FORD CD4E

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Revised
March, 2006

INTRODUCTION
FORD CD4E

The FORD CD4E is a computer controlled, four speed automatic overdrive transaxle and first appeared in the 1994 Probe with the 2.0 Liter engine. This unit is also found in the Ford Contours and the Mercury Mystique. This manual covers the procedures necessary for diagnosis, teardown, repair and overhaul of the CD4E transaxle.

We wish to thank Ford Motor Company for the illustrations and information that have made this booklet possible

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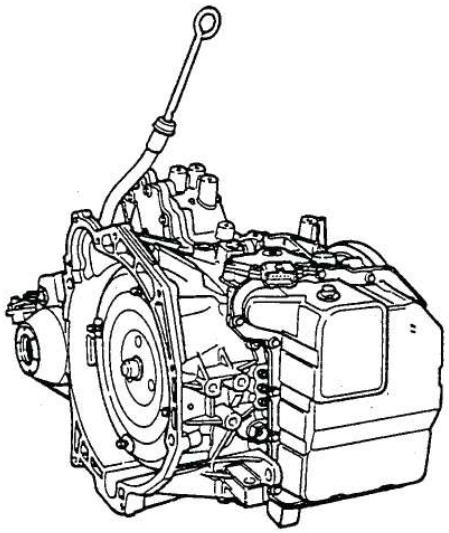
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DESCRIPTION AND OPERATION

Automatic Transaxle.
The CD4E transaxle is a four speed front wheel drive automatic ubit with electronic controls for:
-Electronic Pressure Control (EPC) for shift quality
-Shift Scheduling
-3-2 shift timing
-Coast braking
-Torque Converter Clutch (TCC) control
The CD4E transaxle uses a compund planetary gearset, chain drive, final drive planetary gearset and an open differential. One band, five friction clutches, and two one-way clutches provide four forward gear ratios and reverse.



The transaxle is a four speed unit with electronic control that is designed for operation in a transverse poertrain of front wheel drive vehicles.

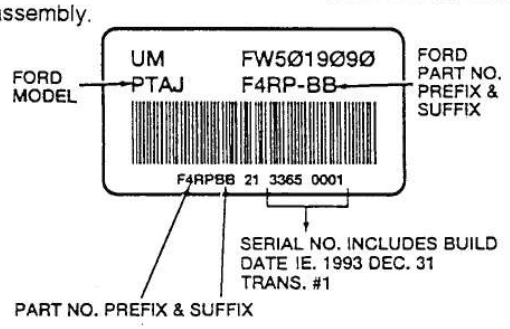
The transaxle features a three element torque converter with a torque converter clutch and geartrain that includes the following parts:
-Compund planetary gearset
-Chain Drive
-Planetary gearset final drive
-Pinion and side gear differential

The hydraulic control system of the transaxle has five solenoids that control:

-Shift feel (through line pressure control
-Shift scheduling (through shift valve position control)
-Modulated apply of the torque converter clutch
-Timing of 3-2 shifts
-Engine braking during coast operation

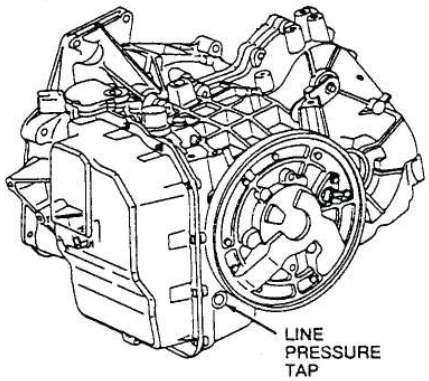
TRANSAXLE IDENTIFICATION

When servicing the transaxle, refer to the identification tag located on the rear of the transaxle case and on the bottom of the main control cover assembly.



CAUTION:
Perform line pressure test prior to performing the stall test. If line pressure is low at stall, DO NOT PERFORM **Stall Test** or furthur transaxle damage will occur. **DO NOT MAINTAIN WOT** in any gear range **FOR MORE THAN (5) SECONDS.**

CAUTION:
To verify transmission oil pressure **DO NOT CONNECT THE TRANSMISSION TESTER** while making the pressure checks.



DIAGNOSIS AND TESTING

CAUTION: The Transmission Tester MUST be removed from the transaxle and the vehicle harness reinstalled to verify these pressures.

LINE PRESSURE SPECIFICATIONS

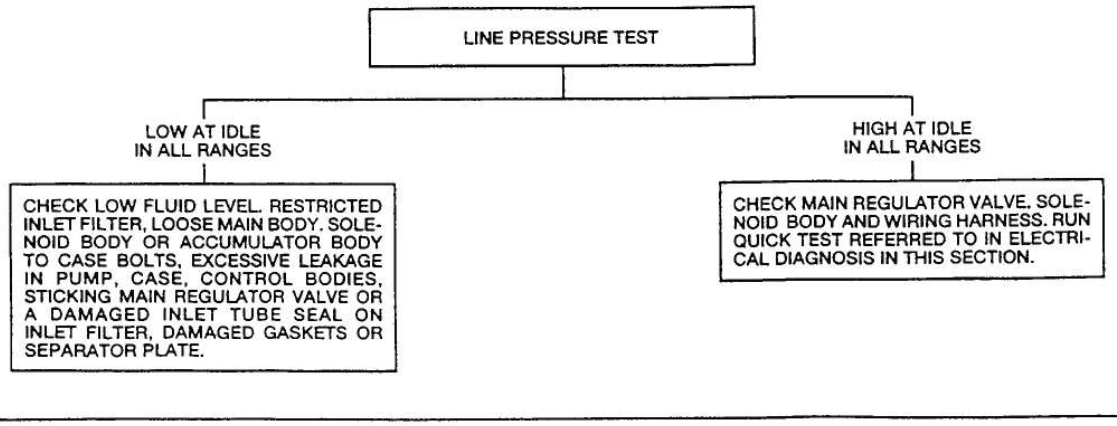
Line Pressure	Idle		Stall	
Range Selector Position	KPA	PSI	KPA	PSI
PARK, NEUTRAL	441-524	64-76	-----	-----
REVERSE	441-524	64-76	1786-2027	259-294
D	310-365	45-63	1158-1269	168-184
2	310-365	45-63	1158-1269	168-184
1	310-365	45-63	1158-1269	168-184

OTHER CONCERN: CLUTCH/BAND APPLICATION CHART #601

Gear	2/4 Band	Reverse Clutch	Direct Clutch	Forward Clutch	Forward One-Way Clutch		Coast Clutch	Low/Rev Clutch	Low One-Way Clutch	
					Drive	Coast			Drive	Coast
REV		X						X		
1ST				X	X	OR			X	OR
2ND	X			X	X	OR			OR	OR
3RD			X	X	X	OR			OR	OR
4TH	X		X	X	OR	OR			OR	OR
M-2ND	X			X	X		X		OR	OR
M-1ST				X	X		X	X	X	

X = TRANSMITS TORQUE OR = OVERRUNNING

Line Pressure Test Chart



DIAGNOSIS AND TESTING (Continued)

Engine Idle Speed Check

Refer to Section 03-04A for the engine idle speed adjustment procedure.

Stall Speed Test

The stall test checks the operation of the following items:

- Converter one-way clutch
- Forward clutch
- Low/reverse one-way clutch
- Reverse clutch
- Forward one-way clutch
- 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. FAILURE TO SET BRAKES MAY RESULT IN DEATH OR BODILY INJURY.

CAUTION: Perform Line Pressure Test prior to performing stall test. If line pressure is low at stall, do not perform stall test or further transaxle damage will occur.

1. Connect a tachometer to the engine.
2. After testing each of the following ranges, D and R, move transaxle range selector lever to N (NEUTRAL) and run engine for about 15 seconds to allow torque 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 speeds should be in appropriate range.

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

Engine	Stall Speed (rpm)
2.0L Probe	2200-2500

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

Stall Speed Diagnosis Chart (High Speed)	
Range	Possible Source
D, 2, 1	• Forward Clutch • Forward One-Way Clutch • Low One-Way Clutch
R	• Reverse Clutch • Low/Reverse Clutch

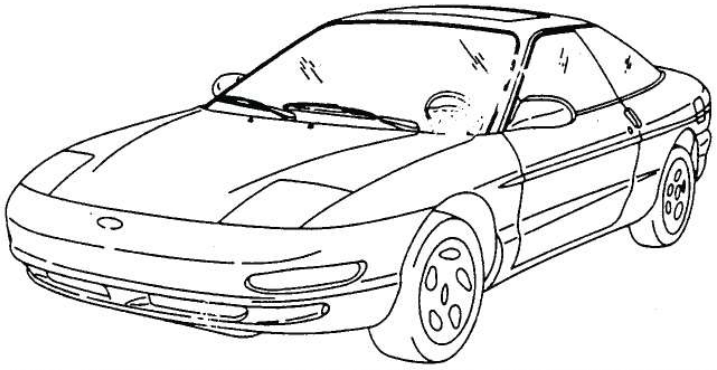
Shift Point Road Test

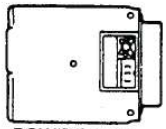
This test verifies that the shift control system is operating properly.

1. Bring engine and transaxle up to normal operating temperature.
2. Operate the vehicle with the transaxle range selector lever in D position.
3. Apply minimum throttle and observe the speeds at which the upshift occurs and the torque converter engages. (Refer to Automatic Transmission Specifications Issue FPS-12180-94).
4. With the vehicle in D (4th gear), depress the Transmission Control Switch. The transaxle should downshift to 3rd gear. Remove foot from accelerator pedal; engine braking should occur. Torque converter clutch should disengage and then reapply.
5. Depress accelerator pedal to floor (WOT). Transaxle should shift from 3rd to 2nd gear, or 3rd to 1st depending on vehicle speed.
6. With vehicle D range above 80 km/h (50 mph) and less than half throttle, move the transaxle range selector lever from D range to manual 2 range and remove foot from accelerator pedal. The transaxle should immediately downshift into 2nd gear. With the vehicle remaining in manual 2 range, move transaxle range selector lever into manual 1 range, and release accelerator pedal. Transaxle should downshift into first gear at speeds BELOW 48-56 km/h (28-32 mph).
7. If transaxle fails to upshift/downshift or torque converter clutch does not apply and release, refer to Diagnosis by Symptom Charts for possible causes.

DESCRIPTION AND OPERATION

Component Illustrations

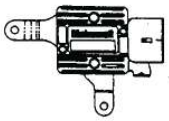




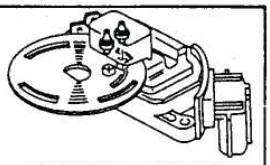
POWERTRAIN CONTROL MODULE (PCM) 12A650



MASS AIR FLOW (MAF) SENSOR 12B579



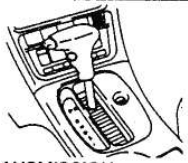
IGNITION CONTROL MODULE (ICM) 12A297



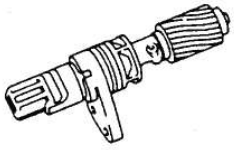
CRANKSHAFT POSITION (CKP) SENSOR (PART OF 12127)



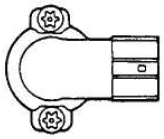
TRANSMISSION CONTROL INDICATOR LAMP (TCIL)



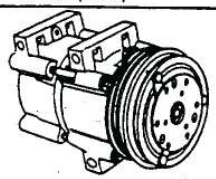
TRANSMISSION CONTROL SWITCH (TCS) 7Z247



VEHICLE SPEED SENSOR (VSS) 9E731



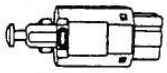
THROTTLE POSITION (TP) SENSOR 9B989



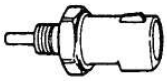
AIR CONDITIONING CLUTCH (ACC)



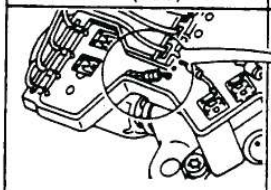
TRANSMISSION SPEED SENSOR (TSS) 7M101



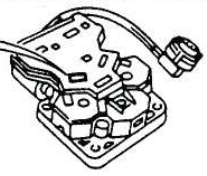
BRAKE ON/OFF (BOO) SWITCH 13480



ENGINE COOLANT TEMPERATURE (ECT) SENSOR 12A648



TRANSMISSION OIL TEMPERATURE (TOT) SENSOR 7H141



SOLENOID BODY ASSEMBLY

SOLENOID BODY ASSEMBLY

INCLUDES:

- ELECTRONIC PRESSURE CONTROL SOLENOID (EPC,
- TORQUE CONVERTER CLUTCH SOLENOID (TCC)
- TRANSMISSION OIL TEMPERATURE (TOT) SENSOR
- 2 SHIFT SOLENOIDS (SS1 & SS2)
- 3–2 TIMING/COAST CLUTCH SOLENOID (3-2T/CCS)



MANUAL LEVER POSITION (MLP) SENSOR 7F293

DESCRIPTION AND OPERATION (Continued)

INPUTS TO PCM

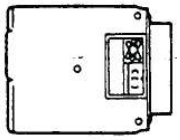
- Transmission Oil Temperature (TOT) sensor
- Manual Lever Position (MLP) sensor
- Brake On/Off (BOO) switch
- Distributor Ignition (DI) System
  - — Crankshaft Position (CKP) sensor
  - — Ignition Control Module (ICM)(12A297)
- Mass Airflow Sensor
- Throttle Position Sensor
- Vehicle Speed Sensor
- Transmission Control Switch (TCS)
- Air Conditioning Clutch (ACC)
- Engine Coolant Temperature Sensor
- Transmission Speed Sensor (TSS)

OUTPUTS FROM PCM

- Transaxle Solenoid Body Assembly
  - — Shift Solenoid #1 (SS1)
  - — Shift Solenoid #2 (SS2)
  - — Electronic Pressure Control (EPC) Solenoid
  - — Torque Converter Clutch (TCC) Solenoid
  - — 3-2 Timing/Coast Clutch Solenoid (3-2T/CCS)
- Transmission Control Indicator Lamp (TCIL)

Powertrain Control Module (PCM) 12A650:

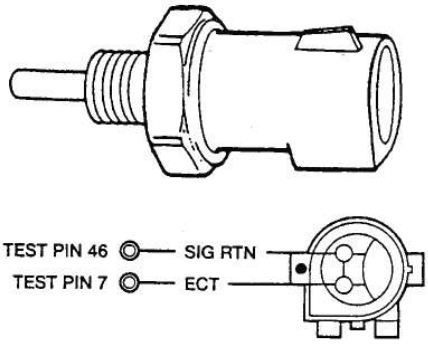
The operation of the transaxle is controlled by the Powertrain Control Module (PCM). Many input sensors provide information to the PCM. The PCM then controls the actuators which affect transaxle operation.



DTCs: 511, 512 and 513

Engine Coolant Temperature (ECT) Sensor 12A648:

The Engine Coolant Temperature Sensor (ECT) detects the temperature of the engine coolant and supplies the information to the Powertrain Control Module (PCM).



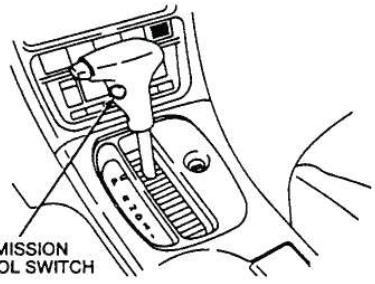
Transaxle Function: ECT sensor is used to control Torque Converter Clutch (TCC) operation.

Symptoms: TCC will always be "OFF" if ECT sensor reads cold or normal, resulting in reduced fuel economy.

DTCs: 116, 117 and 118

Transmission Control Switch (TCS) 7Z247:

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 PCM then energizes the Transmission Control Indicator Lamp (TCIL) and engages or disengages 4th gear operation and provides coast braking in 2nd and 3rd.



Transaxle Function: Disable fourth gear operation and energizes CCS solenoid in 2nd and 3rd gear for engine braking.

Symptoms: No overdrive cancel when switch in cycled.

DTC: 653

DESCRIPTION AND OPERATION (Continued)

Transmission Control Indicator Lamp (TCIL)

The Transmission Control Indicator Lamp (TCIL) is located in the instrument panel and is labeled O/D OFF. The Transmission Control Switch (TCS) controls the ON/OFF operation of the TCIL.



INSTRUMENT CLUSTER GRAPHICS

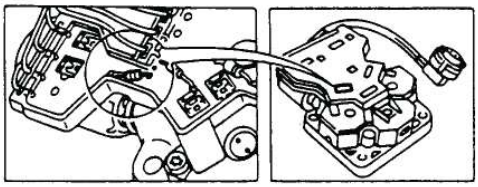
Transaxle Function: When the driver initially presses the button of the TCS, the TCIL turns ON to indicate that transaxle operation in 4th gear is disabled. When the driver presses the TCS again, the TCIL turns OFF.

Symptoms: If the TCIL fails ON or OFF, the driver may have an incorrect indication of transaxle operation.

DTCs: None

Transmission Oil Temperature (TOT) Sensor

The Transmission Oil Temperature (TOT) sensor is located on the solenoid valve body. It is a temperature-sensitive device called a thermistor. The resistance value of the TOT sensor will vary with temperature. The Powertrain Control Module (PCM) monitors the voltage across the TOT sensor to determine the temperature of the transmission oil.



Transaxle Function: The PCM uses this signal to determine shift scheduling and control of line pressure for cold and hot temperatures operation. The PCM also inhibits Torque Converter Clutch (TCC) operation at low transmission temperature. Adjusts Electronic Pressure Control (EPC) pressures for temperature.

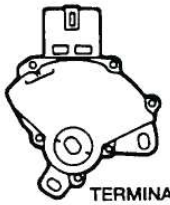
Symptoms: Improper TCC operation and EPC pressure.

DTCs: 636, 637, 638 and 657

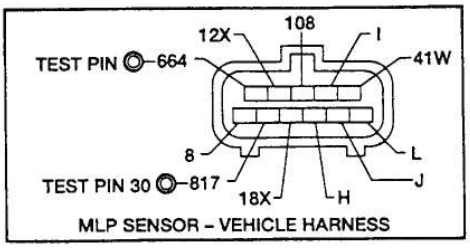
Manual Lever Position (MLP) Sensor 7A247:

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 transaxle range selector lever (P, R, N, D, 2, 1). The MLP sensor is located on the top of the transaxle.

NOTE: The MLP sensor also contains the neutral/start, and backup lamp circuits.



TERMINAL LOCATIONS



MLP SENSOR - VEHICLE HARNESS

Transaxle Function: Determine desired gear and Electronic Pressure Control (EPC) pressure.

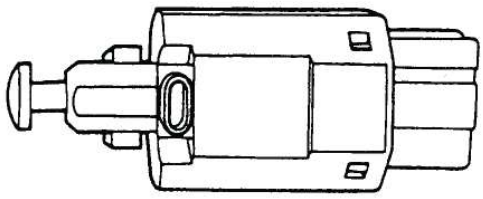
Symptoms: Harsh engagements and firm shift feel. Engine may not crank. May downshift to a lower gear. 2nd or 3rd gear operation. Transaxle not indicating the proper gear. No 4th gear operation, no manual 1st gear.

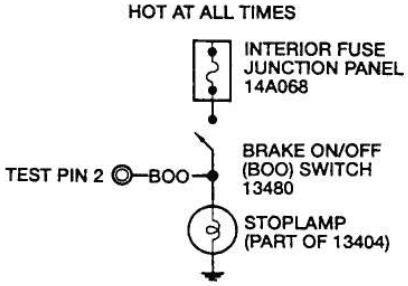
DTCs: 522, 634, 659, 667, 668 and 675

DESCRIPTION AND OPERATION (Continued)

Brake On/Off (BOO) Switch 13480:

The Brake On/Off (BOO) Switch signals the Powertrain Control Module (PCM) when the brakes are applied. The BOO switch is closed when the brakes are depressed and open when they are released.





Transaxle Function: Disengage Torque Converter Clutch (TCC) when brake is applied.

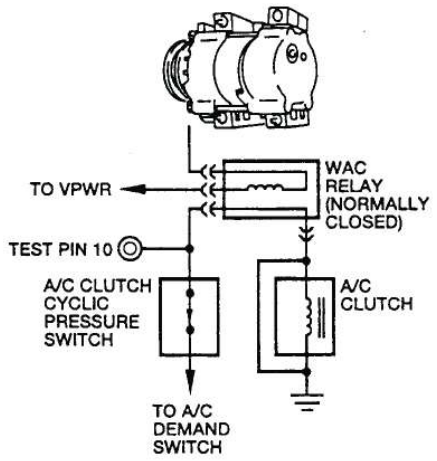
Symptoms: Failed "ON" - TCC will not engage at less the 1/3 throttle.

Failed "OFF" or Not Connected - TCC will not disengage when brake is applied.

DTC: 536

Air Conditioning Clutch (ACC) 2884:

The A/C Cyclic Switch is located on the suction accumulator/drier of an OEM factory-installed air conditioning system. When the ACC switch contacts close, the Powertrain Control Module (PCM) receives a signal voltage from the ACC switch indicating that the air conditioning compressor clutch is engaged.



Transaxle Function: The PCM uses the ACC switch signal to adjust line pressure to compensate for the additional engine load.

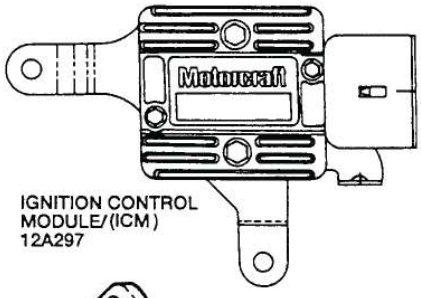
Symptoms: If the ACC switch fails with closed contacts, line pressure will be slightly low with air conditioning OFF. If the ACC switch fails with open contacts, line pressure will be slightly high with air conditioning ON.

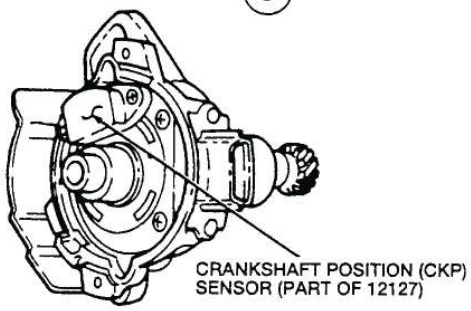
DTC: 539

DESCRIPTION AND OPERATION (Continued)

Distributor Ignition (DI) System

The Distributor Ignition (DI) system has a Crankshaft Position (CKP) sensor and an Ignition Control Module (ICM). The CKP sensor sends crankshaft position information to the ICM, which sends an engine speed signal to the Powertrain Control Module (PCM).





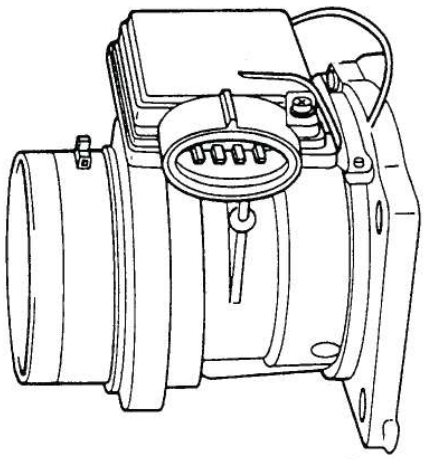
Transaxle Function: The PCM uses the engine speed signal from the DI system for control of line pressure, shift scheduling and Torque Converter Clutch (TCC). Wide Open Throttle (WOT) shift control is also affected by the DI system input.

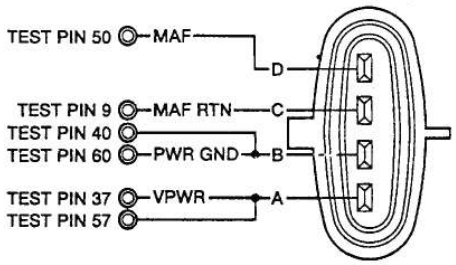
Symptoms: If the engine speed signal has a fault, harsh engagements, firm shifts, or late WOT shifts may occur. Also, TCC apply may not occur.

DTCs: 211-217 and 225-241

Mass Air Flow (MAF) Sensor 12B579:

The Mass Airflow Sensor (MAF) directly measures the mass of the air flowing into the engine. The MAF sensor output is a D.C. (analog) signal ranging from about 0.5 volts to 5.0 volts used by the Powertrain Control Module (PCM) to calculate the injector pulse width for stoichiometry. For transaxle strategies, the MAF sensor is used for Electronic Pressure Control (EPC) pressure control, shift and Torque Converter Clutch (TCC) scheduling.





Transaxle Function: EPC Pressure Control, Shift and TCC scheduling.

Symptoms: Incorrect shift schedule, EPC pressure hi or low, incorrect TCC engagement scheduling and symptoms similar to a Throttle Position (TP) Sensor malfunction. Malfunction Indicator Lamp (MIL) on.

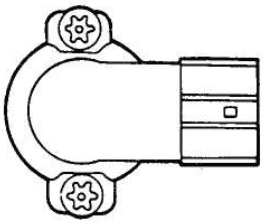
DTCs: 157, 158, 159, 184 and 185

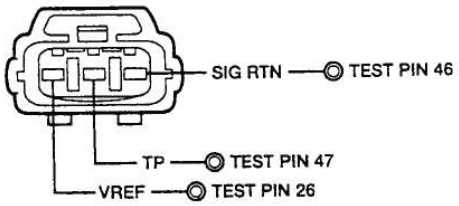
DESCRIPTION AND OPERATION (Continued)

Throttle Position (TP) Sensor 9B989:

The Throttle Position Sensor (TP) is a potentiometer mounted on the throttle body. The TP sensor detects the position of the throttle plate and sends this information to the Powertrain Control Module (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 transaxle at a high Electronic Pressure Control (EPC) pressure to prevent transaxle damage.





Transaxle Function: Shift scheduling. EPC and Torque Converter Clutch (TCC) control.

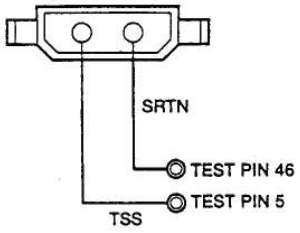
Symptoms: Harsh engagements, firm shift feel, abnormal shift schedule, TCC does not engage, TCC cycling. Malfunction Indicator Lamp (MIL) on.

DTCs: 121, 122, 123, 124, 125 and 167

Transmission Speed Sensor (TSS) 7M101:

A Transmission Speed Sensor (TSS) is a magnetic pickup that sends a signal to the Powertrain Control Module (PCM) that indicates turbine shaft input speed.





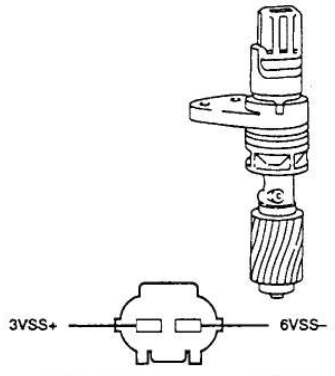
Transaxle Function: Provides converter turbine shaft speed information for Torque Converter Clutch (TCC) control strategy. Also used in determining static Electronic Pressure Control (EPC) pressure setting during shifts.

Symptoms: No torque converter engagements or harsh shifts. No 4th gear operation and engine braking in 2nd and 3rd gear. May flash the TCIL.

DTC: 639

Vehicle Speed Sensor (VSS) 9E731:

The Vehicle Speed Sensor (VSS) is a magnetic pickup that sends a signal to the Powertrain Control Module (PCM). This VSS signal tells the PCM the vehicle speed.



(Continued)

DESCRIPTION AND OPERATION (Continued)

Vehicle Speed Sensor (VSS) 9E731: (Cont'd)

Transaxle Function: Used to determine shift scheduling and Electronic Pressure Control (EPC) control.

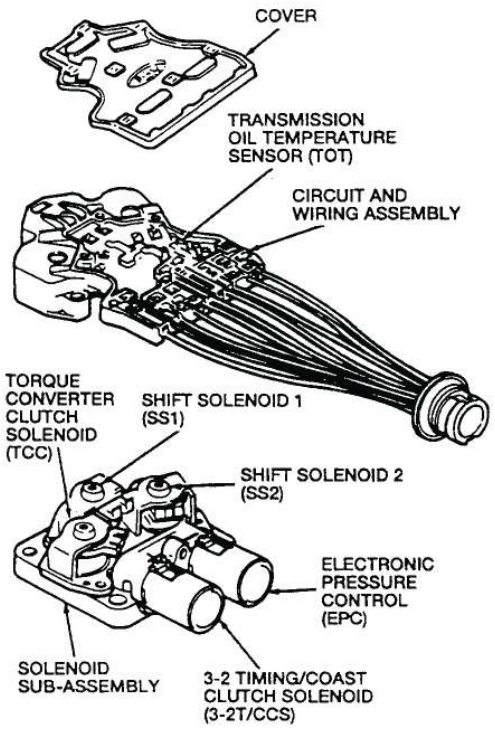
Symptoms: Firm shift feel, abnormal shift schedules, unexpected downshifts may occur at closed throttle. No 4th gear. No engine braking in 2nd or 3rd gear. No Torque Converter Clutch (TCC) apply. May flash the Transmission Control Indicator Lamp (TCIL).

DTC: 452

Solenoid Valve Body Assembly

The solenoid valve body assembly contains the Transmission Oil Temperature (TOT) sensor, as well as five Powertrain Control Module (PCM) controlled output devices.

- Electronic Pressure Control (EPC) solenoid
- Shift Solenoid #1 (SS1)
- Shift Solenoid #2 (SS2)
- 3-2 Timing / Coast Clutch Solenoid (3-2 T/CCS)
- Torque Converter Clutch (TCC) solenoid



The PCM controls the operation of the transaxle through wiring to the solenoid valve body assembly mounted on the main control assembly. An electrical connector from the solenoid valve body assembly fastens to the top of the transaxle case, where it connects to PCM wiring.

The solenoid valve body assembly is serviced as one part when any of its components require replacement.

Shift Control Solenoids 1 and 2

Shift Solenoids 1 and 2 provide gear selection of 1st through 4th gears by providing ON / OFF pressure control to the shift valves.

Shift Solenoid 1 (SS1)

Transaxle Function: Gear Selection.

SS1 Symptoms: Improper gear selection depending on failure mode and transaxle range selector lever position; refer to Shift Solenoid Application Chart.

DTCs: 621 [1], 645 [2] and 648 [2]

Shift Solenoid 2 (SS2)

SS2 Symptoms: Improper gear selection depending on failure mode and shift control lever position; refer to Shift Solenoid Application Chart.

DTCs: 622 [1], 646 [2] and 647 [2]

Torque Converter Clutch (TCC) Solenoid

The Torque Converter Clutch (TCC) solenoid is a Pulse Width Modulating (PWM) style solenoid. The PWM solenoid is used to control the apply and release of the bypass clutch in the torque converter. By modulating the pulse width of the TCC solenoid the pressure in the S4 circuit varies modulating the apply and release of the bypass clutch in the torque converter.

Transaxle Function: Used to apply and release the TCC.

Symptoms: Failed ON - Engine stalls in manual 2nd. Engine lugging, Poor performance at low engine speeds, harsh shifts.

Failed OFF - Poor fuel economy, overheating, TCC will not engage.

DTCs: 628 [2] and 652 [1]

Electronic Pressure Control (EPC) Solenoid

The Electronic Pressure Control (EPC) solenoid is a Variable Force Style (VFS) solenoid. The VFS type solenoid is an electro-hydraulic actuator combining a solenoid and a regulating valve. This solenoid provides Electronic Pressure Control (EPC) which regulates line pressure and line modulator pressure. This is controlled by producing a resisting pressure to the main regulator and line modulator circuits. The LP and LM pressures control the clutch application pressures.

Transaxle Function: Regulates EPC pressure.

(Continued)

1 Output circuit check, generated only by an electrical condition.
2 May also be generated by other NON-electronic related transmission hardware conditions.

DESCRIPTION AND OPERATION (Continued)

Electronic Pressure Control (EPC) Solenoid (Cont'd)

Symptoms: Failed ON - minimum EPC pressure (minimum trans torque capacity). May flash Transmission Control Indicator Lamp (TCIL).

Failed OFF - Maximum EPC pressure, harsh engagements and harsh shifts.

DTCs: 624 [3] and 625 [3]

3-2 Timing/Coast Clutch Solenoid (3-2T/CCS)

The 3-2 Timing/Coast Clutch (3-2T/CCS) is a Variable Force Style (VFS) solenoid. The VFS type solenoid is an electro-hydraulic actuator combining a solenoid and a regulating valve. It supplies pressure to the S3 circuit to control the release of the direct clutch and apply of the Intermediate and Overdrive Band during a 3-2 downshift. This solenoid also regulates the pressure in the S3 circuit to control the application and release of the coast clutch.

Transaxle Function: Used to control the apply and release of the coast clutch and the release timing of the direct clutch.

Symptoms: Failed ON - no engine braking (except in 4th gear), delayed 3-2 downshifts.

Failed OFF - engine braking in 2nd/3rd gears, firm or flared 3-2 downshifts harsh 4-3 downshifts.

DTCs: not available at time of printing

Shift Solenoid Failure Mode Charts

Shift Solenoid Failure "ALWAYS OFF"

Failed OFF due to Powertrain Control Module (PCM) and/or vehicle wiring concerns, and/or solenoid electrically stuck off, and/or hydraulically or mechanically stuck off.

SS1 Always OFF	Transaxle Range Selector Lever Position			
	OD	D*	2	1
PCM Gear Commanded	Actual Gear Obtained			
1	2	2	-	2
2	2	2	2	2
3	3	3	3	3
4	3	-	-	-

* Overdrive cancelled
** When a manual pull-in occurs above a calibrated speed the transaxle will not downshift from the higher gear until the vehicle speed drops below this calibrated speed.

SS2 Always OFF	Transaxle Range Selector Lever Position			
	OD	D*	2	1**
PCM Gear Commanded	Actual Gear Obtained			
1	4	4	-	1

(Continued)

SS2 Always OFF	Transaxle Range Selector Lever Position			
	OD	D*	2	1**
2	3	3	3	1
3	3	3	3	2
4	4	-	-	-

* Overdrive cancelled
** When a manual pull-in occurs above a calibrated speed the transaxle will not downshift from the higher gear until the vehicle speed drops below this calibrated speed.

Shift Solenoid Failure "ALWAYS ON"

Failed ON due to Powertrain Control Module (PCM) and/or vehicle wiring concerns, and/or solenoid electrically stuck on, and/or hydraulically or mechanically stuck on.

SS1 Always ON	Transaxle Range Selector Lever Position			
	OD	D*	2	1**
PCM Gear Commanded	Actual Gear Obtained			
1	1	1	-	1
2	1	1	1	1
3	4	4	4	4
4	4	-	-	-
Also No Reverse				

* Overdrive cancelled
** When a manual pull-in occurs above a calibrated speed the transaxle will not downshift from the higher gear until the vehicle speed drops below this calibrated speed.

SS2 Always ON	Transaxle Range Selector Lever Position			
	OD	D*	2	1**
PCM Gear Commanded	Actual Gear Obtained			
1	1	1	-	4
2	2	2	2	3
3	2	2	2	3
4	1	1	-	-

* Overdrive cancelled
** When a manual pull-in occurs above a calibrated speed the transaxle will not downshift from the higher gear until the vehicle speed drops below this calibrated speed.

3 Output circuit check, generated only by an electrical condition.

DESCRIPTION AND OPERATION (Continued)

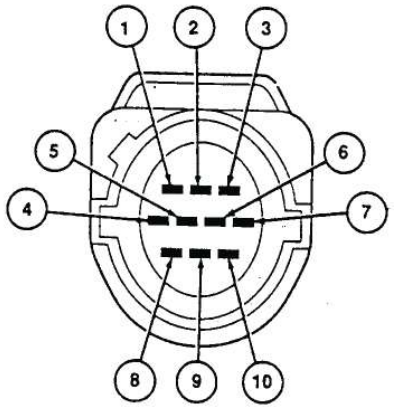
Solenoid Operations Chart

SOLENOID OPERATION CHART — CD4E

Transaxle Range Selector Lever Position	PCM Commanded Gear	CD4E Solenoids			
		SS1	SS2	3-2T/CCS	TCC
PARK	-	OFF	ON	-	OFF
REVERSE	-	OFF	OFF	-	#
NEUTRAL	-	OFF	ON	-	OFF
OD					
D	1	ON	ON	-	#
D	2	OFF	ON	-	*
D	3	OFF	OFF	-	*
D	4	ON	OFF	ON	*
OD OFF					
D	1	ON	ON	ON	#
D	2	OFF	ON	OFF	*
D	3	OFF	OFF	OFF	*
2	2	OFF	ON	OFF	*
"2	3"	OFF	OFF	OFF	*
1	1	ON	OFF	OFF	*
"1	2	OFF	OFF	OFF	*
"1	3	OFF	ON	OFF	*

\# Not allowed by Hydraulics.
* Powertrain Control Module (PCM) commanded.
** When a manual pull-in occurs above a calibrated speed the transaxle will not downshift from the higher gear until the vehicle speed drops below this calibrated speed.

Transaxle Connector/Harness Diagram



D12352-C

CD4E TRANSAXLE CONNECTOR PIN LOCATIONS

Pin	Description	PCM Test Pin
1	TCC Power	37, 57
2	Signal Return	46

(Continued)

CD4E TRANSAXLE CONNECTOR PIN LOCATIONS (Cont'd)

Pin	Description	PCM Test Pin
3	TOT Signal	49
4	SS1 Signal	51
5	Solenoid Power	37, 57
6	SS2 Signal	52
7	TCC Signal	53
8	EPC Signal	38
9	EPC Power	37, 57
10	3-2T/CCS Signal	55

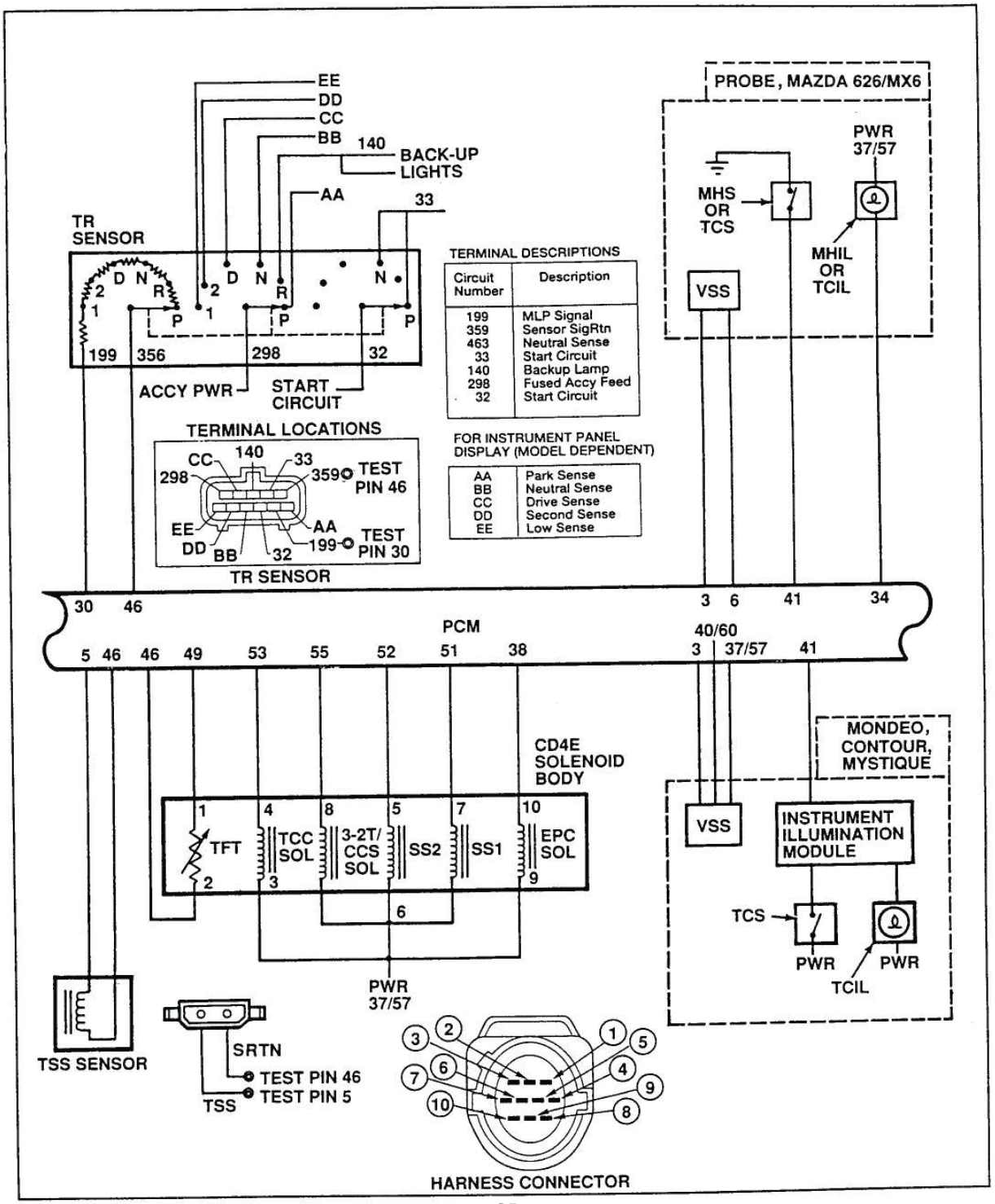
DIAGNOSIS AND TESTING

Diagnostic Strategy

Troubleshooting an electronically controlled automatic transaxle is simplified by using the proven method of diagnosis. One of the most important things to remember is that there is a definite procedure to follow. **DO NOT TAKE SHORT CUTS OR ASSUME THAT CRITICAL CHECKS OR ADJUSTMENTS HAVE ALREADY BEEN MADE.** Follow the procedures as written to avoid missing critical components or steps.

To properly diagnose a concern, the technician should have the following publications available:

ELECTRONIC COMPONENTS



DIAGNOSTIC PROCEDURES

DIAGNOSTIC TROUBLE CODE DESCRIPTION CHARTS

DTC DESCRIPTIONS

Three Digit DTC	Component	Description	Condition	Symptoms
111	System	Pass	No fault detected.	Fault not detected by processor.
116	ECT	ECT out of self-test range.	ECT temperature higher or lower than expected during KOEO and KOER.	Re-run self-test at normal operating temperature.
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 poor fuel economy.
118	ECT	ECT indicates -40°C (-40°F)	ECT temperature higher or lower than expected during KOEO and KOER.	Torque Converter Clutch will always be OFF, resulting in poor fuel economy.
121	TP	TP voltage high/low for self test.	TP was not in the correct position for for self-test.	Re-run at appropriate TP position per application.
122, 123, 124, 125, 167	TP	TP fault codes.	Processor has detected an error. This error may cause a transmission concern. Refer to PC/ED Manual for diagnosis.	Harsh engagements, firm shift feel, abnormal shift schedule, torque converter clutch does not engage. Torque Converter Clutch cycling.
157, 158, 159, 184, 185	MAF	MAF fault codes.	MAF system has malfunction which may cause a transmission concern. Refer to PC/ED Manual for diagnosis.	Incorrect shift schedule, hi/low EPC pressure. Incorrect converter engagement scheduling, symptoms similar to a TPS failure.
211-217 225-241	EI System	EI System fault codes.	Ignition system has malfunction which may cause a transmission concern. Refer to the PC/ED Manual for diagnosis.	Engine malfunction, no torque converter engagement, late WOT shifts.

DIAGNOSTIC TROUBLE CODE DESCRIPTION CHARTS

DTC DESCRIPTIONS

Three Digit DTC	Component	Description	Condition	Symptoms
452	VSS	Insufficient input from VSS.	Processor detected loss of vehicle speed signal during operation.	Firm shift feel, abnormal shift schedules, unexpected downshifts may occur at closed throttle. No 4th gear, no engine braking in 2nd or 3rd gear. No torque converter clutch apply. May flash TCIL.
522	TR	TR Sensor not in PARK.	Self-test not run in PARK.	Rerun self-test in PARK.
536	BOO	Brake not actuated during self-test. BOO switch circuit failed.	Brake not cycled during KOER. Brake On/Off circuit failure.	Failed ON or not connected – converter clutch will not engage engage at less than 1/3 throttle. Failed OFF – converter clutch will not disengage when brake is applied.
539	A/C	A/C switch error.	A/C or Defrost ON condition may result from A/C clutch being ON during Quick Test.	Failed ON – EPC pressure slightly low with A/C off. Failed OFF – EPC pressure slightly low with A/C on.
621*	SS1	SS1 solenoid circuit failure.	Solenoid 1 circuit failed to provide voltage drop across solenoid. Circuit open or shorted or processor driver failure during self-test.	Improper gear selection depending on condition mode and manual lever position. See solenoid ON/OFF chart.

* Output circuit check, generated only by electrical symptoms.
** May also be generated by some other non-electric transmission hardware system.

DIAGNOSTIC TROUBLE CODE DESCRIPTION CHARTS

DTC DESCRIPTIONS

Three Digit DTC	Component	Description	Condition	Symptoms
622*	SS2	SS2 solenoid circuit failure.	Solenoid 2 circuit failed to provide voltage drop across solenoid. Circuit open or shorted or processor drive failure during self-test.	Improper gear selection depending on condition mode and manual lever position. See solenoid ON/OFF chart.
623	MHIL or TCIL	MHIL or TCIL circuit failure.	TCIL or MHIL circuit open or shorted.	Failed OFF – No indication that MHS or TCS mode has been activated. Failed ON – Always indicates that the TCS or MHS mode is active.
624*	EPC	EPC Solenoid circuit failure, open circuit or short to ground.	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 self-test.	Short Circuit – Causes failsafe EPC pressure (maximum capacity). Harsh engagement and shifts may flash TCIL. Short to ground – EPC pressure (minimum capacity) limits engine torque (partial fuel shut-off, heavy misfire) and may flash TCIL.
625*	EPC	Open PCM output driver (Internal to PCM).	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 self-test.	Open circuit – causes maximum EPC pressure, harsh engagements and shifts.

* Output circuit check, generated only by electrical symptoms.
** May also be generated by some other non-electric transmission hardware system.

DIAGNOSTIC TROUBLE CODE DESCRIPTION CHARTS

DTC DESCRIPTIONS

Three Digit DTC	Component	Description	Condition	Symptoms
628**	TCC	Torque converter clutch control engagement error.	Processor picked up an excessive amount of converter clutch slippage when converter was scheduled to be engaged during normal vehicle operation.	Failed OFF – Poor fuel economy, overheating, Torque Converter Clutch will not engage. May flash TCIL.
634	TR	TR Sensor out of range.	Indicated voltage drop across TR sensor exceeds limits established for each position.	2nd or 3rd gear operation, harsh engagements, firm shift feel, no 3-4 shift, may downshift to a lower gear, engine may not crank. No TCC operation. May flash TCIL.
636	TFT	TFT out of ST range.	Transmission not at operating temperature during self-test.	Warm vehicle to normal operating temperature.
637	TFT	-40°C (-40°F) indicated TFT sensor circuit open.	Voltage drop across TFT sensor exceeds scale set for temperature of -40°C (-40°F).	Improper torque converter clutch operation. Improper EPC pressure control.
638	TFT	150°C (302°F) indicated TFT sensor circuit grounded.	Voltage drop across TFT sensor exceeds scale set for temperature of 150°C (302°F).	Improper torque converter clutch operation. Improper EPC pressure control.
639	TSS	Insufficient Input from Turbine Shaft Speed Sensor.	PCM detected a loss of TSS signal during operation.	No torque converter engagements or harsh shifts. No 4th gear operation and engine braking in 2nd and 3rd gear. May flash TCIL.

* Output circuit check, generated only by electrical symptoms.
** May also be generated by some other non-electric transmission hardware system.

DIAGNOSTIC TROUBLE CODE DESCRIPTION CHARTS
DTC DESCRIPTIONS

Three Digit DTC	Component	Description	Condition	Symptoms
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 transmission concerns (e.g., stuck valves, damaged friction material). May flash TCIL.
646**	SS1, SS2, or internal parts.	2nd gear failure.	No 2nd 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 concerns (e.g., stuck valves, damaged friction material). May flash TCIL.
647**	SS1, SS2, or internal parts.	3rd gear failure.	No 3rd 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 transmission concerns (e.g., stuck valves, damaged friction material). May flash TCIL.

* Output circuit check, generated only by electrical symptoms.
** May also be generated by some other non-electric transmission hardware system.

DIAGNOSTIC TROUBLE CODE DESCRIPTION CHARTS
DTC DESCRIPTIONS

Three Digit DTC	Component	Description	Condition	Symptoms
648**	SS1, SS2, or internal parts.	4th gear failure.	No 4th 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 transmission concerns (e.g., stuck valves, damaged friction material). May flash TCIL.
652*	TCC	Torque Converter Clutch solenoid circuit failure during self-test.	TCC solenoid circuit fails to provide voltage drop across solenoid. Circuit shorted or processor drive failure during self-test.	Failed ON – Engine stalls in manual 2nd, engine lugging, poor performance at low engine speeds, harsh shifts.
653	TCS	Transmission Control Switch not changing states during self-test.	TCS not cycled during self-test. Circuit open or shorted.	Rerun Self-Test and cycle switch. No overdrive cancel when switch is cycled. See 653 for MHS.
653	MHS	Manual Hold Switch not changing states during self-test.	MHS not cycled during self-test. Circuit open or shorted.	Rerun On-Board Diagnostic Test and cycle switch. Failed OFF – No modification of shift patterns. Failed ON – Vehicle will not upshift/downshift automatically, coast clutch engages in 2nd and 3rd gear. No 4th gear.

* Output circuit check, generated only by electrical symptoms.
** May also be generated by some other non-electric transmission hardware system.

DIAGNOSTIC TROUBLE CODE DESCRIPTION CHARTS
DTC DESCRIPTIONS

Three Digit DTC	Component	Description	Condition	Symptoms
657	TFT	Transmission Overtemp condition.	Transmission fluid temperature exceeded 270°F.	Increase in EPC pressure. May flash TCIL.
658	E/S	Economy/ Sport Switch not changing states during KOER.	E/S not cycled during KOER. Open or shorted circuit.	Lack of performance or fuel economy, EPC pressure slightly high, shift schedules and torque converter clutch engagement delayed.
659	TR	TR Sensor indicating Park.	TR Sensor indicating Park during vehicle drive operation.	EPC pressure high, all shifts firm. May flash TCIL.
667	TR	TR Sensor out of range. Shorted circuit or sensor.	TR Sensor, circuit or PCM shorted to ground.	No 4th gear operation, firm shift feel, no manual 1st gear. No TCC operation. May flash TCIL.
668	TR	TR Sensor out of range. Open circuit or sensor.	TR Sensor, circuit or PCM indicates open.	No 4th gear operation, firm shift feel, no manual 1st gear. May flash TCIL.
675	TR	TR circuit or sensor signal erratic. (In Range Failure).	TR Sensor, circuit or PCM operating erratically.	No 4th gear operation, firm shift feel, no manual 1st gear.
T.B.D.	3-2T/CCS	3-2T/CCS solenoid circuit failure.	3-2T/CCS circuit fails to provide voltage drop across solenoid. Circuit open or shorted or processor drive circuit failure during self-test.	Failed ON – no engine braking (except in OD), delayed 3-2 downshifts. Failed OFF – engine braking in 2nd/3rd gears, firm or flared 3-2 downshifts. Harsh 4-3 downshifts.
998*		Failure Mode Effect Management (FMEM) failure.	Failure detected in one or more critical inputs.	PCM enables alternate functions. Check for other error codes.

* Output circuit check, generated only by electrical symptoms.
** May also be generated by some other non-electric transmission hardware system.

DIAGNOSIS AND TESTING (Continued)

DIAGNOSIS BY SYMPTOM INDEX

Title	Routines	
	Electrical **	Mechanical/Hydraulic
Engagement Concerns		
No Forward and No Reverse	N/A	307
No Forward Only	N/A	301
No Reverse Only	202	302
Harsh	203	303
Delayed/Soft	N/A	305
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 ("D" Position)	215	315
No Manual First Gear (1st in "D" OK)	216	316
Torque Converter Clutch Concerns		
No Apply	240	340
Always Applied/May Stall Engine	241	341
Other Concerns		
Shift Lever Efforts High	251	351
External Leaks	252	352
Poor Vehicle Acceleration/Performance	253	353
Noise/Vibration - Forward or Reverse	254	354
Engine will not Crank	255	355
No Park Range	256	356
Overheating	257	357
No Engine Braking in Manual 1 Range	258	358
No Engine Braking in DRIVE or Manual 2 Range	259	359
Vehicle Movement with Gear Selector in the "N" Position	262	362
Reference		
Pressure Chart		401
Clutch/Band Application Chart		601

** Perform electrical routine first.

Diagnostic Routines

ENGAGEMENT CONCERN: NO FORWARD

Possible Component	Reference/Action
201 — ELECTRICAL ROUTINE	
No Electrical Concerns	
301 — HYDRAULIC/MECHANICAL ROUTINE	
Internal or External Shift Linkages • Damaged, misadjusted, misassembled	• INSPECT and SERVICE as required. ADJUST linkage as outlined in Service Manual. After servicing linkage, VERIFY that the manual lever position sensor is properly adjusted. REFER to Disassembly/Assembly procedures in Service Manual.
Oil Pump Assembly • Bolts not torqued to specifications • Gaskets damaged	• RETORQUE bolts to specifications. • INSPECT for damage and replace.

(Continued)

DIAGNOSIS AND TESTING (Continued)

ENGAGEMENT CONCERN: NO FORWARD (Cont'd)

Possible Component	Reference/Action
• Porosity/cross leaks and/or ball plug missing or leaking, or a plugged hole	• INSPECT for porosity and leaks. REPLACE as required.
• Pump Support Seal Rings, #3 or #4, damaged	• INSPECT for damage. SERVICE as required.
Main Controls	
• Bolts not torqued to specifications	• RETORQUE bolts to specifications.
• Gaskets damaged or leaking	• INSPECT for damage. SERVICE as required.
• Pressure Tap Plate/Gasket leaking or damaged	• INSPECT for damage. SERVICE as required.
• Separator Plates damaged	• INSPECT for damage. SERVICE as required.
• Hydraulic Passages damaged	• INSPECT for damage. SERVICE as required.
• Main Regulator Valve stuck, damaged or misassembled	• INSPECT for damage. SERVICE as required.
• Forward Accumulator leaking	• INSPECT for damage. SERVICE as required.
Forward Clutch and Coast Clutch Assembly	• PERFORM air pressure check.
• Seals or Pistons damaged	• INSPECT for damage. SERVICE as required.
• Forward Clutch Return Spring damaged	• INSPECT for damage. SERVICE as required.
• Ball Check Valve damaged	• INSPECT for mislocation, poor seating damage. REPLACE piston as required.
• Friction Elements severely damaged or worn	• CHECK for abnormal wear, damage. SERVICE as required.
• Forward/Coast/Direct clutch cylinder damaged, leaking, misassembled or binding	• INSPECT for damage. SERVICE as required.
• Cylinder to Hub Weld broken or Splines damaged	• INSPECT for damage. SERVICE as required.
Low OWC Assembly	
• Worn, damaged, misassembled	• INSPECT for damage. SERVICE as required.
Forward OWC Assembly	
• Worn, damaged, misassembled	• INSPECT for damage. SERVICE as required.
Low Intermediate Carrier	
• Damaged, misassembled	• INSPECT for damage. SERVICE as required.

ENGAGEMENT CONCERN: NO REVERSE

Possible Component	Reference/Action
202 — ELECTRICAL ROUTINE	
Powertrain Control System	
• Electrical Inputs/Outputs, Vehicle Wiring Harnesses, Powertrain Control Module, Shift Solenoid #1 (ON), Manual Lever Position Sensor	• Run OBD Tests with a scanner. SERVICE as required. CLEAR codes, ROAD TEST and RERUN OBD Tests.
302 — HYDRAULIC/MECHANICAL ROUTINE	
External Shift Linkage	
• Damaged, misadjusted	• INSPECT and SERVICE as required. ADJUST linkage as outlined in Service Manual. After servicing linkage, VERIFY that the manual lever position sensor is properly adjusted. REFER to Disassembly/Assembly procedures in Service Manual.
Improper Pressures	
• Low Line Pressure	• CHECK pressure at Line pressure tap. PERFORM Line Pressure and Stall Speed Tests. REFER to Pressure Chart for specifications. If pressure is low, CHECK the following possible components: Main Control, Oil Pump Assembly, Rev. Cl. Assembly, Low/Reverse Cl. Assembly.
Internal Shift Linkage	
• Damaged, misadjusted	• INSPECT and SERVICE as required. ADJUST linkage as outlined in Service Manual. After servicing linkage, VERIFY that the manual lever position sensor is properly adjusted. REFER to Disassembly/Assembly procedures in Service Manual.
Main Controls	
• Bolts not torqued to specifications	• RETORQUE bolts to specifications.

(Continued)

DIAGNOSIS AND TESTING (Continued)

ENGAGEMENT CONCERN: NO REVERSE (Cont'd)

Possible Component	Reference/Action
• Gasket damaged	• INSPECT for damage and REPLACE as required.
• 1-2 Shift Valve, SS1, Main Regulator Valve, Low/Reverse Modulator Valve, Low/Reverse Accumulator Piston, Pressure Tap Plate damaged, missing, stuck, misassembled	• INSPECT for damage. SERVICE as required.
• Separator Plates damaged	• INSPECT for damage. SERVICE as required.
• Hydraulic Passages damaged	• INSPECT for damage. SERVICE as required.
Oil Pump Assembly	
• Bolts not torqued to specifications	• RETORQUE bolts to specifications.
• Gasket damaged	• INSPECT for damage and REPLACE as required.
• Porosity/cross leaks/ball plug missing or leaking, plugged hole	• REPLACE oil pump assembly.
• Pump Support Seal Rings, #6 or #7, damaged	• INSPECT for damage. SERVICE as required.
Reverse Clutch Assembly	• PERFORM Air Pressure Test
• Seals - Piston damaged	• INSPECT for damage. SERVICE as required.
• Ball Check Valve damaged	• INSPECT for damage. SERVICE as required.
• Friction Elements worn, severely damaged or misassembled	• INSPECT for damage. SERVICE as required.
• Piston Return Spring damaged	• INSPECT for damage. SERVICE as required.
• Reverse Clutch Hub to Forward/Coast/Direct Hub Splines damaged	• INSPECT for damage. SERVICE as required.
Low/Reverse Clutch Assembly	• PERFORM Air Pressure Test.
• Seals or piston damaged	• INSPECT for damage. SERVICE as required.
• Friction elements worn or severely damaged	• INSPECT for damage. SERVICE as required.
• Piston Return Spring damaged	• INSPECT for damage. SERVICE as required.
• Wave Spring missing	• INSPECT for spring. SERVICE as required.
• Piston Bore damaged	• INSPECT for damage. SERVICE as required.
Forward/Coast/Direct Clutch Cylinder	
• Reverse Seal Rings damaged, missing, misassembled	• INSPECT for damage. SERVICE as required.
Case	• PERFORM Air Pressure Test.
• Reverse to Low/Reverse Clutch feeds have severe cross leakage or porosity	• INSPECT for damage. SERVICE as required.
Reverse/Overdrive Gear Set	
• Damaged	• INSPECT for damage. SERVICE as required.

ENGAGEMENT CONCERN: HARSH REVERSE/FORWARD

Possible Component	Reference/Action
? ...ECTRICAL ROUTINE	
F ...in Control System	
• L ...ctrical Inputs/Outputs, Vehicle Wiring Harnesses, Powertrain Control Module, EPC Solenoid, Transmission Oil Temperature Sensor	• Run OBD Tests with a scanner. SERVICE as required. CLEAR codes. ROAD TEST and RERUN OBD Tests.
303 — HYDRAULIC/MECHANICAL ROUTINE	
Fluid	
• Level	• ADJUST fluid to proper level.
• Condition	• INSPECT per Service Manual instructions under Fluid Condition Check.
CV Joints/ Front Wheel Driveshaft and Joint	
• Splines damaged	• INSPECT for damage. SERVICE as required.
Powertrain Mounts	
• Loose, broken, missing or misaligned	• INSPECT mounts per Service Manual procedures. SERVICE as required.
• Powertrain contacting with other vehicle components	• INSPECT for contact. SERVICE as required.
External Shift Linkage	

(Continued)

DIAGNOSIS AND TESTING (Continued)

ENGAGEMENT CONCERN: HARSH REVERSE/FORWARD (Cont'd)

Possible Component	Reference/Action
• Damaged, misadjusted	• INSPECT and SERVICE as required. ADJUST to linkage as outlined in Service Manual. After servicing linkage, VERIFY that the manual lever position sensor is properly adjusted. REFER to Disassembly/Assembly procedures in Service Manual.
Improper Pressures • Improper Line Pressure	• CHECK pressure at Line tap. PERFORM Line Pressure and Stall Speed Tests. REFER to Pressure Chart #401 for Specification. If high, VERIFY Engagements at Minimum EPC using the Transmission Tester. If Line remains HIGH, CHECK the following components: Main Controls.
Internal Shift Linkages • Damaged, misadjusted	• INSPECT and SERVICE as required. ADJUST linkage as outlined in Service Manual. After servicing linkage, VERIFY that the manual lever position sensor is properly adjusted. REFER to Disassembly/Assembly procedures in Service Manual.
Oil Filter and Seal Assembly • Filter/Seal damaged, plugged • Recirc Seal damaged, plugged or out of position	• REPLACE filter and seal assembly. • REPLACE Recirculation Seal.
Main Controls • Bolts not torqued to specifications • Gaskets damaged • Low/Reverse Accumulator Piston and Spring (Reverse), Main Regulator Valve, Forward Accumulator Piston and Spring misassembled, stuck or damaged • EPC Solenoid stuck or damaged	• RETORQUE bolts to specifications. • INSPECT for damage and REPLACE as required. • INSPECT for damage. SERVICE as required. • INSPECT for damage, contamination. ACTIVATE solenoid using transmission tester. SERVICE as required.
Forward Cl. Assembly (Forward Only) • Forward Clutch Cylinder damaged • Piston Bore damaged • Friction Elements damaged, worn • Forward Clutch Return Spring damaged or missing • Ball Check damaged • Piston or Seals damaged	• PERFORM Air Pressure Test. • INSPECT for damage. SERVICE as required. • INSPECT for damage. SERVICE as required. • INSPECT for damage. SERVICE as required. • INSPECT for damage. SERVICE as required. • INSPECT for damage. SERVICE as required. • INSPECT for damage. SERVICE as required.
Reverse Cl. Assembly (Reverse Only) • Seals or Piston damaged • Reverse Piston damaged • Friction Elements damaged, worn, misassembled • Return Spring Assembly damaged, worn • Ball Check damaged, missing	• PERFORM Air Pressure Test. • INSPECT for damage. SERVICE as required. • INSPECT for damage. SERVICE as required. • INSPECT for damage. SERVICE as required. • INSPECT for damage. SERVICE as required. • INSPECT for damage. SERVICE as required.
Low/Reverse Cl. Assembly (Reverse Only) • Seals or Reverse Clutch Piston damaged • Wave Spring damaged • Friction Elements damaged, worn, misassembled • Return Spring Assembly damaged, worn or misassembled • Piston Bore damaged	• PERFORM Air Pressure Test. • INSPECT for damage. SERVICE as required. • INSPECT for damage. SERVICE as required. • INSPECT for damage. SERVICE as required. • INSPECT for damage. SERVICE as required. • INSPECT for damage. SERVICE as required.
Direct Clutch Assembly (Reverse Only) • Friction Elements Severely damaged	• PERFORM Air Pressure Test. • INSPECT for damage. SERVICE as required.

ENGAGEMENT CONCERN: DELAYED/SOFT REVERSE OR FORWARD

Possible Component	Reference/Action
205 — ELECTRICAL ROUTINE	
No Electrical Concerns	
305 — HYDRAULIC/MECHANICAL ROUTINE	
Fluid • Improper level	• ADJUST fluid to proper level.

(Continued)

DIAGNOSIS AND TESTING (Continued)

ENGAGEMENT CONCERN: DELAYED/SOFT REVERSE OR FORWARD (Cont'd)

Possible Component	Reference/Action
• Condition	• INSPECT per Service Manual instructions under Fluid Condition Check.
External Shift Linkages	
• Damaged, misadjusted or misassembled	• INSPECT and SERVICE as required. ADJUST linkage as outlined in Service Manual. After servicing linkage, VERIFY that the manual lever position sensor is properly adjusted. REFER to Disassembly/Assembly procedures in Service Manual.
Improper Pressures	
• Low Line Pressure	• CHECK pressure at line tap. PERFORM Line Pressure and Stall Speed Tests. REFER to Pressure Chart #401 for specifications. If pressure is low, CHECK the following possible components: Main Control, Oil Pump Assembly, Clutch Assemblies, Oil Filter and Seal Assembly, Recirculating Seal.
Internal Shift Linkages	
• Damaged, misadjusted or misassembled	• INSPECT and SERVICE as required. ADJUST linkage as outlined in Service Manual. After servicing linkage, VERIFY that the manual lever position sensor is properly adjusted. REFER to Disassembly/Assembly procedures in Service Manual.
Oil Pump Assembly	
• Bolts not torqued to specifications	• RETORQUE bolts to specifications.
• Gaskets damaged	• INSPECT for damage and REPLACE as required.
• Porosity/cross leaks/ball plug missing or leaking, or passage blockage	• REPLACE oil pump assembly.
• Pump Support Seal Rings, #3 or #4 (Forward), or #6 or #7 (Reverse), damaged	• INSPECT for damage. SERVICE as required.
• Pump Gear/Pocket damaged	• INSPECT for damage. SERVICE as required.
• Separator Plate damaged	• INSPECT for damage. SERVICE as required.
Oil Filter and Seal Assembly	
• Filter/Seal damaged, plugged	• REPLACE filter and seal assembly.
• Recirculating Seal damage or out of position	• REPLACE/RESEAT Recirculating Seal.
Main Controls	
• Bolts not torqued to specifications	• RETORQUE bolts to specifications.
• Gaskets damaged	• INSPECT for damage and REPLACE as required.
• Manual Valve, Main Regulator Valve, Low/Reverse Modulator Valve stuck, damaged or misassembled	• INSPECT for damage. SERVICE as required.
• Separator Plates damaged	• INSPECT for damage. SERVICE as required.
• Pressure Tap Plate/Gasket leaks, damaged, misassembled	• INSPECT for damage. SERVICE as required.
Low/Reverse Cl. Assembly (Reverse Only)	• PERFORM Air Pressure Check.
• Piston or Seals damaged	• INSPECT for damage. SERVICE as required.
• Friction Elements damaged, worn	• INSPECT for damage. SERVICE as required.
• Return Spring damaged	• INSPECT for damage. SERVICE as required.
• Piston Bore damaged	• INSPECT for damage. SERVICE as required.
• Excessive Cl. Pack End Clearance	• INSPECT per Service Manual procedures. SERVICE as required.
Reverse Cl. Assembly (Reverse Only)	• PERFORM Air Pressure Check.
• Seals or Piston damaged	• INSPECT for damage. SERVICE as required.
• Check Ball damaged	• INSPECT for damage. SERVICE as required.
• Friction Elements damaged, worn	• INSPECT for damage. SERVICE as required.
• Return Spring worn, damaged	• INSPECT for damage. SERVICE as required.
• Piston Bore damaged	• INSPECT for damage. SERVICE as required.
• Excessive Cl. Pack End Clearance	• INSPECT per Service Manual procedures. SERVICE as required.
Forward Clutch Assembly (Forward Only)	• PERFORM Air Pressure Check.
• Seals or Piston damaged	• INSPECT for damage. SERVICE as required.
• Ball check damaged, missing or not seating properly	• INSPECT for damage, proper seating or missing. REPLACE cylinder as required.
• Friction Elements damaged, worn or excessive end clearance	• INSPECT for damage and end clearance. SERVICE as required.
Forward/Coast/Direct Clutch Cylinder Assembly	
• Reverse Seal Ring damaged or missing	• INSPECT for damage. SERVICE as required.
• Cylinder damaged or leaking	• INSPECT for damage. SERVICE as required.

DIAGNOSIS AND TESTING (Continued)

NO FORWARD AND NO REVERSE ENGAGEMENTS

Possible Component	Reference/Action
207 — ELECTRICAL ROUTINE	
No Electrical Concerns	
307 — HYDRAULIC/MECHANICAL ROUTINE	
Fluid • Improper level	• ADJUST fluid to proper level.
External Shift Linkages • Damaged, misadjusted or misassembled	• INSPECT and SERVICE as required. ADJUST linkage as outlined in Service Manual. After servicing linkage, VERIFY that the manual lever position sensor is properly adjusted. REFER to Disassembly / Assembly procedures in Service Manual.
Improper Pressures • Low / No Line Pressure	• CHECK pressure at Line tap. PERFORM Line Pressure and Stall Speed Tests. REFER to Pressure Chart #401 for specifications. If pressure is low, CHECK the following possible components: Oil Filter and Seal Assembly, Main Controls, Oil Pump Assembly. If OK, PROCEED to Turbine Shaft. • CHECK Flex Plate. • CHECK Torque Converter Pump Shaft and Assembly.
Internal Shift Linkages • Damaged, misadjusted or misassembled	• INSPECT and SERVICE as required. ADJUST linkage as outlined in Service Manual. After servicing linkage, VERIFY that the manual lever position sensor is properly adjusted. REFER to Disassembly / Assembly procedures in Service Manual.
Oil Pump Assembly • Bolts not torqued to specifications • Gasket damaged, missing • Porosity / cross leaks or passage(s) blocked • Pump Support Seal Rings missing • Pump Shaft broken, damaged	• RETORQUE bolts to specifications. • INSPECT for damage and REPLACE as required. • INSPECT for porosity, leaks, blockage. REPLACE pump as required. • INSPECT for damage. SERVICE as required. • INSPECT for damage. SERVICE as required.
Oil Filter and Seal Assembly • Filter / Seal damaged, plugged, or missing • Recirculating Seal damaged or out of position	• REPLACE filter and seal assembly per Service Manual procedures. • REPLACE / RESEAT Recirculating Seal.
Main Controls • Bolts not torqued to specifications • Gaskets damaged • Pressure Plate / Gasket damaged or missing • Main Regulator Valve, Manual Valve stuck, damaged, plugged, missing, "Z" Link not connected	• RETORQUE bolts to specifications. • INSPECT for damage and REPLACE as required. • INSPECT for damage. SERVICE as required. • INSPECT for damage. SERVICE as required.
Flywheel (Starter Gear) • Damaged, broken	• INSPECT for damage. SERVICE as required.
Torque Converter Assembly • Pump Drive Shaft Insert damaged • Studs broken or damaged • Splines damaged • Internal Blades damaged, broken	• INSPECT for damage. SERVICE as required. • INSPECT torque converter using the procedures in the Service Manual. If damaged, REPLACE.
Turbine Shaft to Forward / Coast / Direct Clutch Cylinder Hsg. • Splines damaged	• INSPECT for damage. SERVICE as required.
Chain and Sprocket Assembly • Broken, damaged	• INSPECT for damage. SERVICE as required.
Park Mechanism • Parking Pawl Return Spring damaged, missing or misassembled	• INSPECT for damage. SERVICE as required.
Front Wheel Drive Shafts and Joints • Broken or splines damaged	• INSPECT for damage. SERVICE as required.
Final Drive and Differential Assembly	

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DIAGNOSIS AND TESTING (Continued)

NO FORWARD AND NO REVERSE ENGAGEMENTS (Cont'd)

Possible Component	Reference/Action
• Splines damaged • Gearset damaged	• INSPECT for damage. SERVICE as required. • INSPECT for damage. SERVICE as required.
Planetary Gearsets • Gear Teeth, Carriers, Splines damaged, or broken	• INSPECT for damage. SERVICE as required.

SHIFT CONCERNS: SOME OR ALL SHIFTS MISSING

Possible Component	Reference/Action
210 — ELECTRICAL ROUTINE	
Powertrain Control System • Electrical Inputs/Outputs, Vehicle Wiring Harnesses, Powertrain Control Module, Shift Solenoids, manual lever position sensor, throttle position sensor, VSS, TCS	• PERFORM Shift Point Test. • Run OBD Tests with a scanner. SERVICE as required. CLEAR codes, ROAD TEST and RERUN OBD Tests.
310 — HYDRAULIC/MECHANICAL ROUTINE	
Fluid • Improper level	• ADJUST fluid to proper level.
Internal and External Shift Linkages • Damaged, misadjusted or misassembled	• INSPECT and SERVICE as required. ADJUST linkage as outlined in Service Manual. After servicing linkage, VERIFY that the manual lever position sensor is properly adjusted. REFER to Disassembly/Assembly procedures in Service Manual.
Speedo Input • Speedometer Drive Gear damaged • Speedometer Gear damaged • Speedometer Driven Gear Retainer damaged or missing	• INSPECT for damage. SERVICE as required. • INSPECT for damage. SERVICE as required. • INSPECT for damage. SERVICE as required.
Go to Reference/Action to diagnose specific missing shifts • Shift Concern: No 1-2 Shift • Shift Concern: No 2-3 Shift • Shift Concern: No 3-4 Shift	• Routine 220/320 • Routine 221/321 • Routine 222/322

SHIFT CONCERNS: TIMING — EARLY/LATE

Possible Component	Reference/Action
211 — ELECTRICAL ROUTINE	
Powertrain Control System • Electrical Inputs/Outputs, Vehicle Wiring Harnesses, Powertrain Control Module, Throttle Position Sensor, Vehicle Speed Sensor, Transmission Oil Temperature Sensor	• PERFORM Shift Point Test. • Run OBD Tests with a scanner. SERVICE as required. CLEAR codes, ROAD TEST and RERUN OBD Tests.
311 — HYDRAULIC/MECHANICAL ROUTINE	
Other • Tire Size change	• REFER to the spec. decal on door panel and VERIFY that vehicle has original equipment. Changes in tire size or Speedometer Gear will affect shift timing.
• Speedometer Gear broken or incorrect • Speedometer Drive Gear damaged	• INSPECT for damage. SERVICE as required. • INSPECT for damage. SERVICE as required.

SHIFT CONCERNS: TIMING — ERRATIC/HUNTING

Possible Component	Reference/Action
212 — ELECTRICAL ROUTINE	
Powertrain Control System	

(Continued)

DIAGNOSIS AND TESTING (Continued)

SHIFT CONCERNS: TIMING — ERRATIC/HUNTING (Cont'd)

Possible Component	Reference/Action
• Engine Concerns	• REFER to Engine Section of Service Manual to diagnose erratic engine operations. • PERFORM Shift Point Test.
• Electrical Inputs/Outputs, Vehicle Wiring Harnesses, Powertrain Control Module, Shift Solenoids, Manual Lever Position Sensor, Brake On/Off Switch, TCC Solenoid, Vehicle Speed Sensor, Throttle Position Sensor, TSS, EPC, 3-2T/CCS	• Run OBD Tests with a scanner. SERVICE as required. CLEAR codes. ROAD TEST and RERUN OBD Tests.
312 — HYDRAULIC/MECHANICAL ROUTINE	
Fluid	
• Improper level	• ADJUST fluid to proper level.
• Condition	• INSPECT per Service Manual instructions under Fluid Condition Check.
Vehicle Speed Input	
• Speedometer Drive Gear damaged	• INSPECT for damage. SERVICE as required.
• Speedometer Gear damaged	• INSPECT for damage. SERVICE as required.
Main Control	
• Bolts not torqued to specifications	• RETORQUE bolts to specifications.
• Gaskets damaged	• INSPECT for damage and REPLACE as required.
• 3-2 Timing Valve, Pullin Valve, 2-4 Accumulator, Servo Release Shuttle Valve, 3-2 Control Valve stuck, damaged, misassembled	• INSPECT for damage. SERVICE as required.
• Solenoid Screen blocked	• CLEAN or REPLACE screen.
• Separator Plates damaged, blocked	• INSPECT for damage. SERVICE as required.
• Pressure Tap Plate/Gasket damaged	• INSPECT for damage. SERVICE as required.
• SS1, SS2, 3-2T/CCS Solenoid malfunction, stuck, damaged	• ACTIVATE solenoids with tester. INSPECT for damage. SERVICE as required.
Go to Reference/Action to diagnose specific shift concern	
• Shift Concern: No 1-2 Shift	• Routine 220/320
• Shift Concern: No 2-3 Shift	• Routine 221/321
• Shift Concern: No 3-4 Shift	• Routine 222/322
• Shift Concern: Soft/Slip 1-2 Shift	• Routine 226/326
• Shift Concern: Soft/Slip 2-3 Shift	• Routine 227/327
• Shift Concern: Soft/Slip 3-4 Shift	• Routine 228/328
• Shift Concern: Soft/Slip 4-3 Shift	• Routine 229/329
• Shift Concern: Soft/Slip 3-2 Shift	• Routine 230/330
• Shift Concern: Soft/Slip 2-1 Shift	• Routine 231/331
• Shift Concern: Harsh 1-2 Shift	• Routine 232/332
• Shift Concern: Harsh 2-3 Shift	• Routine 233/333
• Shift Concern: Harsh 3-4 Shift	• Routine 234/334
• Shift Concern: Harsh 4-3 Shift	• Routine 235/335
• Shift Concern: Harsh 3-2 Shift	• Routine 236/336

SHIFT CONCERNS: FEEL — SOFT/SLIPPING

Possible Component	Reference/Action
213 — ELECTRICAL ROUTINE	
Powertrain Control System	• PERFORM Shift Point Test.
• Electrical Inputs/Outputs, Vehicle Wiring Harnesses, Powertrain Control Module, EPC Solenoid, Transmission Oil Temperature Sensor, Throttle Position Sensor, Mass Airflow Sensor	• Run OBD Tests with a scanner. SERVICE as required. CLEAR codes. ROAD TEST and RERUN OBD Tests.
313 — HYDRAULIC/MECHANICAL ROUTINE	
Fluid	
• Improper level	• ADJUST fluid to proper level.
• Condition	• INSPECT per Service Manual instructions under Fluid Condition Check.

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DIAGNOSIS AND TESTING (Continued)

SHIFT CONCERNS: FEEL — SOFT/SLIPPING (Cont'd)

Possible Component	Reference/Action
External Shift Linkage • Damaged, misadjusted or misassembled	• INSPECT and SERVICE as required. ADJUST linkage as outlined in the Service Manual. After servicing linkage, VERIFY that the Manual Lever Position Sensor is properly adjusted. REFER to Disassembly/Assembly procedures in Service Manual.
Improper Pressures • Low Line Pressure	• CHECK pressures at Line tap. PERFORM Line Pressure Tests. REFER to Pressure Chart #401 for specifications. If pressures are low or all shifts are soft/slipping, GO to Main Control, Oil Pump Assembly, Oil Filter/Seal Assembly. If pressures are OK and a specific shift is soft/slipping, REFER to the appropriate routine(s) for additional diagnosis. **Shift** 1-2, **Routine** 226/326 **Shift** 2-3, **Routine** 227/327 **Shift** 3-4, **Routine** 228/328 **Shift** 4-3, **Routine** 229/329 **Shift** 3-2, **Routine** 230/330 **Shift** 2-1, **Routine** 231/331
Internal Shift Linkage • Damaged, misadjusted or misassembled	• INSPECT and SERVICE as required. ADJUST linkage as outlined in the Service Manual. After servicing linkage, VERIFY that the Manual Lever Position Sensor is properly adjusted. REFER to Disassembly/Assembly procedures in Service Manual.
Main Controls • Bolts not torqued to specifications • Gaskets damaged • Main Regulator Valve, Line Modulator Valve stuck, damage or misassembled or springs missing, tangled or damaged • EPC Solenoid stuck or damaged • Separator Plates damaged, blocked • Pressure Tap Plate/Gasket damaged or missing	• RETORQUE bolts to specifications. • INSPECT gaskets and REPLACE as required. • INSPECT for damage. SERVICE as required. • INSPECT for damage, contamination. ACTIVATE solenoid using the trans tester. SERVICE as required. • INSPECT for damage. SERVICE as required. • INSPECT for damage. SERVICE as required.
Oil Pump Assembly • Bolts are not torqued to specifications • Gaskets damaged • Porosity/cross leaks	• RETORQUE bolts to specifications. • INSPECT for damage and REPLACE as required. • INSPECT for porosity. SERVICE as required.
Oil Filter/Seal Assembly • Filter/Seal damaged, plugged or missing • Recirculating Seal damaged or out of position	• REPLACE filter and seal assembly. • REPLACE Recirculating Seal.

SHIFT CONCERNS: FEEL — HARSH

Possible Component	Reference/Action
214 — ELECTRICAL ROUTINE	
Powertrain Control System • Electrical Inputs/Outputs, Vehicle Wiring Harnesses, Powertrain Control Module, EPC Solenoid, Transmission Oil Temperature Sensor, TSS, Throttle Position Sensor, Vehicle Speed Sensor, Mass Airflow Sensor, TCC Solenoid, Manual Lever Position Sensor, 3-2T/CCS	• PERFORM Torque Converter Clutch Operation Test • Run OBD Tests with a scanner. SERVICE as required. CLEAR codes. ROAD TEST and RERUN OBD Tests.
314 — HYDRAULIC/MECHANICAL ROUTINE	
Fluid • Improper level • Condition	• ADJUST fluid to proper level. • INSPECT per Service Manual instructions under Fluid Condition Check.
CV Joint/Front Wheel Driveshafts and Joints • Damaged, loose, splines damaged	• INSPECT for damage. SERVICE as required.
Powertrain Mounts	

(Continued)

DIAGNOSIS AND TESTING (Continued)

SHIFT CONCERNS: FEEL — HARSH (Cont'd)

Possible Component	Reference/Action
• Damaged, loose, missing	• INSPECT for damage. SERVICE as required.
Improper Pressures • High Line Pressure	• CHECK pressure at Line tap. PERFORM Line Pressure Test and Stall Speed Tests. REFER to Pressure Chart #401 for specifications. If pressures are high or all shifts are harsh, GO to Main Control. • If pressures are OK and a specific shift is harsh, REFER to the appropriate shift routine for additional diagnosis. **Shift 1-2, Routine** 232/332 **Shift 2-3, Routine** 233/333 **Shift 3-4, Routine** 234/334 **Shift 4-3, Routine** 235/335 **Shift 3-2, Routine** 236/336 **Shift 2-1, Routine** 237/337
Main Controls • Bolts not torqued to specifications • Gaskets damaged • Main Regulator Valve, By-Pass Valve, Line Modulator Valve stuck, damaged or misassembled. Springs tangled, missing, damaged • EPC Solenoid stuck or damaged • Hydraulic Passages damaged • Separator Plate damaged, blocked	 • RETORQUE bolts to specifications. • INSPECT for damage. SERVICE as required. • INSPECT for damage. SERVICE as required. • INSPECT for damage, contamination. ACTIVATE solenoid using transmission tester. SERVICE as required. • INSPECT for damage. SERVICE as required. • INSPECT for damage. SERVICE as required.
Torque Converter Assembly NOTE: If TCC Applied during shifts • Piston damaged • Pump Support Seal # 1 (CBY circuit) leaking, missing or damaged • Case leakage • Converter Assembly damaged	 • INSPECT for damage. SERVICE as required. • INSPECT for damage. SERVICE as required. • INSPECT for damage. SERVICE as required. • If heat stained, REPLACE converter.

SHIFT CONCERNS: 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, Shift Solenoids, Manual Lever Position Sensor	• Run OBD Tests with a scanner. SERVICE as required. CLEAR codes, ROAD TEST and RERUN OBD Tests.
315 — HYDRAULIC/MECHANICAL ROUTINE	
External Shift Linkages • Damaged, misadjusted or misassembled	• INSPECT for proper adjustment. SERVICE as required. ADJUST linkage as outlined in Service Manual. After servicing linkage, VERIFY that the Manual Lever Position Sensor is properly adjusted. REFER to Disassembly/Assembly procedures in this manual.
Main Controls • Bolts not torqued to specifications • Gaskets damaged • Pull In Valve, Solenoid Regulator Valve, Shift Valves stuck, damaged, misassembled • Solenoid Filter Gasket damaged or misassembled • Hydraulic Passages damaged • SS1, SS2 Solenoid malfunction	 • RETORQUE bolts to specifications. • INSPECT for damage and REPLACE as required. • INSPECT for damage. SERVICE as required. • INSPECT for damage. SERVICE as required. • INSPECT for damage. SERVICE as required. • ACTIVATE solenoid with transmission tester. SERVICE as required.
For diagnosis related to a specific gear, use Transmission Tester (007-0085A) to determine gear	• REFER to the following routines:

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DIAGNOSIS AND TESTING (Continued)

SHIFT CONCERNS: NO 1ST GEAR, ENGAGES IN HIGHER GEAR (Cont'd)

Possible Component	Reference/Action
	Shift 1-2, **Routine** 220/320 **Shift** 2-3, **Routine** 221/321 **Shift** 3-4, **Routine** 222/322
Mechanical • Seals, Clutches damaged, worn • Direct Clutch, 2/4 Band, 2/4 Servo damaged, stuck on	• REFER to Service Manual for Teardown procedures. SERVICE as required.

SHIFT CONCERNS: NO MANUAL 1ST GEAR

Possible Component	Reference/Action
216 — ELECTRICAL ROUTINE	
Powertrain Control System • Electrical Inputs/Outputs, Vehicle Wiring Harnesses, Powertrain Control Module, Shift Solenoids, Manual Lever Position Sensor	• Run OBD Tests with a scanner. SERVICE as required. CLEAR codes. ROAD TEST and RERUN OBD Tests.
316 — HYDRAULIC/MECHANICAL ROUTINE	
Internal and External Shift Linkages • Damaged, misadjusted or misassembled	• INSPECT and SERVICE as required. ADJUST linkage as outlined in Service Manual. After servicing linkage, VERIFY that the Manual Lever Position Sensor is properly adjusted. REFER to Disassembly/Assembly procedures in Service Manual.
Main Controls • Bolts not torqued to specifications • Gaskets damaged • Pullin Valve stuck, damaged • SS2 stuck "ON" • Hydraulic Passages damaged • Separator Plates damaged, blocked	 • RETORQUE bolts to specifications. • INSPECT for damage and REPLACE as required. • INSPECT for damage. SERVICE as required. • ACTIVATE solenoid using transmission tester. SERVICE as required. • INSPECT for damage. SERVICE as required. • INSPECT for damage. SERVICE as required.

SHIFT CONCERNS: 1-2 SHIFT (AUTOMATIC)

Possible Component	Reference/Action
220 — ELECTRICAL ROUTINE	
Powertrain Control System • Electrical Inputs/Outputs, Vehicle Wiring Harnesses, Powertrain Control Module, Shift Solenoids, Manual Lever Position Sensor	• Run OBD Tests with a scanner. SERVICE as required. CLEAR codes, ROAD TEST and RERUN OBD Tests.
320 — HYDRAULIC/MECHANICAL ROUTINE	
Improper Pressures • Line Pressure	• CHECK pressure at Line tap. PERFORM Line Pressure and Stall Speed Tests. REFER to Pressure Chart #401 for specifications. If not OK, CHECK the following possible components: Main Control.
Main Control • Bolts not torqued to specifications • Gaskets damaged • 1-2 Shift Valve, 2-4 Accumulator, Main Regulator Valve stuck, damaged, or misassembled • SS1 malfunction • Pressure Tap Plate/Gasket damaged • Separator Plates damaged • Hydraulic Passages damaged	 • RETORQUE bolts to specifications. • INSPECT for damage and REPLACE as required. • INSPECT for damage. SERVICE as required. • INSPECT for damage. ACTIVATE solenoid by using transmission tester. • INSPECT for damage. SERVICE as required. • INSPECT for damage. SERVICE as required. • INSPECT for damage. SERVICE as required.

(Continued)

DIAGNOSIS AND TESTING (Continued)

SHIFT CONCERNS: 1-2 SHIFT (AUTOMATIC) (Cont'd)

Possible Component	Reference/Action
Int/OD Band and Servo Assembly NOTE: Also No 4th gear	
• Seals damaged, missing	• INSPECT for damage. SERVICE as required.
• Piston damaged	• INSPECT for damage. SERVICE as required.
• Band damaged, worn	• INSPECT for damage. SERVICE as required.
• Springs damaged	• INSPECT for damage. SERVICE as required.
• Servo Rod or Rod Bore damaged	• INSPECT for damage. SERVICE as required.
Low OWC Assembly	
• Damaged	• INSPECT for damage. SERVICE as required.
OD/Reverse Sun Gear and Shell	
• Damaged, weld broken • Lugs damaged	• INSPECT for damage. SERVICE as required.
Case	
• Low and Intermediate Band Anchor Area damaged	• INSPECT for damage. If damaged REPLACE the case.
• Porosity/leakage in Servo Apply, Servo Release circuits	• INSPECT case for leakage/porosity. PERFORM Air Pressure Tests. REPLACE case as required.

SHIFT CONCERNS: 2-3 SHIFT (AUTOMATIC)

Possible Component	Reference/Action
221 — ELECTRICAL ROUTINE	
Powertrain Control System • Electrical Inputs/Outputs, Vehicle Wiring Harnesses, Powertrain Control Module, Shift Solenoids, Manual Lever Position Sensor	• Run OBD Tests with a scanner. SERVICE as required. CLEAR codes. ROAD TEST and RERUN OBD Tests.
321 — HYDRAULIC/MECHANICAL ROUTINE	
Improper Pressures • Line Pressure	• CHECK pressure at Line pressure tap. PERFORM Line Pressure Tests. REFER to Pressure Chart #401 for specification. If NOT OK, CHECK the following possible components: Main Control.
Main Control	
• Bolts not torqued to specifications	• RETORQUE bolts to specifications.
• Gasket leaks	• INSPECT for damage and REPLACE as required.
• 2-3 Shift Valve (also No 4th), Main Regulator Valve stuck, damaged, misassembled	• INSPECT for damage. SERVICE as required.
• SS2 malfunction (also no 4th)	• INSPECT for damage. ACTIVATE solenoid by using transmission tester.
• Separator Plates damaged	• INSPECT for damage. SERVICE as required.
• Pressure Tap Plate/Gasket leaks	• INSPECT for damage. SERVICE as required.
• Hydraulic Passages damaged	• INSPECT for damage. SERVICE as required.
Oil Pump Assembly	
• Bolts not torqued to specifications	• RETORQUE bolts to specifications.
• Gaskets damaged	• INSPECT for damage and REPLACE as required.
• Porosity/cross leaks	• INSPECT for damage. SERVICE as required.
• Pump Support Seal Rings, #4 or #5, damaged	• INSPECT for damage. SERVICE as required.
Direct Clutch Assembly	• PERFORM Air Pressure Check.
• Seals or Piston damaged	• INSPECT for damage. SERVICE as required.
• Piston Bore damaged	• INSPECT for damage. SERVICE as required.
• Friction severely damaged, worn	• INSPECT for damage. SERVICE as required.
• Ball Check not seating properly	• INSPECT for damage. SERVICE as required.
• Return Spring Assembly damaged	• INSPECT for damage. SERVICE as required.
• Cylinder Bore/Splines damaged	• INSPECT for damage. SERVICE as required.
• Shell/Hub damaged	• INSPECT for damage. SERVICE as required.
INT/OD Servo	

(Continued)

DIAGNOSIS AND TESTING (Continued)

SHIFT CONCERNS: 2-3 SHIFT (AUTOMATIC) (Cont'd)

Possible Component	Reference/Action
• Piston or Piston Bore damaged	• INSPECT for damage. SERVICE as required.
• Rod Bore or Rod damaged, leaking	• INSPECT for damage. SERVICE as required.
Case	
• Leakage in the Servo Apply, Servo Release or Direct Clutch Circuits	• INSPECT case for damage. PERFORM Air Pressure Tests. SERVICE or REPLACE case as required.

SHIFT CONCERNS: 3-4 SHIFT (AUTOMATIC)

Possible Component	Reference/Action
222 — ELECTRICAL ROUTINE	
Powertrain Control System	
• Electrical Inputs/Outputs, Vehicle Wiring Harnesses, Powertrain Control Module, Shift Solenoids, Manual Lever Position Sensor, Transmission Control Switch (TCS).	• Run OBD Tests with a scanner. SERVICE as required. CLEAR codes, ROAD TEST and RERUN OBD Tests.
322 — HYDRAULIC/MECHANICAL ROUTINE	
Improper Pressures	
• Line pressure	• CHECK pressure at Line tap. PERFORM Line Pressure Tests. REFER to Pressure Chart #401 for proper specifications. If out of specification CHECK Main Control.
Main Control	
• Bolts not torqued to specifications	• RETORQUE bolts to specifications.
• Gasket leaks	• INSPECT for damage and REPLACE as required.
• 3-4 Shift Valve, Main Regulator Valve stuck, damaged or misassembled	• INSPECT for damage. SERVICE as required.
• SS1 malfunction (also No 1st)	• ACTIVATE solenoid using transmission tester. SERVICE as required.
• Separator Plates damaged or Orifice blocked	• INSPECT for damage. SERVICE as required.
INT/OD Band and Servo Assembly NOTE: Also NO 2nd gear	
• INT/OD Band damaged, worn	• INSPECT for damage. SERVICE as required.
• Servo Rod or Rod Bore damaged	• INSPECT for damage. SERVICE as required.
• Servo Piston or Cover damaged or leaking	• INSPECT for damage. SERVICE as required.
• Springs damaged	• INSPECT for damage. SERVICE as required.
Coast Clutch Assembly	
• Seals damaged, missing	• INSPECT for damage. SERVICE as required.
• Piston damaged	• INSPECT for damage. SERVICE as required.
• Friction severely damaged, worn	• INSPECT for damage. SERVICE as required.
• Check ball severely damaged	• INSPECT for damage. SERVICE as required.
Forward OWC Assembly	
• Damaged	• INSPECT for damage. SERVICE as required.
Case (Also No 2nd gear)	
• Band anchor damaged	• INSPECT for damage. PERFORM Air Pressure Checks. SERVICE as required.
• Servo Apply and Servo Release circuits leaking	• INSPECT for damage. SERVICE as required.

SHIFT CONCERNS: SOFT/SLIPPING 1-2 SHIFT ONLY (AUTOMATIC)

Possible Component	Reference/Action
226 — ELECTRICAL ROUTINE	
Powertrain Control System	
• Electrical Inputs/Outputs, Vehicle Wiring Harnesses, Powertrain Control Module, EPC Solenoid, Transmission Oil Temperature Sensor	• Run OBD Tests with a scanner. SERVICE as required. CLEAR codes. ROAD TEST and RERUN OBD Tests.

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DIAGNOSIS AND TESTING (Continued)

SHIFT CONCERNS: SOFT/SLIPPING 1-2 SHIFT ONLY (AUTOMATIC) (Cont'd)

Possible Component	Reference/Action
326 — HYDRAULIC/MECHANICAL ROUTINE	
Main Control	
• Bolts not torqued to specifications	• RETORQUE bolts to specifications.
• Gaskets damaged	• INSPECT for damage and REPLACE as required.
• 2-4 Accumulator Piston Plug and Seal (also soft 3-4 shift), Main Regulator Valve, Line Modulator Valve (also soft 3-4 shift) stuck, damaged or misassembled	• INSPECT for damage. SERVICE as required.
• Hydraulic Passages damaged	• INSPECT for damage. SERVICE as required.
• Pressure Tap Plate/Gasket damaged	• INSPECT for damage. SERVICE as required.
• Separator Plates damaged	• INSPECT for damage. SERVICE as required.
INT/OD Band and Servo Assembly	
• Piston, Seals or Piston Bore damaged, missing	• INSPECT for damage. SERVICE as required.
• Servo Rod or Rod Bore damaged	• INSPECT for damage. SERVICE as required.
• INT/OD Band and/or Reverse Clutch Drum Assembly worn, damaged or misassembled	• INSPECT for damage. SERVICE as required.
• Springs damaged	• INSPECT for damage. SERVICE as required.
• Servo Cover and Seal damaged	• INSPECT for damage. SERVICE as required.
Forward OWC Assembly (slips in 1st)	
• Not holding or damaged	• INSPECT for damage. SERVICE as required.
Forward Clutch Assembly (slips in 1st)	• PERFORM Air Pressure Check.
• Seals damaged	• INSPECT for damage. SERVICE as required.
• Return Spring damaged	• INSPECT for damage. SERVICE as required.
• Friction elements damaged	• INSPECT for damage. SERVICE as required.
• Pump Supports Seals #3, #4 damaged	• INSPECT for damage. SERVICE as required.
Low OWC Assembly	
• Not overrunning, damaged	• INSPECT for damage. SERVICE as required.
Low Reverse Clutch Assembly	
• Friction elements severely damaged	• INSPECT for damage. SERVICE as required.
Case	
• Band Anchor damaged	• INSPECT for damage. If damaged REPLACE the case.
• Porosity/Leakage in Servo Apply, Servo Release circuits	• INSPECT case for leakage/porosity. PERFORM Air Pressure checks. REPLACE case as required.

SHIFT CONCERNS: SOFT/SLIPPING 2-3 SHIFT ONLY (AUTOMATIC)

Possible Component	Reference/Action
227 — ELECTRICAL ROUTINE	
Powertrain Control System	
• Electrical Inputs/Outputs, Vehicle Wiring Harnesses, Powertrain Control Module, EPC Solenoid, Transmission Oil Temperature Sensor	• Run OBD Tests with a scanner. SERVICE as required. CLEAR codes, ROAD TEST and RERUN OBD Tests.
327 — HYDRAULIC/MECHANICAL ROUTINE	
Oil Pump Assembly	
• Bolts not torqued to specifications	• RETORQUE bolts to specifications.
• Gaskets damaged	• INSPECT for damage and REPLACE as required.
• Pump support seals #4 or #5 damaged, missing	• INSPECT for damage. SERVICE as required.
Main Control	
• Bolts not torqued to specifications	• RETORQUE bolts to specifications.
• Gasket Leaks	• INSPECT for damage and REPLACE as required.
• Line Modulator Valve (also soft 1-2 and 3-4 shifts), Servo Release Shuttle Valve stuck damaged or misassembled	• INSPECT for damage. SERVICE as required.
• Hydraulic passages damaged	• INSPECT for damage. SERVICE as required.
• Separator Plates damaged	• INSPECT for damage. SERVICE as required.

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DIAGNOSIS AND TESTING (Continued)

SHIFT CONCERNS: SOFT/SLIPPING 2-3 SHIFT ONLY (AUTOMATIC) (Cont'd)

Possible Component	Reference/Action
• Pressure Tap Plate/Gasket leaks	• INSPECT for damage. SERVICE as required.
Direct Clutch Assembly	• PERFORM Air Pressure Check.
• Seals or Piston damaged	• INSPECT for damage. SERVICE as required.
• Piston bore damaged	• INSPECT for damage. SERVICE as required.
• Friction element damaged, worn or excessive end clearance	• INSPECT for damage. CHECK end clearance per Service Manual procedures. SERVICE as required.
• Check ball not seating properly	• INSPECT for damage. SERVICE as required.
• Return Spring Assembly damaged	• INSPECT for damage. SERVICE as required.
INT/OD Servo	
• Piston or piston bore damaged	• INSPECT for damage. SERVICE as required.
• Servo rod or rod bore damaged	• INSPECT for damage. SERVICE as required.
Case	
• Leakage in the Servo Apply, Servo Release or Direct Clutch circuits	• INSPECT case for damage. PERFORM Air Pressure Checks. SERVICE or REPLACE case as required.
Forward OWC Assembly	
• Not holding, damaged	• INSPECT for damage. SERVICE as required.

SHIFT CONCERNS: SOFT/SLIPPING 3-4 SHIFT ONLY (AUTOMATIC)

Possible Component	Reference/Action
228 — ELECTRICAL ROUTINE	
Powertrain Control System	
• Electrical Inputs/Outputs, Vehicle Wiring Harnesses, Powertrain Control Module, EPC Solenoids, Transmission Oil Temperature Sensor	• Run OBD Tests with a scanner. SERVICE as required. CLEAR codes, ROAD TEST and RERUN OBD Tests.
328 — HYDRAULIC/MECHANICAL ROUTINE	
Main Control	
• Bolts not torqued to specifications	• RETORQUE bolts to specifications.
• Gasket Leaks	• INSPECT for damage and REPLACE as required.
• Line Modulator Valve, 2-4 Accumulator Valve Plug and Seal (also soft 1-2 shift), stuck, damaged or misassembled	• INSPECT for damage. SERVICE as required.
• Pressure Tap Plate/Gasket leaks	• INSPECT for damage. SERVICE as required.
• Hydraulic passages damaged	• INSPECT for damage. SERVICE as required.
• Separator Plates damaged or Orifice blocked	• INSPECT for damage. SERVICE as required.
INT/OD Band and Servo Assembly	
• INT/OD Band and/or Reverse Clutch Drum Assembly worn, damaged or misassembled	• INSPECT for damage. SERVICE as required.
• Piston, Seals or Piston Bore damaged, missing	• INSPECT for damage. SERVICE as required.
• Servo Cover or Seal damaged	• PERFORM Air Pressure Check. INSPECT for damage. SERVICE as required.
• Servo Rod or Rod Bore damaged	• INSPECT for damage. SERVICE as required.
• Springs damaged	• INSPECT for damage. SERVICE as required.
Direct Clutch Assembly NOTE: May also have 3rd gear slip	• PERFORM Air Pressure Check.
• Seals damaged, missing	• INSPECT for damage. SERVICE as required.
• Piston damaged	• INSPECT for damage. SERVICE as required.
• Check Ball damaged, missing or leaking	• INSPECT for damage. SERVICE as required.
• Return Spring damaged	• INSPECT for damage. SERVICE as required.
• Friction elements damaged	• INSPECT for damage. SERVICE as required.
Case	
• Band anchor damaged	• INSPECT for damage. SERVICE as required.
• Servo apply and servo release circuits leaking	• INSPECT for damage. PERFORM Air Pressure Check. SERVICE as required.

DIAGNOSIS AND TESTING (Continued)

SHIFT CONCERNS: SOFT/SLIPPING 4-3 SHIFT (AUTOMATIC)

Possible Component	Reference/Action
229 — ELECTRICAL ROUTINE	
Powertrain Control System • Electrical Inputs/Outputs, Vehicle Wiring Harnesses, Powertrain Control Module, EPC Solenoid, Vehicle Speed Sensor, Mass Airflow Sensor, Throttle Position Sensor	• Run OBD Tests with a scanner. SERVICE as required. CLEAR codes. ROAD TEST and RERUN OBD Tests.
329 — HYDRAULIC/MECHANICAL ROUTINE	
Main Control	
• Bolts not torqued to specifications	• RETORQUE bolts to specifications.
• Gasket Leaks	• INSPECT for damage and REPLACE as required.
• Servo Release Shuttle Valve, Main Regulator Valve stuck, damaged, or misassembled	• INSPECT for damage. SERVICE as required.
• Hydraulic passages damaged	• INSPECT for damage. SERVICE as required.
• Pressure Tap Plate/Gasket leaks, or damaged	• INSPECT for damage. SERVICE as required.
• Separator Plates damaged, blocked	• INSPECT for damage. SERVICE as required.
INT/OD Band and Servo Assembly	
• INT/OD Band and Reverse Clutch Drum Assembly worn, damaged or misassembled	• INSPECT for damage. SERVICE as required.
• Servo Return Spring broken	• INSPECT for damage. SERVICE as required.
• Servo Rod damaged	• INSPECT for damage. SERVICE as required.
• Piston seal damaged	• INSPECT for damage. SERVICE as required.
Direct Clutch Assembly	• PERFORM Air Pressure Check.
• Seals damaged, missing	• INSPECT for damage. SERVICE as required.
• Piston damaged	• INSPECT for damage. SERVICE as required.
• Check Ball damaged, missing or leaking	• INSPECT for damage. SERVICE as required.
• Return Spring damaged	• INSPECT for damage. SERVICE as required.
• Friction elements damaged	• INSPECT for damage. SERVICE as required.
Forward/Coast Clutch Assembly	• PERFORM Air Pressure Check.
• Seals damaged, missing	• INSPECT for damage. SERVICE as required.
• Piston damaged	• INSPECT for damage. SERVICE as required.
• Friction Elements worn, damaged	• INSPECT for damage. SERVICE as required.
• Check Ball not functioning	• INSPECT for damage. SERVICE as required.
• Forward Clutch Piston and Return Spring damaged	• INSPECT for damage. SERVICE as required.
Case	
• Porosity/cross leaks in Servo Apply, Servo Release, Direct Clutch circuits	• INSPECT for damage. PERFORM Air Pressure Check. SERVICE as required.

SHIFT CONCERNS: SOFT/SLIPPING 3-2 SHIFT (AUTOMATIC)

Possible Component	Reference/Action
230 — ELECTRICAL ROUTINE	
Powertrain Control System • Electrical Inputs/Outputs, Vehicle Wiring Harnesses, Powertrain Control Module, EPC Solenoid, Throttle Position Sensor, Vehicle Speed Sensor, Mass Airflow Sensor, 3-2 Timing/Coast Clutch Solenoid (3-2T/CCS)	• Run OBD Tests with a scanner. SERVICE as required. CLEAR codes. ROAD TEST and RERUN OBD Tests.
330 — HYDRAULIC/MECHANICAL ROUTINE	
Main Control	
• Bolts not torqued to specifications	• RETORQUE bolts to specifications.
• Gasket damaged	• INSPECT for damage and REPLACE as required.
• 3-2 Timing Valve, Solenoid Regulator Valve, 3-2 Control Valve stuck, damaged or misassembled	• INSPECT for damage. SERVICE as required.
• 3-2T/CCS Solenoid malfunction	• ACTIVATE solenoid using transmission tester. SERVICE as required.

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DIAGNOSIS AND TESTING (Continued)

SHIFT CONCERNS: SOFT/SLIPPING 3-2 SHIFT (AUTOMATIC) (Cont'd)

Possible Component	Reference/Action
• Pressure Tap Plate/Gasket leaks or damaged	• INSPECT for damage. SERVICE as required.
• Separator Plates damaged, blocked	• INSPECT for damage. SERVICE as required.
Direct Clutch Assembly	• PERFORM Air Pressure Check.
• Return Spring damaged, broken	• INSPECT for damage. SERVICE as required.
• Friction elements damaged, worn	• INSPECT for damage. SERVICE as required.
• Ball check not releasing	• INSPECT for damage. SERVICE as required.
• Piston or seal damaged	• INSPECT for damage. SERVICE as required.
INT/OD Band and Servo Assembly	
• INT/OD Band and/or Reverse Clutch Drum Assembly worn, damaged or misassembled	• INSPECT for damage. SERVICE as required.
• Servo piston damaged	• INSPECT for damage. SERVICE as required.
• Servo Return and Cushion Springs damaged, misassembled	• INSPECT for damage. SERVICE as required.
• Springs damaged, misassembled	• INSPECT for damage. SERVICE as required.
• Servo rod bent, damaged	• INSPECT for damage. SERVICE as required.
Oil Pump Assembly	
• Bolts not torqued to specifications	• RETORQUE bolts to specifications.
• Gaskets damaged	• INSPECT for damage and REPLACE as required.
• Porosity/cross leaks	• INSPECT for porosity, leaks. REPLACE pump as required.
• Pump Support seal rings #4, 5, 6 damaged or misassembled	• INSPECT for damage. SERVICE as required.
• Forward to direct passage leaks	• INSPECT for damage. SERVICE as required.
Case	
• Band Anchor damaged	• INSPECT for damage. SERVICE as required.
• Leakage in servo apply/release circuits	• INSPECT for leaks. PERFORM Air Pressure Check. SERVICE as required.
• Case bore damaged (Servo Rod)	• INSPECT for damage. SERVICE as required.

SHIFT CONCERNS: SOFT/SLIPPING 2-1 SHIFT (AUTOMATIC OR KICKDOWN)

Possible Component	Reference/Action
231 — ELECTRICAL ROUTINE	
Powertrain Control System • Electrical Inputs/Outputs, Vehicle Wiring Harnesses, Powertrain Control Module. EPC Solenoid, Transmission Oil Temperature Sensor, Throttle Position Sensor, Mass Airflow Sensor	• Run OBD Tests with a scanner. SERVICE as required. CLEAR codes, ROAD TEST and RERUN OBD Tests.
331 — HYDRAULIC/MECHANICAL ROUTINE	
Pump	
• Gaskets damaged	• INSPECT for damage and REPLACE as required.
• Porosity/cross leaks	• INSPECT for leak/porosity. REPLACE as required.
• Pump support seals #3 or 4 leaking, misassembled, damaged	• INSPECT for damage. SERVICE as required.
Intermediate OD Servo and Band Assembly	
• Servo Piston damaged	• INSPECT for damage. SERVICE as required.
• Servo Piston Return Spring damaged	• INSPECT for damage. SERVICE as required.
Forward Clutch Assembly	• PERFORM Air Pressure Check.
• Piston or Seals damaged	• INSPECT for damage. SERVICE as required.
• Friction Elements damaged	• INSPECT for damage. SERVICE as required.
Low OWC	
• Damaged, not holding	• INSPECT for damage. SERVICE as required.

SHIFT CONCERNS: HARSH 1-2 SHIFT ONLY (AUTOMATIC)

Possible Component	Reference/Action
232 — ELECTRICAL ROUTINE	
Powertrain Control System	

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DIAGNOSIS AND TESTING (Continued)

SHIFT CONCERNS: HARSH 1-2 SHIFT ONLY (AUTOMATIC) (Cont'd)

Possible Component	Reference/Action
• Electrical Inputs/Outputs, Vehicle Wiring Harnesses, Powertrain Control Module, EPC Solenoids, Transmission Oil Temperature Sensor, Vehicle Speed Sensor, TSS, Throttle Position Sensor, Mass Airflow Sensor, TCC solenoid, Manual Lever Position Sensor	• Run OBD Tests with a scanner. SERVICE as required. CLEAR codes. ROAD TEST and RERUN OBD Tests.
332 — HYDRAULIC/MECHANICAL ROUTINE	
Main Control	
• Bolts not torqued to specifications	• RETORQUE bolts to specifications.
• Gasket leaks	• INSPECT for damage and REPLACE as required.
• 2-4 Accumulator Valve, 3-2 Control Valve (also harsh 3-4 shift) stuck, damaged or misassembled	• INSPECT for damage. SERVICE as required.
• Separator plates damaged	• INSPECT for damage. SERVICE as required.
• Hydraulic passages damaged	• INSPECT for damage. SERVICE as required.
Pump	
• Bolts not torqued to specifications	• RETORQUE bolts to specifications.
• Gasket damaged	• INSPECT for damage and REPLACE as required.
• Pump support seal rings #3 or #4 damaged	• INSPECT for damage. SERVICE as required.
• Porosity/cross leaks	• INSPECT for damage. SERVICE as required.
INT/OD Band and Servo Assembly	
• Cushion return springs damaged	• INSPECT for damage. SERVICE as required.
• INT/OD Band damaged, worn	• INSPECT for damage. SERVICE as required.
• INT/OD Band and/or Reverse Clutch Drum Assembly worn, damaged or misassembled	• INSPECT for damage. SERVICE as required.
Forward Clutch Assembly	• PERFORM Air Pressure Check.
• Seals damaged	• INSPECT for damage. SERVICE as required.
• Return Spring damaged	• INSPECT for damage. SERVICE as required.
• Friction elements damaged	• INSPECT for damage. SERVICE as required.
Case	
• Band Anchor Area damaged	• INSPECT for damage. If damaged, REPLACE the case.

SHIFT CONCERNS: HARSH 2-3 SHIFT ONLY (AUTOMATIC)

Possible Component	Reference/Action
233 — ELECTRICAL ROUTINE	
Powertrain Control System	
• Electrical Inputs/Outputs, Vehicle Wiring Harnesses, Powertrain Control Module, EPC Solenoid, Manual Lever Position Sensor, Vehicle Speed Sensor, Transmission Oil Temperature Sensor, Mass Airflow Sensor, TCC solenoid, TSS	• Run OBD Tests with a scanner. SERVICE as required. CLEAR codes. ROAD TEST and RERUN OBD Tests.
333 — HYDRAULIC/MECHANICAL ROUTINE	
Main Control	
• Bolts not torqued to specifications	• RETORQUE bolts to specifications.
• Gasket leaks	• INSPECT for damage and REPLACE as required.
• Line Modulator Valve (also 1-2 and 3-4 harsh shift), Servo Release Shuttle Valve stuck, damaged or misassembled	• INSPECT for damage. SERVICE as required.
• Separator plates damaged	• INSPECT for damage. SERVICE as required.
• Hydraulic passages damaged	• INSPECT for damage. SERVICE as required.
Pump	
• Bolts not torqued to specifications	• RETORQUE bolts to specifications.
• Gasket damaged	• INSPECT for damage and REPLACE as required.
• Porosity/cross leaks	• INSPECT for damage. SERVICE as required.
• Pump support seal rings #4 or #5 damaged	• INSPECT for damage and REPLACE as required.
Direct Clutch Assembly	• PERFORM Air Pressure Check.
• Piston or piston bore damaged	• INSPECT for damage. SERVICE as required.
• Friction elements damaged, worn	• INSPECT for damage. SERVICE as required.

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DIAGNOSIS AND TESTING (Continued)

SHIFT CONCERNS: HARSH 2-3 SHIFT ONLY (AUTOMATIC) (Cont'd)

Possible Component	Reference/Action
• Ball check not seating properly	• INSPECT for damage. SERVICE as required.
• Return Spring damaged	• INSPECT for damage. SERVICE as required.
• Clutch cylinder splines damaged	• INSPECT for damage. SERVICE as required.
INT/OD Servo	
• Servo Piston or Piston Bore damaged	• INSPECT for damage. SERVICE as required.
• Servo rod damaged	• INSPECT for damage. SERVICE as required.
Case	
• Leakage in the Servo Apply, Servo Release or Direct Clutch circuits	• INSPECT case for damage. PERFORM Air Pressure Check. SERVICE or REPLACE case as required.
• Servo Rod Bore damaged	• INSPECT for damage. SERVICE as required.

SHIFT CONCERNS: HARSH 3-4 SHIFT ONLY (AUTOMATIC)

Possible Component	Reference/Action
234 — ELECTRICAL ROUTINE	
Powertrain Control System • Electrical Inputs/Outputs, Vehicle Wiring Harnesses, Powertrain Control Module, EPC Solenoid, Vehicle Speed Sensor, 3-2T/CCS, Manual Lever Position Sensor, Transmission Oil Temperature Sensor, TSS, Throttle Position Sensor, Mass Airflow Sensor, TCC solenoid	• Run OBD Tests with a scanner. SERVICE as required. CLEAR codes, ROAD TEST and RERUN OBD Tests.
334 — HYDRAULIC/MECHANICAL ROUTINE	
Main Control	
• Bolts not torqued to specifications	• RETORQUE bolts to specifications.
• Gasket leaks	• INSPECT for damage and REPLACE as required.
• Line Modulator Valve (also 1-2 and 2-3 harsh shift), 3-2 Control Valve, 2-4 Accumulator Valve, Coast Clutch Valve, stuck, damaged or misassembled	• INSPECT for damage. SERVICE as required.
• Hydraulic passages damaged	• INSPECT for damage. SERVICE as required.
• Separator plates damaged, blocked	• INSPECT for damage. SERVICE as required.
Pump	
• Bolts not torqued to specifications	• RETORQUE bolts to specifications.
• Gasket damaged	• INSPECT for damage and REPLACE as required.
• Porosity/cross leaks	• INSPECT for damage. SERVICE as required.
• Coast Clutch Teflon seals damaged	• INSPECT for damage and REPLACE as required.
INT/OD Band and Servo Assembly	
• INT/OD Band and Reverse Clutch Drum Assembly, damaged, worn, misassembled	• INSPECT for damage. SERVICE as required.
• Servo Piston or Cover damaged or leaking	• INSPECT for damage. SERVICE as required.
• Springs damaged	• INSPECT for damage. SERVICE as required.
Coast Clutch Assembly	
• Piston or Seals damaged, missing	• INSPECT for damage. SERVICE as required.
• Friction elements damaged, worn	• INSPECT for damage. SERVICE as required.
• Check Ball not functioning	• INSPECT for damage. SERVICE as required.
Direct Clutch Assembly	• PERFORM Air Pressure Check.
• Piston or seals damaged, missing	• INSPECT for damage. SERVICE as required.
• Check Ball damaged, missing or leaking	• INSPECT for damage. SERVICE as required.
• Return Spring damaged	• INSPECT for damage. SERVICE as required.
• Friction elements damaged	• INSPECT for damage. SERVICE as required.
• Clutch Cylinder splines damaged	• INSPECT for damage. SERVICE as required.
Case	
• Band Anchor damaged	• INSPECT for damage. SERVICE as required.

DIAGNOSIS AND TESTING (Continued)

SHIFT CONCERNS: HARSH 4-3 SHIFT ONLY (AUTOMATIC)

Possible Component	Reference/Action
235 — ELECTRICAL ROUTINE	
Powertrain Control System • Electrical Inputs/Outputs, Vehicle Wiring Harnesses, Powertrain Control Module, EPC Solenoid, Manual Lever Position Sensor, Vehicle Speed Sensor, 3-2T/CCS, Transmission Oil Temperature Sensor, TSS, Throttle Position Sensor, Mass Airflow Sensor, TCC solenoid	• Run OBD Tests with a scanner. SERVICE as required. CLEAR codes, ROAD TEST and RERUN OBD Tests.
335 — HYDRAULIC/MECHANICAL ROUTINE	
Main Control	
• Bolts not torqued to specifications	• RETORQUE bolts to specifications.
• Gasket leaks	• INSPECT for damage and REPLACE as required.
• Servo Release Shuttle Valve, 3-2 Timing/Coast Clutch Valve stuck, damaged or misassembled	• INSPECT for damage. SERVICE as required.
• Hydraulic passages damaged	• INSPECT for damage. SERVICE as required.
• Separator plates damaged, blocked	• INSPECT for damage. SERVICE as required.
Pump	
• Bolts not torqued to specifications	• RETORQUE bolts to specifications.
• Porosity/cross leaks, Seal Rings damaged, missing or leaking ball plug	• INSPECT pump for damage. SERVICE or REPLACE pump as required.
• Gasket damaged	• INSPECT for damage and REPLACE as required.
• Pump Support Seal Rings #2, 3, 4, or #5 (Coast and Direct Clutch circuits) damaged	• INSPECT for damage. SERVICE as required.
INT/OD Band and Servo Assembly	
• Servo Rod bent, damaged	• INSPECT for damage. SERVICE as required.
• Servo Return Spring Broken	• INSPECT for damage. SERVICE as required.
Coast Clutch Assembly	
• Seals damaged, missing	• INSPECT for damage. SERVICE as required.
• Piston damaged	• INSPECT for damage. SERVICE as required.
• Friction elements worn, damaged	• INSPECT for damage. SERVICE as required.
• Check Ball not functioning	• INSPECT for damage. SERVICE as required.
• Forward clutch piston and Return Spring damaged	• INSPECT for damage. SERVICE as required.
Case	
• Porosity/cross leaks in servo apply, servo release, direct clutch, coast clutch circuits	• INSPECT for damage. PERFORM Air Pressure Check. SERVICE as required.

SHIFT CONCERNS: HARSH 3-2 SHIFT ONLY (AUTOMATIC)

Possible Component	Reference/Action
236 — ELECTRICAL ROUTINE	
Powertrain Control System • Electrical Inputs/Outputs, Vehicle Wiring Harnesses, Powertrain Control Module, EPC Solenoid, Manual Lever Position Sensor, Vehicle Speed Sensor, 3-2T/CCS, Transmission Oil Temperature Sensor, TSS, throttle position sensor, Mass Airflow Sensor, TCC solenoid	• Run OBD Tests with a scanner. SERVICE as required. CLEAR codes, ROAD TEST and RERUN OBD Tests.
336 — HYDRAULIC/MECHANICAL ROUTINE	
Main Control	
• Bolts not torqued to specifications	• RETORQUE bolts to specifications.
• Gasket damaged	• INSPECT for damage and REPLACE as required.
• 3-2 Timing Valve, Solenoid Regulator Valve, 3-2 Control Valve stuck, damaged, misassembled	• INSPECT for damage. SERVICE as required.
• Hydraulic passages damaged	• INSPECT for damage and REPLACE as required.
• Separator plates damaged or blocked	• INSPECT for damage. SERVICE as required.
• 3-2T/CCS Solenoid malfunction	• ACTIVATE solenoid using transmission tester. If Coast Clutch operation is OK PROCEED to Direct Clutch Assembly.
Direct Clutch Assembly	• PERFORM Air Pressure Check.

(Continued)

DIAGNOSIS AND TESTING (Continued)

SHIFT CONCERNS: HARSH 3-2 SHIFT ONLY (AUTOMATIC) (Cont'd)

Possible Component	Reference/Action
• Return Spring damaged, broken	• INSPECT for damage. SERVICE as required.
• Friction Elements damaged, worn	• INSPECT for damage. SERVICE as required.
• Check Ball not exhausting	• INSPECT for damage. SERVICE as required.
INT/OD Band and Servo Assembly	
• INT/OD Band and/or Reverse Clutch Drum Assembly damaged, worn or misassembled	• INSPECT for damage. SERVICE as required.
• Servo Piston damaged	• INSPECT for damage. SERVICE as required.
• Servo Return and Cushion Springs damaged, misassembled	• INSPECT for damage. SERVICE as required.
• Springs damaged, misassembled	• INSPECT for damage. SERVICE as required.
• Servo Rod bent or damaged	• INSPECT for damage. SERVICE as required.
Oil Pump Assembly	
• Bolts not torqued to specifications	• RETORQUE bolts to specifications.
• Gaskets damaged	• INSPECT for damage and REPLACE as required.
• Porosity/cross leaks	• INSPECT for porosity, leaks. REPLACE as required.
• Pump Support Seal Rings damaged or misassembled	• INSPECT for damage. SERVICE as required.
Case	
• Band Anchor damaged	• INSPECT for damage. SERVICE as required.
• Servo Rod Bore damaged	• INSPECT for damage. SERVICE as required.

TORQUE CONVERTER OPERATION CONCERN: NO APPLY

Possible Component	Reference/Action
240 — ELECTRICAL ROUTINE	
Powertrain Control System	
• Electrical Inputs/Outputs, Vehicle Wiring Harnesses, Powertrain Control Module, Transmission Oil Temperature Sensor, TCC solenoid, Brake On/Off Switch, TSS	• Run OBD Tests with a scanner. SERVICE as required. CLEAR codes, ROAD TEST and RERUN OBD Tests.
340 — HYDRAULIC/MECHANICAL ROUTINE	
Main Control	
• Bolts not torqued to specifications	• RETORQUE bolts to specifications.
• Gasket damaged	• INSPECT for damage and REPLACE as required.
• Solenoid Pressure Regulator Valve, Bypass Clutch Control Valve and Plunger, Converter Regulator Valve stuck, damaged, misassembled	• INSPECT for damage. SERVICE as required.
• TCC Solenoid malfunction	• ACTIVATE solenoid using transmission tester. SERVICE as required.
• Hydraulic passages damaged	• INSPECT for damage and REPLACE as required.
• Separator plates damaged or blocked	• INSPECT for damage. SERVICE as required.
Torque Converter Assembly	
• Leakage, Internal damage	• INSPECT for damage and leakage. PERFORM Converter checks as outlined in this manual. REPLACE as required.

TORQUE CONVERTER CLUTCH CONCERN: ALWAYS APPLIED/STALLS VEHICLE

Possible Component	Reference/Action
241 — ELECTRICAL ROUTINE	
Powertrain Control System	
• Electrical Inputs/Outputs, Vehicle Wiring Harnesses, Powertrain Control Module, Transmission Oil Temperature Sensor, TCC solenoid	• Run OBD Tests with a scanner. SERVICE as required. CLEAR codes, ROAD TEST and RERUN OBD Tests.
341 — HYDRAULIC/MECHANICAL ROUTINE	
Main Control	

(Continued)

DIAGNOSIS AND TESTING (Continued)

TORQUE CONVERTER CLUTCH CONCERN: ALWAYS APPLIED / STALLS VEHICLE (Cont'd)

Possible Component	Reference / Action
• Bolts not torqued to specifications	• RETORQUE bolts to specifications.
• Gasket damaged	• INSPECT for damage and REPLACE as required.
• Bypass Clutch Control Valve and Plunger (always applied), Converter Regulator Valve stuck, damaged, misassembled	• INSPECT for damage. SERVICE as required.
• Separator Plates damaged, blocked	• INSPECT for damage. SERVICE as required.
• TCC Solenoid malfunction NOTE: Converter clutch not applied in 1st gear or reverse gear	• ACTIVATE solenoid using transmission tester. SERVICE as required.
• Pressure Tap Plate / Gasket damaged	• INSPECT for damage. SERVICE as required.
• Hydraulic Passages damaged	• INSPECT for damage. SERVICE as required.
Oil Pump Assembly	
• Bolts not torqued to specifications	• RETORQUE bolts to specifications.
• Gaskets damaged	• INSPECT for damage and REPLACE as required.
• Pump Support # 1 Seal Ring damaged, missing, misassembled	• INSPECT for damage. SERVICE as required.
Torque Converter Assembly	
• Internal Seals damaged	• INSPECT per Service Manual procedures. SERVICE as required.
• Piston Plate damage / stuck to Cover	• If cover is heat stained, REPLACE converter.
Case	
• Porosity / cross leaks from the CBY circuit	• INSPECT for porosity / leaks. SERVICE or REPLACE case as required.

OTHER CONCERN: SHIFT LEVER EFFORTS HIGH

Possible Component	Reference / Action
251 — ELECTRICAL ROUTINE	
No Electrical Concerns	
351 — HYDRAULIC / MECHANICAL ROUTINE	
Brake Shift Interlock	• REFER to Service Manual for diagnosis.
Internal and External Shift Linkages	
• Damaged, misadjusted or misassembled	• INSPECT and SERVICE as required. ADJUST linkage as outlined in Service Manual. After servicing linkage, VERIFY that the Manual Lever Position Sensor is properly adjusted. REFER to Disassembly / Assembly procedures in Service Manual.
• Manual Control Lever damaged, park mechanism damaged, Shaft bent, Detent Lever Shaft Bore (in case) damaged, Detent Spring bent / damaged, Nut Loose	• INSPECT for damage. SERVICE as required.
Main Control	
• Bolts are not torqued to specifications	• RETORQUE bolts to specifications.
• Manual Valve stuck, damaged	• INSPECT for damage. SERVICE as required.

OTHER CONCERN: EXTERNAL LEAKS

Possible Component	Reference / Action
252 — ELECTRICAL ROUTINE	
No Electrical Concerns	
352 — HYDRAULIC / MECHANICAL ROUTINE	
Fluid	
• Improper level	• ADJUST fluid to proper level.
Seals / Gaskets	
• Differential Seals, Speedometer Gear, Retainer Seal, Pump, Main Control Cover, Servo Cover, Split Flange Gasket, Converter Impeller Hub, Manual Lever Shaft Seal, Oil Level Indicator Tube.	• LOCATE source of leak. SERVICE as required. If Differential Seal or Converter Impeller Hub is leaking, INSPECT drain back holes in Case / Converter Housing. INSPECT surface of Linkshaft or Front Wheel Driveshaft and Joint for a rough surface. Rough surface may cause seal leakage. SERVICE as required.
Other	
• Oil Tube Fitting, Line Pressure Tap, Pressure Port Plugs, Drain Plug, Oil Cooler Tubes, Case porosity, Case cracked	• LOCATE source of leak. SERVICE as required.
• Vent blocked or damaged	• CHECK vent for damage or blockage. SERVICE as required.

(Continued)

DIAGNOSIS AND TESTING (Continued)

OTHER CONCERN: EXTERNAL LEAKS (Cont'd)

Possible Component	Reference/Action
• Bolts at Split Flange or Main Control Cover leaking	• INSPECT for leaks. SERVICE as required.
Sensors/Connectors • Transmission Connector, Manual Lever Position Sensor, TSS Sensor or Seal	• LOCATE source of leak. SERVICE as required.

OTHER CONCERN: POOR VEHICLE PERFORMANCE

Possible Component	Reference/Action
253 — ELECTRICAL ROUTINE	
Powertrain Control System • Base Engine Concerns. • Electrical Inputs/Outputs, Vehicle Wiring Harnesses, Powertrain Control Module, Transmission Oil Temperature Sensor, TCC Solenoid, Manual Lever Position Sensor, Throttle Position Sensor	• REFER to the Engine section of the Service Manual. • Run OBD Tests with a scanner. SERVICE as required. CLEAR codes. ROAD TEST and RERUN OBD Tests.
353 — HYDRAULIC/MECHANICAL ROUTINE	
Internal and External Shift Linkages or Manual Lever Position Sensor • Damaged, misadjusted or misassembled	• INSPECT and SERVICE as required. ADJUST linkage as outlined in Service Manual. After servicing linkage, VERIFY that the Manual Lever Position Sensor is properly adjusted. REFER to Disassembly/Assembly procedures in Service Manual.
Verify Proper Shift Scheduling and Engagements	• GO to the appropriate Diagnostic Routines per Index.
Torque Converter Clutch Always Applied	• GO to Routine #341.
Torque Converter OWC Clutch • Damaged	• PERFORM Service Manual inspection procedures. SERVICE or REPLACE as required.

OTHER CONCERN: 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: • Torque Converter Components • Fluid Level (Low) Pump cavitation • Oil Pump Assembly • Engine Drive Accessories • Oil Cooler Tubes grounding out • Flywheel • Inspection Cover	• LOCATE source of disturbance. SERVICE as required.
For Noises/Vibrations that Change with Vehicle Speed: • Powertrain Mounts Loose, Damaged • Tires • Driveline Concerns: Front Wheel Driveshaft and Joint or Linkshaft, Differential: Final Drive/Chain, Suspension, Modifications • Planetary Gear Sets	• LOCATE source of disturbance. SERVICE as required. For Specific Shifts or Torque Converter concerns, REFER to appropriate routines as listed in the index.
• Chain grounding to Chain Pan • FWD OWC • Torque Converter Assembly	• INSPECT Chain Pan for signs of damage or misinstallation. SERVICE as required.
• LH and RH Front Wheel Driveshaft and Joint Splines worn, damaged • Speedometer Cable or Gears	• INSPECT for damage. SERVICE as required.
Other Noises/Vibrations: • Transmission Shift Cable and Bracket Vibration, Grounding. • Cooler Lines Grounding	• LOCATE source of disturbance. SERVICE as required.

DIAGNOSIS AND TESTING (Continued)

OTHER CONCERN: ENGINE WILL NOT CRANK

Possible Component	Reference/Action
255 — ELECTRICAL ROUTINE	
Powertrain Control System • Base Engine Concerns • Electrical Inputs/Outputs, Vehicle Wiring Harnesses, Powertrain Control Module, Manual Lever Position Sensor (damaged/misadjusted)	• Run OBD Tests with a scanner. SERVICE as required. CLEAR codes, ROAD TEST and RERUN OBD Tests.
355 — HYDRAULIC/MECHANICAL ROUTINE	
Starter/Flywheel • Damaged or misassembled	• INSPECT for damage, misassembly. SERVICE as required.
Internal and External Shift Linkages or Manual Lever Position Sensor • Damaged, misadjusted or misassembled	• ADJUST linkage as outlined in Service Manual. After servicing linkage, VERIFY that the Manual Lever Position Sensor is properly adjusted. REFER to Disassembly/Assembly procedures in Service Manual.

OTHER CONCERN: NO PARK RANGE

Possible Component	Reference/Action
256 — ELECTRICAL ROUTINE	
No Electrical Concerns	
356 — HYDRAULIC/MECHANICAL ROUTINE	
Internal or External Shift Linkages • Damaged, misadjusted or misassembled	• INSPECT and SERVICE as required. ADJUST linkage as outlined in Service Manual. After servicing linkage, VERIFY that the Manual Lever Position Sensor is properly adjusted. REFER to the Disassembly/Assembly procedures in Service Manual.
Park Mechanism • Park Gear on Driven Sprocket Assembly, Parking Pawl Return Spring, Park Pawl Ratcheting Springs, Parking Pawl Shaft, Manual Control Lever, Cam Apply Lever, Manual Lever Detent Spring, Manual Lever Position Sensor, Parking Pawl Apply Cam, Manual Shaft nut damaged, missing or misassembled	• INSPECT for damage. SERVICE as required.

OTHER CONCERN: TRANSAXLE OVERHEATING

Possible Component	Reference/Action
257 — ELECTRICAL ROUTINE	
Powertrain Control System • Electrical Inputs/Outputs, Vehicle Wiring Harnesses, Powertrain Control Module, TCC Solenoid, Transmission Oil Temperature Sensor, TSS	• Run OBD Tests with a scanner. SERVICE as required. CLEAR codes. ROAD TEST and RERUN OBD Tests.
357 — HYDRAULIC/MECHANICAL ROUTINE	
Vehicle Concerns Causing Engine Overheating	• REFER to Engine section of Service Manual for diagnosis.
Fluid • Improper level • Condition	• ADJUST fluid to proper level. • INSPECT per Service Manual instructions under Fluid Condition Check. If fluid is aerated, CHECK Thermo Valve and Filter Seals. SERVICE as required.
Oil Cooler Tubes • Damaged, blocked, reversed	• INSPECT for damage. SERVICE as required.
Intake Cooler • Damaged, blocked, restricted or leaking	• INSPECT for damage. SERVICE as required.

(Continued)

DIAGNOSIS AND TESTING (Continued)

OTHER CONCERN: TRANSAXLE OVERHEATING (Cont'd)

Possible Component	Reference/Action
Auxiliary Cooler (If equipped)	
• Damaged, blocked, restricted, improperly installed	• INSPECT for damage or improper installation. SERVICE as required.
Main Control	
• Bolts not torqued to specifications	• RETORQUE bolts to specifications.
• Main Regulator Valve, Bypass Clutch Control Valve, Converter Regulator Valve stuck, damaged, misassembled	• INSPECT for damage. SERVICE as required.
• Hydraulic Passages damaged	• INSPECT for damage. SERVICE as required.
• Separator Plates/Gaskets damaged	• INSPECT for damage. SERVICE as required.
• TCC Solenoid malfunction (OFF)	• ACTIVATE solenoid using transmission tester. SERVICE as required.
Torque Converter Clutch - No Apply	• SEE Routine #240/340.
Oil Pump Assembly	
• Gasket damaged	• INSPECT for damage and REPLACE as required.
• Rear Lube Passage blocked	• INSPECT for damage. SERVICE as required.
Chain Pan	
• Missing	• INSPECT for missing pan. INSTALL pan if missing.
Thermostatic Oil Level Control Valve	
• Stuck open or damaged	• INSPECT for damage. SERVICE as required.
• Gasket damaged or missing	• INSPECT for damage and REPLACE as required.
• Bolt or bracket damaged, missing, or improperly installed	• INSPECT for damage. SERVICE as required.
Case/Converter Housing/Stator Support	
• Front Lube Passage blocked or restricted • TC, CI, CT Passages blocked or restricted	• INSPECT passages. REFER to Service Manual for identification of passages. SERVICE as required.

OTHER CONCERN: NO ENGINE BRAKING IN MANUAL 1ST POSITION

Possible Component	Reference/Action
258 — ELECTRICAL ROUTINE	
Powertrain Control System	
• Electrical Inputs/Outputs, Vehicle Wiring Harnesses, Powertrain Control Module, 3-2 Timing/Coast Clutch Solenoid	• Run OBD Tests with a scanner. SERVICE as required. CLEAR codes. ROAD TEST and RERUN OBD Tests. Perform Stall Speed Tests.
358 — HYDRAULIC/MECHANICAL ROUTINE	
Main Controls	
• Bolts not torqued to specifications	• RETORQUE bolts to specifications.
• Gaskets damaged	• INSPECT for damage and REPLACE as required.
• Low/Reverse Modulator Valve, Coast Clutch Valve stuck damaged or misassembled	• INSPECT for damage. SERVICE as required.
• 3-2 Timing/Coast Clutch Solenoid stuck or damaged	• INSPECT for damage, contamination. ACTIVATE solenoid with transmission tester. SERVICE as required.
• Hydraulic Passages damaged	• INSPECT for damage. SERVICE as required.
• Pressure Tap Plate/Gasket damaged	• INSPECT for damage. SERVICE as required.
• Separator Plate/Gasket damaged	• INSPECT for damage. SERVICE as required.
Coast Clutch Assembly	
• Assembly misassembled, damaged	• INSPECT for damage. SERVICE as required.
• Forward Clutch Hub Seal damaged	• INSPECT for damage. SERVICE as required.
• Piston or Seals damaged	• INSPECT for damage. SERVICE as required.
• Ball check damaged, missing	• INSPECT for damage. SERVICE as required.
Low/Reverse Clutch Assembly	• PERFORM Air Pressure Check.
• Assembly misassembled, damaged	• INSPECT for damage. SERVICE as required.
• Piston or Seals damaged	• INSPECT for damage. SERVICE as required.
Oil Pump Assembly	
• Pump Support #2 or #3 Seal Rings for the Coast Clutch circuit damaged, missing	• INSPECT for damage. SERVICE as required.

DIAGNOSIS AND TESTING (Continued)

OTHER CONCERN: NO ENGINE BRAKING IN DRIVE (TCS ON) OR MANUAL 2ND POSITION

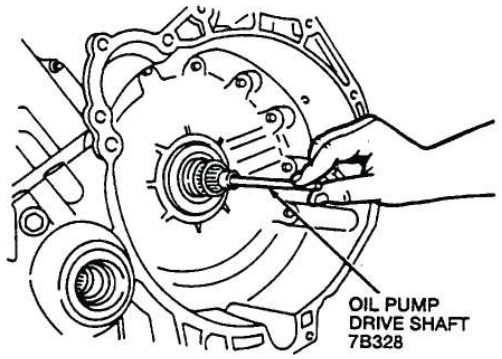
Possible Component	Reference/Action
259 — ELECTRICAL ROUTINE	
Powertrain Control System • Electrical Inputs/Outputs, Vehicle Wiring Harnesses, Powertrain Control Module, 3-2 Timing/Coast Clutch Solenoid	• Run OBD Tests with a scanner. SERVICE as required. CLEAR codes. ROAD TEST and RERUN OBD Tests. Perform Stall Speed Tests.
359 — HYDRAULIC/MECHANICAL ROUTINE	
Internal or External Shift Linkages • Damaged, misadjusted or misassembled	• INSPECT and SERVICE as required. ADJUST linkage as outlined in Service Manual. After servicing linkage, VERIFY that the Manual Lever Position Sensor is properly adjusted. REFER to Disassembly/Assembly procedures in Service Manual.
Main Controls • 3-4 Shift Valve, 1-2 Shift Valve, Pullin Valve, Coast Clutch Control Valve stuck, damaged • 3-2 Timing/Coast Clutch Solenoid stuck or damaged	• INSPECT for damage. SERVICE as required. • INSPECT for damage, contamination. ACTIVATE solenoid with transmission tester. SERVICE as required.
Forward OWC Assembly • Damaged, misassembled	• INSPECT for damage. SERVICE as required.
Coast Clutch Assembly • Assembly misassembled, damaged • Forward Clutch hub Seal damaged • Piston or Seals damaged • Ball check damaged, missing	• INSPECT for damage. SERVICE as required. • INSPECT for damage. SERVICE as required. • INSPECT for damage. SERVICE as required. • INSPECT for damage. SERVICE as required.
Oil Pump Assembly • Pump Support #2 or #3 Seal Rings for the Coast Clutch circuit damaged, missing	• INSPECT for damage. SERVICE as required.

OTHER CONCERN: VEHICLE MOVEMENT WITH GEAR SELECTOR IN THE "N" POSITION

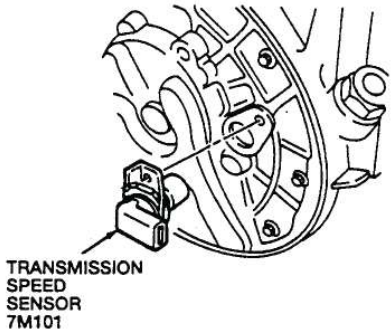
Possible Component	Reference/Action
262 — ELECTRICAL ROUTINE	
No Electrical Concerns	
362 — HYDRAULIC/MECHANICAL ROUTINE	
Internal or External Shift Linkages • Damaged, misadjusted or misassembled	• INSPECT and SERVICE as required. ADJUST linkage as outlined in Service Manual. After servicing linkage, VERIFY that the Manual Lever Position Sensor is properly adjusted. REFER to Disassembly/Assembly procedures in Service Manual.
Oil Pump Assembly • Gaskets severely damaged • Pump Support Seal Ring #2, leakage from Lube Circuit into FC Circuit	• INSPECT for damage and REPLACE as required. • INSPECT for damage. SERVICE as required.
Forward/Coast Clutch Assembly • Friction plates severely damaged • Return Spring damaged • Ball Check damaged, missing	• INSPECT for damage. SERVICE as required. • INSPECT for damage. SERVICE as required. • INSPECT for damage. SERVICE as required.

DISASSEMBLY

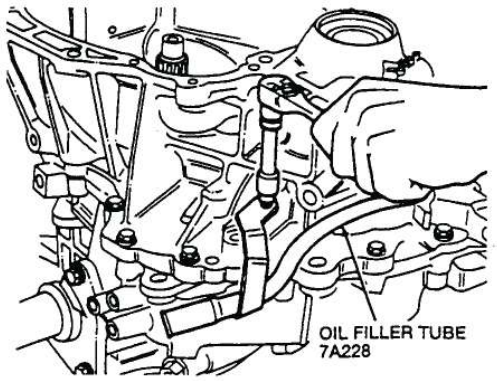
Remove the oil pump drive shaft by pulling it from the end of the turbine shaft assembly.



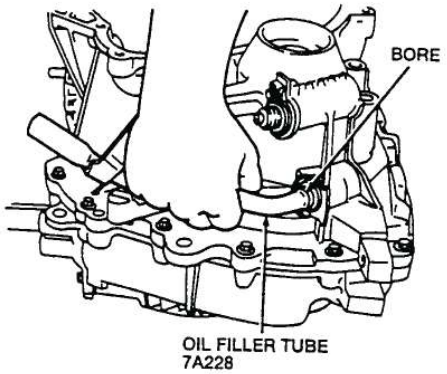
Pull the transmission speed sensor from the bore.



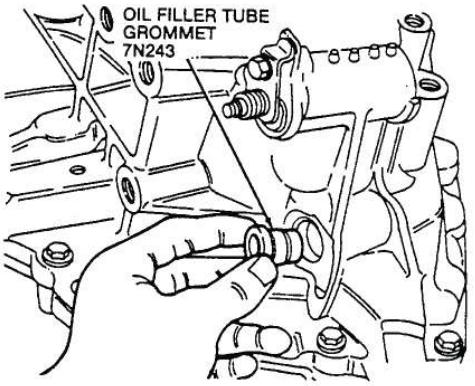
Remove the oil filler tube bolt.



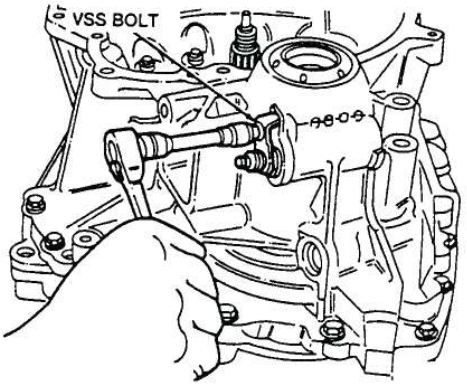
Pull the oil filler tube from the bore.



Remove the oil filler tube and discard the oil filler tube grommet.

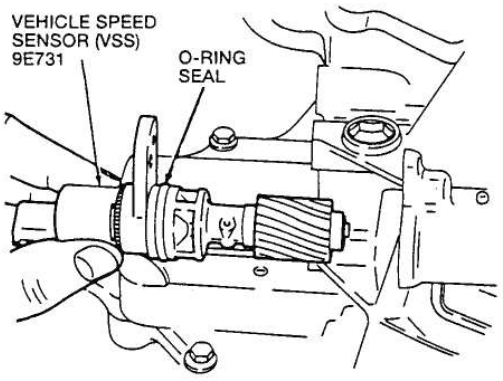


Remove the Vehicle Speed Sensor (VSS) bolt using an 8mm socket.



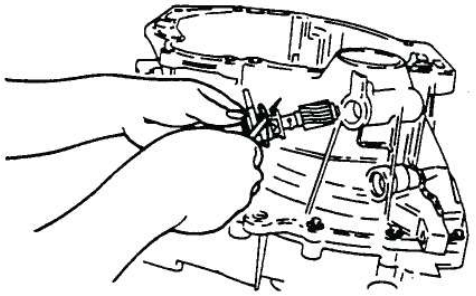
DISASSEMBLY (Continued)

Remove the VSS from the bore.

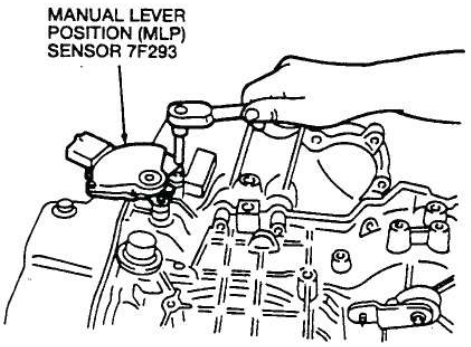


Inspect the VSS teeth for chips, nicks or concave teeth.

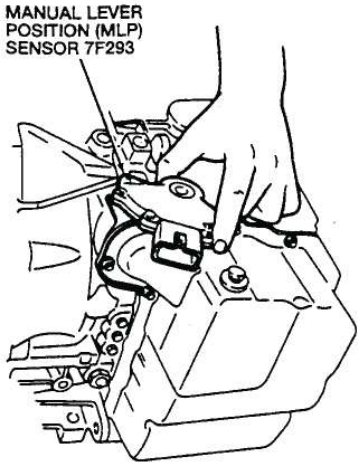
Remove the O-ring from the VSS. Discard the O-ring.



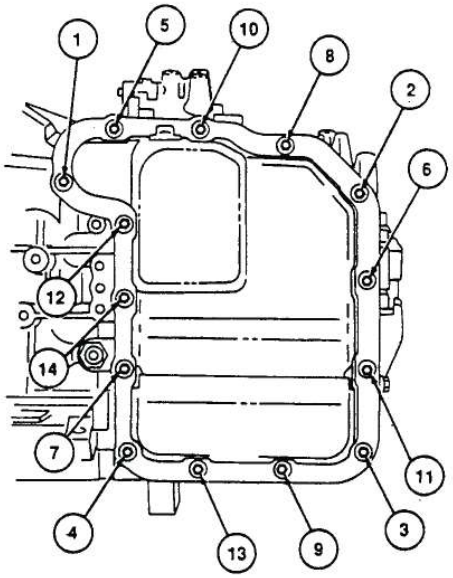
Use an 8mm socket to remove the two Manual Lever Position (MLP) sensor bolts.



Pull the MLP sensor from the manual valve detent lever shaft.



Use an 8mm socket to remove the fourteen main control cover bolts in the sequence shown.



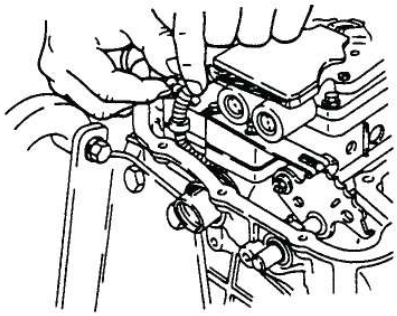
Pull the main control cover assembly from the transaxle case.

Separate the main control cover assembly from the main control cover gasket. Discard the main control cover gasket.

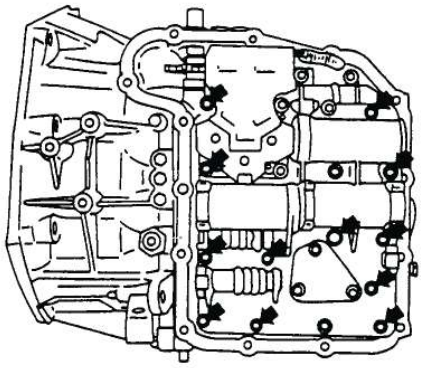
Inspect the main control cover vent assembly and main control cover grommet.

DISASSEMBLY (Continued)

Remove wiring harness clip from main control.

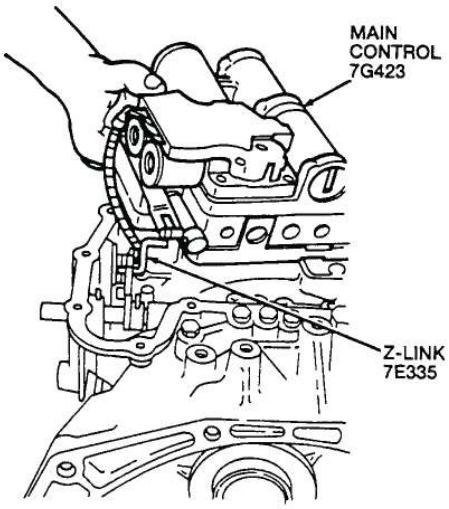


Remove the twelve main control bolts.



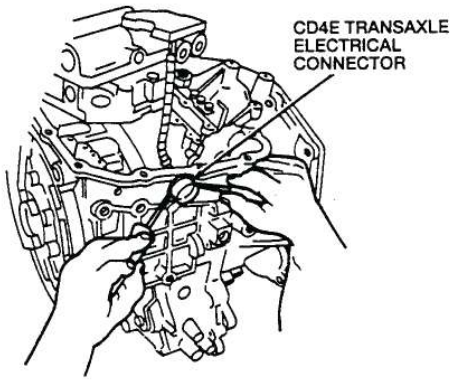
CAUTION: Do not allow loose manual valve to become damaged.

Pull the main control slightly away from the transaxle case. Disconnect the Z-link from the manual valve.



CAUTION: Do not pull on the connector wires or use a hammer on the connector.

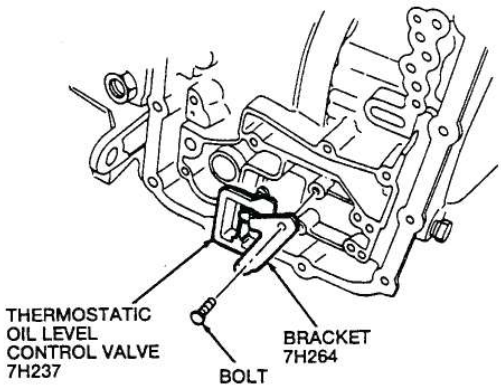
Squeeze the retainer tabs of the electrical connector and remove the connector from the bore in the case. Inspect the O-ring for damage.



Remove the main control from the transaxle case and store in a clean location.

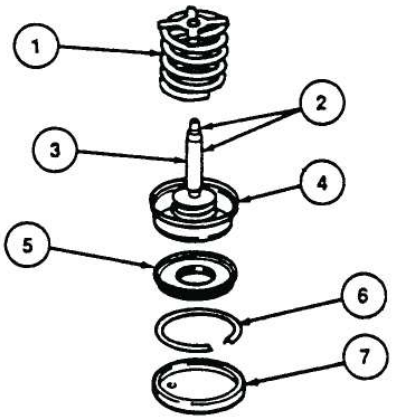
Remove the thermostatic oil level control valve bracket bolt. Remove the bracket.

Pull the thermostatic oil level control valve from the transaxle case.



DISASSEMBLY (Continued)

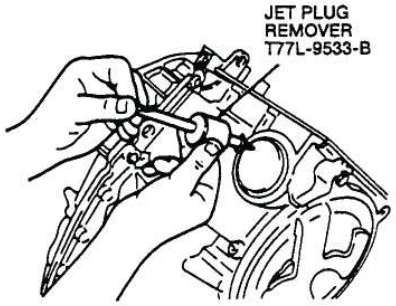
Intermediate and Overdrive Servo



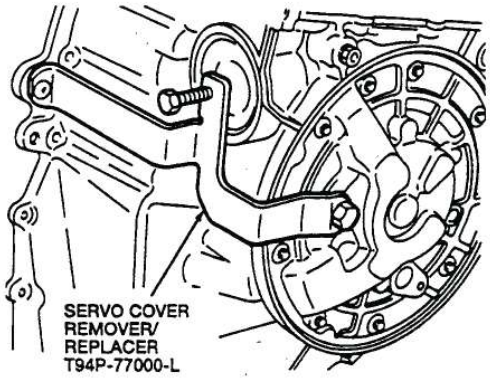
Item	Part Number	Description
1	7F201	Intermediate and Overdrive Servo Return Spring Assembly
2	—	Intermediate and Overdrive Servo Apply Rod Identification Groove Area
3	—	Intermediate and Overdrive Servo Apply Rod (Part of 7H188)
4	—	Intermediate and Overdrive Servo Piston (Part of 7H188)
5	7D027	Servo Cover
6	7H074	Servo Cover Retaining Ring
7	7D027	Servo Cover Cap

WARNING: THE SERVO COVER IS UNDER PRESSURE.

Remove servo cover cap from the transaxle case using Jet Plug Remover T77L-9533-B. Discard servo cover cap.

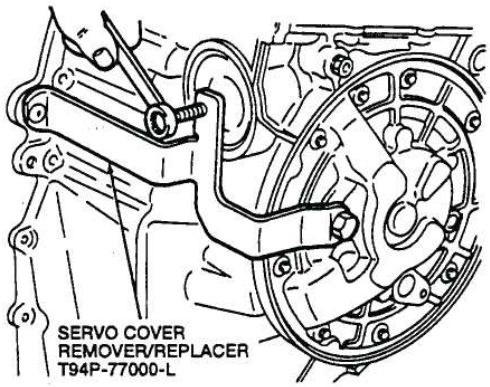


Using a 17mm socket, attach the Servo Cover Remover / Replacer T94P-77000-L to the oil pump assembly.



WARNING: SERVO AND SERVO COVER ARE UNDER HIGH SPRING FORCE.

Use a 15mm socket and screw in the bolt to compress the servo cover assembly and remove the servo cover retaining ring.

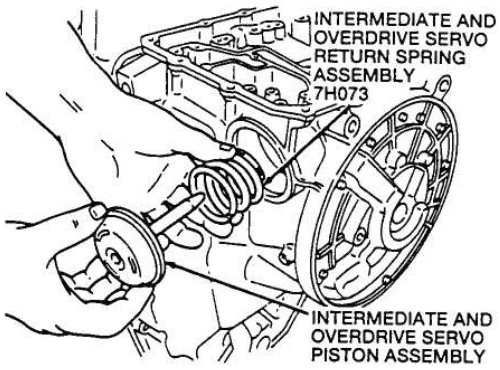


Remove Servo Cover Remover / Replacer.

Remove the servo cover assembly.

DISASSEMBLY (Continued)

Remove the intermediate and overdrive servo piston and return spring.

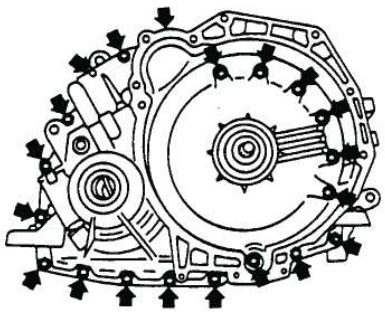


Inspect the following intermediate and overdrive servo parts for damage and wear:

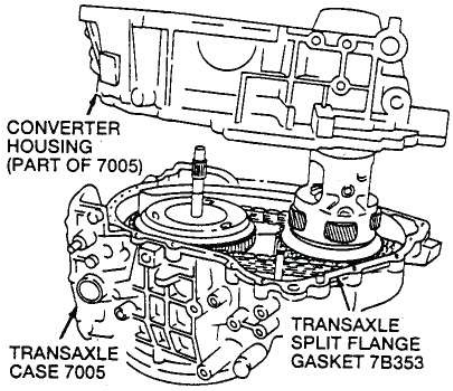
- Cover with integral seal
- Return spring.
- Apply rod and retaining clip.
- Piston with integral seal.
- Cushion spring and backup washer.
- Case servo bore.

Position the transaxle so the converter housing faces up.

Use a 10mm socket to remove the twenty converter housing-to-transaxle case bolts.



Separate the converter housing from the transaxle case.

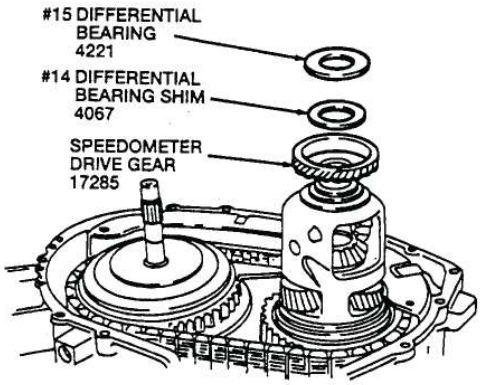


Remove the transaxle split flange gasket from the converter housing. Discard the transaxle split flange gasket.

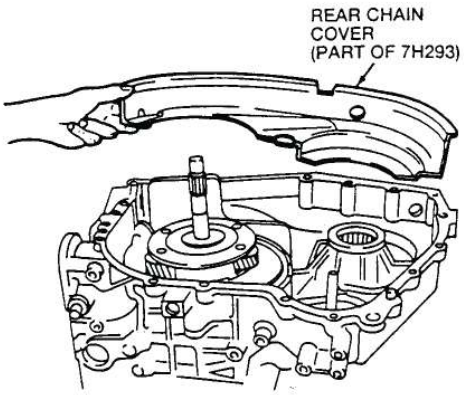
Remove the # 15 differential bearing (4221).

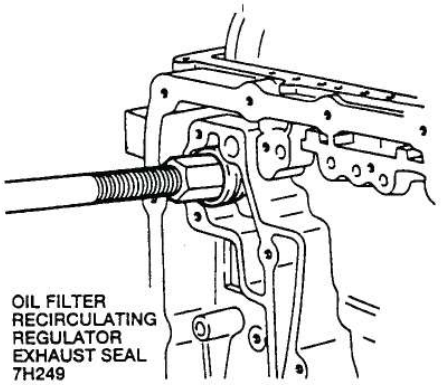
Remove the # 14 differential bearing shim (4067) (selective fit) from the final drive carrier and differential assembly.

Remove the speedometer drive gear from the final drive carrier and differential assembly.



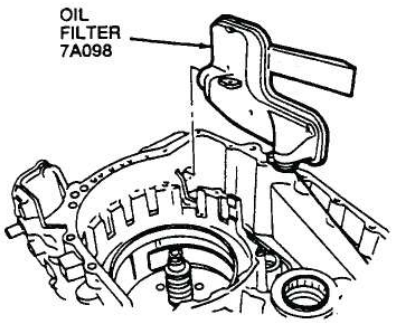
Remove the rear chain cover (with the magnet attached) from the transaxle case. Check the magnet for excessive metal particles.



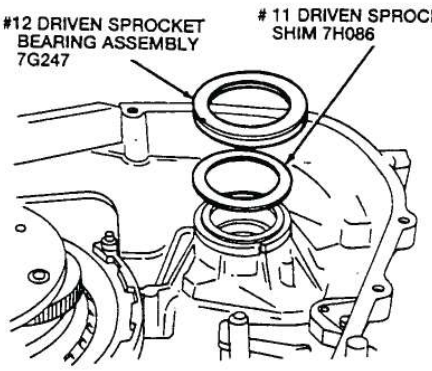


Remove and discard oil filter recirculating regulator exhaust seal.

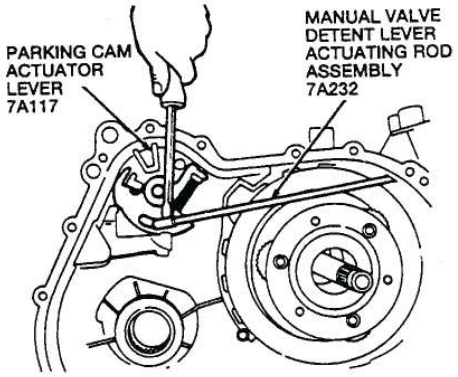
Remove the oil filter and seal assembly. Discard the oil filter and seal assembly.



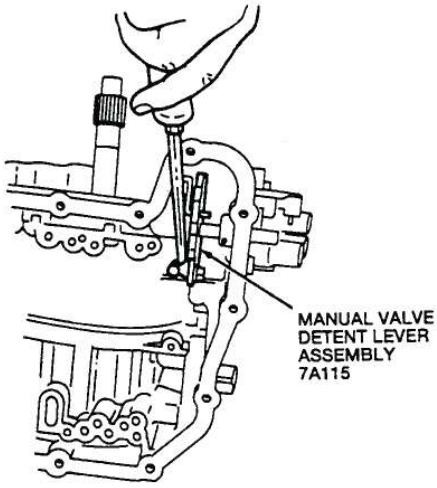
Remove the # 12 driven sprocket bearing assembly and the # 11 driven sprocket shim (selective fit) from the transaxle case.



Unsnap the socket end of the manual valve detent lever actuating rod assembly from the parking cam actuator lever assembly.

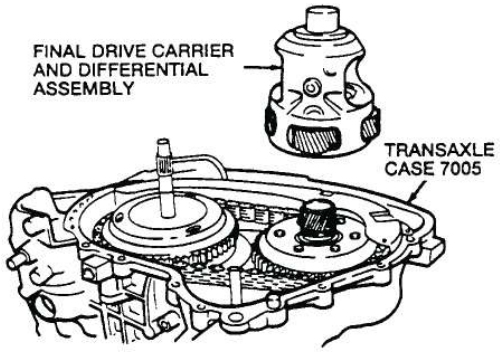


Unsnap the socket end of the manual valve detent lever actuating rod assembly from the manual valve detent lever assembly.

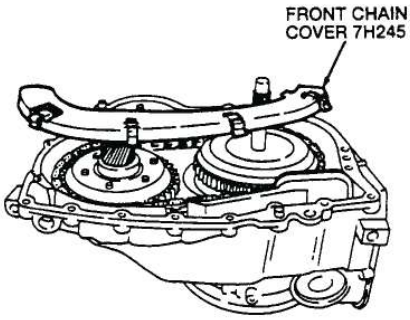


DISASSEMBLY (Continued)

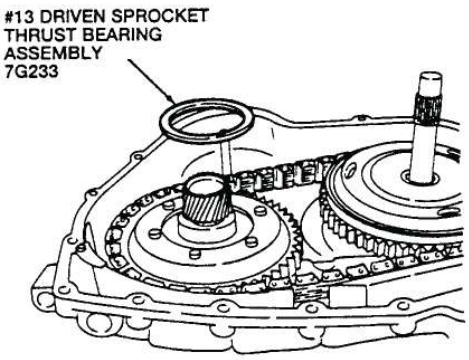
Remove the final drive carrier and differential assembly.



Remove the front chain cover by unsnapping it from the rear chain cover.

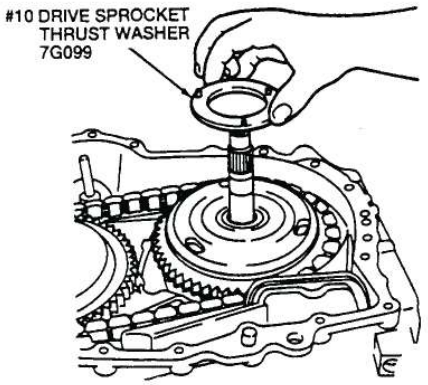


Remove the # 13 driven sprocket thrust bearing assembly.



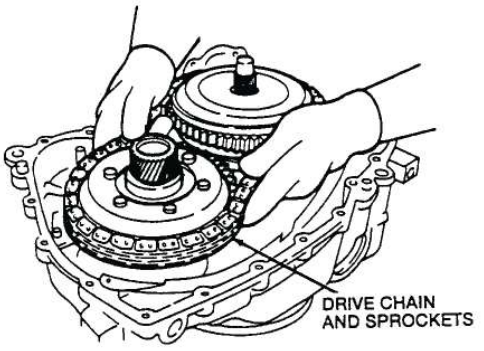
NOTE: The # 10 drive sprocket thrust washer (7G099) may be attached to the converter housing.

Remove the # 10 drive sprocket thrust washer from the Reverse / Overdrive ring gear assembly.

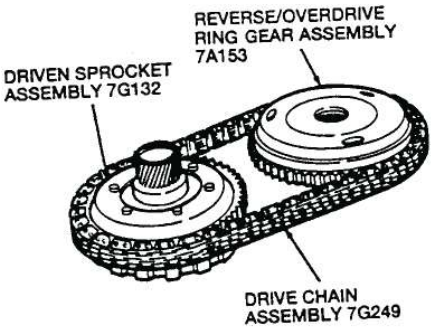


WARNING: WEAR GLOVES AS PROTECTION FROM SHARP CHAIN AND SPROCKET TEETH.

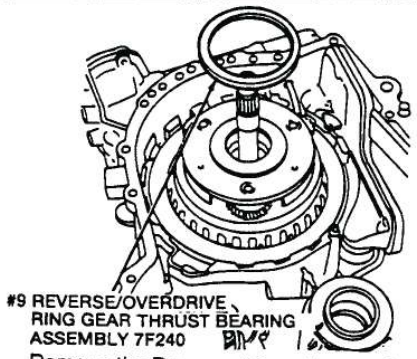
Lift the drive chain assembly, driven sprocket assembly, and the Reverse / Overdrive ring gear assembly together from the transaxle case.



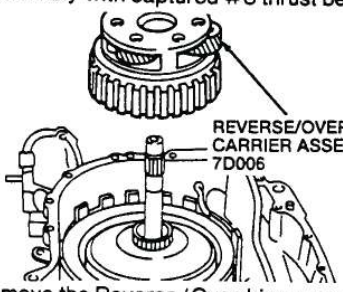
Separate the drive chain assembly from the driven sprocket assembly, and the Reverse / Overdrive ring gear assembly.



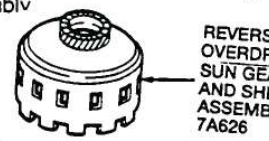
DISASSEMBLY (Continued

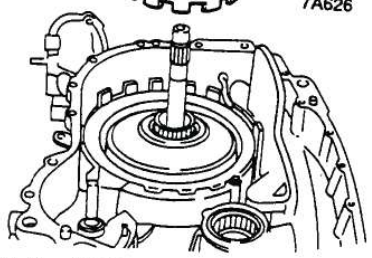


Remove the Reverse / Overdrive carrier assembly with captured #8 thrust bearing.



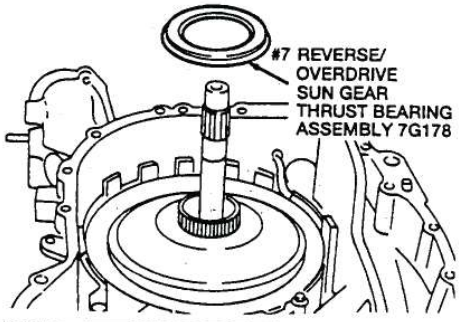
Remove the Reverse / Overdrive sun gear and shell assembly



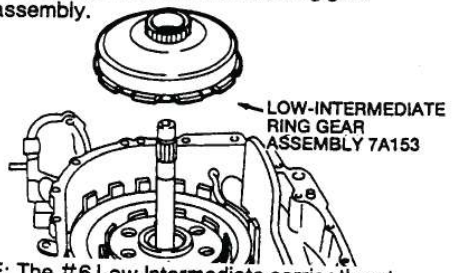


NOTE: The #7 Reverse / Overdrive sun gear thrust bearing assembly may be attached to the Reverse / Overdrive sun gear and shell assembly.

62. Remove the #7 Reverse / Overdrive sun gear thrust bearing assembly.

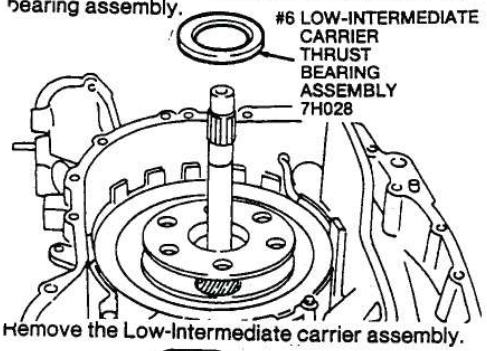


Remove the Low-Intermediate ring gear assembly.

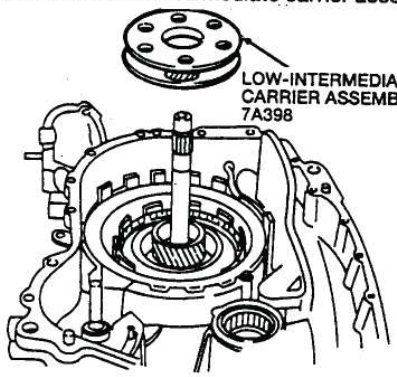


NOTE: The #6 Low-Intermediate carrier thrust bearing assembly may be attached to the Low-Intermediate ring gear assembly.

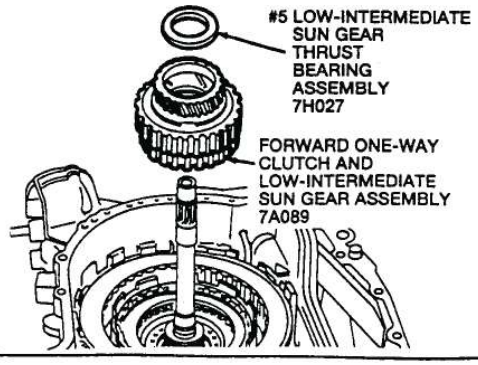
Remove the #6 Low-Intermediate carrier thrust bearing assembly.



Remove the Low-Intermediate carrier assembly.



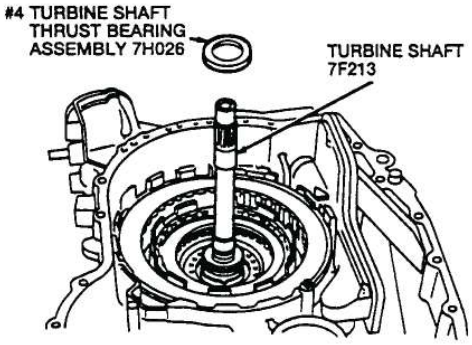
Remove the #5 Low-Intermediate sun gear thrust bearing assembly and the forward one-way clutch and Low-Intermediate sun gear assembly.



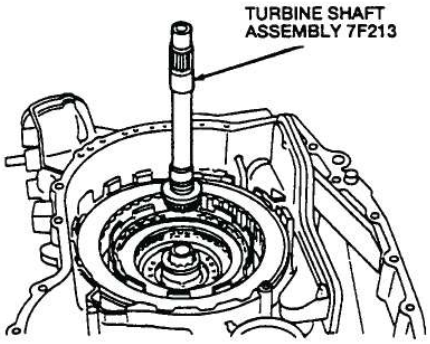
DISASSEMBLY (Continued)

NOTE: THe #4 turbine shaft thrust bearing assembly may be attached to the forward one-way clutch and Low-Intermediate sun gear assembly.

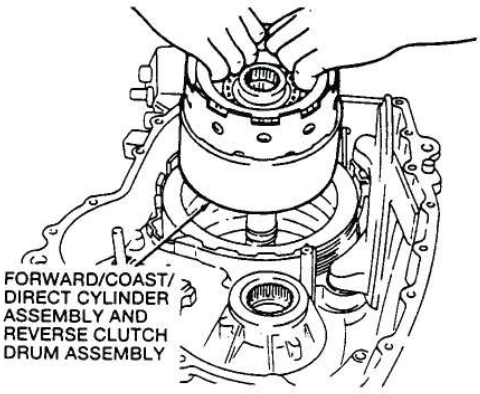
Remove the #4 turbine shaft thrust bearing assembly.



Remove the turbine shaft assembly.

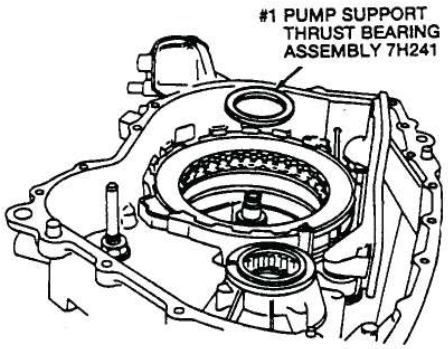


Remove the assembly of the Forward/Coast/Direct (F/C/D) cylinder assembly and reverse clutch drum assembly.

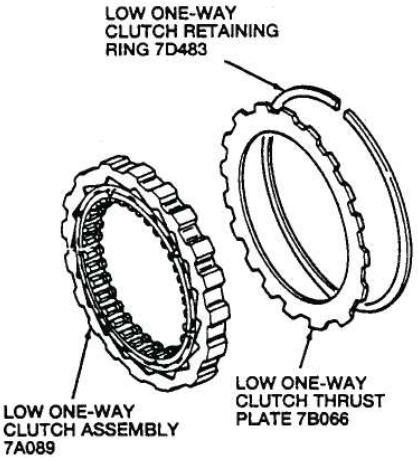


NOTE: The # 1 pump support thrust bearing assembly may be attached to the reverse clutch drum assembly

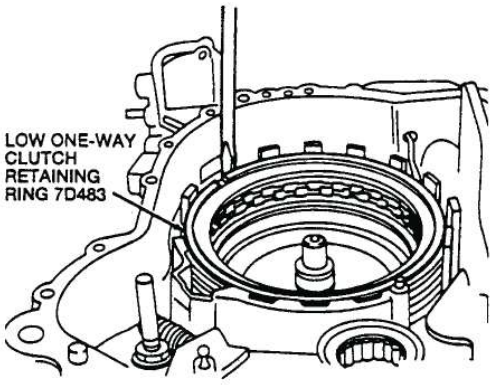
Remove the # 1 pump support thrust bearing assembly.



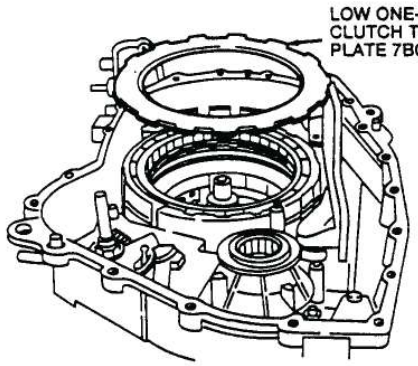
Low One-Way Clutch Assembly



Remove the low one-way clutch retaining ring.

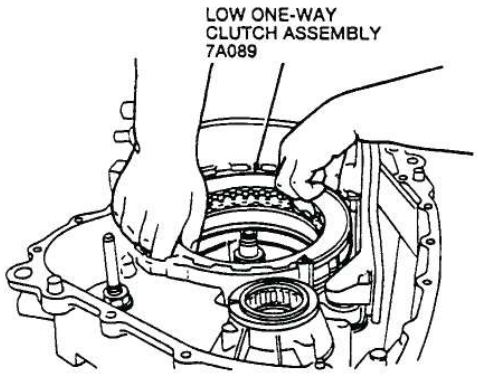


Remove the low one-way clutch thrust plate.

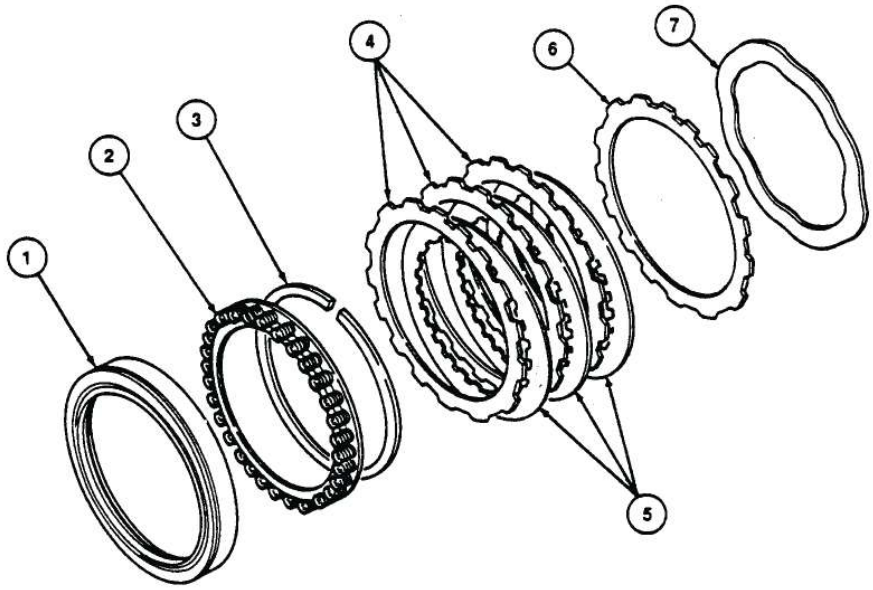


NOTE: The low one-way clutch assembly should be removed as an assembly.

Remove the low one-way clutch assembly.



Low/Reverse Clutch



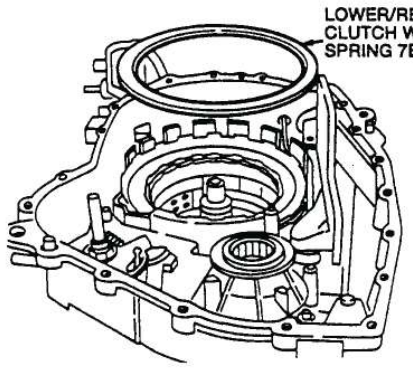
Item	Part Number	Description
1	7D402	Low/Reverse Clutch Piston
2	7H064	Low/Reverse Clutch Return Spring Assembly
3	7D483	Low/Reverse Clutch Return Spring Assembly Retaining Ring
4	7B442	Low/Reverse Clutch External Spline Clutch Plates (Steel)

Item	Part Number	Description
5	7B164	Low/Reverse Clutch Internal Spline Clutch Plates (Friction)
6	7B066	Low/Reverse Clutch Pressure Plate
7	7B070	Low/Reverse Clutch Wave Spring

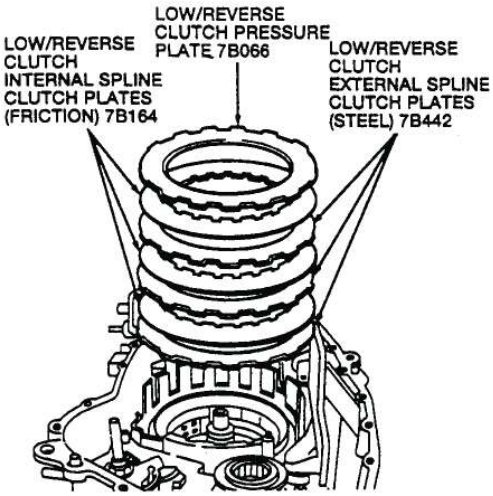
(Continued)

DISASSEMBLY (Continued)

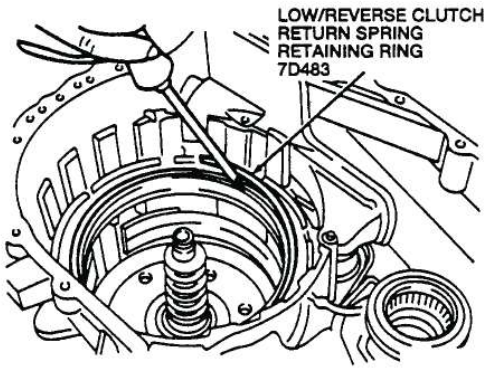
Remove the low / reverse clutch wave spring.



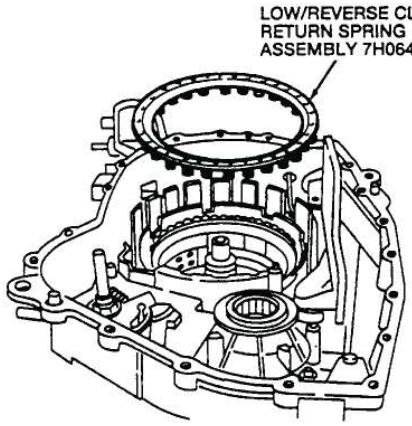
Remove the low / reverse clutch plates.



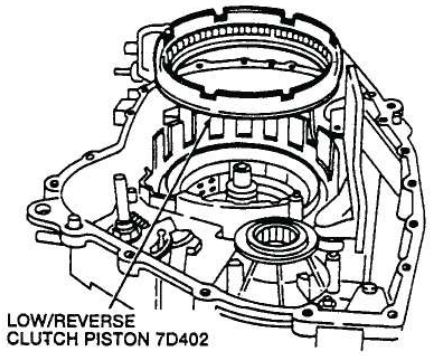
Use a screwdriver to remove the low / reverse clutch return spring retaining ring.



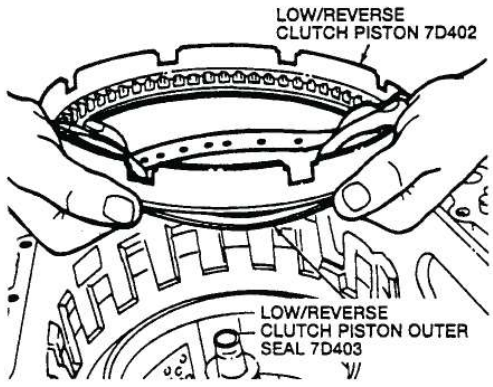
Remove the low / reverse clutch return spring assembly.



Pull the low / reverse clutch piston from the bore.

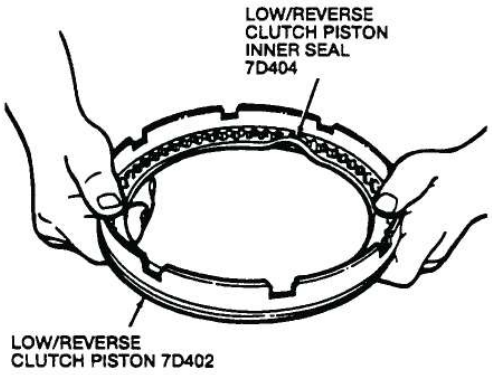


Remove the low / reverse clutch piston outer seal from the low / reverse clutch piston. Discard the outer seal.

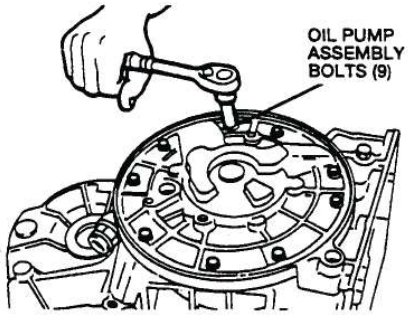


DISASSEMBLY (Continued)

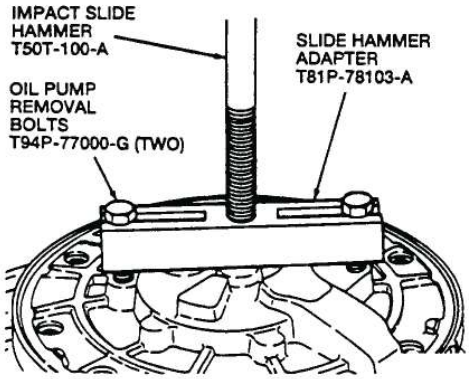
Remove the low / reverse clutch piston inner seal from the low / reverse clutch piston. Discard the inner seal.



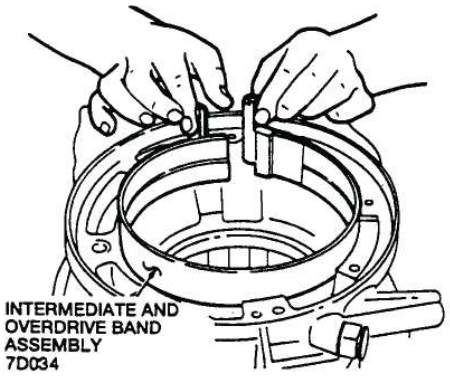
Position the transaxle with the oil pump assembly facing up. Use an 8mm socket to remove the nine oil pump assembly bolts.



Install Slide Hammer Adapter T81P-78103-A, Oil Pump Removal Bolts T94P-77000-G and Impact Slide Hammer T50T-100-A and remove the oil pump assembly from the transaxle case.



Slide the intermediate and overdrive band assembly from the case.



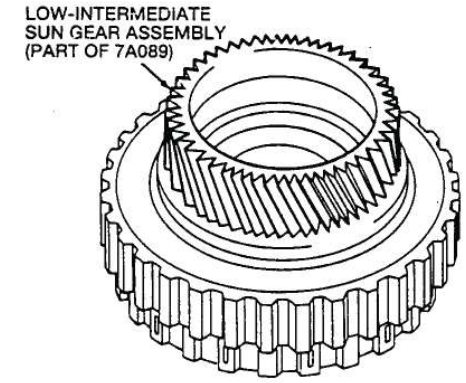
Inspect the intermediate and overdrive band assembly for wear.

DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES

Planetary Gearsets and Chain Drive Parts

Inspect the Low-Intermediate sun gear assembly (part of the forward one-way clutch) for damage and wear:

- Gear teeth
- Thrust bearing surfaces
- Bushing surface

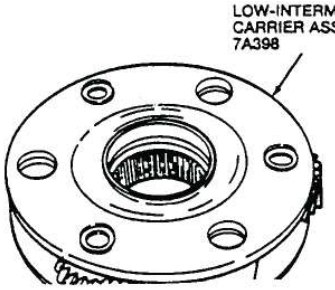


Inspect the Low-Intermediate carrier assembly:

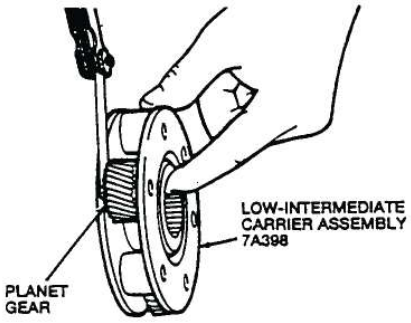
- Pinion gear teeth
- Spline teeth

DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES (Continued)

- Pinion gear surfaces
- Bushing surfaces
- Pinion gear bearings

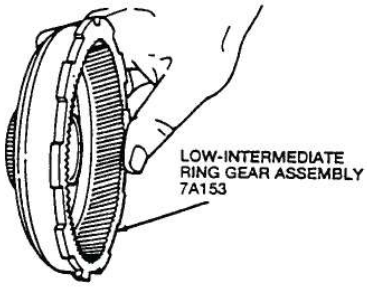


Inspect the Low-Intermediate carrier assembly pinion gear end play. End play should be between 0.15 to 0.72mm (0.006 to 0.028 inch).



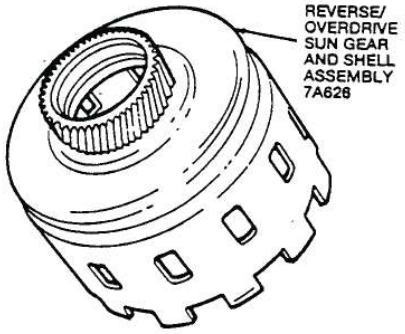
Inspect the Low-Intermediate ring gear assembly:

- Gear teeth
- Spline teeth
- Thrust bearing surfaces
- Bushing surface
- Lug teeth



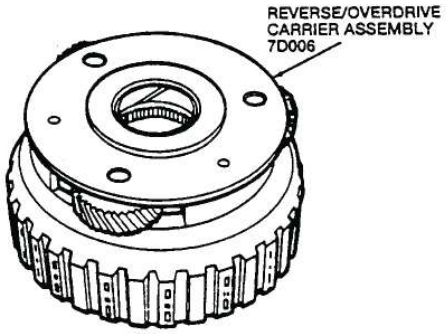
Inspect the Reverse / Overdrive sun gear and shell assembly for damage and wear:

- Gear teeth
- Lug teeth
- Thrust bearing surfaces
- Bushing surface

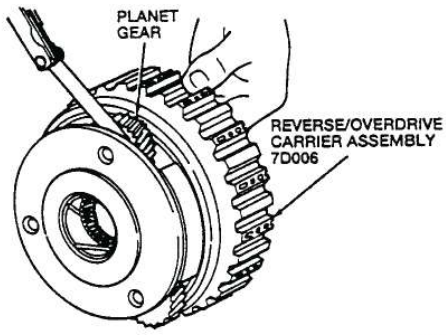


Inspect the Reverse / Overdrive carrier assembly:

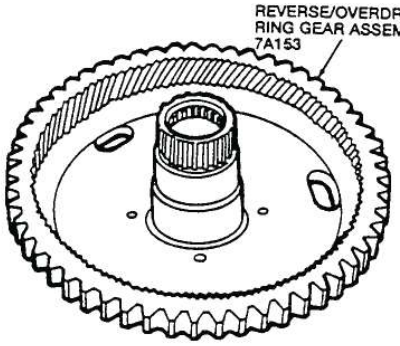
- Pinion gear teeth
- Clutch plate spline teeth
- Pinion gear bearings
- Thrust bearing surfaces
- Bushing surfaces
- #8 Thrust bearing captured between the pinions and carrier



Inspect the Reverse / Overdrive carrier assembly pinion gear end play. End play should be between 0.15 to 0.72mm (0.005 to 0.039 inch).

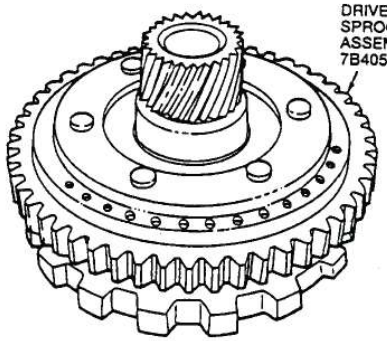


DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES (Continued)



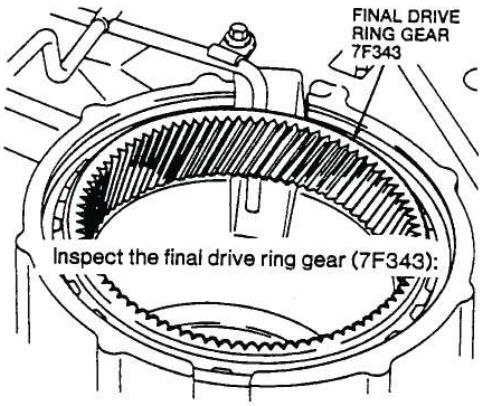
Inspect the driven sprocket assembly:

- Gear teeth
- Parking lock lug teeth
- Driven sprocket teeth
- Thrust bearing surfaces
- Bearing surfaces
- Rivets
- Bushing surfaces
- Lube holes

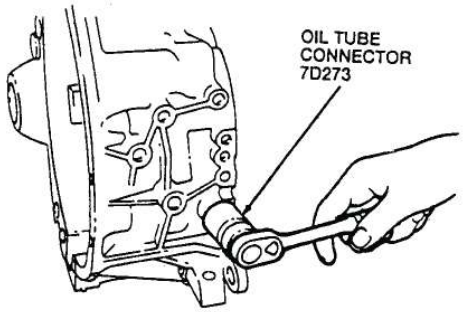


Inspect drive chain assembly for excessive stretching, wear, or tight links.

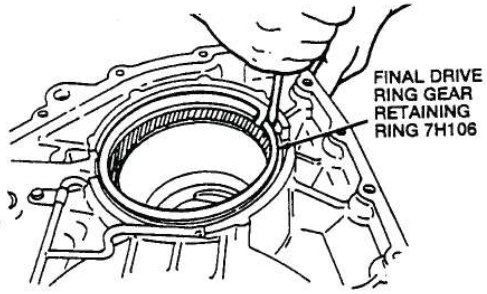




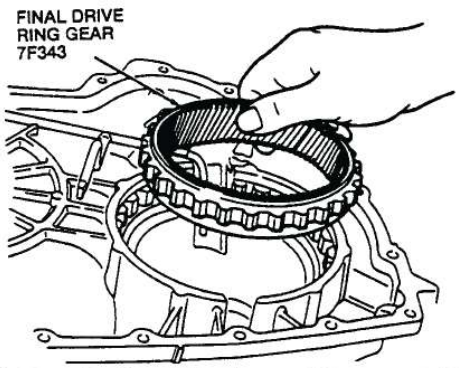
Inspect the final drive ring gear (7F343):



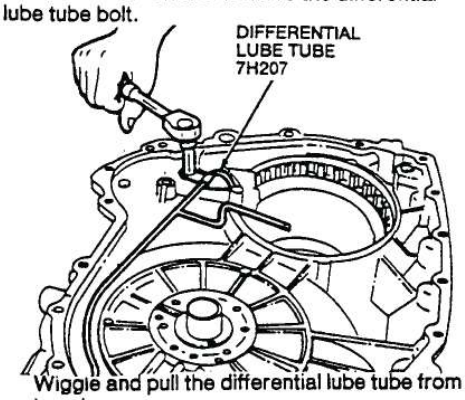
Remove the final drive ring gear retaining ring.



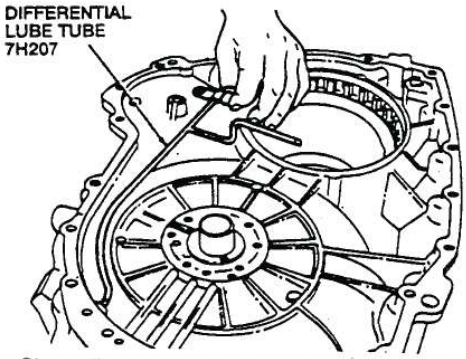
Lift the final drive ring gear from the converter housing. Inspect the gear and housing lug teeth.



Use an 8mm socket to remove the differential lube tube bolt.



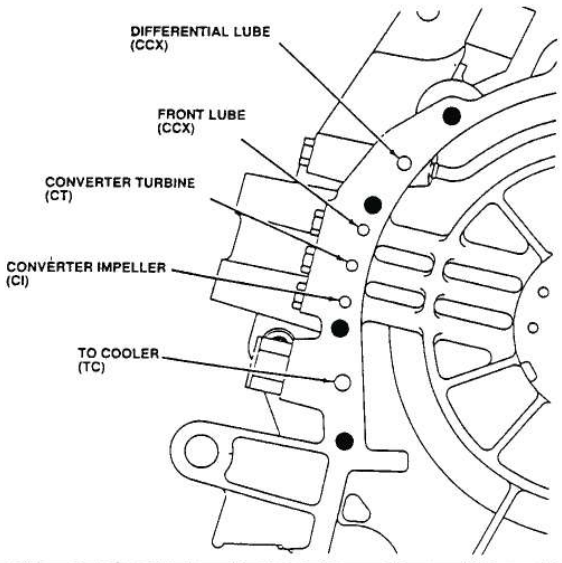
Wiggle and pull the differential lube tube from the housing.



Clean all parts thoroughly in clean solvent and blow dry with moisture-free compressed air.

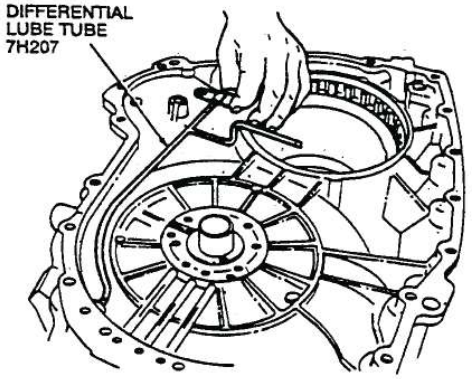
HYDRAULIC PASSAGES

CONVERTER HOUSING

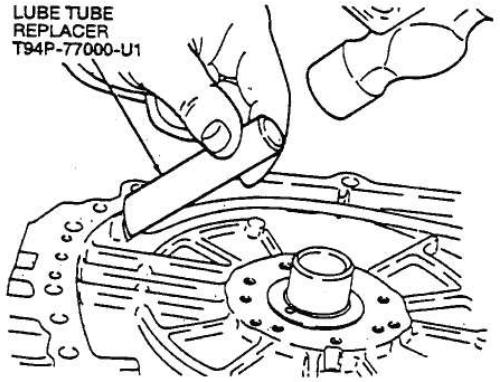


Assembly

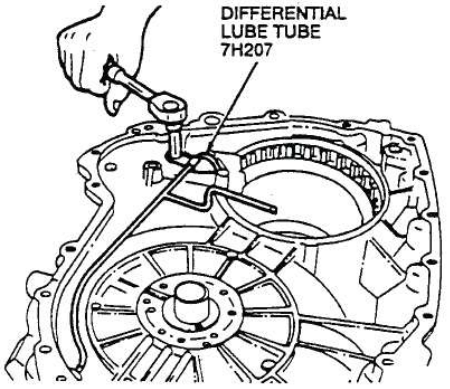
Push the differential lube tube into the converter housing.



Seat the end of the differential lube tube with a Lube Tube Replacer T94P-77000-V1 (part of Lube Tube Replacer Set T94P-77000-U).



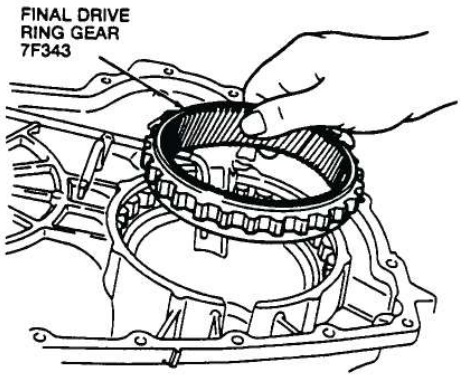
Use an 8mm socket to install and tighten the differential lube tube bolt to 13 N·m (10 lb-ft).



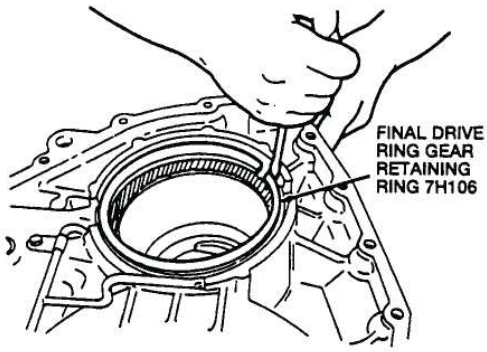
DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES (Continued)

NOTE: The final drive ring gear will fit easily into the converter housing. If it does not, flip the final drive ring gear over.

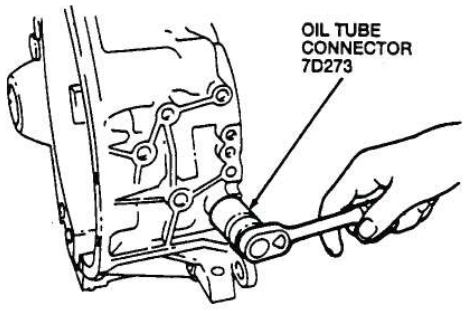
Lower the final drive ring gear into the housing.



Install the final drive ring gear retaining ring.



Install the oil tube connector on the converter housing. Tighten the oil tube connector to 40 N·m (30 lb-ft).



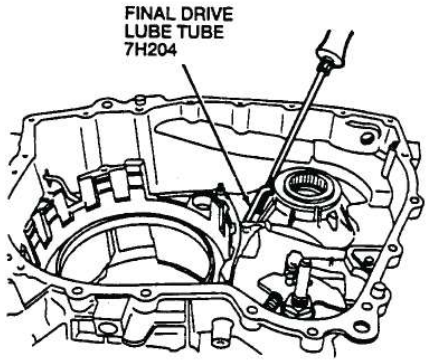
Transaxle Case

Disassembly

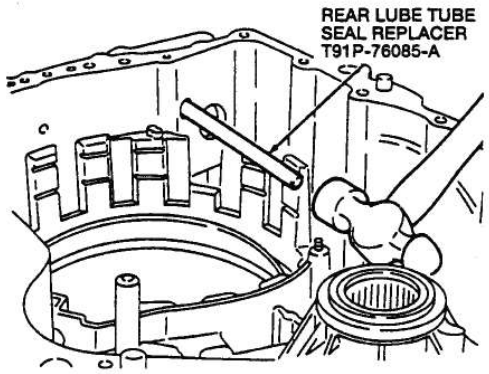
SPECIAL SERVICE TOOL(S) REQUIRED

Description	Tool Number
Rear Lube Tube Seal Replacer	T91P-76085-A
Threaded Drawbar	T75T-1176-A
O-Ring Tool	T71P-19703-C
Needle Bearing Remover / Replacer	T94P-77000-E1
Servo Plug Replacer / Needle Bearing Receiver	T94P-77000-E2
Throttle Shaft Seal Replacer	T81P-70337-A
Lube Tube Replacer	T94P-77000-U2

Use a screwdriver to remove the final drive lube tube from the transaxle case.

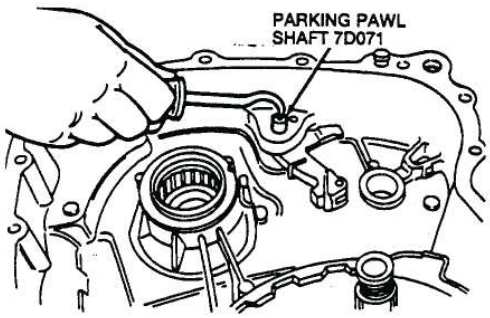


Use Rear Lube Tube Seal Replacer T91P-76085-A to remove the final drive lube tube seal from the transaxle case.

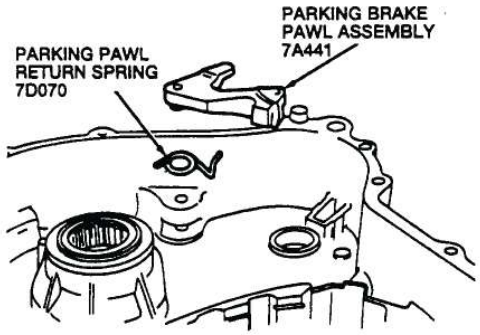


DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES (Continued)

Use O-Ring Tool T71P-19703-C to remove the parking pawl shaft.

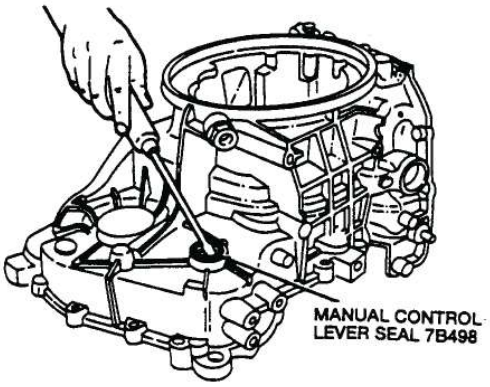


Remove the parking brake pawl assembly and parking pawl return spring.

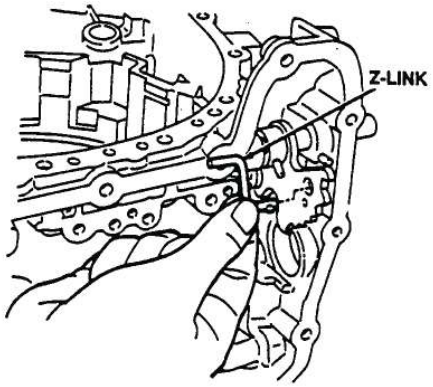


CAUTION: Do not damage the transaxle case bore during seal removal.

Use a screwdriver to remove the manual control lever seal. Discard the seal.



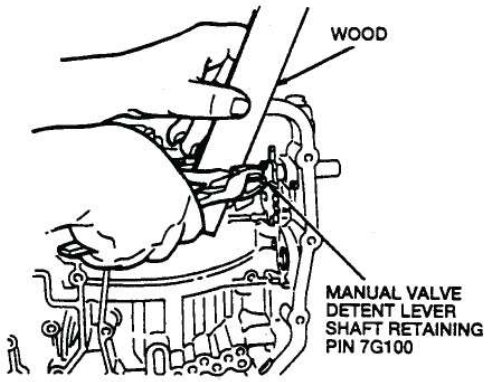
Remove the manual valve actuator rod (Z-link).



CAUTION: Do not damage the transaxle case sealing surface.

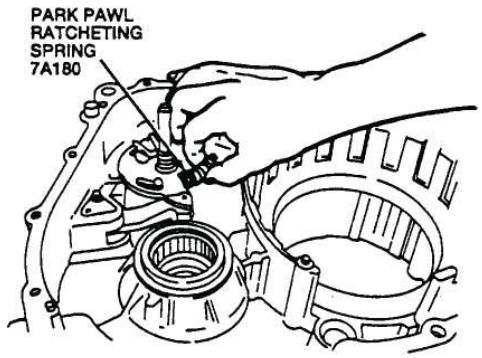
NOTE: There are two retaining pins, one on either side of the manual valve detent lever (7A115).

Protect the transaxle case with wood and use a pair of side cutters to remove the manual valve detent lever shaft retaining pin. Discard the manual valve detent lever shaft retaining pin.

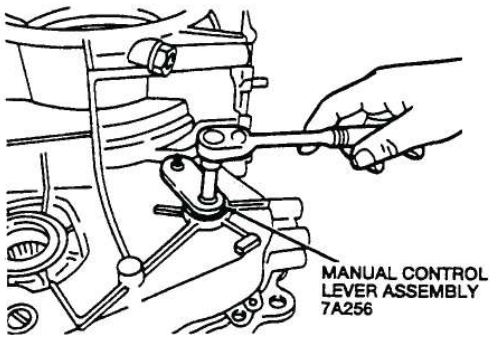


DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES (Continued)

Remove the park pawl ratcheting spring.

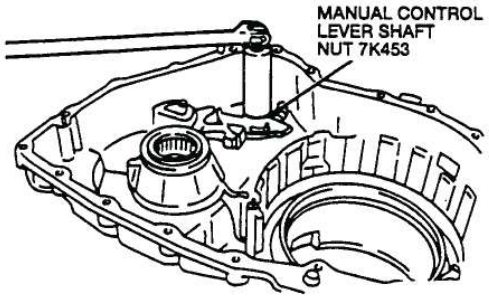


Use a 10mm socket to remove the manual control lever bolt.

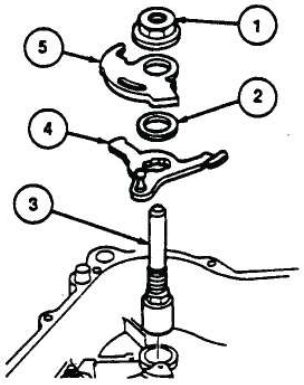


Remove the manual control lever assembly.

Use a 24mm socket to remove the manual control lever shaft nut.

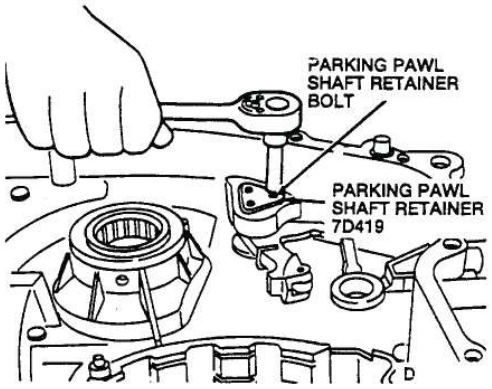


Remove the parking pawl actuating cam, parking cam actuator lever, park lever spacer (7F286), and manual control lever shaft.



Item	Part Number	Description
1	7K453	Manual Control Lever Shaft Nut
2	7F286	Park Lever Spacer
3	7C493	Manual Control Lever Shaft
4	7A117	Parking Cam Actuator Lever Assembly
5	7F354	Parking Pawl Actuating Cam

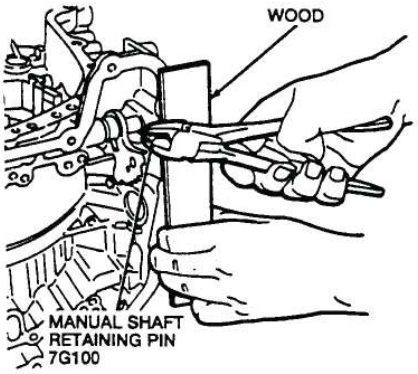
Use a 7mm socket to remove the parking pawl shaft retainer and bolt assembly.



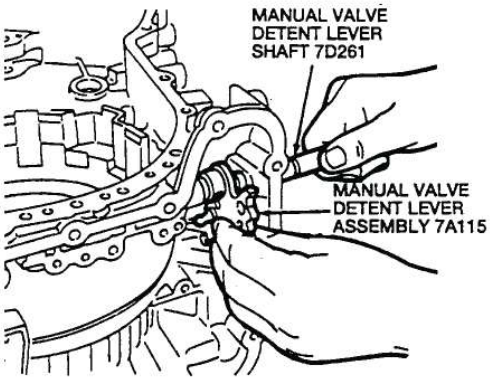
DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES (Continued)

CAUTION: Do not damage the transaxle case sealing surface.

Protect the case with wood and use a pair of side cutters to remove the manual shaft retaining pin (7G100). Discard the manual shaft retaining pin.

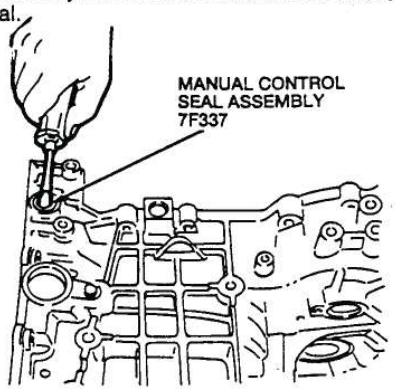


Remove the manual valve detent lever assembly and manual valve detent lever shaft from the transaxle case.

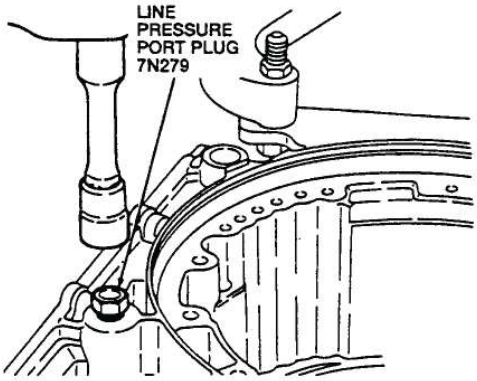


CAUTION: Do not damage the transaxle case during seal removal.

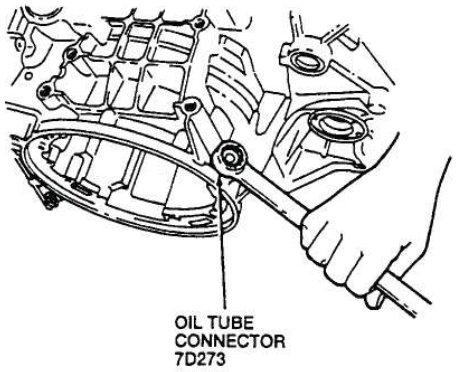
Use a screwdriver to remove the manual control seal assembly from the transaxle case. Discard the seal.



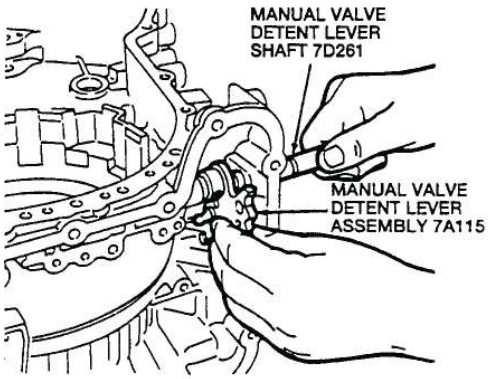
Remove the line pressure port plug from the transaxle case.



Remove the oil tube connector. Inspect the oil tube connector seal.



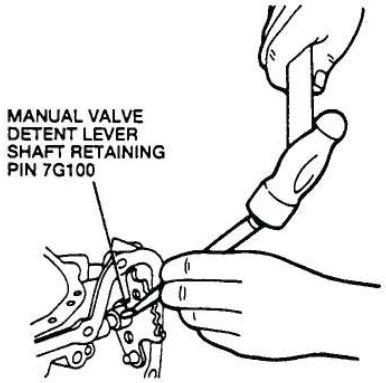
Install the manual valve detent lever assembly and manual valve detent lever shaft into the case.



DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES (Continued)

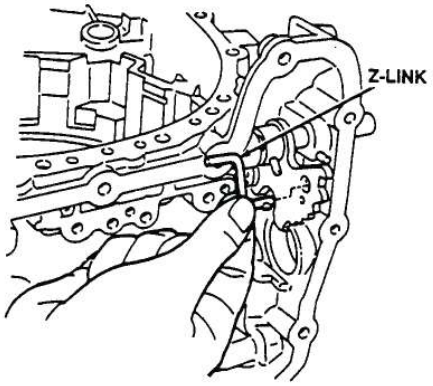
CAUTION: Do not allow the manual shaft retaining pin to make contact with the transaxle case.

Use a hammer and a punch to install the manual valve detent lever shaft retaining pin.

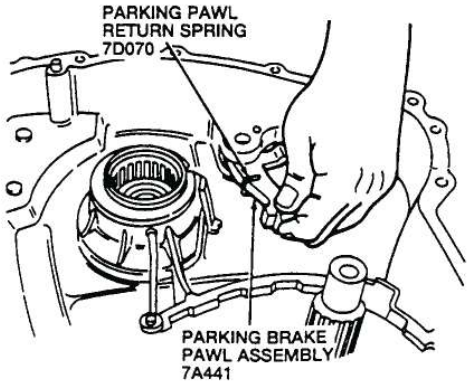


Verify that the manual valve detent lever assembly rotates freely.

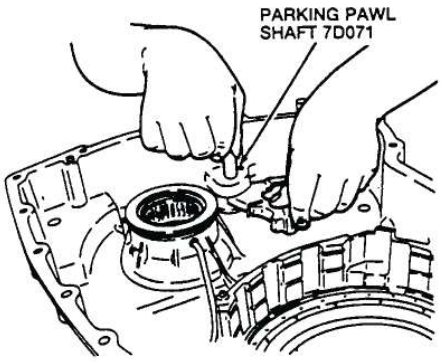
Install the manual valve actuator rod (Z-link).



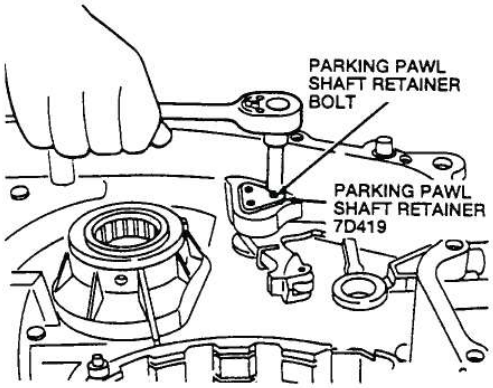
Install the parking brake pawl assembly and parking pawl return spring.



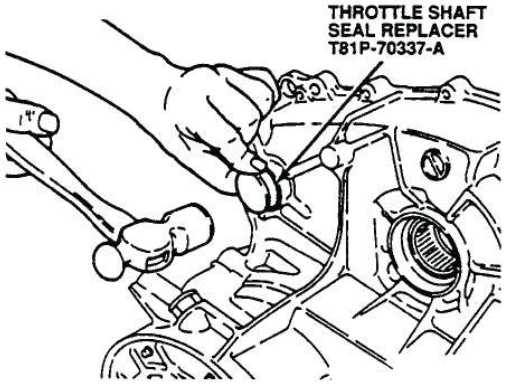
Install the parking pawl shaft.



Install the parking pawl shaft retainer and bolt assembly. Use a 7mm socket to tighten the parking pawl shaft retainer bolt to 8 N·m (6 lb-ft).

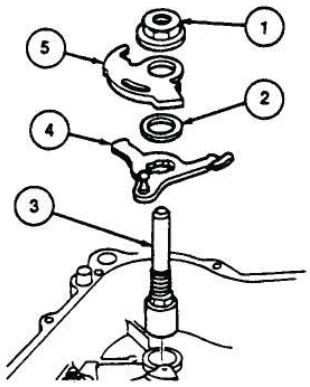


Use Throttle Shaft Seal Replacer T81P-70337-A or equivalent to install the manual control lever seal.



DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES (Continued)

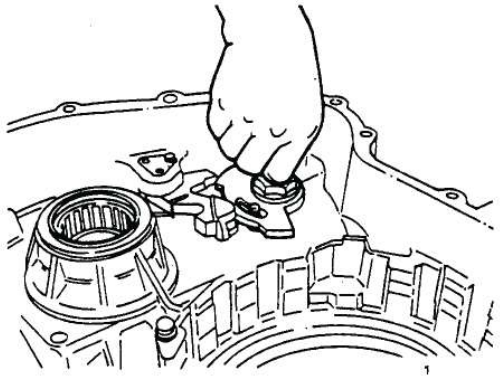
Assemble the parking pawl actuating cam, parking cam actuator lever assembly, park lever spacer on the manual control lever shaft.



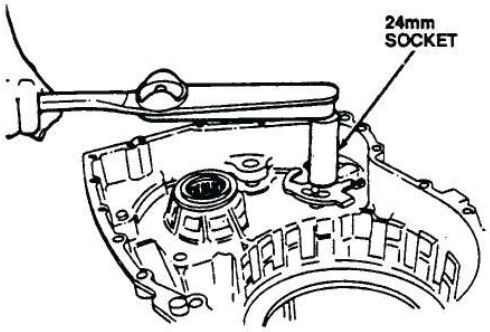
Item	Part Number	Description
1	7K453	Manual Control Lever Shaft Nut
2	7F286	Park Lever Spacer
3	7C493	Manual Control Lever Shaft
4	7A117	Parking Cam Actuator Lever Assembly
5	7F354	Parking Pawl Actuating Cam

NOTE: Verify that the manual control lever shaft assembly can move freely.

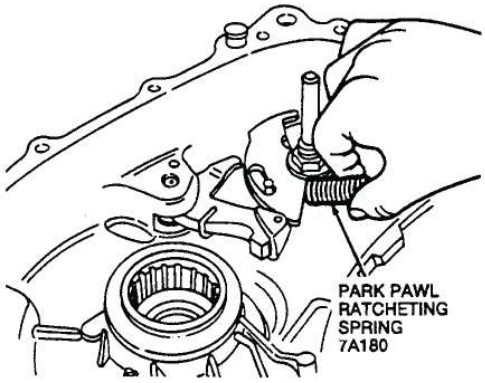
16. Install the manual control lever shaft assembly into the transaxle case.



Install the manual control lever shaft nut. Use a 24mm socket to tighten the manual control lever shaft nut to 74 N·m (55 lb-ft).

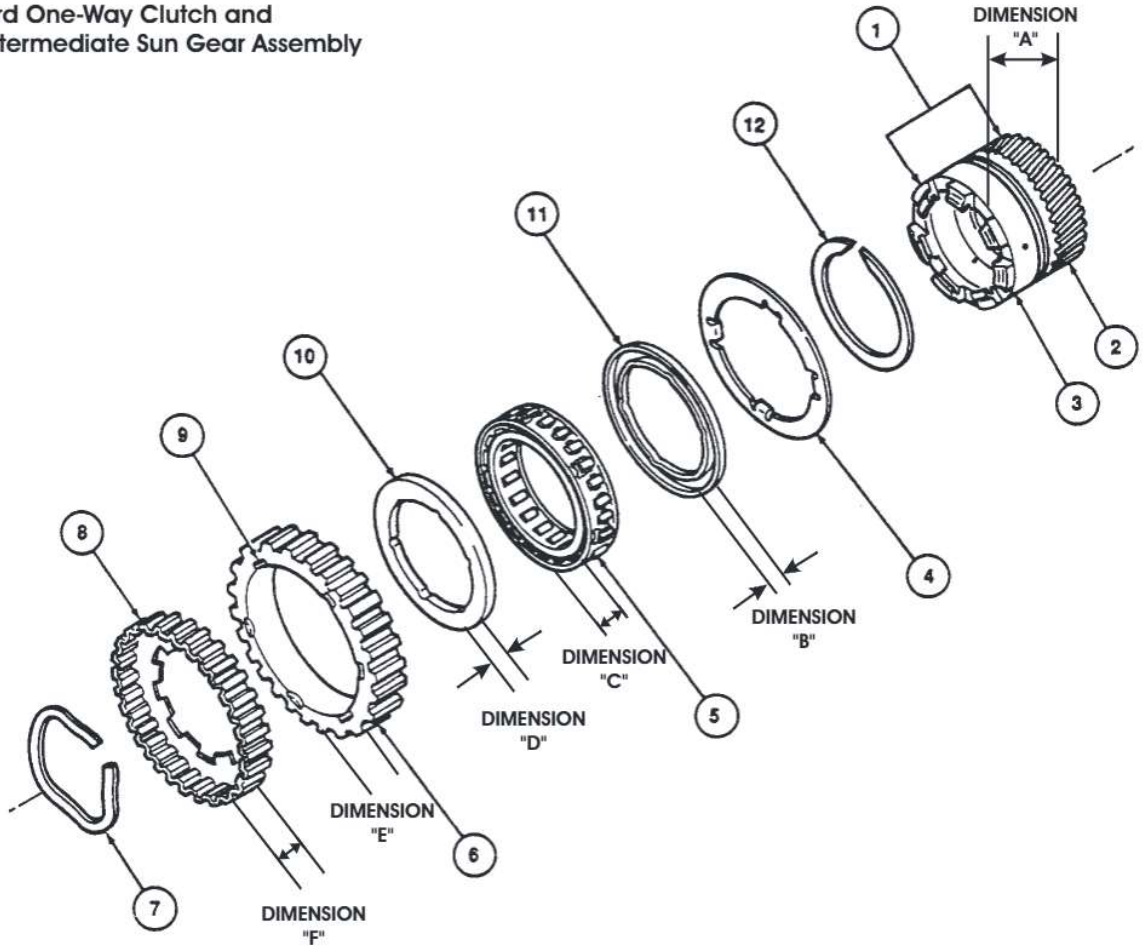


Install the park pawl ratcheting spring.



DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES (Continued)

Forward One-Way Clutch and Low-Intermediate Sun Gear Assembly



Item	Part Number	Description
1	—	Low-Intermediate Sun Gear Assembly (Part of 7A089)
2	—	Low-Intermediate Sun Gear (Part of 7A089)
3	—	Forward One-Way Clutch Inner Race (Part of 7A089)
4	—	Forward One-Way Clutch Retainer (Part of 7A089)
5	—	Forward One-Way Clutch Sprag Assembly (Part of 7A089)

Item	Part Number	Description
6	—	Forward One-Way Clutch Outer Race (Part of 7A089)
7	7C122	Coast Clutch Hub Retaining Ring
8	—	Coast Clutch Hub (Part of 7A089)
9	—	Lube Grooves
10	—	Thick End Cap (Part of 7A089)
11	—	Thin End Cap (Part of 7A089)
12	7H225	Retaining Ring

(Continued)

THE FORWARD SPRAG ASSEMBLY HAD NUMEROUS DIMENSIONAL CHANGES FOR 1998 AND UP MODELS REFER TO THE CHART BELOW FOR THE CORRECT APPLICATION

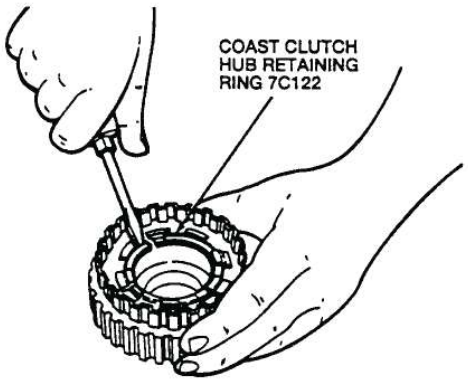
	94-97 MODELS	98 & UP MODELS
DIMENSION "A"	1.760"	1.685"
DIMENSION "B"	.117"	.114"
DIMENSION "C"	.593"	.543"
DIMENSION "D"	.134"	.114"
DIMENSION "E"	.693"	.616"
DIMENSION "F"	.592"	.640"

DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES (Continued)

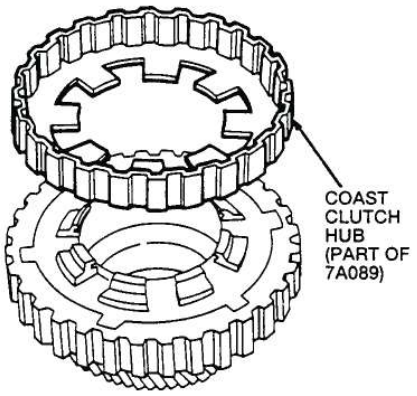
Forward One-Way Clutch

Disassembly

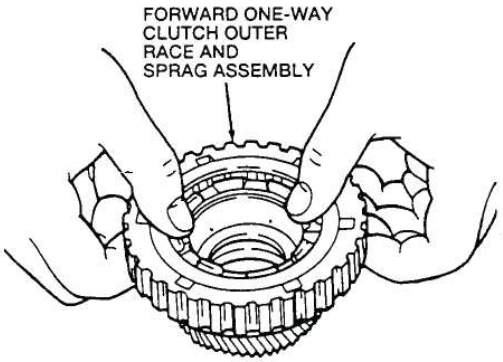
Carefully remove the coast clutch hub retaining ring.



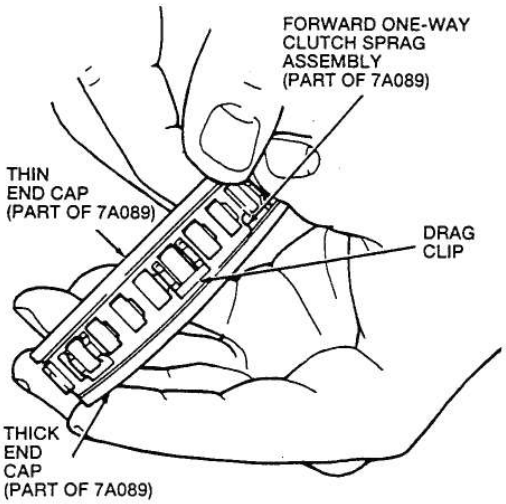
Remove the coast clutch hub.



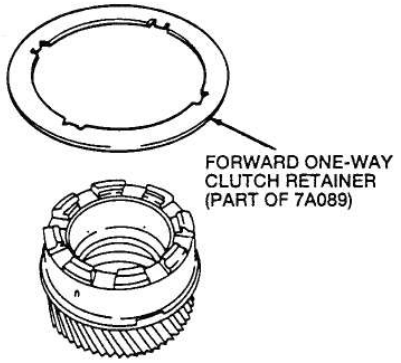
Remove the forward one-way clutch outer race and sprag assembly with end caps.



Separate the sprag assembly and end caps from the outer race. Note the position of the end caps. They are of different thickness and are not interchangeable.

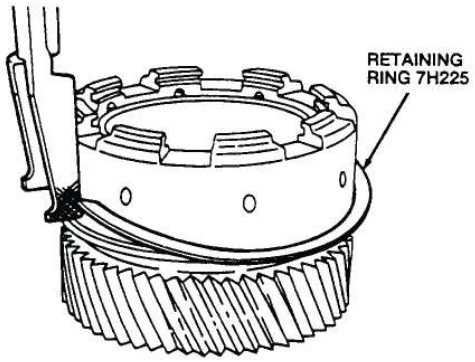


Remove the forward one-way clutch retainer.



DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES (Continued)

Remove the retaining ring.



Clean all parts thoroughly in clean solvent and blow dry with moisture-free compressed air.

Inspect the forward one-way clutch parts for damage and wear:

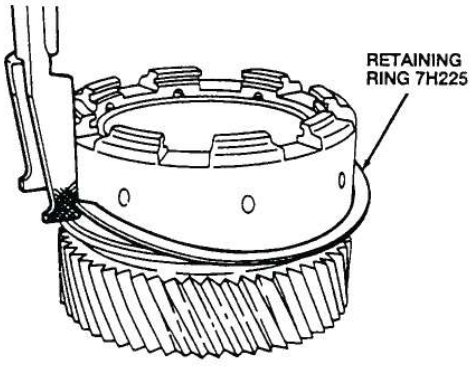
- Outer race
- Sprag assembly and end caps
- Inner race and Low-Intermediate sun gear assembly
- Lube holes
- Coast clutch hub

Assembly

SPECIAL SERVICE TOOL(S) REQUIRED

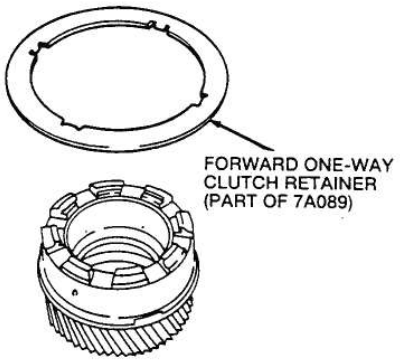
Description	Tool Number
Sprag Replacer	T94P-77000-J

Install the retaining ring.

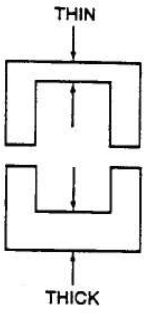


NOTE: The tabs on the retainer should be facing down.

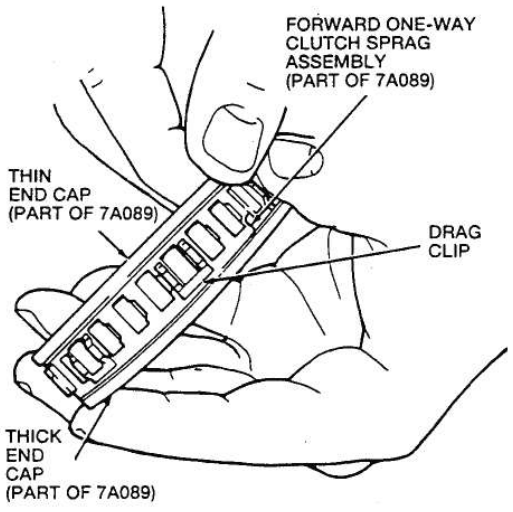
Install the forward one-way clutch retainer.



Identify the thick and thin end caps.

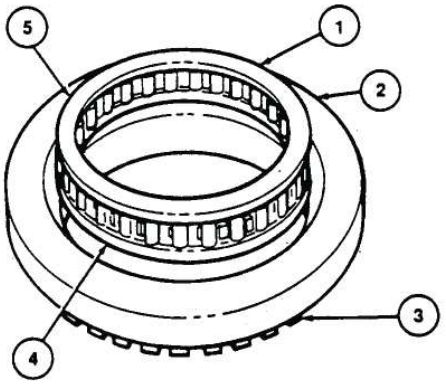


Assemble the forward one-way clutch sprag assembly and end caps.



Use Sprag Replacer T94P-77000-J to install the sprag assembly and end caps in the outer race.

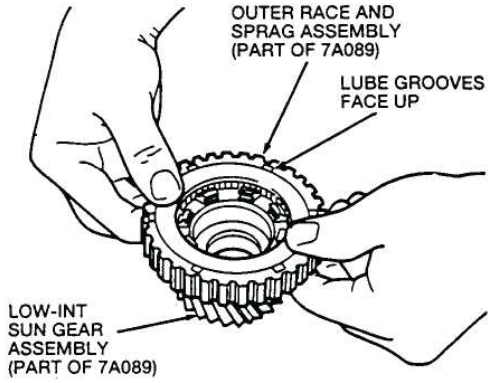
DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES (Continued)



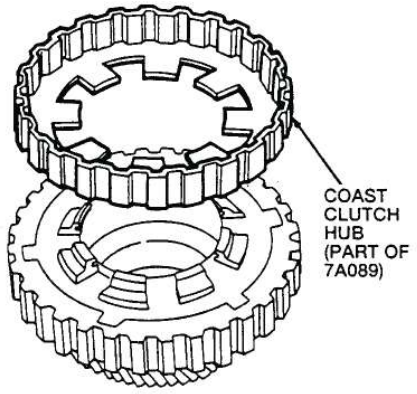
Item	Part Number	Description
1	—	Forward One-Way Clutch Sprag Assembly (Part of 7A089)
2	T94P-77000-J	Sprag Replacer
3	—	Forward One-Way Clutch Outer Race (Lube Grooves Down) (Part of 7A089)
4	—	Thick End Cap (Part of 7A089)
5	—	Thin End Cap (Part of 7A089)

NOTE: Lube grooves face up (away from sun gear).

Flip the outer race and sprag assembly (with end caps) over and install on the forward one-way clutch inner race.

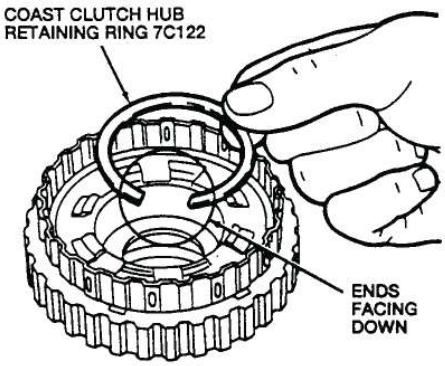


Install the coast clutch hub.



NOTE: The ends of the retaining ring should point towards the coast clutch hub.

Install the coast clutch hub retaining ring.

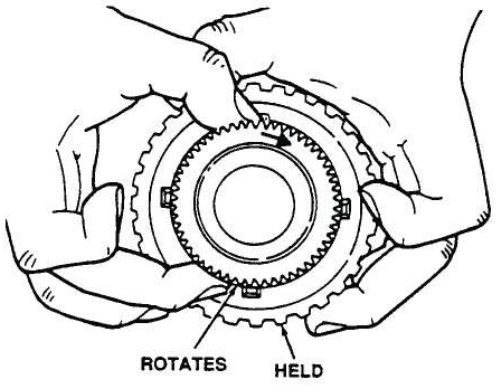


Check the operation of the forward one-way clutch with the Low-Intermediate sun gear facing up. It should work as follows:

- Hold the outer race with one hand.
- Rotate the Low-Intermediate sun gear clockwise. The Low-Intermediate sun gear should rotate with a slight drag without attempting to rotate the outer race.

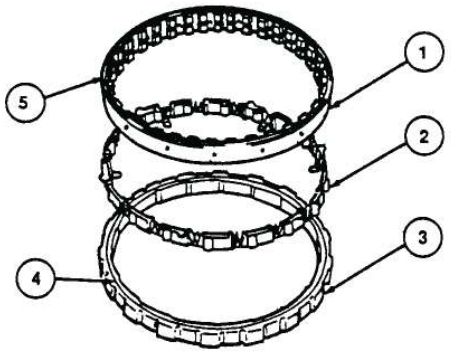
DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES (Continued)

- Rotate the Low-Intermediate sun gear counterclockwise. The Low-Intermediate sun gear should rotate the outer race.



Low One-Way Clutch Assembly*

The following illustration is an exploded view of the low one-way clutch.

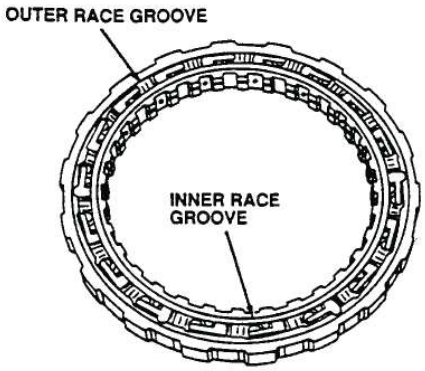


Item	Part Number	Description
1	—	Low One-Way Clutch Inner Race (Part of 7A089)
2	—	Roller Assembly (Part of 7A089)
3	—	Low One-Way Clutch Outer Race (Part of 7A089)
4	—	Identification Groove
5	—	Identification Groove

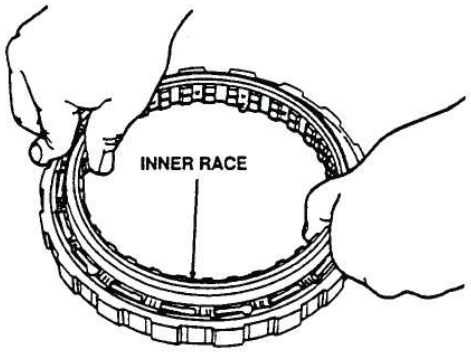
Low One-Way Clutch Assembly

Disassembly

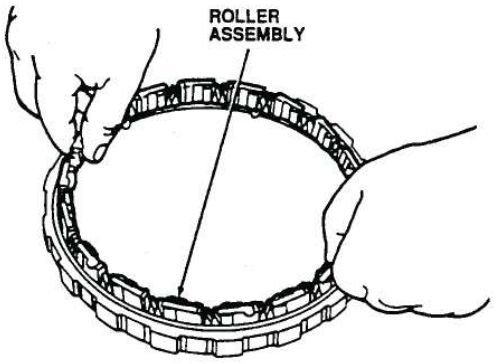
Position the low one-way clutch so that the inner and outer race grooves are facing up.



Remove the inner race.



Remove the roller assembly.



Clean all parts thoroughly in clean solvent and blow dry with moisture-free compressed air.

DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES (Continued)

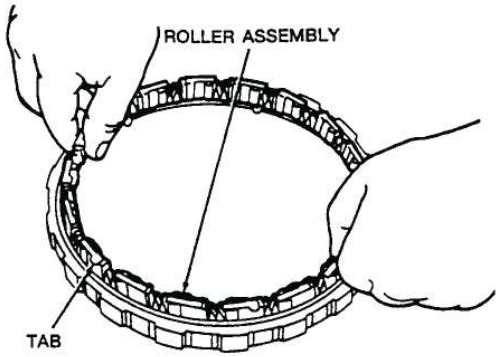
Inspect the low one-way clutch parts for damage and wear:

- outer race
- roller assembly
- inner race
- lube holes

Assembly

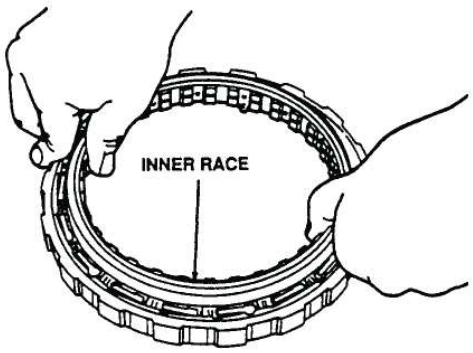
NOTE: The outer tabs of the roller assembly must be facing up.

1. Install the roller assembly into the outer race.



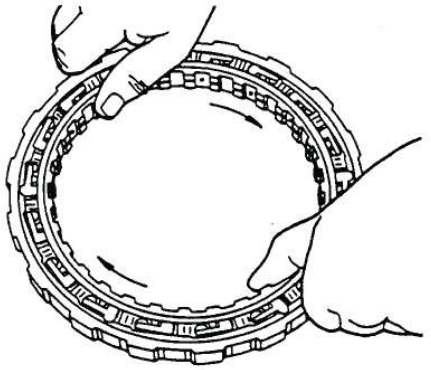
CAUTION: The inner race groove must face up.

Install the inner race with the groove facing up.



Check the operation of the low one-way clutch as follows:

- Hold the outer race.
- Rotate the inner race clockwise. The inner race should rotate with a slight drag without attempting to rotate the outer race.
- Rotate the inner race counterclockwise. The inner race should rotate the outer race.



Final Drive Carrier and Differential Assembly

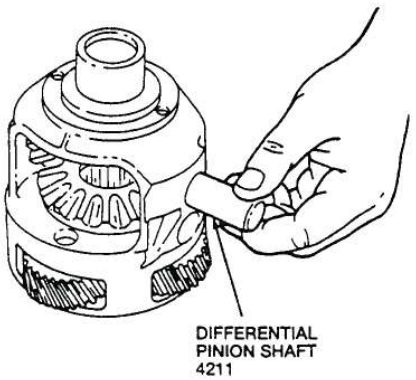
Disassembly

NOTE: Do not remove the final drive pinion shaft retaining ring.

Use a punch to remove the pinion shaft roll pin.

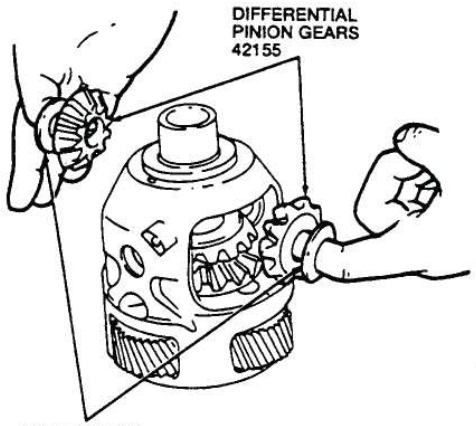


Remove the differential pinion shaft (4211).

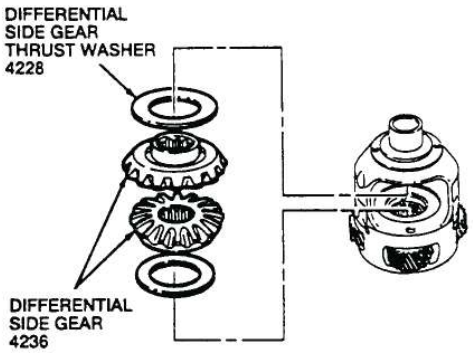


DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES (Continued)

Remove the differential pinion gears and differential pinion thrust washers (4230).



Remove the differential side gears and differential side gear thrust washers (4228).



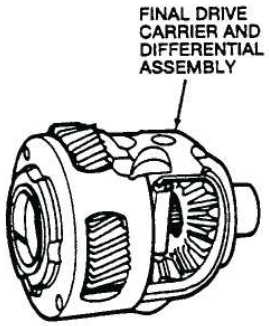
Clean all parts thoroughly in clean solvent and blow dry with moisture-free compressed air.

Inspect the differential parts for damage and wear.

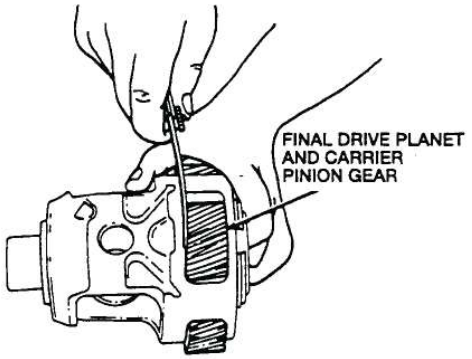
- gear teeth
- thrust washer surface
- thrust bearing surface
- pinion shaft

Inspect the final drive planet and carrier (7F465):

- Pinion gear teeth
- Pinion gear bearings
- Thrust bearing surfaces
- Bushing surfaces

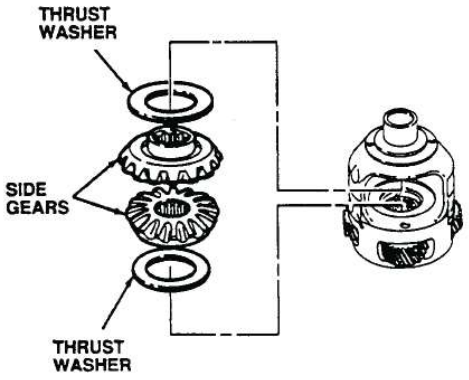


Inspect the final drive planet and carrier pinion gear end play. End play should be between 0.17 to 0.65mm (0.006 to 0.025 inch).



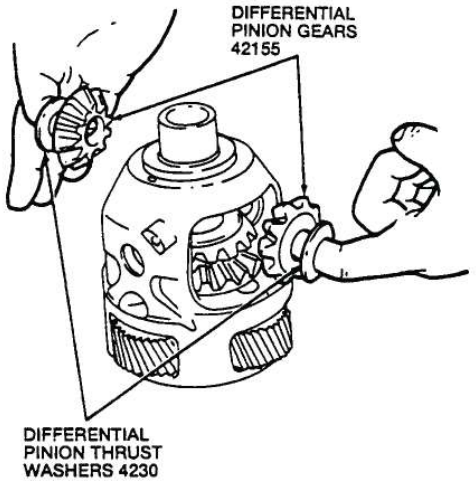
Assembly

Install the differential side gears and differential side gear thrust washers.

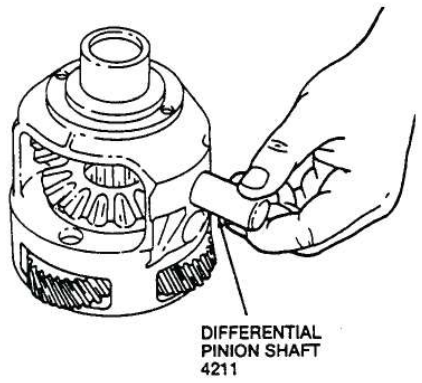


DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES (Continued)

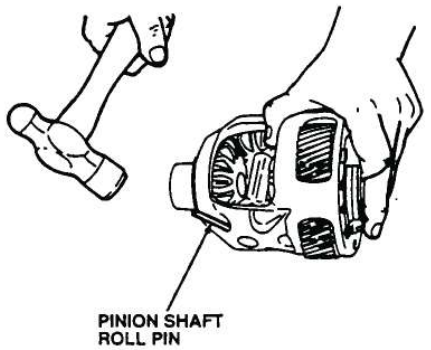
Install the differential pinion gears and differential side gear thrust washers.



Install the differential pinion shaft.



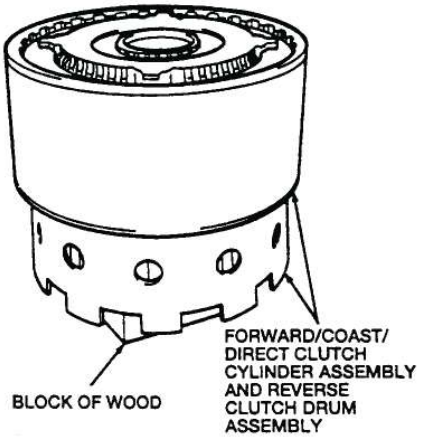
Install the pinion shaft roll pin.



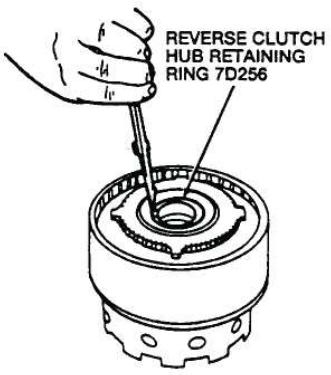
Forward/Coast/Direct Clutch Cylinder Assembly and Reverse Clutch Drum (Disassembly)

Disassembly

Support the assembly of the Forward/Coast/Direct clutch cylinder assembly and reverse clutch drum assembly on a block of wood so that the reverse clutch hub faces upward. This will ease reverse clutch hub retaining ring removal.

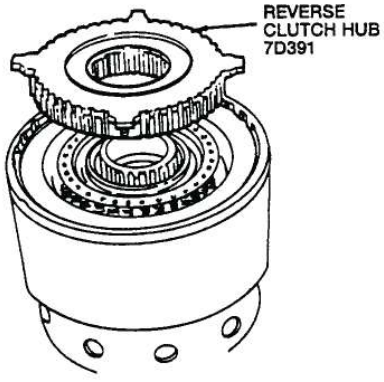


Use a pair of snap ring pliers to remove the reverse clutch hub retaining ring.

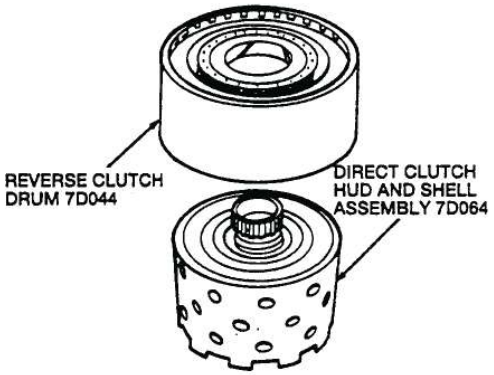


DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES (Continued)

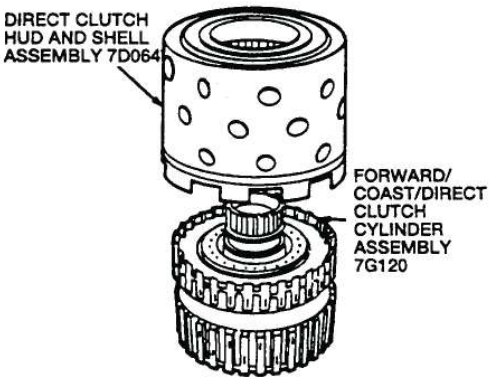
Remove the reverse clutch hub.



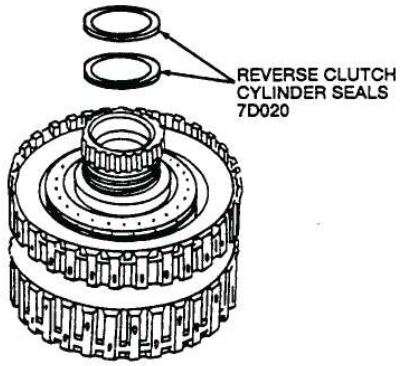
Remove the reverse clutch drum assembly.



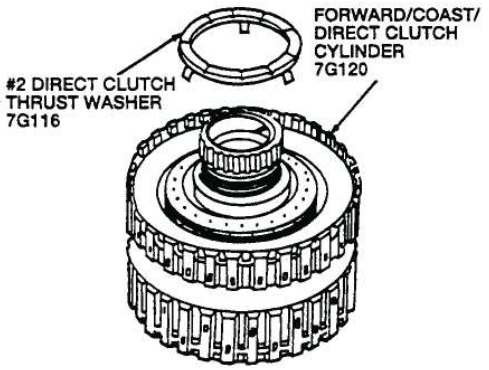
Remove the direct clutch hub and shell from the Forward / Coast / Direct clutch cylinder.



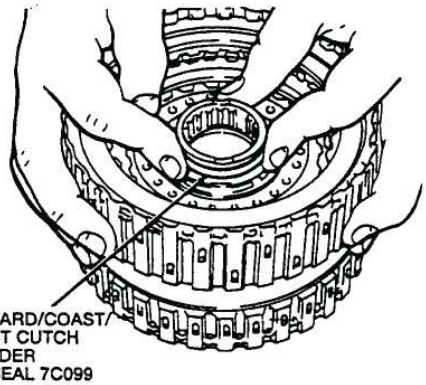
Remove the two reverse clutch cylinder seals (7D020) from the Forward / Coast / Direct clutch cylinder assembly. Discard seals.



Remove the #2 direct clutch thrust washer from the Forward / Coast / Direct clutch cylinder.



Remove the Forward / Coast / Direct clutch cylinder hub seal. Discard the seal.

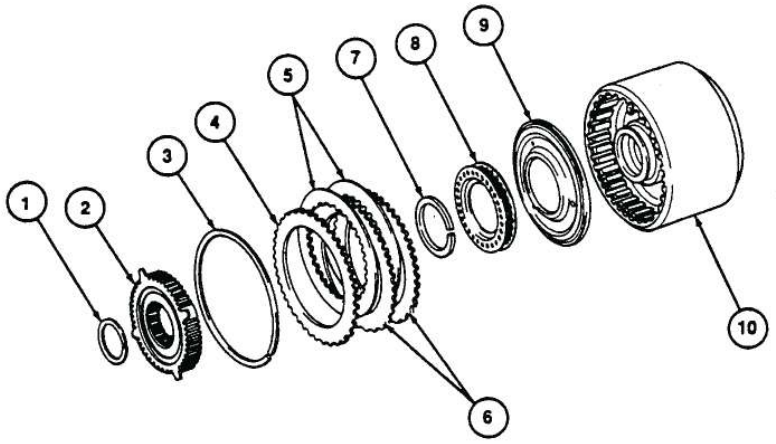


Reverse Clutch

The following illustration is an exploded view of the reverse clutch.

DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES (Continued)

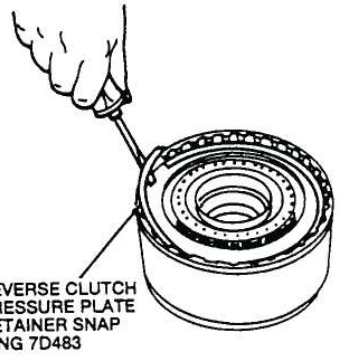
Reverse Clutch



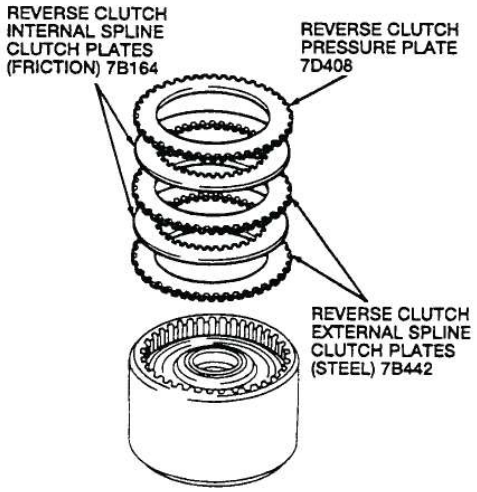
Item	Part Number	Description
1	7D256	Reverse Clutch Hub Retaining Ring
2	7D391	Reverse Clutch Hub
3	7D483	Reverse Clutch Pressure Plate Retainer Snap Ring
4	7D408	Reverse Clutch Pressure Plate
5	7B164	Reverse Clutch Internal Spline Clutch Plates (Friction)

Item	Part Number	Description
6	7B442	Reverse Clutch External Spline Clutch Plates (Steel)
7	7H225	Retaining Ring
8	7G335	Reverse Clutch Return Spring Assembly
9	7E079	Reverse Clutch Piston Assembly
10	7D044	Reverse Clutch Drum Assembly

(Continued)



Remove the reverse clutch plates. Inspect for damage and wear.



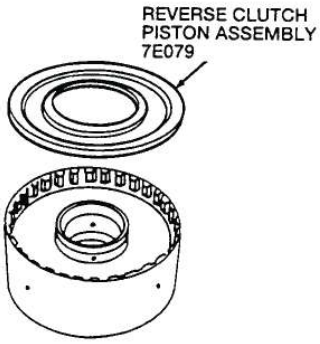
DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES (Continued)



Remove the spring compressor to release the pressure on the reverse clutch return spring assembly. Remove the reverse clutch return spring assembly.

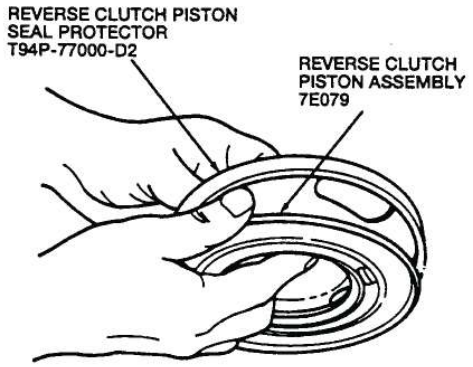


Remove the reverse clutch piston assembly with its integral seals.

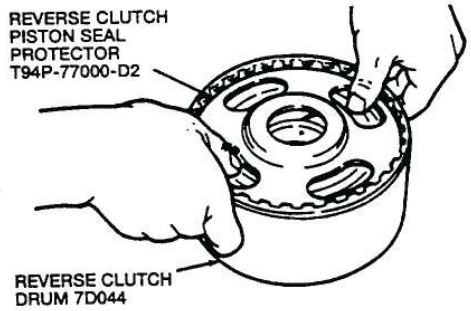


Soak the internal spline clutch plates in clean transmission fluid for 15 minutes before assembly.

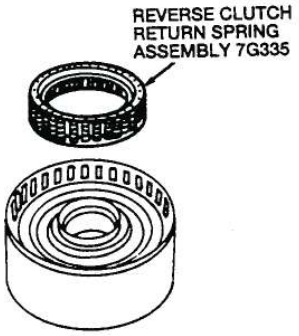
Install the reverse clutch piston assembly in Reverse Clutch Piston Seal Protector T94P-77000-D2 (part of Clutch Piston Seal Protector / Sizer Set T94P-77000-D).



Use Reverse Clutch Piston Seal Protector T94P-77000-D2 (part of Clutch Piston Seal Protector / Sizer Set T94P-77000-D) to install the reverse clutch piston assembly with integral seals.



Install the reverse clutch return spring assembly.



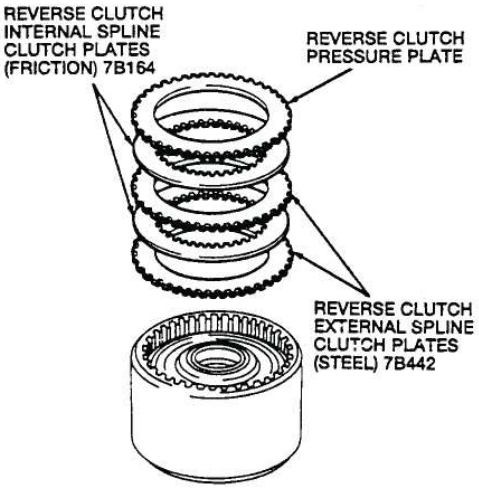
DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES (Continued)

Use a pair of snap ring pliers to install the retaining ring.

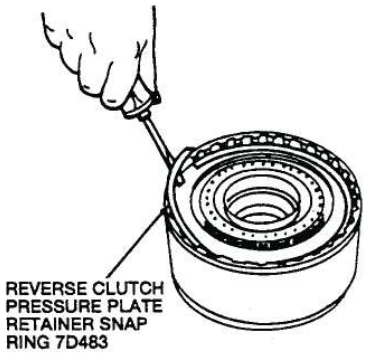


Remove the spring compressor.

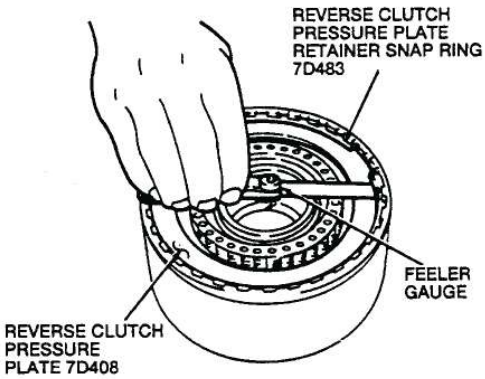
Install the reverse clutch plates.



Install the reverse clutch pressure plate retainer snap ring (selective fit).



Use a feeler gauge to measure the clearance between the reverse clutch pressure plate and the reverse clutch pressure plate retainer snap ring. Make a second measurement on the opposite side. Average the two measurements to get the clearance.



The standard clearance is 0.33 to 0.89mm (0.01 to 0.04 inch). If the clearance is not within the specification, select and install the proper thickness snap ring to obtain the standard clearance.

Snap ring sizes are as follows:

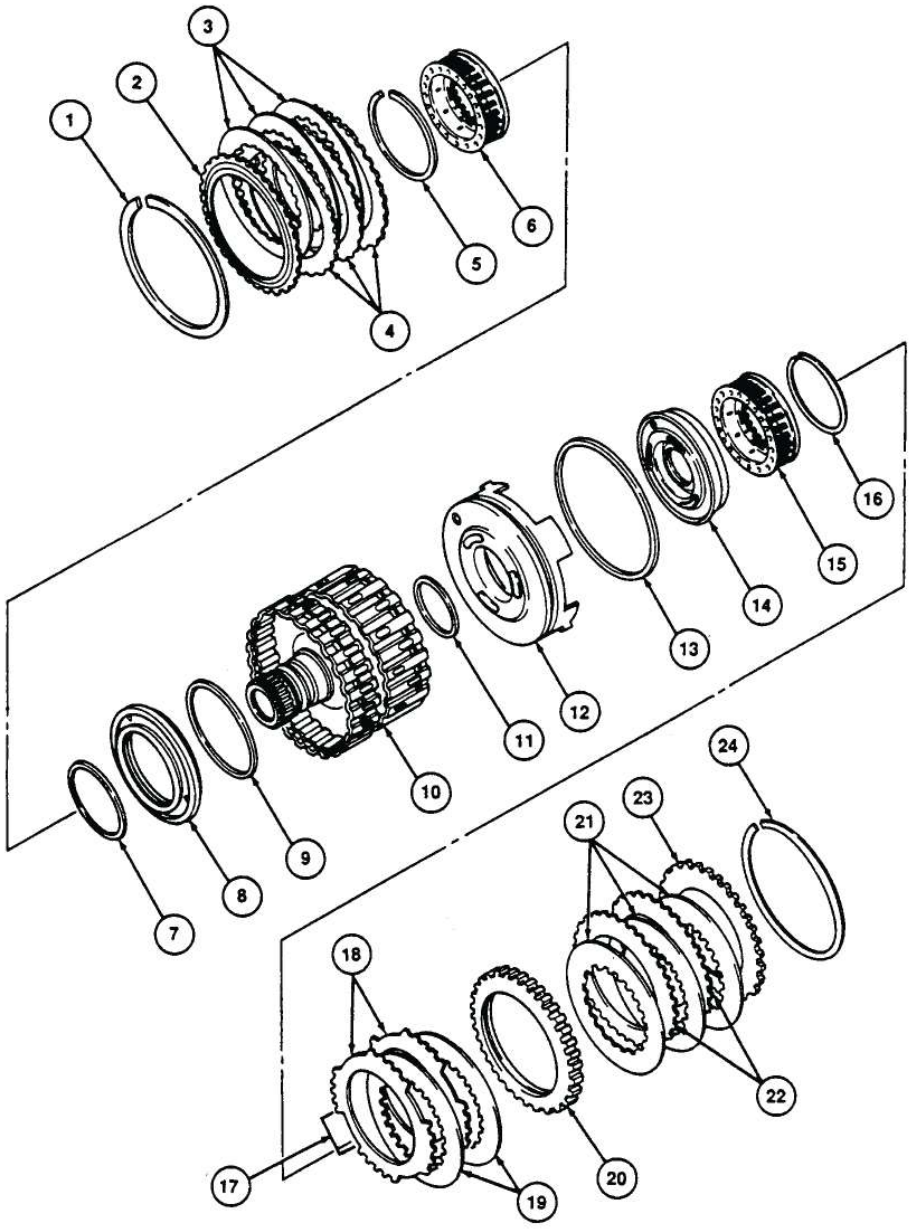
Thickness mm (inch)
1.39-1.49 (0.055 to 0.059)
1.53-1.63 (0.060 to 0.064)
1.68-1.78 (0.066 to 0.070)

Forward/Coast/Direct Clutches

The following illustration is an exploded view of the forward/clutch/direct clutches.

DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES (Continued)

Forward/Coast/Direct Clutches



Item	Part Number	Description
1	7D483	Direct Clutch Pressure Plate Retaining Ring
2	7B477	Direct Clutch Pressure Plate
3	7B164	Direct Clutch Internal Spline Clutch Plates (Friction)

(Continued)

Item	Part Number	Description
4	7B442	Direct Clutch External Spline Clutch Plates (Steel)
5	7C122	Direct Clutch Spring Retaining Ring

(Continued)

DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES (Continued)

Item	Part Number	Description
6	7F235	Direct Clutch Return Spring Assembly
7	7F225	Direct Clutch Piston Inner Lip Seal
8	7A262	Direct Clutch Piston Assembly
9	7A548	Direct Clutch Piston Outer Lip Seal
10	7G120	Forward/Coast/Direct Clutch Cylinder Assembly
11	7A548	Forward Clutch Piston Inner Lip Seal
12	7A262	Forward Clutch Piston Assembly
13	7A548	Forward Clutch Piston Outer Lip Seal
14	7A262	Coast Clutch Piston and Seal Assembly
15	7G299	Forward/Coast Clutch Return Spring Assembly

Item	Part Number	Description
16	7N169	Forward Clutch Spring Retaining Ring
17	—	Clearance for Fingers on the Forward Clutch Piston
18	7B442	Coast Clutch External Spline Clutch Plates (Steel)
19	7B164	Coast Clutch Internal Spline Clutch Plates (Friction)
20	7B066	Coast Clutch Pressure Plate
21	7B164	Forward Clutch Internal Spline Clutch Plates (Friction)
22	7B442	Forward Clutch External Spline Clutch Plates (Steel)
23	7B066	Forward Clutch Pressure Plate
24	7D483	Forward Clutch Pressure Retaining Ring

(Continued)

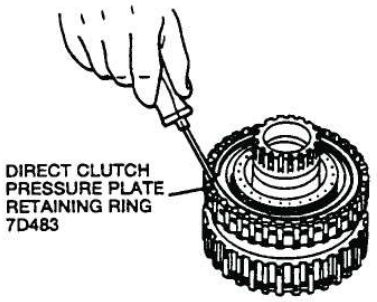
Forward/Coast/Direct Clutches

Disassembly

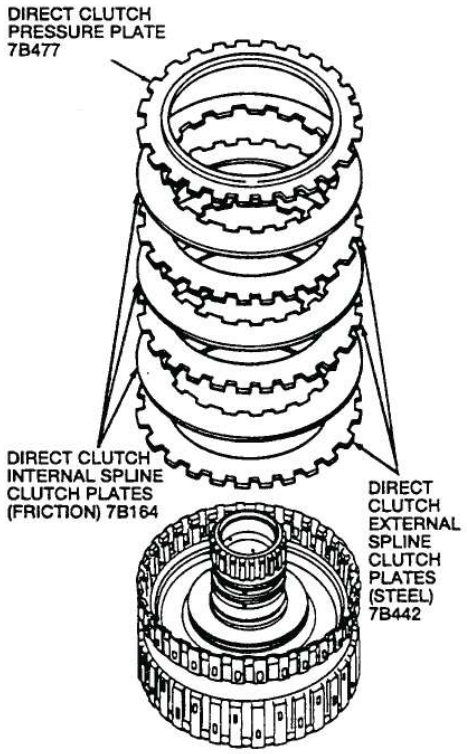
SPECIAL SERVICE TOOL(S) REQUIRED

Description	Tool Number
Clutch Spring Compressor	T65L-77515-A
O-Ring Tool	T71P-19703-C

Remove the direct clutch pressure plate retaining ring.

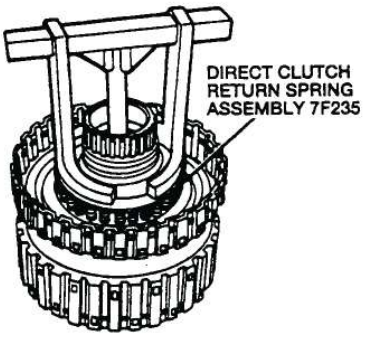


Remove the direct clutch plates.

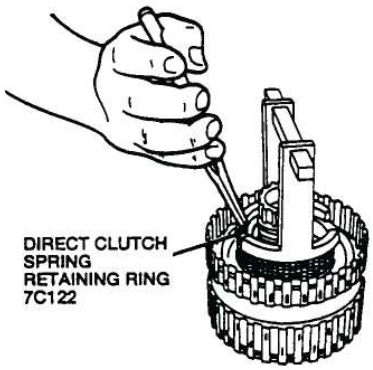


DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES (Continued)

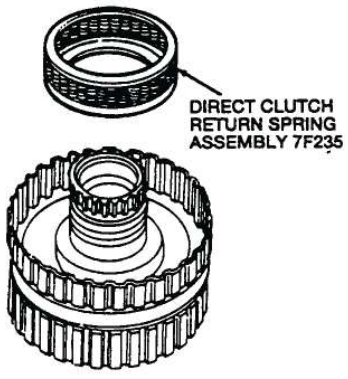
Use Clutch Spring Compressor T65L-77515-A to compress the direct clutch support and spring (7F235).



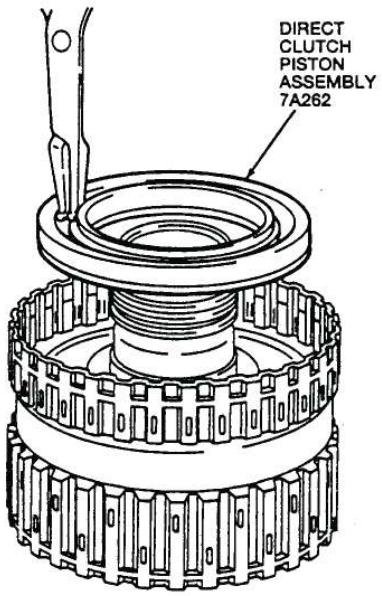
Use a pair of snap ring pliers to remove the direct clutch spring retaining ring.



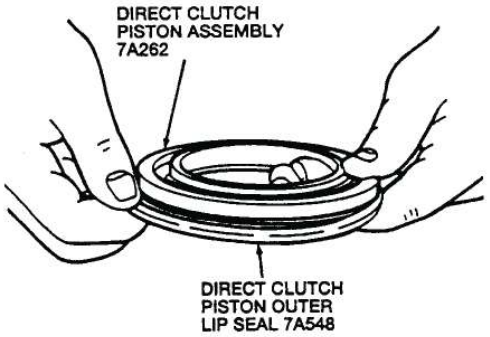
Remove the spring compressor and remove the direct clutch return spring assembly.



Remove the direct clutch piston assembly.

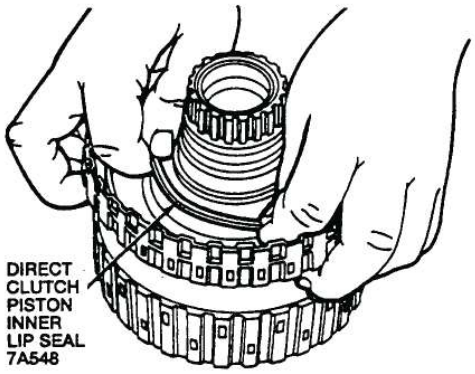


Remove the direct clutch piston outer lip seal from the direct clutch piston assembly. Discard the seal.

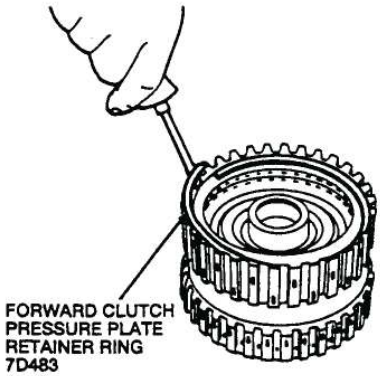


DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES (Continued)

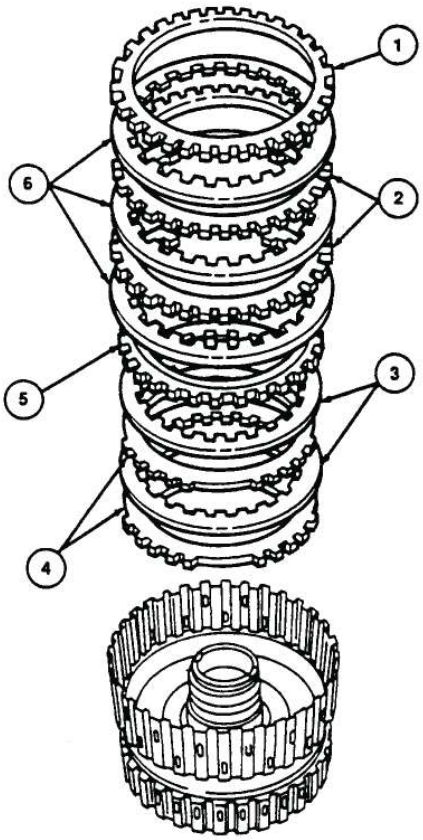
Remove the direct clutch piston inner lip seal from the Forward / Coast / Direct clutch cylinder assembly. Discard the seal.



Flip the Forward / Coast / Direct clutch cylinder over. Remove the forward clutch pressure plate retaining ring.



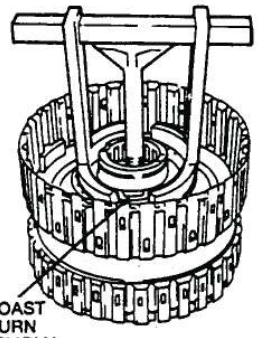
Remove the forward and coast clutch plates.



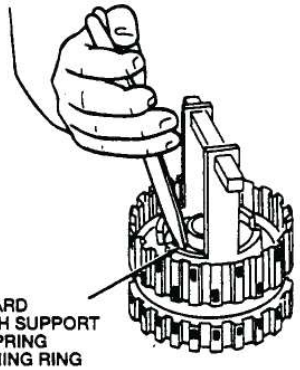
Item	Part Number	Description
1	7B066	Forward Clutch Pressure Plate
2	7B442	Forward Clutch External Spline Clutch Plates (Steel)
3	7B164	Coast Clutch Internal Spline Clutch Plates (Friction)
4	7B442	Coast Clutch External Spline Clutch Plates (Steel)
5	7B066	Coast Clutch Pressure Plate
6	7B164	Forward Clutch Internal Spline Clutch Plates (Friction)

DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES (Continued)

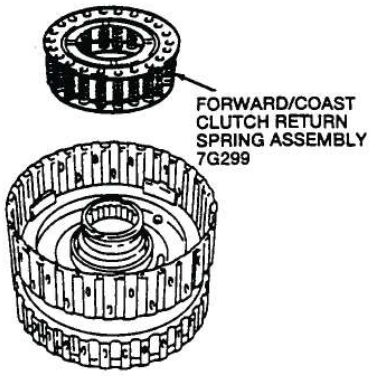
Use Clutch Spring Compressor T65L-77515-A to compress the forward / coast clutch return spring assembly.



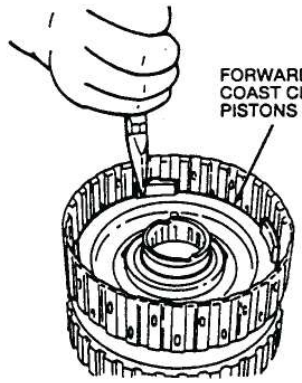
Use a pair of snap ring pliers to remove the forward clutch spring retaining ring.



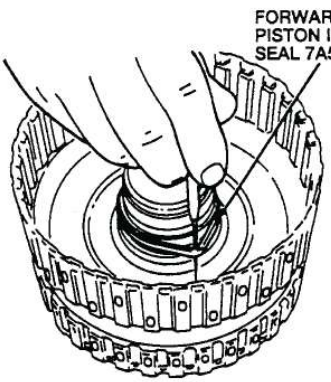
Remove the spring compressor and the forward / coast clutch return spring assembly.



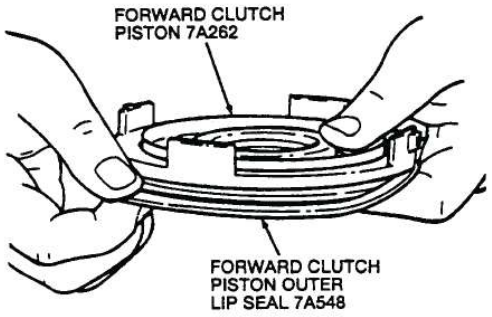
14. Use a pair of needle nose pliers to remove the forward and coast clutch pistons.



Use O-Ring Tool T71P-19703-C to remove the forward clutch piston inner lip seal from the Forward / Coast / Direct clutch cylinder assembly. Discard the seal.

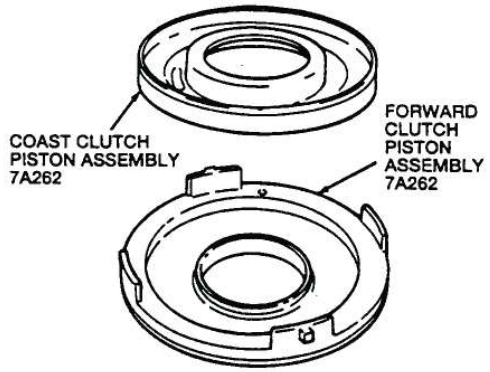


Remove the forward clutch piston outer lip seal. Discard the seal.



DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES (Continued)

Separate the coast clutch piston assembly with integral seal from the forward clutch piston assembly.



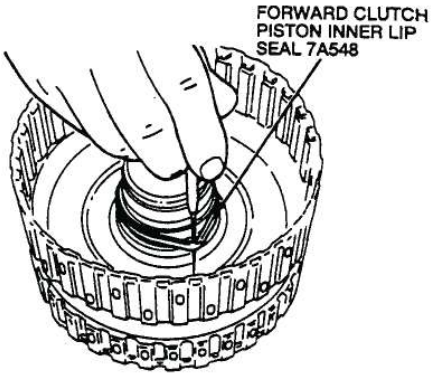
Assembly

SPECIAL SERVICE TOOL(S) REQUIRED

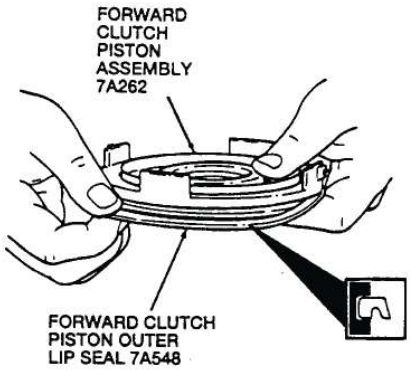
Description	Tool Number
Coast Clutch Piston Seal Protector	T94P-77000-D3
Clutch Spring Compressor	T65L-77515-A

Soak the internal spline clutch plates in clean transmission fluid for 15 minutes before assembly.

Install the forward clutch piston inner lip seal in the Forward / Coast / Direct clutch cylinder assembly.

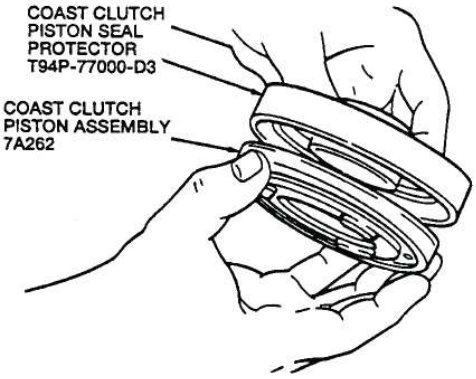


Install the forward clutch piston outer lip seal on the forward clutch piston assembly.

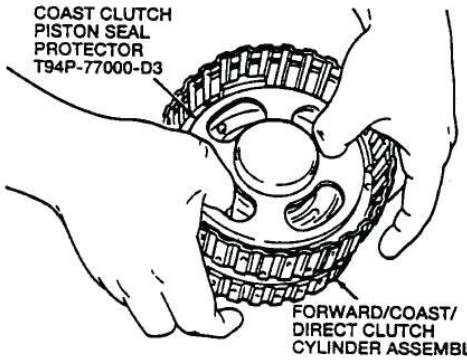


Install the forward clutch piston assembly in the Forward / Coast / Direct clutch cylinder assembly.

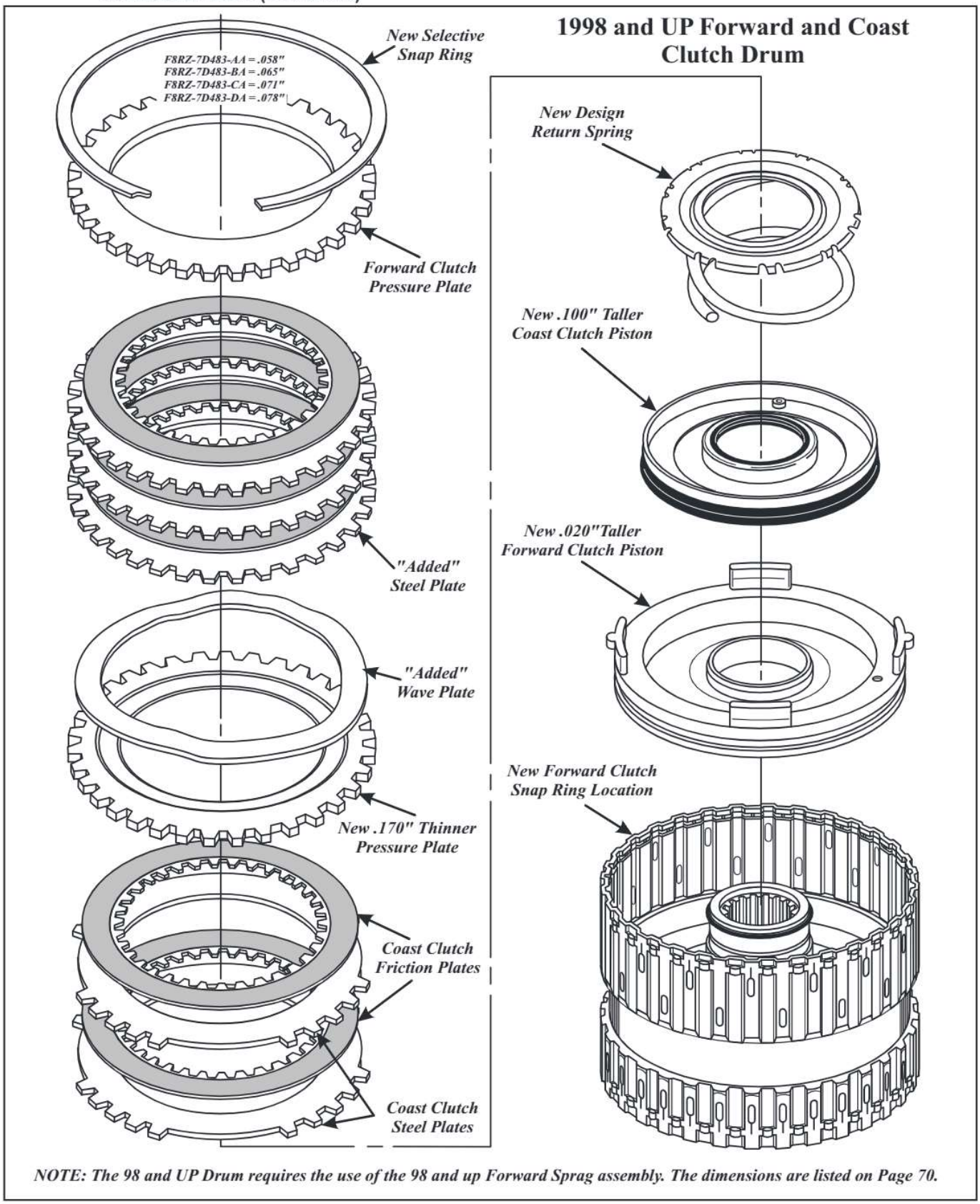
Install the coast clutch piston assembly in Coast Clutch Piston Seal Protector T94P-77000-D3 (part of Clutch Piston Seal Protector / Sizer Set T94P-77000-D).



Use Coast Clutch Piston Seal Protector T94P-77000-D3 (part of Clutch Piston Seal Protector / Sizer Set T94P-77000-D) to install the coast clutch piston into the forward clutch piston assembly.



DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES (Continued)



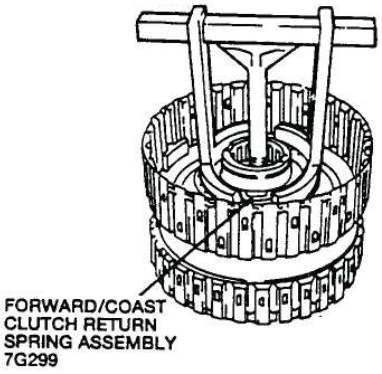
NOTE: The 98 and UP Drum requires the use of the 98 and up Forward Sprag assembly. The dimensions are listed on Page 70.

DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES (Continued)

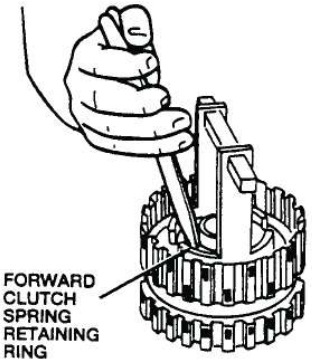
Install the forward / coast clutch return spring assembly.



Use Clutch Spring Compressor T65L-77515-A to compress the forward / coast clutch return spring assembly.

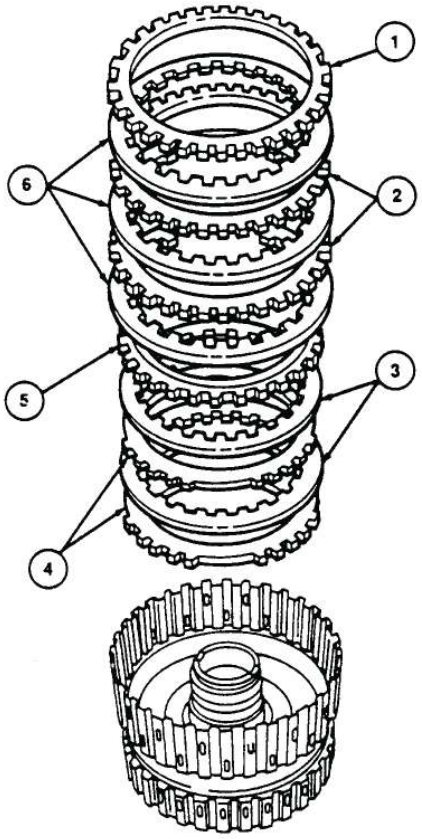


Use a pair of snap ring pliers to install the forward clutch spring retaining ring.



Remove the spring compressor.

Install the forward and coast clutch plates.

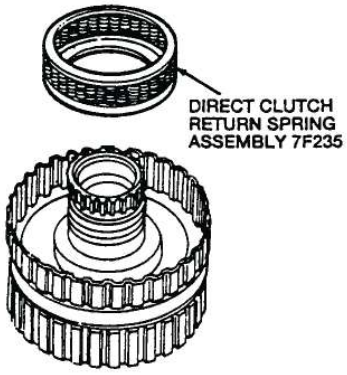


Item	Part Number	Description
1	7B066	Forward Clutch Pressure Plate
2	7B442	Forward Clutch External Spline Clutch Plates (Steel)
3	7B164	Coast Clutch Internal Spline Clutch Plates (Friction)
4	7B442	Coast Clutch External Spline Clutch Plates (Steel)
5	7B066	Coast Clutch Pressure Plate
6	7B164	Forward Clutch Internal Spline Clutch Plates (Friction)

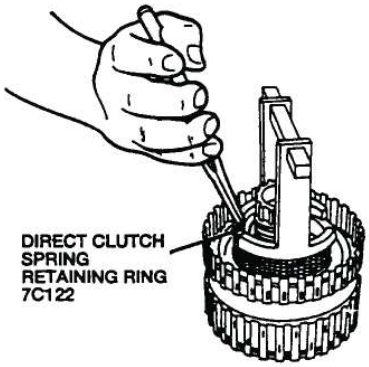
Install the forward clutch pressure plate retaining ring.

DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES (Continued)

Install the direct clutch return spring assembly.

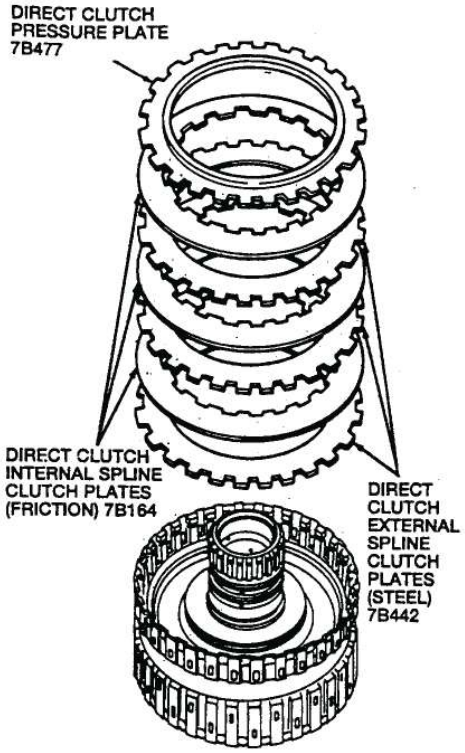


Use a pair of snap ring pliers to install the direct clutch spring retaining ring.

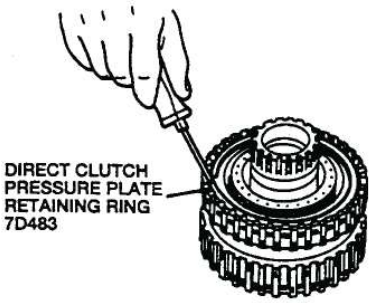


Remove the spring compressor.

Install the direct clutch plates.



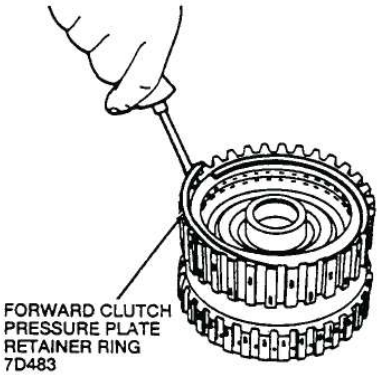
Install the direct clutch pressure plate retaining ring.



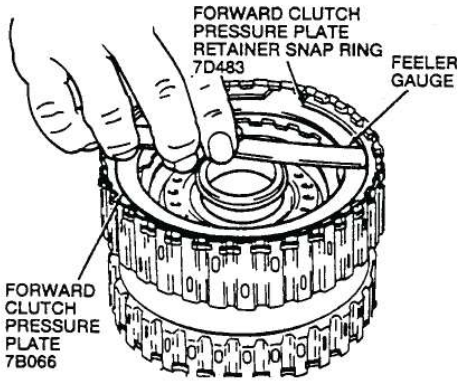
Measure the direct clutch clearance as follows:

- Install a dial indicator on the side of the Forward / Coast / Direct clutch cylinder assembly and zero the needle on the direct clutch pressure plate.

DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES (Continued)



Use a feeler gauge to measure the clearance between the forward clutch pressure plate and the forward clutch pressure plate retaining ring.

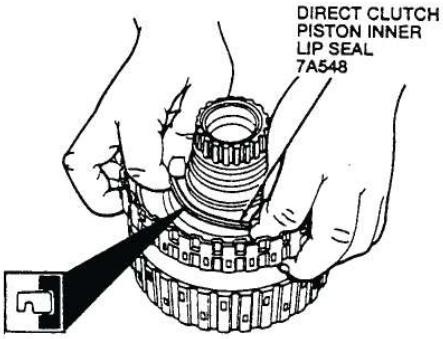


The standard clearance is 0.50 to 1.09mm (0.02 to 0.04 inch). If the clearance is not within the specification, select and install the proper thickness forward clutch pressure plate retaining ring to obtain the standard clearance.

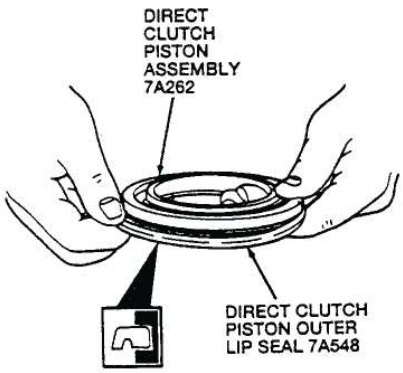
Snap ring sizes are as follows:

Thickness mm (Inch)
1.28-1.38 (0.050-0.054)
1.39-1.49 (0.055-0.059)
1.52-1.62 (0.060-0.064)
1.65-1.75 (0.065-0.069)

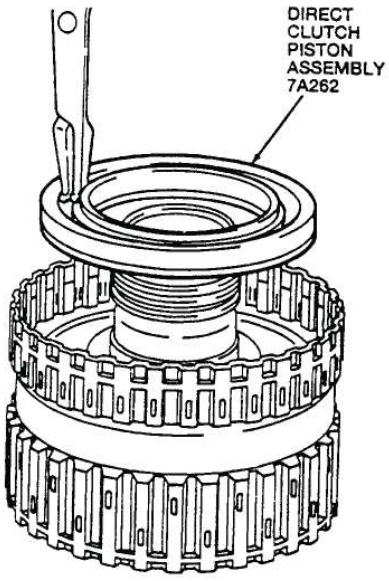
Install the direct clutch piston inner lip seal in the Forward / Coast / Direct clutch cylinder assembly.



Install the direct clutch piston outer lip seal on the direct clutch piston assembly.

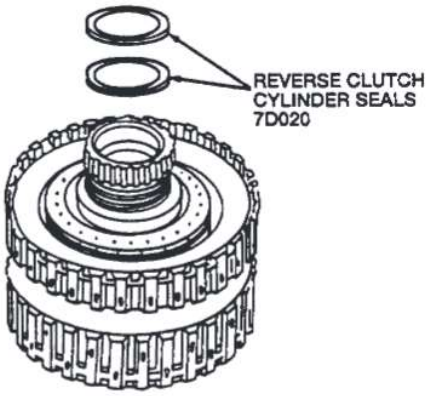


Install the direct clutch piston assembly in the Forward / Coast / Direct clutch cylinder assembly.

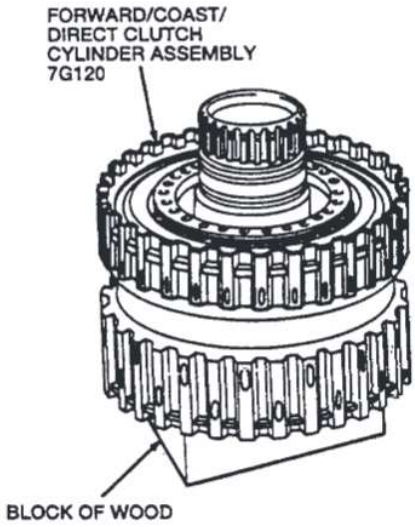


DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES (Continued)

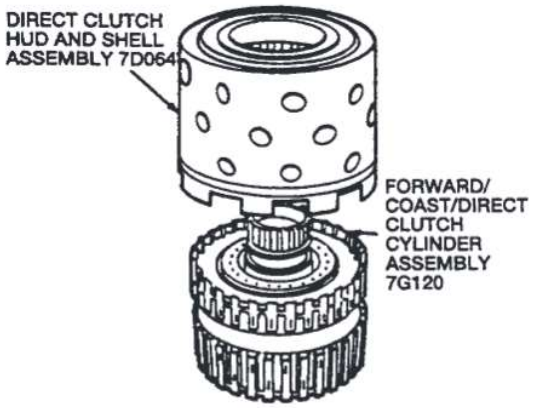
Install the two reverse clutch cylinder seals.



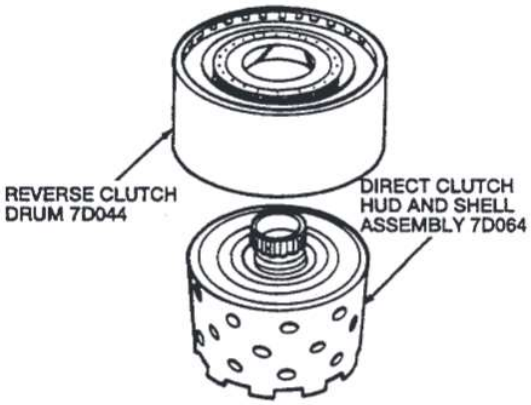
Place the Forward / Coast / Direct clutch cylinder assembly on a block of wood so that the direct clutch faces upward.



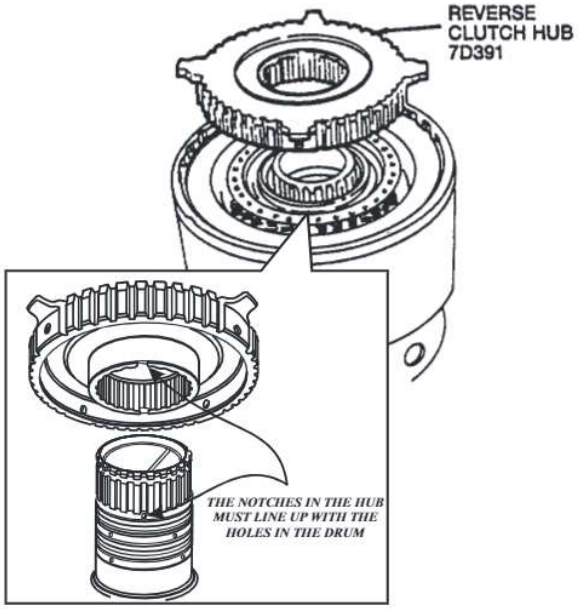
Install the direct clutch hub and shell on the Forward / Coast / Direct clutch cylinder.



Install the reverse clutch drum assembly.

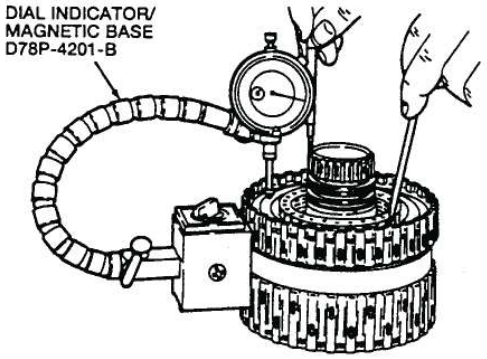


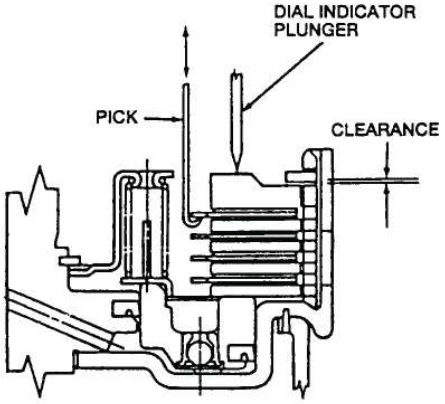
Install the reverse clutch hub.



DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES (Continued)

- Use two picks to pull the direct clutch pressure plate upward. Observe the dial indicator reading.





- Make a second measurement on the opposite side. Average the two measurements to get the clearance.

The standard clearance is 0.52 to 1.12mm (0.02 to 0.04 inch). If the clearance is not within the specification, select and install the proper thickness direct clutch pressure plate retainer snap ring to obtain the standard clearance.

Retaining ring sizes are as follows:

Thickness mm (inch)
1.28-1.38 (0.05-0.054)
1.39-1.49 (0.055-0.59)
1.52-1.62 (0.06- 0.064)
1.65-1.75 (0.065-0.069)

Forward/Coast/Direct Clutch Cylinder Assembly and Reverse Clutch Drum Assembly (Assembly)

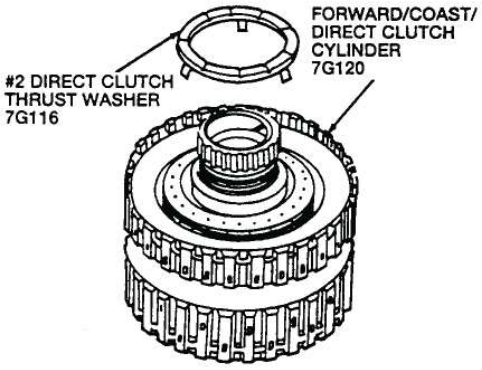
Assembly

SPECIAL SERVICE TOOL(S) REQUIRED

Description	Tool Number
Coast Clutch Piston Seal Sizer	T94P-77000-D4

CAUTION: The tabs on the #2 direct clutch thrust washer must be seated in the direct clutch support and spring.

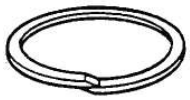
Install the #2 direct clutch thrust washer on the Forward/Coast/Direct clutch cylinder with the tabs facing down.



NOTE: Ensure that the reverse clutch cylinder seals are overlapped correctly.



RIGHT



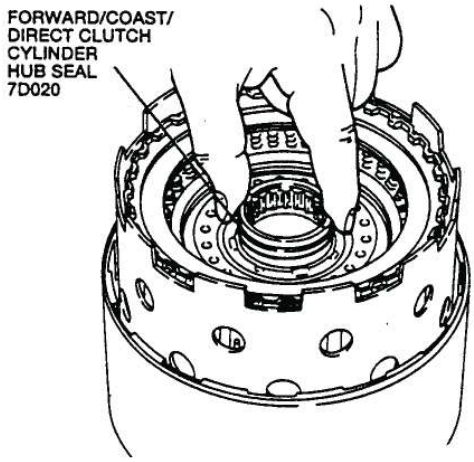
WRONG

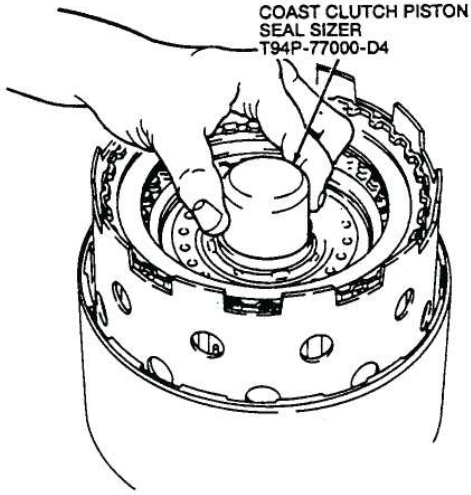
DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES (Continued)

Install the reverse clutch hub retaining ring.



Turn the assembly over and install the Forward / Coast / Direct clutch cylinder hub seal on the Forward / Coast / Direct clutch cylinder.

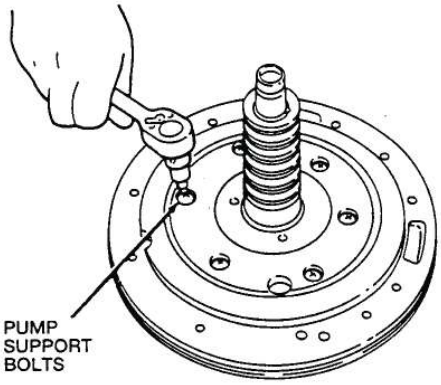




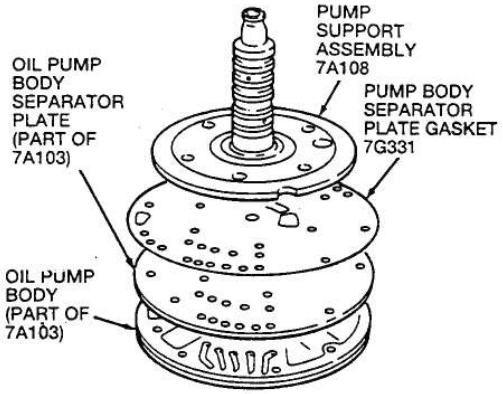
Oil Pump Assembly

Disassembly

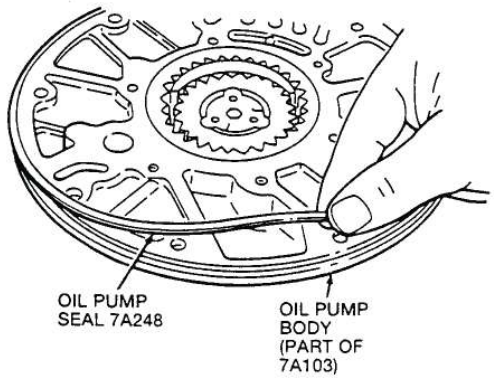
Use a Torx® T30 socket to remove the six pump support bolts.



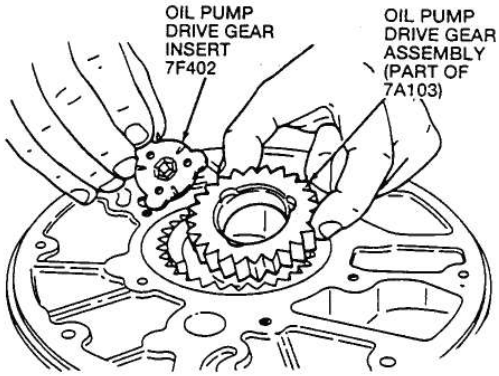
Separate the pump support assembly, oil pump body separator plate, and pump body separator plate gasket (7G331) from the oil pump body.



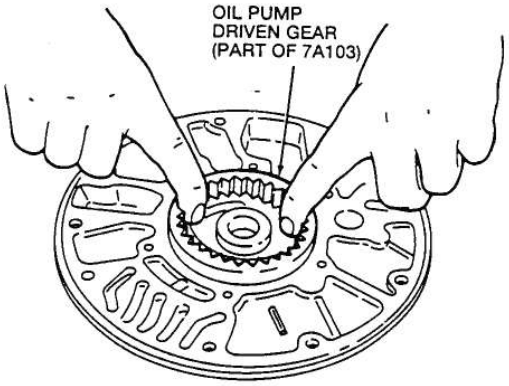
Remove the oil pump seal from the oil pump body. Discard the oil pump seal.



Remove the oil pump drive gear assembly and oil pump drive gear insert (7F402) from the oil pump body.



Remove the oil pump driven gear from the oil pump body.

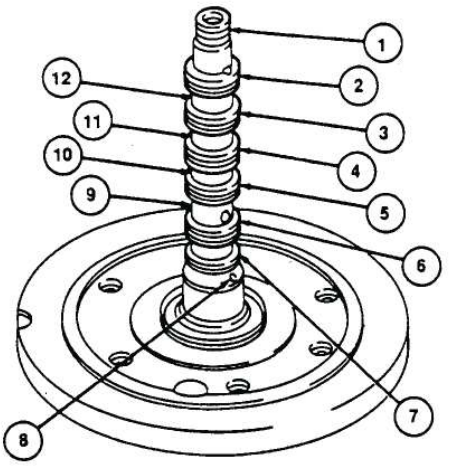


Clean all parts thoroughly in clean solvent and blow dry with moisture-free compressed air.

Inspect the oil pump body and gears:

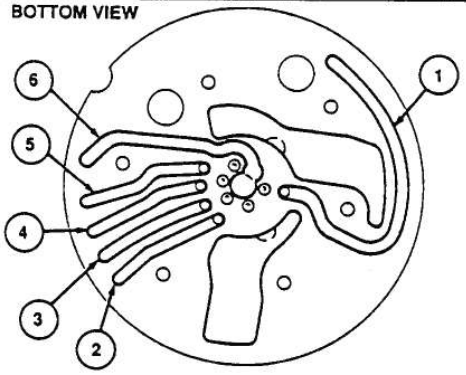
- Driven gear teeth
- Drive gear teeth
- Gear bore
- Crescent
- Lube passages and holes

Inspect the pump support apply circuit passages and lube passages.



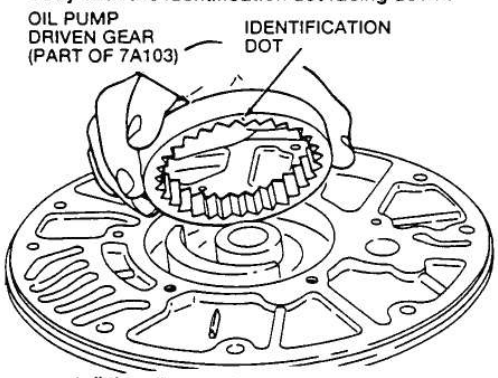
Item	Part Number	Description
1	—	#1 Pump Support Seal Ring
2	—	#2 Pump Support Seal Ring
3	—	#3 Pump Support Seal Ring
4	—	#4 Pump Support Seal Ring
5	—	#5 Pump Support Seal Ring
6	—	#6 Pump Support Seal Ring
7	—	#7 Pump Support Seal Ring
8	—	Rear Lube (From Cooler TC Circuit)
9	—	Reverse Clutch (RC)
10	—	Direct Clutch (DC)
11	—	Forward Clutch (FC)
12	—	Coast Clutch (CC)

BOTTOM VIEW

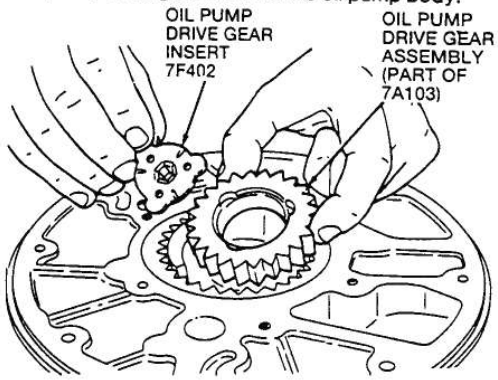


Item	Part Number	Description
1	—	Rear Lube (From Cooler TC Circuit)
2	—	Coast Clutch (CC)
3	—	Direct Clutch (DC)
4	—	Forward Clutch (FC)
5	—	Reverse Clutch (RC)
6	—	Converter Clutch Bypass (CBY)

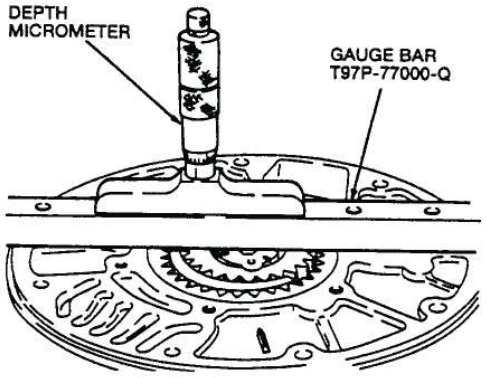
Install the oil pump driven gear in the oil pump body with the identification dot facing down.



Install the oil pump drive gear assembly and oil pump drive gear insert in the oil pump body.



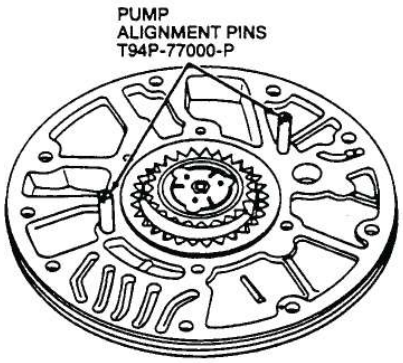
Use Gauge Bar T97P-77000-Q and a depth micrometer to measure the clearance between each gear and the oil pump body face.



The allowable clearance for each gear is .027 to .060mm (0.001 to 0.002 inch). If the clearance exceeds the specification, replace the oil pump assembly.

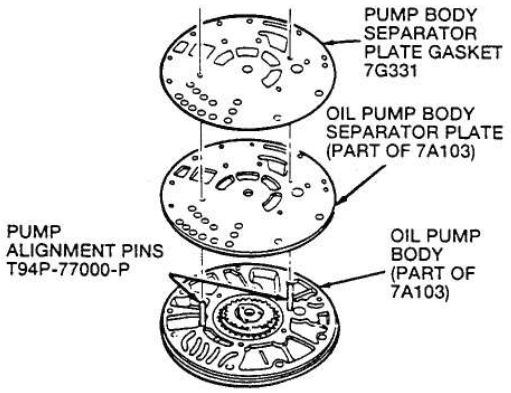
NOTE: Install the alignment pins in the holes shown.

Install Pump Alignment Pins T94P-77000-P in the oil pump body.

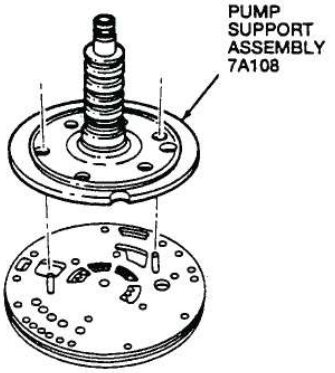


Fill the pump gear cavity with ATF to the top of the gears.

Install the oil pump body separator plate and pump body separator plate gasket on the oil pump body.

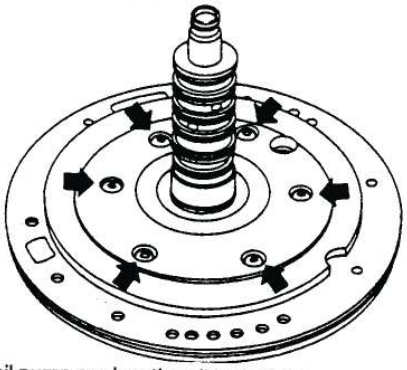


Install the pump support assembly on the oil pump body.

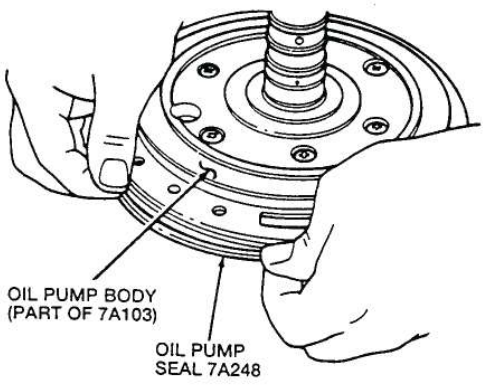


DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES (Continued)

Install and tighten the four pump support bolts to 13 N·m (10 lb-ft) and remove the alignment pins. Install and tighten the two remaining pump support bolts to 13 N·m (10 lb-ft).

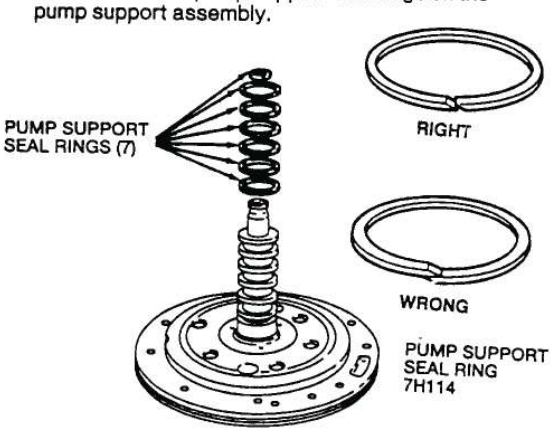


Install the oil pump seal on the oil pump body.



NOTE: Ensure that the pump support seals rings are overlapped correctly.

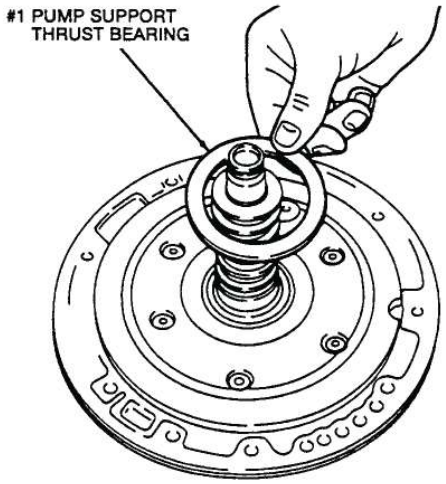
Install the seven pump support seal rings on the pump support assembly.



Install the oil pump drive shaft.

Use a torque wrench to rotate the oil pump drive shaft. The maximum rotating torque is 0.3 N·m (2 lb-in).

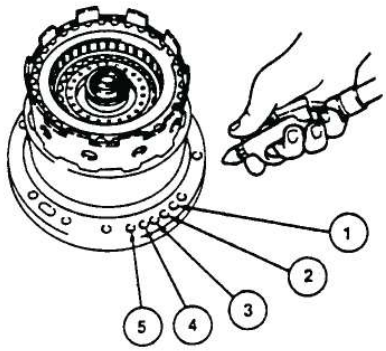
Install the #1 pump support thrust bearing on to the pump support. Pour automatic transmission oil on seal rings.



Install the Forward / Coast / Direct clutch cylinder and the reverse clutch drum (7D044) onto the pump support.

Air check the Forward / Coast / Direct clutch cylinder and reverse clutch drum by blowing moisture free compressed air, regulated to 40psi into the passages in the oil pump body.

With each application of air you should hear the apply of a clutch pack. A hissing or high pitched squeal indicates that a seal is damaged or torn. Investigate to find the source and make necessary corrections.

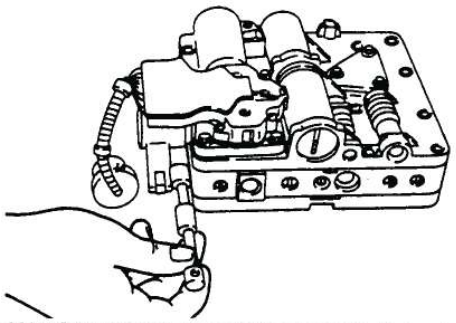


Item	Part Number	Description
1	—	Converter Clutch Bypass (do not apply air pressure)
2	—	Reverse Clutch Passage

Main Control

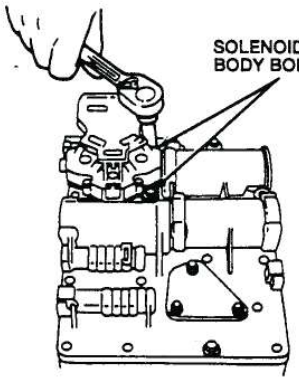
Disassembly

Remove manual valve from main control.

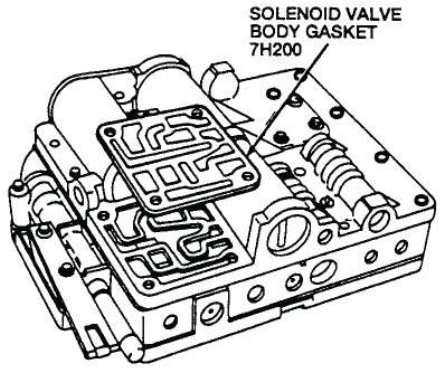


CAUTION: Do not attempt to remove the solenoid valve body wiring cover.

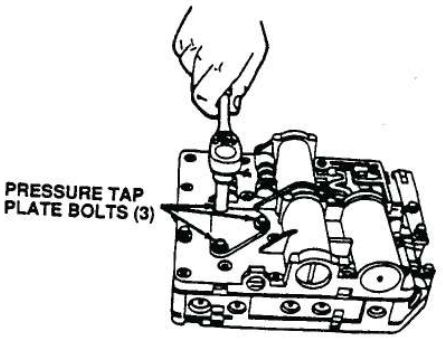
Use an 8mm socket to remove the two solenoid valve body bolts. Remove the solenoid valve body.



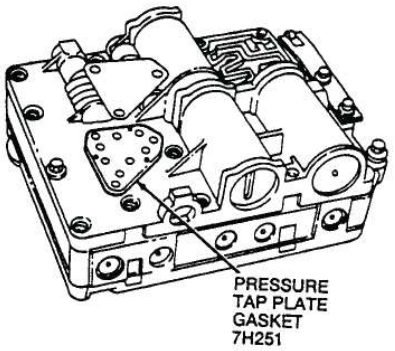
Remove the solenoid valve body gasket from the accumulator body assembly. Discard the solenoid valve body gasket.



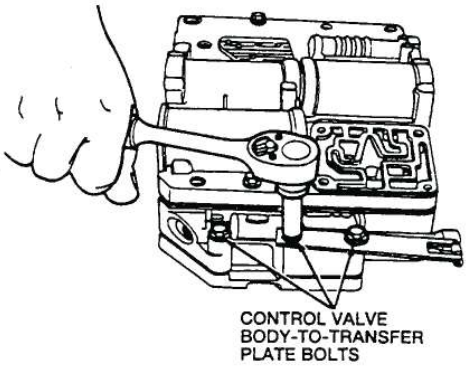
Use a 7mm socket to remove the three pressure tap plate bolts. Remove the pressure tap plate.



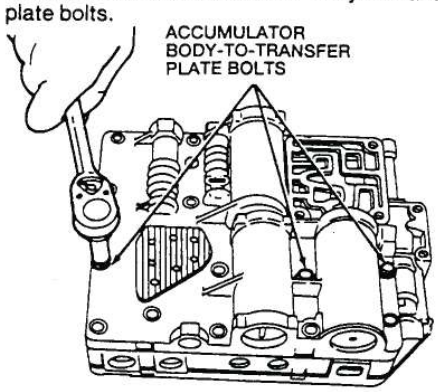
Remove the pressure tap plate gasket from the accumulator body. Discard the gasket.



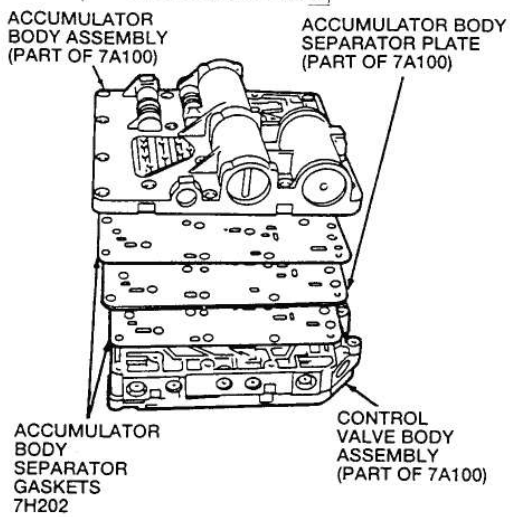
Use an 8mm socket to remove the three control valve body-to-transfer plate bolts. Remove the manual valve detent spring assembly.



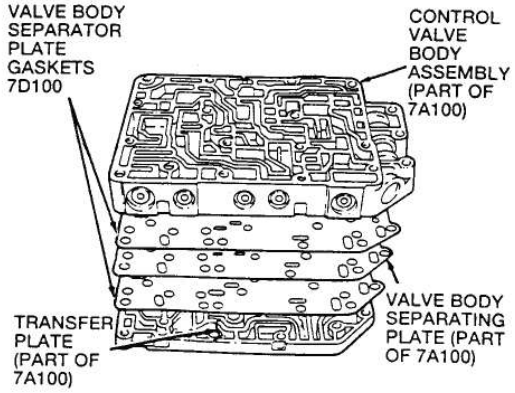
Remove the three accumulator body-to-transfer plate bolts.



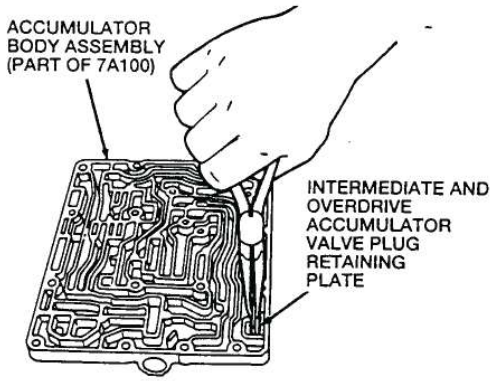
Remove the accumulator body assembly, accumulator body separator plate and accumulator body separator gaskets from the control valve body assembly.



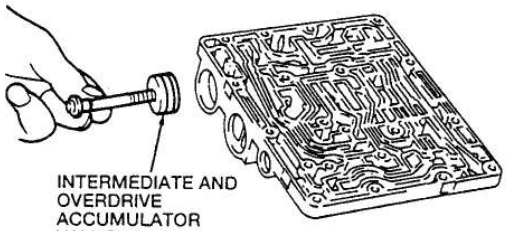
Remove the control valve body assembly, valve body separating plate and valve body separator plate gaskets (7D100) from the transfer plate.



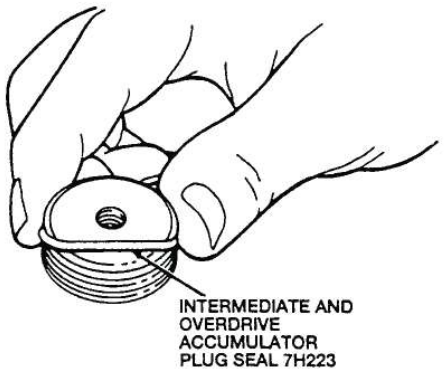
Remove the Intermediate and Overdrive accumulator valve plug retaining plate from the accumulator body assembly.



Thread a M6X1 bolt into the Intermediate and Overdrive accumulator valve plug. Remove the Intermediate and Overdrive accumulator valve plug.



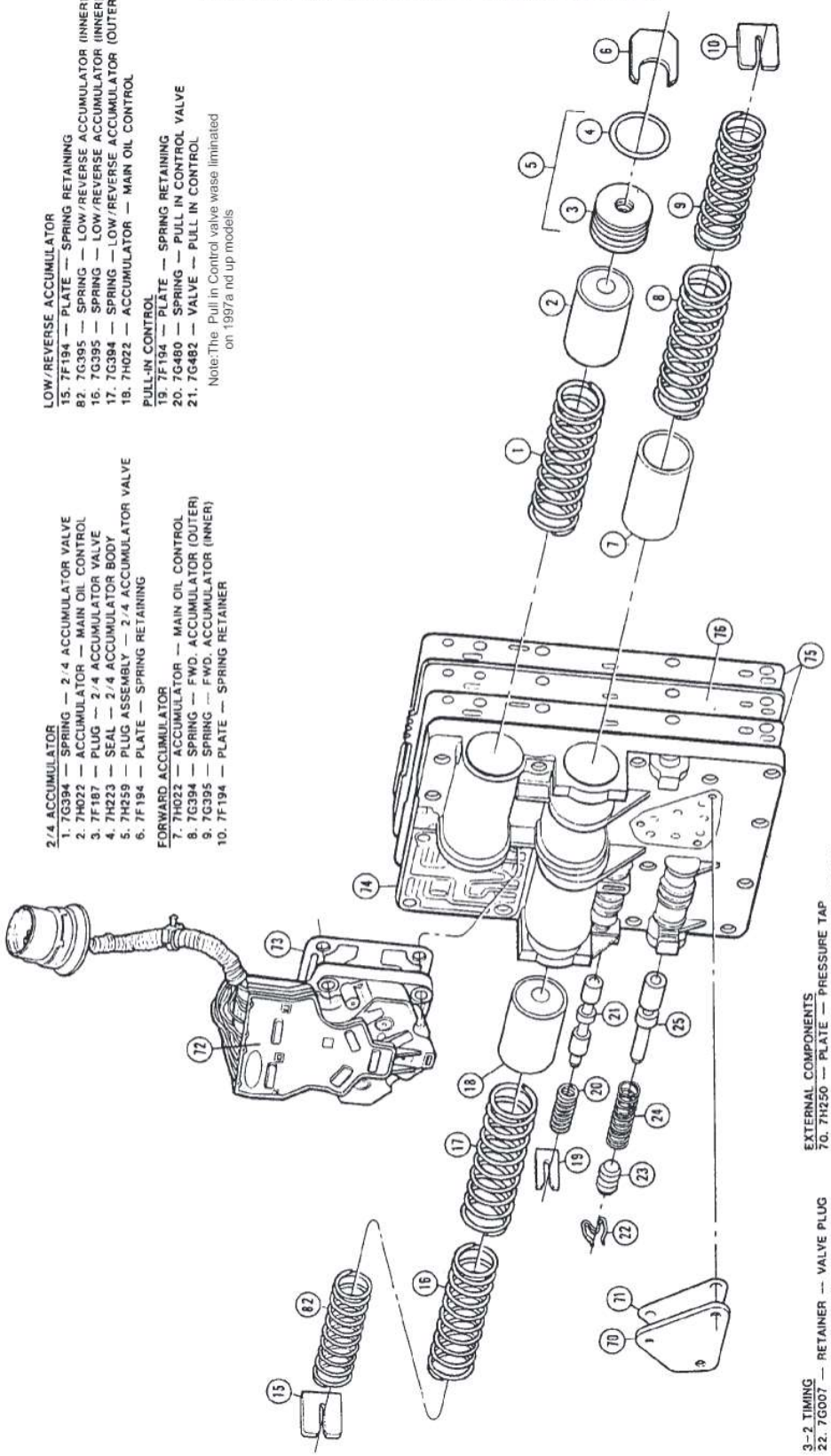
Remove the Intermediate and Overdrive accumulator plug seal. Discard the seal.



CAUTION: Remove and clean one valve at a time to avoid incorrect installation.

EXPLODED VIEW - ACCUMULATOR BODY

MAIN CONTROL ASSEMBLY



2/4 ACCUMULATOR
1. 7G394 — SPRING — 2/4 ACCUMULATOR VALVE
2. 7H022 — ACCUMULATOR — MAIN OIL CONTROL
3. 7F187 — PLUG — 2/4 ACCUMULATOR VALVE
4. 7H223 — SEAL — 2/4 ACCUMULATOR BODY
5. 7H259 — PLUG ASSEMBLY — 2/4 ACCUMULATOR VALVE
6. 7F194 — PLATE — SPRING RETAINING

FORWARD ACCUMULATOR
7. 7H022 — ACCUMULATOR — MAIN OIL CONTROL
8. 7G394 — SPRING — FWD. ACCUMULATOR (OUTER)
9. 7G395 — SPRING — FWD. ACCUMULATOR (INNER)
10. 7F194 — PLATE — SPRING RETAINER

LOW/REVERSE ACCUMULATOR
15. 7F194 — PLATE — SPRING RETAINING
82. 7G395 — SPRING — LOW/REVERSE ACCUMULATOR (INNER)
16. 7G395 — SPRING — LOW/REVERSE ACCUMULATOR (INNER)
17. 7G394 — SPRING — LOW/REVERSE ACCUMULATOR (OUTER)
18. 7H022 — ACCUMULATOR — MAIN OIL CONTROL

PULL-IN CONTROL
19. 7F194 — PLATE — SPRING RETAINING
20. 7G480 — SPRING — PULL IN CONTROL VALVE
21. 7G482 — VALVE — PULL IN CONTROL

Note:The Pull in Control valve wase liminated on 1997a nd up models

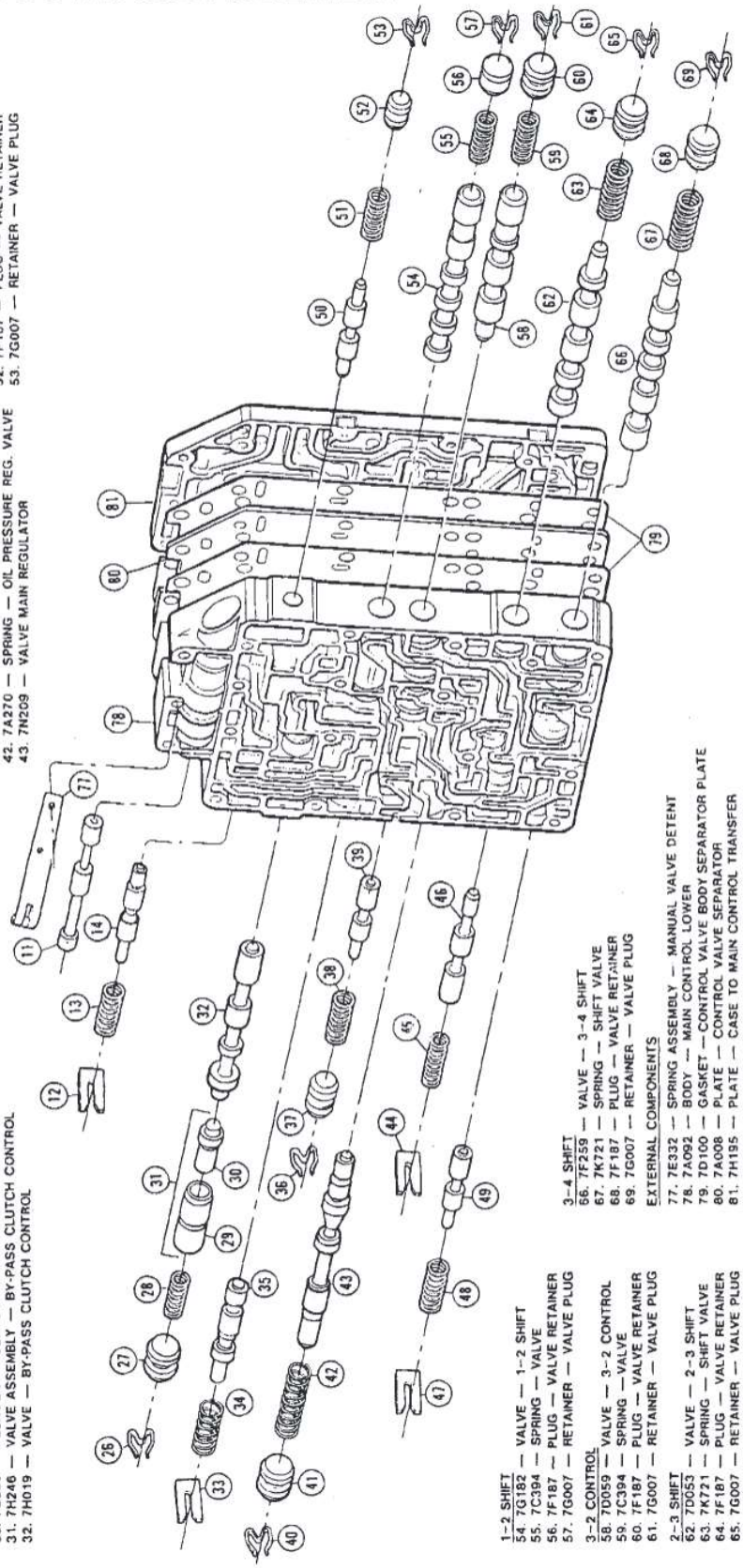
3-2 TIMING
22. 7G007 — RETAINER — VALVE PLUG
23. 7F187 — PLUG — VALVE RETAINER
24. 7F414 — SPRING — 3-2 TIMING VALVE
25. 7E167 — VALVE — 3-2 TIMING

Note:T he32 timing valve line-up on 2002 and up models has the spring first themva lve then plug

EXTERNAL COMPONENTS
70. 7H250 — PLATE — PRESSURE TAP
71. 7H251 — GASKET — PRESSURE TAP PLATE
72. 7G391 — BODY ASSY. — SOLENOID SHIFT & THROTTLE CONTROL
73. 7H200 — GASKET — ELECTRONIC CONTROL BODY
74. 7G393 — BODY — ACCUMULATOR
75. 7H202 — GASKET — ACCUMULATOR BODY SEPARATOR PLATE
76. 7H201 — PLATE — ACCUMULATOR BODY SEPARATOR

MAIN CONTROL ASSEMBLY

EXPLODED VIEW - VALVE BODY



MANUAL CONTROL VALVE
11. 7C389 — VALVE — MANUAL CONTROL

SOLENOID REGULATOR
12. 7F194 — PLATE — SPRING RETAINING
13. 7G411 — SPRING — SOLENOID REGULATOR VALVE
14. 7G473 — VALVE — SOLENOID REGULATOR

BY-PASS — CLUTCH CONTROL
26. 7G007 — RETAINER — VALVE PLUG
27. 7F187 — PLUG — VALVE RETAINER
28. 7H140 — SPRING — BY-PASS CLUTCH CONTROL VALVE
29. 7G319 — SLEEVE — BY-PASS CLUTCH CONTROL
30. 7G320 — PLUNGER — CLUTCH CONTROL VALVE
31. 7H246 — VALVE ASSEMBLY — BY-PASS CLUTCH CONTROL
32. 7H019 — VALVE — BY-PASS CLUTCH CONTROL

CONVERTER REGULATOR
33. 7F194 — PLATE — SPRING RETAINING
34. 7G315 — SPRING — CONVERTER REG. VALVE
35. 7G307 — VALVE — CONVERTER REGULATOR

LINE MODULATOR
36. 7G007 — RETAINER — VALVE PLUG
37. 7F187 — PLUG — VALVE RETAINER
38. 7G489 — SPRING — LINE MODULATOR
39. 7G408 — VALVE — LINE MODULATOR

MAIN REGULATOR
40. 7G007 — RETAINER — VALVE PLUG
41. 7F187 — PLUG — VALVE RETAINER
42. 7A270 — SPRING — OIL PRESSURE REG. VALVE
43. 7N209 — VALVE MAIN REGULATOR

SERVO RELEASE SHUTTLE
44. 7F194 — PLATE — SPRING RETAINING
45. 7G479 — SPRING— SERVO RELEASE SHUTTLE VALVE
46. 7G483 — VALVE — SERVO RELEASE SHUTTLE

COAST CLUTCH SHIFT
47. 7F194 — PLATE — SPRING RETAINING
48. 7G489 — SPRING — COAST CLUTCH SHIFT VALVE
49. 7G408 — VALVE — LINE MODULATOR

LOW/REVERSE MODULATOR
50. 7H039 — VALVE — LOW/REVERSE MODULATOR
51. 7K720 — SPRING — MODULATOR VALVE
52. 7F187 — PLUG — VALVE RETAINER
53. 7G007 — RETAINER — VALVE PLUG

1-2 SHIFT
54. 7G182 — VALVE — 1-2 SHIFT
55. 7C394 — SPRING — VALVE
56. 7F187 — PLUG — VALVE RETAINER
57. 7G007 — RETAINER — VALVE PLUG

3-2 CONTROL
58. 7D059 — VALVE — 3-2 CONTROL
59. 7C394 — SPRING — VALVE
60. 7F187 — PLUG — VALVE RETAINER
61. 7G007 — RETAINER — VALVE PLUG

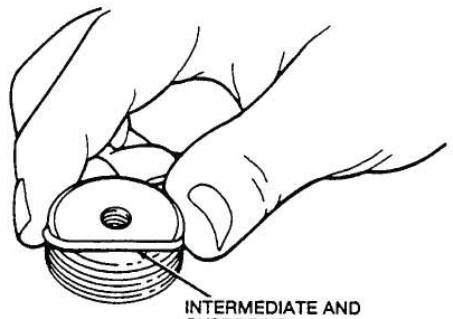
2-3 SHIFT
62. 7D053 — VALVE — 2-3 SHIFT
63. 7K721 — SPRING — SHIFT VALVE
64. 7F187 — PLUG — VALVE RETAINER
65. 7G007 — RETAINER — VALVE PLUG

3-4 SHIFT
66. 7F259 — VALVE — 3-4 SHIFT
67. 7K721 — SPRING — SHIFT VALVE
68. 7F187 — PLUG — VALVE RETAINER
69. 7G007 — RETAINER — VALVE PLUG

EXTERNAL COMPONENTS
77. 7E332 — SPRING ASSEMBLY — MANUAL VALVE DETENT
78. 7A092 — BODY — MAIN CONTROL LOWER
79. 7D100 — GASKET — CONTROL VALVE BODY SEPARATOR PLATE
80. 7A008 — PLATE — CONTROL VALVE SEPARATOR
81. 7H195 — PLATE — CASE TO MAIN CONTROL TRANSFER

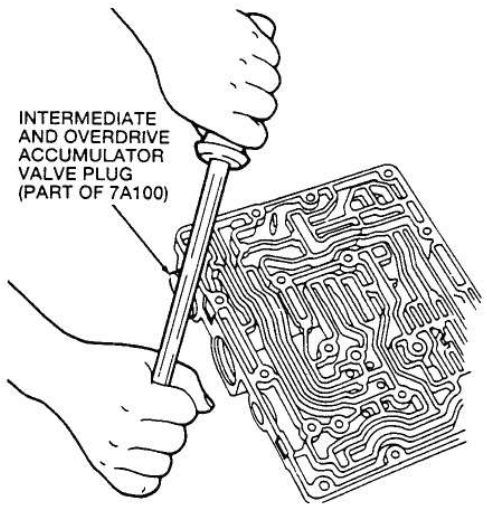
DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES (Continued)

Install a new Intermediate and Overdrive accumulator plug seal on the Intermediate and Overdrive accumulator valve plug and coat with petroleum jelly.

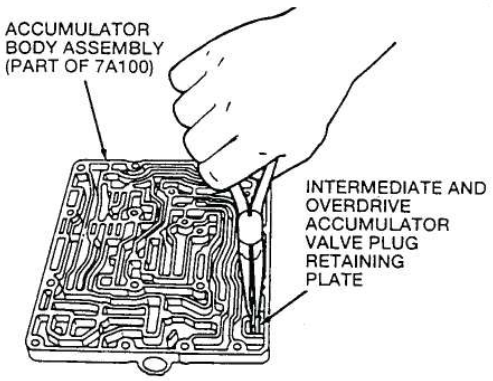


CAUTION: Prevent the Intermediate and Overdrive accumulator valve plug and seal from going too far into the bore and damaging the seal. Only push the low and intermediate accumulator valve plug until it is flush with accumulator body assembly.

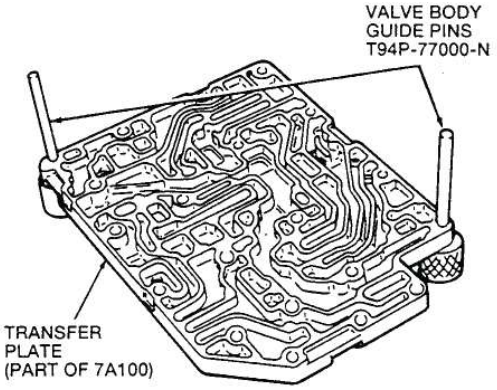
Use a screwdriver to install the Intermediate and Overdrive accumulator valve plug in the accumulator body assembly.



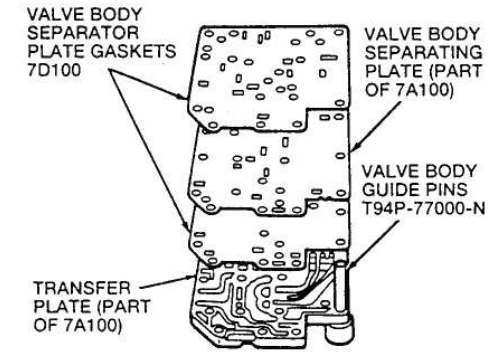
Install the Intermediate and Overdrive accumulator valve plug retaining plate.



Install Valve Body Guide Pins T94P-77000-N in the transfer plate.

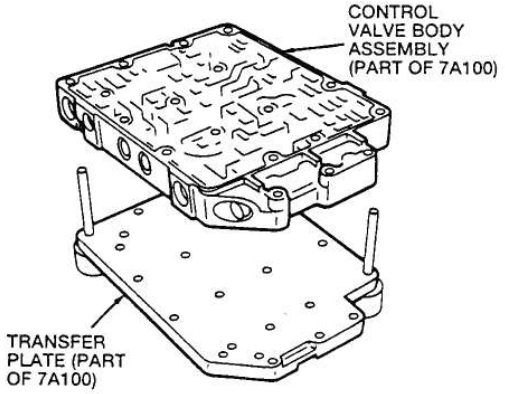


Install the valve body separator plate gaskets and valve body separating plate (7A008) on the transfer plate.

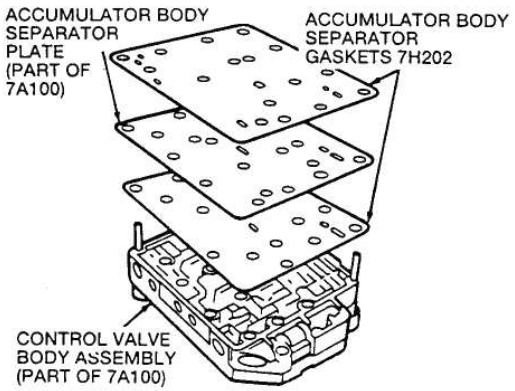


DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES (Continued)

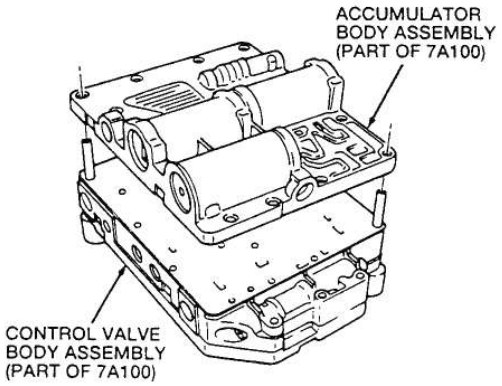
Install the control valve body assembly.



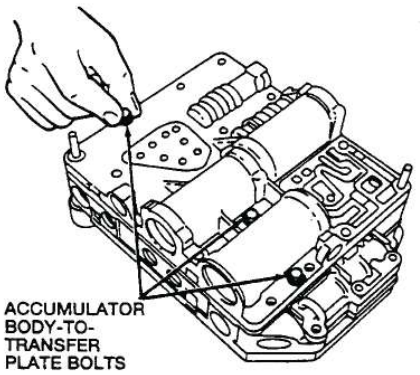
Install the accumulator body separator plate and gaskets on the control valve body assembly.



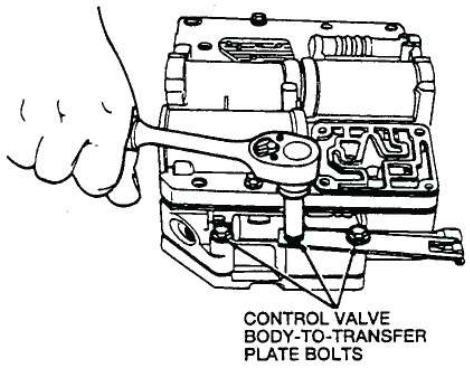
Install the accumulator body assembly.



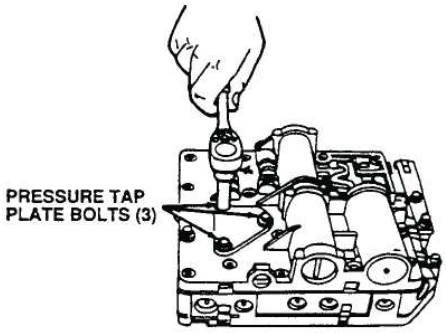
Install and tighten the three accumulator body-to-transfer plate bolts to 10 N·m (7 lb-ft).



Install the three control valve body-to-transfer plate bolts and manual valve detent spring assembly. Tighten the control valve body-to-transfer plate bolts to 10 N·m (7 lb-ft).

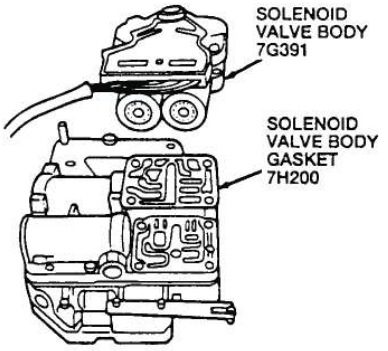


Install the pressure tap plate, gasket and three bolts on the accumulator body assembly. Tighten the pressure tap plate bolts to 8 N·m (6 lb-ft).

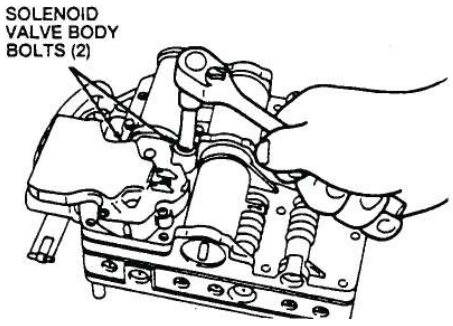


NOTE: Match the solenoid valve body gasket to passages.

Install the solenoid valve body and solenoid valve body gasket on the accumulator body assembly.



Install the two solenoid valve body bolts. Tighten the solenoid valve body bolts to 10 N·m (7 lb-ft).



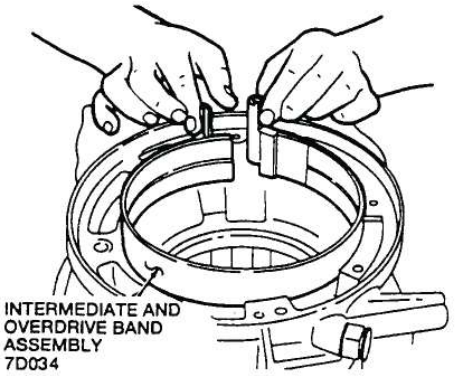
Remove the valve body guide pins.

Install manual valve.

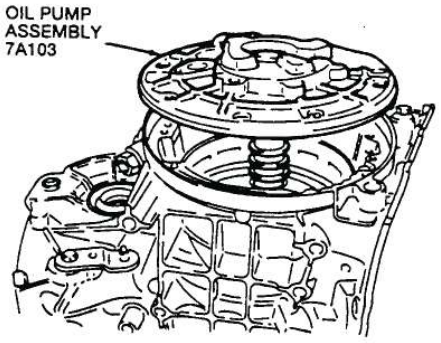
NOTE: Store main control in clean location until re-assembly.

ASSEMBLY (Continued)

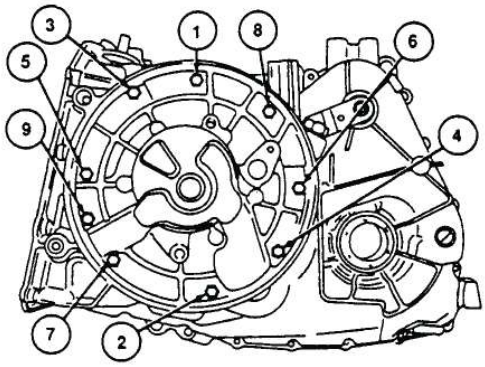
Slide the intermediate and overdrive band assembly into the transaxle case.



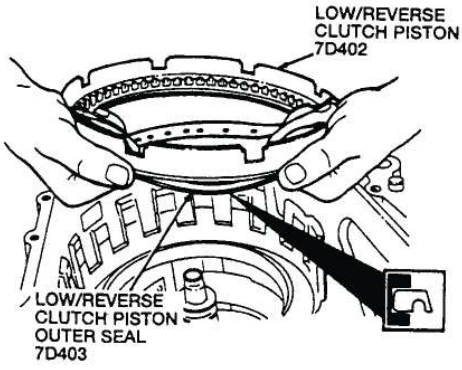
Lower the oil pump assembly into the transaxle case.



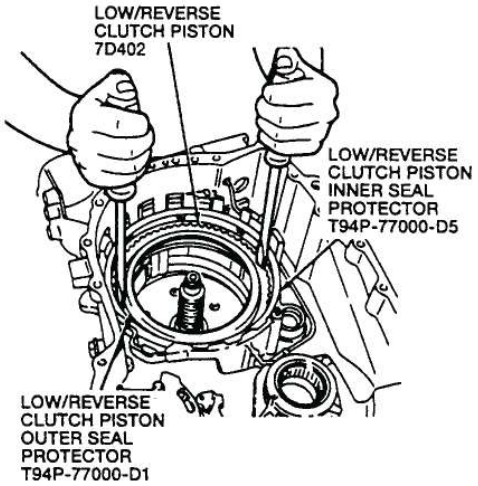
Install the nine oil pump assembly bolts. Use an 8mm socket to tighten the oil pump assembly bolts in the sequence shown to 13 N·m (10 lb-ft).



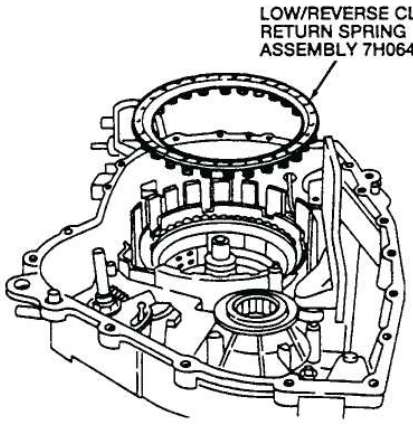
Install the low/reverse clutch piston outer seal on the low/reverse clutch piston.



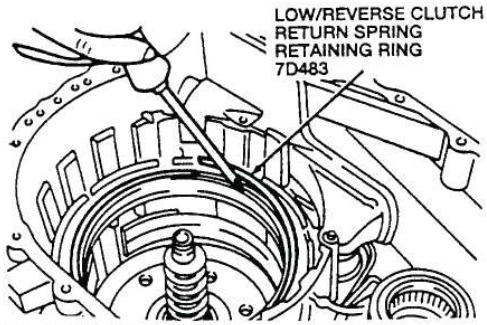
ASSEMBLY (Continued)



Install the low / reverse clutch return spring assembly.

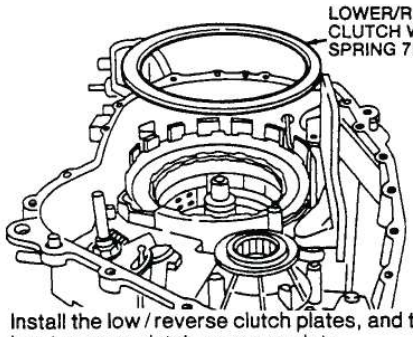


Use a screwdriver to install the low / reverse clutch return spring retaining ring.

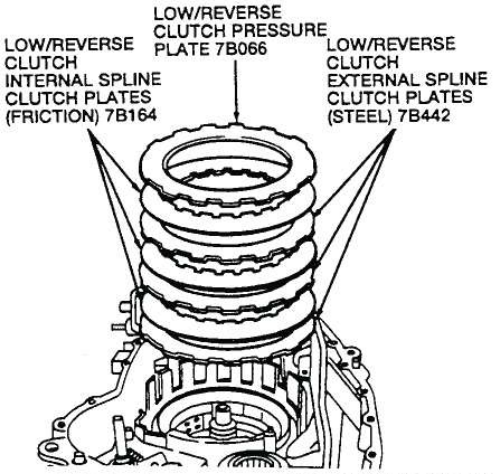


CAUTION: The low / reverse clutch wave spring is installed in this position for measurement purposes only.

Install the low / reverse clutch wave spring.

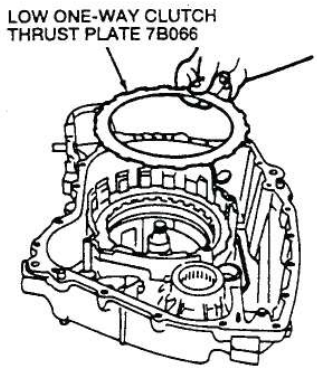


Install the low / reverse clutch plates, and the low / reverse clutch pressure plate.



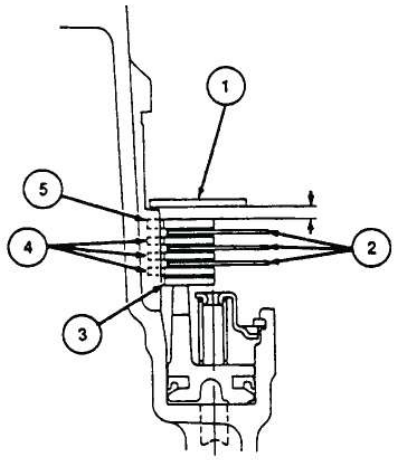
CAUTION: The low one-way clutch thrust plate is installed in this position for measurement purposes only.

Install the low one-way clutch thrust plate.



Use a feeler gauge to measure the clearance between the low / reverse clutch pressure plate and the low one-way clutch thrust plate. Make a second measurement on the opposite side. Average the two measurements to obtain the clearance.

ASSEMBLY (Continued)



Item	Part Number	Description
1	7B066	Low One-Way Clutch Thrust Plate
2	7B164	Low/Reverse Clutch Internal Spline Clutch Plates (Friction)
3	7B070	Low/Reverse Clutch Wave Spring
4	7B442	Low/Reverse Clutch External Spline Clutch Plates (Steel)
5	7B066	Low/Reverse Clutch Pressure Plate

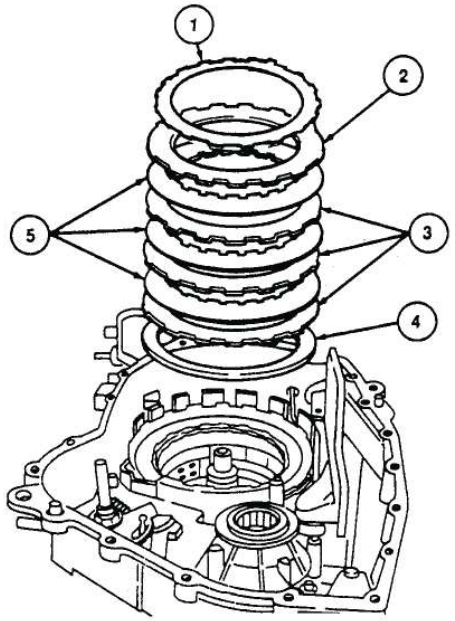
The standard clearance is 0.54 to 1.17mm (0.02 to 0.05 inch). If the clearance is not within specification, select the proper thickness pressure plate to obtain the standard clearance.

Pressure plate sizes are as follows:

Thickness mm (inch)
2.57-2.47 (0.1 to 0.097)
2.36-2.26 (0.092 to 0.088)
2.16-2.06 (0.085 to 0.081)

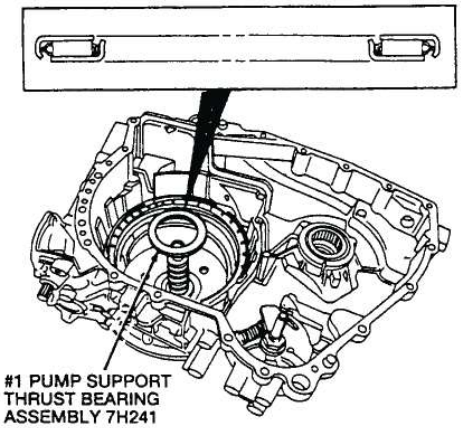
NOTE: One tooth of the low/reverse clutch pressure plate is notched for identification.

Remove the low one-way clutch thrust plate, low/reverse clutch pressure plate, low/reverse clutch external spline clutch plate (steel), low/reverse clutch internal spline clutch plates (friction), and the low/reverse clutch wave spring.



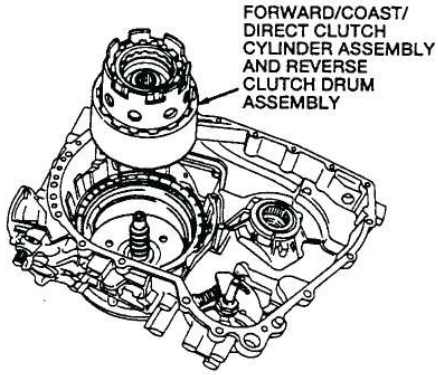
Item	Part Number	Description
1	7B066	Low One-Way Clutch Thrust Plate
2	7B066	Low/Reverse Clutch Pressure Plate
3	7B442	Low/Reverse Clutch External Spline Clutch Plates (Steel)
4	7B070	Low/Reverse Clutch Wave Spring
5	7B164	Low/Reverse Clutch Internal Spline Clutch Plates (Friction)

Install the #1 pump support thrust bearing assembly.

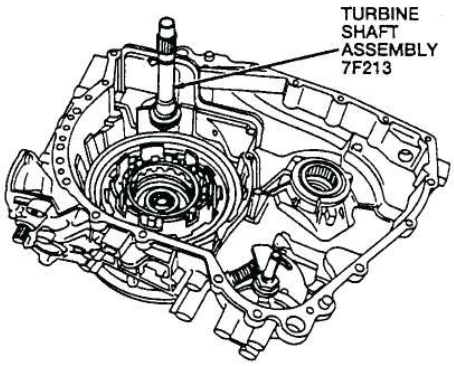


Remove the seal sizer from the Forward/Coast/Direct clutch cylinder assembly.

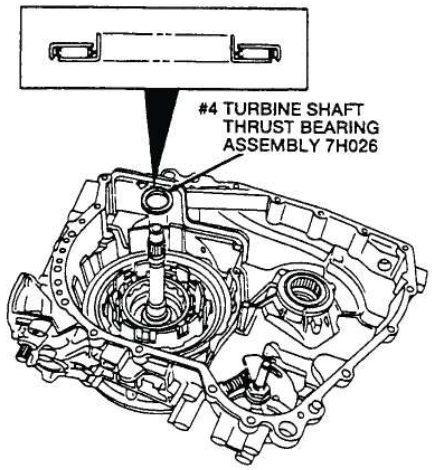
Install the assembly of Forward / Coast / Direct (F / C / D) cylinder assembly and reverse clutch drum assembly.



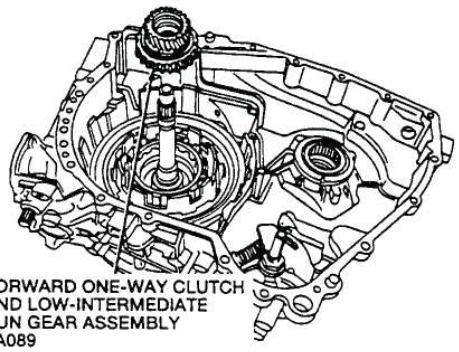
Install the turbine shaft assembly.



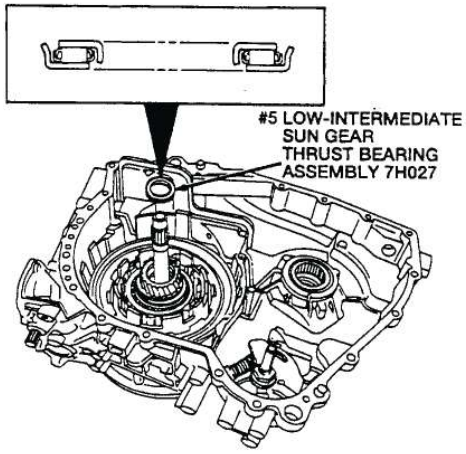
Install the #4 turbine shaft thrust bearing assembly.



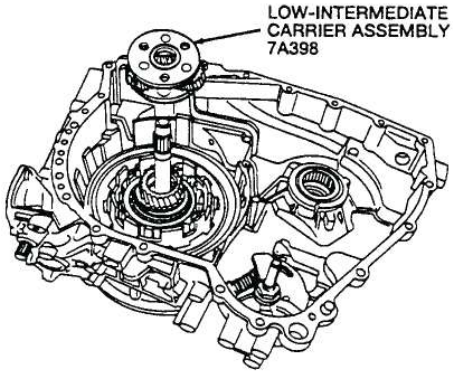
Install the forward one-way clutch and Low-Intermediate sun gear assembly.



Install the #5 Low-Intermediate sun gear thrust bearing assembly.

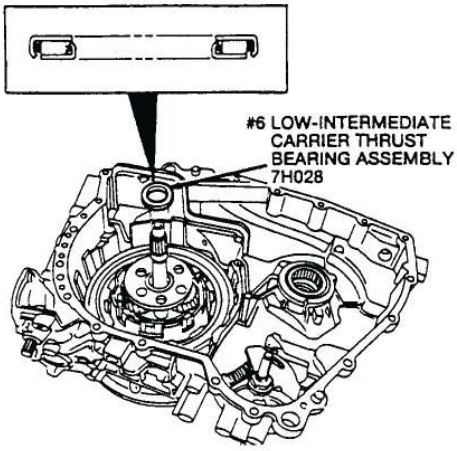


Install the Low-Intermediate carrier assembly.

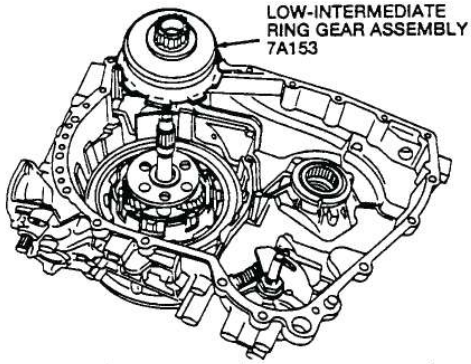


ASSEMBLY (Continued)

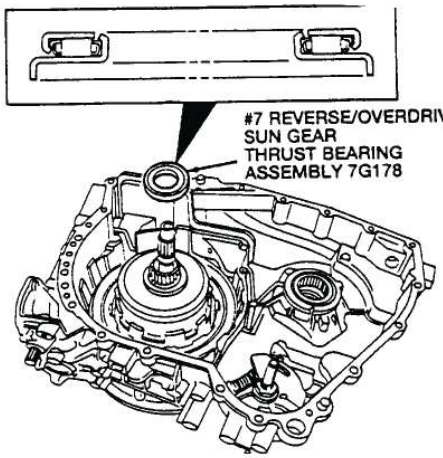
Install the #6 Low-Intermediate carrier thrust bearing assembly.



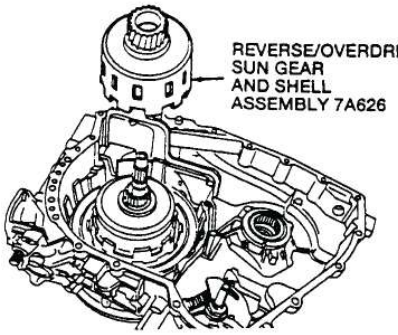
Install the Low-Intermediate ring gear assembly.



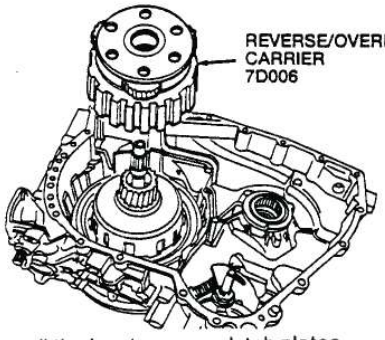
Install the #7 Reverse / Overdrive sun gear thrust bearing assembly.



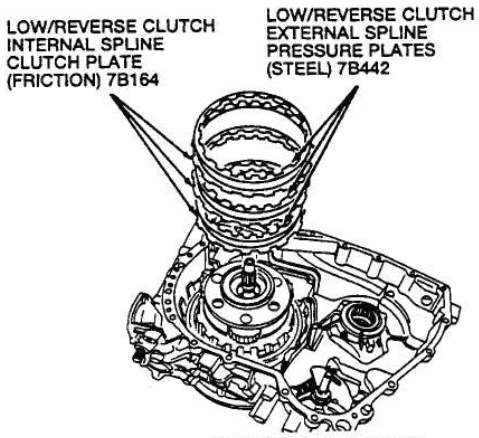
Install the Reverse / Overdrive sun gear and shell assembly.

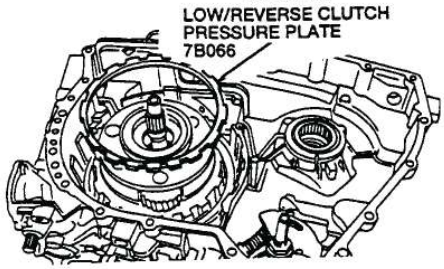


Install the Reverse / Overdrive carrier assembly with the captured #8 thrust bearing.



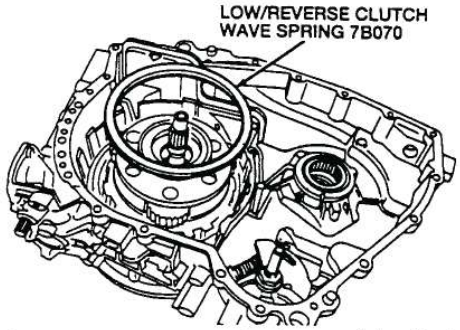
Install the low / reverse clutch plates.



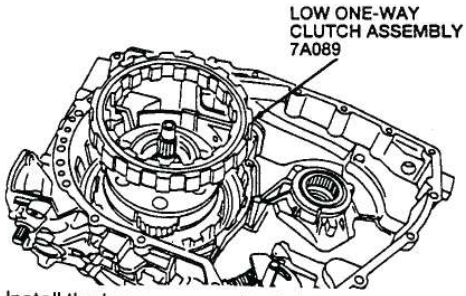


Install the low / reverse clutch pressure plate previously selected.

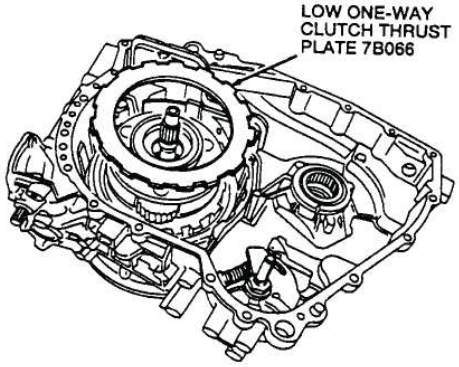
Install the low / reverse clutch wave spring.



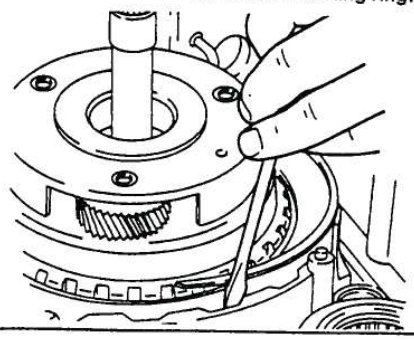
Install the low one-way clutch assembly with the I.D. ring on the inner ring facing up.



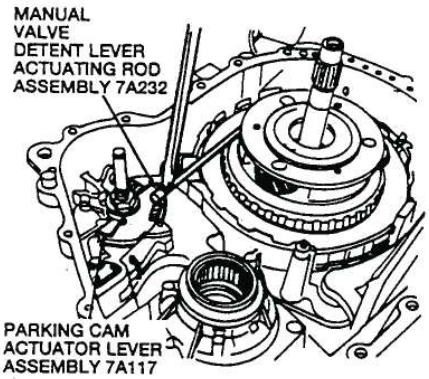
Install the low one-way clutch thrust plate.



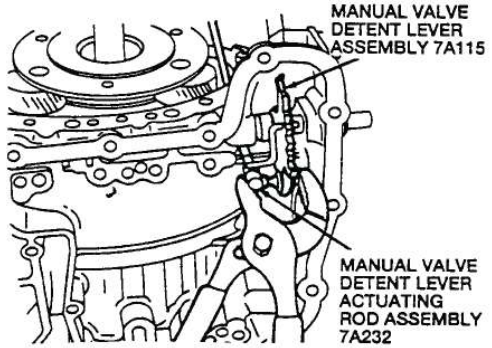
Install the low one-way clutch retaining ring.



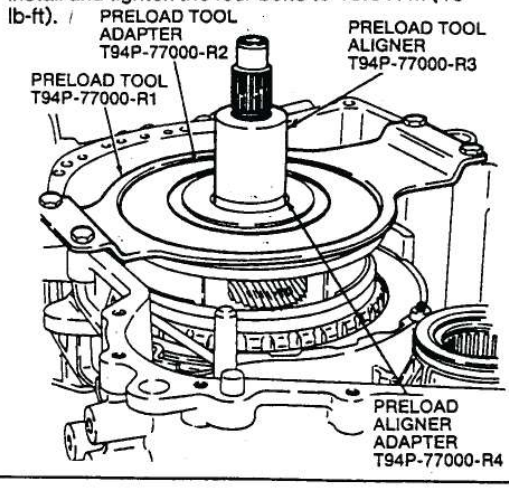
Snap the socket end of the manual valve detent lever actuating rod on the parking cam actuator lever.



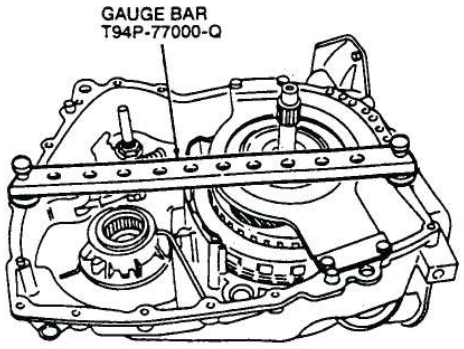
Snap the opposite socket end of the manual valve detent lever actuating rod assembly on the manual valve detent lever assembly.



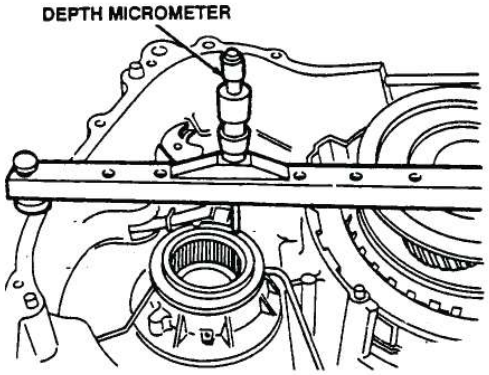
Install Preload Tool T94P-77000-R1, Preload Tool Adapter T94P-77000-R2, Preload Tool Aligner T94P-77000-R3, and Preload Aligner Adapter T94P-77000-R4 (all are part of Preload Tool Adapter / Aligner Set T94P-77000-R), on the Reverse / Overdrive carrier assembly as shown. Install and tighten the four bolts to 13.5 N·m (10 lb-ft).



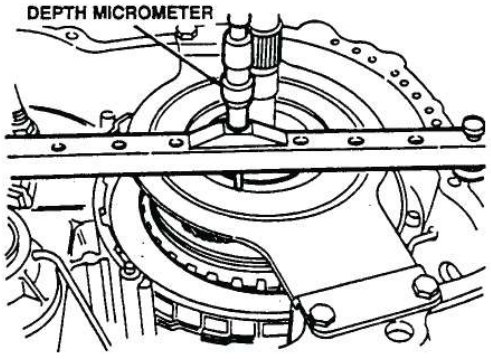
Install Gauge Bar T94P-77000-Q with short spacers across the transaxle case.



Measure the distance from the top of the gauge bar to the # 12 driven sprocket bearing assembly surface area of the transaxle case. This is dimension A.



Use a depth micrometer to measure the distance from the top of the gauge bar to the bearing surface on the Reverse / Overdrive carrier assembly. This is dimension B.



Subtract dimension B from dimension A to get dimension C.

Use dimension C to select the proper # 11 driven sprocket shim from the following chart.

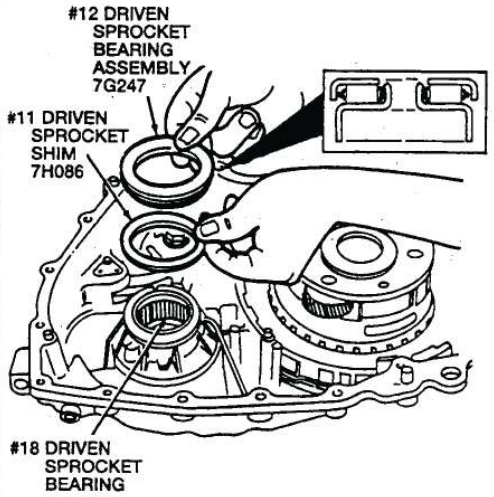
Dimension C	Shim Thickness
14.34-14.17mm (.565-.558 in)	2.20-2.10mm (.087-.083 in)
14.16-14.00mm (.557-.551 in)	2.02-1.92mm (.080-.076 in)
13.99-13.83mm (.550-.544 in)	1.85-1.75mm (.073-.069 in)
13.82-13.66mm (.543-.538 in)	1.67-1.57mm (.066-.062 in)
13.65-13.49mm (.537-.531 in)	1.50-1.40mm (.059-.055 in)
13.48-13.32mm (.530-.524 in)	1.32-1.22mm (.052-.048 in)

Install the selected # 11 driven sprocket shim on the transaxle case.

Remove the gauge bar and preload tool.

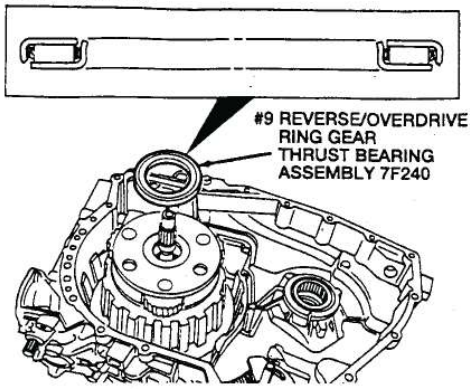
Install the selection # 11 driven sprocket shim on the transaxle case.

Install the # 12 driven sprocket bearing assembly.



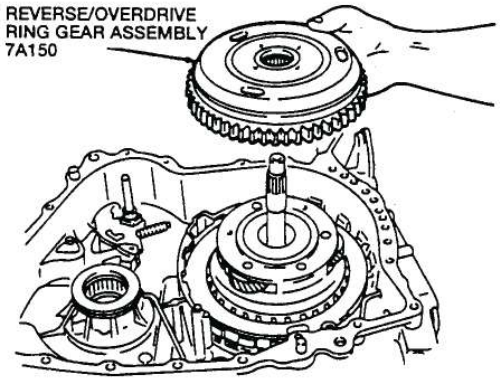
Lubricate the needles and # 18 driven sprocket bearing assembly.

Install the #9 Reverse / Overdrive ring gear thrust bearing assembly.

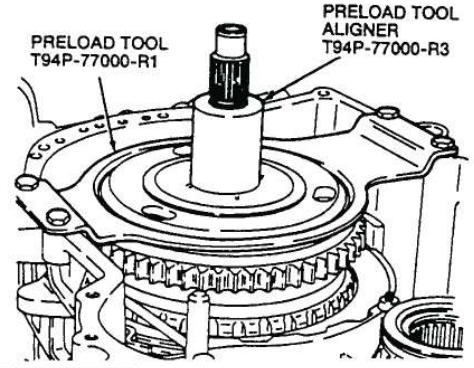


NOTE: Installation of the Reverse / Overdrive ring gear assembly at this time is for measurement purposes only.

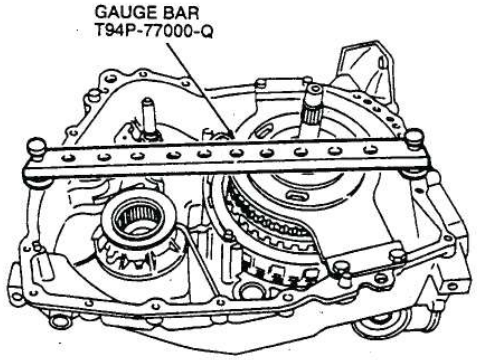
Install the Reverse / Overdrive Ring Gear assembly, for gauging only.



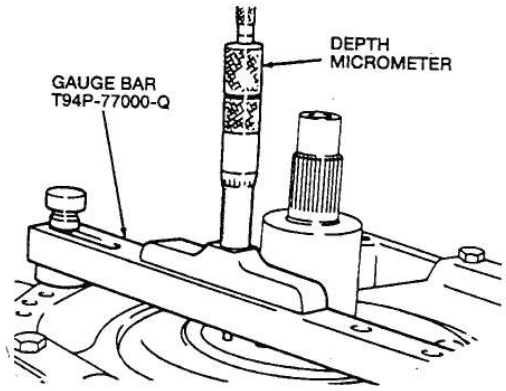
Install Preload Tool Aligner T94P-77000-R3 (part of Preload Tool Adapter / Aligner Set T94P-77000-R) on the shaft. Install and tighten the four bolts to 13.5 N·m (10 lb-ft). Install Preload Tool T94P-77000-R1 (part of Preload Tool Adapter / Aligner Set T94P-77000-R) on the Reverse / Overdrive ring gear assembly.



Install Gauge Bar T94P-77000-Q with short spacers on the transaxle case.



Use a depth micrometer to measure the distance from the top of the Gauge Bar to the face of the Reverse / Overdrive ring gear assembly. This is dimension A.



Use combined thickness 25.4mm (1.00 inch) of Gauge Bar T94P-77000-Q and short spacers as distance B.

Subtract dimension A from dimension B to get dimension C.

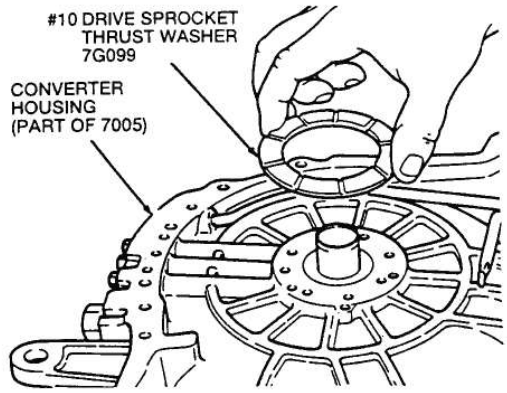
Use dimension C to select the proper # 10 drive sprocket thrust washer from the following chart.

Dimension C	# 10 Thickness
1.12-0.86mm (.044-.034 in.)	1.51-1.41mm (.059-.056 in.)
0.85-0.60mm (.033-.024 in.)	1.77-1.67mm (.070-.066 in.)
0.59-0.34mm (.023-.013 in.)	2.03-1.93mm (.080-.076 in.)
0.33-0.08mm (.013-.003 in.)	2.29-2.19mm (.090-.086 in.)

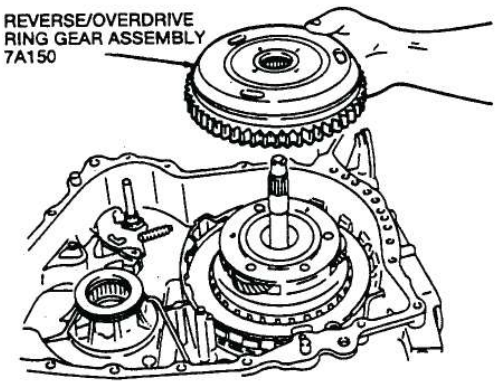
Remove the gauge bar and preload tool.

ASSEMBLY (Continued)

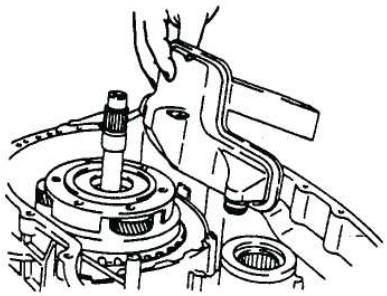
Apply petroleum jelly to the selected # 10 drive sprocket thrust washer and install on the converter housing.



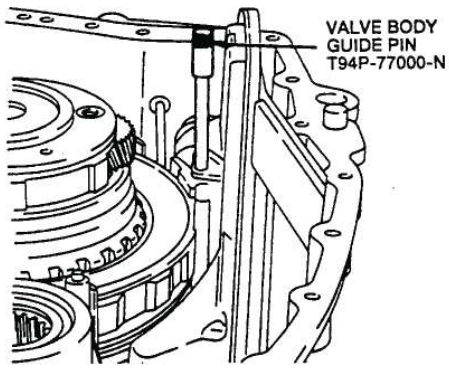
Remove the Reverse / Overdrive ring gear assembly.



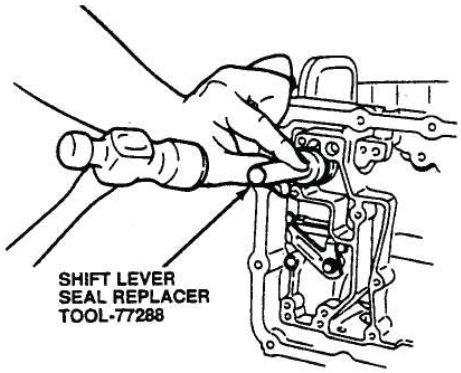
Install the oil filter and seal assembly.



Temporarily install one Valve Body Guide Pin T94P-77000-N in filter eyelet and transaxle case hole.

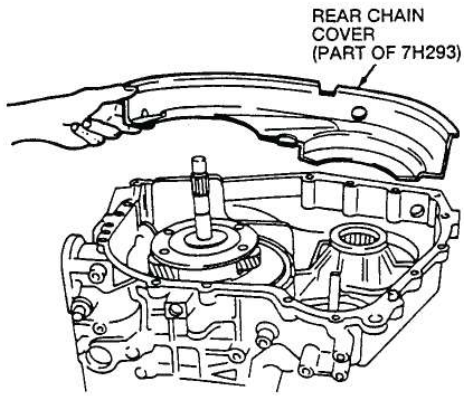


Use Shift Lever Seal Replacer TOOL-77288 to install the oil filter recirculating regulator exhaust seal.



Remove valve body guide pin.

Install the rear chain cover in the transaxle case.

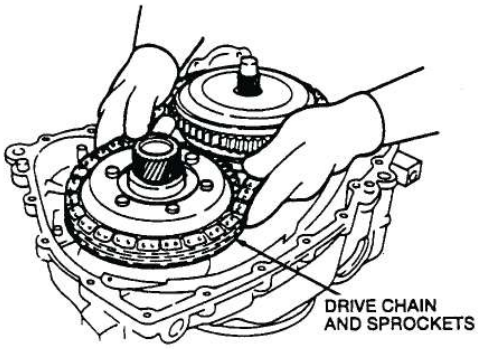


Assemble the drive chain assembly on the driven sprocket assembly, and the Reverse / Overdrive ring gear assembly.

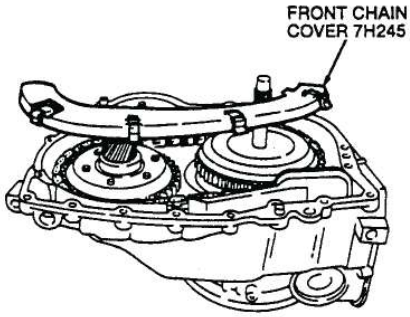
ASSEMBLY (Continued)

WARNING: WEAR GLOVES AS PERSONAL PROTECTION FROM SHARP CHAIN AND SPROCKET TEETH.

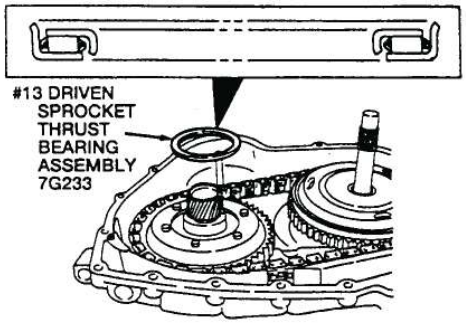
Lower the drive chain assembly, driven sprocket assembly, and the Reverse / Overdrive Ring assembly together in the transaxle case. Verify that the driven sprocket assembly and Reverse / Overdrive ring gear assembly are seated.



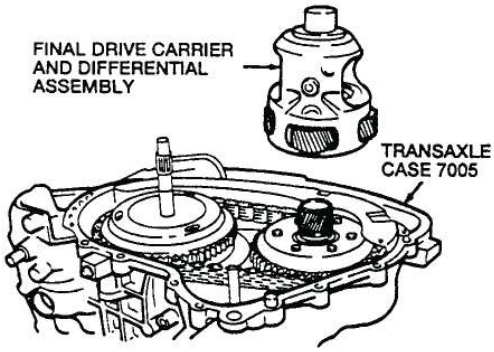
Install the front chain cover by snapping it into place.



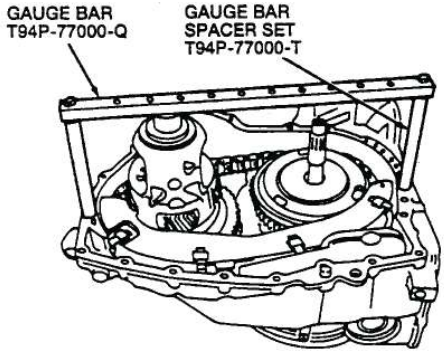
Install the # 13 driven sprocket thrust bearing assembly.



Install the final drive carrier and differential assembly.

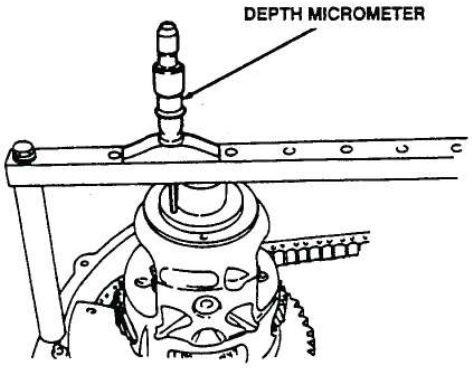


Install Gauge Bar T94P-77000-Q with Gauge Bar Spacer Set T94P-77000-T on the transaxle case. Tighten the bolts to 13 N·m (10 lb-ft).



ASSEMBLY (Continued)

Use a depth micrometer to measure the distance from the top of the gauge bar to the shim surface area of the final drive carrier and differential assembly. Make two measurements and average. This is dimension A.



Use combined thickness of gauge bar with long spacers 177.8mm (7.00 inches) as distance B.

Subtract dimension A from dimension B to get dimension C.

Use dimension C to select the proper # 14 differential bearing shim from the following chart.

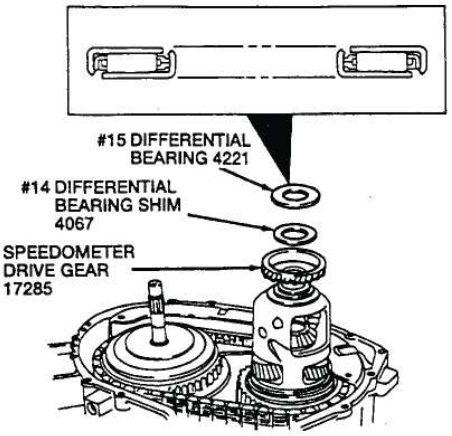
Dimension C	# 14 Shim Thickness
130.76-130.46mm (5.148-5.136 in)	1.08-0.98mm (.043-.039 in)
130.45-130.16mm (5.136-5.124 in)	1.38-1.28mm (.054-.050 in)
130.15-129.87mm (5.123-5.113 in)	1.67-1.57mm (.066-.062 in)
129.86-129.57mm (5.113-5.101 in)	1.97-1.87mm (.078-.074 in)
129.56-127.27mm (5.100-5.089 in)	2.27-2.17mm (.089-.085 in)

Remove the gauge bar and spacers.

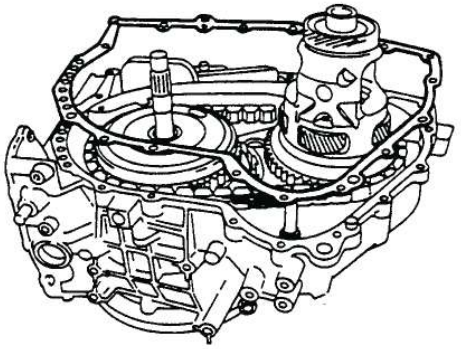
Install the speedometer drive gear with the tabs down and fully seated.

Install the selected # 14 differential bearing shim.

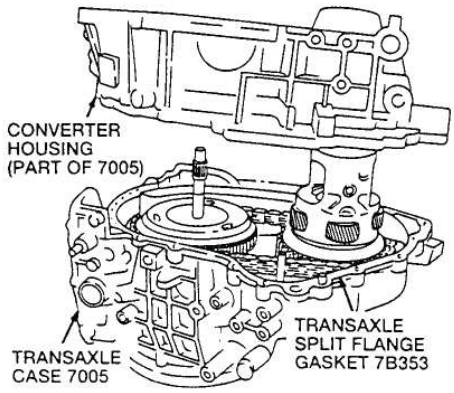
Install the # 15 differential bearing.



Attach the transaxle split flange gasket to the transaxle case.

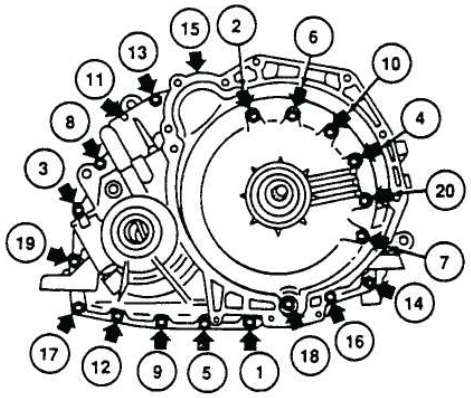


Lower the converter housing onto the transaxle case.

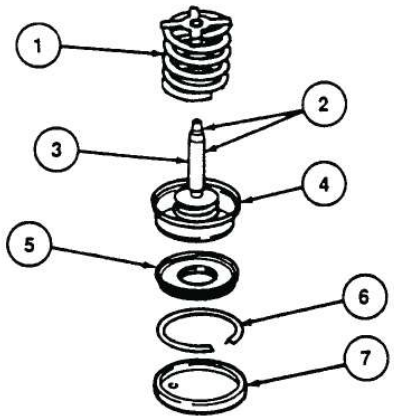


ASSEMBLY (Continued)

Install the twenty converter housing-to-transaxle case bolts. Torque the converter housing-to-transaxle case bolts to 22.5 N·m (19 lb-ft) in the sequence shown.



NOTE: Note the number of grooves on the piston rod.



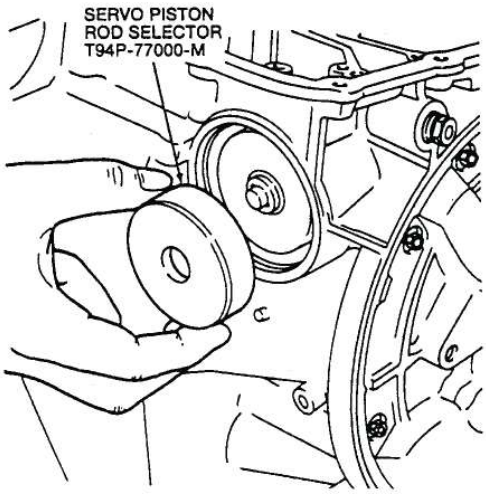
Item	Part Number	Description
1	7F201	Intermediate and Overdrive Servo Return Spring Assembly
2	—	Intermediate and Overdrive Servo Apply Rod Identification Groove Area
3	—	Intermediate and Overdrive Servo Apply Rod (Part of 7H188)

(Continued)

Item	Part Number	Description
4	—	Intermediate and Overdrive Servo Piston Assembly (Part of 7H188)
5	7D027	Servo Cover
6	7H074	Servo Cover Retaining Ring
7	7D027	Servo Cover Cap

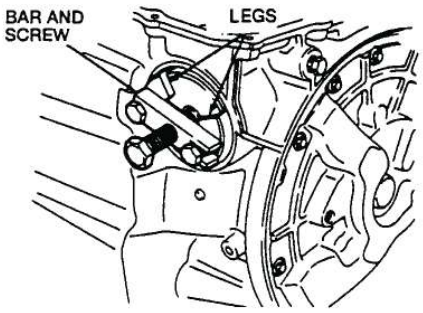
Lubricate and install the intermediate and overdrive servo piston and return spring assembly in the transaxle case bore.

Install Servo Piston Rod Selector T94P-77000-M on the piston.



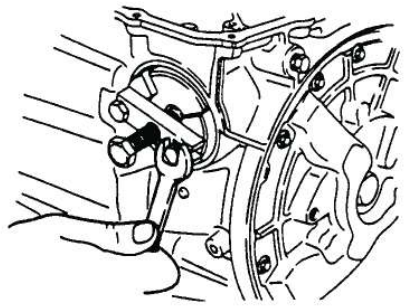
NOTE: Legs of the tool fit into servo cover retaining ring groove.

Loosely assemble the legs and bar from Servo Piston Rod Selector T94P-77000-M in case bore.

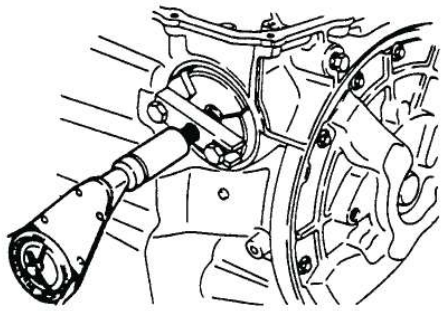


ASSEMBLY (Continued)

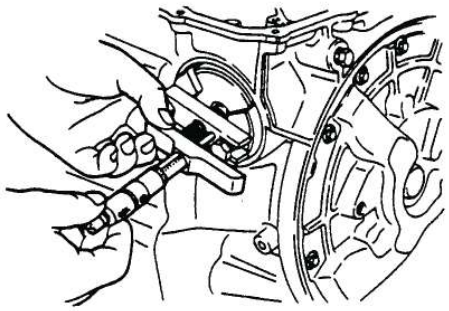
Tighten the bar to the legs using bolts provided.



Torque the center bolt of selector tool to 4 N·m (36 lb-in).



Install a depth micrometer on the head of the selector tool. Measure and record the distance to the bar of the selector tool (distance A).



Back off the center bolt on the servo tool until the piston movement stops. Measure and record distance to bar (distance B).

Subtract A from B to obtain travel C.

Part Number	Number of Grooves	Travel Specification	Rod Length
F3RP-74188-CB	0	2.43 to 4.93mm (.096-.194 in)	108.1mm (4.26 in)
F3RP-74188-BB	1	2.35 to 4.82mm (.093-.190 in)	107.1mm (4.22 in)
F3RP-74188-AB	2	2.43 to 4.93mm (.096-.194 in)	105.7mm (4.16 in)

If the distance is not within the travel specification, replace the Intermediate and Overdrive servo piston and recheck.

Remove the servo piston selection tool.

Install the servo cover in the case.

Install Servo Cover Remover / Replacer T94P-77000-L.

WARNING: SERVO RETURN SPRING FORCE IS VERY HIGH.

Compress the servo cover and install the servo cover retaining ring.

Remove the Servo Cover Remover / Replacer T94P-77000-L.

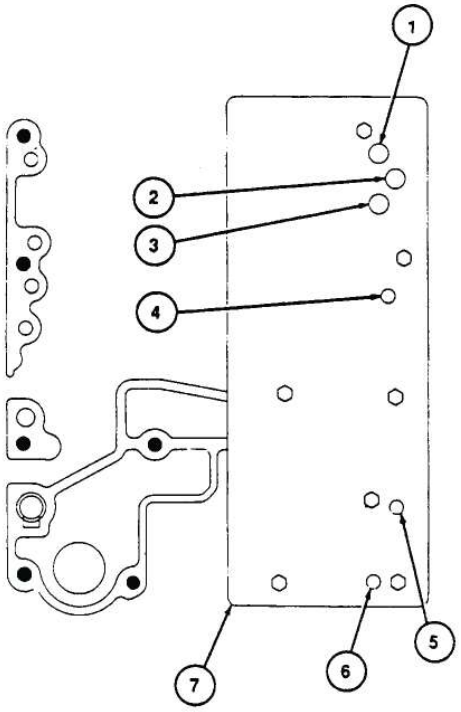
Install servo cover cap in transaxle case using Servo Plug Replacer / Needle Bearing Receiver T94P-77000-E2 (part of T94P-77000-E Needle Bearing Remover / Replacer / Receiver - Servo Plug Replacer).

Install Transmission Test Plate T94P-77000-S and Test Plate Mounting Screws T82P-7006-C.

CAUTION: Do not check the coast clutch since the piston may be forced out of the forward clutch piston.

Use a rubber tipped blow gun and 40 psi of filtered compressed air to check the following clutch hydraulic circuits for function and leakage.

ASSEMBLY (Continued)

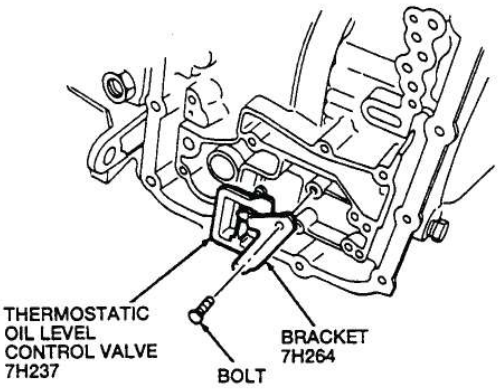


Item	Part Number	Description
1	—	Reverse Clutch
2	—	Forward Clutch
3	—	Direct Clutch
4	—	Low/Reverse Clutch
5	—	Servo Release
6	—	Servo Apply
7	T94P-77000-S	Transmission Test Plate

If air leakage is detected, disassemble the transaxle and locate source of leakage.

Remove Transmission Test Plate T94P-77000-S and Test Plate Mounting Screws T82P-7006-C.

Install the thermostatic oil level control valve in the transaxle case.



Install the bracket and the bolt. Tighten the thermostatic oil level control valve bracket bolt to 12 N·m (9 lb-ft).

Install the O-ring on CD4E transaxle electrical connector.

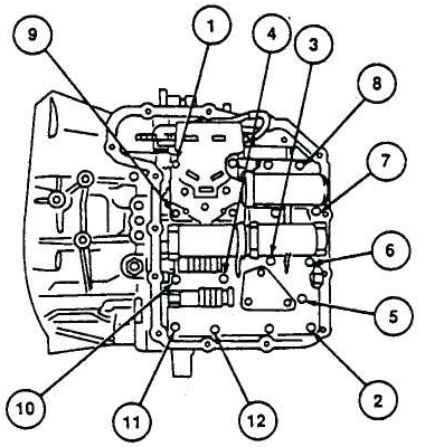
CAUTION: Do not pull wires or damage connector body.

Place the main control slightly away from the transaxle case and push the electrical connector into its bore.

Align the Z-link in the manual valve.

Install wiring harness clip.

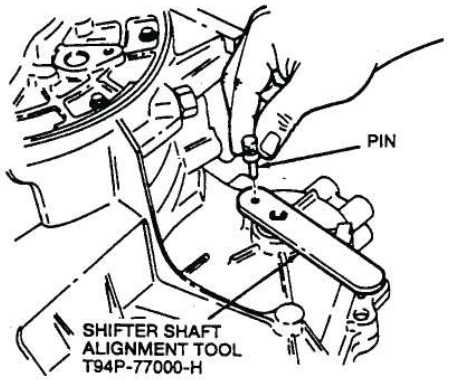
Install the 12 main control bolts. Tighten the main control bolts to 10 N·m (7 lb-ft) in the sequence shown.



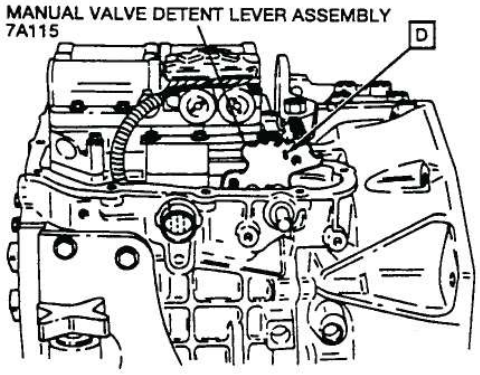
Remove the manual control lever bolt and the manual control lever.

ASSEMBLY (Continued)

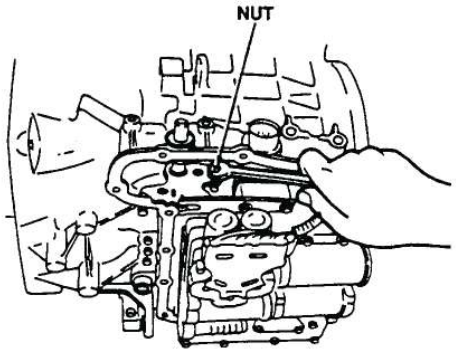
Use Shifter Shaft Alignment Tool T94P-77000-H to move the manual control lever shaft to the "D" position and install the pin to hold the tool in position.



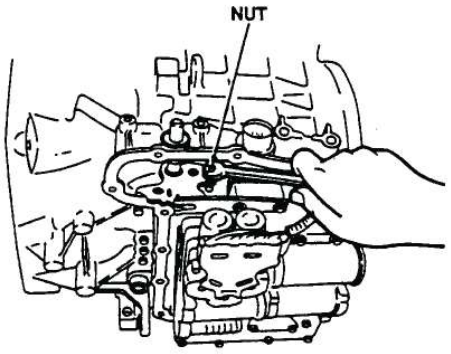
Move the manual valve detent lever assembly to the "D" position.



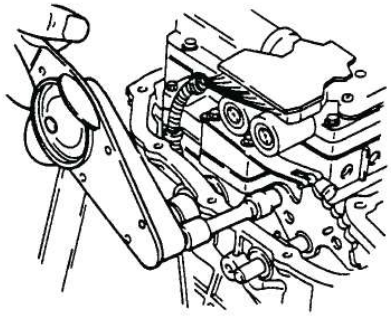
Loosen the nut on the ball stud for the manual valve detent lever actuating rod assembly.



Use a 10mm wrench to initially tighten the nut on the ball. Remove the shifter pin.



Rotate the shifter shift alignment tool until socket can be installed on nut. Tighten the manual valve detent lever ball stud nut to 12 N·m (9 lb-ft). Rotate back to "D" position and recheck adjustment.

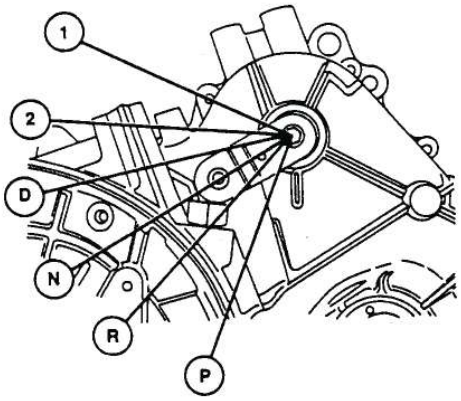


Remove the pin and shifter shaft alignment tool.

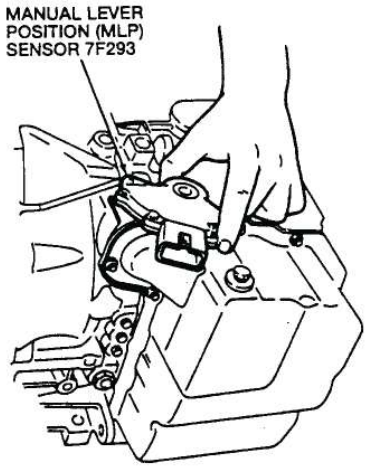
Install the manual control lever assembly and bolt using 10mm socket. Tighten the manual control lever bolt to 25 N·m (18 lb-ft).

ASSEMBLY (Continued)

Rotate manual valve detent lever assembly to "N" position.

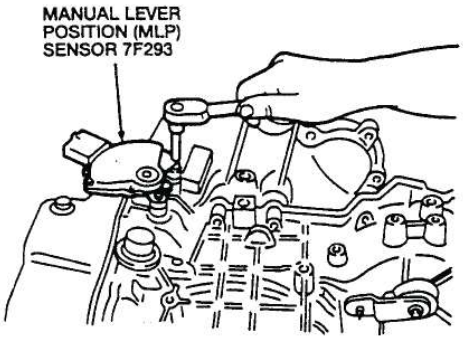


Place the Manual Lever Position (MLP) sensor on the manual valve detent lever shaft.



Use MLPS Alignment Tool T92P-70010-AH to align the MLP sensor on the manual valve detent shaft and transaxle case.

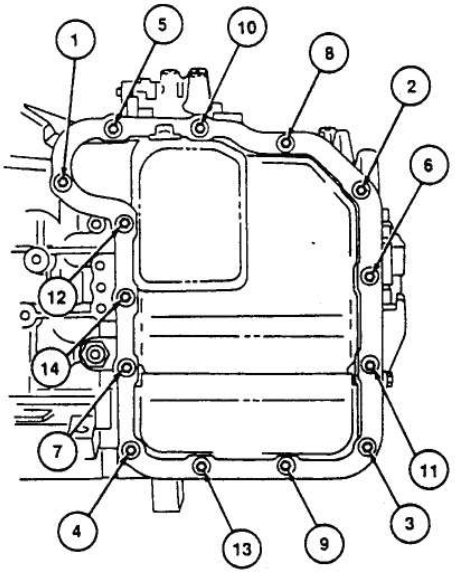
Install and tighten the MLP sensor bolts to 10 N·m (7 lb-ft).



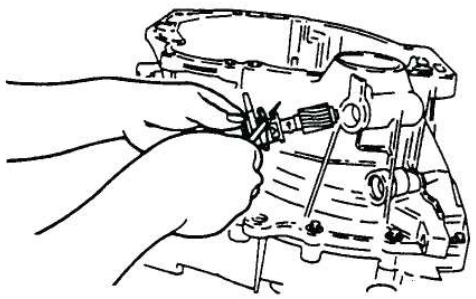
Install the main control cover gasket on the main control cover assembly.

Attach the main control cover assembly to the transaxle case.

Install the fourteen main control cover bolts. Tighten the main control cover bolts 20 N·m (15 lb-ft) in the sequence shown.

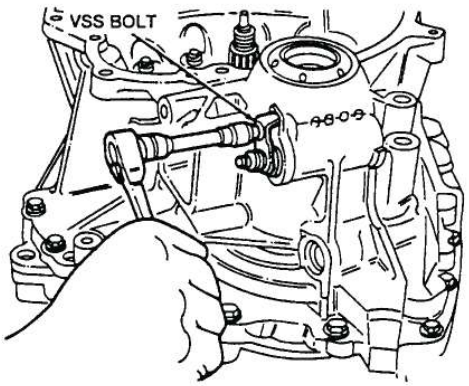


Install the O-ring on the Vehicle Speed Sensor (VSS).

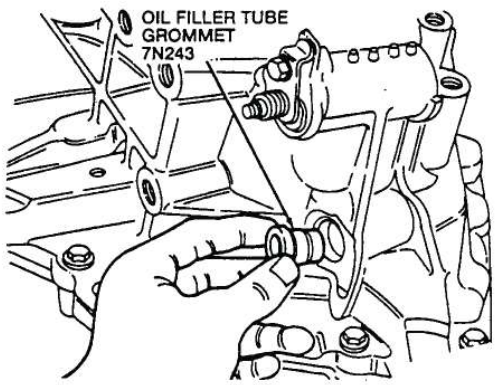


Push the VSS into the bore.

Install the VSS bolt. Use an 8mm socket to tighten the VSS bolt to 5 N·m (4 lb-ft).

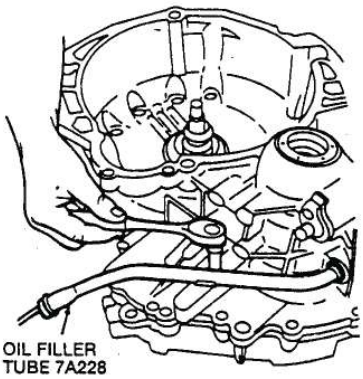


Install a new oil tube filler grommet into the transaxle case.

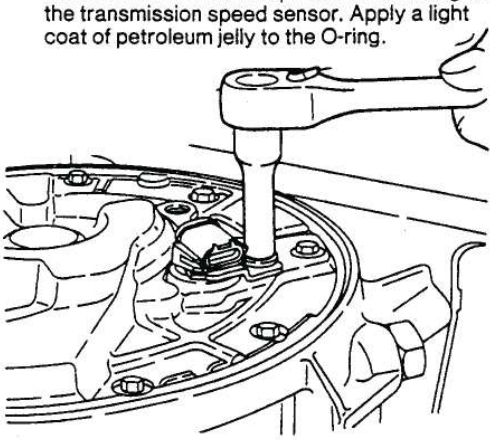


Install the oil filler tube.

Install the oil filler tube bolt. Tighten the oil filler tube bolt to 8 N·m (6 lb-ft).



Install the transmission speed sensor o-ring on the transmission speed sensor. Apply a light coat of petroleum jelly to the O-ring.



Install the oil pump drive shaft into the end of the turbine shaft assembly.

