Verify torque of pressure plate bolts. Tighten bolts to 33 N·m (24 Lb-Ft) if required. • Check for damaged or worn clutch, pressure plate, release bearing, release lever or release shaft pivot. • Check for warped or contaminated clutch disc. • Verify clutch disc hub spline free movement on input shaft spline — lubricate sparingly. Service or replace as required.
• Clutch is Noisy When Pedal is Depressed (Noise Continues as Long as the Pedal is Held Down.)	• Damaged release bearing. • Flywheel housing out of alignment.	• Remove transaxle and replace release bearing. Inspect the release fingers and replace the pressure plate assembly as required. • Align housing.
• Clutch Slips After the Pedal is Fully Released	• Release linkage inside flywheel housing binding or damaged. • Clutch facing excessively worn.	• Lubricate with Premium Long-Life Grease XG-1-C (ESA-M1C75-B) or equivalent. Service or replace linkage parts as required. Refer to Section 08-02. • Remove transaxle. Check pressure plate and clutch disc for wear and contamination. Replace as required.
• Clutch Squeaks or Scrubs When the Pedal is in Motion	• Clutch release linkage — lack of lubrication, binding, interference, worn or kinked. • Lack of lubrication on the clutch release shaft bushing, lower bosses and lever to release bearing contact. • Lack of lubrication in the clutch release bearing bore and the transaxle release bearing guide. • Flywheel housing out of alignment. • Binding clutch cable.	• Lubricate with Premium Long-Life Grease XG-1-C (ESA-M1C75-B) or equivalent. Service or replace as required. • Remove transaxle and release bearing. Lubricate with Premium Long-Life Grease XG-1-C (ESA-M1C75-B) or equivalent on bushing and other areas. • Lubricate with Premium Long-Life Grease XG-1-C (ESA-M1C75-B) or equivalent, accordingly. • Align housing. • Replace clutch cable. Do not lubricate. Refer to Section 08-02.
• Noise When Clutch Pedal is Depressed	• Clutch interlock switch. • Self adjuster ratchet noise. • Speed control interlock switch.	• Inspect interlock switch activating rod for binding or excessive noise. Replace switch if necessary. • Refer to Section 08-02 for diagnosis and service. • Refer to Section 10-03.
• Vehicle Will Not Start With Clutch Pedal Fully Depressed	• Improper adjustment of interlock switch, damaged switch or open or short-circuited wiring.	• Refer to Section 08-02 for diagnosis and service.

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DIAGNOSIS (Continued)

RELEASE BEARING NOISE

TEST STEP		RESULT	ACTION TO TAKE
A1	DEPRESS CLUTCH PEDAL • Chirp, squeak or clatter with pedal up can be caused by insufficient bearing pre-load, out-of-plane pressure plate fingers, transaxle or a worn or damaged release bearing. • With engine idling and transaxle in NEUTRAL, depress clutch pedal to the floor. • **Is there a noise present?**	Yes No	REPLACE damaged or worn release bearing. GO to A2. Release bearing OK.
A2	DISENGAGE BEARING • With engine idling, disconnect clutch cable from release lever and move lever away from cable to disengage bearing from pressure plate fingers. • **Is there a noise present?**	Yes No	Noise is from transaxle. REFER to Section 07-03A for Transaxle Diagnosis. GO to A3. Transaxle is OK.
A3	PRE-LOAD BEARING • With engine idling and clutch cable disconnected, apply 15 lb. load to lever end of clutch release shaft assembly in direction of cable — pull to preload bearing. • **Is there a noise present?**	Yes No	LUBRICATE pivot and bushings to free up binding release lever. Clutch control system damaged or quadrant tension spring out of position. SERVICE or REPLACE as required any sticky or binding clutch control components.

TC9686B

REMOVAL AND INSTALLATION

Dowels, Engine

Removal

Dowels can be removed by using a drift pin where the dowel is installed in a drilled hole and vise grip pliers where the dowel is installed in a blind hole. They should be pulled or driven from their seat, taking care not to damage dowel hole or surface area around dowel during removal.

Installation

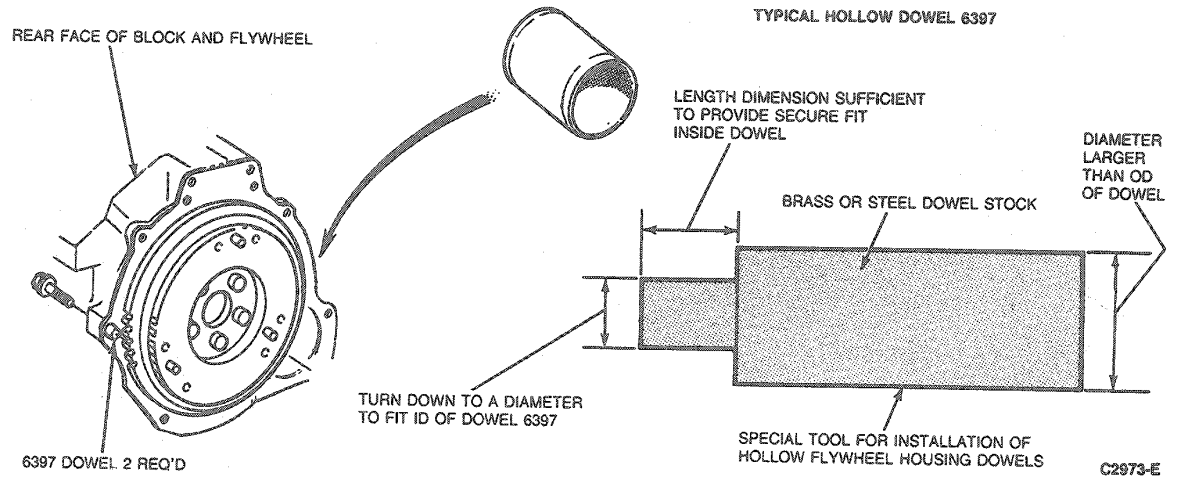
Solid-Type Dowels

All solid-type dowels can be installed by driving them into place using a brass or plastic mallet. Care should be exercised to drive the dowel squarely into place until fully seated and not to damage surrounding surface areas.

REMOVAL AND INSTALLATION (Continued)

Hollow Dowels

Installation can be easily accomplished by fabricating a simple tool from steel or brass dowel stock. Insert the tool into the dowel and with the dowel squarely in position, drive it into the hole in the engine block until it is fully seated. Once seated, check for burrs and remove burrs as needed.



CLEANING AND INSPECTION

Clutch Release Bearing

CAUTION: The bearing is prelubricated and should not be cleaned with solvent.

Wipe all oil and dirt off the release bearing.

Hold the bearing inner race and rotate the outer race while applying pressure. If rotation is rough or noisy, replace the bearing.

Inspect the release bearing assembly for burrs which may cause the assembly to drag on the transaxle bearing retainer. If burrs are found, inspect the transaxle input shaft bearing retainer for evidence of scoring. Polish out burrs and scoring with a crocus pad.

Apply a thin film of Premium Long-Life Grease XG-1-C (ESA-M1C75-B) or equivalent to the bearing retainer, both sides of the release lever fork where it contacts the release bearing hub and retaining springs, and to the release bearing surface that contacts the pressure plate fingers.

CAUTION: Care must always be exercised when applying lubricants to the release bearing, release bearing hub and the release lever fork, as excessive lubricant would contaminate the clutch disc.

Carefully fill the grease groove inside the bearing hub with Premium Long-Life Grease XG-1-C (ESA-M1C75-B) or equivalent (no polyethylene). Clean all excess grease from the bore of the bearing hub as excess grease will be forced into the spline by the transaxle input shaft bearing retainer and will contaminate the clutch disc.

Misalignment between the engine and transaxle can cause release bearing wear and damage.

Clutch Disc

Inspect the clutch disc facings for oil or grease. Eliminate the source of any oil or grease before replacing the disc.

Any excessive amount of lubricant on the release bearing hub will find its way to the disc facings. Too much lubricant in the transaxle or a plugged transaxle vent will force the transaxle lubricant out the input shaft and onto the disc facings. Also, engine rear main bearing oil seal leaks or oil leaks from the flywheel mounting bolts can contaminate the clutch disc.

CLEANING AND INSPECTION (Continued)

Inspect the clutch disc for worn or loose facings, distortion, loose rivets at the hub, and for broken springs. **Replace the disc assembly if any of these conditions are present. Springs loose enough to rattle will not cause noise when the vehicle is operating. Be especially careful when installing a new disc to avoid dropping it or contaminating it with oil or grease.**

Pressure Plate and Cover

CAUTION: Do not use cleaners with petroleum base, and do not immerse the pressure plate in the solvent.

Inspect surface of pressure plate for burn marks, scores, ridges, and warpage. Generally, pressure plate resurfacing is not recommended, but minor burn marks or scores can be removed with a crocus pad. If it is badly heat checked, warped or deeply scored, replace pressure plate and cover assembly. Clean pressure plate and flywheel surfaces with a suitable solvent, such as alcohol to be sure surfaces are free from any oil film.

SECTION 08-01 Clutch/Pressure Plate

SUBJECT	PAGE
DESCRIPTION AND OPERATION	08-01-1
REMOVAL AND INSTALLATION	
Clutch Components	08-01-2
Clutch Disc and Pressure Plate	08-01-4
Release Bearing	08-01-2
REMOVAL AND INSTALLATION (Cont'd.)	
Release Fork and Lever	08-01-3
SPECIAL SERVICE TOOLS	08-01-4
SPECIFICATIONS	08-01-4
VEHICLE APPLICATION	08-01-1

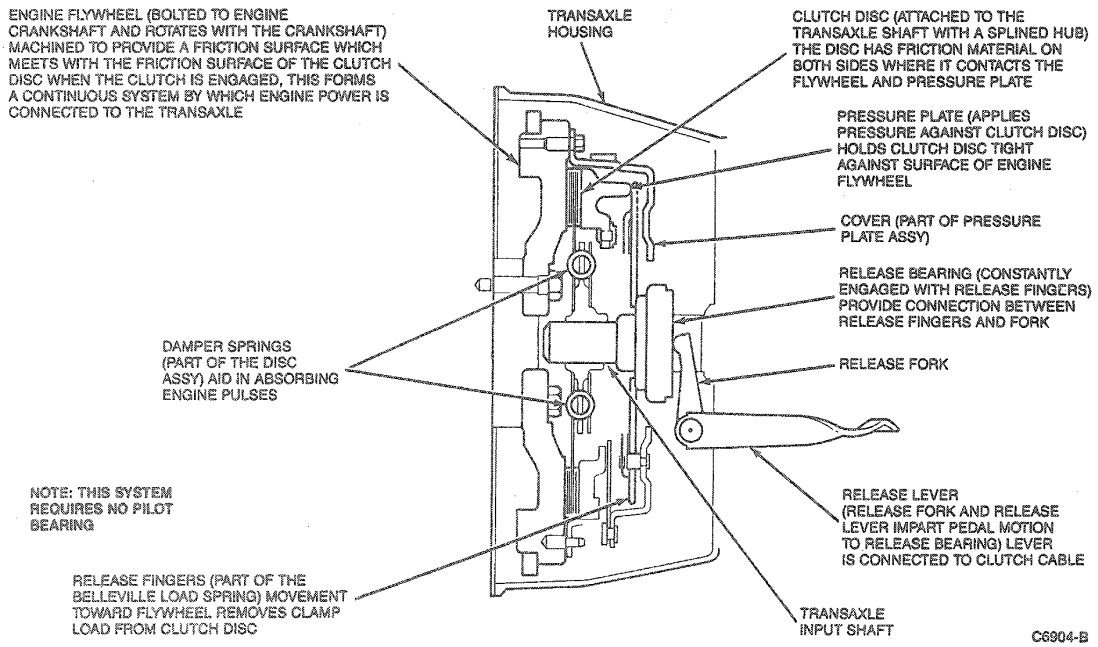
VEHICLE APPLICATION

Taurus With 3.0L SHO Engine.

DESCRIPTION AND OPERATION

The primary function of the clutch system is to couple and uncouple engine power to the transaxle upon driver command.

The clutch system cutaway is in the engaged (pedal released) position and identifies the individual components and their functions. In this position, engine output is coupled to the transaxle input shaft by the friction that exists between the clutch disc facings and the flywheel/pressure plate assembly. The extent of this friction is directly related to the composition of the facing material and the magnitude of the clamping forces exerted by the pressure plate and flywheel on the facings. These are the factors that limit the amount of torque that can be transmitted without slippage. The clamping force is obtained from a Belleville spring contained within the pressure plate assembly.



DESCRIPTION AND OPERATION (Continued)

This force is developed during the attachment of the pressure plate assembly to the flywheel, the Belleville spring being flattened between the pressure plate and the cover.

Disengagement of the clutch (pedal depressed) is accomplished when the release fingers are fully displaced toward the flywheel. This displacement removes the Belleville spring load from the pressure plate and thus eliminates the coupling friction between the engine and the transaxle. The release fingers are moved by the release bearing, which receives its motion through a linkage/cable system from the clutch pedal. It should be noted that partial finger displacement does not release the clutch but results in lower coupling friction which can cause slippage under load.

The secondary function of the pressure plate and disc assemblies is to aid in isolating engine power pulses from the rest of the powertrain. The weight of the plate assembly adds to that of the flywheel and thus improves its function as a vibration damper. Contained within the disc assembly are several coil springs. These springs, along with a controlled amount of friction between the hub and the drive plates, also absorb engine pulsations. The spring and friction characteristics are tailored to each engine/powertrain/vehicle application. Therefore, only specified discs should be used for replacement.

Since the release bearing in this system is constant-running, transaxle neutral rollover noise can be detected only by disengaging the release bearing from the clutch release fingers. This is best accomplished by disconnecting the cable from the release lever and moving the lever away from the cable. If neutral noise is evident under this condition, it is emanating from the transaxle.

NOTE: Lift clutch pedal to the upmost position when connecting or disconnecting the clutch cable.

REMOVAL AND INSTALLATION

Clutch Components

Transaxle Removed

Refer to Section 07-03 for transaxle removal.

Release Bearing

Removal

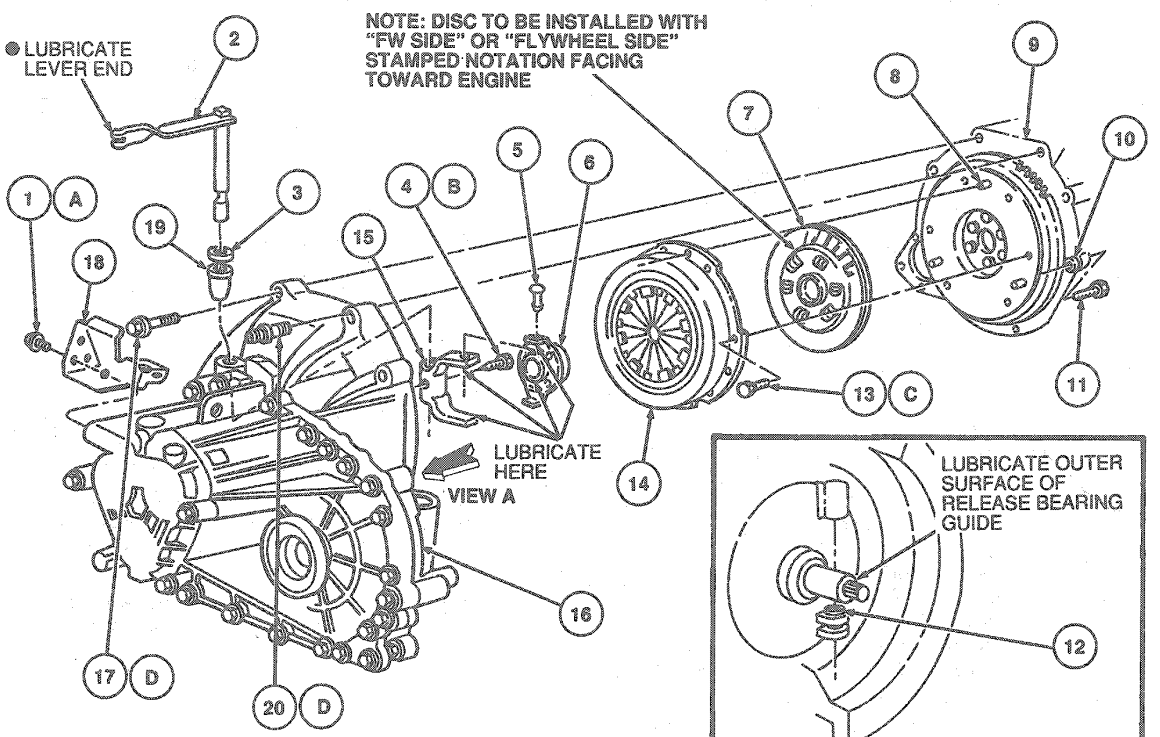
1. Remove release lever-to-release bearing retaining pin.
2. Slide bearing from transaxle extension.

Installation

1. Apply a light film of Premium Long-Life Grease XG-1-C (ESA-M1C75-B) or equivalent to entire outer surface of transaxle bearing retainer and the tips of the release lever where they contact the bearing. Fill bearing groove with same.

   NOTE: The retaining pin is used only as an assembly aid. Any other suitable means of retaining the bearing during transaxle installation is acceptable.
2. Slide bearing onto bearing retainer and attach to release lever with retaining pin (N801408-S).

REMOVAL AND INSTALLATION (Continued)



Item	Part Number	Description
1A	N605800-S2	Bolt (2 Req'd)
2	7503	Clutch Release Shaft Assy
3	N803859-S	Felt Washer
4B	7565	9mm Pin
5	N801408-S	Pin
6	7548	Release Bearing Assy
7	7550	Disc Assy
8	7K578	Dowel (3 Req'd)
9	—	Rear Face
10	6397	Dowel (2 Req'd)
11	N606083-S2 N805630-S2	Bolt (5 Req'd) Stud (1 Req'd)
12	7N620	Bushing

(Continued)

Item	Part Number	Description
13C	N602549-S2	Bolt (6 Req'd)
14	7563	Pressure Plate Assy
15	7541	Release Lever
16	7002	Transaxle Assy
17D	N606083-S2	Bolt
18	7F325	Bracket Assy
19	7N620	Upper Bushing
20D	N805630-S2	Stud
A		Tighten to 35-50 N·m (26-37 Lb-Ft)
B		Tighten to 40-55 N·m (30-40 Lb-Ft)
C		Tighten to 33 N·m (24 Lb-Ft)
D		Tighten to 46-63 N·m (34-46 Lb-Ft)

Release Fork and Lever

Removal

1. Remove release lever-to-clutch release shaft assembly retaining bolt or pin.
2. Slide clutch release shaft assembly from transaxle housing.
3. Remove upper and lower release lever bushings. Inspect for damage or wear.

Installation

1. Install upper and lower bushings (7N620) into housing bores. Lubricate bushings with a light film of Premium Long-Life Grease XG-1-C (ESA-M1C75-B) or equivalent.

REMOVAL AND INSTALLATION (Continued)

2. Position lever in housing with large screw hole to engine side. Slide clutch release shaft assembly through felt washer, upper bushing and fork, and then into housing lower bushing.
3. Align lever and clutch release shaft assembly holes. Install retaining bolt or pin. Tighten to 40-55 N·m (30-40 lb-ft).

Clutch Disc and Pressure Plate

Tools Required:

- Clutch Aligner T81P-7550-A

Removal

1. Loosen the six pressure plate cover retaining bolts evenly to release spring tension gradually and avoid distorting cover. If the same pressure plate and cover are to be installed, mark the cover and flywheel so that the pressure plate can be installed in its original position.
2. Remove pressure plate and clutch disc from flywheel.

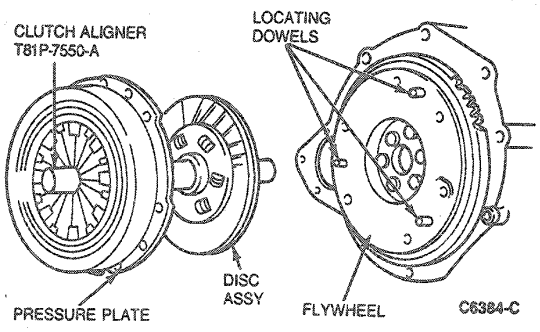
Installation

NOTE: Avoid touching the clutch disc face, dropping parts or contaminating parts with oil or grease.

NOTE: The clutch disc must be assembled so that the "FW Side" or "Flywheel Side" stamped notation is facing toward the engine. The three dowel pins and the flywheel must be properly aligned with the pressure plate. (Bent, damaged or missing dowels must be replaced.)

1. Position clutch disc and pressure plate assembly on flywheel.

   Insert the cover retaining bolts but do not tighten them.
2. Align clutch disc using Clutch Aligner T81P-7550-A inserted in the crankshaft. To avoid pressure plate cover distortion, alternately tighten cover bolts until fully seated, then tighten to 33 N·m (24 lb-ft). Remove alignment tool.



SPECIFICATIONS

PRESSURE PLATE SPECIFICATIONS

Diameter	Color Identification (Paint Daub)
248mm (9.75 inches)	None

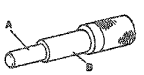
CLUTCH DISC SPECIFICATIONS

Diameter	No. of Springs	Color Identifications (Paint Daub)
248 (9.75 inches)	2 Bright Red (Large) 2 Aquamarine (Small) 2 Silver Grey (Large) 2 Red (Small)	None

TORQUE SPECIFICATIONS

Description	N·m	Lb-Ft
Bolt/Stud—Transaxle Clutch Housing-to-Engine	46-63	34-46
Bolt—Pressure Plate-to-Flywheel	33	24
Pin-to-Release Fork	40-55	30-40
Shield Bolt	35-50	26-37

SPECIAL SERVICE TOOLS

Tool Number/ Description	Illustration
T81P-7550-A Clutch Aligner	

SECTION 08-02 Clutch Controls

SUBJECT	PAGE
DESCRIPTION AND OPERATION	
Clutch Control System, Self-Adjusting	08-02-1
Starter/Clutch Interlock Switch	08-02-2
DIAGNOSIS	08-02-3
PARTS CROSS-REFERENCE	08-02-9
REMOVAL AND INSTALLATION	
Clutch Cable Assembly	08-02-7
Clutch Pedal Quadrant and Pawl Assembly	08-02-4

SUBJECT	PAGE
REMOVAL AND INSTALLATION (Cont'd.)	
Starter/Clutch Interlock Switch	08-02-8
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TESTING	
Starter/Clutch Interlock Switch Continuity	08-02-2
VEHICLE APPLICATION	08-02-1

VEHICLE APPLICATION

Taurus with 3.0L SHO Engine.

DESCRIPTION AND OPERATION

Clutch Control System, Self-Adjusting

The illustration shows the relationship between the clutch controls and the balance of the system. The clutch control system is self-adjusting and pedal motion is transmitted by cable to the clutch release lever.

NOTE: After proper installation of the cable, adjustment is completed by pulling the clutch pedal to its upmost position with 44N (10 lb) of force.

With the pedal in the upmost position, the pawl is free of the quadrant and the quadrant position is governed by the position of the clutch release fingers; the quadrant being free to rotate independent of the pedal. The adjuster load spring force ensures contact between the release bearing and the fingers. As the disc facing wears, the fingers are gradually moved away from the flywheel and this movement is translated to the quadrant, adjusting the quadrant position relative to the pedal, when the pawl is free of the quadrant.

During normal running position, the pawl is engaged with the quadrant, locking it to the pedal. For the rest of the pedal travel, the system works as a conventional system; the pedal motion being transmitted to the release fingers. The quadrant remains locked to the pedal during pedal movement. Since the release bearing in this system is constant-running, transaxle neutral rollover noise can be detected as such only by disengaging the release bearing from the clutch release fingers.

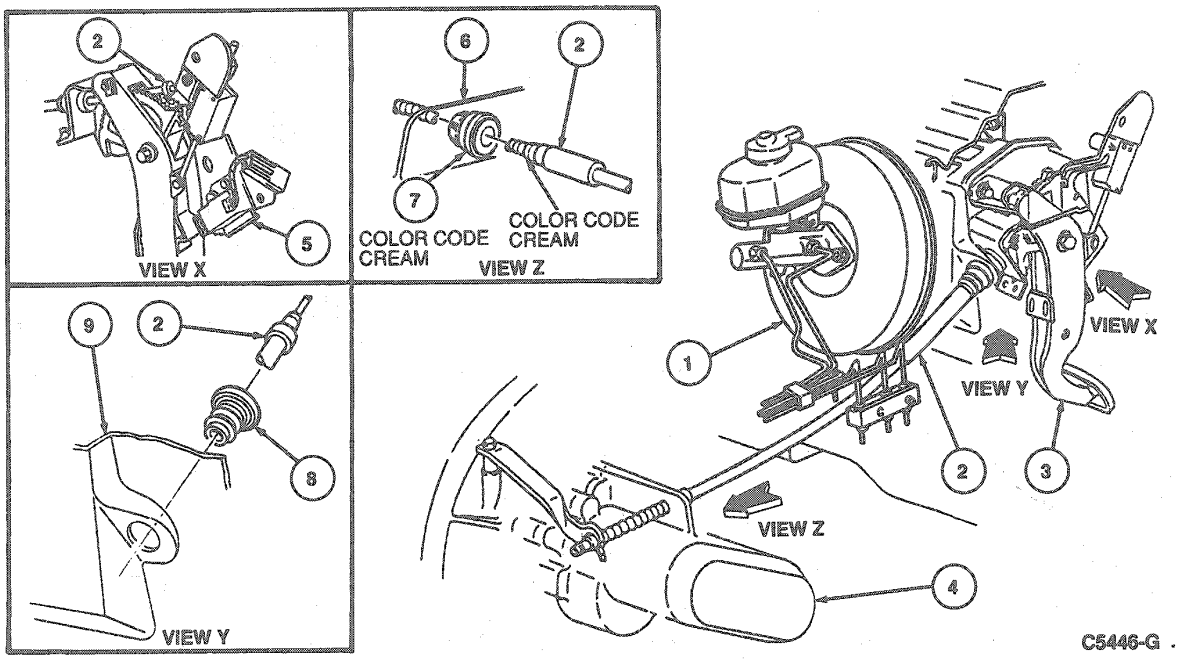
NOTE: Lift clutch pedal to the upmost position when connecting or disconnecting the clutch cable.

This is best accomplished by disconnecting the cable from the release lever and moving the lever away from the cable. If neutral noise is evident under this condition, it is coming from the transaxle.

Noise associated with the release bearing and clutch system will be evident during all or some portion of pedal travel.

The clutch is a Belleville spring-type pressure plate and a multi-stage dampered disc using a self-centering, constant-running release bearing.

DESCRIPTION AND OPERATION (Continued)



Item	Part Number	Description
1	2B195	Brake Booster
2	7K553	Clutch Cable Assy
3	7B633	Clutch Pedal Assy
4	—	Transaxle

(Continued)

Item	Part Number	Description
5	11A152	Switch Assy
6	—	Transaxle Rib
7	7C511	Insulator
8	N804705-S	Dash Panel Grommet
9	—	Dash Panel

Starter/Clutch Interlock Switch

The starter/clutch interlock switch is designed to prevent starting the engine unless the clutch pedal is fully depressed. The switch is connected between the ignition switch and the starter motor relay coil and maintains an open circuit with the clutch pedal up (clutch engaged).

The switch is designed to automatically self-adjust the first time the clutch pedal is pressed to the floor. The self-adjuster consists of a two-piece clip snapped together over a serrated rod. When the plunger or rod is extended, the clip bottoms out on the switch body and allows the rod to ratchet over the serrations to a position determined by the clutch pedal travel. In this way, the switch is set to close the starter circuit when the clutch pedal is pressed all the way to the floor (clutch disengaged).

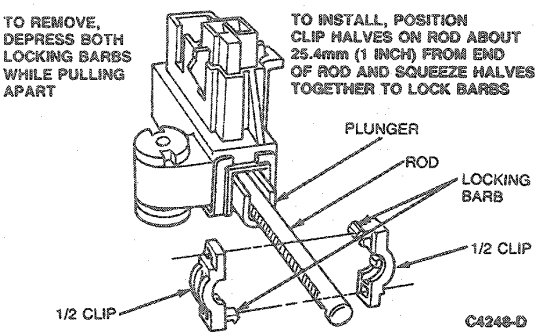
TESTING

Starter/Clutch Interlock Switch Continuity

1. Remove panel above clutch pedal.
2. Disengage wiring connector by flexing retaining tab on switch and withdrawing connector.
3. Using a test lamp or continuity tester, check to see that switch is open with clutch pedal up (clutch engaged), and closed at approximately 25.4mm (1 inch) from clutch pedal full-down position (clutch disengaged).
4. If switch does not operate as in Step 2, check if self-adjusting clip is out of position on rod. It should be near end of rod.
5. If self-adjusting clip is out of position, remove and reposition clip to about 25.4mm (1 inch) from end of rod.
6. Reset switch by pressing clutch pedal to floor.
7. Repeat Step 3. If switch is damaged or clips do not remain in place, replace switch.

TESTING (Continued)

8. Install panel above clutch pedal.



DIAGNOSIS

Refer to the following diagnosis charts to service the clutch linkage.

CLUTCH DIAGNOSIS

CONDITION	POSSIBLE SOURCE	ACTION
• Clutch Does Not Disengage Properly or Gears Clash While Shifting	• Improper clutch pedal travel. • Pawl does not fully engage due to missing, damaged, or weak pawl spring. • Improper clutch cable installed. • Damaged rubber insulators. • Loose pedal support attachments. • Carpet, sound deadener out of position. • Floor mats interfering with pedal travel. • Pawl binding due to entrapped sound absorber. • Damaged components inside of clutch housing. • External linkage worn or damaged. • Improper clutch cable routing.	• Install new spring. • Install correct cable. • Correct insulators. • Loosen and retighten to specifications. • Position correctly. • Reposition floor mats. • Remove contamination and free up pawl. • Replace or service. Refer to Section 08-01. • Service or replace linkage parts as required. • Route clutch cable inboard and under brake tubes.
• Pedal Makes Racheting Noise While Traveling To or From Floor	• Teeth stripped on pawl or quadrant.	• Replace quadrant, pawl and pawl spring.
• Pedal Travels To Floor With No Effort or Noise	• Pawl does not engage quadrant due to missing spring. • Broken clutch cable. • Damaged or loose components inside of clutch housing.	• Install spring. • Replace clutch cable. • Replace or service. Refer to Section 08-01.
• Clutch Squeaks or Scrubs When the Pedal is in Motion—Noise Originating in Engine Compartment	• Clutch release linkage and/or cable—lack of lubrication, binding, interference, worn or kinked. • Lack of lubrication on the clutch release lever to release bearing contact. • Lack of lubricant in the clutch release bearing bore and the release bearing guide. • Flywheel housing out of alignment. • Damaged release bearing.	• Lubricate with Premium Long-Life Grease XG-1-C (ESA-M1C75-B) or equivalent. Service as required. • Remove transaxle and release bearing. Lubricate with Premium Long-Life Grease XG-1-C (ESA-M1C75-B) or equivalent, accordingly. • Lubricate with Premium Long-Life Grease XG-1-C (ESA-M1C75-B) or equivalent, accordingly. • Replace or service. Refer to Section 08-01.

DIAGNOSIS (Continued)

CLUTCH DIAGNOSIS (Continued)

CONDITION	POSSIBLE SOURCE	ACTION
• Excessive Pedal Effort	• Damaged or worn cable.	• Inspect cable. Replace if kinked or crushed.
		• Disconnect cable from release lever. Check for smooth operation or binding. Replace if operation is erratic.
	• Clutch pedal binding.	• Disconnect cable from release lever. Check for free pedal movement and free up as required.
	• Clutch release lever binding.	• Inspect and service. Refer to Section 08-01.
	• Clutch disc worn or pressure plate damaged. Loose pressure plate bolts.	• Replace or service. Refer to Section 08-01.
• Noise When Clutch Pedal is Depressed	• Check clutch interlock switch.	• Inspect interlock switch activating rod for binding or excessive noise. Replace switch if necessary.
	• Noisy clutch speed control switches.	• Check speed control switch if required.
	• Insufficient or dirty lubrication on clutch pivot sleeve.	• Clean and lubricate clutch pivot sleeve with Premium Long-Life Grease XG-1-C (ESA-M1C75-B) or equivalent.
• Vehicle Will Not Start With Clutch Pedal Fully Depressed	• Clutch interlock switch improperly adjusted.	• Reposition self-adjusting clip or rod on press and release clutch pedal.
	• Clutch interlock switch damaged.	• Perform continuity test. Replace switch if necessary.
	• Starter, wiring or battery damaged.	• Refer to Section 10-03 and / or Section 14-01.

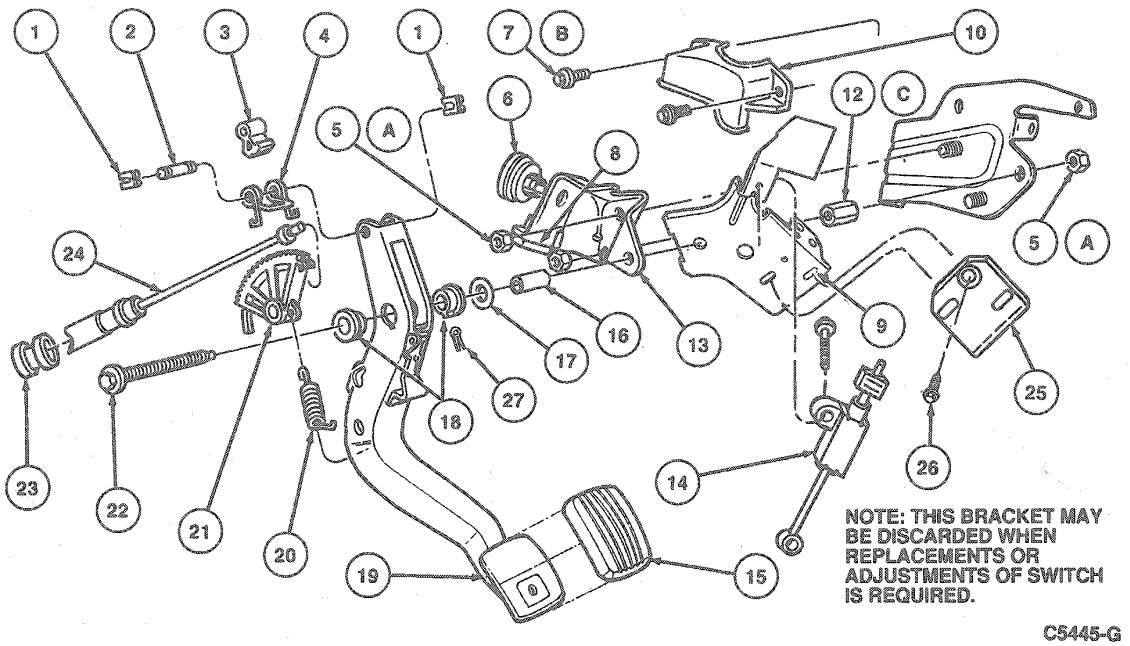
TC9689C

REMOVAL AND INSTALLATION

Clutch Pedal Quadrant and Pawl Assembly

Refer to the following illustration while performing the Removal and Installation procedures for the Clutch Pedal Assembly.

REMOVAL AND INSTALLATION (Continued)



Item	Part Number	Description
1	N801406-S2	Retaining Clip (2 Req'd)
2	7L586	Pin
3	7L584	Pawl
4	7L585	Pawl Tension Spring
5A	382802-S2	Nut (3 Req'd)
6	7C511	Isolator
7B	N601957	Screw (2 Req'd)
8	7B520	Stop
9	9D816	Speed Control Release Switch Mounting Bracket
10	7C521	Shield
11	7B517	Clutch Mounting Plate
12C	390387-S36D	Spacer Nut
13	7K607	Clutch Pedal Stop Bracket
14	11A152	Switch
15	2457	Pad
16	N803233-S	Pivot Sleeve

(Continued)

Item	Part Number	Description
17	7512	Spring Washer
18	7A578	Pivot Bushings (2 Req'd)
19	7519	Clutch Pedal
20	7K576	Gear Quadrant Tension Spring
21	7L583	Gear Quadrant
22	57110-S2	Pivot Bolt
23	N804705-S	Dash Panel Grommet
24	7K553	Clutch Cable
25	—	Bracket
26	N803509-S2	Bolt
27	74273-S2	Clip
A		Tighten to 20-34 N·m (15-25 Lb-Ft)
B		Tighten to 8-12 N·m (71-106 Lb-In)
C		Tighten to 28-45 N·m (21-33 Lb-Ft)

Removal

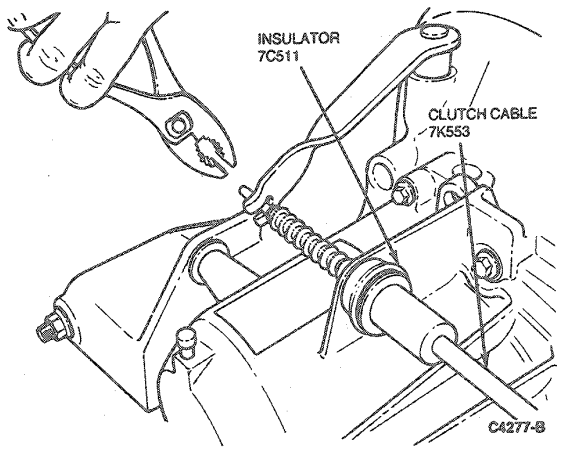
1. Disconnect battery ground cable.
2. Unlatch fuse panel.
3. Position clutch shield away from mounting plate bracket by removing rear retaining screw. Loosen front retaining screw located near toe board, and rotate shield out of way. Secure by snugging up front screw. (Rear retaining screw is nearest instrument panel.)

   CAUTION: Do not allow quadrant to snap back.

REMOVAL AND INSTALLATION (Continued)

4. Lift up on clutch pedal to release pawl and rotate gear quadrant forward and unhook cable from quadrant. Allow gear quadrant to swing rearward.
5. Prop up clutch pedal to lift pawl free of quadrant which is part of self-adjuster mechanism.
6. Remove air cleaner assembly to gain access to clutch cable.

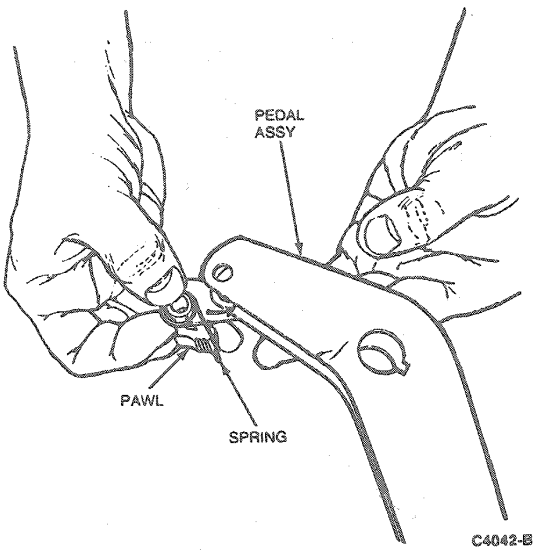
   NOTE: Do not grasp the wire strand portion of inner cable since this may cut the wires and result in cable failure.
7. Grasp extended tip of clutch cable with a pair of pliers, and unhook clutch cable from release lever.



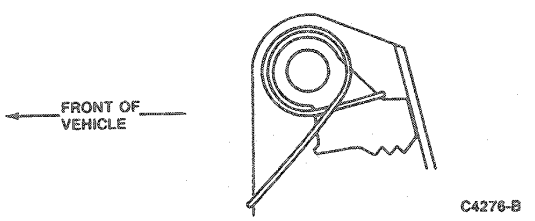
8. Pull cable out through recess between pedal and gear quadrant.
9. Unseat cable from insulator at clutch pedal stop bracket.
10. Disconnect clutch switches.
11. Remove clutch pedal mounting plate and clutch pedal assembly from brake pedal support by removing two nuts from brake booster studs and two screws from pedal support.
12. Remove three nuts retaining clutch pedal stop bracket to clutch pedal mounting plate and remove pedal.
13. Disconnect quadrant tension spring from the pedal. Remove spacer nut and pivot bolt from the clutch pedal and pivot sleeve. Remove spring washer, two bushings, pivot sleeve and gear quadrant.
14. Remove pawl pivot pin retaining clip, pawl pivot pin, pawl tension spring and pawl.

Installation

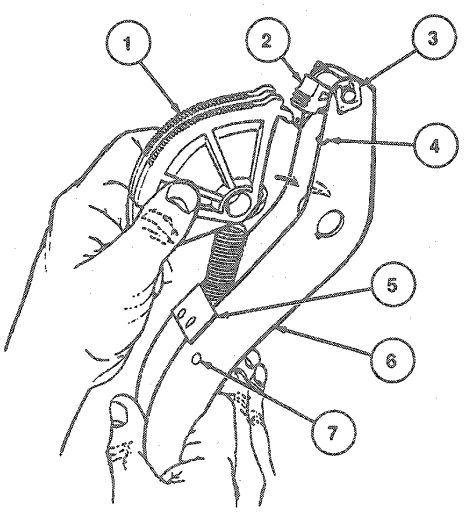
1. Lubricate quadrant pivot bore, pawl pivot bore, quadrant pivot pin and quadrant pivot sleeve with Premium Long-Life Grease XG-1-C (ESA-M1C75-B) or equivalent.
2. Insert pawl, spring and pivot pin into clutch pedal, and secure with retainer clip.



Note proper position of the pawl spring and pawl.



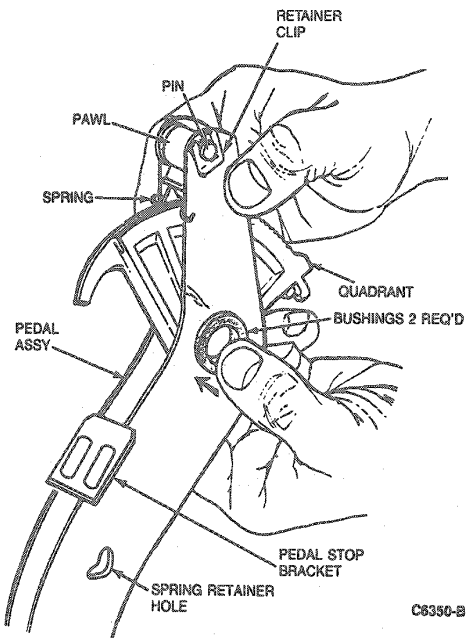
3. Connect gear quadrant spring to gear quadrant. Note direction of hook on free end of spring.



REMOVAL AND INSTALLATION (Continued)

Item	Part Number	Description
1	7L583	Gear Quadrant
2	7L585	Pawl
3	N801406-S2	Retainer (2 Req'd)
4	7K576	Spring
5	—	Pedal Stop Bracket
6	7B633	Pedal Assy
7	—	Spring Retainer Hole

4. Feed gear quadrant tension spring into pedal. Rotate gear quadrant and place pawl on gear quadrant face.
5. Install two bushings and pivot sleeve into clutch pedal.



6. Hook tension spring to hole in clutch pedal.

   NOTE: Ensure spring washer is functional and is not trapped under the pivot sleeve.
7. Place bolt through pivot sleeve. Position spring washer, stop mounting bracket and install switch plate and pivot bolt nut. Tighten to 34-40 N·m (26-29 lb-ft).
8. Position clutch pedal assembly on clutch mounting plate and install three nuts. Tighten to 20-34 N·m (15-25 lb-ft).
9. Secure clutch pedal assembly and mounting plate to brake booster studs and brake pedal support.
10. With the gear quadrant at the window stop position, pull clutch cable through insulator, clutch pedal stop bracket and the recess between pedal and gear quadrant. Rotate gear quadrant forward by lifting up on clutch pedal to release pawl, and hook cable into gear quadrant.
11. Secure clutch shield to clutch mounting plate. Tighten to 8-12 N·m (71-106 lb-in).
12. Install clutch switches and adjust as outlined in Section 10-03.
13. Using a piece of wire, cord, tape or similar device, secure clutch pedal in its upmost position to ensure pawl is disengaged from quadrant.
14. Hook clutch cable into release lever in engine compartment.
15. Remove device used to secure clutch pedal up against stop in Step 13.
16. Reposition fuse panel.
17. Adjust clutch by depressing clutch pedal several times.
18. Install air cleaner assembly.
19. Connect battery ground cable.

Clutch Cable Assembly

CAUTION: Whenever the clutch cable is disconnected for any reason, such as transaxle removal or clutch, clutch pedal components, or clutch cable replacement, it is imperative that the proper method for installing the clutch cable be followed. Improper installation may damage components or cause system failure.

Removal

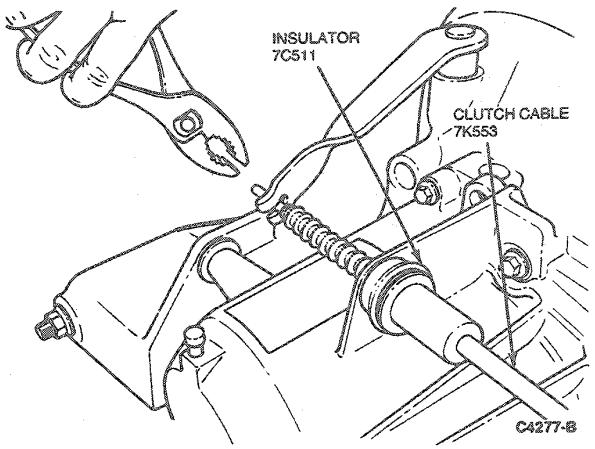
1. Disconnect battery ground cable.
2. Position clutch shield away from mounting plate bracket by removing rear retaining screw. Loosen front retaining screw located near toe board, and rotate shield out of way. Secure by snugging up front screw. (Rear retaining screw is nearest instrument panel.)

   CAUTION: Do not allow quadrant to snap back.
3. With clutch pedal lifted up to release pawl, rotate gear quadrant forward. Unhook clutch cable from gear quadrant. Allow quadrant to swing rearward.
4. Prop up clutch pedal to lift pawl free of quadrant which is part of self-adjuster mechanism.
5. Remove air cleaner assembly to gain access to clutch cable.

   NOTE: Do not grasp wire strand portion of inner cable since this may cut wires and result in cable failure.

REMOVAL AND INSTALLATION (Continued)

6. Grasp the extended tip of the clutch cable with a pair of pliers and unhook clutch cable from clutch bearing release lever.



7. Disconnect cable from insulator that is located on the rib of transaxle.
8. Pull cable out through recess between clutch pedal and gear quadrant, and from insulator on pedal assembly.
9. Withdraw cable through engine compartment.

Installation

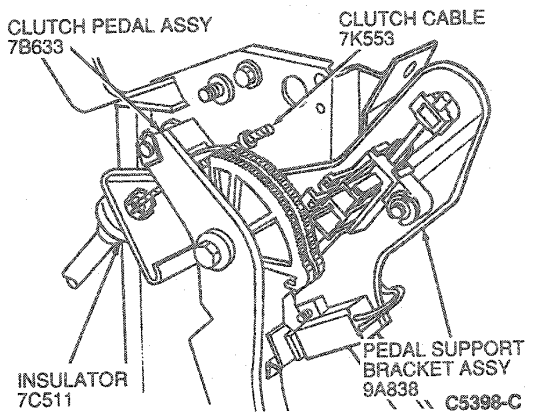
CAUTION: The clutch pedal must be lifted to disengage the adjusting mechanism during cable installation. Failure to do so will result in damage to the self-adjuster mechanism.

CAUTION: Under no circumstances should a prying instrument such as a screwdriver or a pry bar be used to install the cable into the quadrant. Damage to quadrant may result.

NOTE: If the clutch pedal assembly was removed, the cable may be installed through the passenger compartment.

1. Insert clutch cable assembly from engine or passenger compartment through dash panel and dash panel grommet.

   NOTE: Ensure cable is routed inboard of the brake lines and not trapped at the spring tower by the brake lines.
2. With the gear quadrant at the window stop position, push clutch cable through insulator on stop bracket, and through recess between pedal and gear quadrant.



3. With clutch pedal lifted up to release pawl, rotate gear quadrant forward. Hook cable into gear quadrant.
4. Secure clutch shield on clutch mounting plate.
5. Secure pedal in upmost position using a piece of wire, cord, tape or similar device.
6. Install clutch cable in insulator on rib of transaxle.
7. Hook cable into clutch release lever in engine compartment.
8. Remove device used to temporarily secure pedal against its stop.
9. Adjust clutch by depressing clutch pedal several times.
10. Install air cleaner.
11. Connect battery ground cable.

Starter/Clutch Interlock Switch

Removal

1. Disconnect wiring connector.
2. Remove clutch interlock retaining screw and clip, then remove switch.

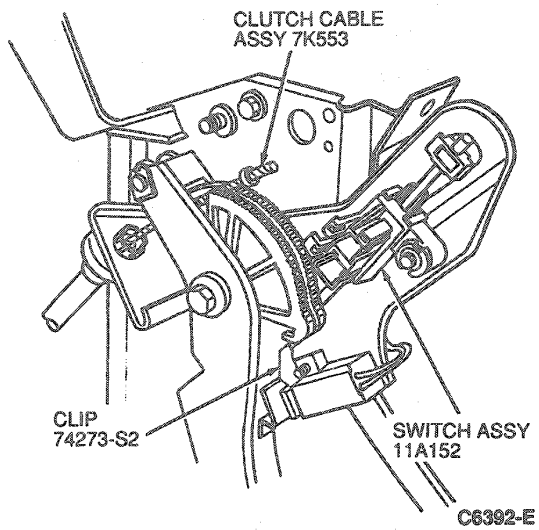
Installation

NOTE: Always install the switch with the self-adjusting clip about 25.4mm (1 inch) from the end of the rod. The clutch pedal must be fully up (clutch engaged), otherwise the switch may be misadjusted.

1. Insert eyelet end of rod over pin on clutch pedal and secure with clip.
2. Align mounting boss with corresponding hole in bracket and install screw. Tighten to 9-13 N·m (80-115 lb-in).
3. Reset clutch interlock switch by pressing clutch pedal to floor.

REMOVAL AND INSTALLATION (Continued)

4. Connect wiring connector.



SPECIFICATIONS

TORQUE SPECIFICATIONS

Description	N·m	Lb-Ft
Pedal Assembly to Brake Support Bracket Nuts	20-34	15-25
Stop Mounting Bracket to Clutch Pedal Assembly	34-40	26-29
Clutch Shield to Clutch Mounting Plate Bolts	8-12	71-106 (Lb-In)
Clutch Spacer Nut to Pivot Bolt	28-45	21-33
Interlock Switch to Bracket Screw	9-13	80-115 (Lb-In)

GROUP

EXHAUST SYSTEM 09

(5000)

SECTION 09-00 Exhaust System

SUBJECT	PAGE
DESCRIPTION	
Exhaust Shields	09-00-2
GENERAL INFORMATION	09-00-1
REMOVAL AND INSTALLATION	
3.0L Multiport Fuel Injection (MFI), 3.0L SHO and 3.8L Police Engines	09-00-2
REMOVAL AND INSTALLATION (Cont'd.)	
3.8L Multiport Fuel Injection (MFI) and 3.2L SHO	09-00-3
SPECIFICATIONS	09-00-11
VEHICLE APPLICATION	09-00-1

VEHICLE APPLICATION

Taurus / Sable and Taurus SHO.

GENERAL INFORMATION

This Section covers the general exhaust system, adjustments and service procedures. Always refer to the Master Parts catalog for parts usage and interchangeability before replacing a component part of the exhaust system.

The exhaust system must be free of leaks, binding, grounding and excessive vibrations. These conditions are usually caused by loose, broken or misaligned clamps, shields, brackets or pipes. If any of these conditions exist, check the exhaust system components and alignment. Adjust or replace, as necessary, to maintain the specified clearances (refer to the illustrations in this Section). Brackets, clamps and insulators should be replaced if they are damaged or badly corroded. Do not attempt to service these parts.

Inspect the inlet pipe(s), outlet pipe(s), catalytic converters and muffler for cracked joints, broken welds, and corrosion damage that would result in a leaking exhaust system. Inspect the clamps, brackets, and insulators for cracks and stripped or badly corroded bolt threads.

When pipe clamp(s) is loosened and / or removed to replace a pipe, muffler or resonator, replace the clamp(s).

DESCRIPTION

The 3.0L 49 States and Canada engine is equipped with a single resonator, single muffler, single catalytic converter and interconnecting pipes.

The 3.0L California and 3.0L FF Vehicle engines are equipped with a two can catalytic converter, a single resonator, single muffler and interconnecting pipes.

The 3.0L and 3.2L SHO engine uses a two can catalytic converter, a single resonator and dual mufflers.

The 3.8L engine is equipped with a muffler and resonator plus a two can catalytic converter system and interconnecting pipes.

DESCRIPTION (Continued)

The 3.8L Police Package uses a two can catalytic converter, a single resonator and dual mufflers.

The production exhaust system shown differs from the service replacement system in the number of basic pieces used.

WARNING: THE NORMAL OPERATING TEMPERATURE OF THE EXHAUST SYSTEM IS VERY HIGH. NEVER ATTEMPT TO SERVICE ANY PART OF THE SYSTEM UNTIL IT HAS COOLED. BE ESPECIALLY CAREFUL WHEN WORKING AROUND THE CATALYTIC CONVERTER. THE TEMPERATURE OF THE CONVERTER RISES TO A HIGH LEVEL AFTER ONLY A FEW MINUTES OF ENGINE OPERATION.

Exhaust Shields

Service and/or Replacement

Exhaust shields, consisting of formed metal sheets, attach to the exhaust system or the catalytic converter using various methods. Exhaust shields are not subject to service other than replacing missing or damaged attaching parts such as clamps or screws, and removing debris that may collect in the shield area. If an exhaust shield is damaged or shows evidence of deterioration, it must be replaced rather than serviced.

The catalyst welded shields are to be replaced with clamp-on service shields.

Removal and installation procedures are, in most cases, a matter of removing the shield attachments and shield. Installation is the reverse process, using new parts. The illustrations indicate the types and proper positioning of exhaust shields and clamps.

REMOVAL AND INSTALLATION

WARNING: THE NORMAL OPERATING TEMPERATURE OF THE EXHAUST SYSTEM IS VERY HIGH. NEVER WORK AROUND OR ATTEMPT TO SERVICE ANY PART OF THE EXHAUST SYSTEM UNTIL IT HAS COOLED. USE SPECIAL CARE WHEN WORKING AROUND THE CATALYTIC CONVERTER. THESE UNITS HEAT TO A HIGH TEMPERATURE AFTER ONLY A SHORT PERIOD OF ENGINE OPERATION.

Typical factory-installed exhaust systems are shown in the illustrations.

Vehicle	Sedan	Station Wagon	Number of Converter Cans	49S	Can.	Cal.	Alt.
Taurus/Sable 3.0L MFI (49 States)	X	X	1	X	X		X
Taurus 3.0L/3.2L SHO	X		2	X	X	X	X
Taurus/Sable 3.8L MFI	X	X	2	X	X	X	X
Taurus/Sable 3.8L Police	X		2	X	X	X	X
Taurus/Sable 3.0L MFI-Calif	X	X	2			X	
Taurus/Sable 3.0 MFI Flexible Fuel (FF)	X		2	X	X	X	X

3.0L Multiport Fuel Injection (MFI), 3.0L SHO and 3.8L Police Engines

Resonator Assembly

Removal

1. Raise vehicle. Refer to Section 00-02.
2. Remove front resonator flange fasteners at flex joint and discard flex joint gasket. Loosen rear U-bolt connection.
3. Separate resonator inlet and outlet connections.
4. Remove resonator.

REMOVAL AND INSTALLATION (Continued)

Installation

1. Loosely install resonator to muffler.
2. Install new flex joint gasket.
3. Install resonator and muffler assembly to converter outlet flex joint.
4. Align exhaust system to specification. Ensure muffler and resonator are fully engaged. Tighten all nuts and bolts, starting at front of system, to specification. Refer to Exhaust illustration.
5. Check system for leaks and lower vehicle.

Muffler Assembly

Removal

1. Raise vehicle. Refer to Section 00-02.
2. Remove U-bolt assembly and rubber insulators from hanger brackets and remove muffler assembly. Slide muffler assembly rearward to disconnect it from resonator.
3. Replace any damaged parts.

Installation

1. Position muffler assembly and slide it onto resonator outlet pipe. Check to ensure slot in muffler and tab on resonator are fully engaged.
2. Install rubber insulators on hanger assemblies and install and tighten U-bolt to 34-46 N·m (26-33 lb-ft). Refer to illustration.
3. Check system for leaks and lower vehicle.

Catalytic Converter, Under Engine Oil Pan

Removal

1. Raise vehicle. Refer to Section 00-02.
2. Remove front and rear catalytic converter flange fasteners from exhaust manifolds and nut and bolt attachments at transmission.
3. Remove bolt and nut retainers at transmission case.
4. Remove two remaining nuts and bolts from catalytic converter outlet connection. Discard flex joint gasket.
5. Remove converter.

Installation

1. Loosely install converter to manifold connection.
2. Install bolt and nut retainers to converter and transmission.
3. Install new flex joint gasket.
4. Install converter to resonator assembly.
5. Align exhaust system to specification. Starting at front of system, tighten all nuts and bolts to specification. Refer to illustration.
6. Check system for leaks and lower vehicle.

3.8L Multiport Fuel Injection (MFI) and 3.2L SHO

Muffler and Resonator Assembly

Removal

1. Raise vehicle. Refer to Section 00-02.
2. Remove U-bolt assembly and rubber insulators from hanger brackets.
3. Slide assembly rearward to disconnect from flexible pipe.
4. Remove muffler and resonator assembly.

Installation

1. Position muffler and resonator assembly and slide forward onto flexible pipe outlet.
2. Install rubber insulators on hanger assemblies.
3. Install U-bolt and tighten to 34-46 N·m (26-33 lb-ft). Refer to illustration.
4. Check system for leaks and lower vehicle.

Catalytic Converter, Engine Compartment

Removal

1. Raise vehicle. Refer to Section 00-02.
2. Remove front and rear catalytic converter flange retaining nuts from exhaust manifold.
3. Remove bolt and nut retainers at transmission.
4. Remove two retaining nuts and bolts connecting catalytic converter to flexible pipe and discard flat gasket.
5. Remove catalytic converter.

Installation

1. Install converter to manifold connections.
2. Install bolt at transmission case.
3. Install nut at transmission case.
4. Install new flat gasket.
5. Install converter to flexible pipe.
6. Align exhaust system to specification. Starting at front of system, tighten all nuts and bolts to specification. Refer to illustration.
7. Check system for leaks and lower vehicle.

Flexible Pipe

Removal

1. Raise vehicle. Refer to Section 00-02.
2. Remove two retaining nuts and bolts that connect the flexible pipe to the catalytic converter flange. Remove and discard gasket.
3. Loosen U-bolt connection and slide flexible pipe from muffler / resonator inlet pipe.

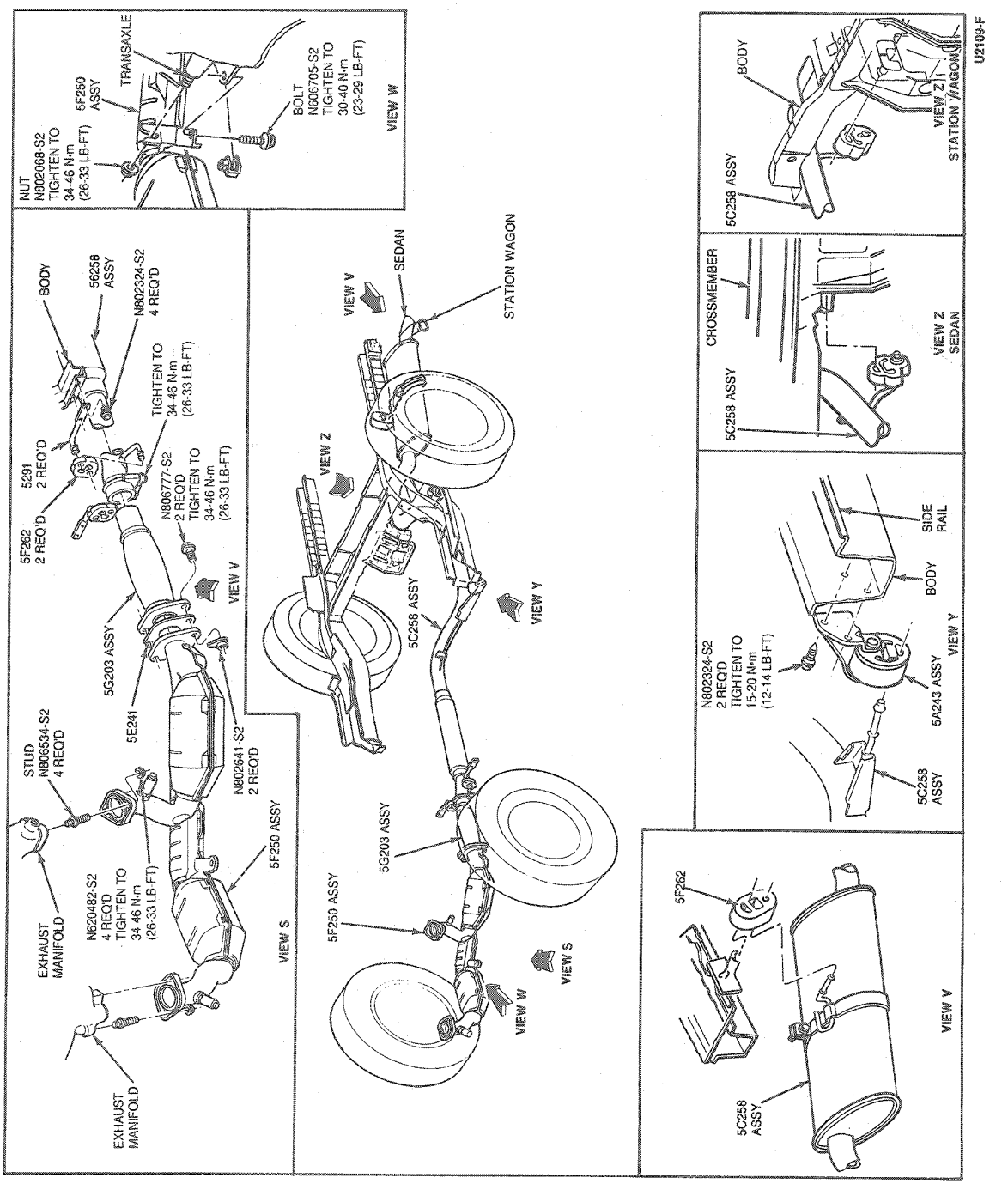
Installation

1. Install flexible pipe into muffler / resonator inlet pipe.
2. Install new gasket.
3. Install retaining nuts and bolts to flexible pipe and converter flange.

REMOVAL AND INSTALLATION (Continued)

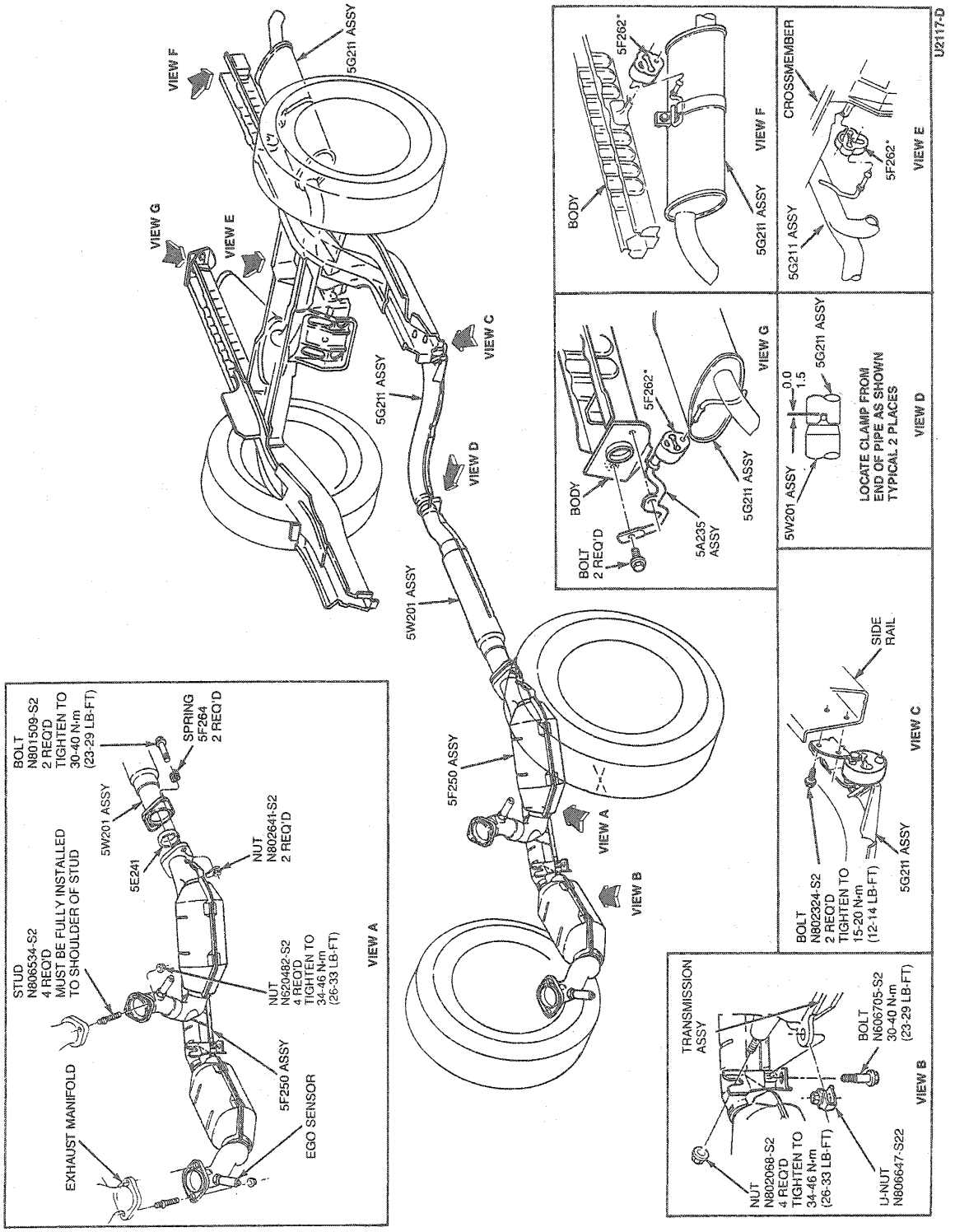
4. Position U-bolt. Tighten to 34-46 N·m (26-33 lb-ft).
5. Check system for leaks and lower vehicle.

3.8L MFI



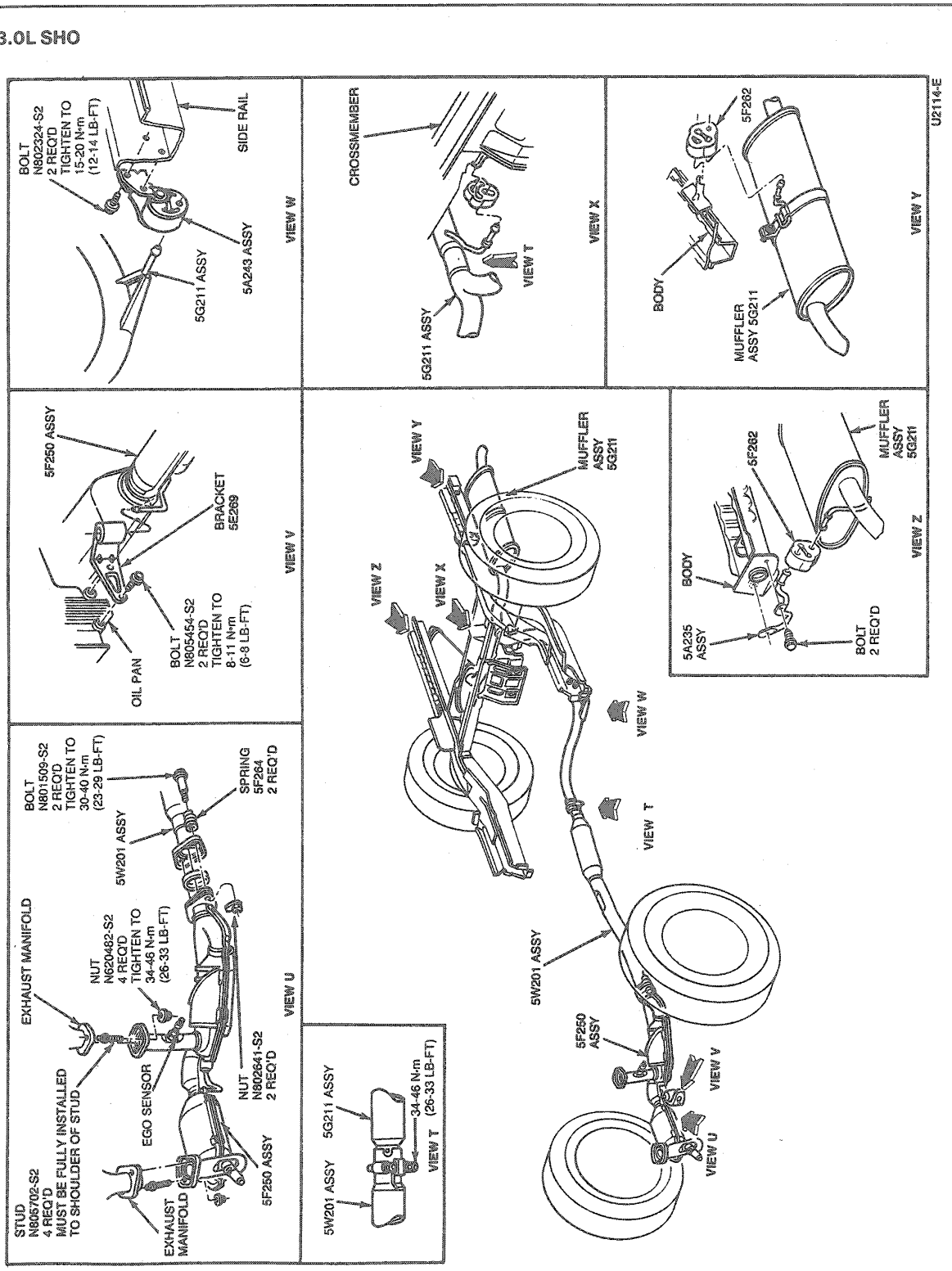
REMOVAL AND INSTALLATION (Continued)

3.8L Police Sedan



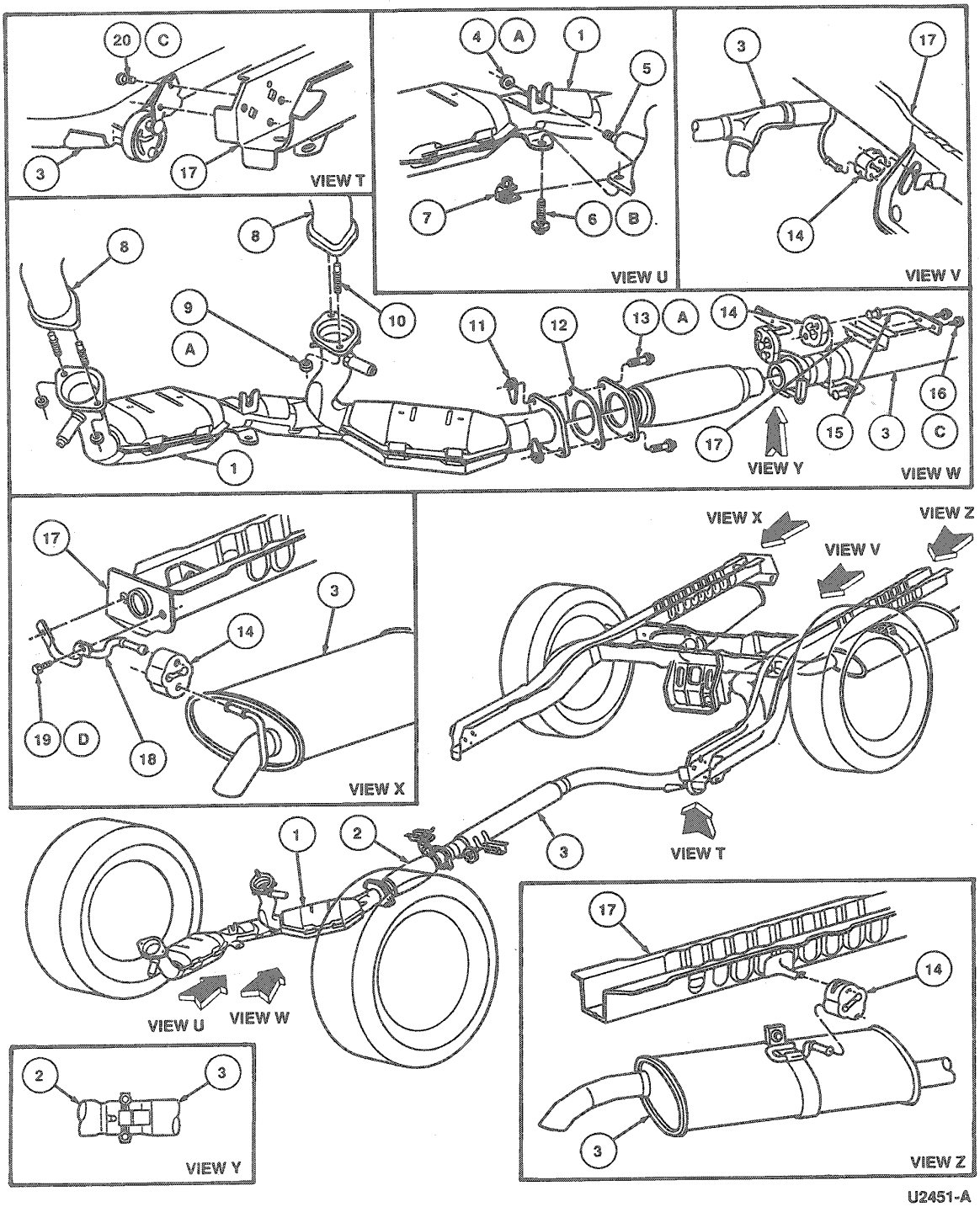
REMOVAL AND INSTALLATION (Continued)

3.0L SHO



REMOVAL AND INSTALLATION (Continued)

3.2L SHO



U2451-A

REMOVAL AND INSTALLATION (Continued)

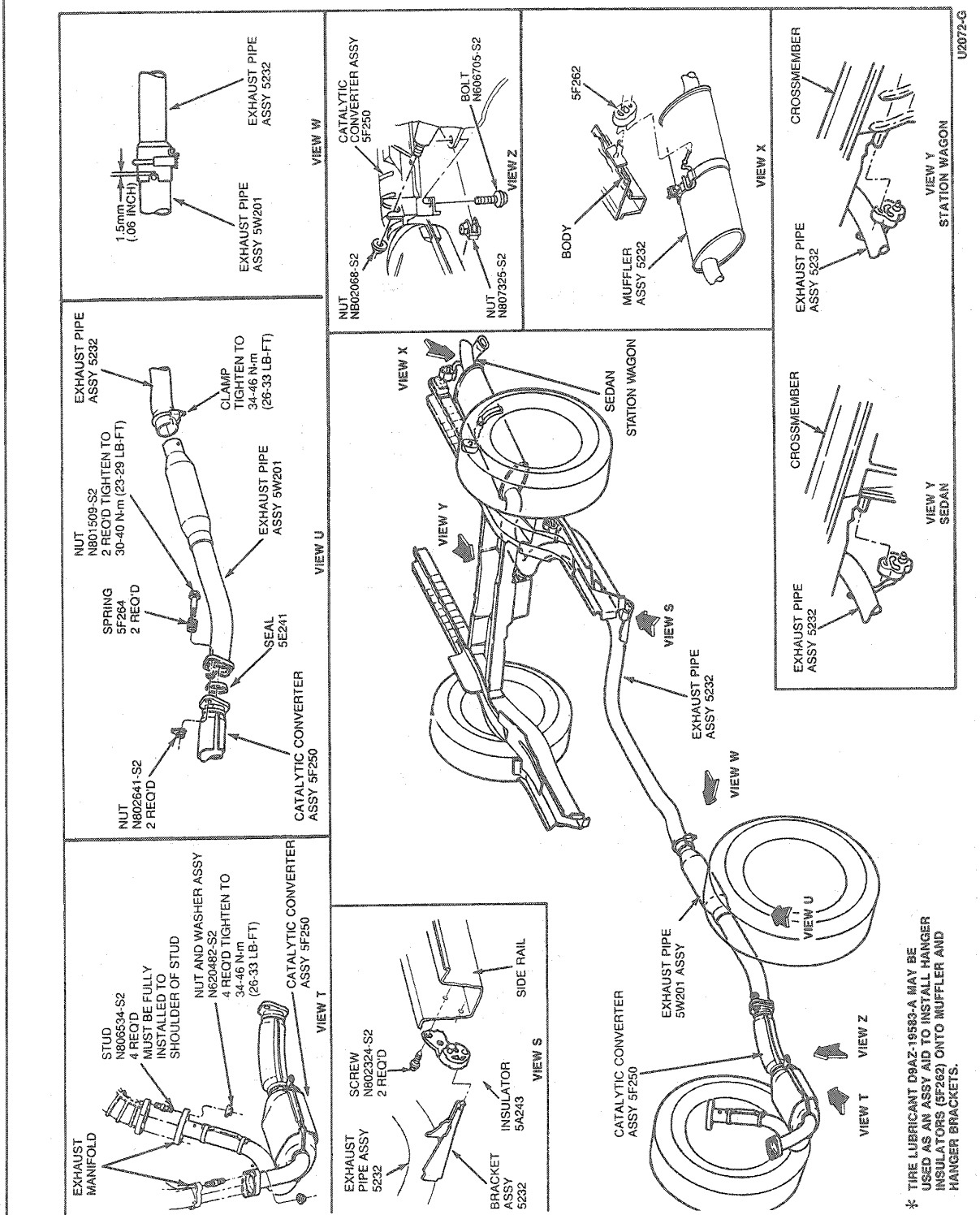
Item	Part Number	Description
1	5G250	Converter and Pipe Assy
2	5G203	Resonator
3	5G213	Exhaust and Muffler Assy
4A	N802068-S2	Nut
5	—	Transmission Mounting Stud
6B	N606705-S2	Bolt
7	N807325-S2	Nut
8	—	Exhaust Manifold
9A	N620482-S2	Nut (4 Req'd)
10	N806534-S	Stud (4 Req'd)
11	N802641-S2	Nut (2 Req'd)
12	5E241	Gasket
13A	N806777-S2	Bolt (2 Req'd)

(Continued)

Item	Part Number	Description
14	5F262	Insulator Hanger
15	5291	Bracket
16C	N802324-S2	Bolt (4 Req'd)
17	—	Body
18	5A235	Bracket
19D	N606703-S2	Bolt (2 Req'd)
20C	N802324-S2	Bolt (2 Req'd)
A		Tighten to 34-46 N·m (26-33 Lb-Ft)
B		Tighten to 29.7-40.3 N·m (22-30 Lb-Ft)
C		Tighten to 14.8-20.2 N·m (11-15 Lb-Ft)
D		Tighten to 35-55 N·m (24-41 Lb-Ft)

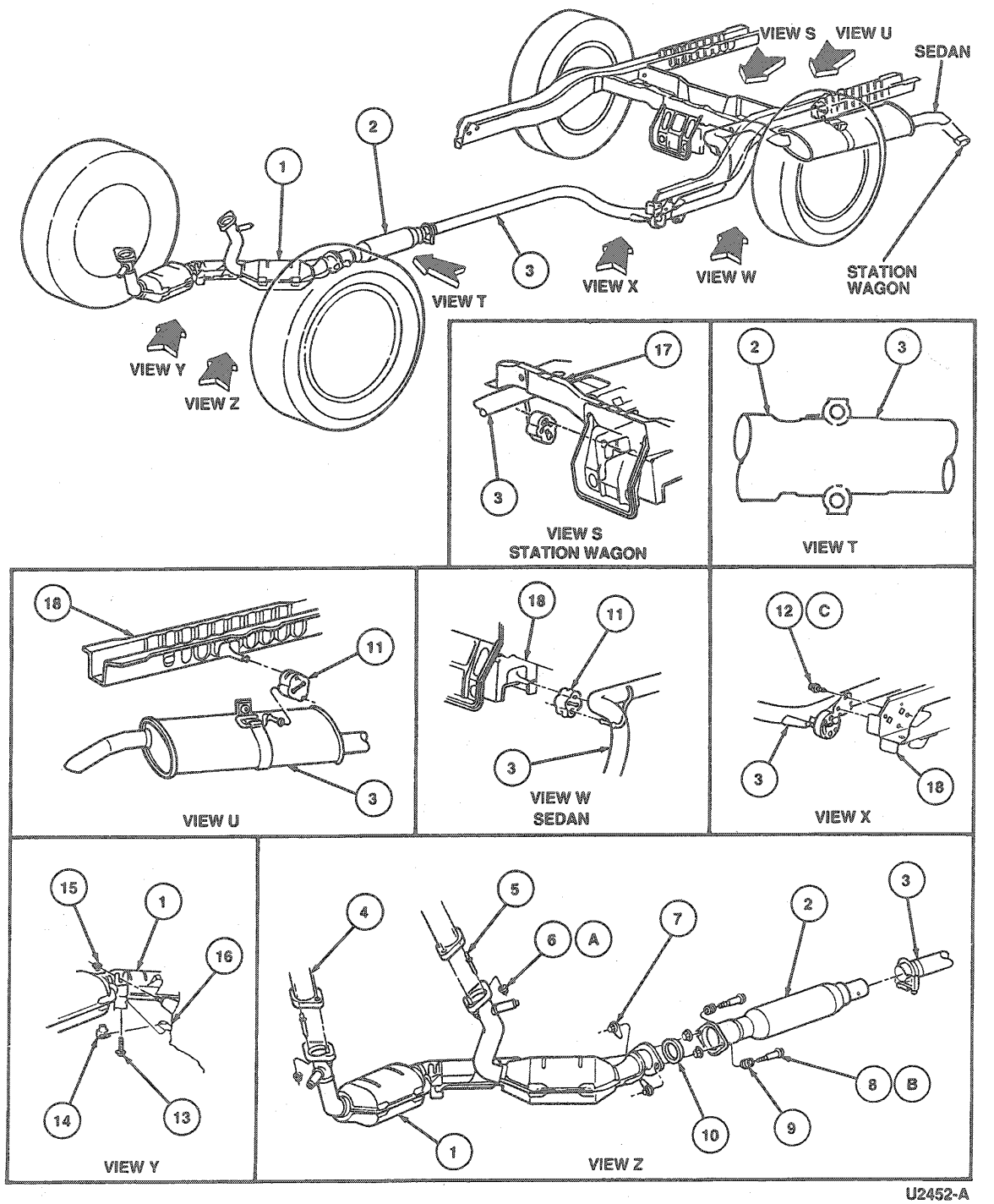
REMOVAL AND INSTALLATION (Continued)

3.0L MFI (49 States)



REMOVAL AND INSTALLATION (Continued)

3.0L MFI California Only



REMOVAL AND INSTALLATION (Continued)

Item	Part Number	Description
1	5F250	Dual Converter Assy
2	5W201	Resonator
3	5232	Exhaust Pipe
4	9430	Exhaust Manifold
5	N806534-S2	Stud (4 Req'd)
6A	N620482-S2	Nut (4 Req'd)
7	N802641-S2	Nut (2 Req'd)
8B	N801509-S2	Bolt (2 Req'd)
9	5F264	Spring (2 Req'd)
10	5E264	Gasket
11	5F262	Insulator

(Continued)

Item	Part Number	Description
12C	N802324-S2	Bolt (2 Req'd)
13B	N606705-S2	Bolt
14	N807325-S2	Nut
15A	N802068-S2	Nut
16	—	Transaxle
17	—	Crossmember
18	—	Body
A		Tighten to 34-46 N·m (26-33 Lb-Ft)
B		Tighten to 30-40 N·m (23-29 Lb-Ft)
C		Tighten to 15-20 N·m (12-14 Lb-Ft)

SPECIFICATIONS

TORQUE SPECIFICATIONS

Description	N·m	Lb-Ft
Y-Pipe to Manifold Nuts	34-46	26-33
Y-Pipe to Flex Pipe (3.8L / 3.2L SHO)	34-46	26-33
Pipe to Transaxle Bolt (3.0L, 3.8L, 3.8L Police, 3.2L SHO))	30-40	23-29
Front Hanger to Body Screws	15-20	12-14
Y-Pipe to Intermediate Pipe Bolts (3.0L, 3.0L SHO, 3.8L Police)	30-40	23-29

(Continued)

TORQUE SPECIFICATIONS (Cont'd)

Description	N·m	Lb-Ft
U-Bolt	34-46	26-33
Hanger Bracket to Oil Pan Bolts (3.0L SHO)	8-11	6-8
Y-Pipe to Flexible Pipe Bolts (3.2L SHO, 3.8L)	34-46	26-33
Pipe to Transaxle Nut (3.0L, 3.8L, 3.8L Police, 3.2L SHO)	34-46	26-33

GROUP

FUEL SYSTEM 10

(9000)

SECTION TITLE	PAGE
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FUEL SYSTEM—SERVICE	10-00-1
FUEL TANK, FILTER AND ELECTRIC FUEL PUMP	10-01-1
SPEED CONTROL SYSTEM	10-03-1

SECTION 10-00 Fuel System—Service

SUBJECT	PAGE
ADJUSTMENTS	10-00-13
CLEANING AND INSPECTION	
Air Cleaner	10-00-12
Idle Air Control (IAC) Valve	10-00-13
DESCRIPTION	10-00-1
DIAGNOSIS	10-00-2
PARTS CROSS-REFERENCE	10-00-13
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VEHICLE APPLICATION	10-00-1

VEHICLE APPLICATION

Taurus / Sable.

DESCRIPTION

This Section covers diagnosis and cleaning procedures related to fuel injection for both unleaded gasoline and flexible fuel (FF) vehicles. Other emission systems related to the fuel system are covered in the Powertrain Control / Emissions Diagnosis Manual[1].

NOTE: Fuel methanol refers to a blend of fuel with a maximum of 85 percent methanol.

WARNING: DO NOT SWALLOW FUEL METHANOL. LIKE GASOLINE, IT IS HIGHLY TOXIC AND IF SWALLOWED CAN CAUSE DEATH OR PERMANENT INJURY. SWALLOWING METHANOL CAN ALSO CAUSE BLINDNESS. CALL A PHYSICIAN IMMEDIATELY TO TREAT ANYONE WHO HAS SWALLOWED FUEL METHANOL. VOMITING SHOULD BE INDUCED UNDER THE DIRECTION OF A PHYSICIAN OR POISON CONTROL CENTER. BE AWARE THAT THE ONSET OF POTENTIAL ILL HEALTH EFFECTS MAY BE DELAYED.

AVOID INHALING FUEL VAPORS. INHALING TOO MUCH FUEL METHANOL OR GASOLINE VAPOR CAN LEAD TO EYE AND RESPIRATORY TRACT IRRITATION. IN SEVERE CASES, EXCESSIVE OR PROLONGED BREATHING OF FUEL METHANOL OR GASOLINE VAPORS CAN CAUSE SERIOUS ILLNESS AND PERMANENT INJURY SUCH AS BLINDNESS.

AVOID GETTING FUEL METHANOL OR GASOLINE LIQUID IN YOUR EYES. IF YOU GET ANY FUEL METHANOL OR GASOLINE IN YOUR EYES, REMOVE CONTACT LENSES (IF WORN), FLUSH IMMEDIATELY WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES AND SEEK MEDICAL ATTENTION.

1 Can be purchased as a separate item.

DESCRIPTION (Continued)

ALLOWING FUEL METHANOL OR GASOLINE TO GET IN YOUR EYES WILL CAUSE SEVERE IRRITATION. FAILURE TO SEEK PROPER MEDICAL ATTENTION FOR FUEL METHANOL OR GASOLINE CONTACT WITH THE EYES COULD LEAD TO PERMANENT INJURY SUCH AS BLINDNESS.

IF YOU GET FUEL METHANOL OR GASOLINE ON YOUR SKIN, WASH WITH SOAP AND WATER. REPEATED OR PROLONGED SKIN CONTACT WITH METHANOL OR GASOLINE LIQUID OR VAPOR CAUSES SKIN IRRITATION. MAKE SURE YOU WASH YOUR HANDS BEFORE HANDLING FOOD.

IF YOU ARE TAKING MEDICATION FOR THE TREATMENT OF ALCOHOLISM, SUCH AS ANTABUSE OR OTHER FORMS OF DISULFIRAM, SKIN CONTACT WITH FUEL METHANOL OR BREATHING ITS VAPORS CAN CAUSE THE SAME KIND OF ADVERSE REACTION AS DRINKING ALCOHOL. IN SENSITIVE INDIVIDUALS, SERIOUS PERSONAL INJURY OR SICKNESS COULD RESULT. IF YOU ARE TAKING SUCH MEDICATION, YOU SHOULD TAKE EXTRA CARE TO AVOID SKIN CONTACT WITH FUEL METHANOL AND TO AVOID BREATHING ITS VAPORS. IF YOU DO GET FUEL METHANOL ON YOUR SKIN, WASH IT OFF IMMEDIATELY. CONSULT A PHYSICIAN PROMPTLY IF YOU EXPERIENCE AN ADVERSE REACTION.

WARNING: DO NOT MODIFY THE FUEL SYSTEM CONFIGURATION OR COMPONENTS, OR REPLACE COMPONENTS WITH PARTS NOT ESPECIALLY DESIGNED FOR USE WITH FUEL METHANOL. FORD MOTOR COMPANY HAS SPECIALLY-DESIGNED THE MATERIALS, COMPONENTS AND SYSTEM CONFIGURATION FOR METHANOL-FUELED VEHICLES AND EACH PARTICULAR SYSTEM IS PRECISELY CALIBRATED FOR EFFICIENT OPERATION. THE USE OF DIFFERENT PARTS OR MATERIALS COULD PRODUCE AN UNTESTED CONFIGURATION THAT COULD RESULT IN FIRE, PERSONAL INJURY, OR COULD CAUSE ENGINE DAMAGE.

WARNING: DO NOT OPERATE ENGINE OR SMOKE WHILE REFUELING.

CAUTION: Use only fuel methanol which meets Ford Specification ESE-M4C97-B. Use of other fuel methanol may cause powertrain damage as well as loss of vehicle performance. It will also invalidate any extended service agreement.

WARNING: IT IS IMPORTANT THAT YOUR FLEXIBLE FUEL VEHICLE BE PROPERLY MAINTAINED BY FORD FLEXIBLE FUEL TRAINED PERSONNEL. IF A PROBLEM OCCURS, IT IS IMPORTANT THAT PROPERLY TRAINED PERSONNEL DIAGNOSE THE CAUSE. IF THE PROBLEM RELATES TO THE FUEL SYSTEM, PROPER PART REPLACEMENT IS IMPERATIVE TO KEEP YOUR VEHICLE OPERATING AT NORMAL PERFORMANCE. FLEXIBLE FUEL COMPONENTS AND STANDARD FUEL COMPONENTS ARE NOT INTERCHANGEABLE AND IF YOUR VEHICLE IS NOT SERVICED IN ACCORDANCE WITH FLEXIBLE FUEL VEHICLE PROCEDURES, DAMAGE MAY OCCUR AND YOUR WARRANTY MAY BE INVALIDATED.

DIAGNOSIS

Almost any electric fuel pump (FP) (9350) malfunction that can occur will result in a loss or reduction of fuel flow and/or pressure. Loss of pressure and/or flow will be detected by a reduction of engine performance. These diagnostic procedures will concentrate on determining if the electric fuel pump is operating properly. Other diagnosis procedures will cover the analysis of other malfunctions that can cause loss or reduction of engine performance.

Refer to the Electrical and Vacuum Troubleshooting manual for detailed wiring schematics.

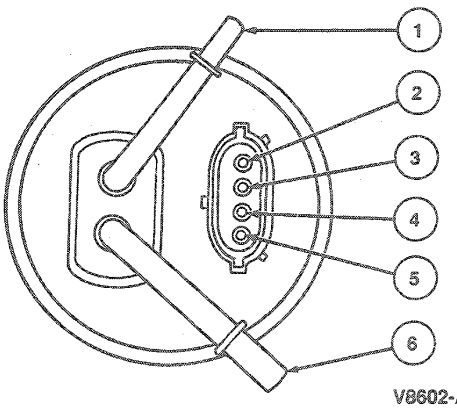
Use the diagnosis charts to determine if the electric fuel pump is operating properly.

CAUTION: At the completion of each pinpoint test step shut off fuel pump by removing ground from jumper to FP lead or by turning ignition switch to the OFF position (unless otherwise specified).

NOTE: Grounding the FP lead of test connector allows pump to run continuously when the ignition switch is in the ON position.

Fuel Pump Terminals

Except FF Vehicles

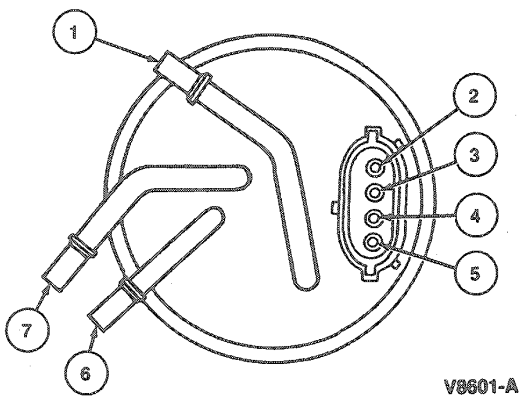


V8602-A

DIAGNOSIS (Continued)

Item	Description
1	Fuel Return
2	Sender Ground
3	Sender Positive
4	Fuel Pump Positive
5	Fuel Pump Negative
6	Fuel Supply

FF Vehicles



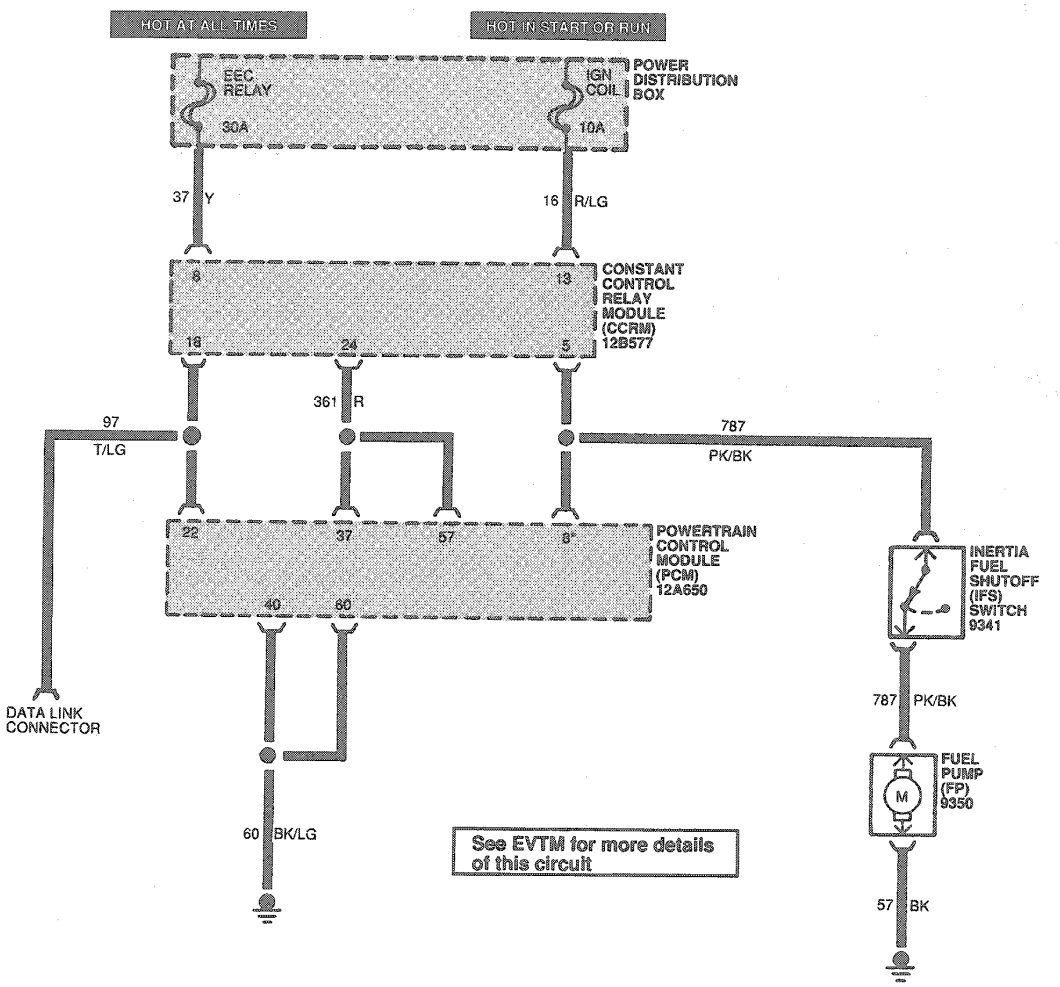
V8601-A

Item	Description
1	Fuel Tank Drain
2	Sender Ground
3	Sender Positive
4	Fuel Pump Positive
5	Fuel Pump Ground
6	Fuel Return
7	Fuel Supply

DIAGNOSIS (Continued)

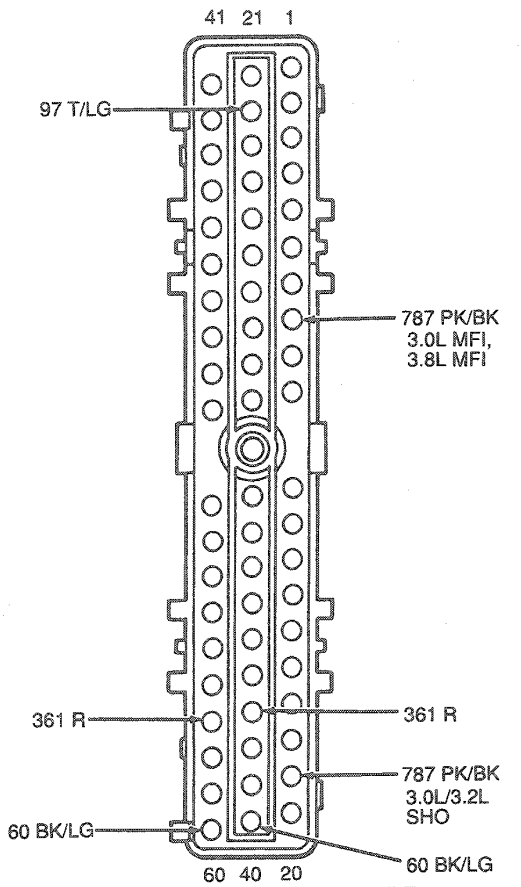
Wiring Diagram

Except FF Vehicles



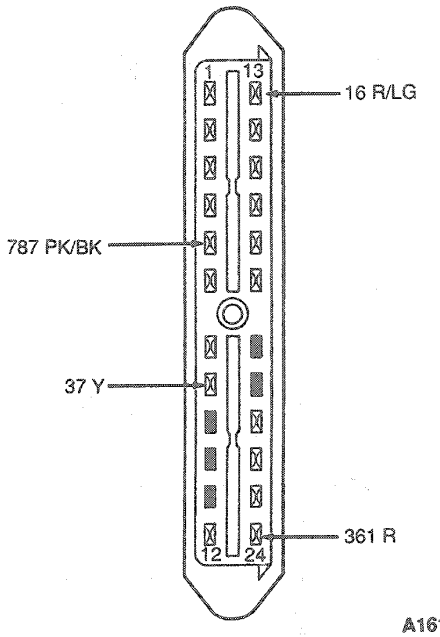
DIAGNOSIS (Continued)

Connector End Views



POWERTRAIN CONTROL MODULE (PCM) CONNECTOR

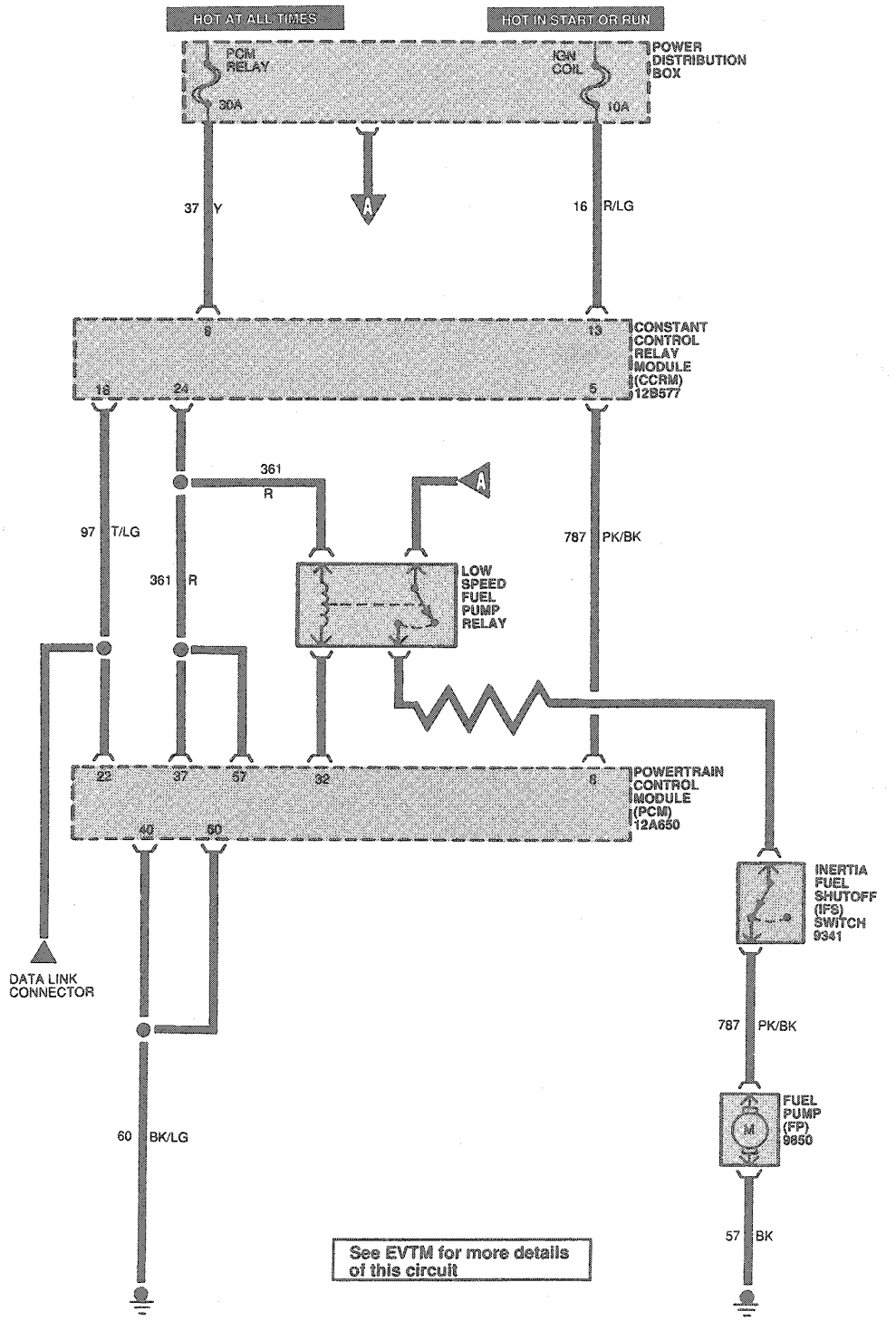
A16167-A



A16164-A

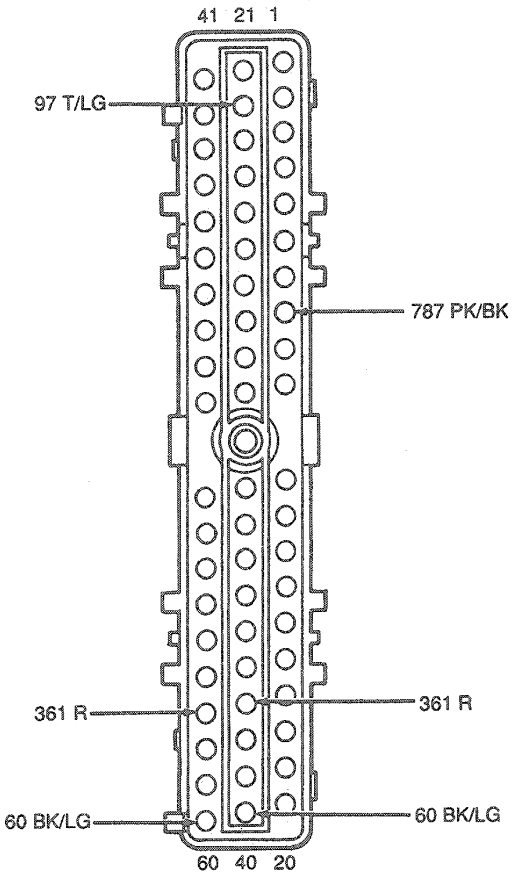
DIAGNOSIS (Continued)

Wiring Diagram
FF Vehicles

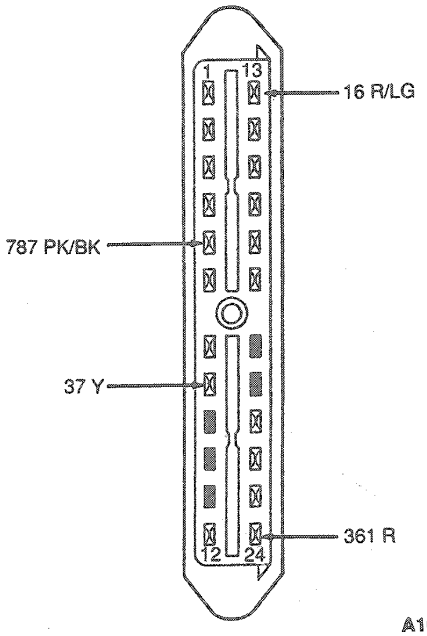


DIAGNOSIS (Continued)

Connector End Views

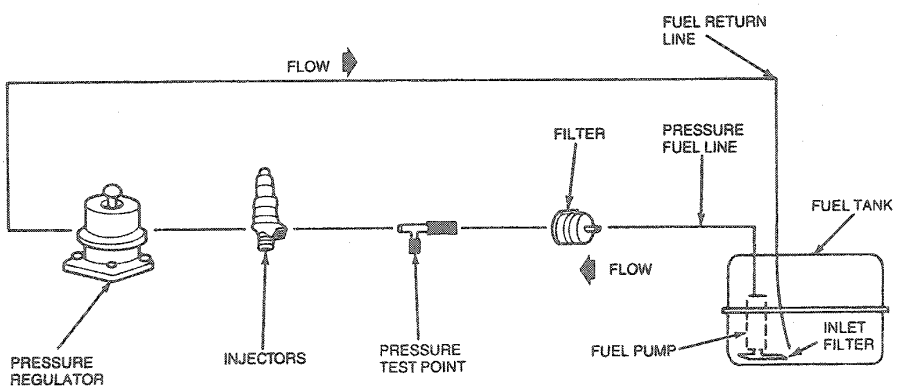


POWERTRAIN CONTROL MODULE (PCM) CONNECTOR V8604-A



A16164-A

System Component Schematics Except FF Vehicles



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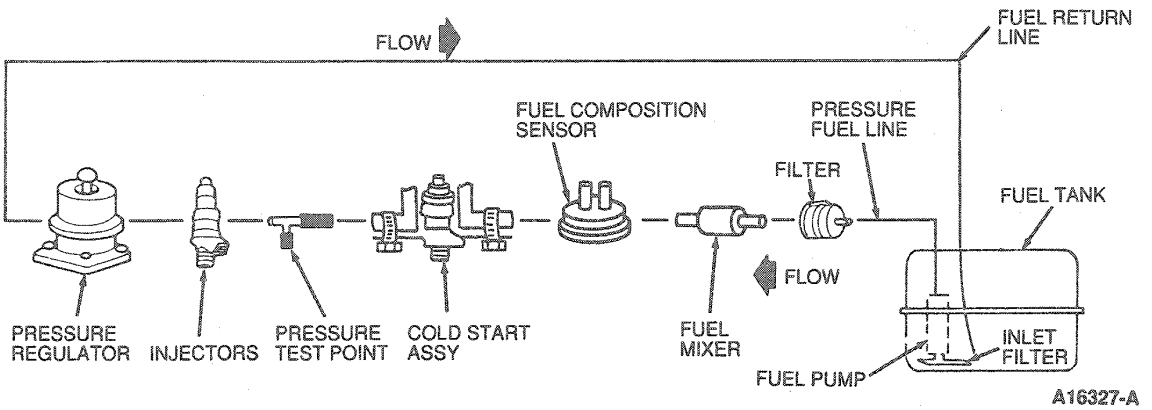
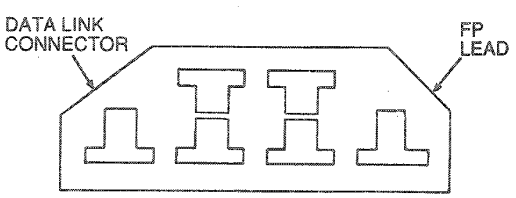
DIAGNOSIS (Continued)

FF Vehicles



PINPOINT TEST A: FUEL SYSTEM DIAGNOSTICS

TEST STEP		RESULT	ACTION TO TAKE
A1	INSPECT SYSTEM		
	• Run Self-Test to verify no electrical codes. • Check fuel system for adequate fuel supply. • Check inertia fuel shutoff (IFS) switch. • Verify that the battery is fully charged. • Check fuse for open condition. • Visually inspect the fuel delivery system including fuel tank, lines, filter, injectors, pressure regulator, battery, electrical lines, and connectors for leakage, looseness, cracks, pinching, kinking, corrosion, grounding, abrasion, or other damage caused by accident, collision, assembly or usage. • **Is the system free of any evidence of leakage, damage, or any evident cause for concern?**	Yes ▶ No ▶	GO to **A2**. SERVICE or REPLACE components as necessary. GO to **A2**.
A2	CHECK FUEL PUMP FUNCTION		
	• Install the fuel pressure tester on the schrader valve on the fuel injection supply manifold. • Locate the data link connector (DLC) in the engine compartment. Ground fuel pump (FP) lead. • Turn the ignition key to the RUN position to operate the fuel pump. • Raise vehicle on hoist and use stethoscope to listen to fuel tank to monitor fuel pump sound. **CAUTION: Unless otherwise specified, at the completion of each step, shut off the fuel pump by removing ground from jumper to FP lead or by turning ignition switch to the OFF position. Grounding the FP lead allows the fuel pump to run continuously when the ignition switch is in the RUN position.** • **Is fuel pump running?**  	Yes ▶ No ▶	GO to **A3**. GO to **A6**.

DIAGNOSIS (Continued)

PINPOINT TEST A: FUEL SYSTEM DIAGNOSTICS (Continued)

TEST STEP		RESULT	ACTION TO TAKE
A3	CHECK FUEL INJECTION SUPPLY MANIFOLD STATIC PRESSURE		
	• Run fuel pump as in A2. • Verify that the observed fuel pressure is within 255-297 kPa (37-43 psi). • Observe the time it takes to reach the specified fuel pressure limits. • **Is the fuel pressure with 255-297 kPa (37-43 psi) within 3 seconds of turning key to RUN?** NOTE: If fuel has been evacuated from the lines which occurs when a line is disconnected or schrader valve is depressed for an extended time (no fuel in lines), it may take up to 12 seconds to obtain system pressure.	Yes ▶ No ▶	GO to A4. If pressure is high, GO to A11. Otherwise, GO to A12.
A4	CHECK FUEL INJECTION SUPPLY MANIFOLD STATIC LEAKDOWN		
	• Run fuel pump as in A2 for 10 seconds and note pressure. • Turn off fuel pump and monitor pressure for 1 minute. (Remove ground or turn ignition switch to the OFF position.) • **Does the fuel rail pressure remain within 34 kPa (5 psi) of shut off pressure for one-minute?**	Yes ▶ No ▶	GO to A5. GO to A13.
A5	TEST VEHICLE UNDER LOAD		
	• Remove and block vacuum hose to pressure regulator. • Run vehicle at idle and then increase engine speed to 2000 rpm or more in short bursts. • **Does fuel injection supply pressure remain 210-310 kPa (30-45 psi) with engine running?** NOTE: Running vehicle under load with vacuum hose removed from fuel pressure regulator (road test) may give better results. NOTE: The Taurus FF vehicle has a voltage control system for the fuel pump. When starting and when the engine speed is greater than 3300 rpm, the fuel pump electrical supply will be at system voltage. At other times, voltage to the fuel pump will be reduced. If this system fails to operate properly, a diagnostic test code will be produced. Refer to Powertrain Control/Emissions Diagnosis[2] manual for electrical system diagnostics for these codes.	Yes ▶ No ▶	Fuel system is OK. DISCONNECT all test connections. CONNECT vacuum hose to pressure regulator. GO to A14 to check injectors. CONNECT vacuum hose to pressure regulator, GO to A6.
A6	CHECK FUEL PUMP VOLTAGE SUPPLY		
	• Check for voltage to fuel pump through the wiring harness by connecting pump power to ground wire leads through a voltmeter. Test point should be in the body wiring harness as close to the fuel pump as is possible. • Attempt to run pump as in A2. • Check battery voltage with voltmeter. • **Is voltage greater than 10.5 volts and within 0.5 volt of battery voltage?** NOTE: The Taurus FF vehicle has a voltage control system for the fuel pump. When operating the fuel as in Step A2, the fuel pump is powered by system voltage.	Yes ▶ No ▶	GO to A7. RUN Self-Test to check electrical system diagnostics. SERVICE as needed, then GO to A3 to verify.

2 Can be purchased as a separate item.

DIAGNOSIS (Continued)

PINPOINT TEST A: FUEL SYSTEM DIAGNOSTICS (Continued)

TEST STEP	RESULT	ACTION TO TAKE
A7 CHECK ELECTRICAL RESISTANCE OF FUEL PUMP		
• Check for continuity through fuel pump by connecting ohmmeter to pump power and ground wire leads as close to fuel pump as possible. • **Is there continuity through the fuel pump?**	Yes ▶ No ▶	If fuel pump runs, GO to **A8**. If fuel pump does not run, GO to **A10**. REPLACE fuel pump and RECHECK as in A2. If fuel pump runs, GO to **A3**. If fuel pump does not run, RECHECK fuel pump connectors for oversize connectors or other source of non-continuous electrical circuit. SERVICE as required, GO to **A3**.
A8 CHECK FUEL PUMP STATIC PRESSURE (IN-LINE FUEL FILTER CHECK)		
• Install a second fuel pressure tester on schrader valve equivalent installed between fuel pump and the in-line fuel filter, as close to fuel pump as possible. • Operate fuel pump as in A3 and compare pressure observed at the fuel injection supply manifold with the pressure observed at the fuel pump. • **Is pressure at fuel pump within 68 kPa (10 psi) of fuel injection supply manifold pressure?** NOTE: When fuel pump is not in operation, the fuel delivery system is at the same pressure, regardless of location of pressure tap. Therefore, both gauges should read the same pressure when pump is not in operation. Any difference in pressure readings when fuel pump is not in operation is due to pressure gauge error.	Yes ▶ No ▶	GO to **A10**. REPLACE in-line fuel filter and GO to **A3**. If pressure is OK, GO to **A4**. If pressure is not OK, RECHECK fuel lines for kinks or other restrictions. SERVICE and RECHECK as in Step A3.
A9 TEST FUEL PUMP CHECK VALVE		
• Install fuel pressure tester on schrader valve equivalent installed between fuel pump and in-line fuel filter, as close to fuel pump as possible. • Operate fuel pump momentarily as in A2 and bring pressure to about system pressure. • Observe fuel pressure for one minute. • **Does pressure remain within 34 kPa (5 psi) of starting pressure over one minute period?**	Yes ▶ No ▶	GO to **A5**. REPLACE fuel pump assembly. RECHECK pressure as in Step A3.
A10 CHECK STATIC FUEL PUMP CURRENT DRAW		
• Install an ammeter in series with the fuel pump electrical circuit. • Operate fuel pump as in A2. • **Is current draw within 2-9 amps?**	Yes ▶ No ▶	Static test of fuel pump is OK. GO to **A14** to check injectors. Dynamic testing may be required to detect root cause. REPLACE fuel pump assembly. If current is high, contamination may be a concern. INSPECT fuel tank for debris and CLEAN tank as needed. GO to **A2**.
A11 CHECK FUEL PRESSURE REGULATOR		
• Disconnect return line at fuel pressure regulator. Connect outlet of regulator to appropriate receptacle to catch return fuel. • Run fuel pump as in Step A2. • **Is fuel pressure within 255-297 kPa (37-43 psi)?**	Yes ▶ No ▶	GO to **A18**. REPLACE fuel pressure regulator. RECHECK pressure as in Step A3.

DIAGNOSIS (Continued)

PINPOINT TEST A: FUEL SYSTEM DIAGNOSTICS (Continued)

TEST STEP	RESULT ▶	ACTION TO TAKE
A12 CHECK FUEL PRESSURE REGULATOR ● Disconnect return line at fuel pressure regulator. Connect outlet of regulator to appropriate receptacle to catch return fuel. ● Run fuel pump as in Step A2. ● **Is fuel being returned from regulator with low pressure in system?**	Yes ▶ No ▶	REPLACE regulator. RECHECK pressure as in Step A3. GO to A4.
A13 CHECK FUEL PRESSURE REGULATOR FOR LEAKS ● Disconnect return line at fuel pressure regulator. Connect outlet of regulator to appropriate receptacle to catch return fuel. ● Run fuel pump as in A2. ● Turn off fuel pump by removing ground or turning ignition to OFF position. ● Observe fuel return flow from regulator and system when pump is off. ● Remove vacuum hose from fuel pressure regulator and check for presence of fuel in regulator fitting (diaphragm leak). ● **Is there return flow when pump is turned off and system pressure is dropping or is there fuel in regulator fitting?**	Yes ▶ No ▶	REPLACE regulator and RECHECK pressure and leakage as in Steps A3 and A4. If OK, GO to A5. If not OK, REPEAT Step A3. If leakdown concern exists, GO to A8. Otherwise, GO to A7.
A14 CHECK FUEL INJECTOR FUNCTION ● With the engine warmed and idling (or cranking it if it does not start) and using a mechanics stethoscope or equivalent, listen for regularly spaced operating sounds at each fuel injector. ● **Is operating sound present?**	Yes ▶ No ▶	GO to A17. GO to A15.
A15 CHECK FUEL INJECTOR RESISTANCE ● Key off. ● Disconnect the electrical connector of the injector (one at the time). ● Measure the resistance of each injector, using the DVOM. ● **Are all resistances between 13.0 and 18.0 ohms?**	Yes ▶ No ▶	GO to A16. REPLACE the worn or damaged injectors. RECONNECT injectors.
A16 CHECK FUEL INJECTOR ELECTRICAL CONTINUITY SIGNAL ● Key off. ● Disconnect the injector lead and insert the continuity checker FA-407 (from the Rotunda Fuel Injector Tester 113-00001) into the injector lead plug. ● Start the engine. ● Observe whether the continuity checker blinks (showing a completed circuit for the injector being tested). ● Repeat the check for each injector. ● **Do all injector circuits show continuity?**	Yes ▶ No ▶	GO to A17. CHECK for 12 volts at each injector lead. SERVICE or REPLACE leads as required. REFER to EEC-IV Quick Test.

DIAGNOSIS (Continued)

PINPOINT TEST A: FUEL SYSTEM DIAGNOSTICS (Continued)

TEST STEP		RESULT	ACTION TO TAKE
A17	CHECK FUEL INJECTOR FLOW AND LEAKAGE		
	• Observe "Note, Caution and Warning" to avoid fuel spillage and injury. • Using the Fuel Injector Tester as described in the accompanying instruction test the fuel injectors and verify that the flow rate for injector group is within specification. • With the tester still installed on the fuel system, note any significant pressure loss due to injector leakage when the tester pump is turned off. • Check the fuel injectors individually for leakage as required using the Injector Bench Fixture and the Fuel Injector Bench Testing Procedure associated with the Rotunda Tester as required and verify that each injector leakage rate is within specification (1 drop per minute maximum). • **Is flow rate for the injector group and the leakage rate for individual injectors within specification?**	Yes ▶ No ▶	Fuel injectors are OK. If pressure leakdown concern exists in system, CHECK lines and connections between fuel pump and pressure regulator for leaks. SERVICE as necessary. REPLACE the worn or damaged injectors as necessary. REPEAT test Step A17. When OK, GO to A3 to verify system.
A18	CHECK FUEL RETURN SYSTEM FOR HIGH PRESSURE CAUSES		
	• Observe the "Note, Caution and Warning" to avoid fuel spillage and injury. • Check the fuel return system for restriction due to blockage, kinking, or pinching. • Remove the fuel return line at the fuel pressure regulator. • Apply 21-34 kPa (3-5 psi) regulated, filtered, shop air to the fuel return line. • **Do you hear air entering the tank?**	Yes ▶ No ▶	GO to A19. GO to A19.
A19	CHECK FUEL RETURN SYSTEM PRESSURE		
	• Key off. • Reconnect fuel return line at the fuel pressure regulator. • Install a second fuel pressure tester on schrader valve equivalent installed in the return line at the fuel tank. • Operate fuel pump as in Step A3 and compare pressure observed at fuel injection supply manifold with the pressure observed at the fuel tank. • **Is pressure at the fuel tank within 34 kPa (5 psi) of fuel injection supply manifold pressure?**	Yes ▶ No ▶	VERIFY that fuel injection supply manifold pressure is higher than specification limits. REPLACE pressure regulator and RECHECK as in Step A3. SERVICE the return fuel line to remove excessive restriction. REPEAT Step A3 to verify.

TESTING

Refer to the Powertrain Control / Emissions Diagnosis Manual[3] for testing procedures.

CLEANING AND INSPECTION

WARNING: DO NOT SMOKE OR CARRY LIGHTED TOBACCO OR OPEN FLAME OF ANY TYPE WHEN WORKING ON OR NEAR ANY FUEL RELATED COMPONENT. HIGHLY FLAMMABLE MIXTURES ARE ALWAYS PRESENT AND MAY BE IGNITED, RESULTING IN POSSIBLE PERSONAL INJURY.

Air Cleaner

Refer to Section 00-03 for the recommended engine air cleaner (9600) assembly maintenance mileage interval. **Cleaning the engine air cleaner or crankcase ventilation filter elements is not recommended.** They should be replaced at the specified mileage intervals. Clean the engine air cleaner body and the cover with a solvent or compressed air. Wipe the engine air cleaner body and cover dry if a solvent is used. Inspect the engine air cleaner body and cover for distortion or damage at the gasket mating surfaces. Replace engine air cleaner cover or body if they are damaged beyond service. Hold filter in front of a light and carefully inspect it for any splits or cracks. If filter is split or cracked, replace it.

3 Can be purchased as a separate item.

CLEANING AND INSPECTION (Continued)

Idle Air Control (IAC) Valve

CAUTION: The idle air control (IAC) valve is a sludge tolerant design and should not be cleaned as damage may occur.

ADJUSTMENTS

Refer to the Powertrain Control / Emissions Diagnosis Manual[4] for adjustments.

SPECIFICATIONS

Refer to the Engine / Emissions Facts Book and Calibration number.

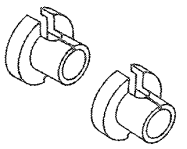
FUEL PRESSURE SPECIFICATIONS

Description	Specification
Engine Running	30-45 psi 210-310 kPa
Key ON Engine OFF	37-43 psi 255-297 kPa

FUEL PUMP CURRENT SPECIFICATION

Description	Specification
Key ON, Engine OFF	2-9 Amps

SPECIAL SERVICE TOOLS

Tool Number / Description	Illustration
T90T-9550-B Fuel Line Disconnect Tool 5 / 16" T90T-9550-C Fuel Line Disconnect Tool 3 / 8"	

ROTUNDA EQUIPMENT

Model	Description
007-00001	Digital Volt-Ohmmeter
014-00748	Fuel Pressure Testing Kit
113-00001	Fuel Injector Tester

PARTS CROSS-REFERENCE

Base Part #	Part Name	Old Part Name
9600	Engine Air Cleaner	

4 Can be purchased as a separate item.

SECTION 10-01 Fuel Tank, Filter and Electric Fuel Pump

SUBJECT	PAGE
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Fuel Filter	10-01-3
Fuel Injected Engines	10-01-2
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SUBJECT	PAGE
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VEHICLE APPLICATION

Taurus / Sable.

DESCRIPTION AND OPERATION

NOTE: Fuel methanol refers to a blend of fuel with a maximum of 85 percent methanol.

WARNING: DO NOT SWALLOW FUEL METHANOL. LIKE GASOLINE, IT IS HIGHLY TOXIC AND IF SWALLOWED CAN CAUSE DEATH OR PERMANENT INJURY. SWALLOWING METHANOL CAN ALSO CAUSE BLINDNESS. CALL A PHYSICIAN IMMEDIATELY TO TREAT ANYONE WHO HAS SWALLOWED FUEL METHANOL. VOMITING SHOULD BE INDUCED BY OR UNDER THE DIRECTION OF A PHYSICIAN OR POISON CONTROL CENTER. BE AWARE THAT THE ONSET OF POTENTIAL ILL HEALTH EFFECTS MAY BE DELAYED.

AVOID INHALING FUEL VAPORS. INHALING TOO MUCH FUEL METHANOL OR GASOLINE VAPOR CAN LEAD TO EYE AND RESPIRATORY TRACT IRRITATION. IN SEVERE CASES, EXCESSIVE OR PROLONGED BREATHING OF FUEL METHANOL OR GASOLINE VAPORS CAN CAUSE SERIOUS ILLNESS AND PERMANENT INJURY SUCH AS BLINDNESS.

AVOID GETTING FUEL METHANOL OR GASOLINE LIQUID IN YOUR EYES. IF YOU GET ANY FUEL METHANOL OR GASOLINE IN YOUR EYES, REMOVE CONTACT LENSES (IF WORN), FLUSH IMMEDIATELY WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES AND SEEK MEDICAL ATTENTION.

ALLOWING FUEL METHANOL OR GASOLINE TO GET IN YOUR EYES WILL CAUSE SEVERE IRRITATION. FAILURE TO SEEK PROPER MEDICAL ATTENTION FOR FUEL METHANOL OR GASOLINE CONTACT WITH THE EYES COULD LEAD TO PERMANENT INJURY SUCH AS BLINDNESS.

IF YOU GET FUEL METHANOL OR GASOLINE ON YOUR SKIN, WASH WITH SOAP AND WATER. REPEATED OR PROLONGED SKIN CONTACT WITH METHANOL OR GASOLINE LIQUID OR VAPOR CAUSES SKIN IRRITATION. MAKE SURE YOU WASH YOUR HANDS BEFORE HANDLING FOOD.

DESCRIPTION AND OPERATION (Continued)

IF YOU ARE TAKING MEDICATION FOR THE TREATMENT OF ALCOHOLISM, SUCH AS ANTABUSE OR OTHER FORMS OF DISULFIRAM, SKIN CONTACT WITH FUEL METHANOL OR BREATHING ITS VAPORS CAN CAUSE THE SAME KIND OF ADVERSE REACTION AS DRINKING ALCOHOL. IN SENSITIVE INDIVIDUALS, SERIOUS PERSONAL INJURY OR SICKNESS COULD RESULT. IF YOU ARE TAKING SUCH MEDICATION, YOU SHOULD TAKE EXTRA CARE TO AVOID SKIN CONTACT WITH FUEL METHANOL AND TO AVOID BREATHING ITS VAPORS. IF YOU DO GET FUEL METHANOL ON YOUR SKIN, WASH IT OFF IMMEDIATELY. CONSULT A PHYSICIAN PROMPTLY IF YOU EXPERIENCE AN ADVERSE REACTION.

WARNING: DO NOT MODIFY THE FUEL SYSTEM CONFIGURATION OR COMPONENTS, OR REPLACE COMPONENTS WITH PARTS NOT ESPECIALLY DESIGNED FOR USE WITH FUEL METHANOL. FORD MOTOR COMPANY HAS SPECIALLY-DESIGNED THE MATERIALS, COMPONENTS AND SYSTEM CONFIGURATION FOR METHANOL-FUELED VEHICLES AND EACH PARTICULAR SYSTEM IS PRECISELY CALIBRATED FOR EFFICIENT OPERATION. THE USE OF DIFFERENT PARTS OR MATERIALS COULD PRODUCE AN UNTESTED CONFIGURATION THAT COULD RESULT IN FIRE, PERSONAL INJURY, OR COULD CAUSE ENGINE DAMAGE.

WARNING: DO NOT OPERATE ENGINE OR SMOKE WHILE REFUELING.

CAUTION: Use only fuel methanol which meets Ford Specification ESE-M4C97-B. Use of other fuel methanol may cause powertrain damage as well as loss of vehicle performance. It will also invalidate any extended service agreement.

WARNING: IT IS IMPORTANT THAT YOUR FLEXIBLE FUEL VEHICLE BE PROPERLY MAINTAINED BY FORD FLEXIBLE FUEL TRAINED PERSONNEL. IF A PROBLEM OCCURS, IT IS IMPORTANT THAT PROPERLY TRAINED PERSONNEL DIAGNOSE THE CAUSE. IF THE PROBLEM RELATES TO THE FUEL SYSTEM, PROPER PART REPLACEMENT IS IMPERATIVE TO KEEP YOUR VEHICLE OPERATING AT NORMAL PERFORMANCE. FLEXIBLE FUEL COMPONENTS AND STANDARD FUEL COMPONENTS ARE NOT INTERCHANGEABLE AND IF YOUR VEHICLE IS NOT SERVICED IN ACCORDANCE WITH FLEXIBLE FUEL VEHICLE PROCEDURES, DAMAGE MAY OCCUR AND YOUR WARRANTY MAY BE INVALIDATED.

Fuel Injected Engines

The fuel systems which are used with fuel injected engines have electric fuel pumps to provide high-pressure fuel to the injectors. The high-pressure pump is part of the fuel tank sending unit and pump (9H307) and is located in the fuel tank (9002).

The fuel lines leading from the fuel tank to the engine are under pressure during vehicle operation. When fuel injected engines are turned off, the fuel in the fuel lines remains pressurized for long periods of time to provide quick start-ups. Special procedures for servicing these pressurized fuel systems are outlined.

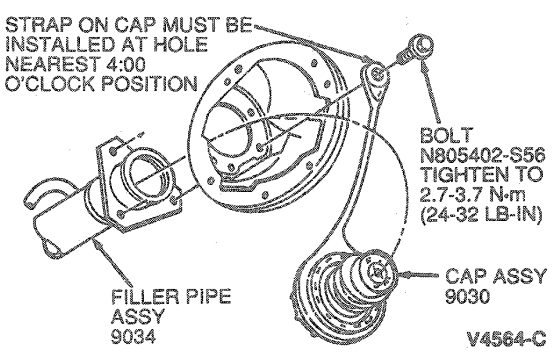
Fuel Lines

All vehicles (except Police and flexible fuel (FF) vehicles), use nylon lines with push connect fittings or spring lock couplings. Police and the flexible fuel vehicles use a combination of nylon / stainless steel fuel lines with steel push connect fittings and spring lock couplings. The steel push connect and spring lock couplings used on the flexible fuel vehicles have special O-rings for methanol fuel compatibility.

In the base and Police vehicles, nylon push connect fittings are used to make the fuel line connections to the fuel pump in the fuel tank and to the fuel filter (9155). Spring lock couplings connect the fuel lines to the engine. The flexible fuel vehicles use steel push connect fittings to make the fuel line connections to the fuel pump and the fuel drain tube in the fuel tank, fuel filter and the fuel mixer / sensor assembly. Special spring lock couplings with methanol compatible O-rings connect the fuel lines to the engine. Unique nylon vapor connectors are used to connect the vapor management system in the FF vehicles. These fittings must be serviced using the procedures outlined.

Fuel Tanks and Fillers

All vehicles, (except FF vehicles), are equipped with a restricted fuel filler opening that allows only a non-leaded fuel nozzle to be inserted.



The restrictor consists of a narrow opening in the fuel tank filler pipe (9034), covered by a spring steel trap door. The smaller non-leaded fuel nozzle will fit through the narrow opening and push the trap door aside, allowing normal filling. Leaded fuel nozzles will not fit through the narrow opening. The trap door being closed causes a fuel backup and automatic nozzle shutoff.

DESCRIPTION AND OPERATION (Continued)

The restricted fuel tank filler pipe is manufactured as an assembly, and must be serviced by removal and replacement with a new fuel tank filler pipe assembly. Fuel tank filler pipes are not to be modified in any way.

Fill limiting is accomplished through fuel tank filler pipe configuration. The fill limiting system is designed to permit an approximate 10 to 12 percent fuel tank volume air space when the fuel tank is filled to capacity. This air space provides for thermal expansion of fuel as well as being an aid to the in-tank vapor vent system.

FF Vehicle Fuel Filler Pipe

The fuel tank filler pipe has a special methanol resistant coating to protect against corrosion. A special screen is installed in the fuel tank filler pipe to prevent syphoning of fuel from the fuel tank through the fuel tank filler pipe. A vent hose is connected between the top of the fuel tank filler pipe and the fuel vapor valve (9B593) on the fuel tank.

Fuel Cap

WARNING: FUEL TANK MAY BE PRESSURIZED. REMOVE FUEL TANK FILLER CAP SLOWLY. IF FUEL TANK FILLER CAP IS VENTING FUEL OR A HISSING SOUND IS HEARD, WAIT UNTIL THE CONDITION STOPS BEFORE REMOVING THE FUEL TANK FILLER CAP. IF THESE PRECAUTIONS ARE NOT FOLLOWED, FUEL MAY SPRAY AND CAUSE PERSONAL INJURY.

The fuel tank filler cap (9030) is a threaded screw-on design with a pre-vent feature that allows the fuel tank to vent for the first three-quarter turn before unthreading. All fuel tank filler caps are attached to the vehicle with a tether using the fuel tank filler pipe-to-housing screw at the three to four o'clock position. The fuel tank filler cap assembly provides pressure and vacuum relief functions and should be replaced with the proper pressure / vacuum relief fuel tank filler cap to prevent possible system malfunction. The fuel tank filler cap is fitted with a torque-limiting ratchet to prevent difficulty in removal. When installing, turn clockwise until the ratchet mechanism gives off three or more distinct "clicks".

WARNING: DO NOT SMOKE, CARRY LIGHTED TOBACCO OR AN OPEN FLAME OF ANY TYPE WHEN WORKING ON OR NEAR ANY FUEL-RELATED COMPONENT. HIGHLY FLAMMABLE MIXTURES ARE ALWAYS PRESENT AND MAY BE IGNITED, RESULTING IN POSSIBLE PERSONAL INJURY.

Fuel Filter

Fuel is filtered at three locations on all applications.

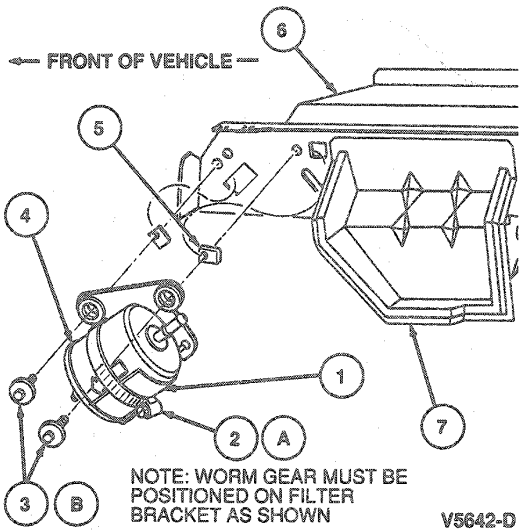
Fuel Pump Inlet Filter

A nylon filter element is mounted on the electric fuel pump inlet inside the fuel tank and is used to protect the fuel pump (FP) (9350) from fuel tank contaminants.

Fuel Filter, In-Line

The purpose of the in-line fuel filter is to provide filtration to protect the small metering orifices of the injector nozzles. The fuel filter is located downstream of the electric fuel pump and is mounted on the underbody. The fuel filter is a one-piece construction which cannot be cleaned. If it becomes clogged it must be replaced.

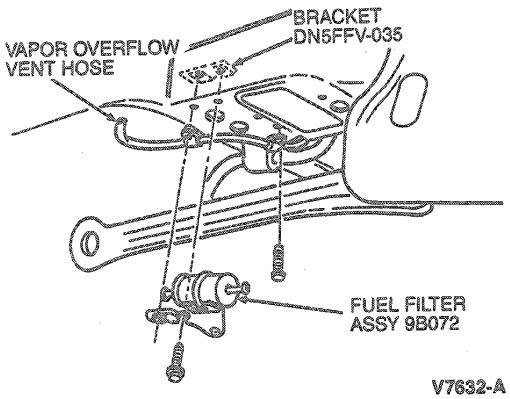
The FF vehicle fuel filter is fuel methanol compatible. Use of a gasoline fuel filter will result in failure of the filter. The filter is located at the rear of the fuel tank.



Item	Part Number	Description
1	9B072	Filter and Bracket Assy
2A	—	Worm Gear Mounting Clamp
3B	N606679-S56	Screw (2 Req'd)
4	9155	Filter
5	N623332-S36	U-Nut (2 Req'd)
6	—	Underside Of Right Rear Frame Rail
7	—	Right Rear Tension Strut Support Bracket
A		Tighten to 1.7-2.8 N·m (15-25 Lb-In)
B		Tighten to 8-12 N·m (71-106 Lb-In)

DESCRIPTION AND OPERATION (Continued)

FF Vehicles

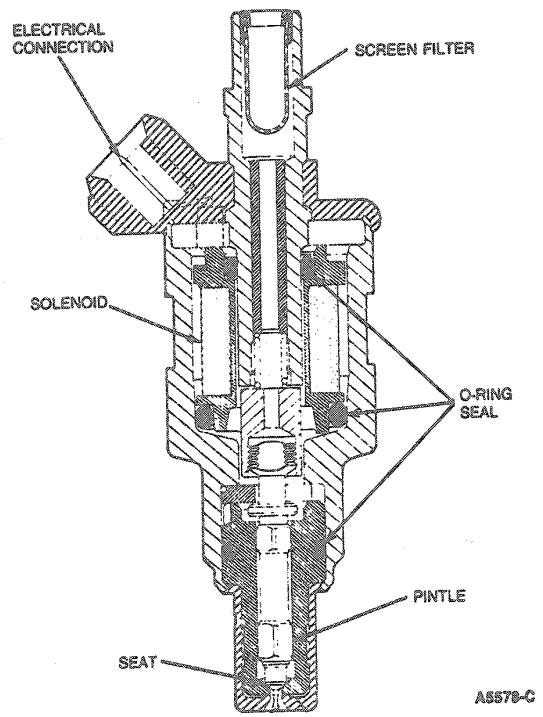


NOTE: When replacing fuel filters, use the fuel filter specified for the engine being serviced.

Injector Filter Screen

An injector filter is located at the top of each injector and is not serviceable. If injector screen becomes clogged, the complete injector assembly must be replaced. Refer to Section 03-04A (3.0L / 3.0L FF), 03-04B (3.0L / 3.2L SHO), and 03-04C (3.8L) for fuel injector information.

Fuel Injector



Fuel Pump (FP)

NOTE: The FF vehicle fuel pump operates the same as unleaded gasoline fuel pumps, but is made of methanol compatible materials.

The fuel system has a fuel pump relay controlled by the powertrain control module (PCM) (12A650), which provides power to the fuel pump under various operating conditions. When the ignition switch is in the OFF position, the contacts of the powertrain control module (PCM) power and fuel pump relays are open. The fuel pump and powertrain control module (PCM) relays are contained in the constant control relay module (CCRM) (12B577) which is serviced as a separate unit.

When the ignition switch is first turned to the ON position, the powertrain control module (PCM) power relay is energized, closing its contacts. Power is provided to both the fuel pump relay and a timing device in the powertrain control module (PCM). The fuel pump runs through the contacts of the fuel pump relay and the inertia switch. If the ignition switch is not turned to the START position, the timing device in the powertrain control module (PCM) will open the ground Circuit 57 after approximately one second. Opening the ground circuit de-energizes the fuel pump relay (opening its contacts), which in turn de-energizes the fuel pump. This circuitry provides for pre-pressurization of the fuel system.

When the ignition switch is turned to the START position, the powertrain control module (PCM) operates the fuel pump relay to provide fuel for starting the engine while cranking.

After the engine starts, the ignition switch is returned to the ON position, and power to the fuel pump is again supplied through the fuel pump relay. The powertrain control module (PCM) senses engine speed and shuts off the fuel pump by opening the ground circuit to the fuel pump relay when the engine stops, or is below 120 rpm.

The fuel system uses a fuel tank sending unit and pump assembly. The fuel tank has an internal reservoir in which the fuel tank sending unit and pump rests. This design increases satisfactory pump operation during extreme vehicle maneuvers and steep vehicle attitudes with low tank fill levels.

The fuel pump is mounted on the fuel sender assembly inside the fuel tank. This assembly includes a check valve which is inside the fuel pump outlet. The function of this valve is to maintain pressure in the system after the vehicle is shut down.

DESCRIPTION AND OPERATION (Continued)

The pressure retention helps prevent hot starting concerns. The pump for the 3.0L MFI, 3.8L MFI and 3.2L SHO is capable of supplying 60 liters (15.8 gal) of fuel per hour at 269 kPa (39 psi). The pump for the 3.0L SHO is capable of supplying 110 L (29 gal) of fuel per hour at 269 kPa (39 psi). The pump for the 3.0L FF vehicle is capable of supplying 145 L (38 gal) of fuel per hour at 269 kPa (39 psi). The fuel pump has an internal pressure relief valve to provide overpressure protection in the event the fuel flow becomes restricted (damaged lines, clogged, filter, etc.). Overpressure is restricted to 850 kPa (123 psi) and reduced fuel flow will result. The system pressure is controlled by a pressure regulator mounted on the engine.

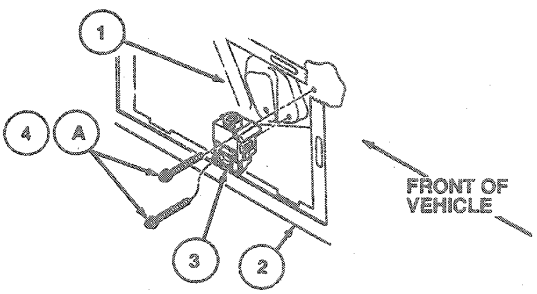
The fuel pump is protected at its inlet by a nylon pick-up screen. It filters dirt and contaminants which could plug or damage the internal pump components, while at the same time allowing passage of small quantities of water which may accumulate within the fuel tank reservoir.

Inertia Fuel Shutoff Switch (IFS)

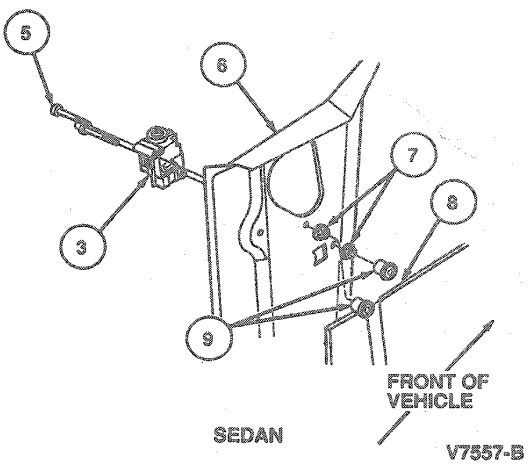
In the event of a collision, the electrical contacts in the inertia fuel shutoff switch (9341) open and the fuel pump automatically shuts off. The fuel pump will shut off even if the engine does not stop running. However, the engine will stop a few seconds after the fuel pump stops. It is not possible to restart the engine until the inertia fuel shutoff switch is manually reset. The inertia fuel shutoff switch is located in the luggage compartment on the door hinge support above the LH inner wheel house on the sedan and on the RH rear lower corner pillar reinforcement behind an access door, on the station wagon. Both locations are clearly marked on the vehicles.

CAUTION: Do not reset the inertia fuel shutoff switch until the fuel system has been inspected for leaks.

To reset the inertia fuel shutoff switch, depress the button on switch.



STATION WAGON



SEDAN

V7557-B

Item	Part Number	Description
1	—	RH Rear Inner Quarter Panel
2	—	Interior Trim Panel
3	9341	Inertia Fuel Shutoff Switch
4A	55911-S36	Screw (2 Req'd)
5	11N523	Retainer
6	—	LH Rear Inner Quarter Panel
7A	N621900-S2	Nut and Washer Assy (2 Req'd)
8	—	Luggage Compartment Liner
9	390694-S	Cap Plugs (2 Req'd)
A		Tighten to 1.5-2.2 N·m (14-19 Lb-In)

REMOVAL AND INSTALLATION

Most component parts of the standard fuel system are retained by a simple nut, bolt or screw for removal and installation. Refer to individual system illustrations for specific part references.

REMOVAL AND INSTALLATION (Continued)

Fuel System Pressure Relief

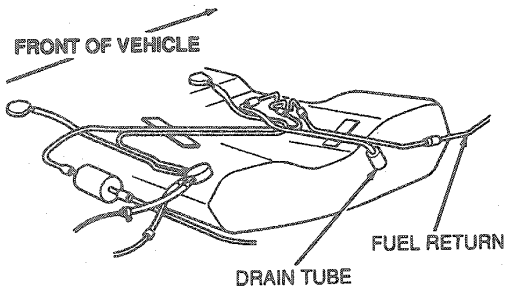
WARNING: FUEL SUPPLY LINES WILL REMAIN PRESSURIZED FOR LONG PERIODS OF TIME AFTER ENGINE SHUT DOWN. THIS PRESSURE MUST BE RELIEVED BEFORE SERVICING OF THE FUEL SYSTEM IS BEGUN. A VALVE IS PROVIDED ON THE FUEL CHARGING ASSEMBLY FOR THIS PURPOSE. REMOVE THE AIR CLEANER. ATTACH EFI AND CFI FUEL PRESSURE GAUGE T80L-9974-B OR EQUIVALENT TO THE FUEL DIAGNOSTIC VALVE ON THE FUEL CHARGING ASSEMBLY. PRESSURE IN THE FUEL SYSTEM MAY NOW BE RELEASED.

Fuel Tank Draining Procedure — Flexible Fuel Vehicles

NOTE: The flexible fuel vehicle fuel tank cannot be drained through the fuel tank filler pipe. A special screen is installed in the fuel tank filler pipe to prevent siphoning of fuel through the fuel tank filler pipe. The fuel tank on this vehicle is equipped with a drain tube connected to the fuel tank sending unit and pump on the RH side of the vehicle which has a quick disconnect for this purpose. It is not necessary to lower the fuel tank to drain the system.

Drain the system as follows:

1. Depressurize fuel system as outlined under Fuel System Pressure Relief.
2. Remove foam cover and protective rubber cover from drain tube.



3. Connect drain tube quick disconnect fitting to Rotunda Fuel Storage Tanker and Adapter Hose 034-00020. Drain fuel from fuel tank.

Fuel Tank

Unleaded Gasoline Vehicles

Tools Required:

- Fuel Tank Sender Switch T74P-9275-A
- Rotunda Fuel Storage Tanker 034-00002
- Rotunda Adapter Hose 034-00012

Removal

1. Depressurize fuel system as outlined under Fuel System Pressure Relief.
2. Fuel should be drained from fuel tank as completely as possible prior to fuel tank removal. On unleaded gasoline vehicles, this is accomplished by siphoning or pumping fuel out the fuel tank filler pipe using Rotunda Fuel Storage Tanker 034-00002 and Adapter Hose 034-00012 or equivalent.

   Vehicles with fuel injected engines have reservoirs inside fuel tank to maintain fuel near fuel pickup during vehicle cornering maneuvers and under low fuel operating conditions. These reservoirs could block siphon tubes or hoses from reaching bottom of fuel tank. This situation can be overcome with a few repeated attempts using different hose orientations.
3. Loosen fuel tank filler pipe and vent hose clamps at fuel tank and remove hoses from fuel tank.
4. Place a safety support under fuel tank and remove bolts from rear of fuel tank support straps (9092). The fuel tank support straps are hinged at the front and will swing out of the way.
5. Partially remove fuel tank and disconnect fuel lines and electrical connector from fuel tank sending unit and pump, if required. Refer to Push Connect Fitting Removal.
6. Remove fuel tank from vehicle.

Installation

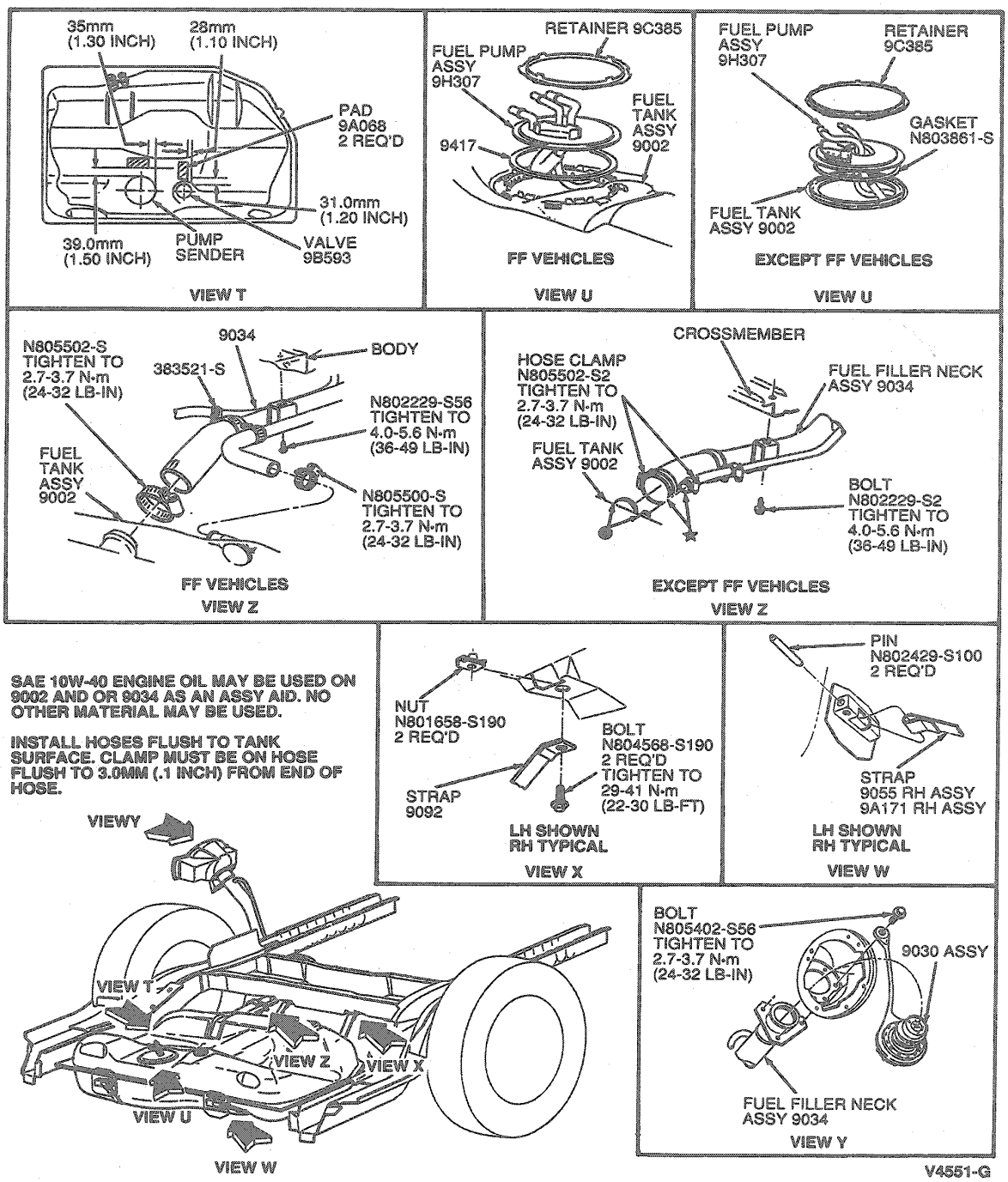
NOTE: If fuel tank sending unit and pump has been removed, the O-ring seal on unleaded gasoline vehicles or gasket on Flexible Fuel vehicles must be replaced.

1. Before proceeding, check following items:
   a. Leak check sender unit. If necessary, use Fuel Tank Sender Wrench T74P-9275-A or equivalent.
   b. Ensure fuel vapor valve is installed completely on fuel tank top.
   c. Make all required fuel line, fuel return line, vapor vent and electrical connections which will be inaccessible after fuel tank is installed. Route lines through clip on fuel tank.
2. Place fuel tank in its proper position in vehicle.
3. Bring fuel tank support straps around fuel tank and start retaining bolt. Align fuel tank as far forward in vehicle as possible while securing retaining bolts.

   CAUTION: If equipped with heat shield, make sure that it is installed with fuel tank support straps and positioned correctly on the fuel tank.
4. Check hoses and wiring mounted on fuel tank top, to ensure they are correctly routed and will not be pinched between fuel tank and body.
5. Tighten fuel tank support strap retaining bolts to 29-41 N·m (22-30 lb-ft).

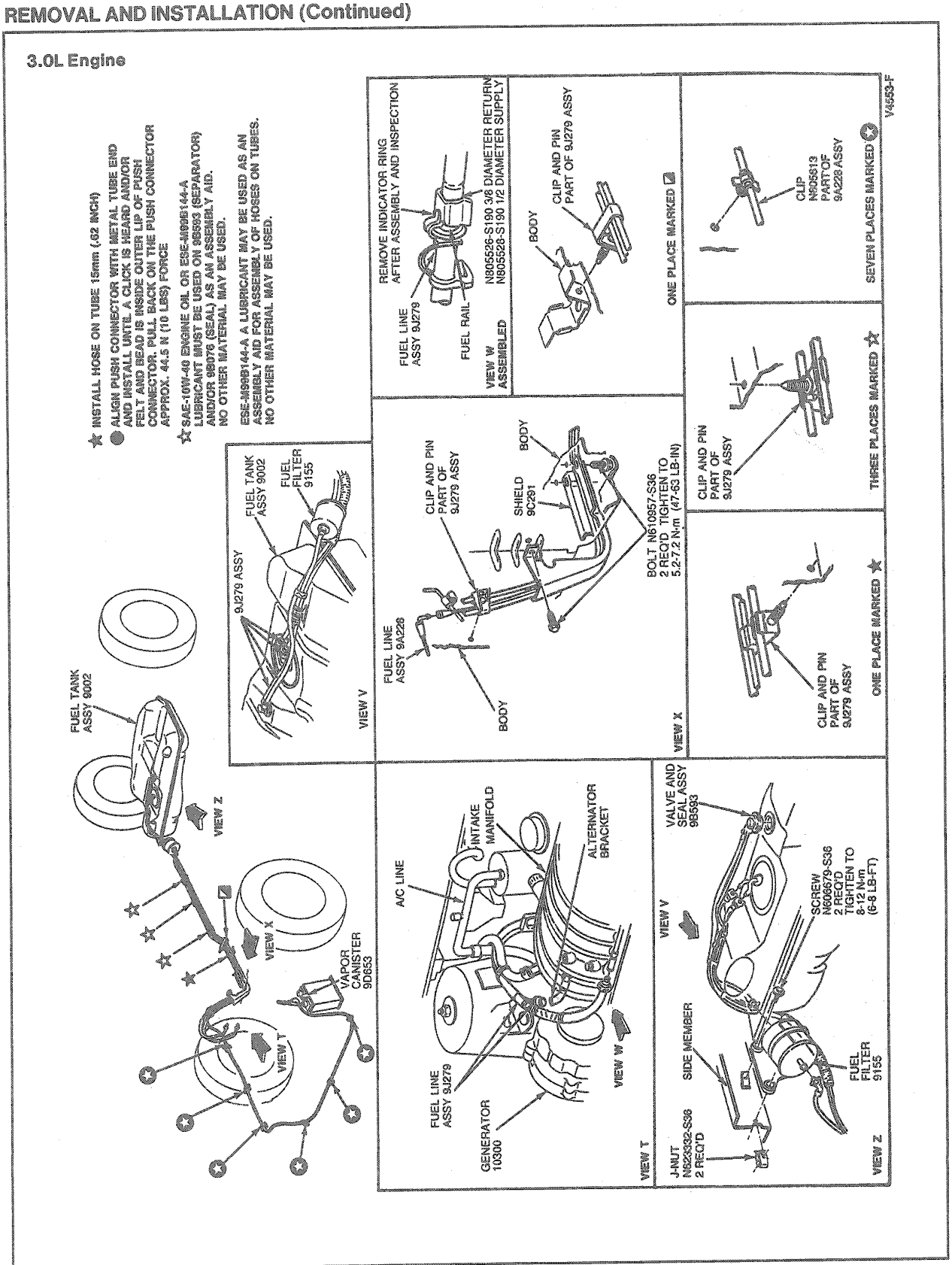
REMOVAL AND INSTALLATION (Continued)

6. Install fuel filler hoses which connect fuel tank to fuel tank filler pipe. Install hose clamps and tighten to 2.7-3.7 N·m (24-32 lb-in).
7. Replace fuel drained from fuel tank.
8. Start engine and check all connections for leaks.



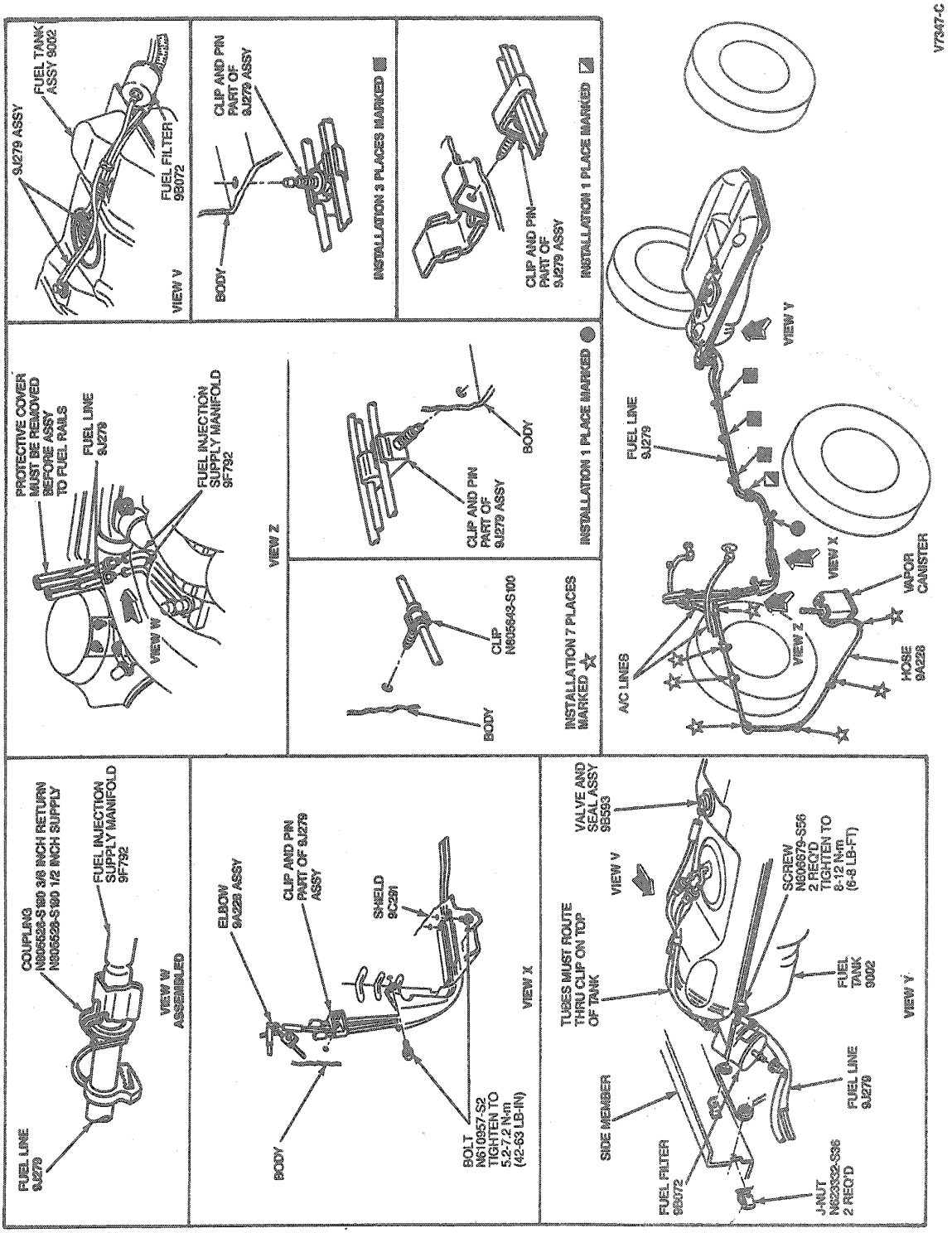
REMOVAL AND INSTALLATION (Continued)

3.0L Engine



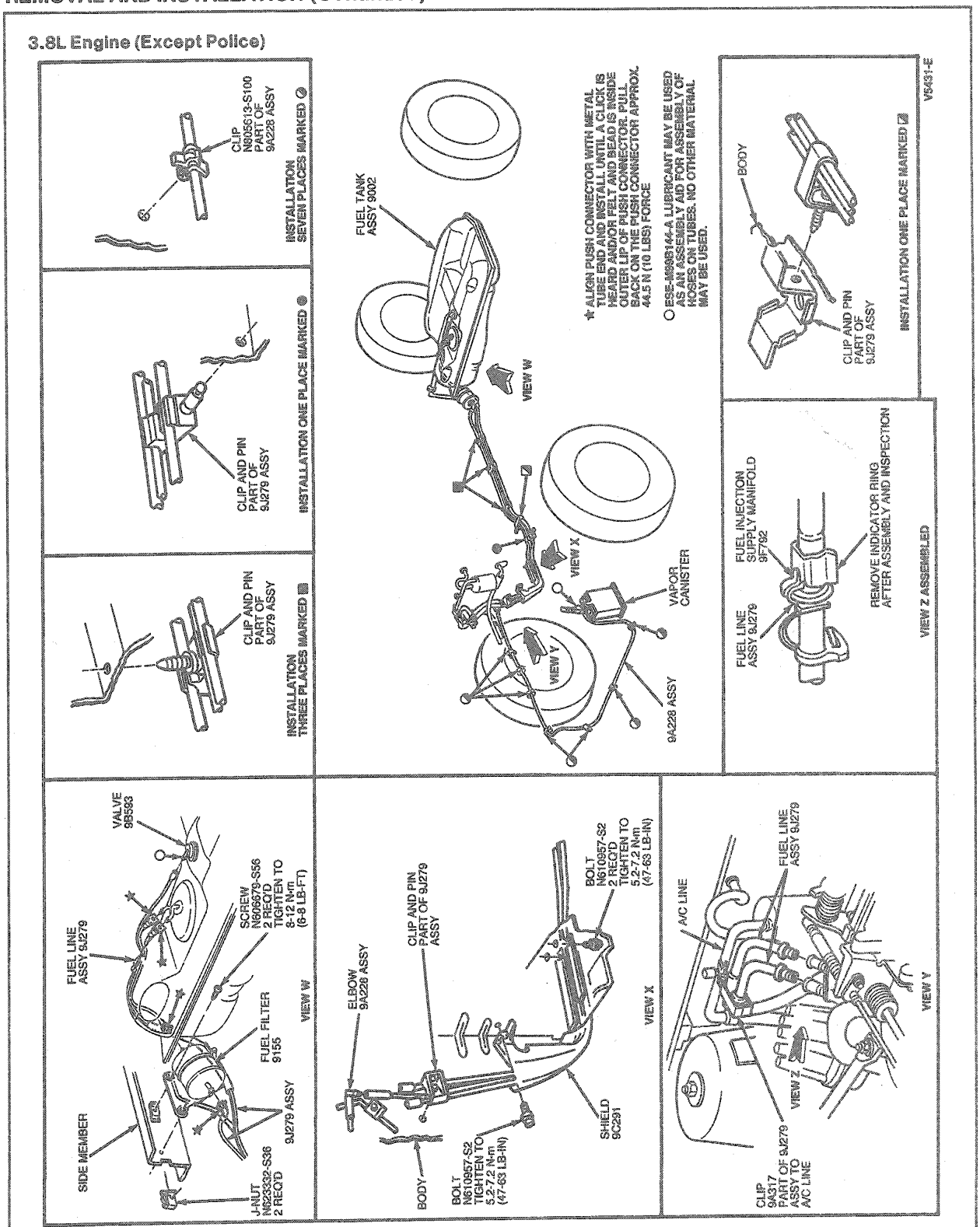
REMOVAL AND INSTALLATION (Continued)

3.0L/3.2L SHO Engine



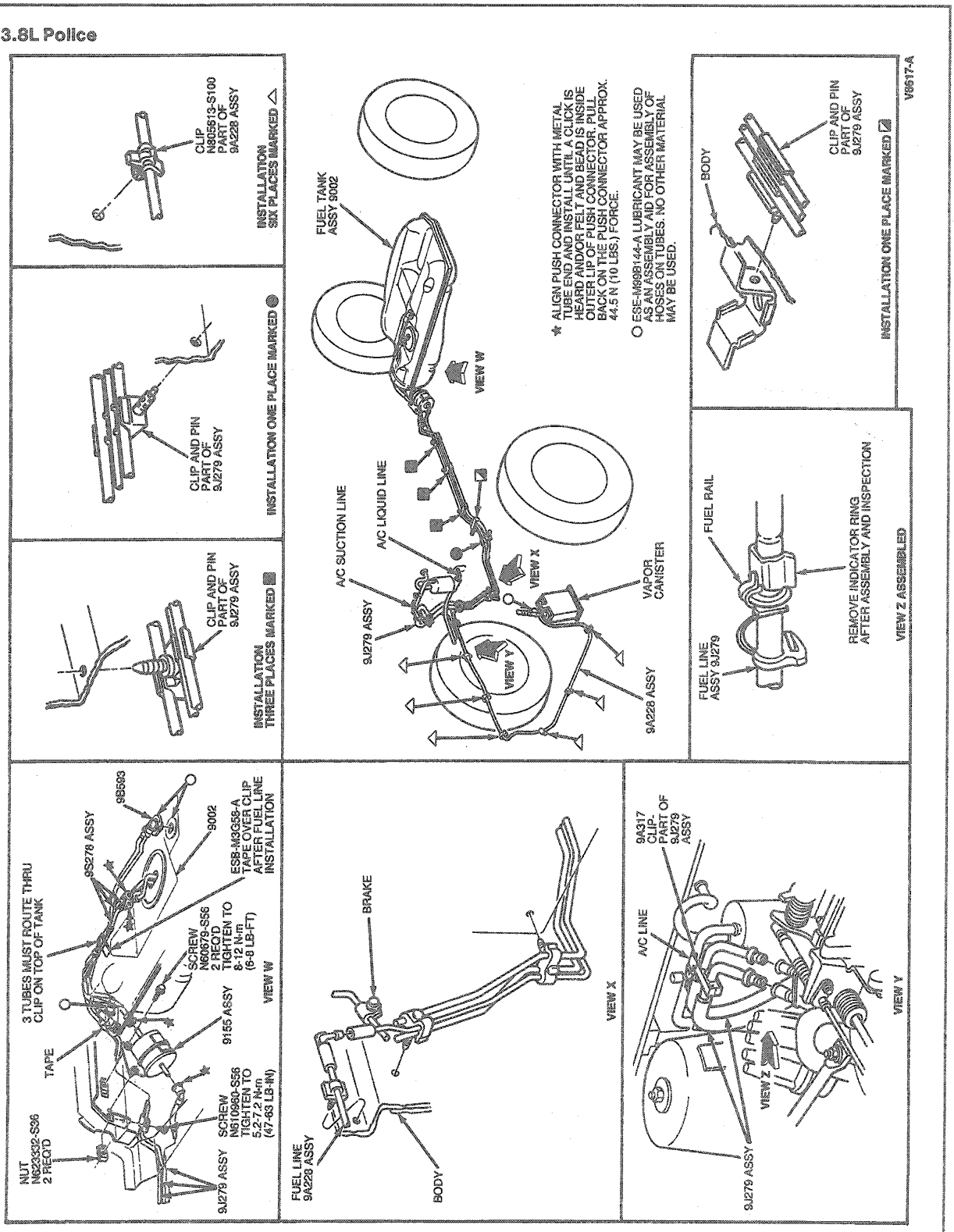
REMOVAL AND INSTALLATION (Continued)

3.8L Engine (Except Police)



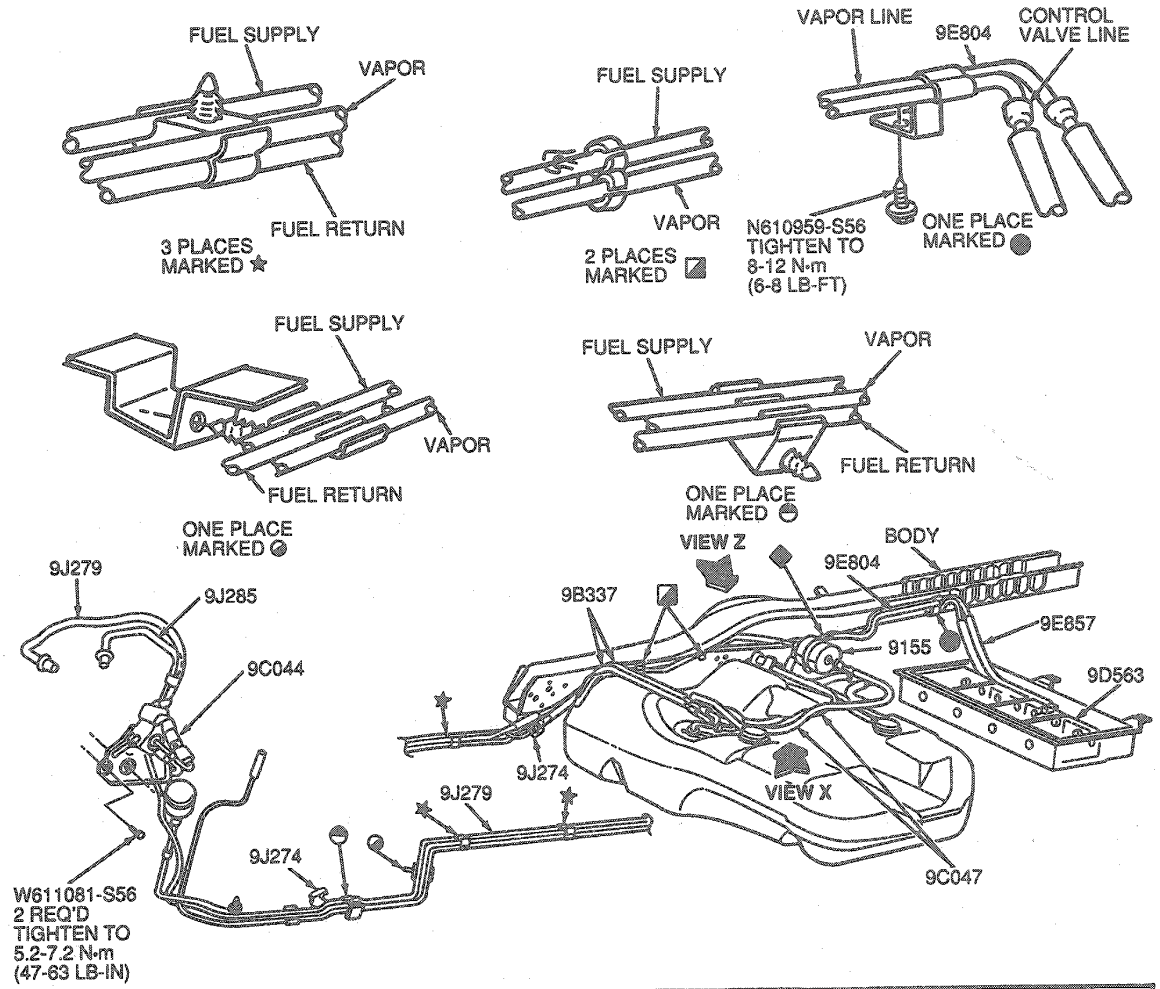
REMOVAL AND INSTALLATION (Continued)

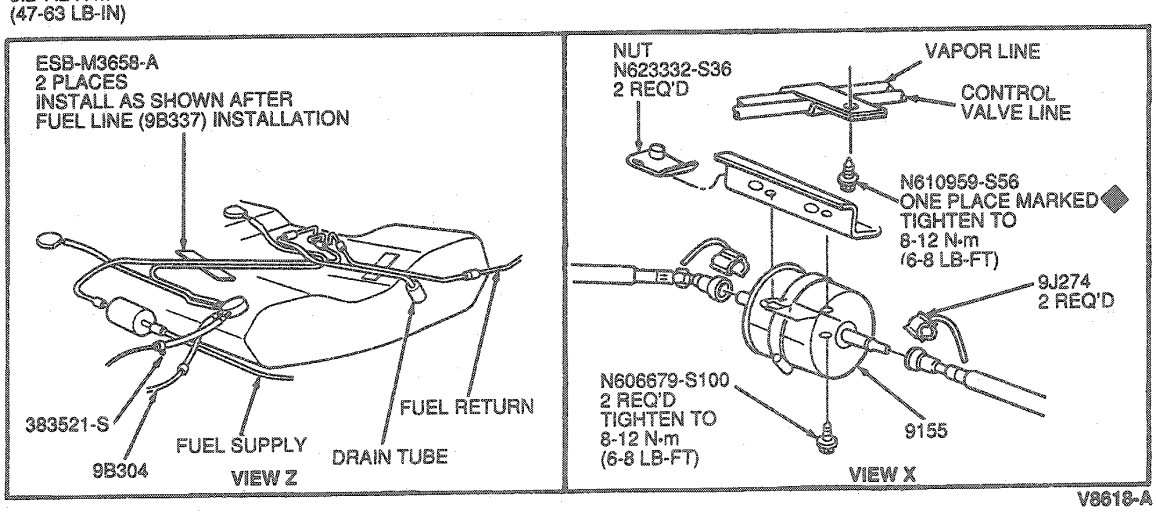
3.8L Police



REMOVAL AND INSTALLATION (Continued)

3.0L Flexible Fuel Vehicle





REMOVAL AND INSTALLATION (Continued)

Filler Pipe

Removal

1. Open filler door to remove three screws retaining fuel tank filler pipe to pocket. Mark filler cap tether location.
2. Raise vehicle. Refer to Section 00-02.
3. Loosen filler and vent hose on fuel tank filler pipe.
4. Remove bolt retaining fuel tank filler pipe assembly to underbody.
5. Remove fuel tank filler pipe.

Installation

1. Position fuel tank filler pipe in body location.
2. Connect hoses with clamps to fuel tank filler pipe.
3. Install underbody fuel tank filler pipe assembly bolt. Tighten to 4-6 N·m (36-53 lb-in).
4. Lower vehicle.
5. Install fuel tank filler cap to tether location and install three retaining screws.

Fuel Tank Straps

Removal

Fuel tank support straps may be removed, and / or replaced without removing the tank, if each fuel tank support strap is removed and installed one at a time and a support is provided under the fuel tank.

The hinged end of the fuel tank support strap attachment holds the fuel tank support strap in place after the fuel tank is removed. This hinged end uses a pin-type attachment through a loop in the end of the fuel tank support strap.

1. To remove fuel tank support strap, push fuel tank support strap up into bracket until pin lines up with large hole. There is a guide and stop inside bracket to assist in aligning fuel tank support strap for removal and installation of pin.

   NOTE: A magnetized screwdriver is helpful to draw pin out of large opening in bracket if pin does not line up properly.
2. Push pin out of large hole in side of bracket by inserting a small drift pin or punch into small hole in opposite side of bracket.

Installation

1. Push fuel tank support strap into bracket opening.

   CAUTION: The pin must rest flat against bottom of bracket. If it does not, fuel tank could be damaged. Do not install fuel tank. Attempt to position pin so that it will seat properly. If unsuccessful, remove pin and fuel tank support strap. Check for, and remove any obstruction that may be inside bracket. Check to ensure pin is correct length.
2. Insert pin into loop in fuel tank support strap.
3. Pull fuel tank support strap down until pin is fully seated on bottom of bracket.

Fuel Lines—Nylon

WARNING: FUEL SUPPLY LINES ON ALL VEHICLES EQUIPPED WITH EFI ENGINES WILL REMAIN PRESSURIZED FOR LONG PERIODS OF TIME AFTER ENGINE SHUTDOWN. THE PRESSURE MUST BE RELIEVED BEFORE SERVICING THE FUEL SYSTEM. REFER TO FUEL SYSTEM PRESSURE RELIEF.

Nylon lines replace the conventional steel tubing (except on Taurus Police and FF vehicles which use combination nylon / stainless steel fuel lines). The individual tubes are clipped and taped together by the manufacturer and are supplied as an assembly. The nylon fuel tube assembly is secured to the body rails with clips and push pins. The clips are located along the tube assembly by upsets on the fuel tube. In addition to locating the clips, these upsets prevent the tubes from sliding through the clips after they have been installed on the vehicle. The fuel supply and return lines are connected to the fuel tank sending unit and pump and fuel filter using push-connects. Connections to the engine are made with spring lock couplings. Refer to Push Connect and Spring Lock Coupling Removal and Installation.

CAUTION: Ford approved nylon fuel tubing is made from material which has been tested and proven to be acceptable for use with commercially available fuels. It is also resistant to most environmental conditions. Avoid using alternate tubing materials. Use of non-approved tubing could pose a hazard in service.

CAUTION: Nylon fuel tube must not be serviced using hose and hose clamps. Push connect fittings cannot be serviced except to replace the retaining clips. Should the plastic tubes, push connect fittings or steel tube ends become damaged and leak, approved service parts must be used to service the fuel lines.

CAUTION: The nylon fuel lines can be damaged by torches, welding sparks, grinding and other operations which involve heat and high temperatures. If any service operation will be used which involves heat and high temperatures, locate all fuel system components, especially the nylon fuel lines to be certain they will not be damaged. It is recommended that the nylon fuel tubes be removed from the vehicle if a torch or high heat producing equipment is to be used for service in the following areas:

1. **Exhaust or suspension components in proximity to fuel tubes**
2. **Floorpan under vehicle and inside the passenger compartment (RH side)**
3. **Rocker panel (RH side)**
4. **Underbody frames, rails and crossmembers (RH side)**

REMOVAL AND INSTALLATION (Continued)

5. **Dash panel, under vehicle or inside the passenger compartment (lower RH side)**
6. **Front or rear wheel house/fender apron (RH side)**

Removal

1. Depressurize fuel system as outlined under Fuel System Pressure Relief.
2. Drain fuel from fuel tank as outlined under Fuel Tank, Removal. On Flexible Fuel vehicles drain fuel tank as outlined under Fuel Tank Draining Procedure — Flexible Fuel Vehicles.
3. Lower fuel tank and disconnect push connect fittings from fuel tank sending unit and pump.
4. Disconnect push connect fittings from fuel filter at RH side of fuel tank.
5. On all vehicles except Flexible Fuel vehicles, remove three screws retaining fuel tube shield (9C291) to lower dash crossmember and remove fuel tube shield.
6. Disconnect vapor tube from fuel line assembly at in-line connection in engine compartment along RH side member between shock tower and dash panel.
7. On vehicles with 3.0L MFI engines, cut strap which retains fuel lines and vacuum hose in engine compartment.
8. Disconnect spring lock couplings from engine.
9. Cut push pins off between each retaining clip and body.

Installation

NOTE: New fuel lines come equipped with push pins. If a fuel line is being reused, new push pins must be installed on existing line. Any damaged clips must be replaced.

1. Install fuel line assembly by pushing five or six pins into existing holes in underbody.

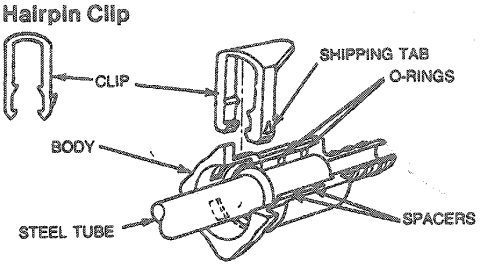
   NOTE: On all vehicles except flexible fuel vehicles, lines must be routed between fuel tube shield and lower dash.
2. Install fuel tube shield to lower dash crossmember and install three retaining screws.
3. Raise fuel tank up to underbody and connect fuel lines to fuel tank sending unit and pump and fuel vapor valve. Route lines through clip on top of tank. Connect electrical connector to fuel pump.
4. Install fuel tank to underbody.
5. Connect fuel lines to fuel filter.
6. Connect vapor tube to fuel tube assembly in engine compartment.
7. Connect fuel line spring lock coupling to engine fuel injection supply manifold (9F792).

Push Connect Fittings

CAUTION: The steel push connect and spring lock couplings used on the Flexible Fuel vehicles have special O-rings for methanol fuel compatibility. Refer to Steel Push Connect 5/16 inch or 3/8 inch fittings Removal and Disconnect procedure. Use Disconnect Tools T90T-9550-B or T90T-9550-C.

Push connect fittings are designed with a retaining clip. The fittings used with 9.5 and 7.9mm (3/8 and 5/16 inch) diameter tubing use a hairpin clip. Clips should be replaced whenever a connector is removed.

Hairpin Clip



Removal

NOTE: Drain fuel tank if necessary, as outlined under Fuel Tank, Removal. On Flexible Fuel vehicles, drain fuel tank as outlined under Fuel Tank Draining Procedure — Flexible Fuel Vehicles.

1. Inspect internal portion of fitting for dirt accumulation. If more than a light coating of dust is present, clean fitting before disassembly.
2. Some adhesion between seals in fitting and tubing occurs with time. To separate, twist fitting on tube, then push and pull fitting until it moves freely on tube.

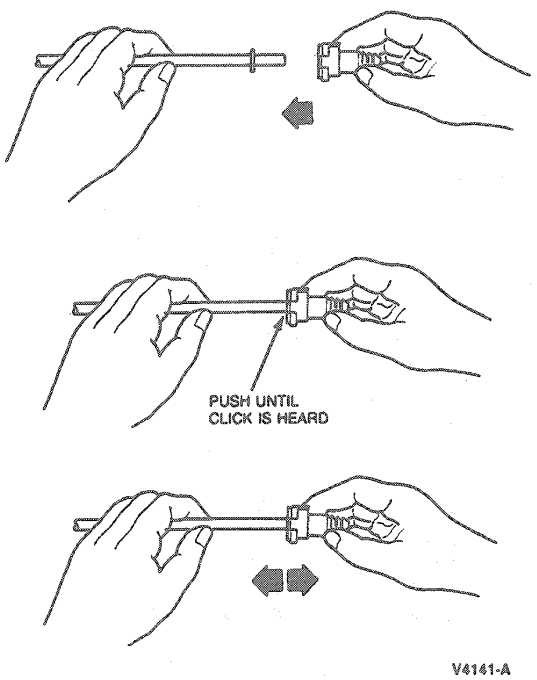
   CAUTION: Do not use any tools.
3. Remove hairpin clip from fitting by first bending shipping tab and breaking. Next **(using hands only)**, spread two clip legs about 3.2mm (1/8 inch) each to disengage body and push legs into fitting. Complete removal is accomplished by lightly pulling from triangular end of clip and working it clear of tube and fitting.

   NOTE: On 90 degree elbow connectors, excessive side loading could break connector body.
4. Grasp fitting and hose assembly and pull in an axial direction to remove fitting from steel tube.
5. After disassembly, inspect and clean the tube end sealing surface. Tube end should be free of scratches and corrosion as they result in path for fuel leakage. Inspect the inside of the fitting for any internal parts such as O-rings and spacers that may have been dislodged from the fitting. Replace any damaged connector.

REMOVAL AND INSTALLATION (Continued)

Installation

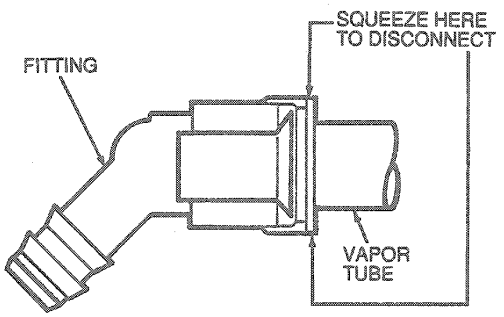
1. Install new connector if damage was found. Install new clip, insert clip into any two adjacent openings with triangular portion pointing away from fitting opening. Install clip to fully engage body (legs of hairpin clip locked on outside of body). Piloting with an index finger is necessary.
2. Before installing fitting on tube, wipe tube end with a clean cloth. Inspect inside of fitting to ensure it is free of dirt and/or obstructions. Apply a light coat of engine oil to the tube end for ease of assembly.
3. To install fitting onto tube, align fitting and tube axially and push fitting onto tube end. When fitting is engaged, a definite click will be heard. Pull on fitting to ensure it is fully engaged.



V4141-A

Fuel Vapor Tube Push Connect Removal

No removal tool is required for the nylon fuel vapor connectors used on the Flexible Fuel vehicles. These connectors can be disconnected by squeezing the connector and pulling it off the tube end.



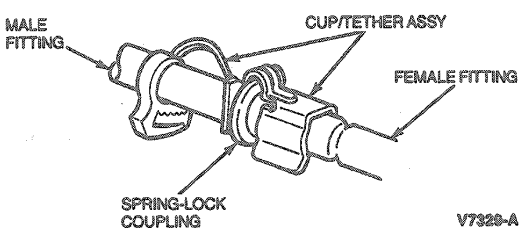
V9614-A

Spring Lock Coupling

Tools Required:

- Fuel Line Disconnect Tool 3/8 Inch (Yellow) D87L-9280-A
- Fuel Line Disconnect Tool 1/2 Inch (Green) D87L-9280-A

The spring lock coupling is a fuel line coupling held together by a garter spring inside a circular cage. When the coupling is connected together, the flared end of the female fitting slips behind the garter spring inside the cage of the male fitting. The garter spring and cage then prevent the flared end of the female fitting from pulling out of the cage. As a redundant locking feature, a horseshoe shaped retaining clip is incorporated to improve the retaining reliability of the spring lock coupling.



V7329-A

Removal

1. Release fuel system pressure as outlined under Fuel System Pressure Relief.
2. Remove retaining clip from spring lock coupling by hand only. Do not use any sharp tool or screwdriver as it may damage the spring lock coupling.
3. Twist fitting to free it from any adhesion at the O-ring seals.
4. Fit Fuel Line Disconnect Tool D87L-9280-A (3/8 inch) (Yellow) or D87L-9280-B (1/2 inch) (Green) or equivalents to coupling.
5. Close tool and push into open side of cage to expand garter spring and release female fitting.
6. After garter spring is expanded, pull fittings apart.

REMOVAL AND INSTALLATION (Continued)

7. Remove tool from disconnected coupling.

Installation

1. Ensure that garter spring is in cage of male fitting. If garter spring is missing, install a new spring by pushing it into cage opening. If garter spring is damaged, remove it from cage with a small wire hook (do not use a screwdriver) and install a new spring.
2. Clean all dirt or foreign material from both pieces of coupling.

   WARNING: USE ONLY THE SPECIFIED O-RINGS AS THEY ARE MADE OF A SPECIAL MATERIAL. THE USE OF ANY O-RING OTHER THAN THE SPECIFIED O-RING MAY ALLOW THE CONNECTION TO LEAK INTERMITTENTLY DURING VEHICLE OPERATION.
3. Replace missing or damaged O-rings. Use only O-rings listed in Spring Lock Coupling illustration.

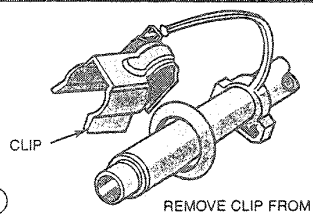
   Lubricate male fitting and O-rings and inside of female fitting with clean engine oil.
4. Fit female fitting to male fitting and push until garter spring snaps over flared end of female fitting.
5. Ensure coupling engagement by pulling on fitting and visually checking to ensure garter spring is over flared end of female fitting.

   NOTE: All vehicles require the large black clip to be installed on the supply side fuel line and the small gray clip to be installed on the return side fuel line.
6. Position retaining clip over metal portion of spring lock coupling. Firmly push retaining clip onto spring lock coupling. Ensure that horseshoe portion of clip is over the coupling. Do not install retaining clip over rubber fuel line.

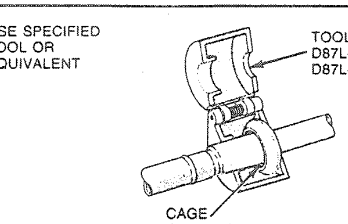
REMOVAL AND INSTALLATION (Continued)

TO DISCONNECT COUPLING

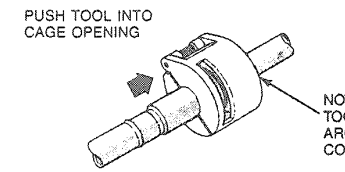
CAUTION — RELIEVE FUEL PRESSURE BEFORE DISCONNECTING COUPLING



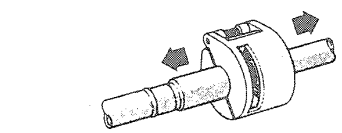
1 REMOVE CLIP FROM COUPLING



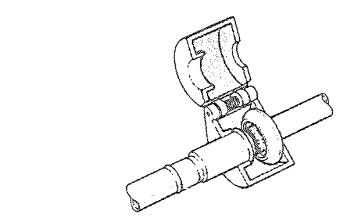
2 FIT TOOL TO COUPLING SO THAT TOOL CAN ENTER CAGE OPENING TO RELEASE THE GARTER SPRING.



3 PUSH THE TOOL INTO THE CAGE OPENING TO RELEASE THE FEMALE FITTING FROM THE GARTER SPRING

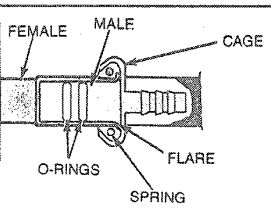


4 PULL THE COUPLING MALE AND FEMALE FITTINGS APART



5 REMOVE THE TOOL FROM THE DISCONNECTED SPRING LOCK COUPLING

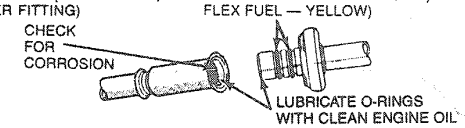
TO CONNECT COUPLING



1

REPLACEMENT O-RINGS
390846-S96 (3/8 INCH DIA., 2 PER FITTING)
390847-S96 (1/2 INCH DIA., 2 PER FITTING)

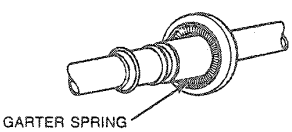
USE ONLY SPECIFIED FUEL RESTRAINT O-RINGS (COLOR: EXCEPT FLEX FUEL — BROWN) FLEX FUEL — YELLOW)



CLEAN FITTINGS WITH SOLVENT. CHECK FOR MISSING OR DAMAGED O-RINGS. REPLACE MISSING O-RINGS. IF EITHER O-RING IS DAMAGED, REPLACE BOTH O-RINGS.

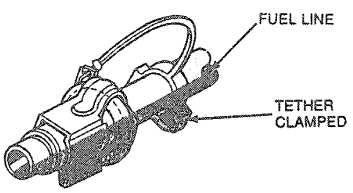
REPLACEMENT GARTER SPRINGS:
3/8-INCH — E1ZZ-19E576-A
1/2-INCH — E1ZZ-19E576-B

2

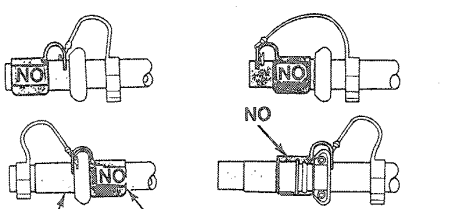


TO ENSURE COUPLING ENGAGEMENT, PULL ON FITTING AND VISUALLY CHECK TO BE SURE GARTER SPRING IS OVER FLARED END OF FEMALE FITTING

3



4 YES



5 **WRONG** — WHEN FLARE OR O-RINGS ARE SHOWING

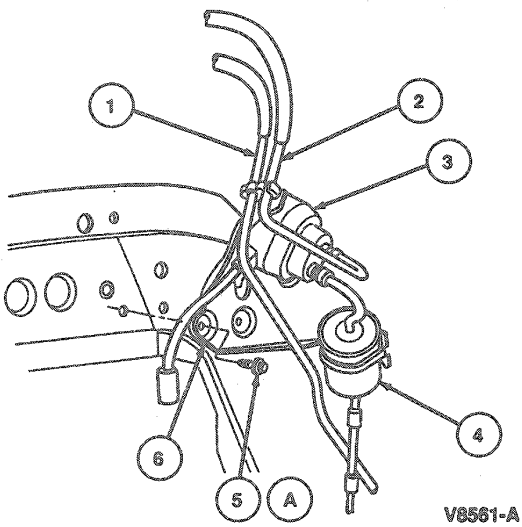
V8616-A

REMOVAL AND INSTALLATION (Continued)

Flexible Fuel Mixer/Sensor Assembly

Removal and Installation

1. Depressurize fuel system as outlined under Fuel System Pressure Relief.
2. Remove upper and lower supply line quick disconnect secondary retaining clips from fittings. Disconnect fuel lines from flexible fuel (FF) sensor (9C044).
3. Remove flexible fuel (FF) sensor (9C044) bracket retaining screws and remove.
4. To install, reverse Removal procedures. Tighten fuel and vapor return tube (9J279) retaining screws to 5.2-7.2 N·m (47-63 lb-in). Start engine and check for fuel leaks.



V8561-A

Item	Part Number	Description
1	9J279	Fuel and Vapor Return Tube
2	9J285	Fuel Supply Line
3	9C044	Flexible Fuel Sensor
4	9S301	Fuel Mixer Assy
5A	W611081-S56	Screw (2 Req'd)
6	9D319	Fuel Sensor Bracket
A		Tighten to 8-11.5 N·m (6-8 Lb-Ft)

Fuel Filter

Tools Required:

- EFI and CFI Fuel Pressure Gauge T80L-9974-B

Removal

WARNING: BECAUSE OF THE COMBUSTION CHARACTERISTICS OF GASOLINE, ALWAYS USE EXTREME CARE WHEN REMOVING AND INSTALLING ANY FUEL SYSTEM COMPONENT.

1. Depressurize fuel system as outlined in Fuel System Pressure Relief.
2. Remove push connect fittings at both ends of the fuel filter as outlined.
3. Install retainer clips in each connect fitting.

   NOTE: The flow arrow direction should be positioned forward and downward to ensure proper flow of fuel through replacement fuel filter.
4. Remove fuel filter from bracket by loosening worm gear mounting clamp enough to allow fuel filter to pass through.

Installation

1. Install fuel filter in bracket, ensuring proper direction of flow as noted earlier. Locate the fuel filter against tab at lower end of bracket.
2. Install push connect fittings at both ends of fuel filter as outlined.
3. Tighten worm gear mounting clamp to 1.7-2.8 N·m (15-25 lb-in).
4. Start engine and inspect for leaks.

Fuel Pump and Sender Assembly

Unleaded Gasoline Vehicles

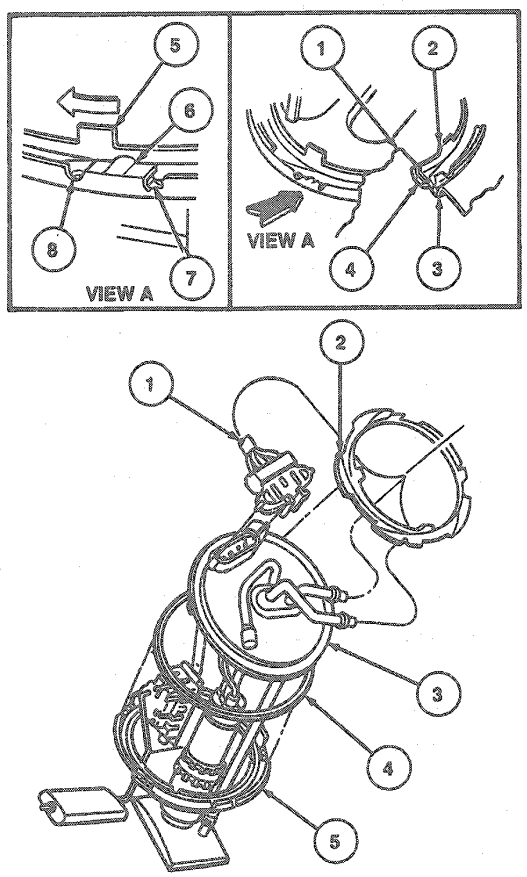
Tools Required:

- Fuel Tank Sender Wrench D84P-9275-A
- Rotunda Fuel Storage Tanker 034-00002
- Rotunda Adapter Hose 034-00012

Removal

1. Place vehicle on hoist, do not raise.
2. Depressurize fuel system as outlined in Fuel System Pressure Relief.
3. Drain fuel from fuel tank through fuel tank filler pipe using Rotunda Fuel Storage Tanker 034-00002 and Adapter Hose 034-00012 or equivalent.
4. Raise vehicle on hoist.
5. Disconnect and remove fuel tank filler pipe.
6. Support fuel tank and remove fuel tank support straps. Lower fuel tank partially and remove fuel lines, electrical connectors and vent lines from tank. Remove fuel tank to bench.
7. Remove any dirt that has accumulated around fuel pump retaining flange so that it will not enter fuel tank during removal and installation.
8. Turn fuel pump locking retainer ring (9C385) counterclockwise using Fuel Tank Sender Wrench D84P-9275-A or an equivalent and remove fuel pump locking retainer ring.
9. Remove fuel tank sending unit and pump.
10. Remove seal gasket and discard.

REMOVAL AND INSTALLATION (Continued)



V8612-A

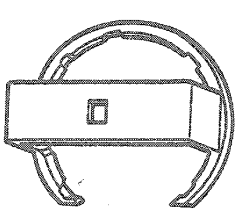
Item	Part Number	Description
1	9H307	Fuel Tank Sending Unit and Pump
2	9C385	Fuel Pump Locking Retainer Ring
3	—	Retainer Ring
4	N803861-S	O-Ring
5	—	Locating Tabs
6	—	Tab
7	—	Stop
8	—	Detent

Installation

1. Clean the fuel tank sending unit and pump mounting flange, fuel tank mounting surface and seal ring groove.
2. Apply a light coating of Premium Long-Life Grease XG-1-C (ESA-M1C75-B) or equivalent on a new seal ring to hold it in place during assembly and install it in fuel ring groove.
3. Install fuel tank sending unit and pump carefully to ensure that filter is not damaged. Ensure that locating keys are in keyways and seal ring remains in place.
4. Hold assembly in place and install fuel pump locking retainer ring finger-tight. Ensure that all locking tabs are under fuel tank lock ring tabs.
5. Secure unit with fuel pump locking retainer ring by rotating fuel pump locking retainer ring clockwise using Fuel Tank Sender Wrench D84P-9275-A or an equivalent until fuel pump locking retainer ring stops against stops.
6. Remove fuel tank from bench to vehicle and support fuel tank while connecting fuel lines, vent line, and electrical connectors to appropriate places.
7. Install fuel tank in vehicle and secure with fuel tank support straps.
8. Lower vehicle.
9. Install fuel tank filler pipe and retaining screws.
10. Install a minimum of 38l (10 gal) of fuel and check for leaks.
11. Turn ignition switch to ON position for three seconds repeatedly (5 to 10 times) until pressure gauge shows at least 270 kPa (30 psi). Check for leaks at fittings.
12. Remove pressure gauge, start engine, and recheck for leaks.

Flexible Fuel (FF) Vehicles

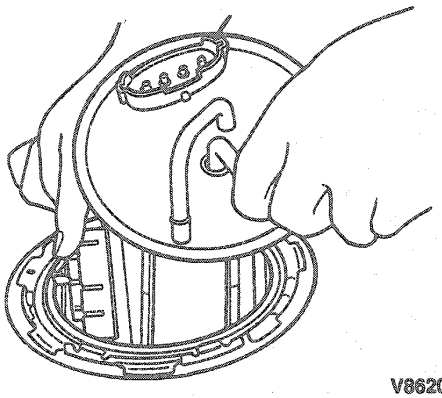
1. Depressurize fuel system as outlined under Fuel System Pressure Relief.
2. Drain fuel tank as outlined under Fuel Tank Draning Procedure—Flexible Fuel Vehicles.
3. Raise vehicle on a hoist. Refer to Section 00-02.
4. Disconnect and remove fuel tank filler pipe.
5. Support fuel tank and remove fuel tank support straps. Lower fuel tank partially and disconnect fuel lines, electrical connectors and fuel vapor and vent lines from fuel tank. Remove fuel tank to bench.
6. Remove any dirt that has accumulated around fuel tank sending unit and pump so that dirt does not enter fuel tank during fuel tank sending unit and pump removal.
7. Remove fuel pump locking retainer ring using Fuel Tank Sender Wrench D90P-9275-A or equivalent.



V8619-A

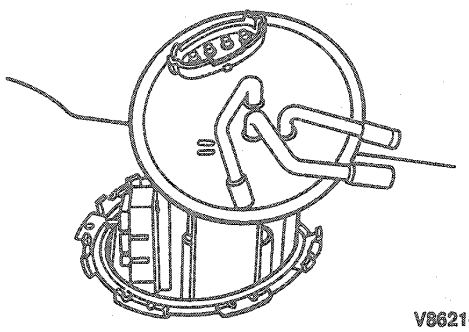
REMOVAL AND INSTALLATION (Continued)

8. Lift fuel tank sending unit and pump locating tabs from fuel tank location slots.
9. Lift fuel tank sending unit and pump upward rotating left, while aligning float wiper arm retainer and return line into fuel tank location slots.



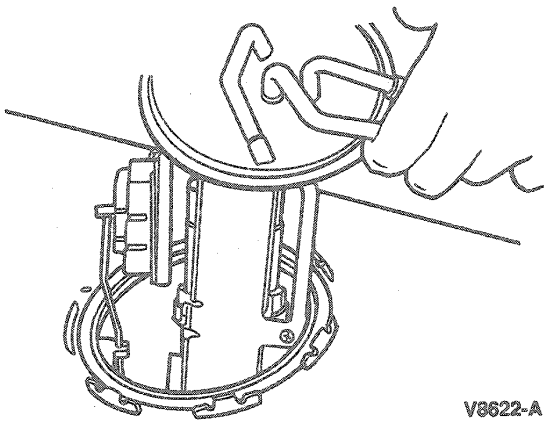
V8620-A

10. Apply slight pressure to remove fuel tank sending unit and pump.



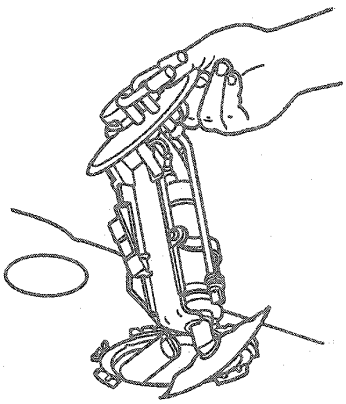
V8621-A

11. Lift float wiper arm through LH fuel tank slot and pass pump motor retaining bracket through the RH fuel tank slot.



V8622-A

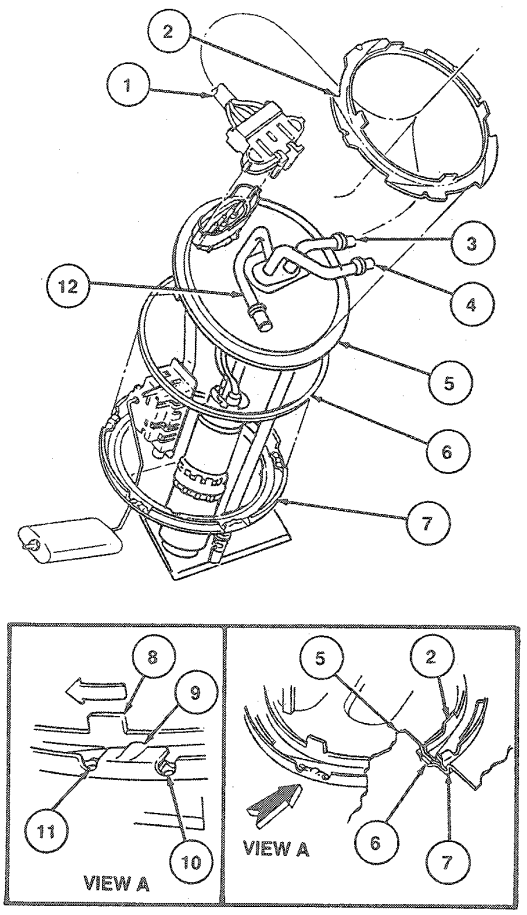
12. Remove fuel tank sending unit and pump keeping return line in fuel tank slot. Lift fuel pump inlet filter then sender arm float through fuel tank opening.



V8623-A

13. Remove fuel methanol compatible fuel pump mounting gasket (9417).
14. To install, position new fuel methanol compatible fuel tank sending unit and pump gasket and reverse Remove procedure.

REMOVAL AND INSTALLATION (Continued)



Item	Part Number	Description
1	—	Electrical Connector
2	9C385	Fuel Pump Locking Retainer Ring
3	—	Fuel Return
4	—	Fuel Supply
5	9H307	Fuel Tank Sending Unit and Pump
6	9417	Fuel Pump Mounting Gasket
7	—	Retainer Ring
8	—	Locating Tabs
9	—	Tab
10	—	Stop
11	—	Detent
12	—	Fuel Tank Drain Tube

15. To install fuel tank, reverse Removal procedure. Start engine and check for leaks.

MAJOR SERVICE OPERATIONS

Fuel Tanks

An electric fuel pump is located in the fuel tank. The pump is attached to the fuel tank, or as part of the sender unit. The fuel tank must be removed to service the fuel pump. Care should be taken during installation due to the hose and wire routing on the tank. Route all fuel lines and electrical harnesses properly. Check the fuel line connections for leaks.

Fuel tanks do not require special service procedures and may be steam-cleaned and / or serviced using standard procedures. After steaming, allow to thoroughly air dry. The vapor separator assembly should be replaced. Replace fuel tank strap bolts.

CAUTION: Remove the fuel pump prior to steaming the fuel tank. Care should be exercised not to deform the plastic reservoir inside the tank with excessively hot steam or direct contact with plastic surface.

WARNING: FUEL SUPPLY LINES ON VEHICLES EQUIPPED WITH FUEL INJECTED ENGINES WILL REMAIN PRESSURIZED FOR LONG PERIODS OF TIME AFTER ENGINE SHUTDOWN. THE PRESSURE MUST BE RELIEVED BEFORE SERVICING THE FUEL SYSTEM. REFER TO FUEL SYSTEM PRESSURE RELIEF.

Fuel Lines

Vehicles equipped with nylon fuel tubes and push connect fittings have two types of service repairs that can be performed on the fuel lines replacing nylon tubing (splicing nylon to nylon) and replacing push connector or spring lock fittings.

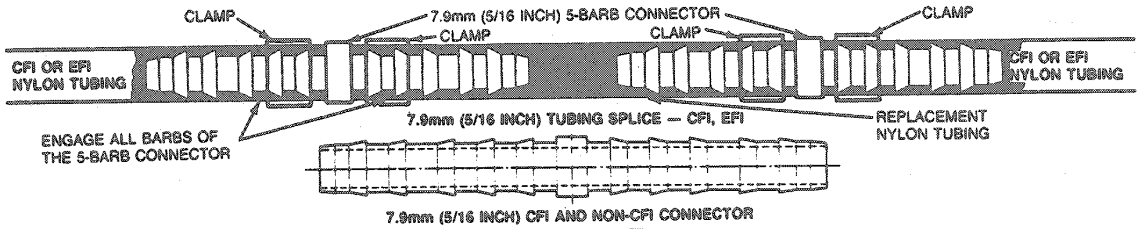
Splicing Nylon to Nylon

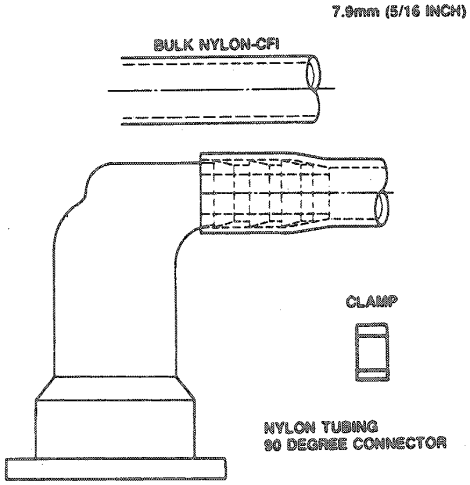
1. Relieve fuel system pressure as outlined in Fuel System Pressure Relief. Read cautionary note prior to relieving pressurized fuel system. If necessary, drain fuel tank as outlined under Fuel Tank, Removal or Fuel Tank Draining Procedure—Flexible Fuel Vehicles.
2. Cut out damaged section of tubing and retain as a guide.
3. Cut a section of service tubing (type 11 or 12 nylon 7.9mm (5 / 16 inch) diameter) to same length as damaged section of tubing.

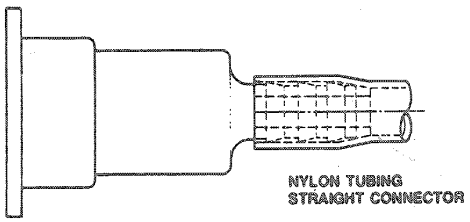
   NOTE: To make hand insertion of barbed connectors into nylon easier, tube end must be soaked in a cup of boiling water for one minute immediately before pushing barbs into nylon.
4. Select proper 7.9mm (5 / 16 inch) barbed connectors for completing splice. Two connectors are required for each splice.
5. Install barbed connectors into each end of replacement tubing using boiling water as outlined.
6. Install clips onto any tubes which might be difficult to access once final splices are completed.
7. Install four keystone clamps loosely onto original nylon tubing before beginning next step.

MAJOR SERVICE OPERATIONS (Continued)

8. Complete splice of replacement nylon to original nylon tubing at both ends.
9. Tighten clamps in locations shown in illustration under Step 11 of this procedure.
10. Install any remaining clips which were removed for this service and check that tubes are secure in original clips.
11. Fill fuel tank, start engine and check for leaks.







PART NO.	PART NAME AND DESCRIPTION	QUANTITY
N803431	UNION 5-BARB STEEL 5/16 INCH	2
N809613	TUBE 5/16 INCH BULK NYLON	AS NECESSARY
377931	CLAMP FOR UNION CORRECTIONS	2 PER SPLICE
9289	TUBE ASSY 5/16 INCH PUSH CONNECT WITH 18 INCH NYLON	1
9289	TUBE ASSY 5/16 INCH ELBOW WITH 18 INCH NYLON	1

V4712-A

Replacing Nylon Push Connectors

Refer to illustration under Splicing Nylon-to-Nylon, Step 11.

NOTE: Damaged push connectors must be discarded and replaced with new push connectors. If only retaining clip is damaged, replace clip.

1. Relieve fuel system pressure as outlined in Fuel System Pressure Relief. Read cautionary note prior to relieving pressurized fuel system. If necessary, drain fuel tank as outlined under Fuel Tank, Removal or Fuel Tank Draining Procedure—Flexible Fuel Vehicles.
2. Disconnect damaged push connector. Be sure to break the tab before removing retaining clip.
3. Select proper size replacement push connector and nylon tube assembly.
4. Cut out a section of original nylon tube to same length as nylon tube attached to new push connector.

   NOTE: To make hand insertion of barbed connectors into nylon easier, tube end must be soaked in a cup of boiling water for one minute immediately before pushing barbs into nylon.
5. Install proper barbed connector into replacement nylon assembly.
6. Install two keystone clamps onto original nylon tubing before beginning next Step.
7. Complete splice by connecting barbed connector to original nylon.
8. Tighten clamps in locations shown in illustration under Step 11 of Splicing Nylon-to-Nylon.
9. Connect new connector assembly to steel tube end.
10. Check that underbody clips are properly securing fuel tubes.
11. Fill tank, start engine and check for fuel leaks.

SPECIFICATIONS

APPROXIMATE FUEL TANK CAPACITY

Model Usage	Liters	Imp.	U.S
Standard	60.6	13.3	16.0
Extended Range	70.4	15.5	18.6

SPECIFICATIONS (Continued)

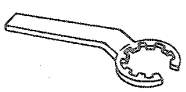
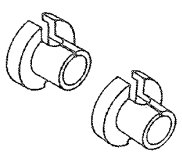
PUSH CONNECT RETAINERS—PART NUMBERS

Part Number	Component
N802241 (Black)	Hair Pin Clip[1]—3/8 Inch Connector
N802239 (White)	Hair Pin Clip[1]—5/16 Inch Connector
N802710-S190	Duck Bill Clip[1]—1/4 Inch
N802441-S	Duck Bill Clip[1]—1/2 Inch

TORQUE SPECIFICATIONS

Description	N·m	Lb-In
Filler Neck-to-Body Screws	2.7-3.7	24-32
Fuel Filler Clamp	1.7-2.8	15-25
Fuel Filter Bracket Screw	8-12	71-106
Inertia Fuel Shutoff Switch Nuts	1.5-2.2	14-19
Fuel Tank Strap Bolts	29-41	22-30 (Lb-Ft)
Fuel Filler Pipe Hose Clamps	2.7-3.7	24-32
Fuel Filler Neck Bolt	4-6	36-53
Flexible Fuel Mixer/Sensor Assy	5.2-7.2	47-63

SPECIAL SERVICE TOOLS

Tool Number/ Description	Illustration
T74P-9275-A Fuel Tank Sender Wrench	 T74P-9275-A
T90T-9550-S Fuel Line Disconnect	 T90T-9550-S

Tool Number	Description
D87L-9280-A	Disconnect Tool 3/8 Inch (Yellow)
D87L-9280-B	Disconnect Tool 1/2 Inch (Green)
D90P-9275-A	Fuel Tank Sender Wrench

ROTUNDA EQUIPMENT

Model	Description
034-00002	Fuel Storage Tanker
034-00012	Adapter Hose
034-00020	Fuel Storage Tanker and Adapter Hose

PARTS CROSS-REFERENCE

Base Part #	Part Name	Old Part Name
9002	Fuel Tank	
9030	Fuel Tank Filler Cap	
9034	Fuel Tank Filler Pipe	
9092	Fuel Tank Support Strap	
9155	Fuel Filter	
9341	Inertia Fuel Shutoff Switch	Fuel Pump Inertia Switch
9417	Fuel Pump Mounting Gasket	
9B593	Fuel Vapor Valve	
9C291	Fuel Tube Shield	
9C385	Fuel Pump Locking Retainer Ring	
9F792	Fuel Injection Supply Manifold	
9H307	Fuel Tank Sending Unit and Pump	
9J279	Fuel and Vapor Return Tube	

1 Replacement Required After Connector Removal

SECTION 10-02 Accelerator Pedal and Linkage

SUBJECT	PAGE
DIAGNOSIS	
Linkage	10-02-1
PARTS CROSS-REFERENCE	10-02-7
REMOVAL AND INSTALLATION	
Accelerator Cable Bracket	10-02-2
REMOVAL AND INSTALLATION (Cont'd.)	
Accelerator Pedal and Shaft Assembly	10-02-2
Throttle Cable	10-02-2
SPECIFICATIONS	10-02-7
VEHICLE APPLICATION	10-02-1

VEHICLE APPLICATION

Taurus / Sable.

DIAGNOSIS

Linkage

Based on the condition, the following Steps are to be used for diagnosis **following disconnection of the throttle cable (9A758) from the throttle body lever. (If the vehicle is equipped with speed control, disconnect the speed control cable from the throttle cable.)**

1. Accelerator pedal is hard to push down, or has a rough / raspy or sticky feel.
   - Make sure that disconnected end of throttle cable or its accelerator retracting spring (9737) does not come into contact with any surrounding parts.
   - Operate pedal by foot.
   - If throttle cable operation is smooth, throttle cable is not damaged. Refer to Powertrain Control / Emissions Diagnosis Manual[1] for other checks.
   - If condition recurs (making sure disconnected end of throttle cable has not come into contact with anything), check foot pedal assembly for free operation. If pedal operation is free, replace throttle cable.

   NOTE: Throttle cable should not be lubricated and is not serviceable.
2. High engine idle speed.
   - If cable ball socket extends beyond throttle lever ball stud (closed throttle plate direction), throttle cable is not damaged. Refer to Powertrain Control / Emissions Diagnosis Manual[1] for other checks.
   - If ball socket does not extend beyond stud, check foot pedal assembly for free operation. If pedal operation is free, replace throttle cable.

DIAGNOSTIC PROCEDURE — ACCELERATOR PEDAL TO THROTTLE CABLE

CONDITION	ACTION
• Accelerator Pedal is Hard to Push Down or Has a Rough / Raspy or Sticky Feel	• Be sure that the disconnected end of the throttle cable or its accelerator retracting spring does not come into contact with any of the surrounding parts. • Operate the pedal by foot. • If the condition recurs (being sure disconnected end of throttle cable has not come into contact with anything), check the accelerator pedal and shaft for free operation. If the accelerator pedal and shaft operation is free, replace the throttle cable.
• High Engine Idle Speed	• If the socket does not extend beyond the stud, check the accelerator pedal and shaft for free operation. If the accelerator pedal and shaft operation is free, replace the throttle cable.

NOTE: Throttle cable should not be lubricated, and it is not serviceable.

TV3036E

1 Can be purchased as a separate item.

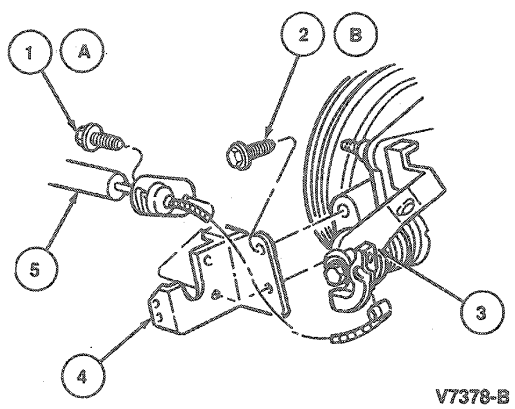
REMOVAL AND INSTALLATION

Throttle Cable

Removal and Installation

1. Remove intake air duct assembly. Refer to Section 03-12.
2. Using a suitable tool, remove throttle cable snap-in nylon bushing from pedal arm.
3. Remove throttle cable housing from dash panel by removing two screws retaining throttle cable to dash panel and pushing outward from inside passenger compartment.
4. On 3.0L SFI engine, remove accelerator control splash shield (9E766).
5. Remove speed control cable from throttle cable, if so equipped. Refer to Section 10-03.

   On 3.0L and 3.2L SHO, unwind cable core wire from pulley and slide cable end fitting out of slot in pulley.
6. Disconnect throttle cable at throttle body throttle lever by inserting a screwdriver between throttle cable and throttle lever and giving a twist.



V7378-B

Item	Part Number	Description
1A	W611624-S36	Screw
2B	N605530-S36 (3.0L SFI) N605905-S2 (All Except 3.0L SFI)	Bolt
3	—	Pulley
4	9723	Accelerator Cable Bracket
5	9A758	Throttle Cable
A		Tighten to 5.2-7.2 N·m (47-63 Lb-in)
B		Tighten to 15-20 N·m (11-14 Lb-Ft)

(Continued)

7. Remove accelerator cable bracket (9723) retaining screw. Remove throttle cable from bracket slot.
8. To install, reverse Removal procedure.

Accelerator Cable Bracket

Removal and Installation

1. Remove air duct assembly and accelerator cable bracket (3.0L SFI engines). Refer to Section 03-12.
2. Disconnect throttle cable at throttle body throttle lever by inserting a screwdriver between throttle cable and throttle lever and giving a twist. On 3.0L and 3.2L SHO, unwind cable core wire from pulley and slide end fitting out of slot on pulley.
3. Remove throttle cable housing to bracket retaining screw.
4. Remove speed control cable from accelerator cable bracket, if so equipped. Refer to Section 10-03.
5. Remove bolts securing accelerator cable bracket to engine.
6. To install, reverse Removal procedure and tighten accelerator cable bracket bolts to 14-20 N·m (10-15 Lb-Ft).

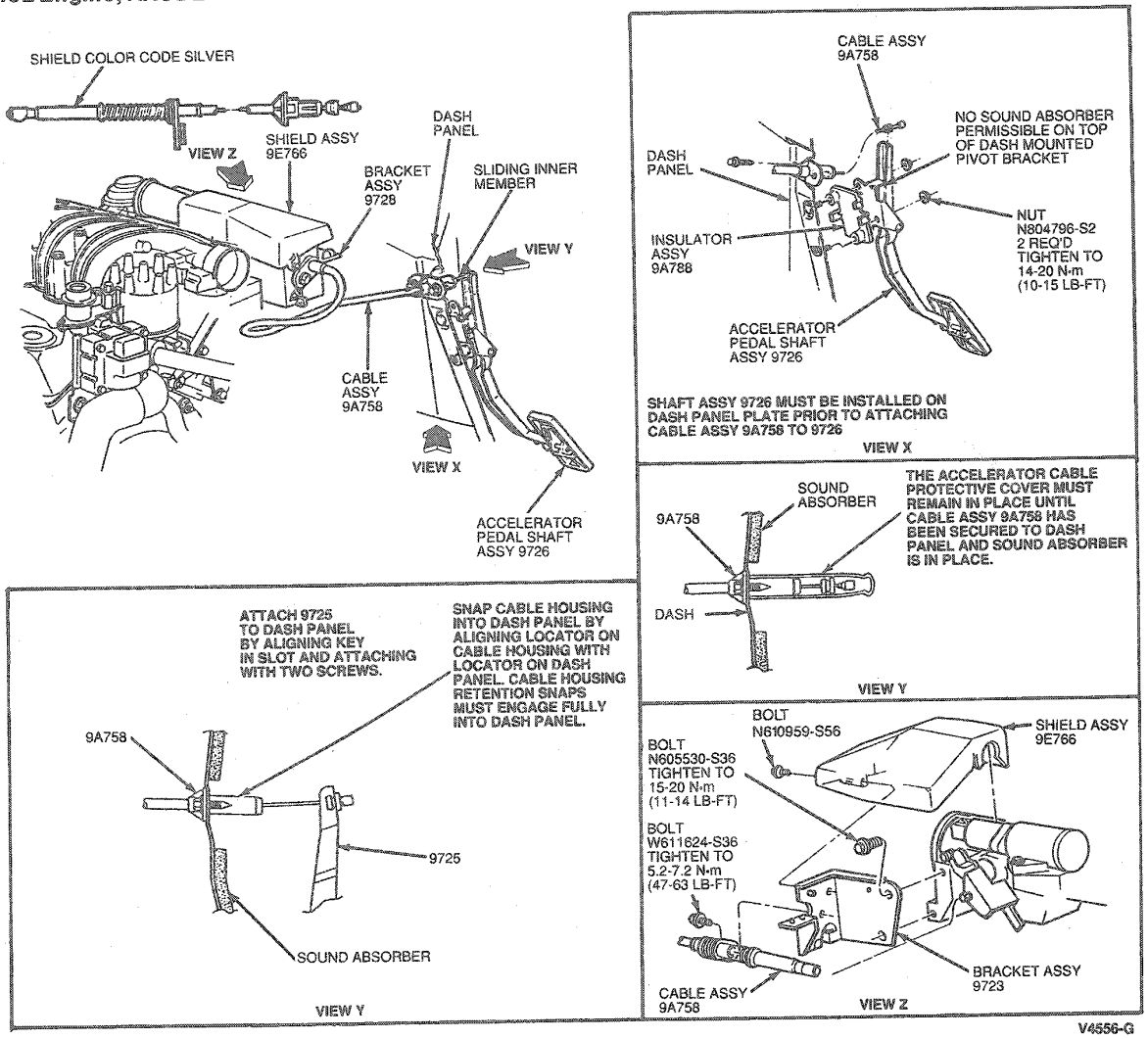
Accelerator Pedal and Shaft Assembly

Removal and Installation

1. Using a suitable tool, push the throttle cable nylon bushing, from back side of arm, out of the accelerator pedal arm.
2. Remove the accelerator pedal and shaft (9725) retaining nuts.
3. To install, reverse Removal procedure. Tighten accelerator pedal and shaft nuts to 14-20 N·m (10-15 lb-ft) and check pedal for smooth operation.

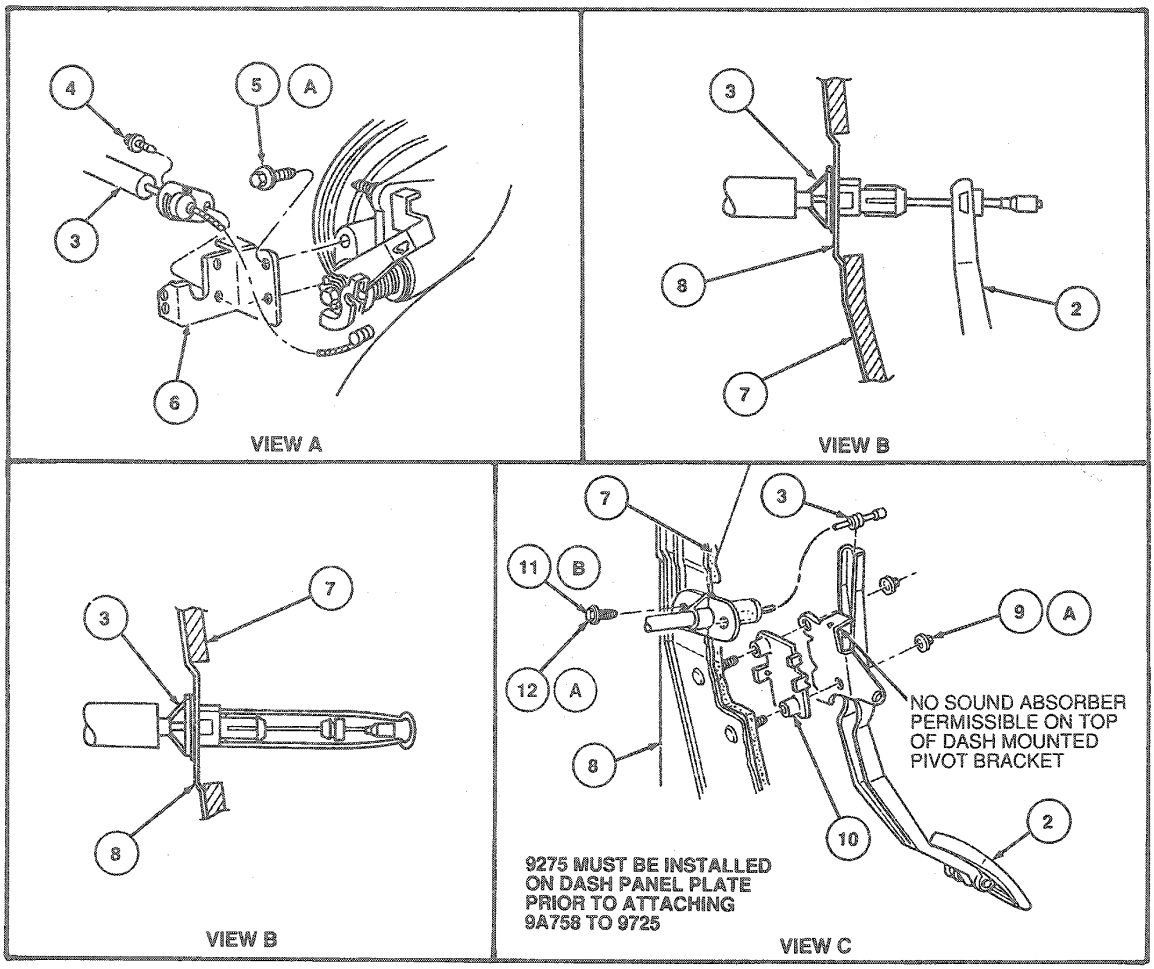
REMOVAL AND INSTALLATION (Continued)

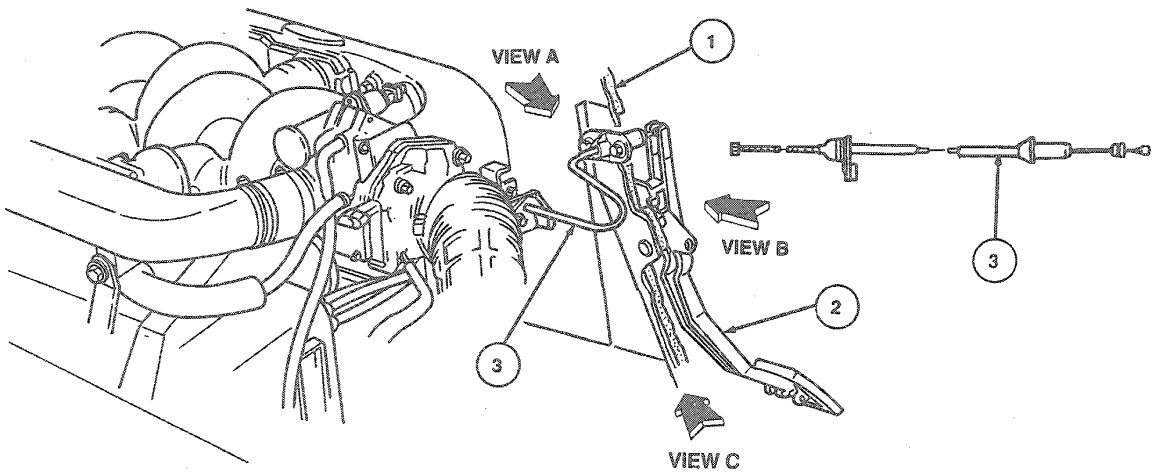
3.0L Engine, AXODE



REMOVAL AND INSTALLATION (Continued)

3.0L SHO Engine, MTX III





V7393-D

REMOVAL AND INSTALLATION (Continued)

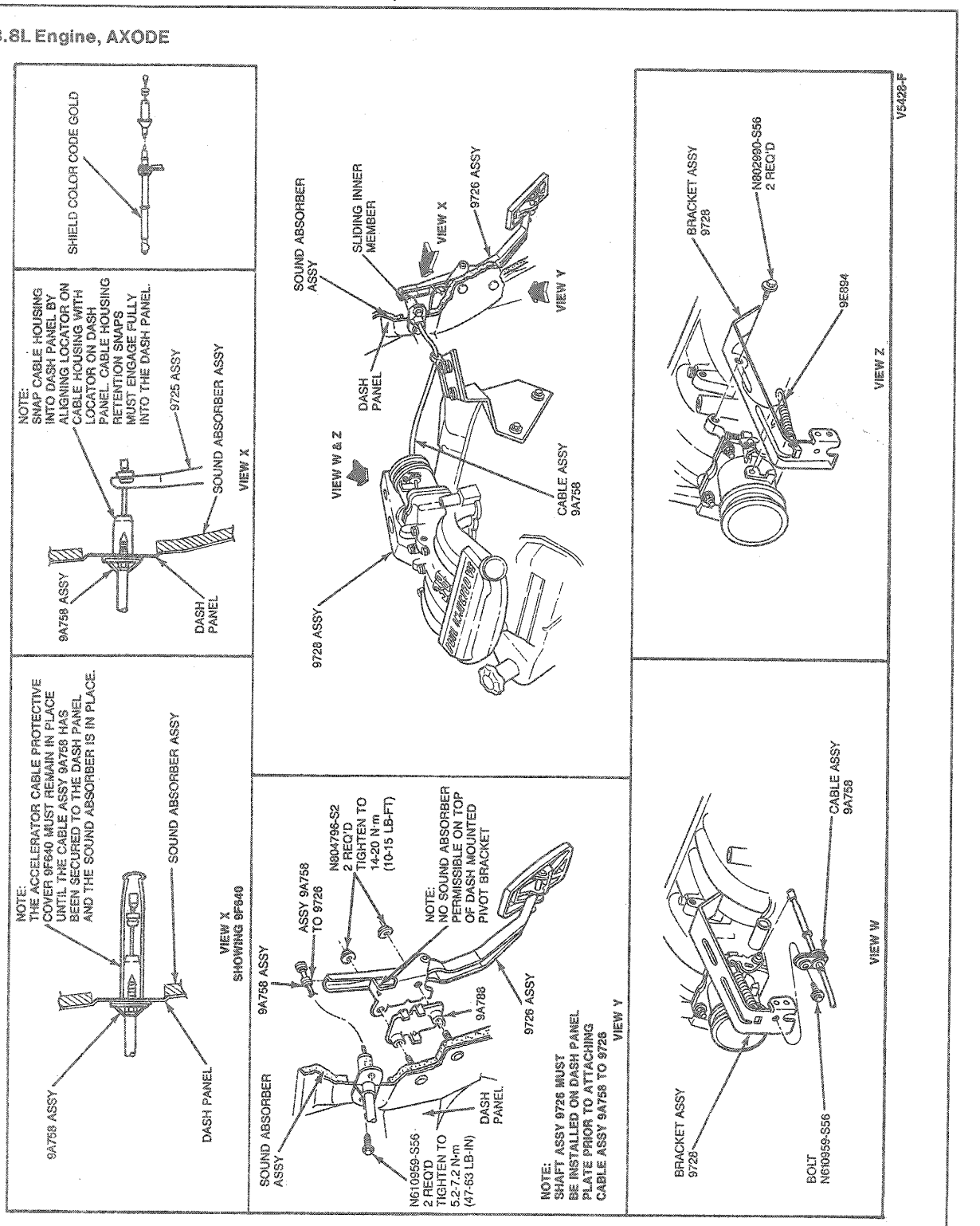
Item	Part Number	Description
1	01670	Sound Absorber Assy
2	9725	Accelerator Pedal and Shaft Assy
3	9A758	Throttle Cable Assy
4	W611624-S36	Bolt
5A	N605905-S2(3.0L SHO)	Bolt (2 Req'd)
6	9728	Accelerator Shaft Bracket Assy

(Continued)

Item	Part Number	Description
7	5401670-AA	Sound Absorber Assy
8	—	Dash
9A	N804796-S56	(2 Req'd)
10	9A788	Throttle Cable Assy
11B	W610959-S56	Bolt (2 Req'd)
12A	N605530-S36 (3.2L SHO)	Bolt (2 Req'd)
A		Tighten to 14-20 N·m (10-15 Lb-Ft)
B		Tighten to 1.6-2.2 N·m (15-19 Lb-in)

REMOVAL AND INSTALLATION (Continued)

3.8L Engine, AXODE



SPECIFICATIONS

TORQUE SPECIFICATIONS

Description	N·m	Lb-Ft
Accelerator Cable Bracket Bolts	14-20	10-15
Accelerator Pedal and Shaft Attachment Nuts	14-20	10-15
Throttle Cable-to-Dash Panel Screws	1.6-2.2	15-19 (Lb-In)
Accelerator Pedal and Shaft-to-Accelerator Cable Bracket Screw	5.2-7.2	47-63 (Lb-In)

PARTS CROSS-REFERENCE

Base Part #	Part Name	Old Part Name
9723	Accelerator Cable Bracket	
9725	Accelerator Pedal and Shaft	
9737	Accelerator Retracting Spring	
9A756	Throttle Cable	
9E766	Accelerator Control Splash Shield	

(Continued)

SECTION 10-03A Speed Control System—3.0L MFI, 3.0L SHO, 3.8L

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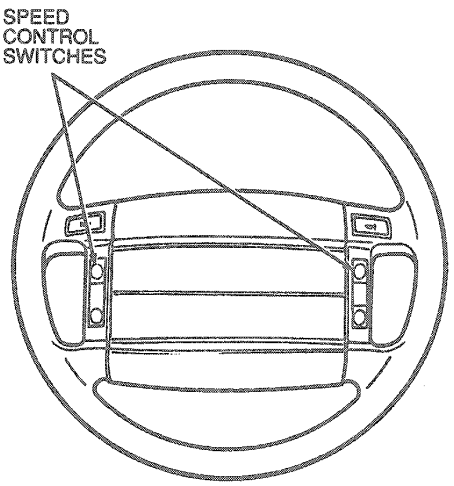
VEHICLE APPLICATION

Taurus / Sable with 3.0L, 3.0L SHO and 3.8L.

DESCRIPTION

The Vehicle Speed Control system consists of operator controls, a speed control servo (9C735) (throttle actuator) assembly, a vehicle speed sensor (VSS)(9E731), a clutch switch (manual transaxle), a stoplamp switch, a speed control metering (dump) valve (9C727), a horn relay, a speed control vacuum reservoir (9E799), a check valve, an speed control amplifier (9D843) assembly and necessary wires and vacuum hoses. The speed control servo assembly is mounted in the engine compartment as shown in the illustrations and is connected to the throttle linkage with an actuator cable. The speed control servo is connected to the speed control vacuum reservoir and to manifold vacuum through the check valve as shown in the illustrations. The speed control amplifier assembly is located behind the glove compartment, under the instrument panel. The vehicle speed sensor is located on the transaxle.



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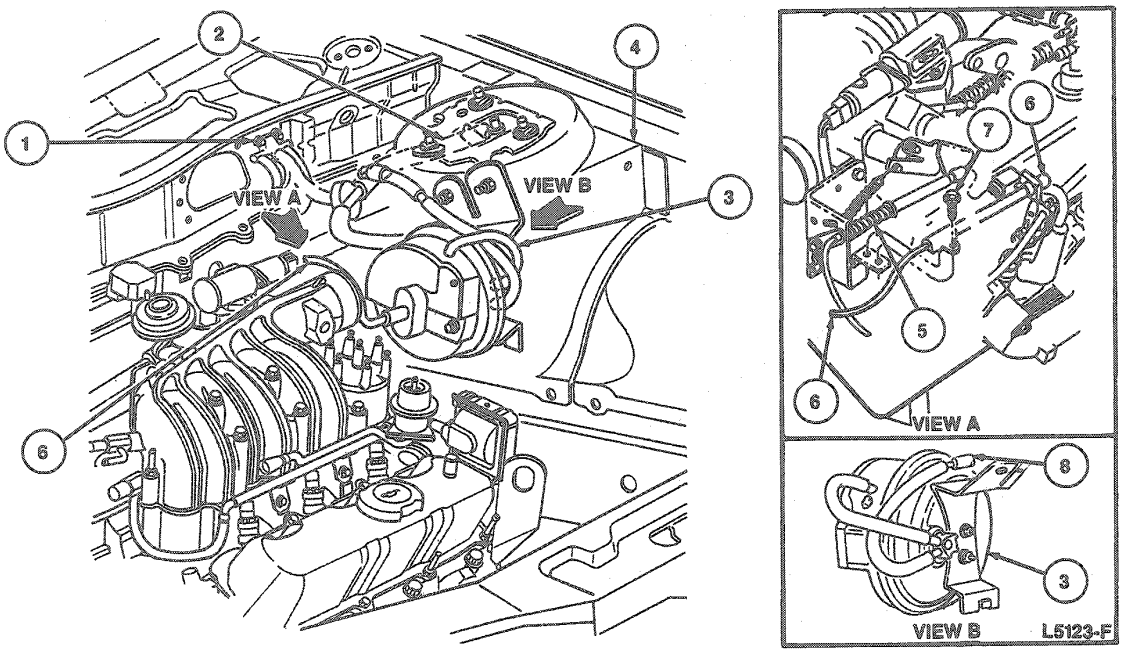
DESCRIPTION (Continued)

3.0L Engine

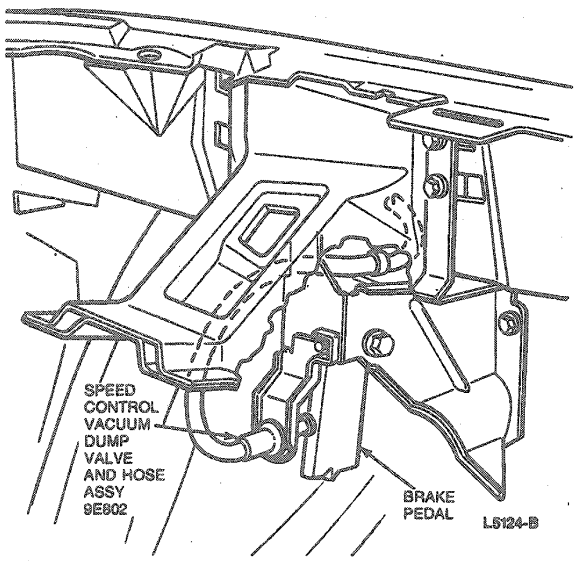


Item	Part Number	Description
1	—	Vacuum Distribution Block
2	—	To Vacuum Reservoir
3	9C735	Speed Control Servo
4	—	Driver's Side Shock Tower
5	—	Throttle Cable
6	9A825	Speed Control Actuator
7	N611057	Screw
8	9C727	To Speed Control Metering (Dump) Valve

DESCRIPTION (Continued)

Speed Control Metering (Dump) Valve

The speed control metering (dump) valve provides an additional redundant safety feature in the system. Normally, when the brake pedal is depressed, an electrical signal from the stoplamps to the speed control amplifier will turn off the system. In addition, the speed control metering (dump) valve will mechanically release the vacuum in the speed control servo when the brake pedal is depressed. This releases the throttle independently of the speed control amplifier control.



OPERATION

System Activation

To operate the speed control system, the engine must be running and the vehicle speed must be greater than 48 km/h (30 mph). Under these conditions, the system is ready to accept a set speed signal. The driver must depress and release the ON switch in the steering wheel, and then the driver must depress and release the SET ACCEL switch. This will result in the current speed being maintained until a new speed is set by the driver, the brake pedal is depressed, the clutch pedal is depressed or the OFF switch is depressed.

Decreasing Set Speed

The vehicle speed may be reduced by applying the brake or clutch pedal and then resetting the speed using the foregoing method or by depressing and holding the COAST switch. When the vehicle has slowed to the desired speed, the COAST switch is released and the new speed is set automatically. If the vehicle speed is reduced below 48 km/h (30 mph), the driver must manually increase the speed and reset the system.

Increasing Set Speed

The vehicle set speed may be manually increased at any time by depressing the accelerator until the higher speed is reached and stabilized, then depressing and releasing the SET ACCEL button.

Speed may also be increased by depressing the SET ACCEL switch button, at speeds over 48 km/h (30 mph), and holding it in that position. The vehicle will then automatically increase speed. When the desired rate of speed is attained and the button is released, that new set speed will be maintained.

RESUME

When the speed control system is deactivated by depressing the brake or clutch pedal, the set speed prior to deactivation may be re-established by momentarily (hold for one or two seconds) depressing the RESUME switch. The RESUME switch is hinged on the side closest to the SET ACCEL switch. Therefore, it should be depressed on the side farthest from the SET ACCEL switch. The resume feature will not function if the system is deactivated with the OFF switch, or if the vehicle speed has been reduced to below 48 km/h (30 mph). In addition, when the ignition switch is turned off, the speed control memory is erased and the resume feature will not function.

DIAGNOSIS AND TESTING

Visual Inspection

Visual inspection is an important part of system diagnosis and should be performed before undertaking any of the following diagnostic procedures.

When performing a visual inspection, check all items for abnormal conditions such as bare, broken or disconnected wires and damaged vacuum hoses. For the speed control system to function properly, it is necessary that the speedometer cable, if so equipped, be properly routed and securely attached. All vacuum hoses must be securely attached and routed with no sharp bends or kinks. The speed control servo (throttle actuator) and throttle linkage should operate freely and smoothly.

DIAGNOSIS AND TESTING (Continued)

The actuator cable should be adjusted as tightly as possible without opening the throttle plate or increasing the idle speed. Electrical connections must be complete and tight. The wiring harness must be properly routed. Look for damaged wiring insulation or evidence of shorts.

Any concern revealed by the visual inspection should be corrected before further tests of the speed control system are made.

Control Switches Test

Tools Required:

- Rotunda Digital Volt-Ohmmeter 014-00407
- Rotunda Speed Control Tester 007-00013

Check main feed fuse and stoplamp fuse first. If these fuses are OK proceed with test. Disconnect the 6-pin connector at the speed control amplifier assembly. Refer to the wiring diagram before performing the following checks.

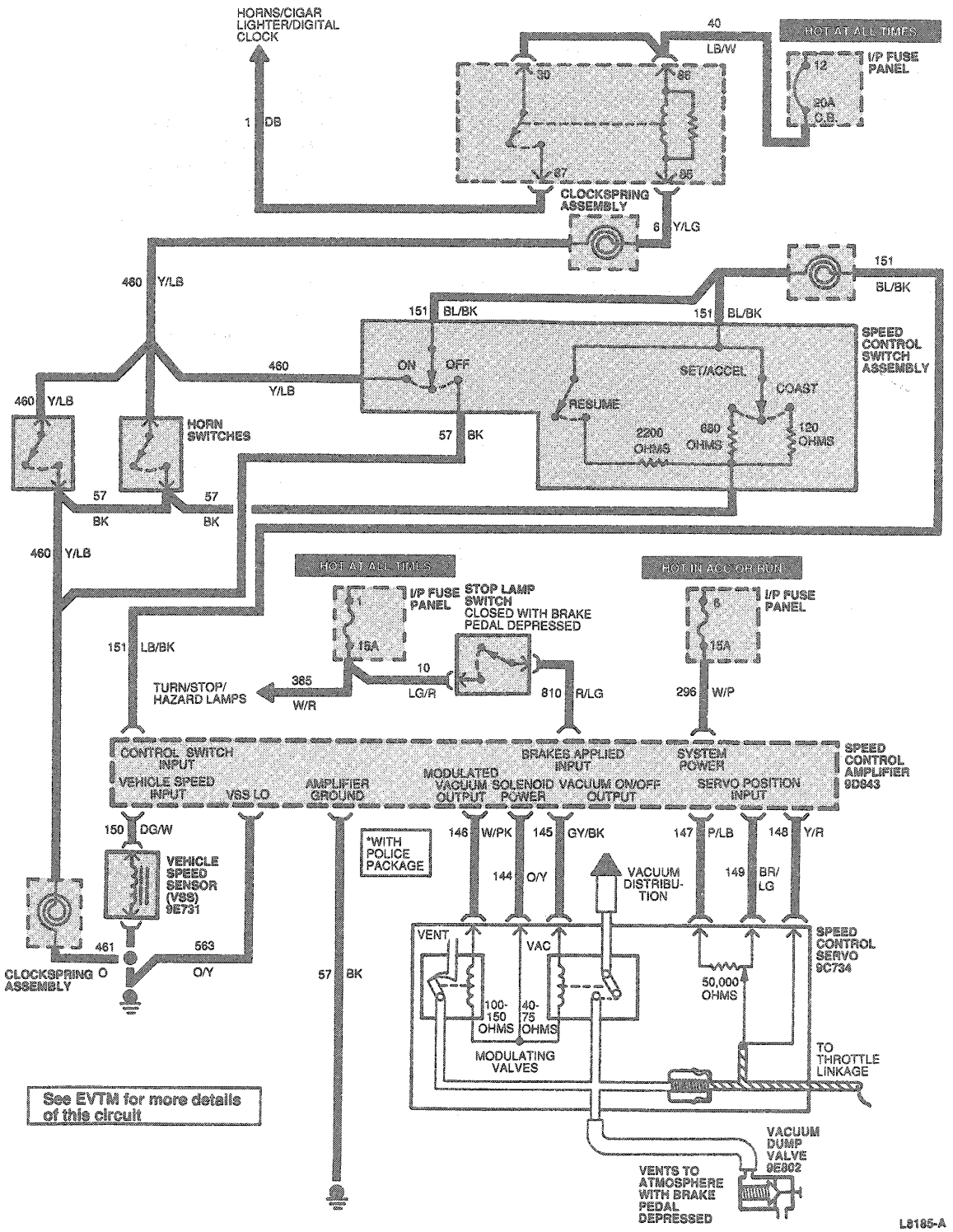
1. Connect a voltmeter across Circuit 151 (LB/BK) and ground. With ignition in the ON position depress the ON button and check for battery voltage.
2. Connect an ohmmeter between Circuit 151 (LB/BK) and ground.
3. Rotate the steering wheel throughout its full range of motion while making the following checks.
   a. Depress the OFF button and check for a reading between 0 and 1 ohm.
   b. Depress the SET ACCEL button and check for a reading between 714 and 646 ohms.
   c. Depress the COAST button and check for a reading between 126 and 114 ohms.
   d. Depress the RESUME button and check for a reading between 2310 and 2090 ohms.

If resistance values are above the allowable limits, check the switch assemblies, clockspring circuits and ground circuit.

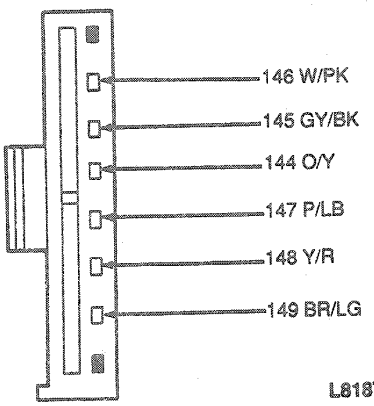
Reconnect the 6-pin connector at the speed control amplifier.

DIAGNOSIS AND TESTING (Continued)

3.0L and 3.8L Engines



DIAGNOSIS AND TESTING (Continued)



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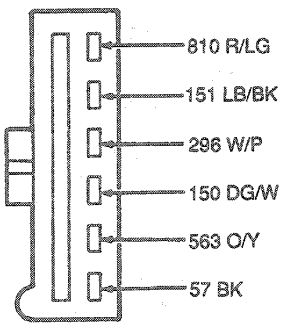

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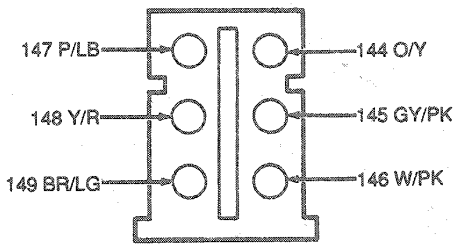

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CIRCUIT NUMBER	CIRCUIT DESCRIPTION	GAUGE	COLOR	CIRCUIT NUMBER	CIRCUIT DESCRIPTION	GAUGE	COLOR
57	STEERING WHEEL SWITCH GROUND	18	BK	460	HORN SWITCH FEED		Y/LB
10	STOPLAMP SWITCH TO TURN SIGNAL SWITCH	18	LG/R	810	BRAKE SWITCH (LOAD SIDE) TO SPEED CONTROL AMPLIFIER DISABLE	18	R/LG
563	VSS GROUND	18	O/Y	150	VSS SIGNAL TO SPEED CONTROL AMPLIFIER	20	DG/W
57	SPEED CONTROL AMPLIFIER GROUND	18	BK	151	SPEED CONTROL AMPLIFIER CONTROL LINE	18	LB/BK
296	IGNITION SWITCH (ACCESSORY) TO SPEED CONTROL AMPLIFIER FEED	20	W/P	149	SPEED CONTROL SERVO FEEDBACK POTENTIOMETER — TO SPEED CONTROL AMPLIFIER	20	BR/LG
148	SPEED CONTROL SERVO FEEDBACK—TO SPEED CONTROL AMPLIFIER	20	Y/R	147	SPEED CONTROL SERVO FEEDBACK POTENTIOMETER POSITION—TO SPEED CONTROL AMPLIFIER	18	P/LB
146	SPEED CONTROL SERVO VENT SOLENOID CONTROL	20	W/PK	145	SPEED CONTROL SERVO VACUUM SOLENOID CONTROL	20	GY/BK
144	SPEED CONTROL SERVO SOLENOID FEED	20	O/Y				

DIAGNOSIS AND TESTING (Continued)

VSS Test

Disconnect the 6-pin connector at the speed control amplifier and connect an ohmmeter between Circuit 150 (DG/W) (VSS signal) and Circuit 57 (BK) (VSS ground). A reading of approximately 200-300 ohms should be obtained. A reading of 0 ohms indicates a shorted coil or a shorted wire in the harness. A maximum reading indicates an open coil in the VSS or open wire in the harness. In either case, repeat the test at the VSS. Replace VSS if resistance is not approximately 200-300 ohms. Service harness if VSS resistance is satisfactory.

If ohmmeter records 200-300 ohms and the speedometer operates properly within needle waver, the VSS is probably good. A VSS of known good quality can also be substituted in place of the existing VSS to check for proper operation.

Servo Assembly Test

1. Separate the 8-pin connector at the speed control amplifier.
2. Connect an ohmmeter between the Circuit 144 (O/Y) and Circuit 145 (GY/BK) leads at the 8-pin connector. A resistance of 40 to 75 ohms should be obtained.
3. Connect the ohmmeter between the Circuit 144 (O/Y) and Circuit 146 (W/PK) leads. A resistance of 100 to 150 ohms should be obtained.
4. Connect the ohmmeter between Circuits 147 (P/LB) and 148 (Y/R). A resistance of 20 K ohms to 30 K ohms should be obtained.
5. Connect the ohmmeter between Circuits 147 (P/LB) and 149 (B/LG). A resistance of 40 K ohms to 60 K ohms should be obtained.
6. If proper resistance is not obtained, check the wiring and speed control servo separately for damage and replace or service as required.

Start the engine, and with the speed control servo disconnected from the speed control amplifier, connect the Circuit 144 (O/Y) lead of the speed control servo to the battery positive terminal. Connect the Circuit 146 (W/PK) lead of speed control servo to ground, and momentarily touch the Circuit 145 (GY/BK) lead of the speed control servo to ground. The speed control servo throttle actuator arm should pull in and the engine speed should increase. The arm should hold in that position or slowly release. When Circuit 146 (W/PK) is removed from ground, the speed control servo should release. Replace the servo if it fails any part of the preceding test.

If the Circuit 144 (O/Y) lead is shorted to either the Circuit 146 (W/PK) or Circuit 145 (GY/BK) leads, it may be necessary to replace the speed control amplifier.

Speed Control Amplifier Test

CAUTION: Do not use a test lamp to perform the following tests as excessive current draw will damage electronic components inside the speed control amplifier. Use only a voltmeter of 5,000 ohm/volt rating or higher.

On Circuit Test

Turn ignition switch to the RUN position. Connect voltmeter between Circuit 296 (W/P) and ground in 6-pin connector at speed control amplifier. Voltmeter should read battery voltage.

If battery voltage is not present, check the fuse voltage and service as required.

Connect voltmeter between Circuit 151 (LB/BK), and ground in 6-pin connector at speed control amplifier. The voltmeter should read battery voltage when the ON switch on the steering wheel is depressed and held. If voltage is not available perform control switch test.

Release the ON button. The voltmeter should read approximately 7.8 volts. The voltage should remain at approximately 7.8 volts until one of the speed control buttons is depressed and held. If the meter reads zero, check the ground connections on the speed control amplifier (either black wire on the 6-pin connector). If there is still no ground on the speed control amplifier, check the system ground connection, and wiring. Also check the 20-amp fuse and/or substitute (but do not install) a known good speed control amplifier and recheck for a properly operating ON circuit.

Brake Circuit Test

Connect an ohmmeter between Circuit 511 (LG) on the 6-pin connector and ground. The resistance should be less than 5 ohms. If it is greater than 5 ohms, check for improper wiring, burned out stoplamps or clutch switch malfunction.

OFF Circuit Test

With the ignition switch in the RUN position and the voltmeter connected between Circuit 151 (LB/BK) on the 6-pin connector and ground, depress and hold the OFF switch on the steering wheel. The voltmeter should indicate 0 volts. If the voltage does not drop to zero, perform control switch test. If the switches check OK, hang in a known good speed control amplifier and recheck the OFF circuit as outlined.

SET ACCEL Circuit Test

With the ignition switch in the RUN position and the voltmeter connected between Circuit 151 (LB/BK) in the 6-pin connector and ground, depress and hold the SET ACCEL button on steering wheel. Voltmeter should indicate approximately 4.5 volt. Rotate the steering wheel back and forth and watch the voltmeter for fluctuations. If the voltage varies more than 0.5 volt, perform the control switch test.

COAST Circuit Test

With the ignition in the RUN position and the voltmeter connected between Circuit 151 (LB/BK) in the 6-pin connector and ground, depress and hold the COAST button on steering wheel. The voltmeter should indicate approximately 1.5 volts.

RESUME Circuit Test

With the ignition in the RUN position and the voltmeter connected between Circuit 151 (LB/BK) in the 6-pin connector and ground, depress and hold the RESUME button on the steering wheel. The voltmeter should read approximately 6.5 volts.

DIAGNOSIS AND TESTING (Continued)

If all the circuits check OK, perform the speed control servo assembly test and hang in a known good speed control amplifier. Do not substitute a good speed control amplifier until the speed control servo assembly test has been successfully completed.

Simulated Road Test

CAUTION: When performing this simulated road test, the front wheels of the vehicle must be raised clear of the floor. Block the rear wheels securely and use only a suitable lifting device (such as a garage-type hoist) and support the front end with one jack stand on each side of the vehicle. Never attempt to use the vehicle bumper jack for tests of this type.

Tools Required:

- Rotunda Speed Control 007-00013
- Rotunda Digital Volt-Ohmmeter (DVOM) 014-00407

1. Start the engine.
2. Shift the transmission gear selector to DRIVE.
3. Turn ON the speed control.

   CAUTION: If any time during the following Steps the system should appear to go out of control and overspeed, be prepared to turn the system off at once with the OFF switch or the ignition switch.
4. Accelerate and hold at 56 km/h (35 mph).
5. Press and release the SET ACCEL button. Hold foot pressure very lightly on accelerator pedal. Normally the speed will continue at 56 km/h (35 mph) for a short period of time and then gradually start surging because the engine is not loaded.
6. Press the OFF button. The engine should drop back to idle. Stop the rear wheels with the brakes.
7. Press ON button, accelerate and hold the speed at 56 km/h (35 mph).
8. Press and hold the SET ACCEL button. Slowly remove the foot from the accelerator. The engine speed should gradually increase.
9. When the speed reaches 80 km/h (50 mph), release the SET ACCEL button. The vehicle should maintain 80 km/h (50 mph) for a short time before the surging begins.
10. Press the COAST button and hold. The engine should idle. Slow the front wheels to 56 km/h (35 mph).
11. Release the COAST button. Speed should maintain 56 km/h (35 mph). Surging should soon start.
12. Press and release the brake pedal. The system should shut off and the engine should slow to idle.
13. Accelerate engine and set the speed at 80 km/h (50 mph). Brake to 56 km/h (35 mph) and maintain 56 km/h (35 mph) with the accelerator. Depress and release the RESUME button. The speed should return to 80 km/h (50 mph).

When performing these tests, keep the vehicle speeds within reasonably low limits. If the system does not perform as normally expected, make note of the malfunction.

Stoplamp Switch and Circuit Test

To be performed when brake application will not disconnect the speed control:

1. Check for stoplamp operation with a maximum brake pedal effort of 3 Kg (6 lb). If more than 3 Kg (6 lb) effort is required, check stoplamp fuse and lamps, check the brake actuation and stoplamp switch. Service or replace as required.
2. If stoplamps do not work, the stoplamp switch supply circuit fuse, or bulbs must be checked.
3. If stoplamps work properly check for battery voltage on Circuit 296 (P/O) at the 6-pin connector. Depress the brake pedal until the stoplamps are lit. Check voltage on the Circuit 511 (LG) lead on the 6-pin connector. The difference between the two voltage readings must not exceed 1.5 volts. If a voltage difference greater than 1.5 volts is found, the high resistance in the stoplamp circuit must be found and corrected. There should be no voltage present on the Circuit 511 (LG) lead with the brakelamps off.
4. Perform the speed control metering valve (9C727) test.

Speed Control Metering Valve Test

The speed control metering valve releases the vacuum in the servo assembly whenever the brake pedal is depressed, and thus acts as a redundant safety feature. It should be checked whenever brake application does not disconnect the speed control.

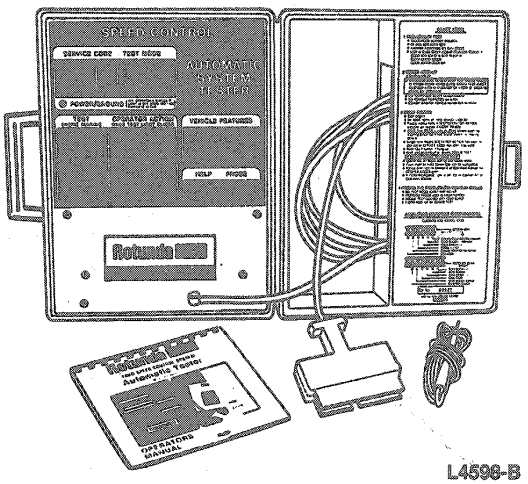
Disconnect the vacuum hose (white stripe) from the speed control metering valve to the speed control servo. Connect a hand vacuum pump to the hose, and pump up a vacuum. If a vacuum can not be obtained, the hose or the dump valve leaks and should be replaced or adjusted. Step on the brake pedal. The vacuum should be released. If it is not, adjust or replace the speed control metering valve.

DIAGNOSIS AND TESTING (Continued)

Speed Control Tester

The speed control system can be operated and diagnosed using the Rotunda Speed Control Tester 007-00013 or equivalent. The tester works on vehicles with all combinations of control switches, transmissions, speedometers (electronic and mechanical), brakes and clutches. With three modes of operation, Automatic, Single Scan, and Scan Probe, the technician can pinpoint any failure including wiring, vacuum hoses, switches and speed control servo. The tester includes an instruction manual with its own specially developed diagnostic tree charts for identifying any failed or marginal component in the speed control system.

SPEED CONTROL TESTER
MODEL 007-00013



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PINPOINT TEST A
SPEED CONTROL DOES NOT WORK

TEST STEP		RESULT ▶	ACTION TO TAKE
A1	VERIFY CONDITION	▶	GO to A2.
A2	CHECK CONNECTIONS		
	• Check all electrical and vacuum connections. • Are all connections OK?	Yes ▶ No ▶	GO to A3. SERVICE or REPLACE as required.
A3	CHECK STOPLAMPS		
	• Press brake pedal. • Are stoplamps operating?	Yes ▶ No ▶	GO to A4 if manual transmission. GO to A5 if automatic transmission. SERVICE stoplamp circuit.
A4	CHECK CLUTCH SWITCH (MANUAL TRANSMISSION)		
	• Check clutch switch for proper operation. • Does switch operate properly?	Yes ▶ No ▶	GO to A5. SERVICE as required.
A5	CHECK ACTUATOR CABLE CONNECTION TO THROTTLE BODY AND SPEED CONTROL SERVO		
	• Check to see if actuator cable is attached to throttle body accelerator linkage. • Check to see if actuator cable is attached to speed control servo linkage. • Is cable attached to both?	Yes ▶ No ▶	GO to A6. ADJUST or SERVICE as required.
A6	CHECK LINKAGE OPERATION		
	• Check the throttle linkage for proper operation. • Does linkage operate properly?	Yes ▶ No ▶	GO to A7. SERVICE as required.

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST A
SPEED CONTROL DOES NOT WORK (Continued)

TEST STEP		RESULT	ACTION TO TAKE
A7	CHECK VACUUM HOSES ● Is vacuum supply hose tightly connected to VAC port on manifold check valve and to vacuum manifold, and free of cuts, cracks and kinks? ● Are vacuum hoses tightly connected between check valves and speed control servo, and free of cuts, cracks and kinks? ● Is vacuum hose tightly connected between check valve and reservoir, and free of cuts, cracks and kinks? ● Is dump valve hose tightly connected to the speed control servo and speed control metering valve, and free of cuts, cracks and kinks?	Yes No	GO to A8. SERVICE as required.
A8	CHECK THE CHECK VALVE AND RESERVOIR ● Disconnect the hose between check valve and speed control servo, at the speed control servo end. ● Apply 60.6 kPa (18 in-Hg) vacuum to open end of hose. ● **Can vacuum be pumped to and held at 60.6 kPa (18 in-Hg) vacuum?**	Yes No	GO to A9. SERVICE as required.
A9	CHECK SPEED CONTROL METERING (DUMP) VALVE ● Check speed control metering (dump) valve. ● **Is speed control metering (dump) valve OK?**	Yes No	GO to A10. SERVICE or ADJUST as required.
A10	PERFORM CONTROL SWITCHES AND CIRCUIT TEST ● Perform control switches and circuit tests as outlined. ● **Are circuits and switches OK?**	Yes No	GO to A11. SERVICE or REPLACE switches or circuits as required.
A11	PERFORM SPEED CONTROL SERVO TESTS ● Perform speed control servo tests as outlined. ● **Are tests successful?**	Yes No	GO to A12. REPLACE speed control servo.
A12	PERFORM VSS TEST ● Perform vehicle speed sensor test as outlined. ● **Is test successful?**	Yes No	GO to A13. REPLACE VSS.
A13	PERFORM SPEED CONTROL AMPLIFIER TEST ● Perform speed control amplifier test as outlined. ● **Is test successful?**	Yes No	INSTALL a new speed control amplifier. EXAMINE all connectors carefully for proper contact. SERVICE as required. REMOVE substitute speed control amplifier.

TL7702B

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST B: SPEED CONTROL OPERATION IS INTERMITTENT

TEST STEP		RESULT ▶	ACTION TO TAKE
B1	VERIFY THE CONDITION		
	• Note carefully when intermittent action occurs.	▶	GO to B2.
B2	INSPECT VISUALLY		
	• Perform Visual Inspection Test.	Intermittent action occurs while cruising ▶	GO to B3.
		Intermittent action occurs while using control buttons or turning steering wheel ▶	GO to B5.
B3	CHECK VACUUM TO SPEED CONTROL SERVO		
	• Check vacuum supply to speed control servo. NOTE: 8.42 kPa, (2.5 in-Hg) is minimum vacuum for normal speed control servo operation. The vacuum source hose is attached to the 7.9mm (5/16 inch) engine vacuum-fitting port. • Is vacuum OK?	Yes ▶	GO to B4.
		No ▶	SERVICE vacuum supply.
B4	PERFORM SPEED CONTROL SERVO ASSEMBLY TEST		
	• Perform Speed Control Servo Assembly Test. Lightly tap speed control servo body while making test. • Is test successful?	Yes ▶	SUBSTITUTE known good speed control amplifier if OK — properly INSTALL speed control amplifier.
		No ▶	REPLACE speed control servo assembly.
B5	PERFORM CONTROL SWITCHES AND CIRCUIT TEST		
	• Perform control switches and circuit tests as outlined. • Are tests successful?	Yes ▶	SUBSTITUTE known good speed control amplifier if OK — properly INSTALL speed control amplifier.
		No ▶	SERVICE circuits. REPLACE horn pad assembly.

TL7386C

PINPOINT TEST C: SPEED CONTROL OPERATES BUT DOES NOT RESUME, ACCELERATE OR COAST DOWN PROPERLY

TEST STEP		RESULT ▶	ACTION TO TAKE
C1	VERIFY THE CONDITION	▶	GO to C2.
C2	CHECK THE FOLLOWING SWITCHES AND CIRCUITS		
	• Check the SET ACCEL switch, RESUME switch, COAST switch and clockspring circuits. • Are all circuits and switches OK?	Yes ▶	GO to C3.
		No ▶	SERVICE the circuit as required.
C3	CHECK VACUUM HOSES		
	• Is vacuum supply hose tightly connected to VAC port on manifold check valve and to vacuum manifold, and free of cuts, cracks and kinks? • Are vacuum hoses tightly connected between check valves and speed control servo, and free of cuts, cracks and kinks? • Is vacuum hose tightly connected between check valve and reservoir, and free of cuts, cracks and kinks? • Is dump valve hose tightly connected to the speed control servo and speed control metering valve, and free of cuts, cracks and kinks?	Yes ▶	GO to C4.
		No ▶	SERVICE as required.

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST C: SPEED CONTROL OPERATES BUT DOES NOT RESUME, ACCELERATE OR COAST DOWN PROPERLY (Continued)

TEST STEP		RESULT	ACTION TO TAKE
C4	CHECK THE CHECK VALVE AND RESERVOIR • Disconnect the hose between check valve and speed control servo, at the speed control servo end. • Apply 60.6 kPa (18 in-Hg) vacuum to open end of hose. • **Can vacuum be pumped to, and held at, 60.6 kPa (18 in-Hg) vacuum?**	Yes No	GO to **C5.** SERVICE as required.
C5	TEST SPEED CONTROL SERVO • Perform speed control servo test as outlined. • **Is test successful?**	Yes No	GO to **C6.** REPLACE speed control servo.
C6	TEST SPEED CONTROL AMPLIFIER • Perform Speed Control Amplifier Test as outlined. • **Is test successful?**	Yes No	REPLACE speed control amplifier. CHECK circuit connections for proper contact. SERVICE as required.

TL7387C

PINPOINT TEST D: SPEED CONTINUOUSLY CHANGES UP AND DOWN

TEST STEP		RESULT	ACTION TO TAKE
D1	VERIFY CONDITION		GO to **D2.**
D2	CHECK THROTTLE LINKAGE • Check throttle linkage for proper operation and adjustment. • **Is operation and adjustment OK?**	Yes No	GO to **D3.** SERVICE or ADJUST as required.
D3	CONTINUITY CHECK • Check continuity of Circuits 147, 148 and 149. • **Is there continuity in all circuits?**	Yes No	GO to **D4.** SERVICE or REPLACE wiring as necessary.
D4	CHECK VACUUM HOSES • Is vacuum supply hose tightly connected to VAC port on manifold check valve and to vacuum manifold, and free of cuts, cracks and kinks? • Are vacuum hoses tightly connected between check valves and speed control servo, and free of cuts, cracks and kinks? • Is vacuum hose tightly connected between check valve and reservoir, and free of cuts, cracks and kinks? • Is dump valve hose tightly connected to the speed control servo and speed control metering valve, and free of cuts, cracks and kinks?	Yes No	GO to **D5.** SERVICE or REPLACE wiring as necessary.
D5	CHECK THE CHECK VALVE AND RESERVOIR • Disconnect the hose between check valve and speed control servo, at the speed control servo end. • Apply 60.6 kPa (18 in-Hg) vacuum to open end of hose. • **Can vacuum be pumped to and held at 60.6 kPa (18 in-Hg) vacuum?**	Yes No	GO to **D6.** SERVICE as required.
D6	TEST SPEED CONTROL SERVO • Perform speed control servo test as outlined. • **Is test successful?**	Yes No	GO to **D7.** REPLACE as required.

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST D: SPEED CONTINUOUSLY CHANGES UP AND DOWN (Continued)

	TEST STEP	RESULT ▶	ACTION TO TAKE
D7	CHECK SPEEDOMETER CABLES		
	• Check speedometer cables, if so equipped, for proper routing no sharp bends or binding. • **Are speedometer cables good?**	Yes ▶ No ▶	GO to D8. SERVICE as required.
D8	TEST VSS		
	• Perform vehicle speed sensor test as outlined. • **Is test successful?**	Yes ▶ No ▶	GO to D9. REPLACE VSS.
D9	CHECK SPEED CONTROL METERING (DUMP) VALVE		
	• Check speed control metering (dump) valve. • **Is dump valve OK?**	Yes ▶ No ▶	GO to D10. SERVICE or ADJUST as required.
D10	TEST SPEED CONTROL AMPLIFIER		
	• Perform speed control amplifier test as outlined. • **Is test successful?**	Yes ▶ No ▶	REPLACE speed control amplifier. CHECK circuit connections for good contacts. SERVICE as required.

TL7701B

PINPOINT TEST E: SPEED CONTROL DOES NOT DISENGAGE WHEN BRAKES ARE APPLIED

	TEST STEP	RESULT ▶	ACTION TO TAKE
E1	VERIFY THE CONDITION	▶	GO to E2.
E2	CHECK STOPLAMPS		
	• Apply brakes and observe stoplamps. • **Do stoplamps operate?**	Yes ▶ No ▶	GO to E3. SERVICE stoplamp circuit as required. VERIFY fuses are not open. GO to E3.
E3	CHECK SPEED CONTROL METERING (DUMP) VALVE		
	• Check speed control metering (dump) valve. • **Is speed control metering (dump) valve ok?**	Yes ▶ No ▶	GO to E4. ADJUST or SERVICE as required.
E4	CHECK SPEED CONTROL SERVO		
	• Check speed control servo operation and throttle linkage. • **Are speed control servo operation and linkage OK?**	Yes ▶ No ▶	GO to E5. REPLACE speed control servo.
E5	TEST SPEED CONTROL AMPLIFIER		
	• Perform Speed Control Amplifier Amplifier Test as outlined. • **Is test successful?**	Yes ▶ No ▶	REPLACE speed control amplifier. CHECK contacts of electrical connector. SERVICE as required.

TL8312A

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST F
SPEED CONTROL SYSTEM DOES NOT DISENGAGE WHEN CLUTCH PEDAL IS DEPRESSED (MANUAL TRANSMISSION ONLY)

TEST STEP		RESULT	ACTION TO TAKE
F1	VERIFY		
	• Verify system disengages when stoplamp switch is activated. • Check clutch switch operation. • **Do both operate properly?**	Yes ▶	SERVICE or REPLACE wire assembly 9A840 as required.
		No ▶	SERVICE or REPLACE as required.

TL7697A

PINPOINT TEST G: SPEED GRADUALLY INCREASES OR DECREASES AFTER SPEED IS SET

TEST STEP		RESULT	ACTION TO TAKE
G1	VERIFY		
	• Verify that engine is properly tuned. • Check accelerator action and actuator cable adjustment. • **Is accelerator operation OK?**	Yes ▶	GO to G2.
		No ▶	ADJUST or CORRECT as required.
G2	CHECK SPEED CONTROL METER VALVE		
	• Check speed control metering valve. • **Is speed control metering valve OK?**	Yes ▶	GO to G3.
		No ▶	ADJUST or SERVICE as required.
G3	CHECK VACUUM HOSES		
	• Is vacuum supply hose tightly connected to VAC port on manifold check valve and to vacuum manifold, and free of cuts, cracks and kinks? • Are vacuum hoses tightly connected between check valves and speed control servo, and free of cuts, cracks and kinks? • Is vacuum hose tightly connected between check valve and reservoir, and free of cuts, cracks and kinks? • Is dump valve hose tightly connected to the speed control servo and speed control metering valve, and free of cuts, cracks and kinks?	Yes ▶	GO to G4.
		No ▶	SERVICE as required.
G4	CHECK THE CHECK VALVE AND SPEED CONTROL VACUUM RESERVOIR		
	• Disconnect the hose between check valve and speed control servo, at the speed control servo end. Apply 60.6 kPa (18 in-Hg) vacuum to open end of hose. • **Can vacuum be pumped to and held at 60.6 kPa (18 in-Hg) vacuum?**	Yes ▶	GO to G5.
		No ▶	SERVICE as required.
G5	TEST SPEED CONTROL SERVO		
	• Perform speed control servo test as outlined. • **Is test successful?**	Yes ▶	PERFORM speed control amplifier test. REPLACE if required.
		No ▶	REPLACE speed control servo.

TL7694B

Taurus 3.0L SHO (MTX) with IVSC

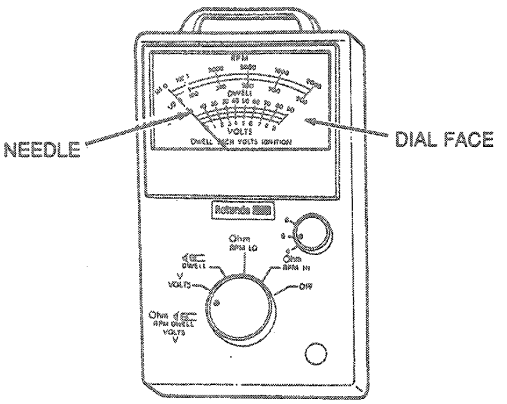
Tools Required:

- Rotunda SUPER STAR II Tester 007-0041A
- Inductive Dwell-Tach Volts-Ohms (DVOM) Tester 059-00010
- Rotunda EEC-IV Breakout Box 014-00322

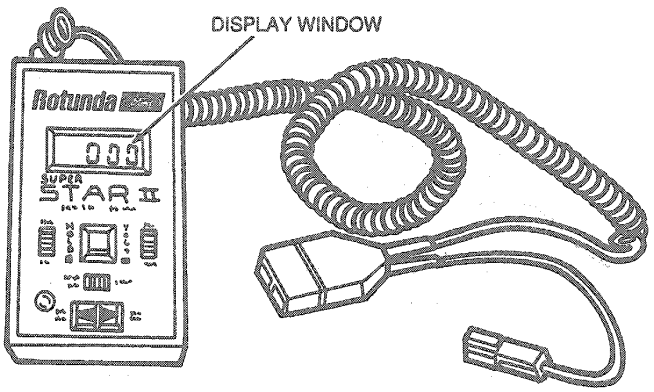
The integrated vehicle speed control (IVSC) contains a self-test capability. Key on, engine off (KOEO) and Key on, engine running (KOER) routines output error codes in a manner similar to EEC-IV subsystem "Quick Tests", which then refer to Pinpoint Tests for specific component diagnosis.

DIAGNOSIS AND TESTING (Continued)

The self-test capability applies only to the Taurus 3.0L SHO. The Rotunda Speed Control automatic system tester 007-00014A or equivalent cannot be used for IVSC diagnosis. The Rotunda SUPER STAR II Tester 007-00041-A, or Inductive Dwell-Tach-Volts Ohms Tester (VOM) 059-00010 or equivalent, 0 to 20 VDC (alternate to STAR) is required to perform the IVSC Quick Test and display error codes.



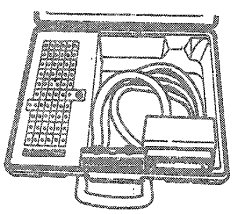
ANALOG-VOLT-OHMMETER
059-00010



SUPER STAR II TESTER
007-0041A

L5126-E

A Rotunda EEC-IV Breakout Box 014-00322 or equivalent can also be used for convenience during Pinpoint Testing.



BREAKOUT BOX
014-00322

L5130-B

Testing for the IVSC is divided into two formats: the Quick Test and Pinpoint Tests. The Quick Test is a functional IVSC system test. The Pinpoint Tests are specific component tests.

The Quick Test checks all IVSC components except the VSS, which must be tested separately. To test and service the IVSC system, perform the Quick Test first. If the system passes, check the VSS. If failure codes are generated, perform only the Pinpoint Test specified by that particular failure code.

After all test and services have been completed, repeat the entire Quick Test to verify that the IVSC system operates properly.

Quick Test

Description

The Quick Test is a functional test of the IVSC system consisting of basic Test Steps (described below). These Steps must be carefully followed in sequence. Otherwise, mis-diagnosis or the replacement of non-faulty components may result.

Quick Test Steps

1. Visual Check and Vehicle Preparation:
   - Checks for obvious faults
   - Properly prepares the vehicle for testing
2. Equipment Hookup:
   - Ensures that the proper equipment for gathering test data is ready, prior to testing
3. Key On, Engine Off Self-Test:
   - Is a static check of IVSC inputs and outputs

DIAGNOSIS AND TESTING (Continued)

4. Key On, Engine Running Self-Test:
   - is a dynamic check of the IVSC with the engine in operation

   WARNING: ANYONE WHO DEPARTS FROM THE INSTRUCTION PROVIDED IN THIS PUBLICATION MUST FIRST ESTABLISH THAT HE COMPROMISES NEITHER HIS PERSONAL SAFETY NOR THE VEHICLE INTEGRITY BY HIS CHOICE OF METHODS, TOOLS OR PARTS.

Visual Check and Vehicle Preparation

Correct test results for the Quick Test are dependent on the proper operation of related non-IVSC component systems. It may be necessary to correct faults in these areas before the IVSC will pass the Quick Test.

Before hooking up any equipment to diagnose the IVSC system, make the following checks:

1. Check all engine vacuum hoses for:
   - Leaks or pinched hoses (speed control servo to speed control metering valve and speed control servo to manifold vacuum)
2. Check the IVSC and EEC system wiring harness electrical connections for:
   - Proper connections
   - Loose or detached connectors, wires and terminals
   - Corrosion
   - Proper routing of harness

   It may be necessary to disconnect or disassemble the connector assembly to perform some of the inspections. (Note the location of each pin before disassembly.)
3. Check the EEC-IV powertrain control module and IVSC sensors and actuators for physical damage.
4. Perform all safety steps required to start and run operation vehicle tests.
5. Apply the emergency brake. Place the shift lever in NEUTRAL.
6. Turn off all electrical loads such as the radio, lamps, air conditioner, etc. Ensure doors are closed whenever readings are made.
7. Verify engine coolant is at the specified level.
8. Start the engine and let idle until the upper radiator hose is hot and pressurized and the throttle is off fast idle.
9. Turn the ignition switch to the OFF position.
10. Service items as required, and proceed to equipment hookup.

Equipment Hookup

Using the SUPER STAR II Tester 007-0041A or equivalent:

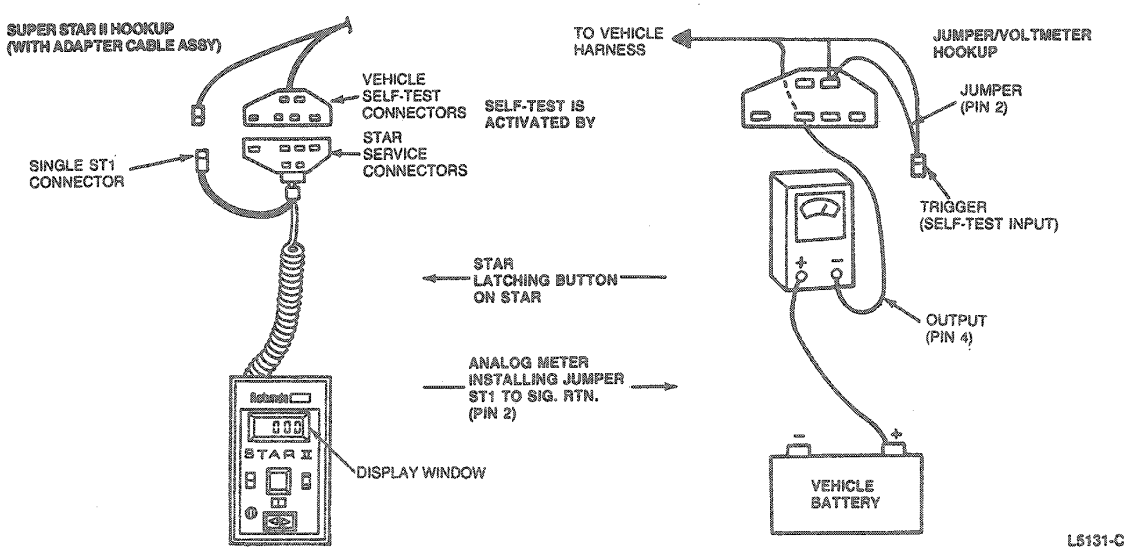
- Turn the ignition switch to the OFF position.
- Connect the adapter cable's two service connectors to the vehicle's appropriate self-test connectors.

After equipment hookup, go to Self Testing.

Using Inductive Dwell-Tach-Volts Ohms Tester 059-00010 or equivalent:

- Turn ignition switch to the OFF position.
- Connect a jumper wire from Self-Test input (STI) to Pin 2, Signal Return on the Self-Test connector (refer to the diagram below).
- Set analog VOM on a DC voltage range to read from 0 to 15 volts DC. Connect VOM from battery (+) to Pin 4 Self-Test Output (STO) in the self-test connector.

After equipment hookup go to Self Testing.



DIAGNOSIS AND TESTING (Continued)

Quick Test Self-Test

Quick Test Self-Testing is divided into two specialized tests: Key On, Engine Off, and Key On, Engine Running. The Self-Test is not a conclusive test by itself, but is used as a part of the functional Quick Test diagnostic procedure. The PCM stores the Self-Test program in its permanent memory. When activated, it checks the IVSC system by testing its functional capability and verifies that various sensors and actuators are connected and operating properly.

The Key On, Engine Off and Engine Running tests are functional tests which only detect faults present at the time of the Self Test.

Key On, Engine Off Test

At this time, a test of the IVSC system is conducted with power applied and engine at rest.

The fault must be present at the time of testing for errors to be detected in this test.

Key On, Engine Running Test

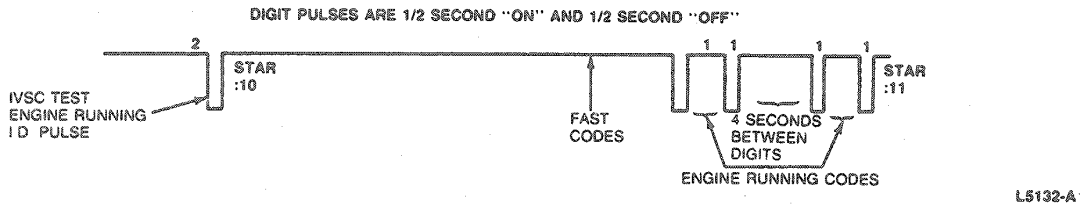
At this time, a test of the IVSC system is conducted with the engine running. The system is checked under actual operating conditions and at normal operating temperatures. The actuators are exercised and checked for corresponding results.

Service Codes

The EEC-IV system communicates service information through the Self-Test diagnostic trouble codes (DTC). These DTC's are two-digit numbers representing the results of the Self Test.

The DTC's are transmitted on the Self-Test output (STO) (found in the Self-Test connector) in the form of timed pulses, and read by the technician on a voltmeter or on the SUPER STAR II Tester.

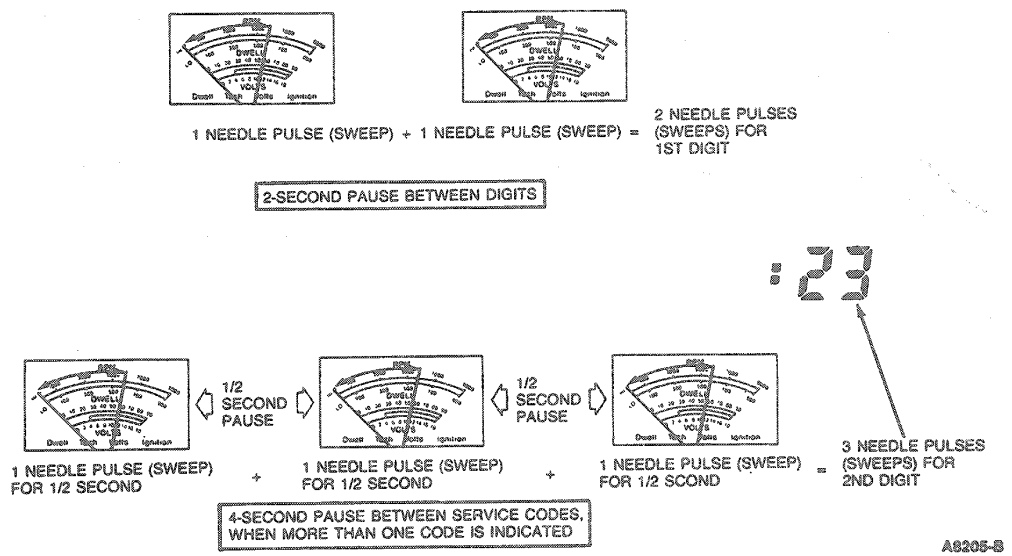
Self-Test Output Code Format



DIAGNOSIS AND TESTING (Continued)

Reading Codes—Analog Voltmeter

When a service code is reported on the analog voltmeter for a function test, it will represent itself as a pulsing or sweeping movement of the voltmeter's needle across the dial face of the voltmeter. Therefore, a single-digit number of three will be reported by three needle pulses (sweeps). However, as previously stated, a DTC is represented by a two-digit number, such as 2-3. As a result, the Self-Test DTC of 2-3 will appear on the voltmeter as two needle pulses (sweeps). After a two-second pause, the needle will pulse (sweep) three times.



Reading Codes—SUPER STAR II Tester 007-0041A or equivalent

After hooking up the SUPER STAR II Tester and turning on its power switch, the tester will run a display check and the numerals 88 will begin to flash in the display window. A steady 00 will then appear to signify that the SUPER STAR II Tester is ready to start the Self-Test and receive the test's diagnostic trouble codes (DTC's).

To receive the DTC's, press the push button at the front of the SUPER STAR II Tester. The button will latch down, and a colon will appear in the display window in front of the 00 numerals. The colon must be displayed to receive the DTC's.

If for any reason the technician wishes to clear the display window during the Self Test, he must turn off the vehicle's engine, press the tester's push buttons once to unlatch it (colon will disappear), then press the button again to latch down the button (colon will appear again). Every time the SUPER STAR II Tester is turned off, the low battery indicator (LO BAT) should show briefly at the upper LH corner of the tester's display window. If the LO BAT indicator shows steadily at any other time during the operation of the SUPER STAR II Tester with any DTC, turn its power switch to OFF and replace the 9-volt battery in the tester.

The SUPER STAR II Tester will display the last DTC received, even after it has been disconnected from the vehicle. It will hold the DTC on the display until the power is turned off or the push button is unlatched and relatched.

DIAGNOSIS AND TESTING (Continued)

QUICK TEST: KEY ON, ENGINE OFF (KOEO) SELF-TEST

TEST STEP		RESULT ▶	ACTION TO TAKE
A1	CODE OUPUT		
	• To activate the KOEO IVSC test, do the following: — Place transmission shift lever in PARK. — Leave single STI connector unplugged; plug in multi-pin self-test connector. — Turn on SUPER STAR II Tester by moving slide switch to ON position. — Press SUPER STAR II push button. — Turn ignition key to RUN position. — Within 10 seconds, press speed control ON switch. — Observe code 10 on SUPER STAR II display (indicates IVSC test in progress). — Press speed control OFF, COAST, ACCEL, RESUME buttons; tap brake pedal once. NOTE: Do not depress throttle during KOEO self-test. — Observe and record all Diagnostic Trouble Codes indicated. One of the following outputs will occur.	Code 111 displayed ▶ Any other code(s) ▶ No codes output ▶	Key On Engine Off Test indicates a pass. GO to Key On Engine Running (KOER) Self-Test. Key On Engine Off Test indicates a fault. Record codes and GO to Step B. REPEAT Self-Test and verify that no DTC's are present. GO to Pinpoint Test Step Q1.

TL5488E

DIAGNOSIS AND TESTING (Continued)

QUICK TEST: KEY ON, ENGINE OFF (KOEO) SELF-TEST—Continued

TEST STEP		RESULT	ACTION TO TAKE
B1	RESULTS AND ACTION TO TAKE		
	• Using the Key On Engine Off service codes from Step A, follow the instructions in the ACTION TO TAKE column in this step. • When more than one DTC is received always start with the first code received. • Whenever a service is made, REPEAT Quick Test. NOTE: Before proceeding to the specified Pinpoint Test, read the instructions on how to use the Pinpoint Tests at the beginning of the Pinpoint Test section.	ON DEMAND DIAGNOSTIC TROUBLE CODES	
		Code 121 ▶	GO to Powertrain Control / Emissions Diagnosis Manual[1]. After service, return to this section and REPEAT Quick Test.
		Code 457 ▶	GO to Pinpoint Test Step **A1**.
		Code 458 ▶	GO to Pinpoint Test Step **A3**.
		Code 459 ▶	GO to Pinpoint Test Step **A5**.
		Code 123 ▶	GO to Powertrain Control / Emissions Diagnosis Manual[1]. After service, return to this section and REPEAT Quick Test.
		Code 122 ▶	GO to Powertrain Control / Emissions Diagnosis Manual[1]. After service, return to this section and REPEAT Quick Test.
		Code 536 ▶	GO to Pinpoint Test Step **B1**.
		Code 528 ▶	GO to Powertrain Control / Emissions Diagnosis Manual[1]. After service, return to this section and REPEAT Quick Test.
		Code 567 ▶	GO to Pinpoint Test Step **C1**.
		Code 568 ▶	GO to Pinpoint Test Step **C5**.
			NOTE: DTC's 121, 123, 122 and 528 are common with EEC-IV Diagnostics. These DTC's must be diagnosed using the Powertrain Control / Emissions Diagnosis Manual[1].

TL5134D

1 Can be purchased as a separate item.

DIAGNOSIS AND TESTING (Continued)

QUICK TEST: KEY ON, ENGINE RUNNING (KOER) SELF-TEST

TEST STEP		RESULT ▶	ACTION TO TAKE
A1	CODE OUTPUT		
	• Before running KOER Self-Test, start the engine and idle until the upper radiator hose is hot and pressurized, with the throttle off fast idle and the idle stabilized, then shut engine off. To activate the KOER self-test, do the following: • Connect SUPER STAR II self-test and STI connectors. • Start engine, turn on SUPER STAR II Tester by moving slide switch to ON position. • Within 30 seconds of starting engine, press speed control ON switch. • Within 15 seconds, press SUPER STAR II pushbutton. • Observe code 10 on SUPER STAR II display (indicates IVSC test in progress). • Observe and record all DTC's indicated. One of the following outputs will occur. NOTE: Do not depress throttle or brake pedal during the KOER Self-Test. This procedure must be followed exactly to obtain IVSC KOER Self-Test. NOTE: The engine may stall at test exit. Turn off the ignition to prevent entry into EEC-IV Key On, Engine Off Self-Test.	Code 111 displayed ▶ Any other code(s) ▶ No codes outputted ▶	Engine Running Self-Test indicates a pass. If the drive symptom is currently present, GO to DIAGNOSTIC BY SYMPTOM. Otherwise testing is complete, IVSC system is OK. Engine Running Self-Test indicates a fault. GO to Step B. Repeat Self-Test and verify that no DTC's are present, then GO to Pinpoint Test Step G1.

TL5135E

QUICK TEST: KEY ON, ENGINE RUNNING (KOER) SELF-TEST

TEST STEP		RESULT ▶	ACTION TO TAKE
B1	RESULTS AND ACTION TO TAKE		
	• Using the Engine Running DTC's from Step A, follow the instructions in the ACTION TO TAKE column in this step. • When more than one DTC is received, always start service with the first code received. • Whenever a service is made, REPEAT QUICK TEST.	ENGINE RUNNING DIAGNOSTIC TROUBLE CODES Code 453 ▶ Code 454 ▶ Code 455 ▶ Code 456 ▶	 GO to Pinpoint Test Step E1. GO to Pinpoint Test Step E5. GO to Pinpoint Test Step D1. GO to Pinpoint Test Step F1.

TL5136F

Pinpoint Tests

Instructions for Using the Pinpoint Tests

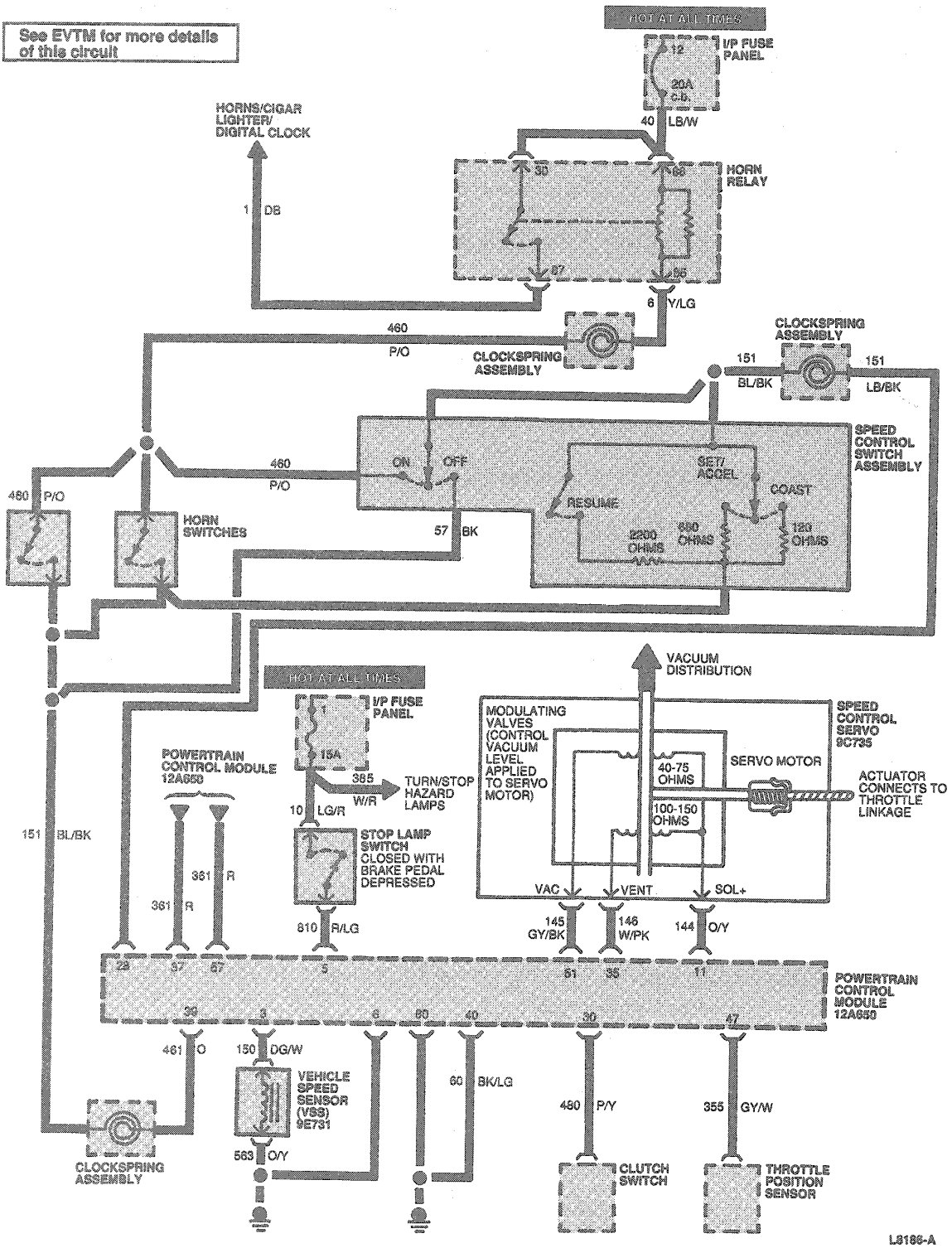
- Do not run any of the following Pinpoint Tests unless instructed by the Quick Test. Each Pinpoint Test assumes that a fault has been detected in the system with direction to enter a specific service routine. Performing any Pinpoint Test without direction from the Quick Test may produce incorrect results and cause replacement of undamaged components.
- Do not replace any parts unless the test result indicates that they should be replaced.
- When more than one DTC is received, always start service with the first code received.
- Do not measure voltage or resistance at the powertrain control module or connect any test lights to it, unless otherwise specified.
- Isolate both ends of a circuit, and turn the ignition switch to the OFF position whenever checking for shorts or continuity, unless otherwise specified.
- Disconnect solenoids and switches from the harness before measuring for continuity, resistance or energizing by way of 12-volt source, unless otherwise instructed.

DIAGNOSIS AND TESTING (Continued)

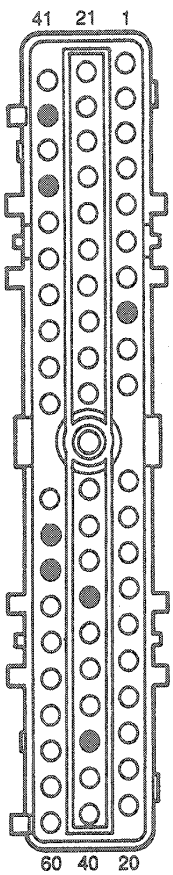
- In using the Pinpoint Tests, follow each Step in order, starting from the first Step in the appropriate test. Follow each Step until the fault is found.
- After completing any service to the IVSC system, verify that all components are properly reconnected and repeat the Quick Test.
- An open is defined as any resistance reading greater than 5 ohms unless otherwise specified.
- A short is defined as any resistance reading less than 10,000 ohms to ground, unless otherwise specified.
- Refer to the following wiring diagram as necessary during Pinpoint testing.

DIAGNOSIS AND TESTING (Continued)

SHO 3.0L Powertrain Control Module



DIAGNOSIS AND TESTING (Continued)



ELECTRONIC ENGINE CONTROL (EEC) MODULE (SHO) L6190-A

PIN NUMBER	CIRCUIT	CIRCUIT FUNCTION
1	37 (Y)	B+
2	330 (Y/LG)	Power Steering Pressure Switch
3	150 (DG/W)	Vehicle Speed Sensor
4	395 (GY/O)	Ignition Diagnostic Monitor
5	810 (R/LG)	Brake On/Off (1300) Switch
6	563 (O/Y)	VSS (-)
7	354 (LG/R)	Engine Coolant Temperature (ECT) Sensor
8	—	Not Used
9	968 (T/LB)	MAF Return
10	883 (PK/LB)	Air Conditioner Clutch Signal
11	144 (O/Y)	Speed Control Solenoid (SOL+)

(Continued)

PIN NUMBER	CIRCUIT	CIRCUIT FUNCTION
12	557 (BR/Y)	Fuel Injector No.3
13	558 (BR/LB)	Fuel Injector No.4
14	559 (T/BK)	Fuel Injector No.5
15	560 (LG/O)	Fuel Injector No.6
16	259 (O/R)	Ignition Ground
17	201 (T/R)	VIP Functional Tester
18	929 (PK)	Octane Adjust
19	787 (PK/BK)	Fuel Pump Monitor
20	57 (BK)	Case Ground
21	68 (O/BK)	Idle Air Control
22	97 (T/LG)	Low Speed Fuel Pump Relay
23	310 (Y)	Knock Sensor
24	795 (DG)	CAM Sensor
25	743 (GY)	Air Charge Temperature Sensor
26	351 (BR/W)	Reference Voltage
27	352 (BR/LG)	Pressure Feedback EGR Sensor
28	151 (LB/BK)	Speed Control Command Switch
29	94 (R/BK)	Heated Oxygen Sensor No.1
30	480 (P/Y)	Clutch Engage Switch
31	101 (GY/Y)	Canister Purge Solenoid
32	965 (LG/P)	Idle Air Control
33	360 (BR/PK)	EGR Valve Regulator
34	—	Not Used
35	146 (W/PK)	Speed Control Vent Solenoid (SCVNT)
36	324 (Y/LG)	Spark Output
37	361 (R)	Vehicle Power
38	—	Not Used
39	461 (O)	Speed Control Command Switch Ground
40	60 (BK/LG)	Power Ground
41	926 (LB/O)	Powertrain Control Module to High-Speed Fuel Pump
42	—	Not Used
43	90 (DB/LG)	H02S No. 2
44	—	Not Used
45	358 (LG/BK)	Barometric Absolute Pressure (BAP) Sensor
46	359 (GY/R)	Signal Return

(Continued)

DIAGNOSIS AND TESTING (Continued)

PIN NUMBER	CIRCUIT	CIRCUIT FUNCTION
47	355 (GY/W)	Throttle Position (TP) Sensor
48	200 (BR)	STI Connector
49	89 (O)	H02S Ground
50	967 (LB/R)	MAF Sensor
51	145 (GY/BK)	Speed Control Vacuum Solenoid (SCVAC)
52	—	Not Used
53	—	Not Used
54	331 (PK/Y)	WOT Cutout Relay
55	197 (T/O)	Electro-Drive Fan
56	349 (DB)	Profile Ignition Pick-Up (PIP)
57	361 (R)	Vehicle Power
58	555 (T)	Fuel Injector No. 1
59	556 (W)	Fuel Injector No. 2
60	60 (BK/LG)	Power Ground

TL8190A

DIAGNOSTIC BY SYMPTOM

SYMPTOM	ACTION TO TAKE
• Speed control does not work.	GO to **G.**
• Code "11" displayed on QUICK TESTS.	
• Clutch does not disengage speed control on 3.0L SHO vehicle.	GO to **H.**

STOP-WARNING

You should enter this Pinpoint Test only when a Diagnostic Trouble Code (DTC) 457, 458 or 459 is received in the KOEO Self-Test.

To prevent the replacement of good components, be aware that the following non-IVSC areas may be at fault:

- Horn relay
- Fuse

This Pinpoint Test is intended to diagnose only the following:

- Speed control switches
- Clockspring assembly
- Wiring harness
- Powertrain Control Module

PINPOINT TEST A
SPEED CONTROL SWITCHES

TEST STEP		RESULT ▶	ACTION TO TAKE
A1	DIAGNOSTIC TROUBLE CODE 457		
	• **Did you press the OFF, COAST, ACCEL and RESUME buttons during the IVSC KOEO Self-Test?**	Yes ▶ No ▶	GO to **A2.** REPEAT IVSC KOEO Self-Test.
A2	SWITCH DOES NOT FUNCTION		
	• Key Off, wait 10 seconds. • Disconnect powertrain control module 60-pin connector. Inspect for damaged pins, corrosion, loose wires, etc. Service as necessary. • Install EEC-IV 60-Pin Breakout Box, leave powertrain control module disconnected. • Measure resistance between test Pin 28 and test Pin 39 per table below. • Rotate steering wheel through its full range while making resistance checks.	Yes ▶ No ▶	REPLACE powertrain control module. REPLACE switches.

DVOM Range	Button Pressed	Resistance Range
200 ohm	OFF	0-4 ohms
200 ohm	COAST	114-126 ohms
2000 ohm	ACCEL	646-714 ohms
5000 ohm	RESUME	2090-2310 ohms

	• **Are resistances within range?**		
A3	DIAGNOSTIC TROUBLE CODE 458		
	• **Did you press the OFF, COAST, ACCEL and RESUME buttons during the IVSC KOEO Quick Test?**	Yes ▶ No ▶	GO to **A4.** REPEAT IVSC KOEO Quick Test.

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST A
SPEED CONTROL SWITCHES (Continued)

TEST STEP		RESULT	ACTION TO TAKE
A4	SWITCH IS STUCK ● Key off, wait 10 seconds. ● Disconnect powertrain control module 60-pin connector. Inspect for damaged pins, corrosion, loose wires, etc. Service as necessary. ● Install breakout box, leave powertrain control module disconnected. ● Rotunda Digital Volt-Ohmmeter (DVOM) 014-00407 or equivalent, on 5000 ohm scale. ● Measure resistance between test Pin 28 and test Pin 39. ● **Is resistance reading between 0 ohms and 2310 ohms?**	Yes No	▶ REPLACE switches. ▶ REPLACE powertrain control module.
A5	DIAGNOSTIC TROUBLE CODE 459 ● **Did you press the OFF, COAST, ACCEL and RESUME buttons during the IVSC KOEO QUICK TEST?**	Yes No	▶ GO to A6. ▶ REPEAT IVSC KOEO Quick Test.
A6	GROUND CIRCUIT TO SWITCHES OPEN ● Key off, wait 10 seconds. ● Disconnect powertrain control module 60-pin connector. Inspect for damaged pins, corrosion, loose wires, etc. Service as necessary. ● Install breakout box, leave powertrain control module disconnected. ● Disconnect speed control switch plug in steering column shroud. ● DVOM on 200 ohm scale. ● Measure resistance between test Pin 39 and ground terminal in 14290 half of disconnected switch plug. ● **Is resistance reading greater than 5 ohms?**	Yes No	▶ SERVICE open circuit between EEC-IV connector Pin 39 and switch plug ground terminal. ▶ REPLACE powertrain control module.

TL5139D

Stop-Warning

You should enter this Pinpoint Test only when a Diagnostic Trouble Code (DTC) 536 is received in the KOEO Self-Test.

To prevent the replacement of good components, be aware that the following non-IVSC areas may be at fault:

- Brakelamp, brake switch, and fuse

This Pinpoint Test is intended to diagnose only the following:

- BOO Circuit
- Powertrain Control Module

PINPOINT TEST B
BRAKE ON/OFF (BOO)

TEST STEP		RESULT	ACTION TO TAKE
B1	DIAGNOSTIC TROUBLE CODE 536 ● **Did you press brake during the KOEO Self-Test?**	Yes No	▶ GO to B2. ▶ REPEAT KOEO Self-Test. PRESS brake once during test.

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST B
BRAKE ON/OFF (BOO) (Continued)

TEST STEP		RESULT	ACTION TO TAKE
B2	BOO CIRCUIT CYCLING		
	• Key off, wait 10 seconds. • Disconnect powertrain control module 60 pin connector. Inspect for damaged pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave powertrain control module disconnected. • Rotunda Digital Volt-Ohmmeter (DVOM) 014-00407 or equivalent, on 20 volt scale. • Measure voltage between test Pin 5 and test Pin 40 at the breakout box while depressing and releasing brake. • **Does the voltage cycle?**	Yes ▶ No ▶	REPLACE powertrain control module. RETEST. GO to **B3.**
B3	BOO CIRCUIT SHORT TO GROUND		
	• Key off. • Breakout box installed. • Powertrain control module disconnected. • DVOM on 200 ohm scale. • Disconnect BOO circuit from 14290 harness (12-pin connector). • Measure resistance between test Pin 5 at the breakout box and ground. • **Is resistance reading greater than 5 ohms?**	Yes ▶ No ▶	SERVICE stoplamp circuit. Refer to Section 17-01. GO to **B4.**
B4	BOO CIRCUIT SHORT TO POWER		
	• Key off. • Breakout box installed. • Powertrain control module disconnected. • DVOM on 20 volt scale. • Disconnect BOO circuit from 14290 harness (12-pin connector). • Measure voltage between test Pin 5 at the breakout box and engine block ground. • **Is voltage reading greater than 10.5 volts?**	Yes ▶ No ▶	SERVICE BOO circuit short to power. BOO circuit OK. SERVICE stoplamp circuit. Refer to Section 17-01.

TL5142D

Stop-Warning

You should enter this Pinpoint Test only when a Diagnostic Trouble Code (DTC) 567 and/or 568 is received in the KOEO Self-Test.

This Pinpoint Test is intended to diagnose only the following:

- Servo vent solenoid
- Servo vacuum solenoid
- Circuits SOL+, SCVNT, and SCVAC
- Powertrain control module

PINPOINT TEST C
SERVO SOLENOIDS
DTC 567 AND/OR 568

TEST STEP		RESULT	ACTION TO TAKE
C1	VENT SOLENOID TEST		
	• Key OFF. • Disconnect powertrain control module 60 pin connector, inspect for damaged pins, corrosion, loose wires, etc. Service as necessary. • Install Breakout box, leave powertrain control module disconnected. • DVOM on 200 ohm scale • Measure resistance between test Pin 11 and and test Pin 35.	Resistance is between 100 and 150 ohms ▶ Resistance is less than 100 ohms ▶ Resistance is greater than 150 ohms ▶	If code 82 is also set, GO to **C4**, if not, GO to **C7.** REPLACE speed control servo. REPEAT Quick Test. GO to **C2.**

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST C
SERVO SOLENOIDS
DTC 567 AND / OR 568 (Continued)

TEST STEP		RESULT	ACTION TO TAKE
C2	CHECK CONTINUITY OF SOL+ CIRCUIT		
	• Disconnect harness connector from the speed control servo. • DVOM on 200 ohm scale • Measure resistance between test Pin 11 and SOL+ Circuit at the harness connector.	Resistance is greater than 5 ohms Resistance is less than 5 ohms.	SERVICE open circuit. REPEAT Quick Test. GO to C3.
C3	CHECK CONTINUITY OF SCVNT CIRCUIT		
	• Disconnect harness connector from the speed control servo. • DVOM on 200 ohm scale • Measure resistance between test Pin 35 and SCVNT Circuit at the harness connector.	Resistance is greater than 5 ohms Resistance is less than 5 ohms	SERVICE open circuit. REPEAT Quick Test. REPLACE speed control servo. REPEAT Quick Test.
C4	VACUUM SOLENOID TEST		
	• Key OFF. • Disconnect powertrain control module 60 pin connector. Inspect for damaged pins, corrosion, loose wires, etc. Service as necessary. • Install Breakout box, leave powertrain control module disconnected. • DVOM on 200 ohm scale. • Measure resistance between test Pin 11 and test Pin 51.	Resistance is between 40 and 75 ohms Resistance is less than 40 ohms Resistance is greater than 75 ohms	GO to C7. REPLACE speed control servo. REPEAT Quick Test. GO to C5.
C5	CHECK CONTINUITY OF SOL+ CIRCUIT		
	• Disconnect harness connector from the speed control servo. • DVOM on 200 ohm scale. • Measure resistance between test PIN 11 and SOL+ circuit at the harness connector.	Resistance is greater than 5 ohms Resistance is less than 5 ohms	SERVICE open circuit. REPEAT Quick Test. GO to C6.
C6	CHECK CONTINUITY OF SCVAC CIRCUIT		
	• Disconnect harness connector from the speed control servo. • DVOM on 200 ohm scale. • Measure resistance between test Pin 51 and SCVAC circuit at the harness connector.	Resistance is greater than 5 ohms Resistance is less than 5 ohms	SERVICE open circuit. REPEAT Quick Test REPLACE speed control servo. REPEAT Quick Test.
C7	CHECK SOL+ SHORT TO GROUND		
	• Disconnect the harness connector from the speed control servo. • DVOM on 200,000 ohm scale. • Measure resistance between test Pin 11 and test Pin 40 at Breakout Box.	Resistance is greater than 10,000 ohms Resistance is less than 10,000 ohms	GO to C8. SERVICE short circuit. REPEAT Quick Test (short may have damaged powertrain control module).
C8	CHECK SCVNT SHORT TO GROUND		
	• Disconnect the harness connector from the speed control servo. • DVOM on 200,000 ohm scale. • Measure resistance between test Pin 35 and test Pin 40 at Breakout Box.	Resistance is greater than 10,000 ohms Resistance is less than 10,000 ohms	GO to C9. SERVICE short circuit. REPEAT Quick Test.
C9	CHECK SCVAC SHORT TO GROUND		
	• Disconnect the harness connector from the speed control servo. • DVOM on 200,000 ohm scale. • Measure resistance between test Pin 51 and test Pin 40 at Breakout Box.	Resistance is greater than 10,000 ohms Resistance is less than 10,000 ohms	REPLACE powertrain control module. REPEAT Quick Test. SERVICE short circuit. REPEAT Quick Test.

DIAGNOSIS AND TESTING (Continued)

STOP-WARNING

You should enter this Pinpoint Test only when Diagnostic Trouble Code (DTC) 455 is received in the KOER Self-Test.

This Pinpoint Test is intended to diagnose only the following:

- Actuator cable
- Vacuum hose connections
- Speed control metering valve adjustment
- Powertrain control module
- Speed control vacuum reservoir
- Check valve

PINPOINT TEST D
SPEED DOES NOT INCREASE DURING DYNAMIC TEST

TEST STEP		RESULT ▶	ACTION TO TAKE
D1	DIAGNOSTIC TROUBLE CODE 455		
	• Repeat KOER Self-Test of Quick Test. Be sure that the speed control ON button is pressed before pressing the SUPER STAR II push button.	Diagnostic Trouble Code 455 still present ▶	GO to D2.
		No Diagnostic Trouble Code 455 ▶	Increase vehicle speed test passed. SERVICE any other Diagnostic Trouble Code as necessary.
D2	CHECK ACTUATOR CABLE CONNECTION TO THROTTLE BODY AND SPEED CONTROL SERVO		
	• Is actuator cable attached to throttle body accelerator linkage? • Is actuator cable attached to speed control servo linkage?	Yes ▶	GO to D3.
		No ▶	SERVICE as necessary.
D3	CHECK VACUUM HOSES		
	• Is speed control servo vacuum supply hose tightly connected to VAC port on check valve and to the vacuum manifold, and free of cuts, cracks and kinks? • Are vacuum hoses tightly connected between check valves and speed control servo, and free of cuts, cracks and kinks? • Is vacuum hose tightly connected between check valve and speed control vacuum reservoir, and free of cuts, cracks and kinks? • Is the speed control metering valve hose tightly connected to the speed control servo and to the speed control metering valve, and free of cuts, cracks and kinks?	Yes ▶	GO to D4.
		No ▶	SERVICE hoses. REPEAT Quick Test.
D4	VACUUM LEAK DOWN CHECK		
	• Disconnect the hose between check valve and speed control servo, at the speed control servo end. • Apply 60.6 kPa (18 in-Hg) vacuum to open end of hose. • Can vacuum be pumped to, and held at 60.6 kPa (18in-Hg) vacuum?	Yes ▶	GO to D6.
		No ▶	GO to D5.
D5	CHECK VACUUM RESERVOIR		
	• Disconnect hose between check valve and speed control vacuum reservoir, at check valve end. • Install vacuum pump to open end of hose to speed control vacuum reservoir. • Apply 60.6 kPa (18 in-Hg) vacuum to the speed control vacuum reservoir. • Does speed control vacuum reservoir hold vacuum?	Yes ▶	REPLACE check valve. REPEAT Quick Test.
		No ▶	REPLACE speed control vacuum reservoir. REPEAT Quick Test.
D6	CHECK SPEED CONTROL METERING (DUMP) VALVE		
	• Is the speed control metering (dump) valve adjusted properly so that the speed control metering (dump) valve is closed when the brake pedal is not depressed?	Yes ▶	GO to C1.
		No ▶	ADJUST speed control metering valve. REPEAT Quick Test.

DIAGNOSIS AND TESTING (Continued)

STOP-WARNING

You should enter this Pinpoint Test only when Diagnostic Trouble Codes (DTC's) 453 and / or 454 are received in the KOER Self-Test.

This Pinpoint Test is intended to diagnose only the following:

- Speed control servo
- Vacuum hose connections
- Speed control vacuum reservoir
- Check valve

PINPOINT TEST E
DOES NOT HOLD SPEED DURING DYNAMIC TEST

TEST STEP		RESULT ▶	ACTION TO TAKE
E1	DIAGNOSTIC TROUBLE CODE 453		
	• Repeat Engine Running Self-Test of QUICK TEST. Be sure that the speed control ON button is pressed before pressing the SUPER STAR II push button.	Diagnostic Trouble Code 453 still present? ▶	GO to E2.
		No Diagnostic Trouble Code 453 ▶	speed control servo leaks down test passed. SERVICE any other Diagnostic Trouble Code as necessary.
E2	CHECK VACUUM HOSES		
	• Is vacuum supply hose tightly connected to VAC port on check valve and to vacuum manifold, and free of cuts, cracks and kinks? • Is vacuum hose tightly connected between check valve and speed control servo, and free of cuts, cracks and kinks? • Is vacuum hose tightly connected between check valve and speed control vacuum reservoir, and free of cuts, cracks and kinks? • Is speed control metering valve hose tightly connected to the speed control vacuum reservoir and speed control metering valve, and free of cuts, cracks and kinks?	Yes ▶	GO to E3.
		No ▶	SERVICE vacuum hoses. REPEAT Quick Test.
E3	CHECK SPEED CONTROL VACUUM RESERVOIR		
	• Disconnect hose between the check valve and speed control vacuum reservoir at check valve end. • Install vacuum pump to open end of hose to speed control vacuum reservoir. • Apply 60.6 kPa (18 in-Hg) vacuum to the speed control vacuum reservoir. • Does speed control vacuum reservoir hold vacuum?	Yes ▶	GO to E4.
		No ▶	REPLACE speed control vacuum reservoir. REPEAT Quick Test.
E4	CHECK THE CHECK VALVE		
	• Disconnect hose between check valve and speed control servo, at the speed control servo end. • Apply 60.6 kPa (18 in-Hg) vacuum to open end of hose. • Can vacuum be pumped to, and held at 60 kPa (18 in-Hg) vacuum?	Yes ▶	REPLACE speed control servo. REPEAT Quick Test.
		No ▶	REPLACE check valve. REPEAT Quick Test.
E5	DIAGNOSTIC TROUBLE CODE 454		
	• REPEAT Engine Running Self-Test. Be sure that the speed control ON button is pressed before pressing the SUPER STAR II push button.	Diagnostic Trouble Code 454 still present? ▶	REPLACE speed control servo. REPEAT Quick Test.
		No Diagnostic Trouble Code 454 ▶	Speed control servo leaks up test passed. SERVICE any other Diagnostic Trouble Code as necessary.

STOP-WARNING

You should enter this Pinpoint Test only when a Diagnostic Trouble Code 456 is received in the KOER Self-Test.

This Pinpoint Test is intended to diagnose only the following:

DIAGNOSIS AND TESTING (Continued)

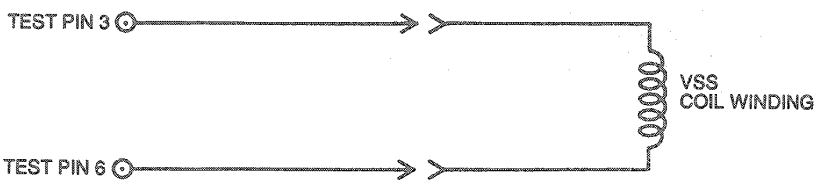
- Actuator cable
- Throttle shaft and linkage
- Throttle position sensor (9B989)
- Powertrain control module

PINPOINT TEST F
SPEED DOES NOT DECREASE DURING DYNAMIC TEST

TEST STEP		RESULT ▶	ACTION TO TAKE
F1	DIAGNOSTIC TROUBLE CODE 456		
	• Repeat KOER Self-Test of Quick Test. Be sure that the speed control ON button is pressed before pressing the SUPER STAR II push button.	Code 456 still present? ▶	GO to F2.
		No Code 456 ▶	Decrease vehicle speed test passed. SERVICE any other Diagnostic Trouble Code(s) as necessary.
F2	CHECK FOR THROTTLE SHAFT/LINKAGE BINDING		
	• **Is the throttle or shaft throttle linkage binding, maintaining a part throttle opening?**	Yes ▶	SERVICE to eliminate binding. REPEAT Quick Test.
		No ▶	GO to F3.
F3	CHECK FOR SPEED CONTROL LINKAGE BINDING		
	• **Is the acutator cable binding?**	Yes ▶	REPLACE the actuator cable. REPEAT Quick Test.
		No ▶	GO to F4.
F4	CHECK FOR TP SENSOR BINDING		
	• **Is TP sensor binding at a part throttle opening?**	Yes ▶	REPLACE the TP sensor. REPEAT Quick Test.
		No ▶	REPLACE the powertrain control module. REPEAT Quick Test.

TL5150D

VSS — PINPOINT TEST G



L7709-B

STOP-WARNING

You should enter this Pinpoint Test only when directed here from the KOER Self-Test and the Diagnostic by Symptom chart.

This Pinpoint Test is intended to diagnose only the following:

- VSS resistance check
- Short or ground in VSS input circuit
- Open in VSS input circuit

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST G: SPEED SENSOR

TEST STEP		RESULT ▶	ACTION TO TAKE
G1	VSS RESISTANCE CHECK		
	• Key off, wait 10 seconds. • Disconnect powertrain control module 60 pin connector. Inspect for damaged pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave powertrain control module disconnected. • Rotunda Digital Volt-Ohmmeter (DVOM) 014-00407 or equivalent, on 2000 ohm scale. • Measure resistance between test Pin 3 and test Pin 6.	DVOM reading less than 180 ohms ▶ DVOM reading greater than 240 ohms ▶ DVOM reading between 180 and 240 ohms ▶	GO to G2. GO to G3. REFER to Section 07-01 for AXOD-E electrical system diagnosis. PERFORM drive cycle and monitor for continuous codes 57, 59, 62 and 69. PERFORM diagnostics as required.
G2	CHECK FOR SHORT IN VSS INPUT CIRCUIT		
	• Key off. • Disconnect harness connector from vehicle speed sensor. • DVOM on 2000 ohm scale. • Measure resistance between the two connector pins on the VSS.	DVOM reading less than 180 ohms ▶ DVOM reading between 180 and 240 ohms ▶	REPLACE VSS. REPEAT Quick Test. SERVICE short in wire harness between VSS and PCM Pins 3 and 6 or grounded 150 Circuit. REPEAT Quick Test.
G3	CHECK FOR OPEN IN VSS INPUT CIRCUIT		
	• Key off. • Disconnect harness connector from VSS. • DVOM on 2000 ohm scale. • Measure resistance between the two connector pins on the VSS.	DVOM reading greater than 240 ohms ▶ DVOM reading between 180 and 240 ohms ▶	REPLACE VSS. REPEAT Quick Test. SERVICE open in wire harness between VSS and PCM Pins 3 and 6. REPEAT Quick Test.

TL5152E

STOP-WARNING

You should enter this Pinpoint Test only if directed here from the Diagnostic by Symptom Chart.

This Pinpoint Test is intended to diagnose only the following:

- Clutch switch resistance check
- Open in clutch switch circuit
- Clutch switch adjustment

PINPOINT TEST H
CLUTCH SWITCH

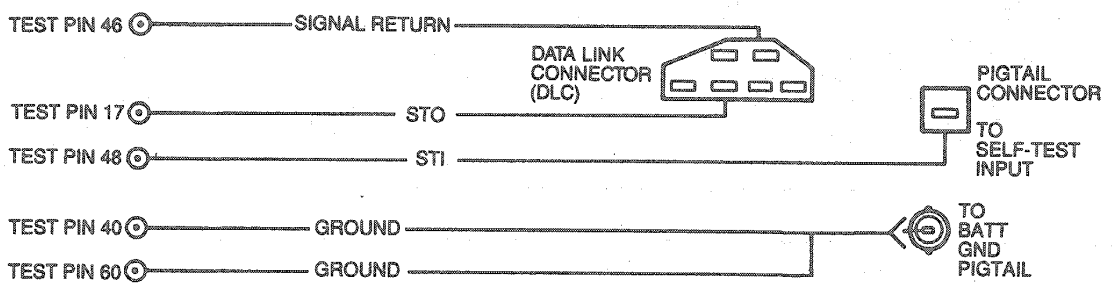
TEST STEP		RESULT ▶	ACTION TO TAKE
H1	CLUTCH INPUT CHECK		
	• Key OFF. Wait 10 seconds. • Disconnect powertrain control module (PCM) 60 pin connector. Inspect for damaged pins, corrosion, loose wires, etc. Service as necessary. • Install Breakout Box. • DVOM on 200 ohm scale. • Measure resistance between test Pin 30 and test Pin 46 with the clutch pedal down. • Is resistance less than 5 ohms?	Yes ▶ No ▶	REPLACE powertrain control module. Road test to verify that depressing the clutch disengages the speed control. GO to H2.

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST H
CLUTCH SWITCH (Continued)

TEST STEP		RESULT	ACTION TO TAKE
H2	CHECK WIRE HARNESS		
	• Key OFF. • Breakout Box installed. • DVOM on 200 ohm scale. • Locate clutch switch (under the instrument panel). • Measure resistance between test Pin 30 and the clutch switch harness connector. • Measure resistance between test Pin 46 and the clutch switch harness connector. • Are all resistance readings less than 5 ohms?	Yes ▶ No ▶	GO to H3. SERVICE open circuit. Road test to verify that depressing the clutch disengages the speed control.
H3	CHECK CLUTCH SWITCH ADJUSTMENT		
	• Check that clutch switch is adjusted as outlined. • Is clutch switch adjusted properly?	Yes ▶ No ▶	REPLACE clutch switch. Road test to verify that depressing the clutch disengages the speed control. RE-ADJUST clutch switch. Road test to verify that depressing the clutch disengages the speed control.

NO CODES, CODES NOT LISTED — PINPOINT TEST Q



TEST PINS ON BREAKOUT BOX. ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

L7710-B

STOP-WARNING

You should enter this Pinpoint Test only when directed here from the KOER or KOEO Self-Test.

This Pinpoint Test is intended to diagnose only the following:

- Powertrain control module
- Harness circuits: signal return, STO, STI, Ground

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST Q
NO CODES, CODES NOT LISTED

TEST STEP		RESULT ▶	ACTION TO TAKE
Q1	SELF-TEST INPUT CONTINUITY CHECK ● Key OFF, wait 10 seconds. ● Disconnect powertrain control module 60-Pin connector. Inspect for damaged pins, corrosion, loose wires, etc. Service as necessary. ● Install breakout box, leave powertrain control module disconnected. ● Set DVOM to 200 ohm scale. ● Measure resistance between Self Test input at the Self Test single pin connector and test Pin 48 at the breakout box. ● **Is resistance less than 5 ohms?**	Yes ▶ No ▶	GO to Q2. CORRECT open in circuit.
Q2	SELF-TEST OUTPUT CIRCUIT CONTINUITY CHECK ● Breakout box installed. ● DVOM to 200 ohm scale. ● Measure resistance between Self-Test output at the data-link connector (DLC) and test Pin 17 at the breakout box. ● **Is resistance less than 5 ohms?**	No ▶ Yes ▶	CORRECT open in circuit. GO to Q3.
Q3	EGO SENSOR GROUND CONTINUITY CHECK ● Breakout box installed. ● Key OFF. ● Measure resistance between EGO ground on engine and test Pin 49 at the breakout box. ● **Is resistance less than 5 ohms?**	Yes ▶ No ▶	GO to Q4. CHECK and SERVICE EGO sensor ground wire or open circuit bad connection.
Q4	STO SHORT TO GROUND ● Breakout box installed. ● DVOM on 200,000 ohm scale. ● Measure resistance between Self Test output at the DLC and engine block ground. ● **Is resistance greater than 10,000 ohms?**	Yes ▶ No ▶	REPLACE powertrain control module. REPEAT Quick Test. SERVICE shorts to ground. REPEAT Quick Test.

TL5153C

REMOVAL AND INSTALLATION

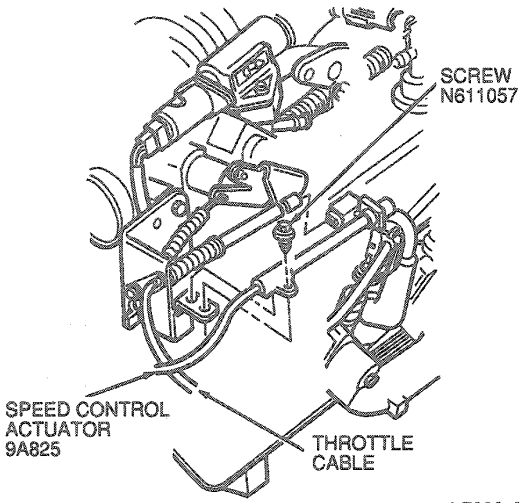
Speed Control Servo Assembly

Removal

1. Remove screw and disconnect speed control actuator cable from accelerator cable bracket.
2. Disconnect speed control actuator cable with adjuster from accelerator cable.

REMOVAL AND INSTALLATION (Continued)

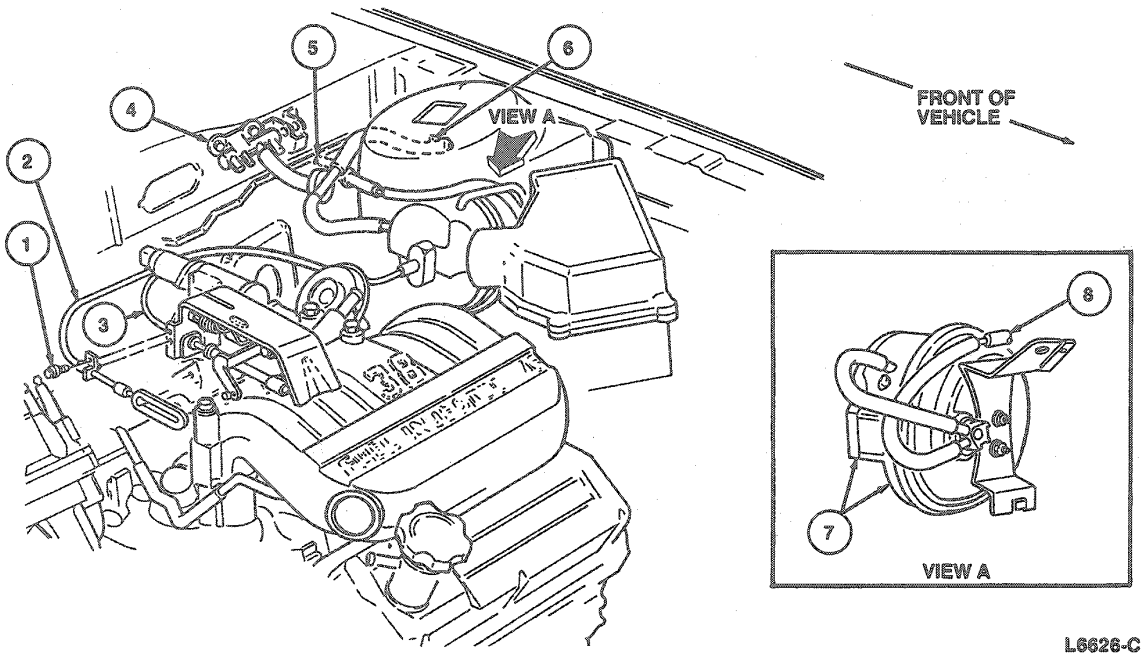
3.0L Engine



L7688-A

3. Remove two vacuum hoses and electrical connector from speed control servo assembly.

3.8L Engine



L6626-C

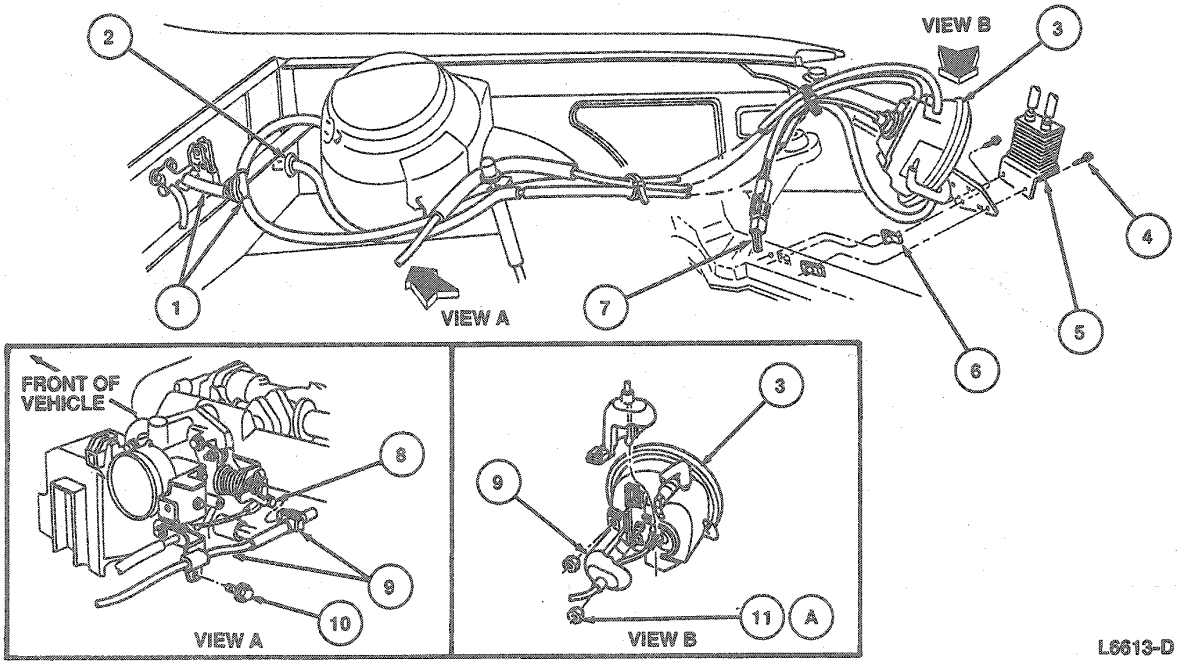
Item	Part Number	Description
1	N611057-S2	Screw
2	9A825	Speed Control Actuator
3	—	Throttle Cable
4	—	Vacuum Distribution Block
5	9C727	To Speed Control Metering (Dump) Valve
6	—	To Vacuum Reservoir Assy

(Continued)

REMOVAL AND INSTALLATION (Continued)

Item	Part Number	Description
7	9C735	Speed Control Servo
8	—	To Dump Valve Assy

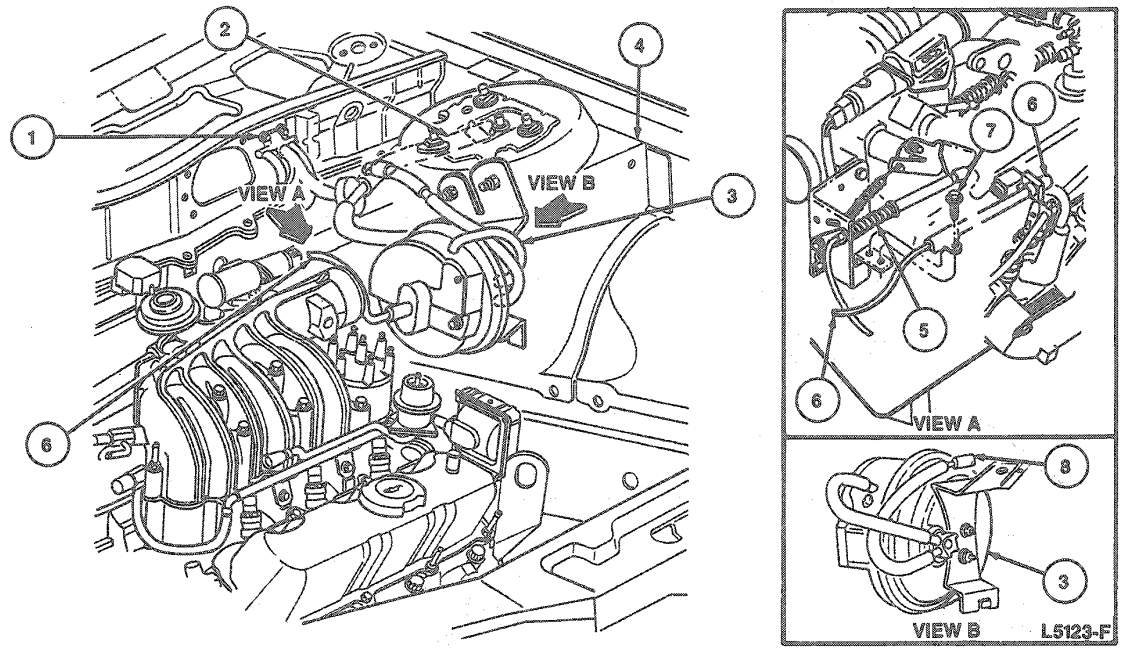
3.0L SHO Engine



Item	Part Number	Description
1	—	Vacuum Manifold
2	—	To Speed Control Metering (Dump) Valve
3	9C735	Speed Control Servo
4	N605892-S2	Bolt (2 Req'd)
5	—	Power Steering Oil Cooler
6	N800925-S100	U-Nut (2 Req'd)
7	12A581	Wiring Assy
8	—	Attachment Point For Speed Control Actuator
9	9A825	Speed Control Actuator
10	N611057-S2	Screw
11A	N620480-S2	Nut (2 Req'd)
A		Tighten to 9.5-12 N·m (7-8 Lb-Ft)

REMOVAL AND INSTALLATION (Continued)

3.0L Engine



Item	Part Number	Description
1	—	Vacuum Distribution Block
2	—	To Vacuum Reservoir
3	9C735	Speed Control Servo
4	—	Driver's Side Shock Tower
5	—	Throttle Cable
6	9A825	Speed Control Actuator
7	N611057	Screw
8	—	To Speed Control Metering (Dump) Valve Assy

4. Remove two nuts retaining speed control servo to its mounting bracket.
5. Carefully remove speed control servo and cable assembly.
6. Remove two nuts retaining cable cover to speed control servo.
7. Pull off cover and remove cable assembly.

Installation

1. Attach cable to speed control servo.
2. Install cable cover to speed control servo with two nuts. Tighten to 5-7 N·m (45-61 lb-in).
3. Install speed control servo to mounting bracket. Tighten retaining nuts to 5-7 N·m (45-61 lb-in).
4. Feed actuator cable under cleaner air duct.
5. Snap actuator cable with adjuster onto accelerator cable.
6. Connect actuator cable to accelerator cable bracket and install push pin.
7. Install two vacuum hoses and electrical connector at speed control servo.

Actuator Cable

Removal and Installation

To replace actuator assembly, remove speed control servo assembly, attach new actuator cable assembly to speed control servo and install total assembly.

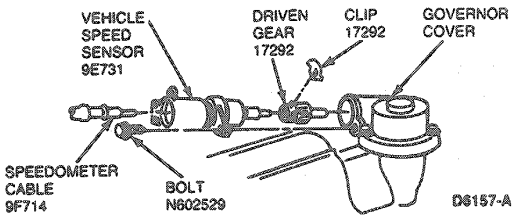
REMOVAL AND INSTALLATION (Continued)

VSS

AXOD-E Transaxle

Removal

1. Raise vehicle on hoist. Refer to Section 00-02.
2. Remove Y-pipe and heated oxygen sensors (H02S)(9F472) from exhaust system.
3. Remove VSS exhaust heat shield.
4. Remove bolt retaining VSS mounting clip to transaxle.
5. Remove VSS and driven gear from transaxle.



6. Disconnect electrical connector and speedometer cable from VSS.

   NOTE: Vehicles equipped with an electronic instrument cluster do not have a speedometer cable.

   NOTE: Do not attempt to remove spring retaining clip from driven gear with speedometer cable in VSS.
7. Remove driven gear retainer and driven gear from VSS.

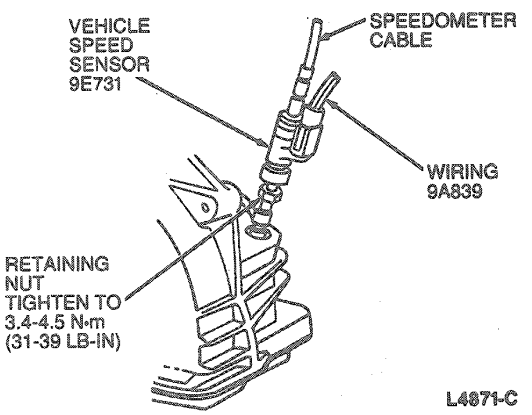
Installation

1. Position driven gear to VSS and install gear retainer.
2. Connect electrical connector to VSS.
3. Ensure internal O-ring is seated properly in VSS housing. Snap speedometer cable into VSS housing.
4. Install VSS into transaxle and secure with retaining bolt.
5. Install VSS exhaust heat shield.
6. Install Y-pipe and heated oxygen sensors to exhaust system.
7. Lower vehicle and verify proper speedometer / odometer operation.

MTX Transaxle

Removal

1. Raise vehicle on a hoist. Refer to Section 00-02.
2. Loosen retaining nut holding VSS in transaxle.
3. Remove VSS from transaxle.



4. Disconnect electrical connector.
5. Disconnect speedometer cable by pulling it out of VSS.

   NOTE: Do not attempt to remove spring retaining clip with speedometer cable in VSS.

Installation

1. Connect electrical connector.
2. Ensure internal O-ring is properly seated in VSS housing. Snap speedometer cable into VSS housing.
3. Insert VSS assembly into transaxle housing. Tighten retaining nut.
4. Lower vehicle.

Speed Control Amplifier Assembly

The speed control amplifier assembly is located on the LH side of the instrument panel behind the lamp dimmer potentiometer.

Removal

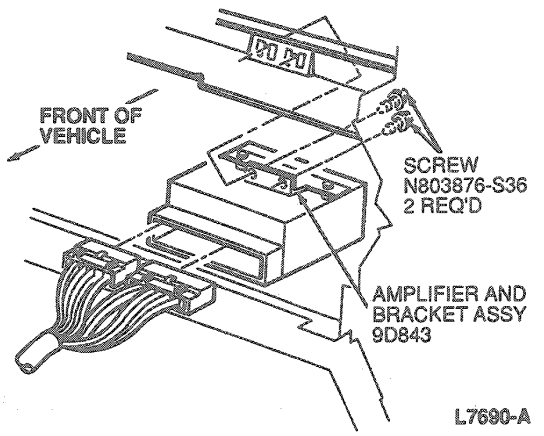
1. Disconnect two electrical connectors at speed control amplifier.
2. Remove two screws retaining speed control amplifier and bracket assembly to air bag power supply module bracket.
3. Remove speed control amplifier and bracket assembly from instrument panel.
4. Remove two bolts and nuts retaining speed control amplifier assembly to mounting bracket.

Installation

1. Install two bolts and nuts which retain speed control amplifier assembly to mounting bracket.
2. Install speed control amplifier and bracket assembly to air bag power supply module bracket with two screws and tighten to 5-7 N·m (45-61 lb-in).

REMOVAL AND INSTALLATION (Continued)

3. Connect two electrical connectors to speed control amplifier.



Speed Control Metering (Dump) Valve

Removal and Installation

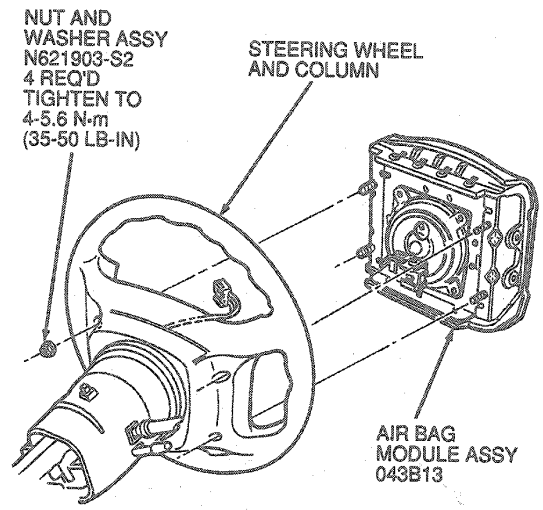
1. Remove vacuum hose from speed control metering (dump) valve.
2. Remove speed control metering (dump) valve from bracket.
3. To install, reverse Removal procedure. Adjust valve as outlined, if replacement part is installed.

Control Switches

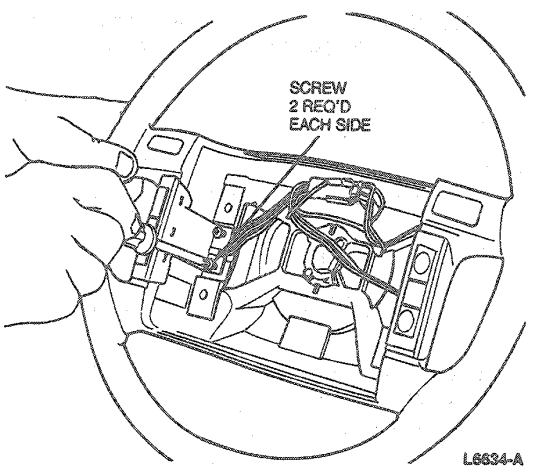
Removal

1. Disconnect battery ground cable and air bag back up power supply. Refer to Section 01-20B.
2. Remove four nut and washer assemblies retaining air bag module to steering wheel.
3. Disconnect air bag electrical connector from clockspring contact connector.
4. Remove air bag module from steering wheel.

   WARNING: PLACE AIR BAG MODULE ON BENCH WITH TRIM COVER FACING UP.

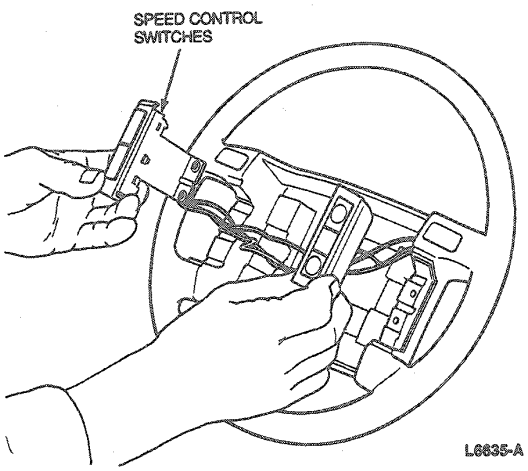


5. Remove horn buttons by gently prying with a small screwdriver. Disconnect horn wiring harness connector.
6. Remove Phillips head screws from speed control switch assemblies.



REMOVAL AND INSTALLATION (Continued)

7. Disconnect speed control switches from wiring harness and remove switches.



Installation

1. Position speed control switches onto steering wheel and install Phillips head screws.
2. Connect wiring harness to horn buttons and install horn buttons.
3. Connect speed control switches. Ensure wires are positioned so that no interference is encountered when installing air bag module.
4. Position air bag module on steering wheel so that clockspring contact connector can be connected to the air bag module.
5. Install air bag module on steering wheel and install four nut and washer assemblies. Tighten to 4-5.6 N·m (35-50 lb-in).
6. Connect battery air bag backup power supply and ground cable.

Clockspring Assembly

Tools Required:

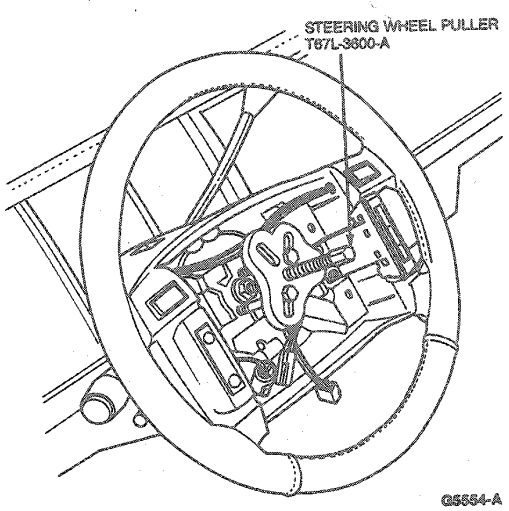
- Steering Wheel Puller T67L-3600-A

Removal

1. Center vehicle front wheels in the straight ahead position.
2. Disconnect battery ground cable and air bag backup power supply.

   WARNING: THE BACKUP POWER SUPPLY MUST BE DISCONNECTED BEFORE ANY AIR BAG COMPONENT SERVICE IS PERFORMED.
3. Remove four nut and washer assemblies retaining air bag module to steering wheel.
4. Disconnect air bag electrical connector from clockspring contact connector.
5. Remove air bag module from steering wheel.

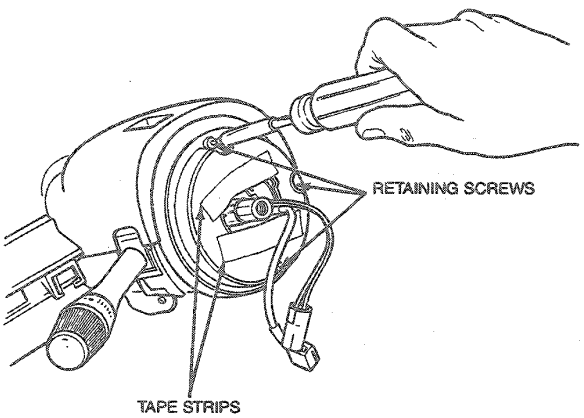
   WARNING: PLACE AIR BAG MODULE ON BENCH WITH TRIM COVER FACING UP.
6. Disconnect speed control switches and horn switches from contact assembly.
7. Remove steering wheel retaining bolt.
8. Install Steering Wheel Puller T67L-3600-A and remove steering wheel.



9. Remove tilt lever if equipped.
10. Remove lower trim panel and lower steering column shroud.
11. Disconnect contact assembly wiring harness.
12. Apply two pieces of tape across contact assembly stator and rotor to prevent accidental rotation.

REMOVAL AND INSTALLATION (Continued)

13. Remove three contact assembly retaining screws and lift contact assembly off steering column shaft.



Installation

1. Ensure that vehicle front wheels are in straight ahead position and steering column shaft alignment mark is at 12 o'clock position.
2. Align contact assembly to column shaft and mounting bosses and slide contact assembly onto the shaft.
3. Install three screws that retain the contact assembly and tighten to 2-3 N·m (18-26 lb-in). Remove tape from contact assembly.
4. Route the contact assembly harness down the column and connect to main wiring.

   NOTE: If a new contact assembly is installed, remove the lock mechanism.
5. Install steering column shroud.
6. Install lower trim panel.
7. Install tilt lever if equipped.
8. Position steering wheel on steering shaft and install new steering wheel retaining bolt. Tighten to 31-45 N·m (23-33 lb-ft).

   NOTE: Route contact assembly wiring through steering wheel as wheel is being positioned.
9. Connect speed control and horn switches to contact assembly.

   NOTE: Ensure wiring is positioned so that no interference is encountered when installing air bag module.
10. Position air bag module on steering wheel so that clockspring contact connector can be connected to the air bag module.
11. Install air bag module on wheel and install four nut and washer assemblies.
12. Connect air bag backup power supply and battery ground cable.
13. Verify air bag warning indicator.

Clutch Switch

Removal

1. Remove screw retaining switch to bracket.
2. Disconnect electrical connector.
3. Remove switch assembly.
4. Remove switch from bracket.

Installation

1. Install switch on bracket.
2. Connect electrical connector.
3. Install retaining screw.
4. Adjust clutch switch as outlined.

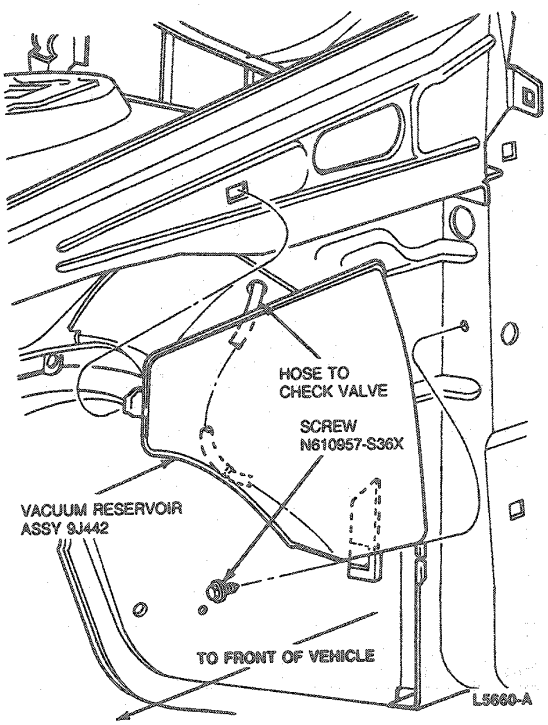
Vacuum Reservoir

Removal

1. Raise vehicle on hoist. Refer to Section 00-02.
2. Remove LH front wheel and tire assembly.
3. Remove inner fender splash shield. Refer to Section 01-02.
4. Remove hose connection at check valve in engine compartment.
5. Remove screw retaining speed control vacuum reservoirassembly to A-pillar and slide speed control vacuum reservoir forward to release hook.

REMOVAL AND INSTALLATION (Continued)

6. Remove speed control vacuum reservoir assembly by pulling hose through cowl side panel.



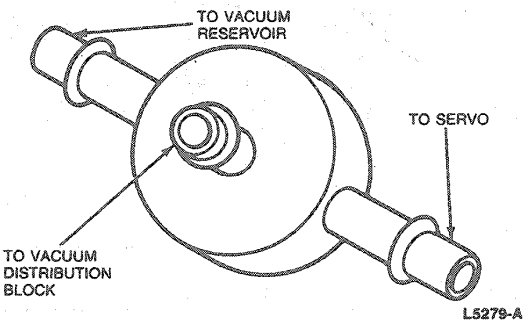
Installation

1. Place speed control vacuum reservoir hook in slot and slide rearward.
2. Install speed control vacuum reservoir assembly to A-pillar with retaining screw.
3. Route vacuum hose from speed control vacuum reservoirr through cowl side panel.
4. Install inner fender splash shield.
5. Connect hose to check valve in engine compartment.
6. Install LH front wheel and tire assembly. Tighten wheel lug nuts to 115-142 N-m (85-105 lb-ft).
7. Lower vehicle.

Check Valve

Removal

1. Disconnect hose to vacuum distribution block.
2. Disconnect hose to speed control servo.
3. Disconnect hose to speed control vacuum reservoir.

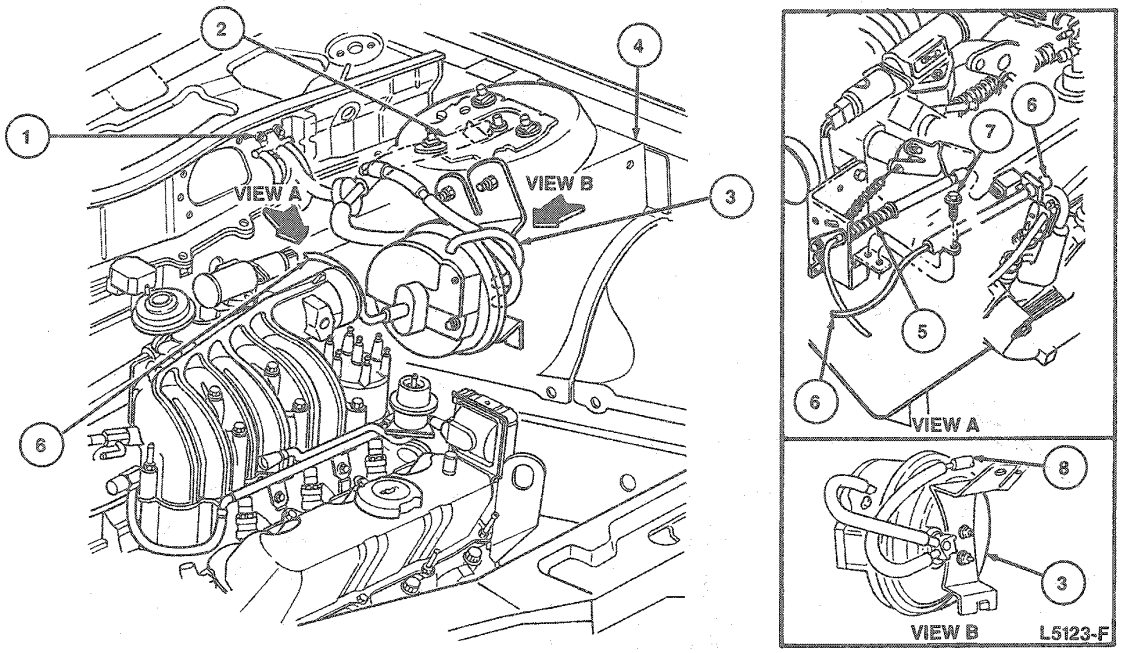


Installation

1. Connect hose from vacuum distribution block to VAC port on check valve.
2. Connect hose from speed control servo.
3. Connect hose from speed control vacuum reservoir.

REMOVAL AND INSTALLATION (Continued)

3.0L Engine

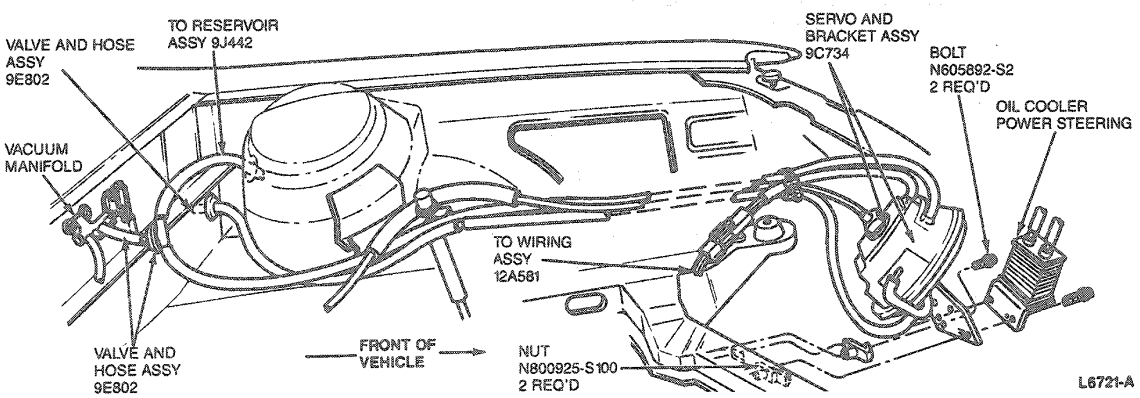


Item	Part Number	Description
1	—	Vacuum Distribution Block
2	—	To Speed Control Vacuum Reservoir
3	9C735	Speed Control Servo

(Continued)

Item	Part Number	Description
4	—	Driver's Side Shock Tower
5	—	Throttle Cable
6	9A825	Speed Control Actuator
7	N611057	Screw
8	—	To Speed Control Metering (Dump) Valve Assy

3.0L SHO

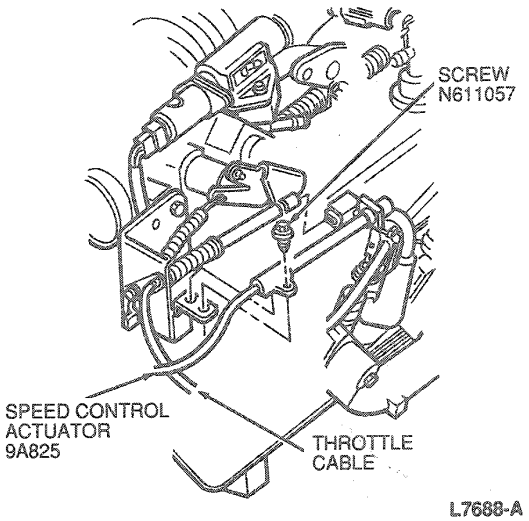


ADJUSTMENTS

Linkage Actuator Cable

1. Remove speed control actuator cable retaining clip.
2. Push actuator cable through adjuster until slight tension is felt.
3. Insert cable retaining clip and snap into place.

3.0L Base Engine



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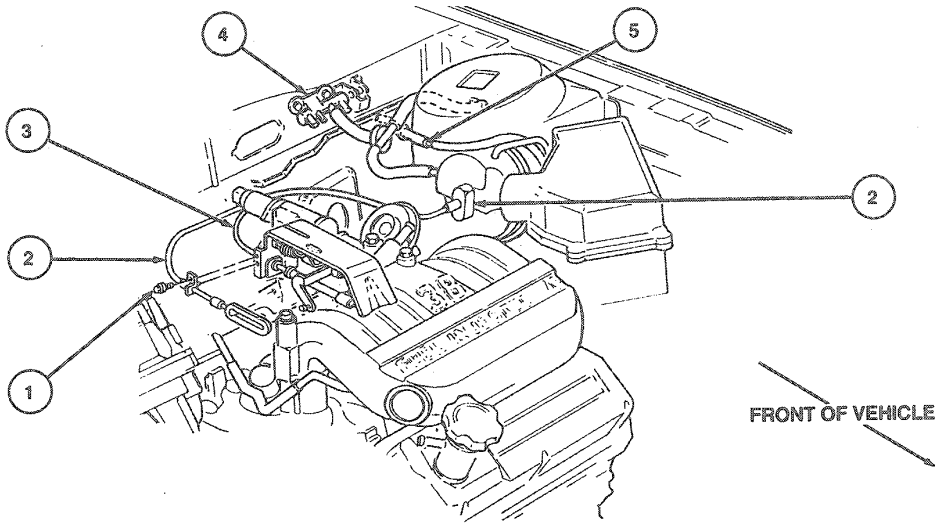
3.8L Engine

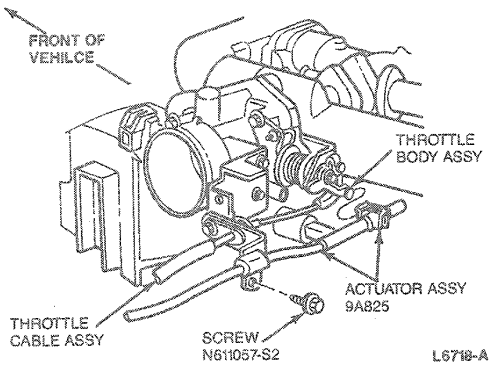


L7689-B

Item	Part Number	Description
1	N611057-S2	Screw
2	9A825	Speed Control Actuator
3	—	Throttle Cable
4	—	Vacuum Distribution Block
5	—	To Speed Control Metering (Dump) Valve

ADJUSTMENTS (Continued)

3.0L SHO Engine

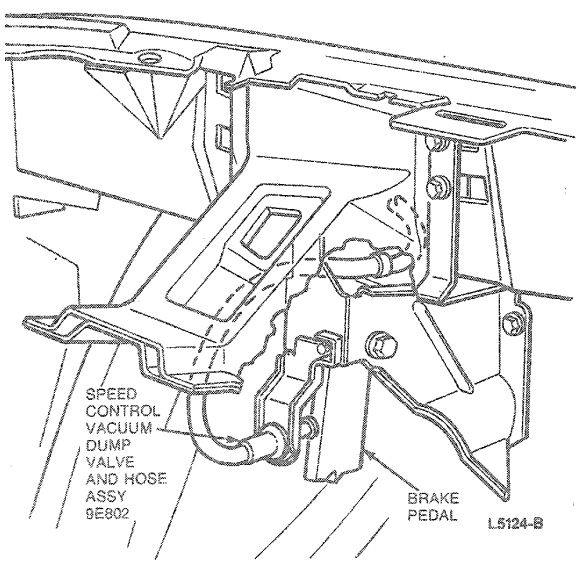


Speed Control Metering (Dump) Valve

Tools Required:

- Rotunda Vacuum Tester 021-00037

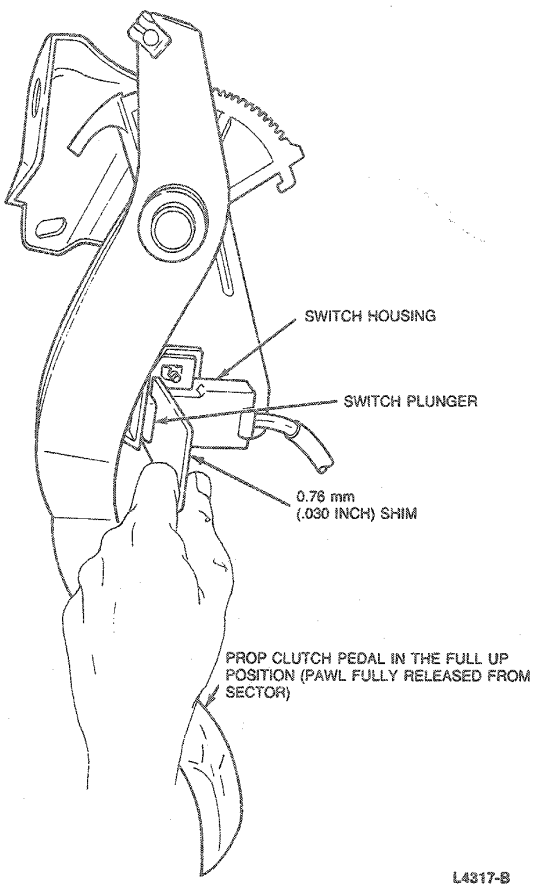
The factory installed speed control metering (dump) valve is no longer adjustable. However, a replacement speed control metering (dump) valve is adjustable at the mounting bracket. It should be adjusted so that it is closed (no vacuum leak) when the brake pedal is in its normal release position (not depressed), and open when the pedal is depressed. Use a hand vacuum pump such as Rotunda Vacuum Tester 021-00037 or equivalent to make this adjustment.



Clutch Switch

3.0L SHO

1. Prop clutch pedal in full-up position (pawl fully released from sector).
2. Loosen switch retaining screw.
3. Slide switch forward toward clutch pedal until switch plunger cap is 0.76mm (0.030 inch) from contacting switch housing. Tighten retaining screw.



4. Remove prop from clutch pedal and test drive for clutch switch cancellation of a speed control.

SPECIFICATIONS

TORQUE SPECIFICATIONS

Description	N·m	Lb-Ft
Speed Control Servo Nut	5-7	45-61 (Lb-In)
Cable Cover Nut	4-6	36-53 (Lb-In)

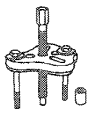
(Continued)

SPECIFICATIONS (Continued)

TORQUE SPECIFICATIONS (Cont'd)

Description	N·m	Lb-Ft
Air Bag Module Nut	4-5.6	35-50 (Lb-in)
Contact Brush Assembly Screw	2-3	18-26 (Lb-in)
Steering Wheel Bolt	31-45	23-33
Wheel Lug Nuts	115-142	85-104
Servo Nut (SHO)	9.5-12	7-8
Sensor Retaining Nut	3.4-4.5	31-39 (Lb-in)

SPECIAL SERVICE TOOLS

Tool Number/ Description	Illustration
T67L-3600-A Steering Wheel Puller	 T67L-3600-A

ROTUNDA EQUIPMENT

Model	Description
007-00013	Speed Control Sensor
007-0041A	SUPER STAR II Tester

(Continued)

ROTUNDA EQUIPMENT (Cont'd)

Model	Description
014-00322	EEC-IV 60-Pin Breakout Box
014-00407	Digital Volt-Ohmmeter (DVOM)
021-00037	Vacuum Tester
059-00010	Inductive Dwell-Tach-Volts-Ohms Tester

PARTS CROSS-REFERENCE

Base Part #	Part Name	Old Part Name
9B989	Throttle Position Sensor	
9C727	Speed Control Metering Valve	
9C735	Speed Control Servo	
9D843	Speed Control Amplifier	
9E731	Vehicle Speed Sensor	Speed Sensor
9E799	Speed Control Vacuum Reservoir	
9F472	Heated Oxygen Sensor	Exhaust Gas Oxygen Sensor

SECTION 10-03B Speed Control System—3.2L SHO

SUBJECT	PAGE
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DESCRIPTION	
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Vehicle Speed Sensor	10-03B-1
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Visual Inspection	10-03B-2
Voltage Measurements	10-03B-7
OPERATION	
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RESUME	10-03B-2
OPERATION (Cont'd.)	
System Activation	10-03B-2
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Vehicle Speed Sensor (VSS) AX4S Transaxle	10-03B-12
SPECIAL SERVICE TOOLS	10-03B-16
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VEHICLE APPLICATION	10-03B-1

VEHICLE APPLICATION

Taurus, 3.2L SHO, Automatic (AX4S).

DESCRIPTION

The speed control system consists of a speed control servo (9C735), actuator cable, horn relay, steering wheel switches, a brakelamp switch and a deactivator switch. The system operates independent of engine vacuum, therefore no vacuum lines are required. The speed control servo is mounted in the engine compartment near the brake booster, and is connected to the throttle linkage with an actuator cable. The electronics are integrated into the speed control servo, eliminating the need for any electronic modules in the vehicle.

Deactivator Switch

The deactivator switch is a normally closed switch and replaces the vacuum dump valve as a redundant safety feature in the system. Normally when the brake pedal is depressed, an electrical signal from the brakelamp circuit to the speed control amplifier (9D843) will disengage the system. Under increased brake pedal efforts (5-10 lbs, engine running), the deactivator switch mounted in the brake line will open and remove power to the speed control servo clutch, releasing the throttle independent of the speed control amplifier control. The deactivator switch is mounted to the underside of the master cylinder.

Vehicle Speed Sensor

The vehicle speed sensor (VSS)(9E731) is mounted to the transaxle.

OPERATION

System Activation

To operate the speed control system, the engine must be running and vehicle speed must be greater than 48 km/h (30 mph). The system is activated by pressing the ON switch in the steering wheel. Then the operator must depress and release the SET/ACCEL switch. Current speed will then be maintained until a new speed is set, the brake pedal is depressed or the OFF switch is depressed.

Increasing Set Speed

The vehicle set speed can be manually increased at any time by depressing the accelerator pedal until the higher speed is reached and stabilized, then depressing and releasing the SET/ACCEL switch.

ACCEL

A continuous depression of the SET/ACCEL switch will cause a smooth increase in vehicle speed. Upon release of the SET/ACCEL switch, the new vehicle speed will be maintained.

Tap-Up

Current vehicle set speed may be increased 1.6 km/h (1 mph) by a momentary tap of the SET/ACCEL switch. Multiple taps of the SET/ACCEL switch will cause vehicle speed to increase in increments of 1.6 km/h (1 mph). For example, if the current set speed is 60 mph, 5 taps will increase the vehicle speed and set it at 65 mph.

Decreasing Set Speed

The vehicle set speed can be manually decreased at any time by momentarily depressing the brake pedal until the lower speed is reached and stabilized, then depressing and releasing the SET/ACCEL switch.

COAST

A continuous depression of the COAST switch will cause a smooth decrease in vehicle speed. Upon release of the COAST switch, the new vehicle speed will be maintained.

If vehicle speed is reduced below 48 km/h (30 mph), the driver must manually increase the speed to over 48 km/h (30 mph) and reset the system.

Tap-Down

Current vehicle set speed may be decreased 1.6 km/h (1 mph) by a momentary tap of the COAST switch. Multiple taps of the COAST switch will cause vehicle speed to decrease in increments of 1.6 km/h (1 mph). For example, if the current set speed is 65 mph, 5 taps will decrease the vehicle speed and set it at 60 mph.

RESUME

When the speed control system is deactivated by pressing the brake pedal, the previous set speed may be re-established by momentarily depressing the RESUME switch. The resume feature will not function if the system has been turned off with the OFF switch, or if the vehicle speed has dropped below 48 km/h (30 mph). In addition, when the ignition switch is turned to the OFF position, the speed control memory is erased and RESUME will not function.

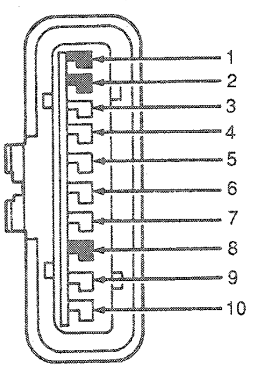
NOTE: Erratic speed control could result from the use of transmitting equipment that is not FCC approved or from driving in areas of high power radio transmitters.

DIAGNOSIS AND TESTING

Visual Inspection

Visual inspection should be performed before undertaking any of the following diagnostic procedures. Check the following items:

1. Horn and stoplamp operation;
   a. Verify proper horn operation. If not, check horn circuit fuse, horn relay and wiring.
   b. Verify proper stoplamp operation. If not, check stoplamp circuit fuse, stoplamps, stoplamp switch and wiring.
2. Wiring and electrical connections;
   a. Connections are complete with no loose wires or terminals.
   b. Wiring is not broken, shorted or corroded.
   c. Wiring is not misrouted.
3. Actuator cable and throttle linkage;
   a. The cable is adjusted properly without holding the throttle open or increasing idle speed.
   b. The throttle linkage operates freely and smoothly when connected to the actuator cable and speed control servo.



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DIAGNOSIS AND TESTING (Continued)

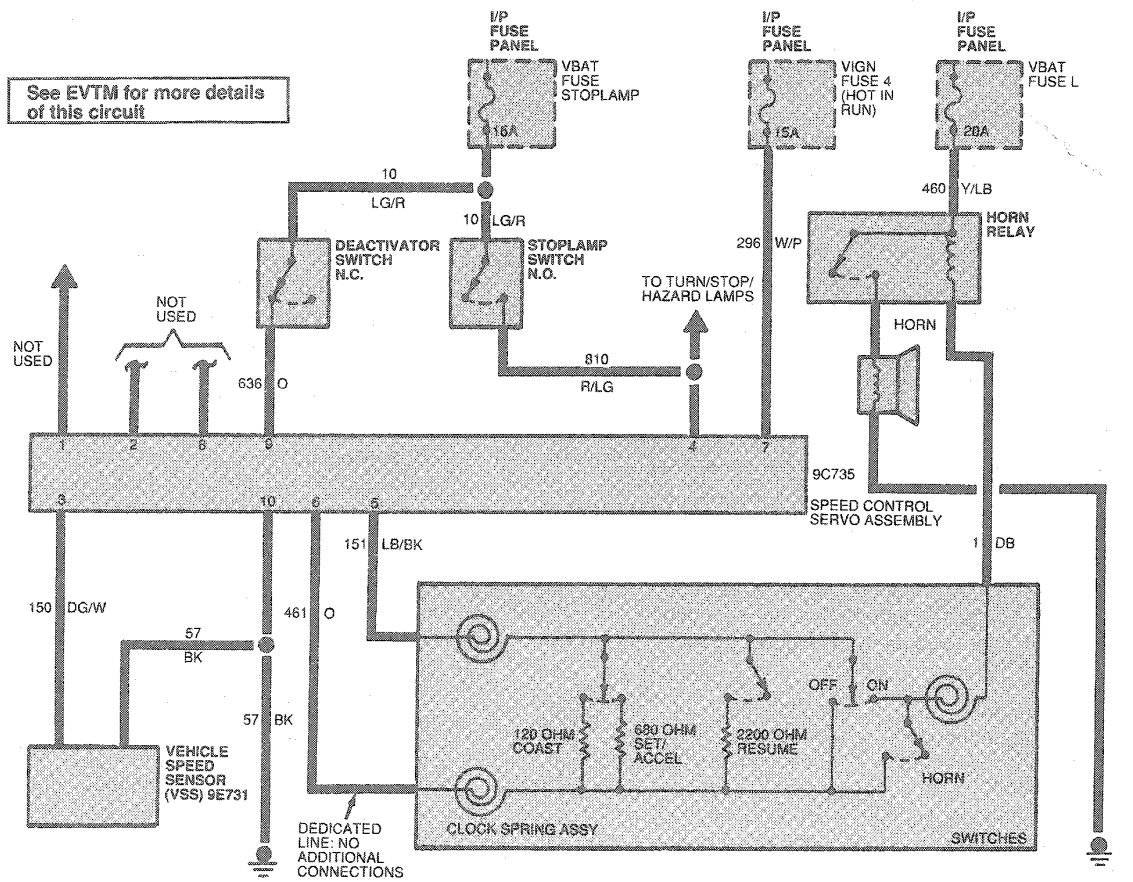
Key to Circuit Numbers and Wire Colors

Description	Pin	Circuit	Wire Harness/Wire Color
Servo Assembly Connector			14290 Harness
Not Used	1		
Not Used	2		
VSS Signal to Servo	3	150	DG/W
Stoplamp Switch to Stoplamps	4	810	R/LG

(Continued)

Key to Circuit Numbers and Wire Colors (Cont'd)

Description	Pin	Circuit	Wire Harness/Wire Color
Command Signal	5	151	LB/BK
Command Return	6	461	O
Fused Accy Feed	7	296	W/P
Not Used	8		
Deactivator Switch	9	636	O
Ground	10	57	BK
Battery Feed	—	10	LG/R



PINPOINT TEST INDEX

SYMPTOM	PINPOINT TESTS
Speed Control Does Not Work	A
Speed Continuously Changes	B

(Continued)

PINPOINT TEST INDEX (Cont'd)

SYMPTOM	PINPOINT TESTS
COAST/Tap-Down Inoperative	C

(Continued)

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST INDEX (Cont'd)

SYMPTOM	PINPOINT TESTS
ACCEL / Tap-Up Inoperative	D
RESUME Inoperative	E
Speed Control Does Not Disengage When Brake is Applied	F
OFF Switch Inoperative	G

Pinpoint Tests

Tools Required:

- Rotunda Digital Volt-Ohmmeter 014-00407

The following pinpoint tests require a Rotunda Digital Volt-Ohmmeter 014-00407 or equivalent.

PINPOINT TEST A
SPEED CONTROL DOES NOT WORK

	TEST STEP	RESULT ▶	ACTION TO TAKE
A1	VERIFY POWER TO SPEED CONTROL SERVO • Disconnect 14290 harness connector from servo assembly. • Use a VOM to make the specified measurements at the connector. • With ignition switch in RUN position, measure voltage between Pin 7 (Battery Positive Voltage (B+), Circuit 296) and Pin 10 (GND, Circuit 57). • **Is there battery voltage?**	Yes ▶ No ▶	GO to **A4.** GO to **A2.**
A2	CHECK IGNITION CIRCUIT • With ignition switch in RUN position, measure voltage between Pin 7 (Battery Positive Voltage (B+), Circuit 296) and a ground point on the chassis. • **Is there battery voltage?**	Yes ▶ No ▶	GO to **A3.** SERVICE ignition fuse or circuit as required.
A3	CHECK MODULE GROUND CIRCUIT • Measure resistance between Pin 10 (GND, Circuit 57) and a ground point on the chassis. • **Is resistance less than 1 ohm?**	Yes ▶ No ▶	REPEAT Step **A1.** SERVICE ground circuit.
A4	CHECK DEACTIVATOR SWITCH CIRCUIT • With no brakes applied, measure voltage between Pin 9 (DEACT, Circuit 636) and Pin 10 (GND, Circuit 57). • **Is there battery voltage?**	Yes ▶ No ▶	GO to **A8.** GO to **A5.**
A5	CHECK DEACTIVATOR SWITCH • Remove 14290 harness connector from deactivator switch. Measure resistance between two pins of switch with no brakes applied. • **Is resistance less than 1 ohm?**	Yes ▶ No ▶	GO to **A6.** REPLACE switch.
A6	VERIFY POWER AT DEACTIVATOR SWITCH HARNESS CONNECTOR • Measure voltage between Circuit 10 of deactivator switch connector and chassis ground. • **Is there battery voltage?**	Yes ▶ No ▶	GO to **A7.** SERVICE blown fuse or open in circuit.
A7	CHECK FOR OPEN CIRCUIT BETWEEN DEACTIVATOR SWITCH AND SPEED CONTROL SERVO • Measure resistance of Circuit 636 from deactivator switch connector to Pin 9 (Circuit 636) of servo connector. • **Is resistance less than 1 ohm?**	Yes ▶ No ▶	REPEAT Step **A4.** SERVICE open circuit in harness.
A8	CHECK BRAKE SWITCH • With no brakes applied, measure voltage between Pin 4 (BRK, Circuit 810) and Pin 10 (GND, Circuit 57). • **Is there battery voltage?**	Yes ▶ No ▶	REPLACE switch. GO to **A9.**
A9	CHECK BRAKE CIRCUIT • Measure resistance between Pin 4 (BRK, Circuit 810) and Pin 10 (GND, Circuit 57). • **Is resistance less than 10 ohms?**	Yes ▶ No ▶	GO to **A10.** SERVICE brakelamp bulbs or circuit.

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST A
SPEED CONTROL DOES NOT WORK (Continued)

TEST STEP		RESULT ▶	ACTION TO TAKE
A10	CHECK FOR STUCK ON SWITCH		
	• With no steering wheel switches depressed, measure voltage between Pin 5 (command, Circuit 151) and Pin 10 (GND, Circuit 57). • **Is there battery voltage?**	No ▶ Yes ▶	GO to **A11.** REPLACE switch.
A11	CHECK ON SWITCH OPERATION		
	• With steering wheel ON switch depressed, measure voltage between Pin 5 (command, Circuit 151) and Pin 10 (GND, Circuit 57). • **Is there battery voltage?**	Yes ▶ No ▶	GO to **A13.** GO to **A12.**
A12	CHECK FOR OPEN CIRCUIT IN SWITCH GROUND		
	• With horn depressed, measure voltage between Pin 6 (command RTN, Circuit 461) and chassis ground. • **Is there battery voltage?**	Yes ▶ No ▶	REPLACE switch. SERVICE open, blown fuse, failed relay or open in switch return circuit.
A13	CHECK FOR STUCK COMMAND SWITCHES		
	• With no steering wheel switches depressed, measure resistance between Pin 5 (command, Circuit 151) and Pin 6 (command RTN, Circuit 461). • **Is resistance greater than 3k ohms?**	Yes ▶ No ▶	GO to **A14.** REPLACE inoperative switch.
A14	CHECK SET/ACCEL SWITCH OPERATION		
	• With the SET/ACCEL switch depressed, measure resistance between Pin 5 (command, Circuit 151) and Pin 6 (command RTN, Circuit 461). • **Is resistance between 646 and 714 ohms?**	Yes ▶ No ▶	GO to **A15.** REPLACE switch.
A15	CHECK VSS CIRCUIT		
	• Measure resistance between Pin 3 (VSS, Circuit 150) and Pin 10 (GND, Circuit 57). • **Is resistance between 200 and 300 ohms?**	Yes ▶ No ▶	GO to **A17.** GO to **A16.**
A16	CHECK VSS		
	• Remove VSS connector. • Measure resistance across VSS terminals. • **Is resistance between 200 and 300 ohms?**	Yes ▶ No ▶	CHECK for opens in wiring or short in Circuit 57. REPLACE VSS.
A17	CHECK FOR BROKEN OR BINDING CABLE		
	• Remove actuator cable from speed control servo assembly. • Check for broken or binding cable by pulling on cable ball slug to ensure throttle moves freely. • **Is cable OK?**	Yes ▶ No ▶	REPLACE servo assembly. REPLACE cable.

PINPOINT TEST B
SPEED CONTINUOUSLY CHANGES

TEST STEP		RESULT ▶	ACTION TO TAKE
B1	VERIFY CONDITION OCCURS ONLY WHILE USING SPEED CONTROL		
	• Verify that engine is properly tuned. • Verify that condition does not occur when driving without speed control. • **Does condition occur without speed control?**	Yes ▶ No ▶	SERVICE engine as required. GO to **B2.**

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST B
SPEED CONTINUOUSLY CHANGES (Continued)

TEST STEP		RESULT	ACTION TO TAKE
B2	CHECK FOR BINDING IN ACTUATOR CABLE AND THROTTLE BODY LINKAGE		
	• Check to be sure actuator cable is attached to throttle linkage / speed control servo linkage. • Check for binding or sticking of actuator cable or throttle linkage and throttle plate. • Make sure accelerator cable bracket and speed control servo bracket are not loose. • **Are components OK?**	Yes No	GO to **B3.** SERVICE as required.
B3	CHECK VSS		
	• Remove VSS connector. • Measure resistance across VSS terminals. • **Is resistance between 200 and 300 ohms?**	Yes No	GO to **B4.** SERVICE VSS or circuit as required.
B4	CHECK SPEED CONTROL SERVO		
	• Substitute known good speed control servo. • Test vehicle for proper operation. • **Does system operate properly?**	Yes No	REPLACE speed control servo. CHECK manifold absolute pressure sensor and EVP.

PINPOINT TEST C
COAST/TAP-DOWN INOPERATIVE

TEST STEP		RESULT	ACTION TO TAKE
C1	CHECK COAST SWITCH OPERATION		
	• Disconnect 14290 harness connector from speed control servo. • With COAST switch depressed, measure resistance between Pin 5 (command RTN, Circuit 151) and Pin 6 (command RTN, Circuit 461) while rotating steering wheel through full range. • **Is resistance between 114 and 126 ohms?**	Yes No	GO to **C2.** REPLACE switch.
C2	CHECK COMMAND SWITCH RETURN CIRCUIT		
	• Measure resistance between Pin 6 (command RTN, Circuit 461) and Pin 10 (GND, Circuit 57). • **Is resistance greater than 1 ohm?**	Yes No	REPLACE speed control servo. SERVICE short in switch return circuit.

PINPOINT TEST D
ACCEL/TAP-UP INOPERATIVE

TEST STEP		RESULT	ACTION TO TAKE
D1	CHECK ACCEL/TAP-UP SWITCH OPERATION		
	• Disconnect 14290 harness connector from speed control servo. • With ACCEL/TAP-UP switch depressed, measure resistance between Pin 5 (command, Circuit 151) and Pin 6 (command RTN, Circuit 461) while rotating steering wheel through full range. • **Is resistance between 646 and 714 ohms?**	Yes No	GO to **D2.** REPLACE switch.
D2	CHECK COMMAND SWITCH RETURN CIRCUIT		
	• Measure resistance between Pin 6 (command RTN, Circuit 461) and Pin 10 (GND, Circuit 57). • **Is resistance greater than 1 ohm?**	Yes No	REPLACE speed control servo. SERVICE short in switch return circuit.

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST E
RESUME INOPERATIVE

TEST STEP		RESULT ▶	ACTION TO TAKE
E1	CHECK RESUME SWITCH OPERATION		
	• Disconnect 14290 harness connector from speed control servo. • With RESUME switch depressed, measure resistance between Pin 5 (command, Circuit 151) and Pin 6 (command RTN, Circuit 461) while rotating steering wheel through full range. • **Is resistance between 2090 and 2310 ohms?**	Yes ▶ No ▶	GO to E2. REPLACE switch.
E2	CHECK COMMAND SWITCH RETURN CIRCUIT		
	• Measure resistance between Pin 6 (command RTN, Circuit 461) and Pin 10 (GND, Circuit 57). • **Is resistance greater than 1 ohm?**	Yes ▶ No ▶	REPLACE speed control servo. SERVICE ground in switch return circuit.

PINPOINT TEST F
SPEED CONTROL DOES NOT DISENGAGE WHEN BRAKE IS APPLIED

TEST STEP		RESULT ▶	ACTION TO TAKE
F1	CHECK BRAKE SWITCH CIRCUIT		
	• Disconnect 14290 harness connector at the speed control servo. • With brakes applied, measure voltage between Pin 4 (BRK, Circuit 810) and Pin 10 (GND, Circuit 57). • **Is there battery voltage?**	Yes ▶ No ▶	REPLACE speed control servo. SERVICE switch, fuse or open circuit.
F2	CHECK FOR BINDS IN ACTUATOR CABLE AND THROTTLE BODY ATTACHMENT		
	• Remove actuator cable from speed control servo. • Check for broken or binding cable by pulling on cable ball slug to ensure throttle moves freely. • **Is cable OK?**	Yes ▶ No ▶	REPLACE speed control servo. SERVICE as required.

PINPOINT TEST G
OFF SWITCH INOPERATIVE

TEST STEP		RESULT ▶	ACTION TO TAKE
G1	CHECK OFF SWITCH OPERATION		
	• Disconnect 14290 harness connector from speed control servo. • With OFF switch depressed, measure resistance between Pin 5 (command, Circuit 151) and Pin 6 (command RTN, Circuit 46) while rotating steering wheel through full range. • **Is resistance less than 4 ohms?**	Yes ▶ No ▶	REPLACE speed control servo. REPLACE switch.

Voltage Measurements

Remove 14290 harness connector from speed control servo. Connect the negative lead of voltmeter to Pin 10 (Circuit 57) of connector. Measure the DC or voltage of the following circuits with positive lead meter.

DIAGNOSIS AND TESTING (Continued)

VOLTAGE MEASUREMENT—DC					
CIRCUIT NAME	PIN	CIRCUIT	WIRE COLOR	TEST CONDITION	APPROXIMATE VOLTAGE
Fused Accy Feed	7	296	W/P	Ignition in RUN position	Battery voltage (12 V)
Deactivator Switch	9	636	O	No brakes applied Brake applied[1]	Battery voltage (12 V) Less than 1/2 volt
Stoplamp Switch to Stoplamp	4	810	R/LG	No brakes applied Brake pedal depressed	Less than 1/2 volt Battery voltage (12 V)
Speed Control Switch to Servo	5	151	LB/BK	No switches pressed Press and hold ON switch	Less than 1/2 volt Battery voltage (12 V)

VOLTAGE MEASUREMENT—AC					
CIRCUIT NAME	PIN	CIRCUIT	WIRE COLOR	TEST CONDITION	APPROXIMATE VOLTAGE
VSS Output Signal to Speed Control Servo	3	150	DG/W	Vehicle on road about 30 mph Vehicle on road about 45 mph	1.4 volts AC minimum 1.6 volts AC minimum

Resistance Measurements

Remove 14290 harness connector at speed control servo. Connect an ohmmeter between the designated circuits with ignition in OFF position.

RESISTANCE MEASUREMENTS					
CIRCUIT NAME	PIN	CIRCUIT	WIRE COLOR	TEST CONDITION	APPROXIMATE RESISTANCE
Stoplamp Switch to Ground	4 to 10	8101 to 57	R/LG to BK	Brakes not applied	Less than 10 ohms
VSS Signal to Ground	3 to 10	150 to 57	DG/W to BK	Harness disconnected from servo	200-300 ohms
Command Signal to Command Return	5 to 6	151 to 461	LB/BK to O	No switches pressed Press OFF switch Press COAST switch Press ACCEL switch Press RESUME switch	Greater than 3000 ohms Less than 4 ohms 114-126 ohms 646-714 ohms 2090-2310
Command Signal to Command Return	6 to 10	461 to 57	O to BK	No switches pressed	Open circuit

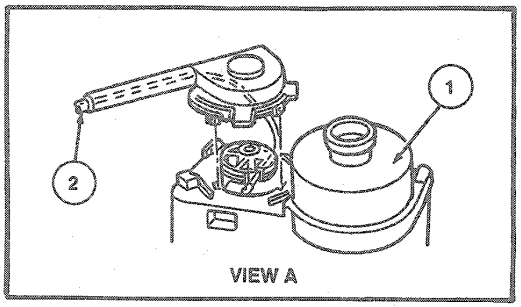
1 Increased brake pedal efforts will be required to trigger switch with engine OFF.

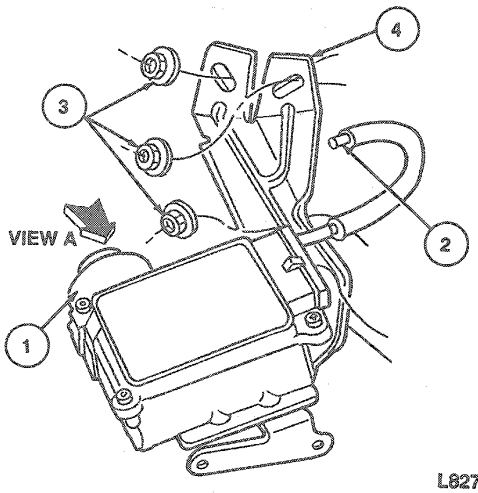
REMOVAL AND INSTALLATION

Servo and Bracket Assembly

Removal

Speed Control Actuator and Servo



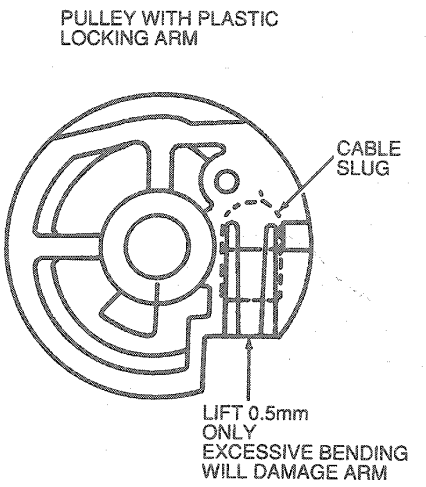


L8270-A

Item	Part Number	Description
1	9C735	Speed Control Servo
2	—	Actuator Assy
3	N620481-S2	Nut (3 Req'd)

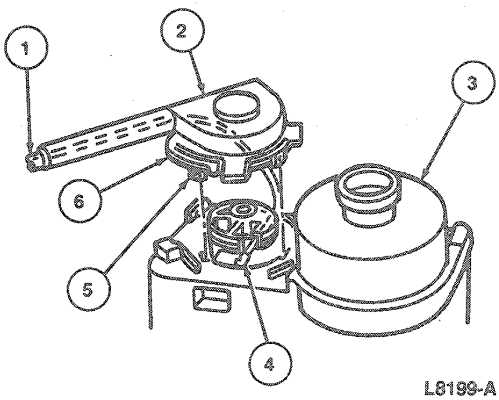
1. Remove retaining clip from actuator cable adjuster fitting.
2. Push actuator tube out of adjuster fitting attached to throttle cable.
3. Disconnect 14290 harness connector at speed control servo.
4. Remove three nuts attaching assembly to vehicle.
5. Remove actuator cable cap from speed control servo by depressing cap locking arm and rotating cap counterclockwise.
6. Remove cable slug from servo pulley. Gently pry-up the arm **slightly** with a small screwdriver, and at the same time push the cable slug out of the pulley slot.

   CAUTION: Excessive bending of the arm will cause it to break. DO NOT USE servos with damaged or missing locking arms.



L8268-A

7. Remove bracket from the speed control servo. Keep bracket and three screws for reinstallation on speed control servo



L8199-A

Item	Part Number	Description
1	—	Actuator Assy
2	—	Actuator Cable Cap
3	9C735	Speed Control Servo
4	—	Cable Ball Slug
5	—	Cap Locking Tabs
6	—	Locking Arm

REMOVAL AND INSTALLATION (Continued)

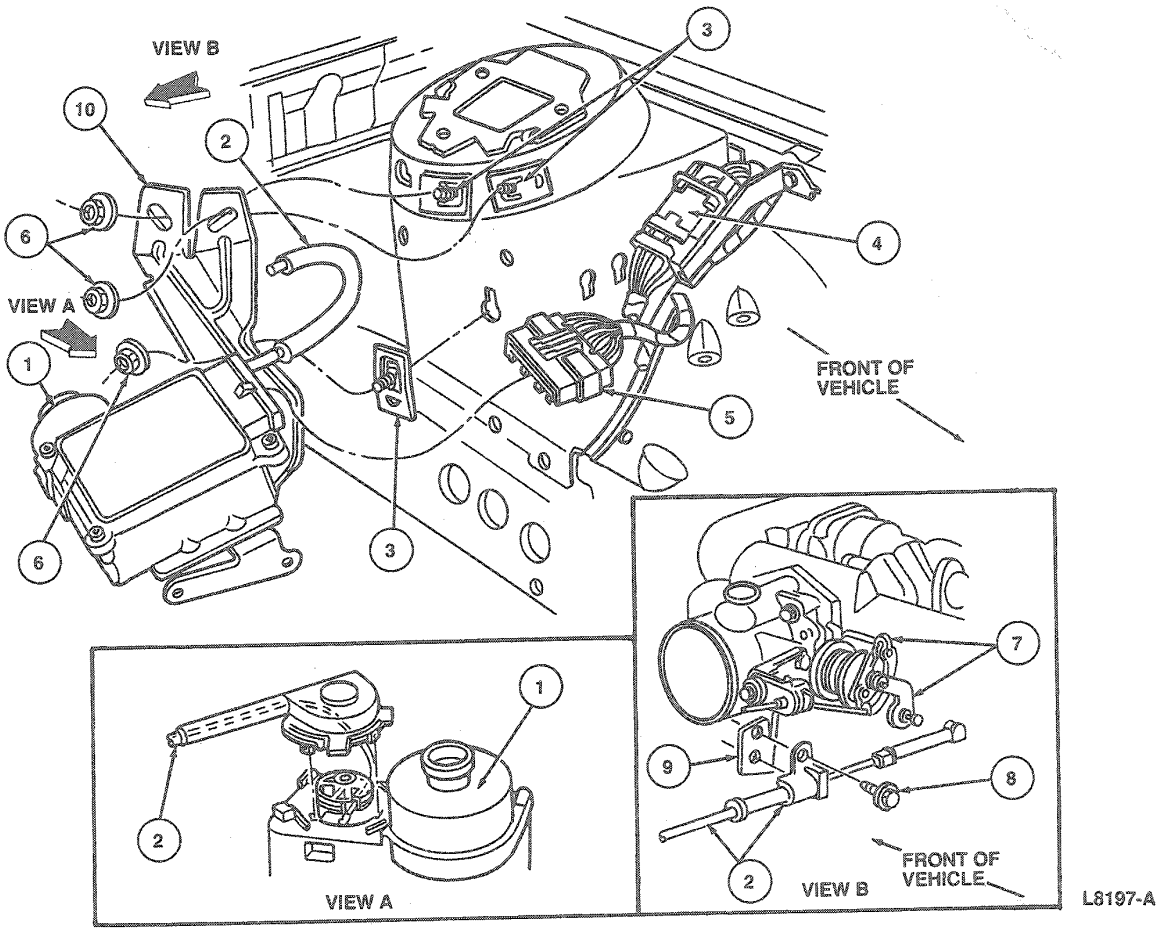
Installation

1. Attach bracket to the speed control servo with three screws. Tighten to 8-11 N·m (6-8 lb-ft).
2. Ensure that rubber seal is fully seated on actuator cable tab.
3. Lock cable ball slug into servo pulley slot.
4. Pull on throttle attachment end of cable to draw cable cap on to servo pulley.
5. Insert cable cap locking tabs into servo slots. Rotate cap clockwise until locking arm engages locking tab on speed control servo.
6. Position actuator cable and servo assembly in vehicle. Tighten mounting nuts to 5-7 N·m (45-61 lb-in).
7. Attach 14290 harness connector to speed control servo.
8. Adjust actuator cable as outlined and install retaining clip.

   NOTE: Incorrect wrapping of cable core wire around servo pulley may result in a high idle condition. Ensure that throttle lever is at idle position after cable installation and adjustment.

Actuator Cable

Speed Control Actuator and Servo



REMOVAL AND INSTALLATION (Continued)

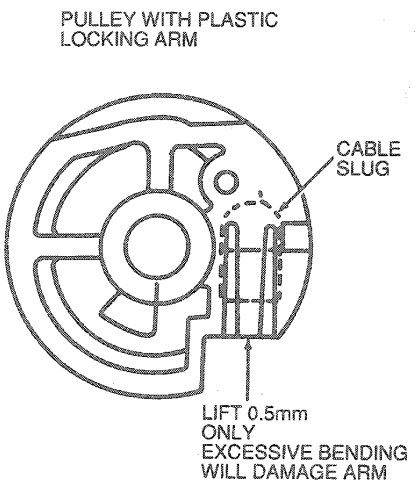
Item	Part Number	Description
1	9C735	Speed Control Servo
2	—	Actuator Assy
3	N804526-S100	Bolt and Retainer (3 Req'd)
4	14401	Wiring Assy
5	14290	Wiring Assy
6	N620481-S2	Nut (3 Req'd)
7	—	Throttle Control Assy
8	N611057-S2	Screw
9	9728	Accelerator Shaft Bracket

(Continued)

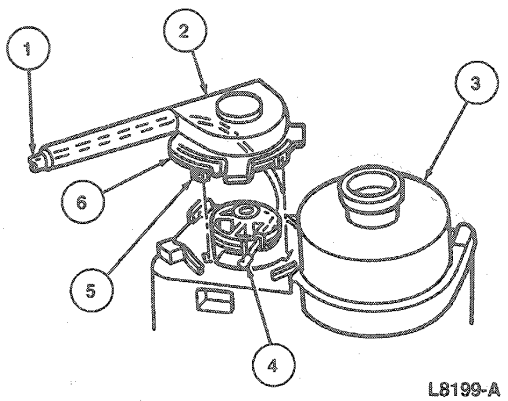
Removal

1. Remove screw attaching actuator assembly cable to accelerator shaft bracket.
2. Remove actuator assembly cable from throttle control.
3. Remove actuator cable cap from the speed control servo by depressing cap locking arm and rotating the cap counterclockwise.
4. Remove cable slug from servo pulley. Gently pry-up the arm **slightly** with a small screwdriver, and at the same time push the cable slug out of the pulley slot.

   CAUTION: Excessive bending of the arm will cause it to break. DO NOT USE servos with damaged or missing locking arms.



L8268-A



L8199-A

Item	Part Number	Description
1	—	Actuator Assy
2	—	Actuator Cable Cap
3	9C735	Speed Control Servo
4	—	Cable Ball Slug
5	—	Cap Locking Tabs
6	—	Locking Arm

Installation

1. Make sure that rubber seal is fully seated on actuator cable cap.
2. Lock cable ball slug into servo pulley slot.
3. Pull on throttle attachment end of cable to draw cable cap onto servo pulley.
4. Align cable cap tabs with slots in servo housing. Insert cap into the speed control servo and rotate clockwise until the locking arm engages.
5. Snap actuator assembly cable onto throttle control and install screw at accelerator shaft bracket. Tighten to 3-4 N·m (27-35 lb-in).
6. Check cable adjustment as outlined.
7. Ensure that cable is routed properly. Position into retaining clips.

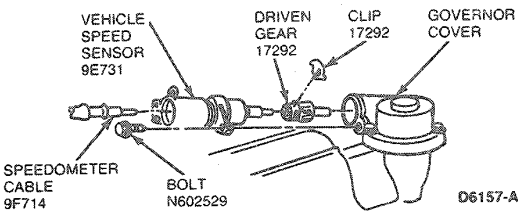
   NOTE: Incorrect wrapping of cable core wire around servo pulley may result in a high idle condition. Ensure that throttle lever is at idle position after cable installation and adjustment.

REMOVAL AND INSTALLATION (Continued)

Vehicle Speed Sensor (VSS)
AX4S Transaxle

Removal

1. Raise vehicle on a hoist. Refer to Section 00-02.
2. Remove Y-pipe and heated oxygen sensors (H02S)(9F472) from the exhaust system.
3. Remove VSS exhaust heat shield.
4. Remove bolt retaining VSS mounting clip to transaxle.
5. Remove VSS and driven gear from transaxle.



6. Disconnect electrical connector and speedometer cable from VSS.

   NOTE: Do not attempt to remove spring retaining clip from driven gear with speedometer cable in VSS.
7. Remove driven gear retainer and driven gear from VSS.

Installation

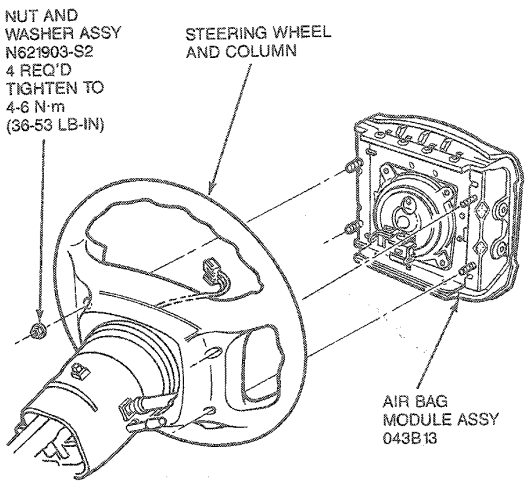
1. Position driven gear to VSS. Install gear retainer.
2. Connect electrical connector to VSS.
3. Ensure internal O-ring is seated properly in VSS housing. Snap speedometer cable into VSS housing.
4. Install VSS into transaxle and secure with retaining bolt.
5. Install VSS exhaust heat shield.
6. Install Y-pipe and heated oxygen sensors to exhaust system.
7. Lower vehicle and verify proper speedometer / odometer operation.

Control Switches

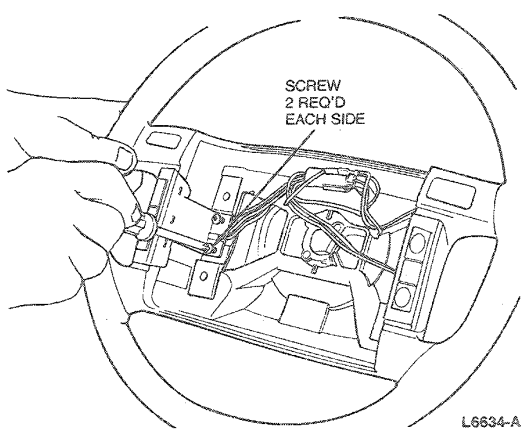
Removal

1. Disconnect battery ground cable and air bag backup power supply. Refer to Section 01-20B.
2. Remove four nut and washer assemblies retaining air bag module to steering wheel.
3. Disconnect air bag electrical connector from clockspring contact connector.
4. Remove air bag module from steering wheel.

   WARNING: PLACE AIR BAG MODULE ON BENCH WITH TRIM COVER FACING UP.

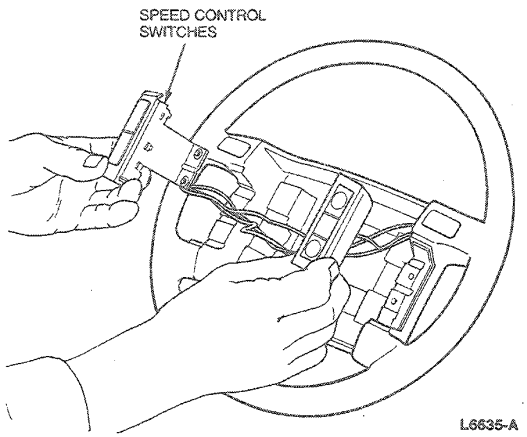


5. Remove horn buttons by gently prying with a small screwdriver. Disconnect horn wiring harness connector.
6. Remove Phillips head screws from speed control switch assemblies.



REMOVAL AND INSTALLATION (Continued)

7. Disconnect speed control switches from wiring harness and remove switches.



Installation

1. Position speed control switches onto steering wheel and install Phillips head screws.
2. Connect wiring harness to horn buttons and install horn buttons.
3. Connect speed control switches. Ensure wires are positioned so that no interference is encountered when installing air bag module.
4. Position air bag module on steering wheel so that clockspring contact connector can be connected to the air bag module.
5. Install air bag module on steering wheel and install four nut and washer assemblies. Tighten to 4-5.6 N·m (35-50 lb-in).
6. Connect battery air bag backup power supply and ground cable.

Clockspring Assembly

Tools Required:

- Steering Wheel Puller T67L-3600-A

Removal

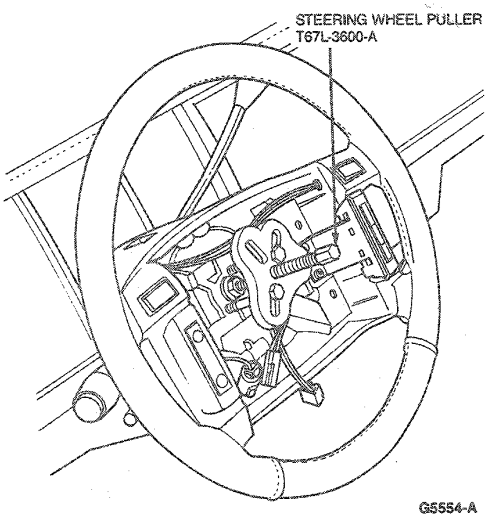
1. Center vehicle front wheels in the straight ahead position.

   WARNING: THE BACKUP POWER SUPPLY MUST BE DISCONNECTED BEFORE ANY AIR BAG COMPONENT SERVICE IS PERFORMED.

2. Disconnect battery ground cable and air bag backup power supply.
3. Remove four nut and washer assemblies retaining air bag module to steering wheel.
4. Disconnect air bag electrical connector from clockspring contact connector. (Refer to Section 11-04 for clockspring Removal and Installation procedure.)

   WARNING: PLACE AIR BAG MODULE ON BENCH WITH TRIM COVER FACING UP.

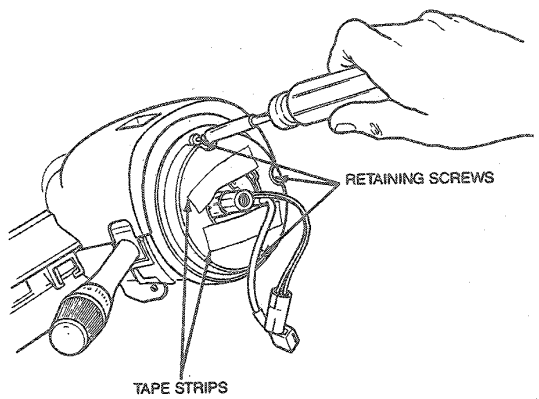
5. Remove air bag module from steering wheel.
6. Disconnect speed control switches and horn switches from contact assembly.
7. Remove steering wheel retaining bolt.
8. Install Steering Wheel Puller T67L-3600-A or equivalent and remove steering wheel.



9. Remove tilt lever if equipped.
10. Remove lower trim panel and lower steering column shroud.
11. Disconnect contact assembly wiring harness.
12. Apply two pieces of tape across contact assembly stator and rotor to prevent accidental rotation.

REMOVAL AND INSTALLATION (Continued)

13. Remove three contact assembly retaining screws and lift contact assembly off steering column shaft.



Installation

1. Ensure that vehicle front wheels are in the straight ahead position and that steering column shaft alignment mark is at the 12 o'clock position.
2. Align contact assembly to column shaft and mounting bosses and slide contact assembly onto the shaft.
3. Install three screws that retain the contact assembly and tighten to 2-3 N·m (18-26 lb-in). Remove tape from contact assembly.
4. Route the contact assembly harness down the column and connect to main wiring.

   NOTE: If a new contact assembly is installed, remove the lock mechanism.
5. Install steering column shroud.
6. Install lower trim panel.
7. Install tilt lever if equipped.
8. Position steering wheel on steering shaft and install new steering wheel retaining bolt. Tighten to 31-45 N·m (23-33 lb-ft).

   NOTE: Route contact assembly wiring through steering wheel as wheel is being positioned.
9. Connect speed control and horn switches to contact assembly.

   CAUTION: Ensure wiring is positioned so that no interference is encountered when installing air bag module.
10. Position air bag module on steering wheel so that clockspring contact connector can be connected to the air bag module.
11. Install air bag module on wheel and install four nut and washer assemblies.
12. Connect air bag backup power supply and battery ground cable.
13. Verify air bag warning indicator.

ADJUSTMENTS

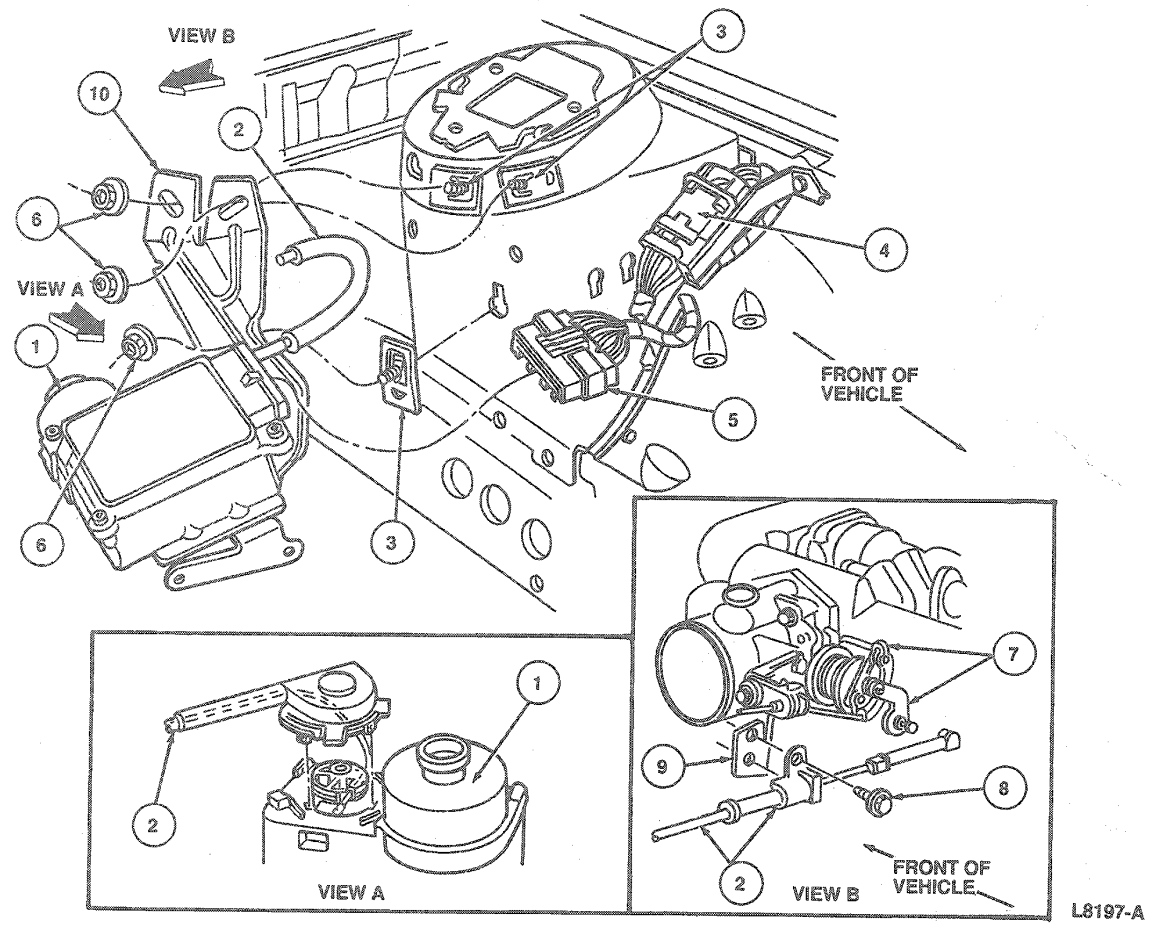
Actuator Cable

1. Remove retaining clip from actuator cable adjuster at throttle.
2. Ensure throttle is in fully closed position.
3. Pull on actuator cable to take up slack. Loosen at least one notch so there is approximately 3mm (0.118 inch) of slack in the cable.

   CAUTION: The cable must not be pulled tight, otherwise speed control may not operate properly.
4. Insert cable retaining clip and snap into place.
5. Check that throttle linkage operates freely and smoothly.

ADJUSTMENTS (Continued)

Speed Control Actuator and Servo



Item	Part Number	Description
1	9C736	Speed Control Servo Bracket
2	—	Actuator Assy
3	N804526-S100	Bolt and Retainer (3 Req'd)
4	14401	Wiring Assy

(Continued)

Item	Part Number	Description
5	14290	Wiring Assy
6	N620481-S2	Nut (3 Req'd)
7	—	Throttle Control Assy
8	N611057-S2	Screw
9	9728	Accelerator Shaft Bracket

SPECIFICATIONS

TORQUE SPECIFICATIONS

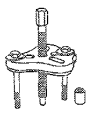
Description	N·m	Lb-in
Servo Nut	5-7	45-61
Cable Cover Nut	4-6	36-53
Air Bag Module Nut	4-5.6	35-50
Contact Brush Assembly Screw	2-3	18-26

(Continued)

TORQUE SPECIFICATIONS (Cont'd)

Description	N·m	Lb-in
Steering Wheel Bolt	31-45	23-33 (Lb-Ft)
Wheel Lug Nuts	115-142	85-104 (Lb-Ft)
Servo Nut	9.5-12	7-8 (Lb-Ft)
Sensor Retaining Nut	3.4-4.5	31-39

SPECIAL SERVICE TOOLS

Tool Number / Description	Illustration
T67L-3600-A Steering Wheel Puller	 T67L-3600-A

ROTUNDA EQUIPMENT

Model	Description
007-00013	Speed Control Sensor
014-00407	Digital Volt-Ohmmeter
059-00010	Inductive Dwell-Tach-Volts-Ohms Tester

PARTS CROSS-REFERENCE

Base Part #	Part Name	Old Part Name
9C735	Speed Control Servo	
9C736	Speed Control Servo Bracket	
9D843	Speed Control Amplifier	
9E731	Vehicle Speed Sensor	Speed Sensor
9F472	Heated Oxygen Sensor	Exhaust Gas Oxygen Sensor
9F479	Manifold Absolute Pressure Sensor	