



FORD 4R100

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INTRODUCTION FORD 4R100

Updated
October, 2003

The Ford 4R100 transmission is an updated version of the E4OD and was first introduced in the 1999 model year, and is currently found in the F250, F350, F450 and F550 Super Duty trucks, E150, E250, E350, E450 vans and the Expedition/Navigator/Excursion vehicles equipped with the 5.4L, 6.8L, and 7.3L engines. Some of the 4R100 units are equipped with a Power-Take-Off (PTO) window on the left hand side of the transmission case. The revisions in the 4R100 have created many new engineering changes that have affected many of the internal and external parts that will affect the servicing, repairing and overhaul of these units.

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

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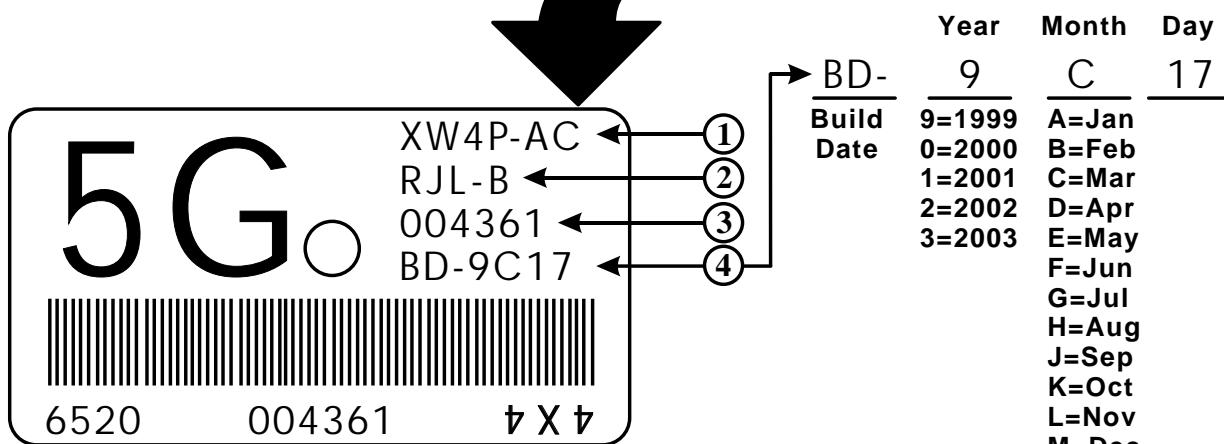
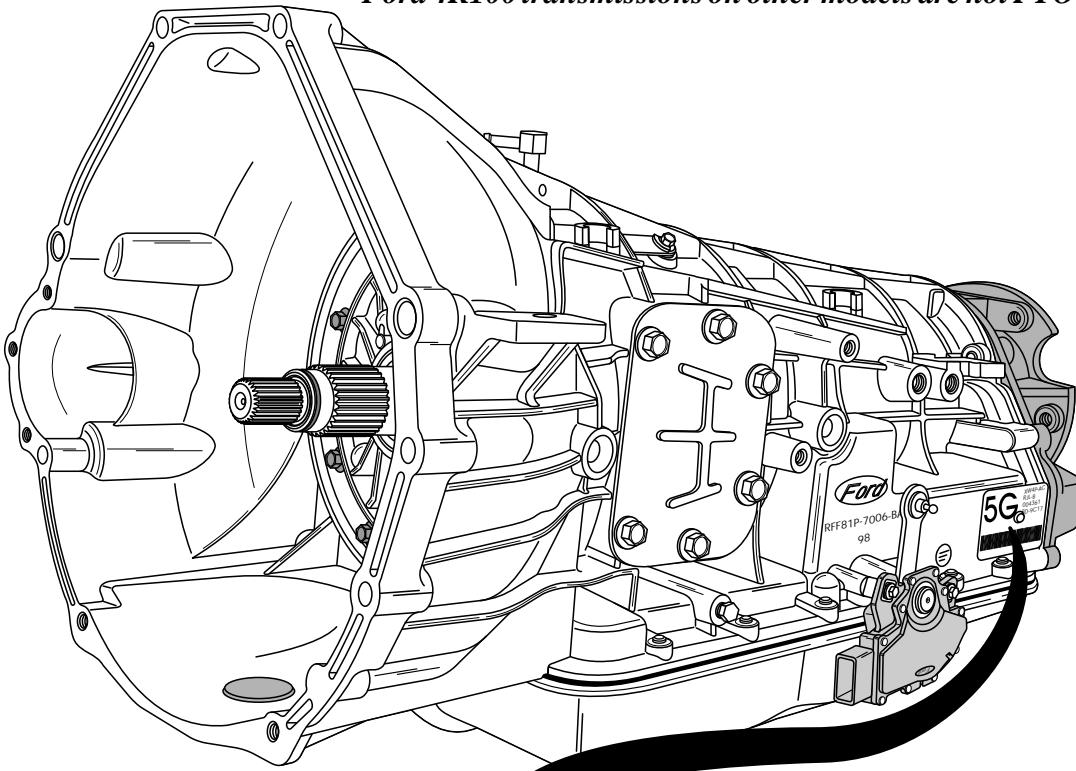
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TRANSMISSION IDENTIFICATION

WITH POWER TAKE OFF OPTION

Note: PTO is available as an option on 8500 GVW or above, Super Duty F-Series trucks with 6.8L gasoline and 7.3L Diesel engines. Ford 4R100 transmissions on other models are not PTO capable.



1	Assembly Part Number, Prefix And Suffix
2	Transmission Model
3	Serial Number
4	Build Date (Year, Month, Day)

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Figure 1

TRANSMISSION DESCRIPTION AND OPERATION

General Description

The Ford 4R100 automatic transmission is a four forward speed unit with electronic shift control. It is designed for longitudinal powertrains for rear wheel drive vehicles.

The 4R100 transmission features a four element torque converter design that includes Torque Converter Clutch (TCC) and a gear train that includes three planetary gearsets.

Some models provide for Power Take Off (PTO) operation in all transmission shift lever positions. During PTO operation in OD, 4th gear is disabled.

The hydraulic control system of the 4R100 unit has five electronically controlled solenoids for:

- Shift feel, through line pressure control.
- Shift scheduling, through shift valve position.
- Engine braking during coast conditions.
- TCC apply (On/Off or Modulating).

Major Internal Components

"Seven Friction Apply Elements"

- **Intermediate Band**
- **Coast Clutch, Multi-disc**
- **Overdrive Clutch, Multi-disc**
- **Intermediate Clutch, Multi-disc**
- **Direct Clutch, Multi-disc**
- **Forward Clutch, Multi-disc**
- **Low/Reverse Clutch, Multi-disc**

"Three One-Way Clutches"

- **Overdrive Roller Clutch**
- **Intermediate Sprag**
- **Low Roller Clutch**

"Three Simple Planetary Gearsets"

- **Overdrive**
- **Forward**
- **Reverse**

"Typical" Shift Quadrant Indicator



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Figure 2

Shift Quadrant Indicator

Vehicles equipped with the 4R100 transmission have a Transmission Control Switch (TCS), also referred to as "Overdrive Cancel Switch", and a Transmission Control Indicator Lamp (TCIL), located on the end of the manual gear shift lever, as shown in Figure 3. The TCS is a momentary contact switch. When this switch is pressed, a signal is sent to the PCM to allow automatic shifts from 1st to 4th gear or from 1st to 3rd gear. After the TCS has been pressed the PCM turns on the TCIL lamp ("OFF"), to indicate that overdrive has been canceled, as shown in Figure 3.

The shift quadrant has the following positions, as shown in Figure 2: **P, R, N, D, 2 and 1**.

D position (TCS OFF) provides 1-2-3-4 automatic upshifts and downshifts. Coast braking occurs in 4th gear. (TCIL Not Illuminated)

D position (TCS ON) provides 1-2-3 automatic upshifts and downshifts. Coast braking occurs in 3rd gear. (TCIL Illuminated)

2 position provides a pull-in shift to 3rd gear with coast braking. After an automatic downshift, a 2nd gear hold occurs with coast braking.

1 position provides a pull-in shift to 2nd gear with coast braking. After an automatic downshift, a 1st gear hold occurs with coast braking.

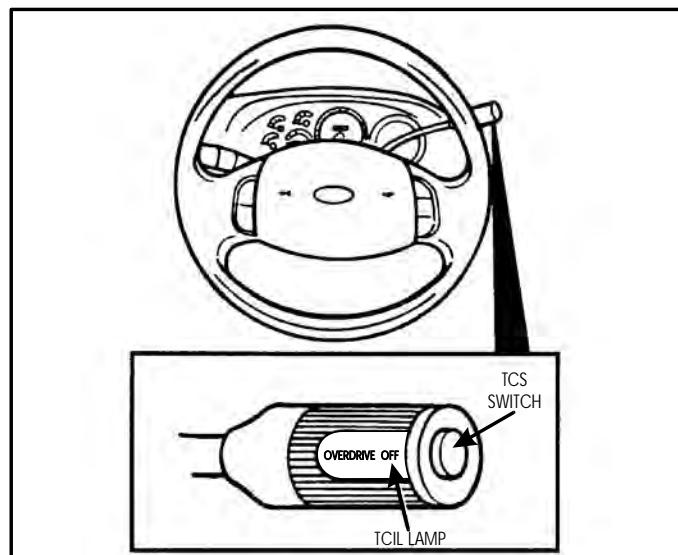
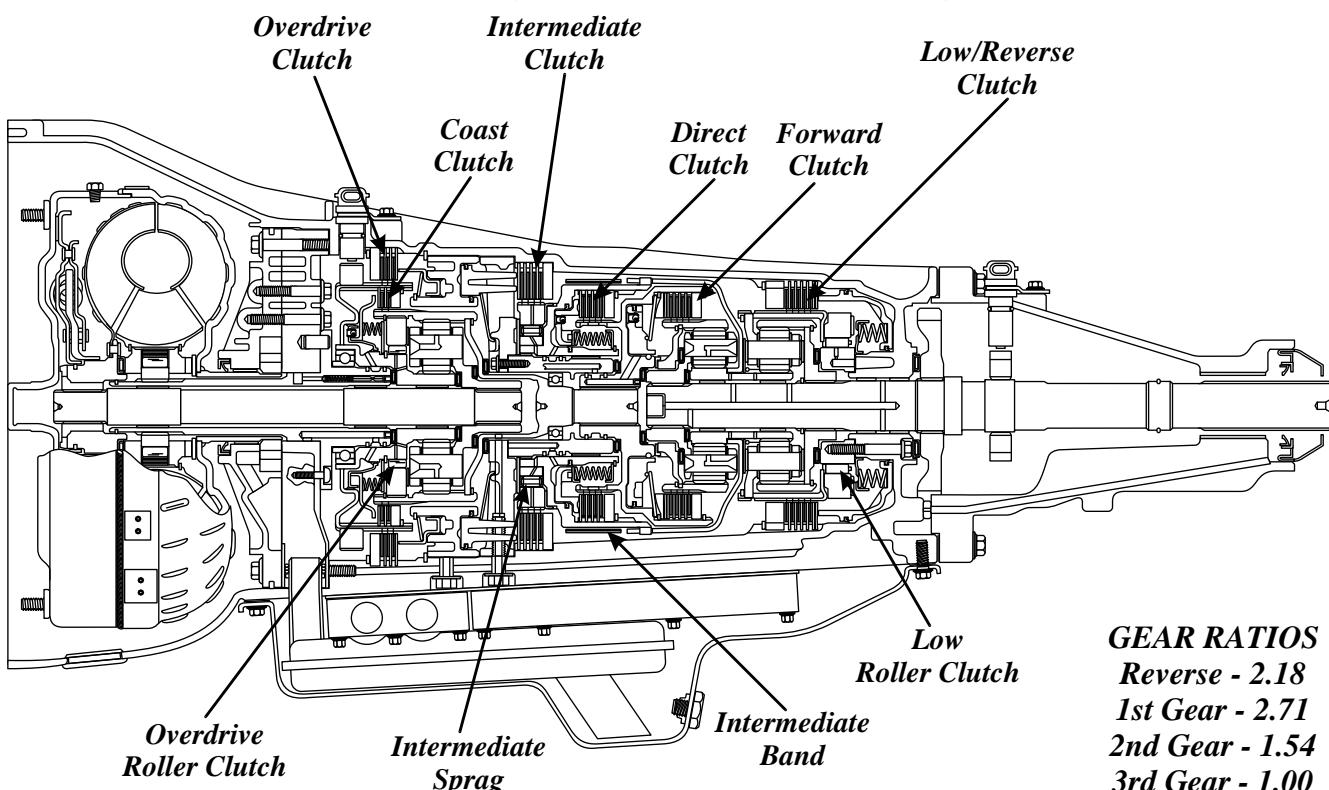


Figure 3

FORD MOTOR COMPANY 4R100 ("PTO" Version Illustrated)



GEAR RATIOS

Reverse - 2.18
1st Gear - 2.71
2nd Gear - 1.54
3rd Gear - 1.00
4th Gear - 0.71

COMPONENT AND SOLENOID APPLICATION CHART

GEAR	Fwd Clut	Int Clut	Dir Clut	O.D. Clut	Cst Clut	Int Band	L/R Clut	O.D. Roller	Int Sprag	Low Roller	SOLENOIDS				
											SS1	SS2	CCS	TCC	EPC
Park/Neut											On	Off	Off	Off	Mod
Reverse			ON		ON		ON	Hold			On	Off	Off	Off	Mod
OD-1st	ON							Hold		Hold	On	Off	*Off	*On	Mod
OD-2nd	ON	ON						Hold	Hold		On	On	*Off	*On	Mod
OD-3rd	ON	ON	ON					Hold			Off	On	*Off	*On	Mod
OD-4th	ON	ON	ON	ON							Off	Off	Off	*On	Mod
OD-3rd**	ON	ON	ON		ON			Hold			Off	On	On	*On	Mod
M-2nd	ON	ON			ON	ON		Hold	Hold		On	On	On	*On	Mod
M-1st	ON				ON		ON	Hold		Hold	On	Off	On	Off	Mod

OD-3rd = TCS "On" with TCIL illuminated showing "Off"**

***On = If the PCM determines that powertrain operating conditions exist for TCC apply, the TCC solenoid may be On (Modulating with PWM TCC units) in any forward gear except Manual 1st.**

***Off = Will be "On", if the TCS switch is pushed.**

Mod = Modulating at all times by the PCM and line pressure will be regulated based on throttle position, engine load and vehicle speed.

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Figure 4

PTO "GENERAL" REQUIREMENTS:

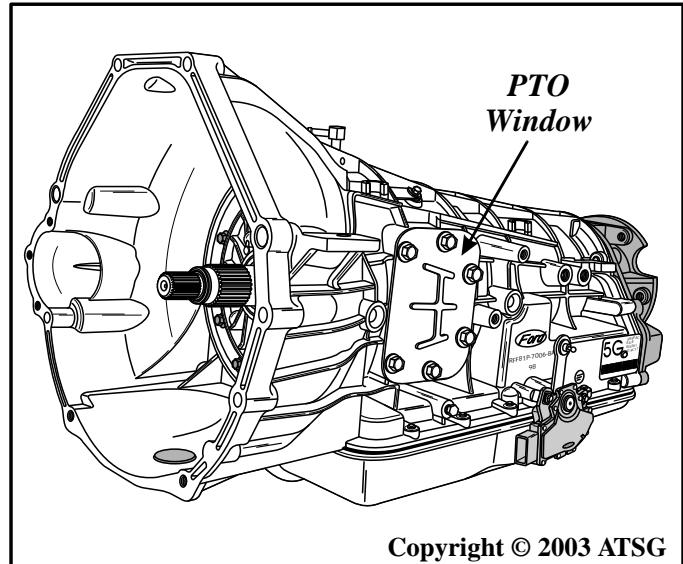
- (1) Obviously the case must be PTO capable with the cast-in window in the transmission where the PTO unit mounts to the transmission, as shown in Figure 5.
- (2) Designed for use during Mobile (Some Models) or Stationary conditions.
- (3) PTO is available as an option **only** on 8500 GVW or above, Super Duty F-Series trucks with 6.8L Gasoline and 7.3L Diesel engines. Ford 4R100 transmissions on other models **are not** PTO capable.
- (4) Battery voltage **must** be supplied to the Powertrain Control Module (PCM) input pin 4 on gasoline models, or pin 66 on diesel models, **when the PTO is engaged**. The processor uses this information to raise EPC pressure to approximately 55 PSI so that you do not burn the coast clutch. **This voltage must be provided by the PTO installer.**
- (5) Shift Solenoid 2 and the Coast Clutch Solenoid must be energized when the PTO is turned ON.

"GENERAL" CONDITIONS FOR OPERATION

- (1) The vehicle is not in the crank or start mode.
- (2) The transmission range selector **must** be in the P, R, O.D, 2 or 1 position. The PTO will not operate when selector is in the neutral position.
- (3) PTO operation is inhibited when in cranking mode, neutral, or 4th gear.
- (4) Transmission only operates 1st through 3rd gears. Computer strategy does not allow 4th gear to engage, under **any** conditions.
- (5) Transmission Fluid Temperature Sensor (TFT) reading must be up to operating temperature.

GASOLINE ENGINE PTO OPERATION:

- (1) PTO installer must obtain a "High Idle Throttle Control" from an aftermarket source.
- (2) Auxiliary Powertrain Control Module seen on Page seven, **does not** work on the gasoline engine models. APCM module works **only** on the 7.3L diesel engine.
- (3) For stationary PTO operation an engine idle speed of 1300 RPM is required.
- (4) The Torque Converter Clutch (TCC) engages once the engine reaches 1300 RPM.



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Figure 5

TRANSMISSION FUNCTIONS DURING PTO OPERATION:

- (1) Shift Solenoid 2 and Coast Clutch Solenoids are turned on, the coast clutch activates and does not allow 4th gear operation during PTO operation.
- (2) Electronic Pressure Control (EPC) pressure is raised to approximately 55 PSI. This is why the coast clutch will be smoked in a short period of time if a battery voltage wire is not supplied to EEC input pin 4 (gasoline) or pin 66 (diesel) when the PTO is engaged, as this rise in pressure would not occur.
- (3) The Transmission Control Indicator Lamp (TCIL) illuminates.
- (4) When the PTO is turned ON, the transmission operates only in 1st through 3rd gears. Overdrive 4th gear is not allowed by the PCM strategy.
- (5) The transmission shift schedule is **early** and shift feel is **very firm**.
- (6) PTO operation can cause transmission fluid temperature to exceed the recommended maximum limit of 250 degrees F. Failure mode logic within PCM strategy prevents transmission damage by disabling the PTO above this temperature limit.

Specific Operation For Diesel, See Page 7.

DIESEL ENGINE PTO OPERATION:**"AUXILIARY" POWERTRAIN CONTROL MODULE
7.3L DIESEL ENGINE (ONLY)**

- The Auxiliary Powertrain Control Module (APCM) commands the Electronic Engine Control (EEC) module to increase the idle speed during PTO operation. The APCM controls engine speed from 1300 to 2500 RPM.
- The Auxiliary Powertrain Control Module is a separate option, *it does not come standard* with a PTO capable transmission, and is for 7.3L diesel applications only.
- Intended for stationary use only, and in stationary operation the PTO requires an engine idle speed of 1300 RPM. During stationary PTO operation on the 7.3L diesel, the EEC increases the idle to 1300 RPM automatically.
- During stationary PTO operation, the Torque Converter Clutch (TCC) engages once the RPM reaches 1200-1300 RPM.
- The following conditions ***must*** be met before the idle speed is increased:
 1. *Parking brake must be engaged for all applications.*
 2. *No hydraulic brake actuation.*
 3. *Accelerator pedal must be in the idle position.*
 4. *Vehicle speed must be zero MPH.*
 5. *Brake lights must be functional.*

 **AUXILIARY POWERTRAIN CONTROL MODULE**
CHARGE PROTECTION

Charge Protection is used for maintaining battery charge.

In Charge Protection mode, the battery voltage is monitored and the engine idle speed is increased as necessary, so the battery charge is maintained as required.

Charge Protection can be activated from in-cab and can be programmed to activate automatically on engine start-up.

RPM CONTROL

RPM Control is used for

RPM Control mode can be activated from in-cab and can be programmed to activate automatically on engine start-up.

The programmable speed presets range from 1300 to

This is the recommended method of elevating idle speed for PTO operations.

APPLICATION

- Exclusively for light trucks with the 7.3L Diesel Engine.
- Intended for Stationary Use Only.
- Order Guide Option Code 961.

KITS INCLUDE

- Aux. Powertrain Control Module.
- Mounting Hardware and Bracket.
- Wiring Harness.
- Instruction Booklet.
- Operators Card.

LCD screen displays the current engine speed or battery voltage.

Each Single Arrow key contains a preset speed allowing for four programmable RPM settings.

The Double Arrow keys can also be used to manually raise or lower the engine speed at a faster or slower rate.

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Figure 6

DIAGNOSTIC CONCERNS WITH PTO EQUIPPED VEHICLES:

- (1) *Always* ensure that PTO is turned OFF, before any diagnostic procedures begin.
- (2) *Never* perform any transmission special tests (i.e. pressure test, stall test etc.) when the PTO is turned ON.
- (3) If a transmission concern or symptom goes away with the PTO turned OFF, it is most likely *not a transmission concern*.
- (4) On Board Diagnostics operate normally during PTO operation with the exception of the engine misfire monitor. The circuit checks made by the PCM and Failure Mode Effect Management (FMEM) capability will continue. The PTO *must* be turned OFF to access Diagnostic Trouble Codes (DTC's) and perform OBD tests.

Caution: *If the batteries are disconnected for any reason, the PCM "must" have a 7 mile drive cycle at speeds above 50 MPH, before it remembers that it is capable of running a PTO*

ELECTRICAL COMPONENT DIAGNOSIS

Accelerator Pedal Position Sensor (Diesel Only)

The Accelerator Pedal (AP) position sensor is mounted on the accelerator pedal inside the vehicle and detects the position of the accelerator pedal and sends this information as a varying voltage signal to the PCM. The PCM then uses the monitored voltage level of the AP sensor for control of EPC pressure and shift scheduling.

The Idle Validation Switch is fed voltage through fuse number 19, as well as the Transmission Control Switch, as shown in Figure 7.

If the Idle Validation Switch feed voltage is lost for any reason, the engine will immediately return to idle and stay there until feed voltage is restored.

4X4 Low Switch

The 4X4 Low Switch is used to the PCM that the transfer case system is operating in LOW range. The PCM receives the 4X4 Low Switch input signal and modifies shift scheduling for the lower gear ratio (See Figure 8).

If the 4X4 LOW indicator fuse is blown, the transmission will shift according to the 4X4 LOW shift schedule, *regardless of transfer case lever position*.

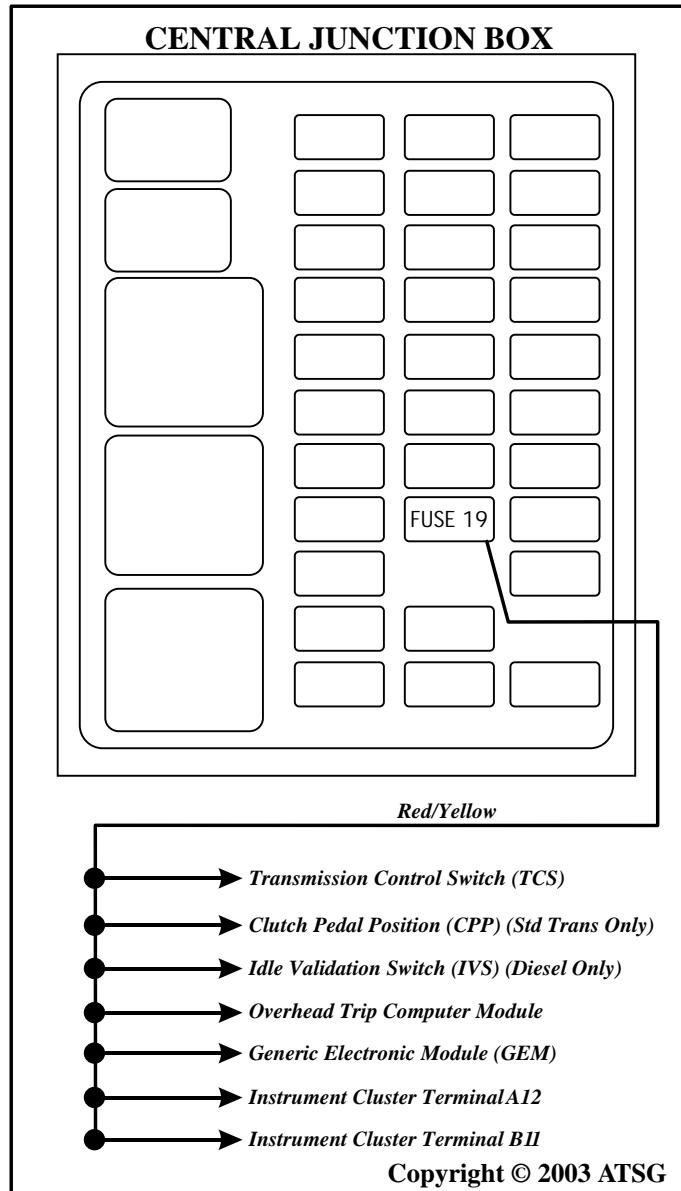


Figure 7

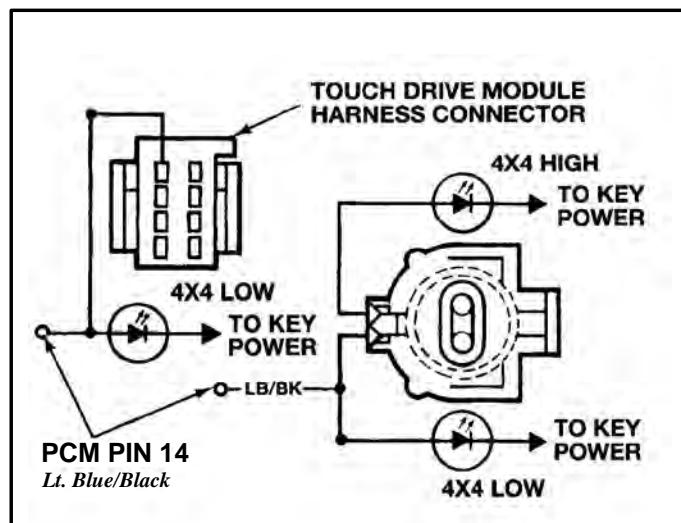


Figure 8

Technical Service Information

Turbine Shaft Speed Sensor

The Turbine Shaft Speed (TSS) sensor is a magnetic pickup that sends the PCM a frequency signal related to the rotating speed of the transmission input shaft.

The TSS mounts on the top front of the case on some models, as shown in Figure 9. We have also provided you with the resistance readings and OEM part numbers on both Turbine Speed Sensors, as the PTO and Non-PTO models use different sensors, as shown in Figure 9.

The PCM uses the TSS sensor signal to control EPC pressure and TCC strategy.

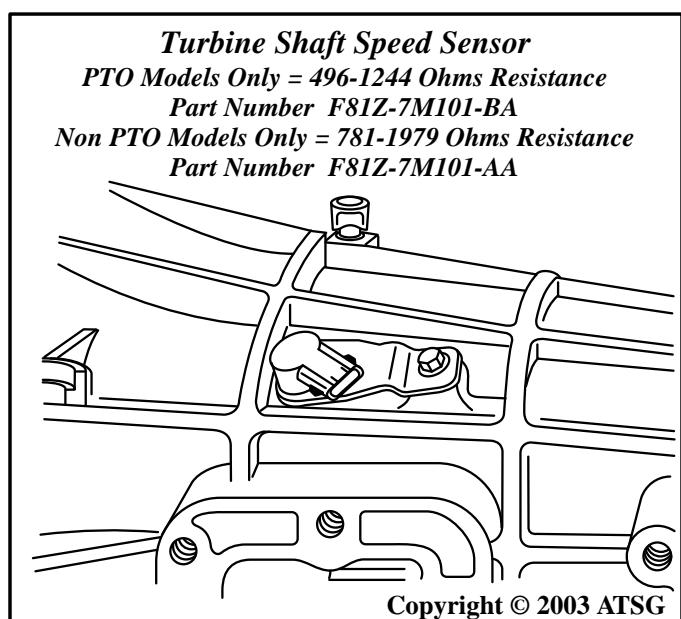


Figure 9

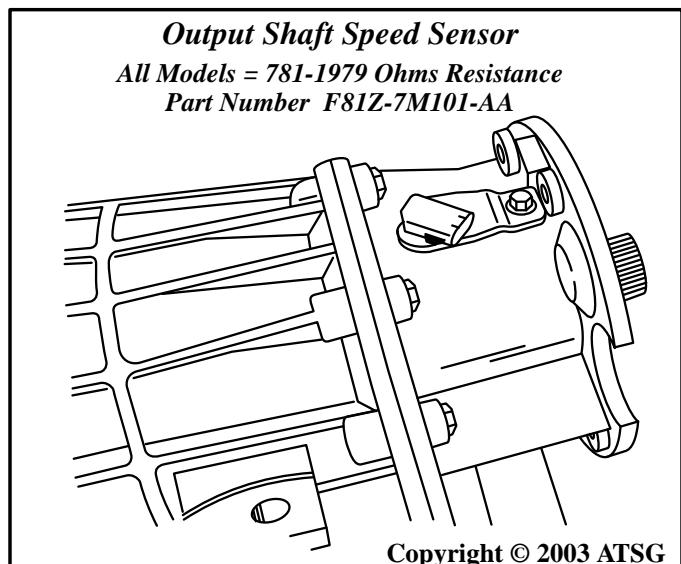


Figure 10

Output Shaft Speed Sensor

The Output Shaft Speed (OSS) sensor is a magnetic pickup that sends the PCM a frequency signal related to the rotating speed of the transmission output shaft.

The OSS sensor was added to the top of extension housing, as shown in Figure 10. The OSS is triggered by an added rotor pressed onto the output shaft. The park gear is also now pressed onto the output shaft, and the number 13 thrust washer has changed to a thrust bearing, as shown in Figure 11. We have provided you with the resistance reading and the OEM part number for the output shaft speed sensor. Refer to Figure 10 for output shaft speed sensor information.

The PCM uses the OSS sensor signal to control EPC pressure, shift scheduling and TCC strategy.

The Park Gear is also a press fit to the output shaft, and the number 13 thrust washer, between the case and the park gear has been replaced with a needle bearing.

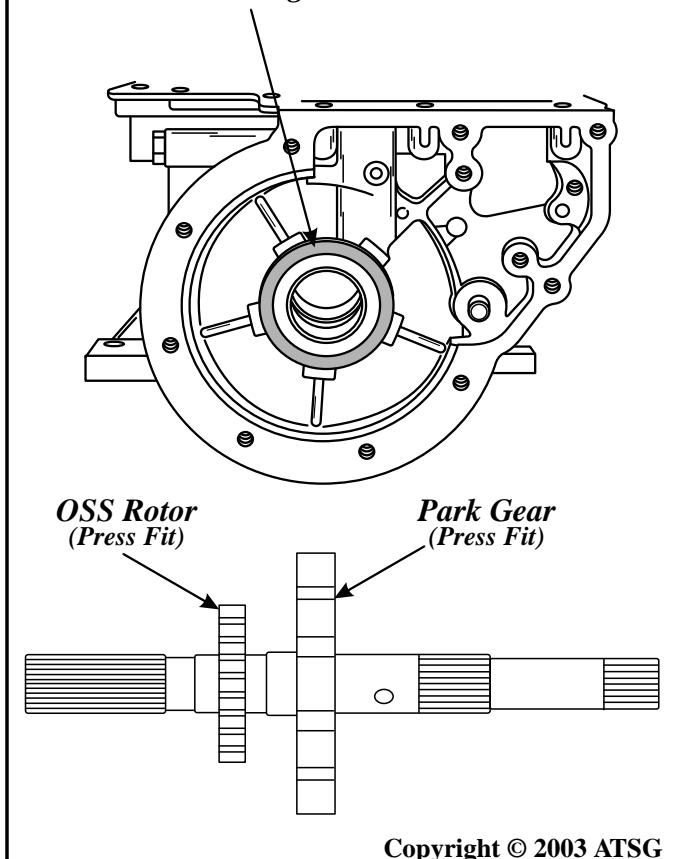


Figure 11

ELECTRICAL COMPONENT DIAGNOSIS

Digital Transmission Range Sensor

The Digital Transmission Range (DTR) sensor has a twelve pin electrical connector and is located on the outside of the transmission at the manual lever, as shown in Figure 12.

The DTR sensor completes the start circuit in Park and Neutral, the backup lamp circuit in Reverse, and the neutral sense circuit (4WD Only) when in Neutral.

The DTR sensor also opens or closes a set of four different switches that are monitored by the Powertrain Control Module (PCM) to determine the position of the transmission manual lever. Refer to Figure 13.

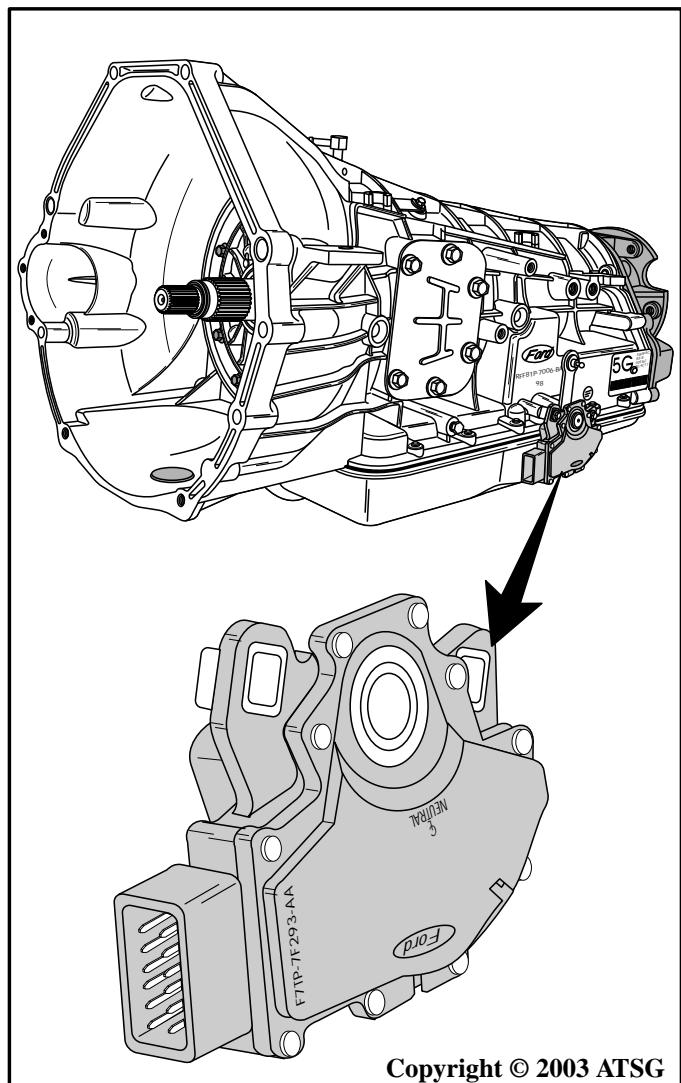


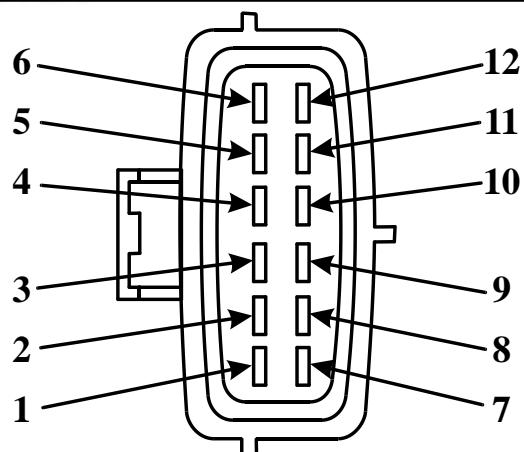
Figure 12

DTR TESTING PROCEDURE

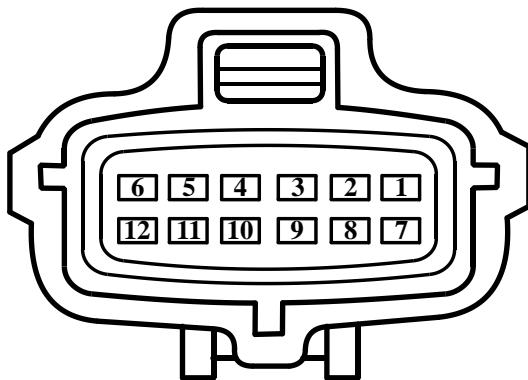
In Figure 13 we have provided you with pin number identification for both the transmission range sensor and the vehicle harness. We have also provided a chart that will give you the open/closed state of each internal switch, dependent on selector position, and notice that three positions read a 270W resistor, that is also internal.

Note: All testing that we have provided for you is done with a DVOM, set to the ohms position, and all tests are performed with the ignition switch in the "OFF" position.

- (1) Testing the transmission range 3A switch, and the 270W internal resistor is done across pins 2 and 3 of the DTR sensor, and must be checked in each selector position to determine the switch and resistor integrity. Refer to Figure 13.
- (2) Testing the transmission range 1 switch is done across pins 2 and 4 of the DTR sensor, and must be checked in each selector position to determine switch integrity. Refer to Figure 13.
- (3) Testing the transmission range 2 switch is done across pins 2 and 5 of the DTR sensor, and must be checked in each selector position to determine switch integrity. Refer to Figure 13.
- (4) Testing the transmission range 4 switch is done across pins 2 and 6 of the DTR sensor, and must be checked in each selector position to determine switch integrity. Refer to Figure 13.
- (5) Testing the reverse lamp circuit is done across pins 9 and 11 of the DTR sensor, and must be checked in each selector position to determine switch integrity. Refer to Figure 13.
- (6) Testing the neutral start circuit is done across pins 10 and 12 of the DTR sensor, and must be checked in each selector position to determine switch integrity. Refer to Figure 13.



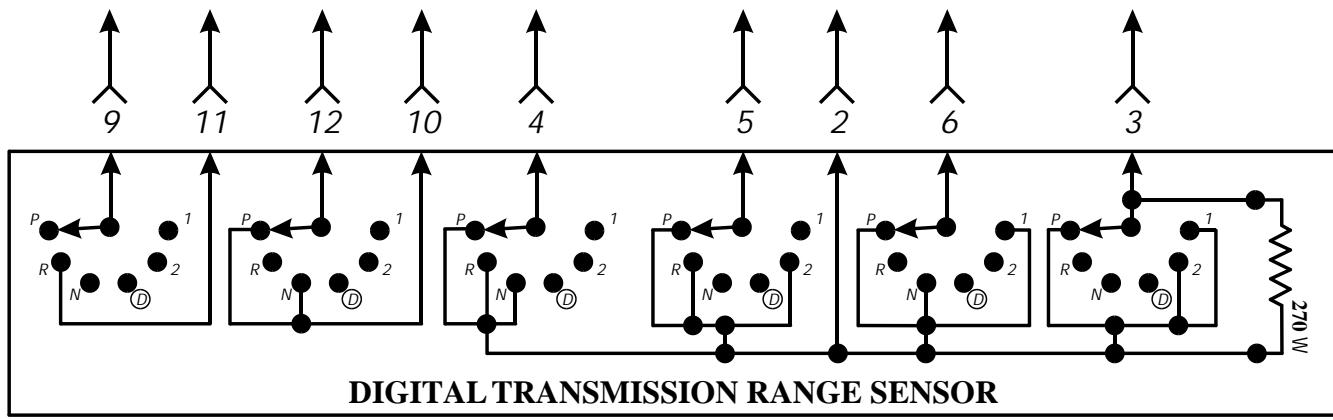
View looking into DTR Sensor harness connector-terminal side



View looking into DTR Sensor harness connector-terminal side

Pin No.	Function	Pin No.	Function
1	<i>Not Used</i>	7	<i>Ground</i>
2	<i>Signal Return (Ground)</i>	8	<i>Neutral</i>
3	<i>TR3A (5 Volts from PCM)</i>	9	<i>Battery Voltage Feed</i>
4	<i>TR1 (10-12 Volts from PCM)</i>	10	<i>Fuse 21, Hot In Start</i>
5	<i>TR2 (10-12 Volts from PCM)</i>	11	<i>Back-up Lamps</i>
6	<i>TR4 (10-12 Volts from PCM)</i>	12	<i>Starter Relay</i>

TERMINALS	P	R	N	(D)	2	1
2 AND 3	CLOSED	270 W	270 W	270 W	CLOSED	CLOSED
2 AND 4	CLOSED	CLOSED	CLOSED	OPEN	OPEN	OPEN
2 AND 5	CLOSED	CLOSED	OPEN	OPEN	CLOSED	OPEN
2 AND 6	CLOSED	OPEN	CLOSED	OPEN	OPEN	CLOSED
9 AND 11	OPEN	CLOSED	OPEN	OPEN	OPEN	OPEN
10 AND 12	CLOSED	OPEN	CLOSED	OPEN	OPEN	OPEN



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Figure 13

Technical Service Information

ELECTRICAL COMPONENT DIAGNOSIS

Solenoid Assembly

The Solenoid Assembly is bolted to the case and located inside the bottom pan. The Solenoid Assembly contains shift solenoid 1, shift solenoid 2, coast clutch solenoid, TCC solenoid, EPC solenoid and the TFT sensor. The solenoids are not serviced individually. You must replace the entire assembly, as shown in Figure 14. Some of these units are equipped with an ON/OFF TCC solenoid and some are equipped with a PWM TCC solenoid, so it is important to determine which you have.

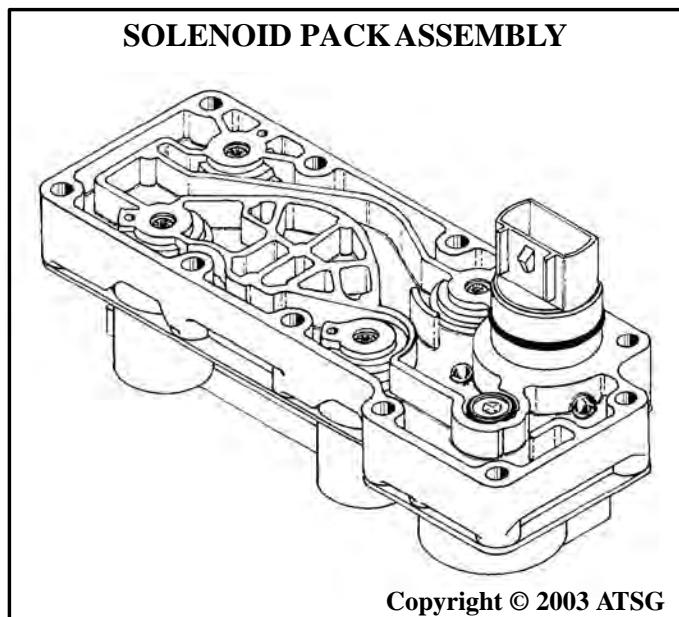


Figure 14

Transmission Fluid Temperature		
•C	•F	Resistance
-40 to -20	-40 to -4	1062k - 284k W
-19 to -1	-3 to 31	284k - 100k W
0 - 20	32-68	100k - 37k W
21-40	69-104	37k - 16k W
41-70	105-158	16k - 5k W
71-90	159-194	5k - 2.7k W
91-110	195-230	2.7k - 1.5k W
111-130	231-266	1.5k - 0.8k W
131-150	267-302	0.8k - 0.54k W

Figure 15

SOLENOID PACK TESTING PROCEDURE

In Figure 16 we have provided you with pin number identification for both the transmission case connector and the vehicle harness. We have also provided a chart that will give you the function of each and the ohms readings you should see on each of the solenoids and the TFT sensor.

Note: All testing that we have provided for you is done with a DVOM, set to the ohms position, and all tests are performed with the ignition switch in the "OFF" position.

- (1) Shift Solenoid 1 is tested across pins 1 and 3, and should read 20-30 ohms resistance. Refer to Figure 16.
- (2) Shift Solenoid 2 is tested across pins 1 and 2, and should read 20-30 ohms resistance. Refer to Figure 16.
- (3) TCC **On/Off** Solenoid is tested across pins 1 and 4, and should read 20-30 ohms resistance. Refer to Figure 16.
- (4) TCC **PWM** Solenoid is tested across pins 1 and 4, and should read 10-20 ohms resistance. Refer to Figure 16.
- (5) Coast Clutch Solenoid is tested across pins 1 and 5, and should read 20-30 ohms resistance. Refer to Figure 16.
- (6) EPC Solenoid is tested across pins 11 and 12, and should read 3.0-5.0 ohms resistance. Refer to Figure 16.
- (7) TFT sensor is tested across pins 7 and 8. Refer to the chart provided in Figure 15.

4R100 FLUID REQUIREMENTS

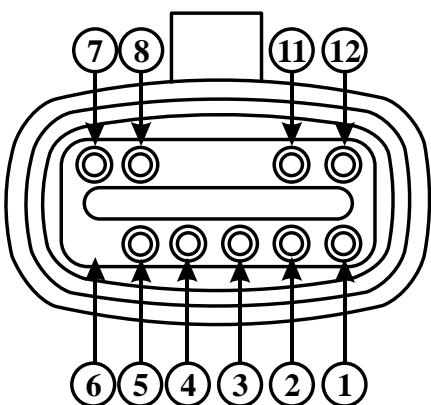
Only Motorcraft Mercon® multi-purpose automatic transmission fluid XT-2-QDX or an equivalent Mercon® fluid should be used in all Ford 4R100 transmissions. Before adding any fluid, ensure that it is the correct type.

Checking Fluid

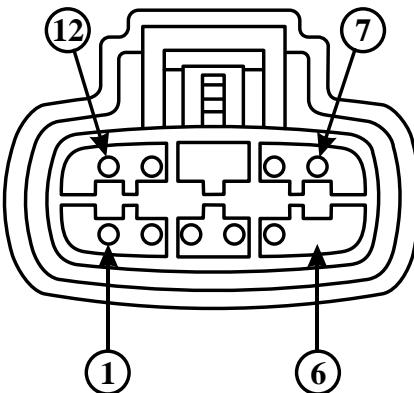
Always use the transmission fluid level indicator (Dipstick) to set the correct fluid level. Set the fluid level at normal operating temperature which is 150° to 170°F, engine at idle in Park.

SOLENOID BODY PIN IDENTIFICATION AND FUNCTION

SOLENOID BODY CONNECTOR



VEHICLE HARNESS CONNECTOR



Solenoid Resistance Chart

Solenoid	Solenoid Body Pin Numbers	Resistance
Shift Solenoid "B" (2)	1 and 2	20-30 Ohms
Shift Solenoid "A" (1)	1 and 3	20-30 Ohms
TCC Solenoid, (On-Off)	1 and 4	20-30 Ohms
TCC Solenoid, (PWM)	1 and 4	10-20 Ohms
Coast Clutch Solenoid	1 and 5	20-30 Ohms
Electronic Pressure Control Solenoid	11 and 12	3.0-5.0 Ohms
Transmission Fluid Temp Sensor	7 and 8	See Chart Below

Solenoid Connector Pin Identification and Function

Pin No.	Description	PCM Connector Pin	
		Gas & Diesel (Cal)	Diesel (49 State)
1	Vehicle Power In For Solenoids (VPWR)	71, 97	71, 97
2	Shift Solenoid "B" (2) Ground from PCM	11	1
3	Shift Solenoid "A" (1) Ground from PCM	6	27
4	Converter Clutch Solenoid Ground from PCM	54	28
5	Coast Clutch Solenoid Ground from PCM	20	53
6	Not Used		
7	Transmission Fluid Temp Sensor	37	37
8	Transmission Fluid Temp Sensor (Signal Return)	91	91
9	Not Used		
10	Not Used		
11	Electronic Pressure Control (EPC)	81	81
12	Vehicle Power In For EPC Solenoid (VPWR)	71, 97	71, 97

Figure 16

FORD 4R100
Abbreviation Description

Abbreviation	Description	Abbreviation	Description
4X4L	4X4 Low Switch	ICP	Injector Control Pressure Sensor
ABS	Antilock Brake System	IPR	Injector Pressure Regulator
A/C	Air Conditioning	IVS	Idle Validation Switch
ACCS	Air Conditioning Clutch Status	KAM	Keep Alive Memory
AP	Accelerator Pedal Position Sensor	KAPWR	Keep Alive Power
APGND	Accelerator Pedal Sensor Ground	KOEO	Key On Engine Off
ARPMDES	Ancillary Engine Speed Desired	KOER	Key On Engine Running
BARO	Barometric Pressure Sensor	MAF	Mass Air Flow Sensor
BOO	Brake ON/OFF Switch	MAP	Manifold Absolute Pressure Sensor
BPA	Brake Pressure Applied	MIL	Malfunction Indicator Lamp
BPP	Brake Pedal Position	OCT ADJ	Octane Adjust
BUS +	Data Link Connector	OSS	Output Shaft Speed Sensor
BUS -	Data Link Connector	PBA	Parking Brake Applied
CASE GND	Case Ground	PCM	Powertrain Control Module
CCS	Coast Clutch Solenoid	PIP	Profile Ignition Pickup
CID	Cylinder Identification	ROM	Read Only Memory
CMP	Camshaft Position Sensor	RPM	Engine Speed
CPP	Clutch Pedal Position	SCCS	Speed Control Command Switch
CRUISE	Cruise Control Mode (Driving)	SS1	Shift Solenoid "1"
DLC	Data Link Connector	SS2	Shift Solenoid "2"
DTC	Diagnostic Trouble Code	SSA	Shift Solenoid "A"
DTC CNT	Diagnostic Trouble Code Count	SSB	Shift Solenoid "B"
DTR	Digital Transmission Range Sensor	SPOUT	Spark Output
EBP	Exhaust Back Pressure	TAC	Tachometer Signal
ECT	Engine Coolant Temperature	TCC	Torque Converter Clutch
EOT	Engine Oil Temperature	TCIL	Trans Control Indicator Lamp
EPC	Electronic Pressure Control	TCS	Transmission Control Switch
EPR	Exhaust Pressure Regulator	TFT	Transmission Fluid Temperature
FEPS	Flash EPROM Power Supply	TP	Throttle Position Sensor
FUEL PW	Fuel Pulse Width	TSS	Turbine Shaft Speed Sensor
GP	Glow Plug	VPWR	Vehicle Power Supply
GPC	Glow Plug Control Duty Cycle	VREF	Vehicle Reference Voltage
GPL	Glow Plug Lamp	VSS	Vehicle Speed Sensor
IAT	Intake Air Temperature	WOT	Wide Open Throttle

Figure 17



Technical Service Information

FORD 4R100 <i>Diagnostic Trouble Code Chart</i>		
<i>Diagnostic Code</i>	<i>Description</i>	<i>Symptom</i>
P0102 P0103	MAF sensor system fails to operate in a normal manner, which may cause a transmission concern.	High EPC pressure. Firm shifts and engagements. May flash TCIL.
P0107 P0108	BARO sensor circuit signal higher or lower than expected.	Firm shift feel, late shifts at higher altitudes.
P0122	(TP) Throttle Position sensor or (AP) Accelerator Pedal Position sensor below specification during normal operation.	Harsh engagements, firm shift feel, abnormal shift schedule, abnormal TCC operation or does not engage.
P0123	(TP) Throttle Position sensor or (AP) Accelerator Pedal Position sensor above or below normal specifications during normal operation.	Harsh engagements, firm shift feel, abnormal shift schedule, abnormal TCC operation or does not engage.
P0235	MAP sensor or circuit open, shorted to ground or to 5V.	Firm shift feel, late shifts at higher altitudes.
P0236	MAP sensor signal higher or lower than expected or no response due to vacuum hose circuit damaged, disconnected or restricted.	Firm shift feel, late shifts at higher altitudes.
P0237	MAP sensor out of On-Board Diagnostics range. No response during Dynamic Response (Goose) test.	Rerun On-Board Diagnostics and perform "Goose" test when asked.
P0340 P0341 P0344	(DI) Distributor Ignition circuit concern or (CKP) Crankshaft Position sensor failure.	Engine will stall or will not run. May flash TCIL.
P0500 P0503	Insufficient or intermittent vehicle speed input from VSS/ABS.	Harsh engagements, firm shift feel, abnormal shift pattern, unexpected downshifts may occur at closed throttle, abnormal TCC operation or engages only at WOT. May flash TCIL.
P0571	(BPP) Brake Pedal Position switch failure, or not connected.	Failed off. TCC will not disengage when brake is applied.
P0703	(BPP) Brake Pedal Position switch failure, or not connected.	Failed off. TCC will not disengage when brake is applied.
P0705	(DTR) Digital Transmission Range sensor circuit malfunction.	Harsh engagements, firm shift feel. May flash TCIL.
P0708	(DTR) Digital Transmission Range sensor circuit malfunction.	Slight increase in EPC pressure.
P0712	TFT sensor circuit grounded, exceeds scale set for temperature of 315°F.	Harsh engagements, firm shift feel, abnormal shift schedule, abnormal TCC operation or does not engage.

Figure 18



Technical Service Information

FORD 4R100 Diagnostic Trouble Code Chart		
Diagnostic Code	Description	Symptom
P0713	TFT sensor circuit open, exceeds scale set for temperature of minus 40°F.	TCC and stabilized shift schedule may be enabled sooner after cold start. May flash TCIL.
P0715	Insufficient input from TSS sensor.	Set DTC, Flash TCIL and Flash MIL.
P0717	TSS sensor signal intermittent.	Set DTC, Flash TCIL.
P0718	TSS sensor signal noisy.	Set DTC.
P0720	Insufficient input from OSS sensor.	Set DTC, Flash TCIL and Flash MIL.
P0721	OSS sensor signal noisy.	Set DTC.
P0722	OSS sensor signal intermittent.	Set DTC, Flash TCIL.
P0731	1-2 shift error because of SSA, SSB, or internal transmission components.	Improper gear selection depending on failure mode and transmission range selector position. Refer to shift solenoid operation chart.
P0732	2-3 shift error because of SSA, SSB, or internal transmission components.	Improper gear selection depending on failure mode and transmission range selector position. Refer to shift solenoid operation chart.
P0733	3-4 shift error because of SSA, SSB, or internal transmission components.	Improper gear selection depending on failure mode and transmission range selector position. Refer to shift solenoid operation chart.
P0741	The PCM picked up an excessive amount of TCC slippage during normal operation.	TCC slippage/erratic or no torque converter clutch operation. Flash TCIL.
P0743	TCC Solenoid circuit failure.	<i>Short Circuit:</i> Engine stalls in "D" or "2" at idle with brake applied. <i>Open Circuit:</i> TCC never engaged.
P0750	SSA circuit failure.	Improper gear selection depending on failure mode and transmission range selector position. Refer to shift solenoid operation chart.
P0755	SSB circuit failure.	Improper gear selection depending on failure mode and transmission range selector position. Refer to shift solenoid operation chart.

Figure 19



Technical Service Information

FORD 4R100 Diagnostic Trouble Code Chart		
Diagnostic Code	Description	Symptom
P0781	1-2 shift error because of SSA, SSB, or internal transmission components.	Improper gear selection depending on failure mode and transmission range selector position. Refer to shift solenoid operation chart.
P0782	2-3 shift error because of SSA, SSB, or internal transmission components.	Improper gear selection depending on failure mode and transmission range selector position. Refer to shift solenoid operation chart.
P0783	3-4 shift error because of SSA, SSB, or internal transmission components.	Improper gear selection depending on failure mode and transmission range selector position. Refer to shift solenoid operation chart.
P1100 P1101	MAF sensor system fails to operate in a normal manner, which may cause a transmission concern.	High EPC pressure. Firm shifts and engagements. May flash TCIL.
P1111	System Pass.	No Codes Detected.
P1120	Throttle Position Sensor voltage lower than expected.	Harsh engagements, firm shift feel, abnormal shift schedule, abnormal TCC operation or does not engage.
P1124	Throttle Position Sensor out of On-Board Diagnostics range during KOEO test.	TP sensor (Gas Engines) not at idle position during KOEO test.
P1280	Injection Control Pressure (ICP) sensor circuit failure (Diesel Engine), or out of range low.	May result in firm shifts.
P1281	Injection Control Pressure (ICP) sensor circuit failure (Diesel Engine), or out of range high.	May result in firm shifts.
P1460 P1463 P1464	A/C switch error.	<i>Failed On:</i> EPC pressure slightly low with A/C off. <i>Failed Off:</i> EPC pressure slightly low with A/C on.
P1500	Insufficient or intermittent vehicle speed input from VSS/ABS.	Harsh engagements, firm shift feel, abnormal shift pattern, unexpected downshifts may occur at closed throttle, abnormal TCC operation or engages only at WOT. May flash TCIL.

Figure 20



Technical Service Information

FORD 4R100 <i>Diagnostic Trouble Code Chart</i>		
<i>Diagnostic Code</i>	<i>Description</i>	<i>Symptom</i>
P1702	Digital Transmission Range (DTR) sensor signal intermittent.	Erratic harsh shift engagements.
P1703	(BPP) Brake Pedal Position switch not actuated during KOER test.	Failed on or not connected, TCC will not engage at less than one-third throttle opening.
P1704	Digital Transmission Range (DTR) sensor misaligned or failed electronically.	Increase in EPC pressure.
P1705	Digital Transmission Range (DTR) sensor not run in park or neutral during On-Board Diagnostics KOEO or KOER tests.	Rerun On-Board Diagnostics.
P1711	Transmission not at operating temperature during On-Board Diagnostics.	Warm vehicle to normal operating temperature and rerun On-Board Diagnostics.
P1713	No change in TFT sensor - Low range.	May flash TCIL.
P1714	SSA mechanical failure detected.	Improper gear selection depending on failure mode and transmission range selector position. Refer to shift solenoid operation chart.
P1715	SSB mechanical failure detected.	Improper gear selection depending on failure mode and transmission range selector position. Refer to shift solenoid operation chart.
P1718	No change in TFT sensor - High range.	May flash TCIL.
P1728	Excessive amount of transmission slippage has been detected.	Transmission slippage, erratic or no TCC operation. May flash TCIL.
P1729	4X4 Low switch circuit failure.	Early or delayed shift schedule.
P1740	TCC solenoid mechanical failure detected.	Harsh shift, may flash TCIL.
P1744	The PCM picked up an excessive amount of TCC slippage during normal operation.	TCC slippage/erratic or no torque converter clutch operation. Flash TCIL.
P1746	Failure of the EPC control pressure driver located inside the PCM.	Open circuit causes maximum EPC pressure, harsh engagements and shifts. May flash TCIL.
P1747	EPC shorted circuit failure, or PCM.	Shorted circuit causes minimum EPC pressure, limits engine torque with partial fuel shut off and heavy misfire. Flashing TCIL.

Figure 21



Technical Service Information

FORD 4R100 <i>Diagnostic Trouble Code Chart</i>		
<i>Diagnostic Code</i>	<i>Description</i>	<i>Symptom</i>
P1754	CCS circuit failure.	<i>Failed Off:</i> No third gear engine braking in O.D. cancel. <i>Failed On:</i> Third gear engine braking in O.D. range. Coast clutch may be damaged causing eventual failure.
P1760	EPC signal intermittent short.	Short circuit causes minimum EPC pressure.
P1780	TCS not cycled during the On-Board Diagnostics or the circuit is open or shorted.	No overdrive cancel when switch is cycled.
P1781	4X4 Low switch circuit failure.	Early or delayed shift schedule.
P1783	Transmission Fluid Temperature has exceeded 270°F.	Slight increase in EPC pressure. May flash TCIL.

Figure 22

Shift Solenoid Application Chart					
Selector Lever Range	Commanded Gear	Shift Solenoid "A"	Shift Solenoid "B"	TCC Solenoid	Coast Clutch Solenoid
P/R/N	1	ON	OFF	*	*
(D)	1	ON	OFF	*	*
(D)	2	ON	ON	*	*
(D)	3	OFF	ON	*	*
(D)	4	OFF	OFF	*	*
(D) Cancel First Through 3rd Gear Only, SSA, SSB, TCC, Same as Overdrive, CCS Always On.					
MANUAL 2	2	*	*	*	ON
MANUAL 1	2	OFF	OFF	OFF	ON
MANUAL 1	1	ON	OFF	OFF	ON

* Controlled by PCM

SHIFT SOLENOID TROUBLE CHART GUIDE

SHIFT SOLENOID "A" ALWAYS OFF

PCM Gear Commanded	Selector Lever Position		
	(D)	2	1
	Actual Gear Obtained		
1st	4	2	1
2nd	3	2	2
3rd	3	2	2
4th	4	2	2

SHIFT SOLENOID "B" ALWAYS OFF

PCM Gear Commanded	Selector Lever Position		
	(D)	2	1
	Actual Gear Obtained		
1st	1	2	1
2nd	1	2	1
3rd	4	2	2
4th	4	2	2

SHIFT SOLENOID "A" ALWAYS ON

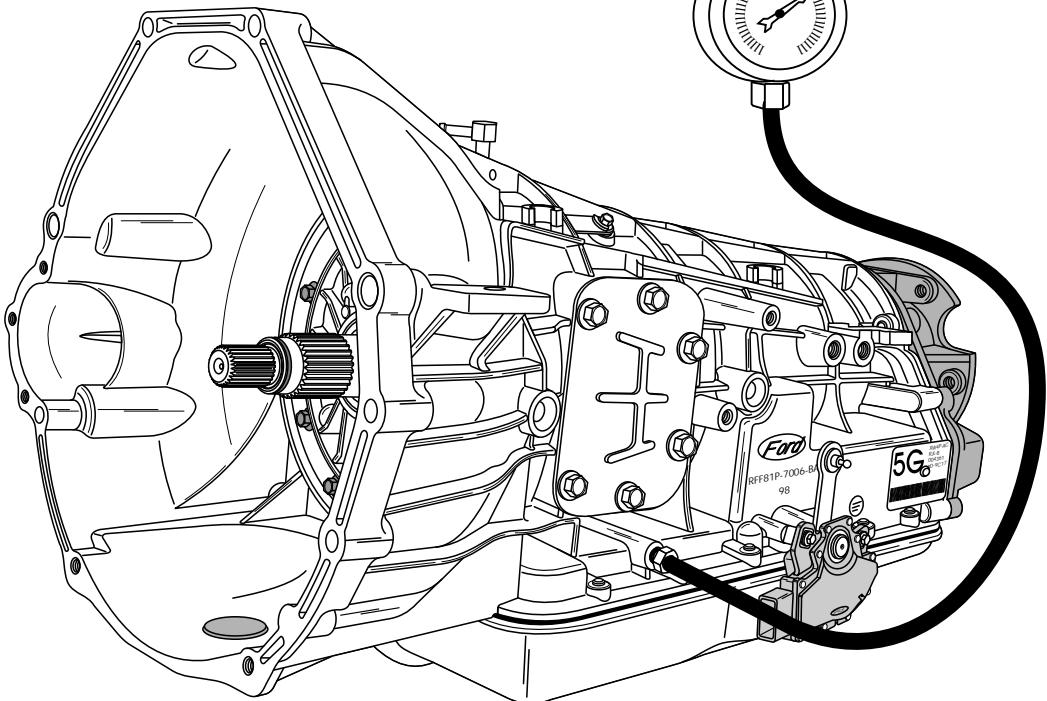
PCM Gear Commanded	Selector Lever Position		
	(D)	2	1
	Actual Gear Obtained		
1st	1	2	1
2nd	2	2	1
3rd	2	2	1
4th	1	2	1

SHIFT SOLENOID "B" ALWAYS ON

PCM Gear Commanded	Selector Lever Position		
	(D)	2	1
	Actual Gear Obtained		
1st	2	2	1
2nd	2	2	1
3rd	3	2	2
4th	3	2	2

Figure 23

LINE PRESSURE TEST



LINE PRESSURE SPECIFICATION CHART

Gear	Idle	Stall
P, N	50-65 psi	—
R	70-100 psi	220-240 psi
OD, M2	50-65 psi	136-156 psi
M1	70-115 psi	175-210 psi

NOTE: On vehicles equipped with PTO units, access to the line pressure port may require that you remove the PTO unit depending on the type of unit installed. If required, remove the PTO unit and install PTO cover and gasket "Before" doing the line pressure test.

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Figure 24

LINE PRESSURE TEST

NOTE: Perform the line pressure test before performing the "Stall" test. If the line pressure is low at "Idle", DO NOT perform the "Stall" test or further transmission damage will occur.

Do Not Maintain Wide Open Throttle in any gear range for more than "5 Seconds" or transmission damage may occur.

NOTE: If equipped, turn "Off" the PTO unit to ensure proper test results.

1. Install a 300 psi line pressure gauge to the line pressure tap, as shown in Figure 24.
2. Start the engine and check line pressure in all ranges at "Idle". Refer to the chart shown in Figure 24 to determine if they are within the specifications.
3. If the line pressures are within the specifications at "Idle", now you can perform the "Stall" test to determine if specifications are okay there.
4. Once again, refer to the chart in Figure 24, to determine proper specifications at "Stall".



Technical Service Information

FORD 4R100 "NON-PTO" AND "PTO" HYDRAULIC DIFFERENCES

CHANGE: Beginning at the start of production for 1999 models, Ford Motor Company made available a "Power Take Off" option for some F250, F350, F450 and F550 Super Duty Trucks, equipped with 5.4L, 6.8L and 7.3L engines.

REASON: The "PTO" option addition, to the 4R100, required many changes to the transmission to make the "PTO" function. The "PTO" window, added to the case, the "PTO" drive gear and other cosmetic changes were covered on Page 6 in this manual. Hydraulic changes also had to be made to make the coast clutch operate in ranges other than the Drive ranges (See Figure 35).

PARTS AFFECTED:

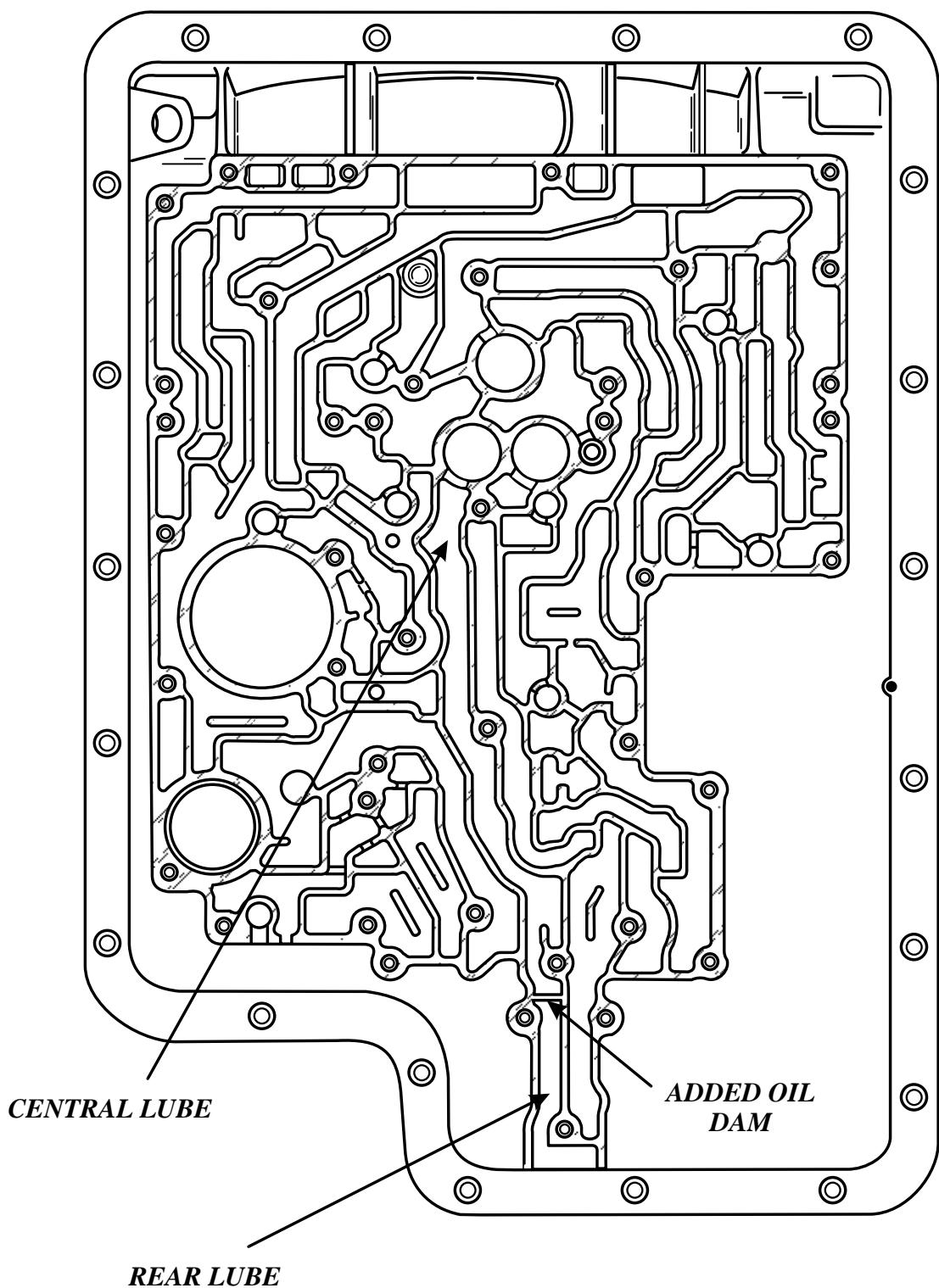
- (1) **TRANSMISSION CASE:** The transmission case was changed to accommodate the "PTO" window, as shown in this manual. *All* 4R100 Cases, "NON-PTO" and "PTO," also had a "Dam" added to separate "Rear Lube" and to incorporate "Central Lube" as shown in Figure 25.
- (2) **VALVE BODY TO CASE SPACER PLATE:** The Valve Body to Case Spacer plate on the "PTO" versions had a hole added to supply the 3-4 Shift Valve with Line Pressure, as shown in Figure 27. A hole was also added to the Spacer Plate on "NON-PTO" and "PTO" versions to connect "Solenoid Regulator Valve" oil to supply "Central Lubrication." Refer to Figures 26 and 27 for identification of "NON-PTO" and "PTO" Valve Body To Case Spacer Plates.
- (3) **MAIN VALVE BODY:** A passage was added on the "Upper Side" of the Main Valve Body on "PTO" versions, as shown in Figure 29, to supply Line Pressure to the 3-4 Shift Valve. A passage was also added, on the "Lower Side" of the Main Valve Body, to connect the 3-4 Shift Valve (Coast Clutch Circuit) to an exhaust as shown in Figure 31. The spring side of the 3-4 Shift Valve was also separated from the Low/Reverse circuit as shown in Figure 31. Refer to Figures 28 thru 31 for identification of "NON-PTO" and "PTO" Main Valvebody's.
- (4) **LOWER VALVE BODY:** The Lower Valve Body has a passage added, as shown in Figure 33, to connect to the "*new*" exhaust passage in the Main Valve Body. Refer to Figures 32 and 33, for identification of "NON-PTO" and "PTO" Lower Valvebody's.
- (5) **LOWER VALVE BODY SPACER PLATE:** The Lower Valve Body Spacer Plate had a hole added to connect the "*new*" exhaust passage in the Main Valve Body to the "*new*" exhaust passage in the Lower Valve body as shown in Figure 34. Refer to Figure 34 for "NON-PTO" and "PTO" Lower Valve Body Spacer Plate identification.

INTERCHANGEABILITY:

None of the parts listed above will interchange between "NON-PTO" and "PTO" versions.

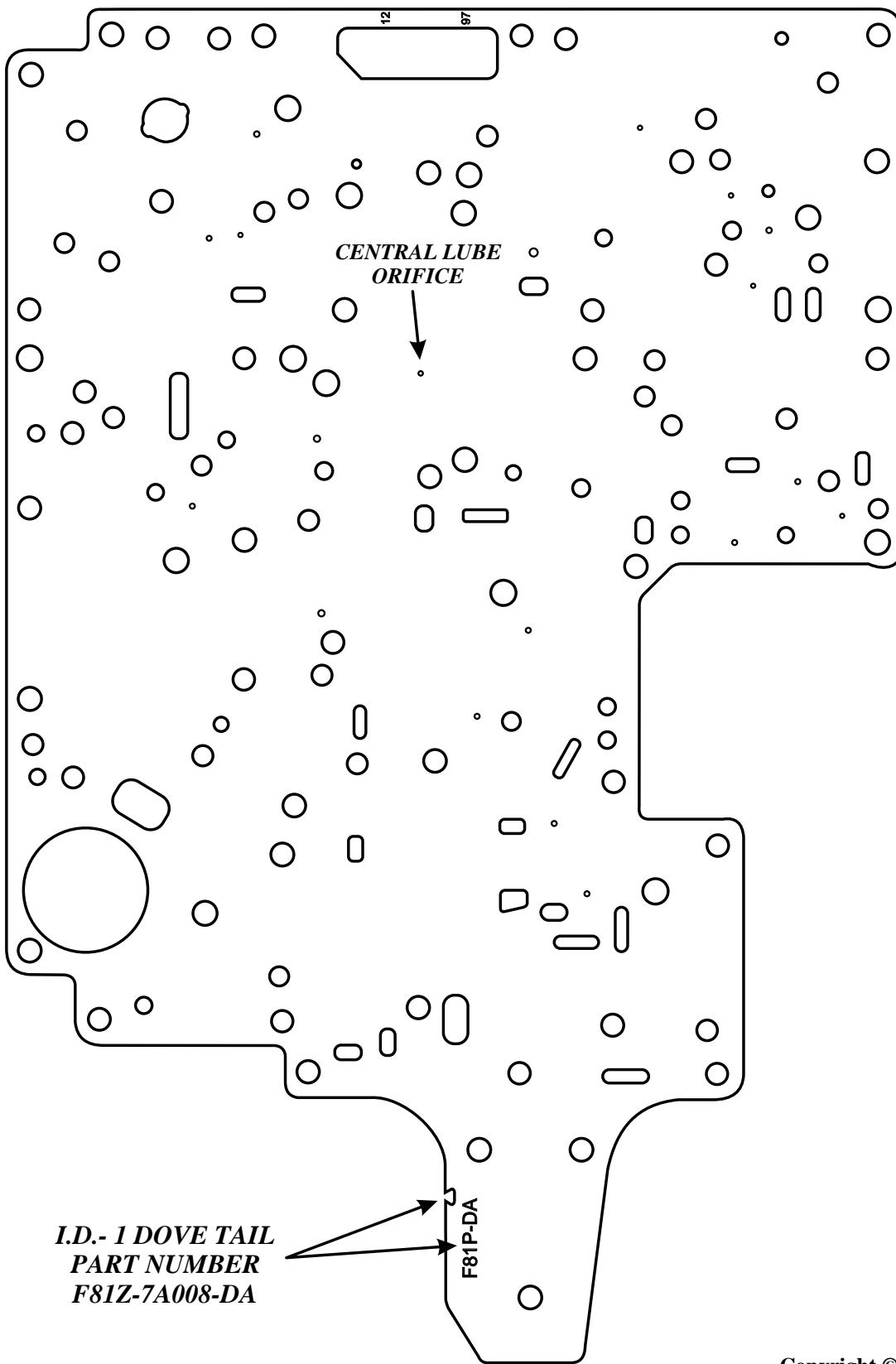
SERVICE INFORMATION:

Valve Body To Case Spacer Plate (Non-PTO)	F81Z-7A008-DA
Valve Body To Case Spacer Plate (PTO)	F81Z-7A008-BA

**4R100 CASE ASSEMBLY
"NON-PTO" AND "PTO" MODELS**

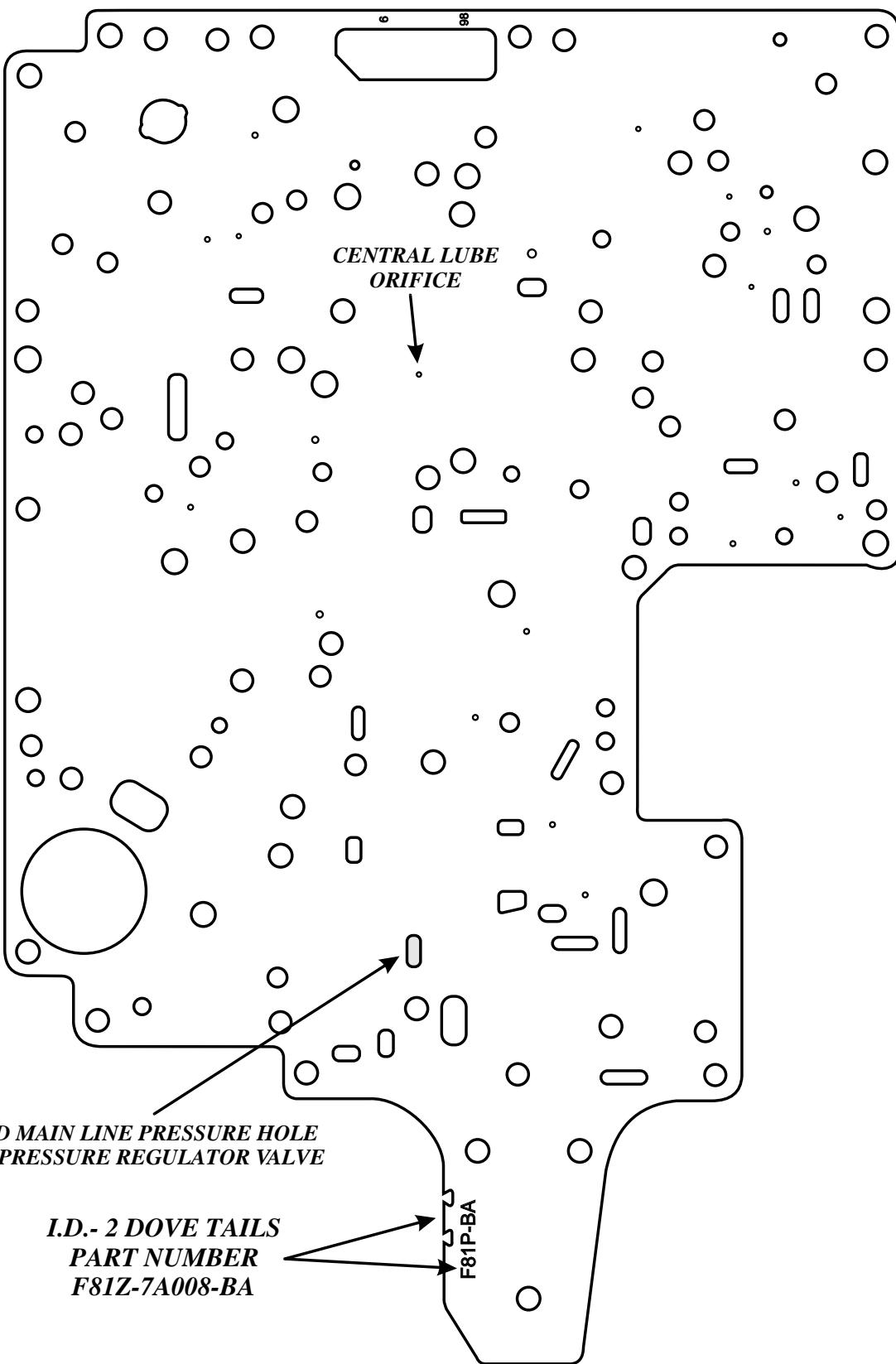
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Figure 25

**4R100 MAIN SPACER PLATE
"NON-PTO" MODELS ONLY**

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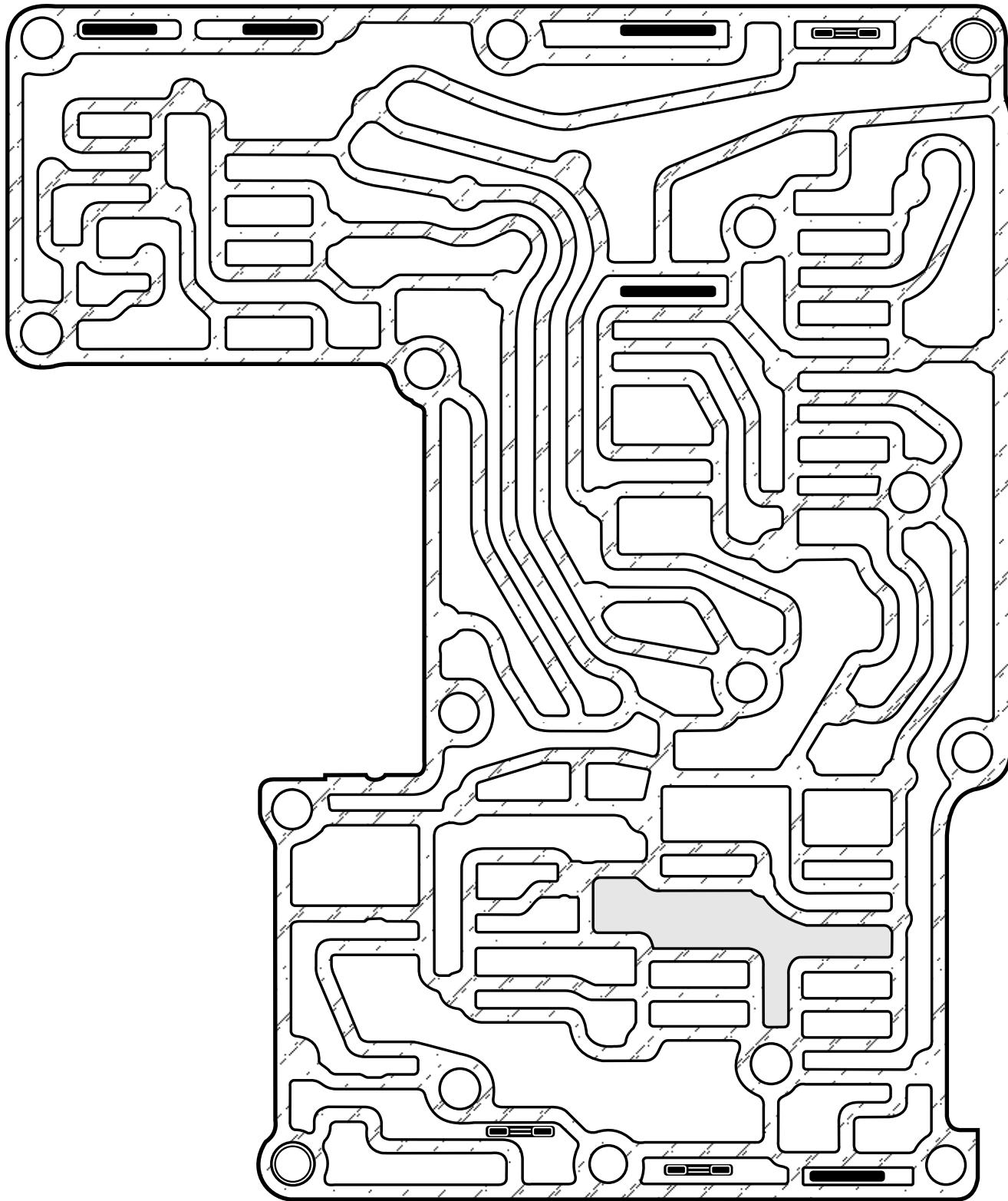
Figure 26

**4R100 MAIN SPACER PLATE
"PTO" MODELS ONLY**

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Figure 27

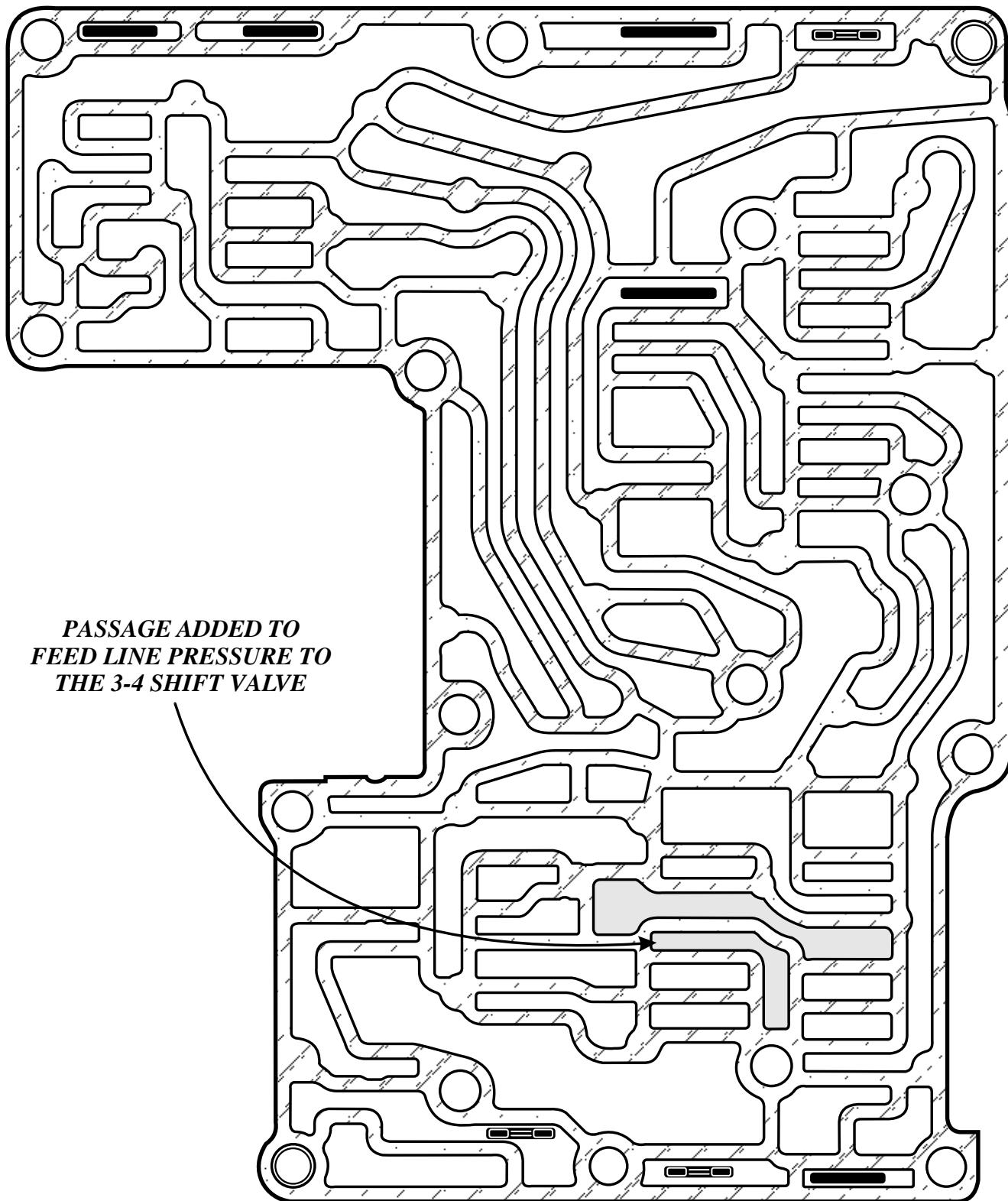
**"UPPER SIDE" 4R100 MAIN VALVE BODY
"NON-PTO" MODELS ONLY**



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Figure 28

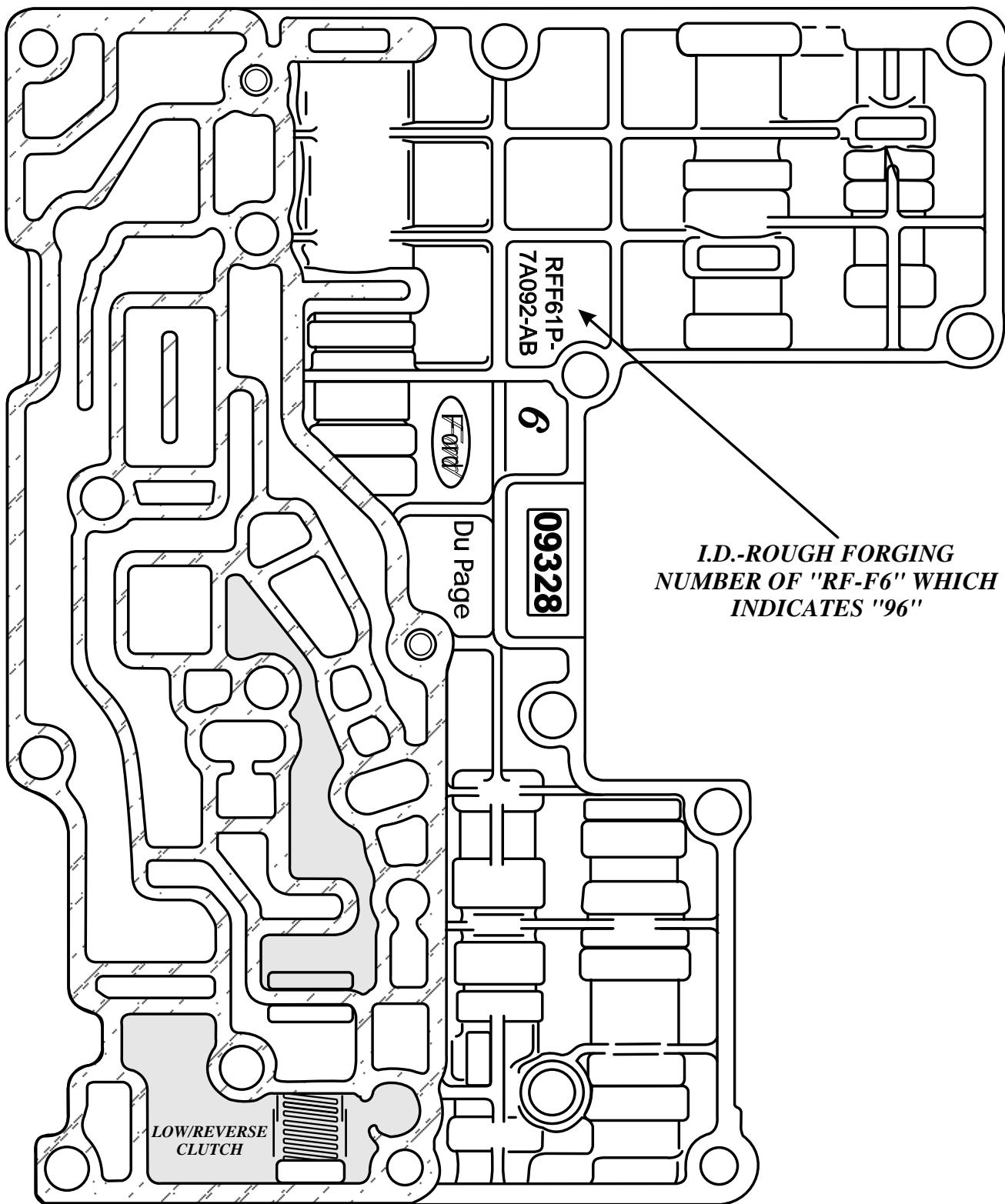
**"UPPER SIDE" 4R100 MAIN VALVE BODY
"PTO" MODELS ONLY**



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Figure 29

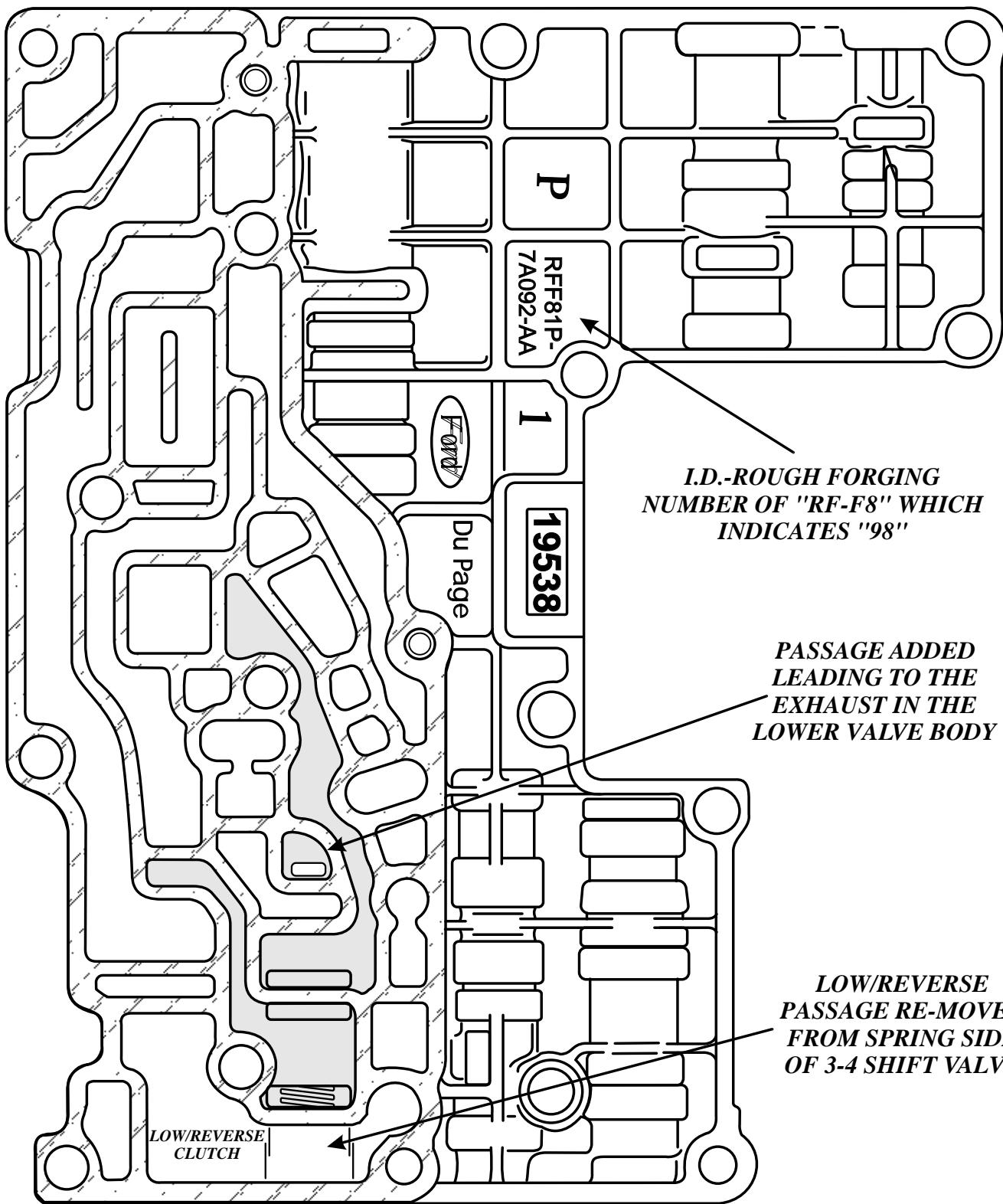
**"LOWER SIDE" 4R100 MAIN VALVE BODY
"NON-PTO" MODELS ONLY**



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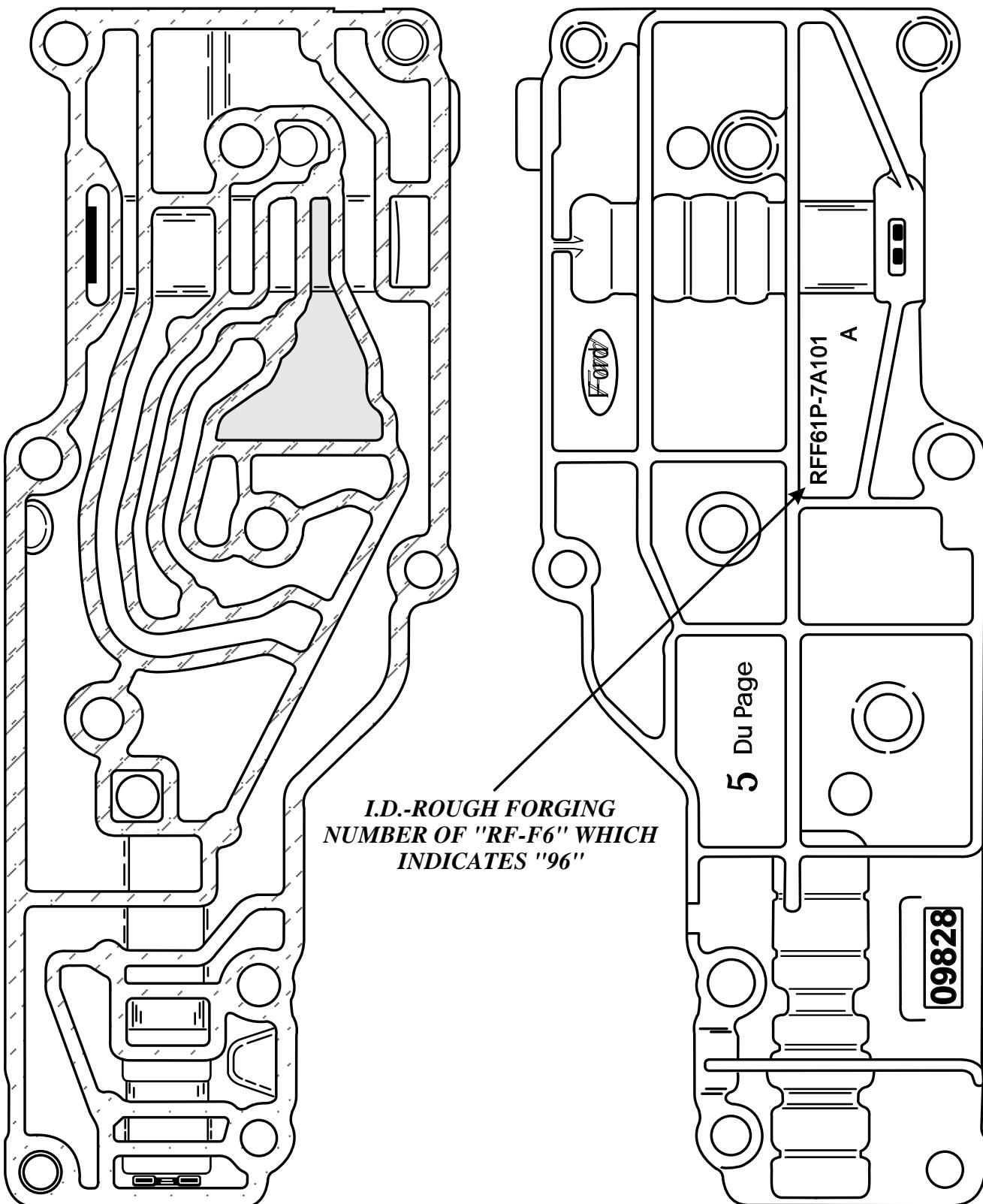
Figure 30

**"LOWER SIDE" 4R100 MAIN VALVE BODY
"PTO" MODELS ONLY**



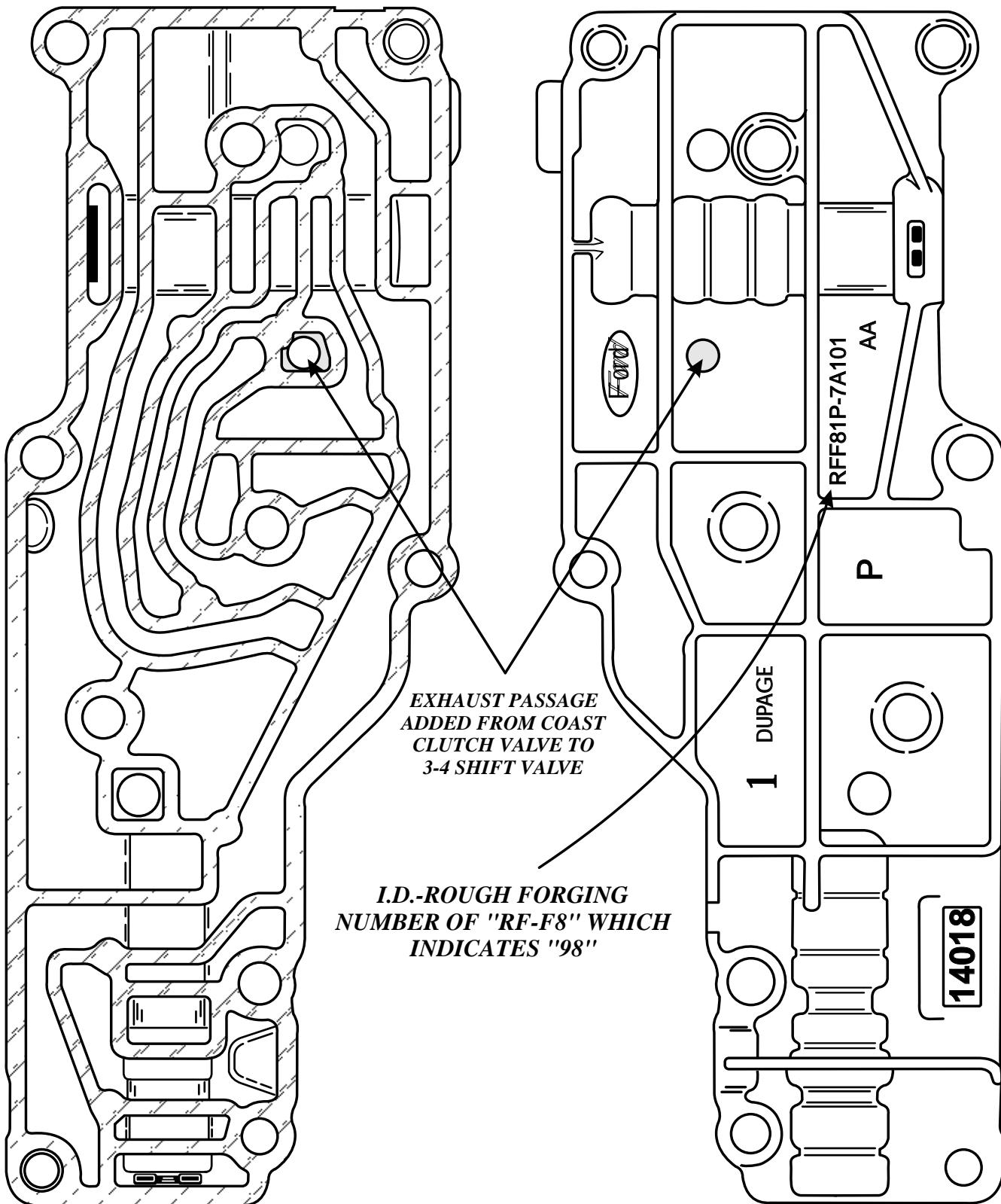
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Figure 31

**4R100 LOWER VALVE BODY
"NON-PTO" MODELS ONLY**

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Figure 32

**4R100 LOWER VALVE BODY
"PTO" MODELS ONLY**

Copyright © 2003 ATSG

Figure 33

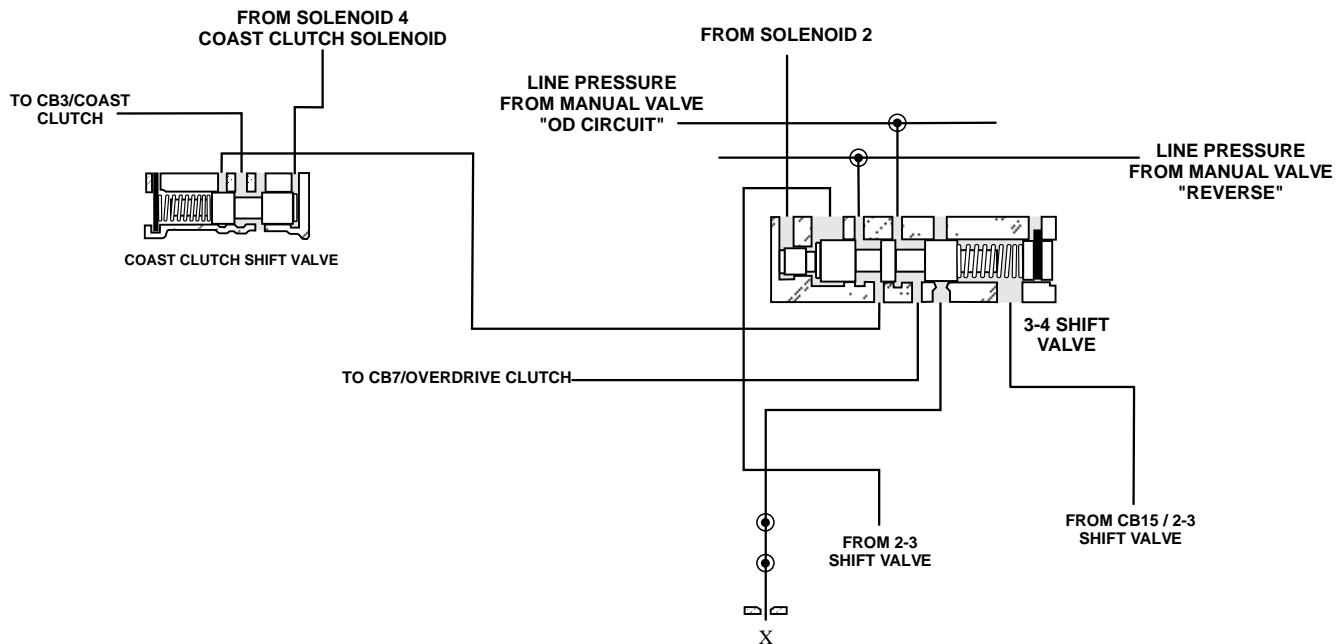
4R100 LOWER VALVE BODY SPACER PLATE**"NON-PTO" MODELS ONLY***I.D.- 1 DOVE TAIL***"PTO" MODELS ONLY***I.D.- 2 DOVE TAILS*

*HOLE ADDED TO CONNECT
WITH EXHAUST PASSAGE
IN LOWER VALVE BODY*

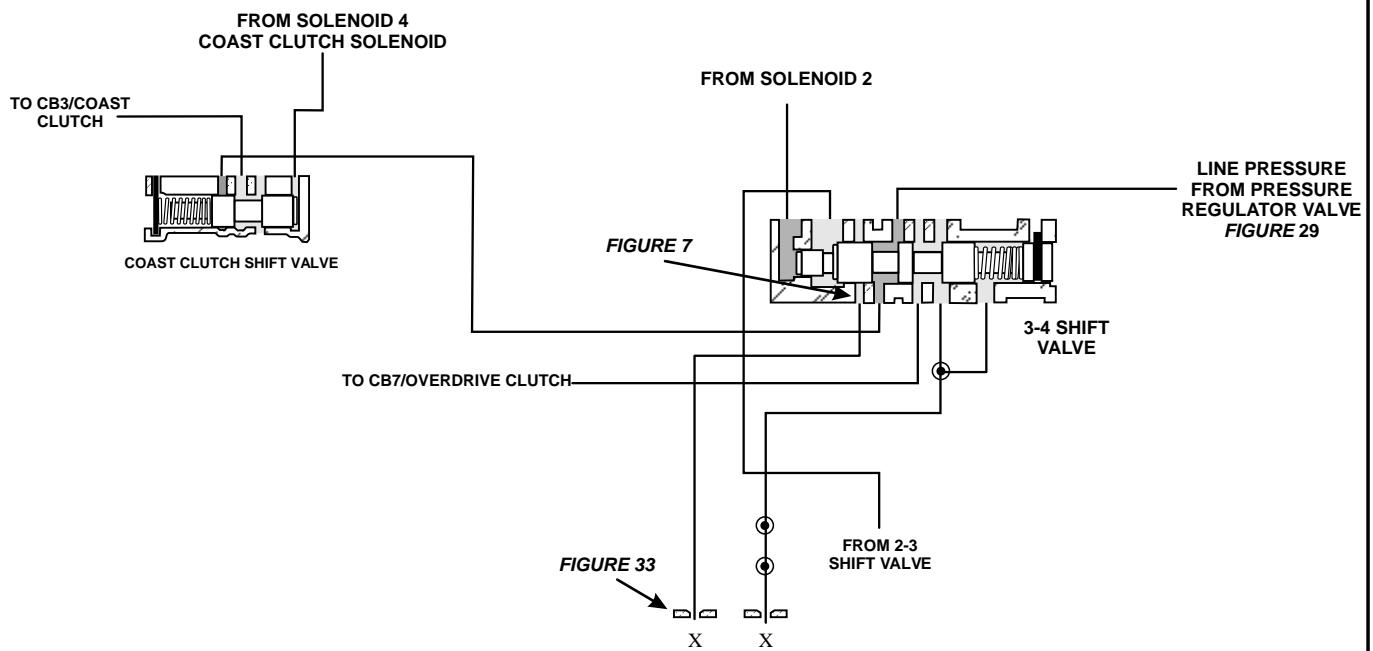
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Figure 34

"NON-PTO" 3-4 SHIFT VALVE HYDRAULIC CIRCUIT



"PTO" 3-4 SHIFT VALVE HYDRAULIC CIRCUIT



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Figure 35



Technical Service Information

FORD 4R100 "PWM" AND "NON-PWM" PUMP DIFFERENCES

CHANGE: Beginning at the start of production in 1999, the 4R100 transmission was offered with two different torque converter clutch application strategies. A "PWM" (Pulse Width Modulated) version, was added for V-10 gas powered vehicles and all diesels, and a "NON-PWM" version, offered in all other gas powered vehicles. This required two different solenoid packs as well as two different pump assemblies.

REASON: For smooth converter clutch apply on V-10 gas and diesel engine models.

PARTS AFFECTED:

(1) PUMP ASSEMBLY:

- The pump cover assembly had the rear of the Converter Clutch Valve bore enlarged approximately .070" to accommodate the enlarged land of the Converter Clutch Valve as shown in Figure 36. A .036" orifice and an air bleed were added to the TCC Solenoid signal passage as shown in Figure 38.
- The Converter Clutch Control Valve's rear spool was enlarged approximately .070." There was also a bushing and valve added to the end of the valve train as shown in Figure 36.
- A hole was added to the pump cover to connect the Converter Clutch Control Valve Bushing to Converter Regulator Valve oil, as shown in Figure 38.
- The Converter release orifice in the NON-PWM pump cover, as shown in Figure 37, was removed from the PWM pump cover as shown in Figure 38.

THE SOLENOID PACK:

- (2) The PWM solenoid pack requires a Pulse Width Modulated torque converter clutch solenoid and the NON-PWM solenoid pack requires an on-off torque converter clutch solenoid.

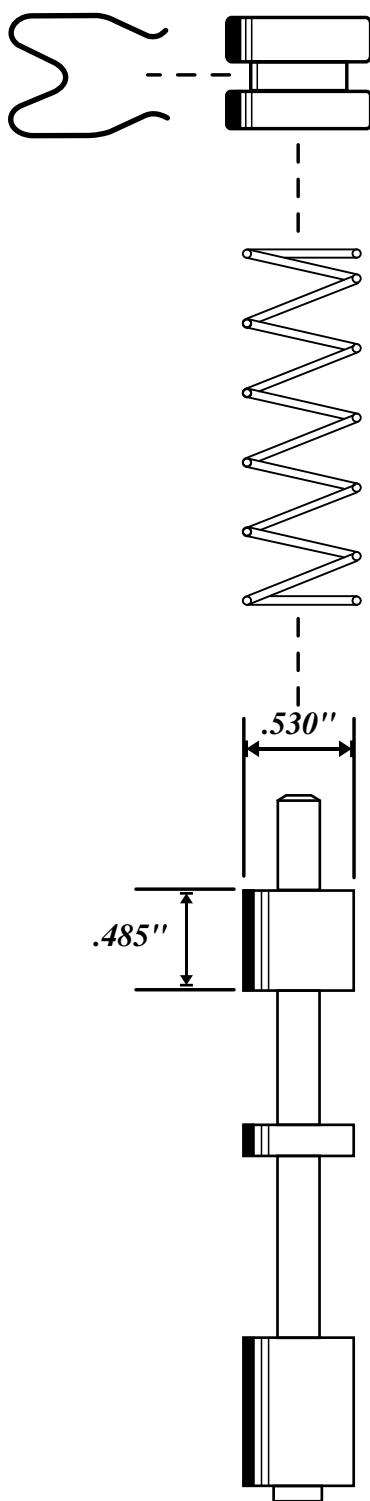
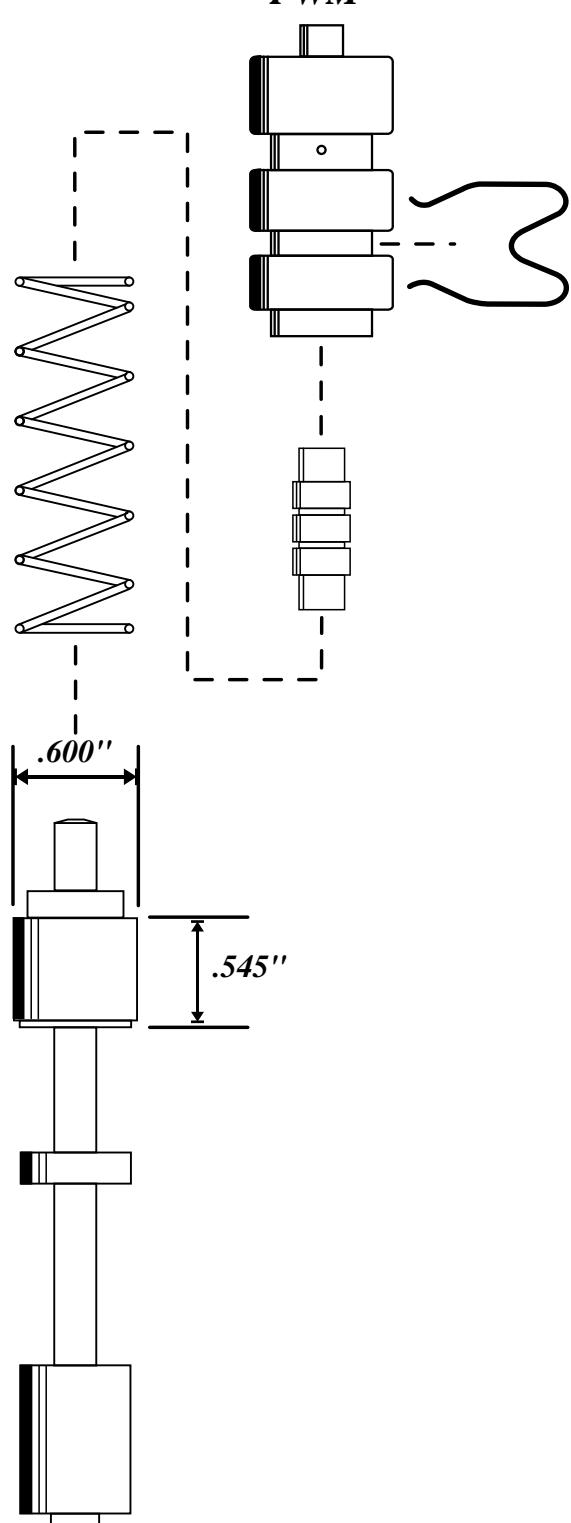
INTERCHANGABILITY:

None of the parts listed above are interchangeable from model to model.

SERVICE INFORMATION:

"NON-PWM" Pump assy. (with "Cast Iron" coast clutch drum).....	F81Z-7A103-AA
"NON-PWM" Pump assy. (with "Stamped Steel" coast clutch drum).....	F81Z-7A103-BA
"PWM" Pump assy. (with "Stamped Steel" coast clutch drum).....	F81Z-7A103-CA
"NON-PWM" Solenoid Pack.....	F81Z-7G391-BA
"PWM" Solenoid Pack.....	F81Z-7G391-AB

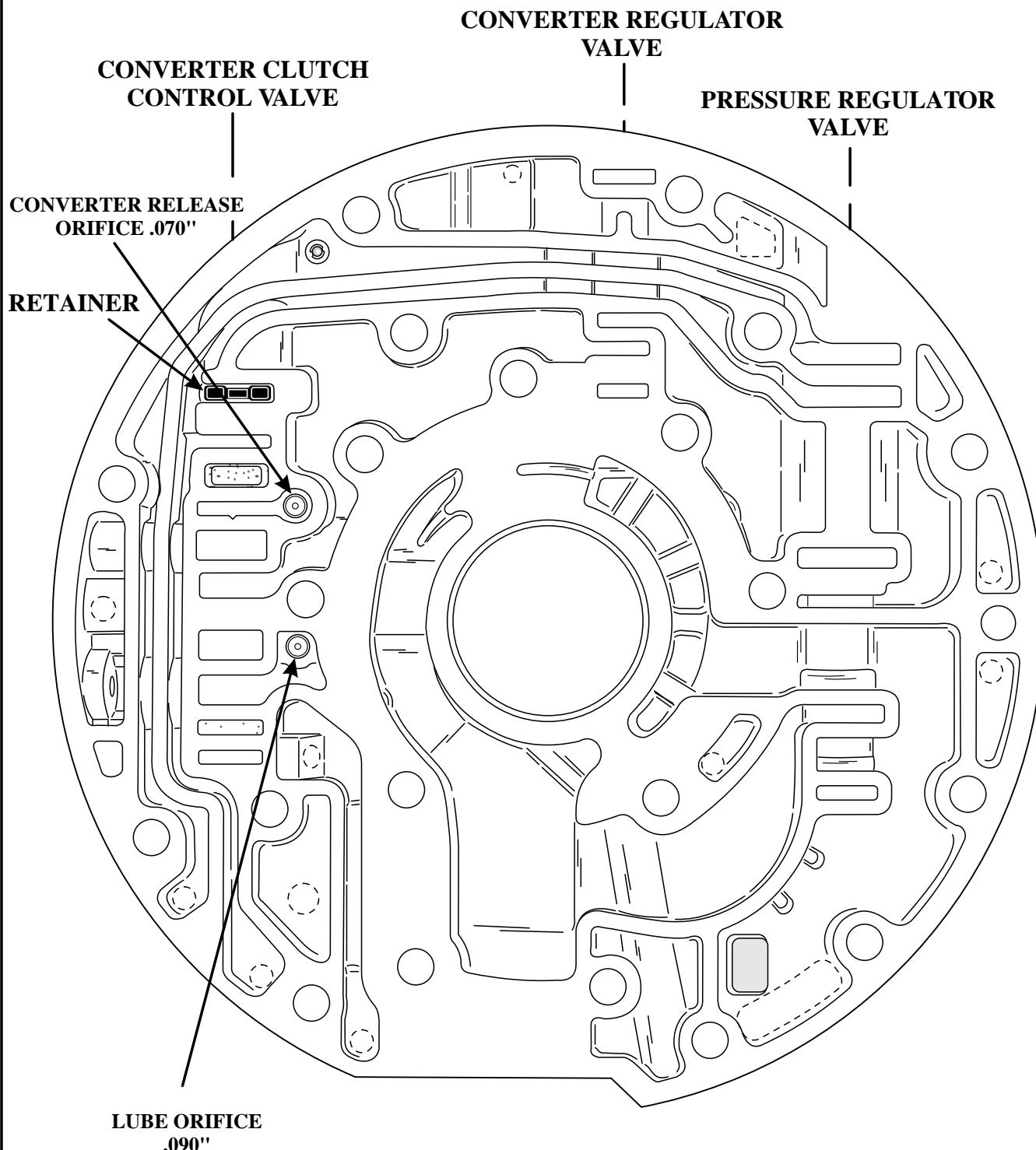
CONVERTER CLUTCH CONTROL VALVE

"NON-PWM"**"PWM"**

THE DIAMETER AND THE LENGTH OF THE SPOOL ON THE VALVE LAND SHOWN ABOVE, WERE INCREASED ON PWM VERSIONS. THE BORE IN THE PUMP COVER WAS ALSO ENLARGED APPROXIMATELY .070" TO ACCOMMODATE THE CHANGES IN THE DIAMETER OF THE VALVE

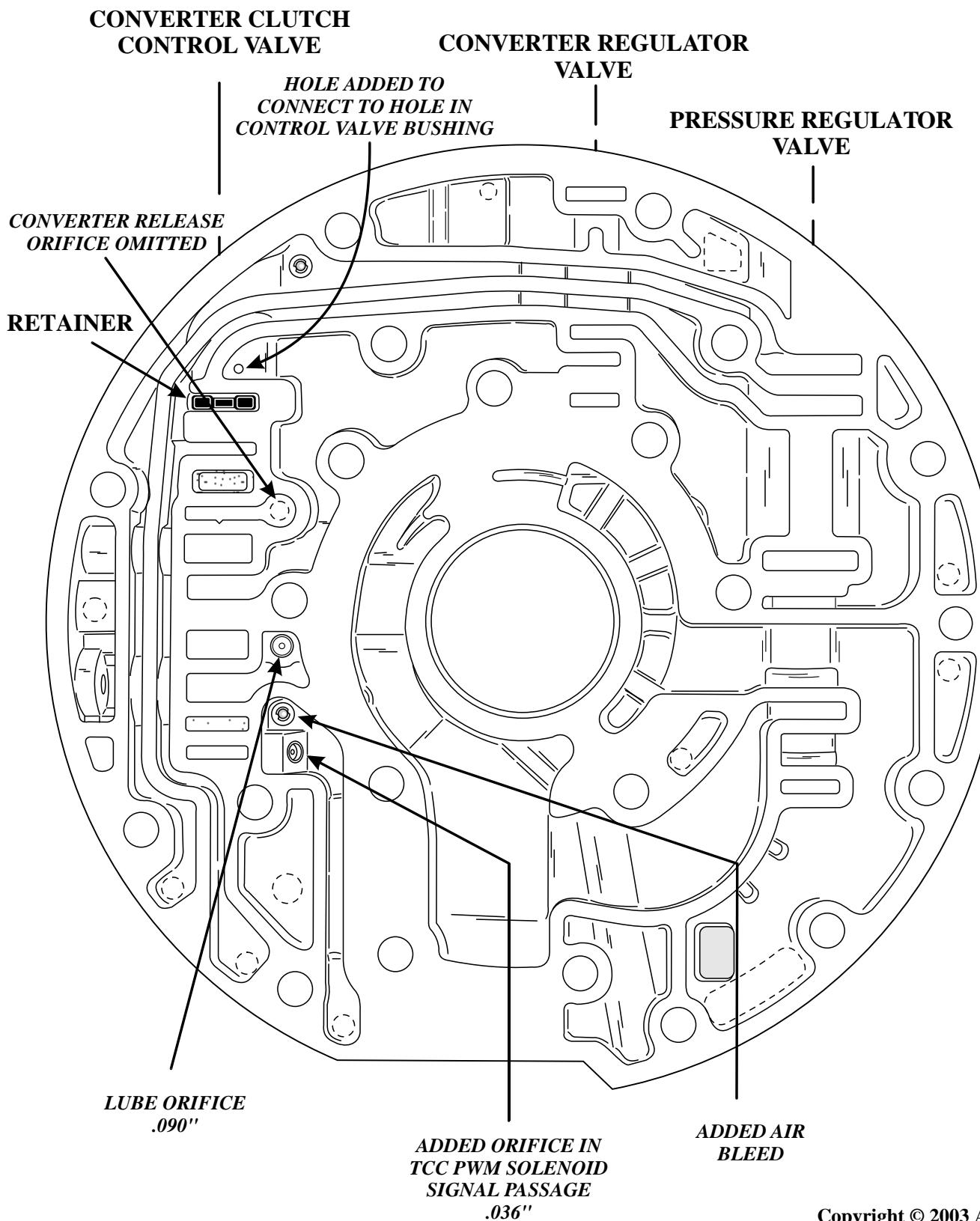
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Figure 36

**4R100 PUMP COVER ASSEMBLY
"NON-PWM" MODELS ONLY**

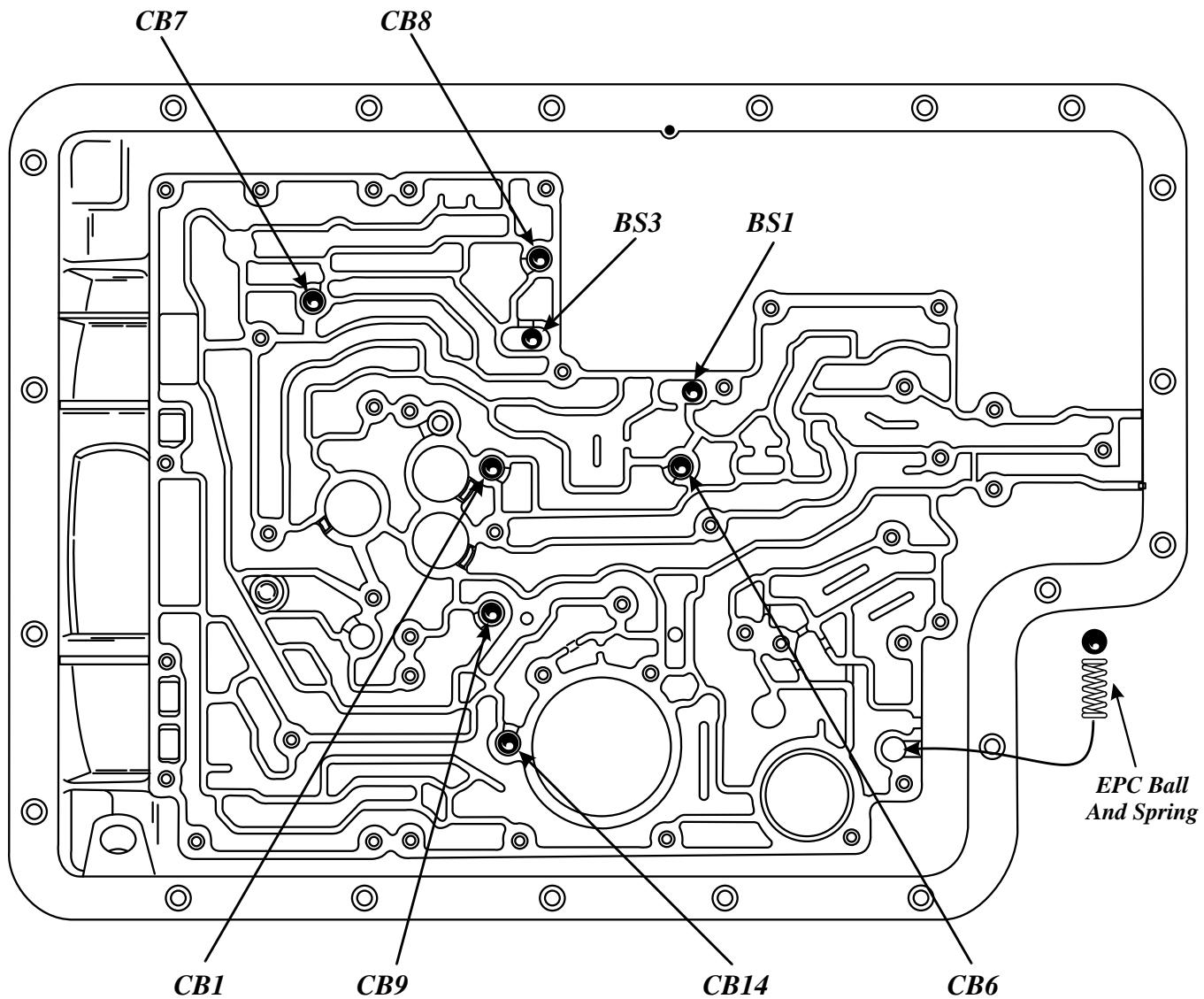
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Figure 37

**4R100 PUMP COVER ASSEMBLY
"PWM" MODELS ONLY**

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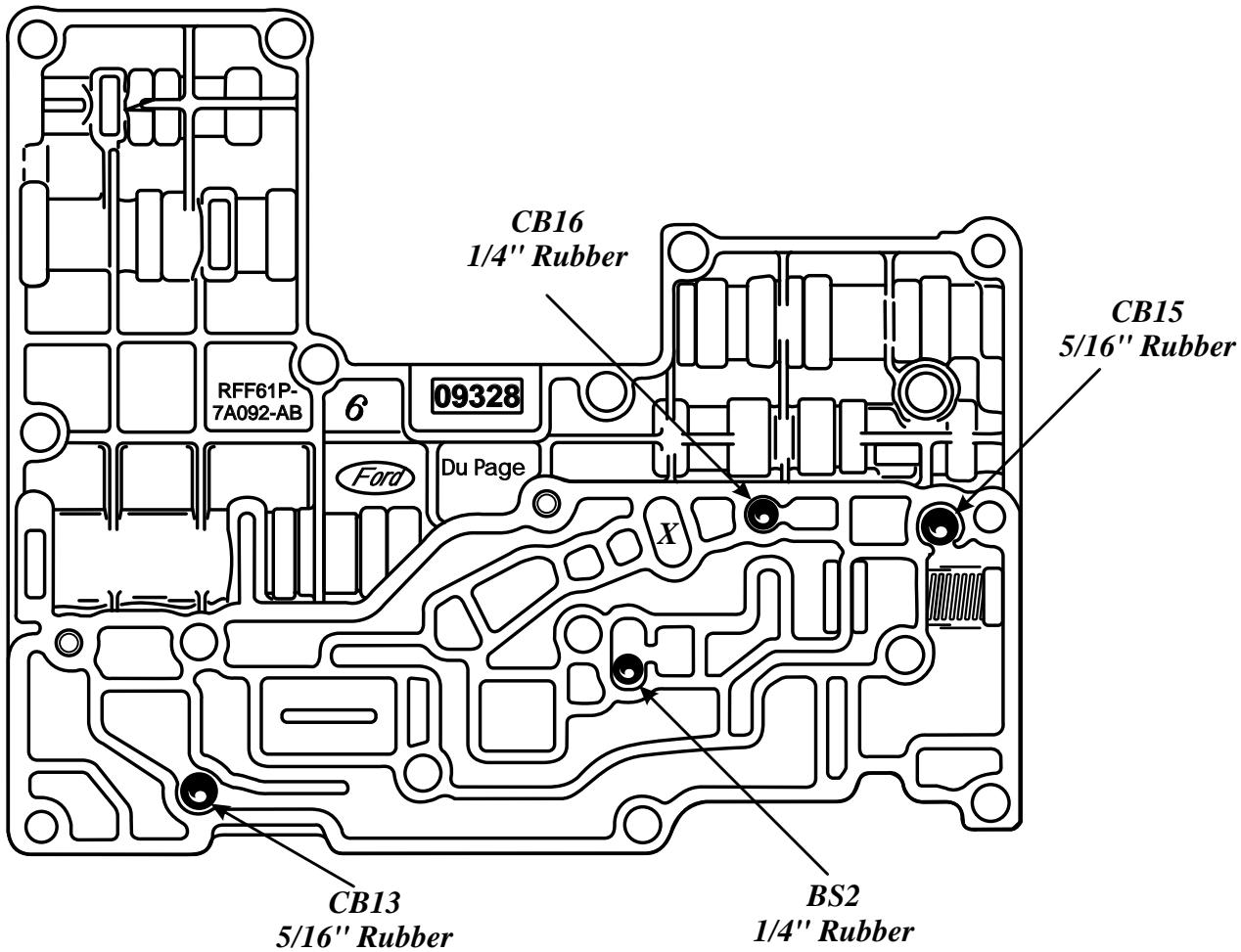
Figure 38

**4R100 CASE CHECKBALL LOCATIONS
"NON-PTO" AND "PTO" MODELS**

Requires Eight 5/16" Diameter Rubber Checkballs
Plus The EPC Ball And Spring, As Shown Above.

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Figure 39

**4R100 VALVE BODY CHECKBALL LOCATIONS
"NON-PTO" AND "PTO" MODELS**

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Figure 40

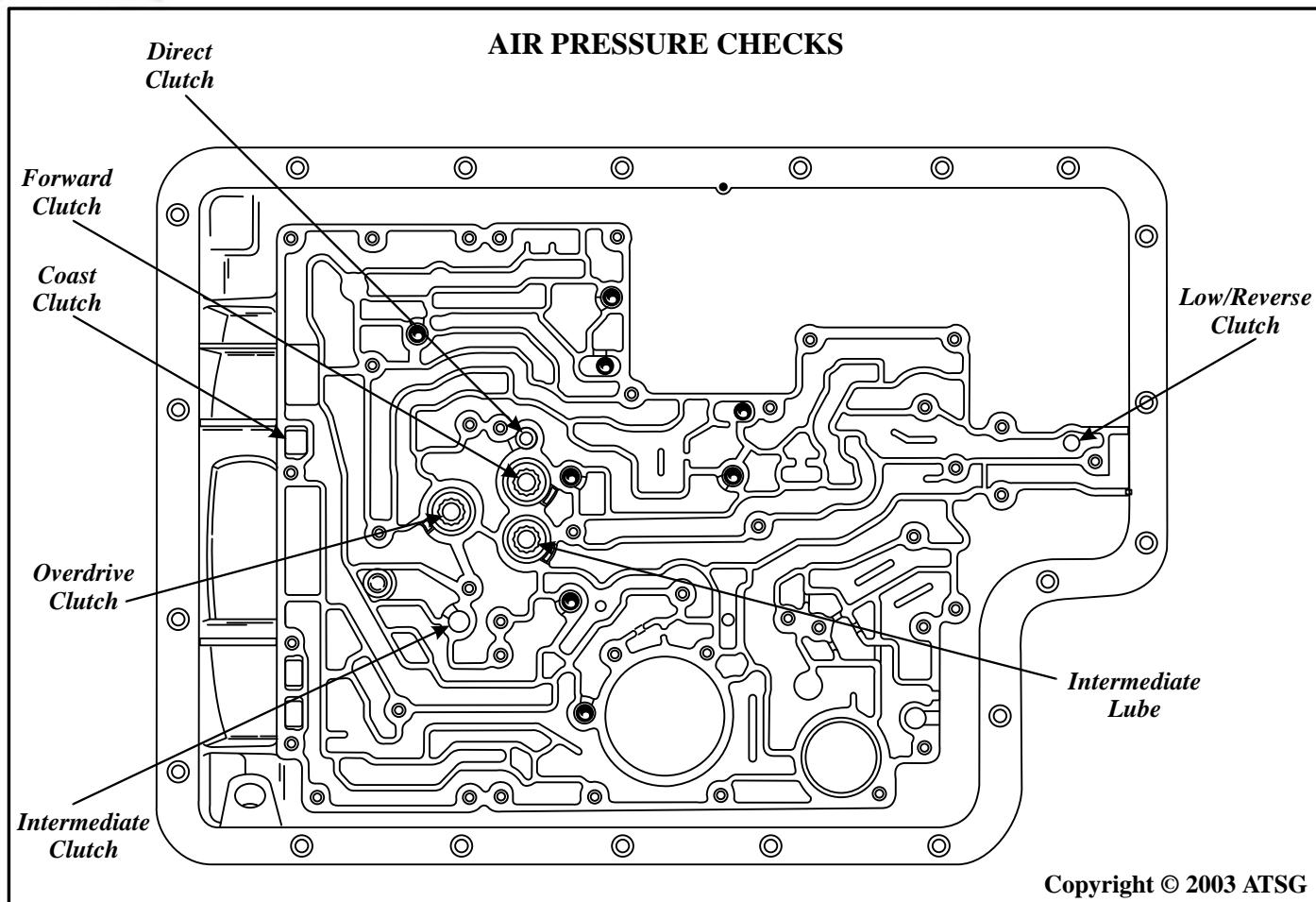


Figure 41

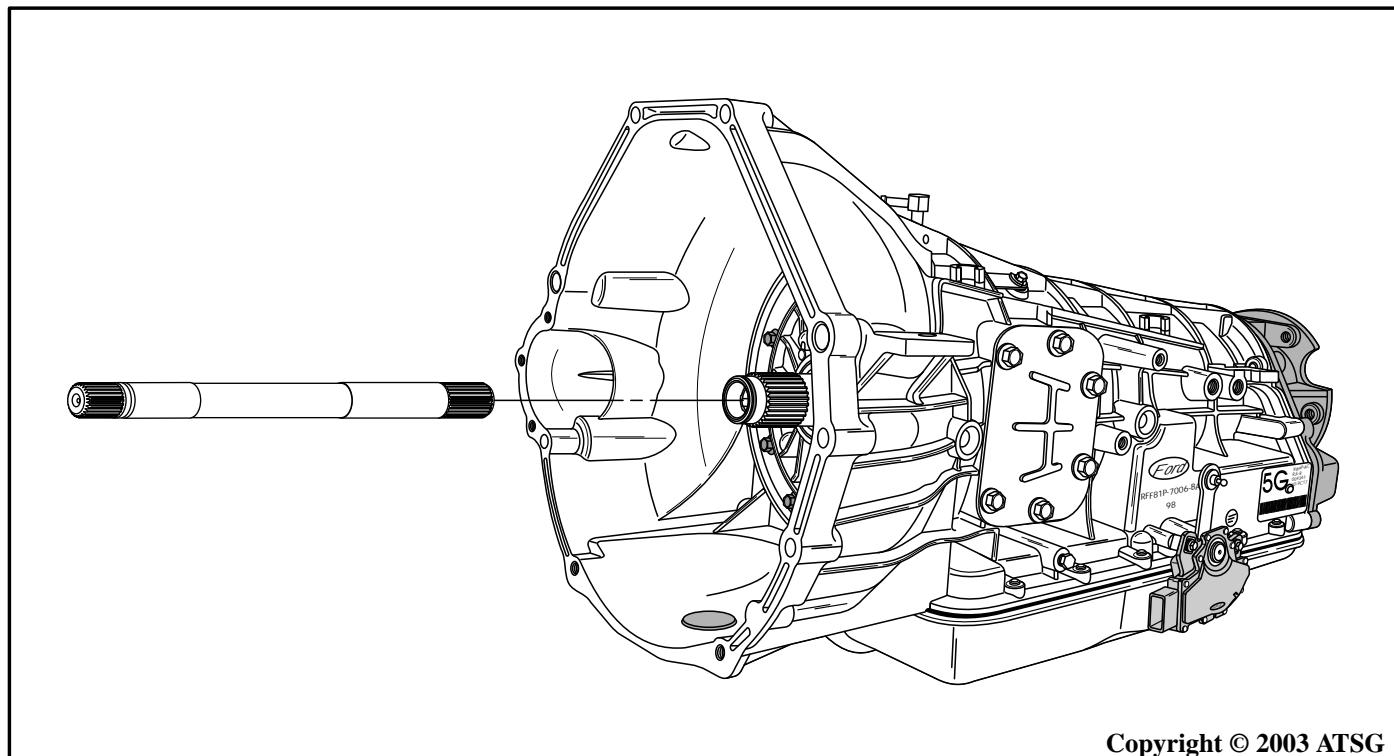


Figure 42

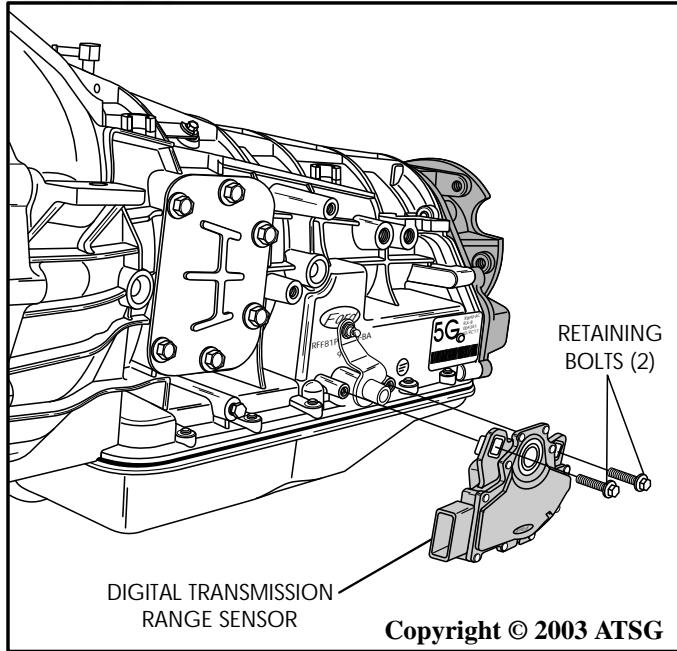


Figure 43

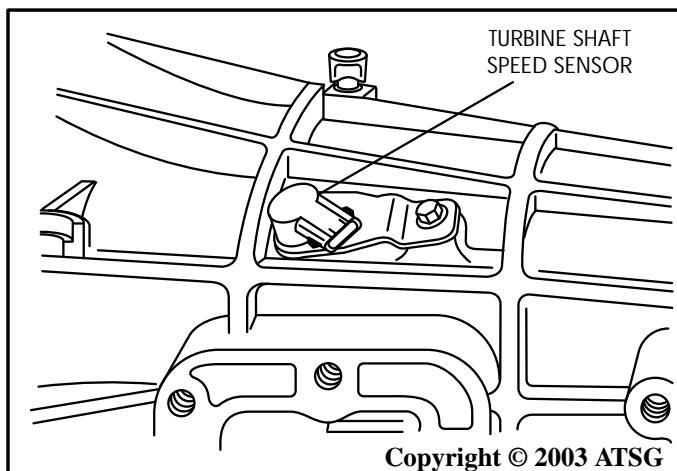


Figure 44

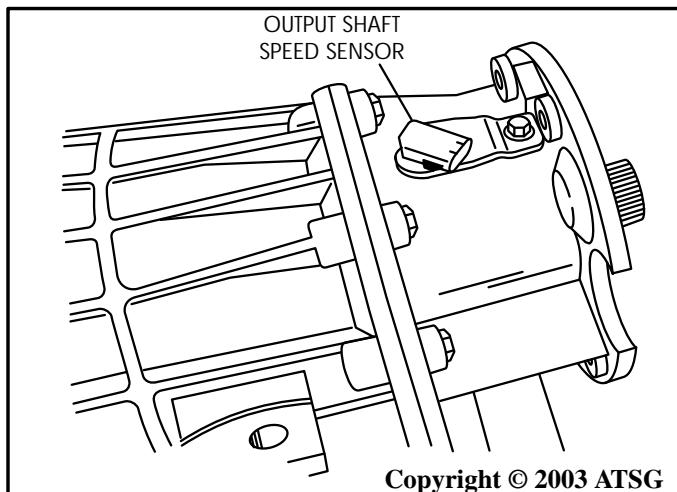


Figure 45

TRANSMISSION DISASSEMBLY

External Components

1. Remove the turbine shaft from the transmission as shown in Figure 42. Inspect the spline area on both ends and set aside for final assembly.
2. Remove the two Digital Transmission Range sensor retaining bolts, as shown in Figure 43, and remove the DTR sensor.
3. If equipped, the turbine shaft speed sensor and output shaft speed sensor must be removed to prevent damage, as shown in Figure 44 and 45.
4. Install a compatible holding fixture onto the transmission case, as shown in Figure 46, that will allow you to safely rotate the transmission when installed in the bench fixture.
5. Rotate the transmission so that the bottom pan is facing up, as shown in Figure 47.

Continued on Page 42.

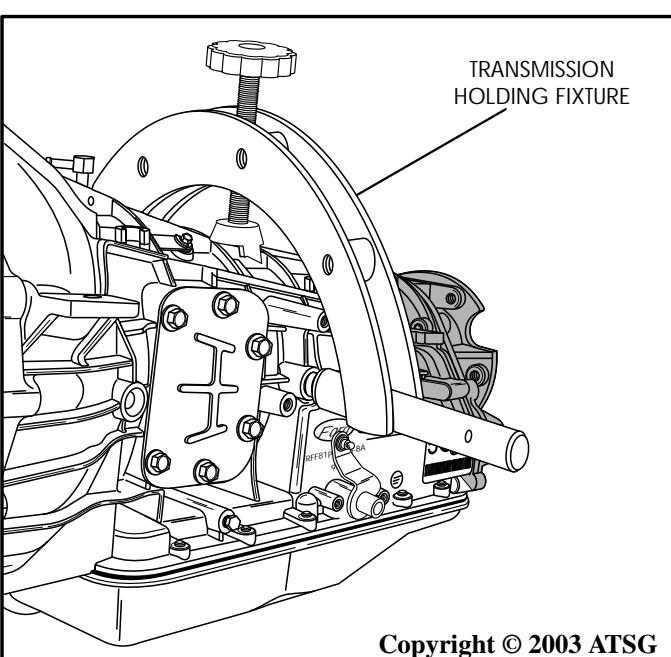


Figure 46

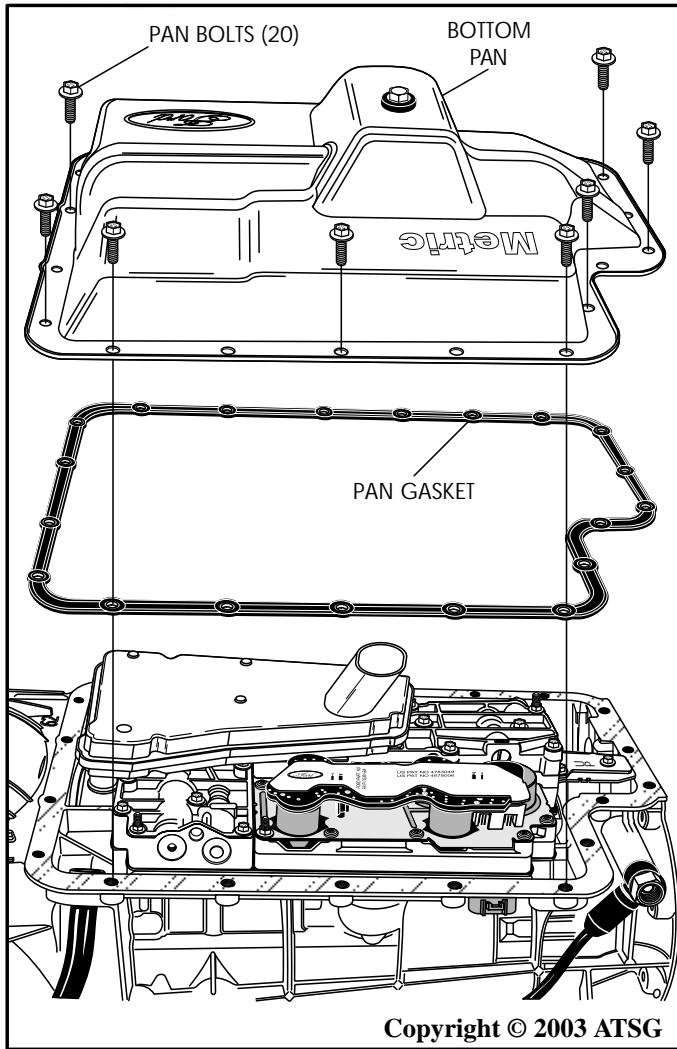


Figure 47

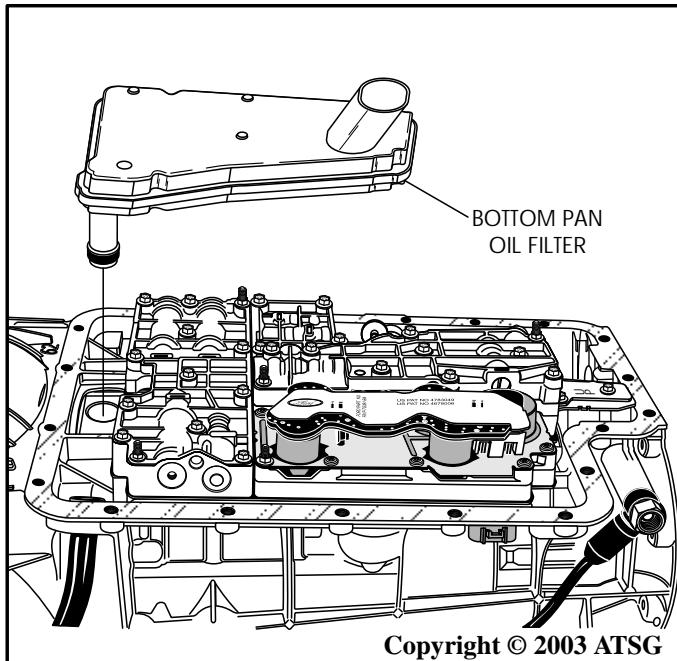


Figure 48

TRANSMISSION DISASSEMBLY

Bottom Pan Components

1. Remove the 20 bottom pan bolts, the bottom pan and the bottom pan gasket, as shown in Figure 47.
 2. Remove the bottom pan oil filter, as shown in Figure 48, by prying up with screwdriver.
 3. Remove two accumulator valve body retaining nuts and 11 bolts, as shown in Figure 49, and remove accumulator valve body.
 4. Set the accumulator valve body aside for the component rebuild section.
 5. Remove two main valve body retaining nuts and the 14 bolts, as shown in Figure 50, and remove upper and lower valve bodies together as a package.
 6. Set the main upper and lower valve bodies aside for the component rebuild section.
- Note:** *Do not remove the two bolts holding the upper and lower valve bodies together. Refer to Figure 50.*

Continued on Page 43.

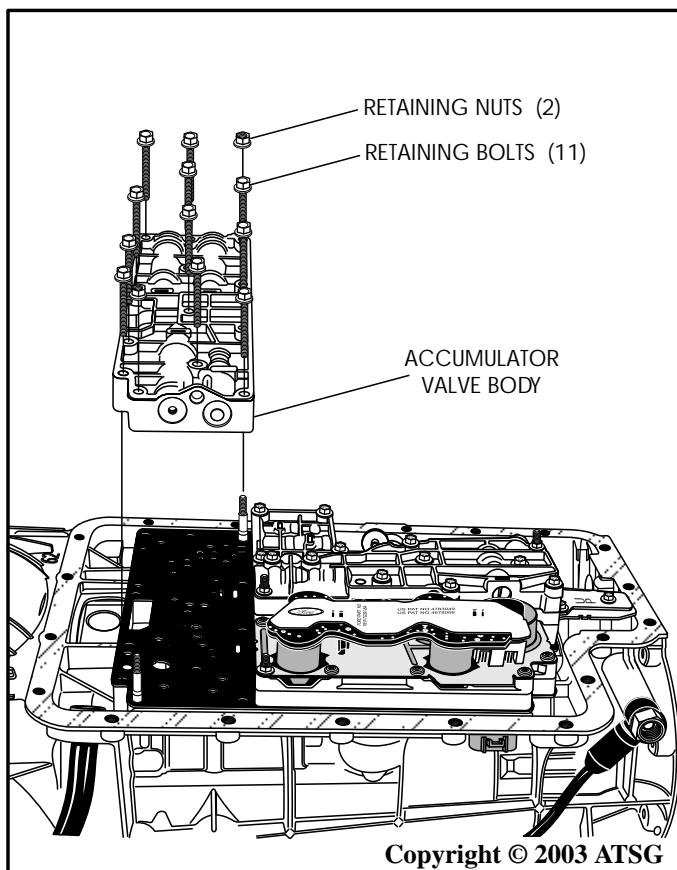


Figure 49

TRANSMISSION DISASSEMBLY

Bottom Pan Components

7. Remove the solenoid body retaining nut and the 9 retaining bolts, as shown in Figure 51, and remove the solenoid body assembly.
8. Remove the solenoid body by lifting up with a small twist to free the connector "O" ring from the case bore (See Figure 51).
9. Remove and discard the spacer plate to main valve body gasket, as shown in Figure 52.
10. Remove the solenoid body screen from spacer plate, as shown in Figure 52, by rotating and lifting straight up.

Continued on Page 44.

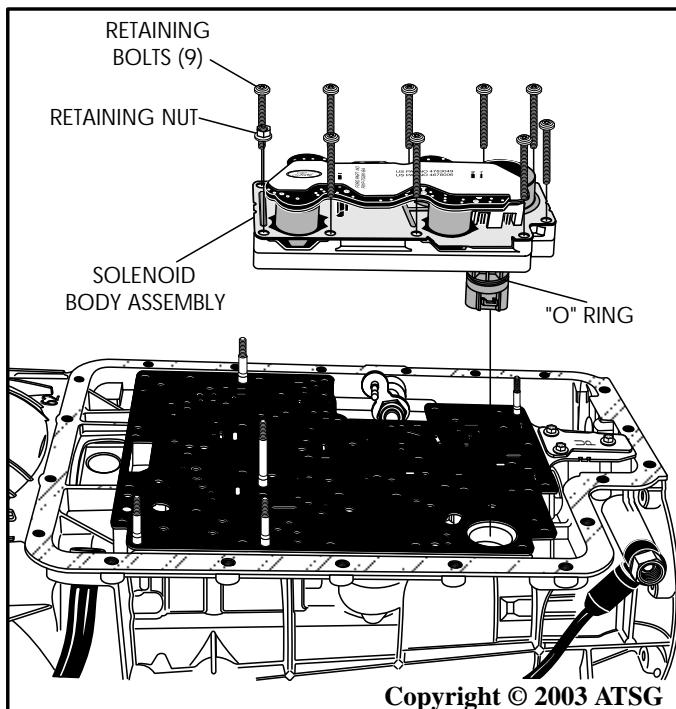


Figure 51

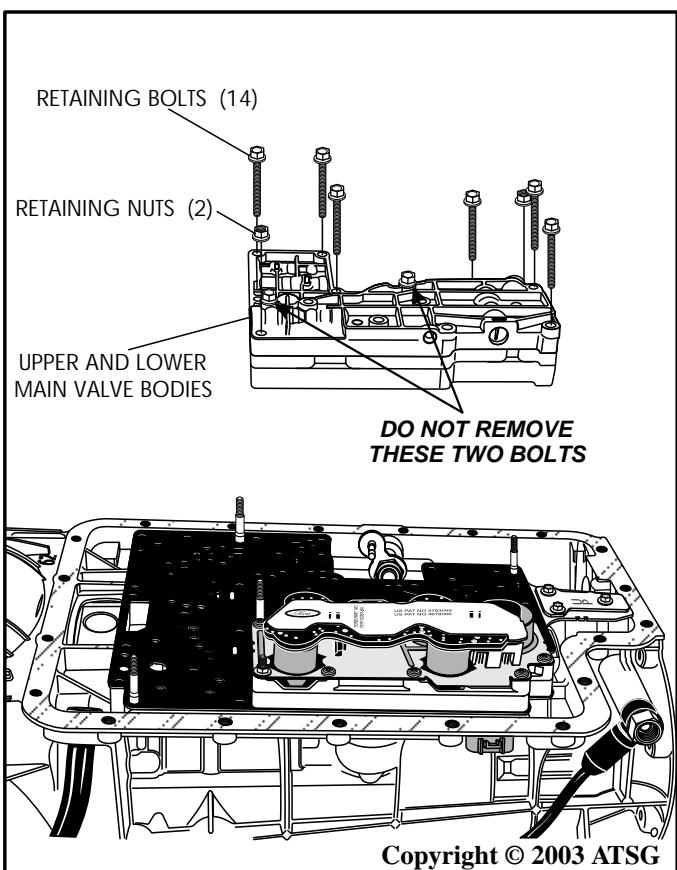


Figure 50

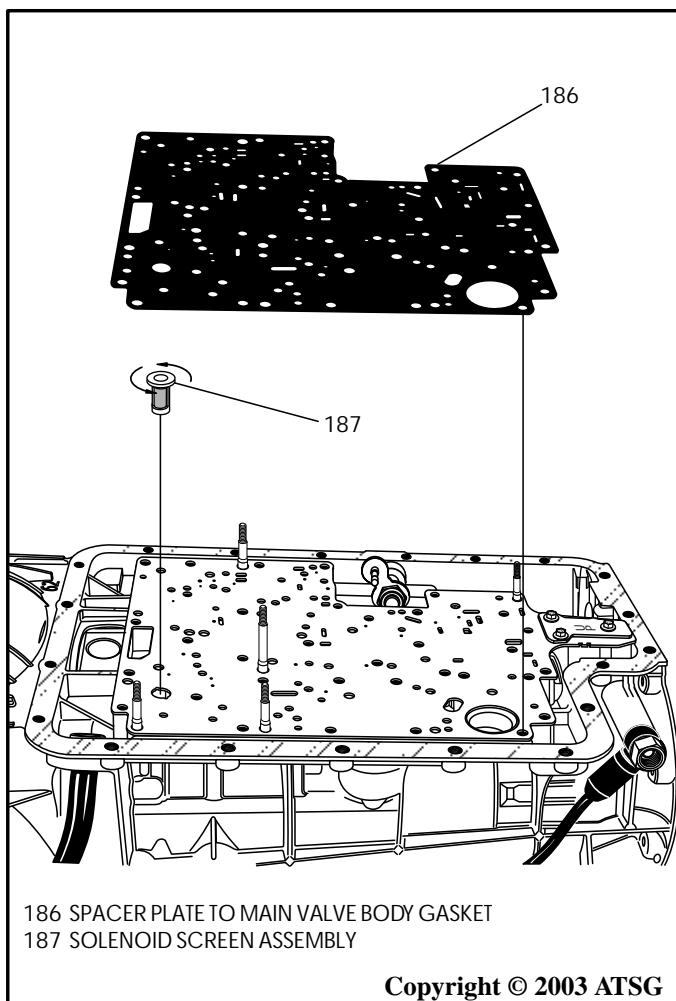


Figure 52

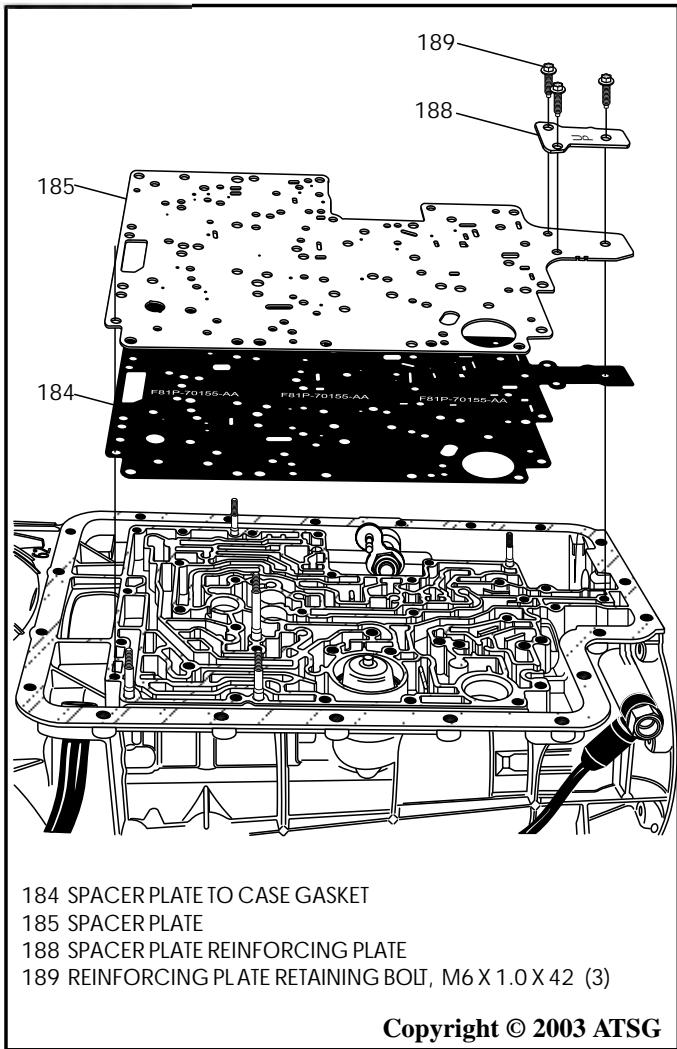


Figure 53

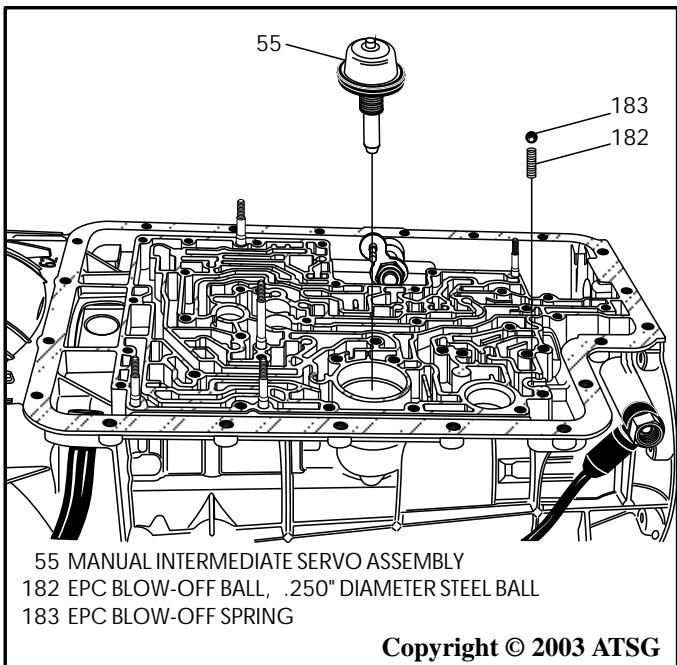


Figure 54

TRANSMISSION DISASSEMBLY

Bottom Pan Components (Cont'd)

11. Remove the 3 retaining bolts for the reinforcing plate, as shown in Figure 53, and remove the reinforcing plate and the spacer plate.
12. Remove and discard the spacer plate to case gasket, as shown in Figure 53.
14. Remove 1/4" Dia. steel EPC ball, and spring from the case pocket, as shown in Figure 54.
15. Remove the manual intermediate servo piston, as shown in Figure 54, by tapping gently on the piston with a rubber mallet to release it from case bore.
16. Remove the eight checkballs from their case pockets, as shown in Figure 55, using a small screwdriver.
17. The case checkballs are 5/16" diameter rubber material, so use care to avoid any damage.
18. Remove and discard the 3 support feed bolts, as shown in Figure 56.

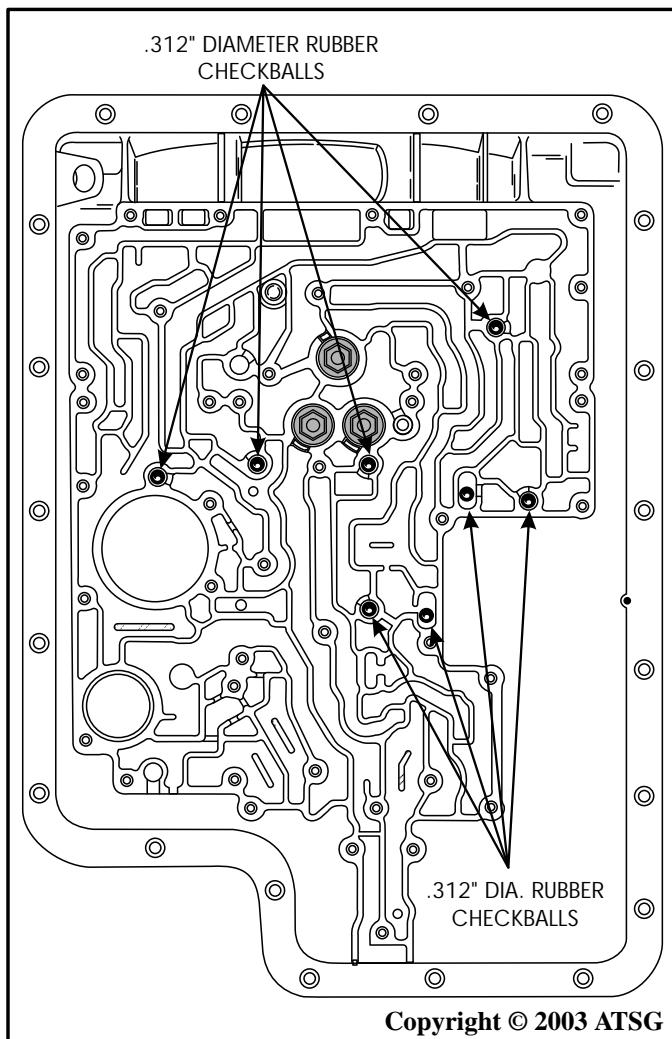


Figure 55

TRANSMISSION DISASSEMBLY

Internal Components

1. Remove the nine oil pump assembly retaining bolts, as shown in Figure 57.
2. Remove and discard the sealing washers from the nine pump retaining bolts.
3. Using two slide hammers, remove the oil pump assembly, as shown in Figure 57, and set aside for the component rebuild section.
4. Remove and discard the oil pump assembly to case gasket, as shown in Figure 57.
5. Remove the number 1 thrust washer, as shown in Figure 57, which may be stuck to oil pump assembly.
- Note: The number 1 thrust washer is not used on the PTO equipped models.**
6. Remove the number 2 thrust bearing, as shown in Figure 57, which may be stuck to oil pump assembly.

Continued on Page 46.

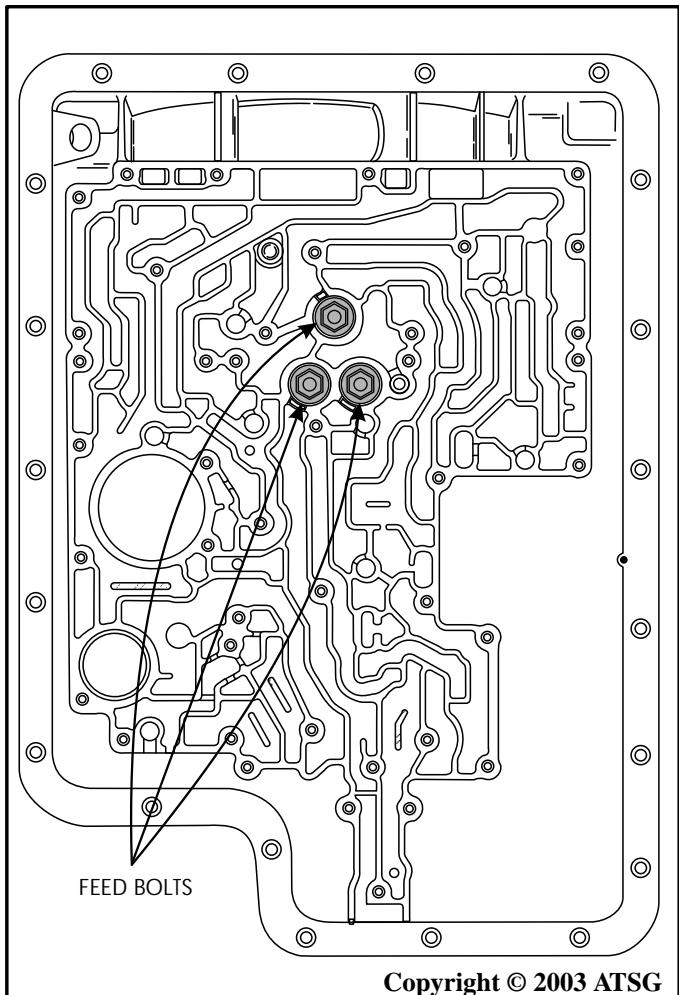


Figure 56

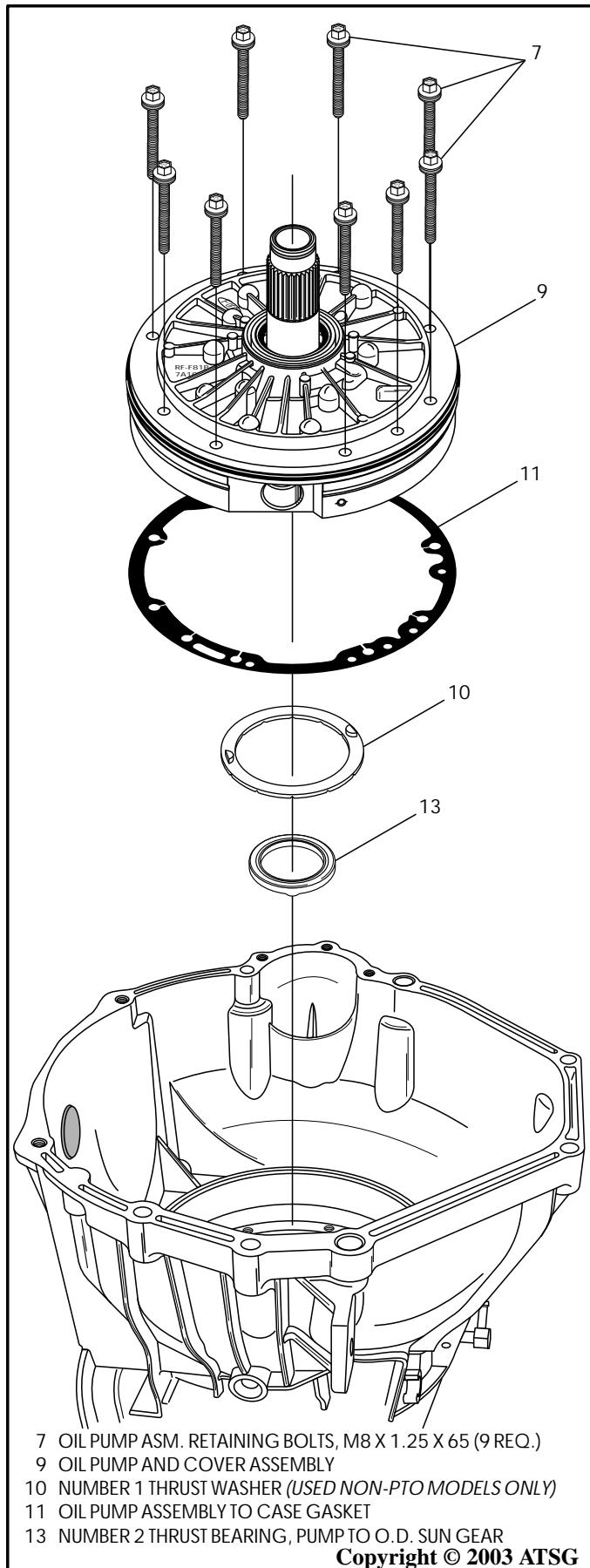


Figure 57

TRANSMISSION DISASSEMBLY***Internal Components (Cont'd)***

7. Remove the coast clutch housing, as shown in Figure 58, and set aside for component rebuild section.

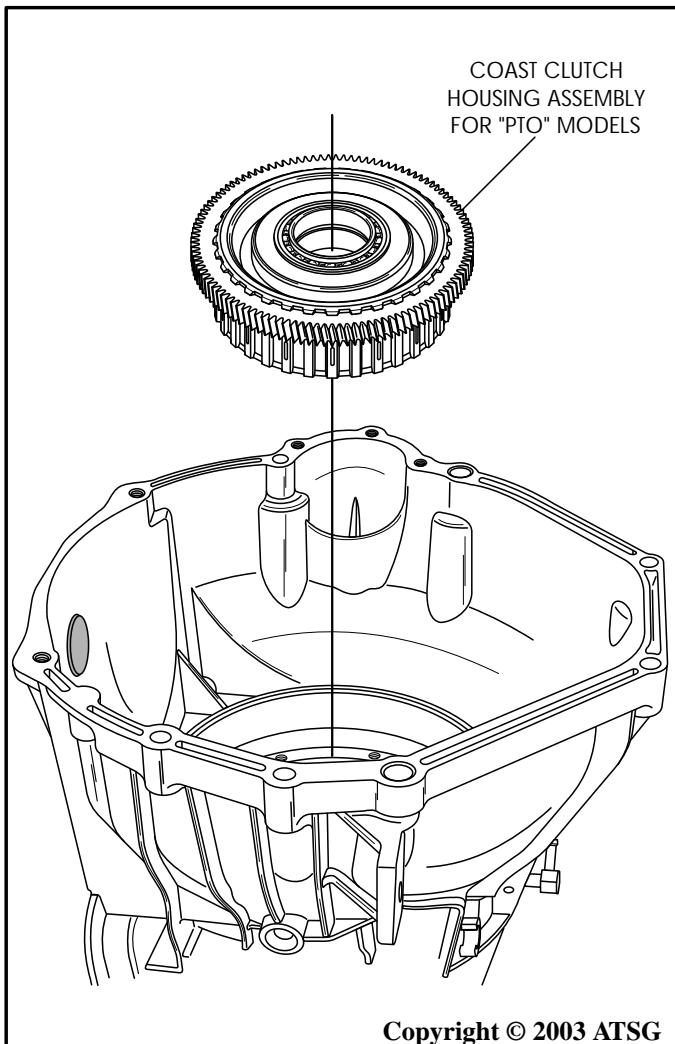
Note: There are three different versions of the coast clutch housing, which we will show you in the component rebuild section. Shown here is the PTO version.

8. Remove the overdrive clutch backing plate snap ring, as shown in Figure 59, using a large screwdriver.

Note: This snap ring is a selective thickness and should be measured at this time.

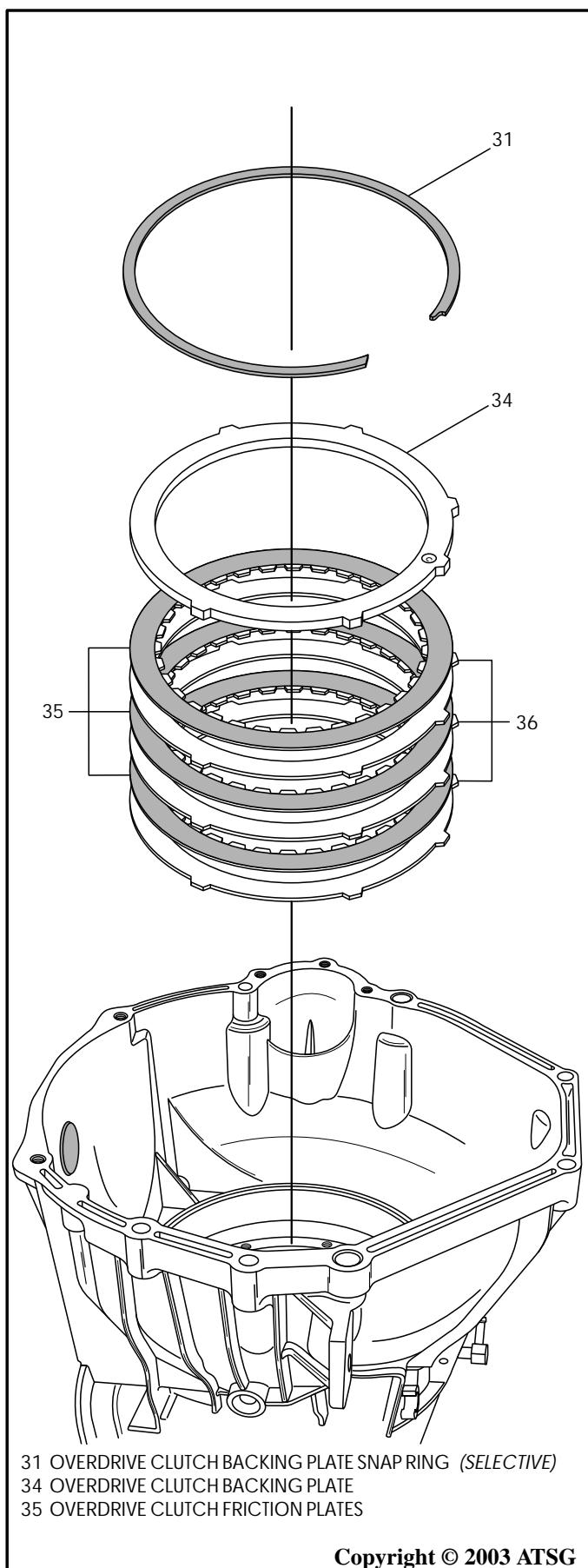
9. Remove the overdrive clutch backing plate and overdrive clutch pack, as shown in Figure 59.

Continued on Page 47.



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Figure 58



31 OVERDRIVE CLUTCH BACKING PLATE SNAP RING (SELECTIVE)
34 OVERDRIVE CLUTCH BACKING PLATE
35 OVERDRIVE CLUTCH FRICTION PLATES

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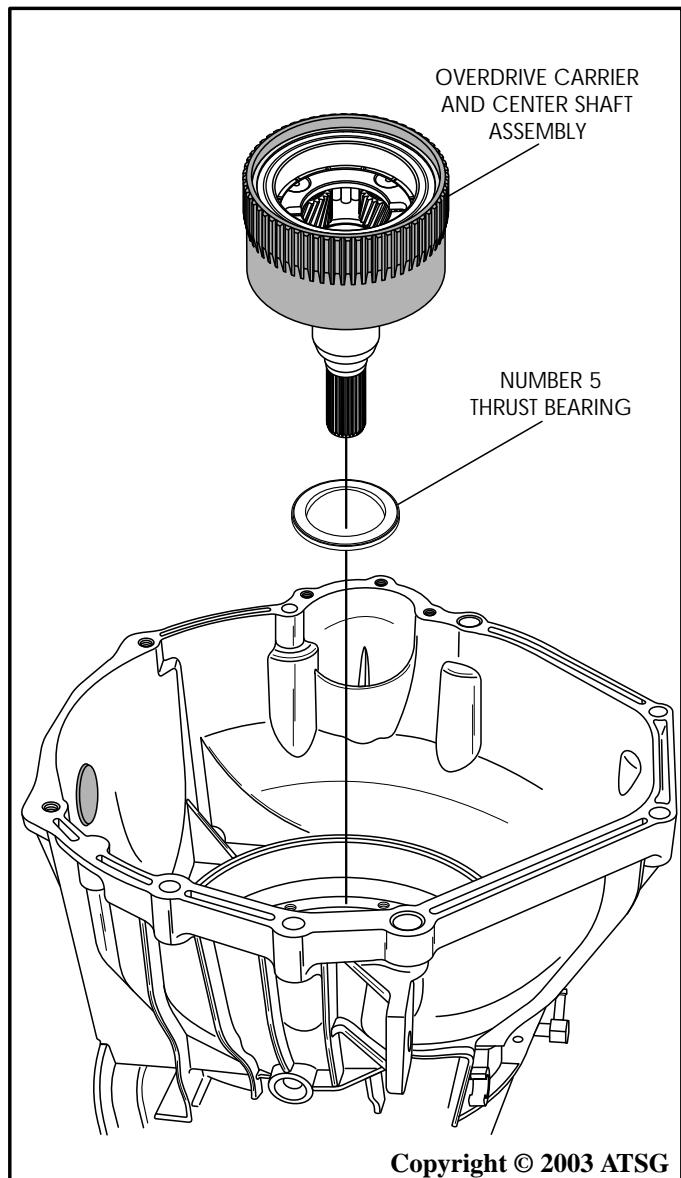
Figure 59

TRANSMISSION DISASSEMBLY

Internal Components (Cont'd)

10. Remove the overdrive carrier and center shaft assembly, as shown in Figure 60, and set aside for the component rebuild section.
11. Remove the number 5 thrust bearing, as shown in Figure 60, which may be on center support.
12. Install clutch spring compressor as shown in Figure 61, or equivalent, to compress the intermediate/overdrive clutch cylinder so that snap ring can be removed.
13. Remove snap ring with large a screwdriver as shown in Figure 62, and then remove the compressor tool.

Continued on Page 48.



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Figure 60

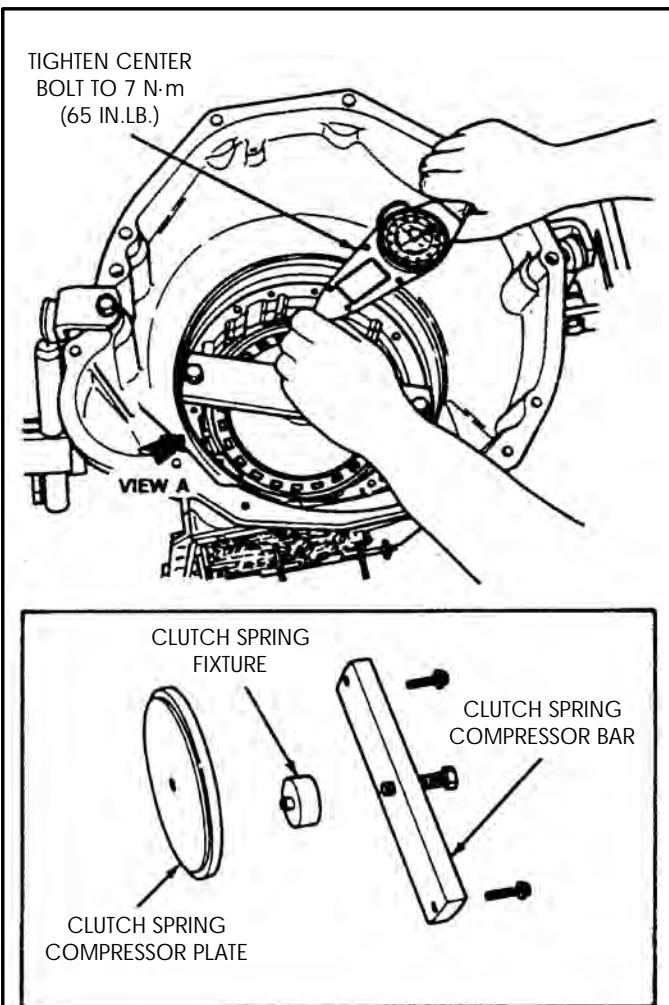


Figure 61

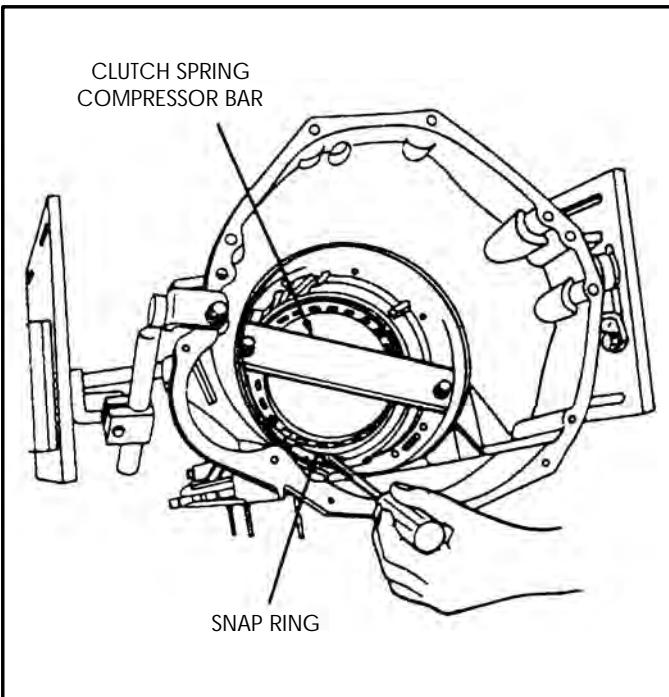
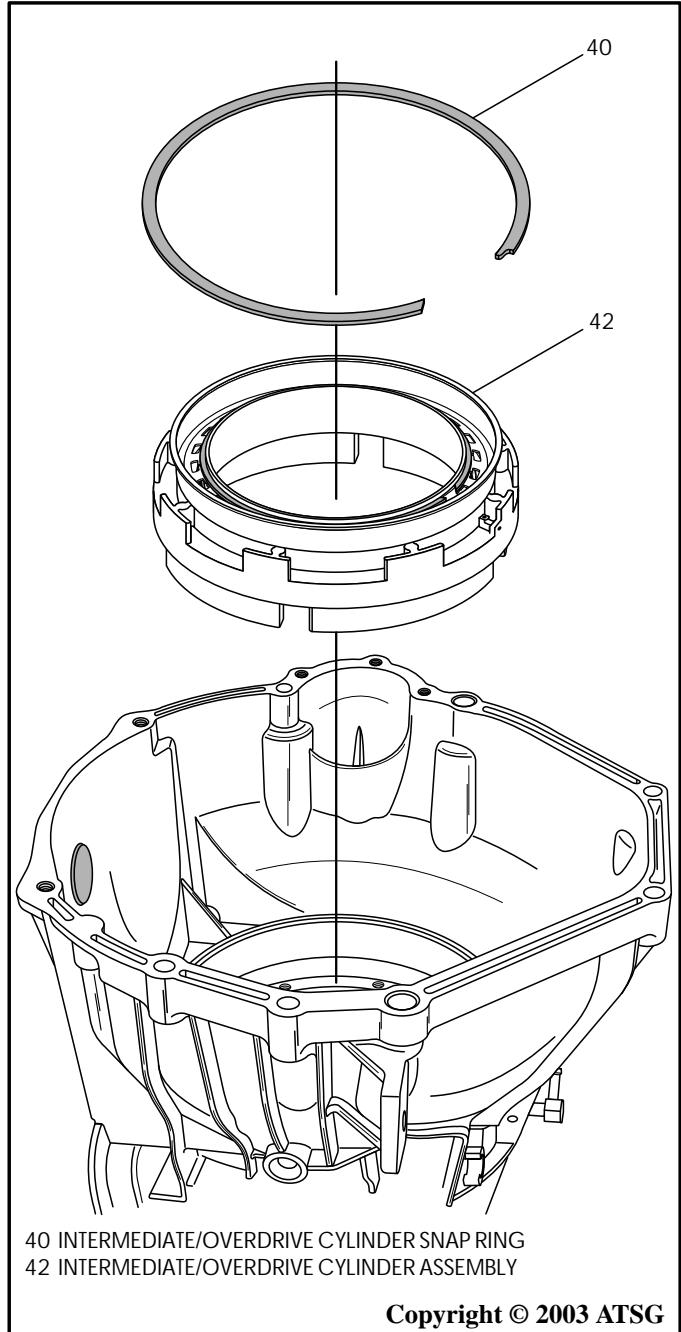


Figure 62

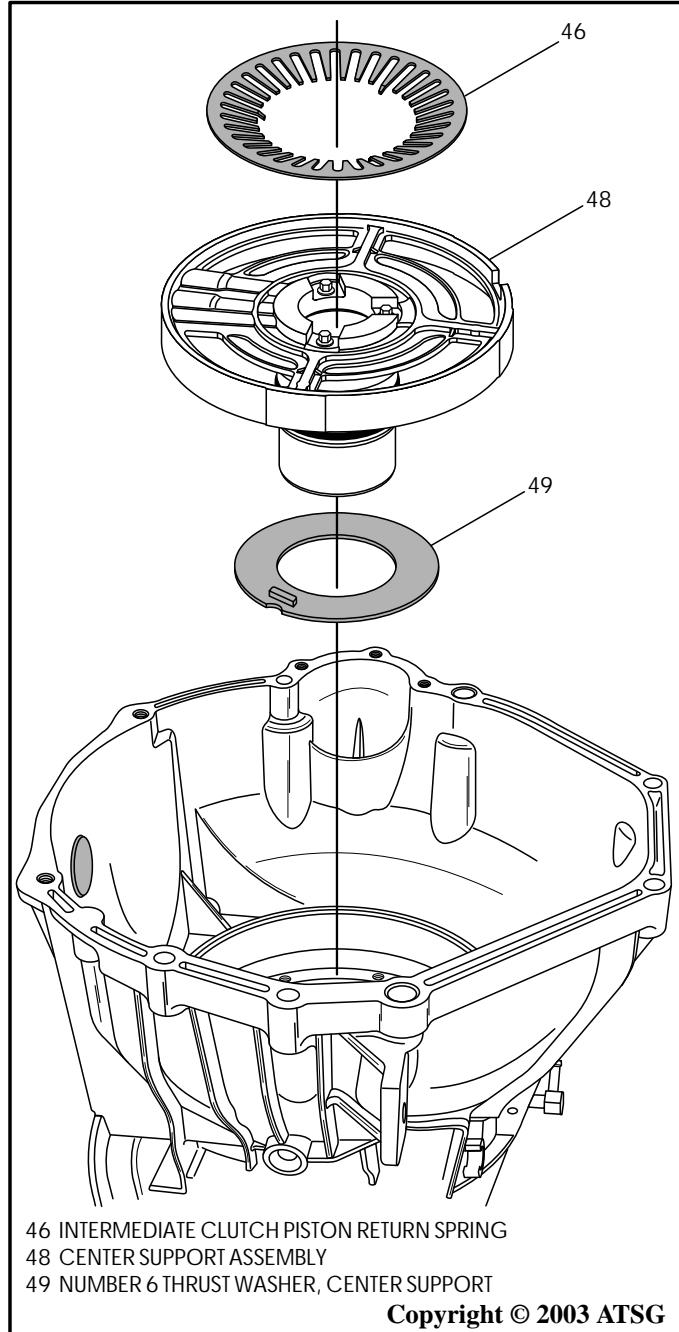
TRANSMISSION DISASSEMBLY***Internal Components (Cont'd)***

14. Remove snap ring and intermediate/overdrive cylinder assembly, as shown in Figure 63, and set aside for component rebuild section.
15. Remove the intermediate clutch piston return spring, as shown in Figure 64.
16. Remove the center support assembly, as shown in Figure 64, and set aside for the component rebuild section.
17. Remove the number 6 thrust washer, center support to direct clutch housing, as shown in Figure 64.
18. Remove the intermediate clutch pack and the backing plate, as shown in Figure 65.
19. Remove the intermediate band assembly, as shown in Figure 66.

Continued on Page 49.

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Figure 63



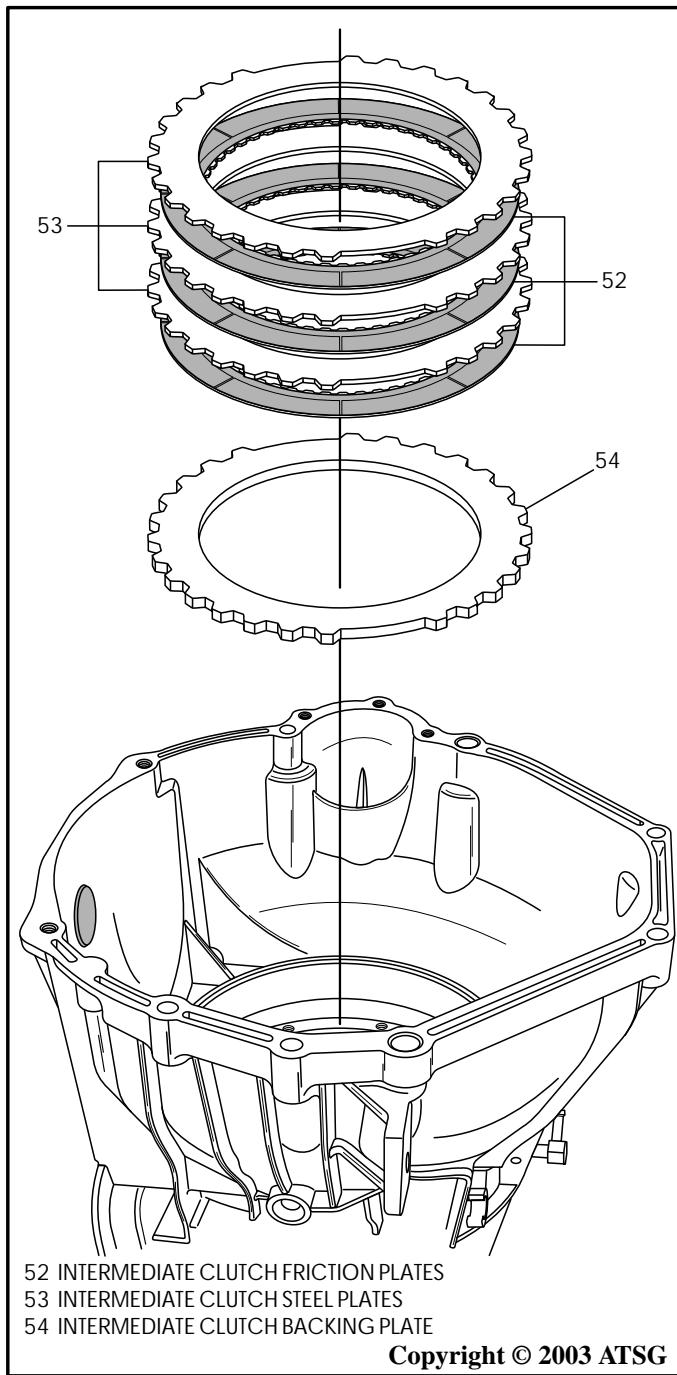
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Figure 64

TRANSMISSION DISASSEMBLY***Internal Components (Cont'd)***

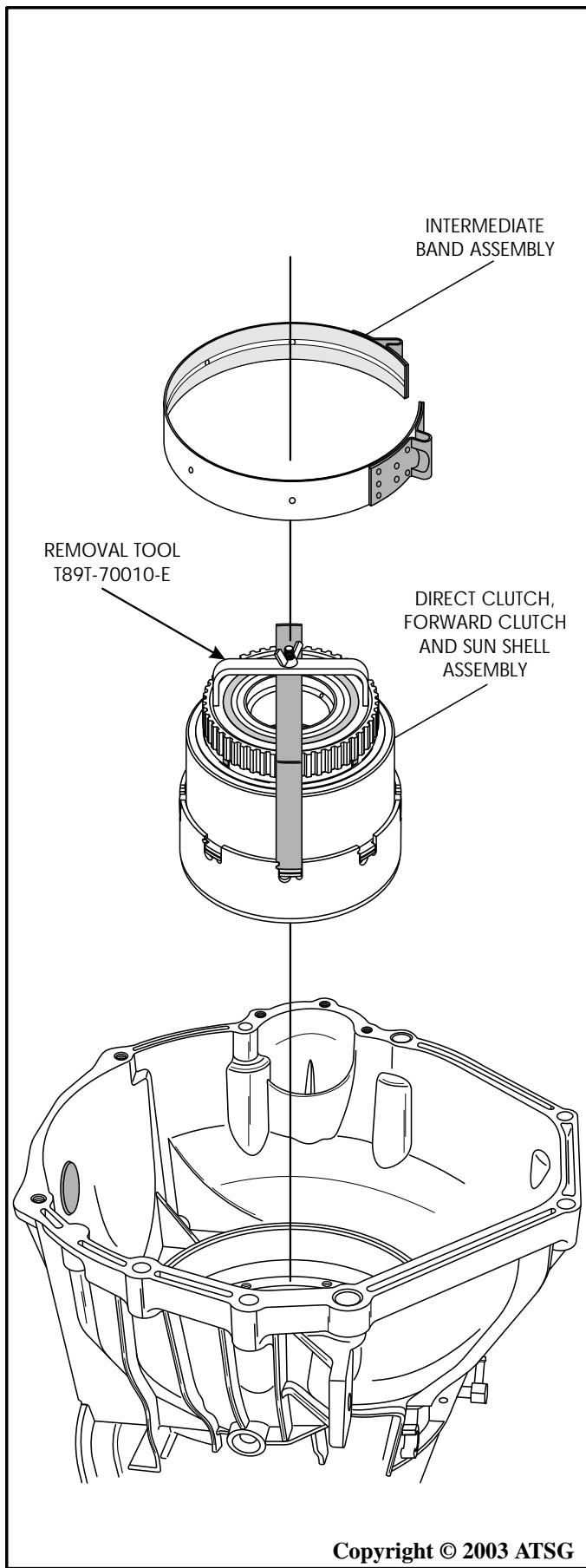
20. Install the removal tool and remove the direct clutch drum, forward clutch drum and the sun shell as an assembly, as shown in Figure 66.
21. Set the direct drum, forward drum and the sun shell assembly aside for the component rebuild section.

Continued on Page 50.



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Figure 65



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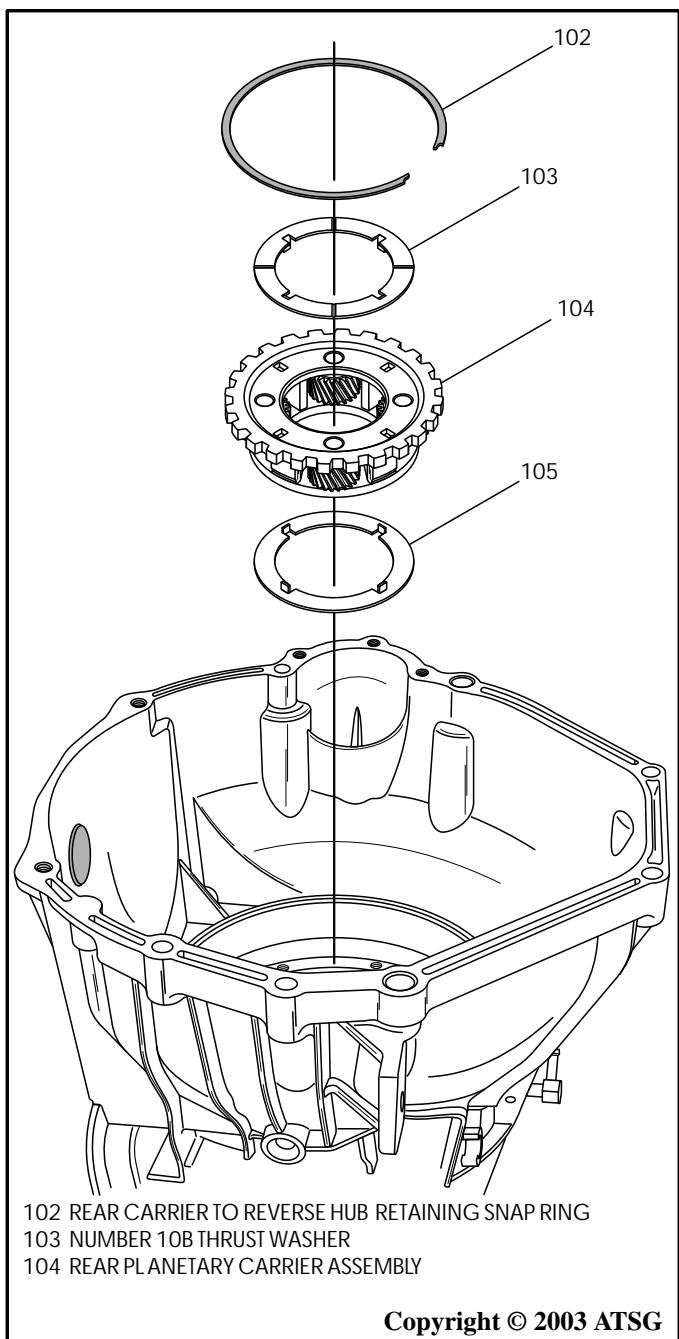
Figure 66

TRANSMISSION DISASSEMBLY

Internal Components (Cont'd)

22. Remove the snap ring retaining rear planetary carrier in reverse clutch hub (See Figure 67).
23. Remove the rear planetary carrier and both of the thrust washers, as shown in Figure 67.
24. Remove the output shaft snap ring using snap ring pliers, as shown in Figure 68.
25. Remove snap ring, rear planetary ring gear and the number 12 thrust bearing (See Figure 69).

Continued on Page 51.



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Figure 67

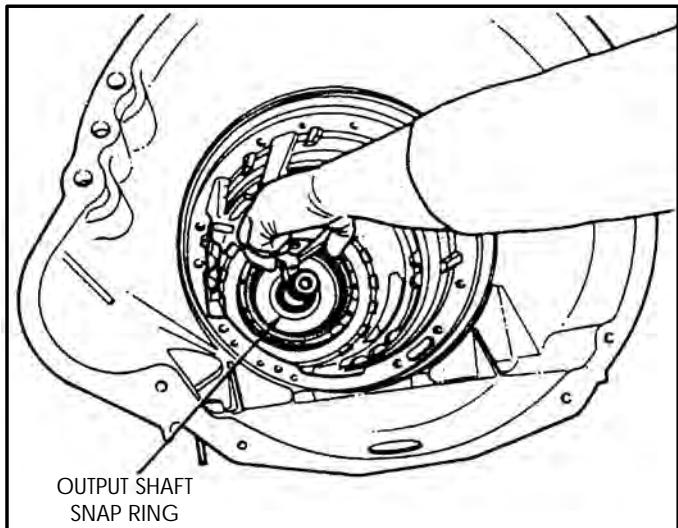
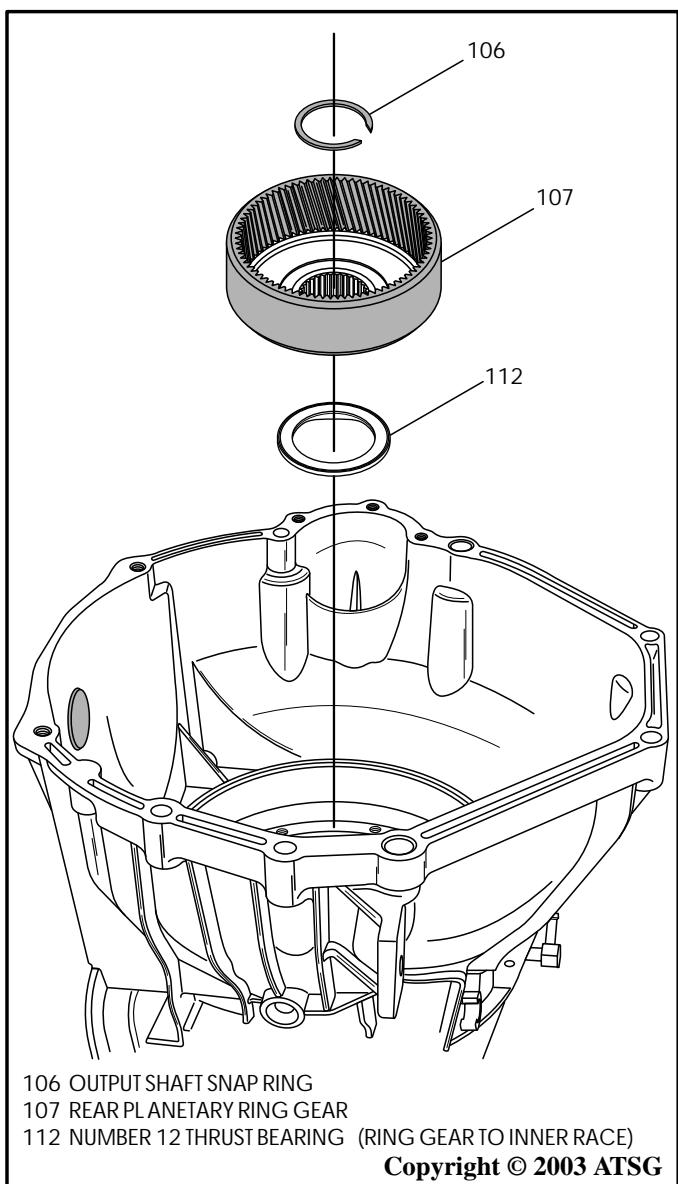


Figure 68



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Figure 69

TRANSMISSION DISASSEMBLY***Internal Components (Cont'd)***

26. Remove the reverse clutch hub and low roller clutch assembly, as shown in Figure 70, and set aside for component rebuild.
27. Remove the snap ring retaining the low/reverse clutch pack, using a large screwdriver as shown in Figure 71, from the groove in case.
28. Remove the snap ring from case, as shown in Figure 72.

Continued on Page 52.

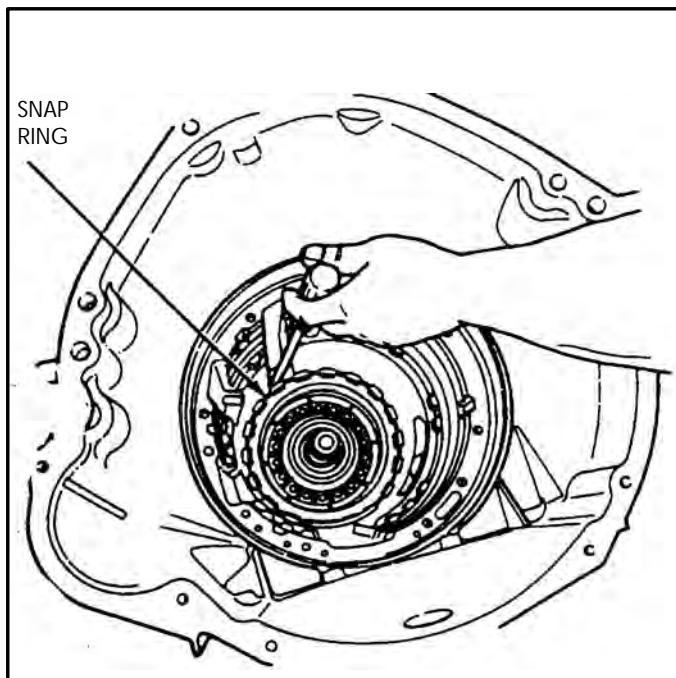


Figure 71

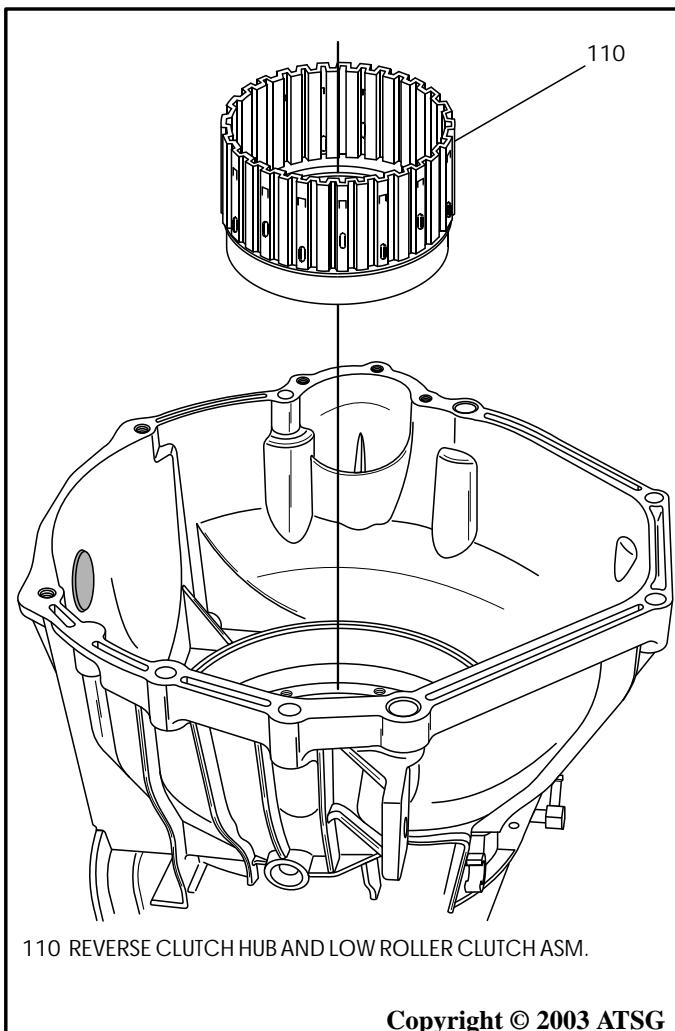
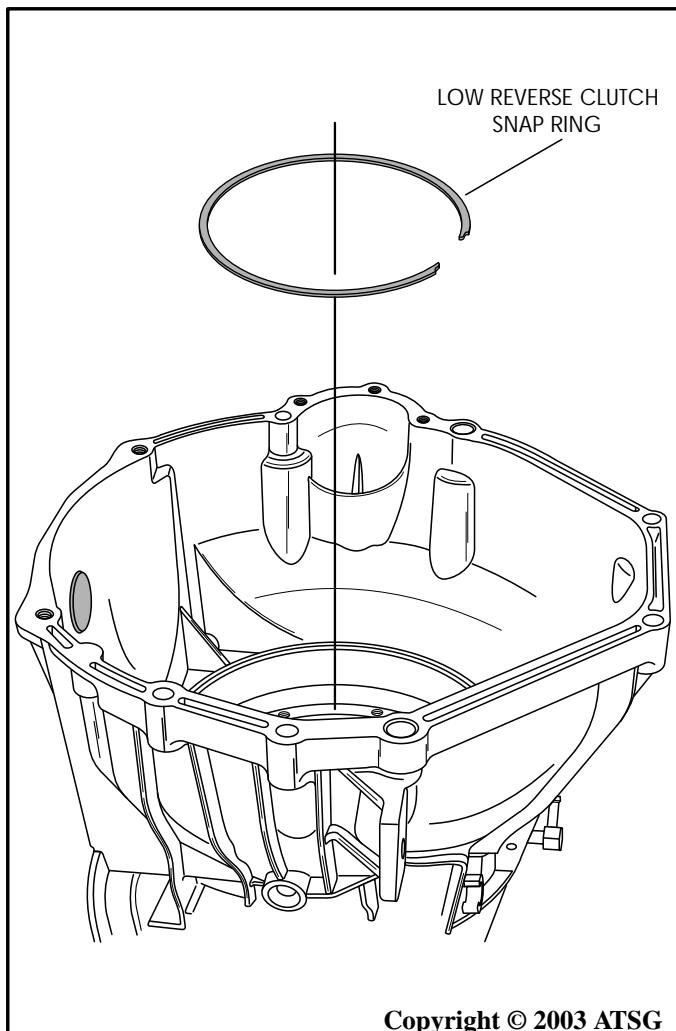


Figure 70



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Figure 72

TRANSMISSION DISASSEMBLY***Internal Components (Cont'd)***

29. Remove the low/reverse clutch pack including wave plate, as shown in Figure 73.
30. Rotate transmission in fixture so output shaft is facing up, as shown in Figure 74.
31. Remove the extension housing retaining bolts and housing, as shown in Figure 74.
32. We have illustrated the typical 4WD version in Figure 74, and the 2WD version in Figure 75.

Continued on Page 53.

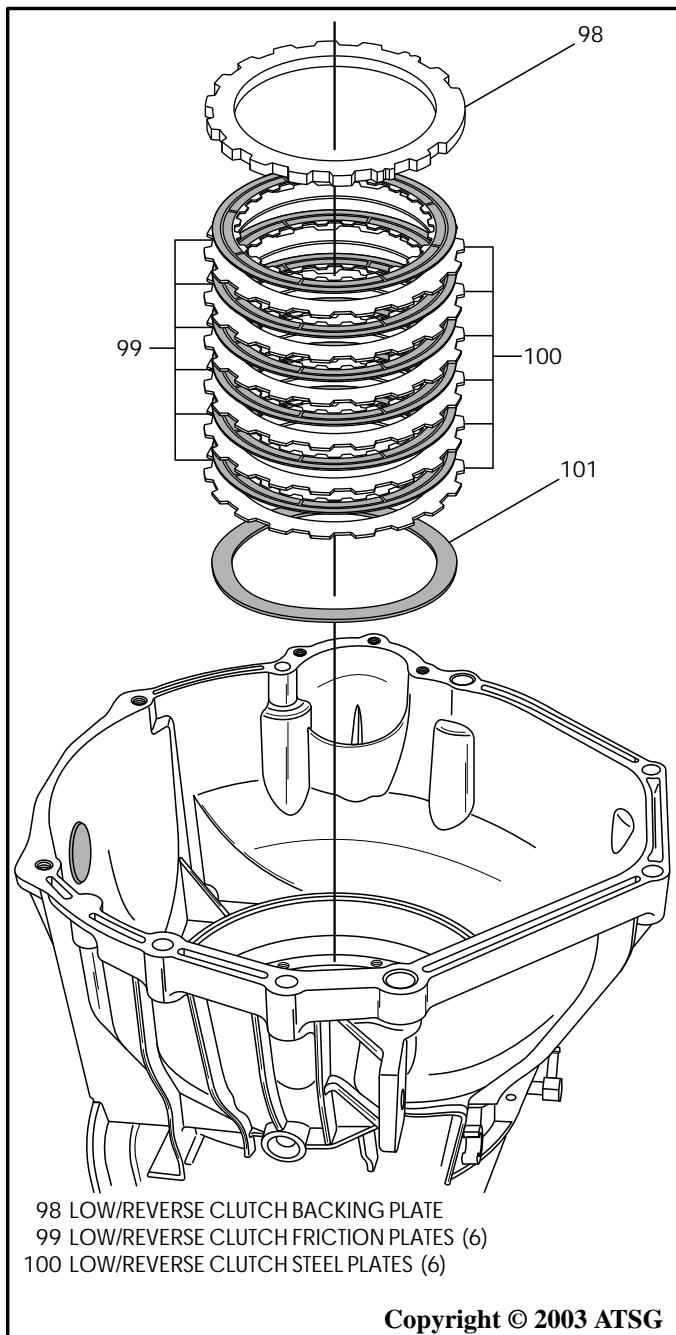


Figure 73

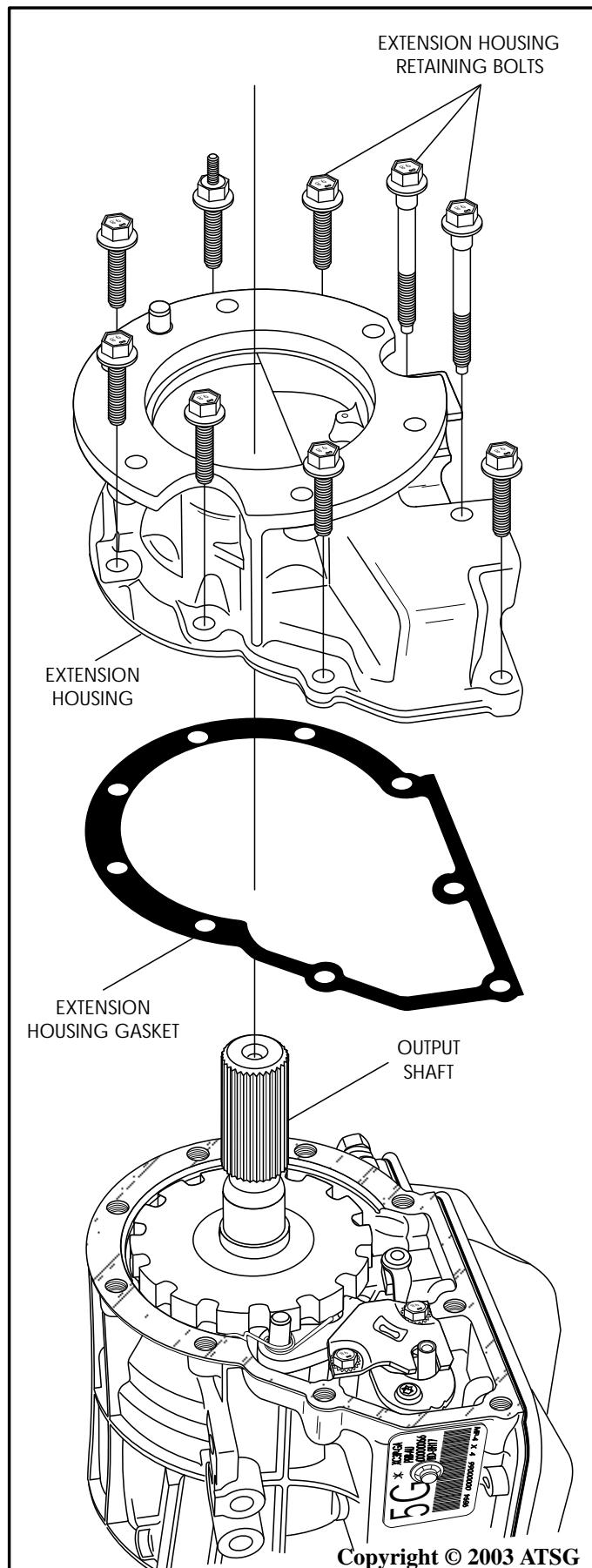


Figure 74

TRANSMISSION DISASSEMBLY

Internal Components (Cont'd)

33. Notice that the 2WD version has a speed sensor reluctor wheel that must be pressed off and on, if necessary to replace, as shown in Figure 75.
34. Remove and discard the extension housing gasket, as shown in Figure 74.
35. Remove the park rod guide plate, parking pawl, park pawl pivot pin and return spring, as shown in Figure 76.

Continued on Page 54.

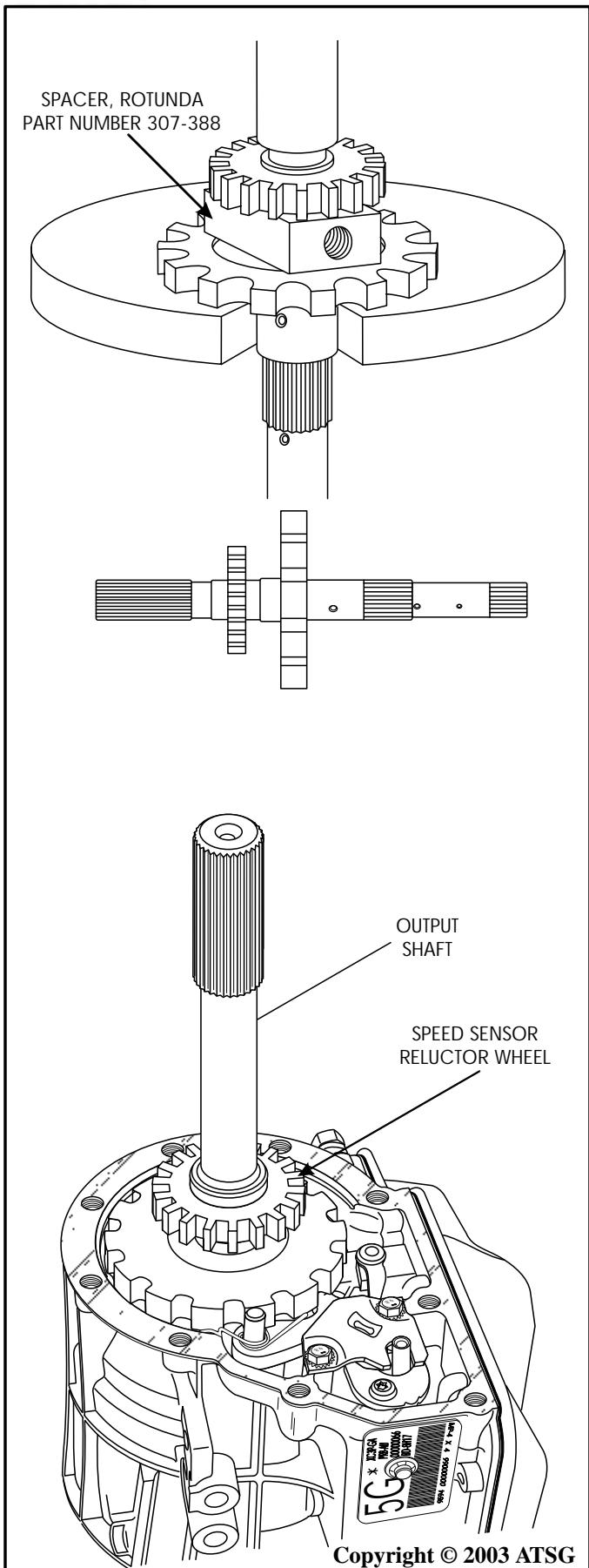


Figure 75

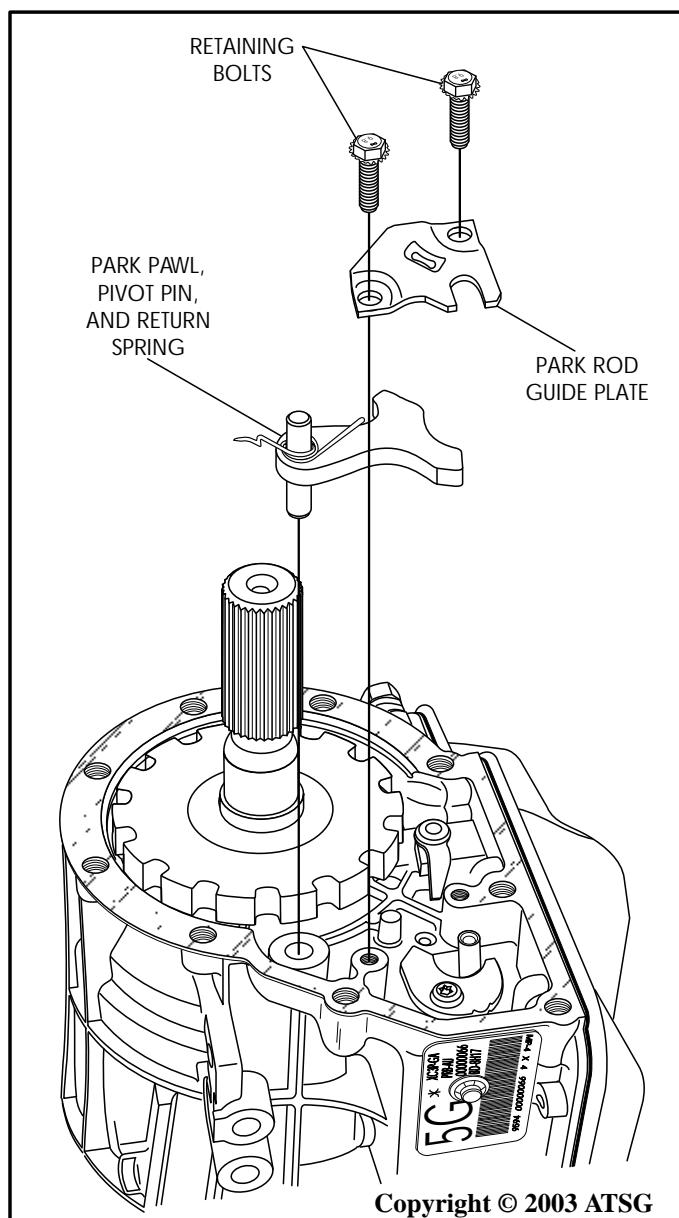


Figure 76

TRANSMISSION DISASSEMBLY***Internal Components (Cont'd)***

36. Remove the output shaft by pulling straight up, as shown in Figure 77.
37. Remove the number 13 thrust bearing from the back of case, as shown in Figure 77.
38. Remove and discard the lube orifice plug from rear of case, as shown in Figure 78.

Continued on Page 55.

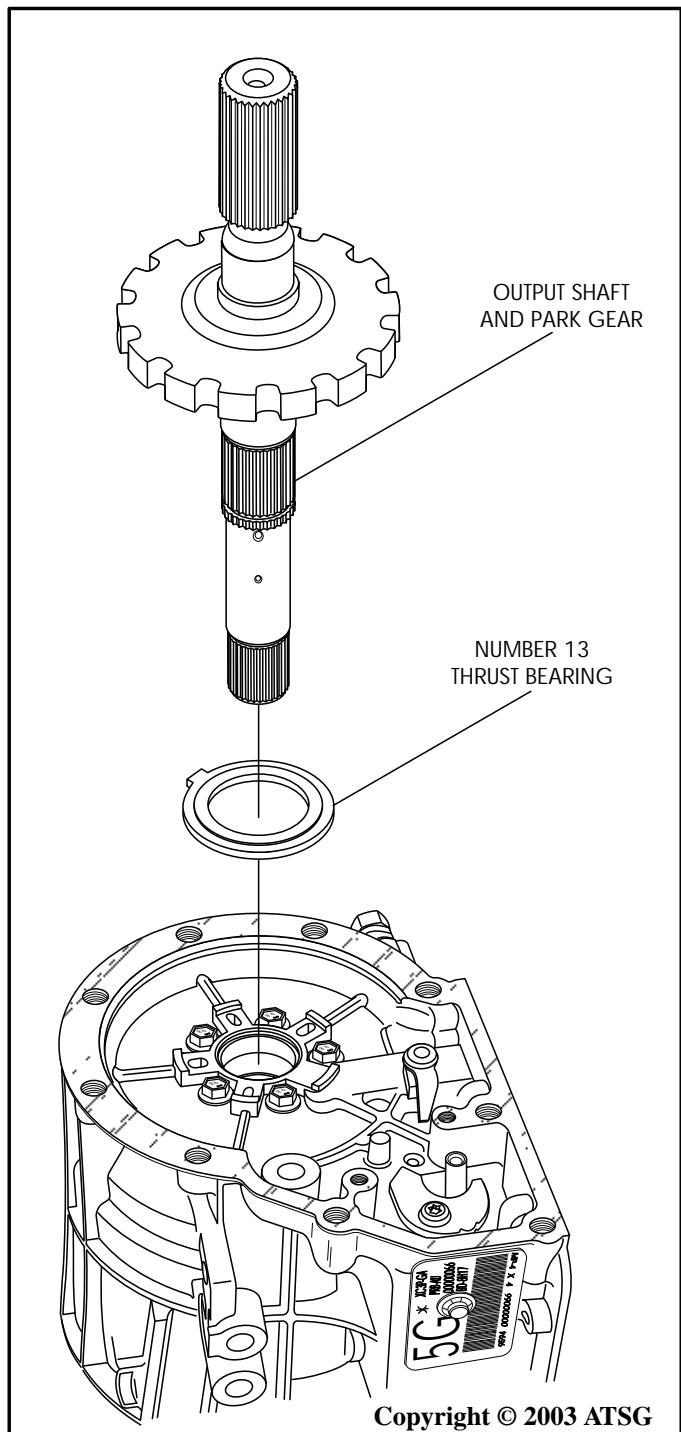


Figure 77

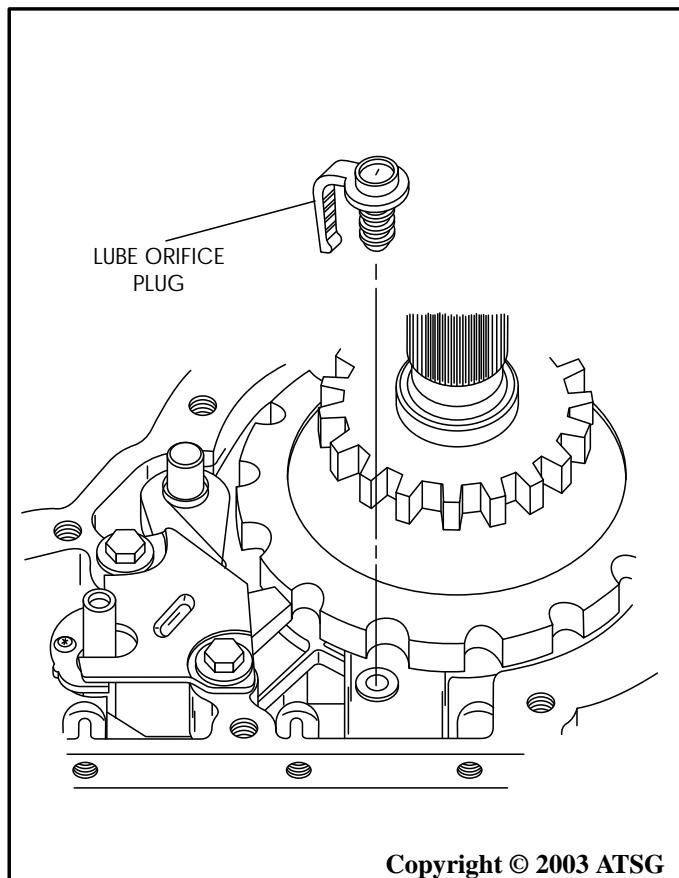


Figure 78

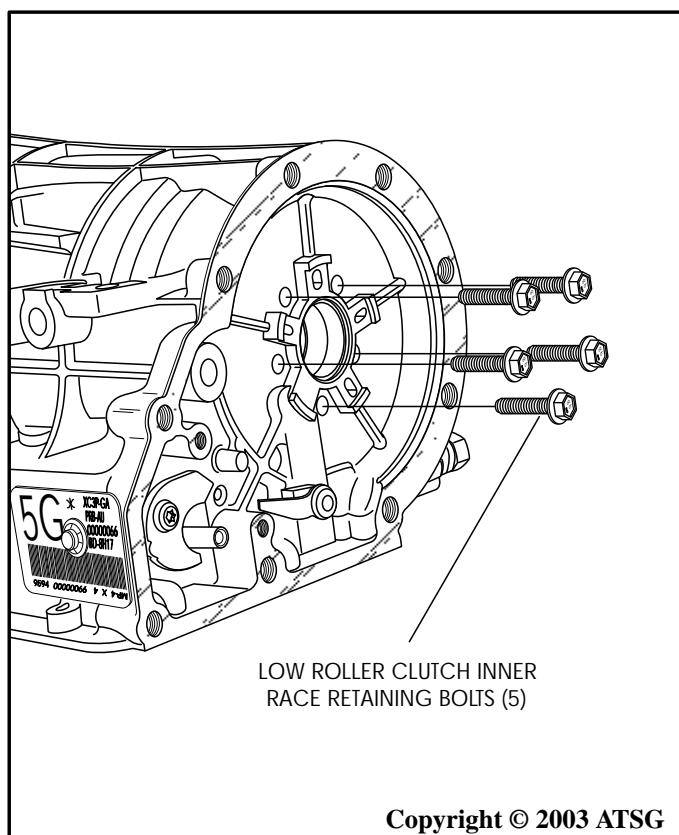
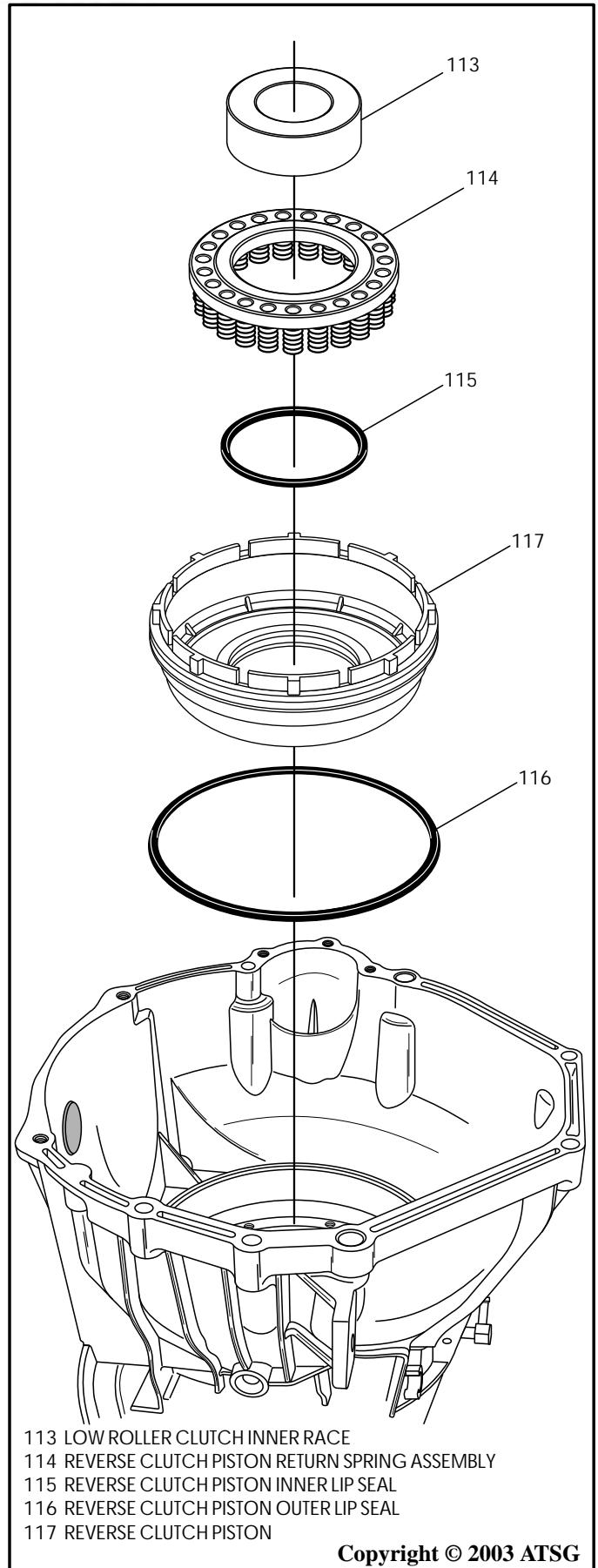


Figure 79



113 LOW ROLLER CLUTCH INNER RACE
 114 REVERSE CLUTCH PISTON RETURN SPRING ASSEMBLY
 115 REVERSE CLUTCH PISTON INNER LIP SEAL
 116 REVERSE CLUTCH PISTON OUTER LIP SEAL
 117 REVERSE CLUTCH PISTON

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Figure 80

TRANSMISSION DISASSEMBLY

Internal Components (Cont'd)

39. Rotate the transmission in fixture so the pan rail surface is facing down (See Figure 79).
40. Remove the 5 low roller clutch inner race bolts, as shown in Figure 79.
41. Rotate the transmission in fixture so the bell housing is facing up, as shown in Figure 80.
42. Remove the low roller clutch inner race, the reverse clutch piston return spring assembly, and reverse clutch piston (See Figure 80).
43. Remove and discard the reverse clutch piston inner and outer lip seals (See Figure 80).

COMPONENT REBUILD

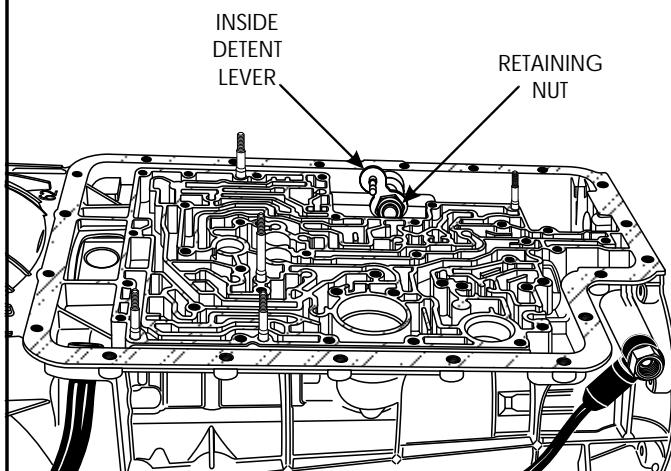
Transmission Case Assembly

1. Remove the inside detent lever retaining nut, using a crescent wrench to hold the external shift lever, to avoid damage to the inside detent spring (See Figure 80).

Caution: If this procedure is not followed, damage to the detent spring will occur and replacement will be necessary.

Continued on Page 56.

Hold External Shift Lever With Crescent Wrench When Removing The Inside Detent Lever Retaining Nut



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Figure 81

COMPONENT REBUILD

Transmission Case Assembly (Cont'd)

2. Remove the shift lever retaining roll pin from the case, using pin removal tool T87P-3504-N, as shown in Figure 82.
3. Remove external shift lever from case and remove shift lever seal from case using the proper puller.
4. Clean all case parts thoroughly and dry with compressed air.
5. Inspect all case parts thoroughly for any wear and/or damage. Replace as necessary.
6. Install new shift lever seal into the case bore using the proper seal driver

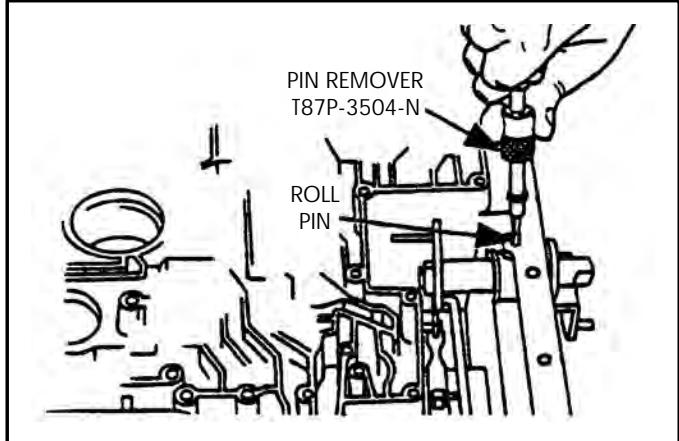


Figure 82

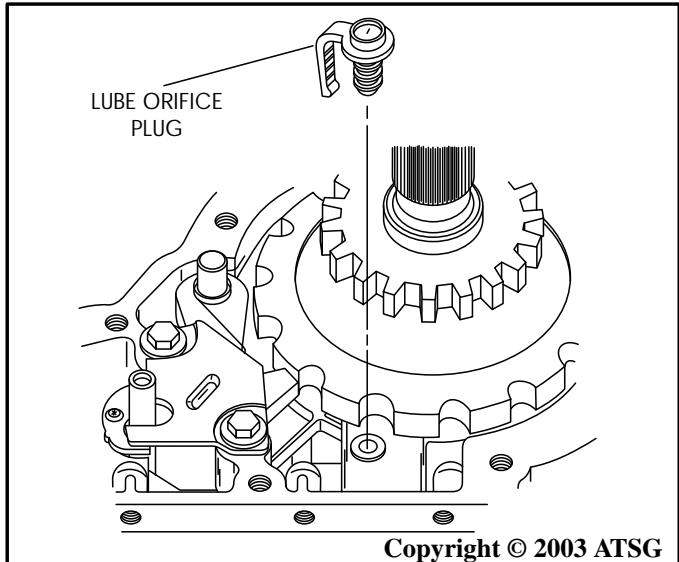
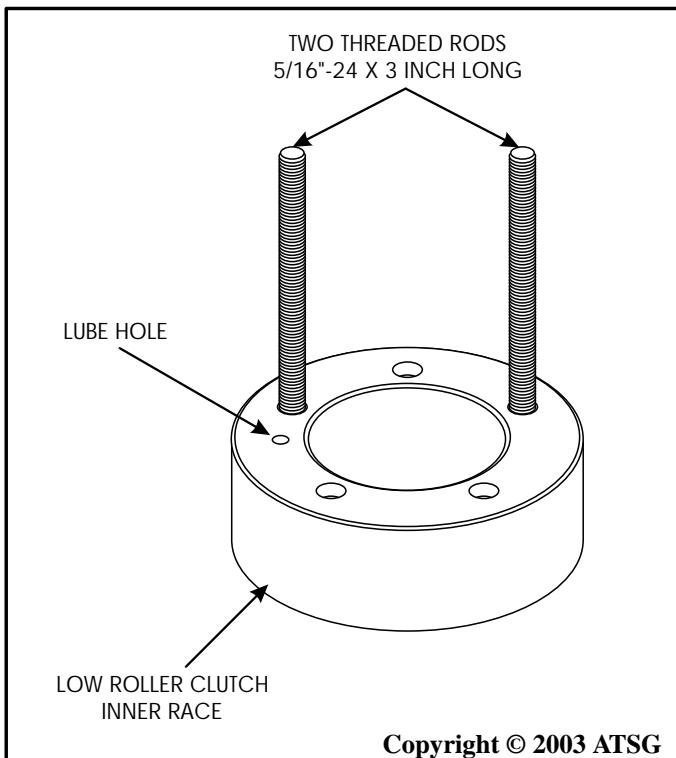


Figure 83

7. Install the external shift lever, inside detent lever and retaining nut. Torque the retaining nut to 41-54 N·m (30-40 ft.lb.), again using a crescent wrench to hold external shift lever. (See Figure 81).
 8. Install a ***new*** lube orifice plug into the case, as shown in Figure 83, and ensure fully seated.
 9. Install new inner and outer lip seals in grooves of the reverse piston, with the lips facing the direction shown in Figure 85.
 10. Lubricate both lip seals with a small amount of Trans-Jel®.
 11. Install the reverse piston into the case with a rotating motion, using care not to damage the lip seals (See Figure 85).
 12. Install the reverse clutch piston return spring assembly, as shown in Figure 85.
 13. Install two threaded rods into the low roller inner race, as shown in Figure 84. They can be made from bolts with the head removed.
- Note:** *The lube hole in the race should be positioned in the 5 o'clock position when it is installed. The 6 o'clock position is the bottom of the case.*
14. Install the low roller clutch inner race in case, as shown in Figure 86, and install two nuts on the threaded rods.

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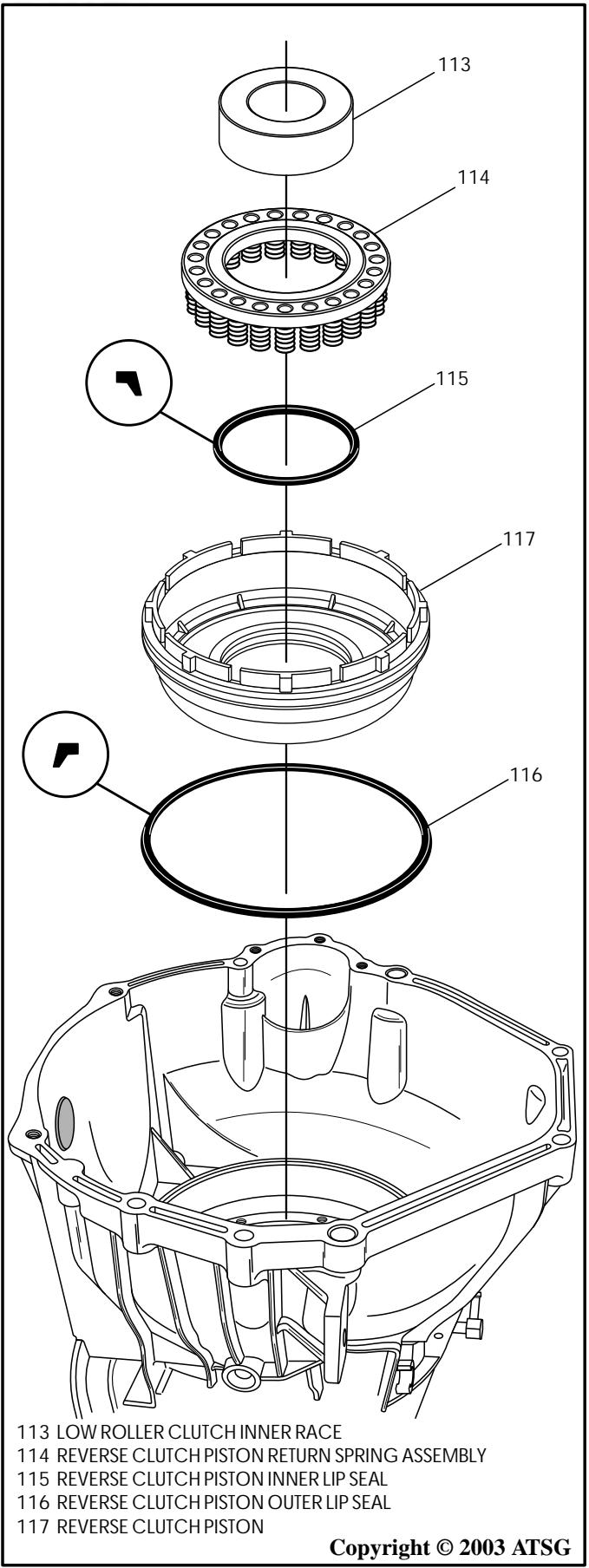
Figure 84

COMPONENT REBUILD

Transmission Case Assembly (Cont'd)

15. Tighten the nuts to compress the reverse clutch return spring assembly, as shown in Figure 86.
16. Install 3 low roller inner race retaining bolts, as shown in Figure 86, and remove the 2 threaded rods and nuts.
17. Install the two remaining retaining bolts and torque all five to 24-34 N·m (18-25 ft.lb.) in a criss-cross pattern, as shown in Figure 87.

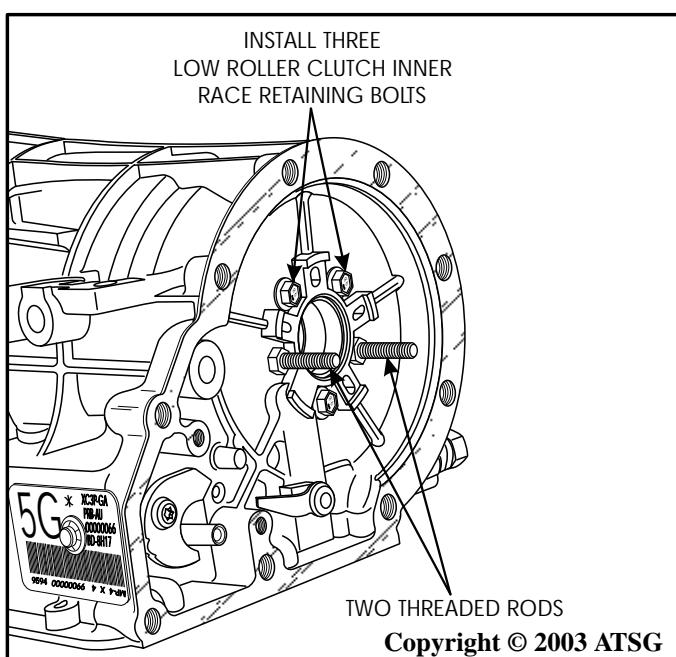
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113 LOW ROLLER CLUTCH INNER RACE
 114 REVERSE CLUTCH PISTON RETURN SPRING ASSEMBLY
 115 REVERSE CLUTCH PISTON INNER LIP SEAL
 116 REVERSE CLUTCH PISTON OUTER LIP SEAL
 117 REVERSE CLUTCH PISTON

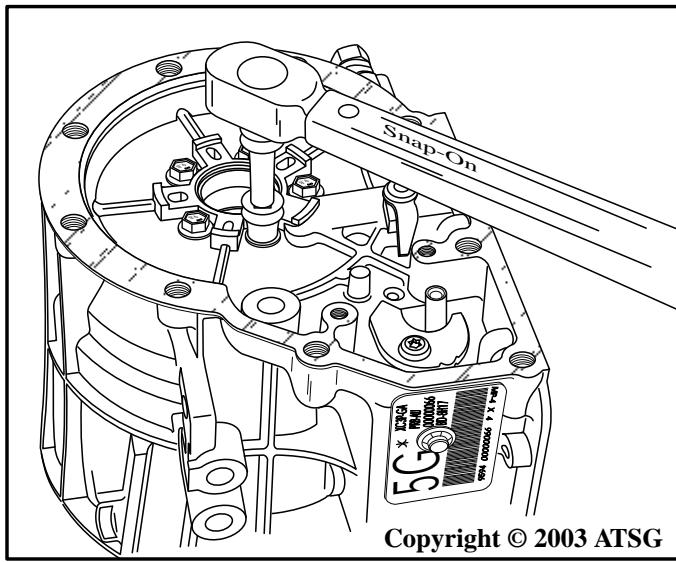
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Figure 85



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Figure 86



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Figure 87

COMPONENT REBUILD

Transmission Case Assembly (Cont'd)

18. Install the number 13 thrust bearing onto case, in the direction shown in Figure 88.

19. Install the output shaft into the case, as shown in Figure 88.

Note: We have illustrated the 4WD version in Figure 88.

Continued on Page 59.

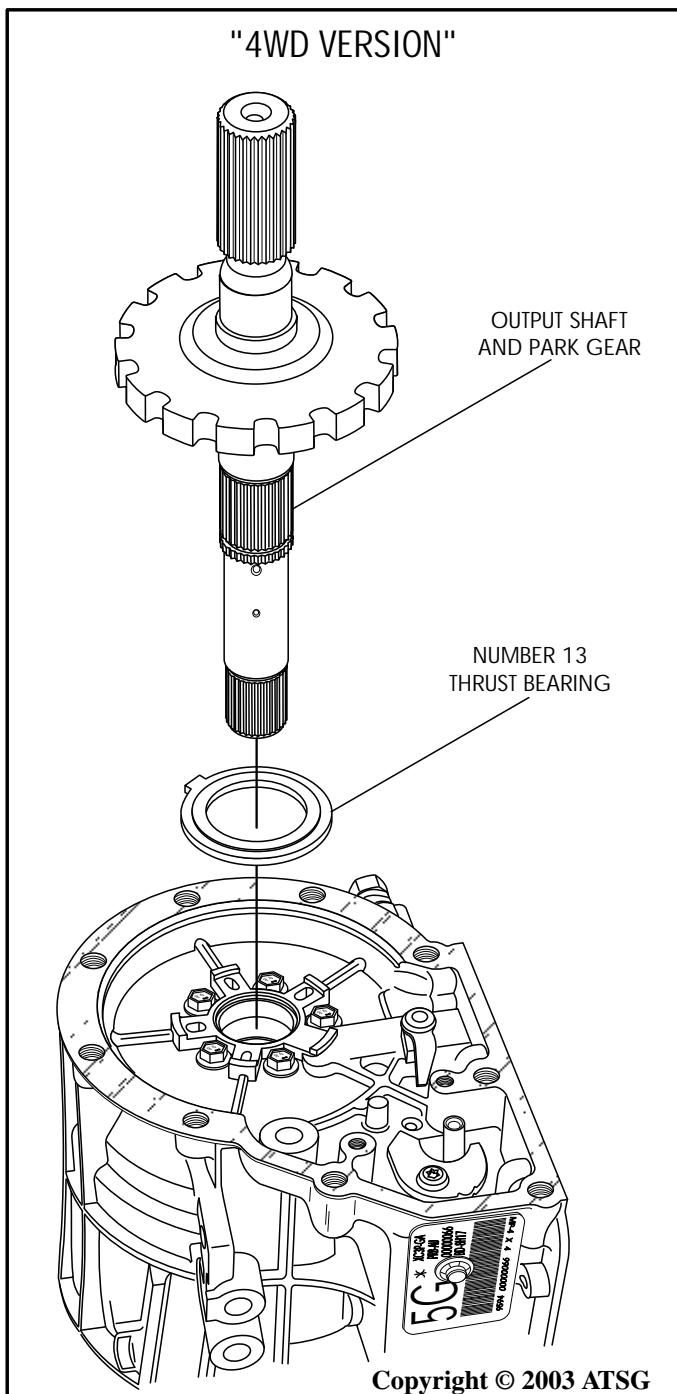


Figure 88

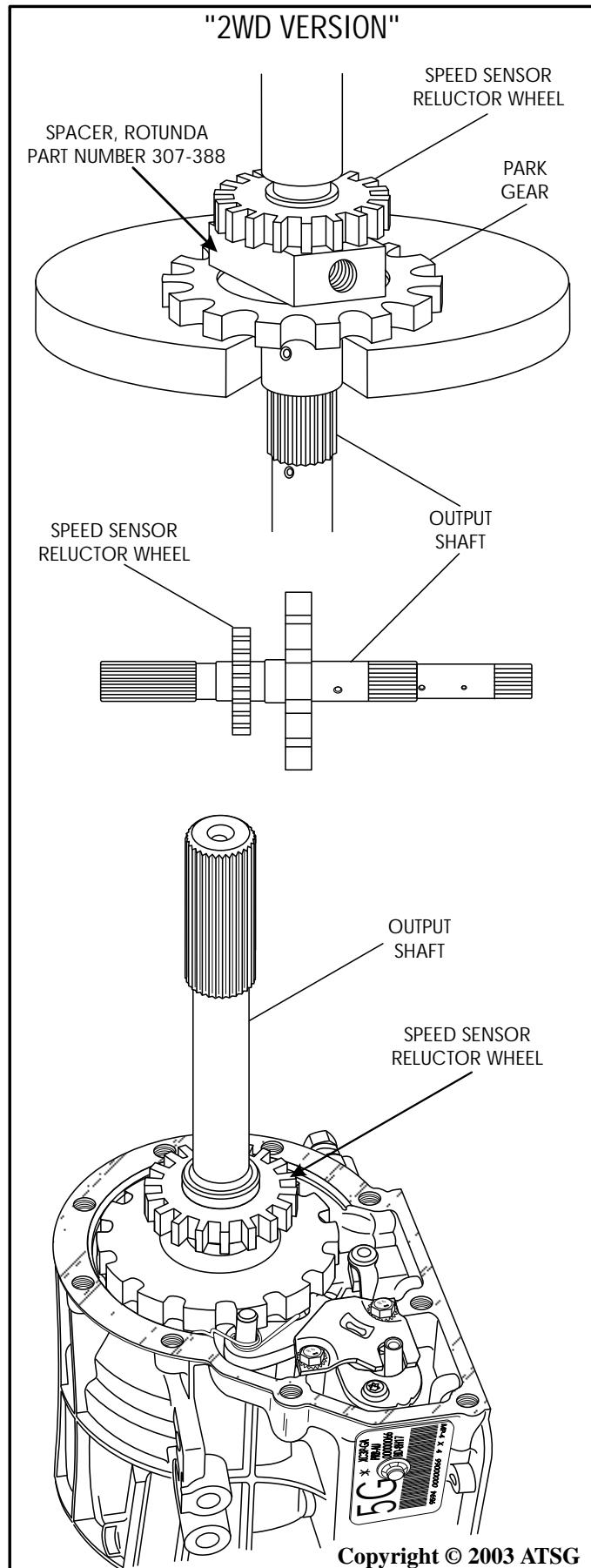


Figure 89

COMPONENT REBUILD

Transmission Case Assembly (Cont'd)

20. The 2WD version is illustrated in Figure 89, and notice that it has a speed sensor reluctor wheel pressed on next to the park gear, which is also a press fit on the output shaft.
- Caution:** If the speed sensor reluctor wheel was removed for any reason, special spacer, Rotunda number 307-388, must be used to locate the reluctor wheel in proper position.
21. Install the parking pawl, pivot pin and return spring, as shown in Figure 90, and ensure that it is hooked properly behind the case, as shown in Figure 91.

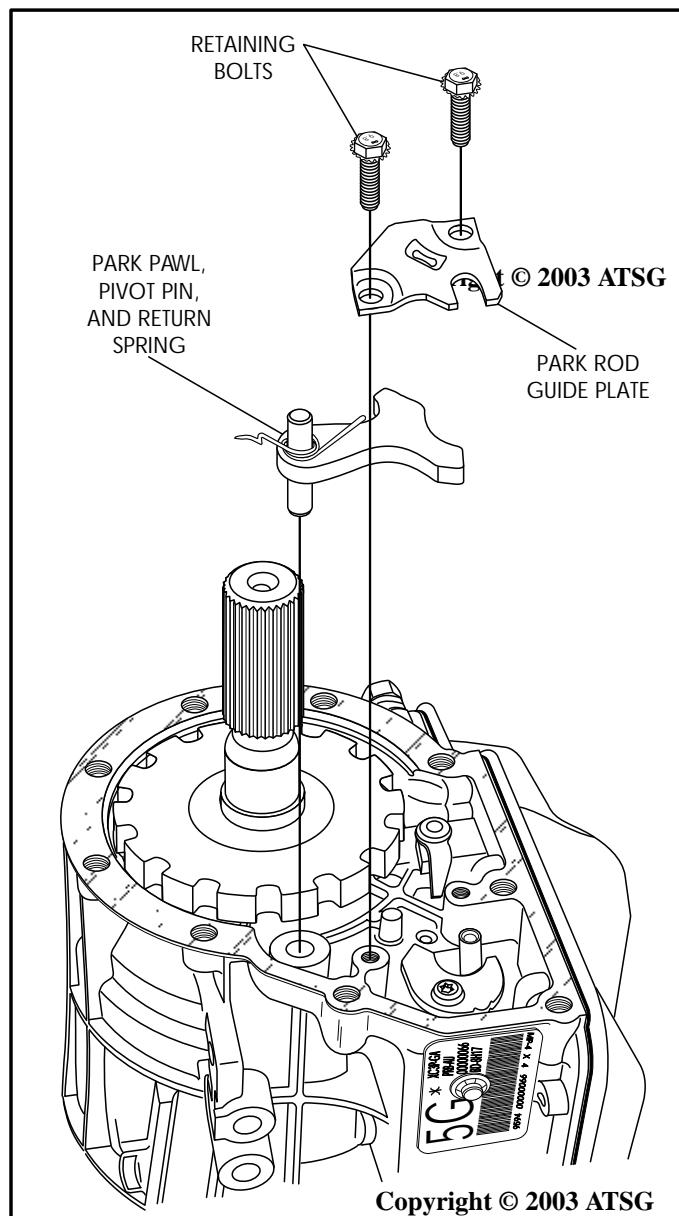


Figure 90

22. Install the parking rod guide plate, as shown in Figure 90.
23. Install the two park rod guide plate retaining bolts and torque to 16-27 N·m (12-20 ft.lb.).
- Note:** Ensure that park rod operates freely through the guide plate (See Figure 91).
24. The Torx head bolt retaining the park pawl abutment plate, shown in Figure 91, has thread locking compound and should not be removed unless damage is apparent.
- Note:** If it was removed, Ford recommends that it be discarded and a new bolt installed and torqued to 16-27 N·m (12-20 ft.lb.).

Continued on Page 60.

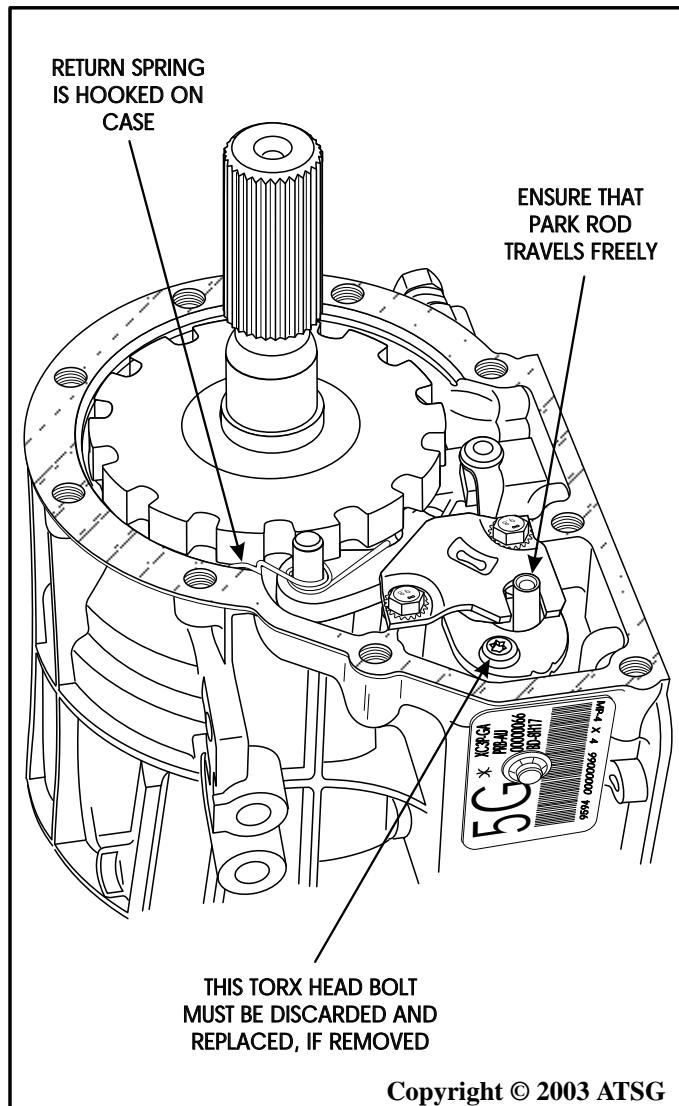


Figure 91

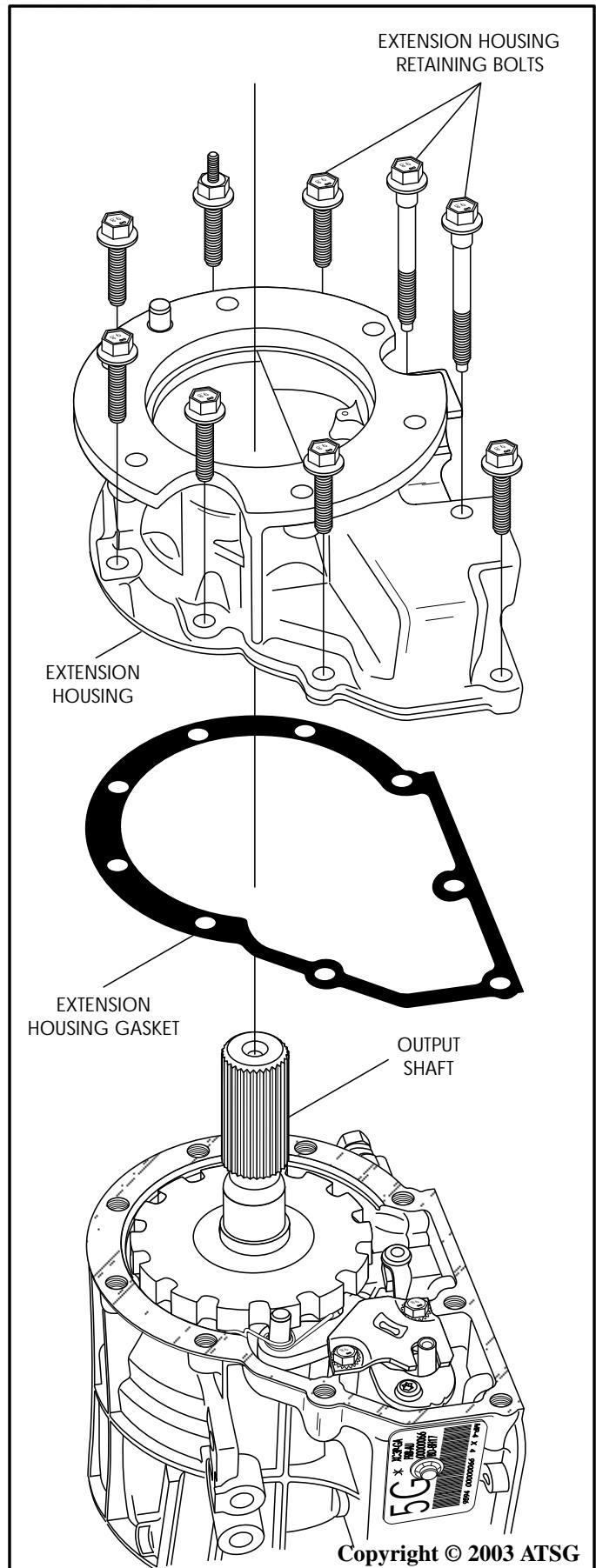


Figure 92

COMPONENT REBUILD***Transmission Case Assembly (Cont'd)***

25. Install new extension housing gasket on case surface, as shown in Figure 92.

26. Install the 4WD extension housing, as shown in Figure 92.

Note: The 4R100 unit requires an extension housing with the added boss, or shoulder (4X4), as illustrated in Figure 94, to retain the lube orifice plug. If replacement becomes necessary, refer to Figure 94 for a proper replacement.

27. If installing a 2WD version extension housing, install a new rear seal using the proper driver.

28. Install extension housing and retaining bolts, as shown in Figure 92.

29. Torque the extension housing bolts, as shown in Figure 93 to 41-54 N·m (30-40 ft.lb.).

Continued on Page 62.

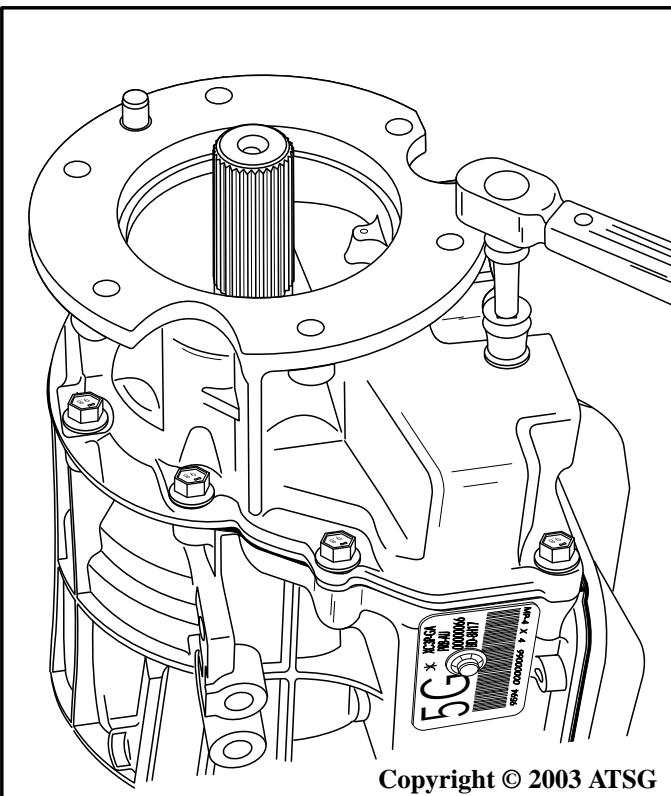
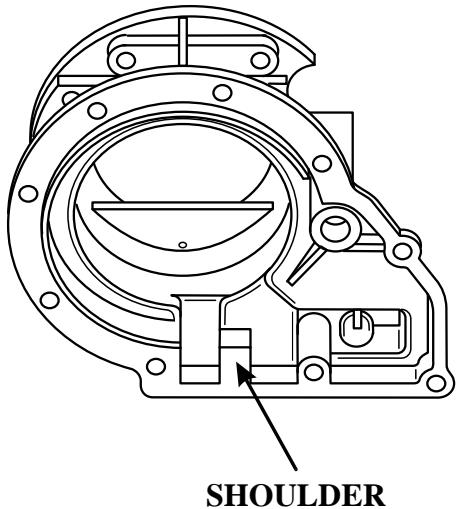
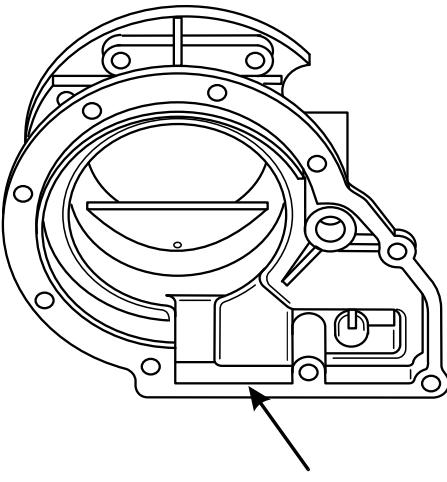
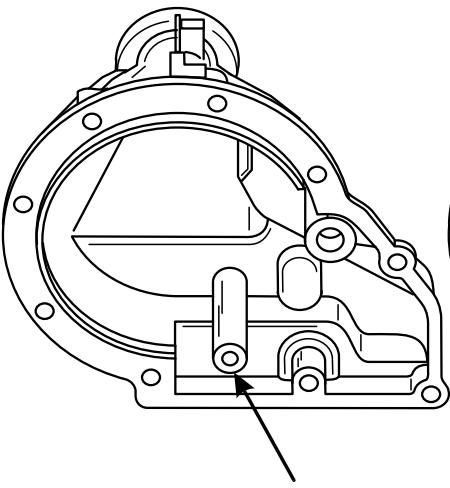
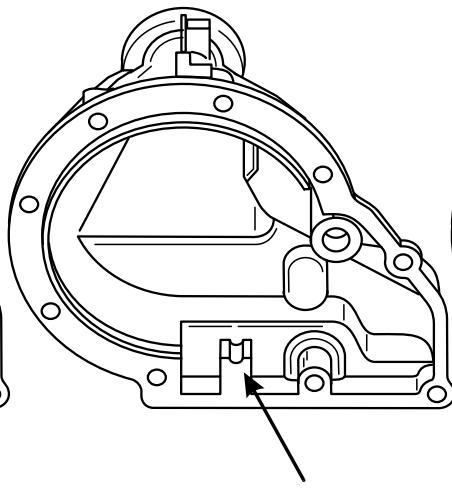
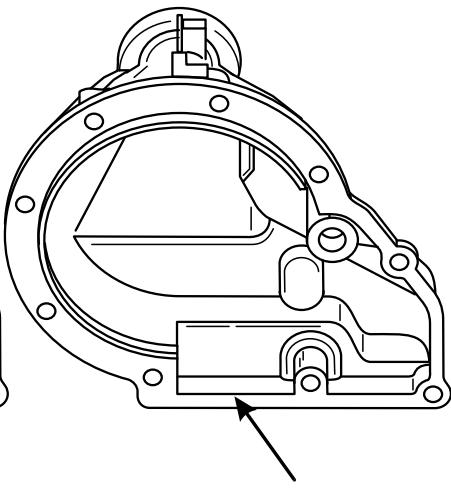


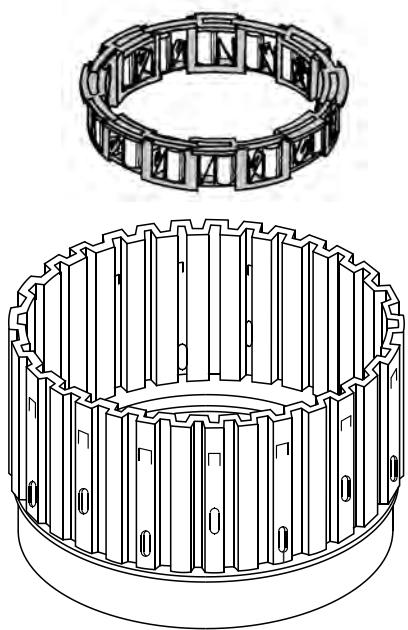
Figure 93

**4R100 TYPICAL
4 WHEEL DRIVE****E4OD 4X4 WITHOUT
LUBE PLUG****FORD 4R100
6.8L AND 7.3L
2 WHEEL DRIVE****ALL OTHER 4R100
2 WHEEL DRIVE
APPLICATIONS****E4OD WITHOUT
LUBE PLUG**

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Figure 94

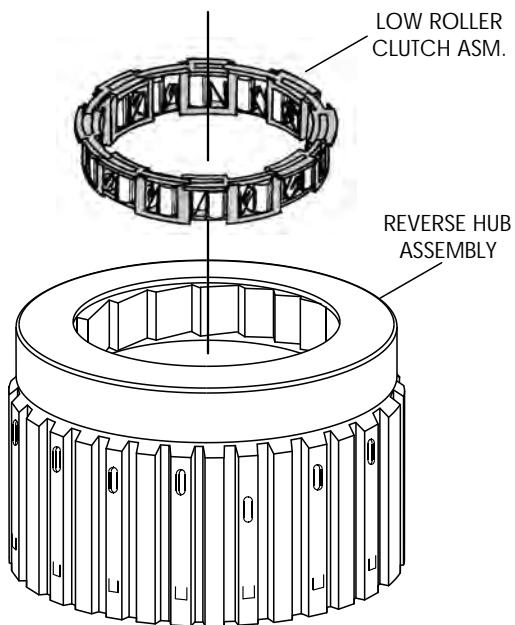
"INCORRECT" INSTALLATION



IF THE ROLLER CLUTCH IS INSTALLED IN THIS DIRECTION, THE REVERSE HUB WILL FREEWHEEL IN BOTH DIRECTIONS, WHEN INSTALLED IN CASE.

Figure 95

"CORRECT" INSTALLATION



INSTALL IN THIS DIRECTION AND TURN SLIGHTLY CLOCK-WISE TO LOCK IN PLACE

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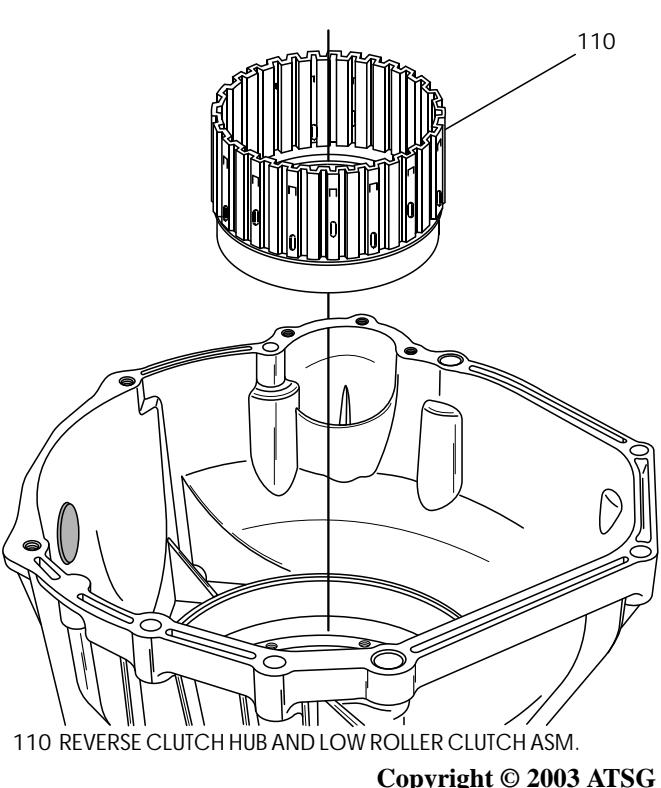
Figure 96

COMPONENT REBUILD

Transmission Case Assembly (Cont'd)

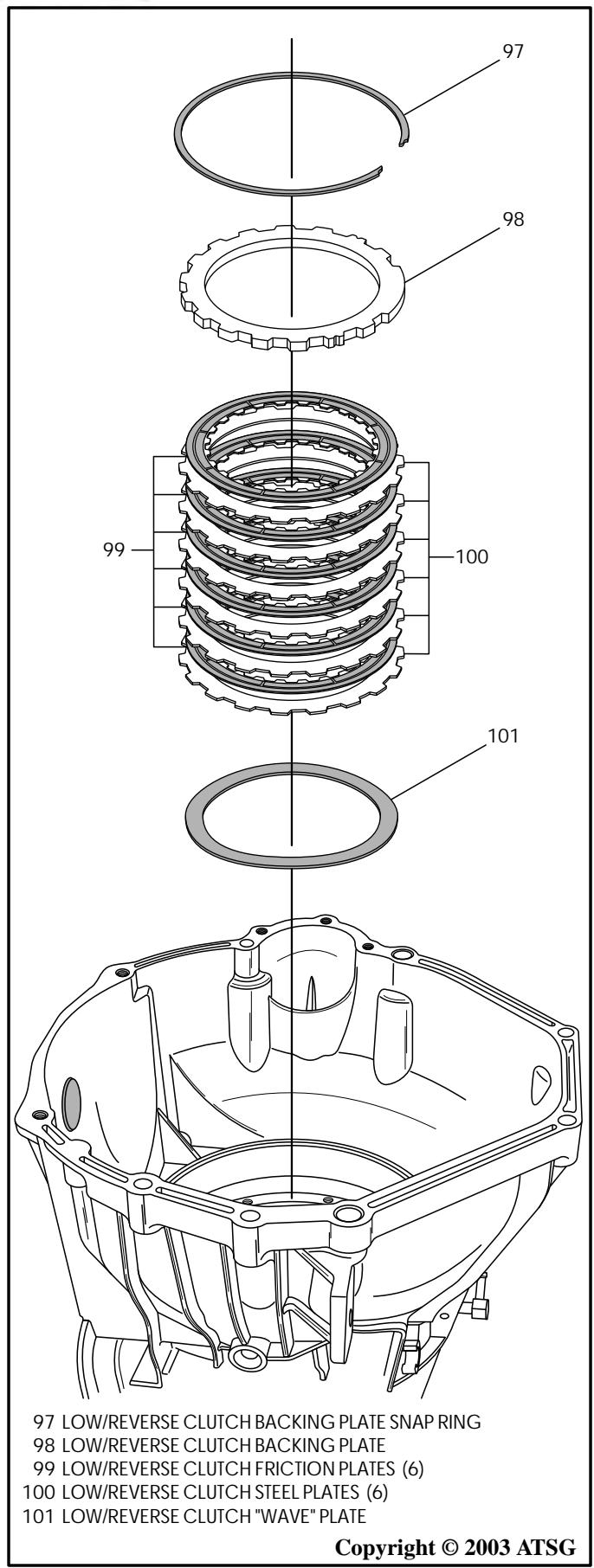
30. Install the low roller clutch into the reverse hub in the direction shown in Figure 96, and rotate slightly clock-wise to lock it in place.
Caution: If the roller clutch is installed in reverse hub in the direction shown in Figure 95, the reverse hub will freewheel in both directions, when installed in case.
31. Rotate the transmission in fixture so the bell housing is facing up, as shown in Figure 97.
32. Install the reverse hub and low roller clutch assembly into the case by rotating clockwise, as shown in Figure 97, until fully seated.
Note: Reverse clutch hub should freewheel clockwise and lock counter-clockwise after installation in case.
33. Install the reverse clutch "Wave" plate on top of the reverse piston in the case, as shown in Figure 98.
34. Install the reverse clutch pack beginning with a steel plate and alternating with a friction plate as shown in Figure 98, until the proper amount of plates are installed.

Continued on Page 63.



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Figure 97

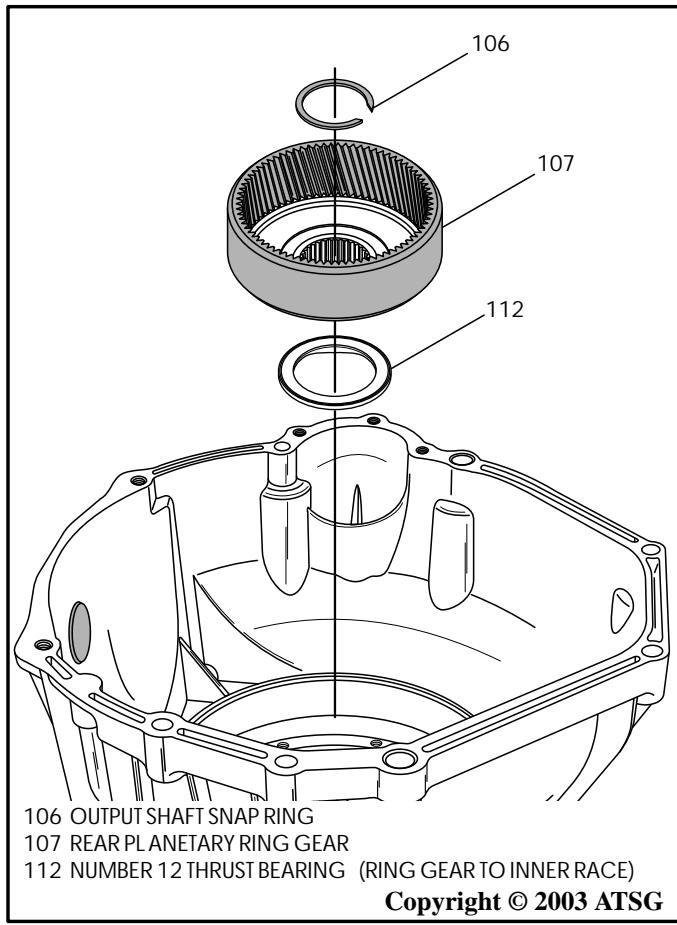


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Figure 98

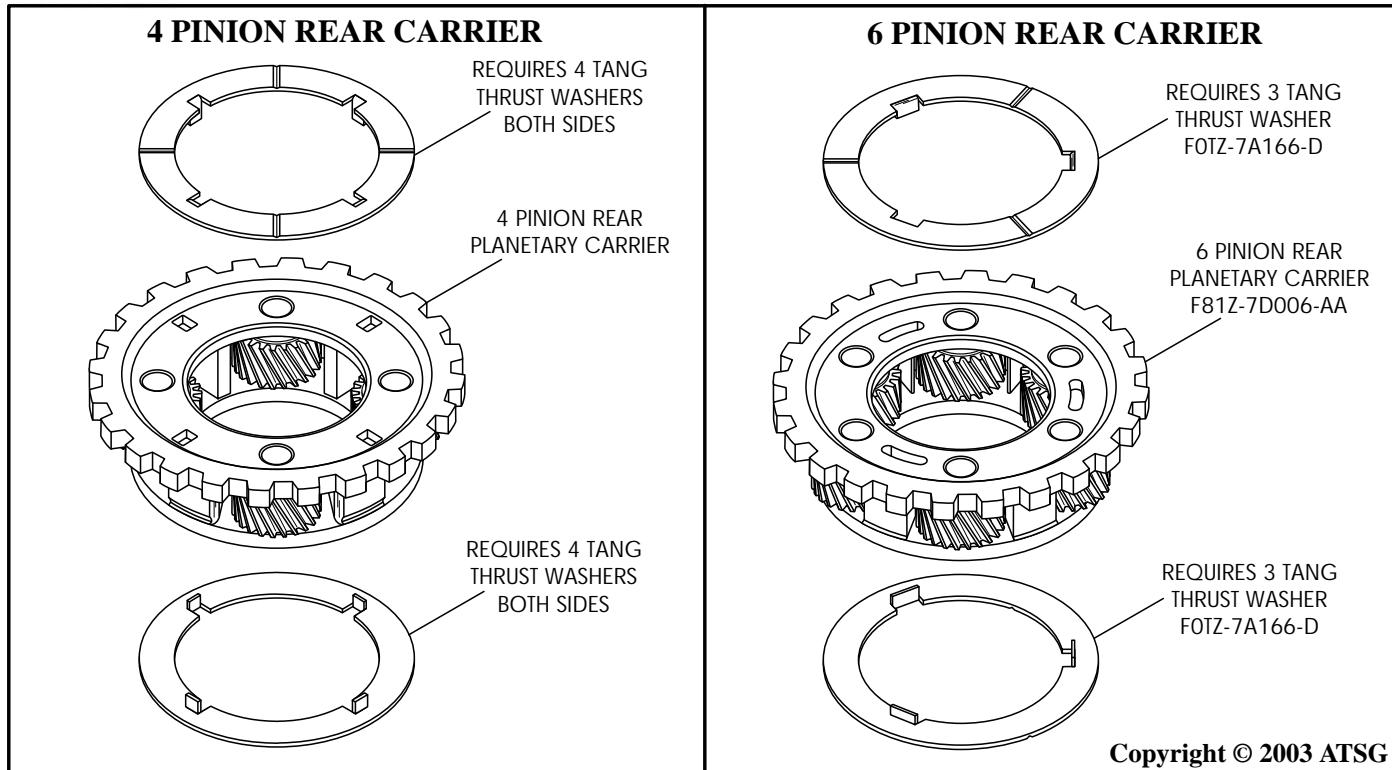
Transmission Case Assembly (Cont'd)

35. Install the reverse clutch backing plate on top of the last friction, as shown in Figure 98.
36. Install the reverse clutch backing plate snap ring, as shown in Figure 98, and ensure that it is fully seated in case groove.
Note: The number of reverse plates is model sensitive and may vary from the illustration. A stack-up clearance measurement is not required for the reverse clutch.
37. Install the number 12 thrust bearing and rear ring gear into case, as shown in Figure 99.
Note: Before installing snap ring provisions must be made to retain output shaft fully seated against rear bearing.
38. Install the output shaft snap ring onto output shaft, as shown in Figure 99
Note: Do not over stretch snap ring during installation. Ford recommends a new snap ring for this location.
39. Ensure that snap ring is fully seated in groove in output shaft, and the case is finally ready for the final assembly process.



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Figure 99



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Figure 100

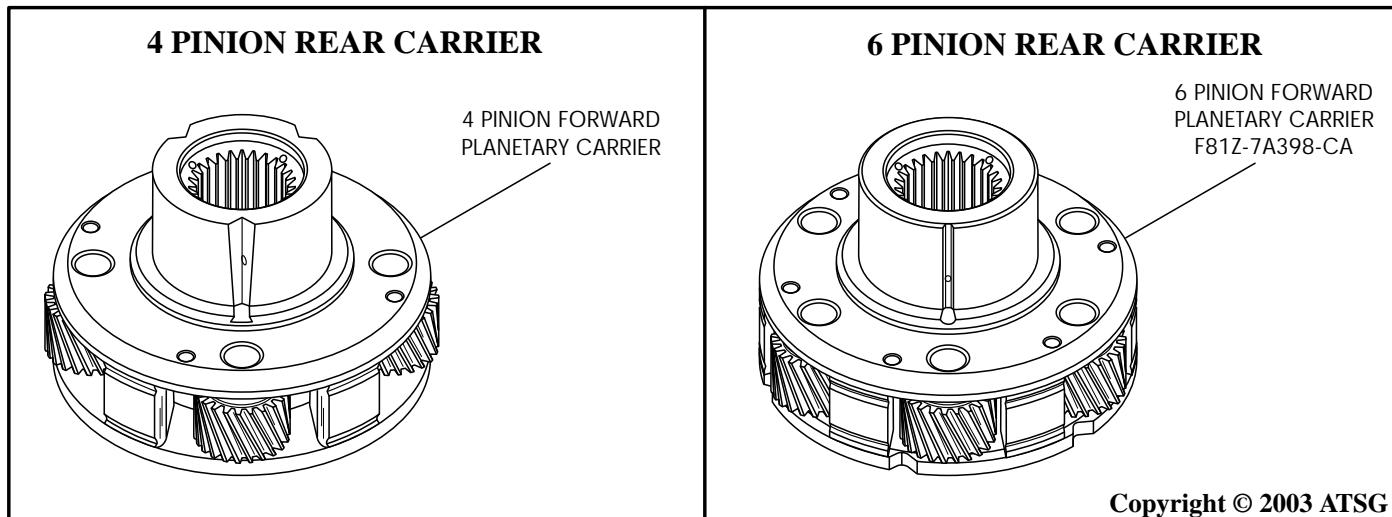
Planetary Carrier Differences

Both planetary carriers are model sensitive parts, and may contain a 4 pinion carrier or a 6 pinion carrier, as shown in Figures 100, 101. Obviously the 6 pinion carrier has much more torque carrying capacity and is highly recommended, especially in heavy duty applications.

The 6 pinion rear carrier also requires 3 tang thrust washers on both sides of the carrier. We have provided you with the part numbers, in Figure 100, that were current at the time of printing this manual.

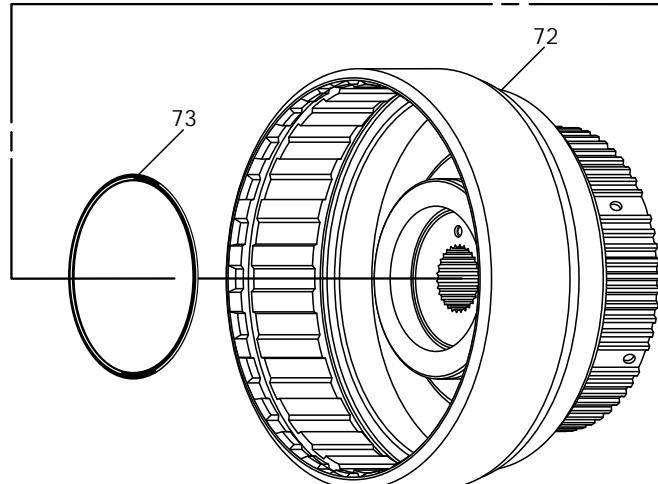
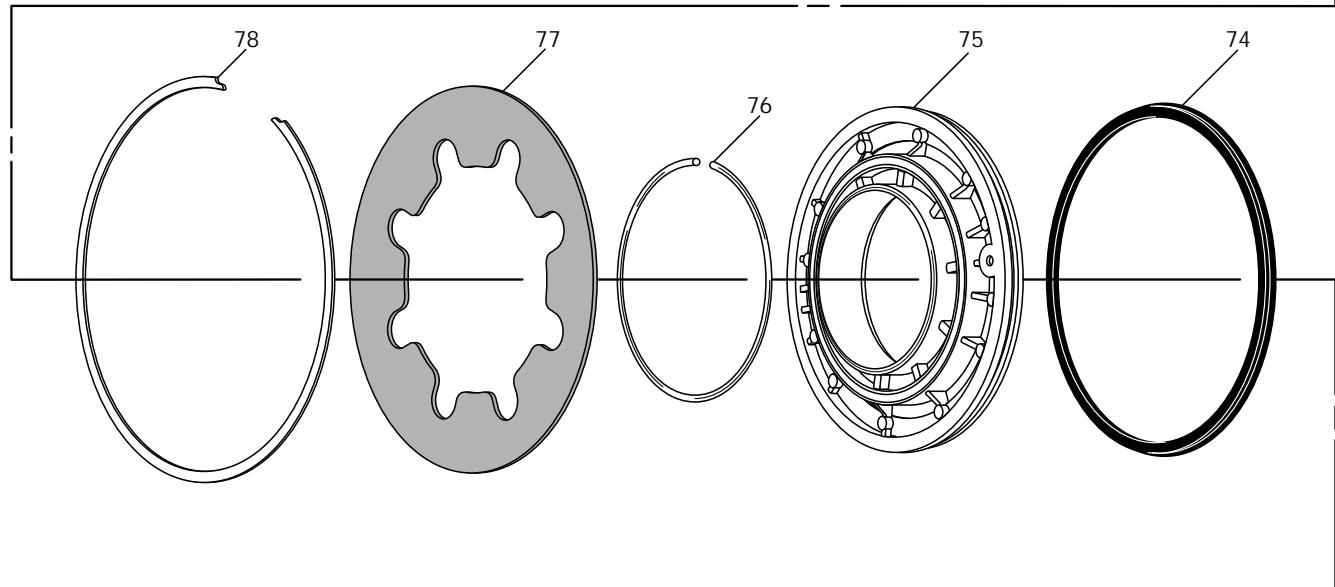
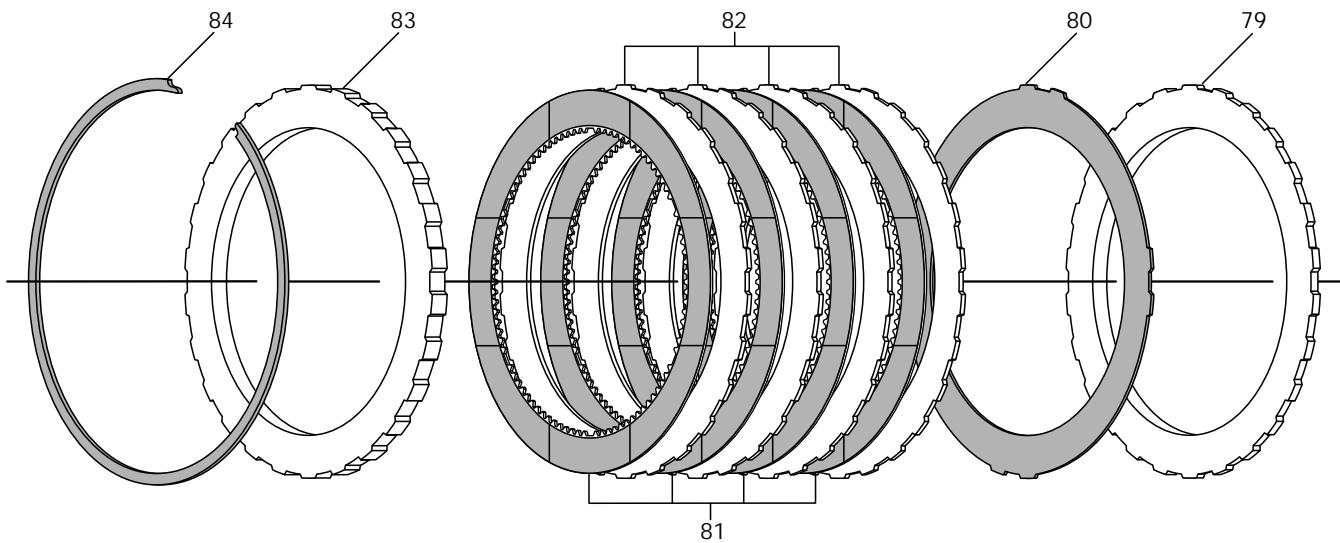
COMPONENT REBUILD**Front And Rear Planetary Carriers**

1. Inspect planetary carriers for the following;
 - Carrier pins for looseness or damage.
 - Pinion gears for damaged or worn teeth.
 - Pinion gears for free rotation, and wobble.
 - Carrier for cracks, wear and/or damage.
2. Use a new service part if any of the above conditions exist.
3. Set the carriers aside for final assembly.

Continued on Page 66.

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Figure 101

FORWARD CLUTCH EXPLODED VIEW

- 72 FORWARD CLUTCH HOUSING
- 73 FORWARD CLUTCH HOUSING INNER "O" RING SEAL
- 74 FORWARD PISTON OUTER LIP SEAL
- 75 FORWARD CLUTCH PISTON ASSEMBLY
- 76 FORWARD CLUTCH PISTON APPLY RING
- 77 FORWARD CLUTCH PISTON "BELLVILLE" RETURN SPRING
- 78 FORWARD CLUTCH RETURN SPRING SNAP RING
- 79 FORWARD CLUTCH APPLY PLATE
- 80 FORWARD CLUTCH "WAVE" PLATE
- 81 FORWARD CLUTCH FRICTION PLATES
- 82 FORWARD CLUTCH STEEL PLATES
- 83 FORWARD CLUTCH BACKING PLATE
- 84 FORWARD CLUTCH BACKING PLATE SNAP RING (SELECTIVE)

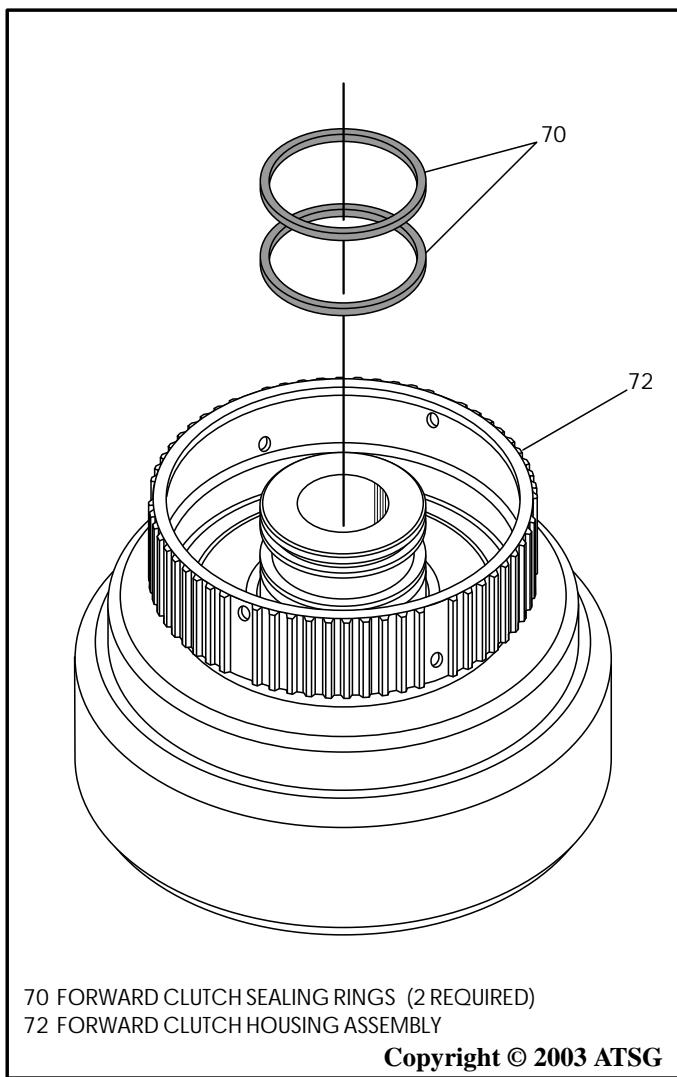
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Figure 102

COMPONENT REBUILD**Forward Clutch Housing**

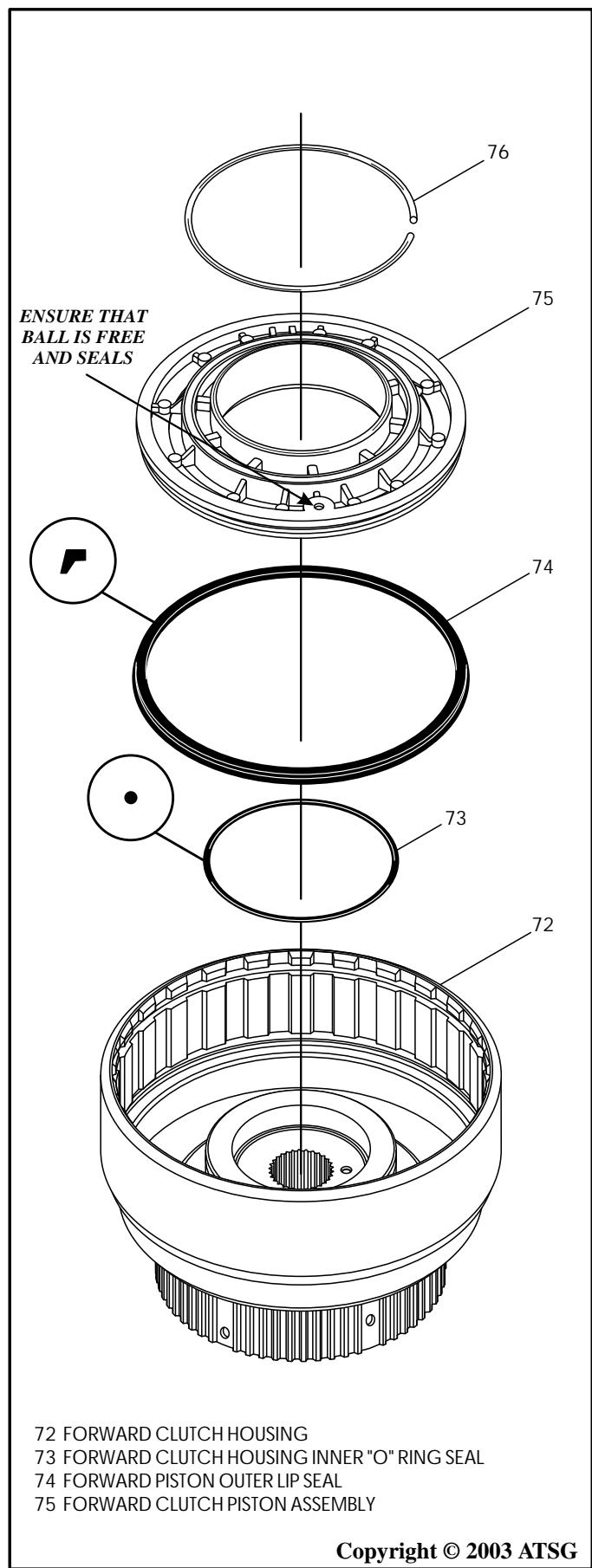
1. Disassemble the forward clutch housing using Figure 102 as a guide.
2. Clean all forward clutch housing parts using a suitable cleaning solution and dry with compressed air.
3. Inspect all forward clutch housing parts for any wear and/or damage.
Note: Ensure that the air bleed ball in the forward clutch piston is free and operational (See Figure 104).
4. Remove and discard the forward clutch inner and outer seals.
5. Place the forward clutch housing on a flat work surface, in the direction shown in Figure 103, and install new sealing rings.

Continued on Page 67.



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Figure 103



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Figure 104

Forward Clutch Housing (Cont'd)

6. Turn forward clutch housing over, as shown in Figure 104, and install forward clutch piston inner "O" ring seal into drum (See Figure 104).
7. Install forward clutch piston outer lip seal into groove in piston, with lip facing the direction shown in Figure 104.
8. Lubricate both seals with a small amount of Trans-Jel®, and install piston into the forward clutch housing with a twisting motion, using care not to damage seals (See Figure 104).
9. Install the forward clutch piston apply ring into groove on top of piston (See Figure 104).
10. Install the forward clutch "Bellville" return spring into housing in the direction shown in Figure 105.
11. Compress the return spring and install return spring snap ring, and ensure it is fully seated (See Figure 105).
12. Install the forward clutch apply plate with the flat side facing up, as shown in Figure 106.
13. Install the forward clutch "Wave" plate on top of the apply plate, as shown in Figure 106.

Continued on Page 68.

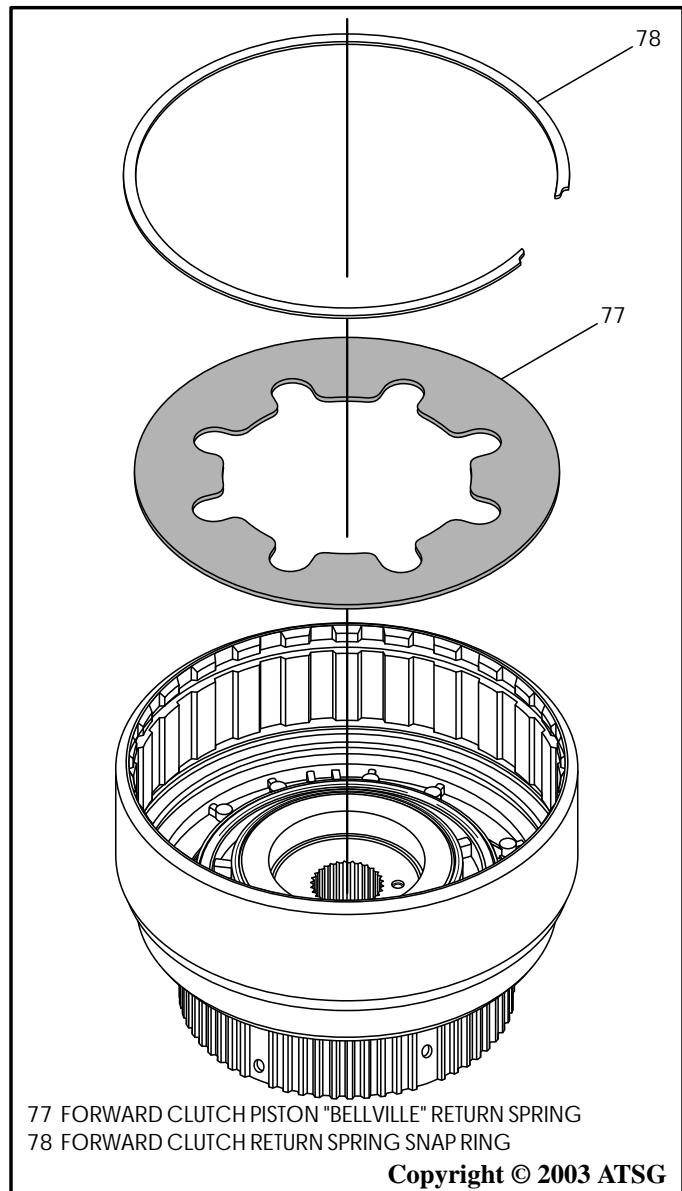


Figure 105

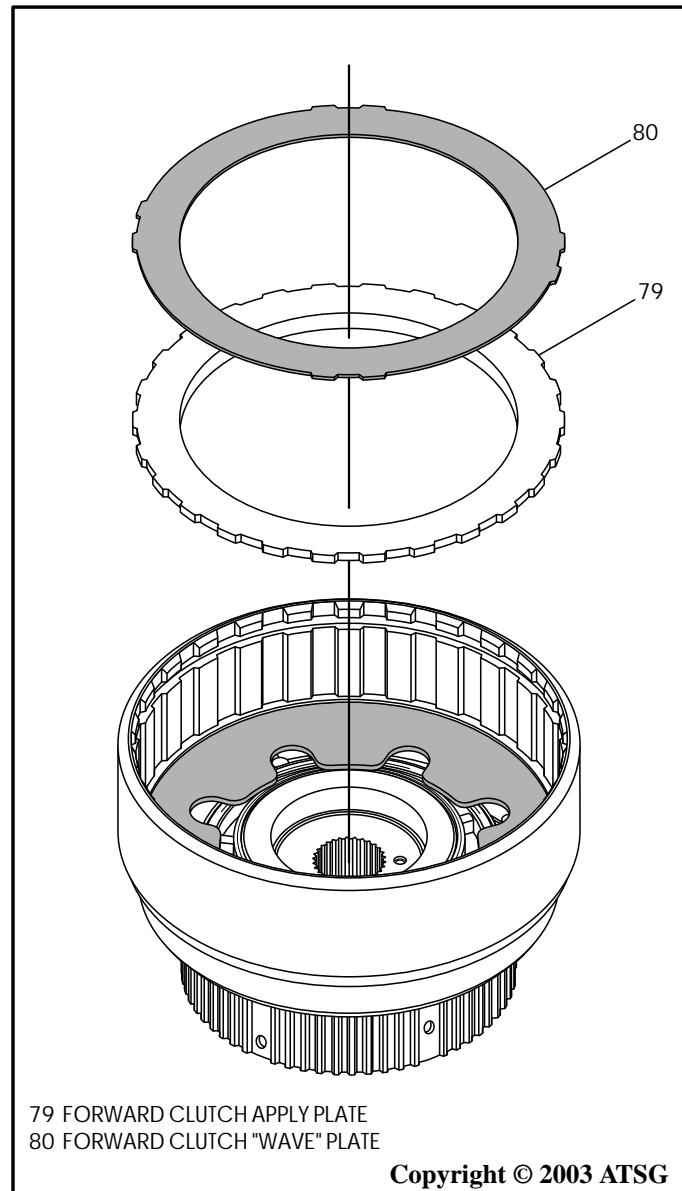


Figure 106

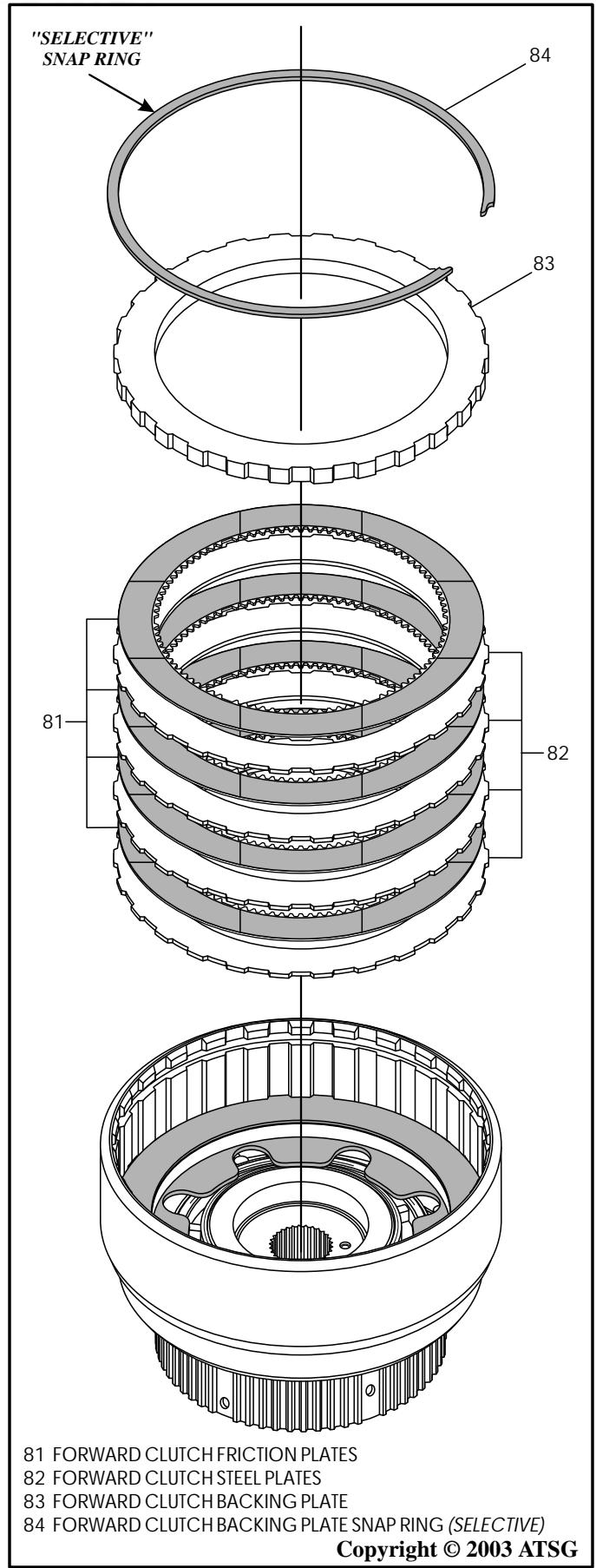


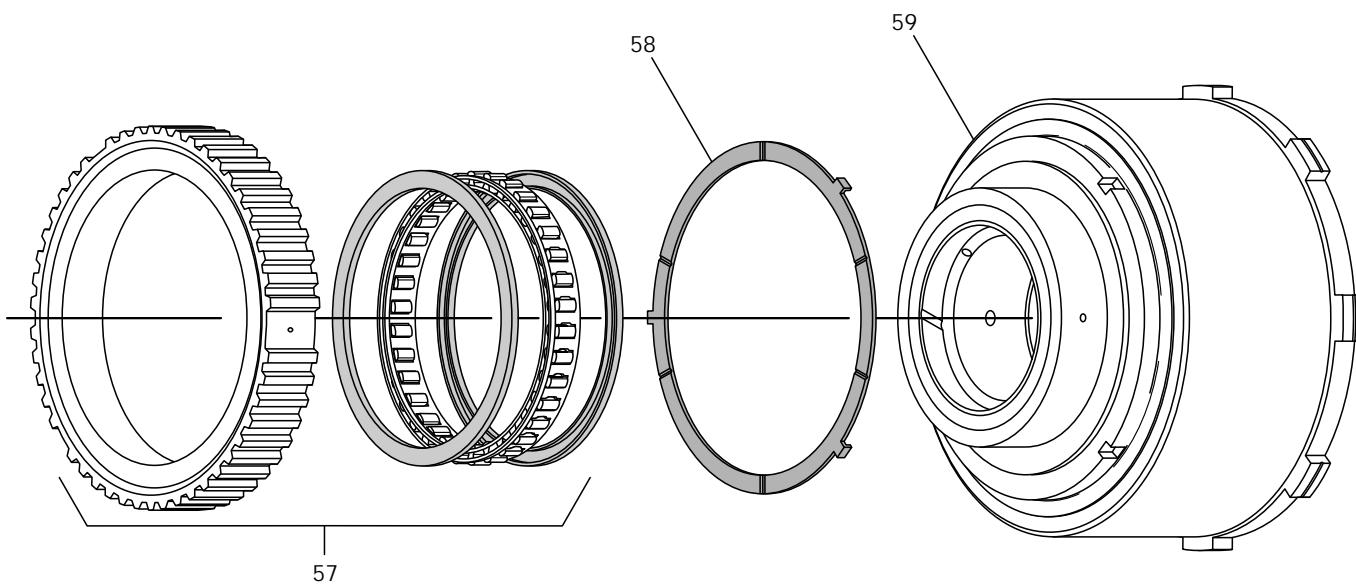
Figure 107

Forward Clutch Housing (Cont'd)

14. Install forward clutch pack beginning with a steel plate and alternating with a friction plate, as shown in Figure 107, until the proper amount of plates are installed.
Note: The number of forward plates is model sensitive and may vary from the illustration.
15. Install the forward clutch backing plate, as shown in Figure 107.
16. Install **selective** forward clutch backing plate snap ring, as shown in Figure 107, and ensure that it is fully seated.
17. Measure the forward clutch clearance between the selective snap ring and the backing plate, as shown in Figure 108.
18. Forward clutch clearance should measure:
0.76 - 1.40mm (.030" - .055").
19. Change the selective snap ring as necessary to obtain the proper clearance (See Figure 108).
20. Set the completed forward clutch housing aside for future sub assembly.

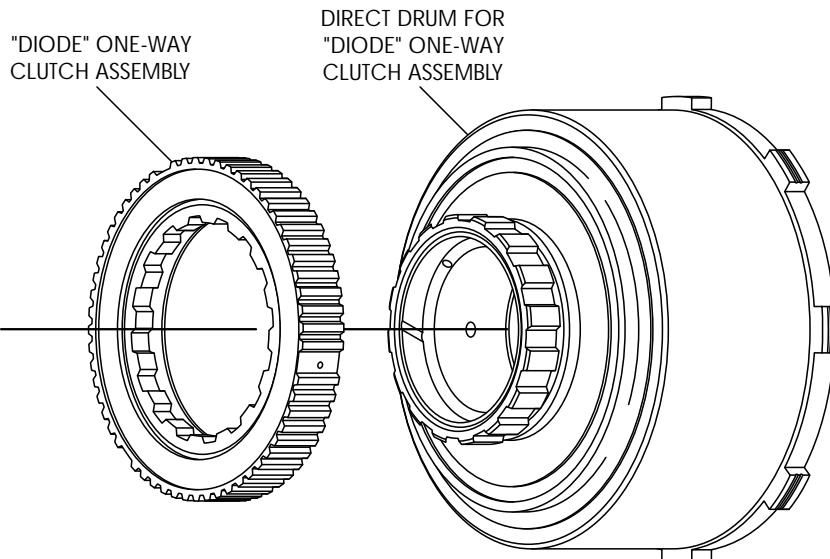


Figure 108

DIRECT CLUTCH HOUSING "FRONT SIDE" EXPLODED VIEW

57 INTERMEDIATE SPRAG ASSEMBLY
58 INTERMEDIATE SPRAG OUTER RACE THRUST WASHER (NUMBER 7)
59 DIRECT CLUTCH HOUSING ASSEMBLY

"DO NOT USE" REPLACE WITH PARTS SHOWN ABOVE

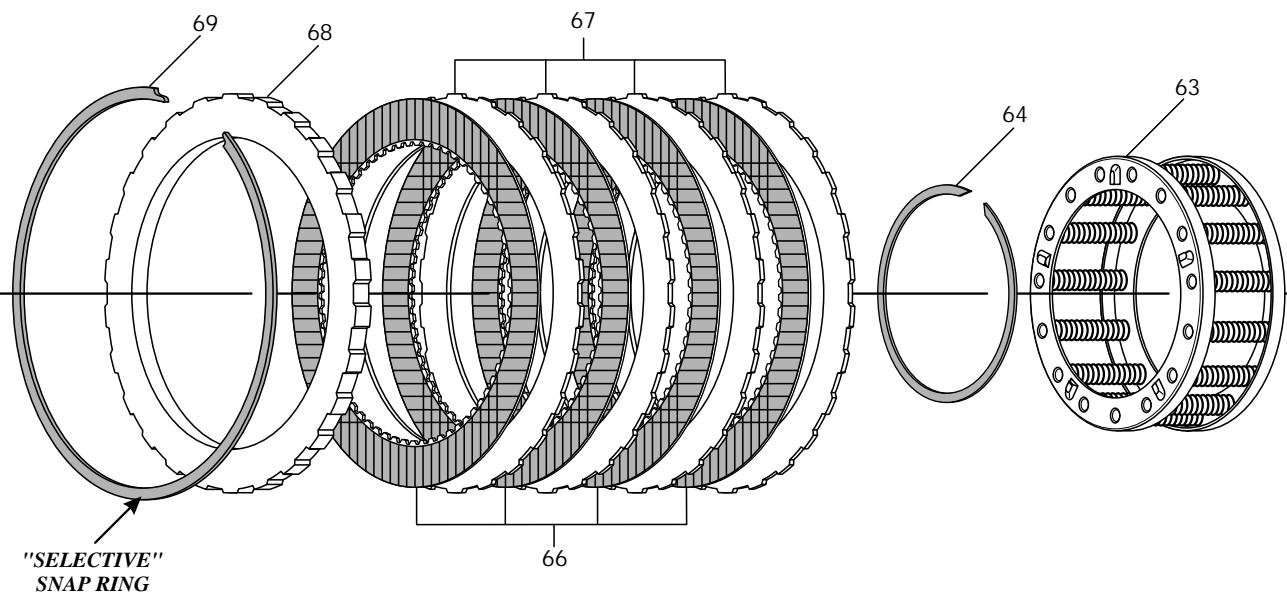
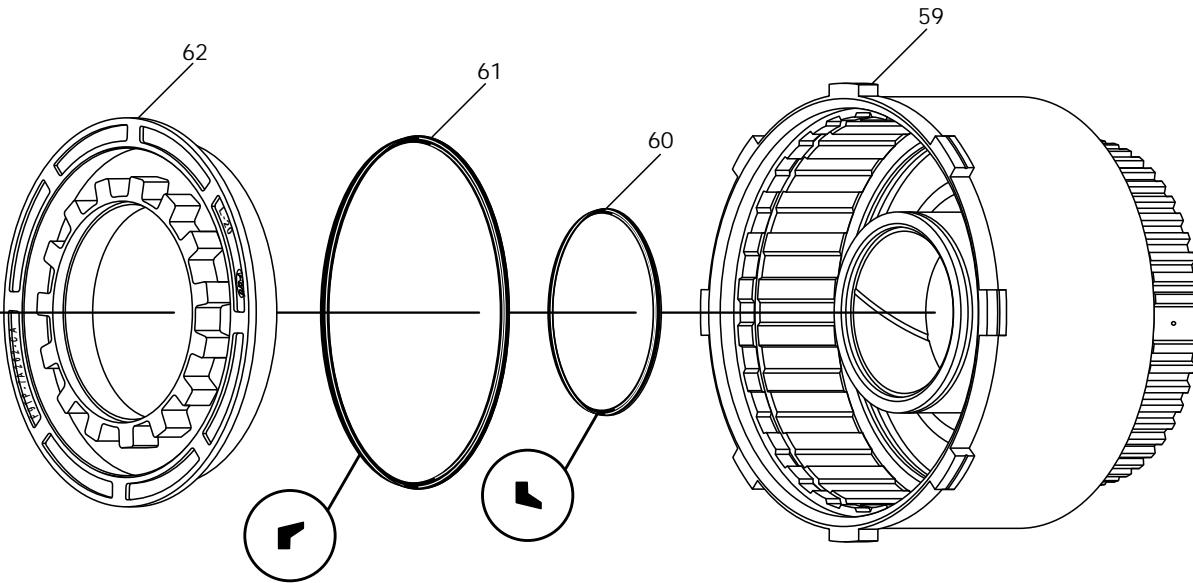


"DO NOT USE" REPLACE WITH PARTS SHOWN ABOVE

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Figure 109

DIRECT CLUTCH HOUSING "REAR SIDE" EXPLODED VIEW



- 59 DIRECT CLUTCH HOUSING ASSEMBLY
- 60 DIRECT CLUTCH PISTON INNER LIP SEAL
- 61 DIRECT CLUTCH PISTON OUTER LIP SEAL
- 62 DIRECT CLUTCH PISTON ASSEMBLY
- 63 DIRECT CLUTCH PISTON RETURN SPRING ASSEMBLY
- 64 DIRECT CLUTCH PISTON RETURN SPRING SNAP RING
- 66 DIRECT CLUTCH FRICTION PLATES
- 67 DIRECT CLUTCH STEEL PLATES
- 68 DIRECT CLUTCH BACKING PLATE
- 69 DIRECT CLUTCH BACKING PLATE SNAP RING (SELECTIVE)

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Figure 110

COMPONENT REBUILD

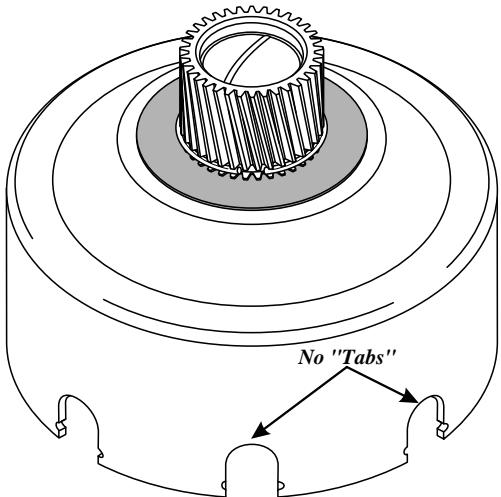
Direct Clutch Housing

1. Disassemble the direct clutch housing using Figures 109 and 110 as a guide.
2. Clean all direct clutch parts with a suitable cleaning solution and dry with compressed air.
3. Inspect all direct clutch parts for any wear and/or damage. Replace as necessary.

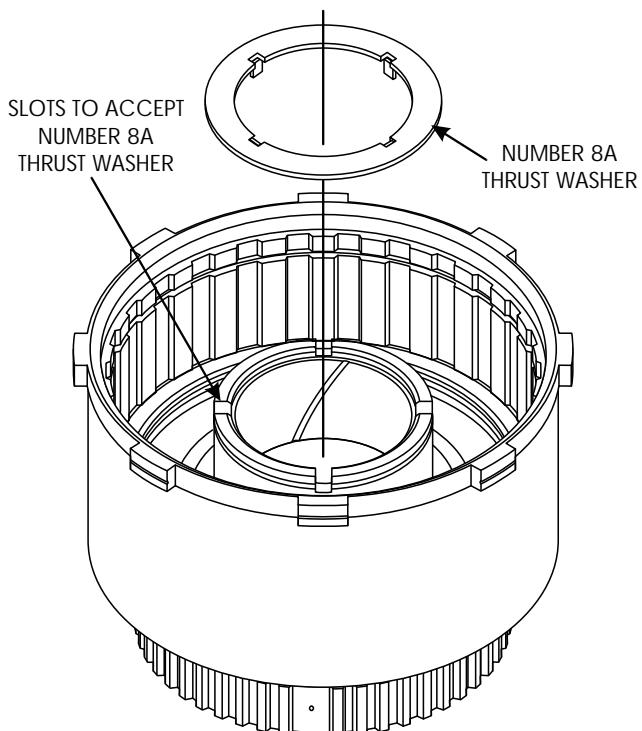
4. Refer to Figures 111 and 112 to ensure that you have compatible parts, especially if it was necessary to replace the sun shell or the direct clutch housing.

Note: Use extra care at this step to ensure compatible parts for direct clutch drum.

"EARLY" DESIGN LEVEL



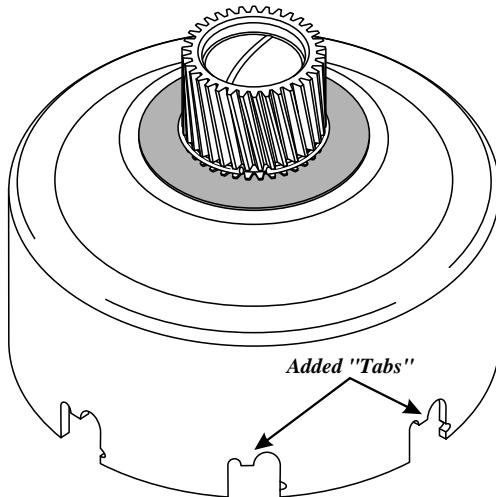
INPUT SUN SHELL - NOTE: Using the early style sun shell "Requires" that you use the number 8A thrust washer on direct drum, and the direct drum that accepts it.



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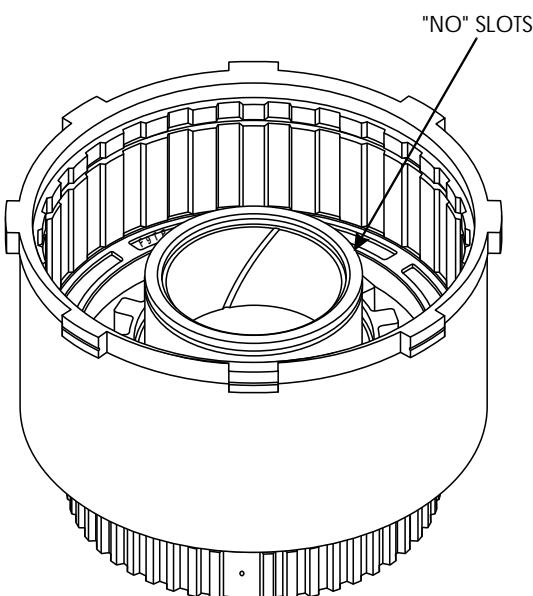
Figure 111

"LATE" DESIGN LEVEL



INPUT SUN SHELL - New design have "Tabs" added to the center of the sun shell slots, as shown above, which now support the direct drum for the required clearance between the direct and forward clutch housings, and allows elimination of the number 8A thrust washer.

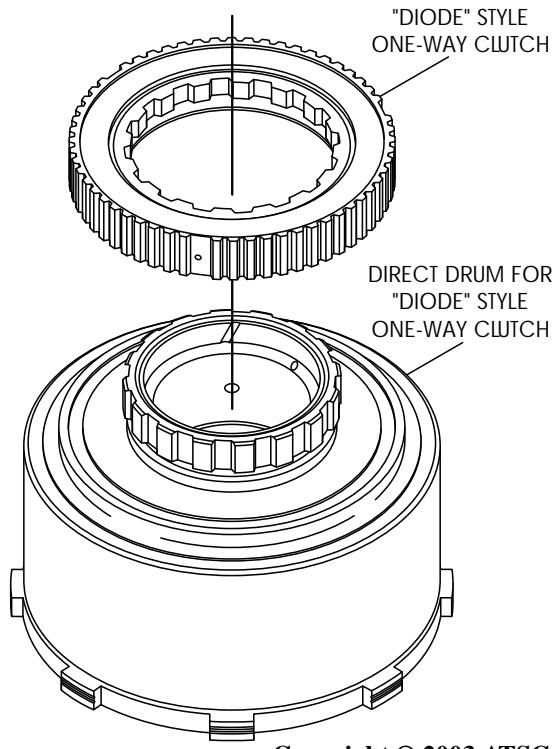
"Late" design sun shell will retro-fit back on all models.



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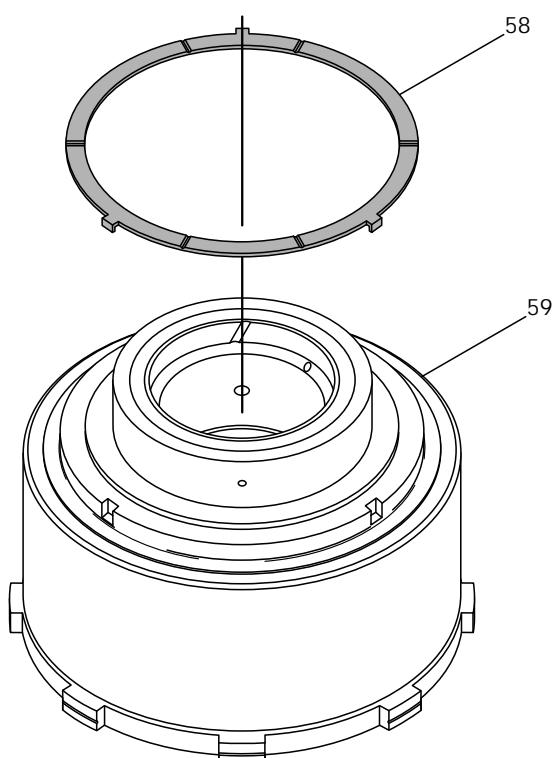
Figure 112

DO NOT USE THIS STYLE DRUM



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Figure 113



58 INTERMEDIATE SPRAG OUTER RACE THRUST WASHER (NO. 7)
59 DIRECT CLUTCH HOUSING ASSEMBLY

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Figure 114

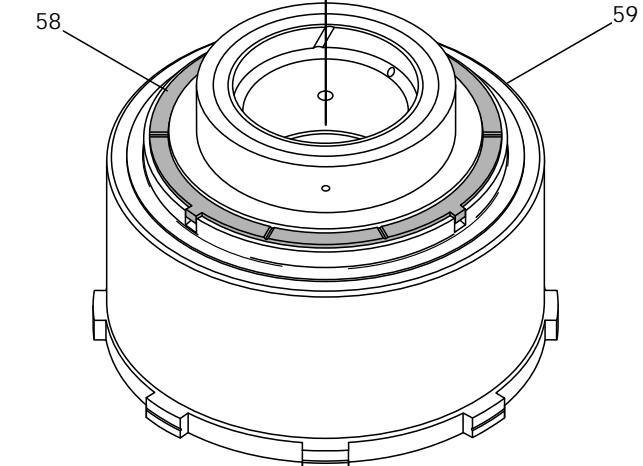
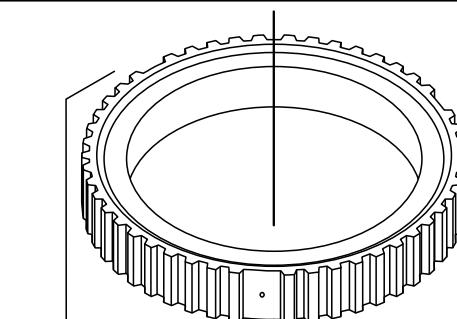
COMPONENT REBUILD

Direct Clutch Housing (Cont'd)

- We have illustrated the "Diode" style one-way intermediate clutch and the associated direct clutch drum in Figure 113.

Note: *Do Not use this type of one-way clutch in this unit. It will not live.*

- Place the direct clutch housing on a flat work surface in the direction shown in Figure 114.
- Install the number 7 thrust washer, as shown in Figure 114, and retain with Trans-Jel®.



57 INTERMEDIATE SPRAG ASSEMBLY
58 INTERMEDIATE SPRAG OUTER RACE THRUST WASHER (NO. 7)
59 DIRECT CLUTCH HOUSING ASSEMBLY

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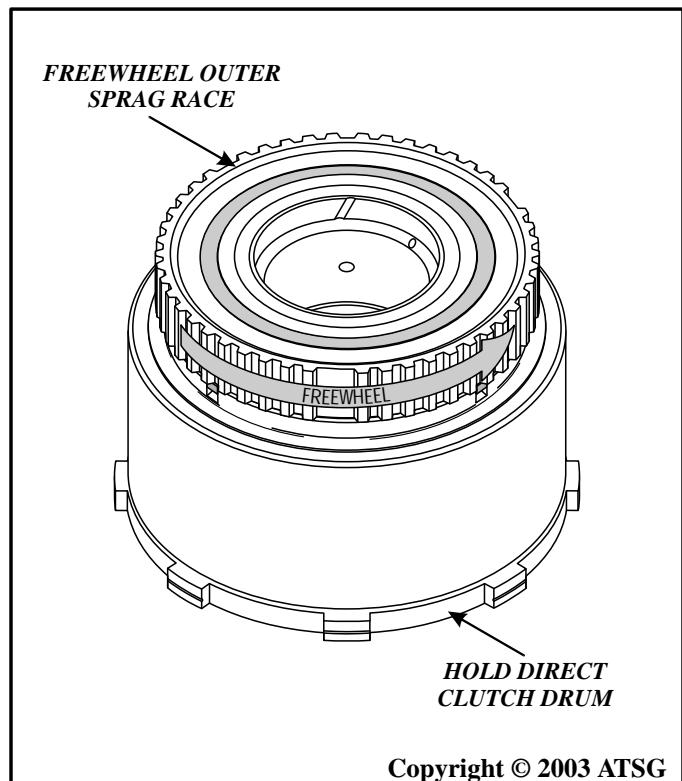
Figure 115

COMPONENT REBUILD

Direct Clutch Housing (Cont'd)

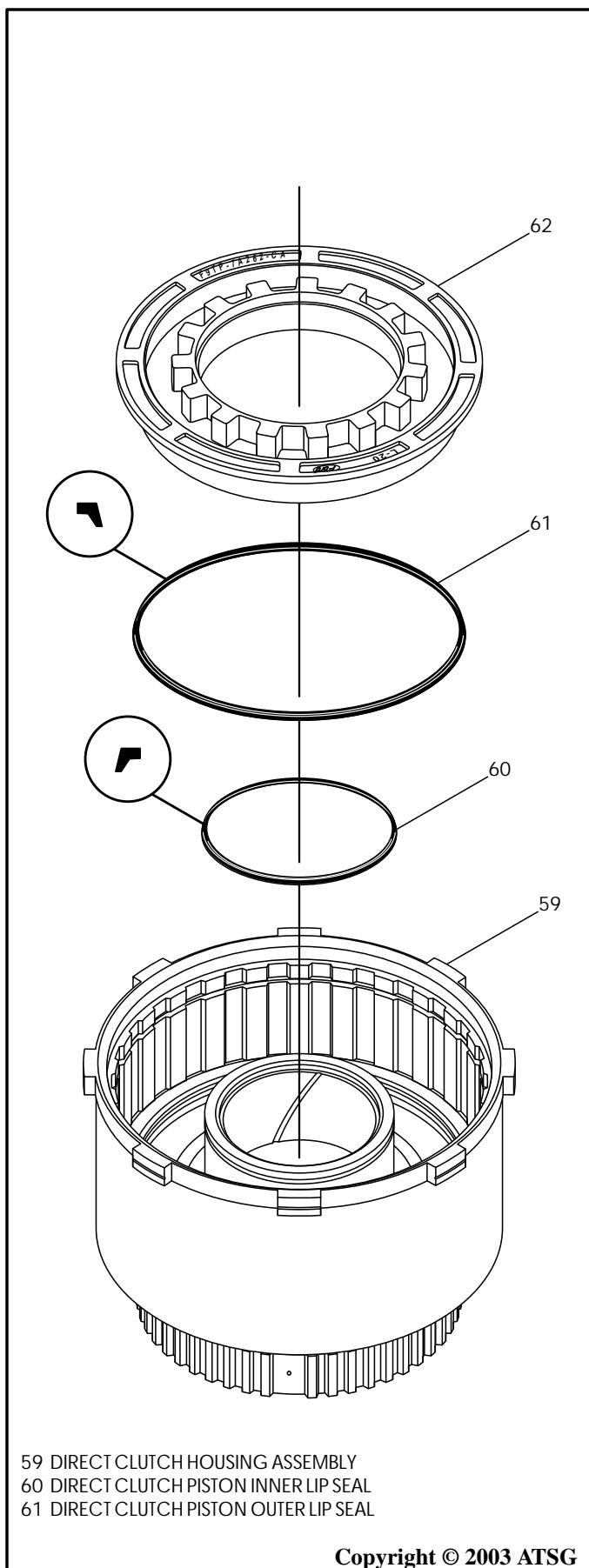
8. Install the intermediate sprag assembly and the outer sprag race, as shown in Figure 115.
 9. After installing intermediate sprag assembly, check to ensure proper operation, as shown in Figure 116.
- Note: Outer sprag race should freewheel counter-clockwise and lock clockwise, as shown in Figure 116.**
10. Turn the direct clutch housing over on a flat work surface, as shown in Figure 117.
 11. Install the inner direct clutch piston lip seal in the groove in drum, with the lip facing in the direction shown in Figure 117.
 12. Install the outer direct clutch piston lip seal in the groove in drum, with the lip facing in the direction shown in Figure 117.
 13. Lubricate both seals and both piston surfaces with a small amount of Trans-Jel®.
 14. Install the direct clutch piston assembly into direct clutch housing with a twisting motion, using care so as not to damage the lip seals. (See Figure 117).

Continued on Page 74.



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Figure 116



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Figure 117

COMPONENT REBUILD**Direct Clutch Housing (Cont'd)**

15. Install the direct clutch piston return spring into direct clutch housing, as shown in Figure 118.
16. Compress the return spring assembly using a foot press and install the direct clutch return spring snap ring (See Figure 118).
17. Install the number 8A thrust washer at this time if your unit requires one because of the early style sun shell (See Figure 119)

Note: Refer to Figures 111 and 112 for the information regarding the 8A thrust washer, and compatible parts.

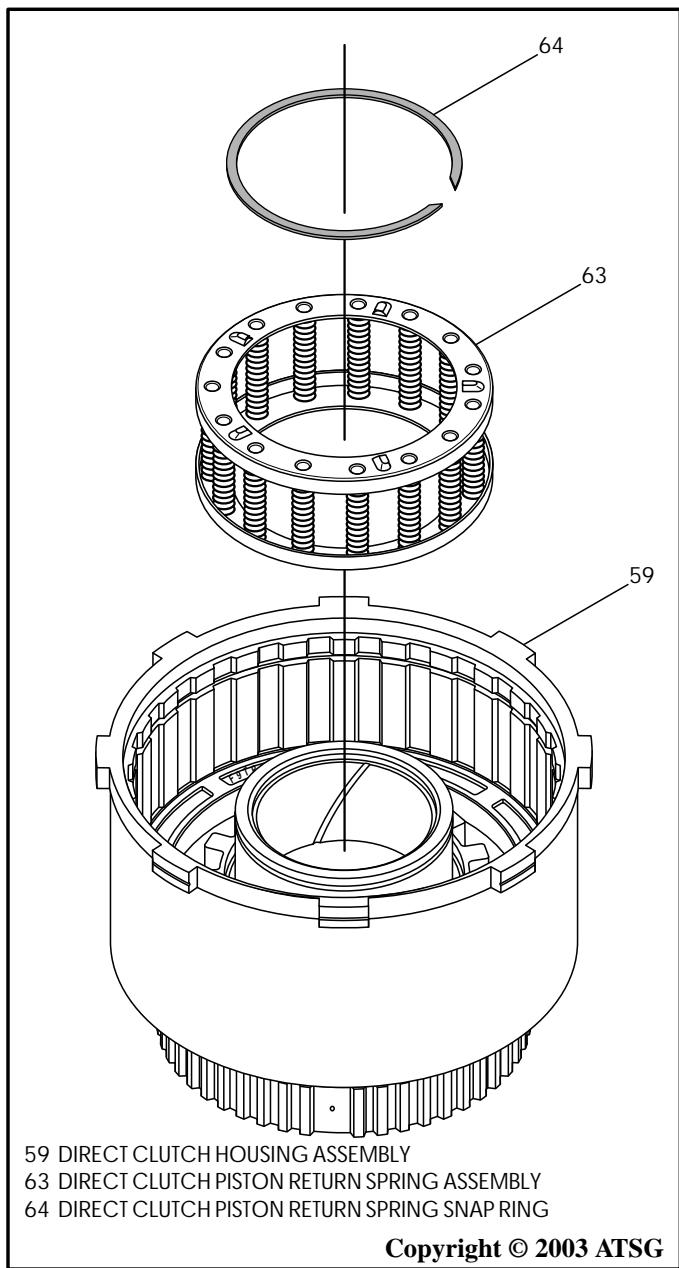


Figure 118

18. Install the direct clutch pack beginning with a steel plate and alternating with a friction plate, as shown in Figure 120, until you have proper amount of plates installed.
- Note:** The number of direct plates is model sensitive and may vary from illustration.
19. Install the direct clutch backing plate on top of the last friction plate, as shown in Figure 120.
20. Install the selective direct clutch backing plate snap ring, as shown in Figure 120, and ensure that it is fully seated.
21. Measure the direct clutch clearance between the selective snap ring and the backing plate, as shown in Figure 121.
22. Direct clutch clearance should measure: 1.15 - 2.06mm (.045" - .081").
23. Change the selective snap ring as necessary to obtain the proper clutch clearance. Refer to Figure 121 for snap rings available.
24. Set the completed direct clutch housing aside for future sub-assembly.

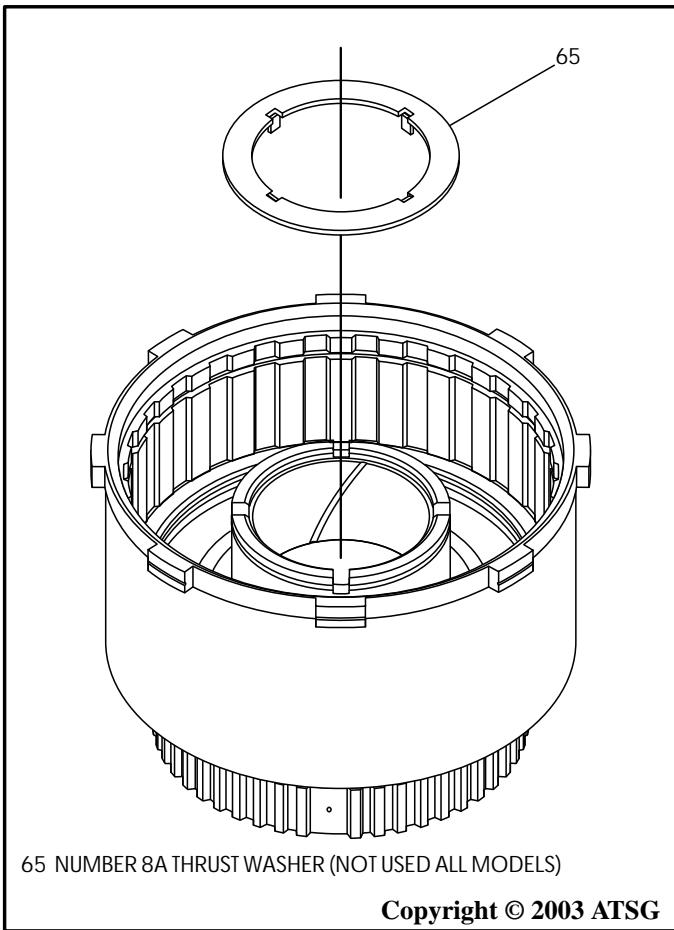


Figure 119

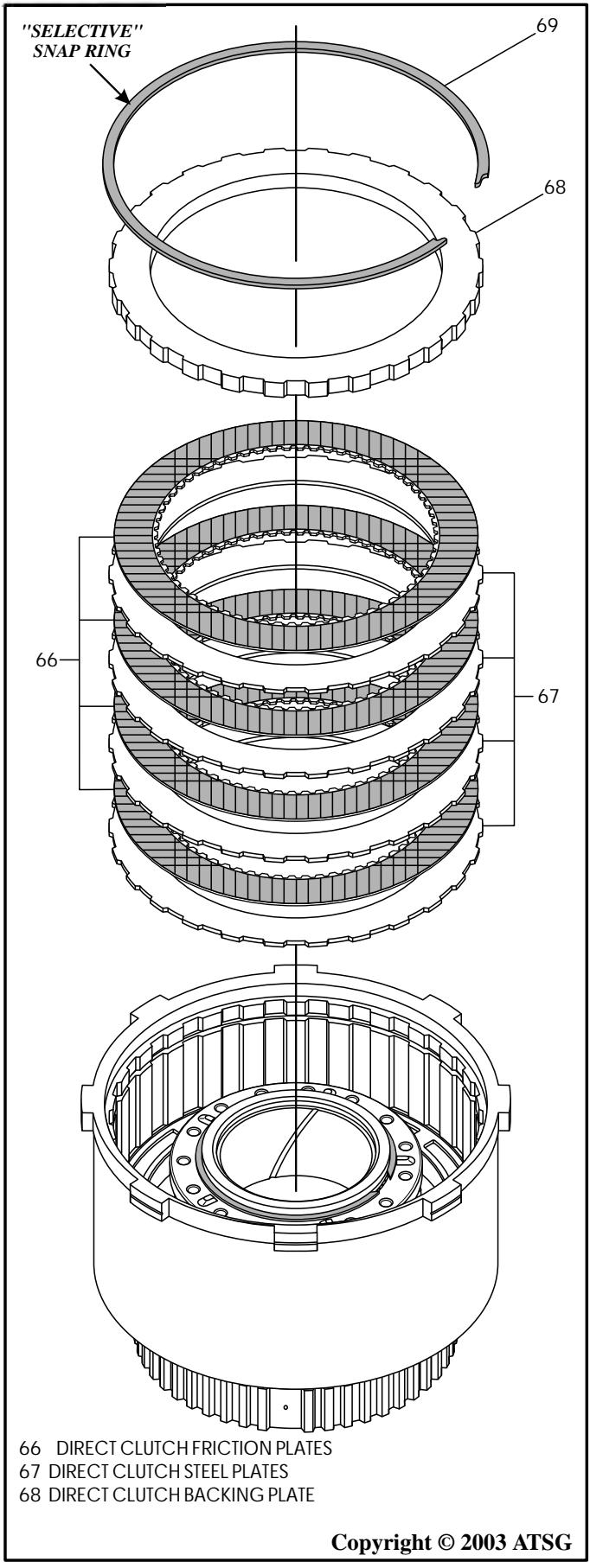


Figure 120

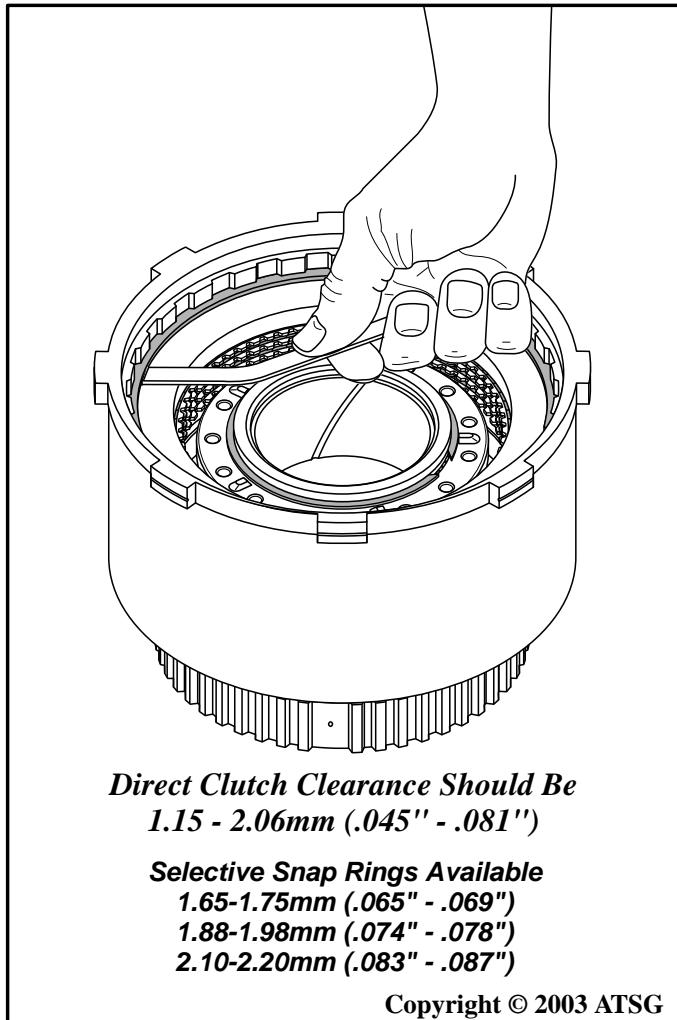


Figure 121

COMPONENT REBUILD**Forward And Direct Clutch Sub-Assemblies**

1. We are once again showing you the difference between the "Early" and "Late" direct clutch housings in Figures 122 and 123, as this is the last chance you will have to install the number 8A thrust washer, if you require one.
2. Place the completed direct clutch housing on a flat work surface in the direction that is shown in Figure 123.
3. Install the completed forward clutch housing into the completed direct clutch housing by rotating back and forth until fully seated, as shown in Figure 123.

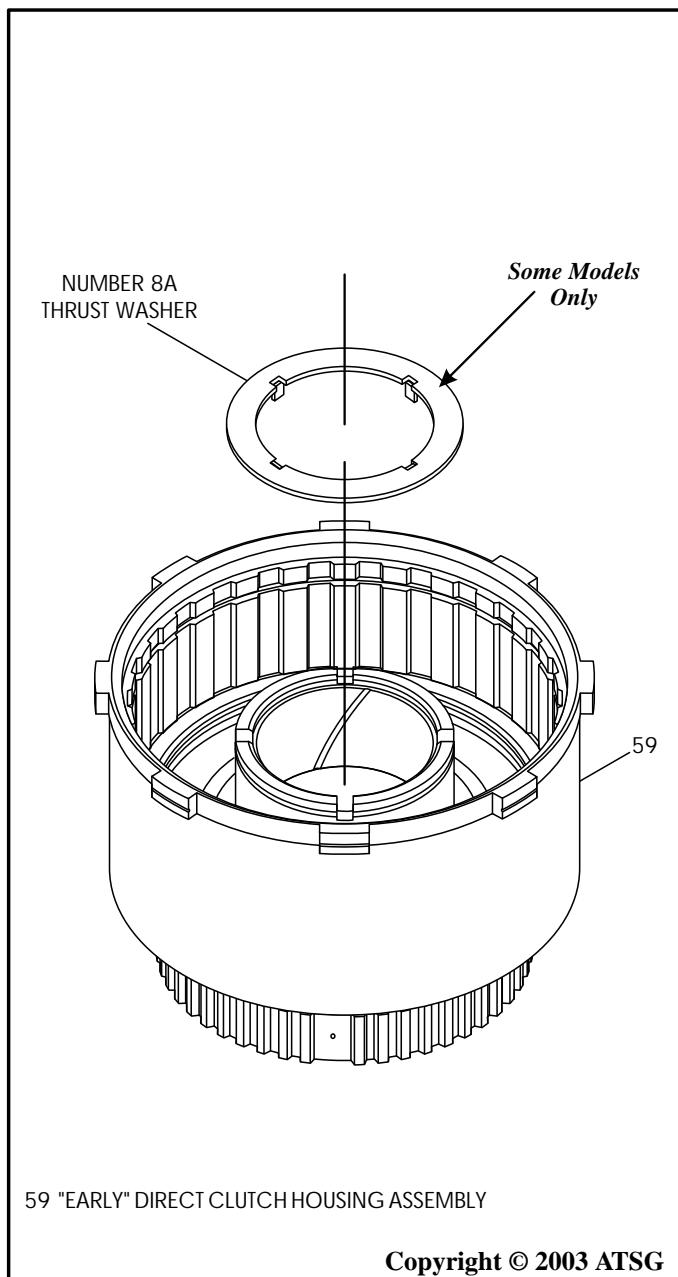


Figure 122

4. Install the number 9A thrust bearing into the forward clutch housing in the direction shown in Figure 124, with black side facing up.
5. Install the number 8C thrust washer onto the forward ring gear and hub assembly, as shown in Figure 125, and retain with Trans-Jel®.
6. Install forward ring gear and thrust washer into forward clutch plates, as shown in Figure 126, by rotating back and forth until fully seated.

Continued on Page 78.

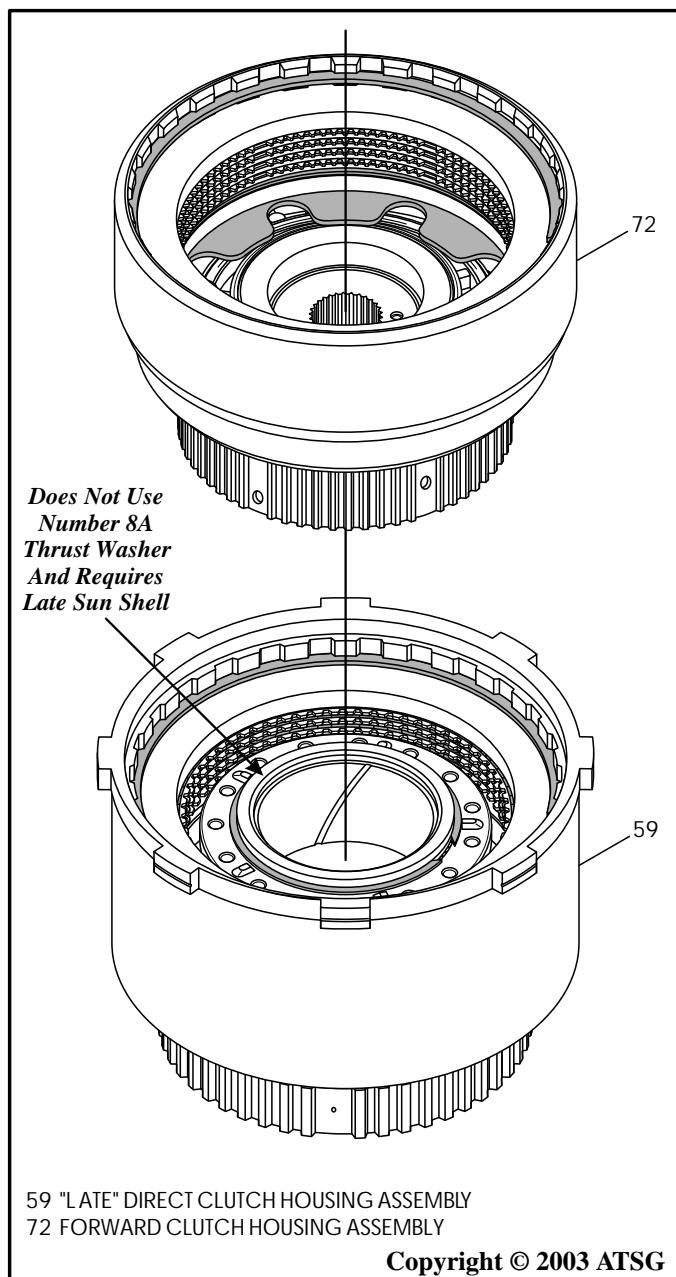
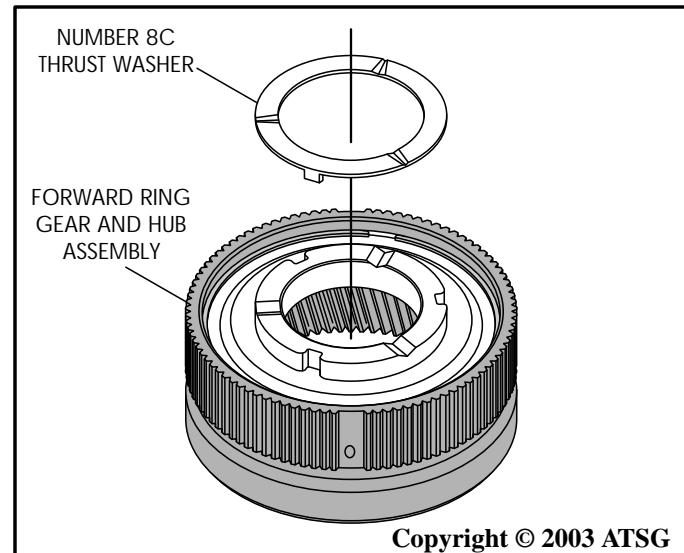


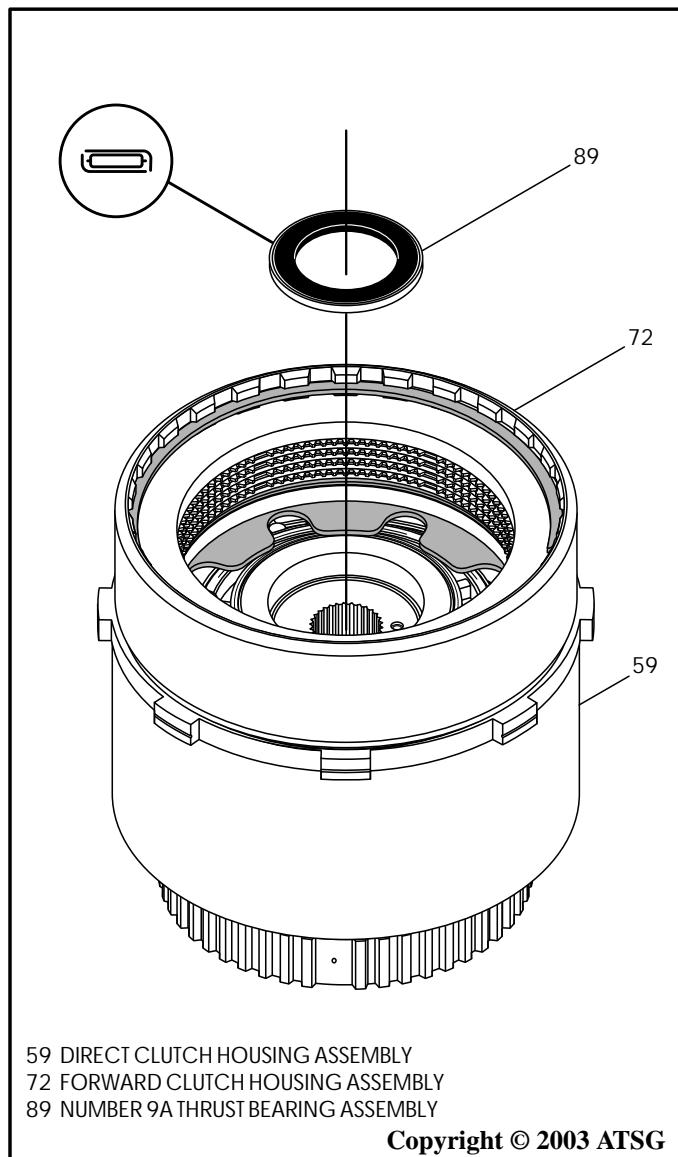
Figure 123

Technical Service Information



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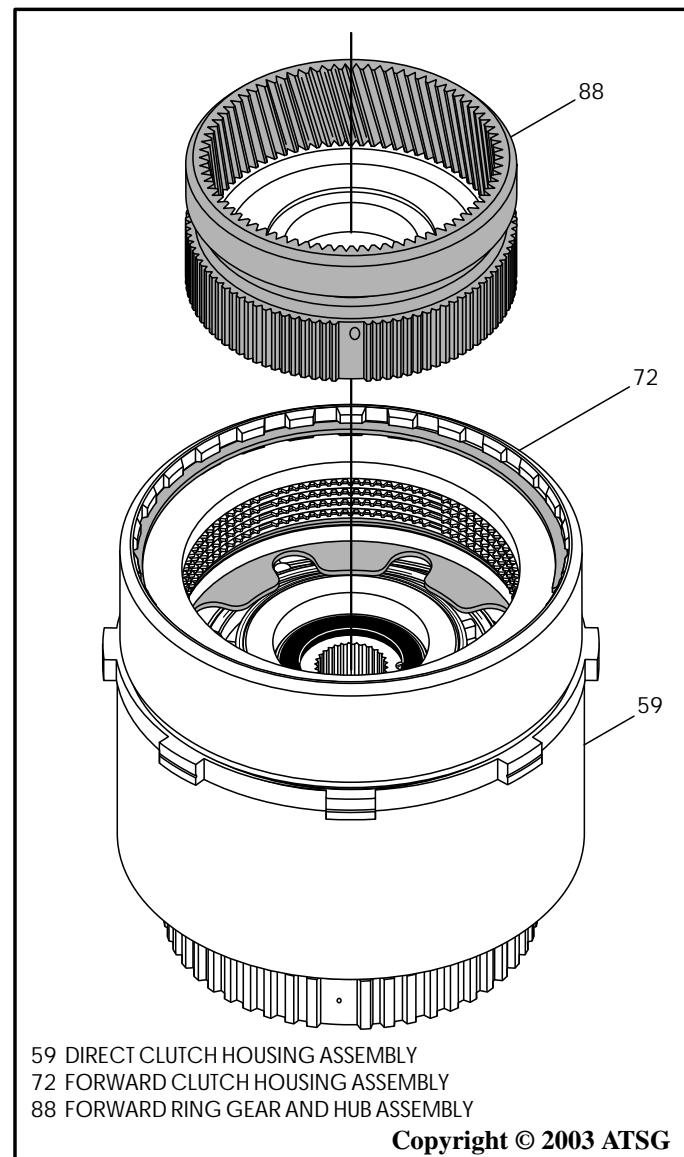
Figure 125



59 DIRECT CLUTCH HOUSING ASSEMBLY
72 FORWARD CLUTCH HOUSING ASSEMBLY
89 NUMBER 9A THRUST BEARING ASSEMBLY

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Figure 124



59 DIRECT CLUTCH HOUSING ASSEMBLY
72 FORWARD CLUTCH HOUSING ASSEMBLY
88 FORWARD RING GEAR AND HUB ASSEMBLY

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Figure 126

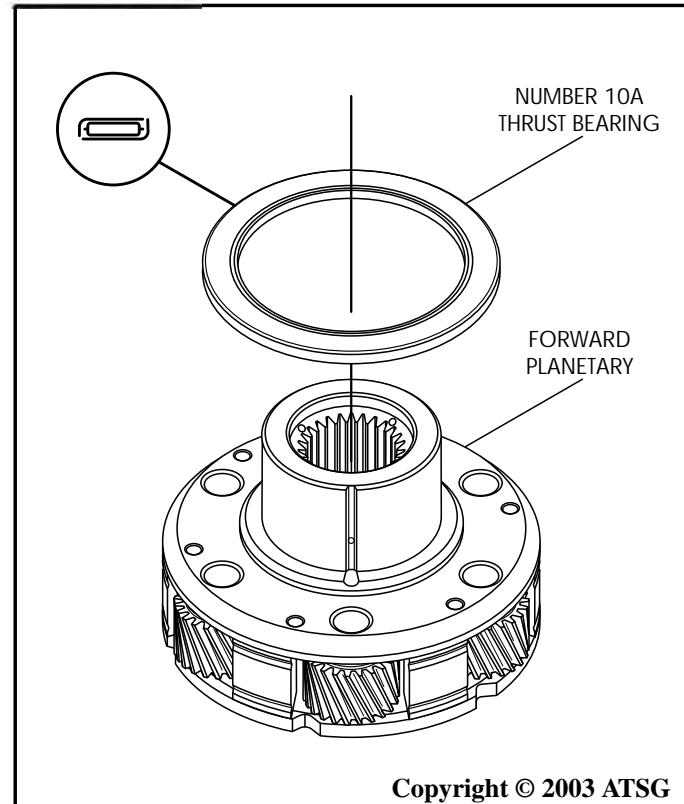


Figure 127

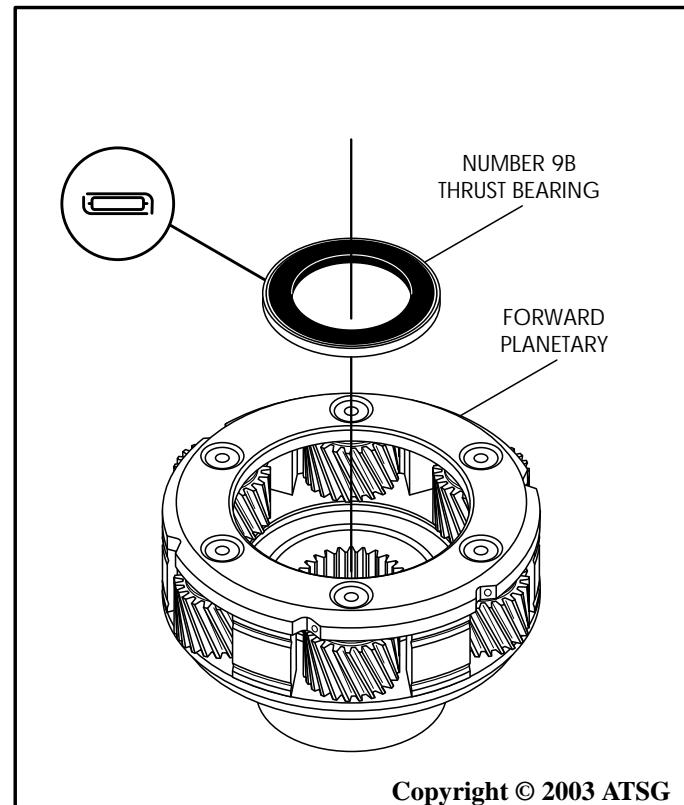


Figure 128

COMPONENT REBUILD

Forward And Direct Clutch Sub-Assemblies

7. Install the number 10A thrust bearing onto the forward planetary carrier, in the direction that is shown in Figure 127, and retain the bearing with Trans-Jel®.
8. Turn the planetary carrier over and install the number 9B thrust bearing into the planetary carrier in the direction shown in Figure 128.
Note: Black side faces up.
9. Install the complete forward planetary carrier assembly into the ring gear, by rotating into position, as shown in Figure 129.

Continued on Page 79.

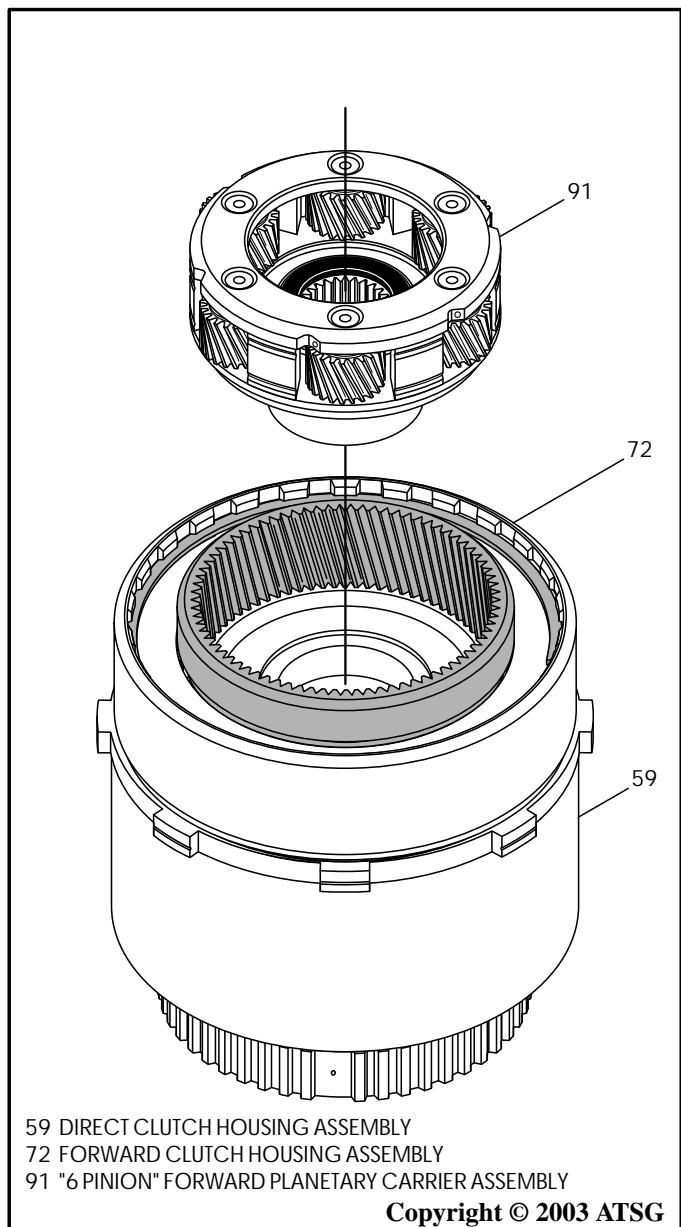


Figure 129

COMPONENT REBUILD***Forward And Direct Clutch Sub-Assemblies***

10. Install the proper sun gear shell over the entire assembly, as shown in Figure 130.
11. Hold the completed assembly together and roll complete assembly over so that it is setting on the sun gear, as shown in Figure 131.
12. Install the number 8B thrust washer onto the forward clutch drum surface, in the direction shown in Figure 131.

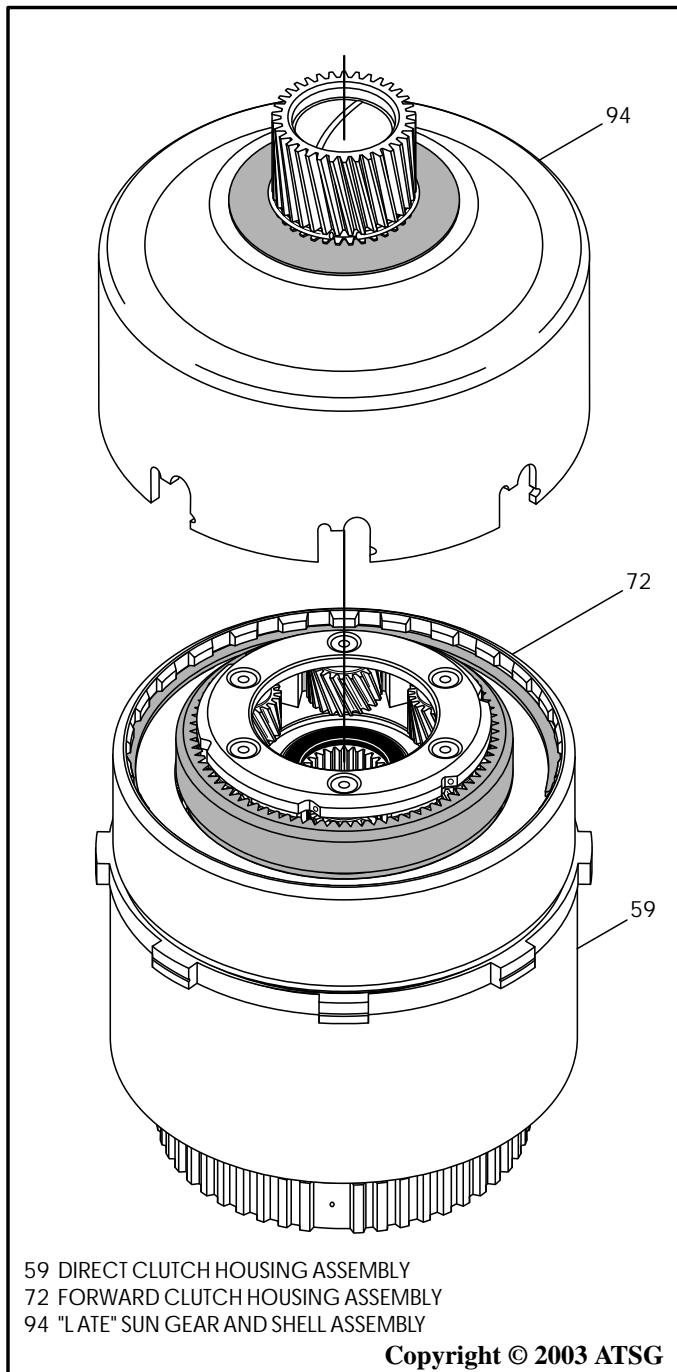


Figure 130

13. Install the installation tool onto the complete assembly, as shown in Figure 131, and set the completed assembly aside for final assembly.

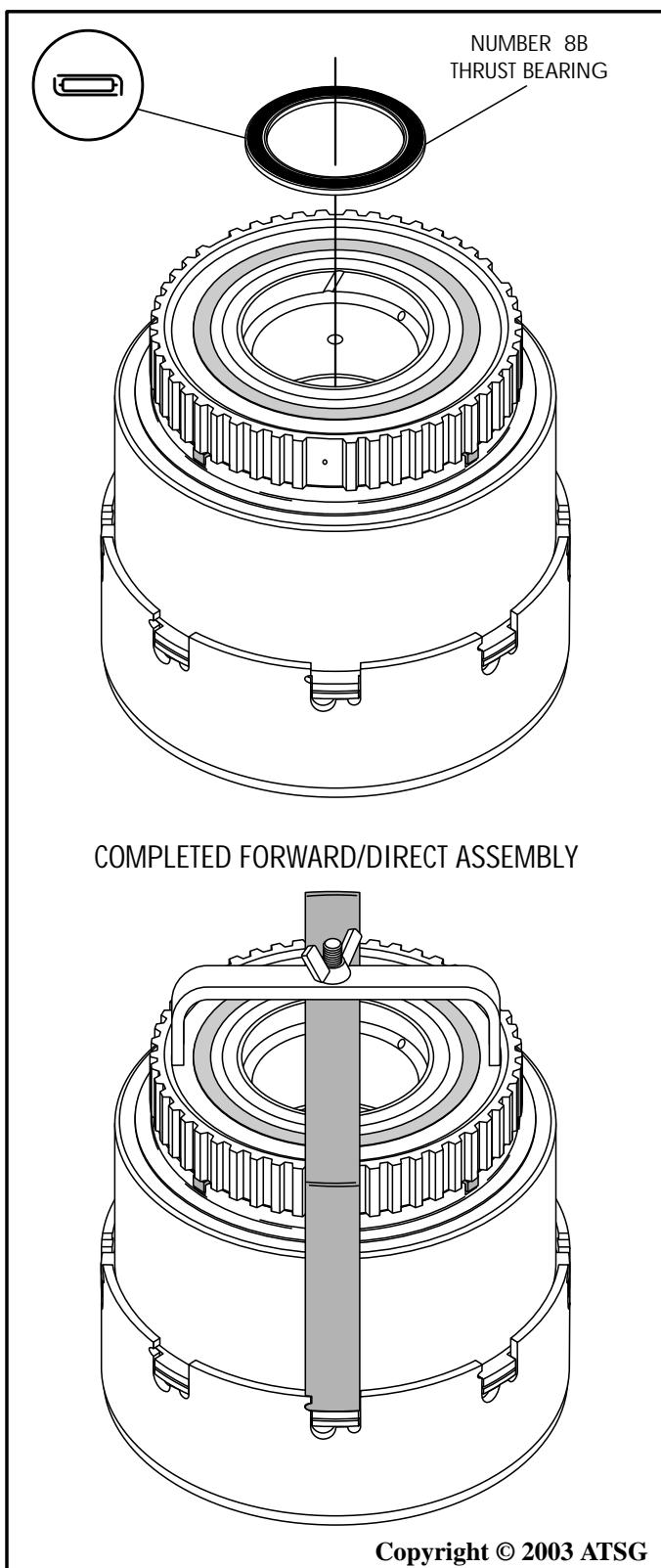


Figure 131

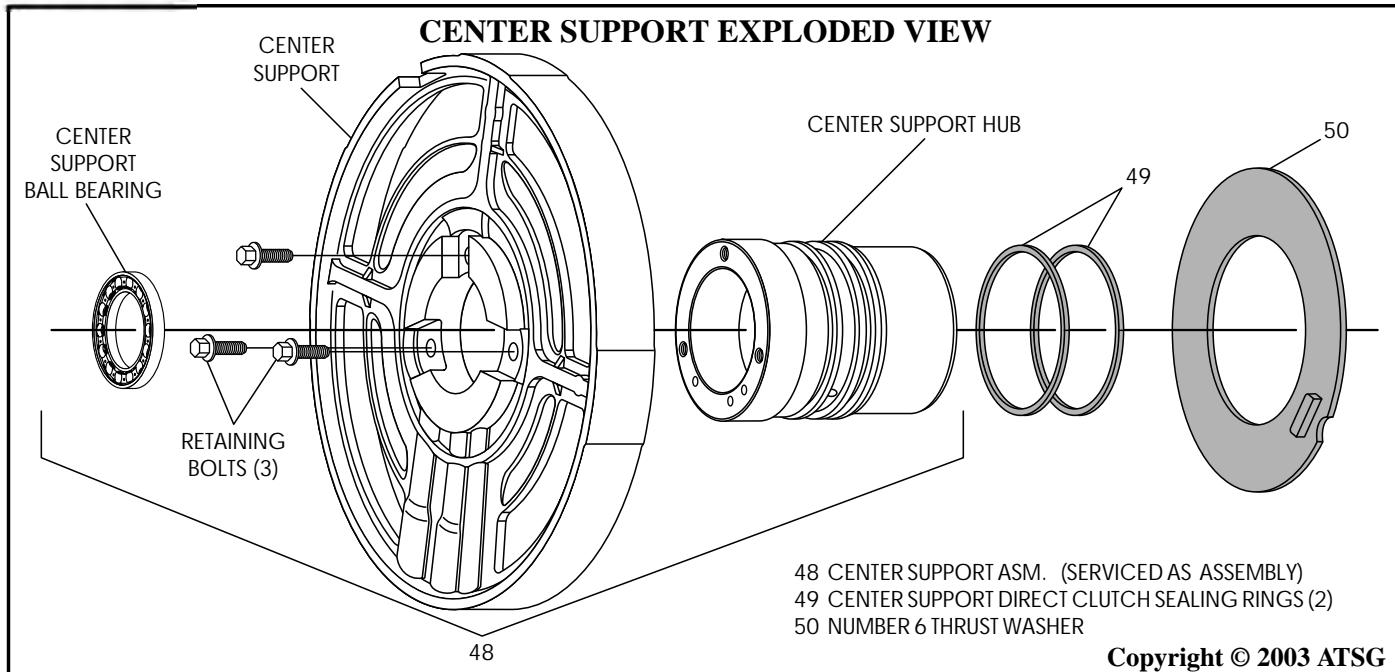


Figure 132

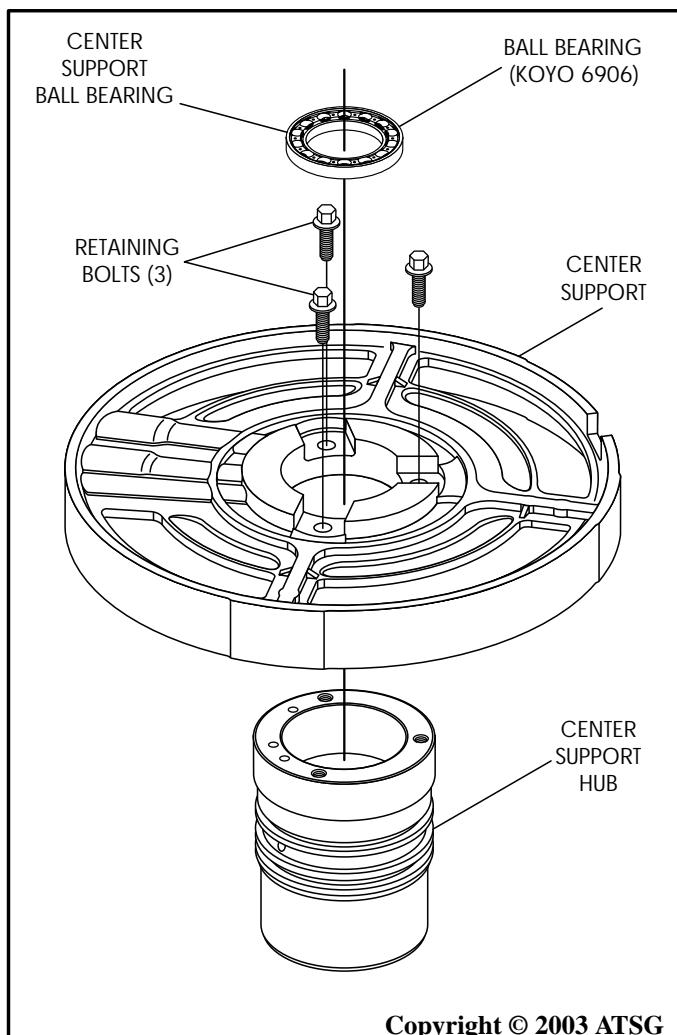


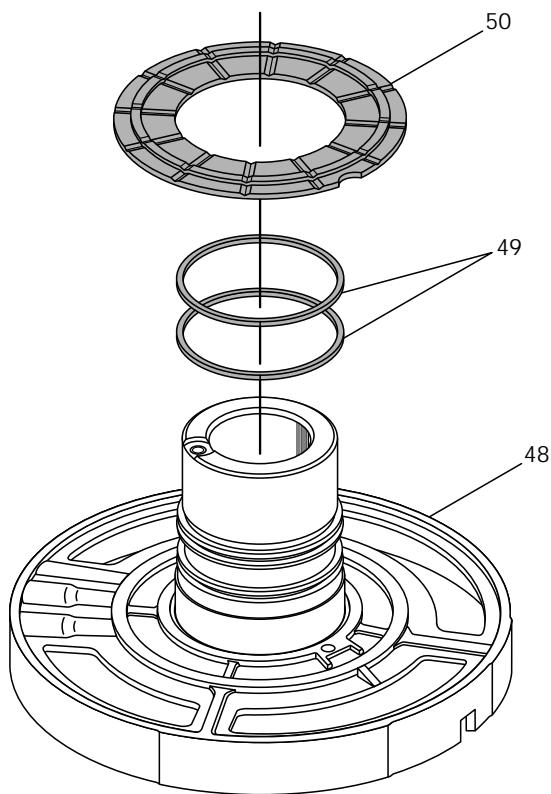
Figure 133

1. Disassemble center support, if necessary, using Figure 132 as a guide.
2. Clean all center support parts thoroughly using a suitable cleaning solution and blow dry with compressed air.
3. Inspect all center support parts thoroughly for any wear and/or damage.
4. Remove and discard the two center support direct clutch sealing rings (See Figure 132).
5. It is not necessary to remove the center support from the hub, but if you did, assemble the hub to support as shown in Figure 133, and torque the retaining bolts to 9 - 14 N·m (80-100 in.lb.).
6. The ball bearing in the center support is not serviced by Ford, but is available from your local bearing supply house using the number supplied in Figure 133.
7. Install a new ball bearing into center support, as shown in Figure 133, using proper bearing drivers.
8. Turn the center support over and install new sealing rings into the grooves in center support hub, as shown in Figure 134.

Continued on Page 81.

COMPONENT REBUILD***Center Support Assembly***

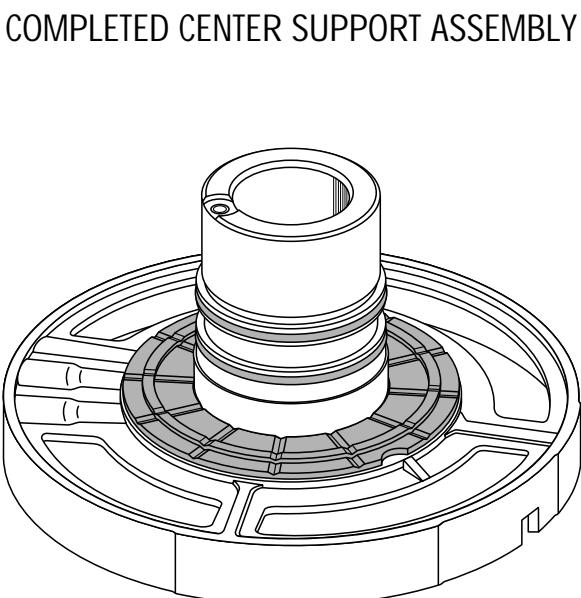
9. If the sealing rings are the "Hook" joint type, ensure that they are properly hooked and that they rotate freely in the grooves.
10. Install the number 6 thrust washer onto center support, as shown in Figure 134, and retain with Trans-Jel®.
11. Set the completed center support assembly aside for final assembly (See Figure 135).



48 CENTER SUPPORT ASM. (SERVICED AS ASSEMBLY)
49 CENTER SUPPORT DIRECT CLUTCH SEALING RINGS (2)
50 NUMBER 6 THRUST WASHER

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Figure 134

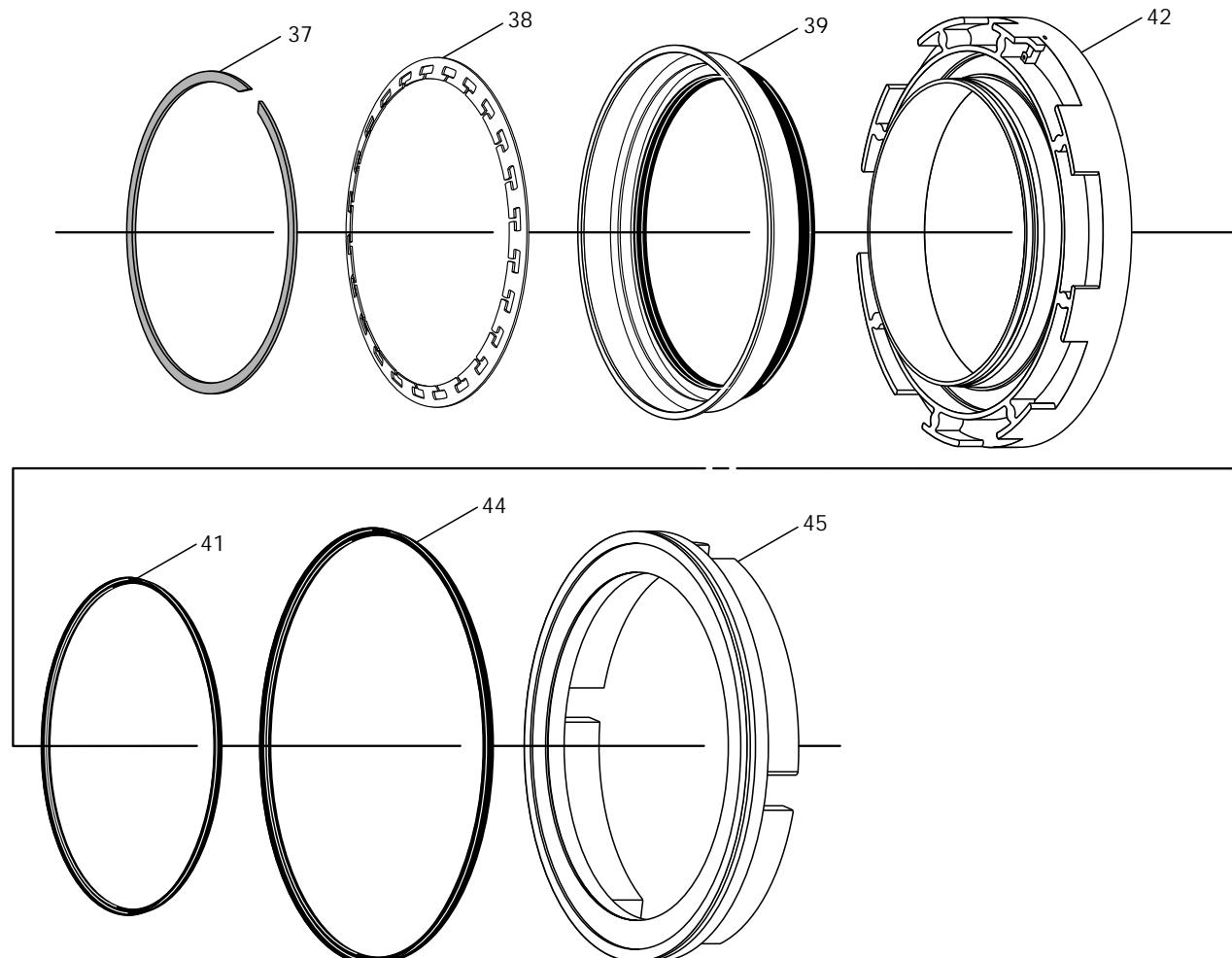


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Figure 135

Component Rebuild
Continued on Page 82.

INTERMEDIATE/OVERDRIVE SUPPORT ASSEMBLY EXPLODED VIEW



37 OVERDRIVE CLUTCH PISTON RETURN SPRING SNAP RING

38 OVERDRIVE CLUTCH PISTON RETURN SPRING

39 OVERDRIVE CLUTCH PISTON

41 INTERMEDIATE CLUTCH PISTON INNER LIP SEAL

42 INTERMEDIATE AND OVERDRIVE CLUTCH CYLINDER

44 INTERMEDIATE CLUTCH PISTON OUTER LIP SEAL

45 INTERMEDIATE CLUTCH PISTON

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Figure 136

COMPONENT REBUILD*Intermediate/Overdrive Support Assembly*

1. Disassemble intermediate/overdrive cylinder using Figure 136 as a guide.
2. Clean all intermediate/overdrive cylinder parts thoroughly using a suitable cleaning solution.
3. Inspect all intermediate/overdrive cylinder parts thoroughly for any wear and/or damage.
4. Remove and discard overdrive clutch molded piston and both intermediate clutch piston lip seals.
5. Place the intermediate/overdrive cylinder on a flat work surface, in the direction shown in Figure 137.
6. Install a new intermediate clutch piston inner lip seal into the groove in cylinder, with the lip facing the direction shown in Figure 137.
7. Install a new intermediate clutch piston outer lip seal into the groove in piston, with the lip facing the direction shown in Figure 137.
8. Lubricate both lip seals with Trans-Jel®, and install piston assembly into cylinder, as shown in Figure 137.
9. Turn the cylinder over, as shown in Figure 138, and install a new overdrive molded piston.

Continued on Page 83.

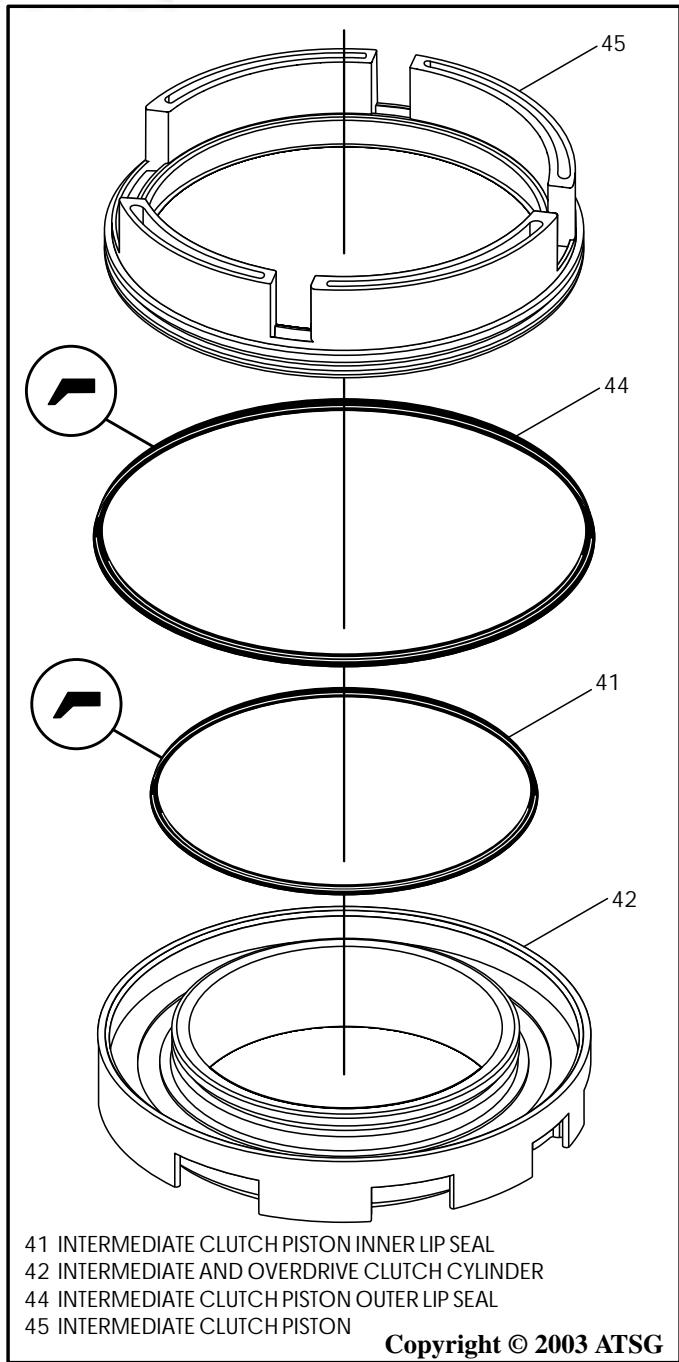
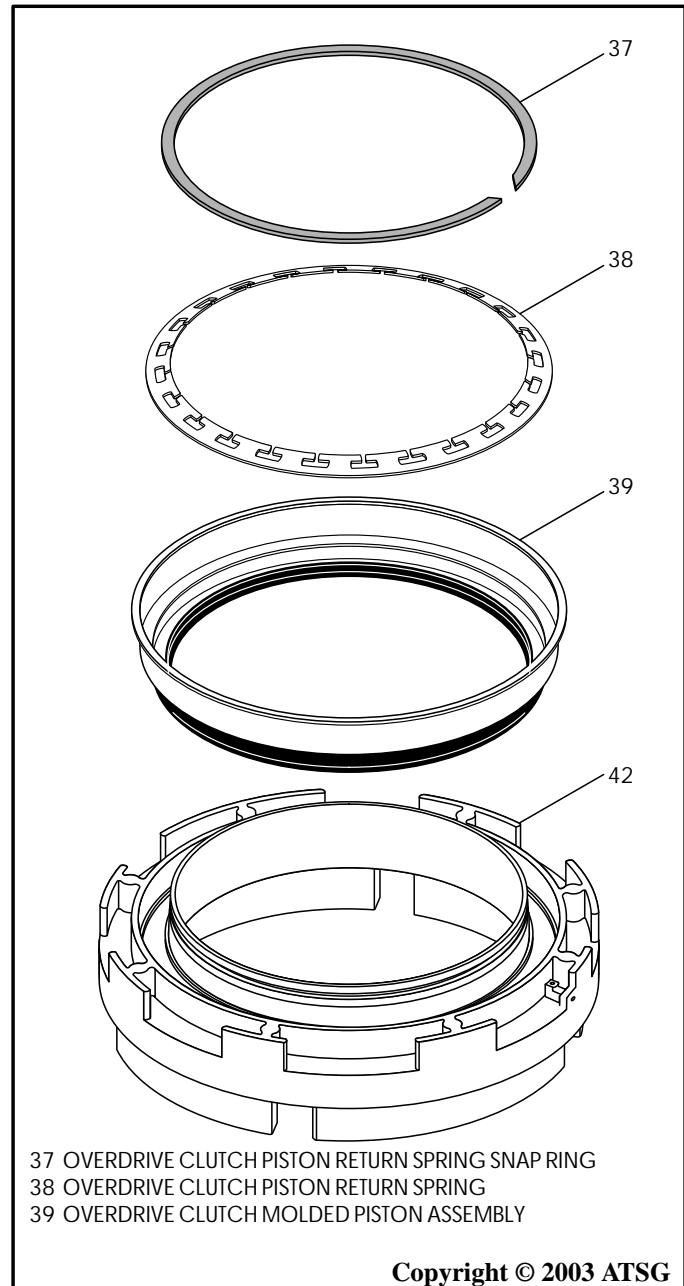


Figure 137

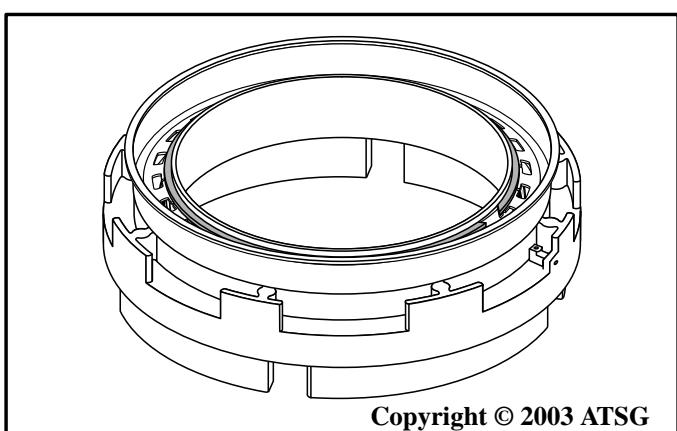
Intermediate/Overdrive Support Assembly (Cont'd)

10. Install the overdrive clutch piston return spring in the direction shown in Figure 138.
11. Compress the return spring and install snap ring and ensure it is fully seated (See Figure 138).
12. Set completed intermediate/overdrive clutch cylinder aside for the final assembly process. (See Figure 139).



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Figure 138



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Figure 139

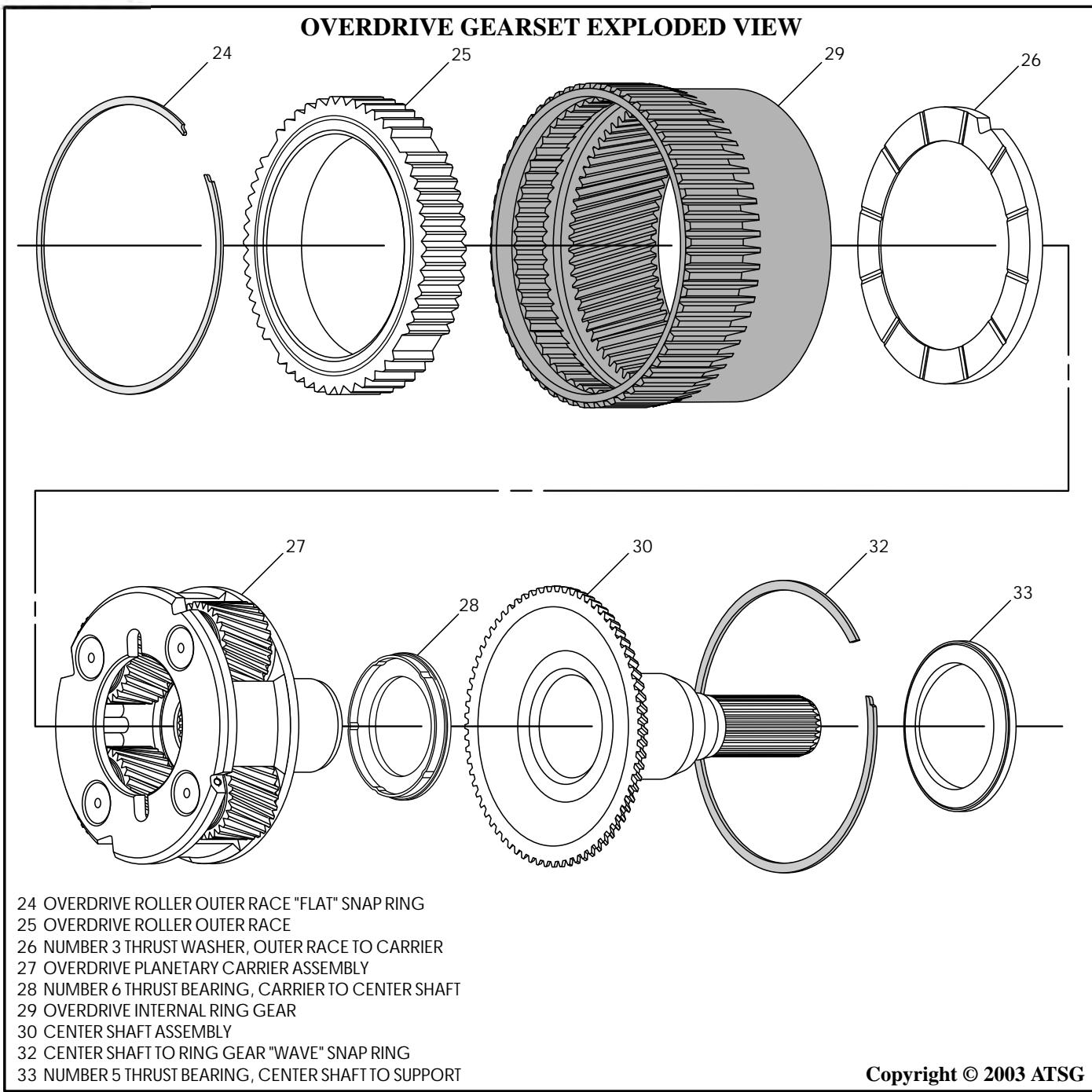


Figure 140

COMPONENT REBUILD

Overdrive Gearset Assembly

1. Disassemble overdrive gearset using Figure 140 as a guide.
2. Clean all overdrive gearset parts thoroughly using a suitable cleaning solution.
3. Inspect all overdrive gearset parts thoroughly for any wear and/or damage.
4. Position the overdrive ring gear on a flat work surface, as shown in Figure 141.
5. Install overdrive roller clutch outer race into overdrive ring gear, as shown in Figure 141.
Note: Groove in outer race must face up, as shown in Figure 141.

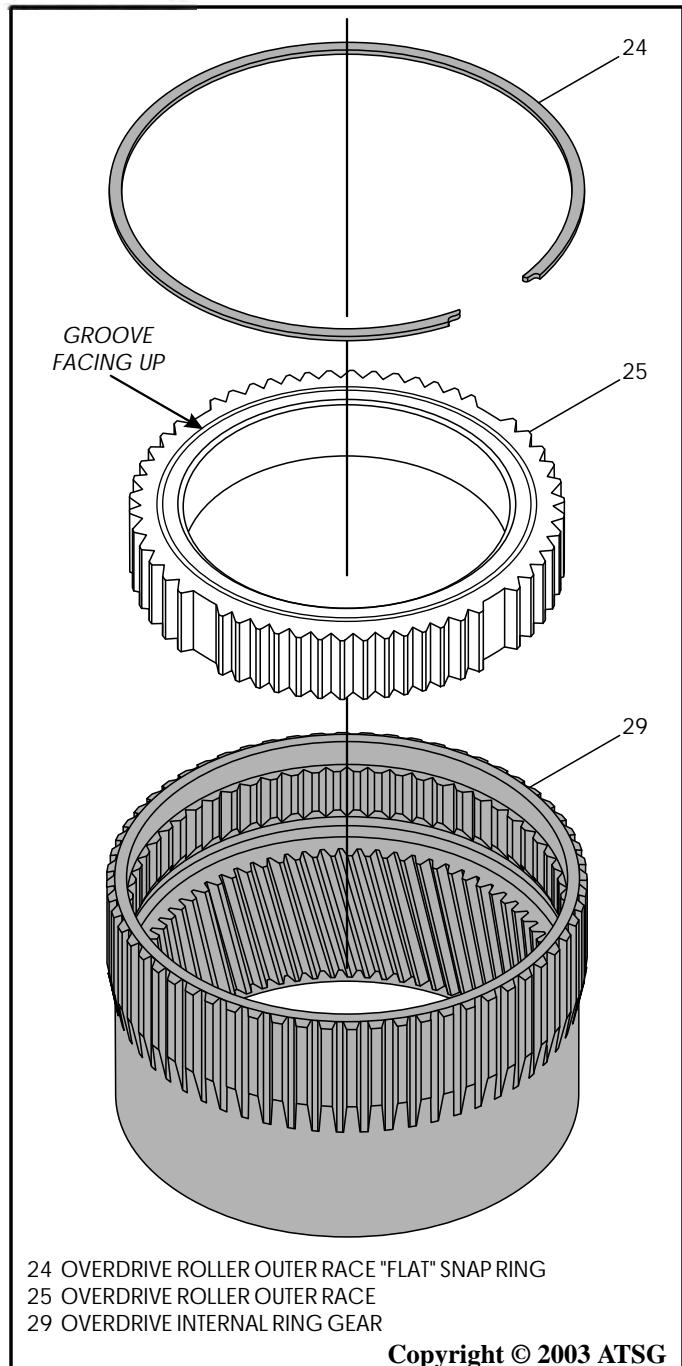


Figure 141

Overdrive Gearset Assembly (Cont'd)

6. Install the **flat** snap ring into the groove in ring gear, as shown in Figure 141, and ensure that it is fully seated, as shown in Figure 142.
7. Install number 3 thrust washer onto back of the overdrive planetary carrier and retain with a small amount of Trans-Jel® (See Figure 143).

Continued on Page 86.

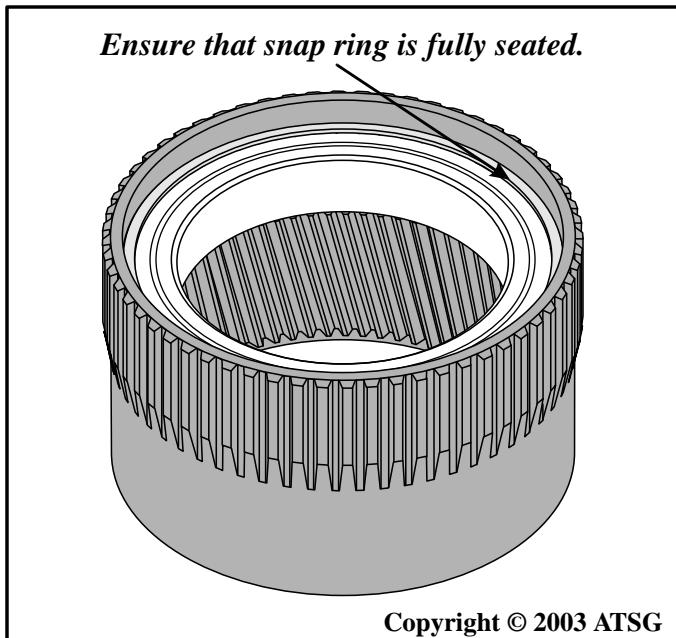


Figure 142

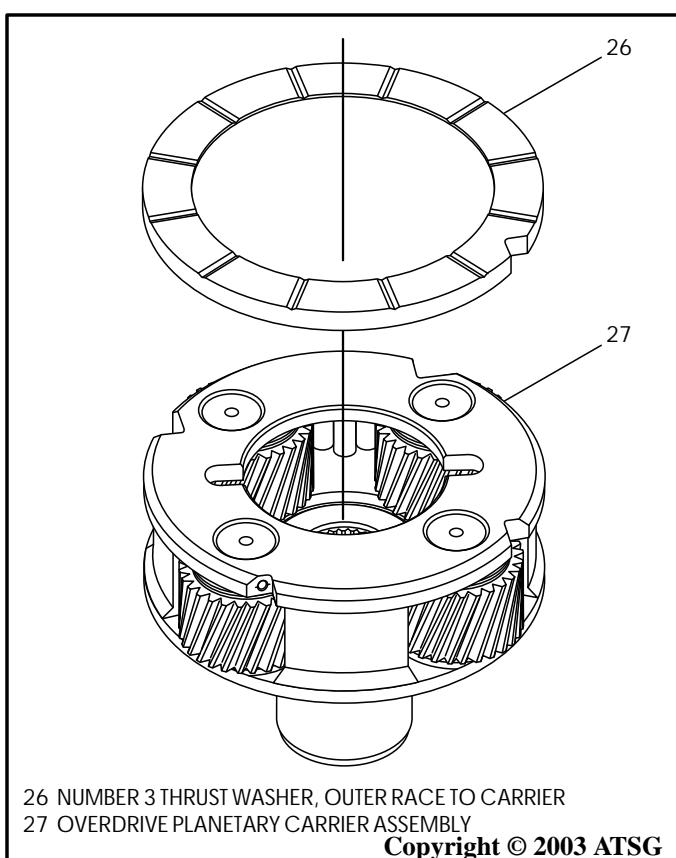
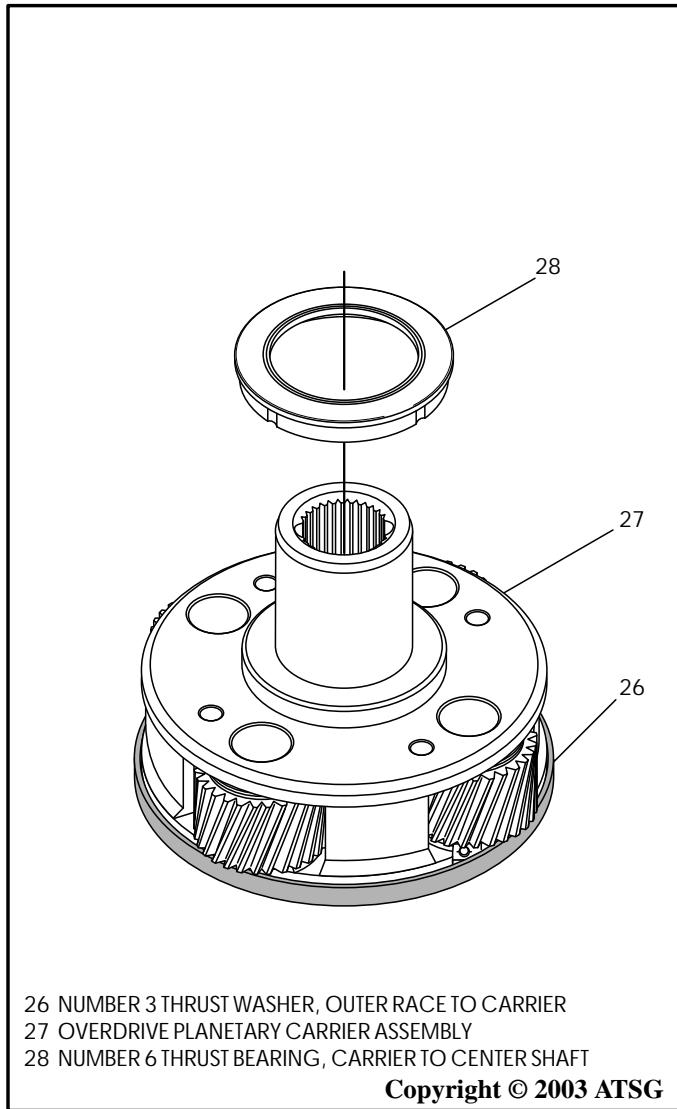


Figure 143

COMPONENT REBUILD

Overdrive Gearset Assembly (Cont'd)

8. Flip the overdrive planetary carrier over with the number 3 thrust washer installed, as shown in Figure 144.
9. Install the number 6 thrust bearing onto the overdrive planetary carrier in the direction shown in Figure 144.
10. Install completed overdrive planetary carrier into the pre-assembled overdrive ring gear, as shown in Figure 145, by rotating into position until fully seated.
11. Install the overdrive center shaft onto overdrive planetary carrier, as shown in Figure 146.
12. Install the *wave* center shaft snap ring into the groove in ring gear, as shown in Figure 146.
Note: Use a brass drift against the wave snap ring to ensure that it is fully seated.

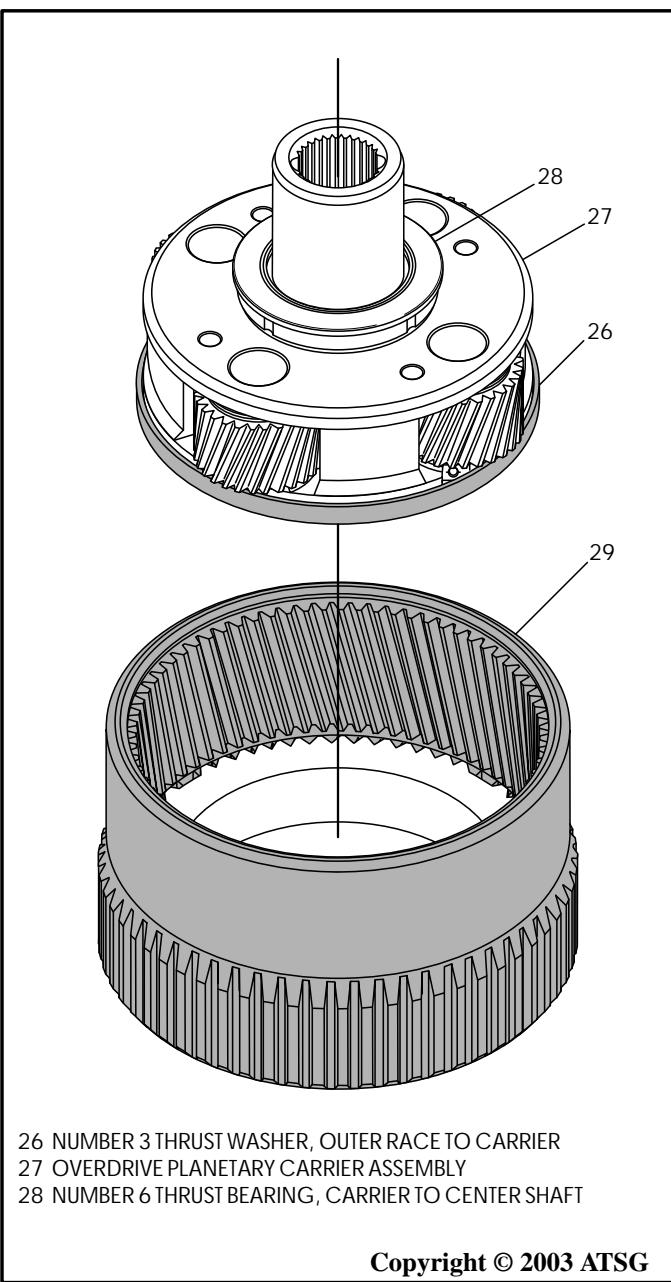


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Figure 144

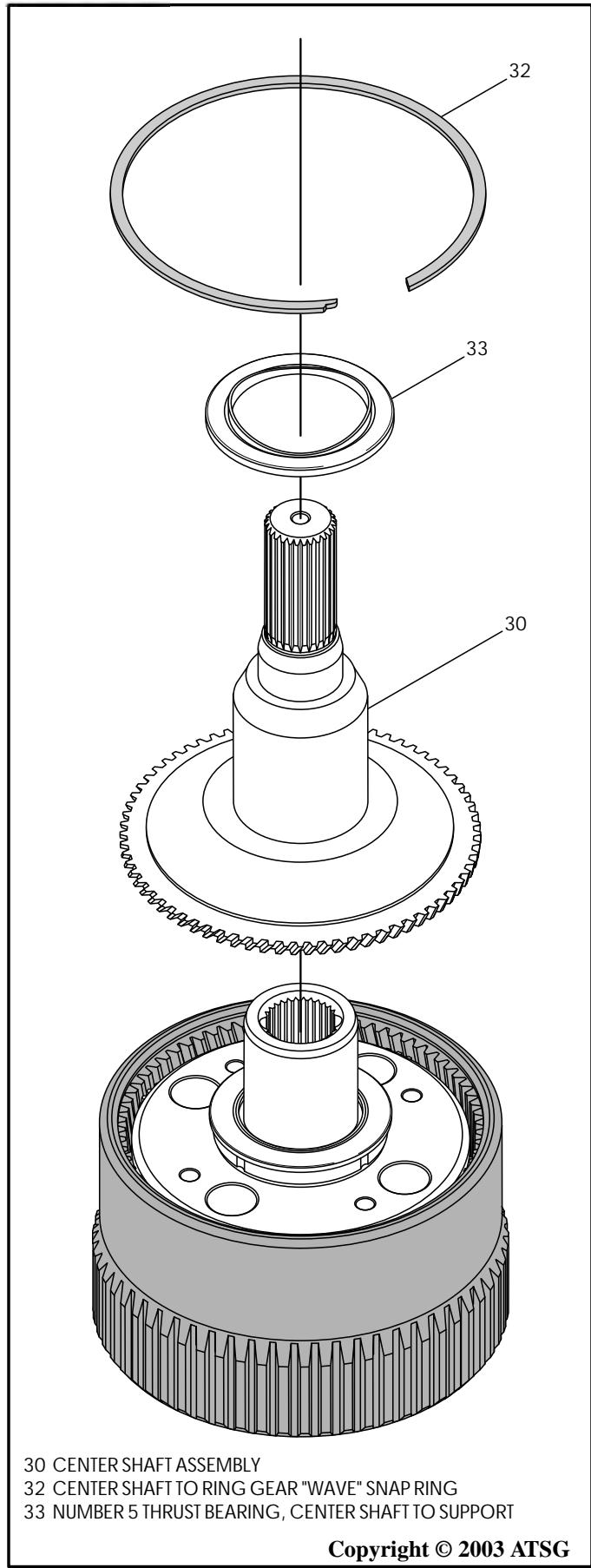
13. Install the number 5 thrust bearing on overdrive center shaft, in direction shown in Figure 146, and retain with Trans-Jel®.
14. Set the completed overdrive gearset aside for additional sub-assembly after the coast clutch housing is built (See Figure 147).

**Component Rebuild
Continued on Page 88.**



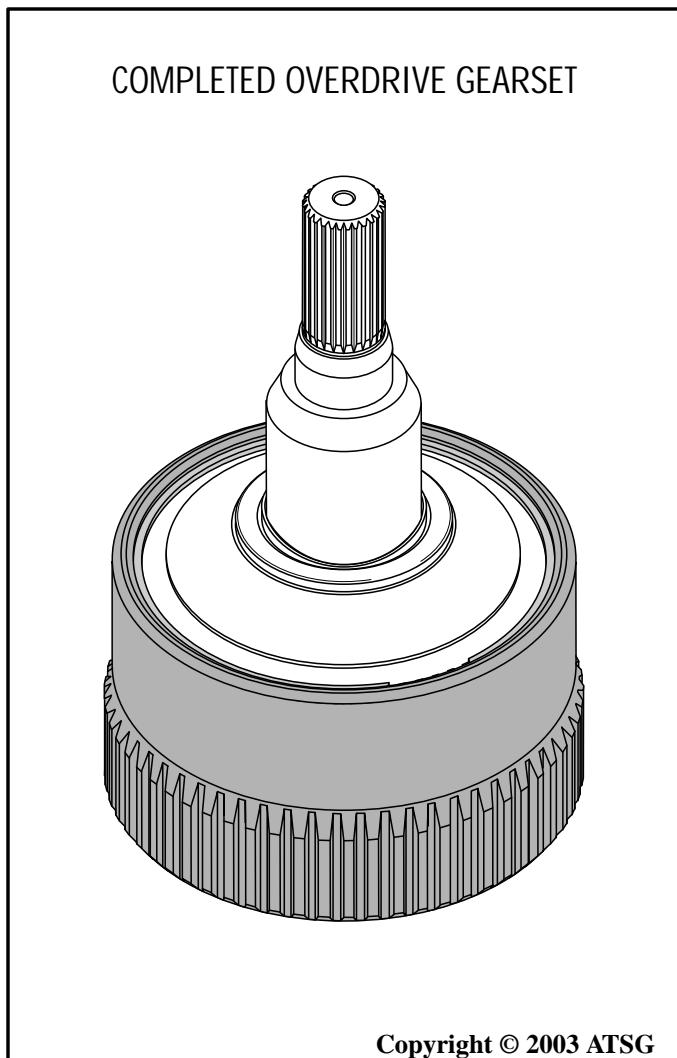
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Figure 145



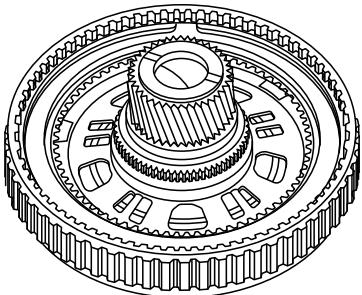
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Figure 146

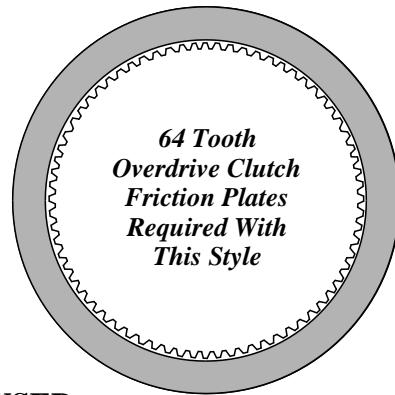


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Figure 147

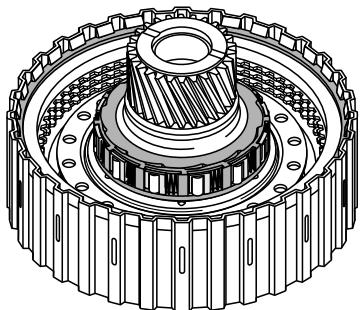


**60 Tooth
Coast Clutch
Steel Plates
Required With
This Style**

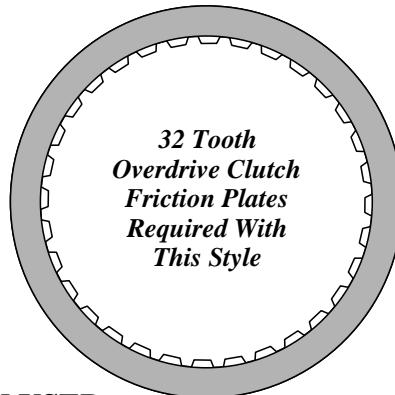


**64 Tooth
Overdrive Clutch
Friction Plates
Required With
This Style**

**"CAST IRON" COAST CLUTCH DRUM USED
WITH 5.4L AND 6.8L "WITHOUT" PTO OPTION**

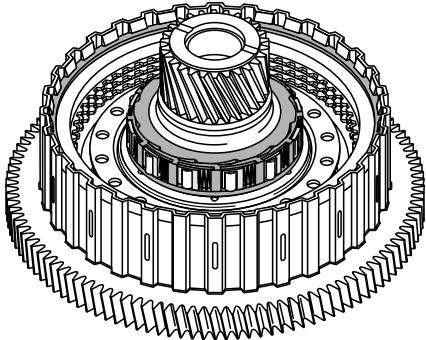


**32 Tooth
Coast Clutch
Steel Plates
Required With
This Style**

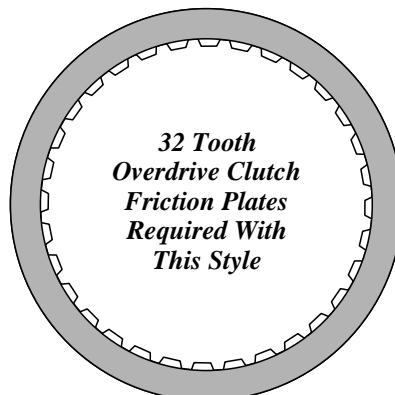


**32 Tooth
Overdrive Clutch
Friction Plates
Required With
This Style**

**"STAMPED STEEL" COAST CLUTCH DRUM USED
WITH 5.4L AND 6.8L "WITHOUT" PTO OPTION**



**32 Tooth
Coast Clutch
Steel Plates
Required With
This Style**



**32 Tooth
Overdrive Clutch
Friction Plates
Required With
This Style**

**"STAMPED STEEL" COAST CLUTCH DRUM USED
WITH 6.8L AND 7.3L "WITH" PTO OPTION**

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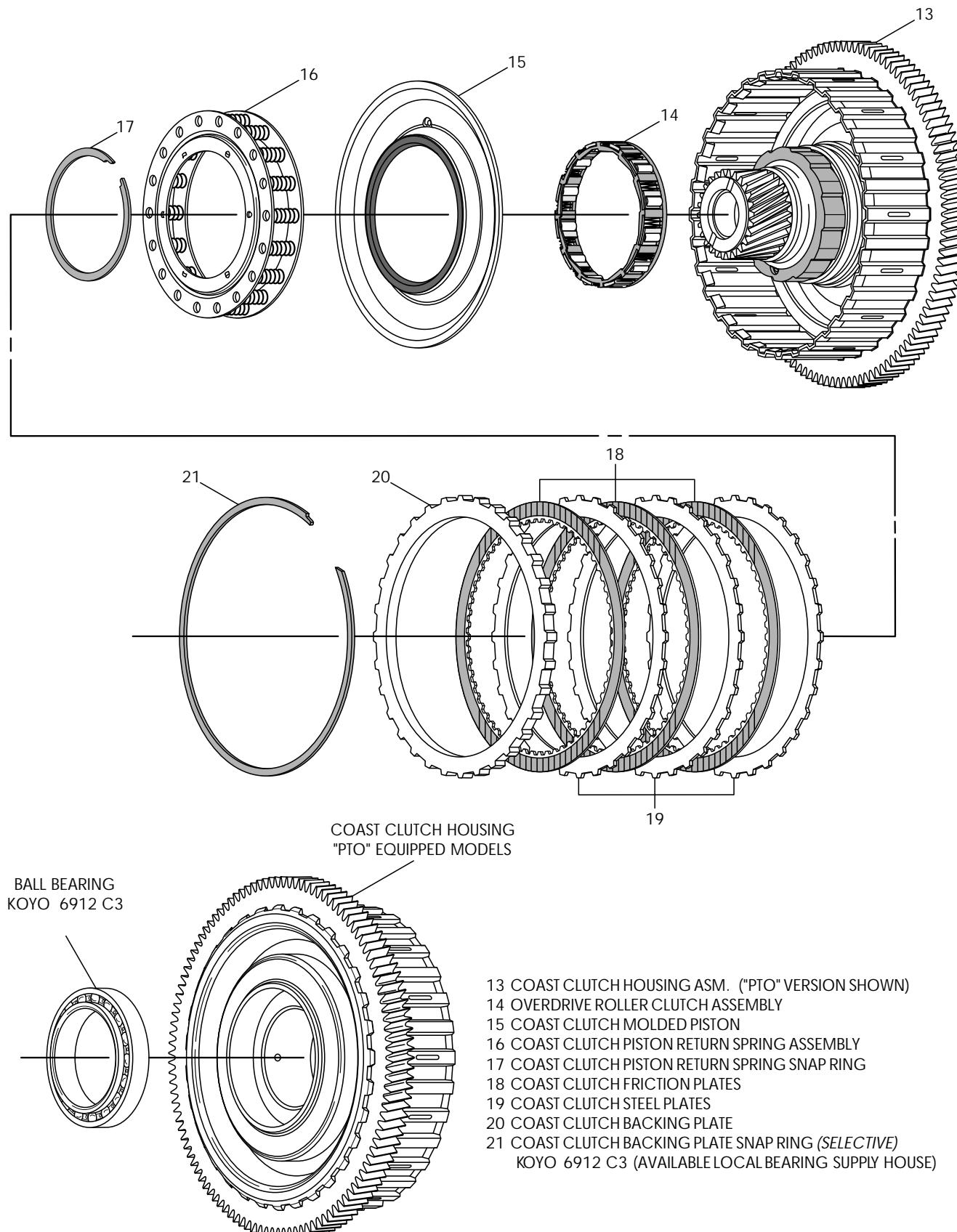
Figure 148

Coast Clutch Housing Changes

The coast clutch housing is model sensitive and there are three different versions, as shown above. The "Cast-Iron" coast clutch housing is the same as the E4OD housing. When the "Stamped Steel" version was introduced, it affected other parts in the transmission, like the coast clutch steel plates and the overdrive friction plates, as shown above.

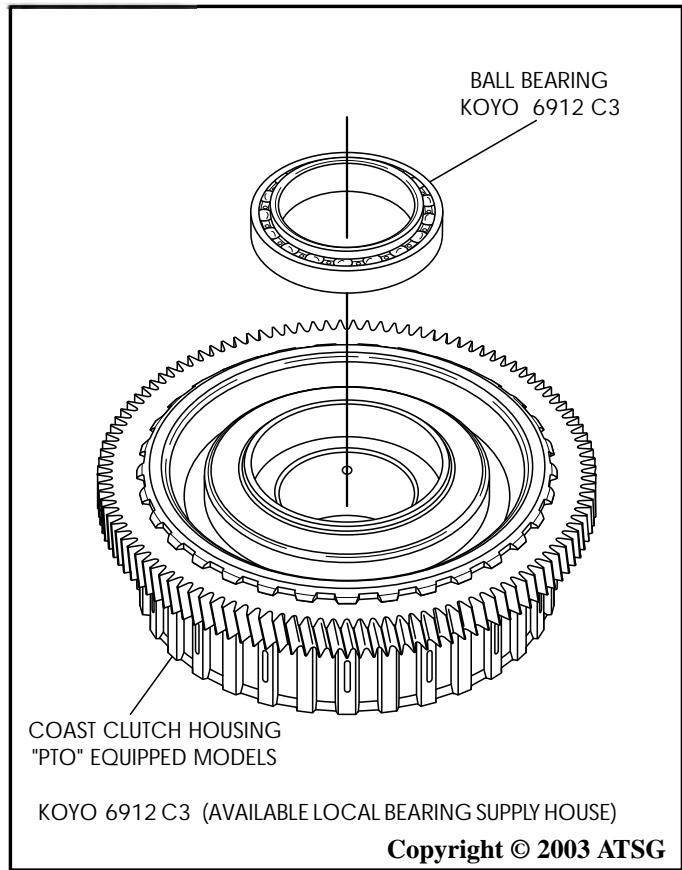
The sealing ring locations on the oil pump stator were also affected, which makes the oil pump stator shaft model sensitive, depending on which coast clutch housing you have, but we will discuss this in the oil pump section of this manual.

The rebuild procedure on all 3 coast clutch housings is very similar and begins on Page 90.



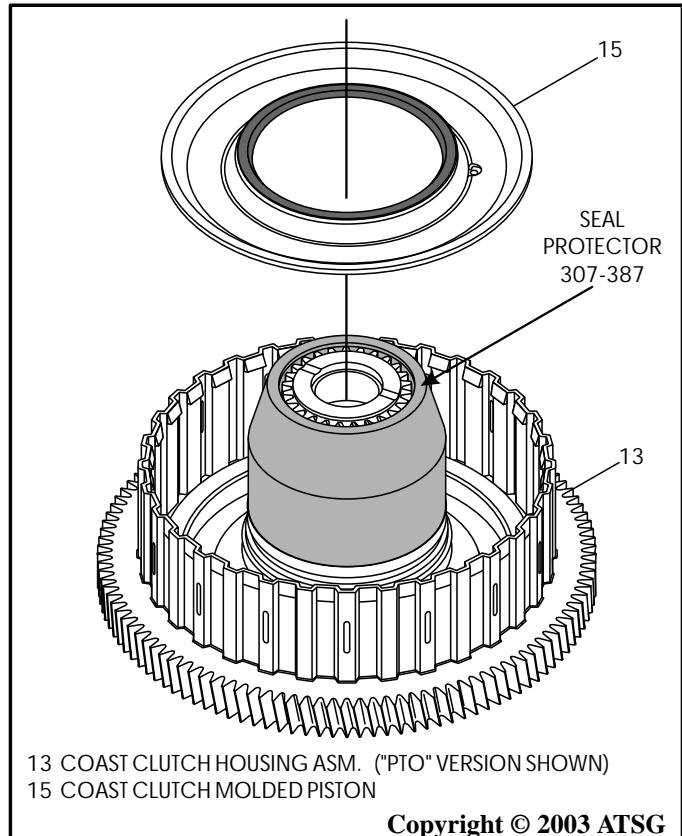
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Figure 149



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Figure 150



Copyright © 2003 ATSG

Figure 151

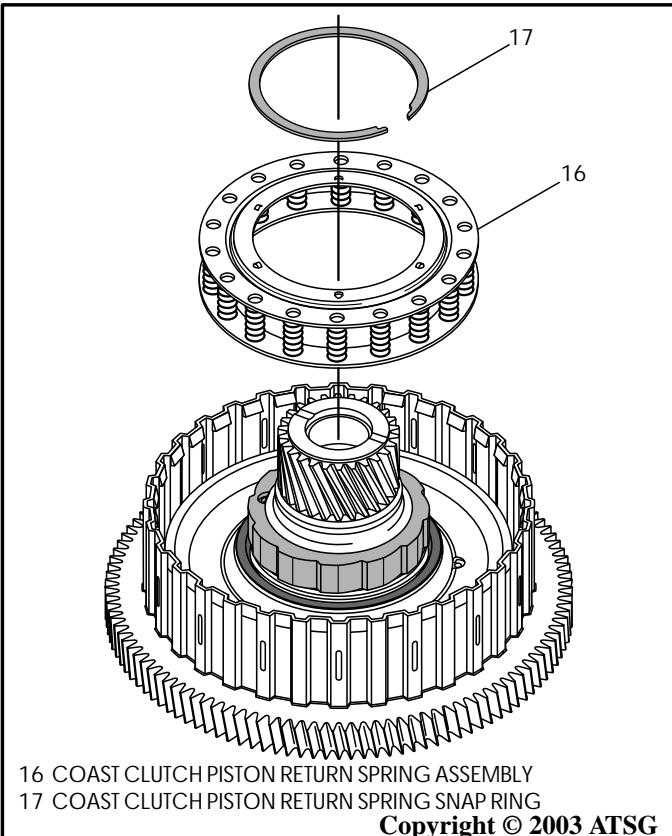
COMPONENT REBUILD**Coast Clutch Housing**

1. Disassemble the coast clutch housing using Figures 148 and 149 as a guide.

Note: Figure 148 illustrates the 3 different coast clutch housings available in 4R100 transmissions. The procedures for rebuild are very similar. We will be illustrating the "PTO" version.

2. Clean all coast clutch housing parts thoroughly using a suitable cleaning solution and dry with compressed air.
3. Inspect all coast clutch parts thoroughly for any wear and/or damage.
4. Remove and discard the molded coast clutch piston. (See Figure 149).
5. Replace the ball bearing as necessary using the proper pullers and press (See Figure 150).
Note: This ball bearing is not available from Ford individually, but is available from your local bearing supply under KOYO 6912 C3.
6. Place the coast clutch housing on a flat work surface, as shown in Figure 151.

Continued on Page 91.



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Figure 152

Coast Clutch Housing (Cont'd)

7. Install lip seal protector 307-387 onto the coast clutch housing, as shown in Figure 151.
8. Lubricate both seals on the new coast clutch piston and install piston into the coast clutch housing, as shown in Figure 151.
9. Install the coast clutch piston return spring assembly, as shown in Figure 152.
10. Compress the return spring assembly using a foot press and install the return spring snap ring, as shown in Figure 152, and ensure that it is fully seated.
11. Install the overdrive roller clutch assembly, as shown in Figure 153, and rotate roller clutch counter-clockwise to lock it in position.
12. Install the coast clutch plates in coast clutch housing, as shown in Figure 154, beginning with a steel plate and alternating with friction plates, until you have proper amount installed.
Note: The number of coast plates is model sensitive and may vary from illustration.
13. Install the coast clutch backing plate, as shown in Figure 154.

Continued on Page 92.

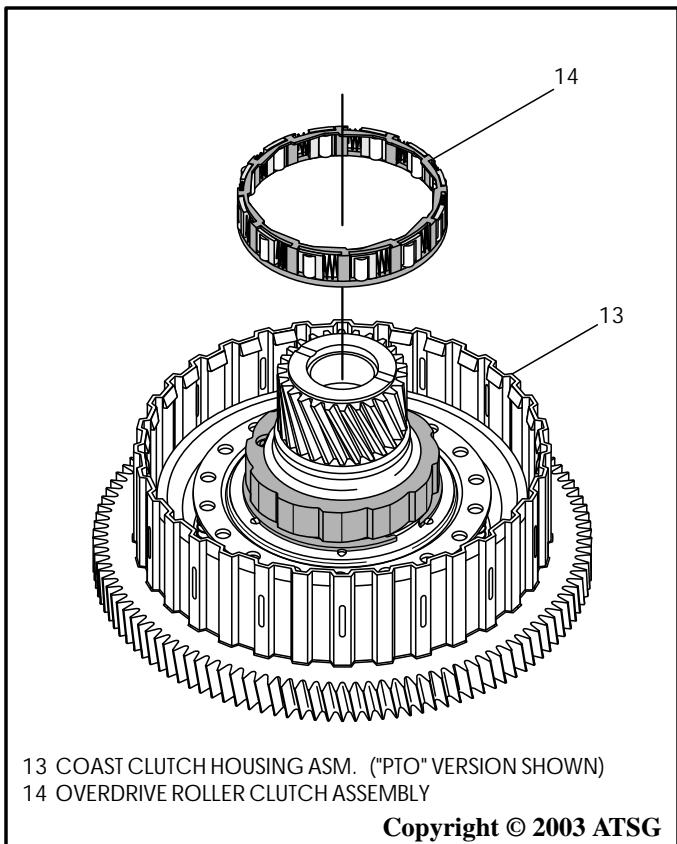


Figure 153

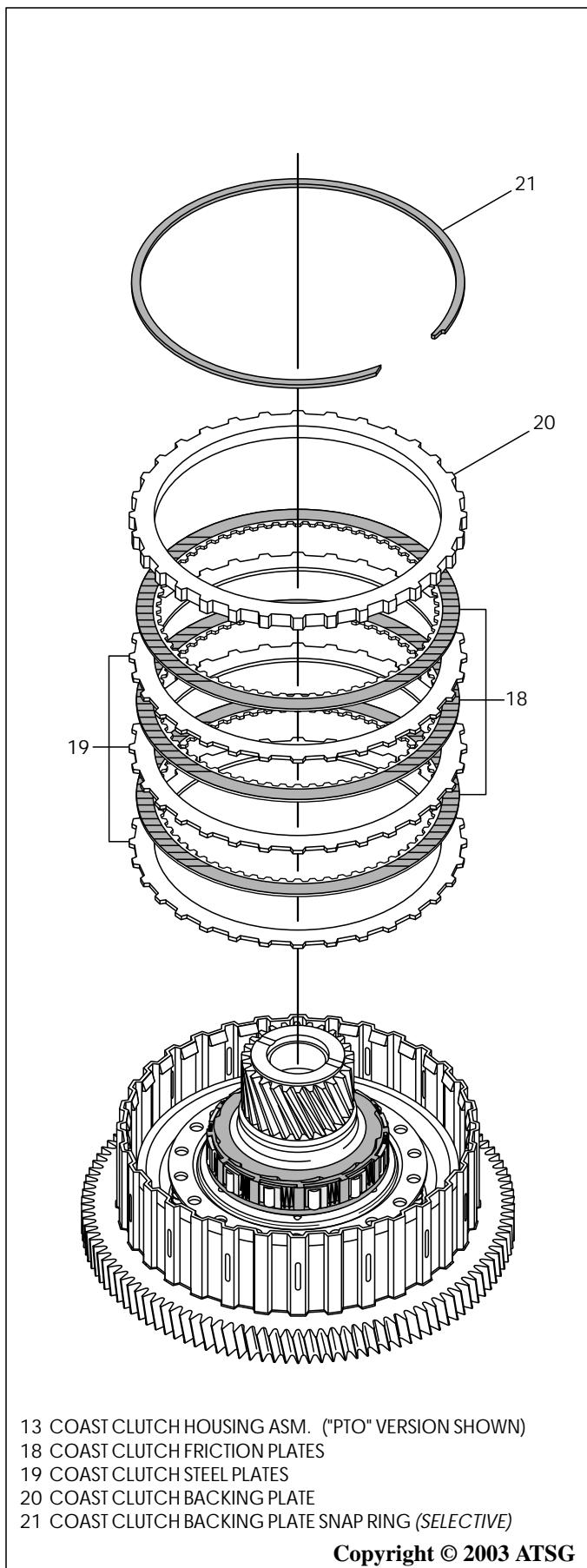
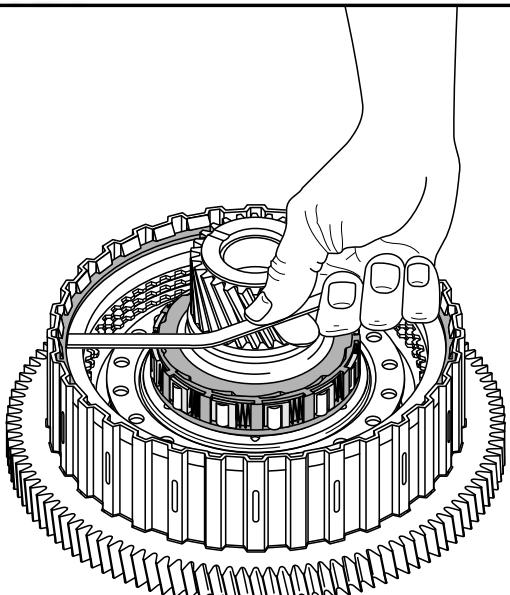


Figure 154

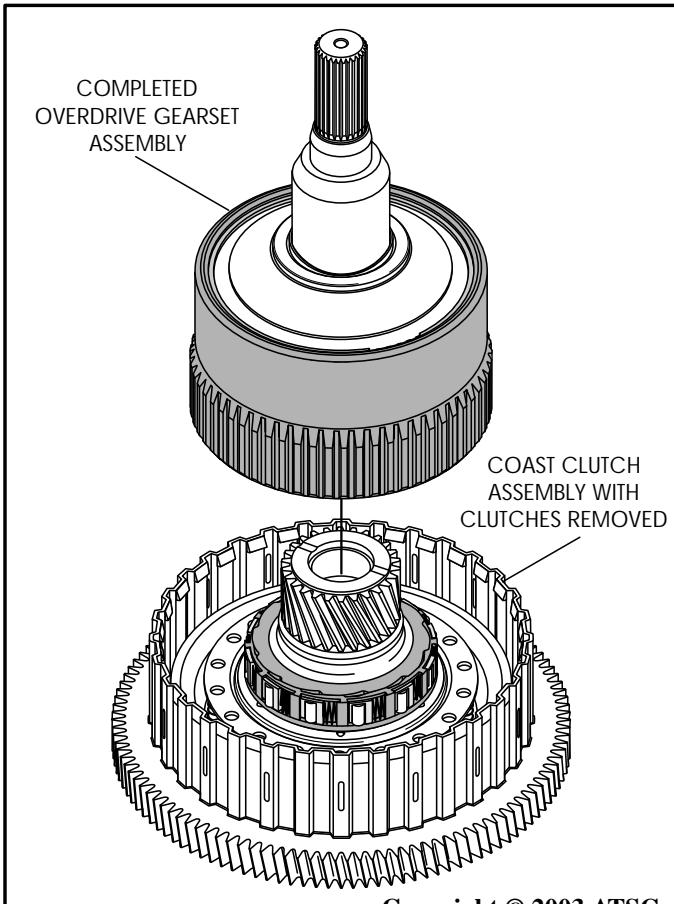


**Coast Clutch Clearance Should Be
0.76 - 1.27mm (.030" - .050")**

Selective Snap Rings Available
1.35 - 1.45mm (.053" - .057")
1.75 - 1.85mm (.068" - .072")
2.15 - 2.25mm (.084" - .088")

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Figure 155



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Figure 156

Coast Clutch Housing (Cont'd)

14. Install the **selective** coast clutch backing plate snap ring, as shown in Figure 154, and ensure that it is fully seated.
 15. Measure the coast clutch clearance between the selective snap ring and backing plate, as shown in Figure 155. Coast clutch clearance should be 0.76 - 1.27mm (.030" - .050").
 16. Change the selective snap ring as necessary to obtain proper clutch clearance. Refer to Figure 155 for snap ring thickness' available.
 17. After you have obtained the proper clearance, remove all of the coast clutch plates.
 18. With coast clutch plates removed, install the pre-assembled overdrive gearset onto coast clutch housing, as shown in Figure 156, by rotating counter-clockwise until fully seated.
- Note: After installation, overdrive gearset should freewheel counter-clockwise and lock in a clockwise direction, while holding the coast clutch housing.**

Coast Clutch Housing (Cont'd)

19. Re-install the coast clutch plates, as shown in Figure 157.
 20. Install the coast clutch remover/installer, as shown in Figure 158.
- Special Note: This tool is almost mandatory for the "PTO" version. The overdrive clutches must be installed "before" the coast clutch housing is installed, as they will not pass by the PTO gear.**
21. If you are rebuilding the "Non-PTO" version, the input shaft can be used, with transmission centerline horizontal, to install this assembly and then install the overdrive clutches. We do not have that luxury with the "PTO" version, please use the installation tool.

Caution: The overdrive one-way clutch may be damaged if the tool is not used or installed correctly. The tool must tightly hold entire assembly.

 22. Set the completed assembly aside for the final assembly process (See Figure 158).

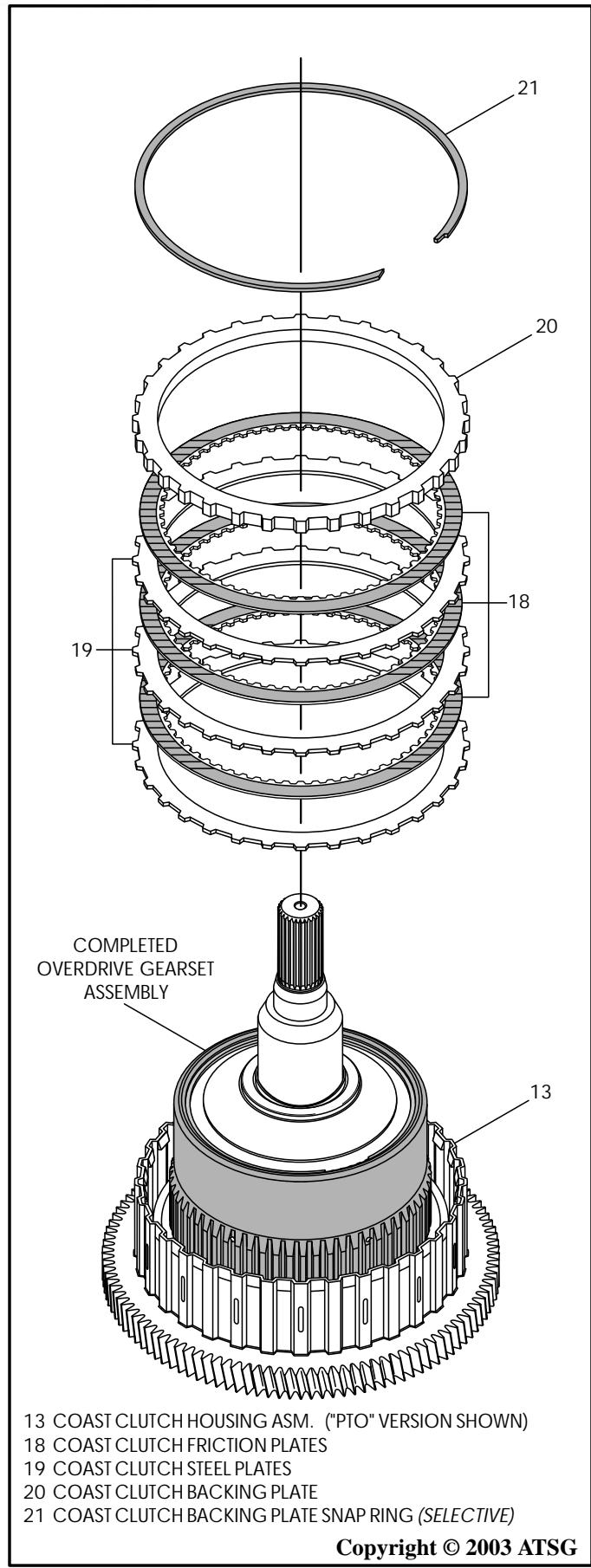


Figure 157

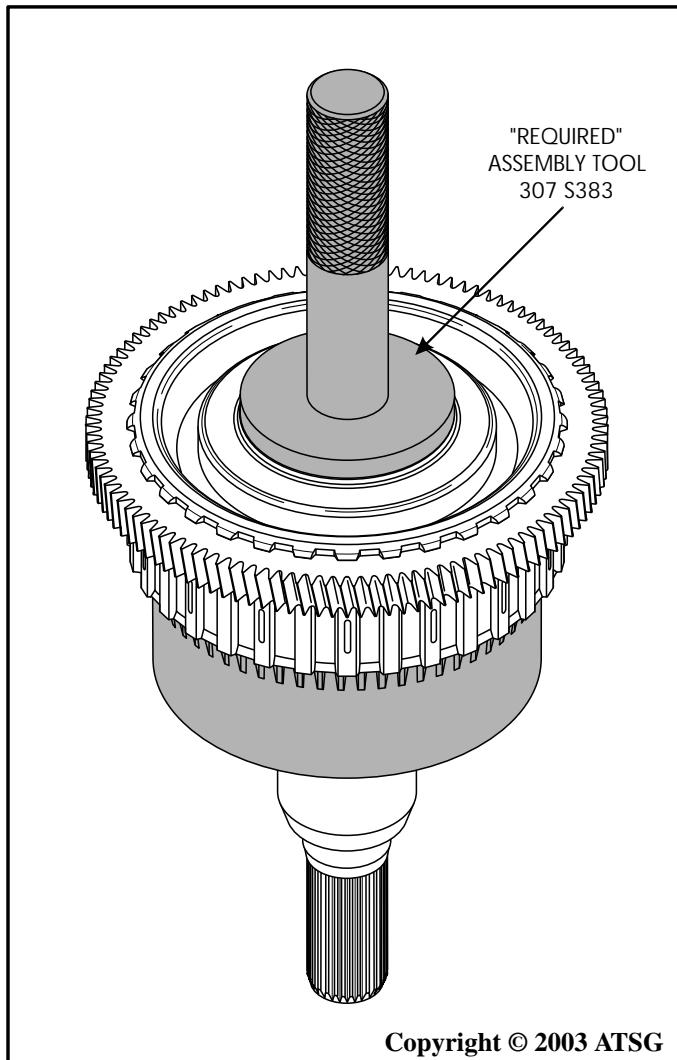
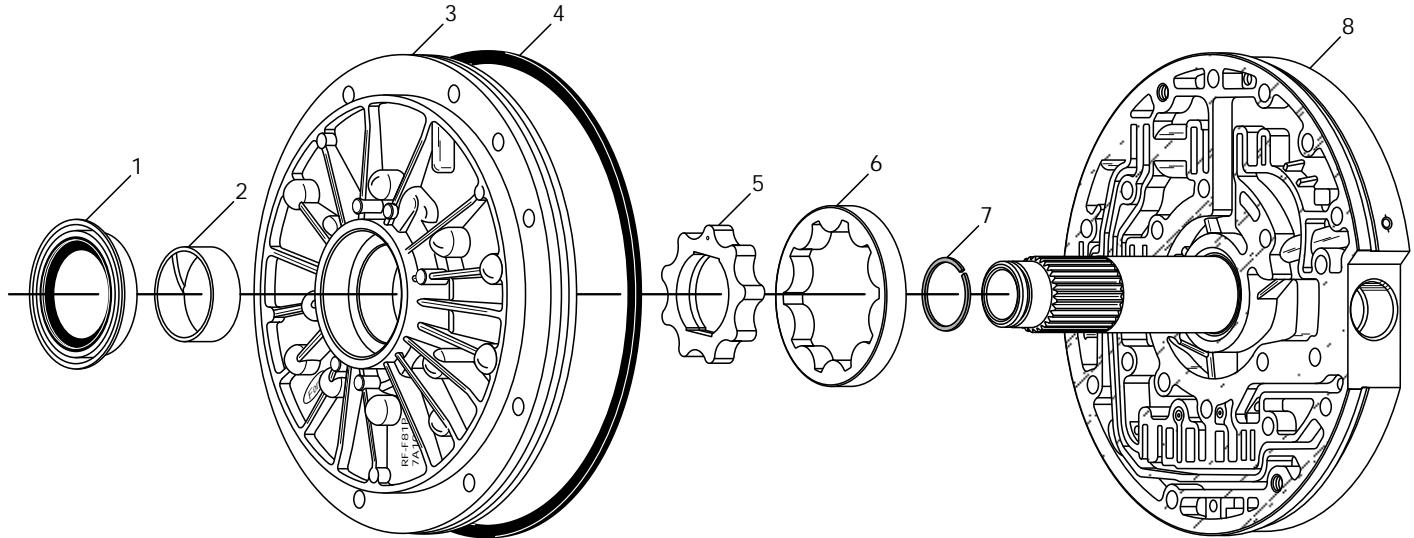
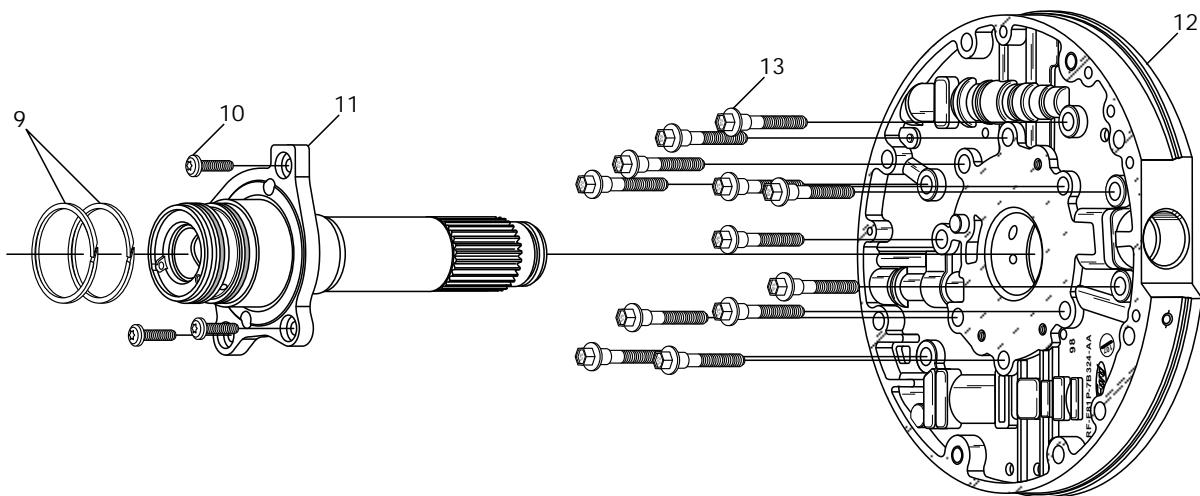


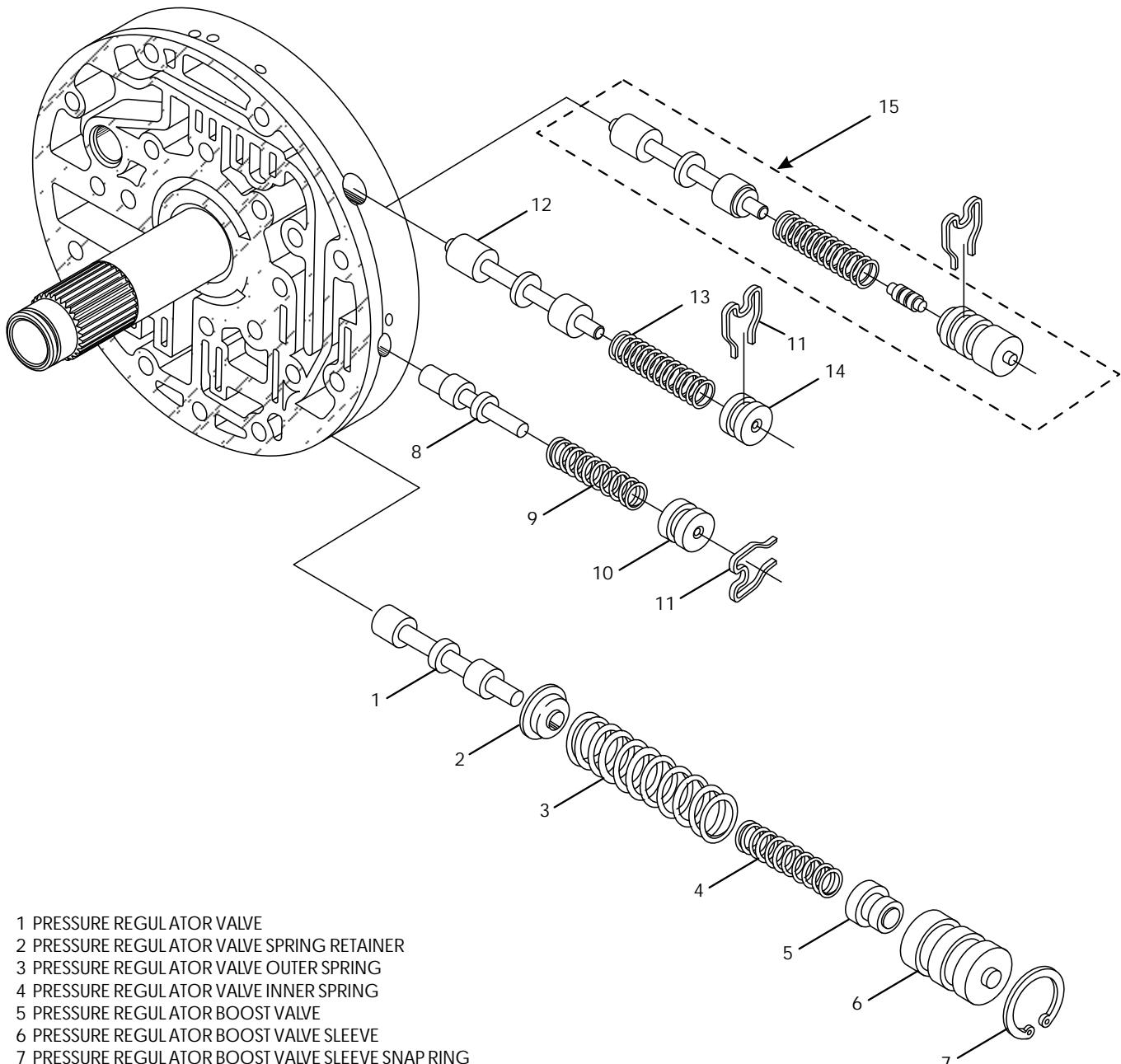
Figure 158

OIL PUMP ASSEMBLY "FRONT" SIDE EXPLODED VIEW**OIL PUMP ASSEMBLY "REAR" SIDE EXPLODED VIEW**

- 1 OIL PUMP CONVERTER SEAL
- 2 OIL PUMP CONVERTER HUB BUSHING
- 3 OIL PUMP BODY
- 4 OIL PUMP BODY TO CASE "O" RING SEAL
- 5 OIL PUMP INNER GEAR
- 6 OIL PUMP OUTER GEAR
- 7 STATOR SHAFT CONVERTER SEAL RING
- 8 STATOR SHAFT AND OIL PUMP COVER ASSEMBLY
- 9 COAST CLUTCH SEAL RINGS (2 REQUIRED)
- 10 STATOR SHAFT TO OIL PUMP COVER RETAINING BOLTS (3 REQUIRED)
- 11 STATOR SHAFT ASSEMBLY
- 12 OIL PUMP COVER ASSEMBLY
- 13 OIL PUMP COVER TO OIL PUMP BODY RETAINING BOLTS (12 REQUIRED)

*Refer to Page 34 through 37 for
specific Oil Pump Differences
between "PWM" and "NON-PWM"*

FORD 4R100 VALVE LINE-UPS IN PUMP ASSEMBLY



*Refer to Page 34 through 37 for
specific Oil Pump Differences
between "PWM" and "NON-PWM"*

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Figure 160

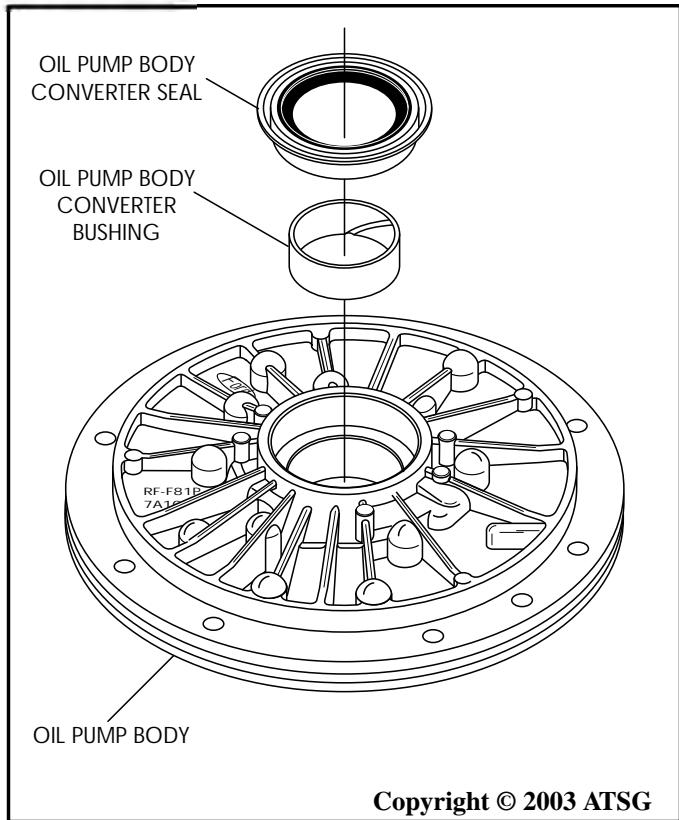


Figure 161

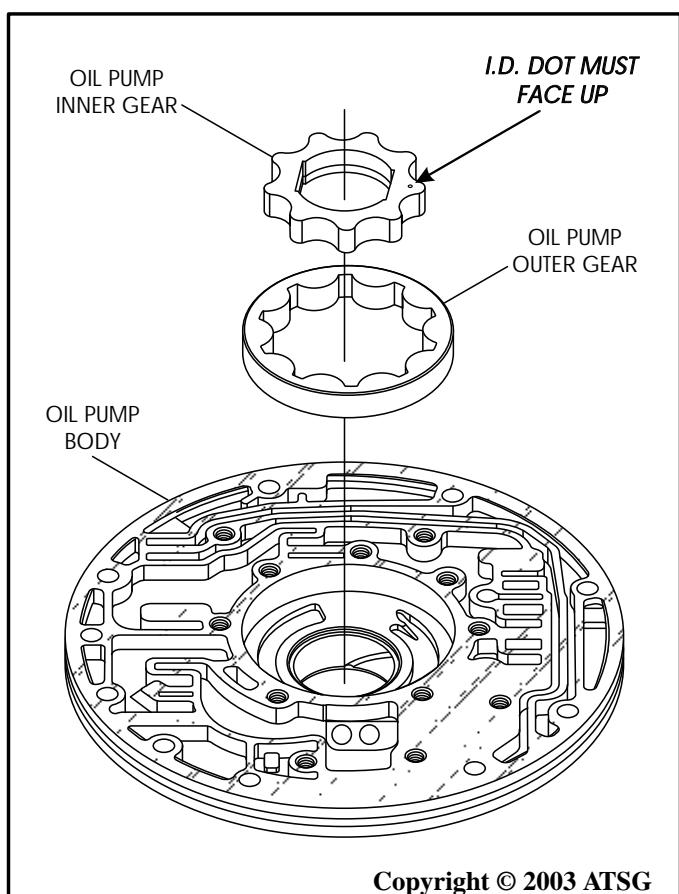


Figure 162

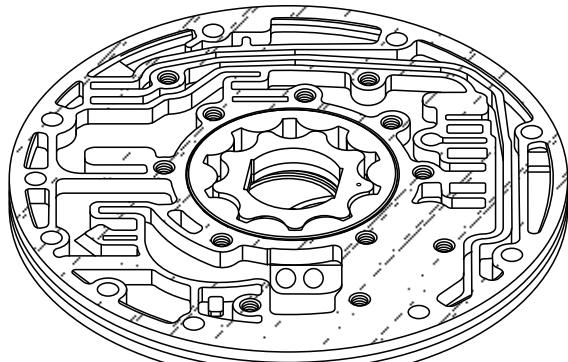
COMPONENT REBUILD

Oil Pump Body And Cover Assembly

1. Disassemble the oil pump and cover assembly using Figure 159 as a guide.
2. Clean all of the oil pump and cover parts using a suitable cleaning solution.
3. Inspect all oil pump and cover parts for any wear and/or damage.
Note: Refer to Pages 34 through 37 for the differences between PWM and NON-PWM, if any parts replacement is necessary.
4. Remove and discard oil pump converter seal, oil pump body to case seal ring, and the two coast clutch seal rings (See Figure 159).
5. Install new converter bushing into the oil pump body, as shown in Figure 161, using the proper drivers for removal and installation.
6. Install new converter hub seal into the oil pump body, as shown in Figure 161, using the proper drivers for removal and installation.
7. Turn the oil pump body over and install inner and outer pump gears, as shown in Figure 162, and lubricate with transmission fluid.
8. Set the completed pump body aside for the future sub-assembly (See Figure 163).
9. Install the valves, springs and bore plugs into the oil pump cover assembly *exactly* as shown in Figure 160.
Note: Refer to Pages 34 through 37 for the specific differences between PWM and the NON-PWM pump covers.
10. It is not necessary to remove the stator shaft assembly from the pump cover unless damage is apparent (See Figure 164).

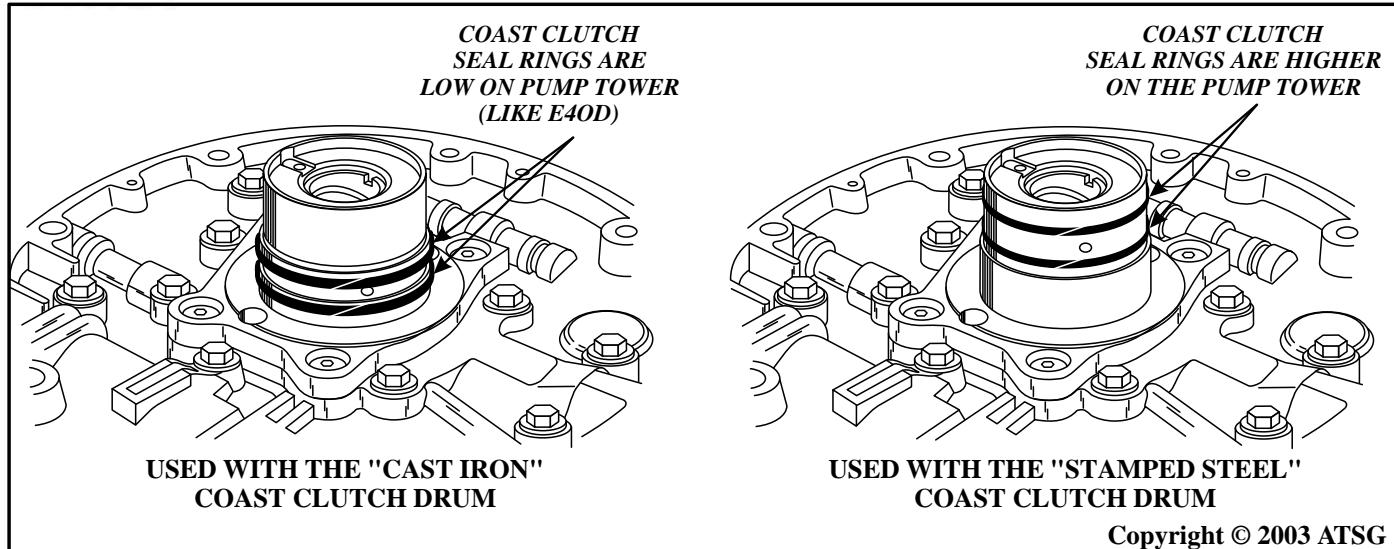
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COMPLETED OIL PUMP BODY ASSEMBLY



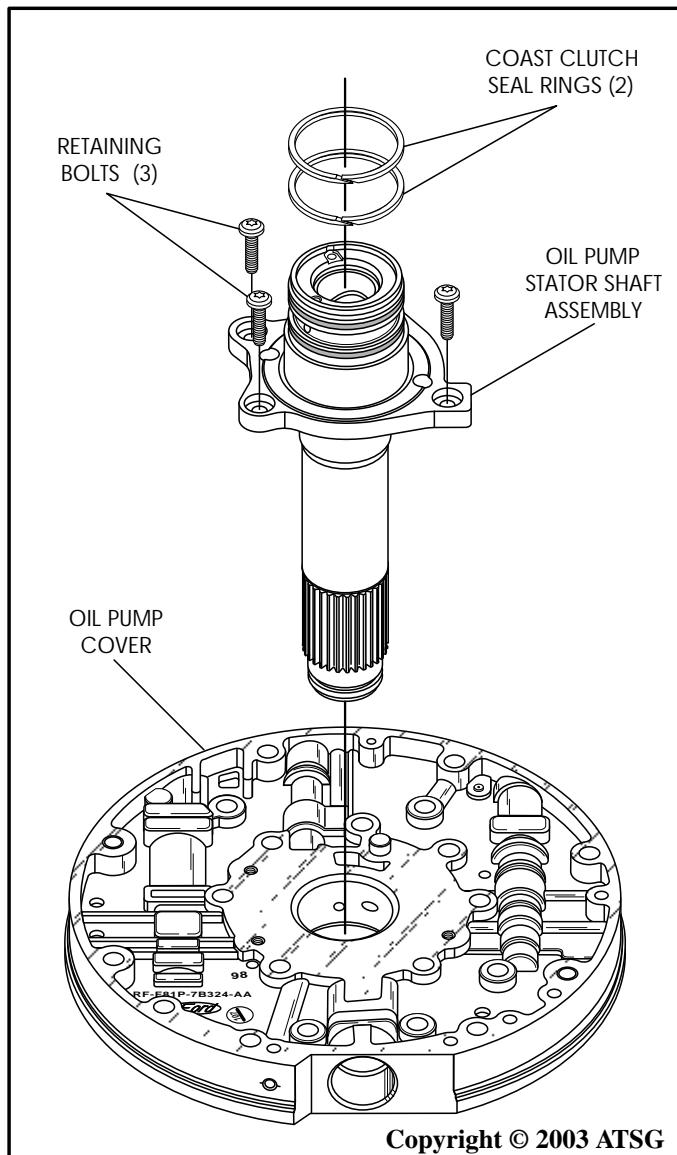
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Figure 163



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Figure 164



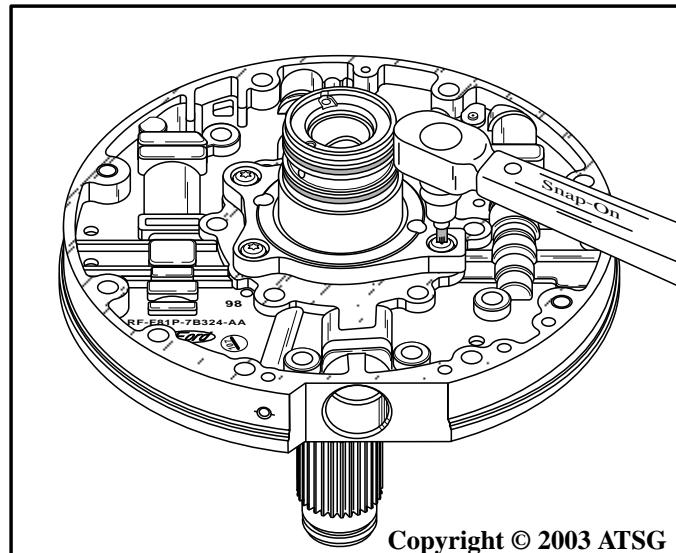
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Figure 165

Oil Pump Body And Cover Assembly (Cont'd)

11. If removal was necessary because of damage, refer to Figure 164, to ensure the replacement part is correct.
12. Install the stator shaft assembly into the pump cover, as shown in Figure 165, and torque the 3 retaining bolts to 9-11 N·m (80-100 in.lb.), as shown in Figure 166.
13. Install the two coast clutch sealing rings into their grooves in the stator shaft assembly, as shown in Figure 165.

Continued on Page 98.



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Figure 166

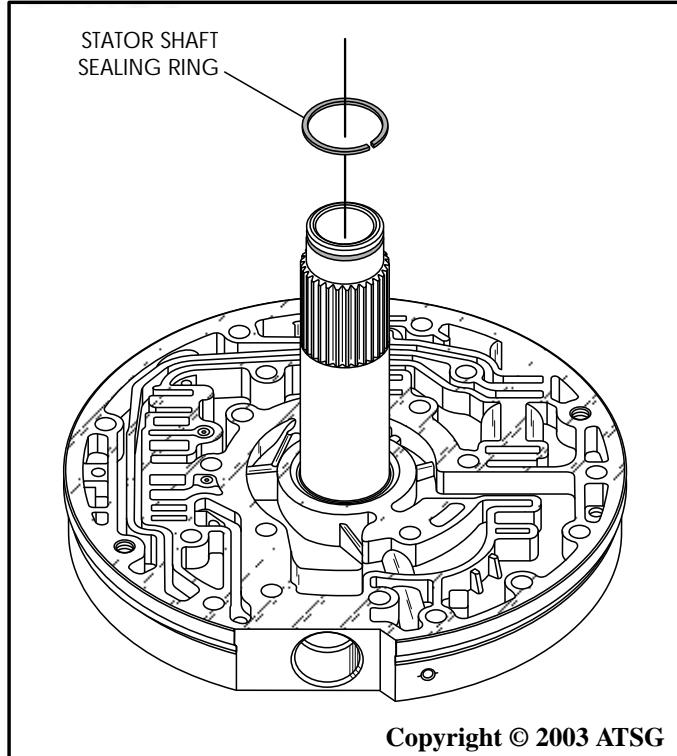


Figure 167

Oil Pump Body And Cover Assembly (Cont'd)

14. Turn the oil pump cover over and install the sealing ring on the front of the stator shaft, as shown in Figure 167, and ensure that it is free turning in the groove.
 15. Set the completed oil pump body assembly, as shown in Figure 168, over a hole in the work bench so that stator shaft will pass through the hole (See Figure 168).
 16. Install the completed oil pump cover assembly onto oil pump body, as shown in Figure 168.
 17. Install the 12 pump body to pump cover bolts in the locations shown in Figure 168, and hand tighten only at this time.
 18. Install the oil pump alignment strap, as shown in Figure 169, and tighten securely.
 19. Torque the 12 pump body to pump cover bolts, working in a criss-cross pattern. Torque the bolts to 24-31 N·m (18-23 ft.lb.), as shown in Figure 169, and then remove alignment strap.
 20. Install the number 1 thrust washer, as shown in Figure 170, and retain with Trans-Jel®, if you are building a unit that is not PTO equipped.
- Note: The number 1 thrust washer is not used on PTO equipped vehicles. The ball bearing rests directly on stator on PTO models.***

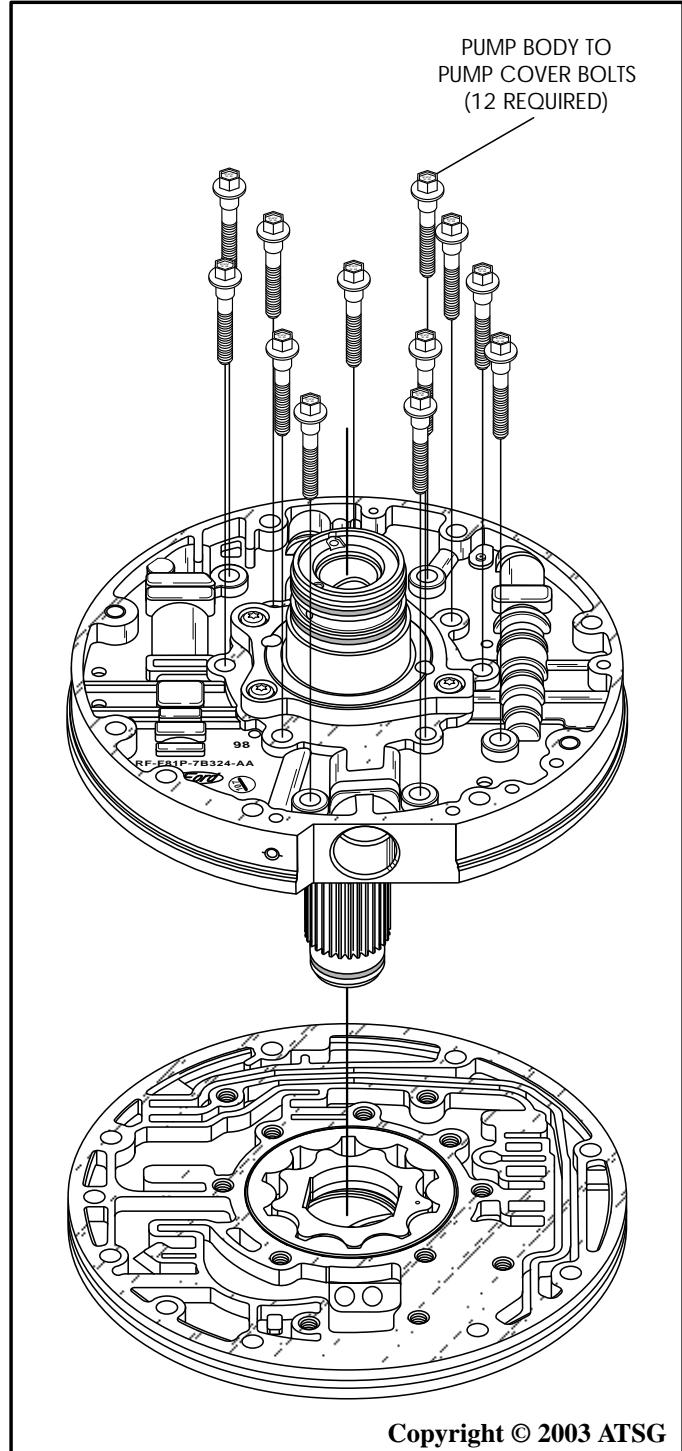


Figure 168

21. Install the number 2A thrust bearing in the direction shown in Figure 170, and retain with Trans-Jel®.

Continued on Page 99.

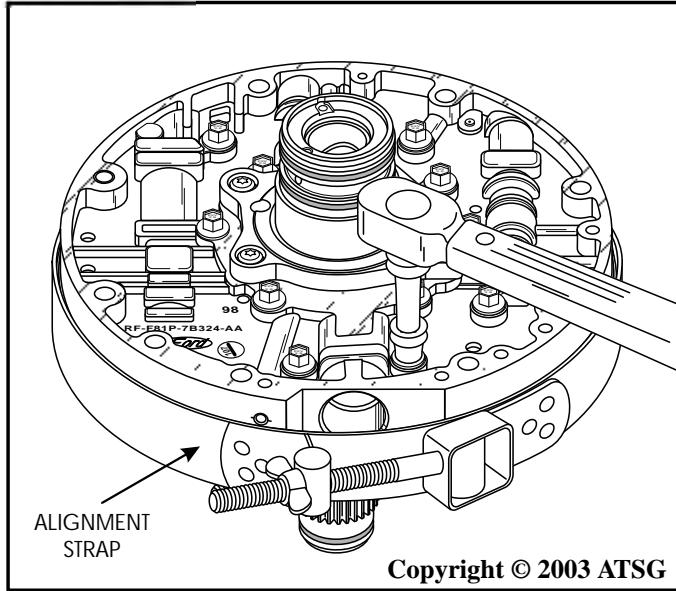


Figure 169

Oil Pump Body And Cover Assembly (Cont'd)

22. Install pump body to case seal ring, as shown in Figure 171, and ensure that it is not twisted in the groove.
23. Set the completed oil pump assembly aside for the final assembly process (See Figure 172).

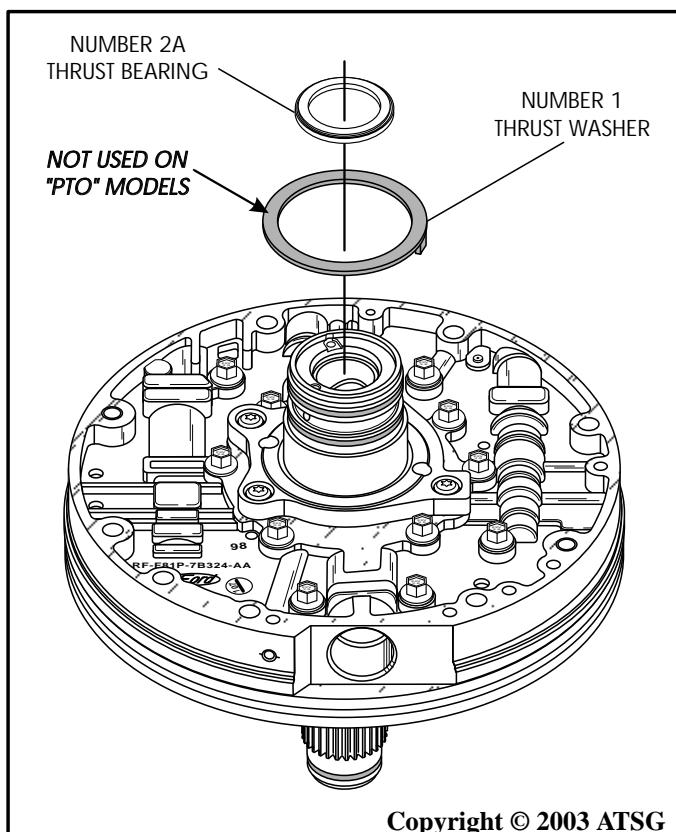


Figure 170

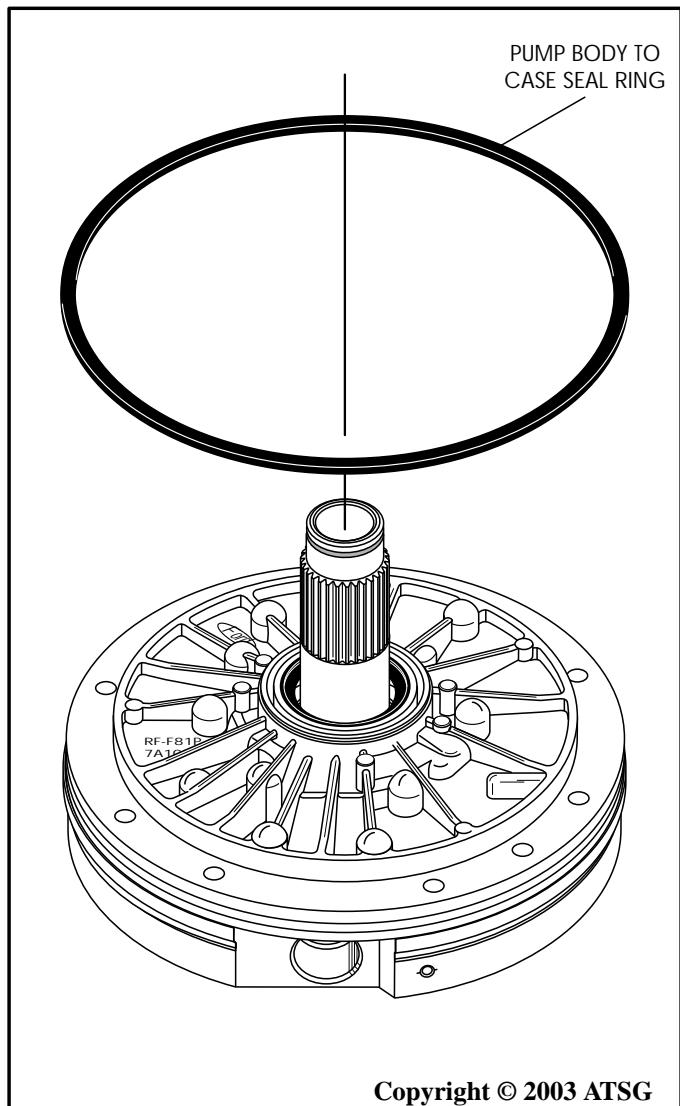


Figure 171

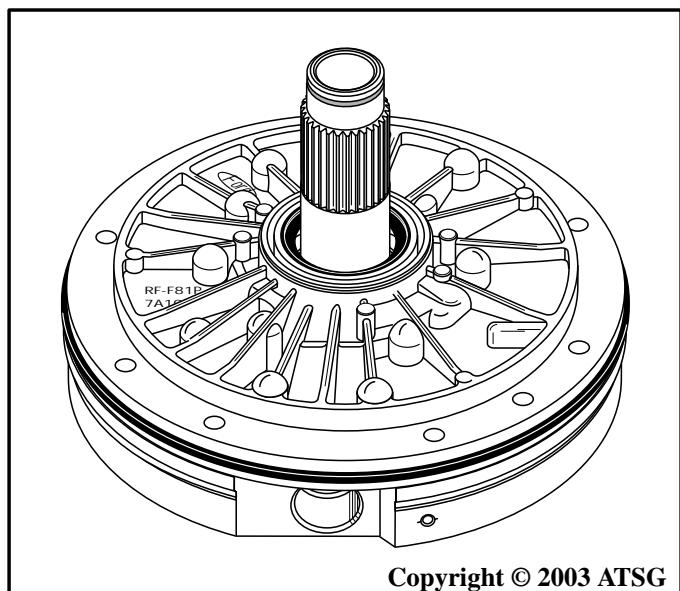
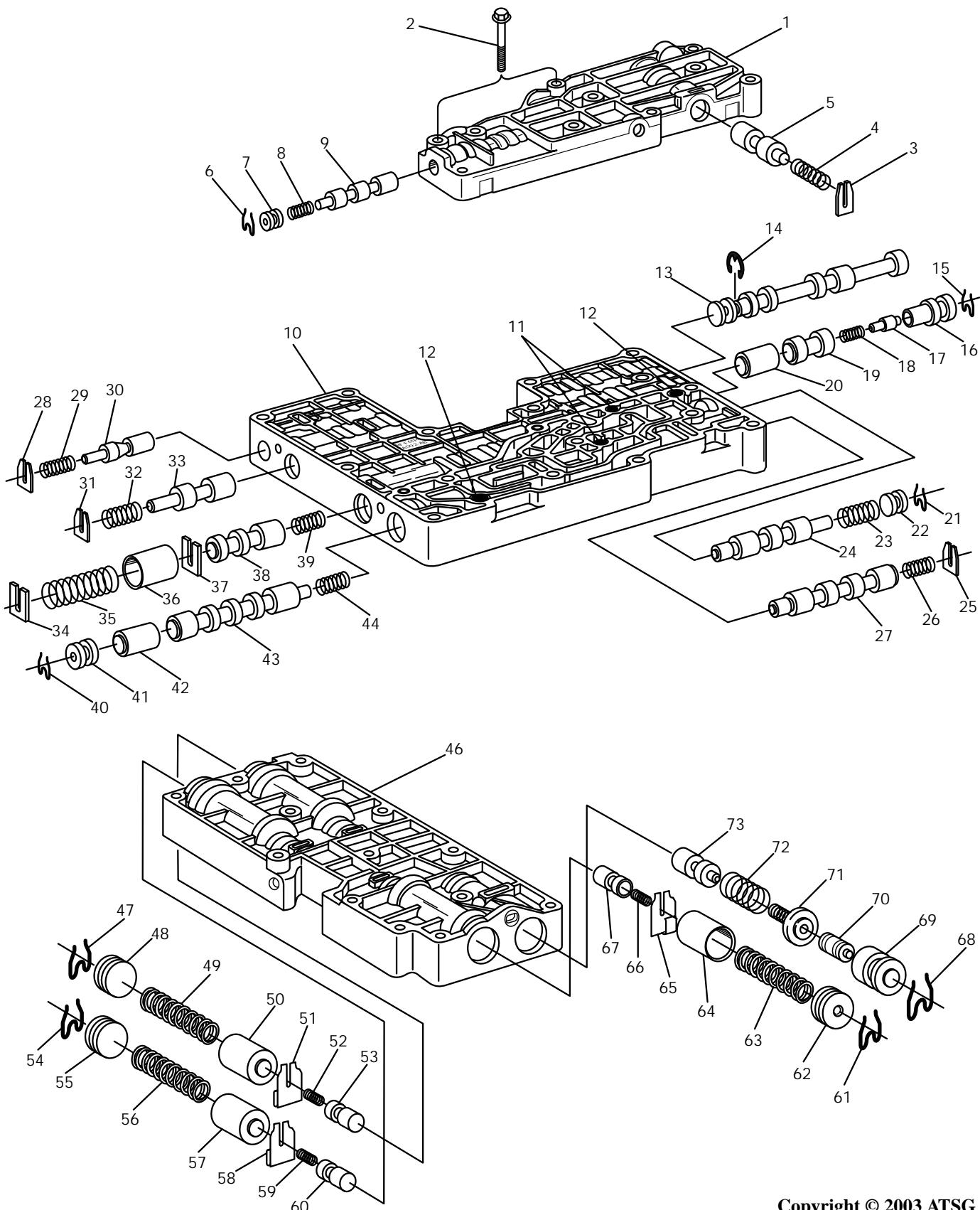


Figure 172

FORD 4R100**MAIN, LOWER, AND ACCUMULATOR VALVE BODIES DISASSEMBLED**

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Figure 173

FORD 4R100 MAIN, LOWER, AND ACCUMULATOR VALVE BODY LEGEND

Item	Description	Item	Description
1 LOWER VALVE BODY CASTING		37 4-3-2 SHIFT TIMING VALVE RETAINING PLATE	
2 HEX HEAD BOLT, (2 REQUIRED)		38 4-3-2 SHIFT TIMING VALVE	
3 RETAINING PLATE		39 4-3-2 SHIFT TIMING VALVE SPRING	
4 MANUAL 1-2 TRANSITION VALVE SPRING		40 SPRING CLIP BORE PLUG RETAINER	
5 MANUAL 1-2 TRANSITION VALVE		41 1-2 SHIFT VALVE BORE PLUG	
6 SPRING CLIP BORE PLUG RETAINER		42 DRIVE 2 VALVE	
7 ENGAGEMENT VALVE BORE PLUG		43 1-2 SHIFT VALVE	
8 ENGAGEMENT VALVE SPRING		44 1-2 SHIFT VALVE SPRING	
9 ENGAGEMENT VALVE		46 ACCUMULATOR VALVE BODY CASTING (MODEL SENSITIVE)	
10 MAIN VALVE BODY CASTING		47 SPRING CLIP BORE PLUG RETAINER	
11 CHECKBALL 1/4", (2 REQUIRED)		48 DIRECT CLUTCH ACCUM REGULATOR PLUNGER BORE PLUG	
12 CHECKBALL 5/16", (2 REQUIRED)		49 DIRECT CLUTCH ACCUM REGULATOR PLUNGER SPRING	
13 MANUAL CONTROL VALVE		50 DIRECT CLUTCH ACCUM REGULATOR PLUNGER	
14 MANUAL VALVE "E" CLIP		51 DIRECT CLUTCH ACCUM REGULATOR VALVE RETAINER	
15 SPRING CLIP BORE PLUG RETAINER		52 DIRECT CLUTCH ACCUM REGULATOR VALVE SPRING	
16 LOW REVERSE MODULATOR VALVE SLEEVE		53 DIRECT CLUTCH ACCUM REGULATOR VALVE	
17 LOW REVERSE MODULATOR VALVE PLUNGER		54 SPRING CLIP BORE PLUG RETAINER	
18 LOW MODULATOR VALVE SPRING		55 O.D. CLUTCH ACCUM REGULATOR PLUNGER BORE PLUG	
19 LOW MODULATOR VALVE		56 O.D. CLUTCH ACCUM REGULATOR PLUNGER SPRING	
20 LOW REVERSE MODULATOR VALVE		57 O.D. CLUTCH ACCUM REGULATOR PLUNGER	
21 SPRING CLIP BORE PLUG RETAINER		58 O.D. CLUTCH ACCUM REGULATOR VALVE RETAINER	
22 3-4 SHIFT VALVE BORE PLUG		59 O.D. CLUTCH ACCUM REGULATOR VALVE SPRING	
23 3-4 SHIFT VALVE SPRING		60 O.D. CLUTCH ACCUM REGULATOR VALVE	
24 3-4 SHIFT VALVE		61 SPRING CLIP BORE PLUG RETAINER	
25 2-3 SHIFT VALVE SPRING RETAINING PLATE		62 INT. CLUTCH ACCUM REGULATOR PLUNGER BORE PLUG	
26 2-3 SHIFT VALVE SPRING		63 INT. CLUTCH ACCUM REGULATOR PLUNGER SPRING	
27 2-3 SHIFT VALVE		64 INT. CLUTCH ACCUM REGULATOR PLUNGER	
28 SOLENOID REGULATOR VALVE SPRING RETAINING PLATE		65 INT. CLUTCH ACCUM REGULATOR VALVE RETAINER	
29 SOLENOID REGULATOR VALVE SPRING		66 INT. CLUTCH ACCUM REGULATOR VALVE SPRING	
30 SOLENOID REGULATOR VALVE		67 INT. CLUTCH ACCUM REGULATOR VALVE	
31 COAST CLUTCH SHIFT VALVE SPRING RETAINING PLATE		68 SPRING CLIP BORE PLUG RETAINER	
32 COAST CLUTCH SHIFT VALVE SPRING		69 LINE PRESSURE MODULATOR SLEEVE	
33 COAST CLUTCH SHIFT VALVE		70 LINE PRESSURE MODULATOR PLUNGER	
34 4-3-2 SHIFT TIMING CONTROL VALVE PLUNGER RETAINING PLATE		71 LINE PRESSURE MODULATOR SPRING AND RETAINER ASSEMBLY	
35 4-3-2 SHIFT TIMING CONTROL VALVE PLUNGER SPRING		72 LINE PRESSURE MODULATOR VALVE SPRING	
36 4-3-2 SHIFT TIMING CONTROL VALVE PLUNGER		73 LINE PRESSURE MODULATOR VALVE	

Figure 173 Legend

COMPONENT REBUILD

Valve Body Assemblies

1. Disassemble the main valve body, the lower valve body and the accumulator valve body using Figure 173 as a guide.
2. Disassemble the valve bodies one at a time. Lay each valve line-up out in order as you remove them from the valve body casting.
3. Inspect each valve, valve spring, bore plug and retainers for any wear and/or damage.

Caution: Refer to Pages 22 through 33 for the differences in "PTO" valve bodies and the NON-PTO valve bodies and spacer plate. None of these parts will interchange, so if replacement is necessary, use extra care in the inspection process for replacement parts.

4. Clean all valve body parts thoroughly and dry with compressed air.
5. Install each valve train back into their bores ***exactly*** as shown in Figure 173, lubricating them with Mercon® fluid as they are installed.
6. Install the checkballs in the main valve body in the locations shown in Figure 173, or refer to Figure 40 for more detail.
7. Install the lower valve body onto main valve body and install the 2 retaining bolts, as shown in Figure 173, and finger tighten only.
8. Set the completed valve bodies aside for the final assembly process.

FINAL ASSEMBLY

Internal Case Components

1. Rotate the pre-assembled case assembly in the fixture so bell housing is facing up, as shown in Figure 174.
2. Install the pre-assembled rear planetary carrier with the washers secured with Trans-Jel® into the reverse hub, as shown in Figure 174, and rotate into position.

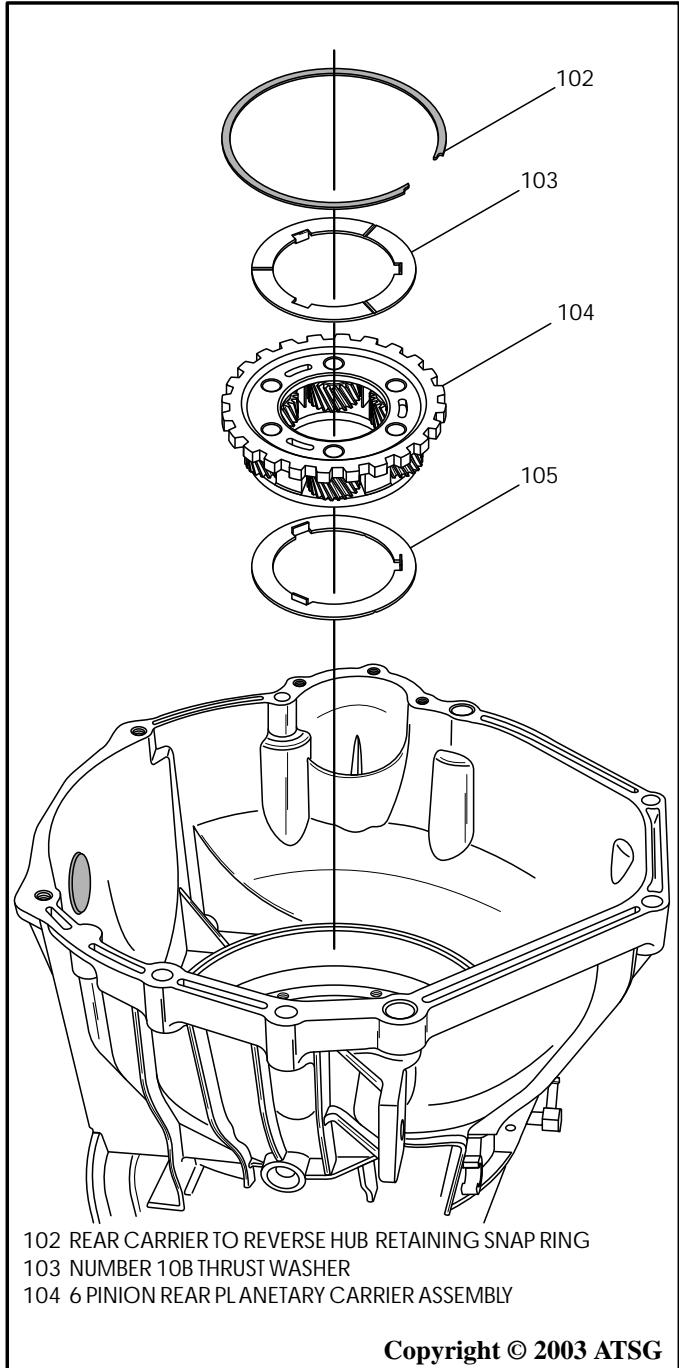


Figure 174

3. Install the rear carrier retaining snap ring, into the reverse clutch hub, as shown in Figure 174, and ensure it is fully seated.

Note: The reverse hub may have to be raised up slightly to gain access to the snap ring groove in the reverse clutch hub.

4. Install the pre-assembled direct clutch, forward clutch and sun shell assembly using installation tool, as shown in Figure 175, by rotating into position until fully seated.
5. Remove the T89T-70010-E installation tool.
6. Install intermediate band assembly, as shown in Figure 175, and ensure engagement on the case band anchor. You may want to install the intermediate servo piston at this time to help hold the band in position.

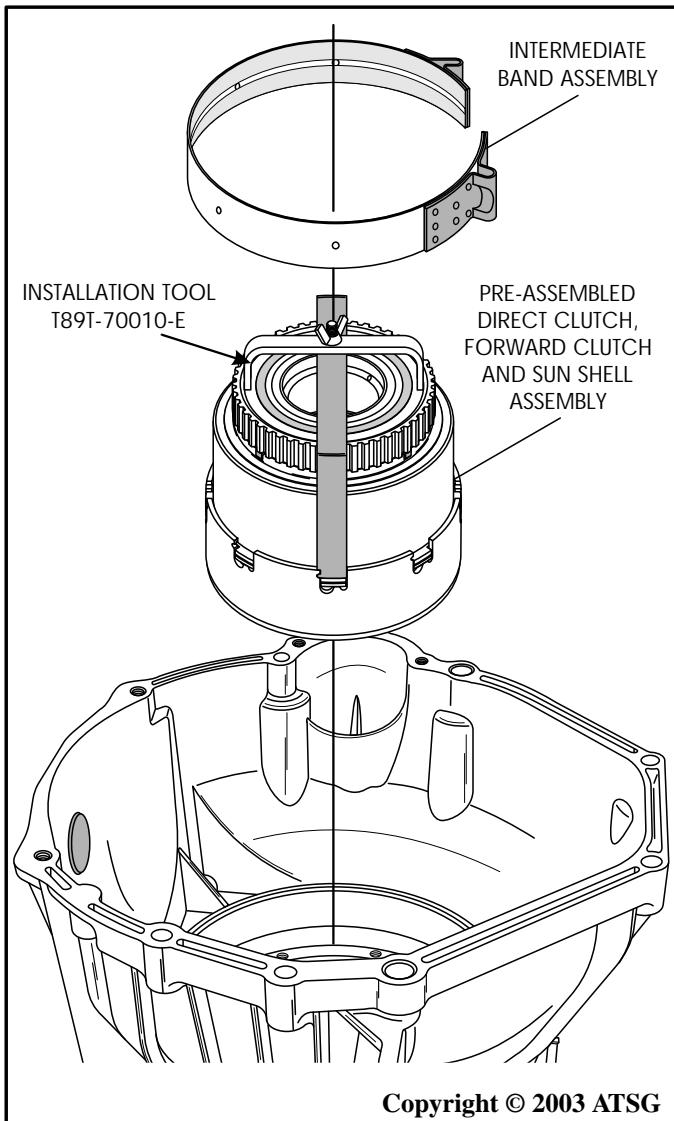


Figure 175

FINAL ASSEMBLY

Internal Case Components (Cont'd)

7. Install the intermediate clutch backing plate, as shown in Figure 176, with the gaps in the steel plates at the 6 and 12 o'clock positions in case.
8. Install the intermediate clutch plates, as shown in Figure 176, beginning with a friction plate and alternating with steel plates until you have the proper amount installed.
9. Again the gaps in the steel plates should be at the 6 and 12 o'clock positions in the case.

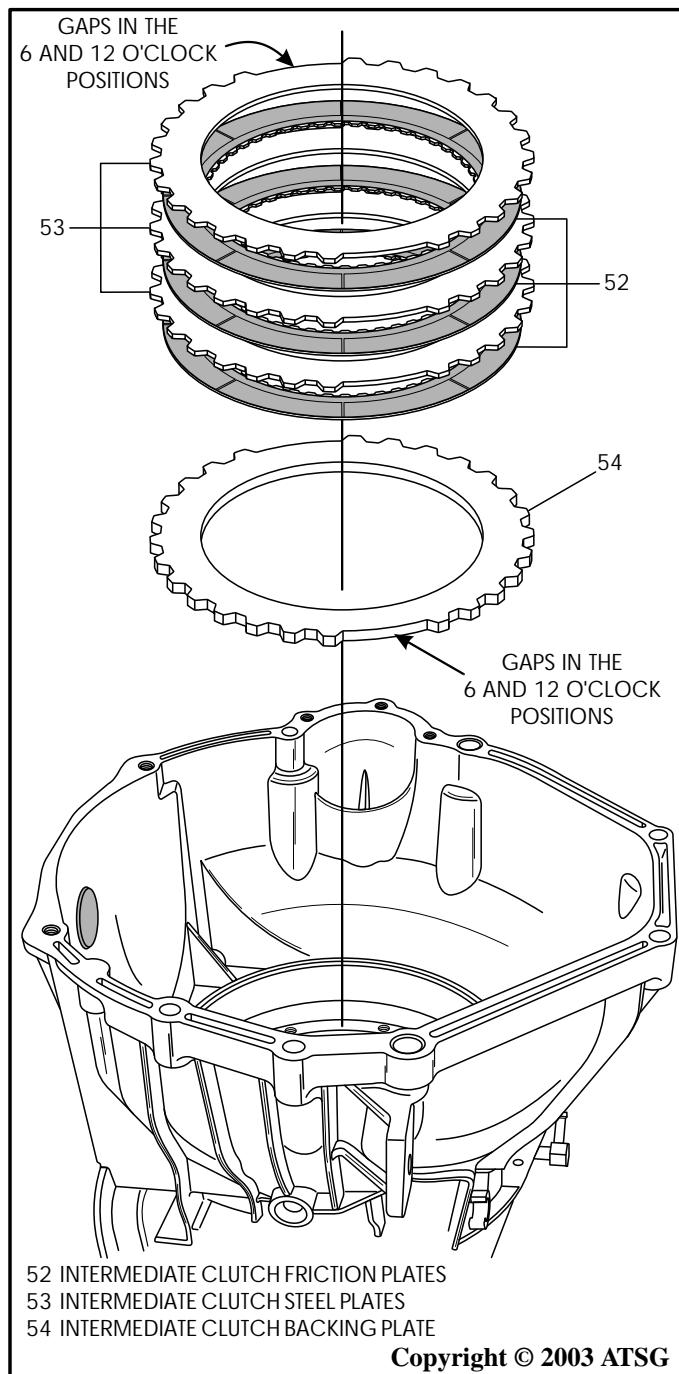


Figure 176

10. Install pre-assembled center support assembly, as shown in Figure 177, ensuring that the number 6 thrust washer is in place, and align the feed holes.
11. Loosely install the two center support feedbolts as shown in Figure 178.
12. Install intermediate clutch piston return spring, as shown in Figure 177, with one spring tab at the 6 o'clock position.

Continued on Page 104.

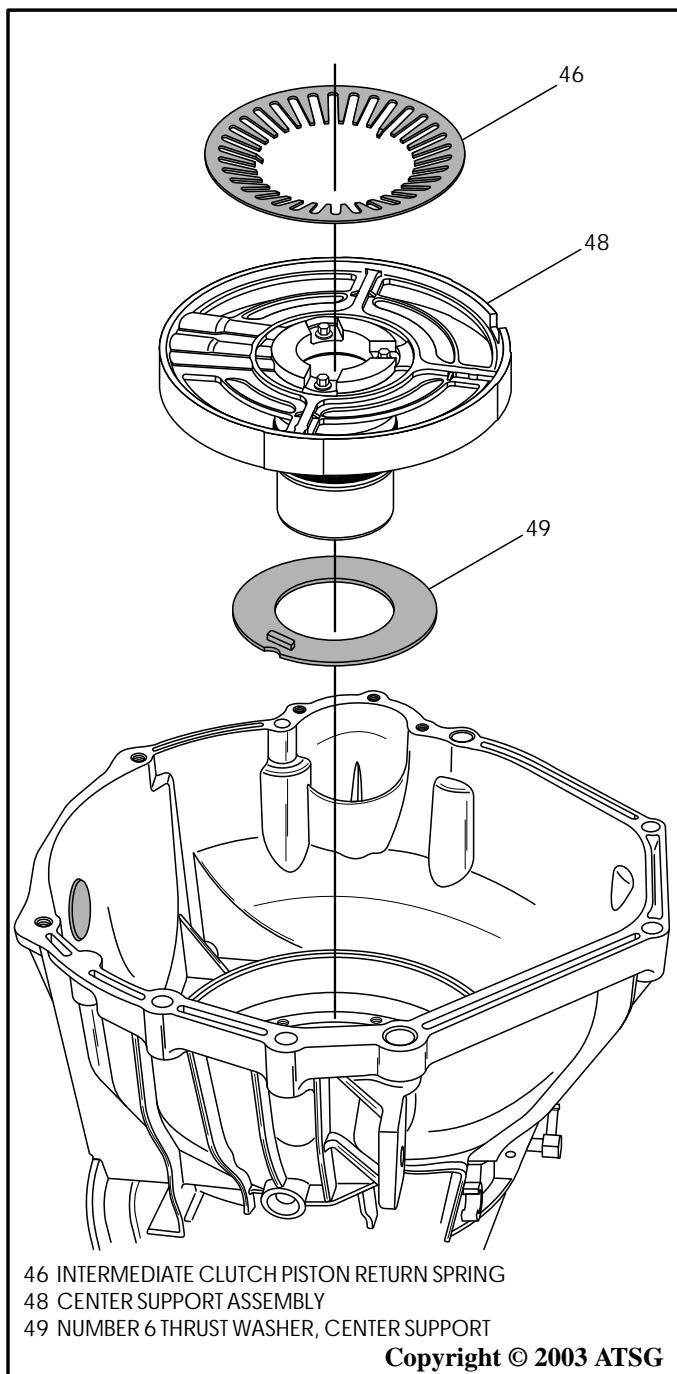


Figure 177

FINAL ASSEMBLY***Internal Case Components (Cont'd)***

13. Install pre-assembled intermediate/overdrive cylinder assembly, as shown in Figure 179, and align the feed hole.
14. Place the snap ring into the case and install the clutch spring compressor tool 307-S223, as shown in Figure 180, and tighten the center bolt in the tool to 7 N·m (65 in.lb.).
15. Install the snap ring into the case groove with the gap at 6 o'clock (bottom) position in case.

16. Ensure that the snap ring is fully seated and remove the clutch spring compressor tool.
17. Loosely install a **new** overdrive clutch cylinder feedbolt as shown in Figure 178.
18. Since we are building the "PTO" version, we must now install the overdrive clutch pack as the overdrive clutches will not pass by the PTO gear on the coast clutch housing.

Continued on Page 105.

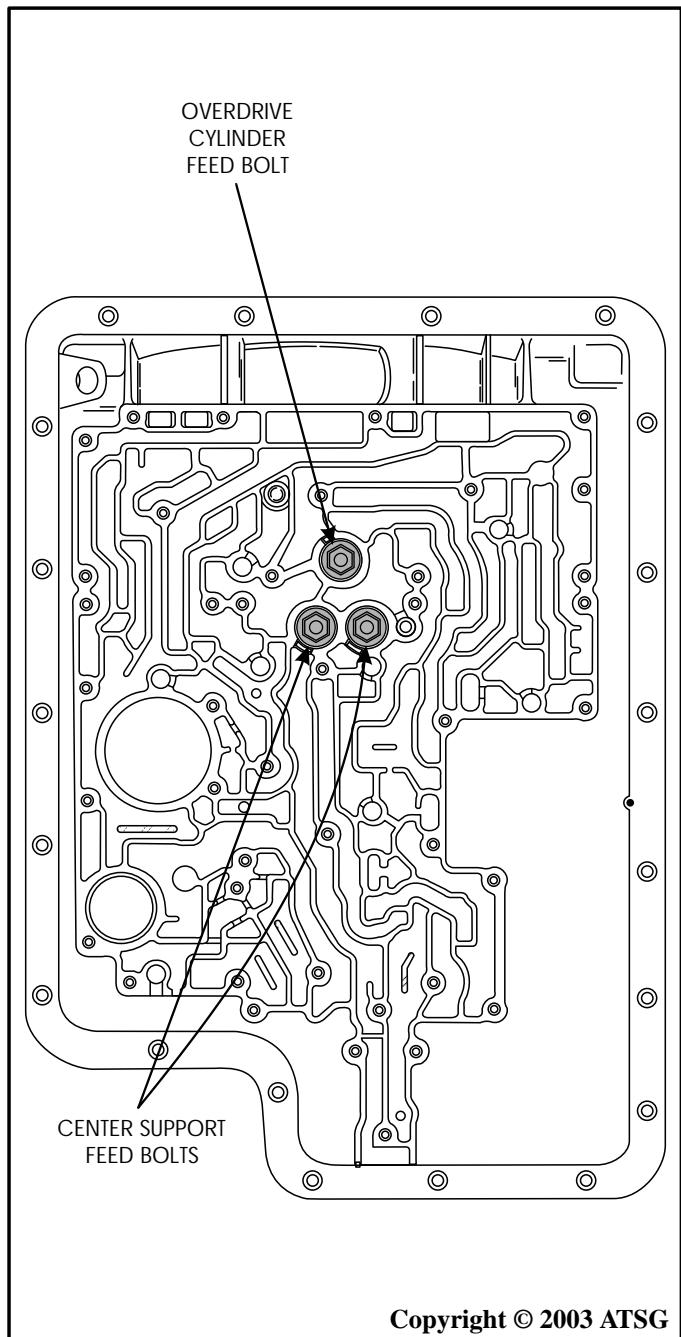


Figure 178

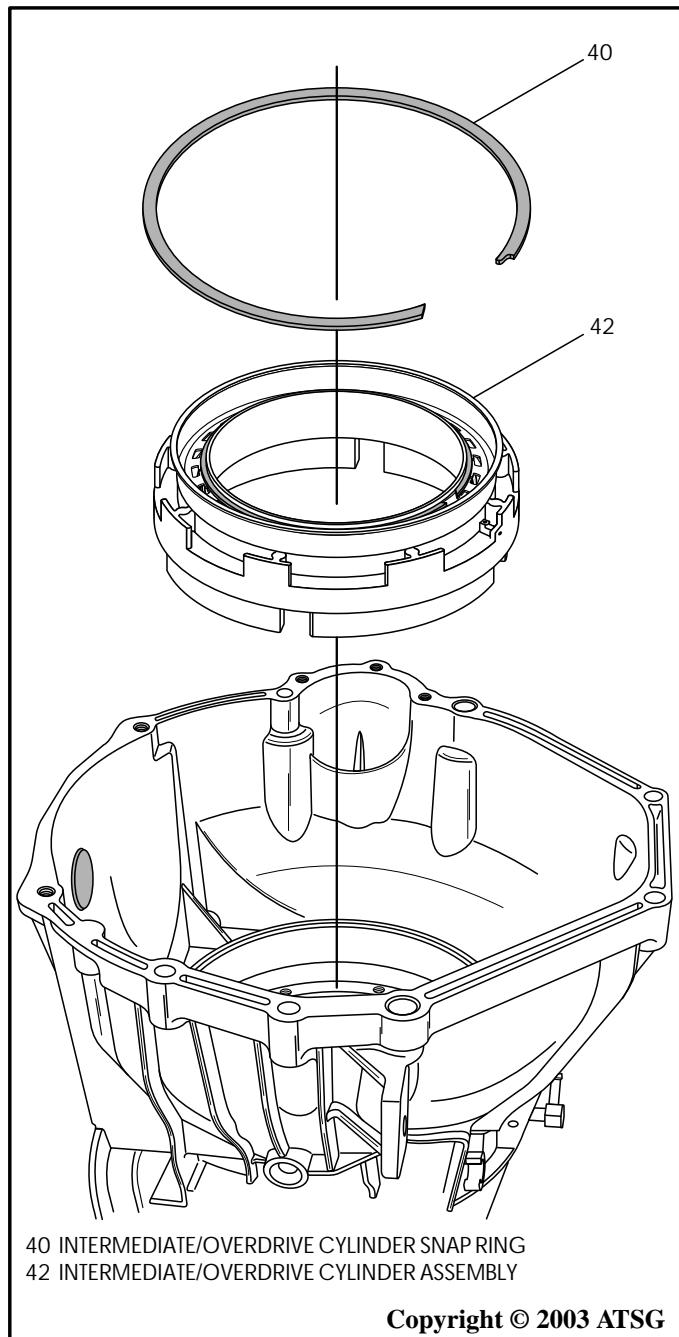


Figure 179

FINAL ASSEMBLY

Internal Case Components (Cont'd)

19. With the units that are not equipped with PTO, the procedure would be the same as E4OD.
20. Install the overdrive clutch pack into the case, as shown in Figure 181, beginning with a steel plate and alternating with friction plates, until you have installed the proper amount.
Note: The number of overdrive plates is model sensitive and may vary from illustration.
21. Install the overdrive clutch backing plate on top of the last friction plate, with the "dimple" facing up and in the 12 o'clock (top) position in the case (See Figure 181).
22. Install overdrive clutch backing plate *selective* snap ring, as shown in Figure 181, and ensure that it is fully seated in case groove, with the snap ring gap at the 6 o'clock position.

Continued on Page 106.

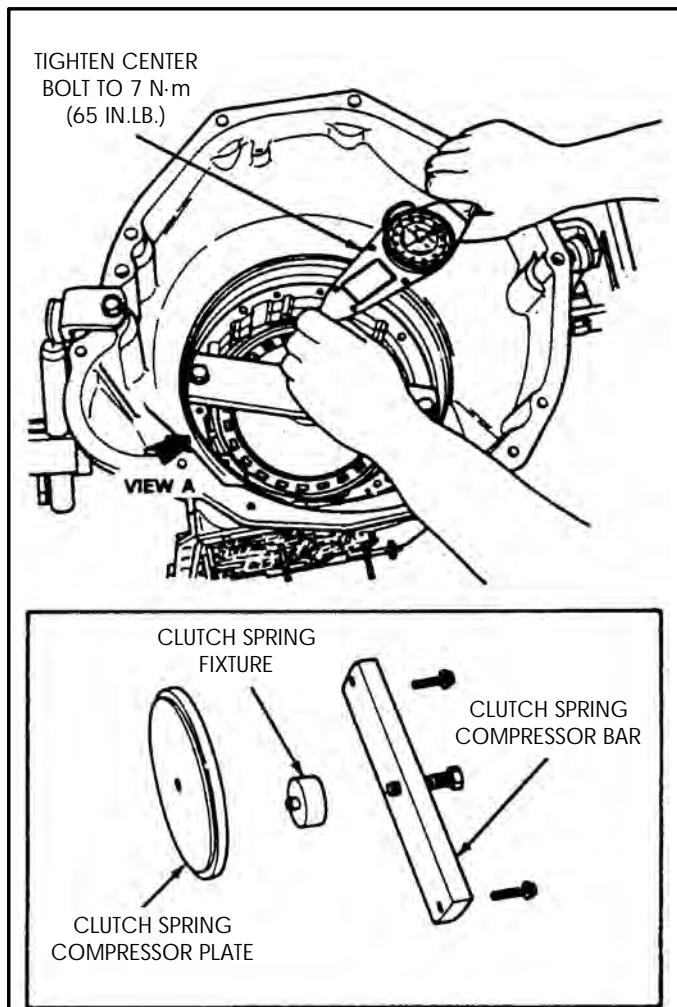
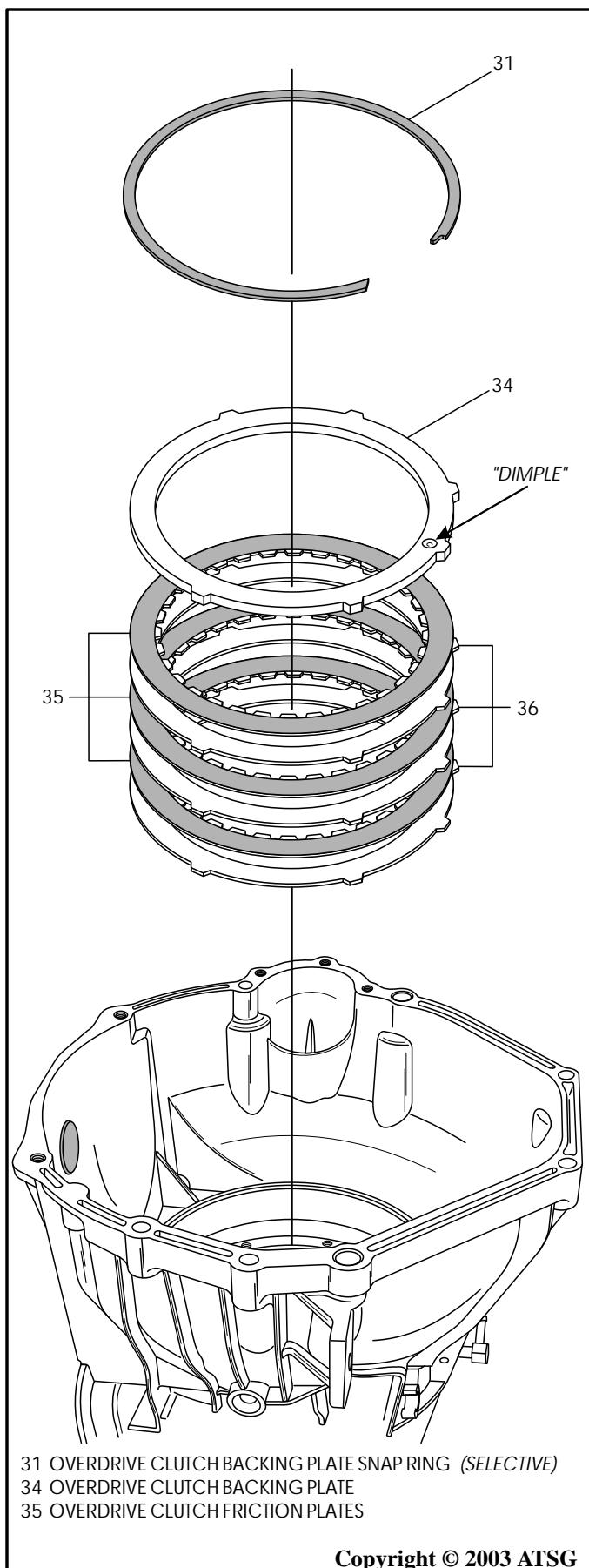


Figure 180



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FINAL ASSEMBLY***Internal Case Components (Cont'd)***

23. Measure the overdrive clutch clearance using a feeler gauge between the selective snap ring and the backing plate (See Figure 182).
 24. Refer to Figure 182 for the specification as the 2 plate and 3 plate stacks are different.
 25. Change the selective snap ring as necessary to obtain the proper clearance. The selective snap rings available are listed in Figure 182, along with the OEM part number.
 26. Install the pre-assembled coast clutch housing and overdrive gearset as an assembly using the **required** installation tool 307 S383, as shown in Figure 183. Ensure that the number 5 thrust bearing is still in place on center shaft.
- Caution: The overdrive one-way roller clutch may be damaged if this tool is not used on the "PTO" equipped transmissions***
27. The assembly will have to be rotated back and forth to engage the center shaft splines and all of the overdrive friction plates, and extra care must be used during installation to avoid any damage until fully seated.

Continued on Page 107.

OVERDRIVE CLUTCH CLEARANCE

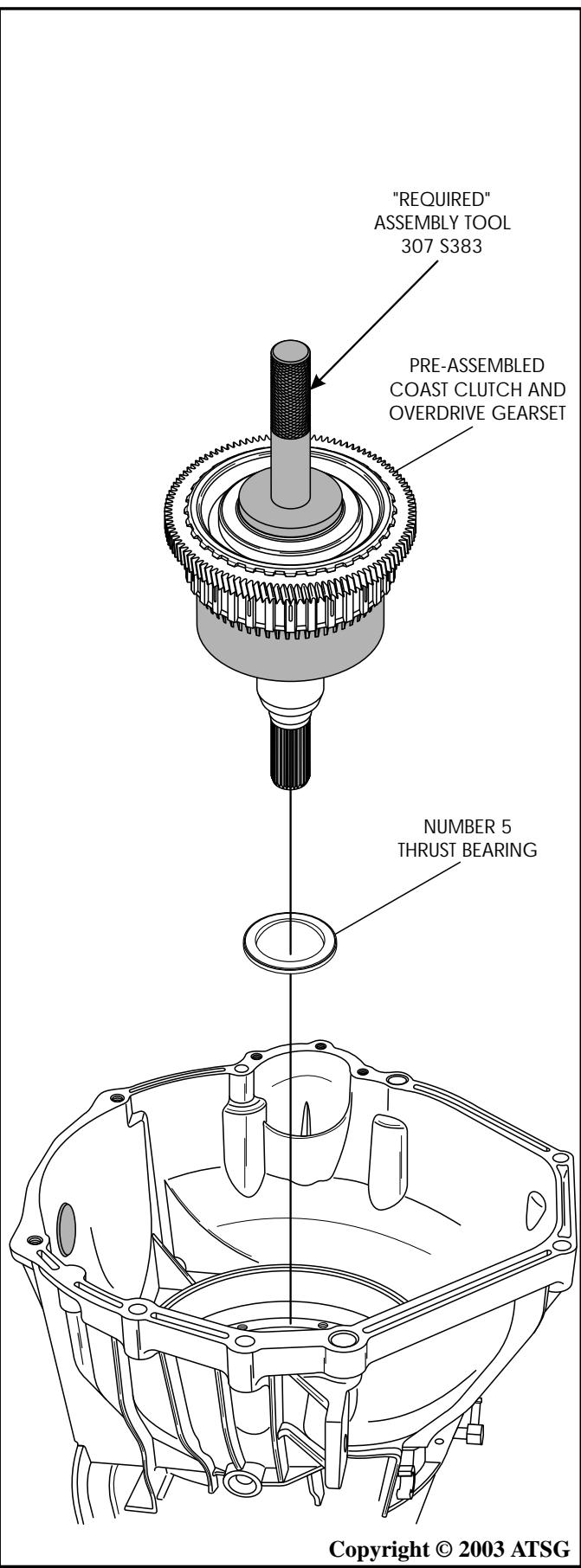
2 PLATE
0.68 - 1.33mm
(0.27" - 0.52")

3 PLATE
0.81 - 1.47mm
(0.32" - 0.58")

Selective Snap Rings Available

1.95 - 2.05mm (.077" - .081") = E9TZ-7B421-BA
2.50 - 2.60mm (.098" - .102") = E9TZ-7B421-CA
3.00 - 3.10mm (.118" - .122") = E9TZ-7B421-DA
3.50 - 3.60mm (.138" - .142") = E9TZ-7B421-EA

Figure 182



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Figure 183

FINAL ASSEMBLY

Internal Case Components (Cont'd)

28. After coast clutch is fully seated, remove the installation tool.
 29. Install an alignment dowel in one of the pump holes in case, as shown in Figure 184.
 30. Install the input shaft into transmission, to also help with alignment concerns (See Figure 184).
 31. Install a new oil pump to case gasket on case surface, as shown in Figure 185, and use small amount of Trans-Jel® to help secure in place.
 32. Install the pre-assembled oil pump assembly, ensuring the number 2 thrust bearing is secure with Trans-Jel® (See Figure 185).
 33. Ensure that the number 1 thrust washer is held in place with Trans-Jel®, if it is used.
- Note: The number 1 thrust washer is not used on "PTO" models.**
34. Fully seat the pump assembly using only hand pressure. Do not use the bolts to pull the pump assembly into the case.
 35. Install new washers on pump bolts and install, as shown in Figure 185, hand tight only.

Continued on Page 108.

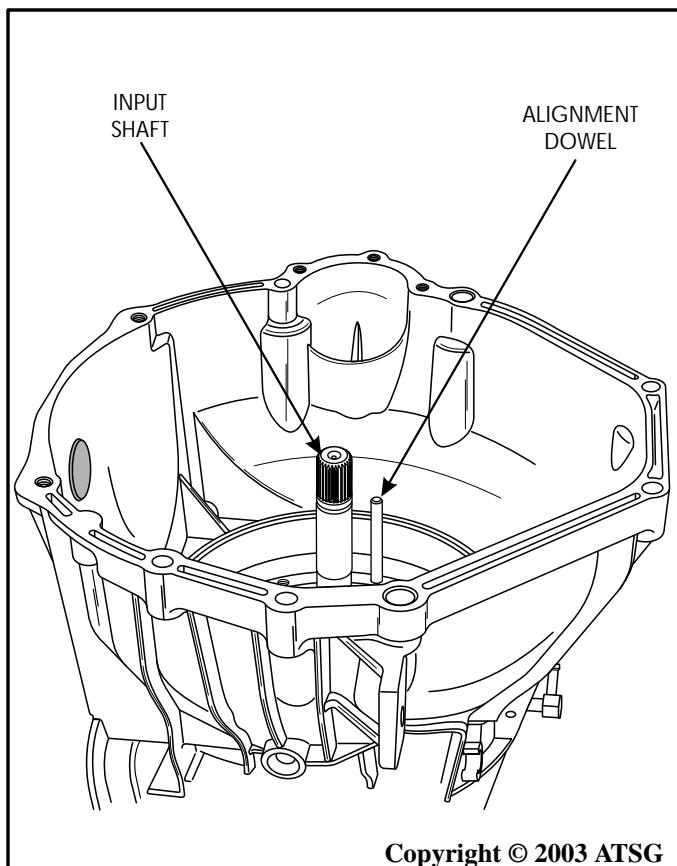
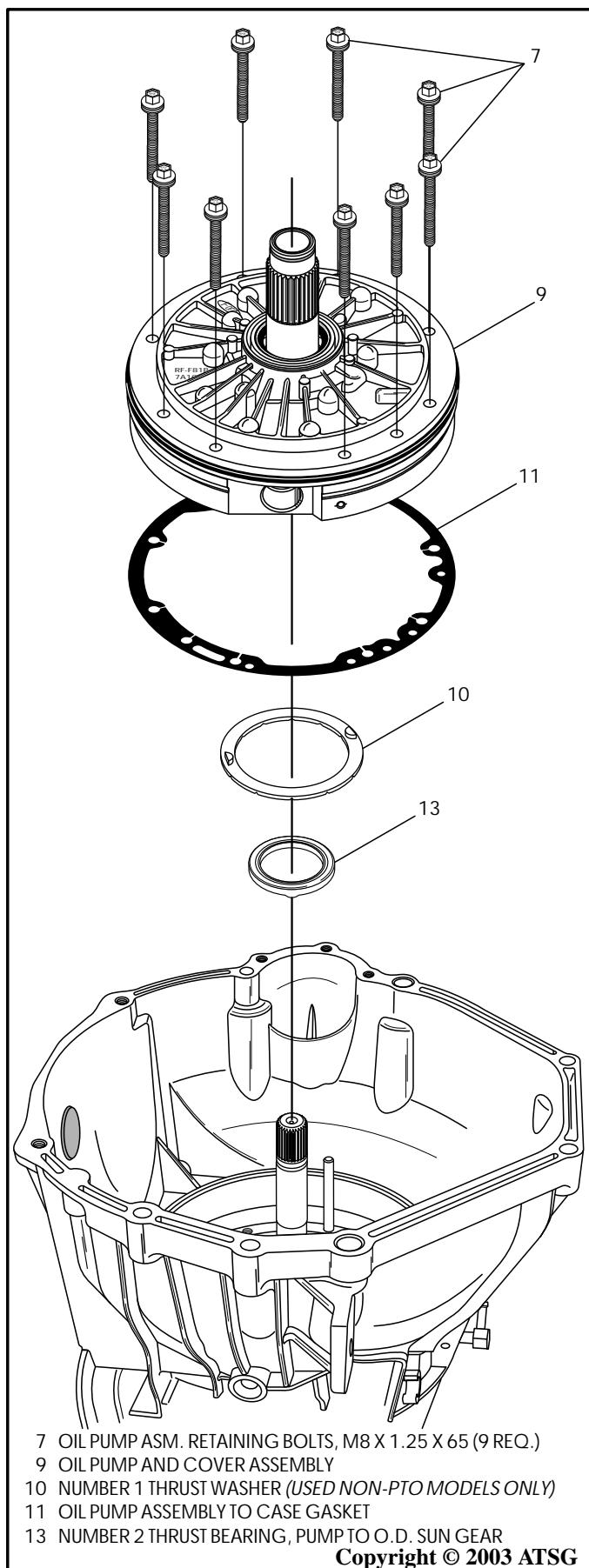


Figure 184



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Figure 185

FINAL ASSEMBLY***Internal Case Components (Cont'd)***

36. After all pump bolts are installed, torque them to 24-31 N·m (18-23 ft.lb.), using a criss-cross pattern (See Figure 186).
37. Remove input shaft as shown in Figure 186.
38. Rotate transmission in fixture so that bottom pan surface is facing up.
39. Ensure that **new** feed bolts are used for center support and overdrive clutch cylinder.

40. Torque overdrive clutch cylinder feed bolt to, 8-14 N·m (6-10 ft.lb.) (See Figure 187).
41. Torque both of the center support feed bolts to, 11-16 N·m (8-12 ft.lb.). (See Figure 187).
Caution: Overtightening the feed bolts will cause the case to warp, and result in transmission failure.

**Final Assembly
Continued on Page 109.**

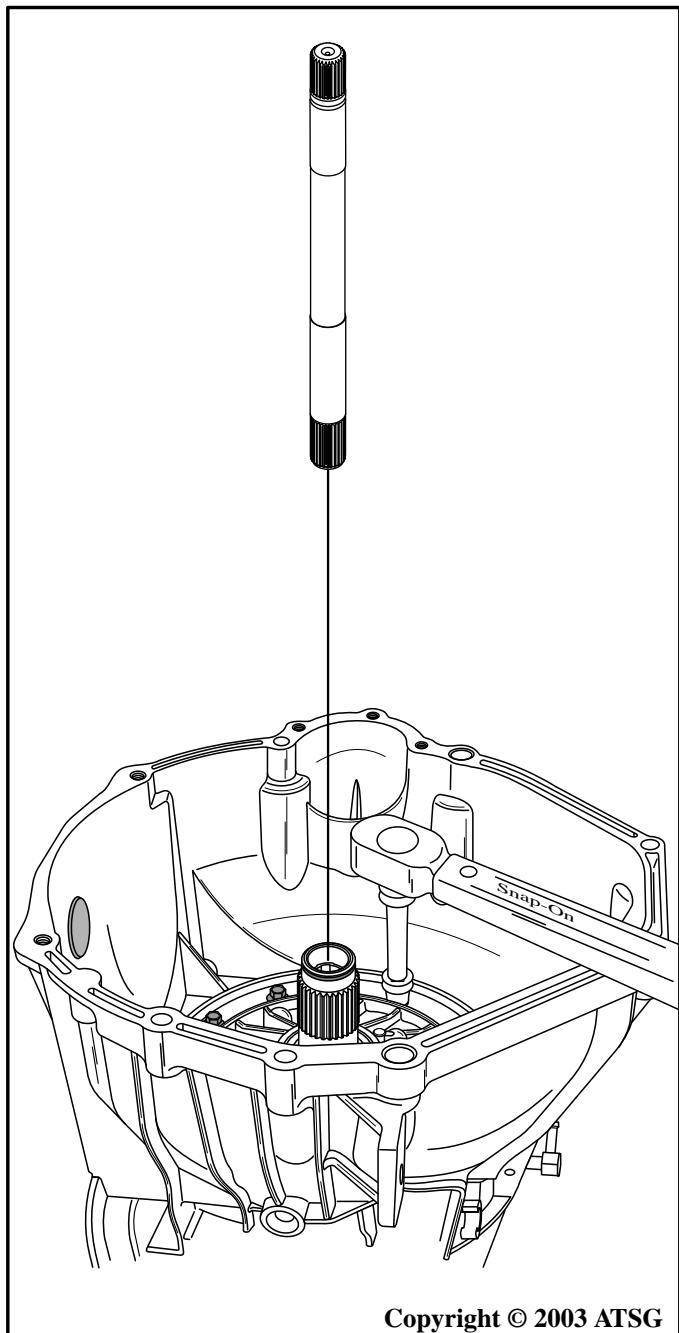


Figure 186

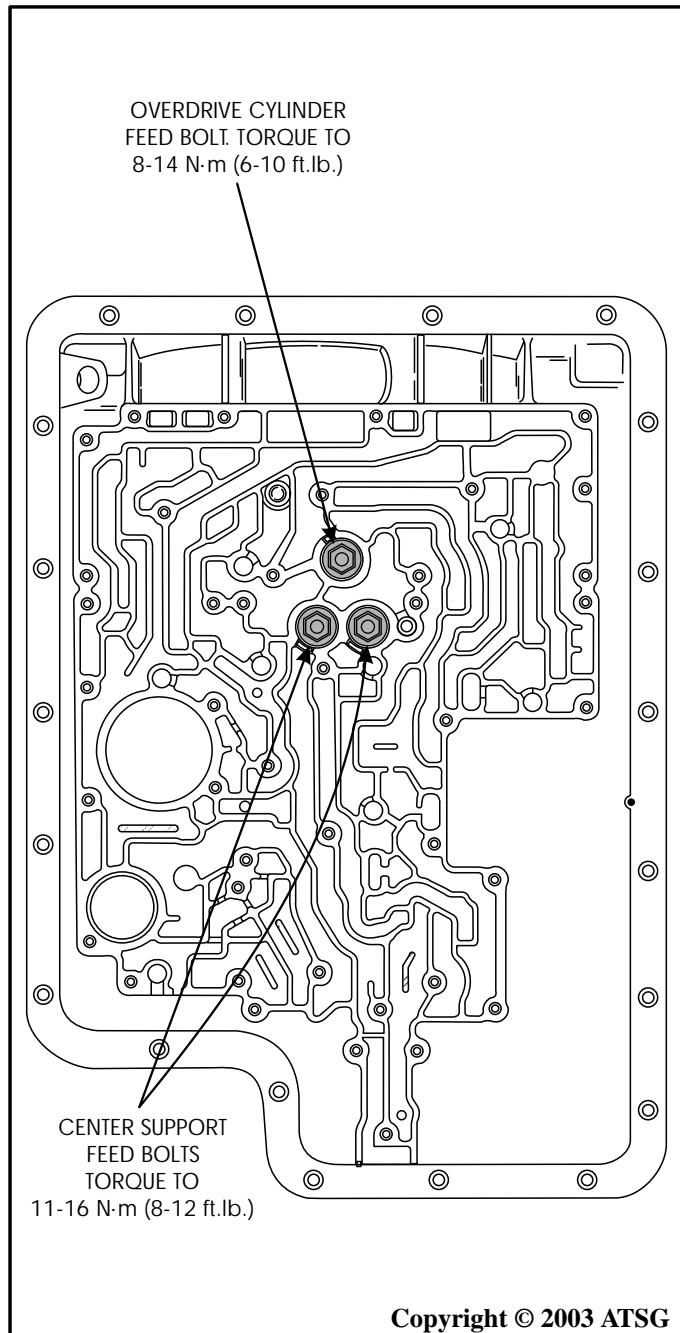


Figure 187

FINAL ASSEMBLY

Bottom Pan Components

1. Install eight (8) 5/16" diameter checkballs in their case pockets, as shown in Figure 188.
2. Install EPC blow-off spring and .250" diameter steel ball on top of spring, in location shown in Figures 188 and 189.
3. Install the manual intermediate servo piston, as shown in Figure 189, and ensure engagement with the target area on manual band.
4. Install new spacer plate to case gasket on case surface, as shown in Figure 190.
5. Install spacer plate, reinforcing plate and the 3 retaining bolts, as shown in Figure 190, and hand tighten only at this time.

Note: The stamped word "UP" on reinforcing plate should be facing up.

Continued on Page 110.

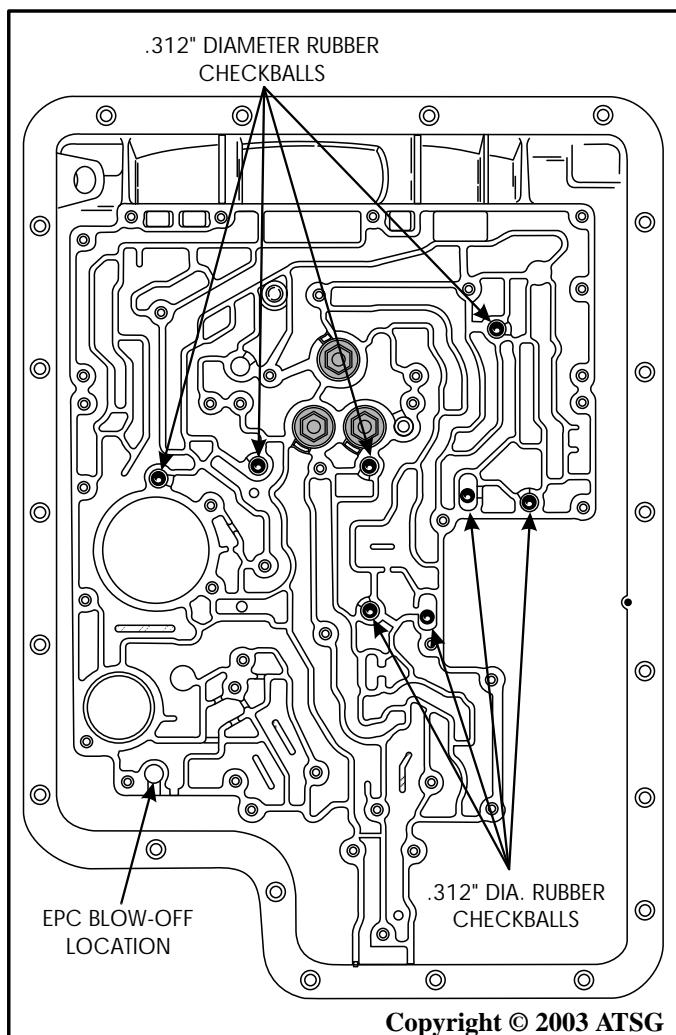


Figure 188

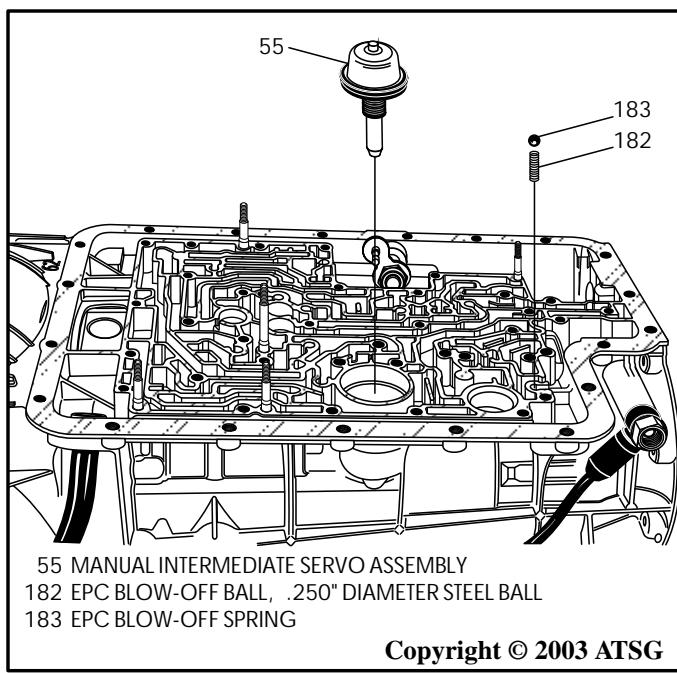


Figure 189

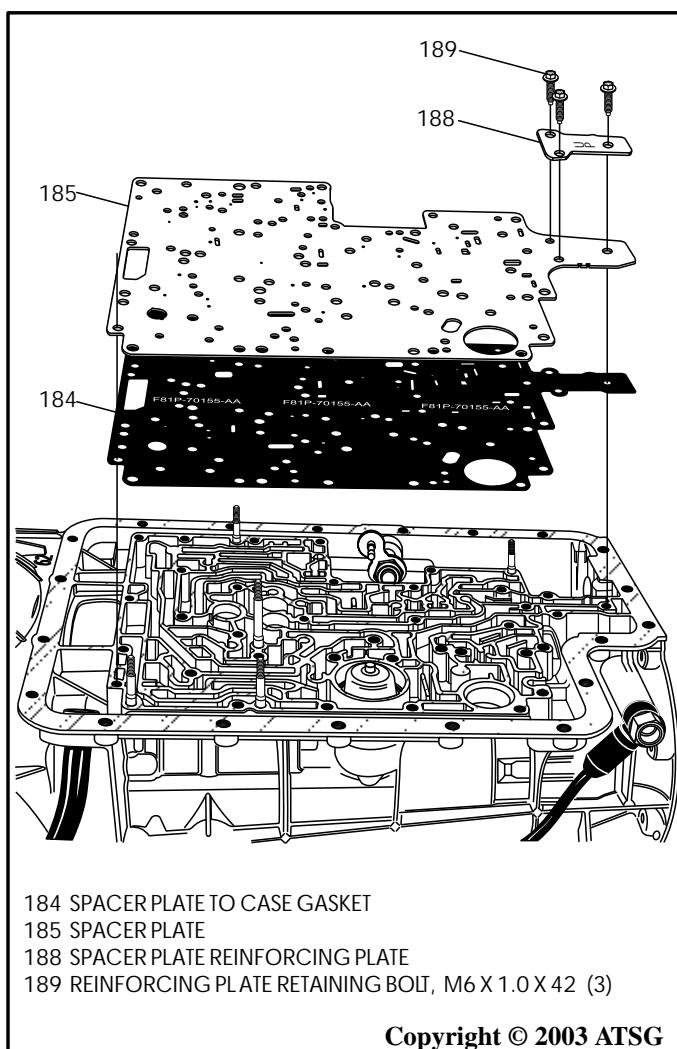


Figure 190

FINAL ASSEMBLY

Bottom Pan Components (Cont'd)

6. Install the solenoid screen into the spacer plate, as shown in Figure 191, and rotate clockwise to lock in place.
7. Install the spacer plate to valve body gasket on spacer plate, as shown in Figure 191.
8. Install new "O" ring seal on the solenoid case connector, as shown in Figure 192, lube the "O" ring with Trans-Jel®, and install solenoid body (See Figure 192).
9. Install the nine solenoid body bolts and the one nut, as shown in Figure 192, and hand tighten only at this time.

Note: Refer to Valve Body Bolt Chart found on Page 116 for proper locations.

10. Install the pre-assembled upper and lower main valve bodies, as shown in Figure 193, ensuring that manual valve is engaged on manual lever.
11. Install the 14 valve body retaining bolts and the two nuts, as shown in Figure 193, and hand tighten only at this time.

Note: Refer to Valve Body Bolt Chart found on Page 116 for proper locations.

Continued on Page 111.

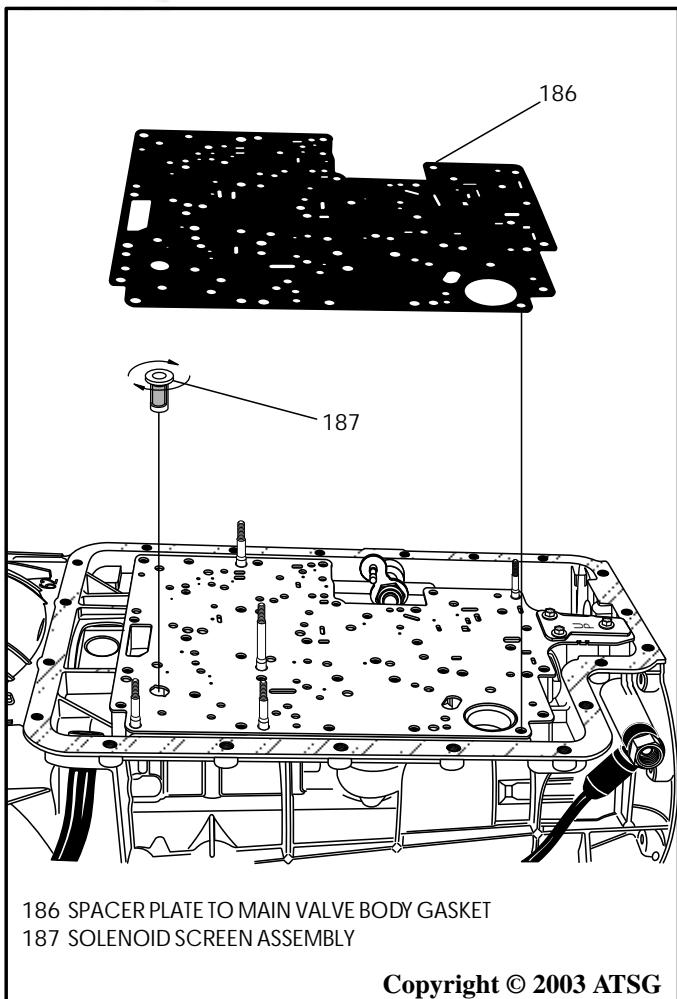


Figure 191

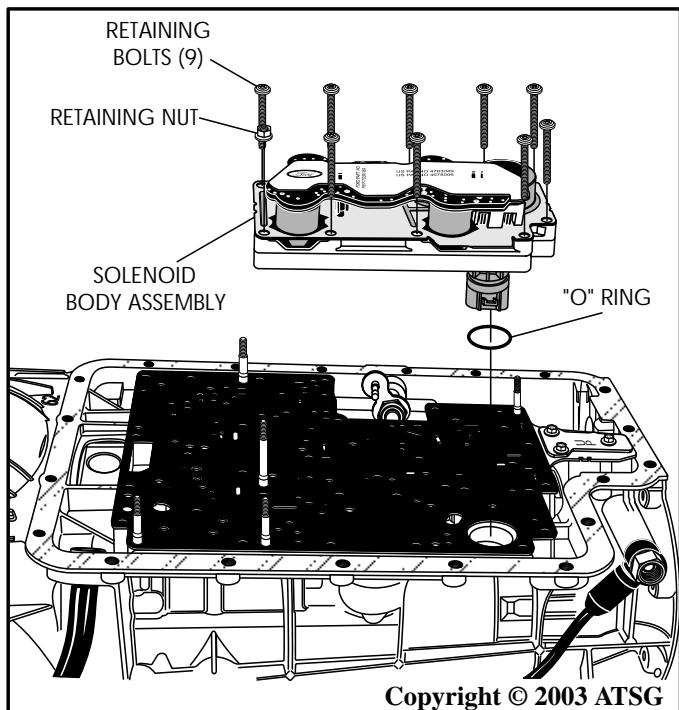


Figure 192

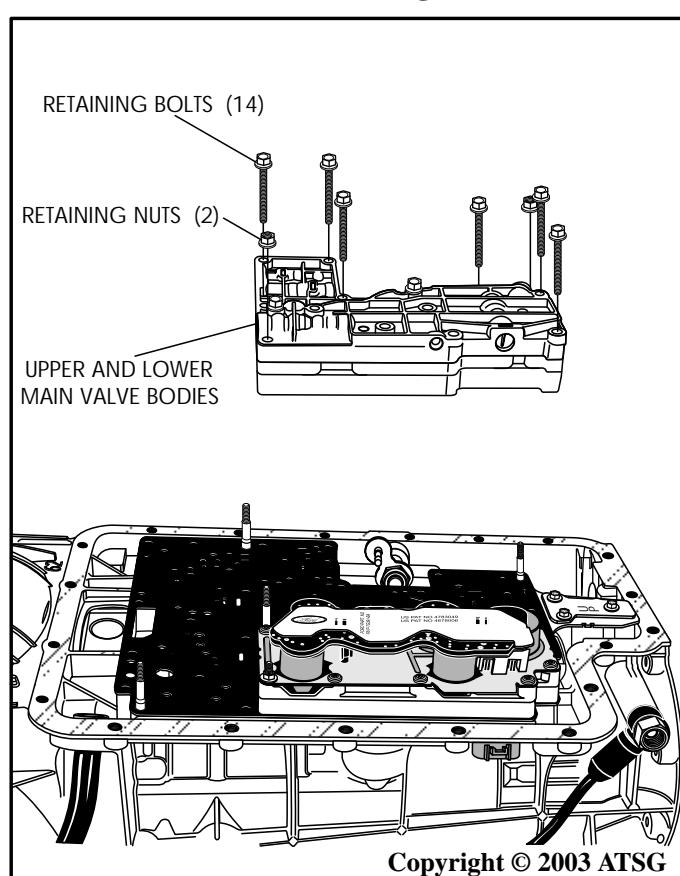


Figure 193

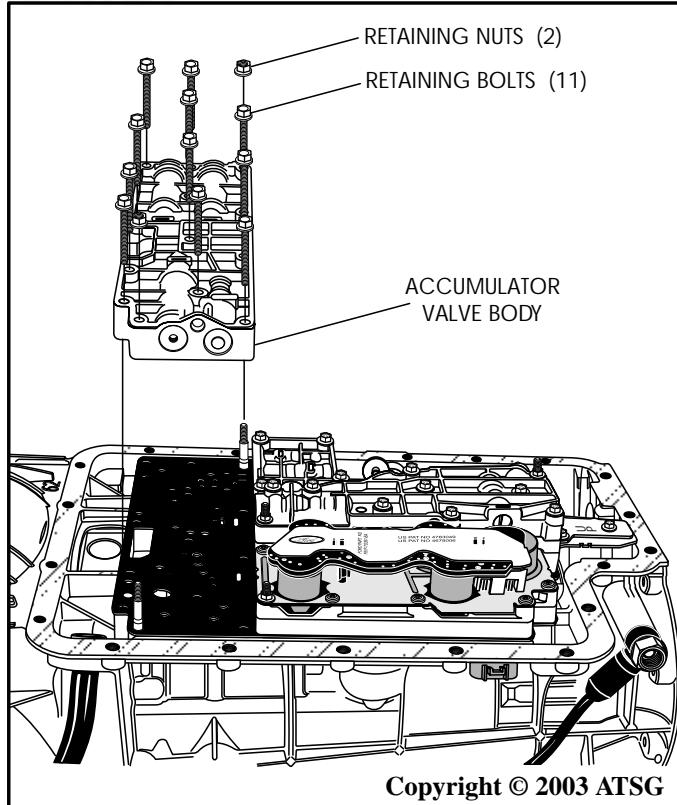


Figure 194

Manual Valve should protrude .050" past the rear of valve body casting, with the manual lever in the reverse position.

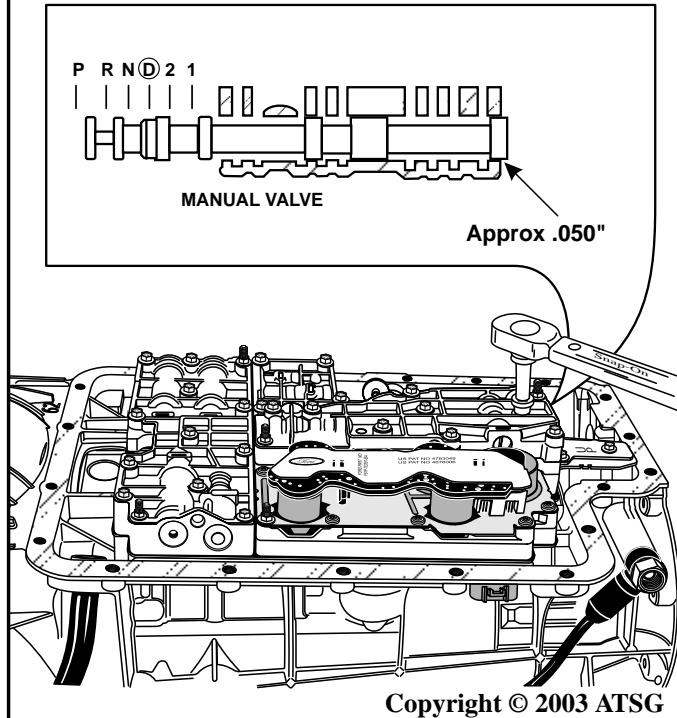


Figure 195

FINAL ASSEMBLY

Bottom Pan Components (Cont'd)

12. Install the accumulator valve body, as shown in Figure 194, install 11 retaining bolts and the two nuts and hand tighten at this time.

Note: Refer to Valve Body Bolt Chart found on Page 116 for proper locations.

13. Finish tightening the bolts and nuts on the accumulator body (11 bolts, 2 nuts), main control valve body (14 bolts, two nuts), the solenoid body (9 bolts, one nut) and reinforcing plate (3 bolts).

Note: Refer to Valve Body Bolt Chart found on Page 116 for proper locations.

14. Torque all valve body bolts and nuts, as shown in Figure 195 to: 9-11 N·m (80-100 in.lb.).

Note: Place the manual lever in the reverse position and measure distance that manual valve is protruding past the rear of the valve body casting. It should be approximately .050", as shown in Figure 195. If dimension is not correct, replace the detent spring and roller assembly with a "New" one.

15. Lubricate the seal on the new filter with small amount of Trans-Jel®, and install new filter into bore in oil pump, as shown in Figure 196.

Continued on Page 112.

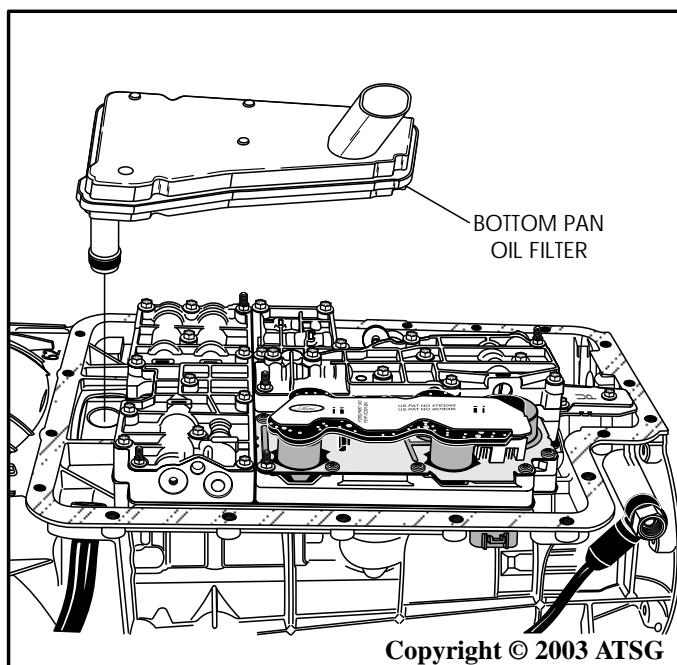


Figure 196

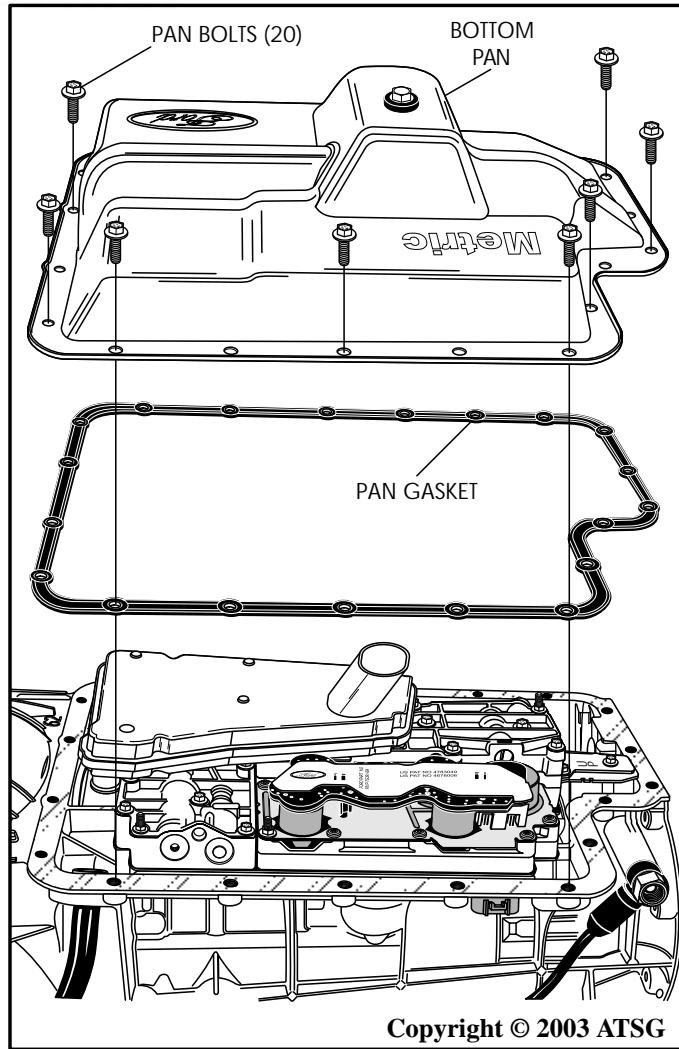


Figure 197

FINAL ASSEMBLY

Bottom Pan Components (Cont'd)

16. Install a new pan gasket on case surface, as shown in Figure 197.
17. Install the bottom pan on top of pan gasket, as shown in Figure 197.
18. Install the twenty (20) pan bolts, as shown in Figure 197, and torque all bottom pan bolts to, 14-16 N·m (10-12 ft.lb.).
19. Rotate transmission in fixture so bottom pan is facing down, as shown in Figure 199.

FINAL ASSEMBLY

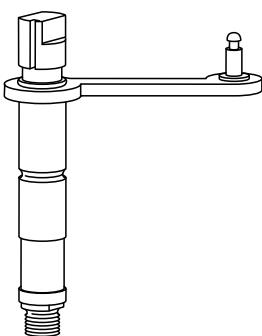
External Components

1. The manual shift levers are also model sensitive as shown in Figure 198. Ensure that you have the proper manual shift lever for the model that you are building.
2. Install the Digital Transmission Range (DTR) sensor, as shown in Figure 199, install 307-351 alignment tool (or equivalent).
3. Install the two sensor retaining bolts, as shown in Figure 199, and torque retaining bolts to, 8-10 N·m (71-88 in.lb.).

Continued on Page 113.

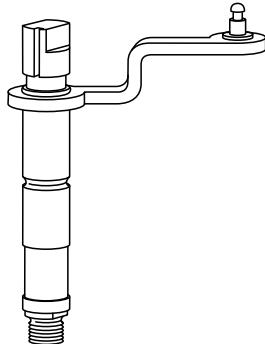
FORD 4R100 MANUAL SHIFT LEVERS

"With" PTO OPTION
STAMPED F81P-AA



FORD PART NUMBER
F81Z-7A256-AA

"Without" PTO OPTION
STAMPED F75P-BB



FORD PART NUMBER
F7UZ-7A256-BB

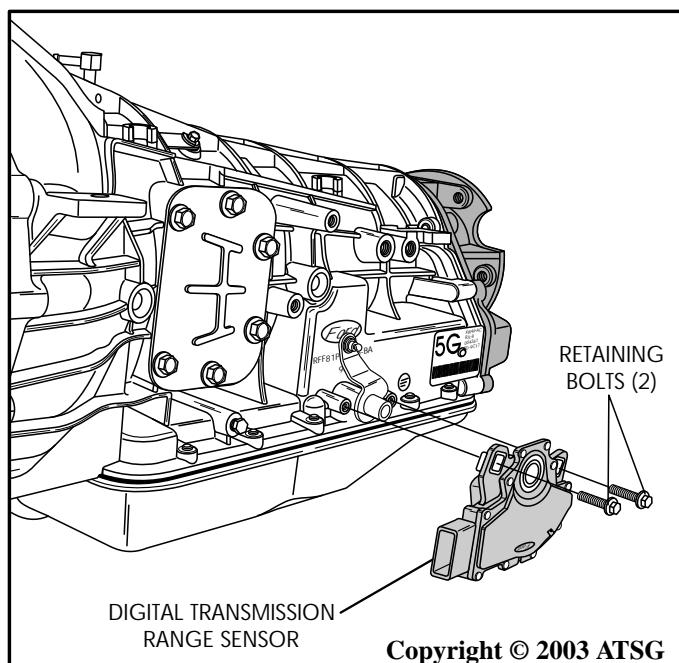


Figure 198

Figure 199

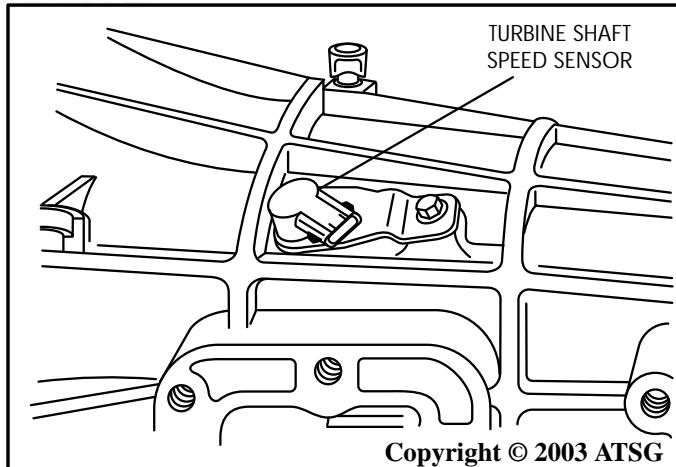


Figure 200

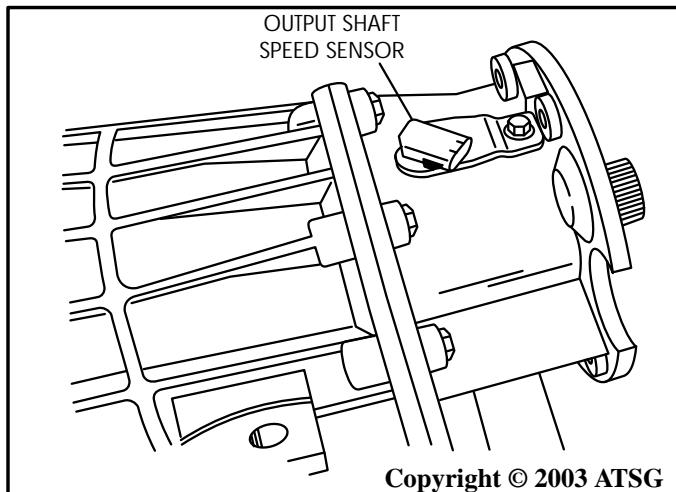


Figure 201

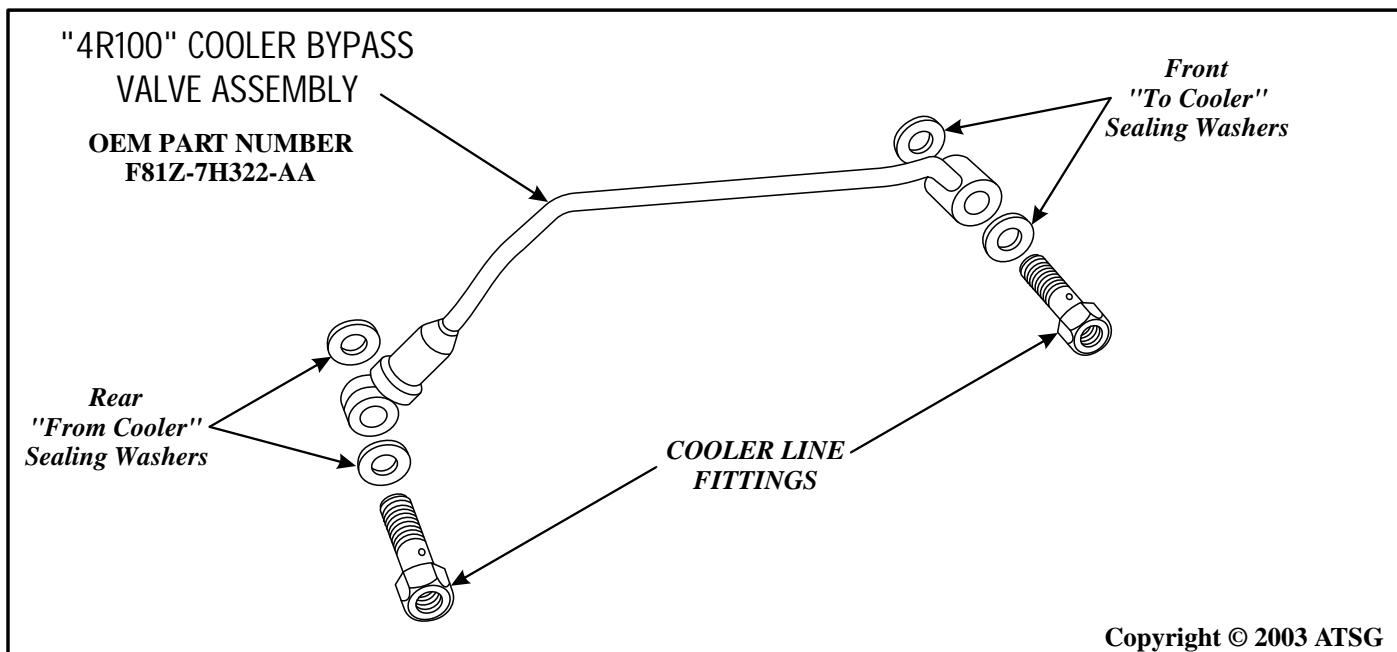
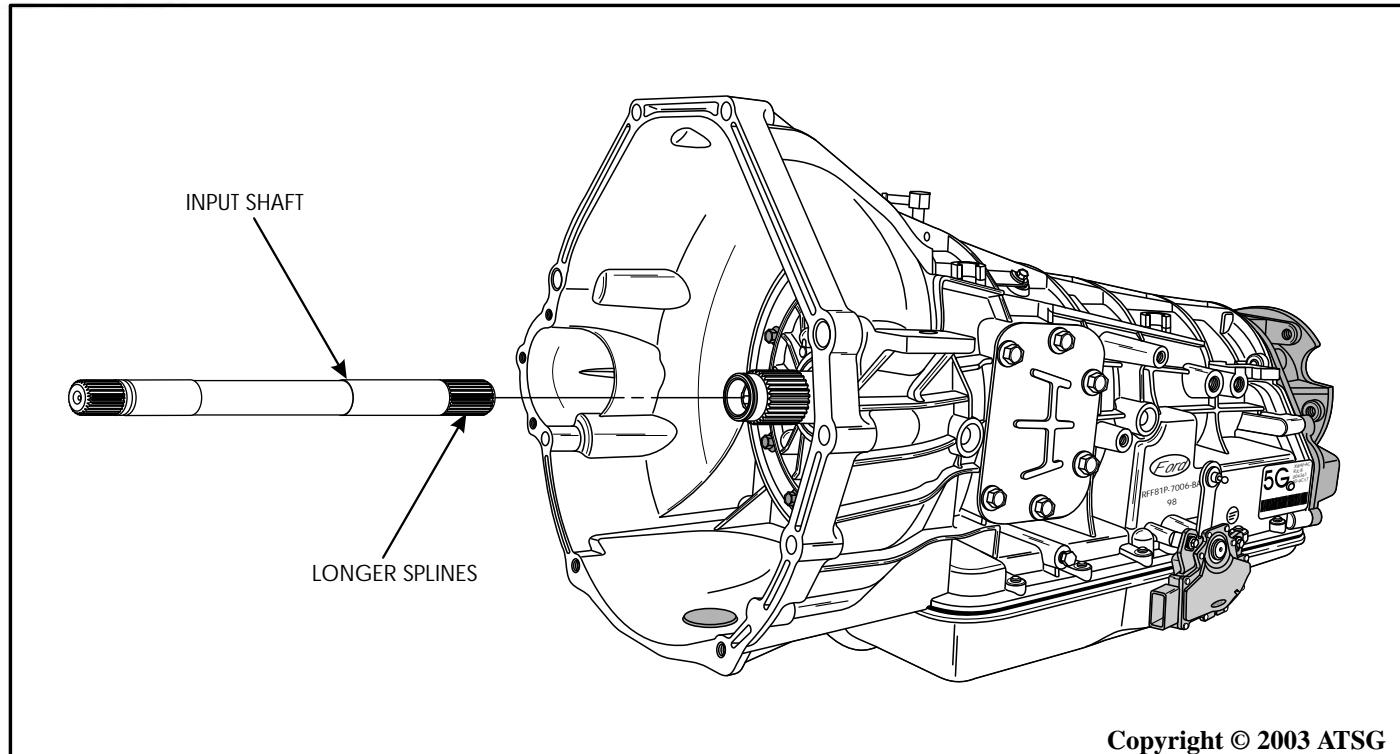


Figure 202

FINAL ASSEMBLY**External Components (Cont'd)**

4. Install turbine shaft speed sensor, if equipped, as shown in Figure 200, and torque the bolt to, 8-10 N·m (71-88 in.lb.).
5. Install output shaft speed sensor, if equipped, as shown in Figure 201, and torque the bolt to, 8-10 N·m (71-81 in lb.)
- Note: The TSS and OSS are model dependant.**
6. Install the cooler bypass valve with the sealing washers positioned as shown in Figure 202, and install threaded cooler line case fittings.
7. Torque front fitting to, 30 N·m (22 ft.lb.).
Torque rear fitting to, 36 N·m (27 ft.lb.)

Continued on Page 114.



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Figure 203

FINAL ASSEMBLY

External Components (Cont'd)

8. Remove the transmission from bench fixture and set on flat work surface (See Figure 203).
9. Install the input shaft, as shown in Figure 203, with the long spline end going in first.
10. Lubricate the converter hub with Mercon® fluid XT-2-QDX, or equivalent, as shown in Figure 204.
11. Install torque converter and check the seating by placing a straight-edge across the front of case, as shown in Figure 205.
12. Ensure that there is a gap between the converter pilot face and the straight-edge, as shown in Figure 205.

CONGRATULATIONS-YOU ARE FINISHED!

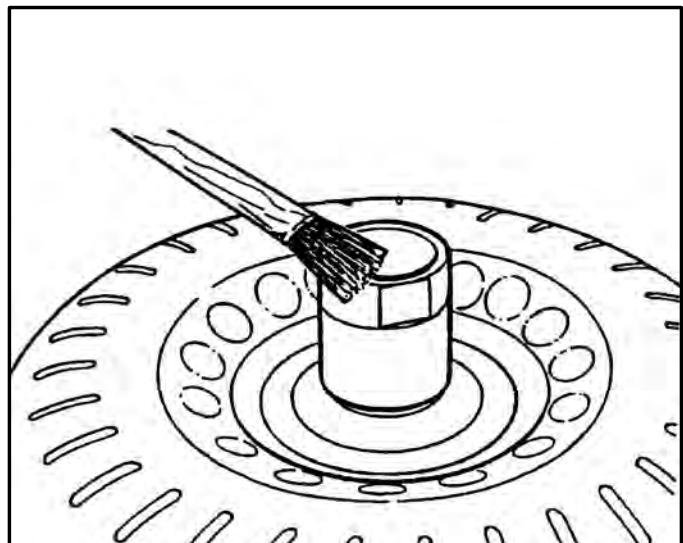


Figure 204

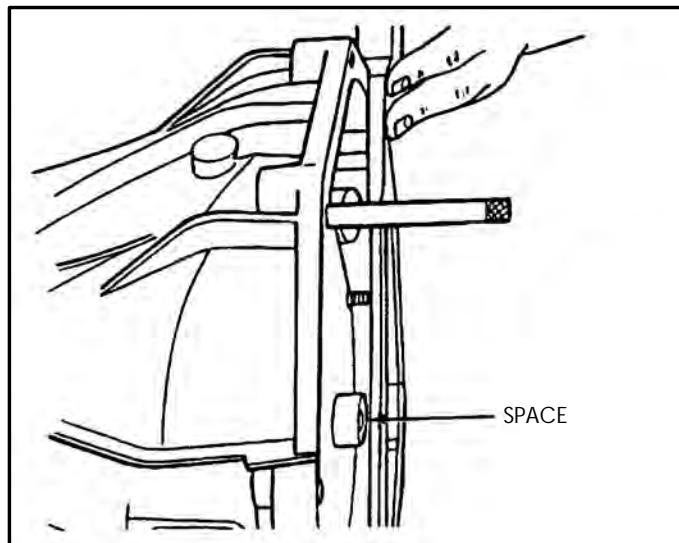


Figure 205

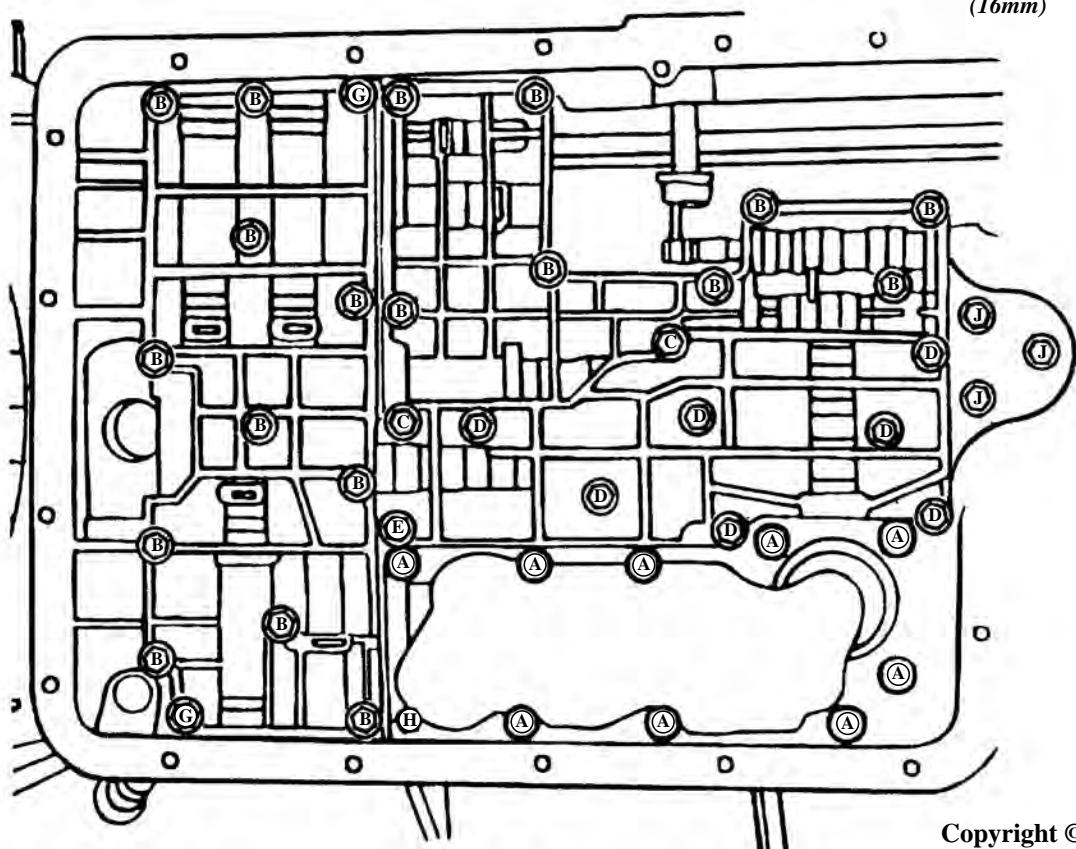
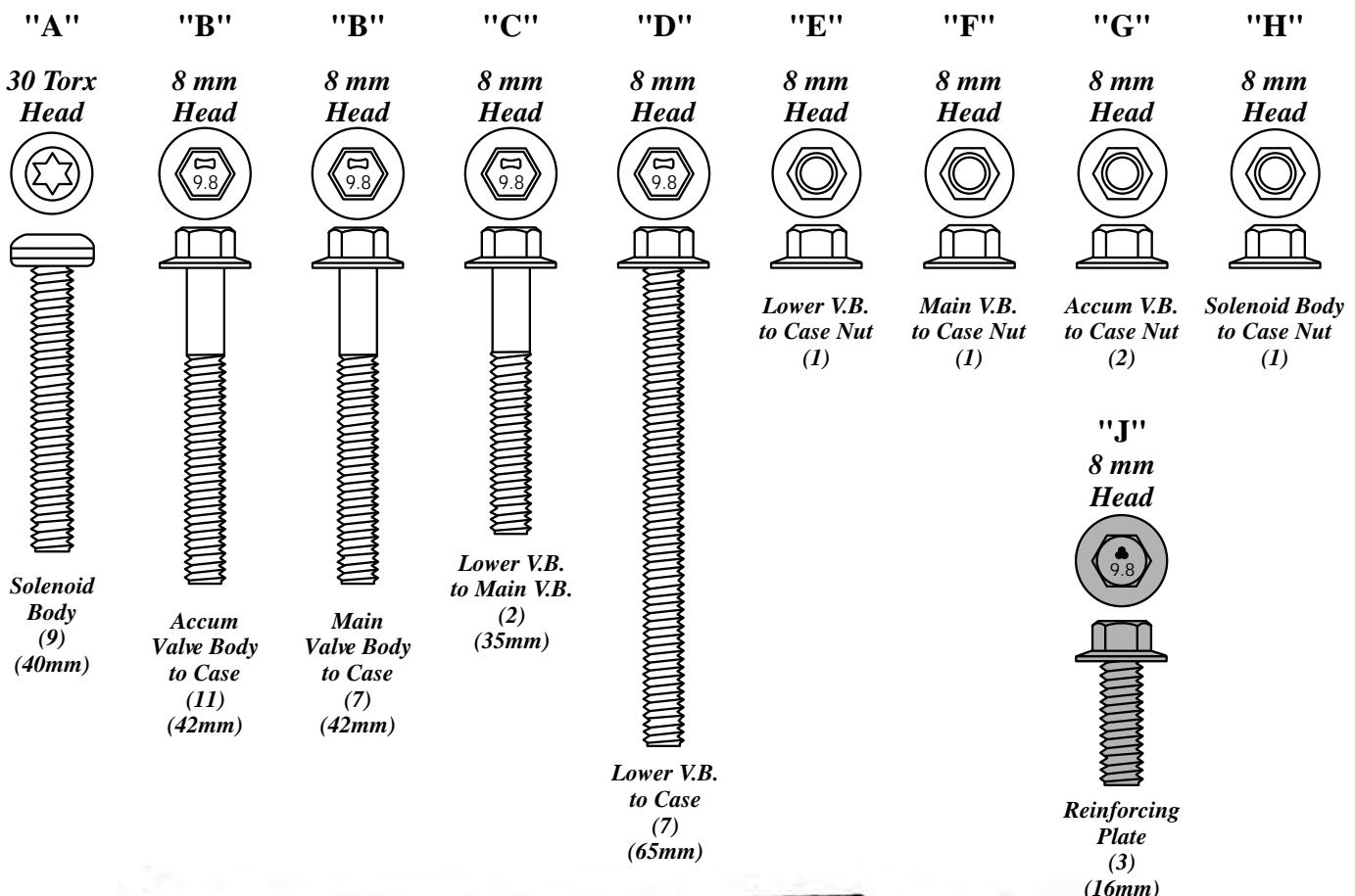


Technical Service Information

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Figure 206

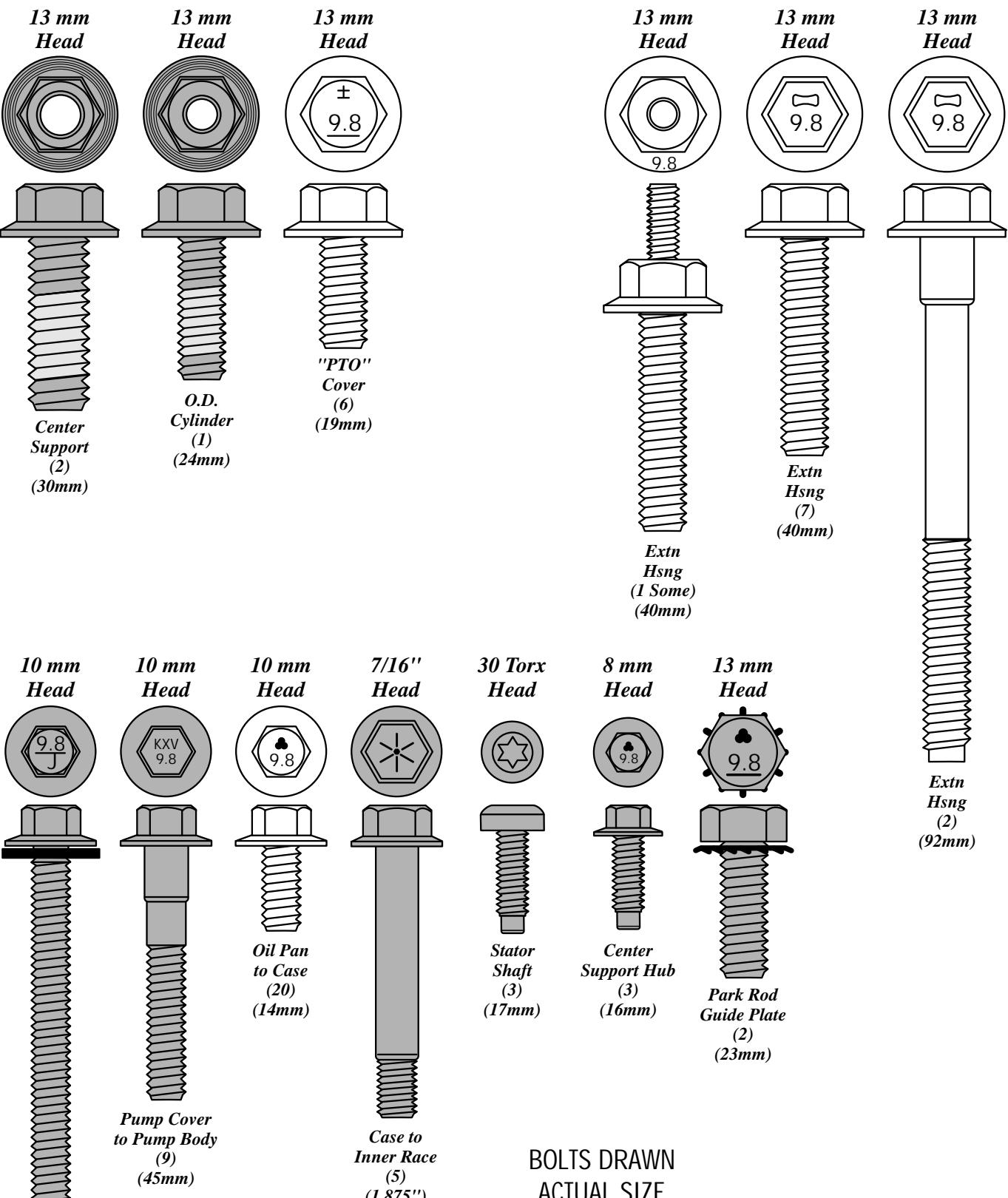
VALVE BODY BOLT CHART



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Figure 207

BOLT CHART



BOLTS DRAWN
ACTUAL SIZE

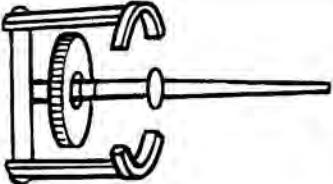
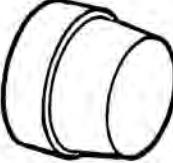
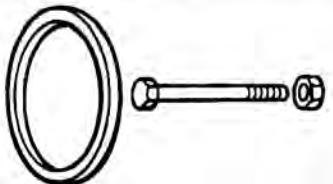
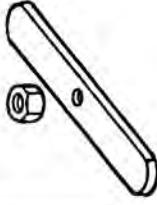
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Figure 208

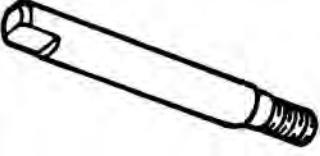
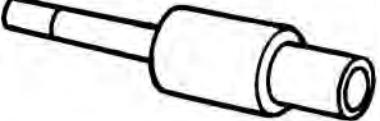
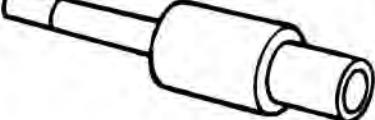
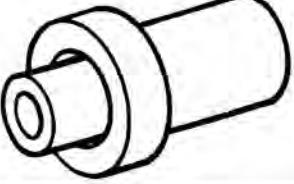
SPECIAL SERVICE TOOLS

ILLUSTRATION	PART NUMBER	DESCRIPTION
	308-001	Puller
	307-221	Pump Puller Adapters
	307-S383	Coast Clutch Assembly Remover/Installer
	307-S223	Clutch Spring Fixture
	307-227 307-436	Clutch Remover/Installer Note: Tool 307-436 has two legs and a bridge (3 pieces)
	307-001 (TOOL-1175-AC)	Seal Remover

SPECIAL SERVICE TOOLS

ILLUSTRATION	PART NUMBER	DESCRIPTION
	307-D004 (D89L-77000-A)	Pump Banding Tool
	307-015 (T65L-77515-A)	Clutch Spring Compressor
	307-387	Coast Clutch Piston Seal Protector
	307-225 (T89T-70010-C2)	Clutch Spring Compressor Plate
	307-228 (T89T-70010-F)	Clutch Spring Compressor Plate
	307-192 (T88C-77000-AH2)	Clutch Spring Compressor Bar

SPECIAL SERVICE TOOLS

ILLUSTRATION	PART NUMBER	DESCRIPTION
	307-222 (T89T-70010-B)	Pump Alignment Pin
	307-063	Extension Housing Bushing Installer
	307-381	Extension Housing Bushing Installer
	307-013	Seal Installer
	301-351 (T97L-70010-A)	TR Sensor Alignment Tool