FORD 5R110W *(Torqshift)*

INDEX

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INTRODUCTION

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FORD 5R110W *("TorqShift")*

The new Ford 5R110W, referred to by Ford Motor Company as the "TorqShift" transmission, is a redesign of the 4R100 transmission with some previous strategy applied. This unit was introduced in model year 2003 in the F Series Trucks and the Excursion vehicles that are equipped with the new 6.0L diesel engine. The "TorqShift" (5R110W) is a 5 speed, rear wheel drive unit that actually has six forward speeds available, depending on hot or cold mode operation. The gear ratio for 1st gear was lowered from 2.71 to 3.09. For 2nd gear the overdrive clutch is applied to provide a ratio of 2.20. 3rd gear provides a ratio of 1.54, which is the same ratio as the previous second gear. All sound familiar? When in cold mode operation, below -15°C (5°F), determined by the TFT sensor, the overdrive clutch is engaged in 3rd gear to provide a ratio of 1.09 for 4th gear, and the transmission will shift directly into 6th gear (overdrive), which is a ratio of 0.71. In cold mode the transmission shifts 1st gear, 2nd gear, 3rd gear, 4th gear, 6th gear. When in hot mode the transmission will shift 1st gear, 2nd gear, 3rd gear, 5th gear (ratio 1.00), 6th gear. Either way it is still a five speed unit with six forward gear ratios available, depending on cold mode or hot mode of operation.

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

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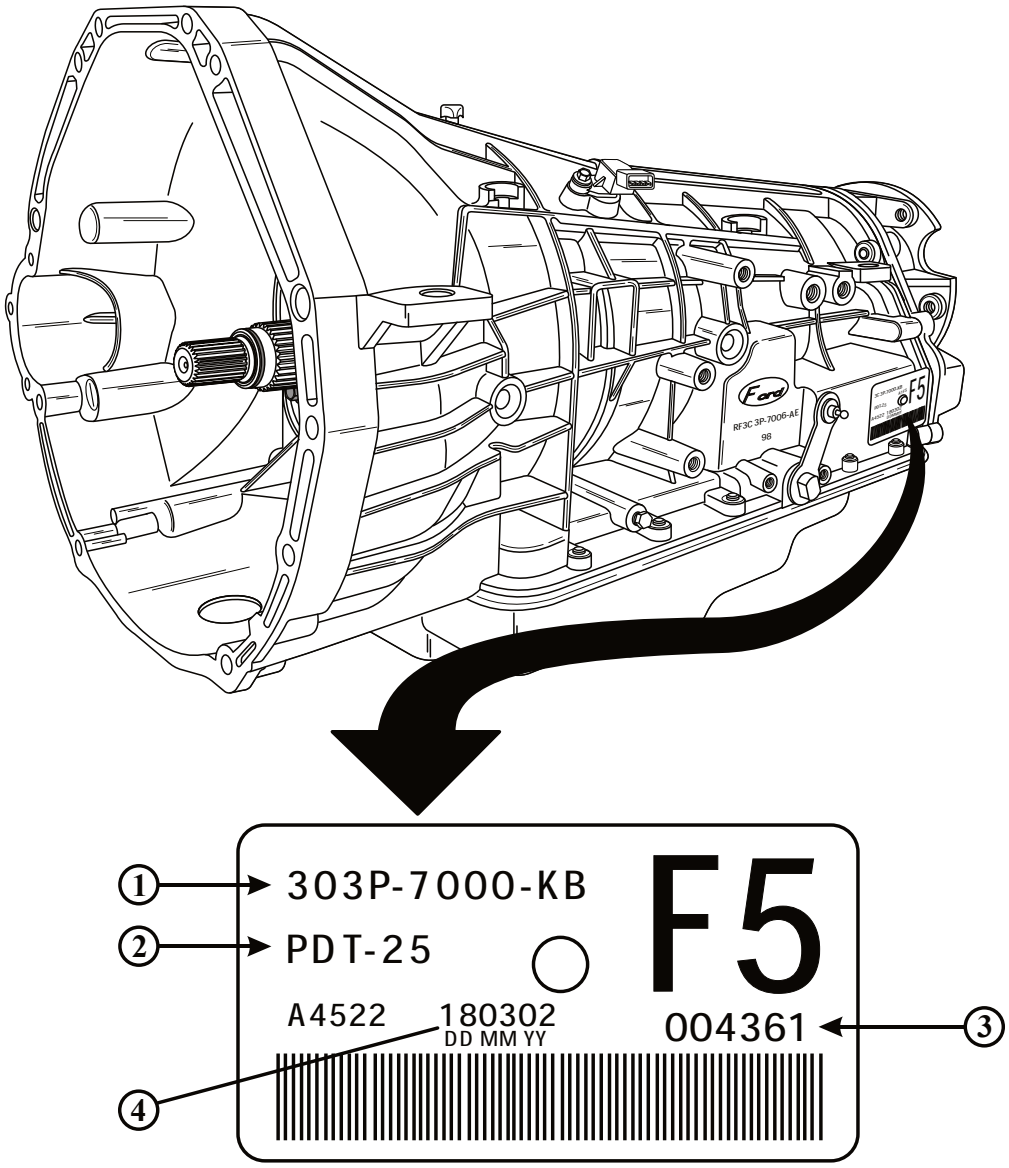
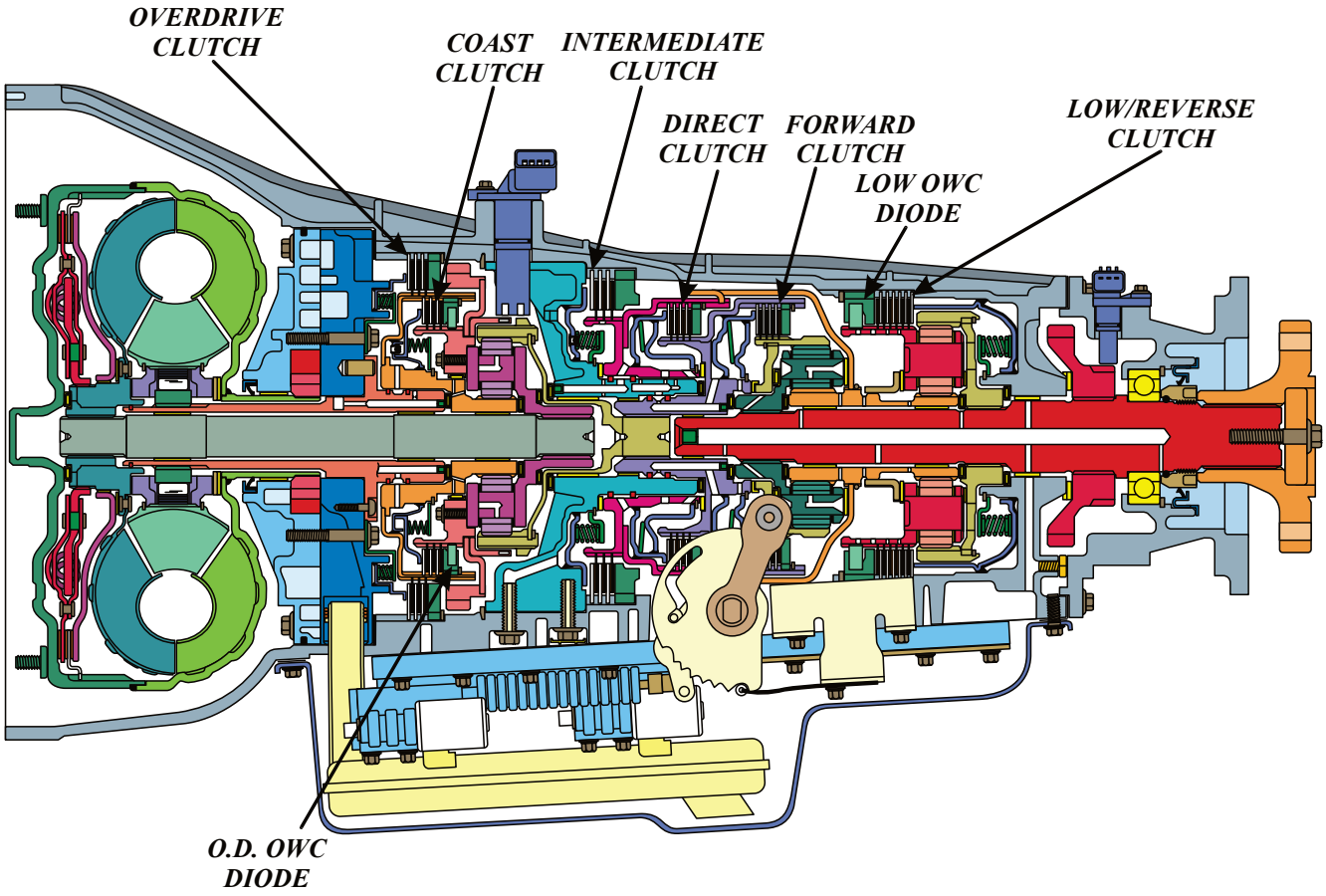
IDENTIFICATION TAG LOCATION AND DESCRIPTION



1	***Assembly Part Number, Prefix And Suffix***
2	***Transmission Model***
3	***Serial Number***
4	***Build Date: DD = Day, MM = Month, YY = Year***

Figure 1

COMPONENT APPLICATION CHART



COMPONENT APPLICATION CHART *WITH TOW/HAUL "OFF"*

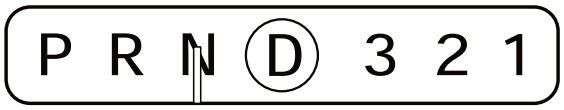
Range/Gear	*Fwd. Clutch*	*Int. Clutch*	*Direct Clutch*	*O.D. Clutch*	*Coast Clutch*	*Lo/Rev Clutch*	*O.D. Diode*	*Low Diode*	*Gear Ratio*	*Eng Brak*
Park/Neut						*ON (a) (c)*				
Reverse			*ON (d)*		*ON*	*ON (a)*			*2.88*	
O.D.- 1st	*ON (d)*					*ON (a) (c)*	*HOLD*	*HOLD*	*3.09*	
O.D.- 2nd	*ON (d)*			*ON*			*O/R*	*HOLD*	*2.20*	
O.D.- 3rd	*ON (d)*	*ON*					*HOLD*	*O/R*	*1.54*	
O.D.- 4th (b)	*ON (d)*	*ON*		*ON*			*O/R*	*O/R*	*1.09*	
O.D.- 5th	*ON (d)*		*ON*				*HOLD*	*O/R*	*1.00*	
O.D.- 6th	*ON (d)*		*ON*	*ON*			*O/R*	*O/R*	*0.71*	
Man- 3rd	*ON (d)*	*ON*			*ON*		*HOLD*	*O/R*	*1.54*	*YES*
Man- 2nd	*ON (d)*			*ON*		*ON (a)*	*O/R*	*HOLD*	*2.20*	*YES*
Man- 1st	*ON (d)*				*ON*	*ON (a)*	*HOLD*	*HOLD*	*3.09*	*YES*

(a) PCM Calibration Controlled
(b) Cold Strategy (See Page 6)
(c) 30 psi Until 5 kmh (3 mph)
(d) Clutch Applied Through Manual Valve Position

Figure 2

GENERAL TRANSMISSION DESCRIPTION AND OPERATION

The Ford 5R110W "TorqShift" transmission has seven range positions that can be selected with the manual shift lever, P, R, N, (D), 3, 2, 1. Following is a description of each range.



P When the Park position is selected, there is no powerflow through the transmission. The parking pawl is engaged which locks the output shaft to the transmission case. The engine can be started and the ignition key can be removed.

R When the Reverse position is selected, the vehicle can be operated in a rearward direction at a reduced gear ratio.

N When the Neutral position is selected, there is no powerflow through the transmission. The output shaft is not held and is free to turn and the engine can be started. This position can also be selected while vehicle is moving, to restart the engine if that becomes necessary.

(D) The Overdrive position is the normal position for most forward gear operations. The Overdrive position provides automatic upshifts and downshifts, apply and release of the converter clutch, and maximum fuel economy during normal operation.

3 The 3rd Gear position provides third gear start and hold, for improved traction on slippery roads. This position can also be selected at any vehicle speed for improved engine braking. Transmission will not downshift if it will cause an engine overspeed condition.

2 The 2nd Gear position provides second gear start and hold, for improved traction on slippery roads. This position can also be selected at any vehicle speed for improved engine braking. If this position is selected at higher speeds, the transmission will downshift to the next lower gear, and will downshift into second gear after the vehicle decelerates to a vehicle speed that will not create an engine overspeed condition.

1 The Manual Low Gear position provides 1st gear operation only. This position can also be selected at any vehicle speed to provide improved engine braking for descending steep grades. If this position is selected at higher speeds, the transmission will downshift to the next lower gear, and will downshift into first gear after the vehicle decelerates to a vehicle speed that will not create an engine overspeed condition.

Transmission Temperature Gage

There has also been added to the instrument cluster, a transmission temperature gauge that we think is long over-due, and should be on all vehicles.

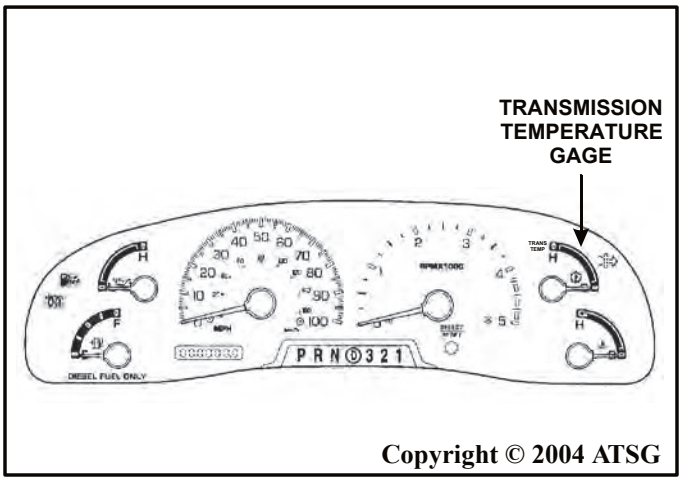


Figure 3

Tow/Haul Feature

The Tow/Haul feature was designed to assist the driver when towing a trailer or a heavy load. All transmission gear ranges, including all five forward gears, are available when using the Tow/Haul feature. The Tow/Haul Switch is located on the end of the manual shift lever, (See Figure 4) and is a momentary contact switch. The Tow/Haul Switch provides a signal to the PCM when pressed by the operator, resulting in a change in shift and TCC scheduling. When the Tow/Haul Switch has been turned on, the indicator lamp that is located at the end of the manual shift lever will illuminate "Tow/Haul - ON". When Tow/Haul is activated, upshifts will now occur at a higher vehicle speed, and when decelerating, the downshifts will also occur at a higher vehicle speed, providing some added engine braking. When the switch is pressed again, Tow/Haul will be cancelled and the Transmission Control Indicator Lamp (TCIL) will turn off. The PCM controls the operation of the TCIL. The PCM may also flash the TCIL on and off, to alert the driver that a transmission operational error has occured, when certain faults in monitored sensors, solenoids or other transmission components are detected.

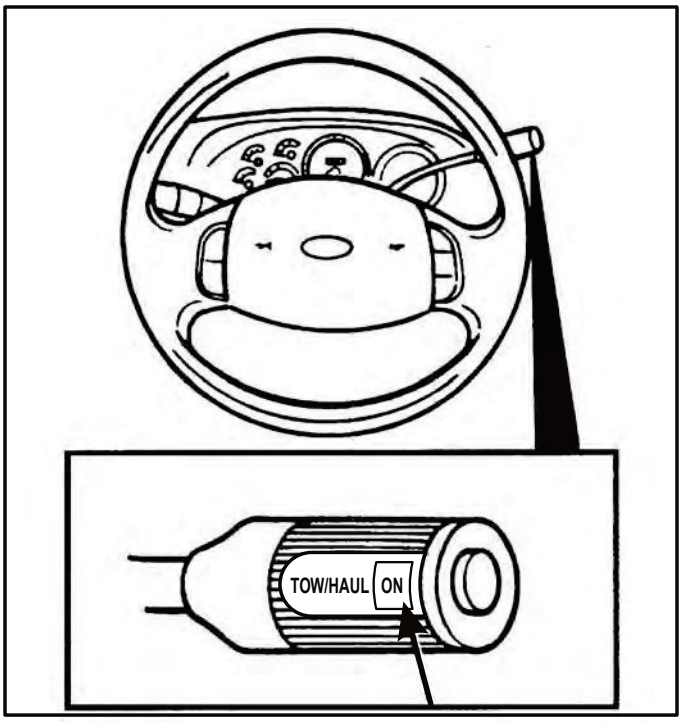


Figure 4

Cold Mode Operation

The "TorqShift" (5R110W) is a 5 speed, rear wheel drive unit that actually has six forward speeds available, depending on hot or cold mode operation. The gear ratio for 1st gear was lowered from 2.71 to 3.09. For 2nd gear the overdrive clutch is applied to provide a ratio of 2.20. 3rd gear provides a ratio of 1.54, which is the same ratio as the previous second gear. All sound familiar? When in cold mode operation, below -15°C (5°F), determined by the TFT sensor, the overdrive clutch is engaged in 3rd gear to provide a ratio of 1.09 for 4th gear, and the transmission will shift directly into 6th gear (overdrive), which is a ratio of 0.71. In cold mode the transmission shifts 1st gear, 2nd gear, 3rd gear, 4th gear, 6th gear. When in hot mode the transmission will shift 1st gear, 2nd gear, 3rd gear, 5th gear (ratio 1.00), 6th gear. Either way it is still a five speed unit with six forward gear ratios available, depending on cold mode or hot mode of operation.

Battery Disconnect, Dead Battery

Any time the battery is disconnected for ***any*** reason, a new PCM has been installed, or the calibration has been reflashed, the adaptive strategy for the "Engagement Schedule" ***must*** be updated.

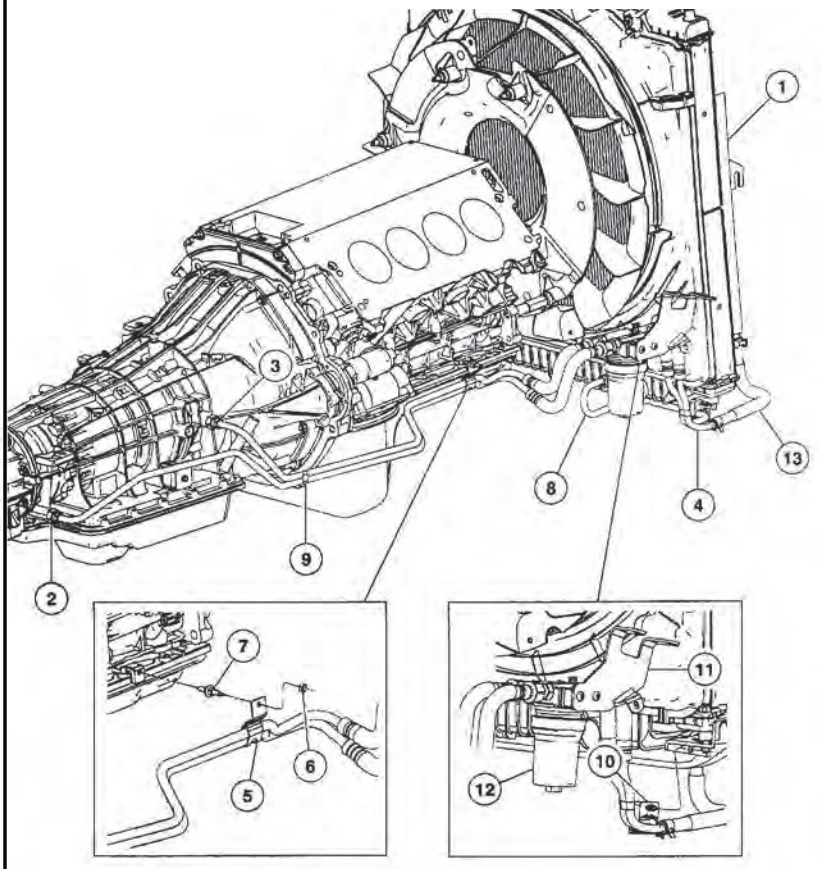
This procedure will prevent the customer from returning with firm or harsh engagement complaints.

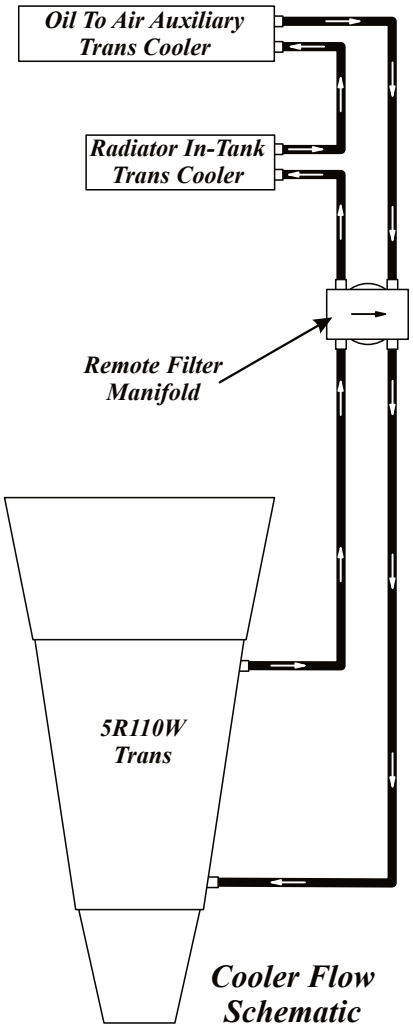
Procedure is as follows:

Note: ***All*** of the following engagements ***must*** be performed, in order for engagement pressures to correctly adapt with the new calibration.

1. Install diagnostic equipment and monitor TFT.
2. Warm the transmission fluid to 54°C (130°F) as indicated by the TFT.
3. Perform 5 engagements from ***Park to Reverse.*** Each engagement must be five seconds apart.
4. Perform 5 engagements from ***Drive to Reverse.*** Each engagement must be five seconds apart.
5. Perform 5 engagements from ***Reverse to Drive.*** Each engagement must be five seconds apart.
6. Perform 5 engagements from ***Neutral to Drive.*** Each engagement must be five seconds apart.

REMOTE TRANSMISSION FILTER IN COOLER LINES





1 OIL TO AIR TRANSMISSION FLUID AUXILIARY COOLER
2 REAR "FROM COOLER" LINE CASE FITTING
3 FRONT "TO COOLER" LINE CASE FITTING
4 REMOTE FILTER "IN" LINE
5 COOLER LINE BRACKET
6 NUT
7 STUD
8 RADIATOR COOLER "IN" LINE
9 COOLER LINE "C" CLIP
10 COOLER LINE CLIP
11 REMOTE FILTER MANIFOLD BRACKET
12 REMOTE TRANSMISSION FLUID FILTER
13 HOSE ASSEMBLY

CAUTION: The transmission cooler lines must be disconnected prior to flushing out the cooler lines. Do Not attempt to flush the remote filter housing because of the internal orifice.

Figure 5

Remote Transmission Filter

This transmission is equipped with a remote fluid filter, as shown in Figure 5. This filter passes ten percent of the transmission fluid from the transmission through a small orifice into a servicable screw-on filter element. The filtered fluid is then directed back into the rear lube circuit through the large opening in the remote filter manifold.

Fluid Requirements Mercon®SP

The new Ford 5R110W "TorqShift" transmission also uses a new transmission fluid called Mercon®SP, and is ***not interchangeable*** with Mercon® or Mercon®V. The use of any other transmission fluid than Mercon®SP, can result in the transmission failing to operate in a normal manner and/or transmission failure. Ford recommends the transmission fluid and bottom pan filter be changed every 48,000 km (30,000 miles) regardless of normal or special operating conditions.

ELECTRONIC COMPONENT LOCATIONS AND IDENTIFICATION

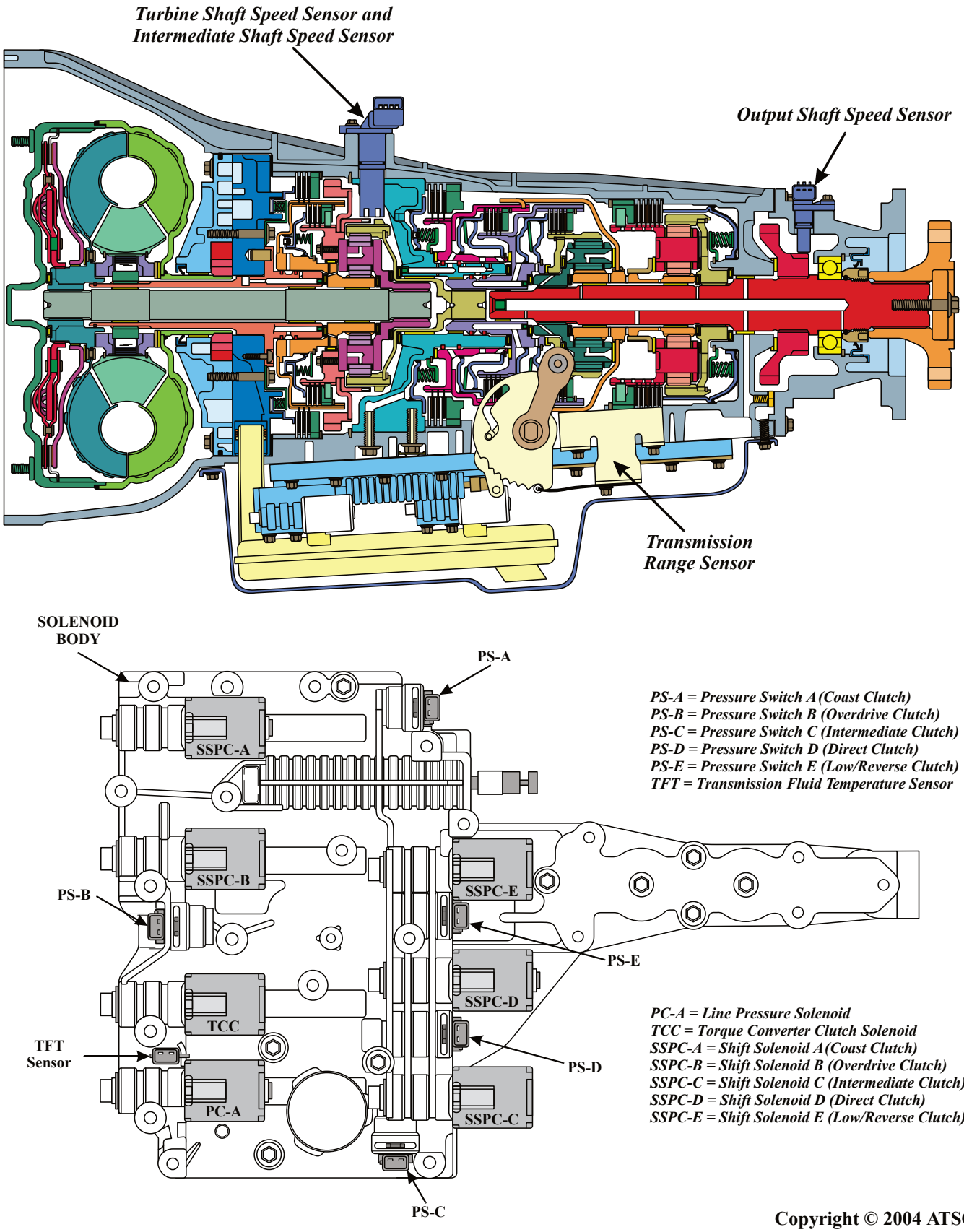


Figure 6

ELECTRICAL COMPONENT DESCRIPTION AND OPERATION

The following provides a brief description of each of the sensors and actuators used by the PCM for proper transmission operation

Powertrain Control Module (PCM)

The operation of the transmission is controlled by the Powertrain Control Module (PCM). Many input sensors provide information to the PCM. The PCM then uses this information to control actuators which determine transmission operation. Refer to Figure 14 for PCM location and connector terminal information and identification.

Engine Coolant Temperature (ECT) Sensor

The engine coolant temperature (ECT) sensor is a thermistor in which resistance changes when the temperature changes. The resistance of the sensor increases as engine temperature decreases and the voltage sent to the PCM increases. The PCM uses this information to help determine TCC operation.

Intake Air Temperature (IAT) Sensor

The intake air temparature (IAT) sensor is a thermistor in which the resistance changes with temperature. The resistance decreases as the intake air temperature increases. The IAT provides air temperature information to the PCM, which is used to help determine transmission line pressure and shift scheduling.

Accelerator Pedal Position (APP) Sensor

The accelerator pedal position (APP) sensor is mounted on the accelerator pedal on 6.0L diesel applications. The APP sensor detects the position of the accelerator pedal and inputs this information, as a voltage to the PCM. The PCM uses APP sensor information to help in determining line pressure, shift scheduling and TCC operation.

Failure of the APP sensor will cause transmission to operate at a higher than normal line pressure to help avoid damage to the transmission. This will result in harsh upshifts and harsh engagements.

Brake Pedal Position (BPP) Switch

The brake pedal position (BPP) switch supplies battery voltage to the PCM, that the brake pedal is applied. The PCM uses this information to release the torque converter clutch, speed control, and auxiliary idle (if equipped).

Tow/Haul Switch

The Tow/Haul Switch is located on the end of the manual shift lever and is a momentary contact switch. The Tow/Haul Switch provides a signal to the PCM when pressed by the operator, resulting in a change in shift and TCC scheduling. When the Tow/Haul Switch has been pressed, the indicator lamp that is located at the end of the manual shift lever will illuminate "Tow/Haul - ON". When the switch is pressed again, Tow/Haul will be cancelled and the TCIL will turn off (See Figure 4).

Transmission Control Indicator Lamp (TCIL)

The TCIL is used along with the Tow/Haul Switch. The TCIL is located near the end of the manual shift lever and will illuminate "Tow/Haul - ON" when the Tow/Haul switch has been pressed. The PCM controls the operation of the TCIL. The PCM may also flash the TCIL on and off, to alert the driver that a transmission operational error has occured, when certain faults in monitored sensors, solenoids or other transmission components are detected (See Figure 4).

4 X 4 Low Switch

The 4X4 Low Switch, located on the dash on the right hand side of the driver, sends a ground signal to the instrument cluster when the vehicle is in 4X4 Low. The PCM then receives 4X4 Low status from the instrument cluster and adjusts the transmission shift schedule accordingly. Four wheel "High" can be selected while moving at any speed up to 55 MPH.

ELECTRICAL COMPONENT DESCRIPTION AND OPERATION (Cont'd)

Transmission Solenoid Body Assembly

The Solenoid Body Assembly is bolted to the transmission case inside the bottom pan and looks similar to what we have previously referred to as a valve body. The Solenoid Body Assembly contains the following:

- ***Seven Variable Force Solenoids***
- ***Five Normally Closed Pressure Switches***
- ***Transmission Fluid Temperature Sensor***
- ***Manual Shift Valve***
- ***Over-Pressurization Relief Ball***

There is a solenoid and a pressure switch dedicated to the function of each clutch pack, except the forward clutch, as it is controlled by the manual valve. There are no other valves in the solenoid body except for the pressure relief ball and spring. All shifts are controlled by five solenoids. Line pressure and the torque converter clutch each have their own solenoid. Four of the solenoids, TCC, OD Clutch, Intermediate Clutch and the Low/Reverse Clutch, are ***directly proportional*** which means the pressure output is directly proportional to the applied DC amps. The current is varied between 0 and 1 amp from the PCM, and 1 amp equals maximum pressure in the oil circuit. Three of the solenoids, Line Pressure, Coast Clutch and Direct Clutch, are ***inversely proportional*** which means the pressure output is inversely proportional to the applied DC amps. The current is varied between 0 and 1 amp from the PCM, and 0 amp equals maximum pressure in the oil circuit.

The different design solenoids are keyed differently to prevent mis-assembly in the solenoid body and all are retained with a large "E" clip. The "Natural" colored wire connectors connect to the solenoids. The "Black" colored connectors connect to the pressure switches. There are separate connectors for the TFT sensor and for the TR-P sensor. All of the solenoids except the line pressure solenoid can be serviced without removing the solenoid body from the case. Refer to Figure 6 for location and identification of the solenoids and switches on the solenoid body. Refer to Figure 8 for the differences and how to identify between the direct and inversely proportional solenoids.

Line Pressure Control Solenoid (PC-A)

The Line Pressure Control Solenoid (PC-A) is an ***inversley proportional*** three port solenoid. The pressure output is inversely proportional to the applied DC current supplied through an electronically controlled driver. The current is varied between 0 amp and 1 amp from the PCM, and 0 amp equals maximum pressure in the oil circuit. The PC-A Solenoid controls the line pressure oil circuits (See Figure 8)

Torque Converter Clutch (TCC) Solenoid

The Torque Converter Clutch (TCC) Solenoid is a ***directly proportional*** three port solenoid. The pressure output is directly proportional to the applied DC current supplied through an electronically controlled driver. The current is varied between 0 amp and 1 amp from the PCM, and 1 amp equals maximum pressure in the oil circuit. The TCC Solenoid controls the apply and release rates of the converter clutch (See Figure 8).

Shift Solenoid Pressure Control Solenoids (SSPC-B, SSPC-C, SSPC-E)

The overdrive (SSPC-B), intermediate (SSPC-C), and low/reverse (SSPC-E) clutches are each controlled by a ***directly proportional*** three port solenoid. The pressure output is directly proportional to the applied DC current supplied through an electronically controlled driver. The current is varied between 0 amp and 1 amp from the PCM, and 1 amp equals maximum pressure in the particular clutch oil circuit. The Shift Solenoid controls the apply and release rates of the particular clutch pack (See Figure 8).

Shift Solenoid Pressure Control Solenoids (SSPC-A, SSPC-D)

The coast (SSPC-A), and direct (SSPC-D) clutch packs are each controlled by an ***inversely proportional*** three port solenoid. The pressure output is inversely proportional to the applied DC current supplied through an electronically controlled driver. The current is varied between 0 amp and 1 amp from the PCM, and 0 amp equals maximum pressure in the particular clutch oil circuit. The Shift Solenoid controls the apply and release rates of the particular clutch pack. Refer to Figure 8.

ELECTRICAL COMPONENT DESCRIPTION AND OPERATION (Cont'd)

Pressure Switches
(PS-A, PS-B, PS-C, PS-D, PS-E)

Each of the five shift pressure control solenoids has a corresponding pressure switch, which is normally closed. The pressure switch is designed to open when shift solenoid control pressure exceeds 40 psi. All five of the pressure switches are identical and will interchange in the solenoid body, as shown in Figure 7. Their particular functions are as follows:

PS-A = Coast Clutch
PS-B = Overdrive Clutch
PS-C = Intermediate Clutch
PS-D = Direct Clutch
PS-E = Low/Reverse Clutch

Refer to Figure 6 for their particular locations in the solenoid body.

Special Note: Use of the pressure switch input was dropped from the vehicle calibration before the 2003 model year went into production.

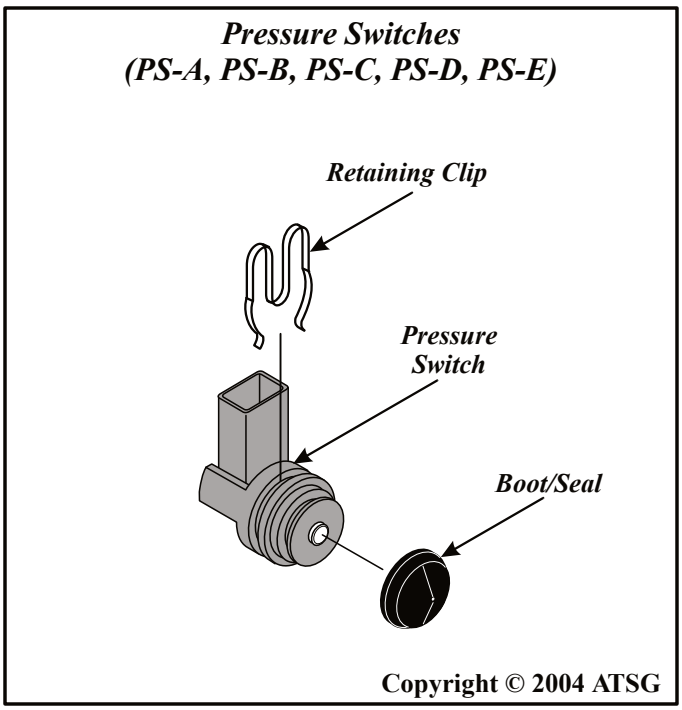


Figure 7

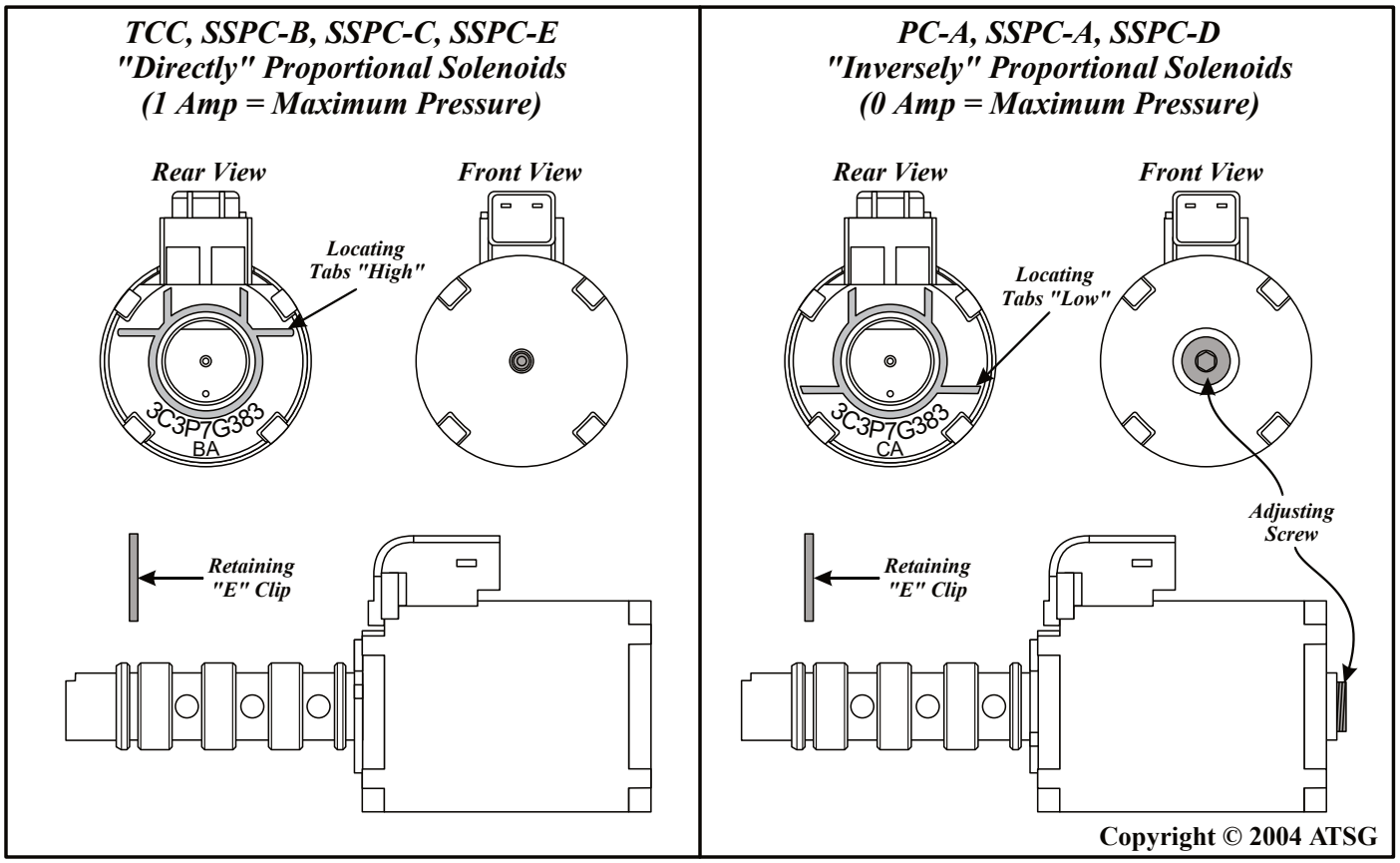


Figure 8

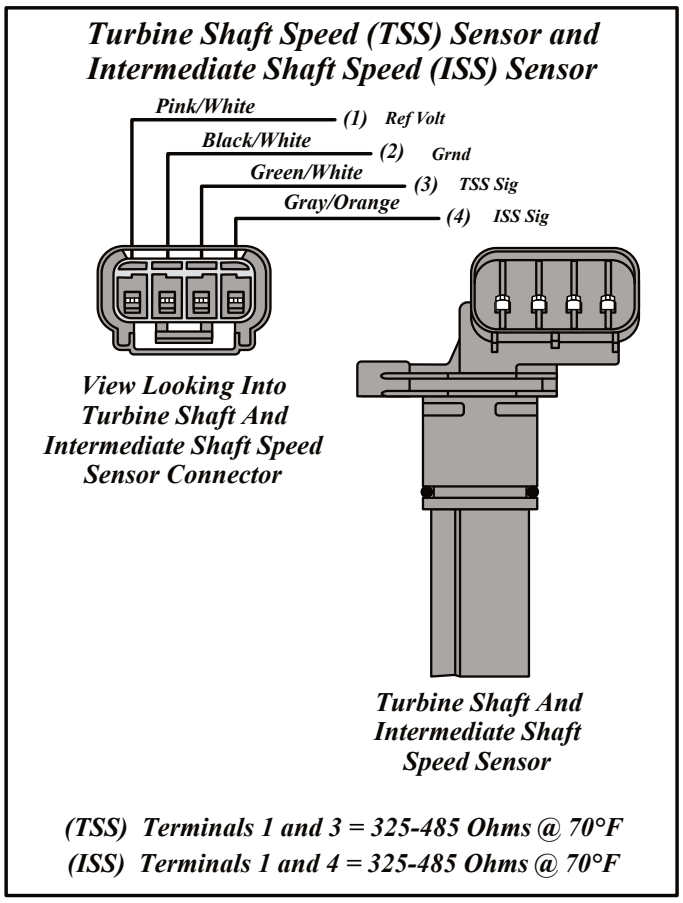


Figure 9

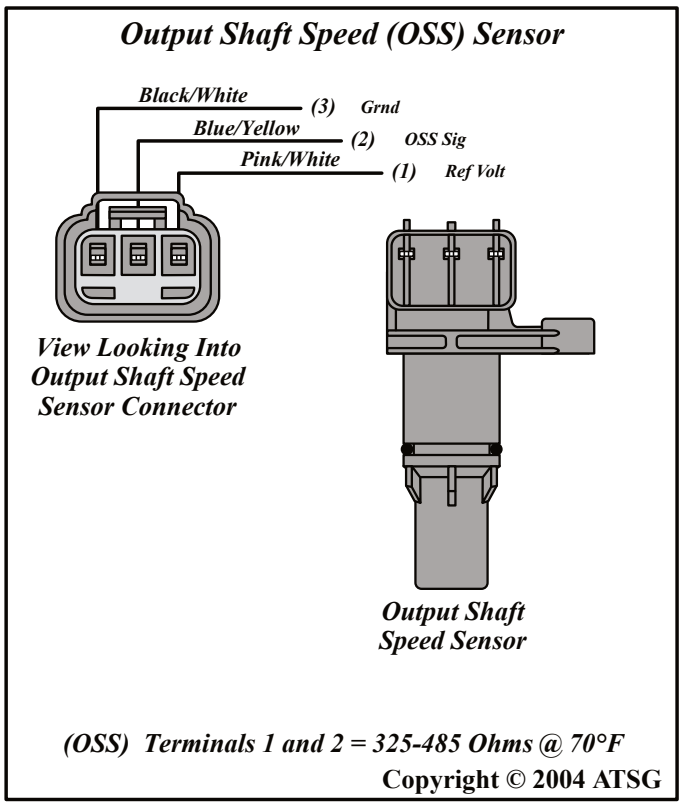


Figure 10

ELECTRICAL COMPONENT DESCRIPTION AND OPERATION (Cont'd)

Turbine Shaft Speed (TSS) Sensor and Intermediate Shaft Speed (ISS) Sensor

The turbine shaft speed (TSS) and intermediate shaft speed (ISS) sensors are hall effect sensors requiring a 12-volt power supply and a ground. In this unit both sensors are incorporated into one housing. The other two terminals at the sensor are for TSS and ISS signals to the PCM. The sensor detects teeth on the coast clutch input hub for TSS signal, and the adjacent overdrive ring gear teeth for the ISS signal. Both sensors read 30 teeth per revolution. The TSS/ISS sensors are mounted externally on the transmission case (See Figure 6). The TSS/ISS sensors input to the PCM is digital and used to determine line pressure, shift timing and TCC operation. Refer to Figure 9 for TSS/ISS sensor illustrations and connector information.

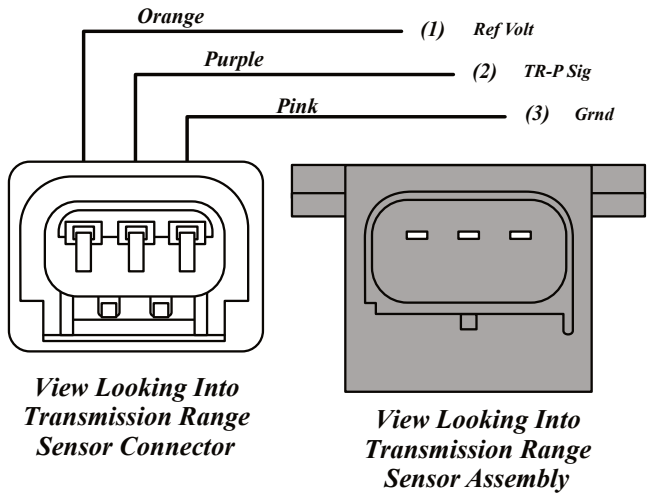
Output Shaft Speed (OSS) Sensor

The transmission output shaft speed (OSS) sensor is located on the extension housing (See Figure 6). The OSS is a hall effect type sensor. The OSS reads a set of gear teeth on the park gear, that are different than the teeth used for the park function. The OSS signal to the PCM is used for vehicle speed signal, shift scheduling and TCC operation. The OSS has bi-directional capability and uses a digital output. The OSS tone wheel has 3 different width spaces between its teeth. The PCM uses the difference in pulse width to identify shaft direction rotation. Refer to Figure 10 for OSS sensor illustrations and connector information.

Cold Mode/Hot Mode Operation

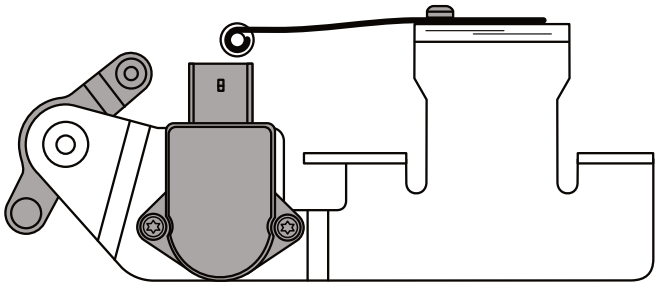
When the transmission is in cold mode operation, below -15°C (5°F), ***determined by the TFT sensor,*** the transmission shifts 1st gear, 2nd gear, 3rd gear, 4th gear (ratio 1.09), 6th gear. When in hot mode the transmission will shift 1st gear, 2nd gear, 3rd gear, 5th gear (ratio 1.00), 6th gear. Either way it is still a five speed unit with six forward gear ratios available, depending on cold mode or hot mode of operation.

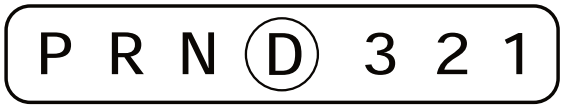
Transmission Range Sensor Assembly



View Looking Into Transmission Range Sensor Connector

View Looking Into Transmission Range Sensor Assembly





TR-P Duty Cycle Chart		
Position	*Min % Duty Cycle*	*Max % Duty Cycle*
P	*7.13*	*22.93*
R	*22.94*	*36.64*
N	*36.65*	*48.55*
D	*48.56*	*58.82*
3	*58.83*	*68.08*
2	*68.09*	*77.96*
1	*77.97*	*90.34*

Figure 11

ELECTRICAL COMPONENT DESCRIPTION AND OPERATION (Cont'd)

Transmission Range (TR-P) Sensor Assembly

The transmission range (TR-P) sensor assembly, shown in Figure 11, is an internally mounted sensor that includes the detent spring, rooster comb lever and bracket, located next to the solenoid body and bolted to the transmission case. The transmission range sensor is non-adjustable and is not serviced independently. The TR-P sensor contains electronic circuitry that provides the PCM a fixed frequency, at a duty cycle, for each of the seven positions of the manual shift lever. Refer to Figure 11 for the duty cycle specifications for the various positions. The PCM uses the TR-P sensor signal for starting in Park and Neutral only, reverse lamp operation, and for line pressure control, shift scheduling and TCC operation.

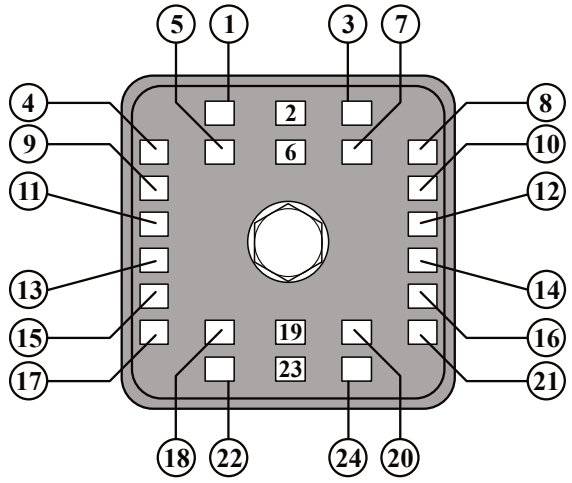
Transmission Fluid Temperature (TFT) Sensor

The transmission fluid temperature (TFT) sensor twist-locks into the solenoid body and is a temperature sensitive device called a thermistor. As the fluid temperature increases, the TFT resistance decreases, as shown in the chart in Figure 12. The PCM uses the TFT signal as an input to determine ***cold and hot temperature shift scheduling*** and for TCC apply and release scheduling.

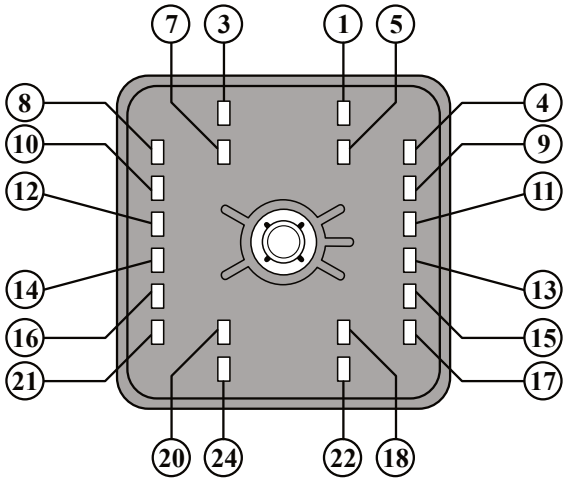
Transmission Fluid Temperature (TOT)		
Degrees C	*Degrees F*	*Resistance (Ohms)*
-40 to -20	*-40 to -4*	*967k to 284k*
-19 to -2	*-3 to 31*	*284k to 100k*
0 to 20	*32 to 68*	*100k to 37k*
21 to 40	*69 to 104*	*37k to 16k*
41 to 70	*105 to 158*	*16k to 5k*
71 to 90	*159 to 194*	*5k to 2.7k*
91 to110	*195 to 230*	*2.7k to 1.5k*
111 to130	*231 to 266*	*1.5k to 0.8k*
131 to150	*267 to 302*	*0.8k to 0.54k*

Figure 12

5R110W TRANSMISSION CASE CONNECTOR PIN FUNCTIONS	
Pin Number	***Description***
1	***Ground signal to Shift Solenoid Pressure Control "E" (SSPC-E)***
3	***Ground signal to Shift Solenoid Pressure Control "B" (SSPC-B)***
4	***Ground signal to Shift Solenoid Pressure Control "D" (SSPC-D)***
5	***Ground signal to Shift Solenoid Pressure Control "C" (SSPC-C)***
7	***VPWR to Pressure Control (PC-A) Solenoid and TCC Solenoid***
8	***Ground signal to Torque Converter Clutch (TCC) Solenoid***
9	***Pressure Switch "C" (PS-C), Intermediate Clutch Signal to PCM***
10	***Ground signal to Pressure Control (PC-A) Solenoid (Line Pressure)***
11	***Pressure Switch "D" (PS-D), Direct Clutch Signal to PCM***
12	***Ground signal to Shift Solenoid Pressure Control "A" (SSPC-A)***
13	***Pressure Switch "E" (PS-E), Low/Reverse Clutch Signal to PCM***
14	***Pressure Switch "A" (PS-A), Coast Clutch Signal to PCM***
15	***Transmission Range - Park (TR-P) Sensor, Signal to PCM***
16	***Pressure Switch "B" (PS-B), Overdrive Clutch Signal to PCM***
17	***Transmission Range - Park (TR-P) Sensor, Ground***
18	***Transmission Fluid Temperature (TFT) Sensor signal to PCM***
20	***VPWR to SSPC-A and SSPC-B Solenoids***
21	***VPWR to Transmission Range - Park (TR-P) Sensor Only***
22	***Pressure Switches and TFT Sensor ground***
24	***VPWR to SSPC-C, SSPC-D and SSPC-E Solenoids***
Special Note: Pin Numbers 2, 6, 19, and 23 are not used.	



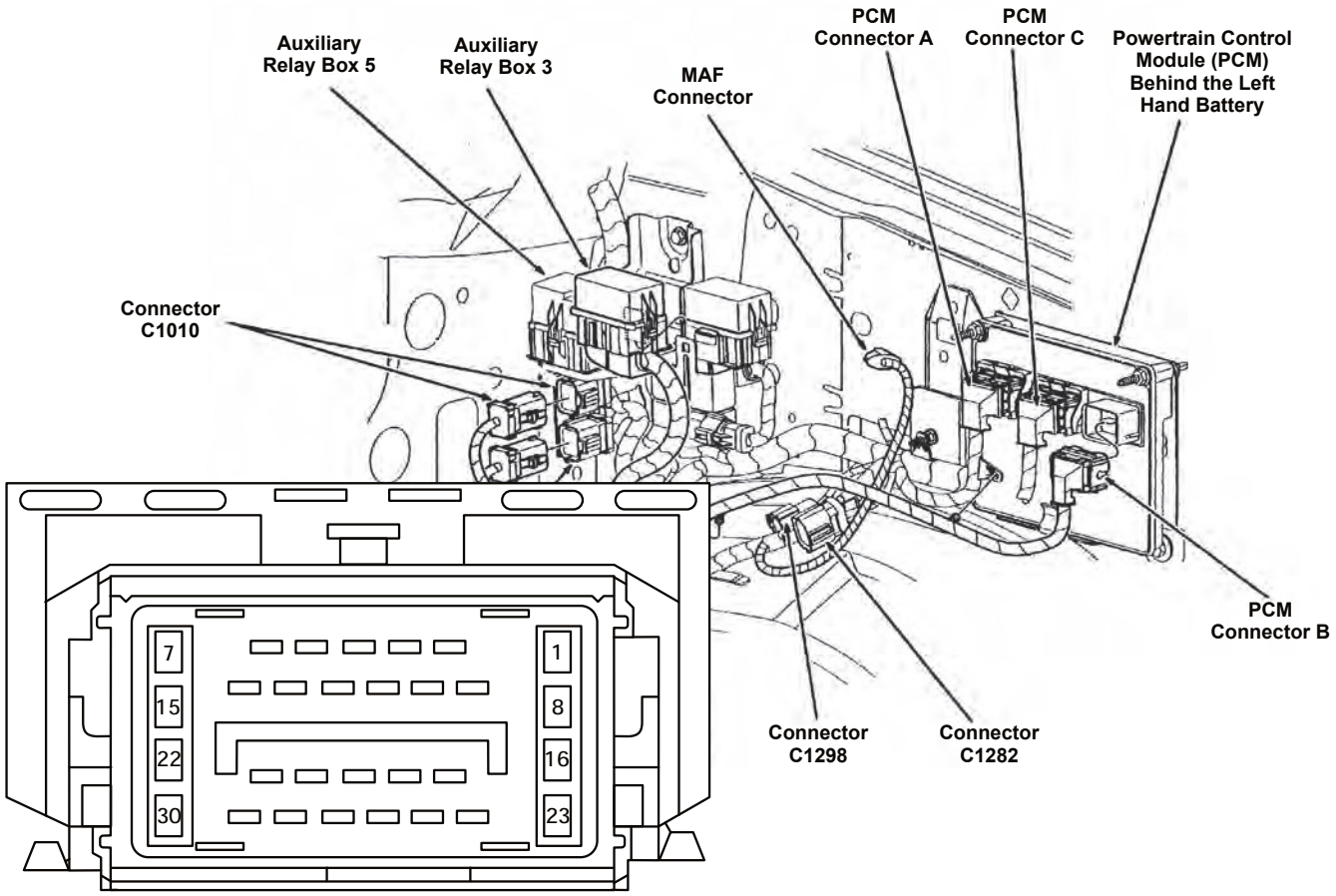
View Looking Into Wire Side Of Vehicle Harness Connector



View Looking Into Face Side Of Vehicle Harness Connector

Figure 13

5R110W PCM CONNECTOR "B" PIN IDENTIFICATION AND FUNCTIONS AND PCM LOCATION



View Looking Into Face Side Of Vehicle PCM Connector "B"

Pin	Wire Color	Circuit Function	Pin	Wire Color	Circuit Function
1	Pink/White	12V Reference Voltage, Speed Sensors and TRP	16		"Not Used"
2	Violet/Yellow	PC-A Pressure Control Solenoid Ground	17	White/Yellow	PS-A Pressure Switch "A" Signal
3	Yellow/Lt Green	Reverse Lamp Relay, Control	18	Dk Blue/Pink	PS-B Pressure Switch "B" Signal
4	Red/White	Transfer Case Neutral Signal	19	Lt Blue/Red	PS-C Pressure Switch "C" Signal
5	White/Lt Green	TCIL, Control (Tow/Haul)	20	White/Red	PS-D Pressure Switch "D" Signal
6		"Not Used"	21	Pink/Lt Blue	PS-E Pressure Switch "E" Signal
7	Yellow/White	12V Power to Solenoids	22	Black/White	Both Speed Sensors and TR-P Ground
8		"Not Used"	23		"Not Used"
9	Orange/Yellow	SSPC-A Shift Solenoid Pressure Control A Ground	24		"Not Used"
10	Violet/Orange	SSPC-B Shift Solenoid Pressure Control B Ground	25	Lt Blue/Yellow	TR-P Transmission Range Sensor Signal
11	Pink/Black	SSPC-C Shift Solenoid Pressure Control C Ground	26	Orange/Black	TFT Transmission Fluid Temp Sensor Signal
12	Black/Lt Green	SSPC-D Shift Solenoid Pressure Control D Ground	27	Gray/Orange	ISS Intermediate Shaft Speed Sensor Signal
13	Dk Blue/White	SSPC-E Shift Solenoid Pressure Control E Ground	28	Dk Blue/Yellow	OSS Output Shaft Speed Sensor Signal
14	Brown/Orange	TCC Torque Converter Clutch Solenoid Ground	29	Green/White	TSS Turbine Shaft Speed Sensor Signal
15		"Not Used"	30	Orange/White	Pressure Switch And TFT Sensor Ground

Figure 14

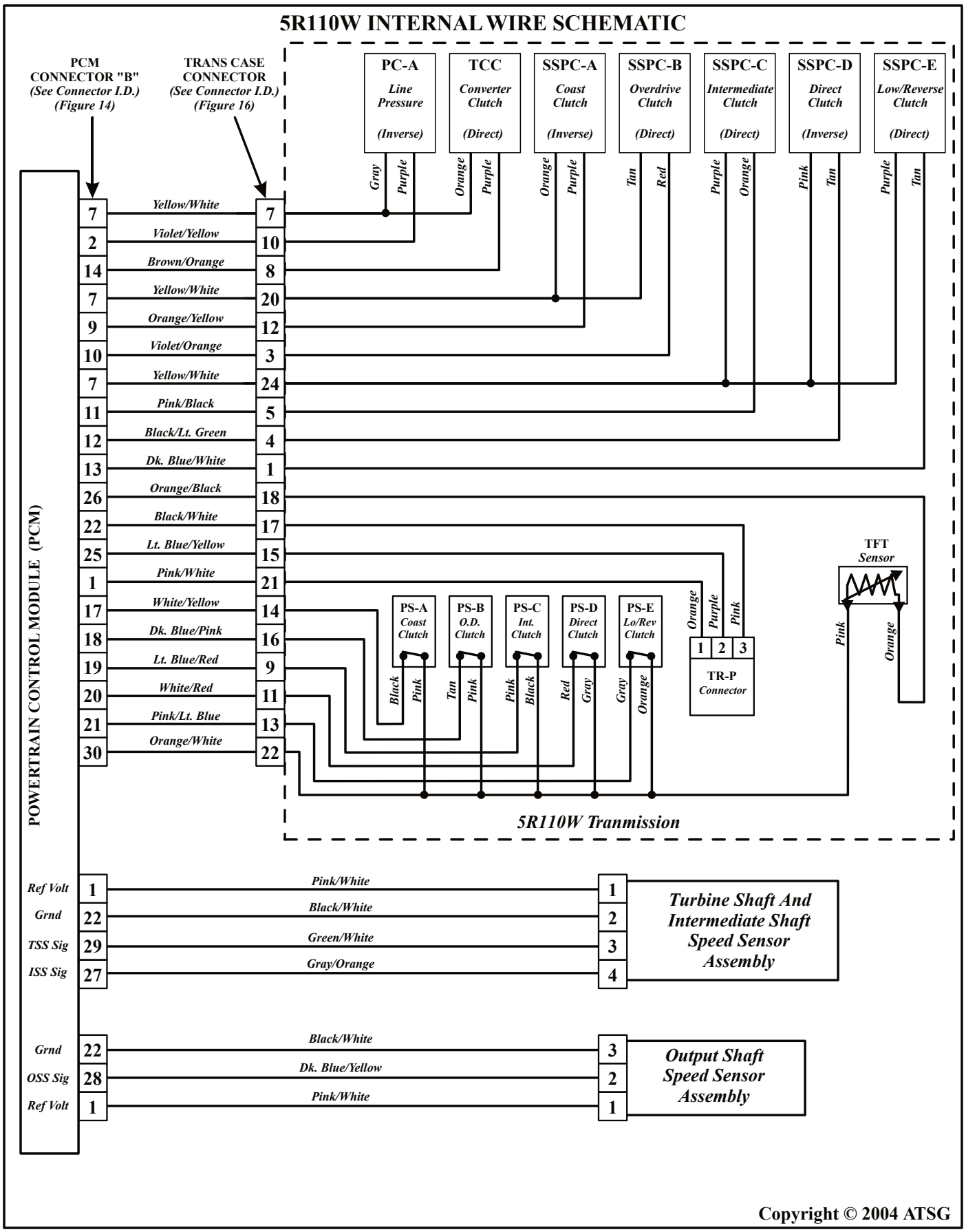
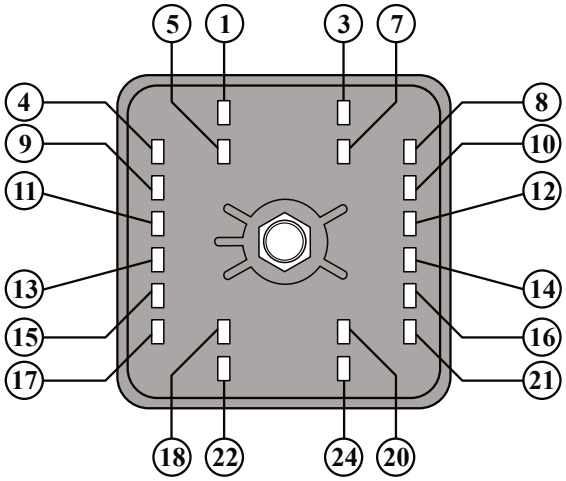

5R110W INTERNAL WIRE SCHEMATIC
PCM CONNECTOR "B" (See Connector I.D.) (Figure 14)
TRANS CASE CONNECTOR (See Connector I.D.) (Figure 16)
PC-A Line Pressure (Inverse)
TCC Converter Clutch (Direct)
SSPC-A Coast Clutch (Inverse)
SSPC-B Overdrive Clutch (Direct)
SSPC-C Intermediate Clutch (Direct)
SSPC-D Direct Clutch (Inverse)
SSPC-E Low/Reverse Clutch (Direct)
POWERTRAIN CONTROL MODULE (PCM)
7 Yellow/White 7
2 Violet/Yellow 10
14 Brown/Orange 8
7 Yellow/White 20
9 Orange/Yellow 12
10 Violet/Orange 3
7 Yellow/White 24
11 Pink/Black 5
12 Black/Lt. Green 4
13 Dk. Blue/White 1
26 Orange/Black 18
22 Black/White 17
25 Lt. Blue/Yellow 15
1 Pink/White 21
17 White/Yellow 14
18 Dk. Blue/Pink 16
19 Lt. Blue/Red 9
20 White/Red 11
21 Pink/Lt. Blue 13
30 Orange/White 22
PS-A Coast Clutch
PS-B O.D. Clutch
PS-C Int. Clutch
PS-D Direct Clutch
PS-E Lo/Rev Clutch
TR-P Connector
TFT Sensor
5R110W Tranmission
Ref Volt 1 Pink/White 1
Grnd 22 Black/White 2
TSS Sig 29 Green/White 3
ISS Sig 27 Gray/Orange 4
Turbine Shaft And Intermediate Shaft Speed Sensor Assembly
Grnd 22 Black/White 3
OSS Sig 28 Dk. Blue/Yellow 2
Ref Volt 1 Pink/White 1
Output Shaft Speed Sensor Assembly
Copyright © 2004 ATSG

Figure 15

INTERNAL COMPONENT RESISTANCE CHART			
INTERNAL COMPONENT	**CASE CONNECTOR PIN NUMBERS**	**OHMS RESISTANCE**	***** Internal Wire Colors At Component Connector***
SSPC-A Soleniod	*12 and 20*	*4.1 to 4.7 @ 72° F*	*Purple and Orange*
SSPC-B Soleniod	*3 and 20*	*4.1 to 4.7 @ 72° F*	*Red and Tan*
SSPC-C Soleniod	*5 and 24*	*4.1 to 4.7 @ 72° F*	*Orange and Purple*
SSPC-D Soleniod	*4 and 24*	*4.1 to 4.7 @ 72° F*	*Tan and Pink*
SSPC-E Soleniod	*1 and 24*	*4.1 to 4.7 @ 72° F*	*Tan and Purple*
PC-A Solenoid (Early)	*7 and 10*	*4.1 to 4.7 @ 72° F*	*Gray and Purple*
PC-A Solenoid (Late)	*7 and 10*	*5.1 to 5.8 @ 72° F*	*Gray and Purple*
TCC Solenoid	*7 and 8*	*4.1 to 4.7 @ 72° F*	*Purple and Orange*
PS-A	*14 and 22*	*0.5 Ohms @ 72° F*	*Black and Pink*
PS-B	*16 and 22*	*0.5 Ohms @ 72° F*	*Tan and Pink*
PS-C	*9 and 22*	*0.5 Ohms @ 72° F*	*Pink and Black*
PS-D	*11 and 22*	*0.5 Ohms @ 72° F*	*Red and Gray*
PS-E	*13 and 22*	*0.5 Ohms @ 72° F*	*Gray and Orange*
TFT	*18 and 22*	*See Chart Below*	*Orange and Pink*
TR-P Sensor		*See Figure 11*	
TSS/ISS Sensor		*See Figure 9*	
OSS Sensor		*See Figure 10*	

*** Wire colors may vary.*

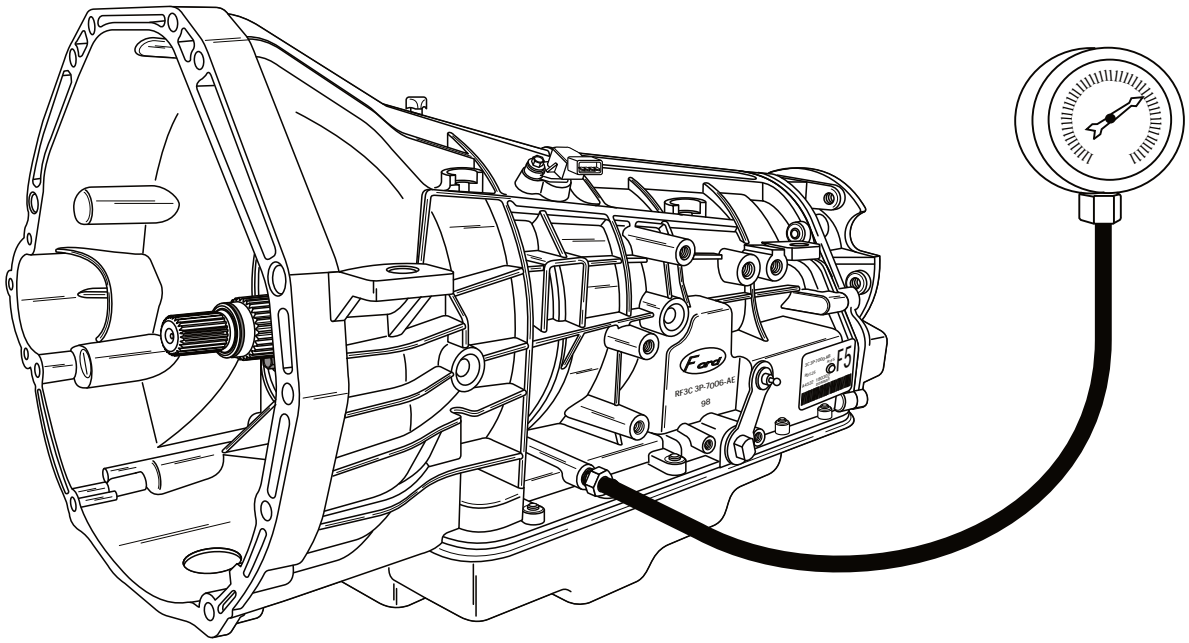


View Looking Into Transmission Case Connector

Transmission Fluid Temperature (TOT)		
Degrees C	*Degrees F*	*Resistance (Ohms)*
-40 to -20	*-40 to -4*	*967k to 284k*
-19 to -2	*-3 to 31*	*284k to 100k*
0 to 20	*32 to 68*	*100k to 37k*
21 to 40	*69 to 104*	*37k to 16k*
41 to 70	*105 to 158*	*16k to 5k*
71 to 90	*159 to 194*	*5k to 2.7k*
91 to110	*195 to 230*	*2.7k to 1.5k*
111 to130	*231 to 266*	*1.5k to 0.8k*
131 to150	*267 to 302*	*0.8k to 0.54k*

Figure 16

LINE PRESURE TESTS



LINE PRESSURE CHART		
Range	***Idle Speed***	***Stall Speed***
P/N	***50 psi***	———
R	***100 psi***	***320 psi***
(D)	***70 psi***	***320 psi***
3	***80 psi***	***260 psi***
2	***80 psi***	***215 psi***
1	***80 psi***	***270 psi***

All Pressures Listed Are Approximate

PRECAUTIONS:

(1) Certain sensor failures may cause high line pressure and Failure Mode Effect Management (FMEM) actions. Ensure that on-board diagnostic and electrical repairs have been carried out first, or test results may be incorrect.

(2) Perform the line pressure test in all ranges prior to performing the Stall Speed Test. If line pressure is low at idle, "Do Not" carry out the Stall Speed Test or additional transmission damage will occur. Do not maintain wide open throttle (WOT) in any range for more than 5 seconds or transmission damage may occur.

(3) Apply the parking brake and block wheels during the line pressure test. Vehicle movement during the test may cause personal injury or damage to the vehicle and equipment.

Figure 17

FORD 5R110W *Abbreviation Description*			
Abbreviation	*Description*	*Abbreviation*	*Description*
4X4L	4X4 Low Switch	PC-A	Pressure Control Solenoid "A"
ABS	Antilock Brake System	PCM	Powertrain Control Module
A/C	Air Conditioning	PS-A	Pressure Switch "A"
ACCS	Air Conditioning Clutch Status	PS-B	Pressure Switch "B"
APGND	Accelerator Pedal Sensor Ground	PS-C	Pressure Switch "C"
APP	Accelerator Pedal Position Sensor	PS-D	Pressure Switch "D"
BARO	Barometric Pressure Sensor	PS-E	Pressure Switch "E"
BPP	Brake Pedal Position	ROM	Read Only Memory
BUS +	Data Link Connector	RPM	Engine Speed
BUS -	Data Link Connector	SCCS	Speed Control Command Switch
CASE GND	Case Ground	SSPC-A	Shift Solenoid Pressure Control A
CID	Cylinder Identification	SSPC-B	Shift Solenoid Pressure Control B
CMP	Camshaft Position Sensor	SSPC-C	Shift Solenoid Pressure Control C
DLC	Data Link Connector	SSPC-D	Shift Solenoid Pressure Control D
DTC	Diagnostic Trouble Code	SSPC-E	Shift Solenoid Pressure Control E
DTC CNT	Diagnostic Trouble Code Count	TAC	Tachometer Signal
ECT	Engine Coolant Temperature	TCC	Torque Converter Clutch
EOT	Engine Oil Temperature	TCIL	Trans Control Indicator Lamp
FEPS	Flash EPROM Power Supply	TCS	Transmission Control Switch
FUEL PW	Fuel Pulse Width	TFT	Transmission Fluid Temperature
GP	Glow Plug	TR-P	Transmission Range Sensor
GPC	Glow Plug Control Duty Cycle	TP	Throttle Position Sensor
GPL	Glow Plug Lamp	TSS	Turbine Shaft Speed Sensor
IAT	Intake Air Temperature	VPWR	Vehicle Power Supply
ICP	Injector Control Pressure Sensor	VREF	Vehicle Reference Voltage
IPR	Injector Pressure Regulator	VSS	Vehicle Speed Sensor
ISS	Interm. Shaft Speed Sensor	WOT	Wide Open Throttle
IVS	Idle Validation Switch	OWC	One Way Clutch
KAM	Keep Alive Memory		
KAPWR	Keep Alive Power		
KOEO	Key On Engine Off		
KOER	Key On Engine Running		
MAF	Mass Air Flow Sensor		
OSS	Output Shaft Speed Sensor		

Figure 18

5R110W Diagnostic Trouble Code Chart		
Diagnostic Code	***Symptom***	***Description***
P0102 P0103 P1100 P1101	***Mass Air Flow (MAF) sensor***	**MAF sensor system fails to operate in a normal manner, which may cause a transmission concern.**
P0112	***Intake Air Temperature (IAT) sensor***	**IAT sensor exceeds the scale set for temperature of 254°F.**
P0113	***Intake Air Temperature (IAT) sensor***	**IAT sensor exceeds the scale set for temperature of minus 40°F.**
P0114	***Intake Air Temperature (IAT) sensor***	**IAT sensor higher or lower than expected during KOEO and KOER test.**
P0116	***Engine Coolant Temp (ECT) sensor***	**ECT sensor temperature higher or lower than expected during KOEO or KOER**
P0117	***Engine Coolant Temp (ECT) sensor***	**ECT sensor exceeds the scale set for temperature of 254°F.**
P0118	***Engine Coolant Temp (ECT) sensor***	**ECT sensor exceeds the scale set for temperature of minus 40°F.**
P0121 P0122 P0123 P1120 P1121 P1124 P1125	***Throttle Position (TP) or (APP) sensor***	**(TP) Throttle Position sensor or (APP) Accelerator Pedal Position sensor above or below normal specifications during normal operation.**
P0300 P0308 P0320 P0340 P1351-1364	***(EI) Systems***	**(DI) Distributor Ignition circuit concern or (CKP) Crankshaft Position sensor failure.**
P0500	***Antilock Brake Systems (ABS)***	**PCM detected a loss of VSS signal through SCP link from ABS.**
P0503	***Antilock Brake Systems (ABS)***	**PCM detected an intermittent loss of VSS signal through SCP link from ABS.**
P0706	***Transmission Range (TR-P) Sensor***	**Transmission Range sensor signal frequency is out of normal range**

Figure 19

5R110W Diagnostic Trouble Code Chart		
Diagnostic Code	*Symptom*	*Description*
P0707	***Transmission Range (TR-P) Sensor***	**Transmission Range sensor signal duty cycle is below threshold, sensor/circuit elect. malfunction.**
P0708	***Transmission Range (TR-P) Sensor***	**Transmission Range sensor signal duty cycle is above threshold, sensor/circuit elect. malfunction.**
P1705	***Transmission Range (TR-P) Sensor***	**Transmission Range sensor circuit failure, or KOEO or KOER not run in P or N positions.**
P0711	***Trans Fluid Temp (TFT) Sensor***	**PCM has detected no TFT change during operation. Stuck at some normal reading.**
P0712	***Trans Fluid Temp (TFT) Sensor***	**Voltage drop across TFT sensor exceeds scale set for temperature of 315°F.**
P0713	***Trans Fluid Temp (TFT) Sensor***	**Voltage drop across TFT sensor exceeds scale set for temperature of minus 40°F.**
P1711	***Trans Fluid Temp (TFT) Sensor***	**Transmission not operating at normal temperature during On-Board diagnostics.**
P1783	***Trans Fluid Temp (TFT) Sensor***	**Transmission overtemp condition indicated.**
P0715	***Turbine Shaft Speed (TSS) Sensor***	**PCM detected a loss of TSS signal during normal operation.**
P0717	***Turbine Shaft Speed (TSS) Sensor***	**PCM has not detected a TSS signal.**
P0718	***Turbine Shaft Speed (TSS) Sensor***	**PCM has detected a noisy TSS signal.**
P0720	***Output Shaft Speed (OSS) Sensor***	**PCM detected a loss of OSS signal during normal operation.**
P0721	***Output Shaft Speed (OSS) Sensor***	**PCM has detected a noisy OSS signal.**
P0722	***Output Shaft Speed (OSS) Sensor***	**PCM has detected no OSS signal.**
P0730	***Clutch Control Solenoid or Internal Problem***	**PCM has detected a gear ratio error.**
P0740	***TCC Solenoid***	**TCC Solenoid, Electrical, Open Circuit.**
P0741	***TCC Solenoid***	**TCC slippage detected during engagement. Mechanical or Hydraulic concern.**

Figure 20

5R110W Diagnostic Trouble Code Chart		
Diagnostic Code	***Symptom***	***Description***
P0742	***TCC Solenoid***	**TCC Solenoid circuit, shorted to ground.**
P0743	***TCC Solenoid***	**TCC Solenoid circuit failure.**
P0744	***TCC Solenoid***	**TCC Solenoid circuit, shorted to power.**
P1744	***TCC Solenoid***	**TCC slippage detected during engagement. Mechanical or Hydraulic concern.**
P0748	***Line Pressure Control (PC-A) Solenoid***	**PC-A Solenoid circuit failure.**
P0960	***Line Pressure Control (PC-A) Solenoid***	**PC-A Solenoid circuit open failure.**
P0962	***Line Pressure Control (PC-A) Solenoid***	**PC-A Solenoid circuit, shorted to ground.**
P0963	***Line Pressure Control (PC-A) Solenoid***	**PC-A Solenoid circuit, shorted to power.**
P0750	***SSPC-A Solenoid (Coast Clutch)***	**SSPC-A Solenoid circuit open failure.**
P0751	***SSPC-A Solenoid (Coast Clutch)***	**SSPC-A Solenoid circuit, or solenoid failure OFF.**
P0752	***SSPC-A Solenoid (Coast Clutch)***	**SSPC-A Solenoid circuit, or solenoid failure ON.**
P0753	***SSPC-A Solenoid (Coast Clutch)***	**SSPC-A Solenoid circuit failure.**
P0972	***SSPC-A Solenoid (Coast Clutch)***	**SSPC-A Solenoid circuit, or solenoid failure OFF.**
P0973	***SSPC-A Solenoid (Coast Clutch)***	**SSPC-A Solenoid circuit, shorted to ground.**
P0974	***SSPC-A Solenoid (Coast Clutch)***	**SSPC-A Solenoid circuit, shorted to power.**
P0755	***SSPC-B Solenoid (Overdrive Clutch)***	**SSPC-B Solenoid circuit open failure.**
P0756	***SSPC-B Solenoid (Overdrive Clutch)***	**SSPC-B Solenoid circuit, or solenoid failure OFF.**
P0757	***SSPC-B Solenoid (Overdrive Clutch)***	**SSPC-B Solenoid circuit, or solenoid failure ON.**

Figure 21

5R110W Diagnostic Trouble Code Chart		
Diagnostic Code	***Symptom***	***Description***
P0758	***SSPC-B Solenoid (Overdrive Clutch)***	**SSPC-B Solenoid circuit failure.**
P0975	***SSPC-B Solenoid (Overdrive Clutch)***	**SSPC-B Solenoid circuit, or solenoid failure OFF.**
P0976	***SSPC-B Solenoid (Overdrive Clutch)***	**SSPC-B Solenoid, or shorted to ground.**
P0977	***SSPC-B Solenoid (Overdrive Clutch)***	**SSPC-B Solenoid, or shorted to power.**
P0760	***SSPC-C Solenoid (Intermediate Clutch)***	**SSPC-C Solenoid circuit open failure.**
P0761	***SSPC-C Solenoid (Intermediate Clutch)***	**SSPC-C Solenoid circuit, or solenoid failure OFF.**
P0762	***SSPC-C Solenoid (Intermediate Clutch)***	**SSPC-C Solenoid circuit, or solenoid failure ON.**
P0978	***SSPC-C Solenoid (Intermediate Clutch)***	**SSPC-C Solenoid circuit, or solenoid failure OFF.**
P0979	***SSPC-C Solenoid (Intermediate Clutch)***	**SSPC-C Solenoid, or circuit shorted to ground.**
P0980	***SSPC-C Solenoid (Intermediate Clutch)***	**SSPC-C Solenoid, or circuit shorted to power.**
P0765	***SSPC-D Solenoid (Direct Clutch)***	**SSPC-D Solenoid circuit open failure.**
P0766	***SSPC-D Solenoid (Direct Clutch)***	**SSPC-D Solenoid circuit, or solenoid failure OFF.**
P0767	***SSPC-D Solenoid (Direct Clutch)***	**SSPC-D Solenoid circuit, or solenoid failure ON.**
P0768	***SSPC-D Solenoid (Direct Clutch)***	**SSPC-D Solenoid circuit failure.**
P0981	***SSPC-D Solenoid (Direct Clutch)***	**SSPC-D Solenoid circuit, or solenoid failure OFF.**
P0982	***SSPC-D Solenoid (Direct Clutch)***	**SSPC-D Solenoid, or circuit shorted to ground.**
P0983	***SSPC-D Solenoid (Direct Clutch)***	**SSPC-D Solenoid, or circuit shorted to power.**

Figure 22

5R110W Diagnostic Trouble Code Chart		
Diagnostic Code	***Symptom***	***Description***
P0770	***SSPC-E Solenoid (Low/Reverse Clutch)***	**SSPC-E Solenoid circuit open failure.**
P0771	***SSPC-E Solenoid (Low/Reverse Clutch)***	**SSPC-E Solenoid circuit, or solenoid failure OFF.**
P0772	***SSPC-E Solenoid (Low/Reverse Clutch)***	**SSPC-E Solenoid circuit, or solenoid failure ON.**
P0773	***SSPC-E Solenoid (Low/Reverse Clutch)***	**SSPC-E Solenoid circuit failure.**
P0984	***SSPC-E Solenoid (Low/Reverse Clutch)***	**SSPC-E Solenoid circuit, or solenoid failure OFF.**
P0985	***SSPC-E Solenoid (Low/Reverse Clutch)***	**SSPC-E Solenoid, or circuit shorted to ground.**
P0986	***SSPC-E Solenoid (Low/Reverse Clutch)***	**SSPC-E Solenoid, or circuit shorted to power.**
P0791	***Intermediate Shaft Speed Sensor (ISS)***	**Insuffecient input from ISS.**
P0793	***Intermediate Shaft Speed Sensor (ISS)***	**No input from ISS.**
P0794	***Intermediate Shaft Speed Sensor (ISS)***	**ISS signal intermittent.**
P0840	***Pressure Switch A (PS-A)***	**Pressure Switch A circuit error, stuck open or closed, shorted to power or ground.**
P0841	***Pressure Switch A (PS-A)***	**Pressure Switch A circuit error, stuck open or closed, shorted to power or ground.**
P0845	***Pressure Switch B (PS-B)***	**Pressure Switch B circuit error, stuck open or closed, shorted to power or ground.**
P0846	***Pressure Switch B (PS-B)***	**Pressure Switch B circuit error, stuck open or closed, shorted to power or ground.**
P0870	***Pressure Switch C (PS-C)***	**Pressure Switch C circuit error, stuck open or closed, shorted to power or ground.**
P0871	***Pressure Switch C (PS-C)***	**Pressure Switch C circuit error, stuck open or closed, shorted to power or ground.**

Figure 23

5R110W Diagnostic Trouble Code Chart		
Diagnostic Code	*Symptom*	*Description*
P0875	***Pressure Switch D (PS-D)***	**Pressure Switch D circuit error, stuck open or closed, shorted to power or ground.**
P0876	***Pressure Switch D (PS-D)***	**Pressure Switch D circuit error, stuck open or closed, shorted to power or ground.**
P0987	***Pressure Switch E (PS-E)***	**Pressure Switch E circuit error, stuck open or closed, shorted to power or ground.**
P0988	***Pressure Switch E (PS-E)***	**Pressure Switch E circuit error, stuck open or closed, shorted to power or ground.**
P1124	***Throttle Position (TP) or (APP) sensor***	**Throttle position was not in proper correct position for the On-Board diagnostics.**
P1460	***A/C Switch***	**A/C pressure cycling switch error.**
P1572	***Brake Pedal Position (BPP) Switch***	**Brake Pedal Position Switch, circuit failure.**
P1636	***SSx ISIG***	**PCM detected an error with the ISIG chip. Replace the PCM**
P1703	***Brake Pedal Position (BPP) Switch***	**Brake Pedal not cycled during KOER test, or brake ON circuit failure during KOEO.**
P1780	***Transmission Control Switch (TCS)***	**Transmission Control Switch voltage incorrect.**
P1729	***4X4 Low Switch***	**4X4 Low Switch circuit or switch failure.**
P1781	***4X4 Low Switch***	**4X4 Low Switch or circuit, out of self test range.**
P2700	***Coast Clutch System Error***	**Friction element apply time, range, or functional error detected.**
P2701	***Overdrive Clutch System Error***	**Friction element apply time, range, or functional error detected.**
P2702	***Intermediate Clutch System Error***	**Friction element apply time, range, or functional error detected.**
P2703	***Direct Clutch System Error***	**Friction element apply time, range, or functional error detected.**
P2704	***Low/Reverse Clutch System Error***	**Friction element apply time, range, or functional error detected.**

Figure 24

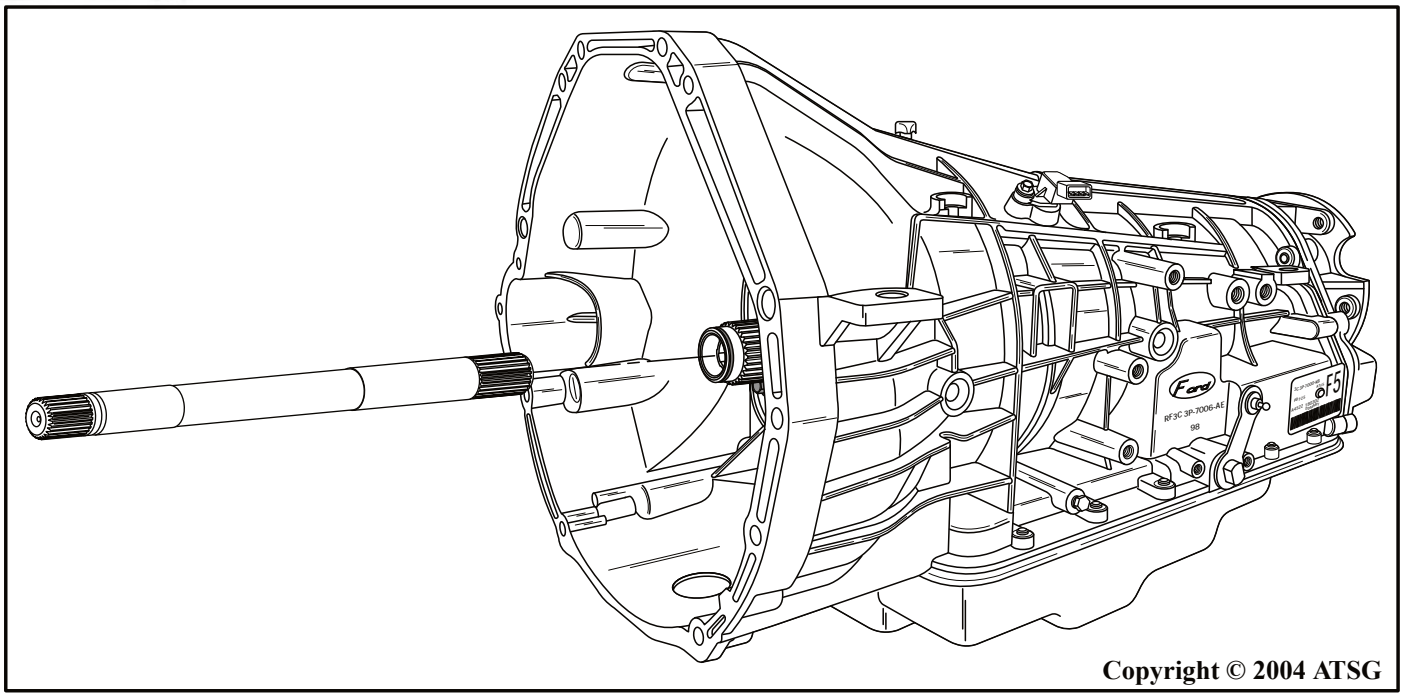


Figure 25

TRANSMISSION DISASSEMBLY

EXTERNAL COMPONENTS

1. Install transmission holding fixture, as shown in Figure 26, that will allow you to rotate the transmission.
2. Remove the input shaft from transmission, as shown in Figure 25.
3. Remove the output shaft speed sensor from the extension housing, as shown in Figure 27.
4. Remove and discard the output shaft speed sensor "O" ring, as shown in Figure 27.

Continued on Page 27

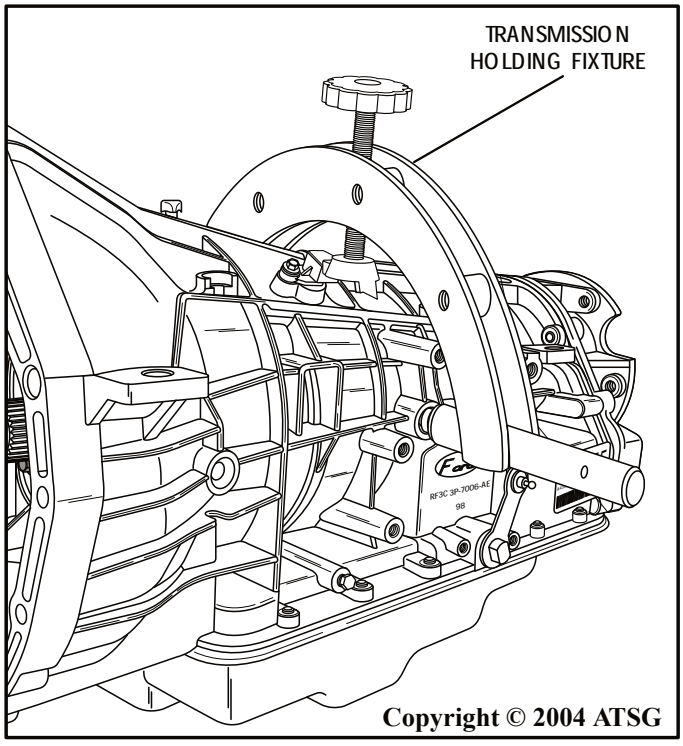


Figure 26

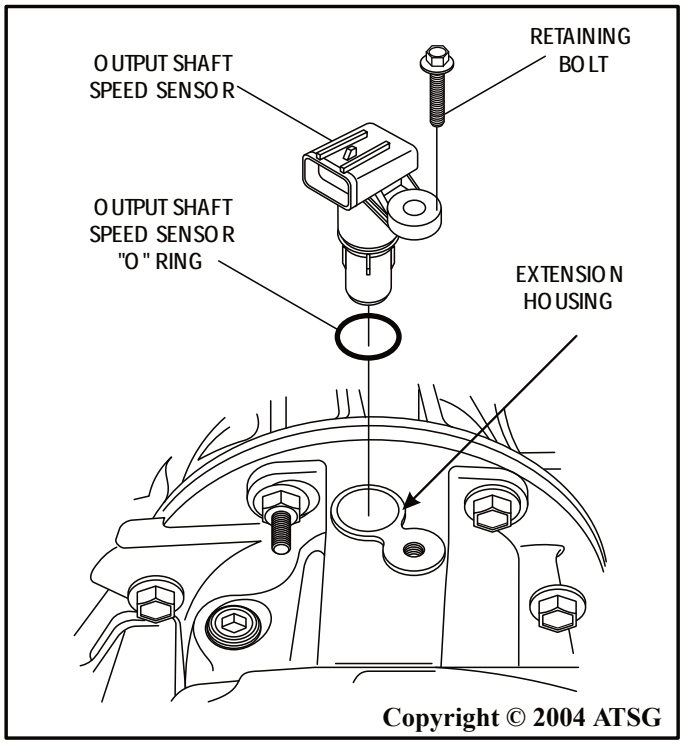


Figure 27

TRANSMISSION DISASSEMBLY

EXTERNAL COMPONENTS

5. Remove the turbine shaft/intermediate shaft speed sensor from the transmission case, as shown in Figure 28.
6. Remove and discard the turbine/intermediate speed sensor "O" ring, as shown in Figure 28.
7. Check both speed sensors for the proper ohms readings using Figure 29 and 30.
8. Replace the speed sensors as necessary.

Continued on Page 28

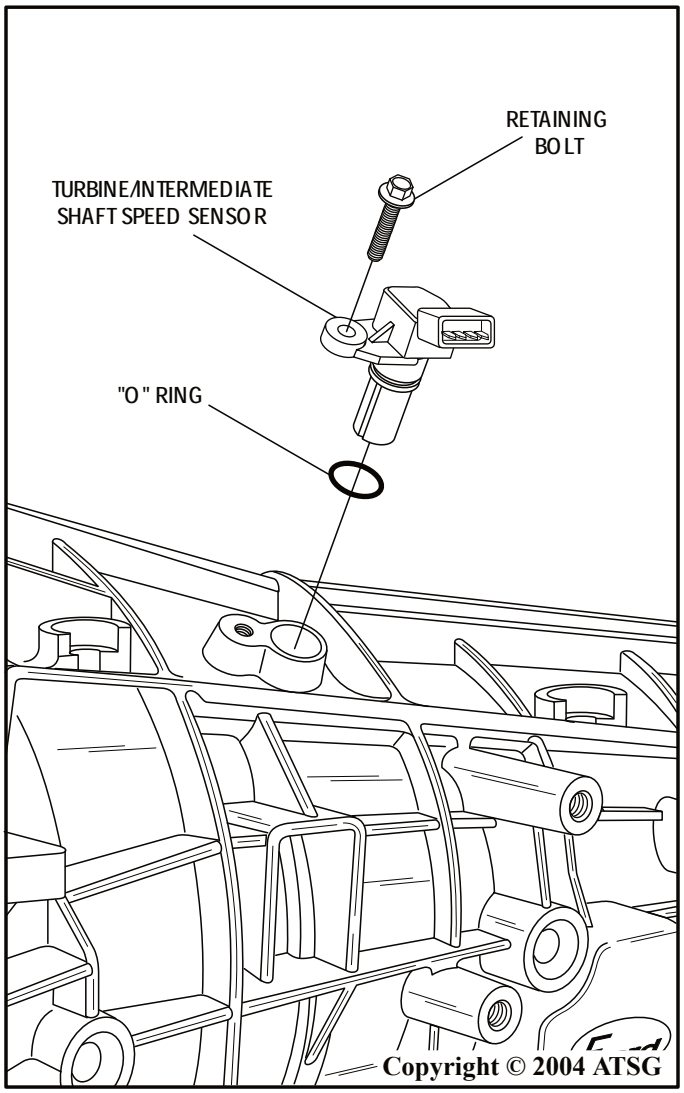


Figure 28

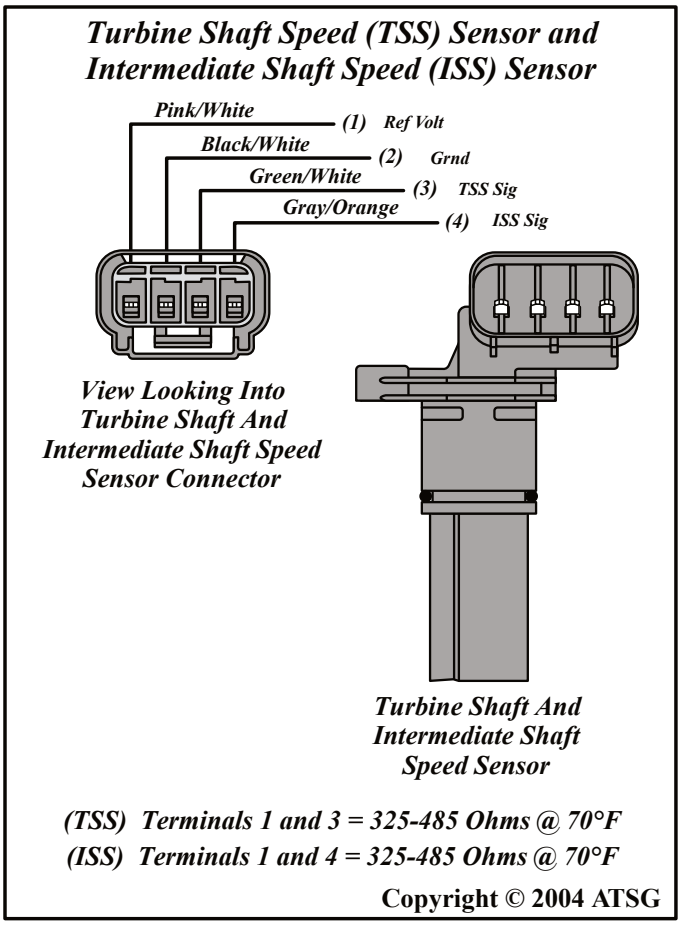


Figure 29

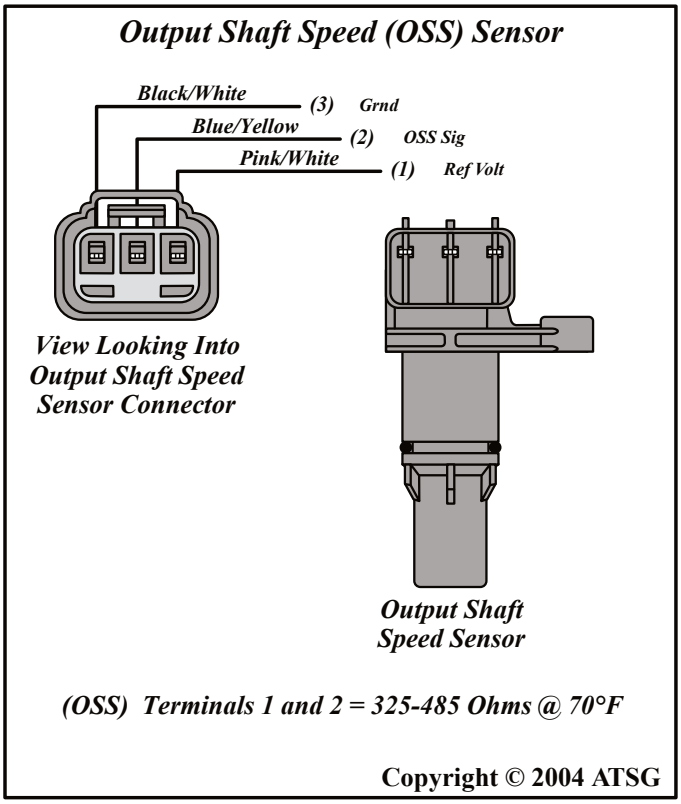


Figure 30

TRANSMISSION DISASSEMBLY

INTERNAL COMPONENTS

9. Rotate the transmission so that the bottom pan is facing up, as shown in Figure 31.
10. Remove the twenty oil pan bolts, as shown in Figure 31, and remove the oil pan.

Continued on Page 29

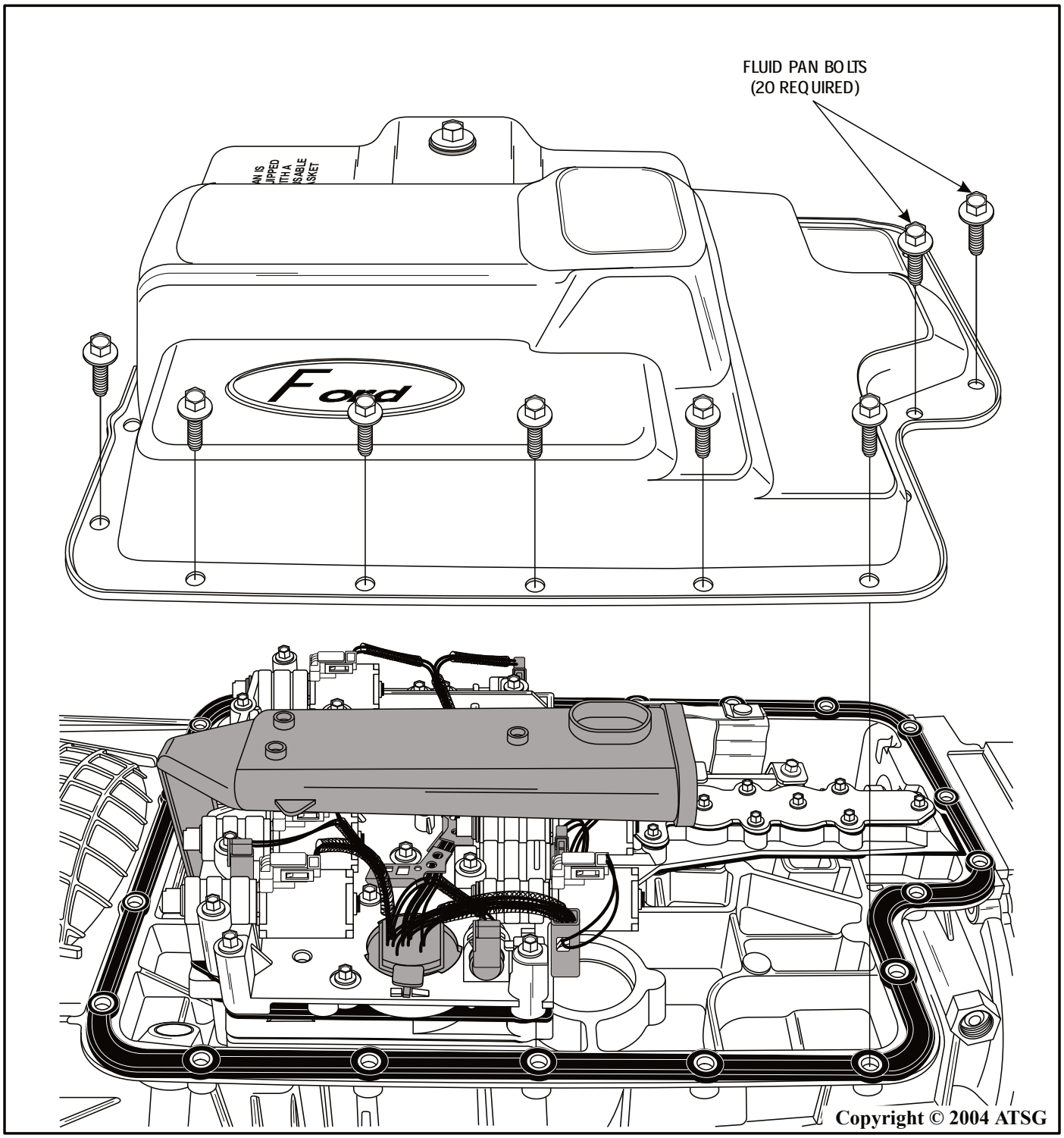


Figure 31

TRANSMISSION DISASSEMBLY

INTERNAL COMPONENTS (CONT'D)

11. Remove and discard the fluid filter and filter seal, as shown in Figure 32.
12. Disconnect Transmission Range Sensor (TRS) connector from the range sensor, as shown in Figure 32.
13. Remove the pan gasket from the transmission case, as shown in Figure 32.
    Note: The pan gasket is reusable as long as none of the beads are broken.

Continued on Page 31

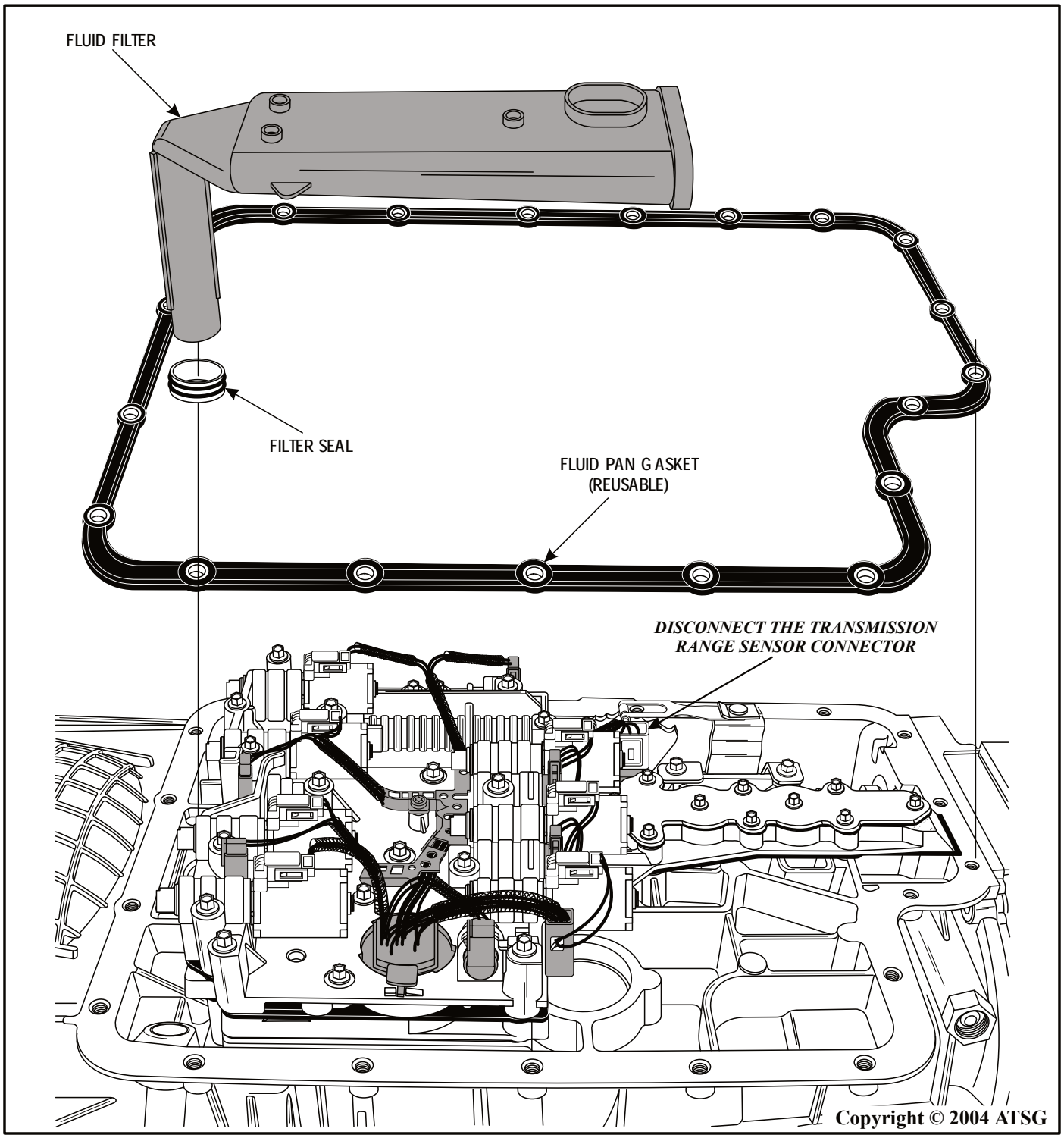
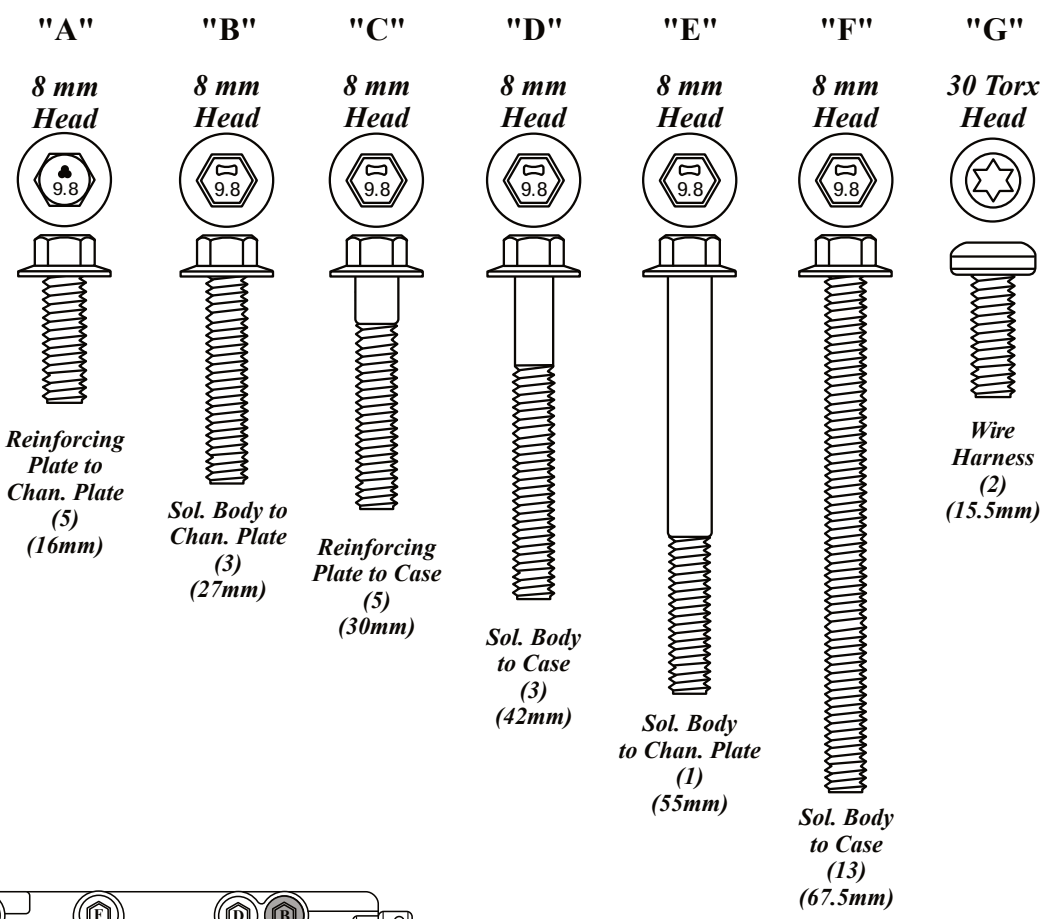


Figure 32

5R110W (Torqueshift) VALVE BODY BOLT CHART



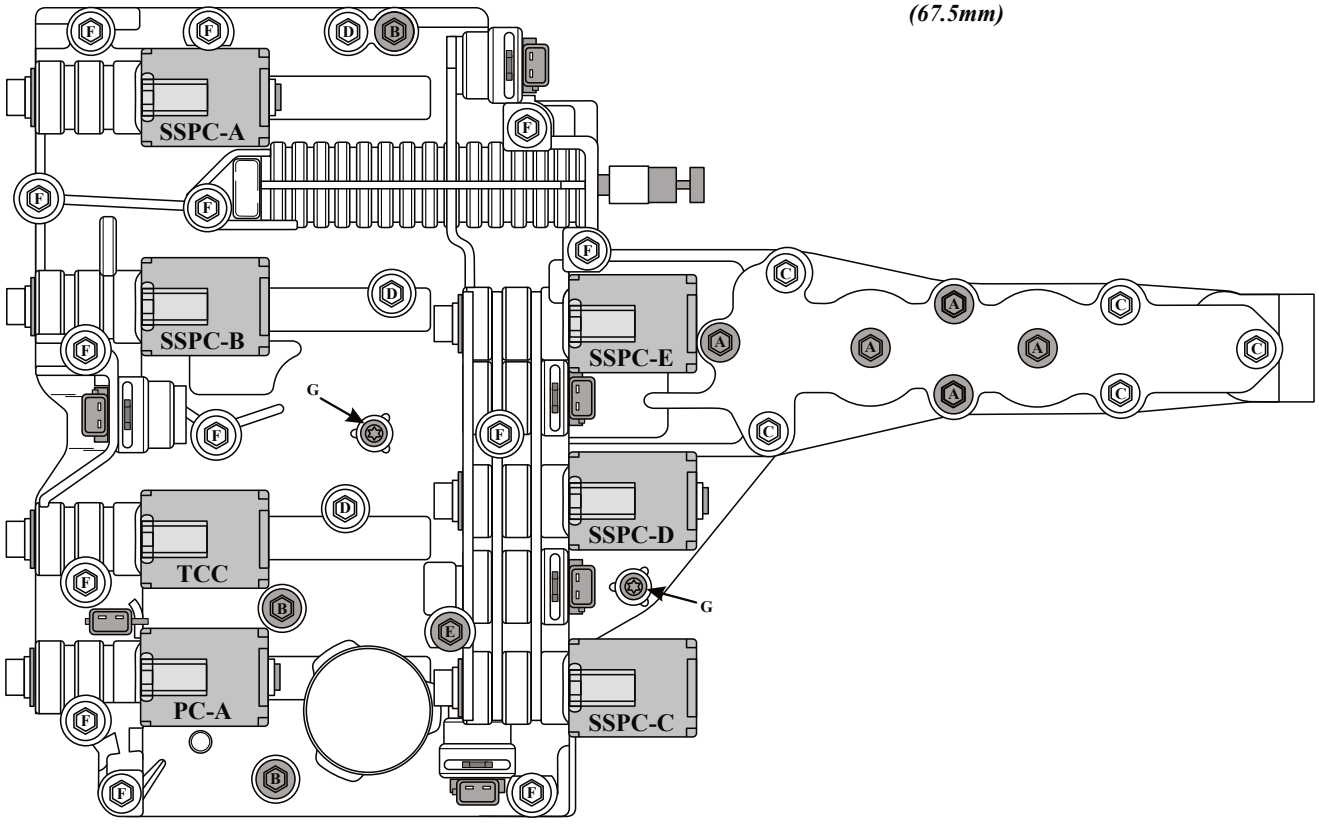


Figure 33

TRANSMISSION DISASSEMBLY

INTERNAL COMPONENTS (CONT'D)

14. Remove only the valve body bolts ***not shaded*** in Figure 33, which are the bolts that retain the valve body to the case, as shown in Figure 34.
15. Remove the valve body from the case using a slight twisting motion to remove the main case connector from the case bore (See Figure 34).
16. Set the complete valve body and channel plate assembly aside for component rebuild section.

Continued on Page 32

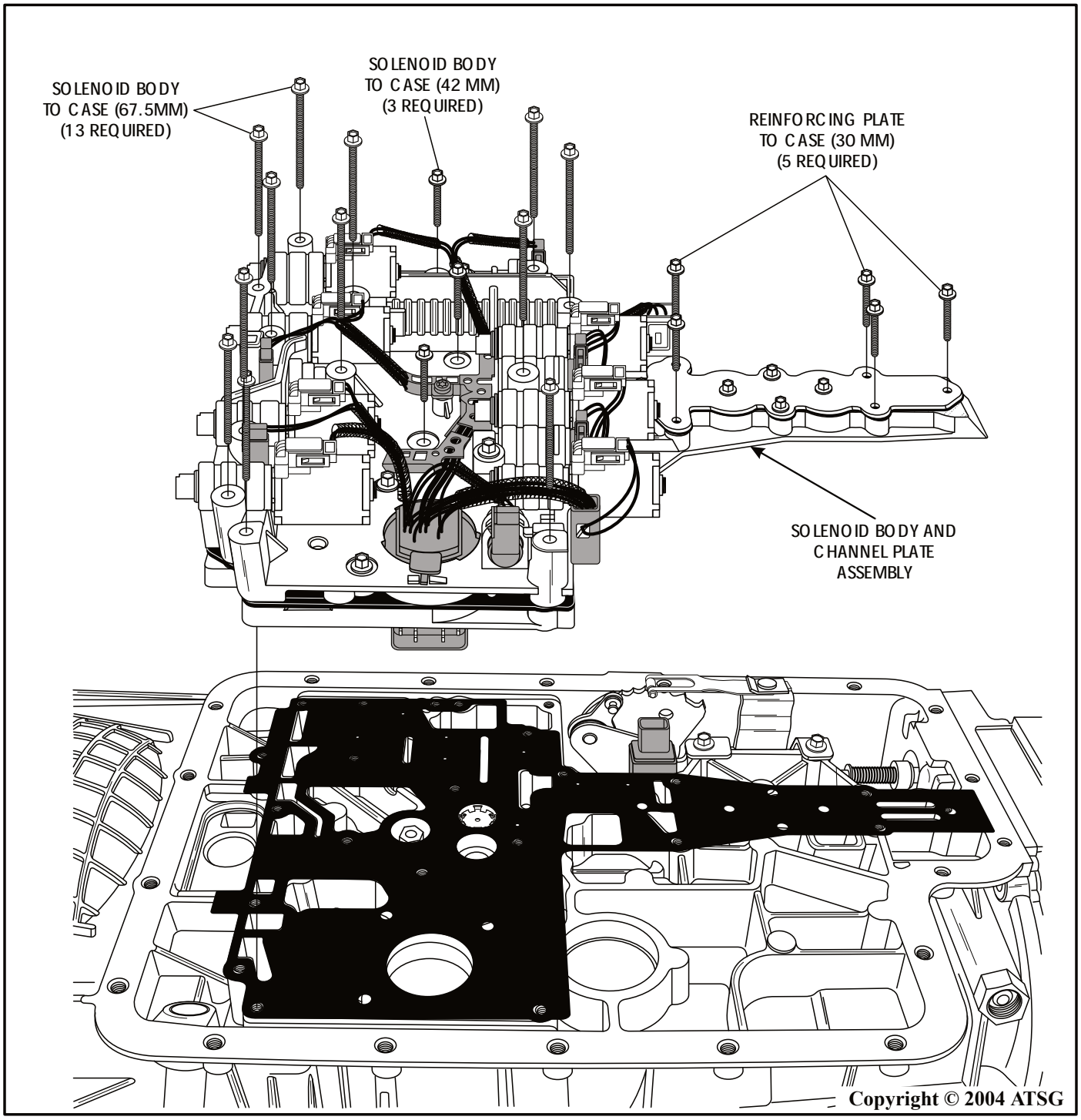


Figure 34

TRANSMISSION DISASSEMBLY

INTERNAL COMPONENTS (CONT'D)

17. Remove and discard the channel plate to case gasket, as shown in Figure 35.
18. Remove the forward clutch orifice from the case cavity, as shown in Figure 35.
    Note: Place forward clutch orifice in a place where it will not get lost.

Continued on Page 33

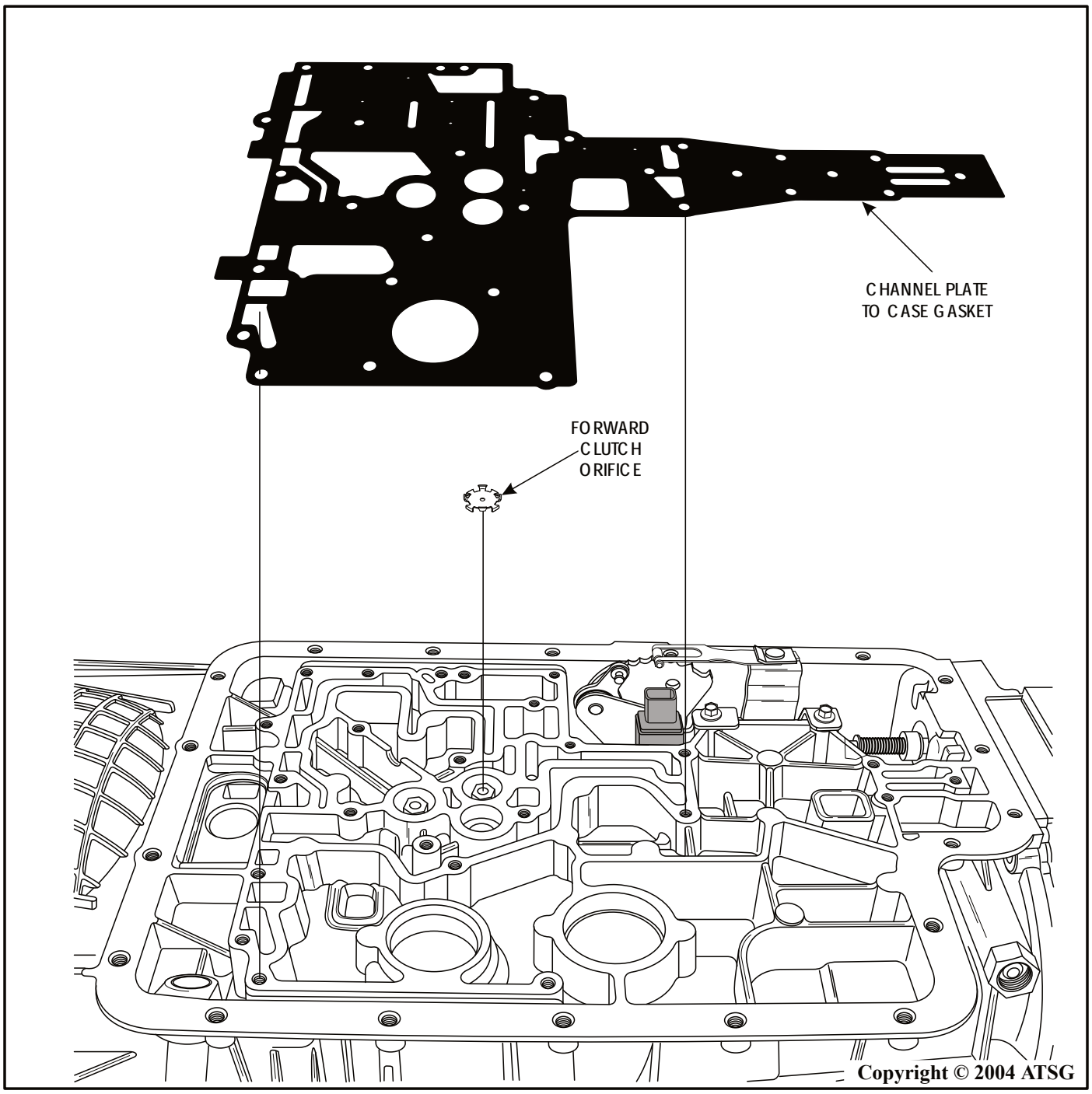


Figure 35

TRANSMISSION DISASSEMBLY

INTERNAL COMPONENTS (CONT'D)

19. Remove the external manual lever retaining pin using a No. 51 (.037") drill bit, as shown in Figure 36, by tapping it with small hammer into roll pin, and removing pin with side cutters.
20. Remove the external manual shift lever from transmission case, as shown in Figure 36.
21. Remove the two TRS retaining bolts, as shown in Figure 37, and remove the transmission range sensor assembly and parking rod as an assembly (See Figure 37).

Continued on Page 34

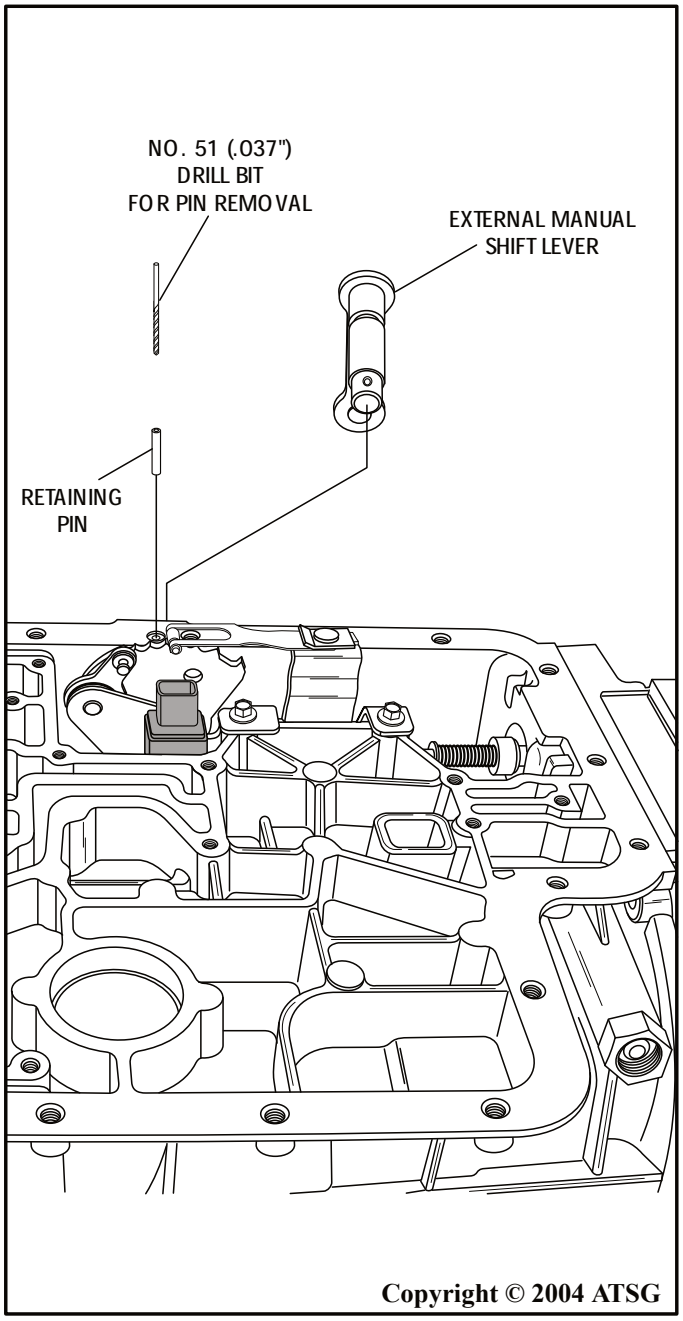


Figure 36

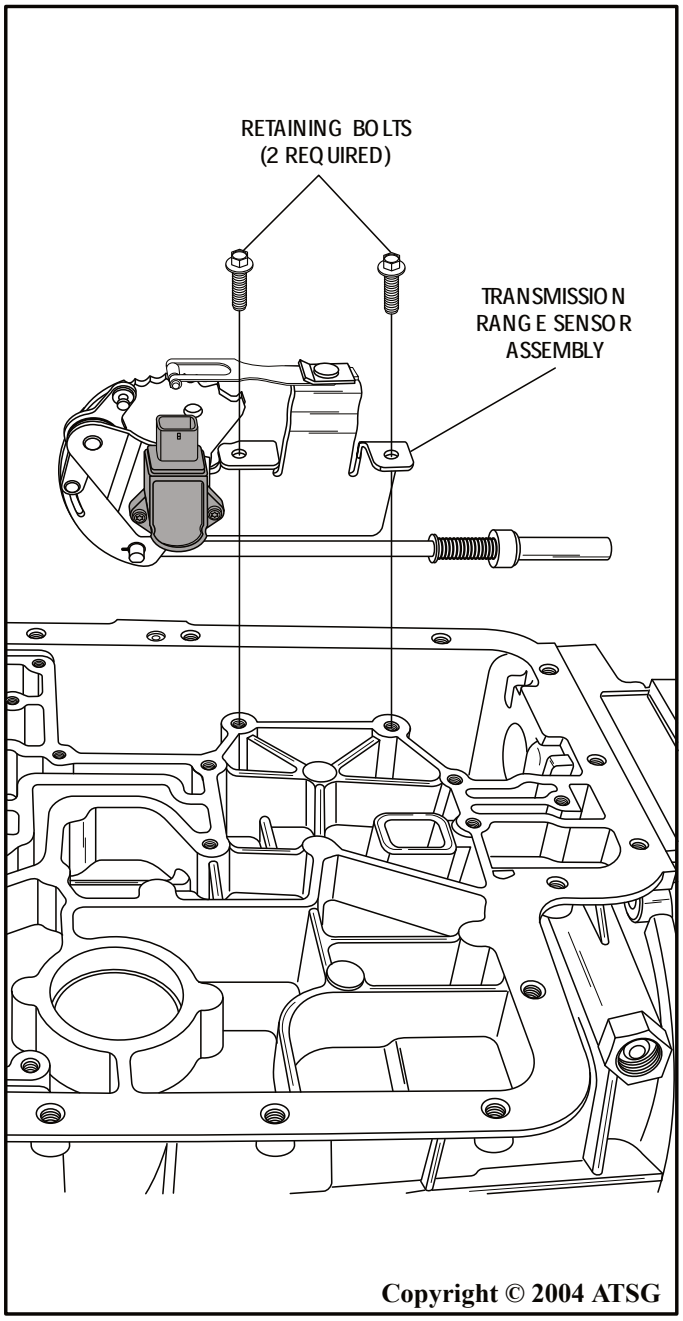


Figure 37

TRANSMISSION DISASSEMBLY

INTERNAL COMPONENTS (CONT'D)

22. Remove and discard the two support feed bolts, as shown in Figure 38.
    Note: The feed bolts will not retain torque specification if they are reused.
23. Rotate transmission in fixture so that the bell housing is facing up, as shown in Figure 39.
24. Remove the nine oil pump to case retaining bolts, as shown in Figure 39.
25. Remove the oil pump assembly using slide hammer as necessary (See Figure 39).
26. Remove and discard oil pump to case gasket, as shown in Figure 39.

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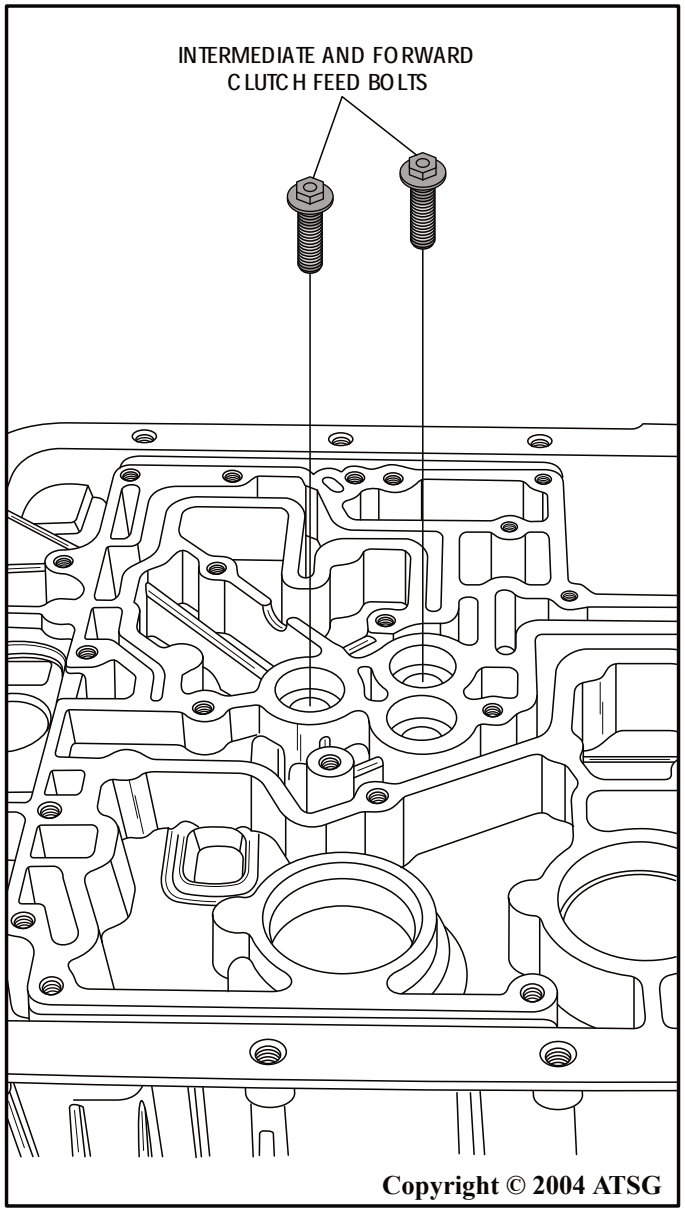
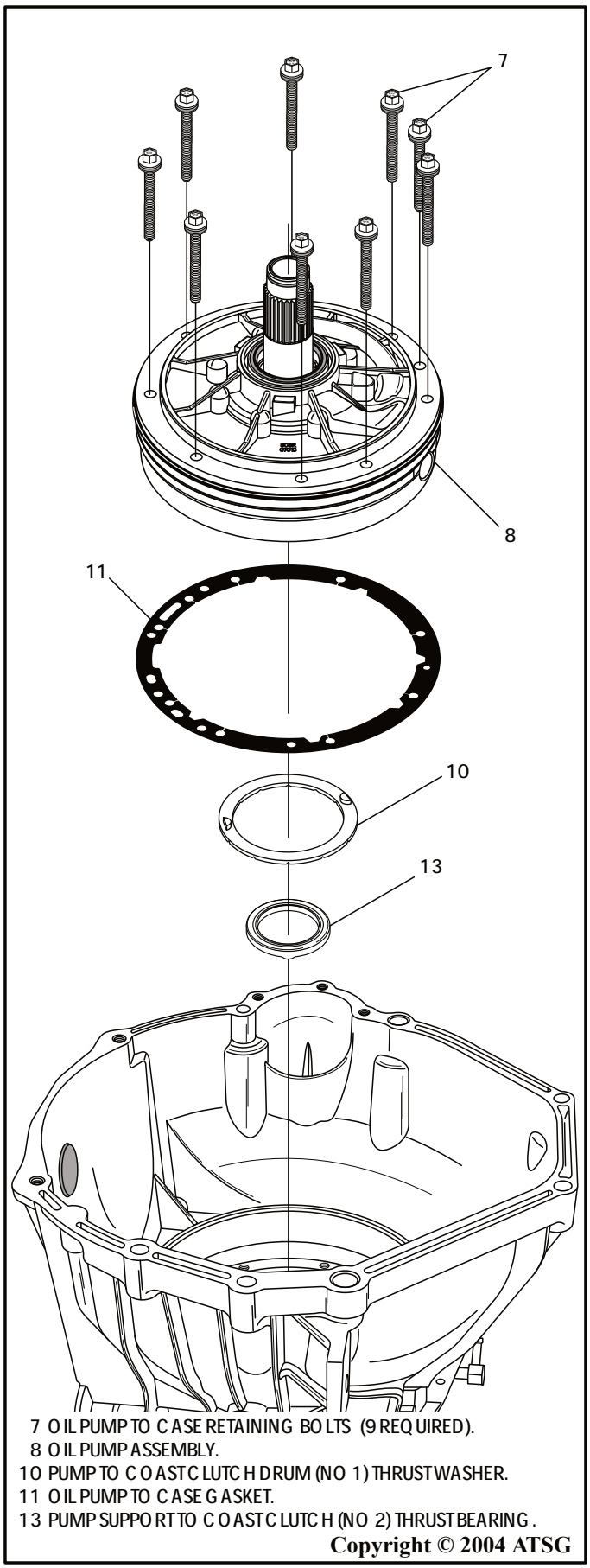


Figure 38



7 OIL PUMP TO CASE RETAINING BOLTS (9 REQUIRED).
8 OIL PUMP ASSEMBLY.
10 PUMP TO COAST CLUTCH DRUM (NO 1) THRUST WASHER.
11 OIL PUMP TO CASE GASKET.
13 PUMP SUPPORT TO COAST CLUTCH (NO 2) THRUST BEARING.

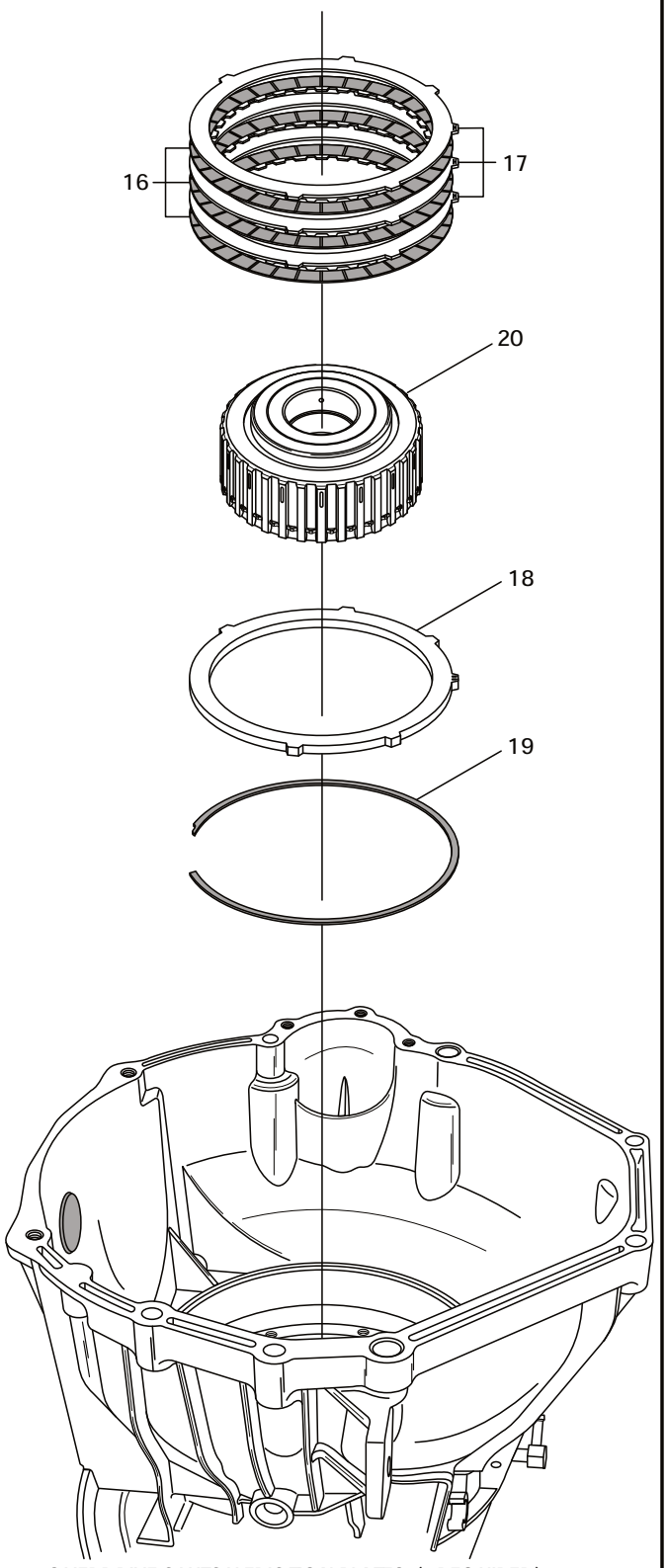
Figure 39

TRANSMISSION DISASSEMBLY

INTERNAL COMPONENTS (CONT'D)

27. Remove the pump support to coast clutch drum (No. 1) thrust washer (See Figure 39).
28. Remove the pump support to coast clutch drum (No. 2) thrust bearing (See Figure 39).
    Note: Both thrust washer and bearing may be stuck to back of pump support.
29. Remove the overdrive steel and lined plates, as shown in Figure 40.
30. Remove the coast clutch housing assembly, by lifting straight up, as shown in Figure 40.
31. Set the coast clutch housing assembly aside for the component rebuild section.
32. Remove the overdrive clutch backing plate, as shown in Figure 40.
33. Remove the overdrive clutch backing plate snap ring from case groove and remove from transmission, as shown in Figure 40.

Continued on Page 36



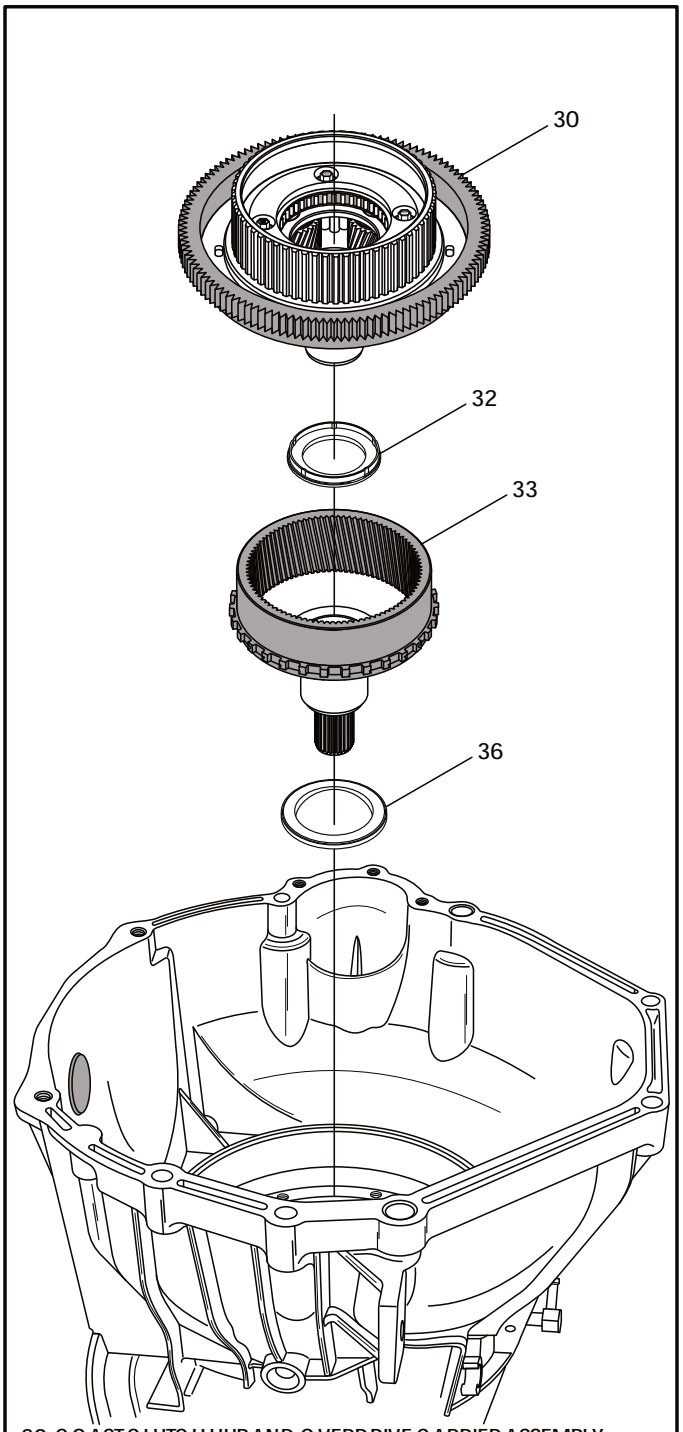
16 OVERDRIVE CLUTCH FRICTION PLATES (3 REQUIRED).
17 OVERDRIVE CLUTCH STEEL PLATES (3 REQUIRED).
18 OVERDRIVE CLUTCH BACKING PLATE.
19 OVERDRIVE CLUTCH BACKING PLATE SNAP RING.
20 COAST CLUTCH HOUSING ASSEMBLY.

Figure 40

TRANSMISSION DISASSEMBLY

INTERNAL COMPONENTS (CONT'D)

34. Remove the coast clutch hub and overdrive carrier assembly, as shown in Figure 41, by lifting straight up.
Note: "PTO" version illustrated in Figure 41.



30 COAST CLUTCH HUB AND OVERDRIVE CARRIER ASSEMBLY
32 NUMBER 4 THRUST BEARING ASSEMBLY
33 OVERDRIVE RING GEAR AND CENTER SHAFT ASSEMBLY
36 NUMBER 5 THRUST BEARING ASSEMBLY

Figure 41

35. Remove the number 4 thrust bearing, as shown in Figure 41.
Note: Bearing may be stuck to back side of the overdrive carrier.
36. Remove the overdrive ring gear and center shaft, as shown in Figure 41.
37. Remove the number 5 thrust bearing, as shown in Figure 41.
Note: Bearing may be stuck to back side of center shaft and ring gear assembly.
38. Remove the retaining snap ring from the case groove and remove the center support assembly from case, as shown in Figure 42.
Note: Thrust washer may be stuck to back side of center support.
39. Set the center support assembly aside for the component rebuild section.

Continued on Page 37

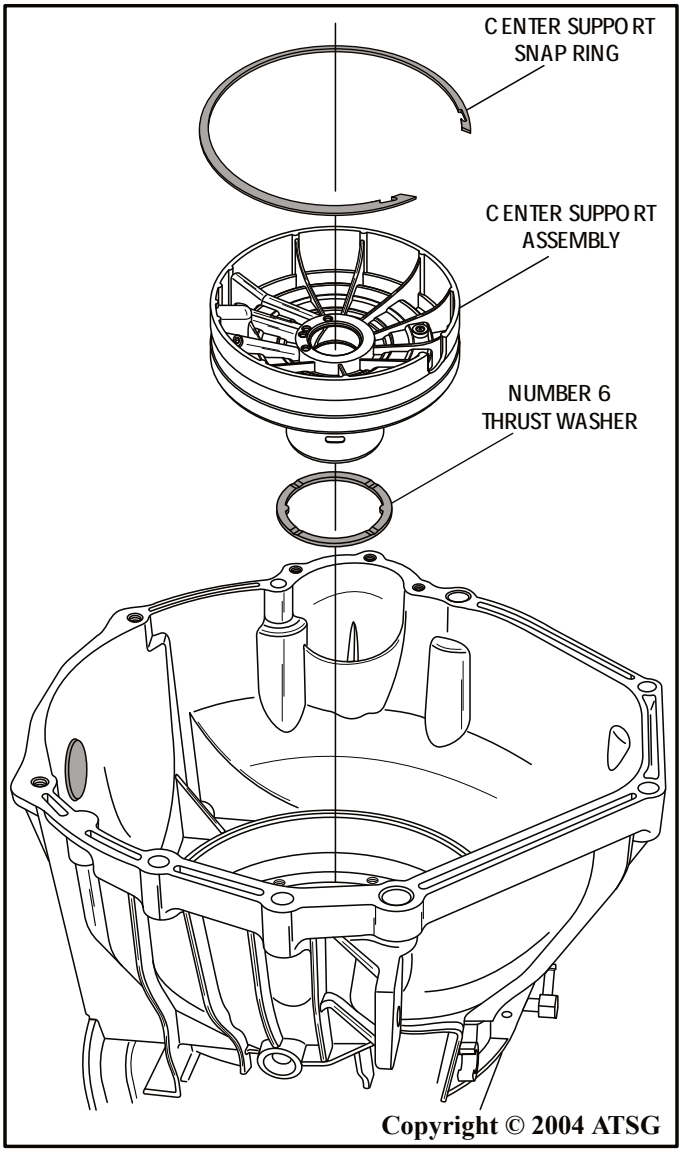


Figure 42

TRANSMISSION DISASSEMBLY

INTERNAL COMPONENTS (CONT'D)

40. Remove the intermediate clutch plates and the intermediate clutch backing plate, as shown in Figure 43.
41. Remove the direct clutch housing assembly, as shown in Figure 44, and set housing aside for the component rebuild section.
42. Remove the forward clutch housing assembly, as shown in Figure 44, and set housing aside for the component rebuild section.
43. The number 7 thrust washer and the number 8 thrust bearing should remain with the forward clutch housing.

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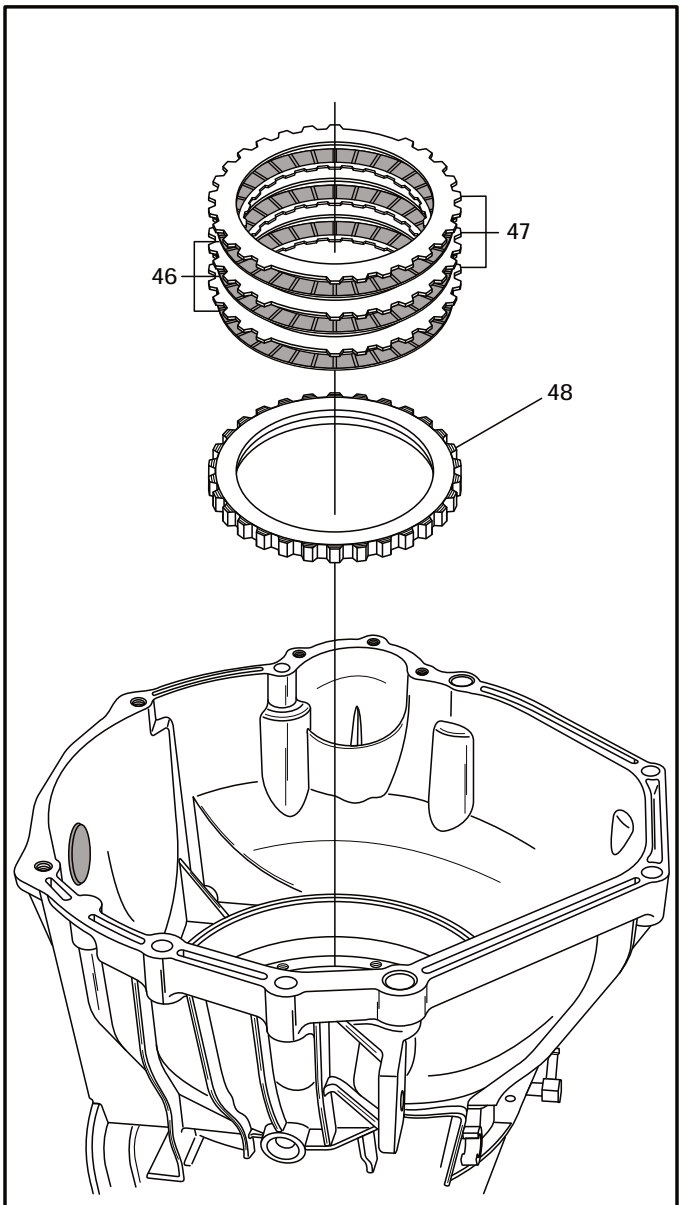
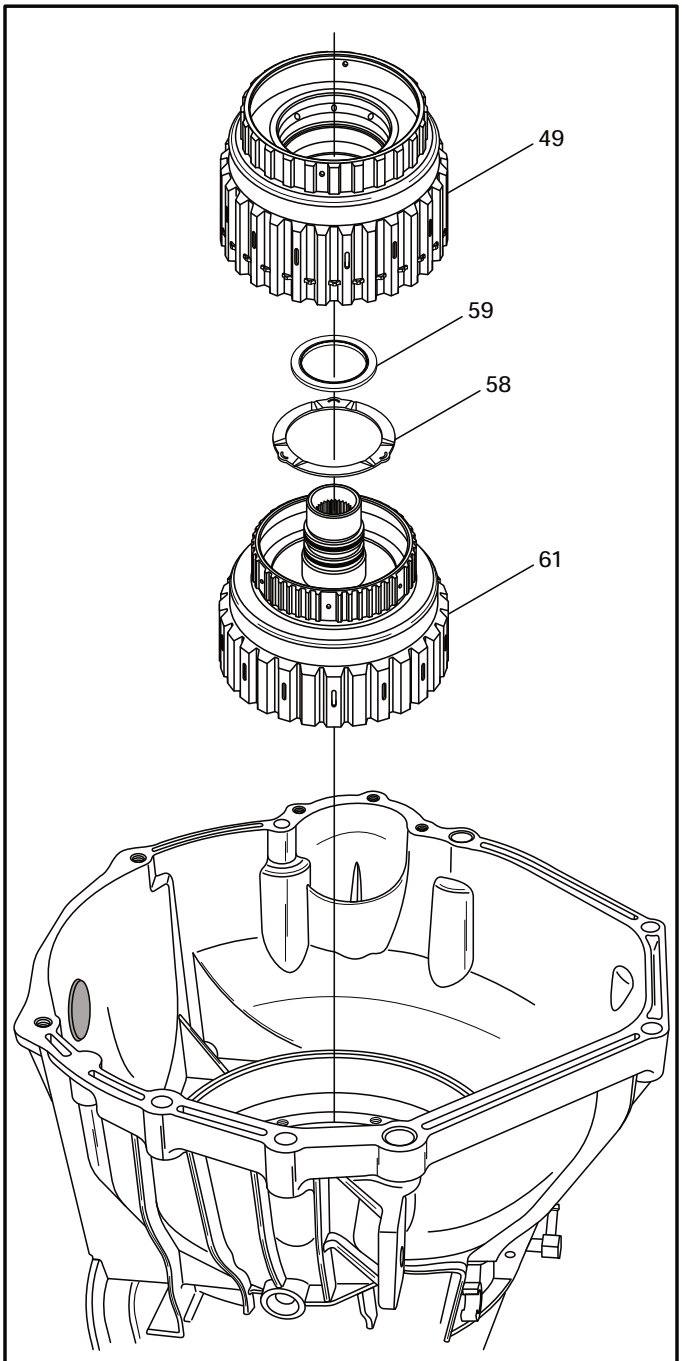


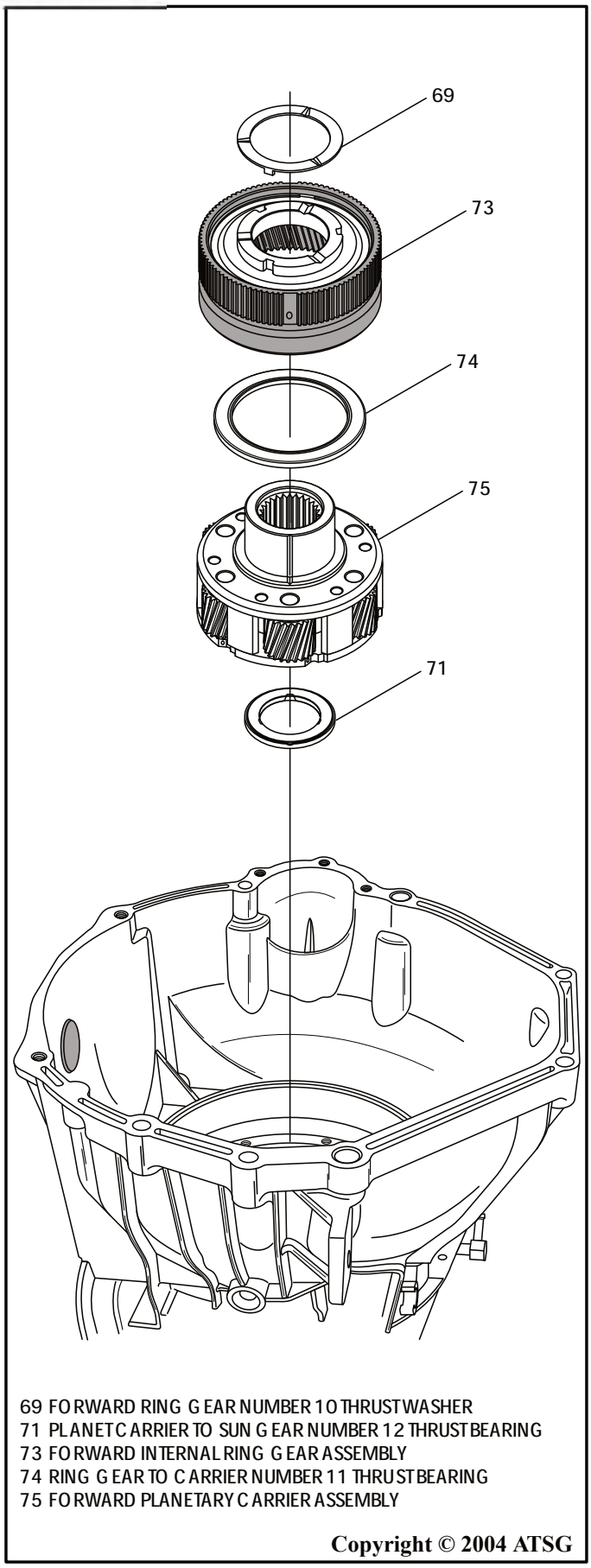
46 INTERMEDIATE CLUTCH FRICTION PLATES
47 INTERMEDIATE CLUTCH STEEL PLATES
48 INTERMEDIATE CLUTCH BACKING PLATE

Figure 43



49 DIRECT CLUTCH HOUSING, COMPLETE
58 NUMBER 7 THRUST WASHER
59 NUMBER 8 THRUST BEARING
61 FORWARD CLUTCH HOUSING, COMPLETE

Figure 44



69 FORWARD RING GEAR NUMBER 10 THRUST WASHER
71 PLANET CARRIER TO SUN GEAR NUMBER 12 THRUST BEARING
73 FORWARD INTERNAL RING GEAR ASSEMBLY
74 RING GEAR TO CARRIER NUMBER 11 THRUST BEARING
75 FORWARD PLANETARY CARRIER ASSEMBLY

Figure 45

TRANSMISSION DISASSEMBLY

INTERNAL COMPONENTS (CONT'D)

44. Remove the forward ring gear and number 10 thrust washer, as shown in Figure 45.
45. Remove the forward planetary carrier assembly and the number 11 thrust bearing, as shown in Figure 45.
46. Remove the carrier to sun gear shell assembly number 12 thrust bearing (See Figure 45)
47. Remove the sun gear and shell assembly, as shown in Figure 46.

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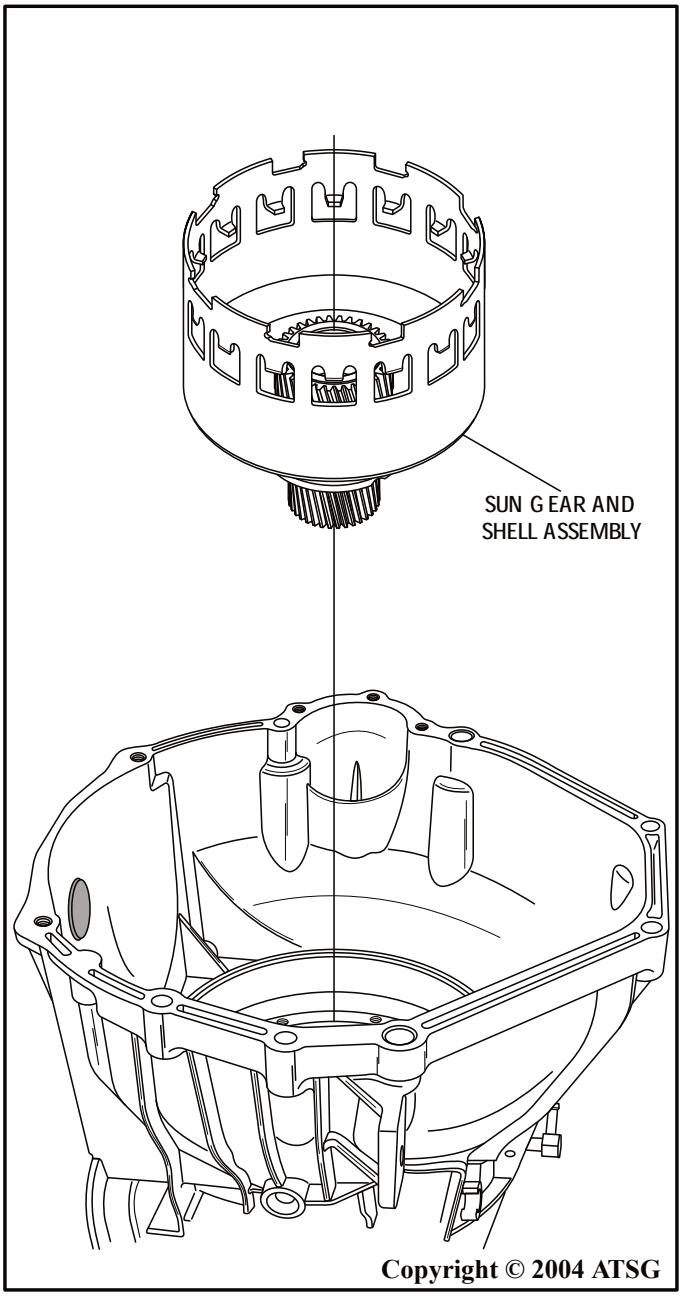
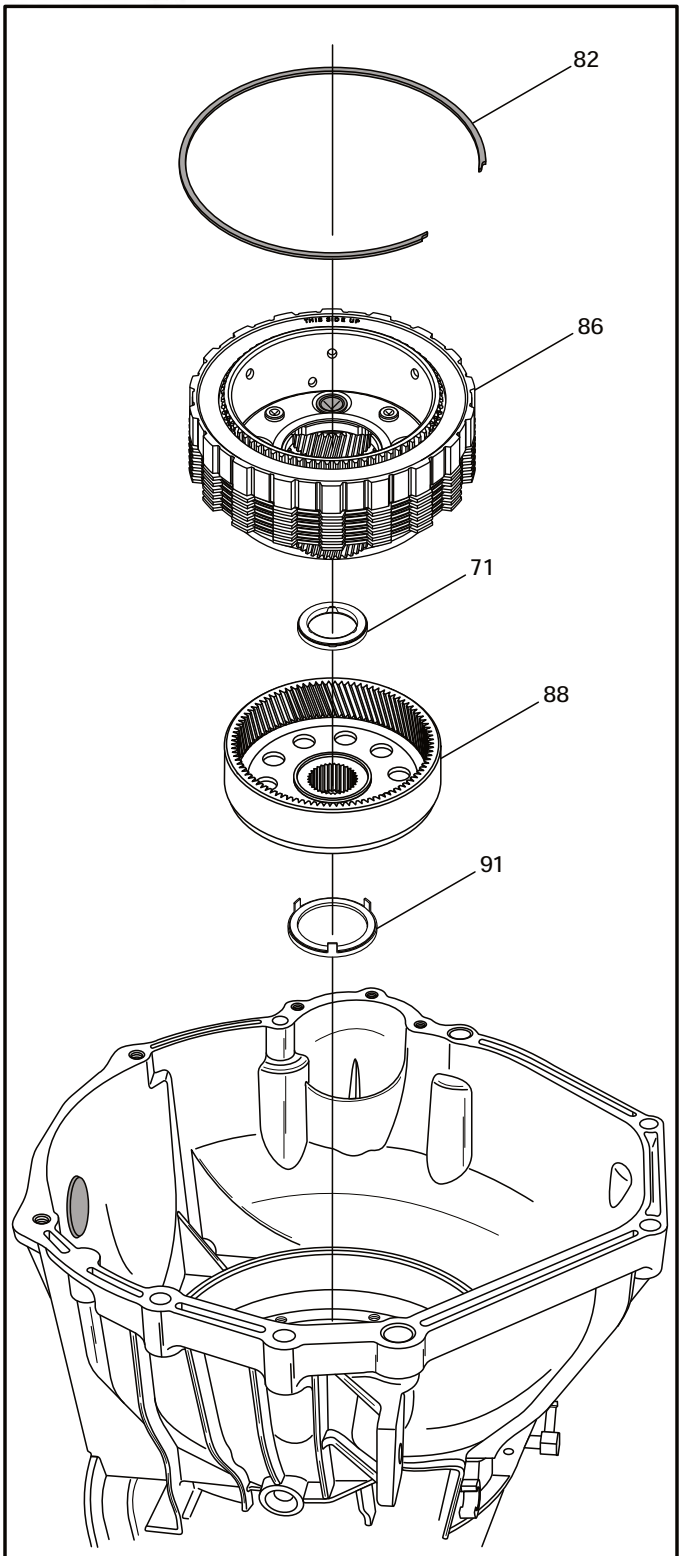


Figure 46



71 NUMBER 15 THRUST BEARING ASSEMBLY
82 LOW DIODE RETAINING SNAP RING
86 LOW DIODE, L/R CLUTCHES, REAR PLANETARY CARRIER
88 REAR PLANETARY CARRIER INTERNAL RING GEAR
91 NUMBER 16 THRUST BEARING ASSEMBLY

Figure 47

TRANSMISSION DISASSEMBLY

INTERNAL COMPONENTS (CONT'D)

48. Remove the low diode retaining snap ring from the case groove (See Figure 47).
49. Remove the low diode, low/reverse clutch pack and rear planetary carrier as an assembly, as shown in Figure 47.
50. Remove the rear carrier to rear ring gear thrust bearing (Number 15), as shown in Figure 47.
51. Remove the rear planetary ring gear assembly and the number 16 thrust bearing, as shown in Figure 47.
52. Rotate the transmission in holding fixture so extension housing is facing up, as shown in Figure 48.
    Note: 4WD version is shown.
53. Using the special socket 307-458, as shown in Figure 48, loosen the output shaft nut on the 4WD version.

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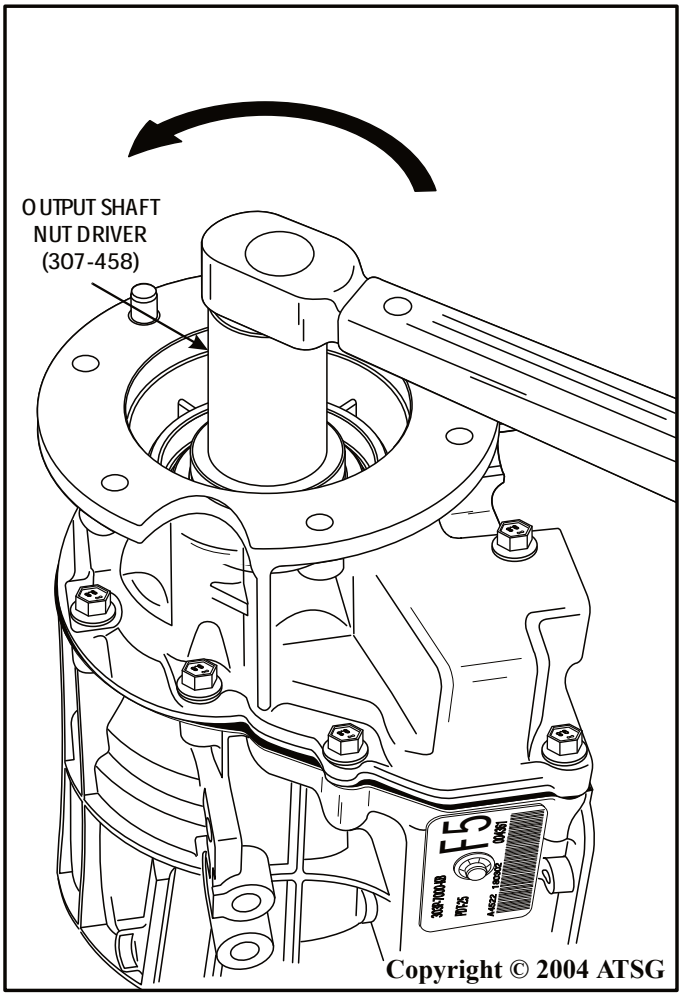

Figure 48

TRANSMISSION DISASSEMBLY

INTERNAL COMPONENTS (CONT'D)

54. Remove the output shaft nut from the output shaft, as shown in Figure 49.
55. Remove the nine bolts retaining the extension housing, as shown in Figure 50.
56. Remove the extension housing, as shown in Figure 50, and set aside for component rebuild section.
57. Remove and discard extension housing gasket, as shown in Figure 50.

Continued on Page 41

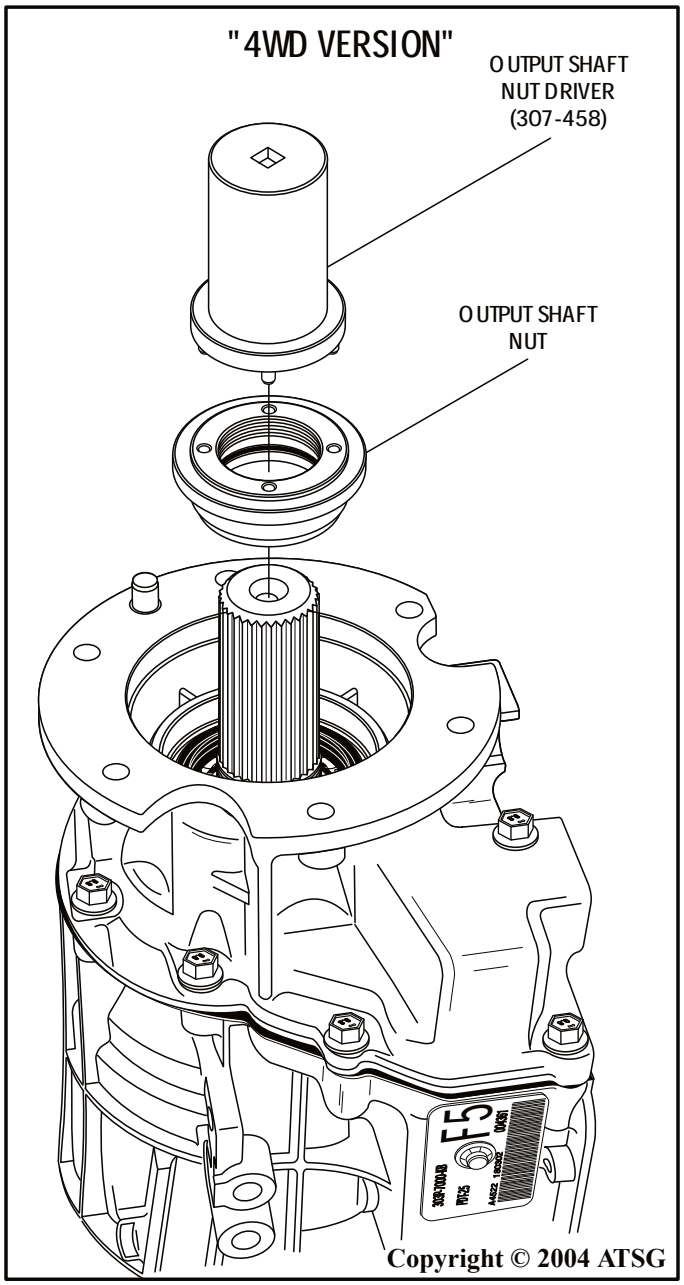

Figure 49

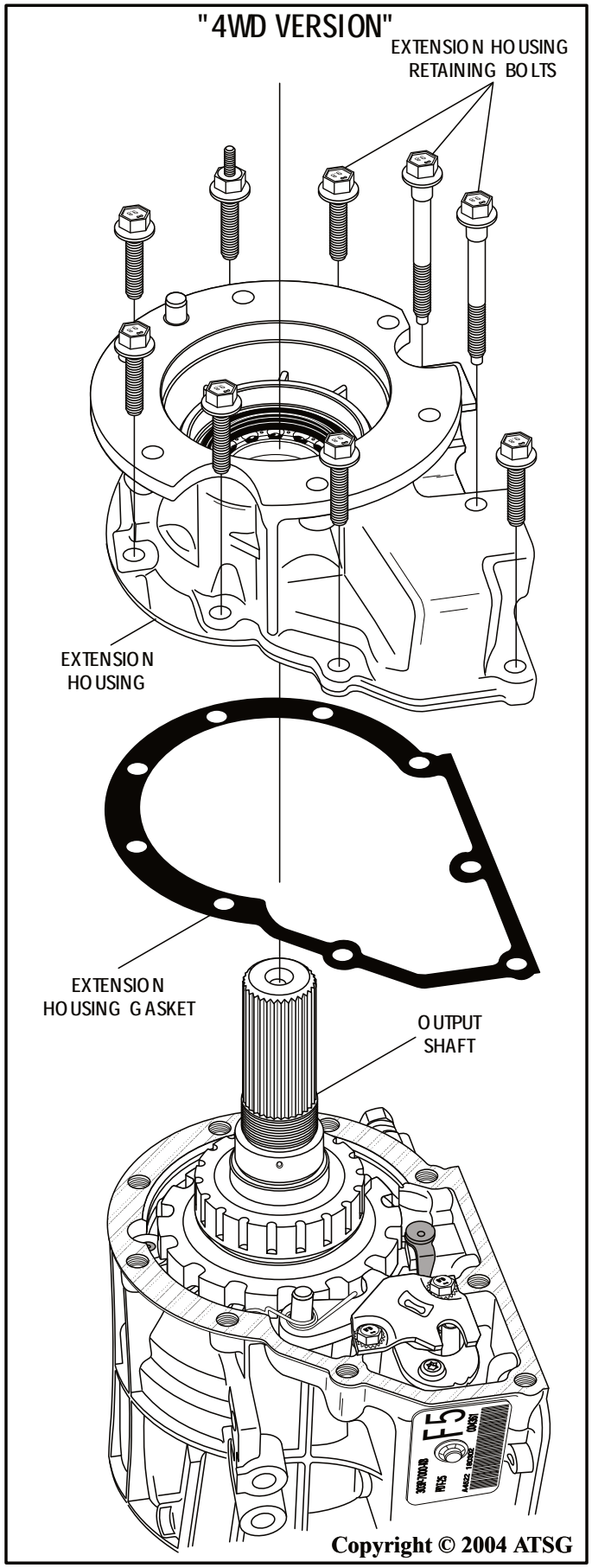

Figure 50

TRANSMISSION DISASSEMBLY

INTERNAL COMPONENTS (CONT'D)

58. Remove the output shaft from transmission, as shown in Figure 51.
59. Remove the No. 17 thrust bearing, as shown in Figure 51.

Continued on Page 42

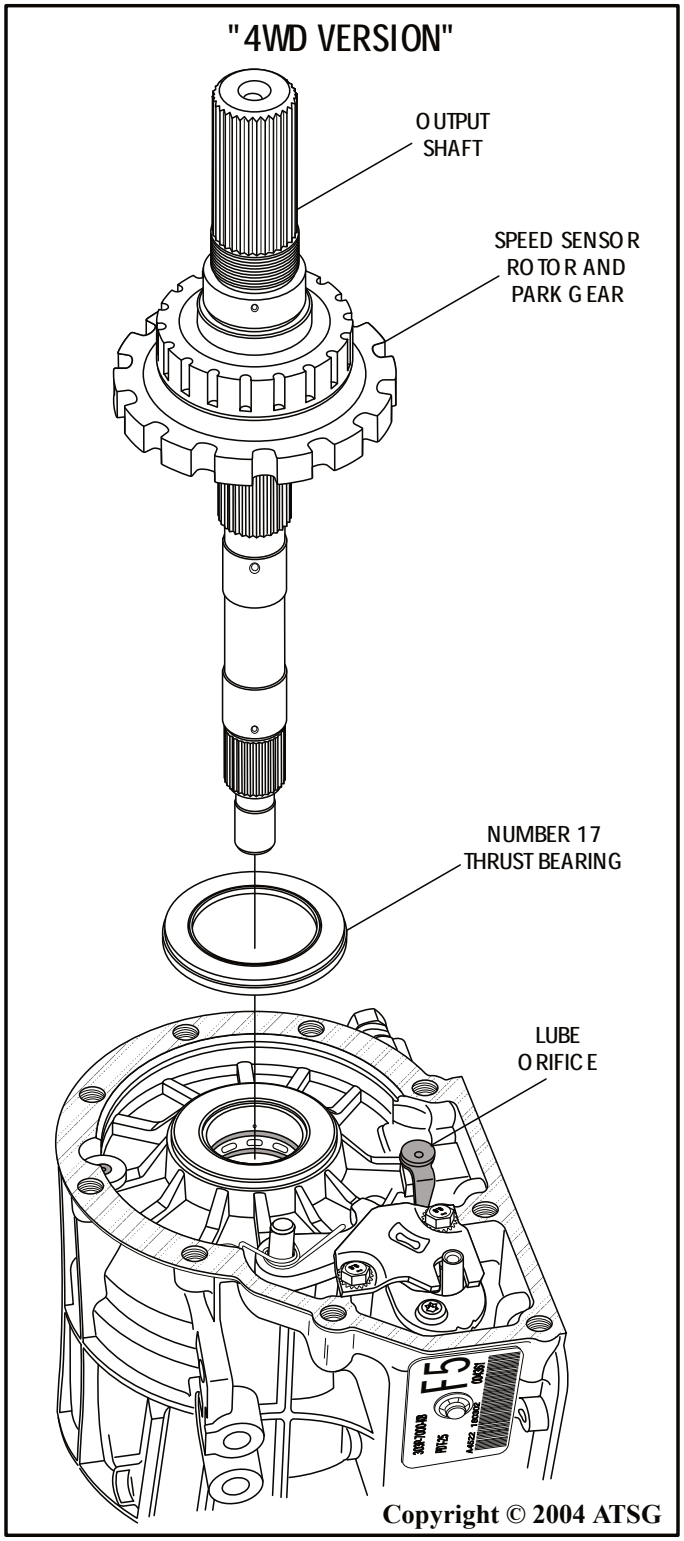

Figure 51

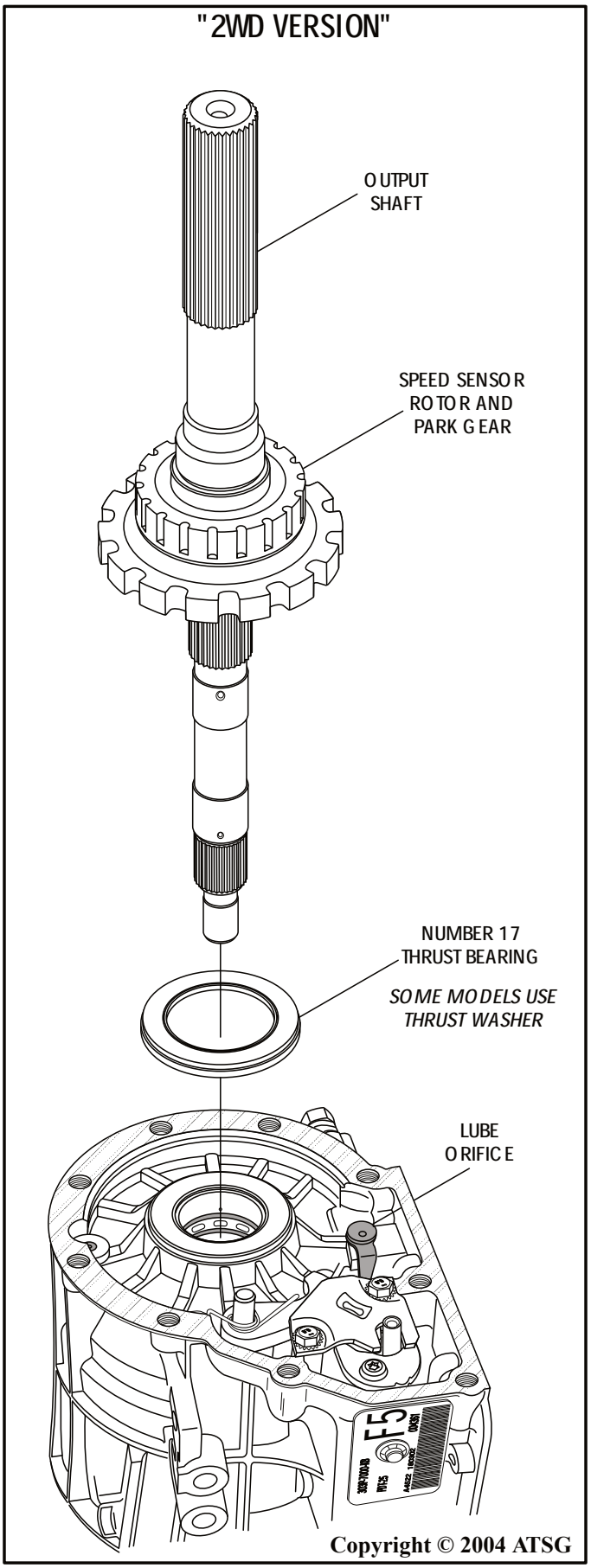

Figure 52

TRANSMISSION DISASSEMBLY

INTERNAL COMPONENTS (CONT'D)

60. The 2WD version is shown in Figure 52, which is basically the same as the 4WD version.
Note: Some models use a Number 17 thrust washer between park gear and case instead of a thrust bearing.
61. Remove the park rod guide plate, parking pawl, park pawl pivot pin and return spring, as shown in Figure 53.
62. Rotate the transmission in fixture so that bell housing is facing up, as shown in Figure 54.
63. Using a suitable spring compressor, compress the low/reverse clutch piston return spring and remove the snap ring (See Figure 54).
64. Remove the low/reverse clutch piston return spring assembly, as shown in Figure 54.
65. Remove the low/reverse clutch apply piston, as shown in Figure 54.

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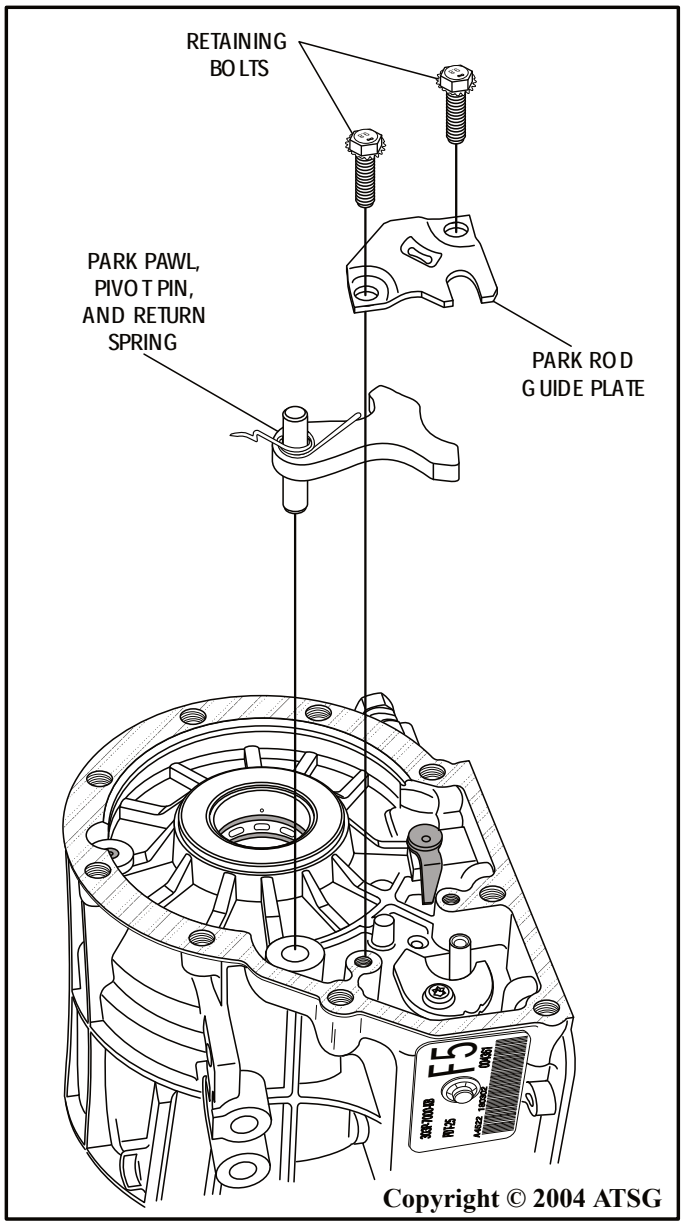
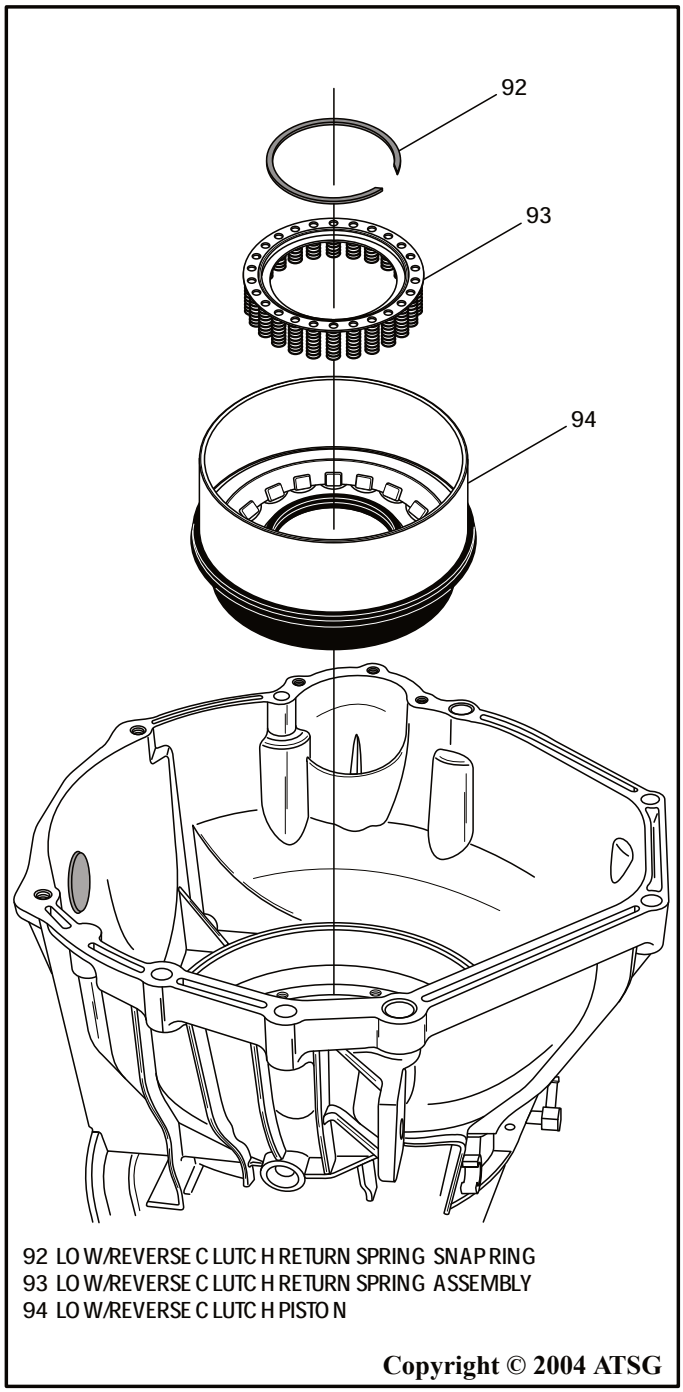


Figure 53



92 LOW/REVERSE CLUTCH RETURN SPRING SNAP RING
93 LOW/REVERSE CLUTCH RETURN SPRING ASSEMBLY
94 LOW/REVERSE CLUTCH PISTON

Figure 54

COMPONENT REBUILD

TRANSMISSION CASE

1. Inspect all case parts thoroughly for any wear and/or damage. Repair or replace as necessary.
2. Clean all case parts thoroughly and dry with compressed air.
3. Remove and discard the case linkage seal.
4. Using the proper seal driver, install a new case linkage seal, and lubricate with a small amount of Trans-Jel®.
5. Install two new scarf-cut Teflon® seals into the seal retainer in back of case just below the rear case bushing, as shown in Figure 55.
6. Lubricate the two seals with a small amount of Trans-Jel®.
7. Lube the seals on a new low/reverse molded piston and install piston into case, as shown in Figure 56.
8. Install the low/reverse piston return spring, as shown in Figure 56.
9. Compress the return spring with appropriate spring compressor and install snap ring.
10. Ensure that snap ring is fully seated in the case groove.

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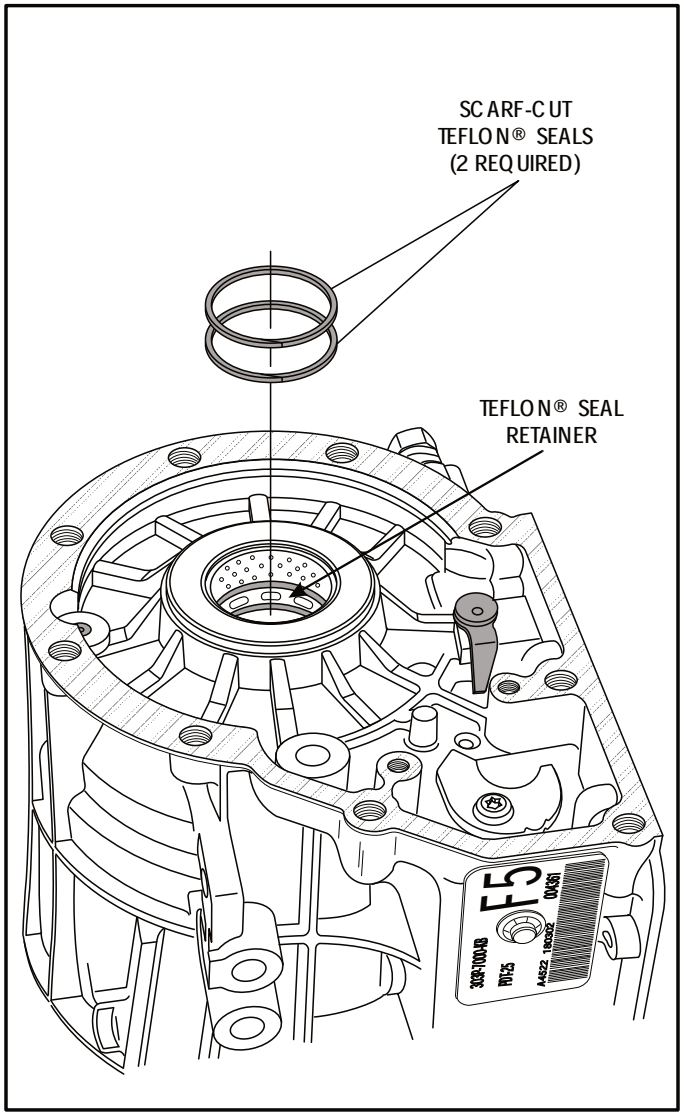

Figure 55

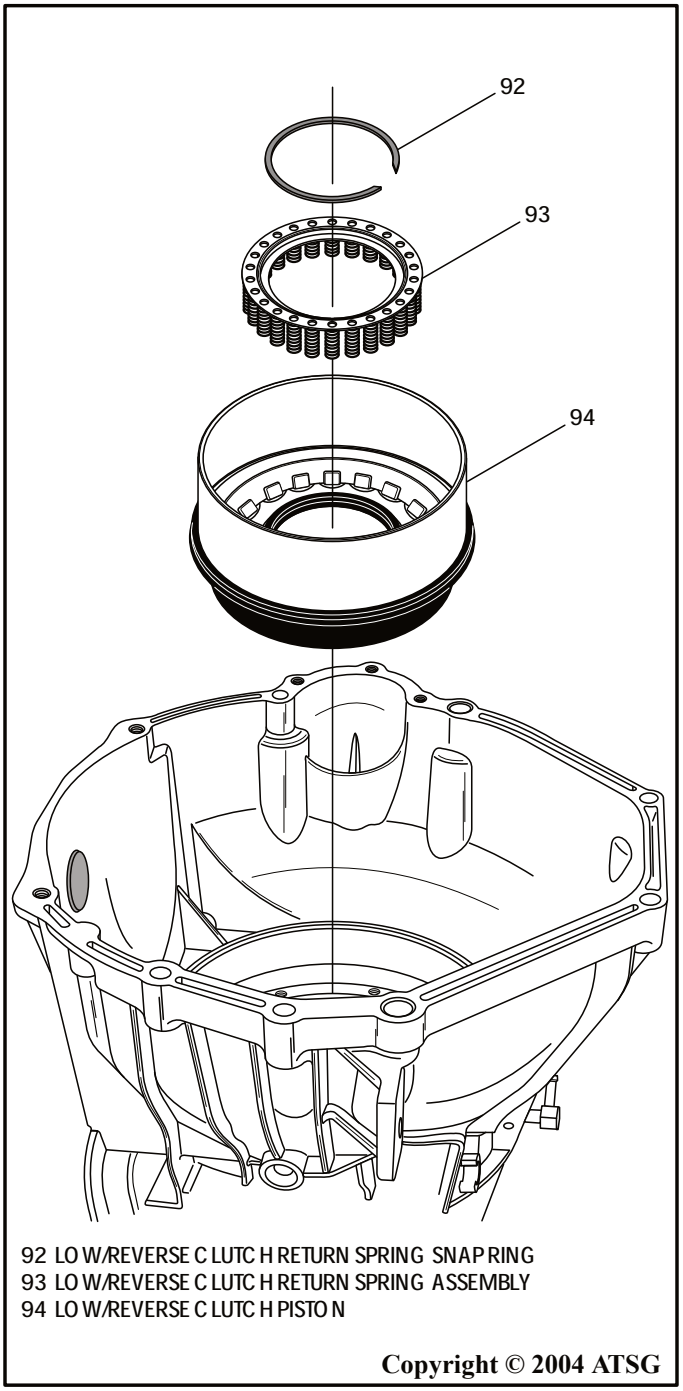

Figure 56

COMPONENT REBUILD

TRANSMISSION CASE (Cont'd)

11. Rotate the case with pan surface facing up and install the park rod, inside detent lever and the transmission range sensor (See Figure 57).
12. Install the two range sensor retaining bolts, but do not tighten.
13. Install the external manual shift lever through the case and into the range sensor, as shown in Figure 58, and install case retaining pin.
14. Rotate the shift lever to align with hole in the range sensor and install new sensor retaining pin, as shown in Figure 59.
    Note: Leave 1/16 inch of pin exposed.

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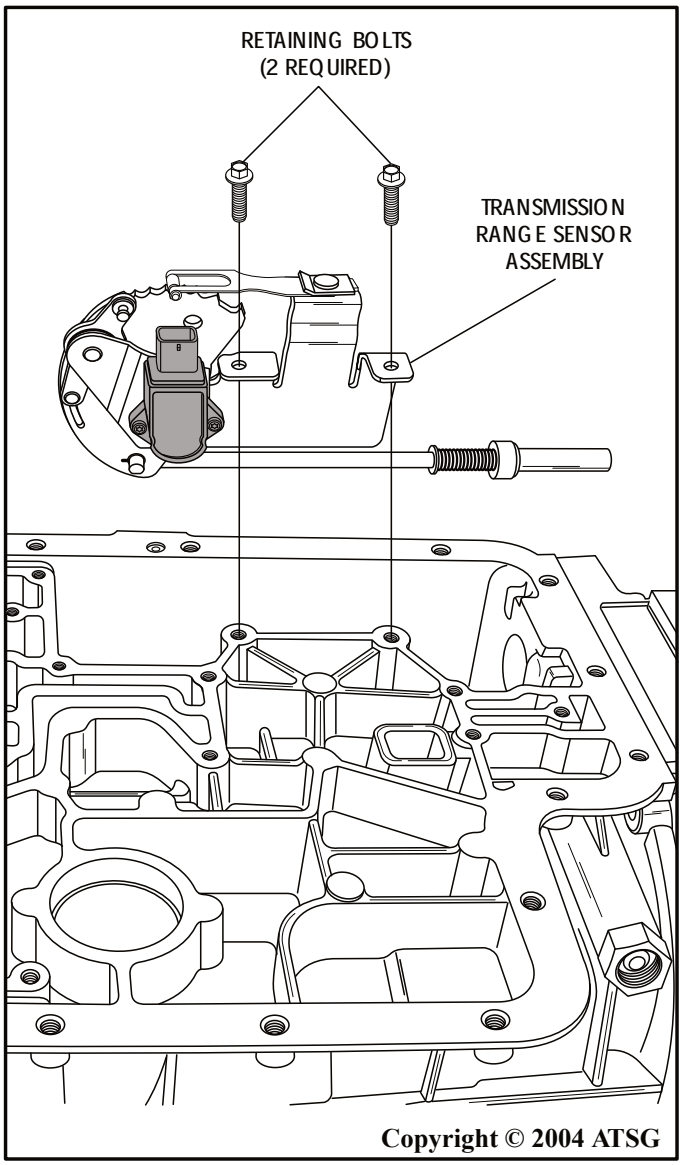

Figure 57

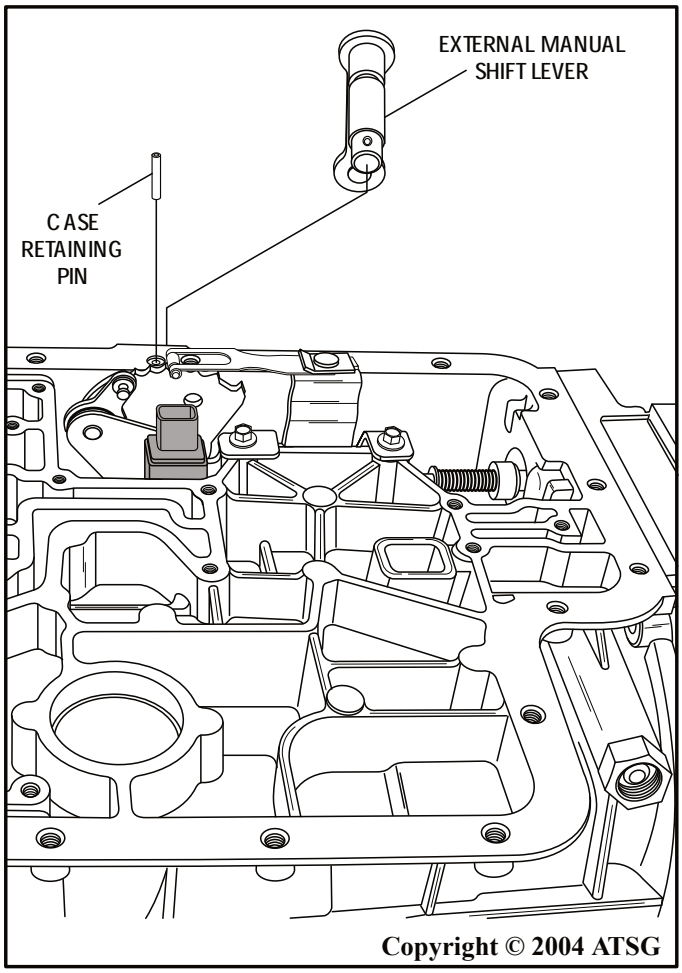

Figure 58

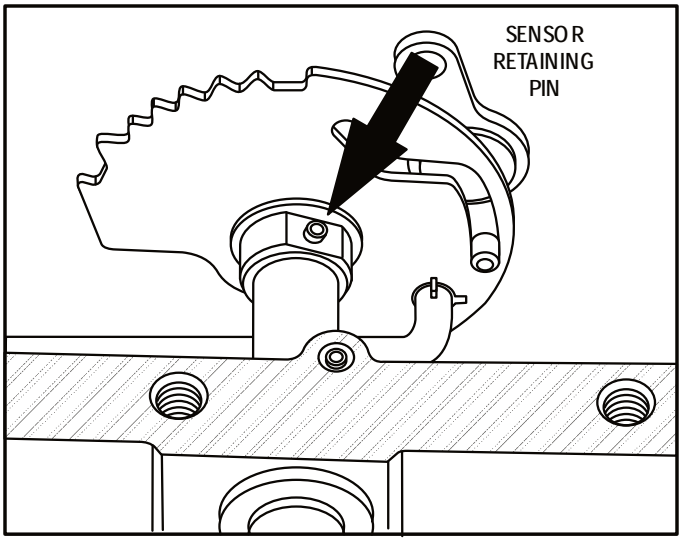

Figure 59

COMPONENT REBUILD

TRANSMISSION CASE (Cont'd)

15. Torque the transmission range sensor retaining bolts to 10 N•m (89 in.lb.) (See Figure 60).
16. Rotate transmission in fixture so that the rear surface is facing up, as shown in Figure 61.
17. Install the parking pawl, pivot pin and return spring, as shown in Figure 61, and ensure that return spring is hooked properly behind case.
18. Install the parking rod guide plate, as shown in Figure 61.
19. Install the two park rod guide plate retaining bolts and torque to 24 N•m (18 ft.lb.).
    Note: Ensure that park rod operates freely through the guide plate.
20. Install the number 17 thrust bearing onto the case, in the direction shown in Figure 62, and retain with a small amount of Trans-Jel®.
    Note: Some models use a Number 17 thrust "washer" between case and park gear instead of a thrust bearing.

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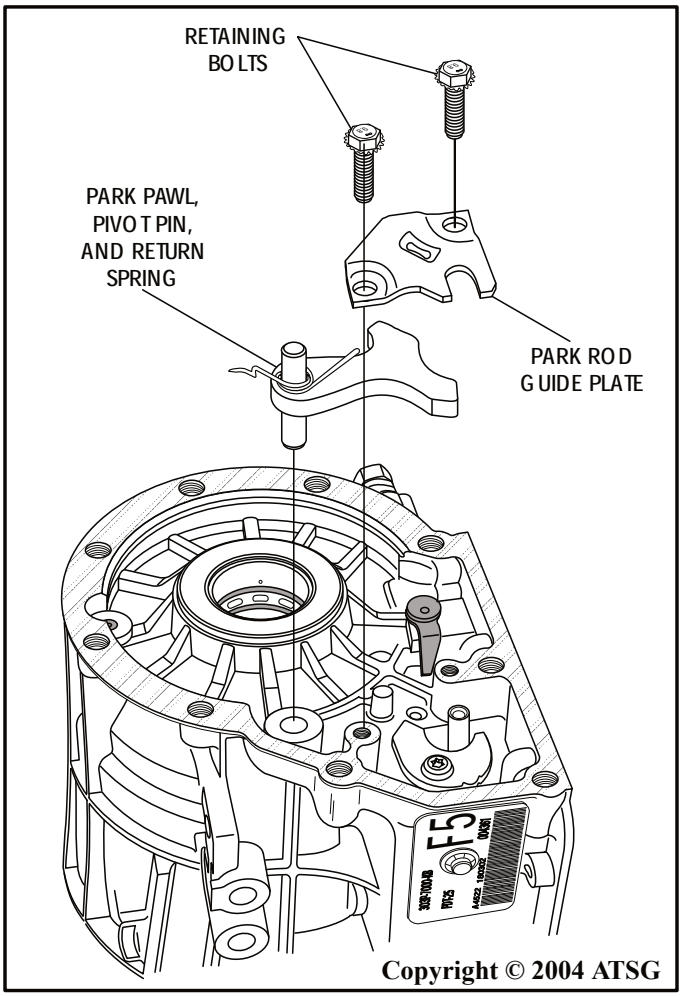


Figure 61

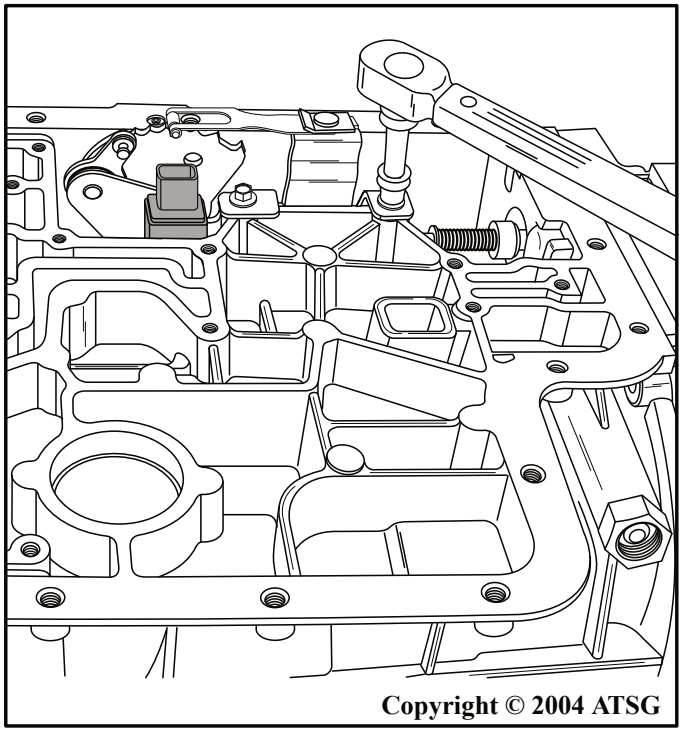


Figure 60

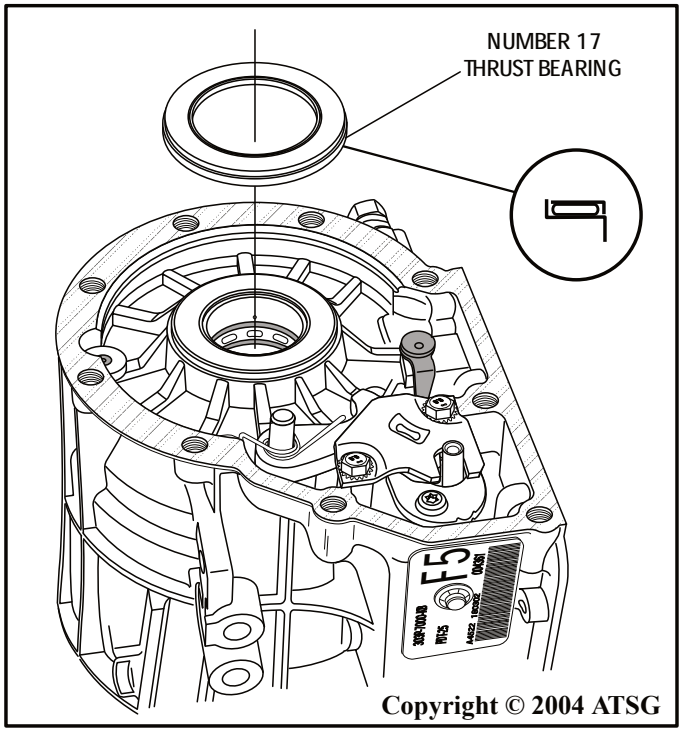


Figure 62

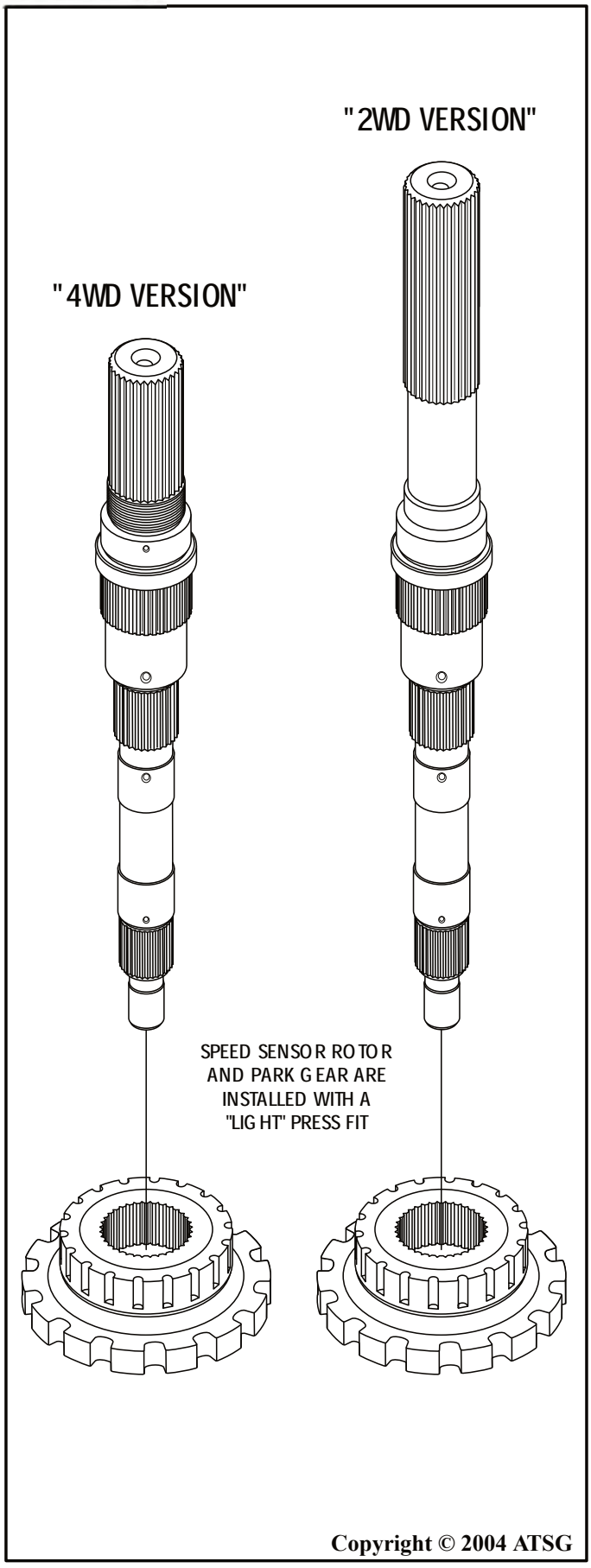


Figure 63

TRANSMISSION CASE (Cont'd)

21. Remove and inspect park gear/speed sensor rotor, as shown in Figure 63, and replace as necessary.
22. Install the output shaft and park gear assembly into the transmission, as shown in Figure 64.

Continued on Page 47

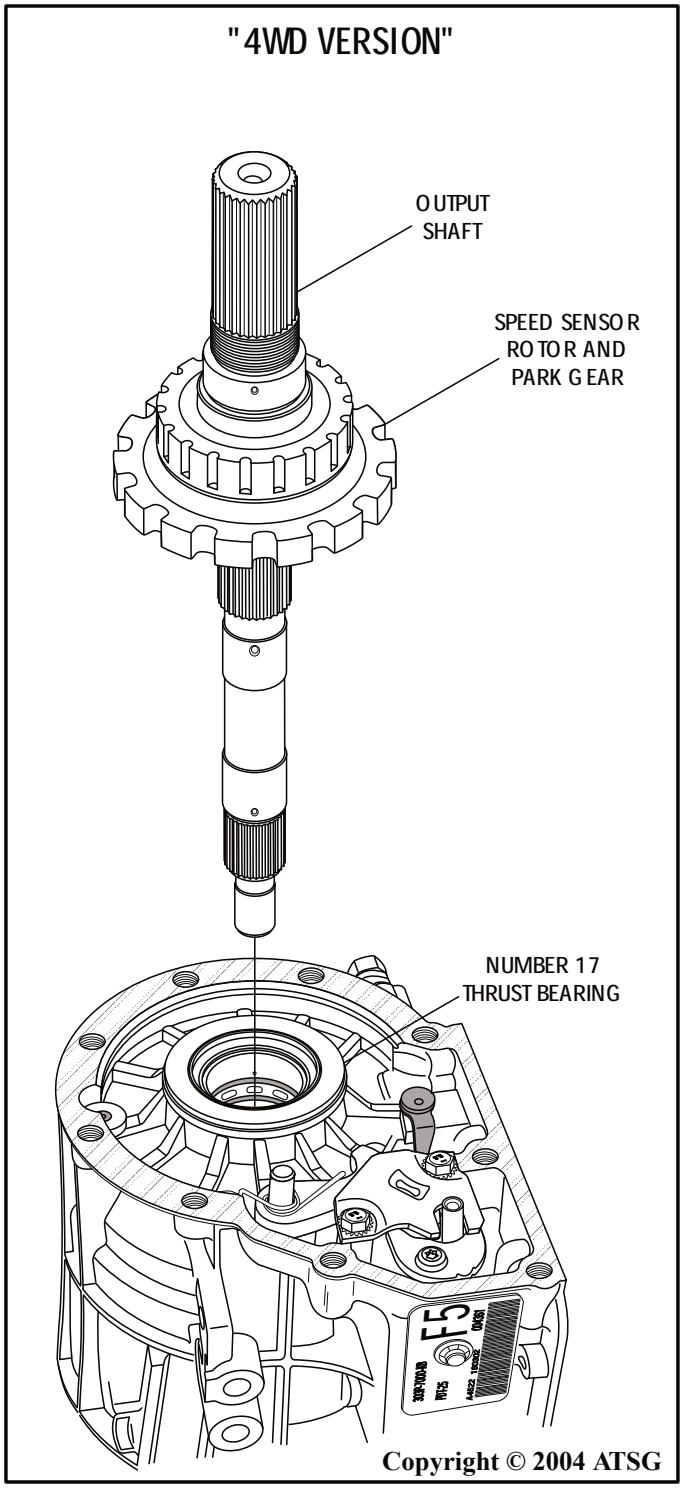


Figure 64

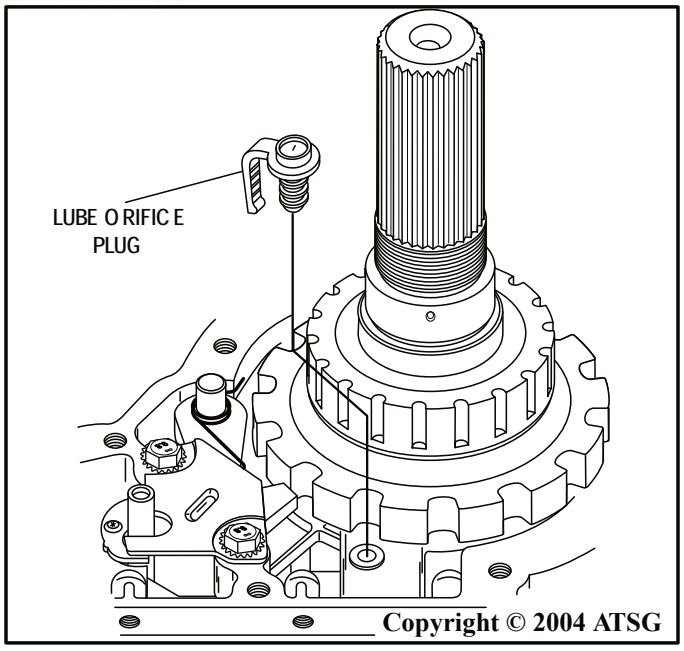


Figure 65

TRANSMISSION CASE (Cont'd)

23. Install a new lube orifice plug in the case, as shown in Figure 65.
24. Before installing extension housing, ensure that park pawl return spring is hooked behind the case, and park rod operates freely through the guide plate (See Figure 66).
25. The Torx head bolt retaining the parking pawl abutment plate, shown in Figure 66, 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.).
26. Install new extension housing seal using the proper seal driver (See Figure 67).
    Note: 4WD version is shown, 2WD similiar.
27. Replace the ball bearing in the 4WD version as necessary using the proper drivers. Refer to Figure 67.

Continued on Page 48

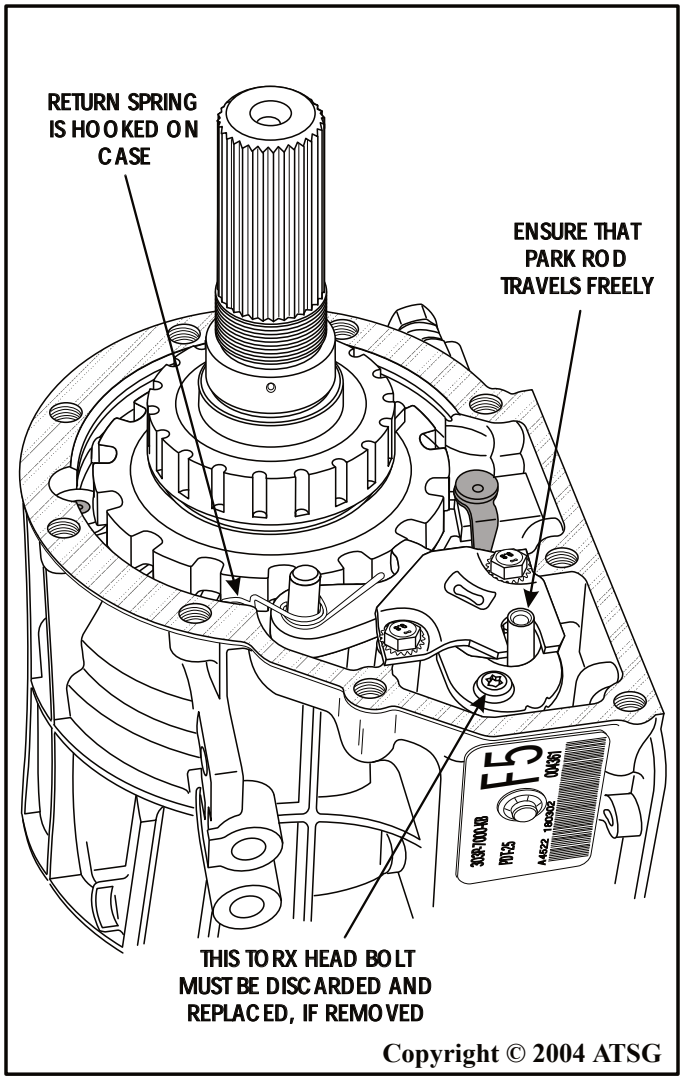


Figure 66

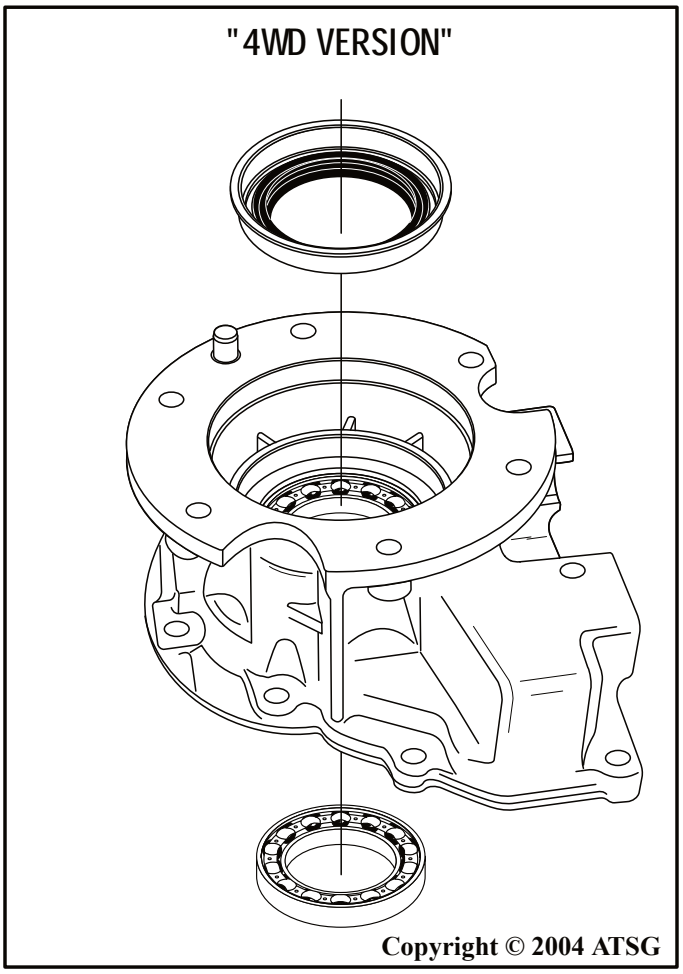


Figure 67

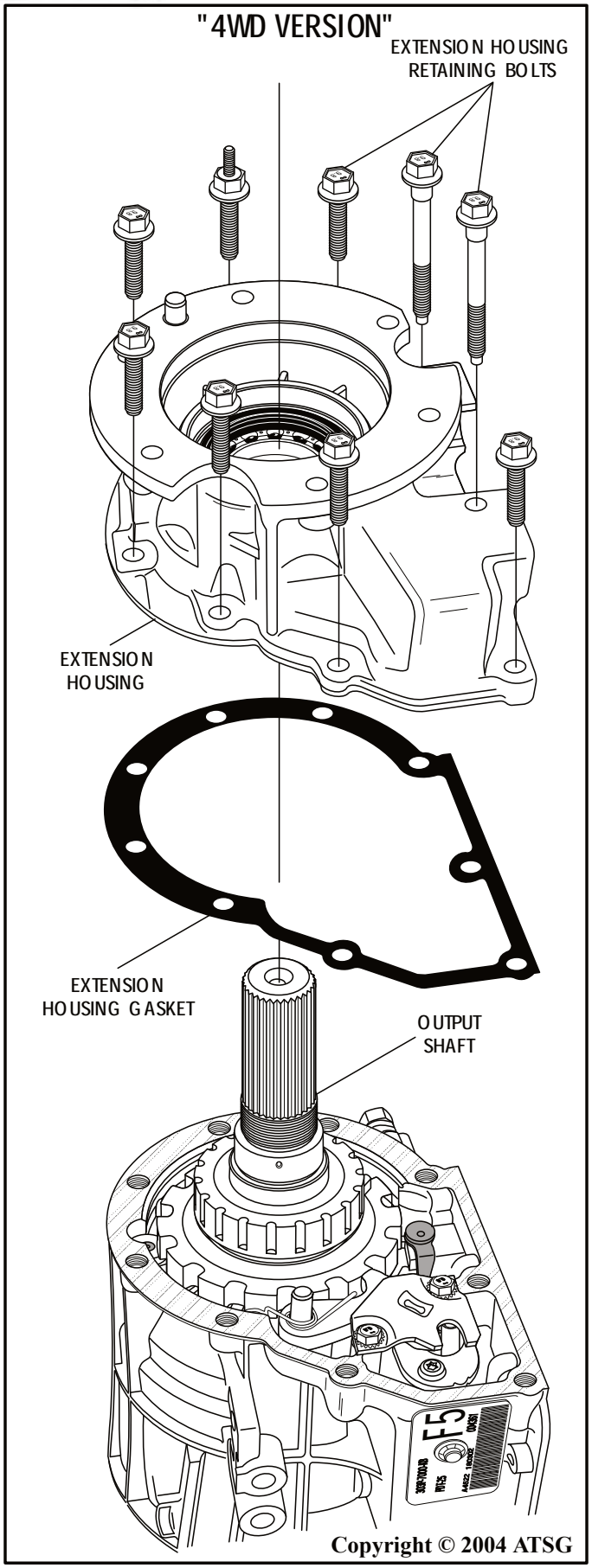


Figure 68

TRANSMISSION CASE (Cont'd)

28. Install new extension housing gasket onto the transmission, as shown in Figure 68.
29. Install the completed extension housing onto the transmission, as shown in Figure 68.
30. Install the extension housing retaining bolts, as shown in Figure 68.
31. Torque all of the extension housing bolts to 47 N•m (35 ft.lb.), as shown in Figure 69.

Continued on Page 49

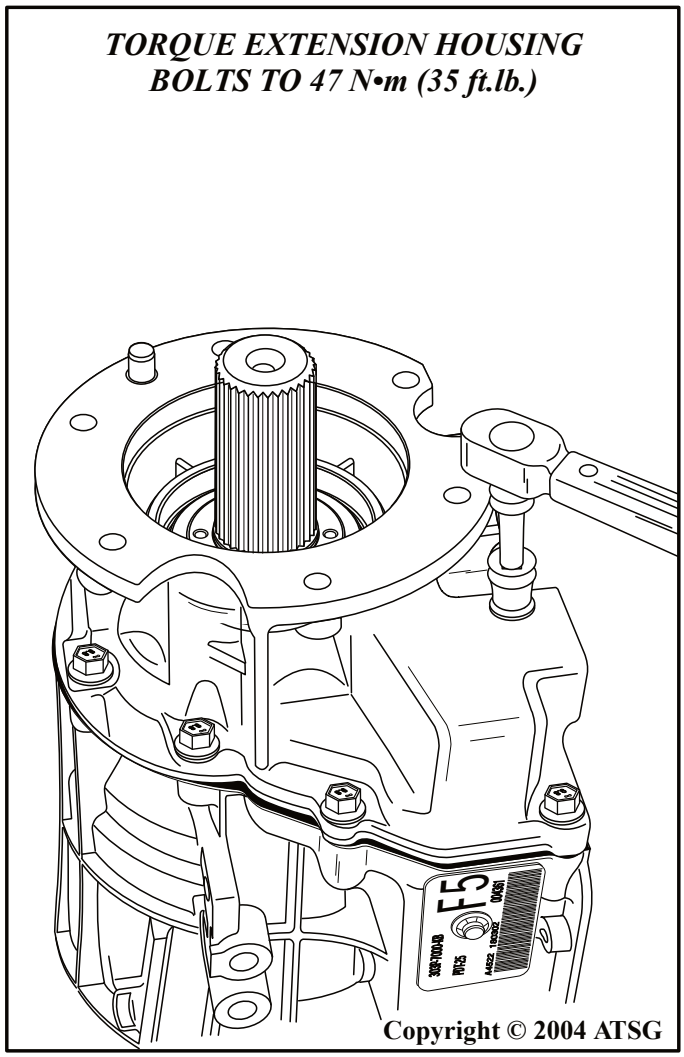


Figure 69

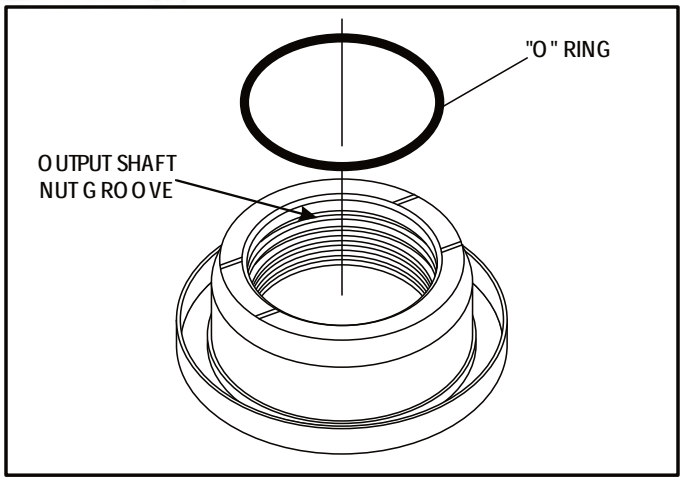


Figure 70

TRANSMISSION CASE (Cont'd)

32. Install new "O" ring into the groove in output shaft nut, as shown in Figure 70, and lube with a small amount of Trans-Jel®.
33. Install the output shaft nut onto output shaft, using the special nut driver 307-458, as shown in Figure 71, and hand tighten.
34. Torque the output shaft nut, using 1/2" drive torque wrench, to 200 N•m (148 ft.lb.), as shown in Figure 72.
35. Transmission case is now ready for the final assembly process. Rotate the transmission so that bell housing is facing up.

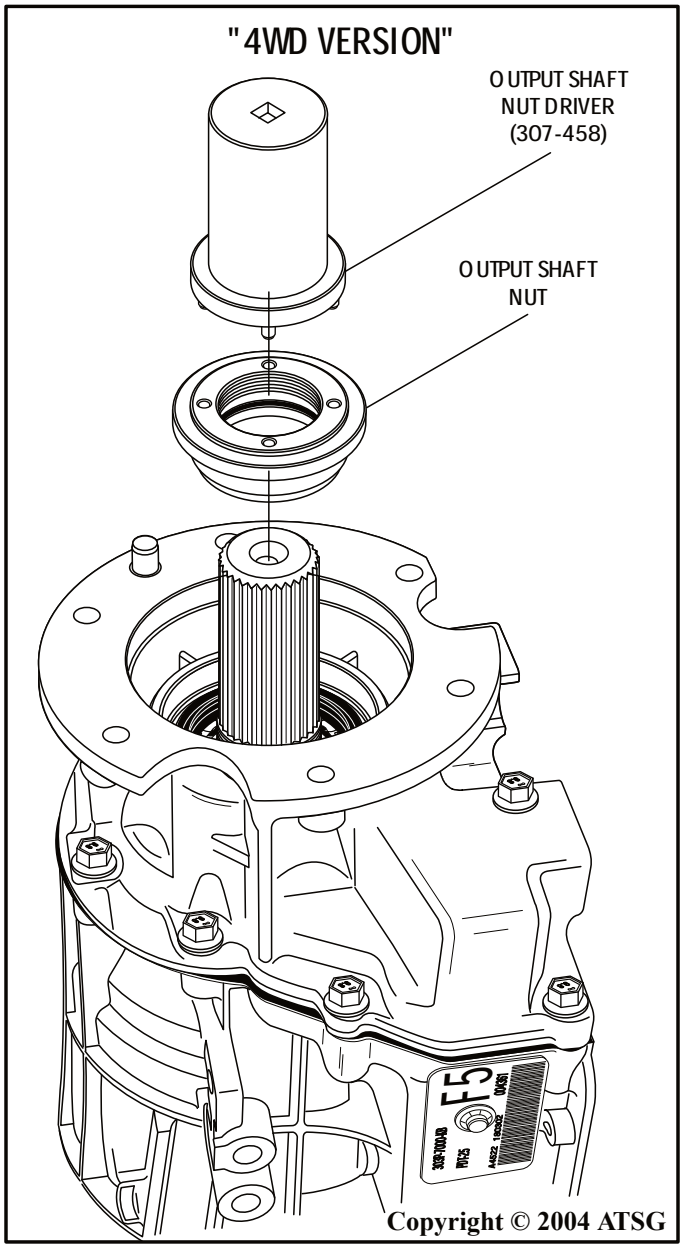


Figure 71

COMPONENT REBUILD
Continued on Page 50

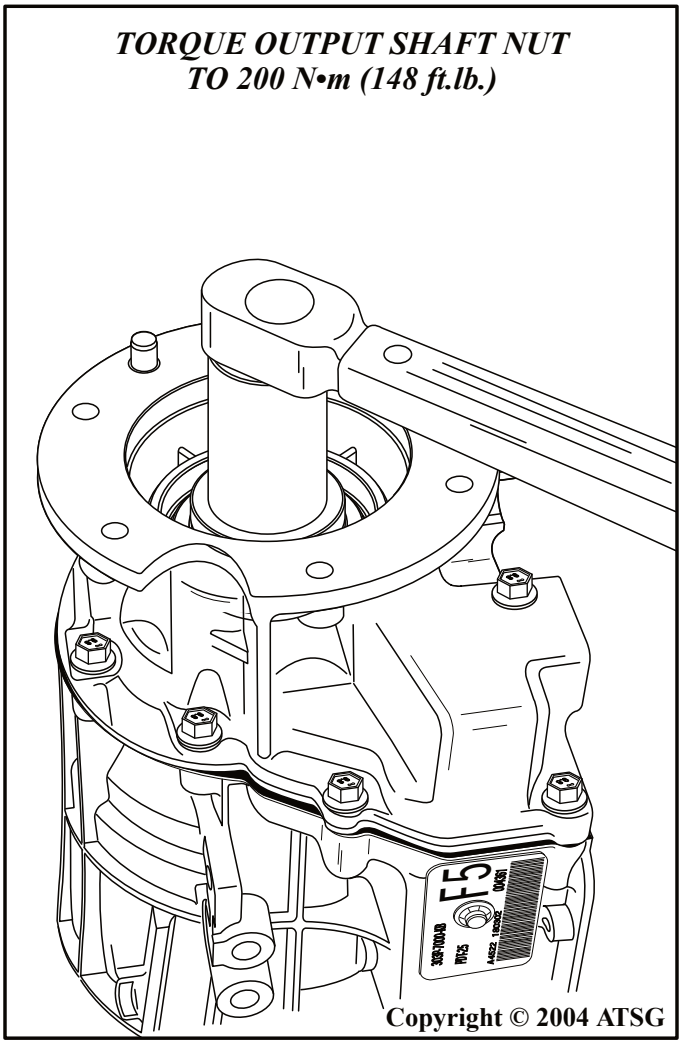


Figure 72

COMPONENT REBUILD

SOLENOID BODY ASSEMBLY

1. Remove the 4 bolts that retain the solenoid body to the channel plate and one bolt into the channel plate for internal wiring harness, as shown in Figure 73.
2. Remove the 5 bolts holding the reinforcing plate to the channel plate and discard gasket, as shown in Figure 73.

Continued on Page 52

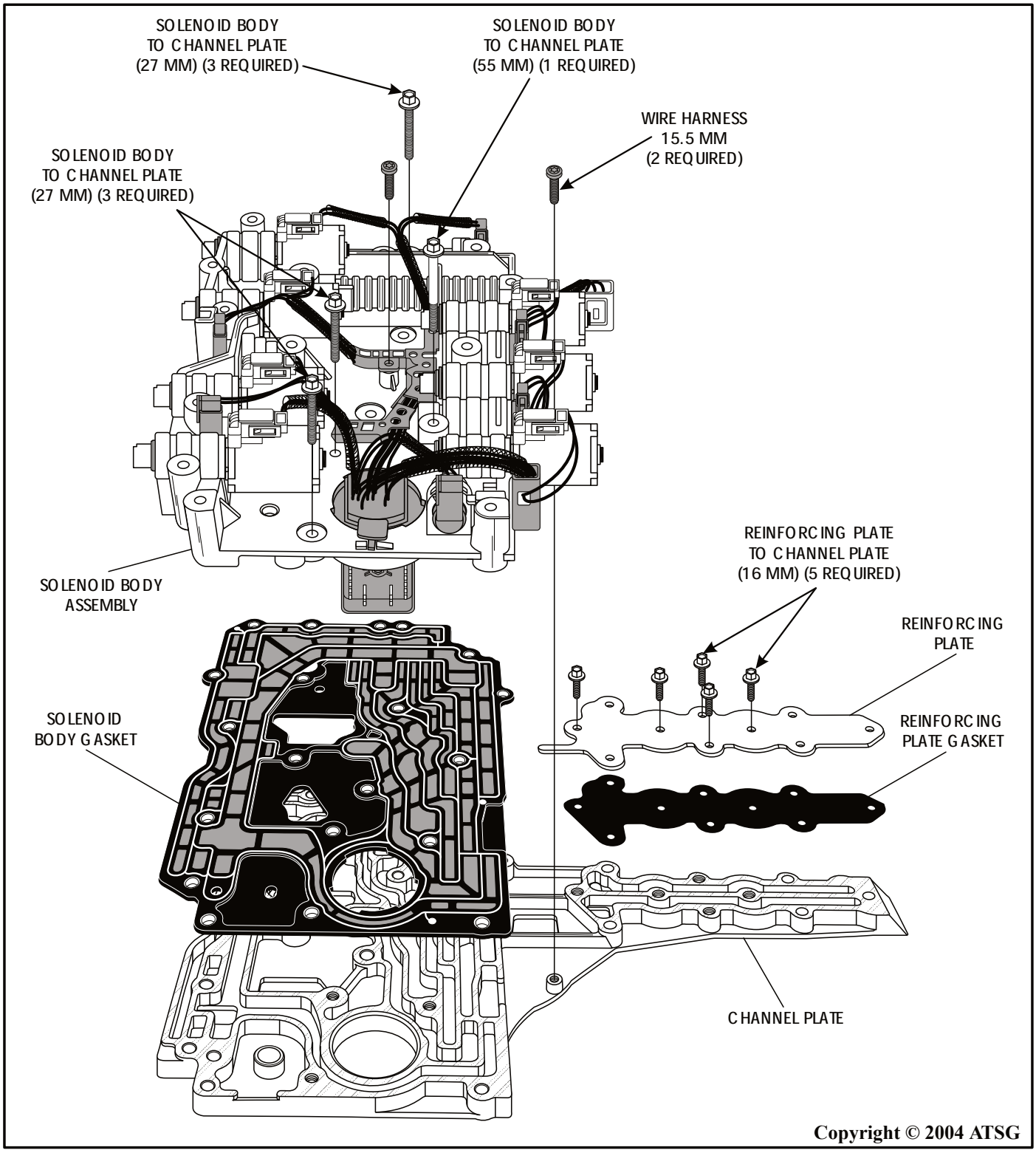
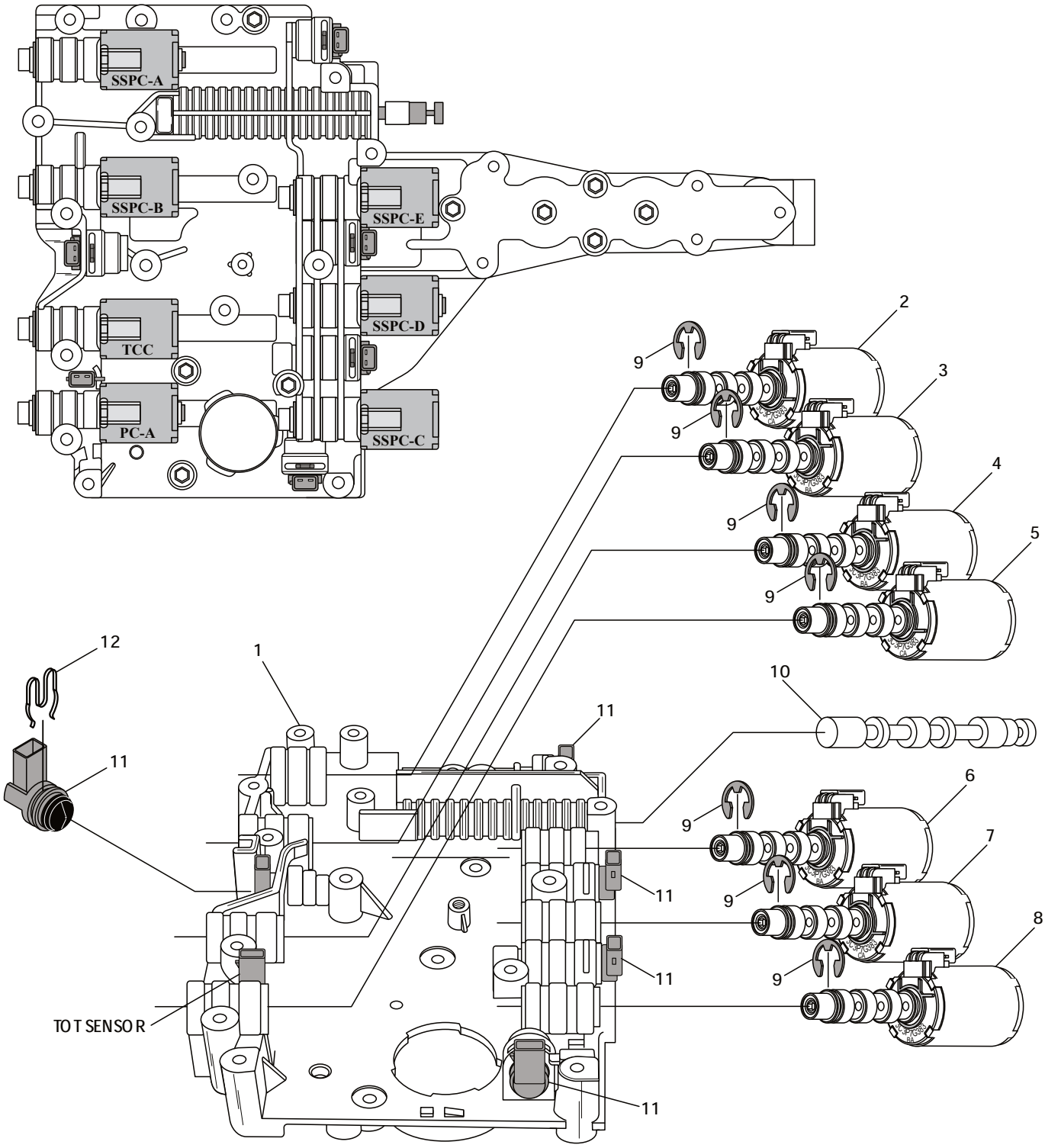


Figure 73

SOLENOID BODY ASSEMBLY EXPLODED VIEW



1 SOLENOID BODY CASTING
2 COAST CLUTCH SOLENOID, SSPC -"A" (INVERSE)
3 OVERDRIVE CLUTCH SOLENOID, SSPC -"B" (DIRECT)
4 TORQUE CONVERTER CLUTCH SOLENOID, TCC (DIRECT)
5 PRESSURE CONTROL SOLENOID, PC -"A" (INVERSE)
6 LOW/REVERSE CLUTCH SOLENOID, SSPC -"E" (DIRECT)
7 DIRECT CLUTCH SOLENOID, SSPC -"D" (INVERSE)
8 INTERMEDIATE CLUTCH SOLENOID, SSPC -"C" (DIRECT)
9 SOLENOID RETAINING "E" CLIP (7 REQUIRED)
10 MANUAL SHIFT VALVE
11 PRESSURE SWITCH ASSEMBLY
12 PRESSURE SWITCH ASSEMBLY RETAINING CLIP

Figure 74

COMPONENT REBUILD

SOLENOID BODY ASSEMBLY

3. Disassemble the solenoid body assembly, as shown in Figure 74.
4. If it becomes necessary to replace the internal wire harness and/or the entire solenoid body on a 5R110W Torqshift transmission, please be aware of the following:
   A. You may have to install a new Ford service harness, ***without*** switch connectors, into a unit that ***has*** pressure switches.
   B. You may have to install a new Ford service solenoid body, ***without*** pressure switches into a unit that has the original harness ***with*** switch connectors (See Figure 74 for locations).

   Note: These are both acceptable repairs and will not affect the function or operation of the transmission. Use of the pressure switch input was dropped from the vehicle calibration before the 2003 model year went into production.

5. Clean all solenoid body parts thoroughly with cleaning solution and dry with compressed air.
6. Notice that the solenoids have locating tabs that are in different locations, to prevent you from installing them in the wrong locations. Refer to Figure 74 and 75 for identification of the different solenoids.
7. Install the solenoids in their proper locations exactly as shown in Figure 74.
   Note: Solenoids can be tested for the proper resistance using the chart in Figure 16.
8. Install the retaining "E" clip on each one of the solenoids, as shown in Figure 74.
9. Install new seals on each pressure switch to ensure no leakage, even if there are no wire connectors on the harness (See Figure 76).
10. Install the internal wire harness through the hole in the solenoid body and lock into place with a twisting motion (See Figure 77).
11. Install each of the connectors in their proper locations and ensure they are fully seated and locked (See Figure 77).
12. Install the manual shift valve in the direction shown in Figure 74.
13. Install new "O" ring seal in upper most groove of the internal wire harness case connector, as shown in Figure 78, and lubricate with a small amount of Trans-Jel®.

Continued on Page 54

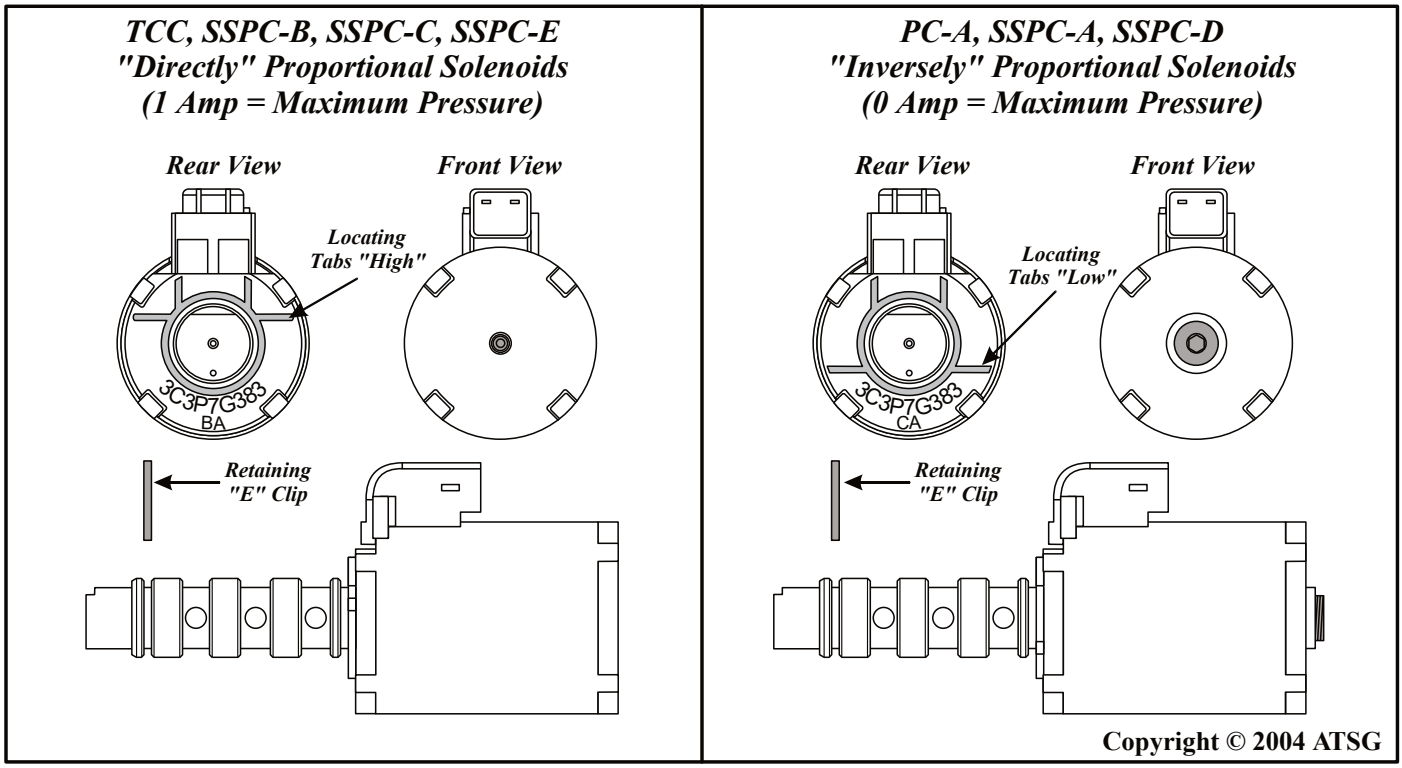


Figure 75

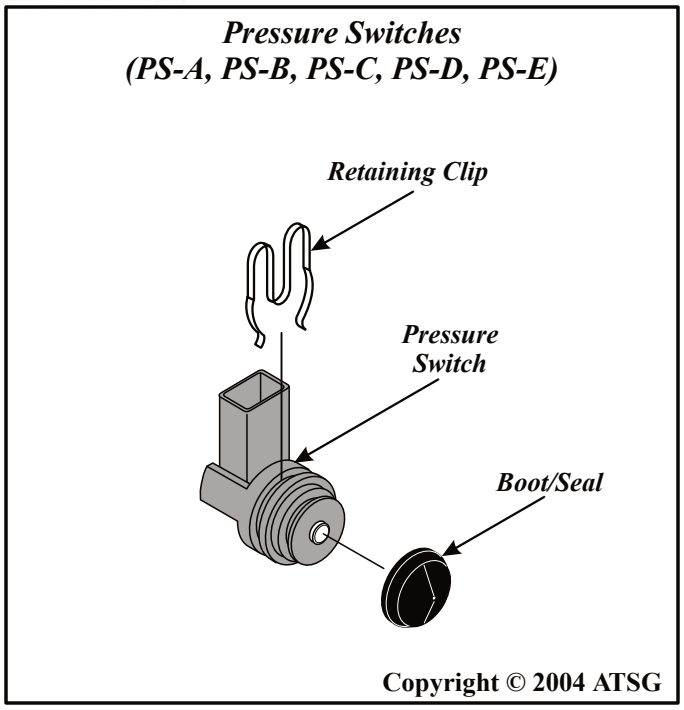


Figure 76

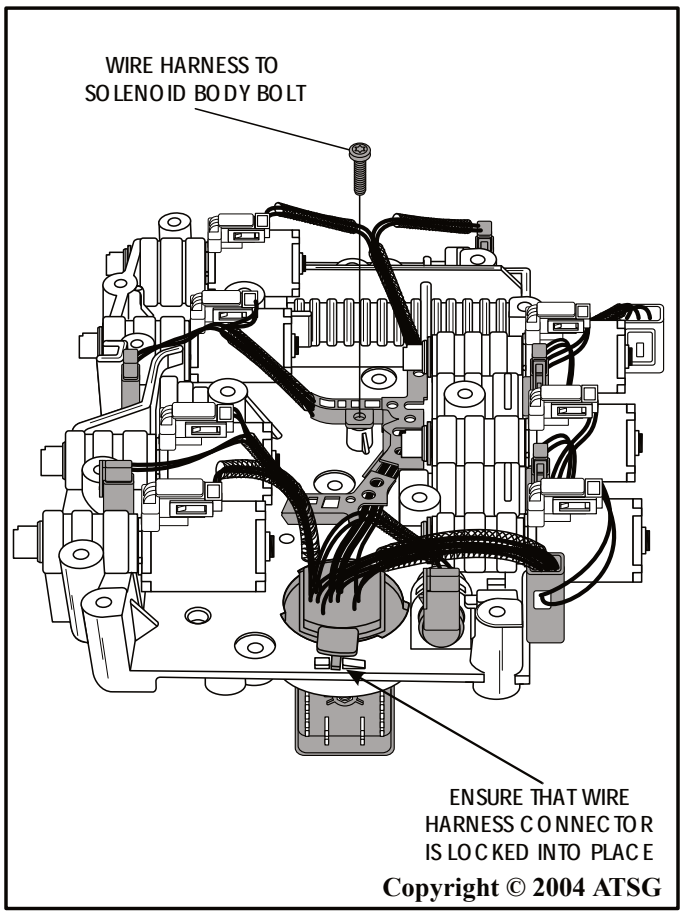


Figure 77

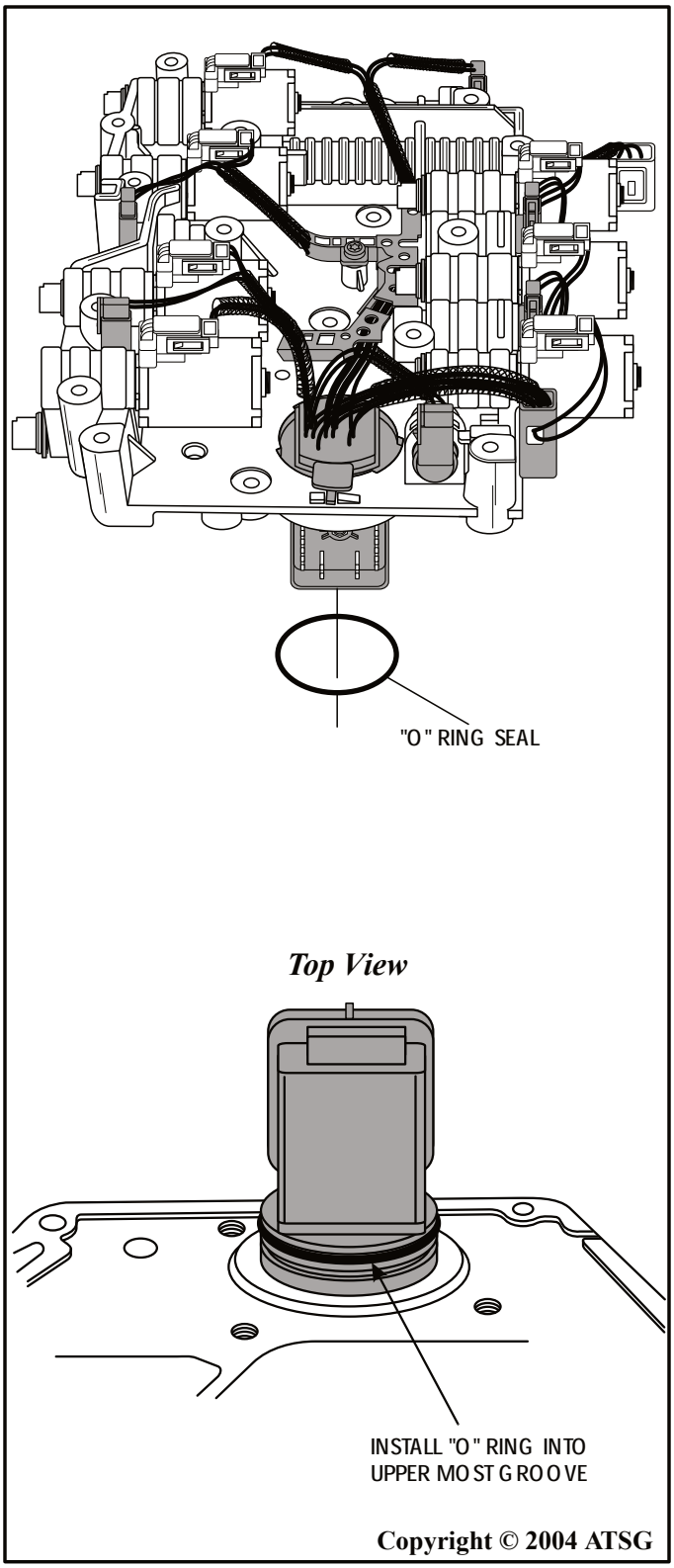


Figure 78

Continued on Page 54

COMPONENT REBUILD

SOLENOID BODY ASSEMBLY

14. Install new reinforcing plate gasket on channel plate, as shown in Figure 79.
15. Install reinforcing plate and 5 bolts, as shown in Figure 79, and hand tighten only.
16. Install new solenoid body to channel plate screen/gasket, as shown in Figure 79.
17. Install the previously completed solenoid body assembly, as shown in Figure 79.
18. Install the 4 solenoid body to channel plate bolts in the locations shown in Figure 79, and hand tighten only at this time.
19. Install the wire harness to channel plate bolts as shown in Figure 79.
20. Set the completed solenoid body aside for the final assembly process (See Figure 80).

Continued on Page 55

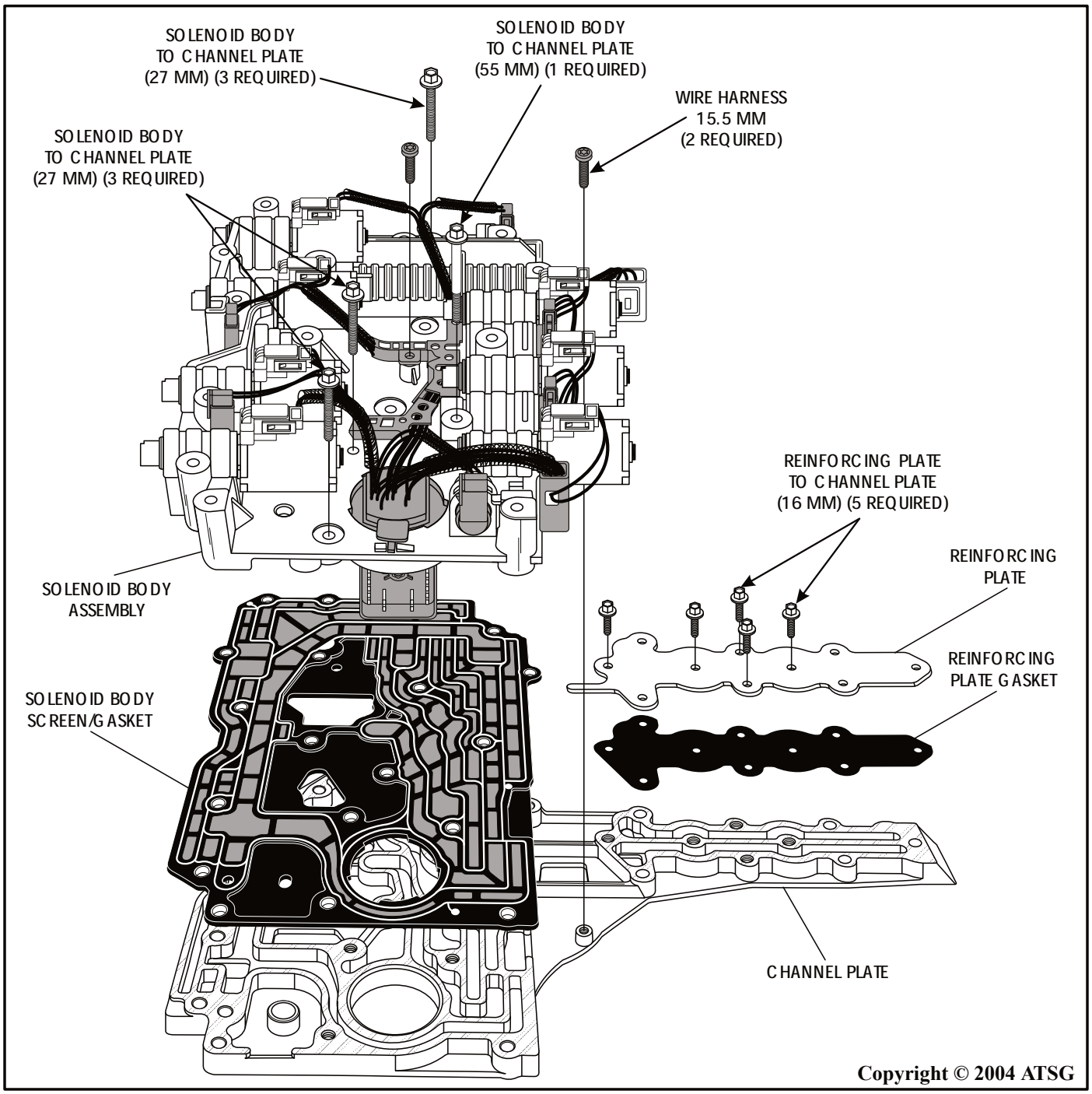


Figure 79

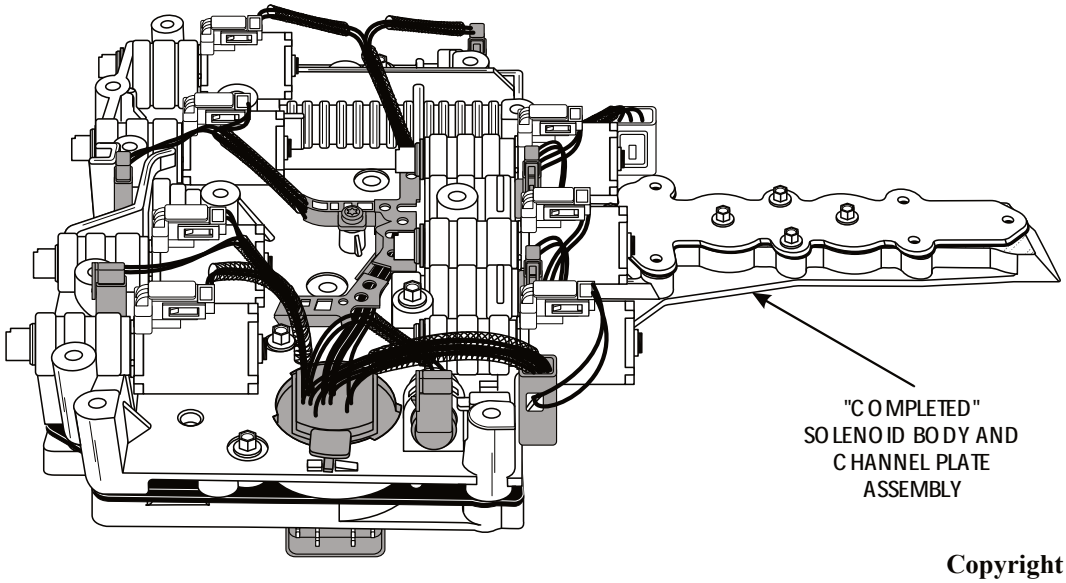


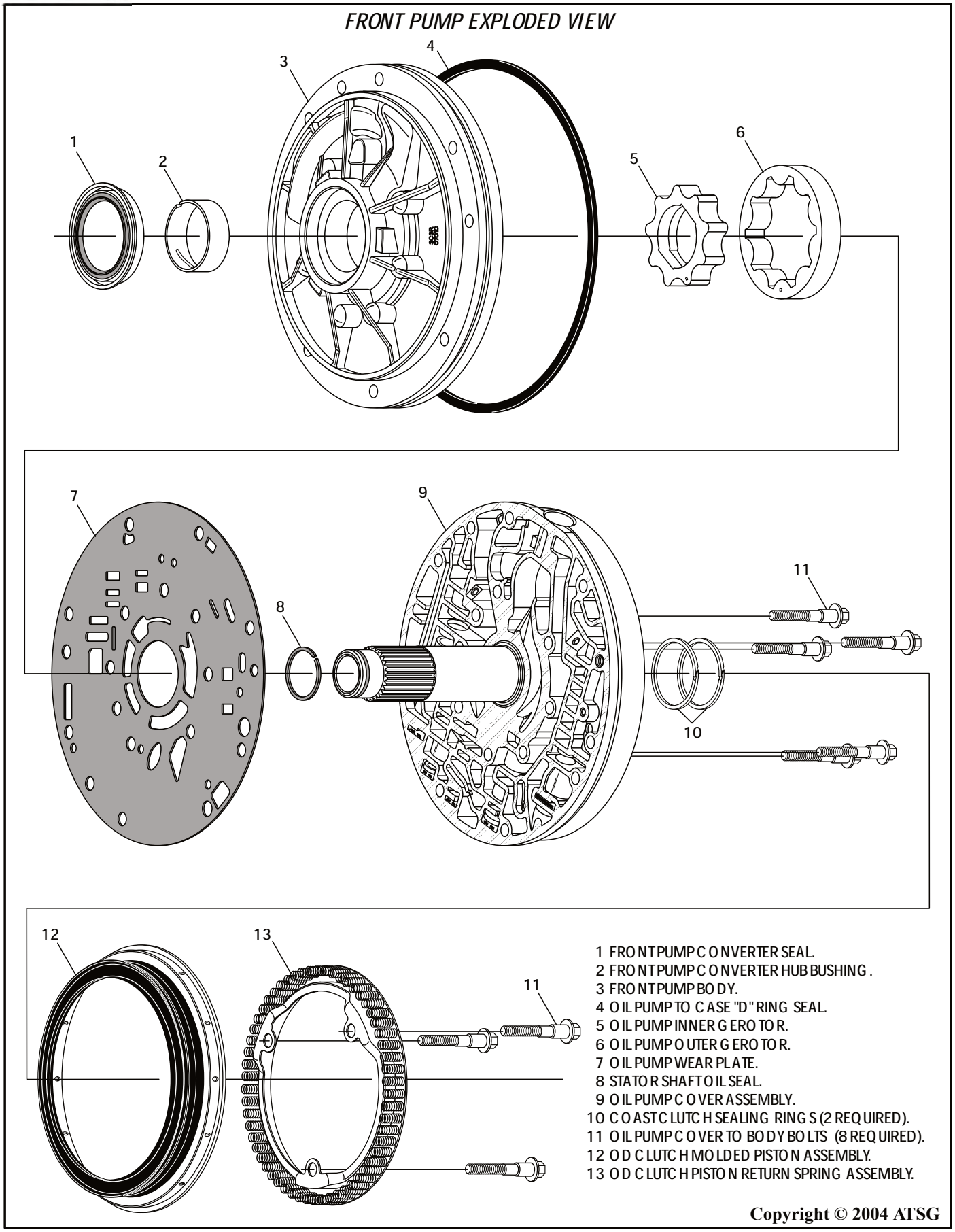
Figure 80

INTERNAL HARNESS OR SOLENOID BODY SERVICE

If it becomes necessary to replace the internal wire harness and/or the entire solenoid body on a 5R110W Torqshift transmission, please be aware of the following:

1. You may have to install a new service harness, ***without*** pressure switch connectors, into a unit ***with*** the pressure switches in the solenoid body. (See Figure 74 for locations)
2. You may have to install a new service solenoid body, ***without*** pressure switches, into a unit that has the original internal harness ***with*** pressure switch connectors. (See Figure 74 for locations)

Note: These are both acceptable repairs and will not affect the function or operation of the transmission. Use of the pressure switch input was dropped from the vehicle calibration before the 2003 model year went into production.


FRONT PUMP EXPLODED VIEW
1
2
3
4
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11
12
13
1 FRONT PUMP CONVERTER SEAL.
2 FRONT PUMP CONVERTER HUB BUSHING.
3 FRONT PUMP BODY.
4 OIL PUMP TO CASE "D" RING SEAL.
5 OIL PUMP INNER GEROTOR.
6 OIL PUMP OUTER GEROTOR.
7 OIL PUMP WEAR PLATE.
8 STATOR SHAFT OIL SEAL.
9 OIL PUMP COVER ASSEMBLY.
10 COAST CLUTCH SEALING RINGS (2 REQUIRED).
11 OIL PUMP COVER TO BODY BOLTS (8 REQUIRED).
12 OD CLUTCH MOLDED PISTON ASSEMBLY.
13 OD CLUTCH PISTON RETURN SPRING ASSEMBLY.
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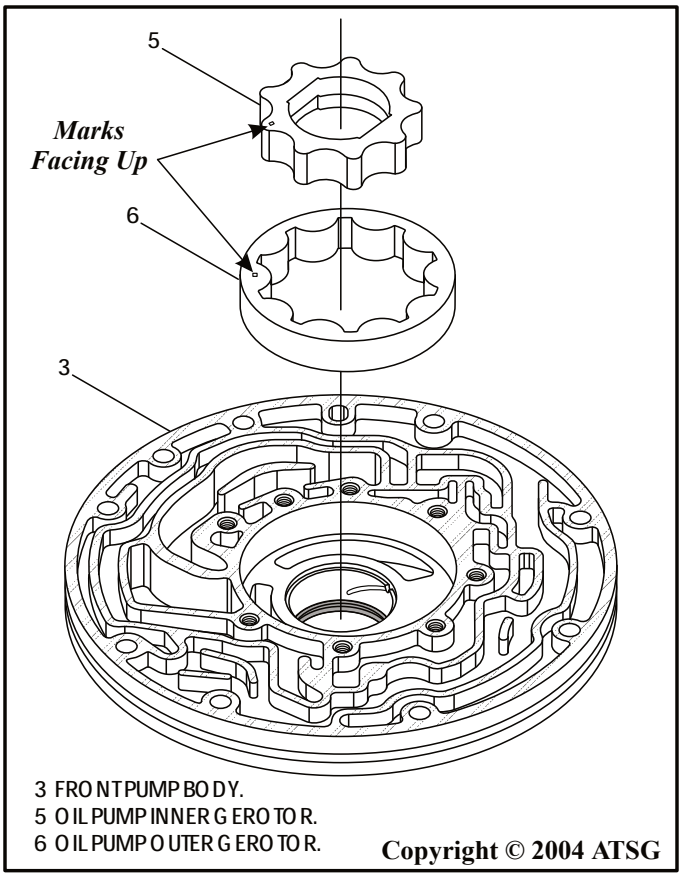
Figure 81

COMPONENT REBUILD

OIL PUMP ASSEMBLY

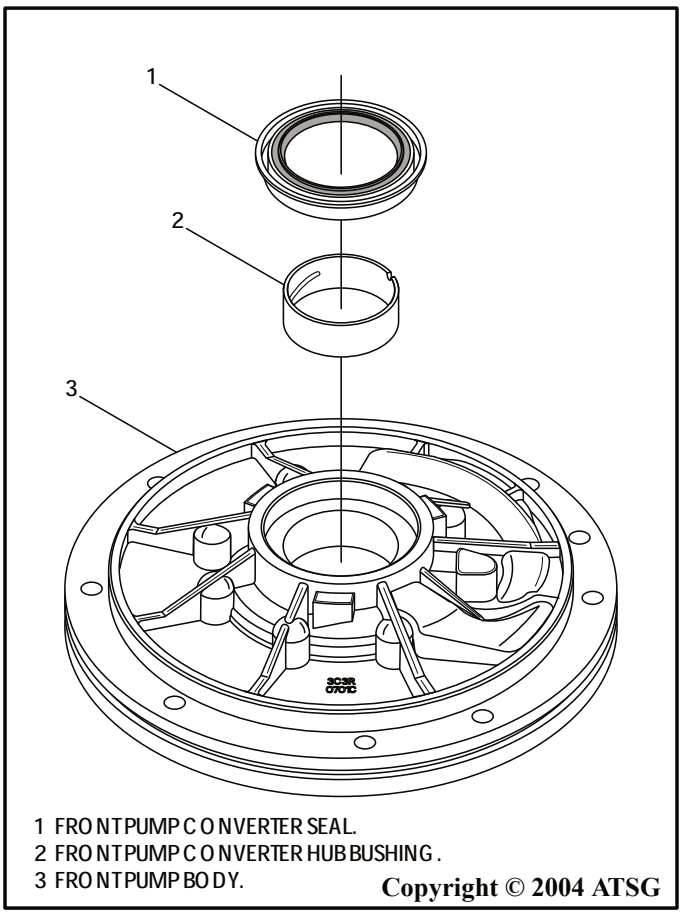
1. Disassemble the oil pump assembly using Figure 81 as a guide.
2. Remove and discard the converter seal, pump body "O" ring, and sealing rings.
3. Inspect all oil pump parts thoroughly for any wear and/or damage, replace as necessary.
4. Clean all oil pump parts thoroughly and dry with compressed air.
5. Inspect the pump body bushing and replace as necessary, as shown in Figure 82, using the proper driver.
6. Install a new oil pump converter seal using the proper driver, as shown in Figure 82.
7. Lubricate the oil pump gears with fluid and install them into the pump body pocket with marks facing up, as shown in Figure 83.
8. Measure the gear to face clearance with the depth micrometer, as shown in Figure 84.
9. Proper clearance should be: .04-.06 mm (.0015"-.0023") (See Figure 84).

Continued on Page 58



3 FRONT PUMP BODY.
5 OIL PUMP INNER GEROTOR.
6 OIL PUMP OUTER GEROTOR.

Figure 83



1 FRONT PUMP CONVERTER SEAL.
2 FRONT PUMP CONVERTER HUB BUSHING.
3 FRONT PUMP BODY.

Figure 82

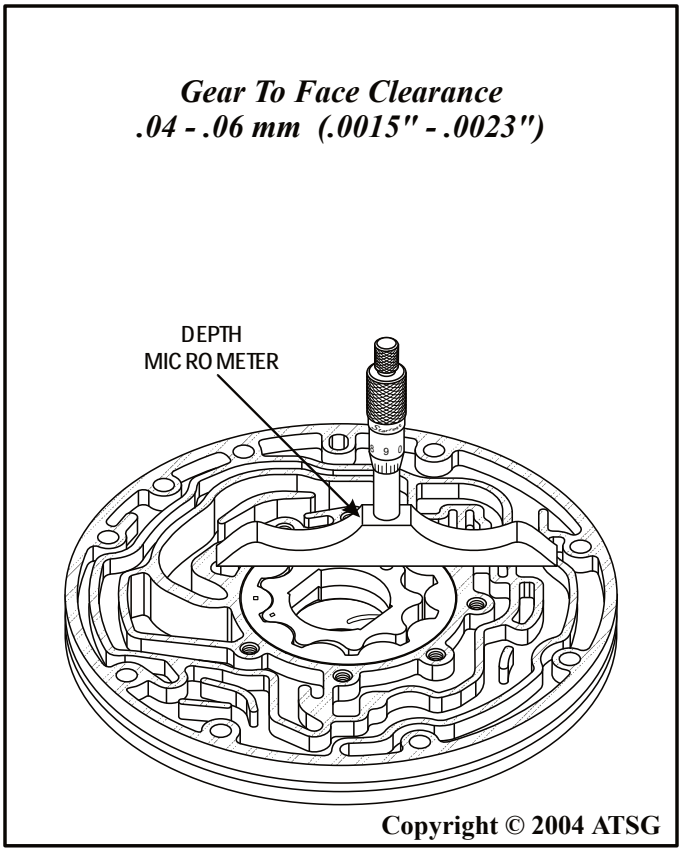


Figure 84

COMPONENT REBUILD

OIL PUMP ASSEMBLY (CONT'D)

10. Install 2 alignment dowels made from spare bolts in pump body, as shown in Figure 85.
11. Install the oil pump wear plate over the dowels, as shown in Figure 85.
12. It is not necessary to remove the stator shaft from pump cover unless damage is apparent.
13. If it was removed, install the stator shaft and torque the bolts to 9-11 N•m (80-100 in.lb.) as shown in Figure 86 and 87.
14. Install 2 new coast clutch scarf-cut seal rings onto the stator shaft, as shown in Figure 87.
15. Install the valves, springs, bore plugs and the retainers, ***exactly*** as shown in Figure 88. ***Note: Retainer locations are also shown in Figure 88.***
16. Prior to installation, lubricate valves and bore plugs with transmission fluid.

Continued on Page 60

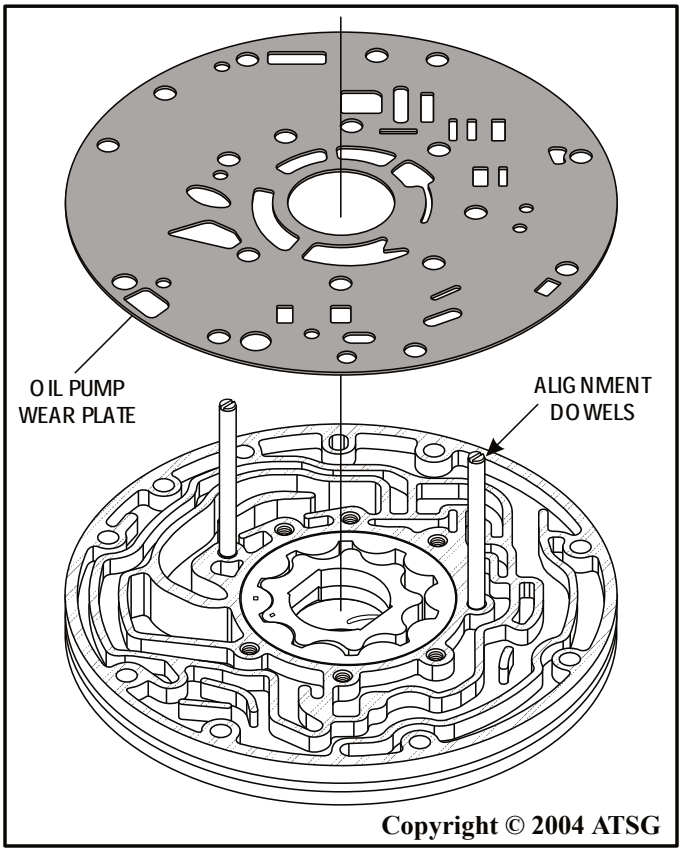


Figure 85

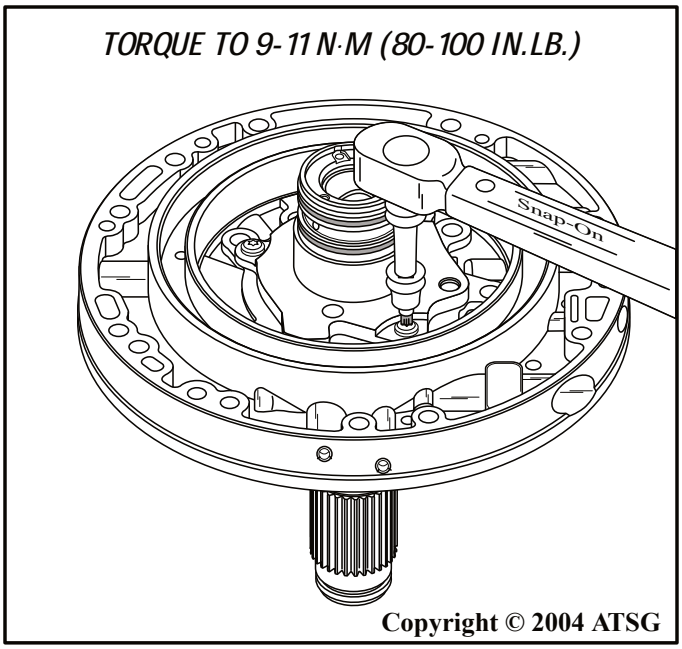


Figure 86

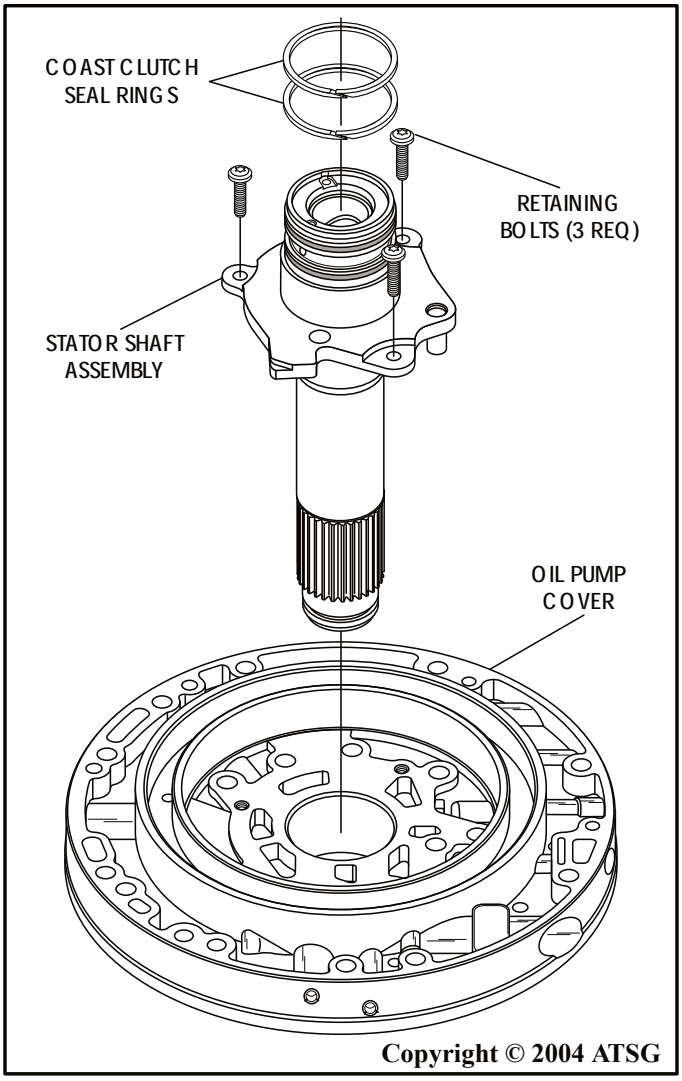
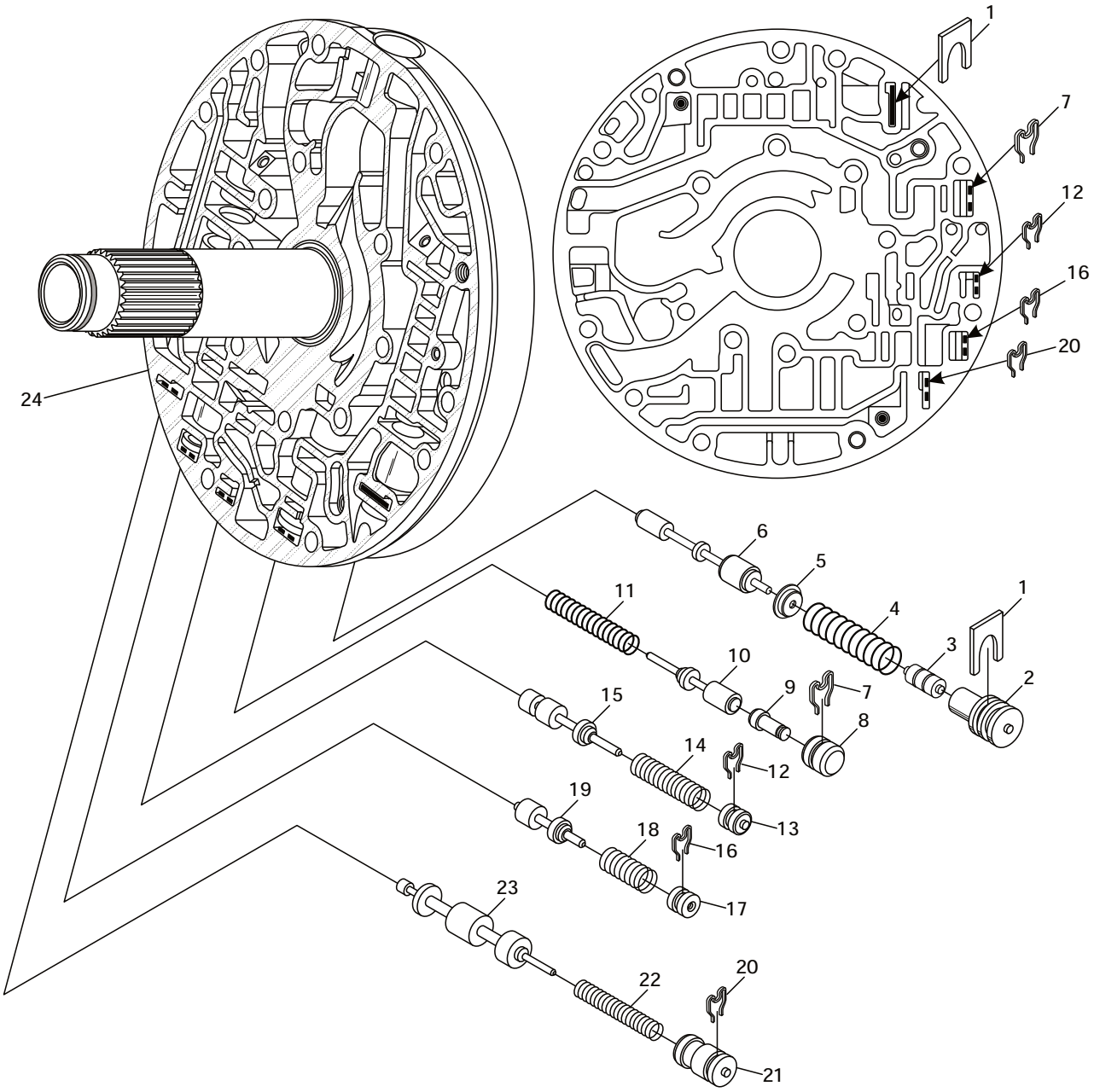


Figure 87

OIL PUMP COVER ASSEMBLY EXPLODED VIEW



1 CONVERTER CLUTCH CONTROL VALVE BORE PLUG RETAINER.
2 CONVERTER CLUTCH CONTROL VALVE SLEEVE.
3 CONVERTER CLUTCH CONTROL VALVE PLUG.
4 CONVERTER CLUTCH CONTROL VALVE SPRING.
5 CONVERTER CLUTCH CONTROL VALVE SPRING SEAT
6 CONVERTER CLUTCH CONTROL VALVE.
7 COOLER BYPASS VALVE BORE PLUG RETAINER (ORANGE I.D.).
8 COOLER BYPASS VALVE BORE PLUG.
9 THERMOSTATIC VALVE ASSEMBLY.
10 COOLER BYPASS VALVE.
11 COOLER BYPASS VALVE SPRING.
12 CONVERTER PRESSURE LIMIT VALVE BORE PLUG RETAINER.
13 CONVERTER PRESSURE LIMIT VALVE BORE PLUG.
14 CONVERTER PRESSURE LIMIT VALVE SPRING.
15 CONVERTER PRESSURE LIMIT VALVE.
16 CONVERTER ANTI-DRAIN BACK VALVE BORE PLUG RETAINER.
17 CONVERTER ANTI-DRAIN BACK VALVE BORE PLUG.
18 CONVERTER ANTI-DRAIN BACK VALVE SPRING.
19 CONVERTER ANTI-DRAIN BACK VALVE.
20 MAIN REGULATOR VALVE BORE PLUG RETAINER.
21 MAIN REGULATOR VALVE BORE PLUG.
22 MAIN REGULATOR VALVE SPRING.
23 MAIN REGULATOR VALVE.
24 OIL PUMP COVER ASSEMBLY.

Figure 88

COMPONENT REBUILD

OIL PUMP ASSEMBLY (CONT'D)

17. Install the completed pump cover assembly over the dowels, as shown in Figure 89.
18. Lubricate and install new overdrive clutch piston, as shown in Figure 90.
19. Install the overdrive clutch piston return spring assembly, as shown in Figure 90.
20. Install three return spring retaining bolts in the locations, shown in Figure 90, and tighten by hand only.

Continued on Page 61

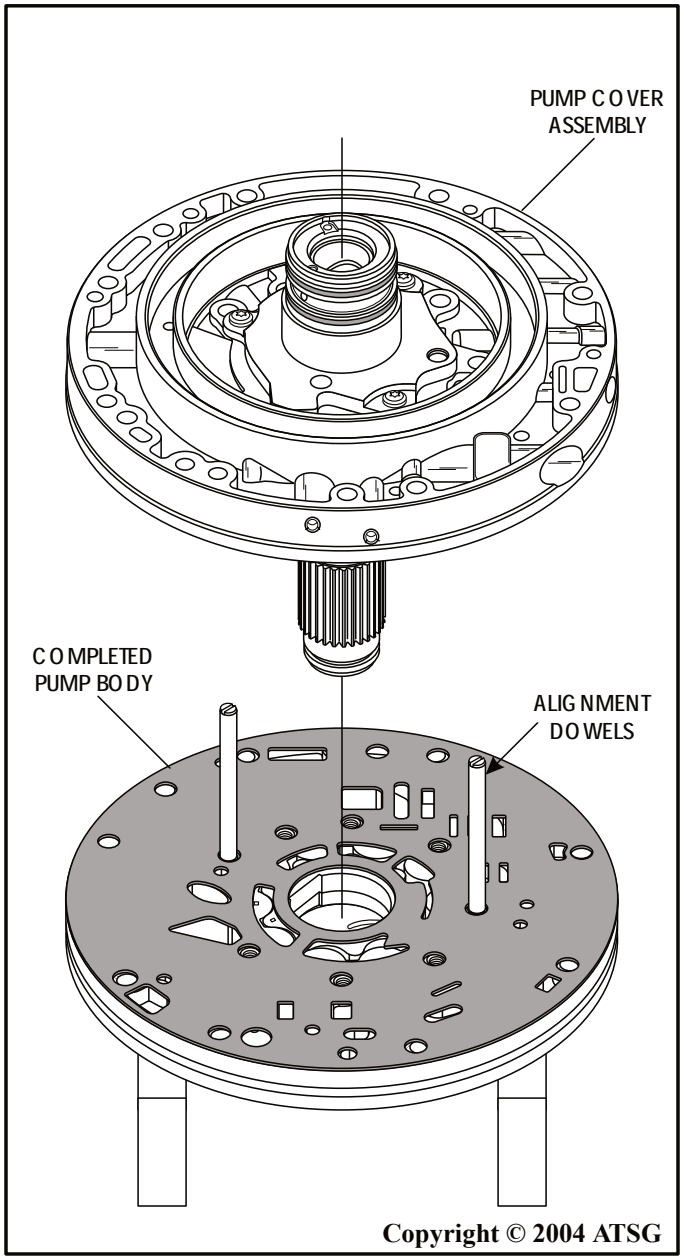
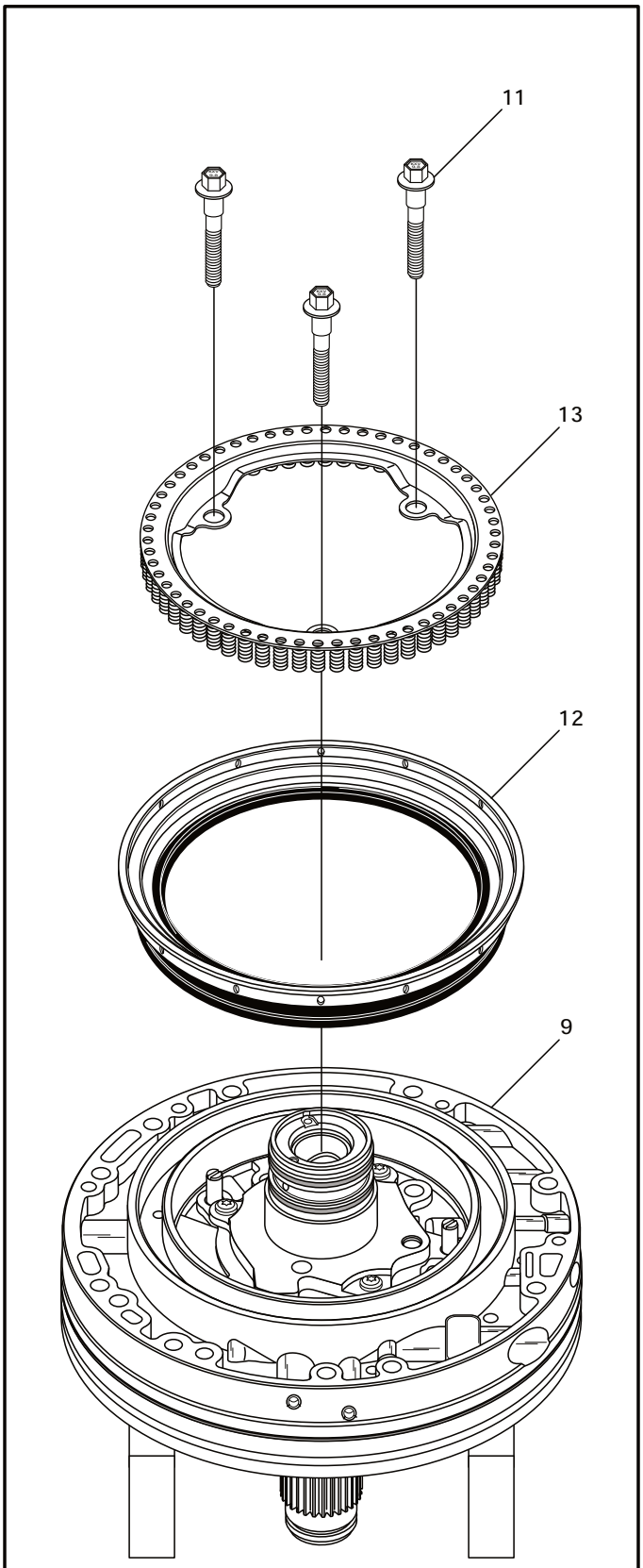


Figure 89



9 OIL PUMP COVER ASSEMBLY.
11 OIL PUMP COVER TO BODY BOLTS (8 REQUIRED).
12 OD CLUTCH MOLDED PISTON ASSEMBLY.

Figure 90

COMPONENT REBUILD

OIL PUMP ASSEMBLY (CONT'D)

21. Install the 5 remaining pump cover to pump body bolts in the locations shown in Figure 91 and hand tighten only.
22. Install and tighten the alignment strap around the pump body and cover (See Figure 92).
23. Torque all pump cover to pump body bolts to 31 N•m (23 ft.lb.) as shown in Figure 92.
24. Install the number 1 thrust washer, as shown in Figure 93, and retain with a small amount of Trans-Jel®.
25. Install the number 2 thrust bearing onto stator shaft, in the direction shown in Figure 93, and retain with a small amount of Trans-Jel®.

Continued on Page 62

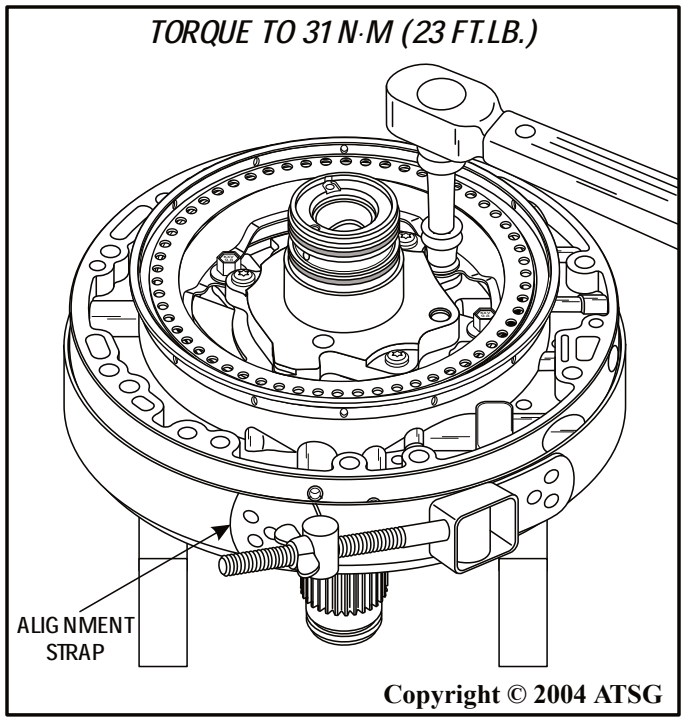


Figure 92

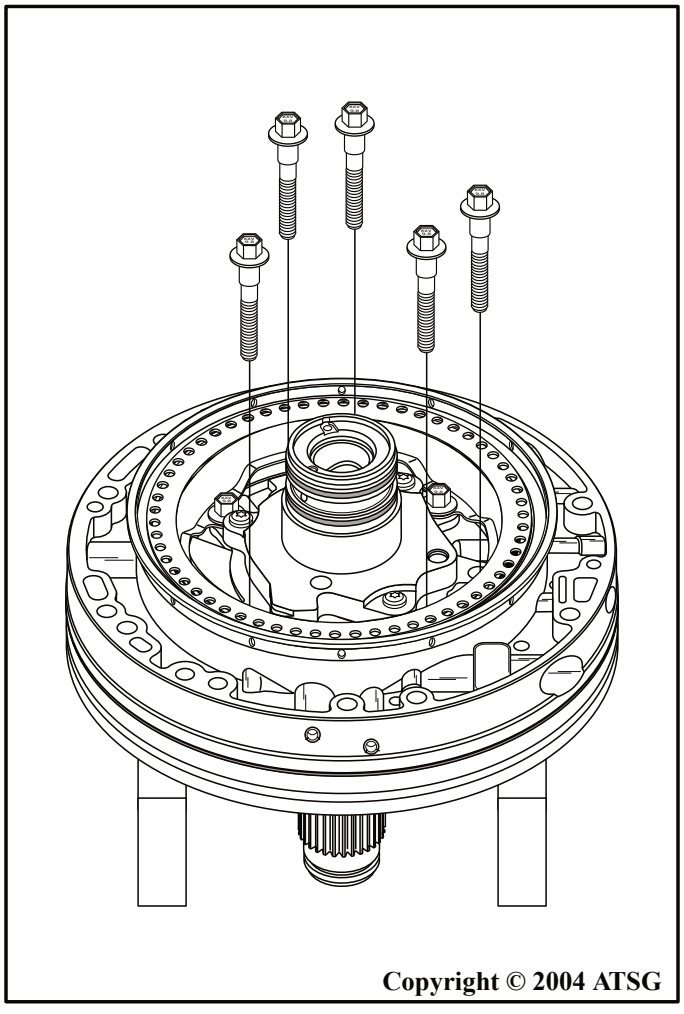
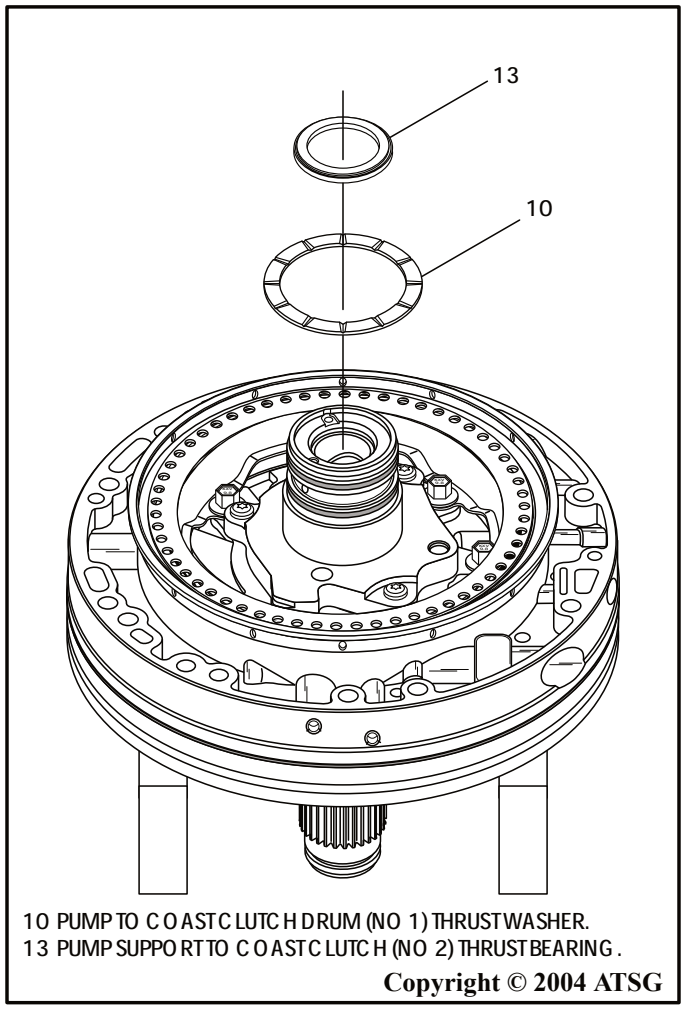


Figure 91



10 PUMP TO COAST CLUTCH DRUM (NO 1) THRUST WASHER.
13 PUMP SUPPORT TO COAST CLUTCH (NO 2) THRUST BEARING.

Figure 93

COMPONENT REBUILD

OIL PUMP ASSEMBLY (CONT'D)

26. Install new pump to case "D" ring seal into the groove in pump body and ensure that it is not twisted (See Figure 94).
27. Install new Teflon® seal on stator shaft, as shown in Figure 94.
28. Set the completed oil pump assembly aside for the final assembly process (See Figure 95).

Component Rebuild
Continued on Page 63

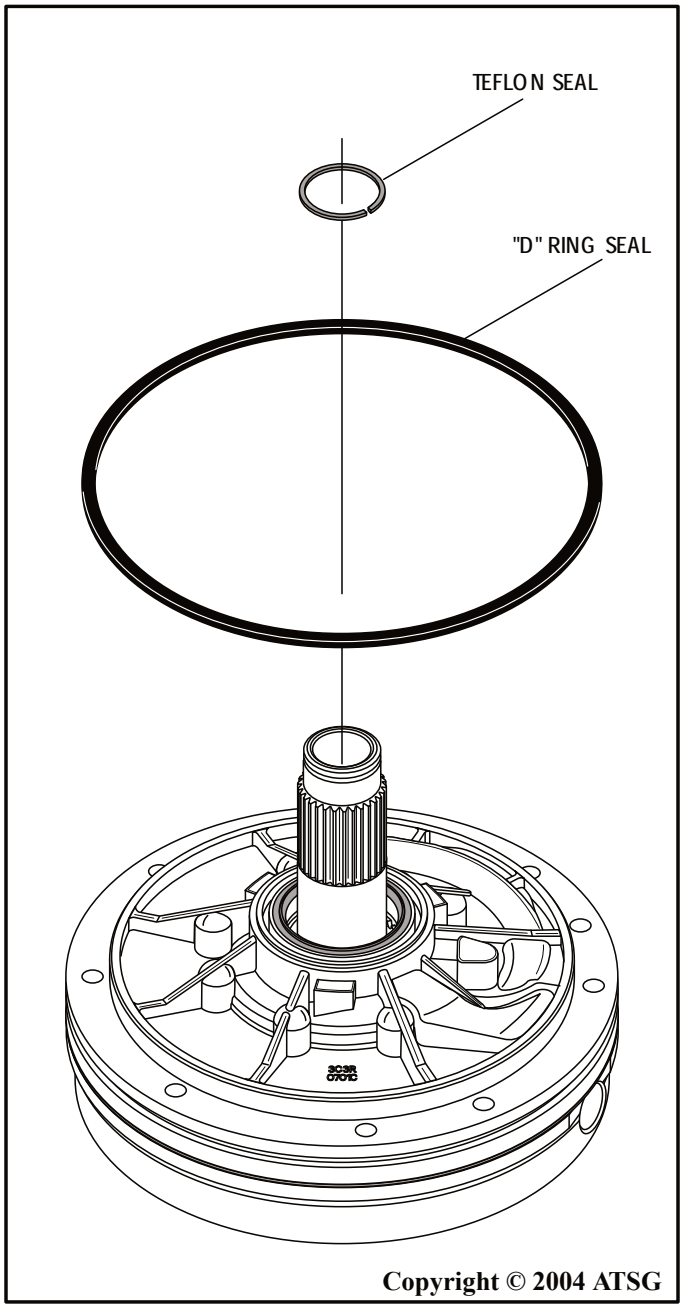


Figure 94

COMPLETED OIL PUMP ASSEMBLY

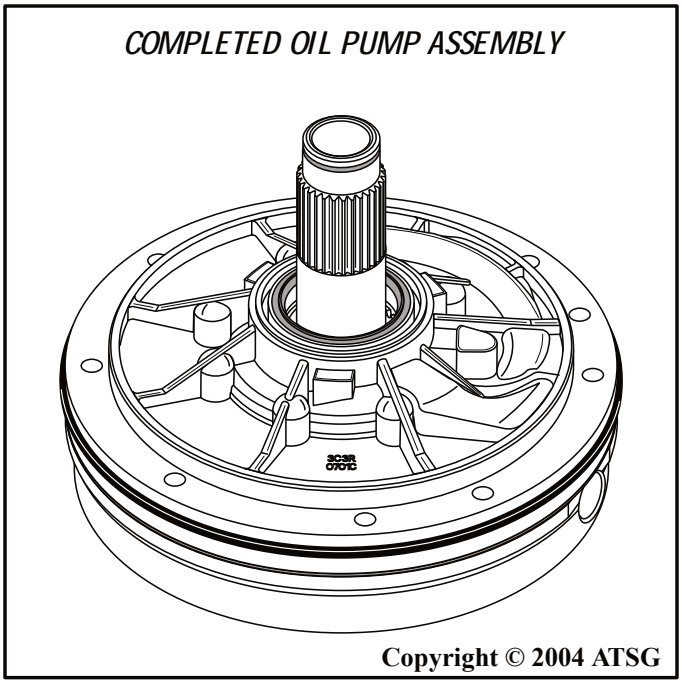
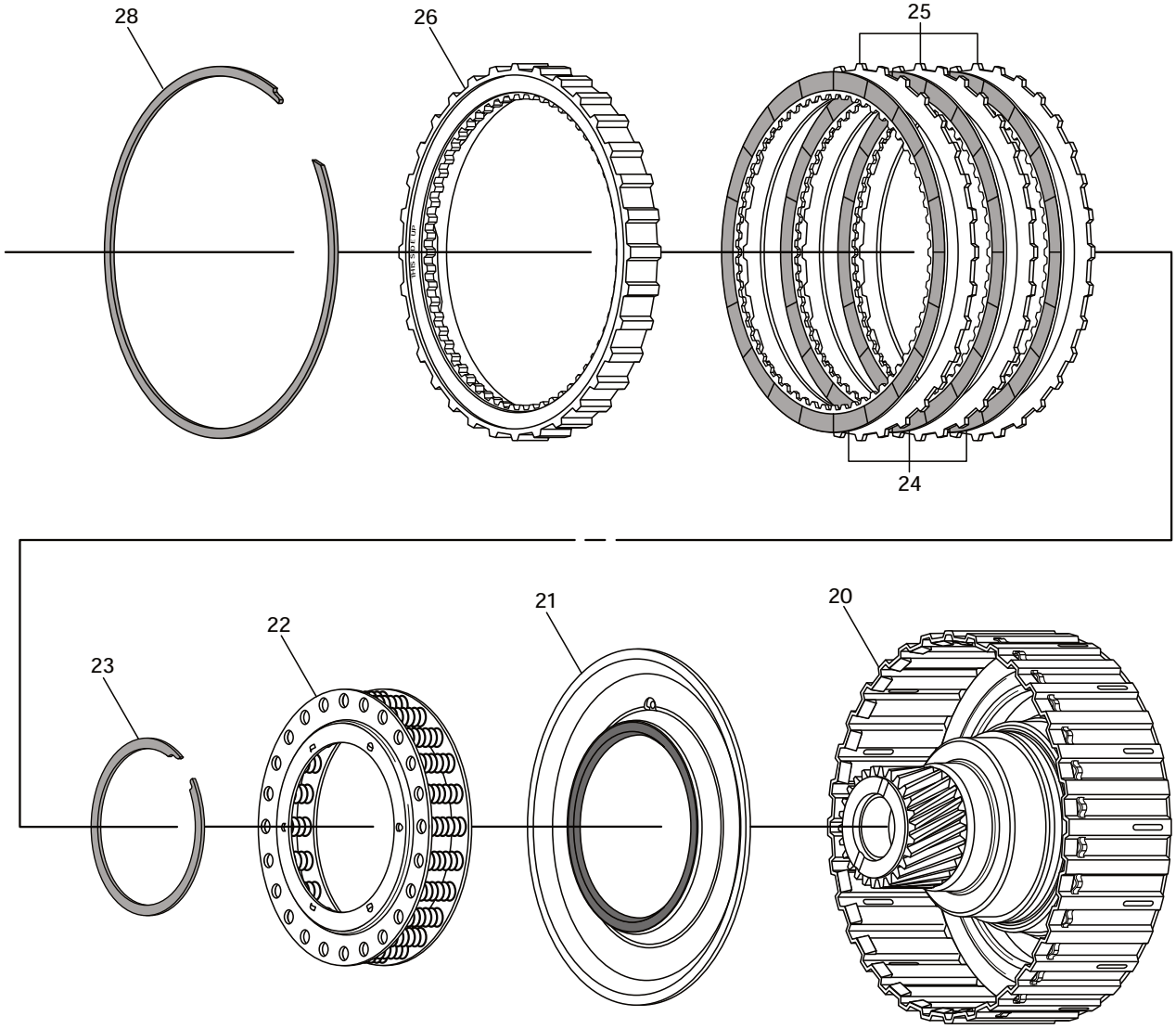


Figure 95

Special Note: Start now pre-soaking all clutch friction plates in "Mercon® SP" fluid only, prior to any further assembly.

COAST CLUTCH HOUSING EXPLODED VIEW



20 COAST CLUTCH HOUSING ASSEMBLY.
21 COAST CLUTCH MOLDED RUBBER, STAMPED STEEL PISTON ASSEMBLY.
22 COAST CLUTCH PISTON RETURN SPRING ASSEMBLY.
23 COAST CLUTCH RETURN SPRING ASSEMBLY SNAP RING.
24 COAST CLUTCH FRICTION PLATES (3 REQUIRED).
25 COAST CLUTCH STEEL PLATES (3 REQUIRED).
26 COAST CLUTCH BACKING PLATE/OVERDRIVE ONE-WAY CLUTCH DIODE ASSEMBLY.
28 COAST CLUTCH BACKING PLATE SNAP RING.

Figure 96

COMPONENT REBUILD

COAST CLUTCH HOUSING

1. Disassemble the coast clutch housing using Figure 96 as a guide.
2. Inspect all coast clutch parts thoroughly for any wear and/or damage.
3. Inspect coast clutch pressure plate which now incorporates the mechanical diode one way clutch, as shown in Figure 97.
   Note: Inside splines should freewheel in the direction shown in Figure 97, and lock in the opposite direction.
4. Clean all coast clutch parts thoroughly and dry with compressed air.
5. Lube and install a new coast clutch piston into the coast clutch housing using the installer, as shown in Figure 98.
6. Remove the seal installer.
7. Install the coast clutch piston return spring assembly, as shown in Figure 99.
8. Compress the return spring using the proper adapters and install the snap ring, as shown in Figure 99.
9. Ensure that snap ring is fully seated in the groove in coast clutch housing.

Continued on Page 65

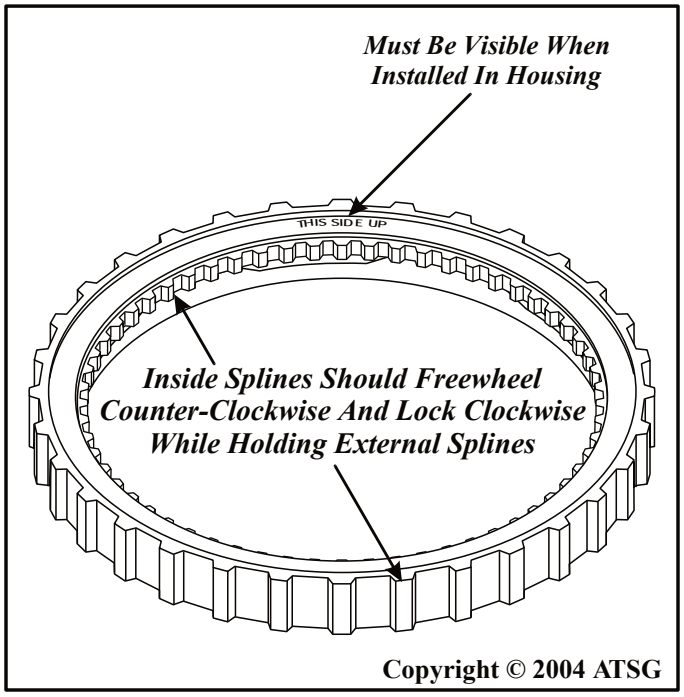


Figure 97

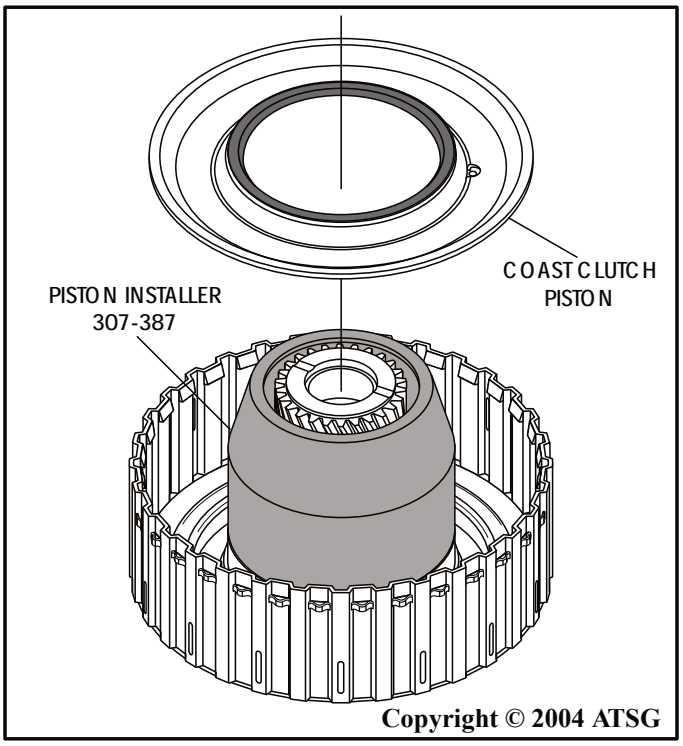


Figure 98

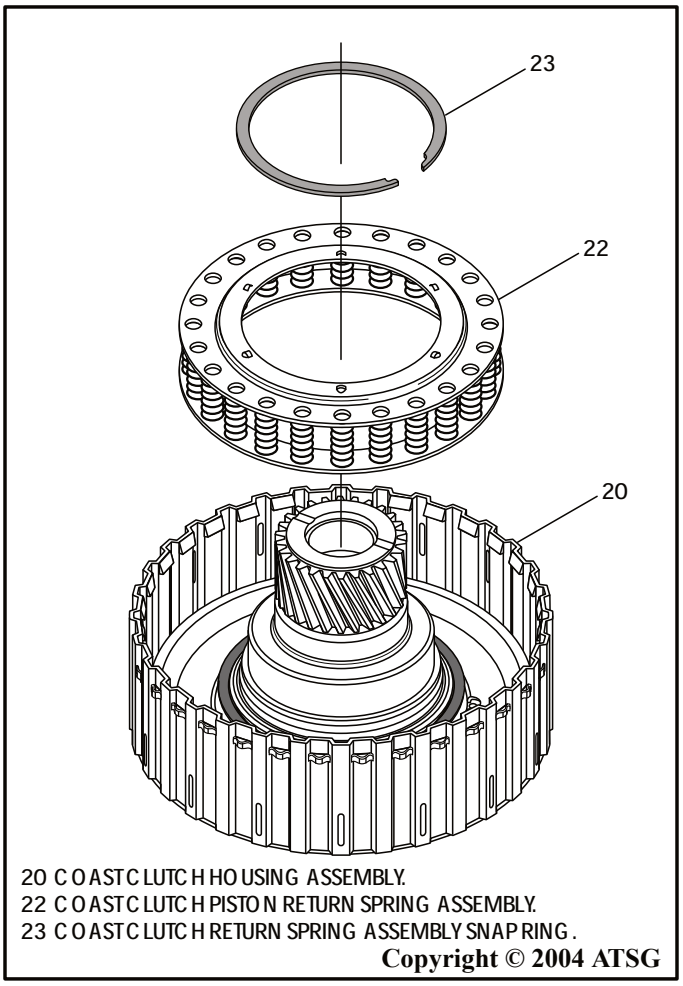
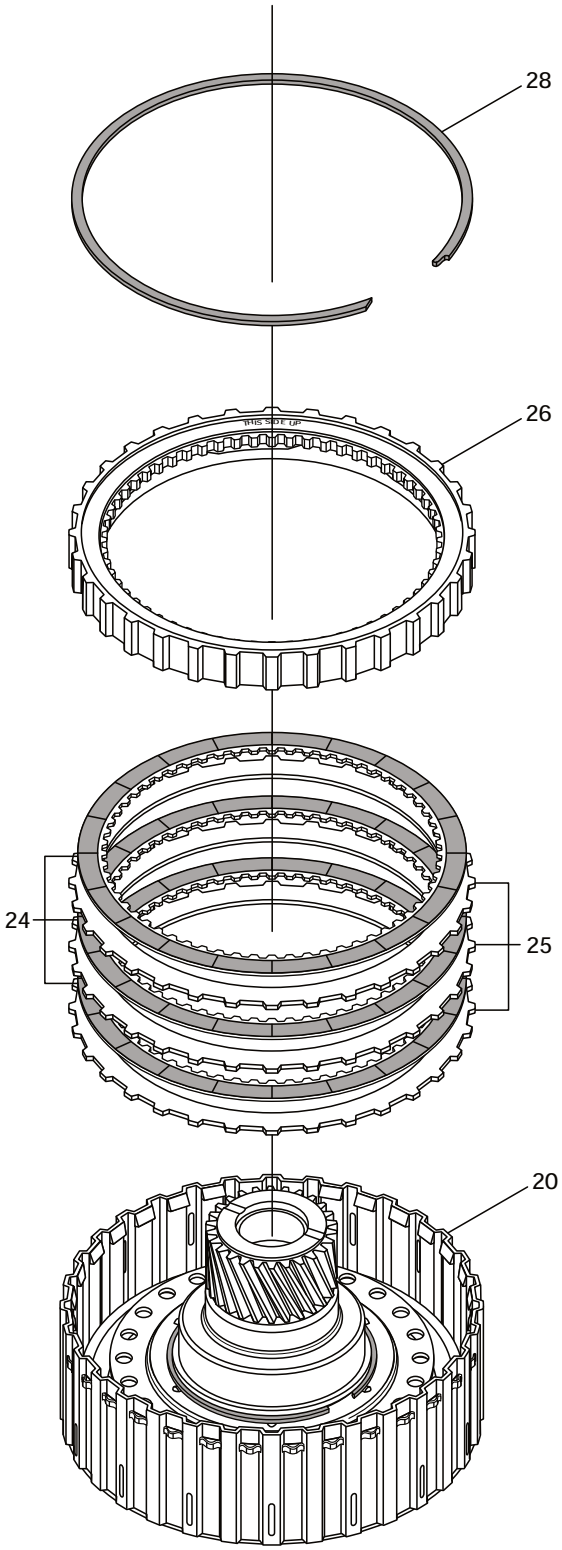


Figure 99



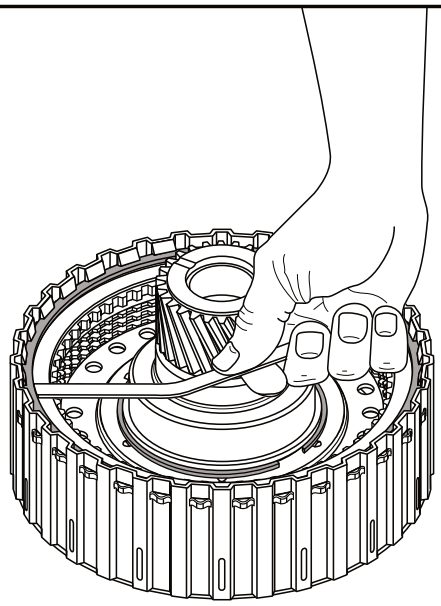
20 COAST CLUTCH HOUSING ASSEMBLY.
24 COAST CLUTCH FRICTION PLATES (3 REQUIRED).
25 COAST CLUTCH STEEL PLATES (3 REQUIRED).
26 COAST CLUTCH BACKING PLATE/ONE-WAY CLUTCH ASSEMBLY.
28 COAST CLUTCH BACKING PLATE SNAP RING.

Figure 100

COMPONENT REBUILD

COAST CLUTCH HOUSING (CONT'D)

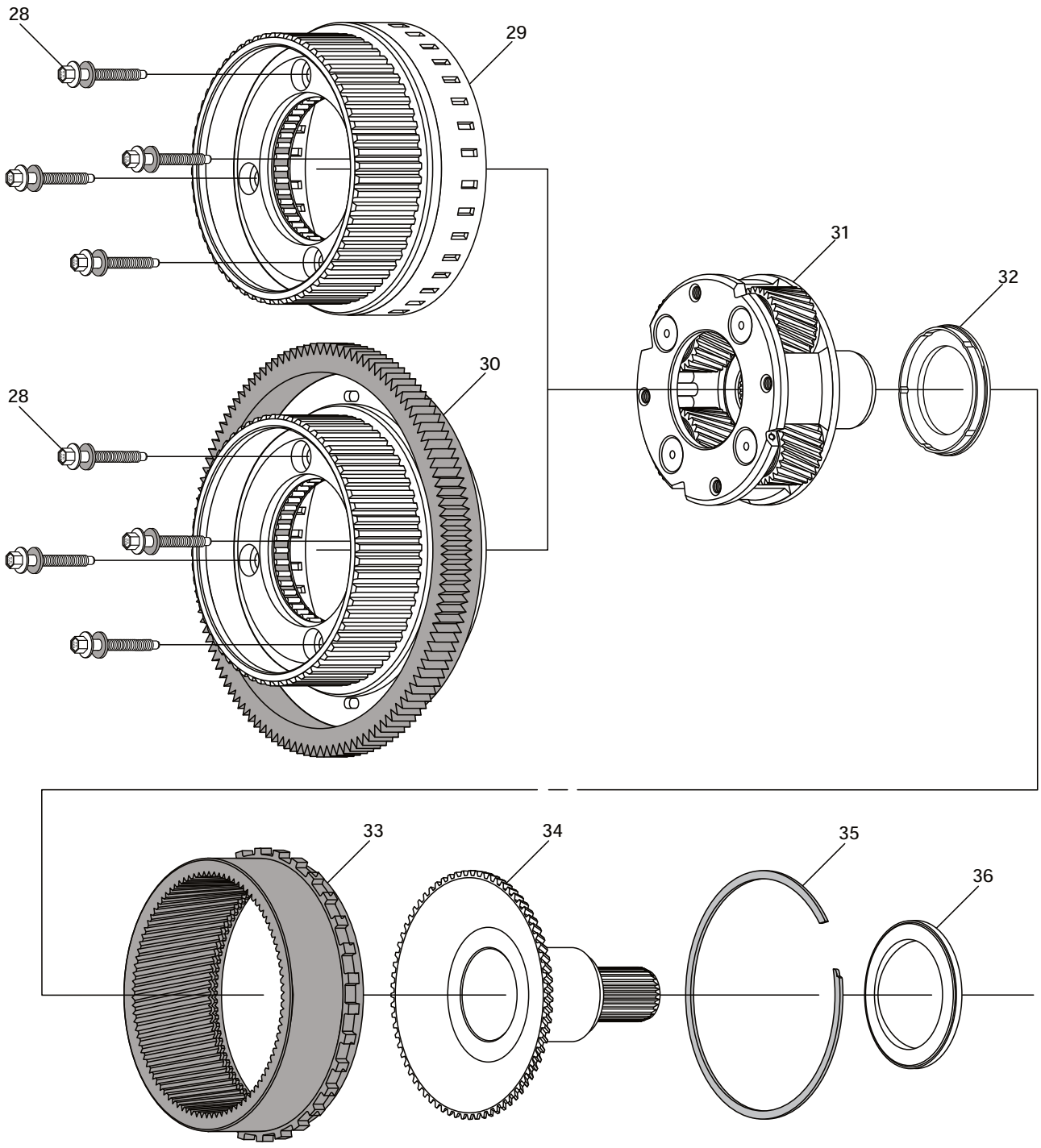
10. Install the coast clutches beginning with a steel plate and alternating with friction plates until you have installed three of each, as shown in Figure 100.
11. Install the coast clutch backing plate and O.D. one-way clutch assembly, into the coast clutch housing in the direction shown in Figure 100. ***Note: The words "This Side Up" must be visible after installation (See Figure 97).***
12. Install the coast clutch backing plate snap ring into the housing, as shown in Figure 100, and ensure that it is fully seated.
13. Turn the coast clutch drum over and tap against the work bench to seat the snap ring to the top of the groove.
14. Measure between the snap ring and the backing plate, as shown in Figure 101, with a feeler gauge to determine clutch clearance.
15. Proper coast clutch clearance should be: .76-1.27 mm (.030"-.050").
16. Change the selective snap ring as necessary to obtain the proper coast clutch clearance.
17. Set the completed coast clutch housing aside for the final assembly process.



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

Figure 101

OVERDRIVE SECTION EXPLODED VIEW



28 COAST CLUTCH HUB TO O.D. CARRIER BOLT (4 REQUIRED)
29 COAST CLUTCH HUB, "NON-PTO" VERSION
30 COAST CLUTCH HUB, "PTO" VERSION
31 OVERDRIVE PLANETARY CARRIER ASSEMBLY
32 THRUST BEARING (NO. 4), CARRIER TO CENTER SHAFT
33 OVERDRIVE INTERNAL RING GEAR
34 CENTER SHAFT ASSEMBLY
35 CENTER SHAFT TO RING GEAR SNAP RING
36 THRUST BEARING (NO. 5), CENTER SHAFT TO CENTER SUPPORT

Figure 102

COMPONENT REBUILD

OVERDRIVE SECTION

1. Disassemble the overdrive section parts using Figure 102 as a guide.
   Note: It is not necessary to remove the coast clutch hub assembly from the overdrive planetary carrier, unless damage is apparent.
2. Inspect all overdrive section parts thoroughly for any wear and/or damage.
3. Clean all overdrive parts thoroughly and dry with compressed air.
   Note: Do not spin the planetary pinions with air as damage may occur.
4. If it does become necessary to replace either overdrive planetary carrier or the coast clutch hub, remove the bolts as shown in Figure 103 and Figure 104.
   Note: These bolts "CANNOT" be reused because of the torquing procedure. They "MUST" be replaced with new bolts.

Continued on Page 68

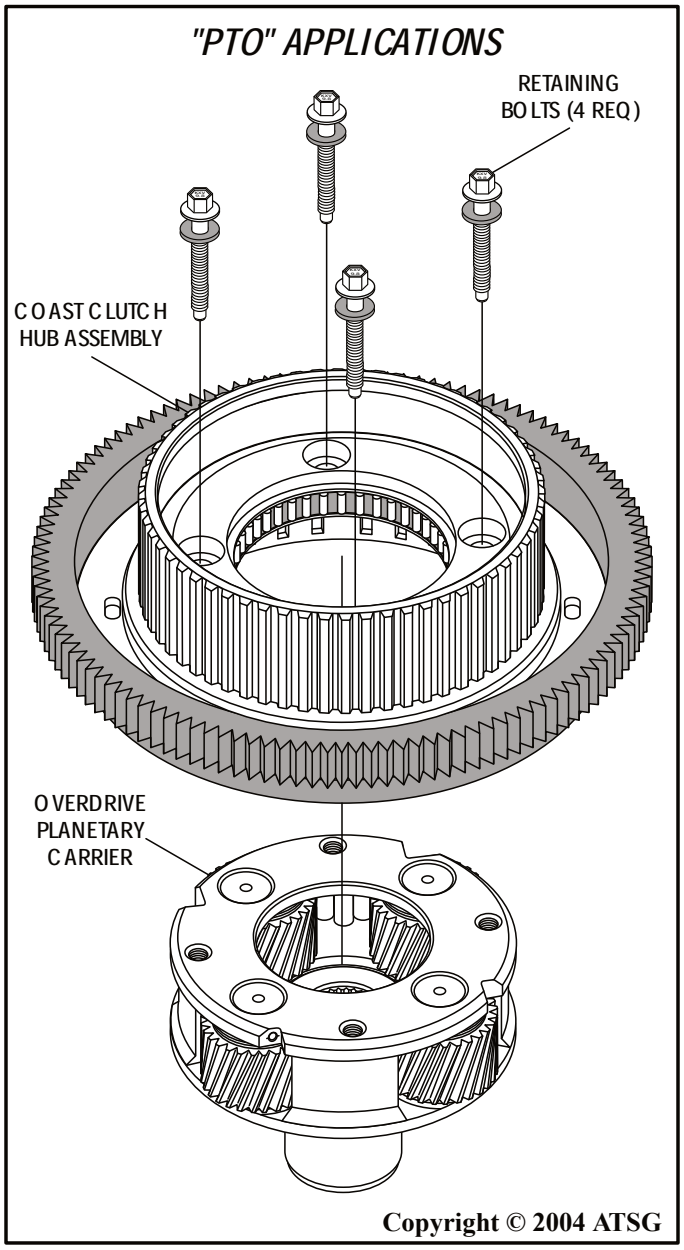


Figure 103

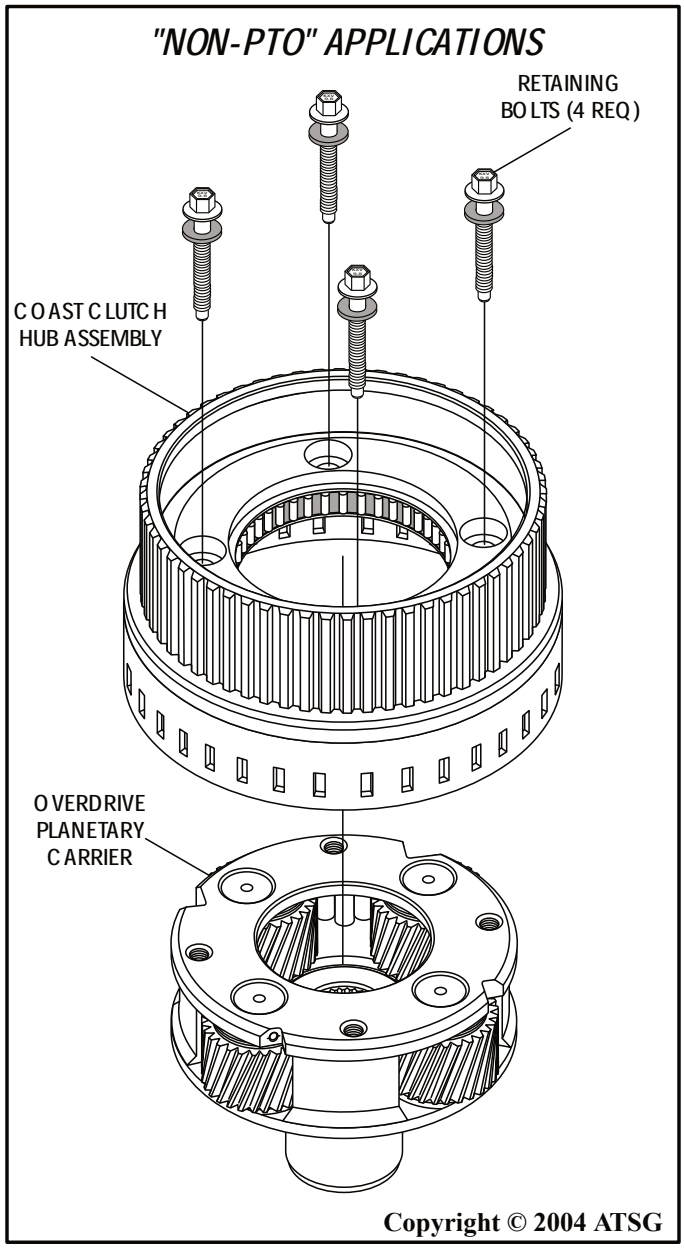


Figure 104

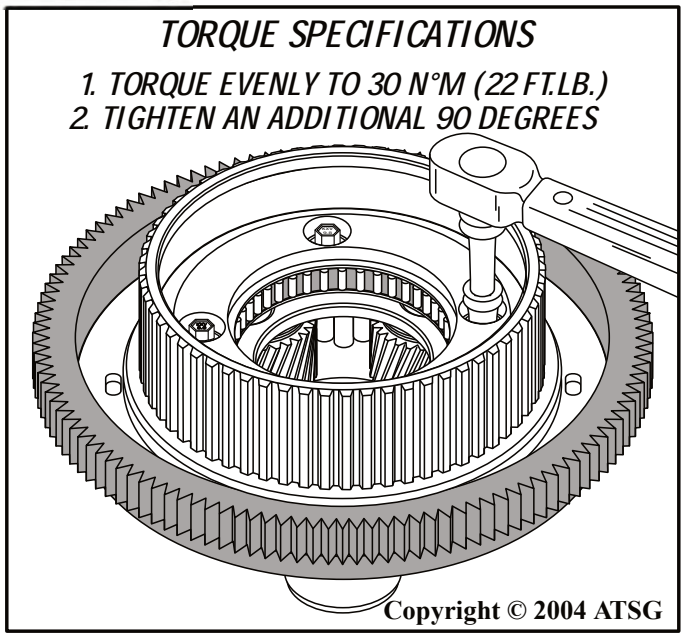


Figure 105

COMPONENT REBUILD

OVERDRIVE SECTION (CONT'D)

5. If it was necessary to replace the overdrive planetary carrier or the coast clutch hub, torque the ***new*** bolts as shown in Figure 105.
   Note: Do not over-torque or you will have to start again with more new bolts.
6. Set the coast clutch hub and overdrive carrier assembly onto a set of blocks, as shown in Figure 106.
7. Install the previously completed coast clutch housing onto the coast clutch hub, by rotating back and forth, to engage all friction plates on the hub and ensure it is fully seated. Refer to Figure 106.
8. Turn the entire assembly over and install the number 4 thrust bearing, in the direction shown in Figure 107, and retain with a small amount of Trans-Jel®.

Continued on Page 69

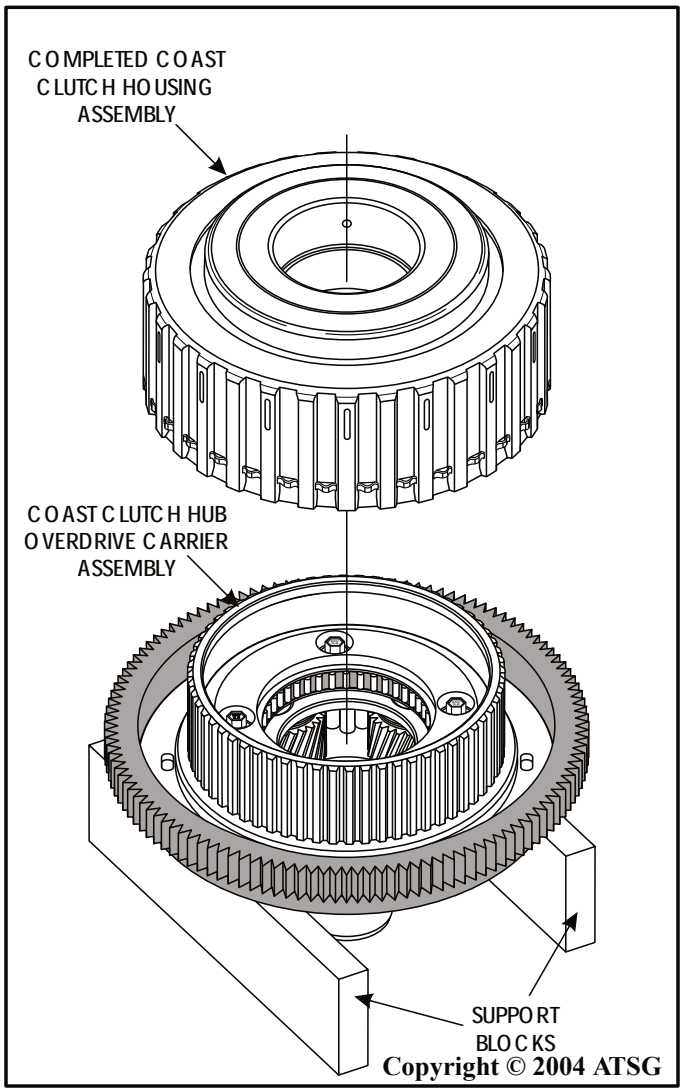


Figure 106

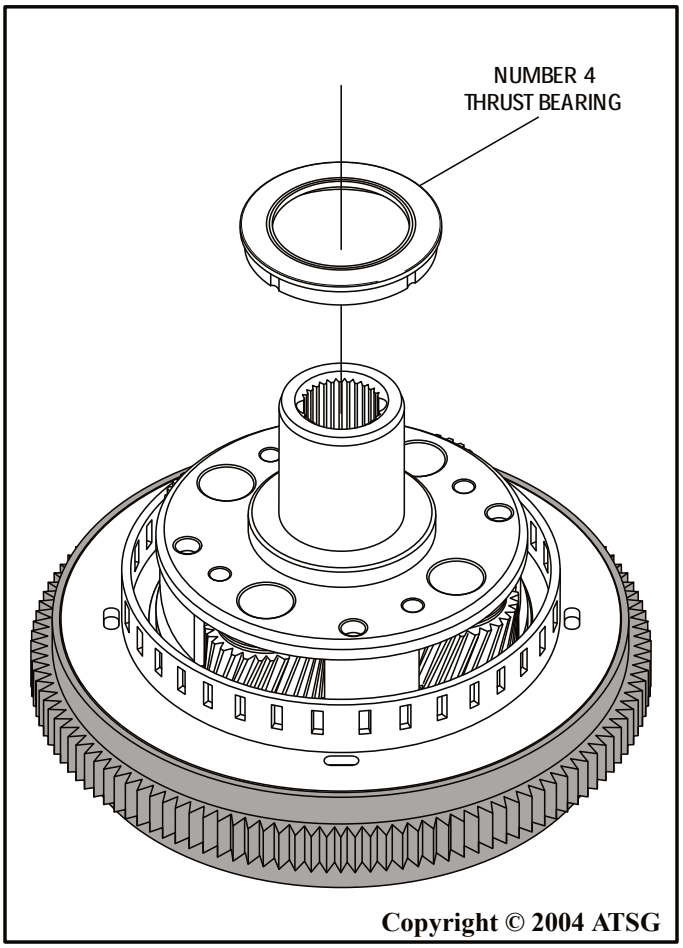


Figure 107

COMPONENT REBUILD

OVERDRIVE SECTION (CONT'D)

9. Turn the assembly over once again onto the set of blocks, as shown in Figure 108, and install the special installation tool 307-S383.
10. Tighten the special tool securely and set the assembly aside for the final assembly process.
11. It is not necessary to disassemble the internal ring gear and hub assembly, unless damage is apparent.
12. If replacement parts were needed at this time, use Figure 109 for assembly and disassembly of the ring gear and hub.
13. Set the overdrive ring gear and hub assembly aside for the final assembly process.

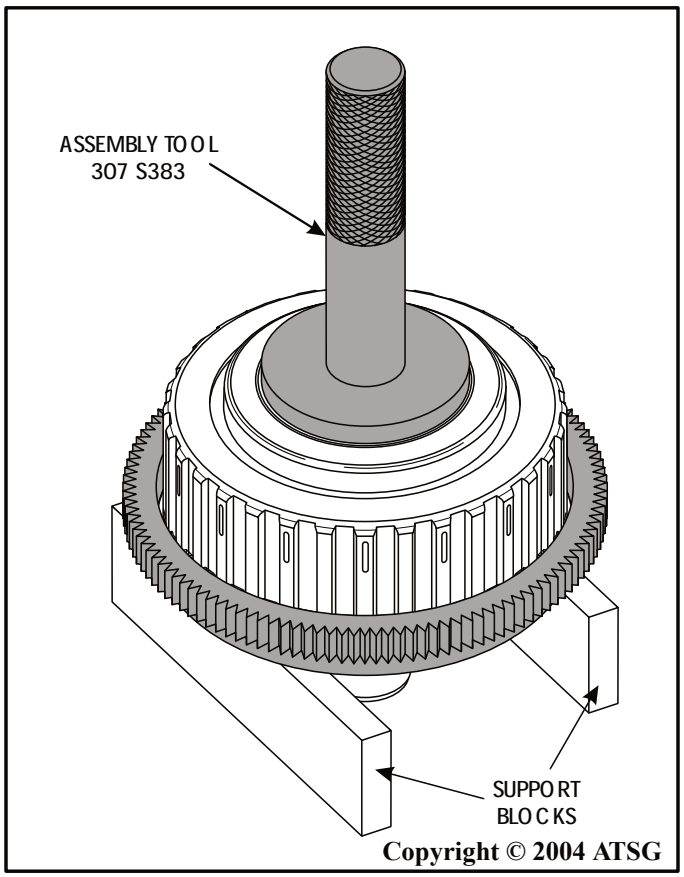
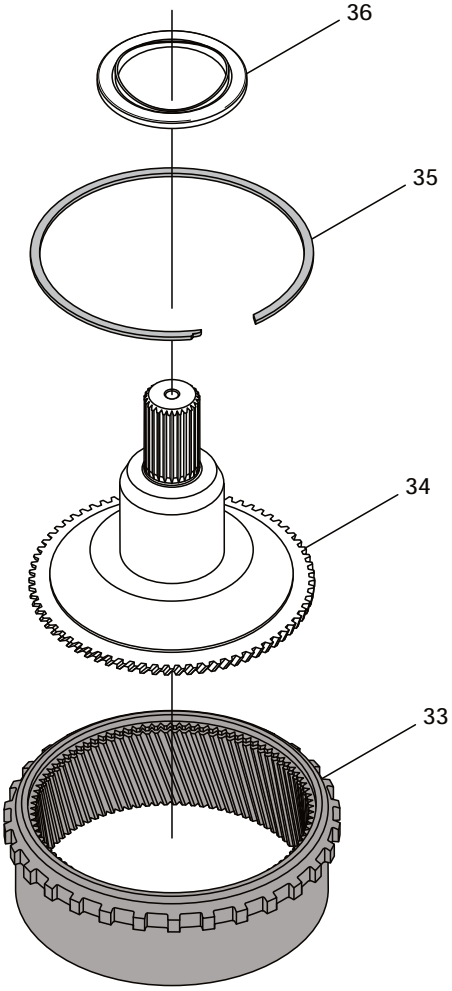


Figure 108



33 OVERDRIVE INTERNAL RING GEAR
34 CENTER SHAFT ASSEMBLY
35 CENTER SHAFT TO RING GEAR SNAP RING

COMPLETED OVERDRIVE RING GEAR AND CENTER SHAFT ASSEMBLY

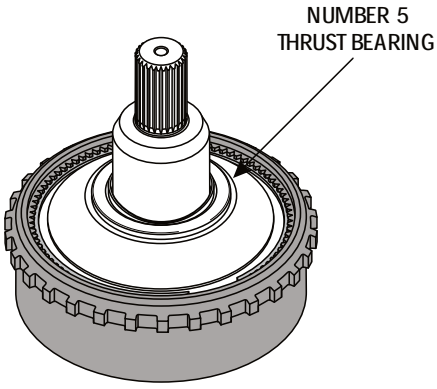
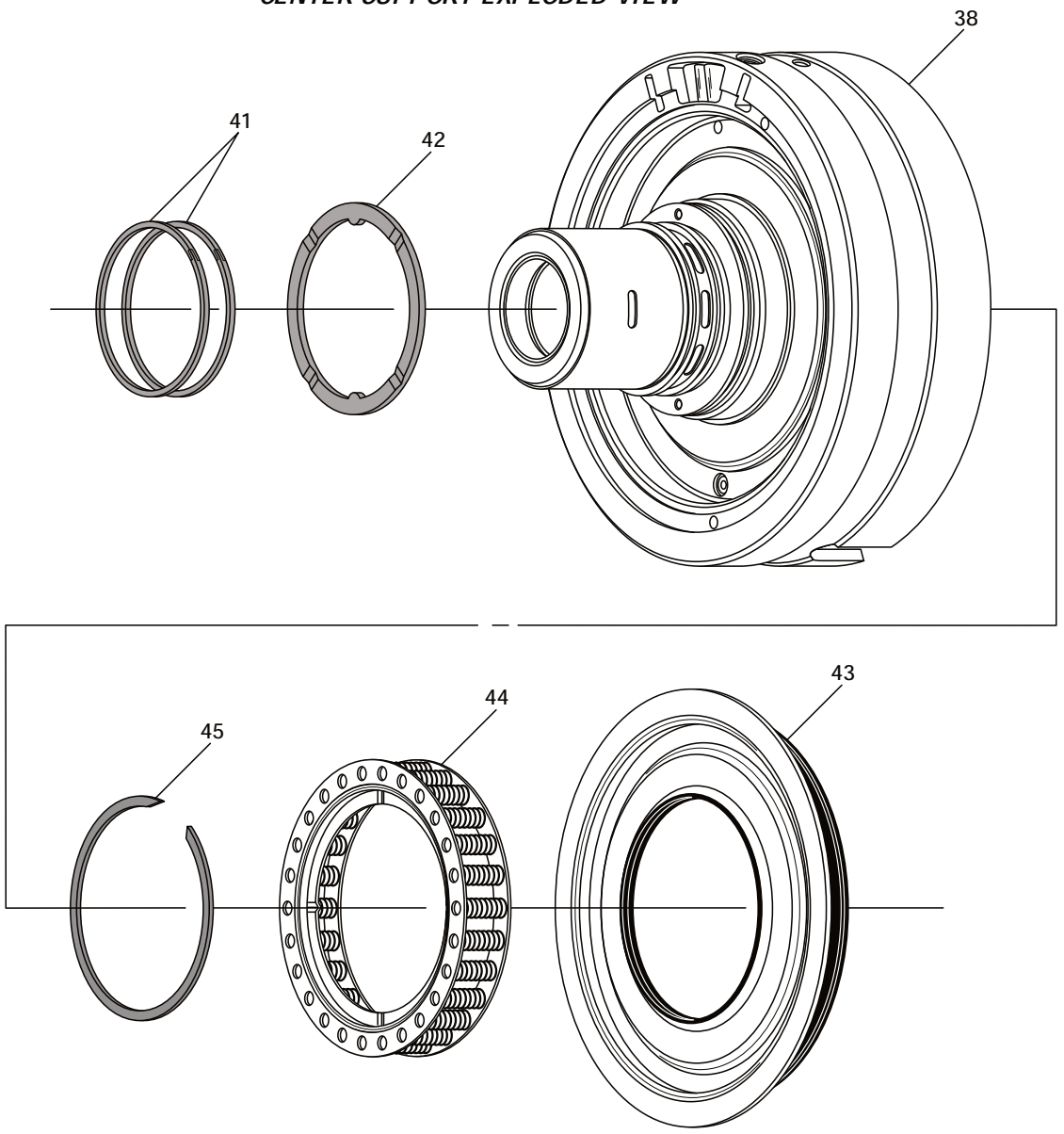


Figure 109

CENTER SUPPORT EXPLODED VIEW



38 CENTER SUPPORT ASSEMBLY
41 DIRECT CLUTCH TEFLON® SEALING RINGS (2 REQUIRED)
42 NUMBER 6 THRUST WASHER
43 INTERMEDIATE CLUTCH MOLDED PISTON
44 INTERMEDIATE CLUTCH PISTON RETURN SPRNG ASSEMBLY
45 INTERMEDIATE CLUTCH RETURN SPRING SNAP RING

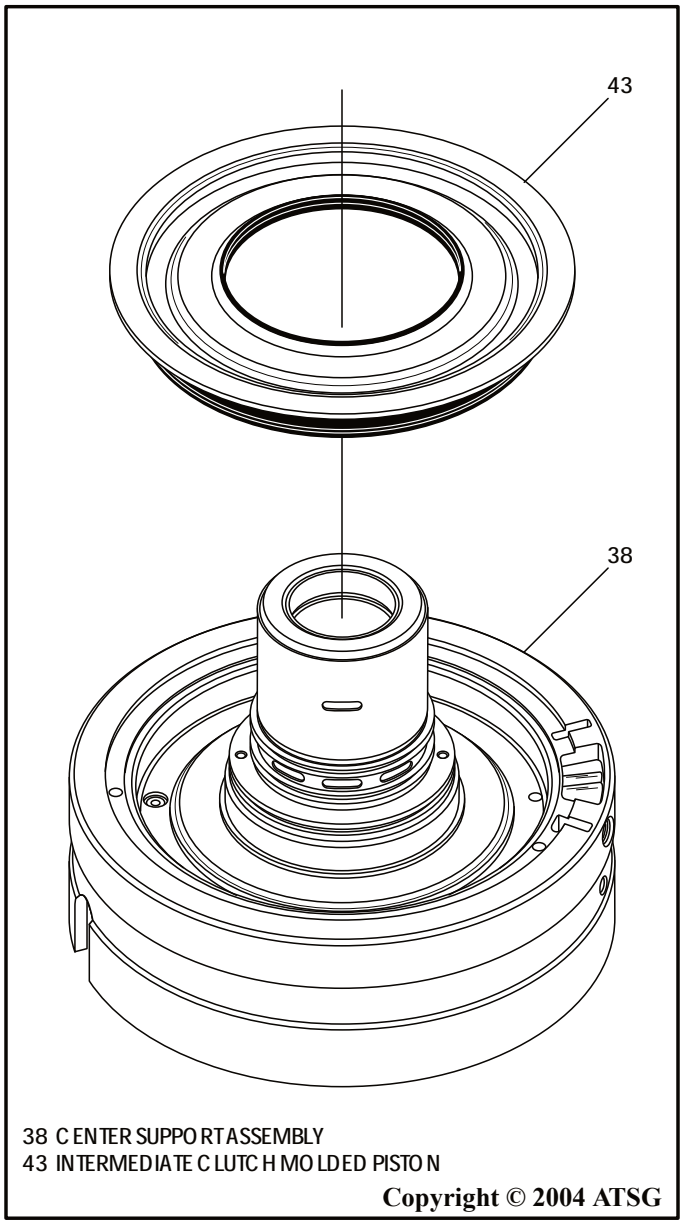
Figure 110

COMPONENT REBUILD

CENTER SUPPORT ASSEMBLY

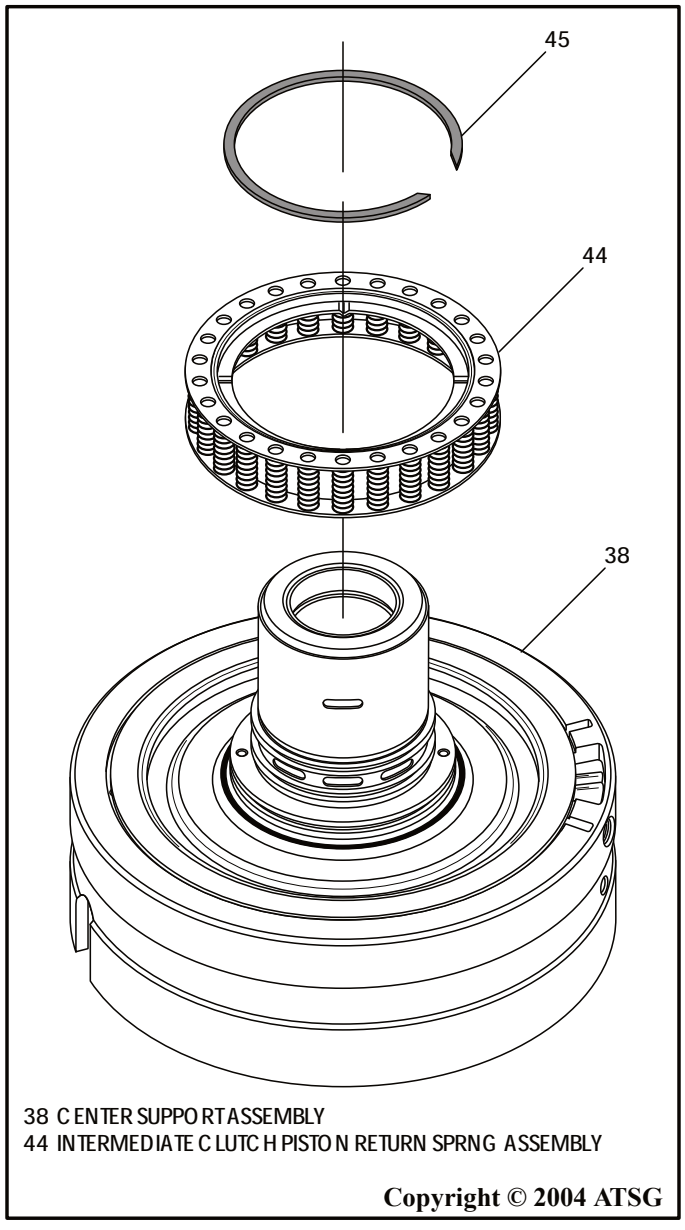
1. Disassemble the center support assembly using Figure 110 as a guide.
2. Inspect all center support parts thoroughly for any wear and/or damage.
3. Clean all center support parts thoroughly and dry with compressed air.
4. Set center support on a flat work surface, as shown in Figure 111.
5. Lubricate new intermediate clutch piston seals with a small amount of Trans-Jel®.
6. Install the intermediate clutch piston into the center support, as shown in Figure 111.
7. Install the intermediate clutch piston return spring in direction shown in Figure 112.
8. Compress the return spring using appropriate spring compressor and install snap ring.
9. Ensure that snap ring is fully seated in groove.

Continued on Page 72



38 CENTER SUPPORT ASSEMBLY
43 INTERMEDIATE CLUTCH MOLDED PISTON

Figure 111



38 CENTER SUPPORT ASSEMBLY
44 INTERMEDIATE CLUTCH PISTON RETURN SPRNG ASSEMBLY

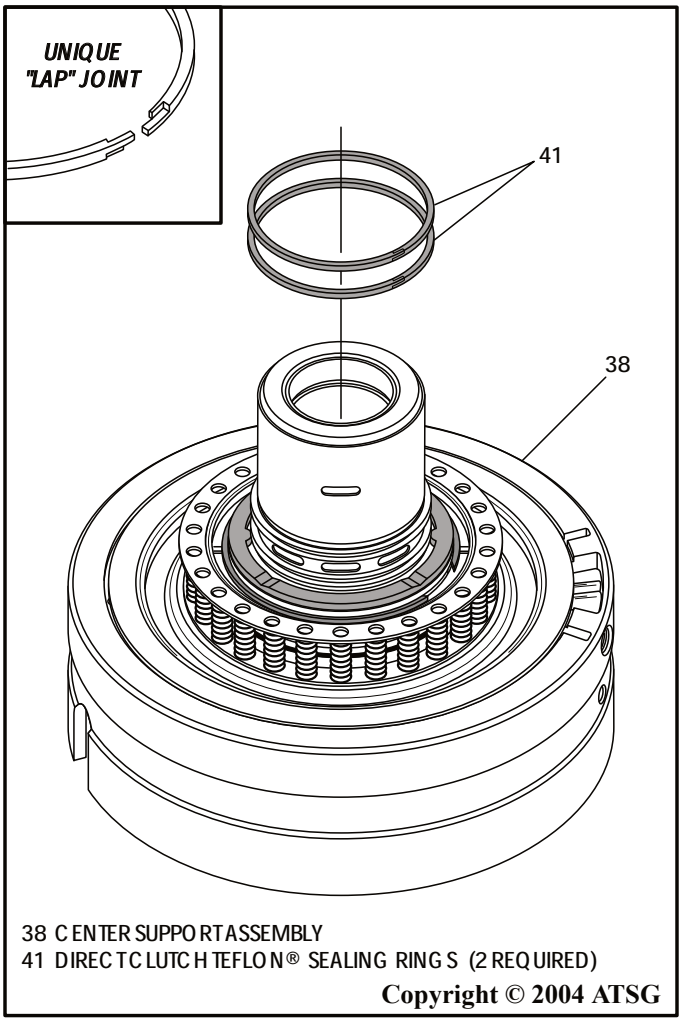
Figure 112

COMPONENT REBUILD

CENTER SUPPORT ASSEMBLY

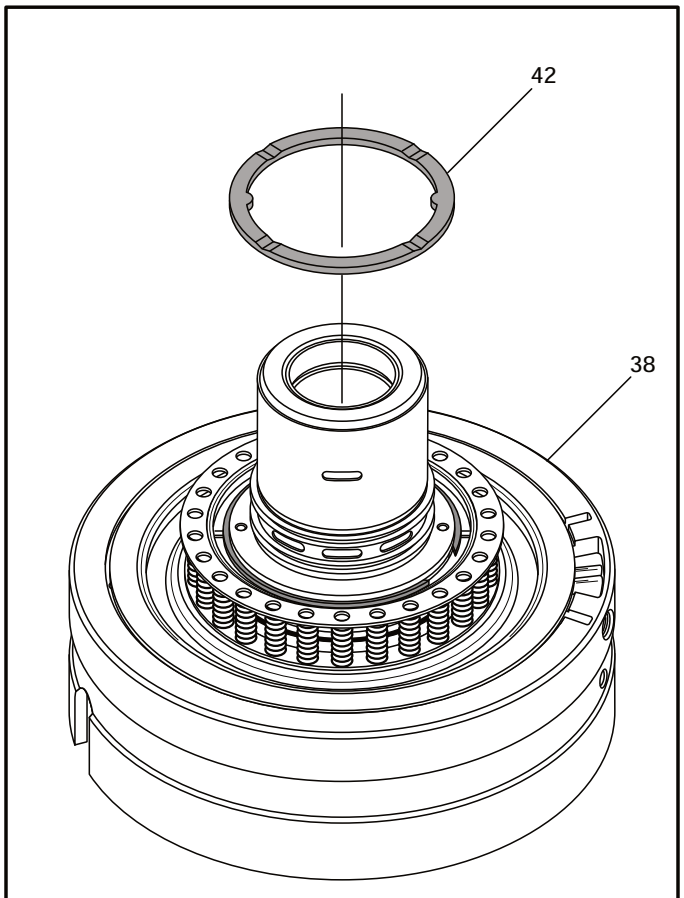
10. Install the number 6 thrust washer onto the center support, as shown in Figure 113, and retain with a small amount of Trans-Jel®.
11. Install new direct clutch sealing rings into the grooves in the center support (See Figure 114).
12. Notice that the rings have a "unique" lap joint, as shown in Figure 114, and will require some ***special*** attention, to ensure that they engage properly.
13. Set the completed center support assembly, as shown in Figure 115, aside for final assemby.

Component Rebuild
Continued on Page 75



38 CENTER SUPPORT ASSEMBLY
41 DIRECT CLUTCH TEFLON® SEALING RINGS (2 REQUIRED)

Figure 114



38 CENTER SUPPORT ASSEMBLY
42 NUMBER 6 THRUST WASHER

Figure 113

COMPLETED CENTER SUPPORT ASSEMBLY

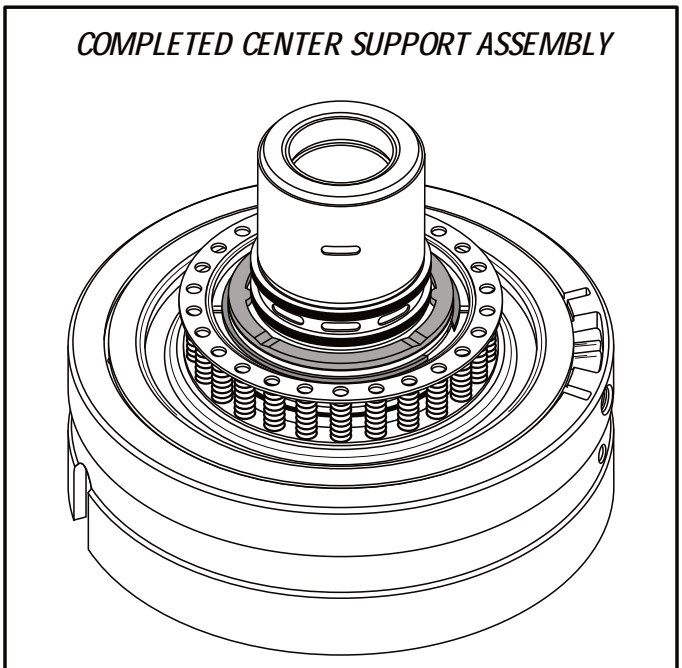


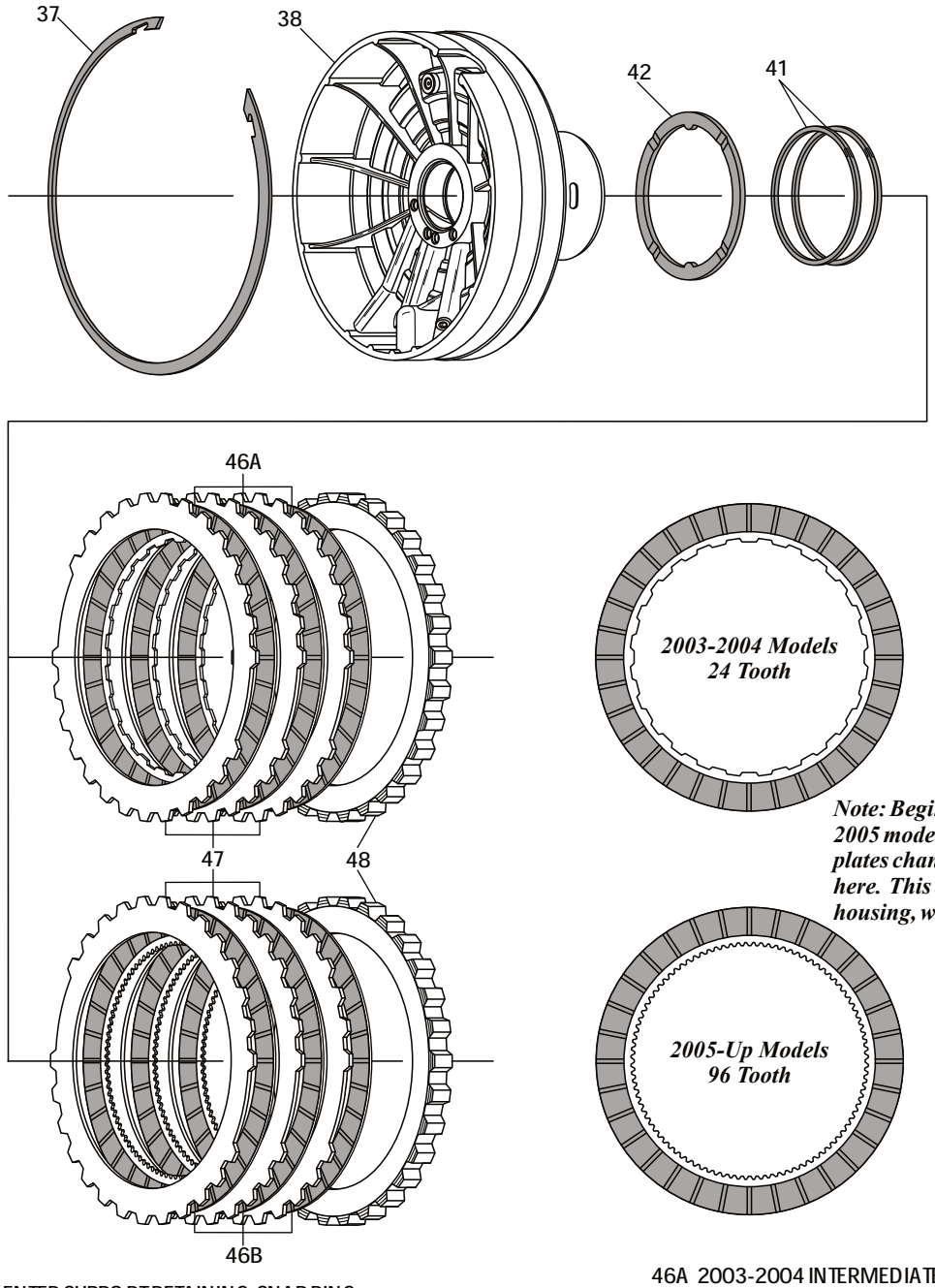
Figure 115

INTERMEDIATE CLUTCH PLATES

1. Inspect intermediate clutch plates and ensure that you have the proper plates in your kit. ***Note: Beginning at start of production for 2005 models, the tooth count on the friction plates changed from 24 to 96, as shown in Figure 116. This also changes the direct clutch housing, which we will show later.***
2. Set the ***"Proper"*** intermediate clutch friction plates, steel plates and backing plate aside for the final assembly process.

Component Rebuild
Continued on Page 75

INTERMEDIATE CLUTCH EXPLODED VIEW

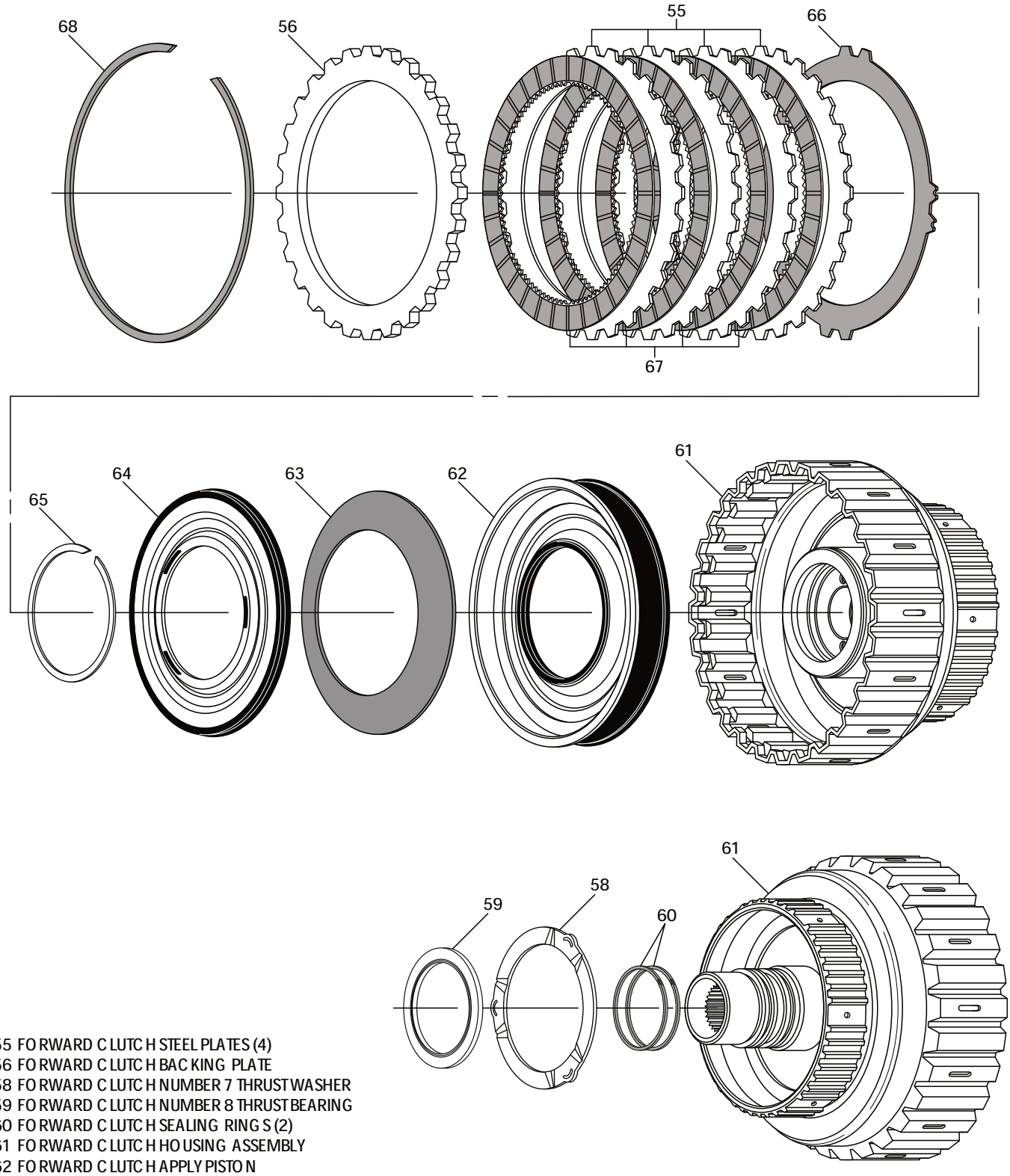


Note: Beginning at start of production for 2005 models, the tooth count on the friction plates changed from 24 to 96, as shown here. This also changes the direct clutch housing, which is shown on Page 82.

37 CENTER SUPPORT RETAINING SNAP RING
38 COMPLETE CENTER SUPPORT ASSEMBLY
41 DIRECT CLUTCH TEFLON® SEALING RINGS (2 REQUIRED)
42 NUMBER 6 THRUST WASHER
46A 2003-2004 INTERMEDIATE FRICTION PLATES (24 TOOTH)
46B 2005-UP INTERMEDIATE FRICTION PLATES (96 TOOTH)
47 INTERMEDIATE CLUTCH STEEL PLATES (ALL MODELS)
48 INTERMEDIATE CLUTCH BACKING PLATE (ALL MODELS)

Figure 116

FORWARD CLUTCH HOUSING EXPLODED VIEW



55 FORWARD CLUTCH STEEL PLATES (4)
56 FORWARD CLUTCH BACKING PLATE
58 FORWARD CLUTCH NUMBER 7 THRUST WASHER
59 FORWARD CLUTCH NUMBER 8 THRUST BEARING
60 FORWARD CLUTCH SEALING RINGS (2)
61 FORWARD CLUTCH HOUSING ASSEMBLY
62 FORWARD CLUTCH APPLY PISTON
63 FORWARD CLUTCH "BELLVILLE" RETURN SPRING
64 FORWARD CLUTCH BALANCE PISTON
65 FORWARD CLUTCH RETURN SPRING SNAP RING
66 FORWARD CLUTCH "WAVE" PLATE
67 FORWARD CLUTCH FRICTION PLATES
68 FORWARD CLUTCH BACKING PLATE SNAP RING *(SELECTIVE)*

Figure 117

COMPONENT REBUILD

FORWARD CLUTCH HOUSING

1. Disassemble the forward clutch housing using Figure 117 as a guide.
2. Inspect all forward clutch parts thoroughly for any wear and/or damage.
3. Clean all forward clutch parts thoroughly and dry with compressed air.

Forward Clutch
Continued on Page 77

FORWARD CLUTCH HOUSING DIFFERENCES

NOTICE: At start of production for 2005 models, Ford Motor Co. increased the diameter of the forward planetary carrier, increased pinion height, and larger pinion pins for increased durability. This required changes in the forward clutch housing components and are as follows.

1. ***Increased inside and pilot diameters of the forward clutch steel plates, as shown in Figure 118.***
2. ***Increased inside and outside diameters of the forward clutch friction plates, as shown in Figure 119, which changes the tooth count.***

Forward Clutch Housing Differences
Continued on Page 76

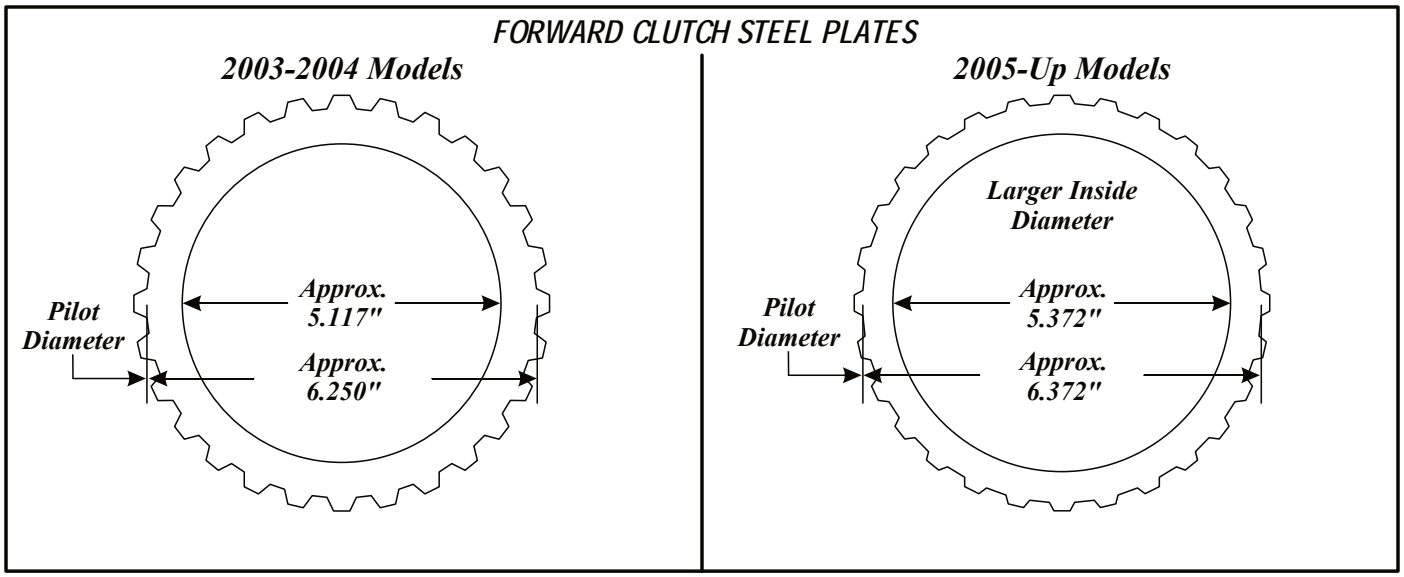


Figure 118

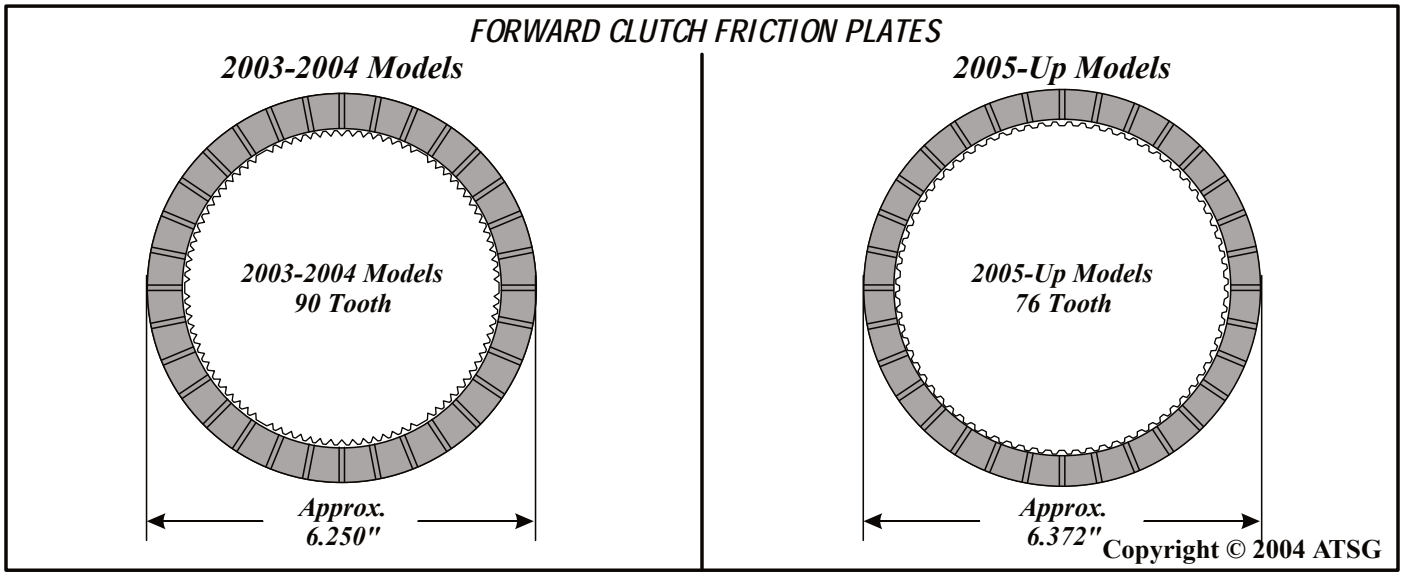


Figure 119

FORWARD CLUTCH HOUSING DIFFERENCES (CONT'D)

NOTICE: Continued from Page 75:

3. Increased inside and pilot diameters of the forward clutch backing plate, as shown in Figure 120.

4. Forward clutch internal ring gear increases in diameter, and the tooth count changes to accommodate the new friction plates, as shown in Figure 121.

5. The number 9 thrust washer changes to accommodate the new ring gear, as shown in Figure 121.

6. The forward clutch housing also changes with increased diameter lube holes in the hub for the direct clutch plates (See Figure 122).

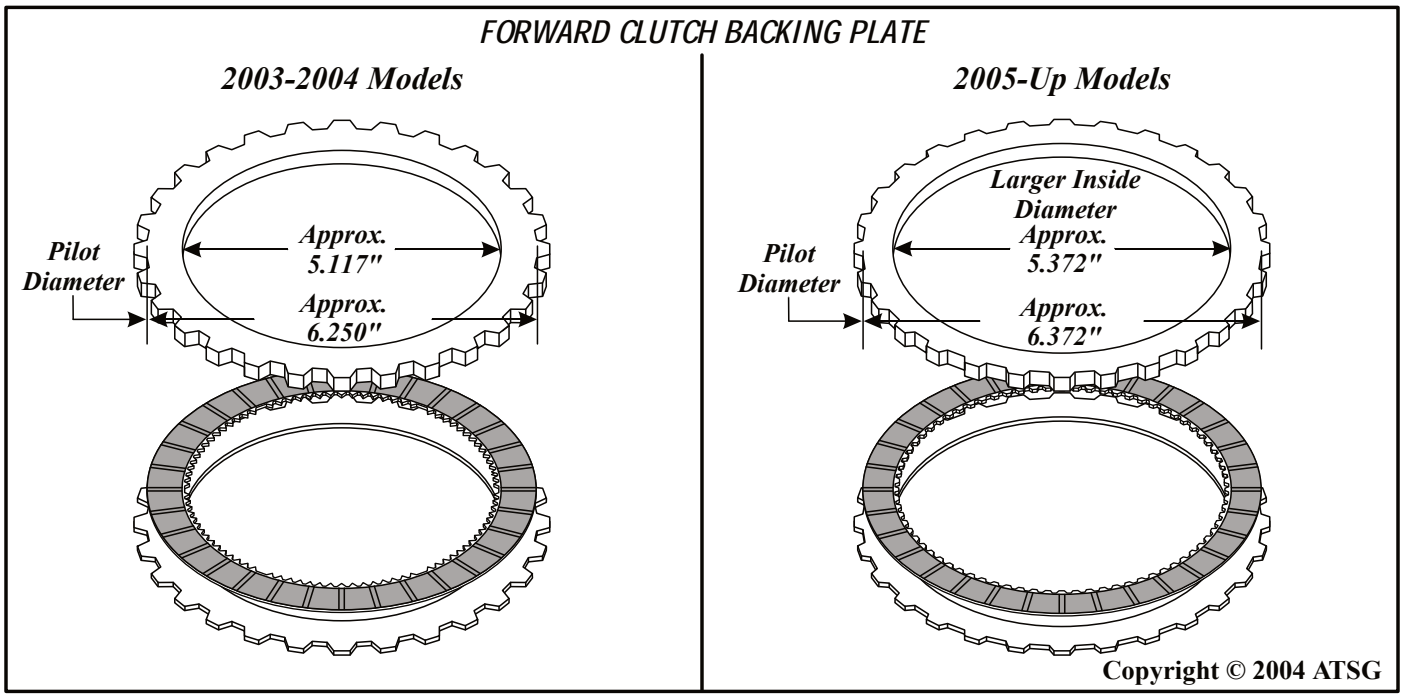


Figure 120

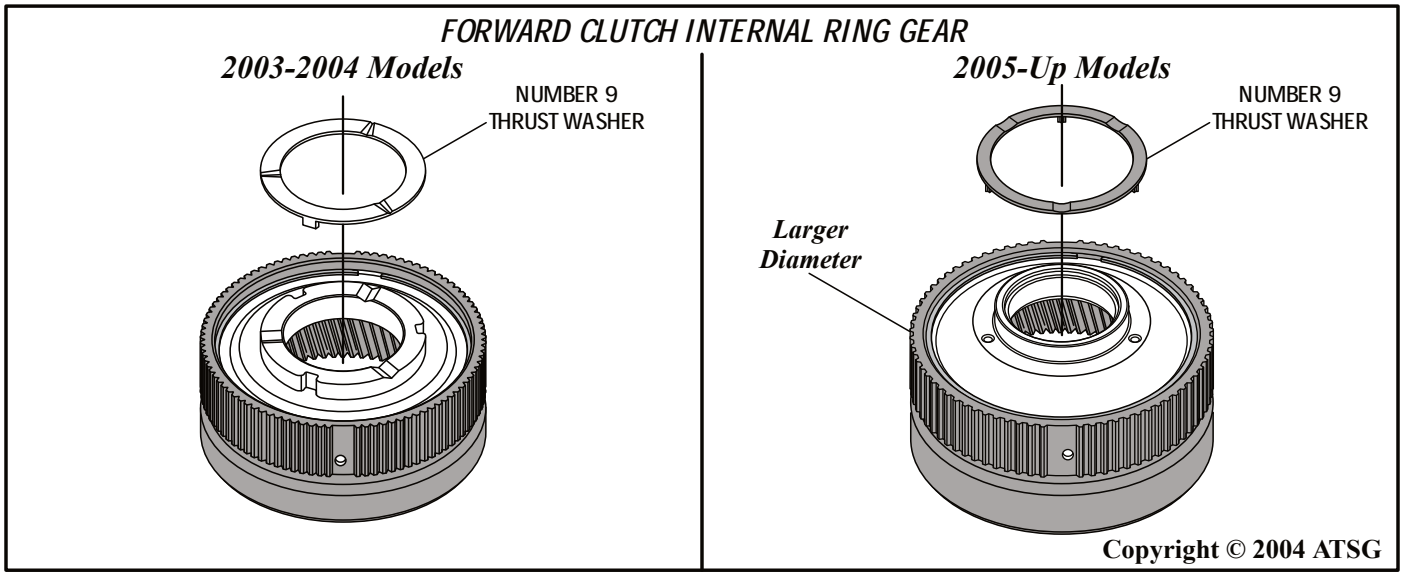


Figure 121

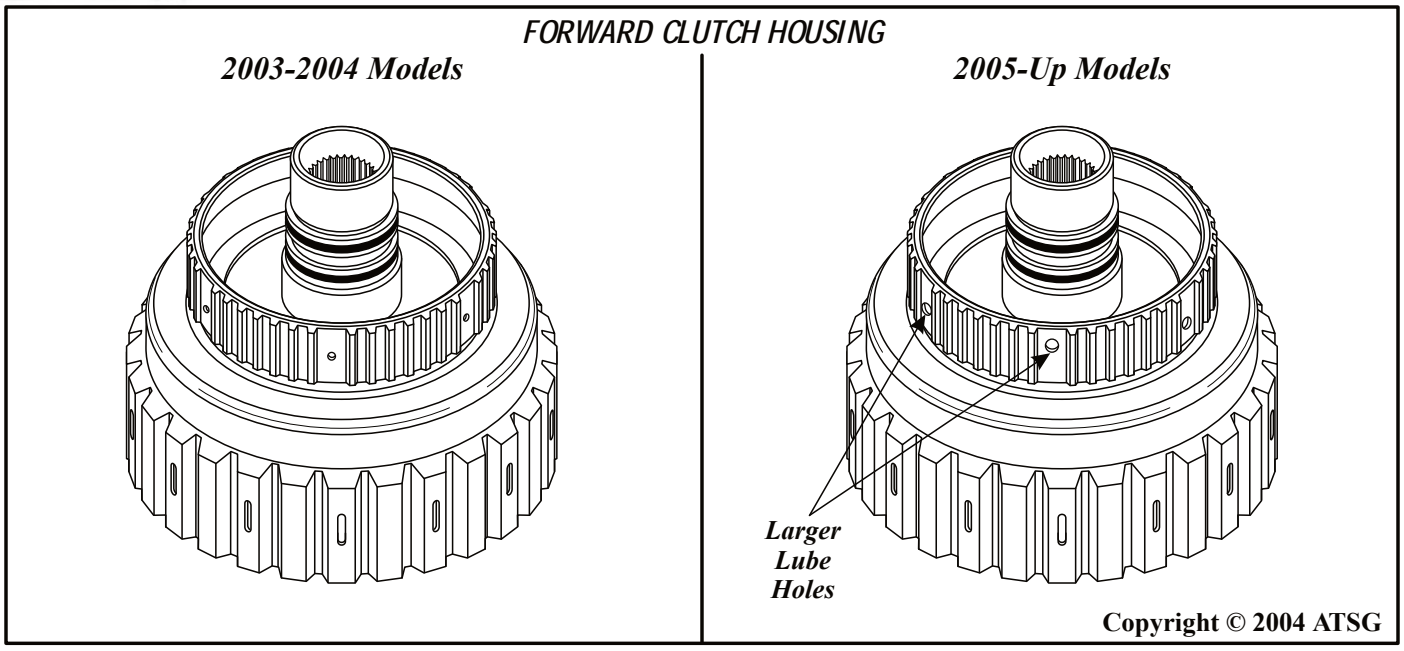


Figure 122

COMPONENT REBUILD

FORWARD CLUTCH HOUSING (CONT'D)

4. Place the forward clutch housing on flat work surface, as shown in Figure 123.
   Note: Ensure that you have all of the correct forward clutch parts for the model that you are rebuilding, using the descriptions found in "Forward Clutch Differences".
5. Lubricate both inner and outer seal surfaces on forward clutch piston with Trans-Jel®.
6. Install the forward clutch piston into forward clutch housing, as show in Figure 123, using a slight twisting motion.

Continued on Page 78

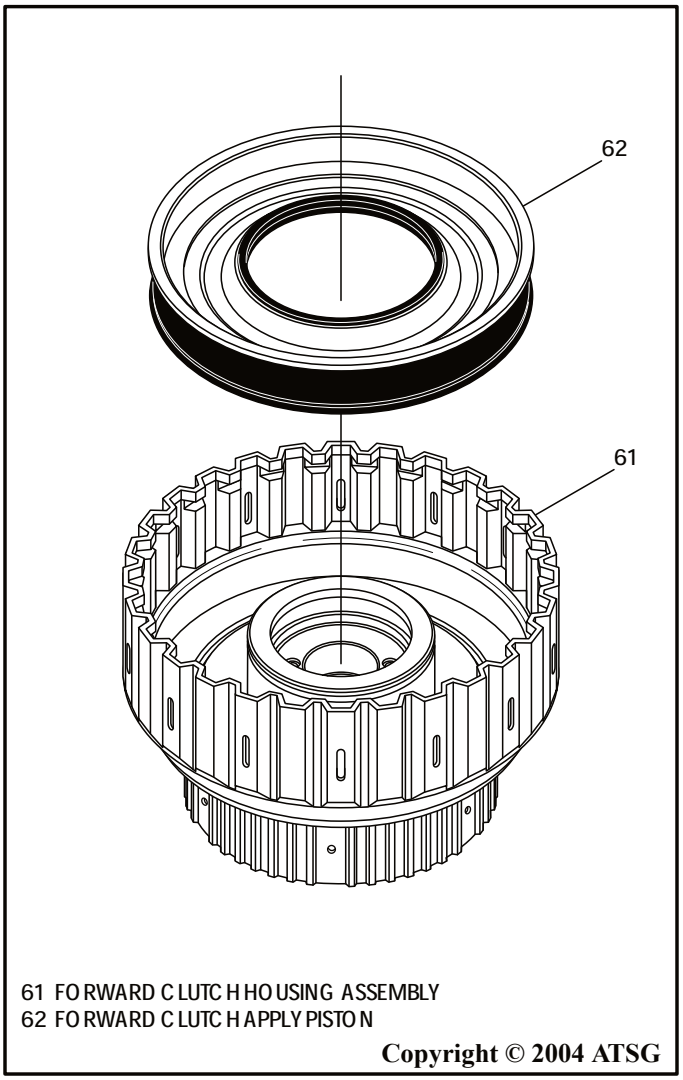
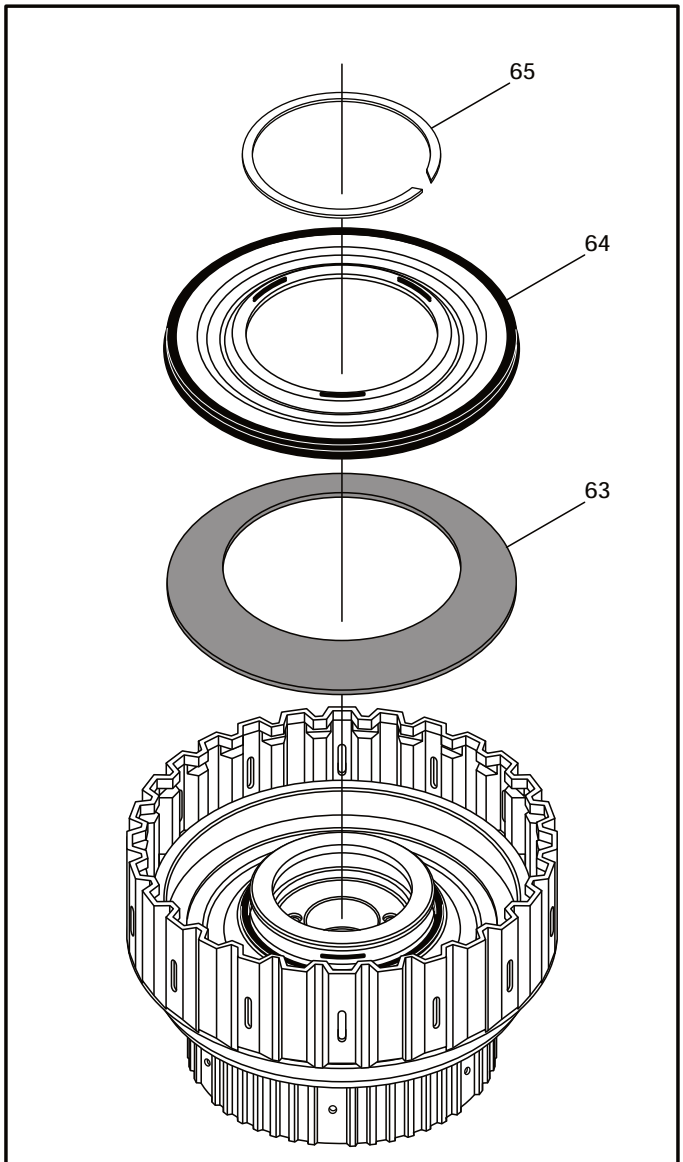


Figure 123

FORWARD CLUTCH HOUSING (CONT'D)

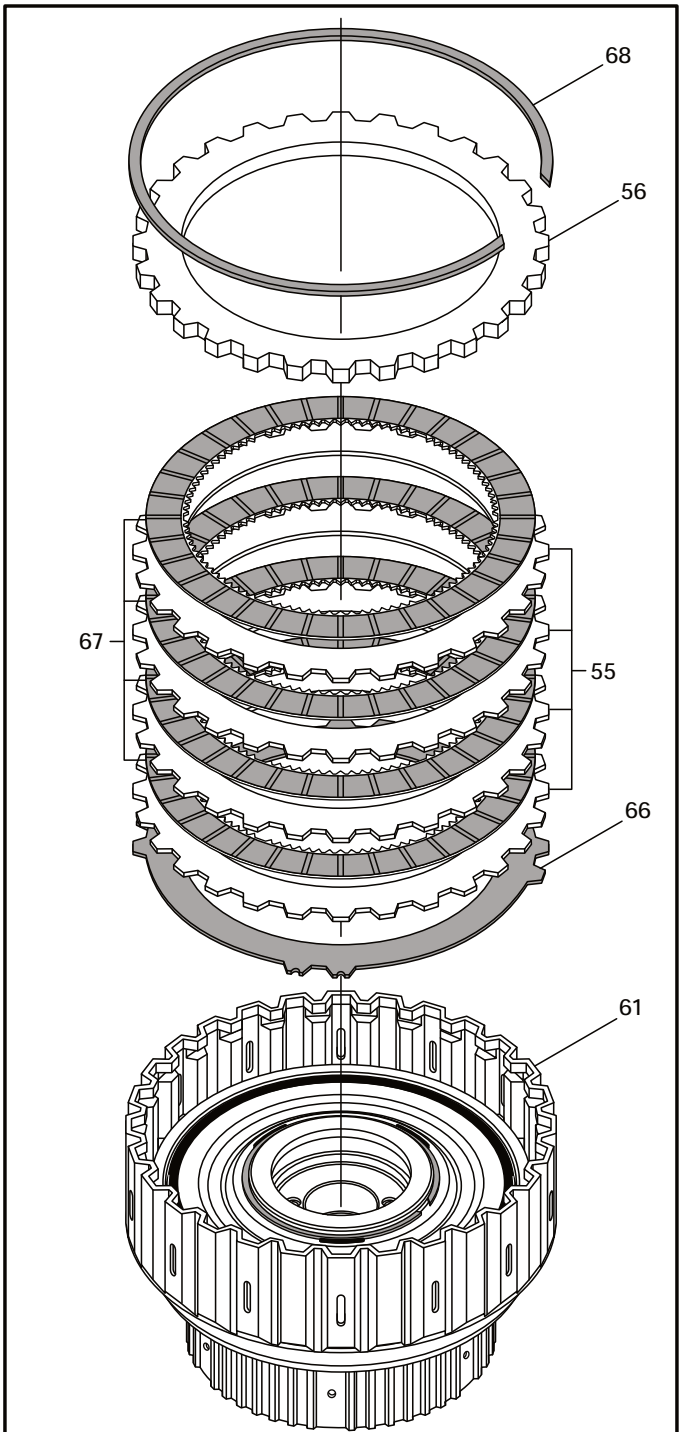
7. Install forward clutch piston return "Bellville" spring on top of the forward clutch piston in the direction shown in Figure 124.
8. Lubricate the seal and install the forward clutch balance piston, as shown in Figure 124.
9. Compress the return spring and balance piston and install snap ring (See Figure 124).
   Note: This operation requires hydraulic press.
10. Install the forward clutch "Wave" plate, as shown in Figure 125.
11. Install 4 steel plates and 4 friction plates for the model you're building, as shown in Figure 125.
12. Install the forward clutch backing plate and the selective snap ring, as shown in Figure 125.
    Note: Flat side of backing plate faces up.

Continued on Page 79



63 FORWARD CLUTCH "BELLVILLE" RETURN SPRING
64 FORWARD CLUTCH BALANCE PISTON
65 FORWARD CLUTCH RETURN SPRING SNAP RING

Figure 124



55 FORWARD CLUTCH STEEL PLATES (4)
56 FORWARD CLUTCH BACKING PLATE
61 FORWARD CLUTCH HOUSING ASSEMBLY
66 FORWARD CLUTCH "WAVE" PLATE
67 FORWARD CLUTCH FRICTION PLATES
68 FORWARD CLUTCH BACKING PLATE SNAP RING *(SELECTIVE)*

Figure 125

FORWARD CLUTCH HOUSING (CONT'D)

13. Tap the clutch pack side of completed forward clutch housing against the flat work surface to fully seat the snap ring.
14. Check the forward clutch clearance using feeler gauge, as shown in Figure 126, between the backing plate and snap ring.
15. The forward clutch clearance should measure; 1.15 - 1.65 mm (.045" - .065"), as shown in Figure 126.
16. Change the selective backing plate snap ring as necessary to obtain the proper clearance.
17. Install the number 9 thrust bearing into the forward clutch housing, in the direction shown in Figure 127, and retain with liberal amount of Trans-Jel®.
18. Install the number 7 thrust washer, as shown in Figure 128, and retain with Trans-Jel®.
19. Install the number 8 thrust bearing in forward clutch housing, as shown in Figure 128, and retain with liberal amount of Trans-Jel®.

Continued on Page 80

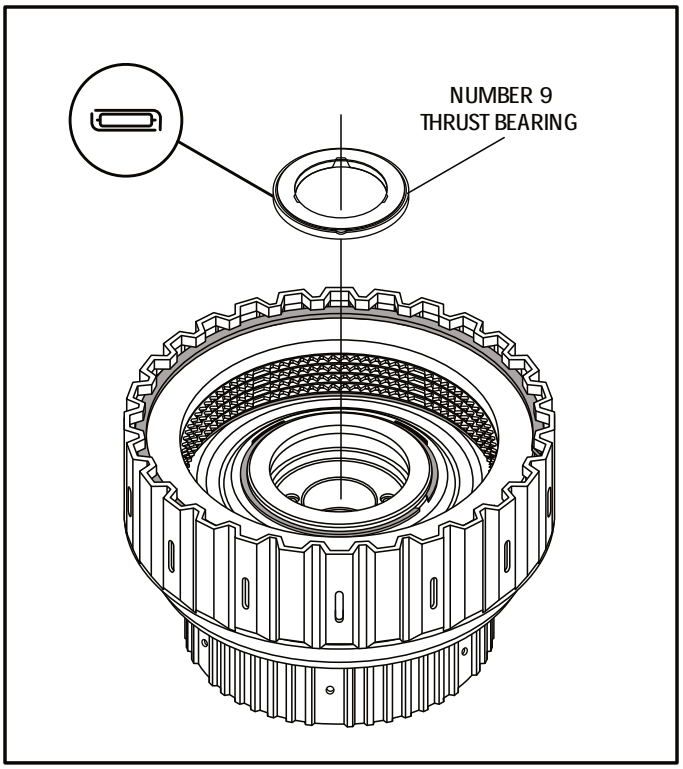
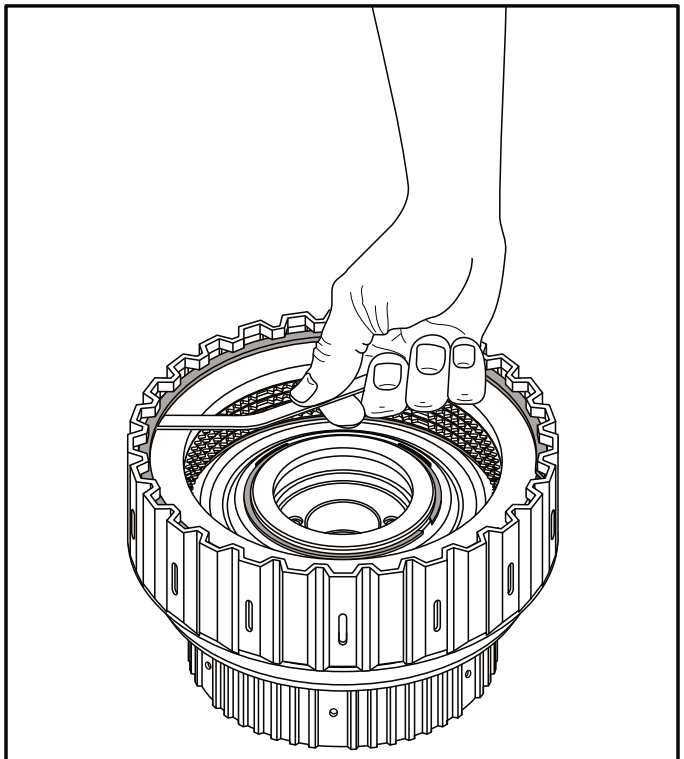
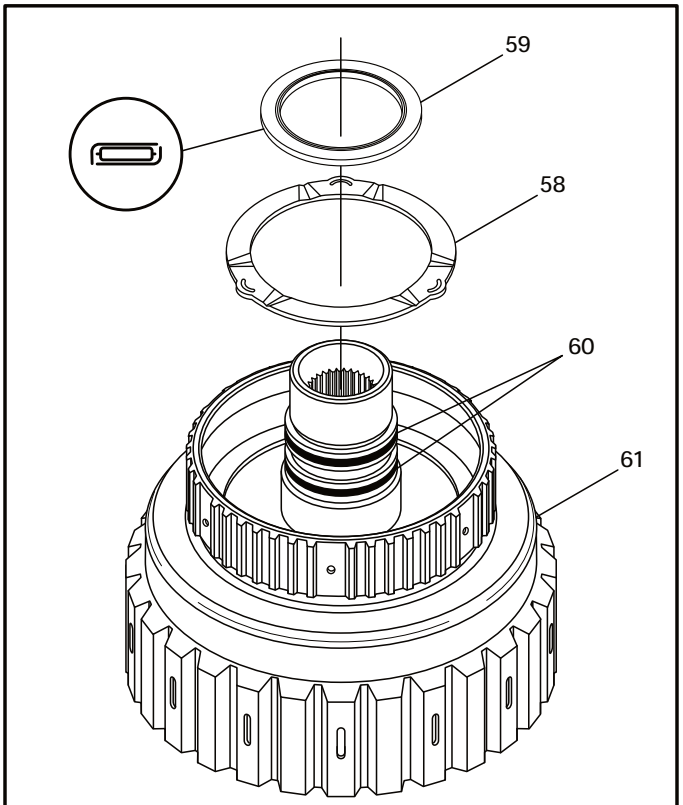


Figure 127



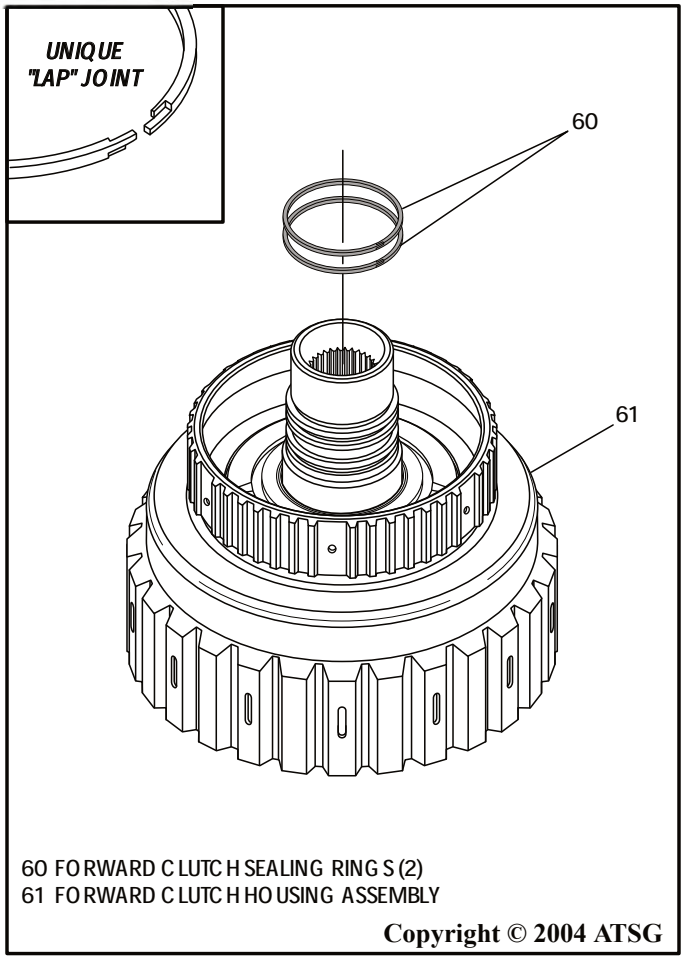
Forward Clutch Clearance Should Be: 1.15-1.65 mm (.045" - .065")

Figure 126



58 FORWARD CLUTCH NUMBER 7 THRUST WASHER
59 FORWARD CLUTCH NUMBER 8 THRUST BEARING
60 FORWARD CLUTCH SEALING RINGS (2)
61 FORWARD CLUTCH HOUSING ASSEMBLY

Figure 128



60 FORWARD CLUTCH SEALING RINGS (2)
61 FORWARD CLUTCH HOUSING ASSEMBLY

Figure 129

COMPLETED FORWARD CLUTCH HOUSING

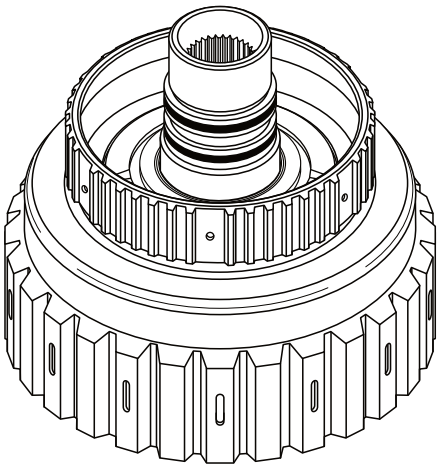


Figure 130

FORWARD CLUTCH HOUSING (CONT'D)

20. Install the two forward clutch sealing rings, as shown in Figure 129.
Note: Notice the unique "Lap" joint of this set of seal rings, as shown in Figure 129. Ensure they are joined properly.
21. Set the completed forward clutch housing aside for the final drum assembly process, as shown in Figure 130.

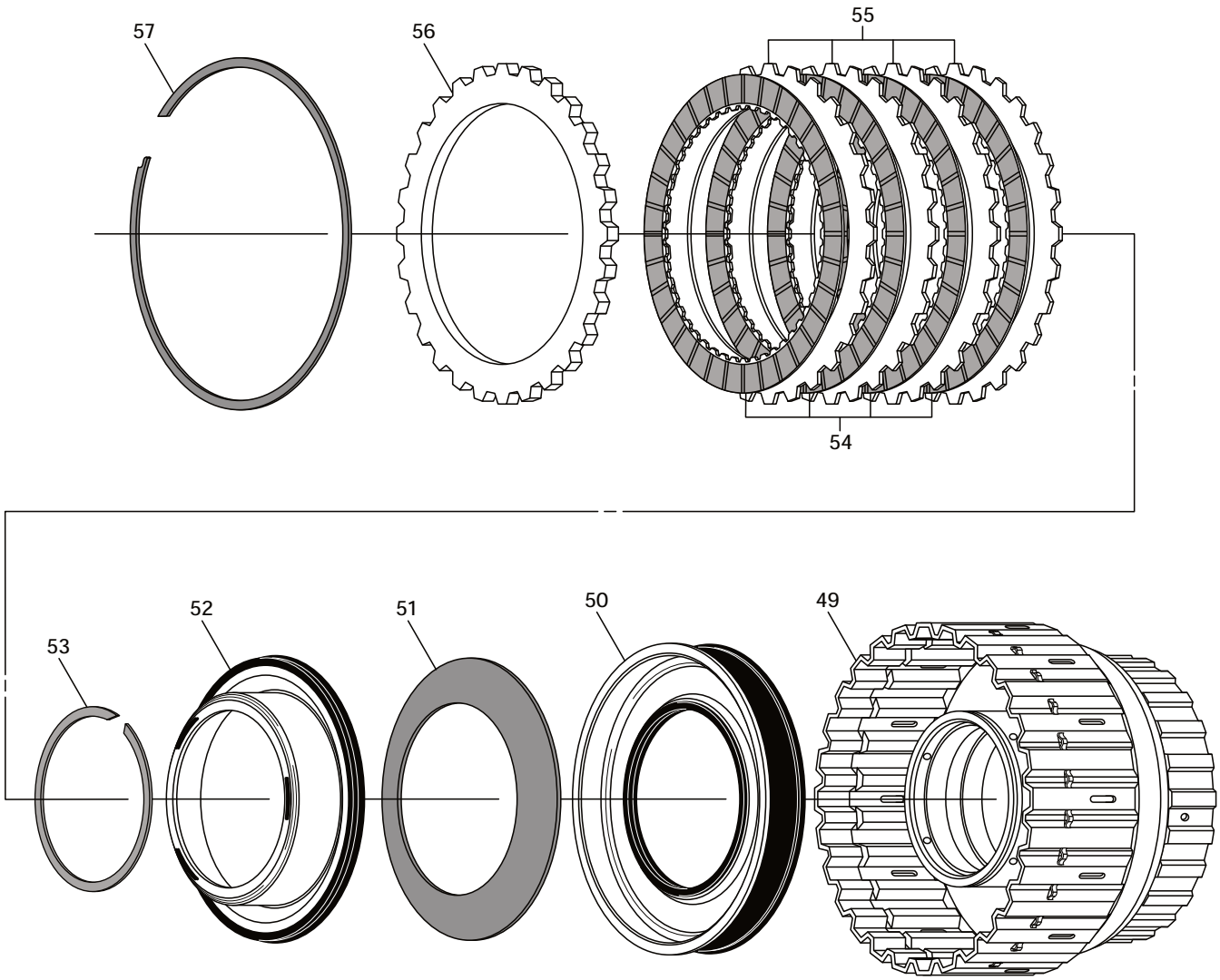
COMPONENT REBUILD

DIRECT CLUTCH HOUSING

1. Disassemble the direct clutch housing using Figure 131 as a guide.
2. Inspect all direct clutch parts thoroughly for any wear and/or damage, replace as necessary.
3. Clean all direct clutch parts thoroughly and dry with compressed air.

Direct Clutch Housing
Continued on Page 82

DIRECT CLUTCH HOUSING EXPLODED VIEW



49 DIRECT CLUTCH HOUSING ASSEMBLY
50 DIRECT CLUTCH APPLY PISTON
51 DIRECT CLUTCH PISTON "BELLVILLE" RETURN SPRING
52 DIRECT CLUTCH BALANCE PISTON
53 DIRECT CLUTCH BALANCE PISTON SNAP RING
54 DIRECT CLUTCH FRICTION PLATES (4)
55 DIRECT CLUTCH STEEL PLATES (4)
56 DIRECT CLUTCH BACKING PLATE
57 DIRECT CLUTCH BACKING PLATE SNAP RING *(SELECTIVE)*

Figure 131

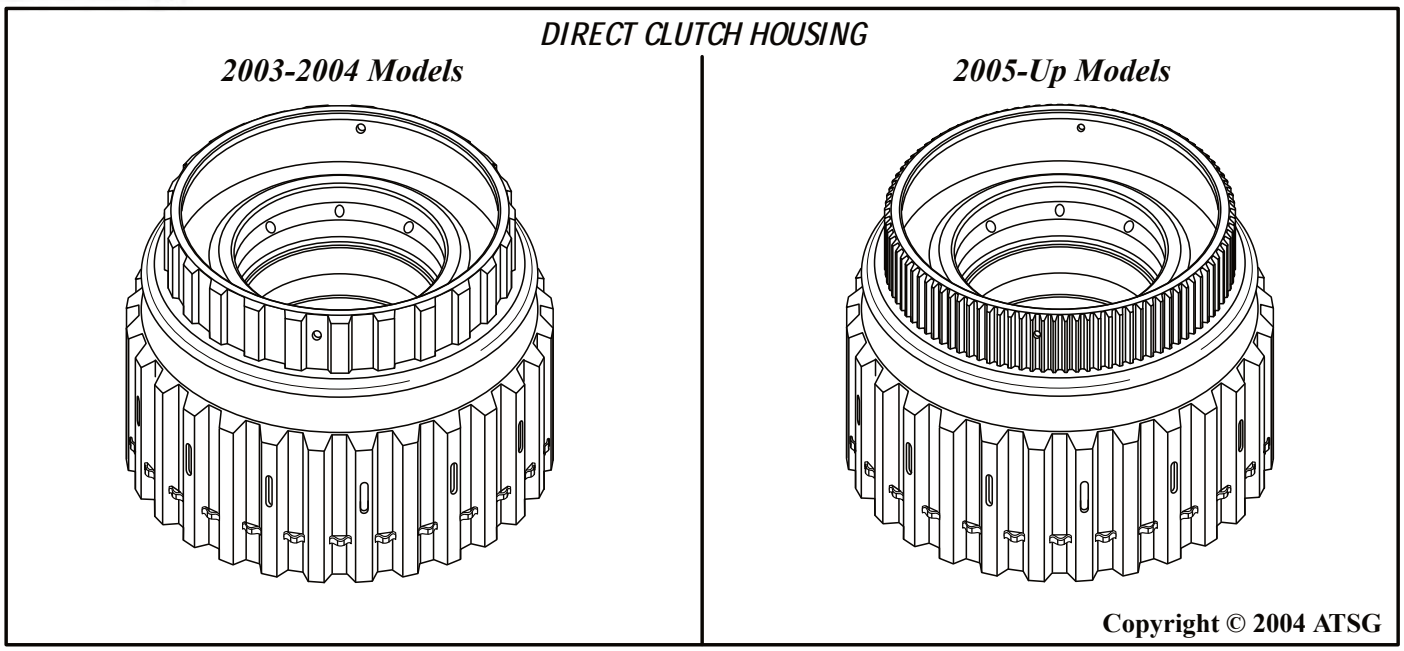


Figure 132

DIRECT CLUTCH HOUSING DIFFERENCES

NOTICE: At start of production for 2005 model, Ford Motor Co. changed the tooth count on the intermediate friction plates, as shown on Page 73 in Figure 116. This required the direct clutch housing change, as shown in Figure 132, to accommodate the new intermediate frictions.

COMPONENT REBUILD

DIRECT CLUTCH HOUSING

4. Place the direct clutch housing on a flat work surface, as shown in Figure 133.
   Note: Ensure that you have the proper direct clutch housing for the model that you are rebuilding (See Figure 132)
5. Lubricate both inner and outer seal surfaces on the new direct clutch piston with Trans-Jel®.
6. Install the direct clutch piston into the direct clutch housing, as shown in Figure 133, using a slight twisting motion.

Continued on Page 83

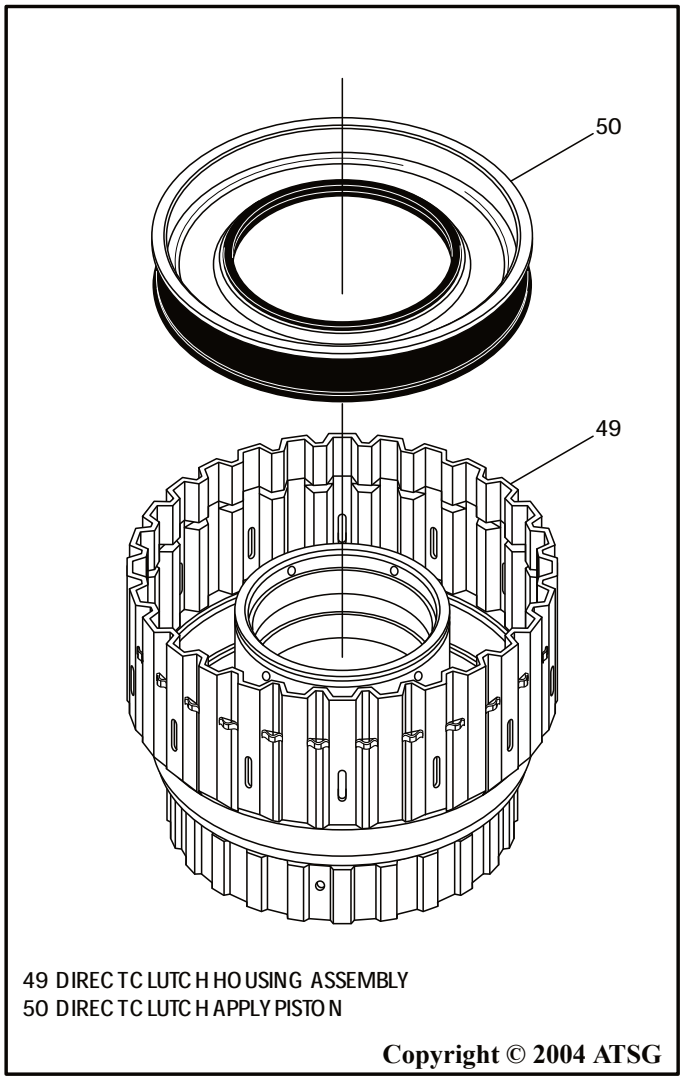
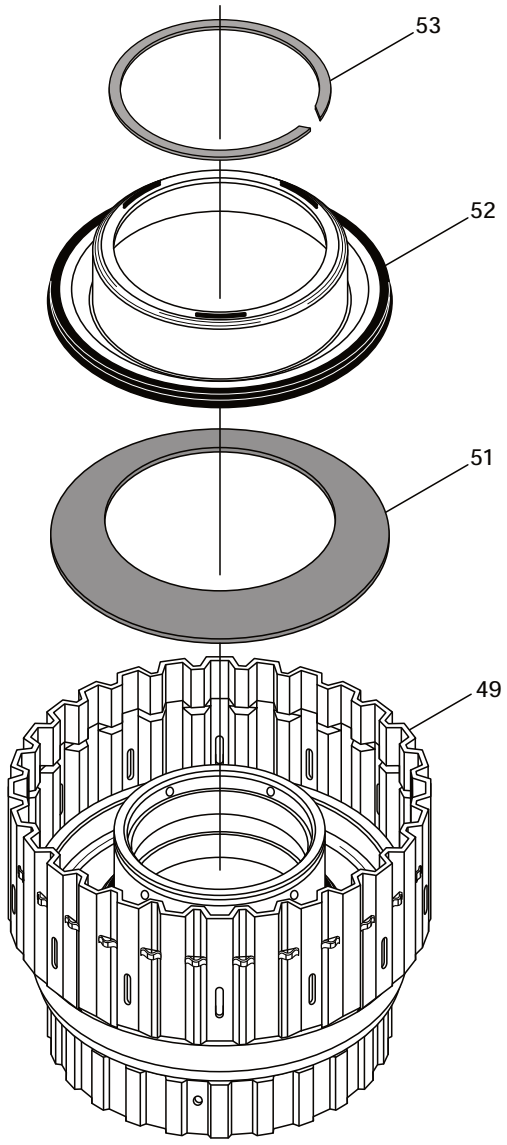


Figure 133

DIRECT CLUTCH HOUSING (CONT'D)

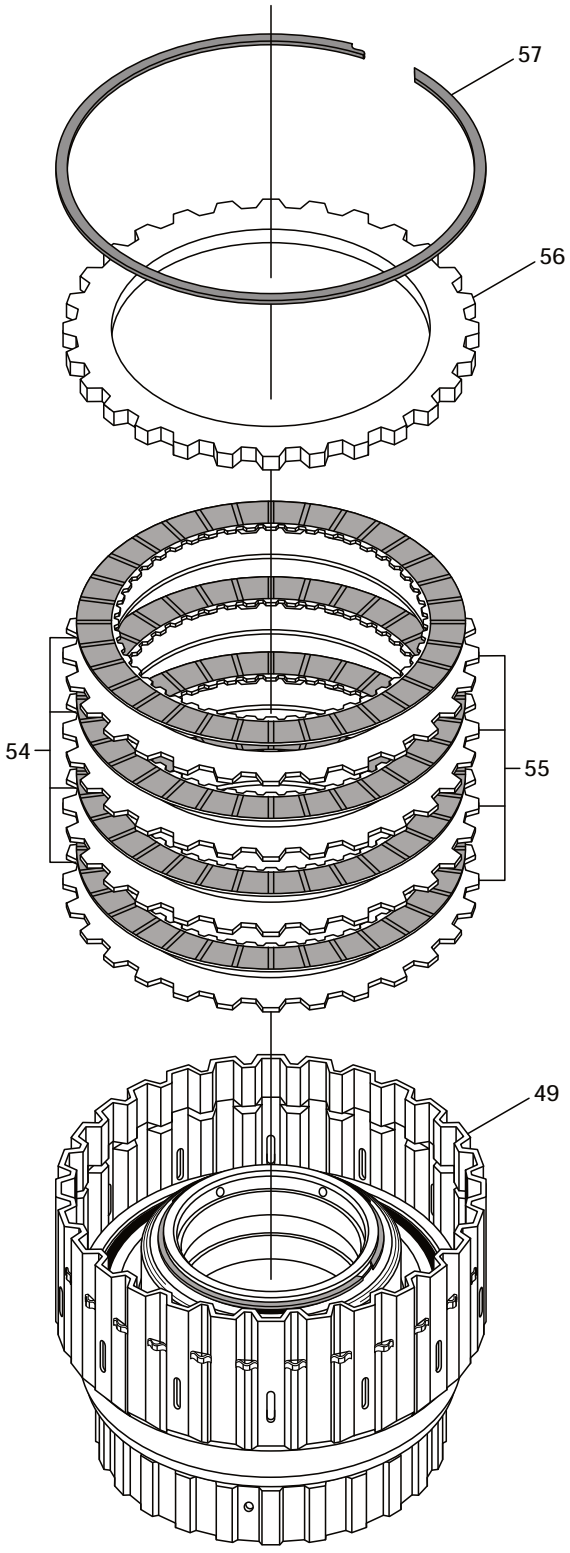
7. Install direct clutch piston "Bellville" return spring on top of the direct clutch piston in the direction shown in Figure 134.
8. Lubricate the seal and install the direct clutch balance piston, as shown in Figure 134.
9. Compress the return spring and balance piston and install snap ring (See Figure 134).
10. Install 4 steel plates and 4 friction plates in the order shown in Figure 135.
11. Install the direct clutch backing plate and the selective snap ring, as shown in Figure 135.

Continued on Page 84



49 DIRECTCLUTCH HOUSING ASSEMBLY
51 DIRECTCLUTCH PISTON "BELLVILLE" RETURN SPRING
52 DIRECTCLUTCH BALANCE PISTON
53 DIRECTCLUTCH BALANCE PISTON SNAP RING

Figure 134



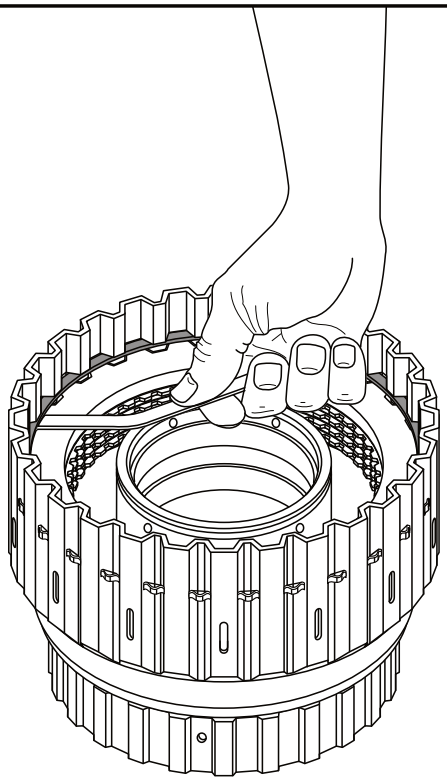
49 DIRECTCLUTCH HOUSING ASSEMBLY
54 DIRECTCLUTCH FRICTION PLATES (4)
55 DIRECTCLUTCH STEEL PLATES (4)
56 DIRECTCLUTCH BACKING PLATE
57 DIRECTCLUTCH BACKING PLATE SNAP RING *(SELECTIVE)*

Figure 135

COMPONENT REBUILD

DIRECT CLUTCH HOUSING (CONT'D)

12. Tap the clutch pack side of completed direct clutch housing against the flat work surface to fully seat the snap ring to top of the groove.
13. Check the direct clutch clearance using feeler gauge, as shown in Figure 136, between the backing plate and the snap ring.
14. The direct clutch clearance should measure; 1.14 - 2.06 mm (.045" - .081"), as shown in Figure 136.
15. Change the selective backing plate snap ring as necessary to obtain the proper clearance.
16. Set the completed direct clutch housing aside for the final drum assembly process.



Direct Clutch Clearance Should Be: 1.14 - 2.06 mm (.045" - .081")

Figure 136

COMPONENT REBUILD

FORWARD PLANETARY SYSTEM

1. Disassemble the forward planetary carrier parts using Figure 137 or 138 as a guide.
2. Inspect all forward planetary carrier parts thoroughly for any wear and/or damage.
3. Clean all forward planetary carrier parts and dry with compressed air.

Forward Planetary Carrier Sub Assembly

Continued on Page 86

FORWARD PLANETARY SYSTEM DIFFERENCES

NOTICE: Beginning at start of production for 2005 models, Ford Motor Co. redesigned the forward planetary system for increased durability. The 2003/2004 version is shown in Figure 137, and the 2005 version is shown in Figure 138, and the differences are as follows:

- ***1. Forward Planetary Carrier.***
  - ***Increased Overall Diameter and Height.***
  - ***Increased Pinion Gear Height.***
  - ***Increased Pinion Pin Diameter.***
- ***2. Forward Planetary Carrier Lube Dam.***
  - ***Increased Diameter.***
  - ***4 Tabs Instead of 6.***
- ***3. Number 11 Thrust Bearing.***
  - ***Decreased Diameter.***
- ***4. Forward Internal Ring Gear.***
  - ***Increased Overall Diameter and Height.***
  - ***Different Tooth Count For Forward Plates.***
- ***5. Number 10 Thrust Washer.***
  - ***Increased Diameter.***
  - ***Different Tab Configuration.***

All of these changes are illustrated in Figure 137 and Figure 138.

2003/2004 MODELS

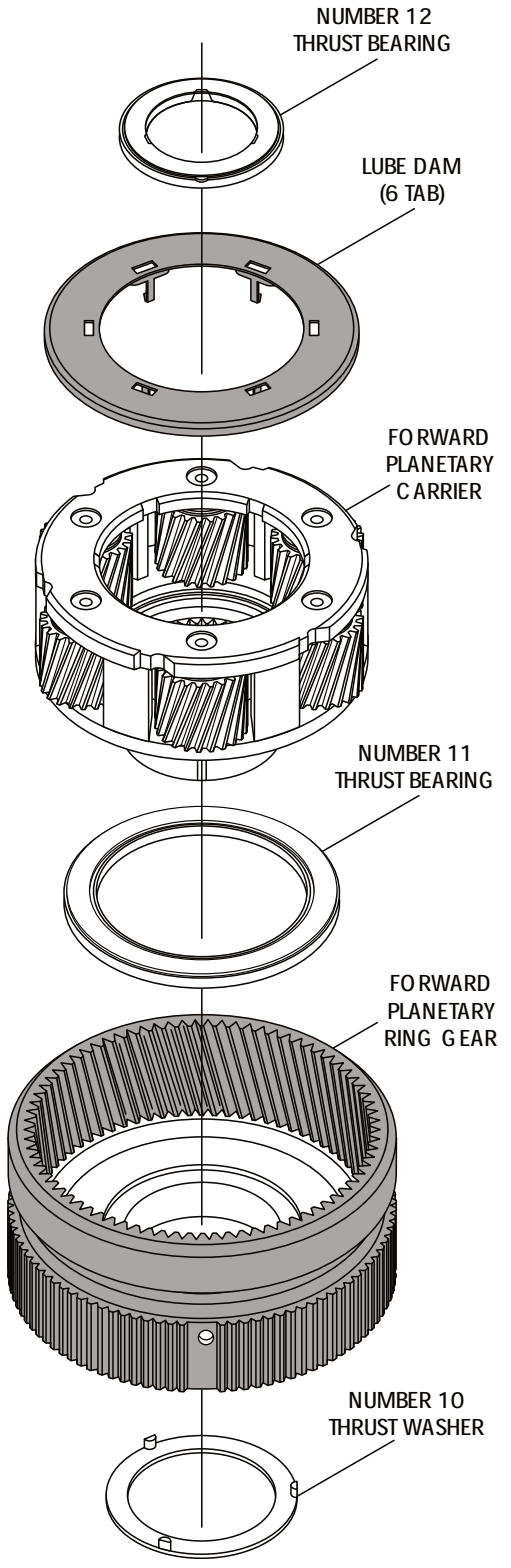


Figure 137

2005/UP MODELS

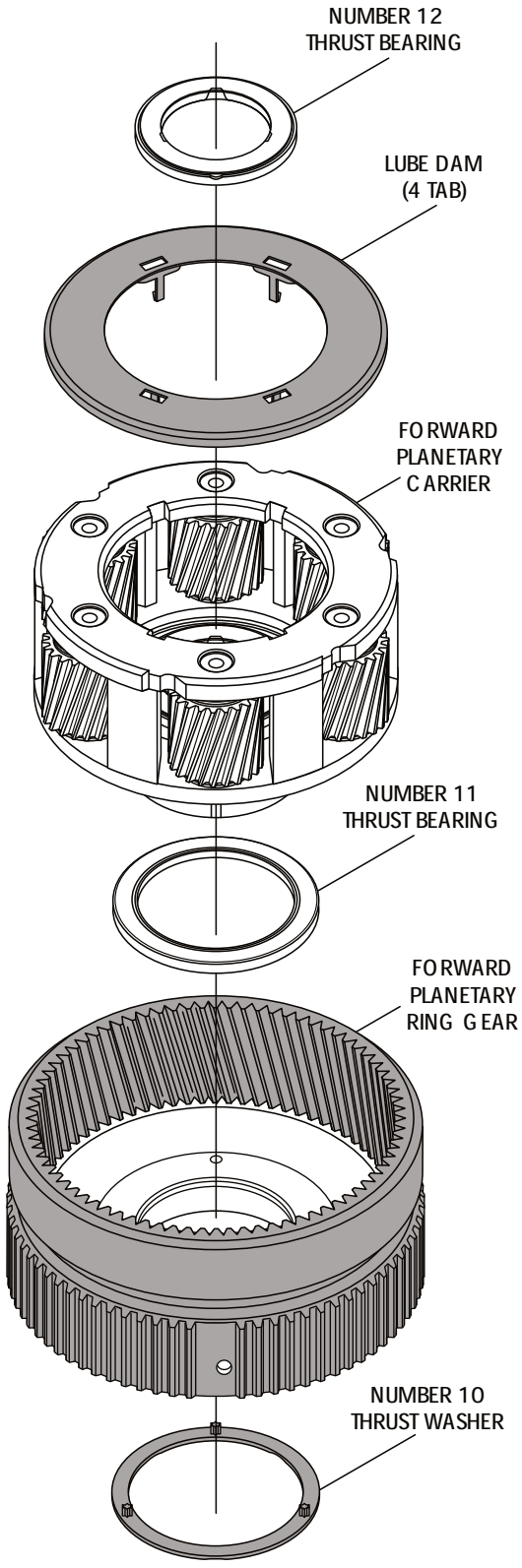


Figure 138

COMPONENT REBUILD
FORWARD PLANETARY SYSTEM (CONT'D)

4. Ensure that you have the proper parts for the model that you are rebuilding.
5. Check forward planetary carrier pinion end play, as shown in Figure 139, and replace the planetary carrier as necessary.
6. If removed, install the proper forward planetary lube dam, as shown in Figure 140, and ensure that all tabs are snapped into position.
7. Install the number 12 thrust bearing into the forward planetary carrier, in the direction that is shown in Figure 140.
   Note: The number 12 thrust bearing is the same on both models, did not change.

Continued on Page 87

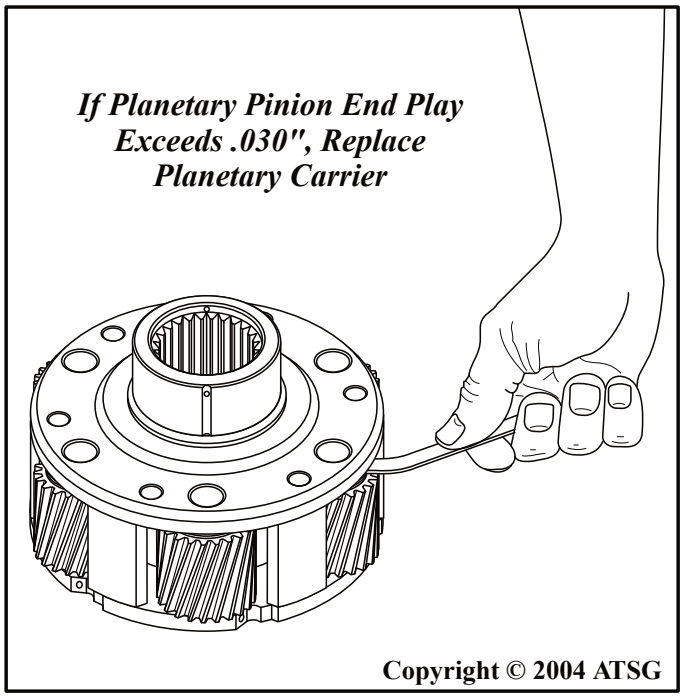


Figure 139

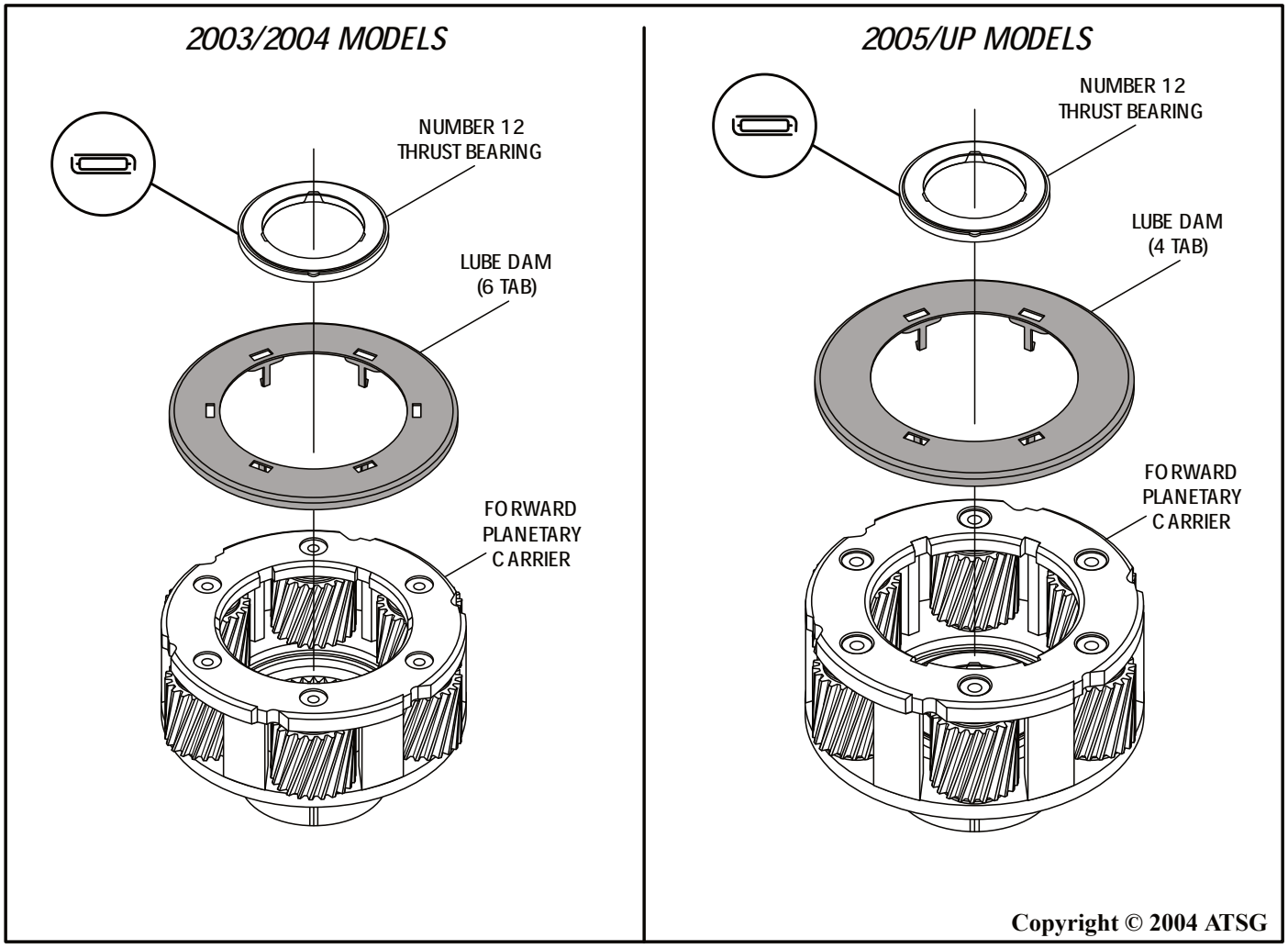


Figure 140

COMPONENT REBUILD
FORWARD PLANETARY SYSTEM (CONT'D)

8. Install the proper number 11 thrust bearing in the direction shown in Figure 141, and retain with liberal amount of Trans-Jel®.
9. Install the proper number 10 thrust washer onto the forward ring gear, as shown in Figure 142, with Trans-Jel®.
10. Set the completed forward planetary carrier and the completed forward ring gear aside for the drum assembly process.
11. We are now ready to assemble the drums and and front gear train, but first look at the sun shell differences on Page 89.

Continued on Page 90

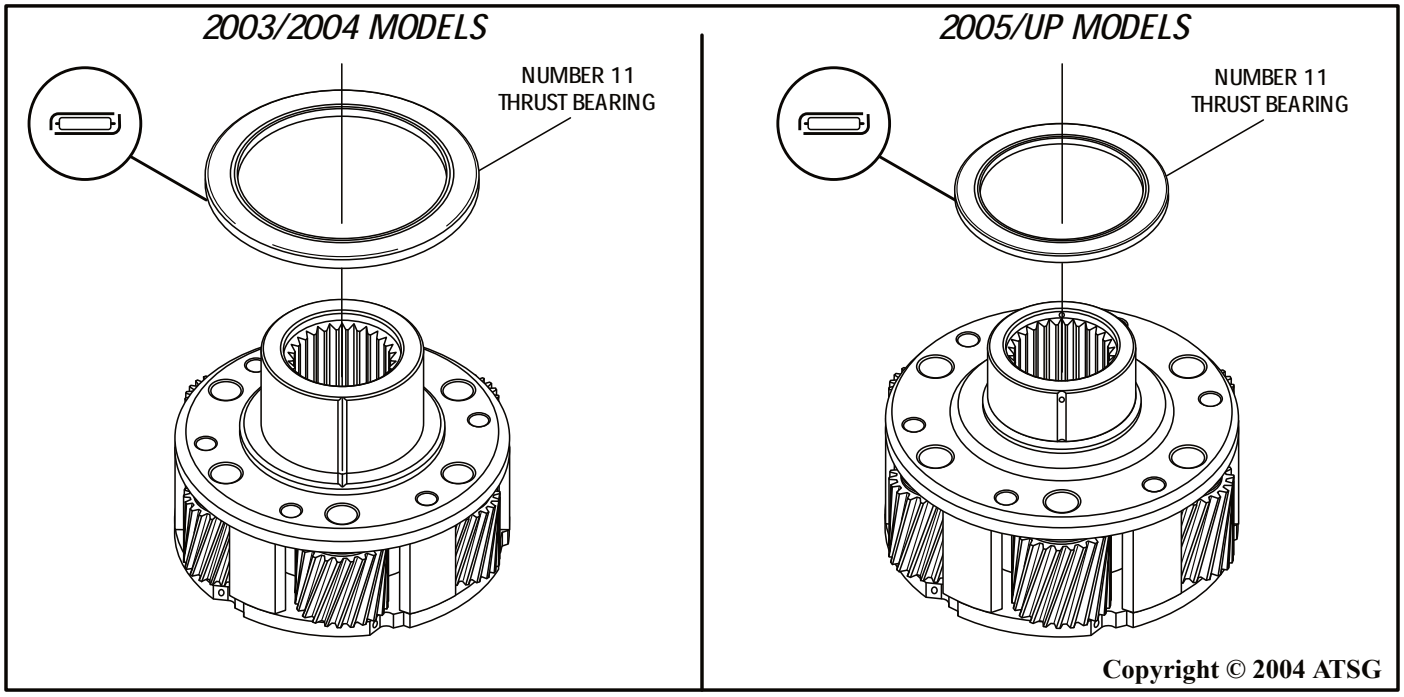


Figure 141

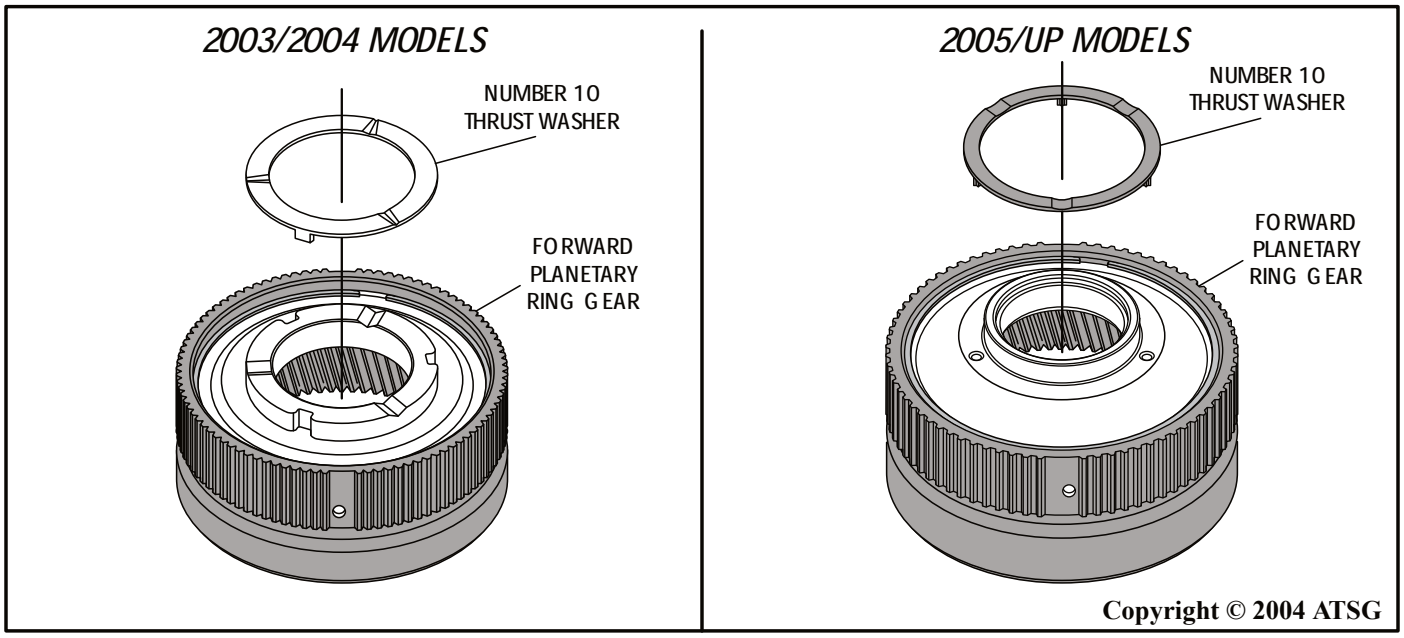


Figure 142

DRUM AND GEAR TRAIN ASSEMBLIES EXPLODED VIEW

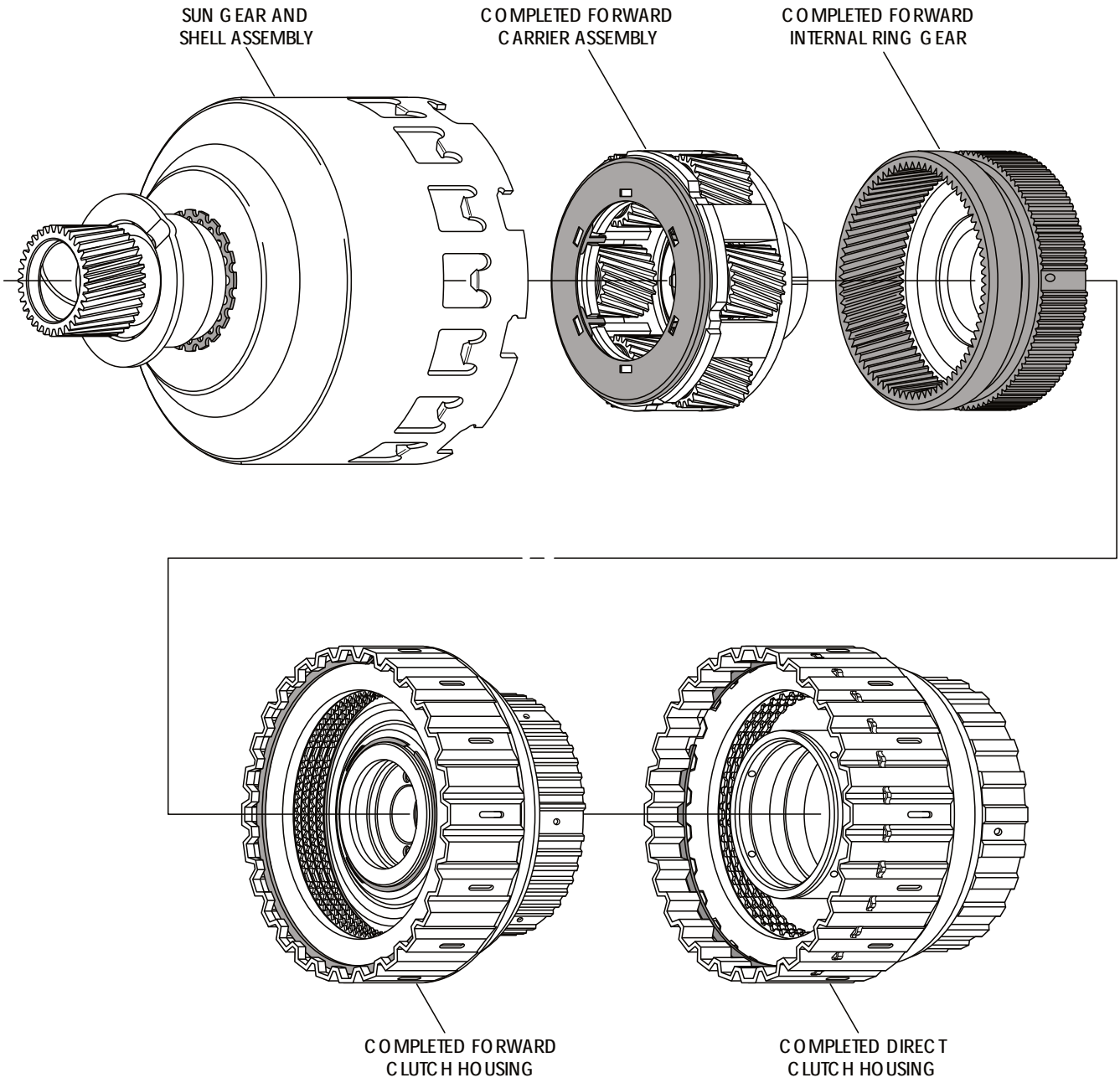


Figure 143

COMPONENT REBUILD

SUN SHELL DIFFERENCES

NOTICE: The sun gear and shell also changed at the start of production for 2005 models so that it would be compatable with the new forward carrier and the visual differences are as follows.

1. ***Looking at the front of the sun shell assembly it is obvious that the sun gear is larger, and tooth count has been increased to 55 teeth, as shown in Figure 144.***
2. ***Looking at the back of the sun shell assembly you cannot see the retaining snap ring and the bearing support that is pressed onto the sun gear is different configuration, as shown in Figure 144.***
3. ***Setting side by side the 2005 version of the sun shell assembly is approximately 1/8" taller than the 2004 version, as shown in Figure 144.***

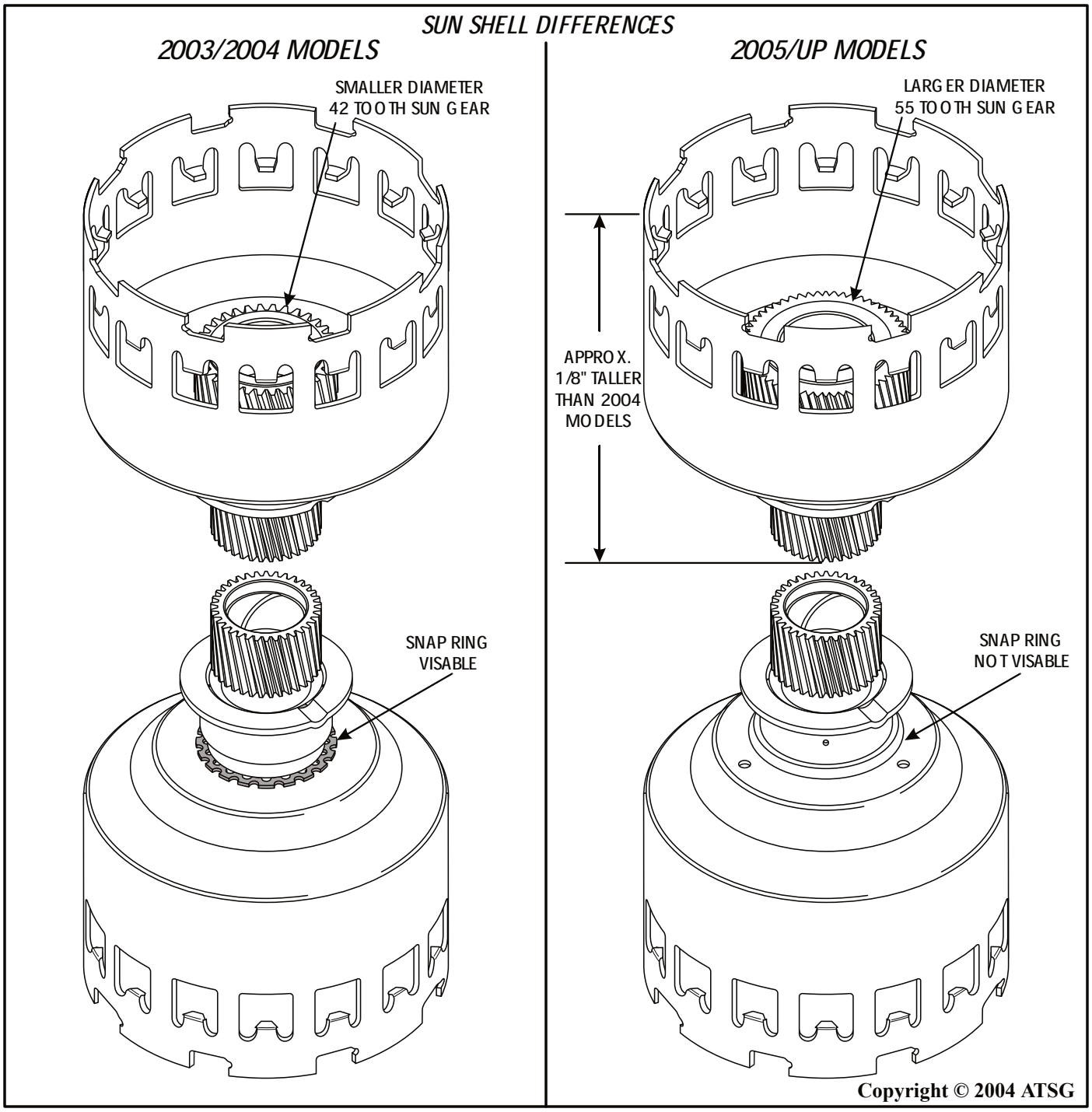


Figure 144

COMPONENT REBUILD

DRUM AND SUN GEAR SHELL ASSEMBLY

1. Place the completed direct clutch housing on a flat work surface, as shown in Figure 145.
2. Install the completed forward clutch housing assembly, as shown in Figure 145, by rotating back and forth until fully seated and all direct clutch plates engaged on hub.
   Note: Ensure that number 7 thrust washer and number 8 thrust bearing are still in place with the Trans-Jel®, before installing.
3. Ensure that the number 9 thrust bearing is still in place, as shown in Figure 146.
4. Install completed forward ring gear assembly, as shown in Figure 146, by rotating back and forth to engage the forward clutch frictions, until fully seated.
   Note: Ensure that number 10 thrust washer is still in place before installing.

Continued on Page 91

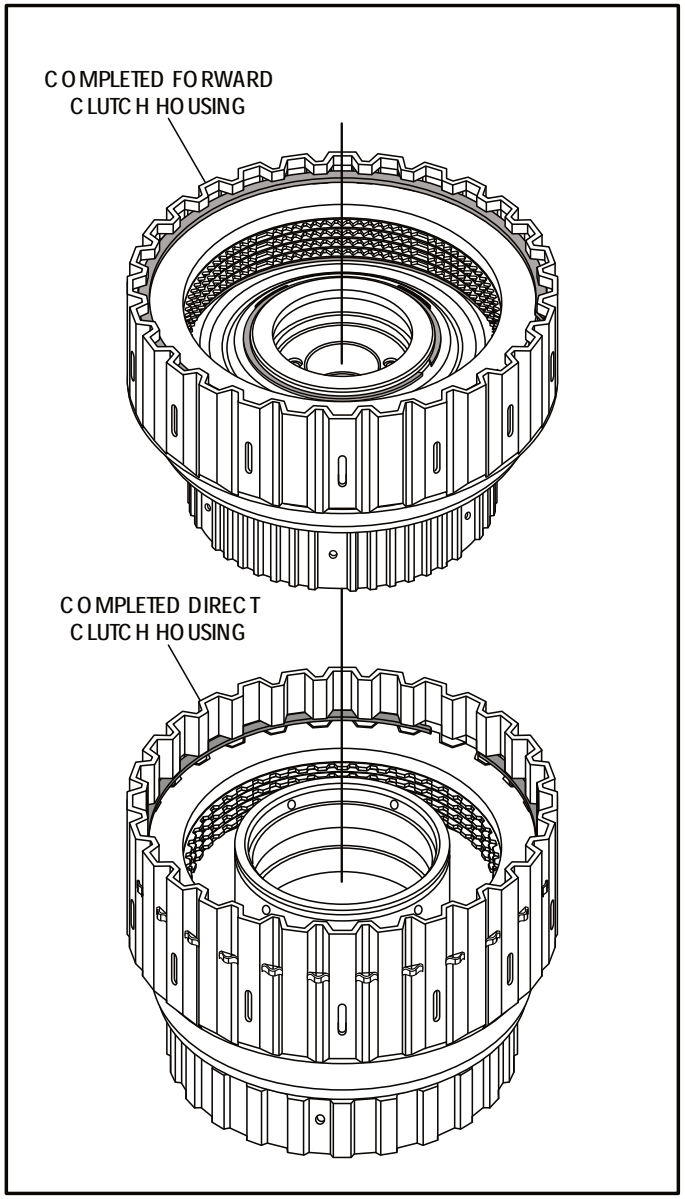


Figure 145

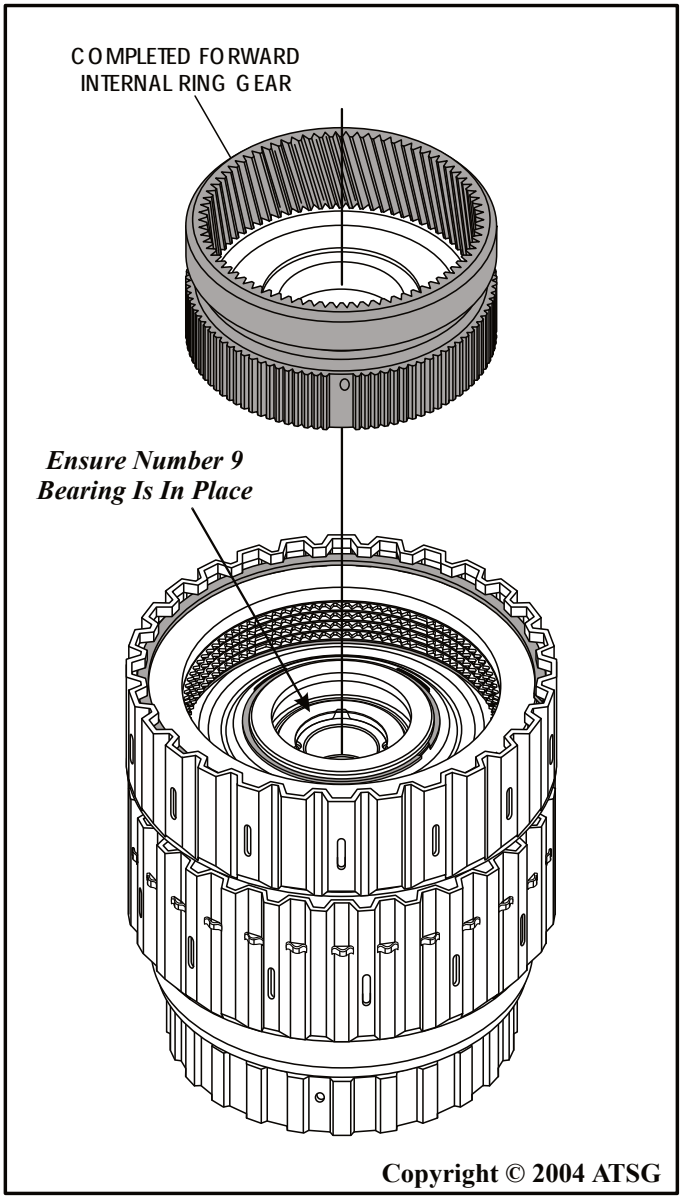


Figure 146

COMPONENT REBUILD
DRUM AND SUN GEAR SHELL ASSEMBLY (CONT'D)

5. Install the completed forward planetary carrier, as shown in Figure 147, by rotating into the ring gear until fully seated.
   Note: Ensure that number 11 bearing is still in place before installing carrier.
6. Install the proper sun gear and shell assembly, as shown in Figure 148, by rotating back and forth until fully seated.
   Note: Ensure that number 12 thrust bearing is in place, as shown in Figure 148, before installing sun shell.

Continued on Page 92

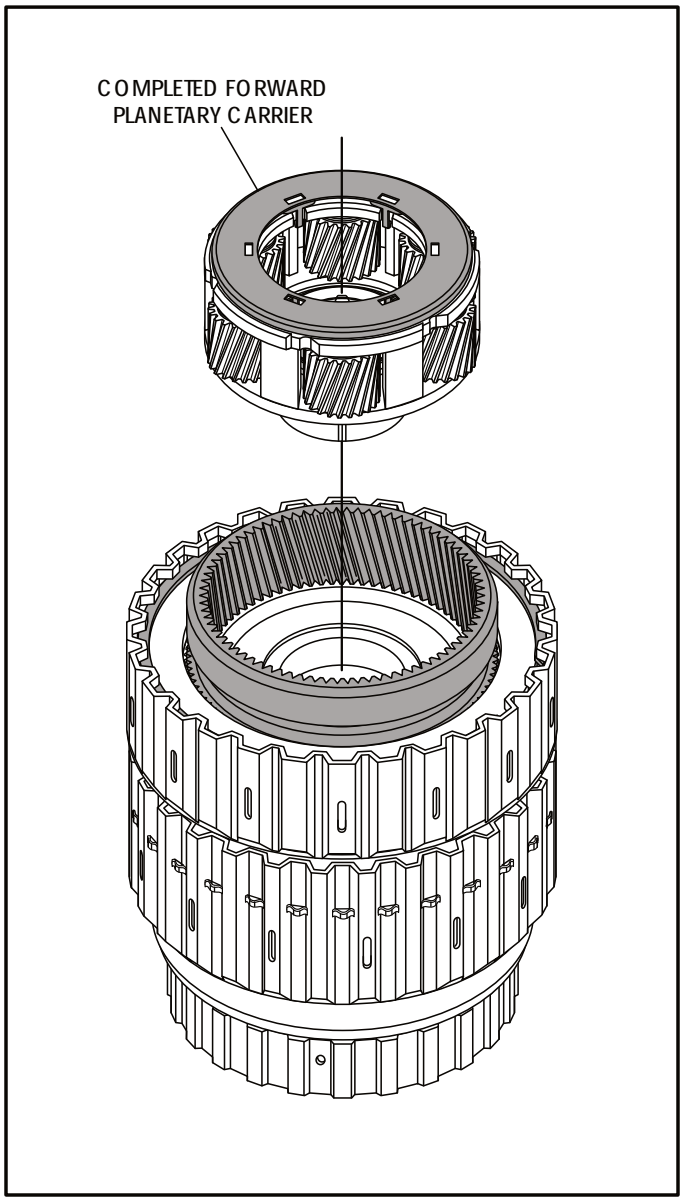


Figure 147

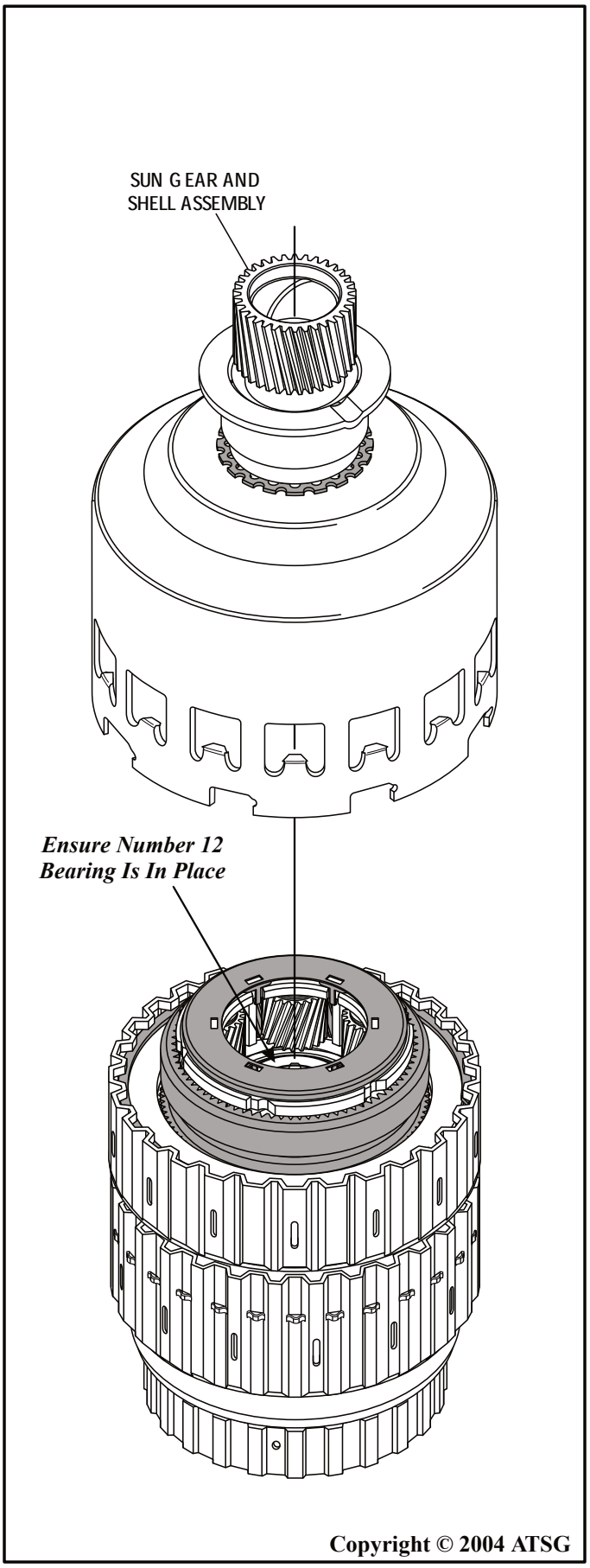
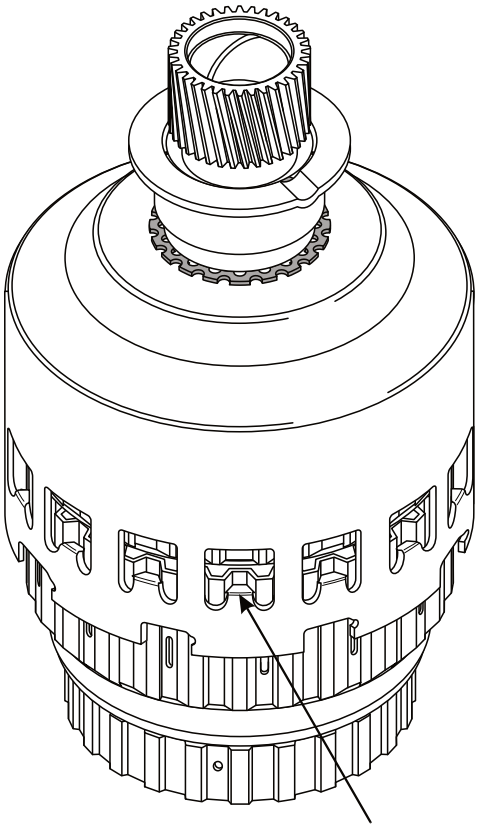


Figure 148

COMPONENT REBUILD
DRUM AND SUN GEAR SHELL ASSEMBLY (CONT'D)

7. Ensure that sun gear shell tabs are engaged in the slots of the direct clutch housing, as shown in Figure 149.
8. While holding the assembly together, turn it over so that the assembly is setting on the sun gear, as shown in Figure 150.
9. Install special tools 307-436 and 307-436-01, as shown in Figure 150.
10. Set the completed drum and sunshell assembly aside for the final assembly process.

Continued on Page 93



Ensure that sun shell "Tabs" are engaged into direct clutch housing slots, as shown above.

Figure 149

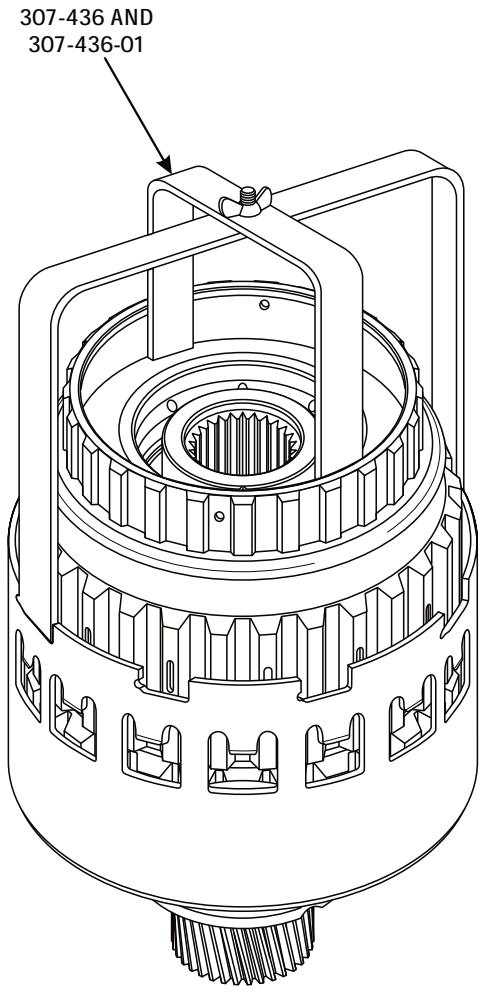
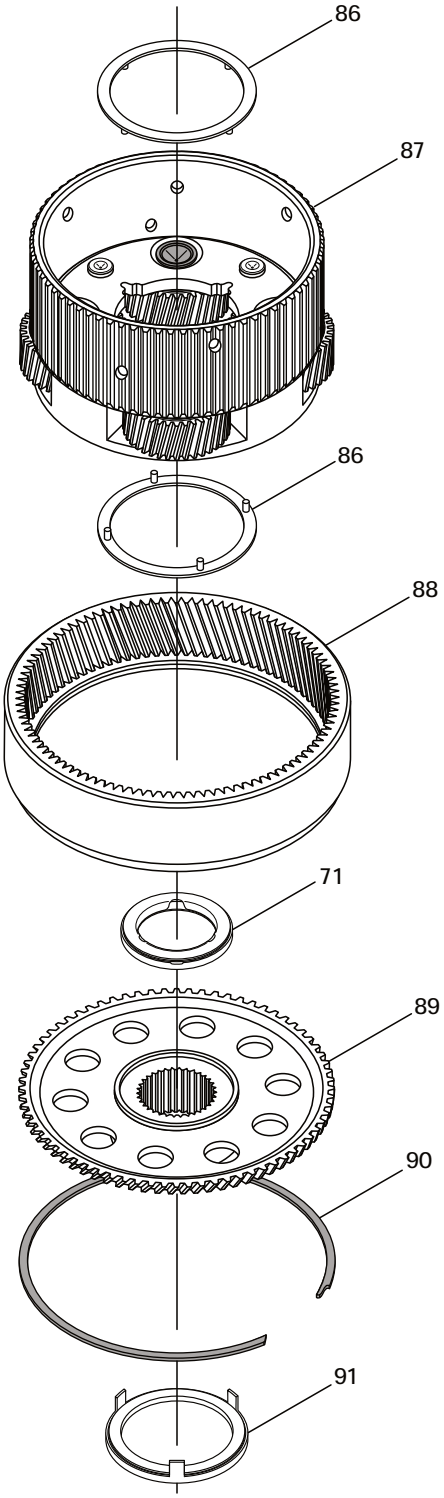


Figure 150

REAR PLANET EXPLODED VIEW



71 NUMBER 15 THRUST BEARING ASSEMBLY
86 NUMBER 13 AND 14 REAR CARRIER THRUST WASHERS
87 REAR PLANETARY CARRIER ASSEMBLY
88 REAR PLANETARY CARRIER INTERNAL RING GEAR
89 REAR PLANETARY CARRIER INTERNAL RING GEAR HUB
90 REAR PLANETARY CARRIER RING GEAR HUB SNAP RING
91 NUMBER 16 THRUST BEARING ASSEMBLY

Figure 151

COMPONENT REBUILD

REAR PLANETARY CARRIER

1. Disassemble rear planetary carrier parts using Figure 151 as a guide.
2. Inspect rear planetary carrier parts thoroughly for any wear and/or damage, and replace as necessary
   Note: There is a new design rear planetary carrier available that has a 2005 part number. Refer to Figure 153 for identification and the new part number. "DO NOT" use "Any" previous design carriers, even if they look good and serviceable.
3. Place the rear planetary carrier on a flat work surface, as shown in Figure 152.
4. Check rear planetary carrier pinion end play using a feeler gauge, as shown in Figure 152.
5. If planetary pinion end play exceeds .030", replacement is necessary.

Continued on Page 94

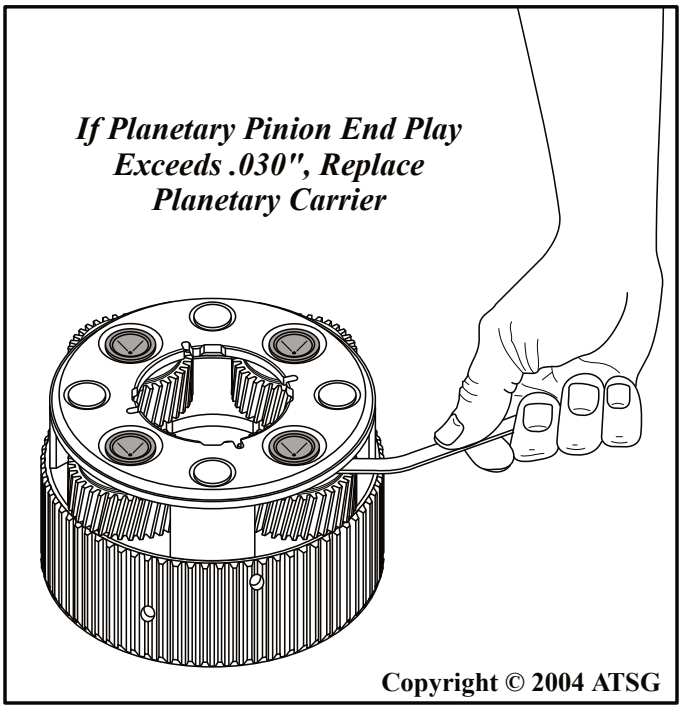
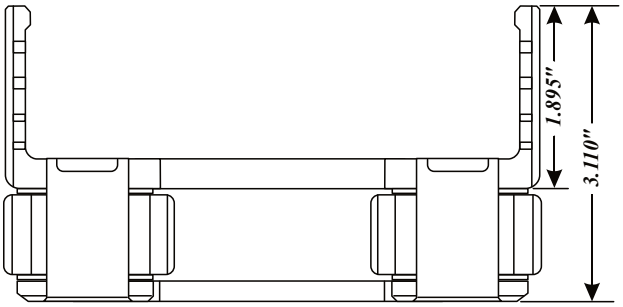


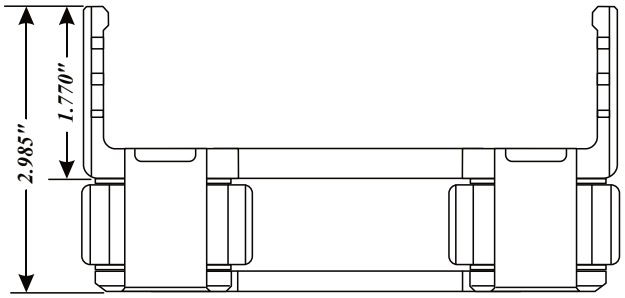
Figure 152

2003/2004 MODEL
"1ST DESIGN"
REAR PLANETARY CARRIER



"DO NOT USE"

2005/UP MODEL
"2ND DESIGN"
REAR PLANETARY CARRIER



PART NUMBER
5C3Z-7DOO6-AB

Figure 153

COMPONENT REBUILD

REAR PLANETARY CARRIER DIFFERENCES

NOTICE: The rear planetary carrier assembly has changed for the 2005 production year because of pinion shafts "walking" in the carrier. The new design rear planetary carrier has a staking process change for the pinion pins to prevent them from "walking" out of the carrier assembly which greatly improves durability and reliability. There have also been some dimensional changes which helps us for identification. The overall height of the carrier has been reduced by .125" (1/8"), as shown in Figure 153. The splines for the low/reverse frictions have also been shortened by .125" (1/8"), as shown in Figure 153.

INTERCHANGEABILITY:

The new design planetary carrier "Will" retro-fit back on all model years, and is required on any rebuild that has the previous design parts.
Note: "Do Not" reuse "Any" previous design rear planetary carriers.

COMPONENT REBUILD

REAR PLANETARY CARRIER (CONT'D)

6. Install the number 13 thrust washer on the rear planetary carrier, as shown in Figure 154, and retain with Trans-Jel®.
   Note: If thrust washers are damaged because of previous carrier damage, use OEM part number 3C3Z-7A166-A

Continued on Page 95

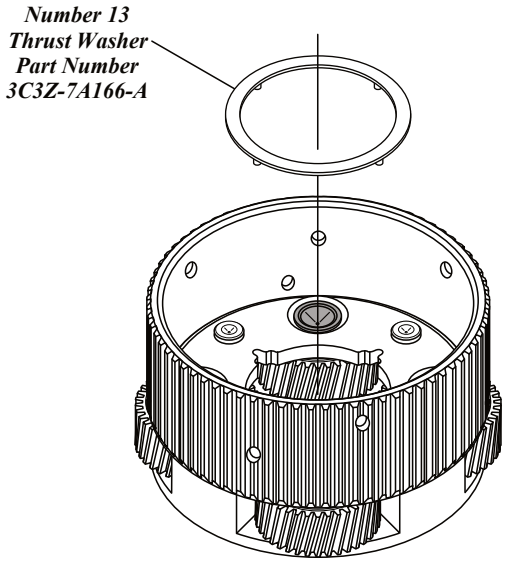


Figure 154

COMPONENT REBUILD
REAR PLANETARY CARRIER (CONT'D)

7. Install the number 14 thrust washer on the rear planetary carrier, as shown in Figure 155, and retain with Trans-Jel®.
8. If necessary disassemble the rear planetary ring gear using Figure 156 as a guide.
   Note: The rear planetary ring gear hub also received a design change for the 2005 model year. The new design has the holes removed from the center, as shown in Figure 156.

Continued on Page 96

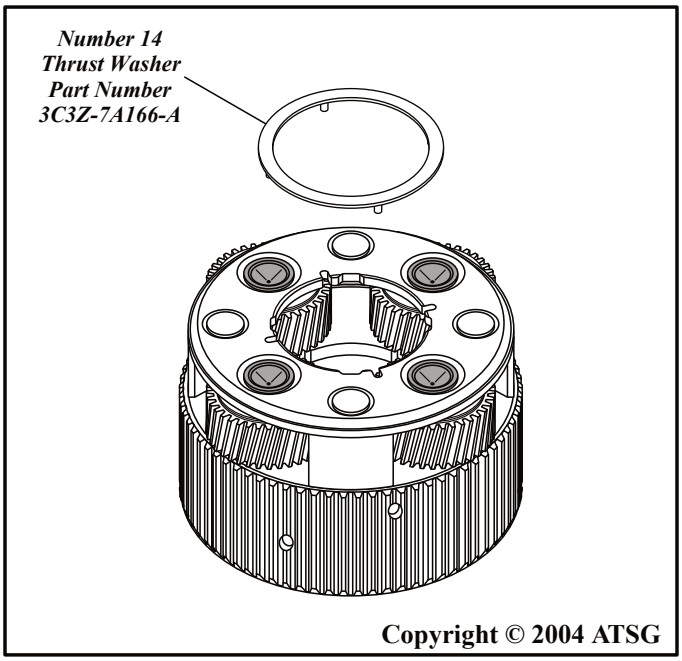


Figure 155

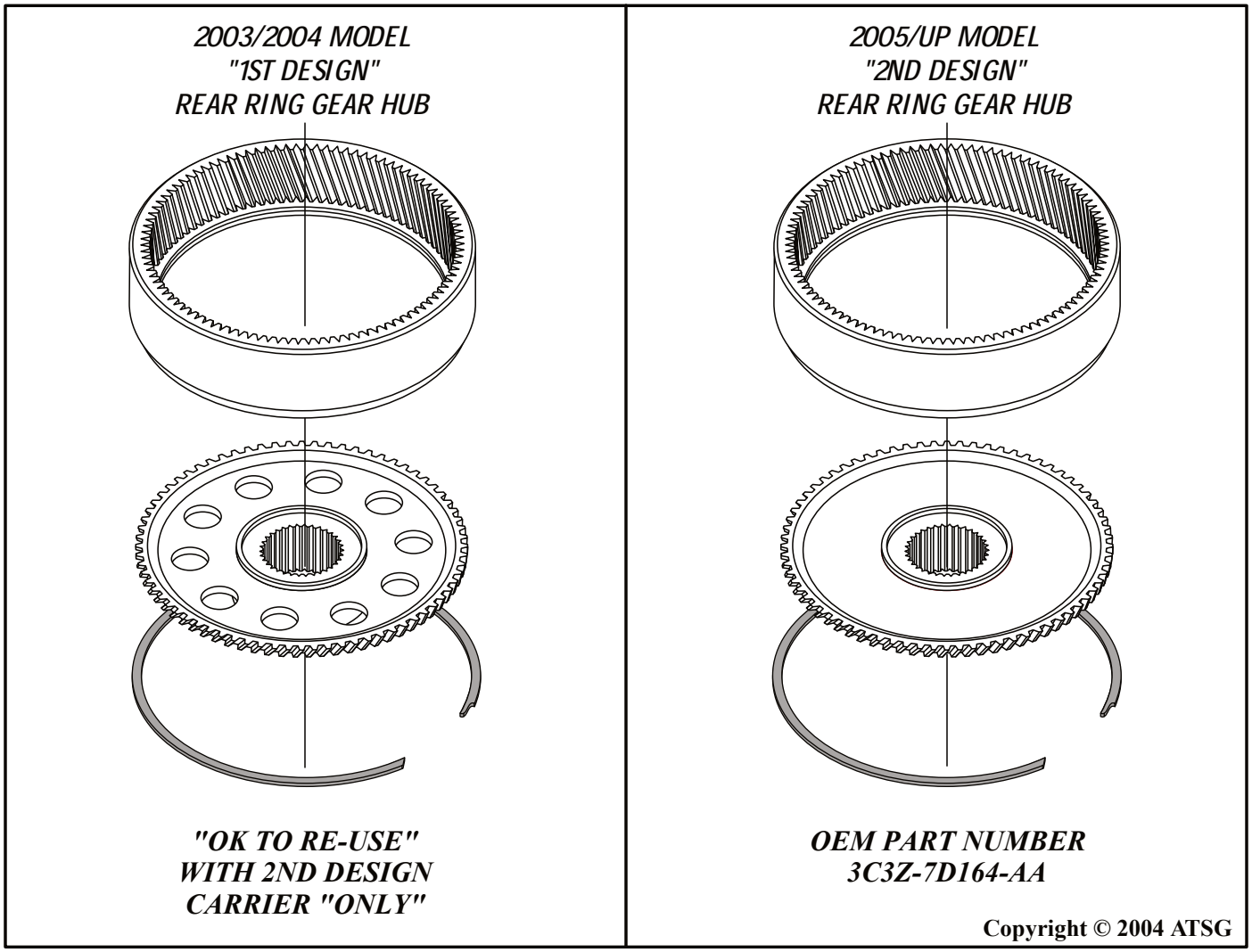


Figure 156

COMPONENT REBUILD
REAR PLANETARY CARRIER (CONT'D)

9. Assemble the ring gear hub to the ring gear and install the snap ring, as shown in Figure 157.
10. Install number 15 thrust bearing in direction shown in Figure 158, and retain with a small amount of Trans-Jel®.
11. Install number 16 thrust bearing in direction shown in Figure 159, and retain with a small amount of Trans-Jel®.
12. Set the completed rear planetary carrier and the completed rear ring gear aside for the final assembly process.

COMPONENT REBUILD
Continued on Page 97

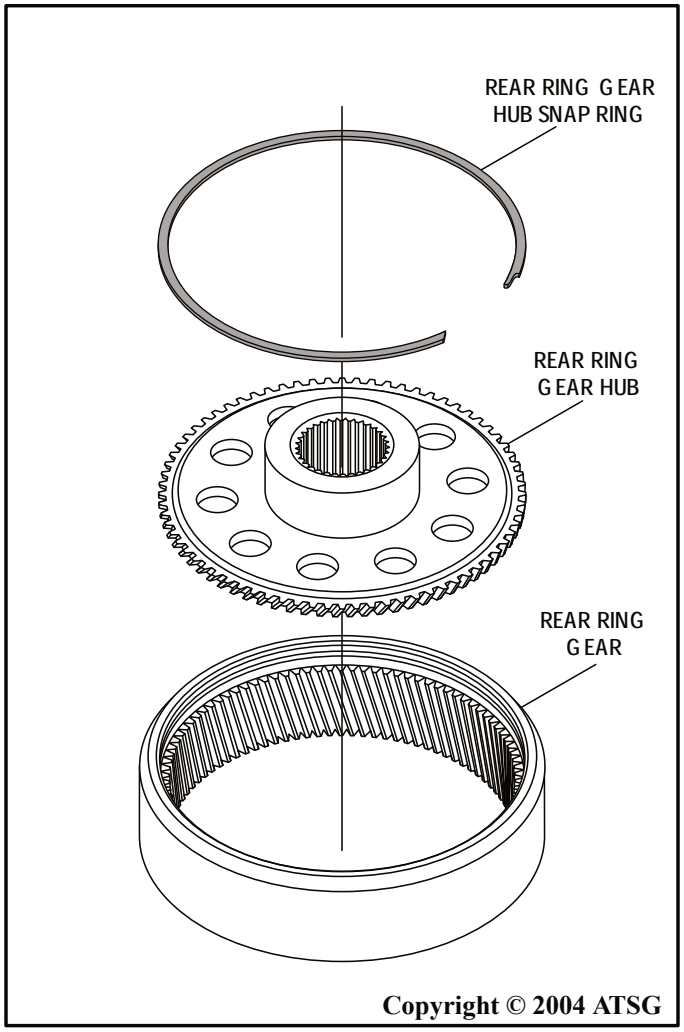


Figure 157

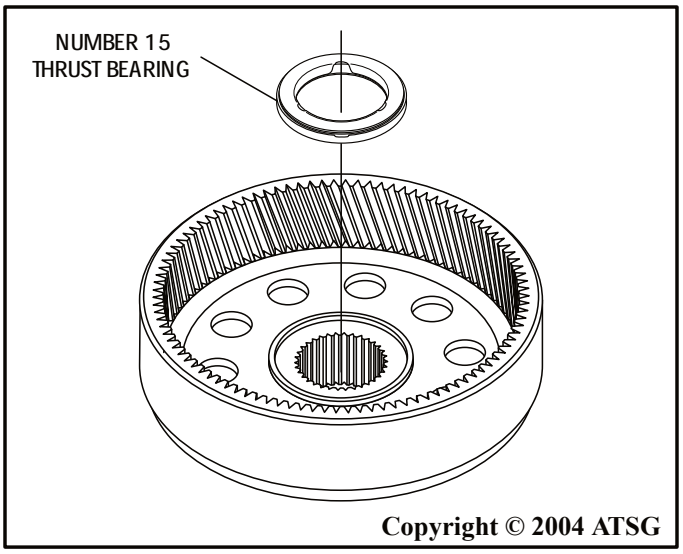


Figure 158

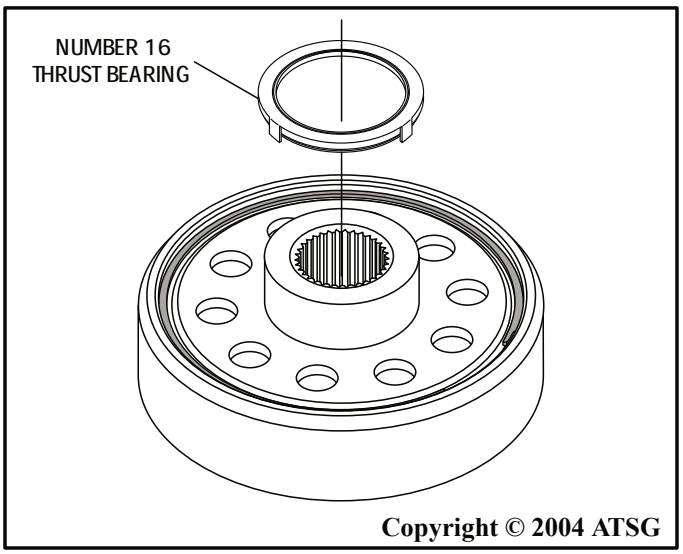


Figure 159

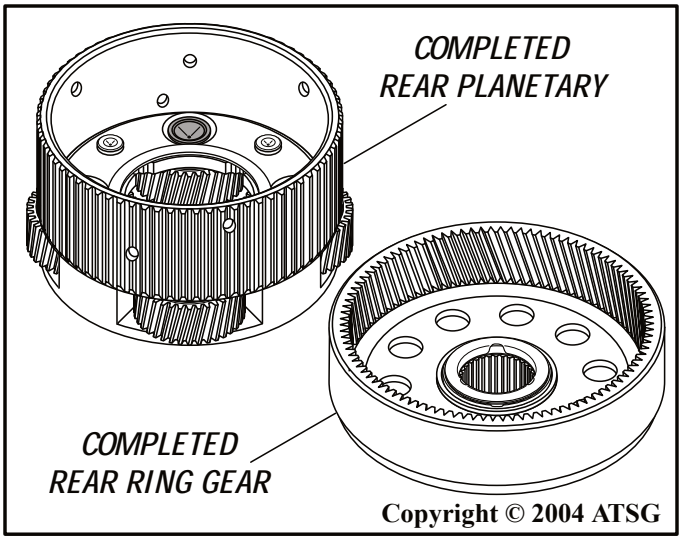


Figure 160

COMPONENT REBUILD

LOW ONE WAY CLUTCH DIODE ASSEMBLY

1. The low diode assembly received a material change on all pieces of the diode assembly and a small "Dimple" was added to one tooth of the inner race for identification (See Figure 162). ***Note: "Do Not" install any low diode that does not have the dimple on one tooth.***
2. Check the low diode for proper operation, as shown in Figure 161. ***Note: Low diode inner race should freewheel Clockwise and lock Counter-Clockwise while holding the outer race.***
3. Set the low diode assembly aside for the final assembly process.

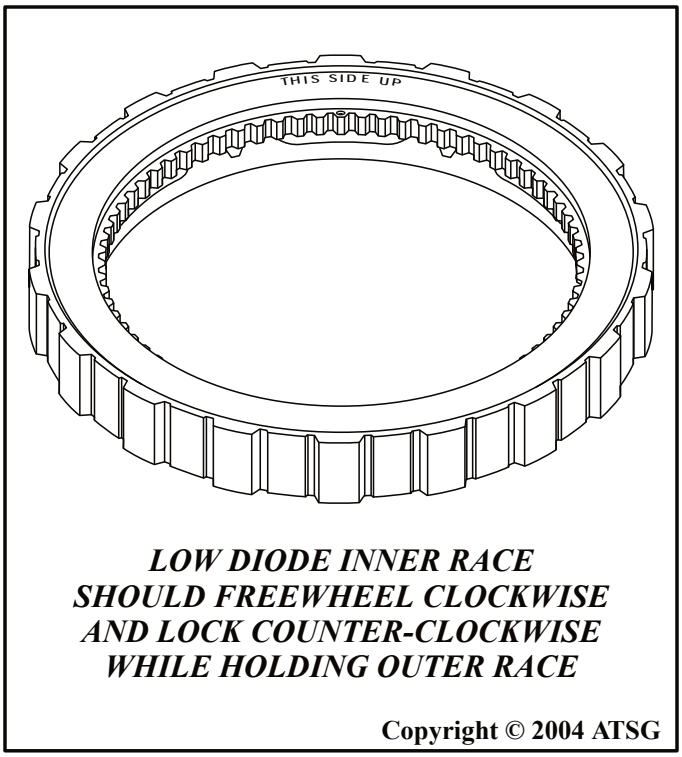


Figure 161

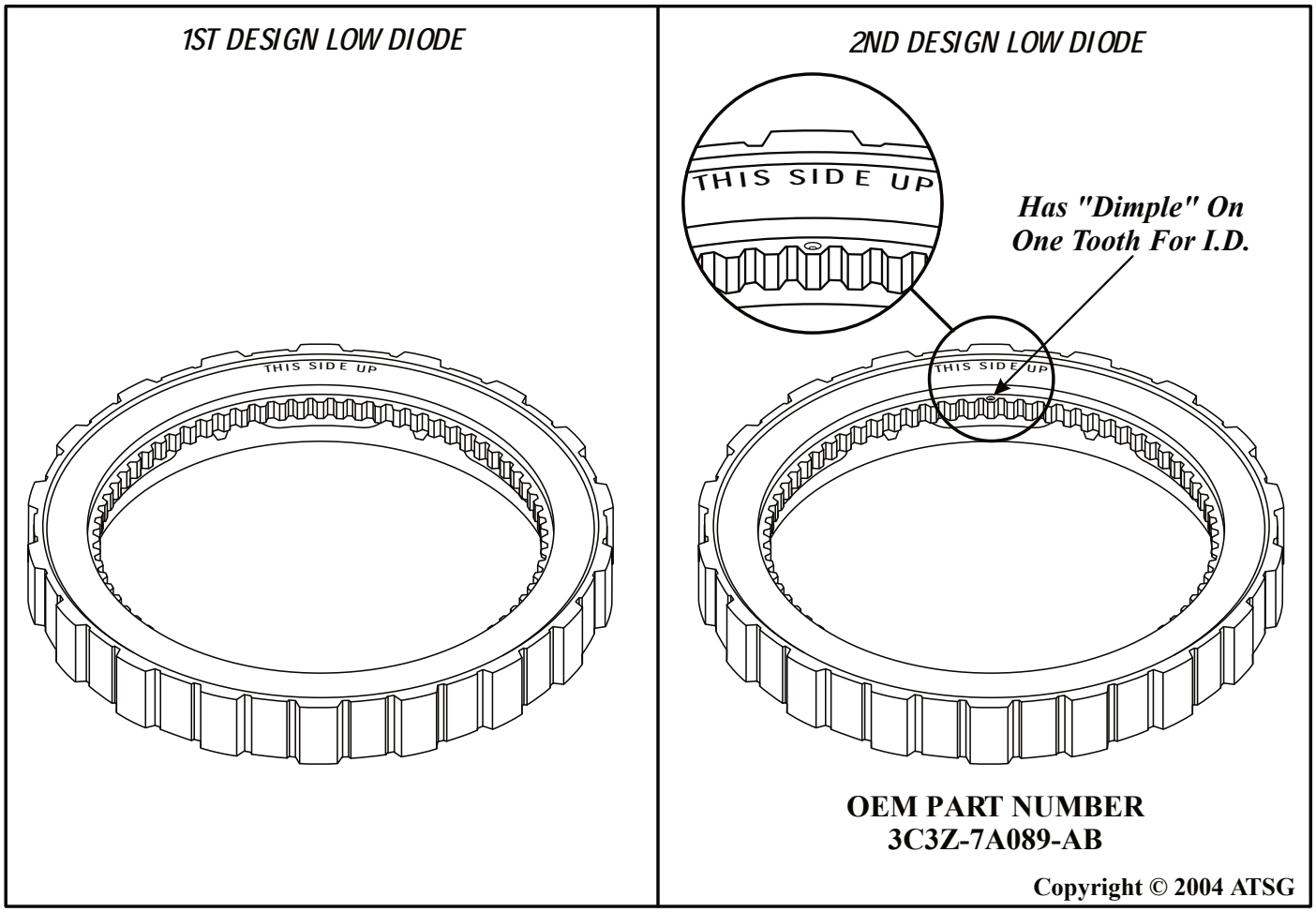
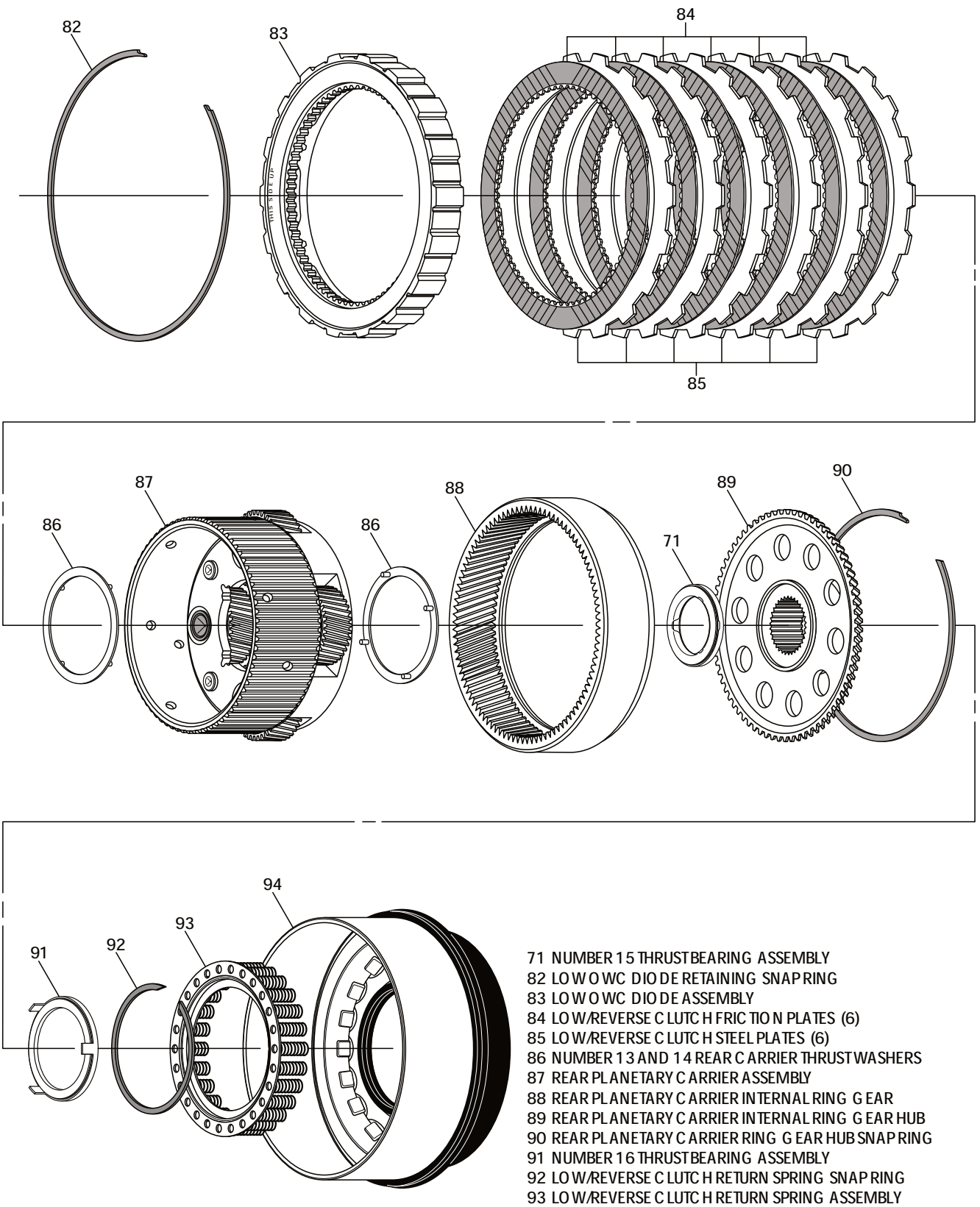


Figure 162

LOW/REVERSE CLUTCH PARTS EXPLODED VIEW



71 NUMBER 15 THRUST BEARING ASSEMBLY
82 LOW OWC DIODE RETAINING SNAP RING
83 LOW OWC DIODE ASSEMBLY
84 LOW/REVERSE CLUTCH FRICTION PLATES (6)
85 LOW/REVERSE CLUTCH STEEL PLATES (6)
86 NUMBER 13 AND 14 REAR CARRIER THRUST WASHERS
87 REAR PLANETARY CARRIER ASSEMBLY
88 REAR PLANETARY CARRIER INTERNAL RING GEAR
89 REAR PLANETARY CARRIER INTERNAL RING GEAR HUB
90 REAR PLANETARY CARRIER RING GEAR HUB SNAP RING
91 NUMBER 16 THRUST BEARING ASSEMBLY
92 LOW/REVERSE CLUTCH RETURN SPRING SNAP RING
93 LOW/REVERSE CLUTCH RETURN SPRING ASSEMBLY
94 LOW/REVERSE CLUTCH PISTON

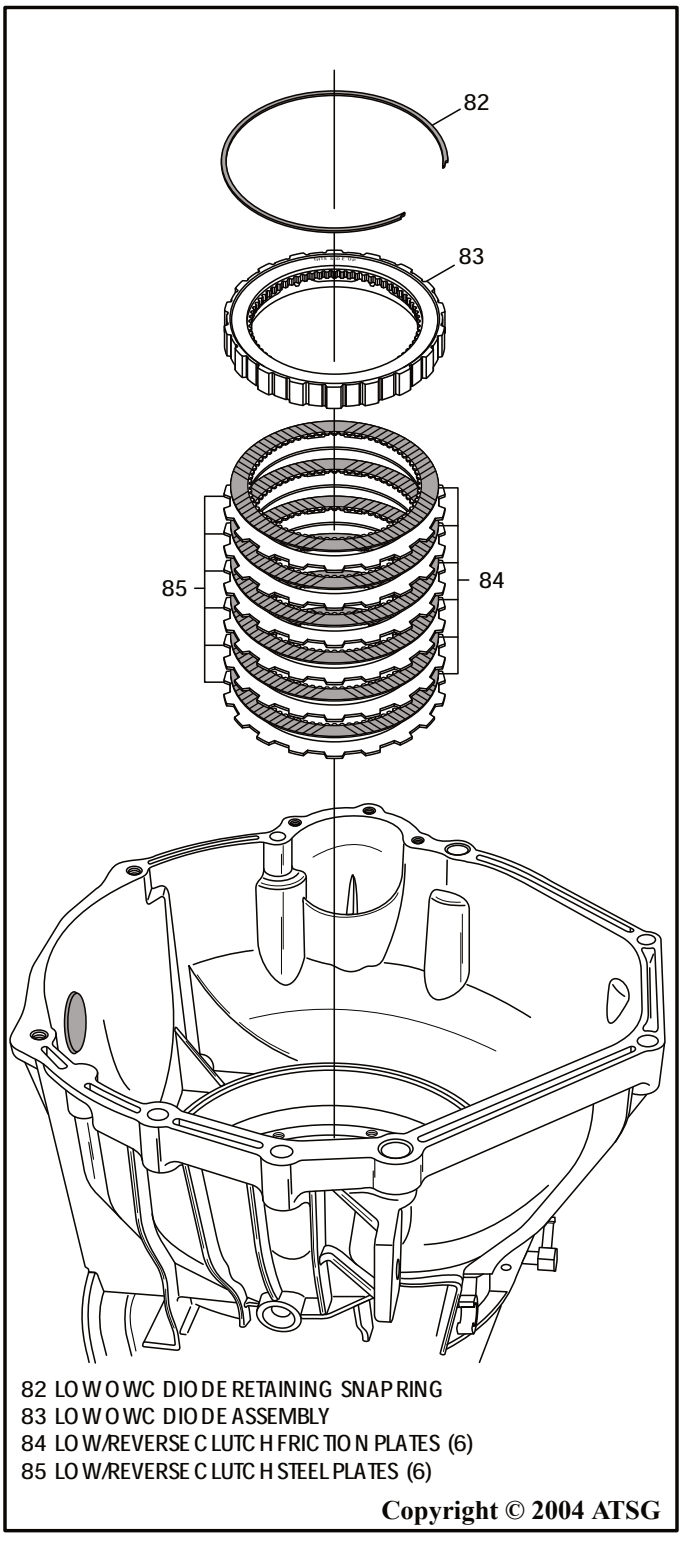
Figure 163

TRANSMISSION ASSEMBLY

INTERNAL COMPONENTS

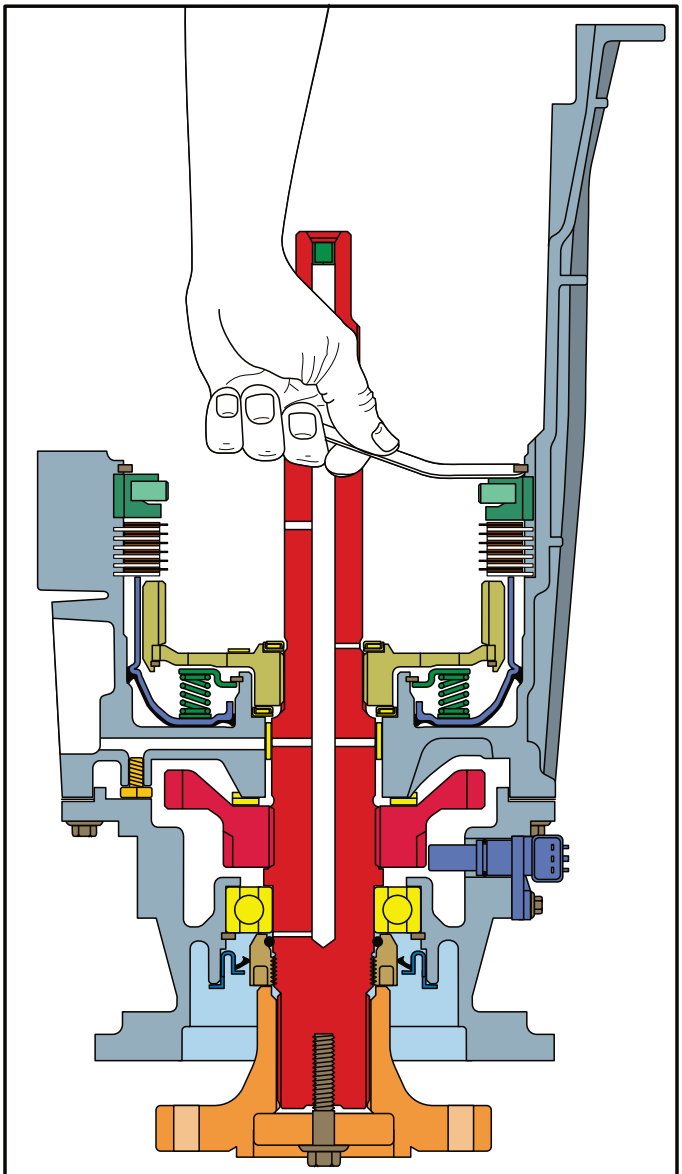
1. Rotate the case so that bell housing is facing up as shown in Figure 164.
2. Install the complete low/reverse clutch pack, low OWC diode assembly and snap ring, as shown in Figure 164.
3. Check the low/reverse clutch clearance using a feeler gauge, as shown in Figure 165.
4. Low/reverse clutch pack clearance should be; 1.81-3.01 mm (.070" - .120").
5. Change the selective snap ring as necessary to obtain the proper low/reverse clutch clearance.
6. Remove snap ring and complete low/reverse clutch pack for installation later.

Continued on Page 100



82 LOW OWC DIODE RETAINING SNAP RING
83 LOW OWC DIODE ASSEMBLY
84 LOW/REVERSE CLUTCH FRICTION PLATES (6)
85 LOW/REVERSE CLUTCH STEEL PLATES (6)

Figure 164



Low/Reverse Clutch Clearance Should Be; 1.81 - 3.01 mm (.070" - .120")

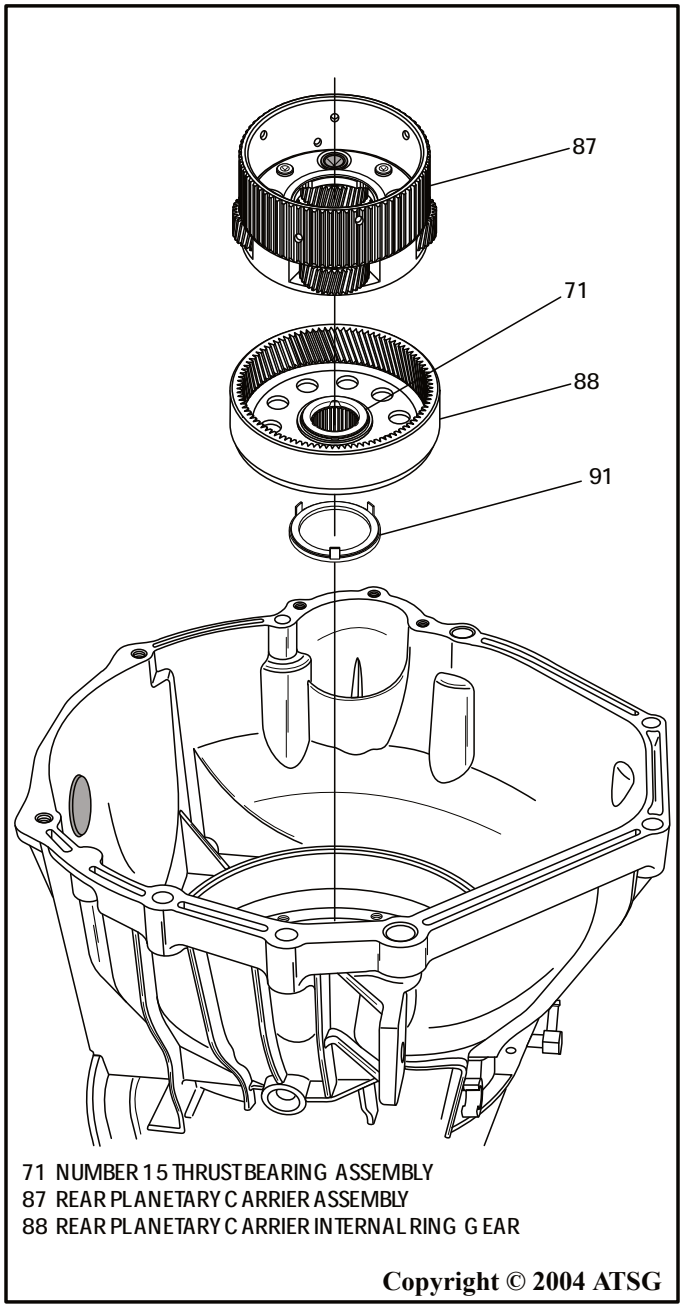
Figure 165

TRANSMISSION ASSEMBLY

INTERNAL COMPONENTS (CONT'D)

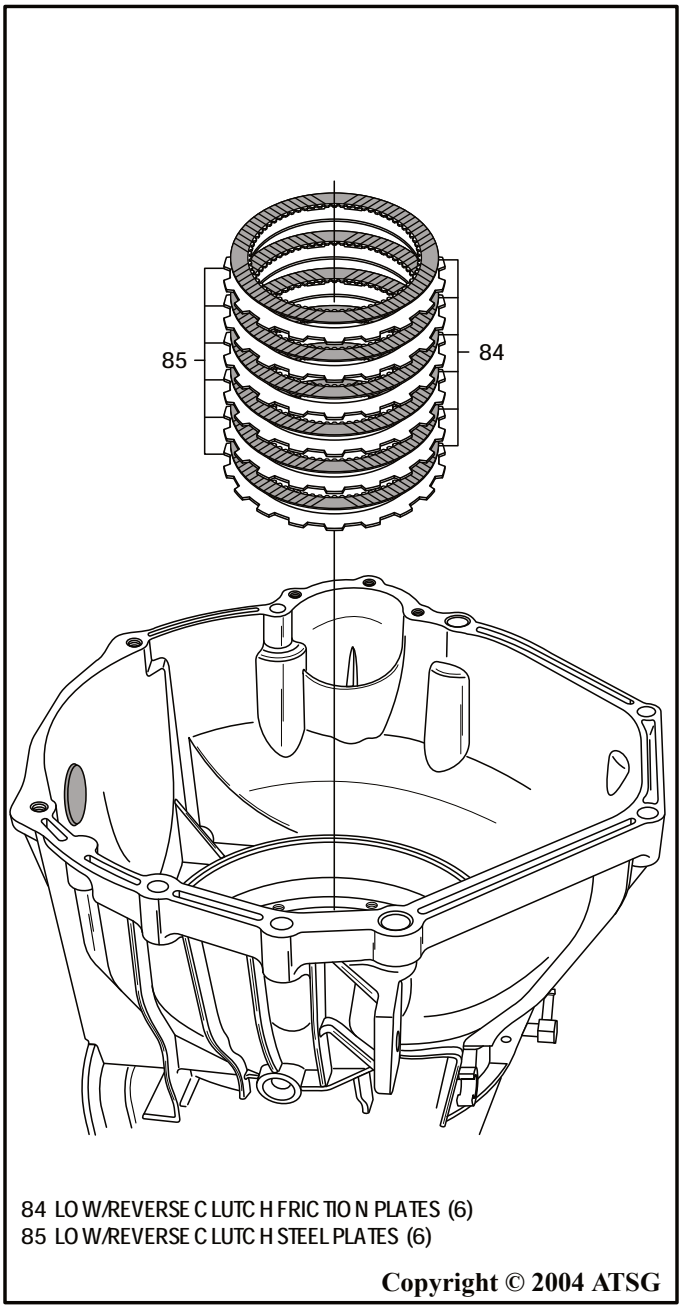
7. Check the bottom of the case one more time to ensure snap ring for low/reverse clutch piston return spring is seated properly.
8. Install the pre-assembled rear ring gear and thrust bearings, as shown in Figure 166.
   Note: Ensure number 16 bearing is still in place on back side.
9. Install the 2005 style rear planetary carrier, as shown in Figure 166, by rotating into position.
   Note: Ensure that number 13 and 14 thrust washers are still in place.
10. Re-install low/reverse clutch plates, as shown in Figure 167, beginning with a steel plate and alternating with friction plates, until you have installed six of each.
    Note: Low/reverse friction plates should be soaked in Mercon SP® before installing.

Continued on Page 101



71 NUMBER 15 THRUST BEARING ASSEMBLY
87 REAR PLANETARY CARRIER ASSEMBLY
88 REAR PLANETARY CARRIER INTERNAL RING GEAR

Figure 166



84 LOW/REVERSE CLUTCH FRICTION PLATES (6)
85 LOW/REVERSE CLUTCH STEEL PLATES (6)

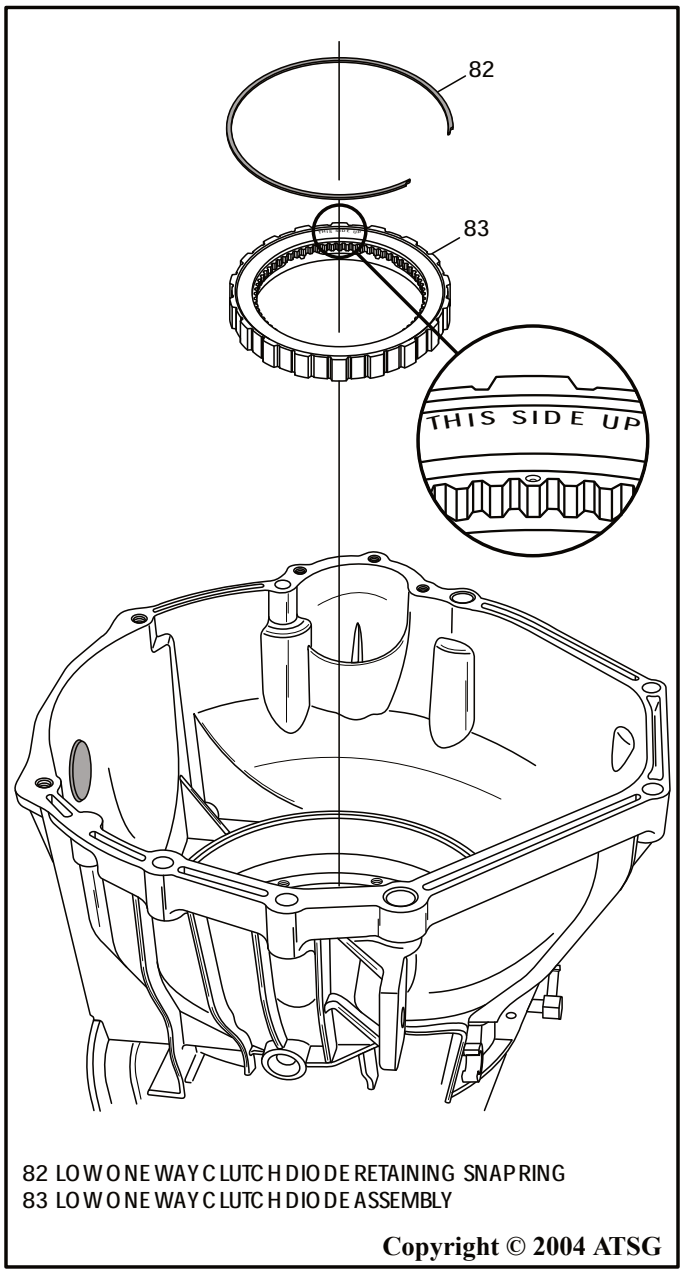
Figure 167

TRANSMISSION ASSEMBLY

INTERNAL COMPONENTS (CONT'D)

11. Install the low diode assembly, as shown in Figure 168, with the words "This Side Up" visible after installation.
    Note: If the low diode is installed correctly, the rear carrier should hold when trying to turn it counter-clockwise, and freewheel in a clockwise direction.
12. Install the low OWC diode retaining snap ring, as shown in Figure 168.
    Note: The opening of the snap ring should be placed at the one O' clock position.
13. Install the pre-assembled drums and sun gear shell assembly, as shown in Figure 169, using the special tools and rotating into position to engage the sun gear into the rear planetary.

Continued on Page 102



82 LOW ONE WAY CLUTCH DIODE RETAINING SNAP RING
83 LOW ONE WAY CLUTCH DIODE ASSEMBLY

Figure 168

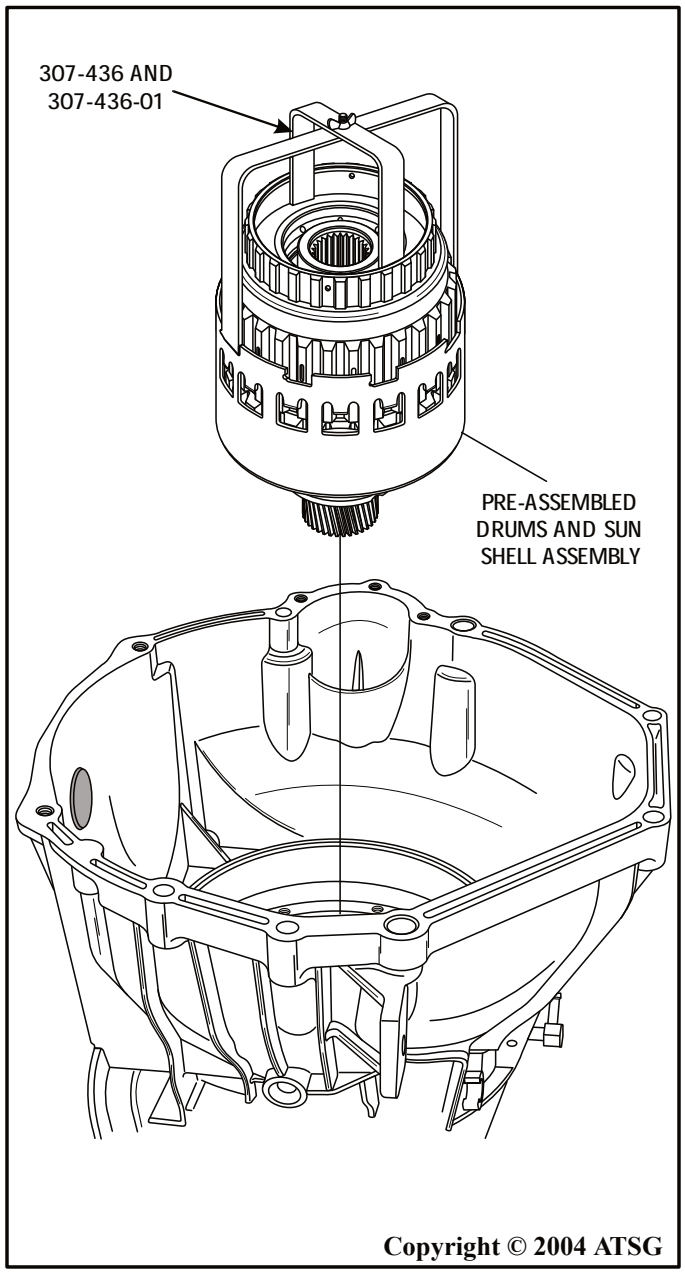


Figure 169

TRANSMISSION ASSEMBLY

INTERNAL COMPONENTS (CONT'D)

14. Install the intermediate clutch backing plate, as shown in Figure 170.
15. Install the intermediate clutch plates, as shown in Figure 170, beginning with a friction plate and alternating with steel plates until you have installed 3 of each.
    Note: Intermediate friction plates should be soaked in Mercon SP® before installation.
16. Install the pre-assembled center support into case, as shown in Figure 171.
17. Loosely install new center support bolts.
18. Install the center support snap ring, as shown in Figure 171, with the opening facing the six o' clock position in the case..
    Note: This snap ring is tapered and the flat side faces downward towards center support.

Continued on Page 103

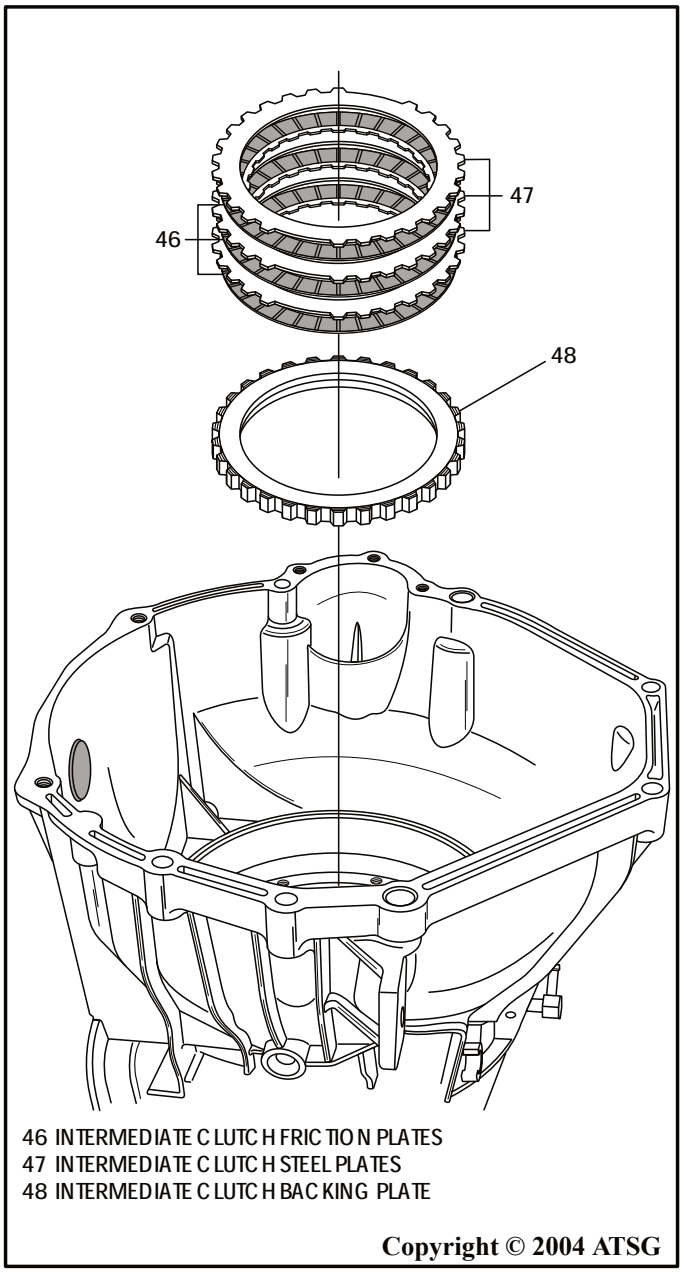


Figure 170

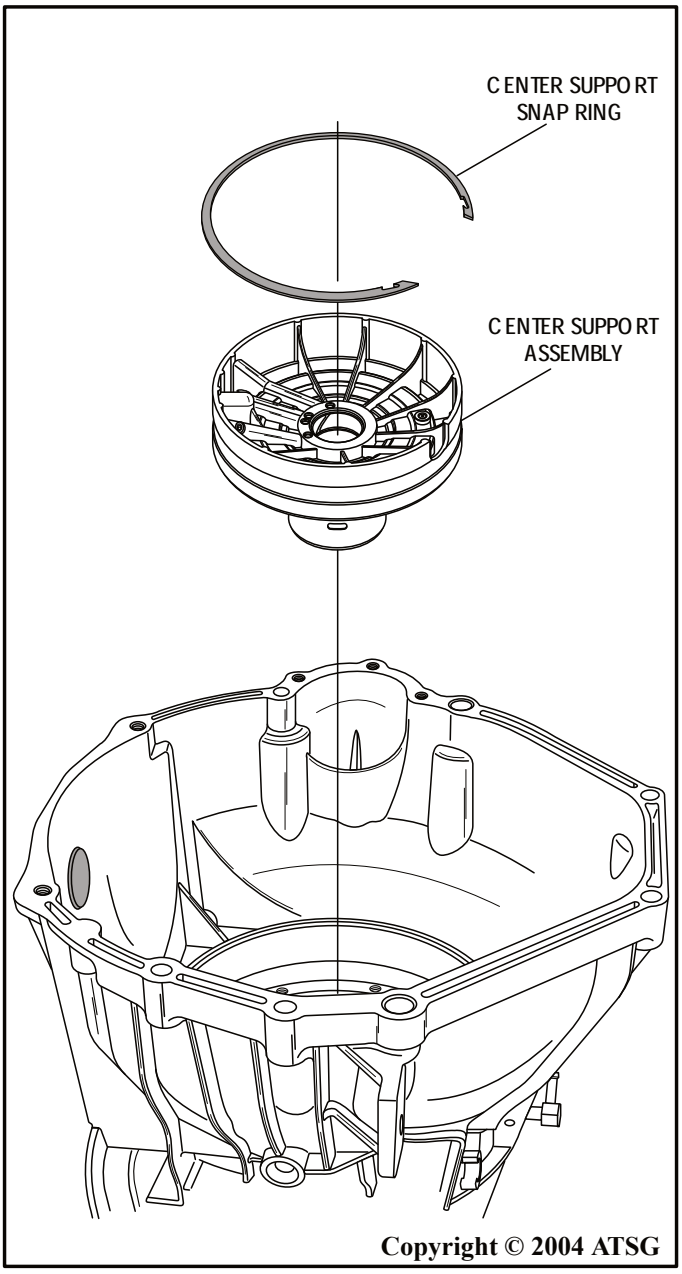
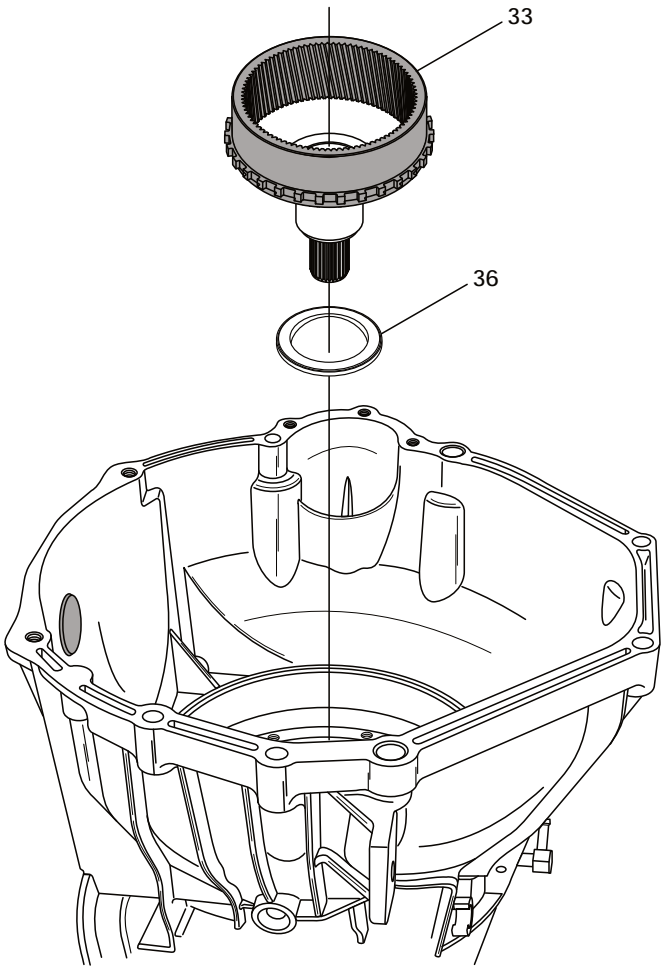


Figure 171

TRANSMISSION ASSEMBLY
INTERNAL COMPONENTS (CONT'D)

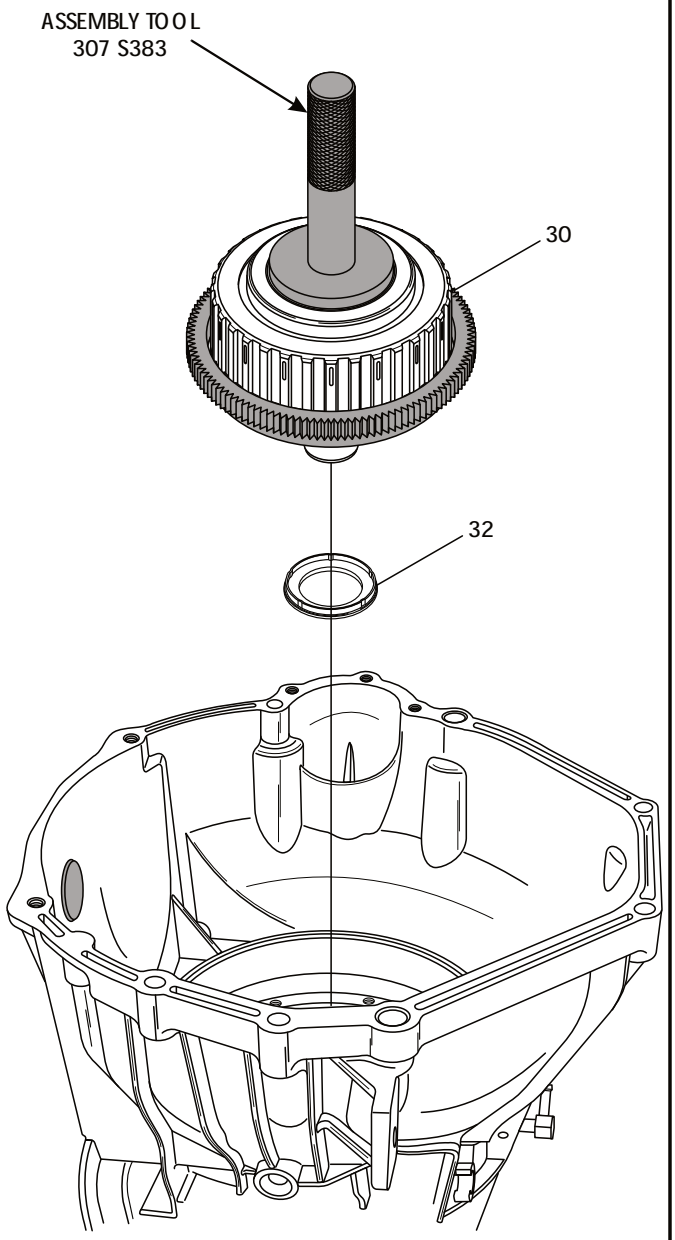
19. Install the pre-assembled overdrive ring gear and center shaft, as shown in Figure 172.
Note: Ensure the number 5 thrust bearing is still in place on center shaft.
20. Install the pre-assembled coast clutch housing and overdrive carrier assembly, as shown in Figure 173, by rotating into position using the special assembly tool 307 S383.
Note: Ensure that number 4 thrust bearing is still in place on overdrive carrier.

Continued on Page 104



33 OVERDRIVE RING GEAR AND CENTER SHAFT ASSEMBLY
36 NUMBER 5 THRUST BEARING ASSEMBLY

Figure 172



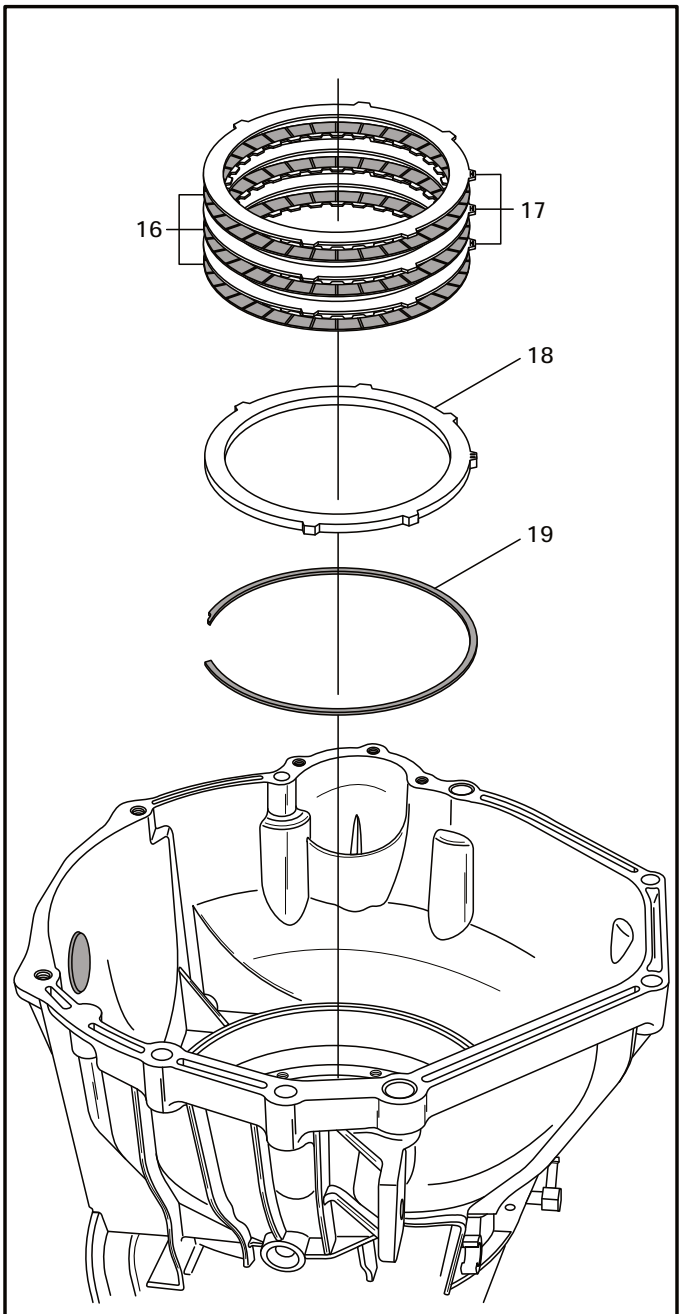
30 COAST CLUTCH DRUM AND OVERDRIVE CARRIER ASSEMBLY
32 NUMBER 4 THRUST BEARING ASSEMBLY

Figure 173

TRANSMISSION ASSEMBLY
INTERNAL COMPONENTS (CONT'D)

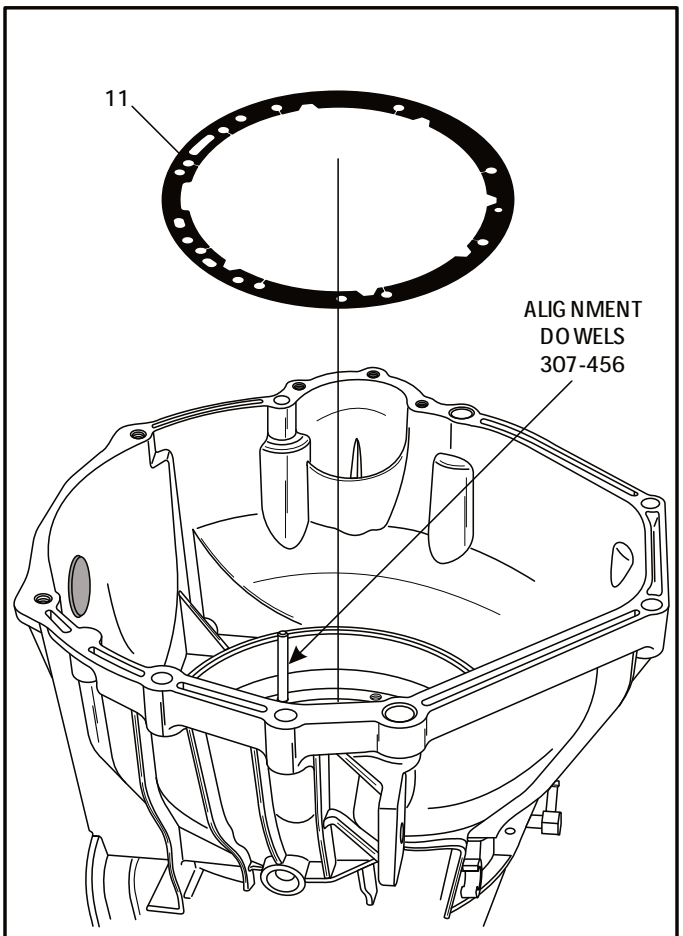
21. Install the overdrive backing plate snap ring, as shown in Figure 174, with the opening in the six o' clock position in the case.
    Note: This is a flat snap ring.
22. Install the overdrive clutch backing plate into the case, as shown in Figure 174.
23. Install the overdrive clutch plates, as shown in Figure 174, beginning with a friction plate and alternating with steel plates.
    Note: Friction plates should be soaked with Mercon SP® before installation.
24. Install alignment dowels 307-456, as shown in Figure 175.
25. Install new pump to case gasket over alignment dowels, as shown in Figure 175.

Continued on Page 105



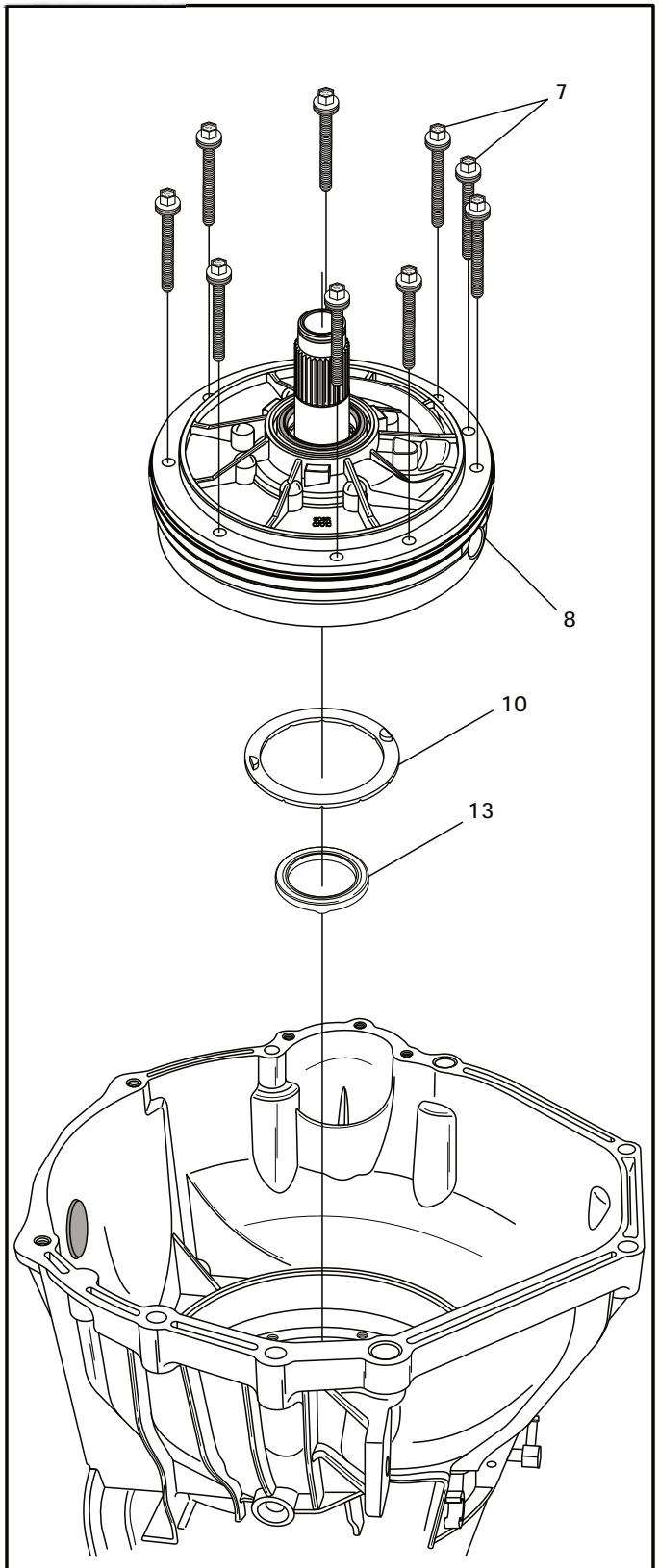
16 OVERDRIVE CLUTCH FRICTION PLATES (3 REQUIRED).
17 OVERDRIVE CLUTCH STEEL PLATES (3 REQUIRED).
18 OVERDRIVE CLUTCH BACKING PLATE.

Figure 174



11 OIL PUMP ASSEMBLY TO CASE GASKET

Figure 175



7 OIL PUMP TO CASE RETAINING BOLTS (9 REQUIRED).
8 OIL PUMP ASSEMBLY.
10 PUMP TO COAST CLUTCH DRUM (NO 1) THRUST WASHER.
13 PUMP SUPPORT TO COAST CLUTCH (NO 2) THRUST BEARING.

Figure 176

TRANSMISSION ASSEMBLY

INTERNAL COMPONENTS (CONT'D)

26. Install the pre-assembled oil pump assembly, as shown in Figure 176.
Note: Ensure that number 1 thrust washer and number 2 thrust bearing are still in place, on back side of pump.
27. Install the nine new retaining bolts, as shown in Figure 176, and remove the locating dowels.
28. Torque the nine pump to case bolts, as shown in Figure 177, to 27 N•m (20 ft.lb.).

Continued on Page 106

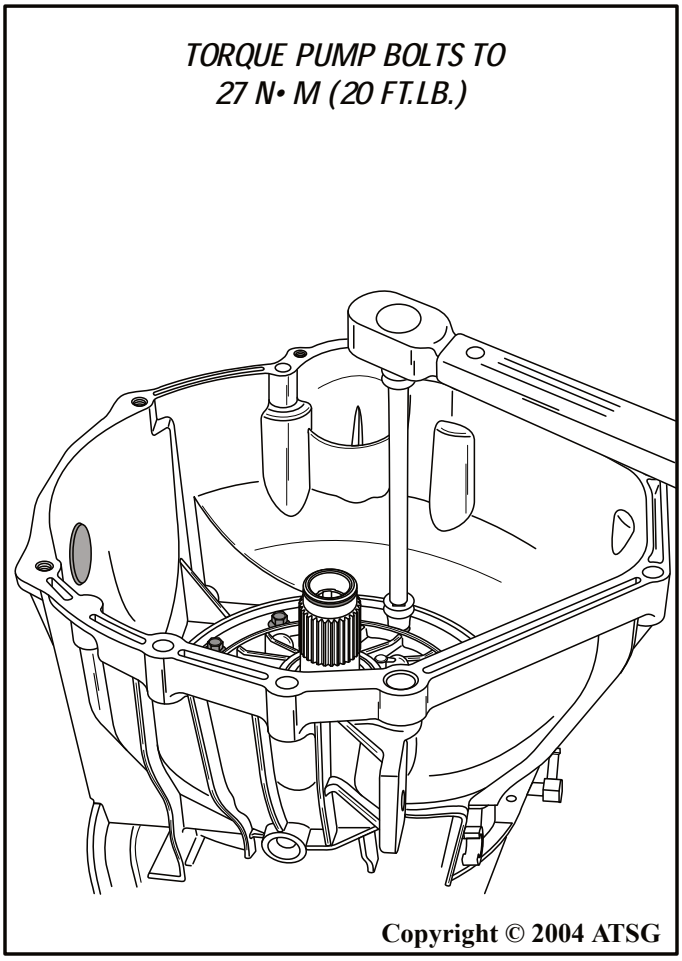


Figure 177

TRANSMISSION ASSEMBLY

INTERNAL COMPONENTS (CONT'D)

29. Rotate the transmission so that the pan surface is facing up, as shown in Figure 178.
30. Now, torque the new center support bolts to, 32 N•m (24 ft.lb.), as shown in Figure 178.
31. Install the forward clutch orifice on top of the center support bolt, as shown in Figure 179. ***Note: Retain forward clutch orifice with a small amount of Trans-Jel®.***
32. Install a new channel plate to case gasket, as shown in Figure 179, over the locating dowels.

Continued on Page 107

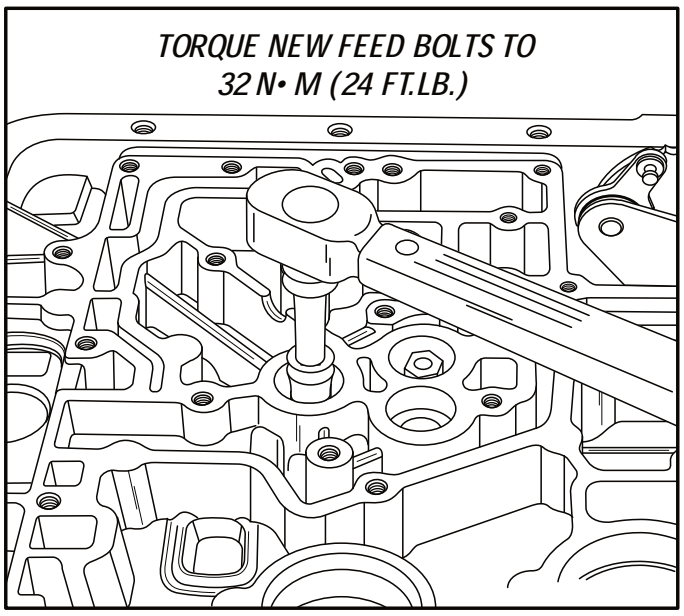


Figure 178

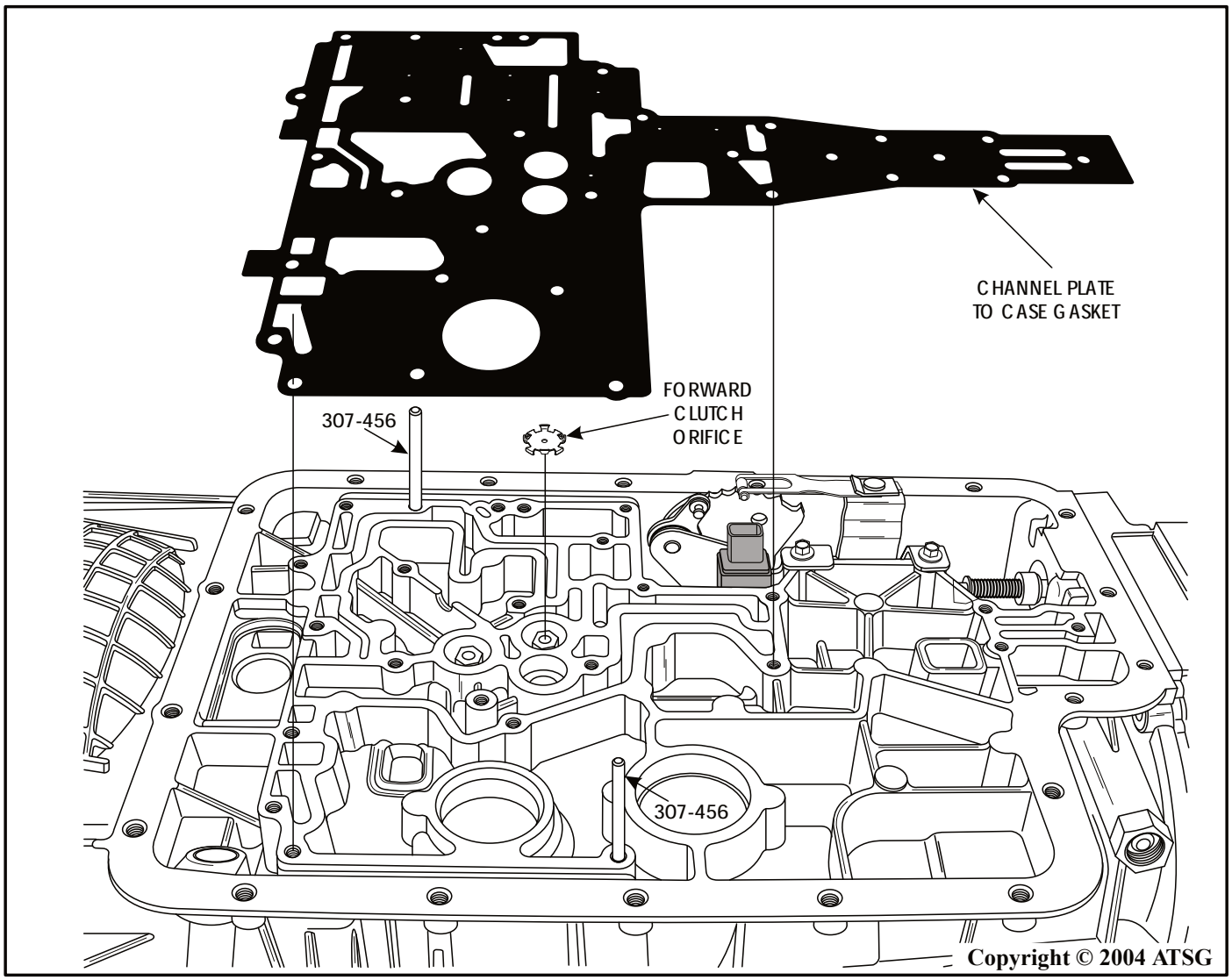


Figure 179

TRANSMISSION ASSEMBLY

INTERNAL COMPONENTS (CONT'D)

33. Install pre-assembled solenoid body assembly, as shown in Figure 180.
34. Install the solenoid body to case bolts in their proper locations, as there are various lengths. ***Note: Use the chart in Figure 181 for the proper location of the bolts.***
35. Use care when pushing case connector through the case bore so as not to damage the "O" ring.
36. Ensure that the manual valve is engaged with the inside detent lever.

Continued on Page 109

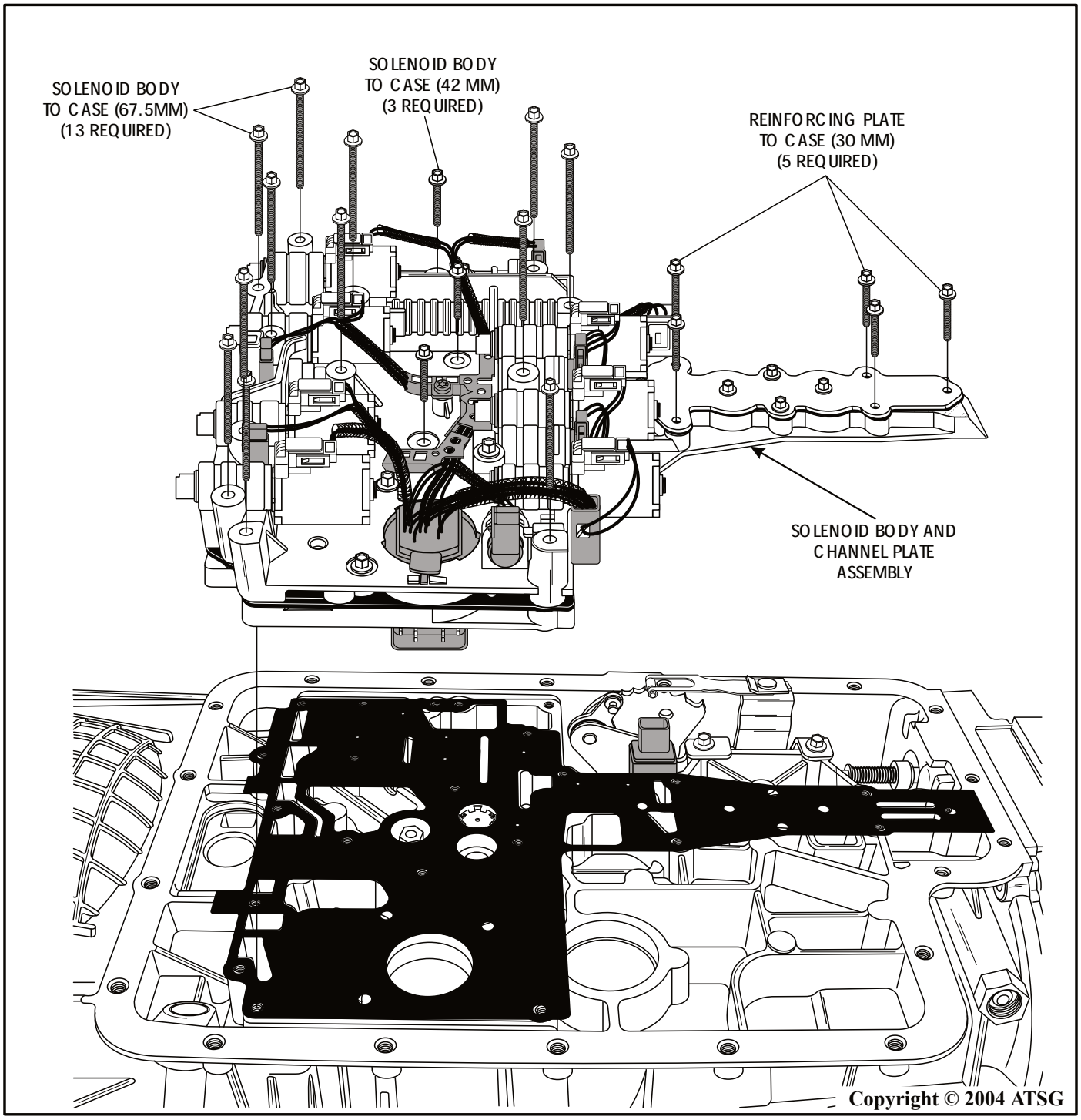
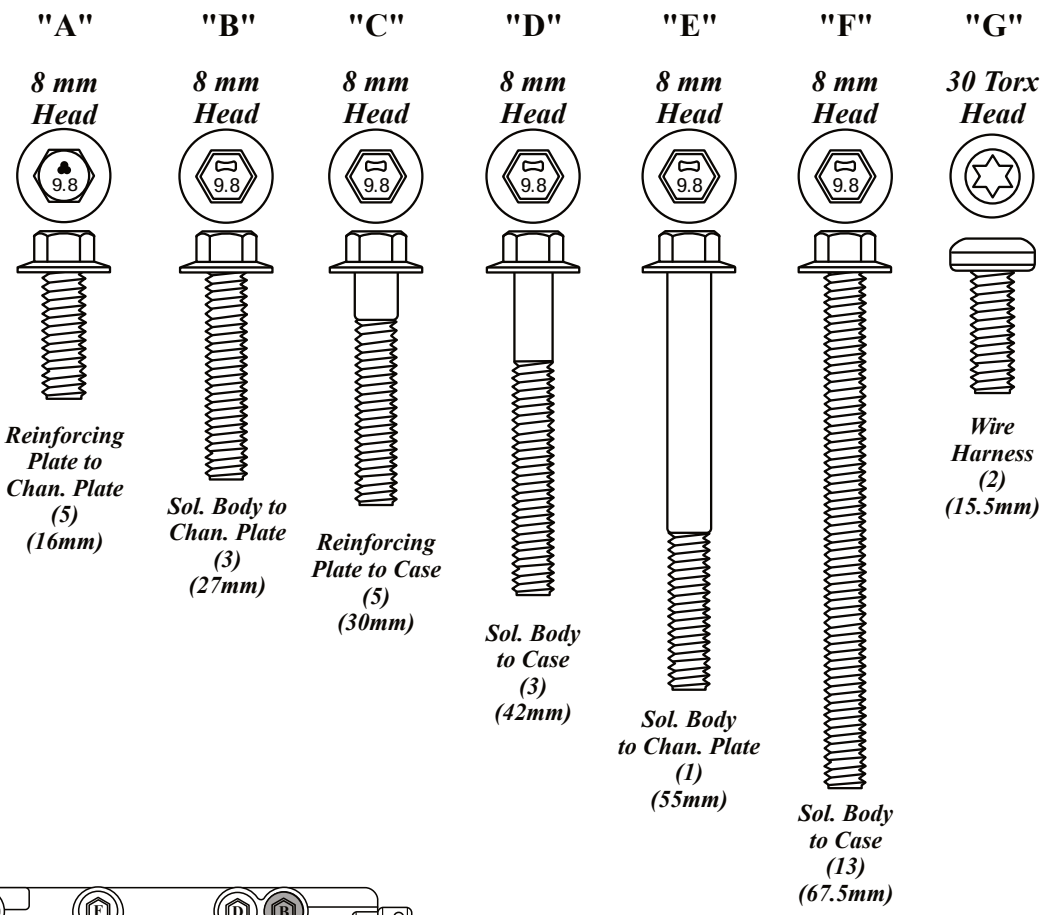


Figure 180

5R110W (Torqshift) VALVE BODY BOLT CHART



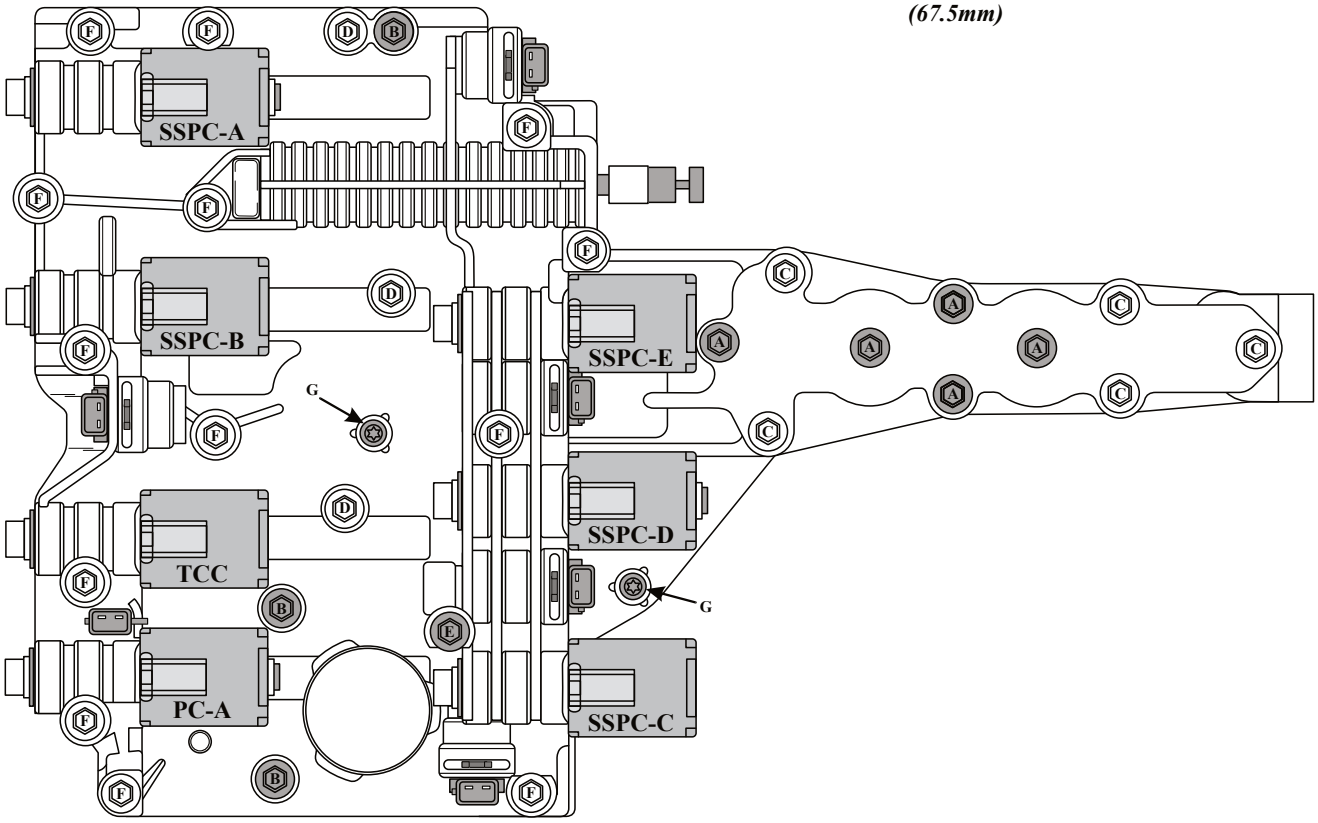


Figure 181

INTERNAL COMPONENTS (CONT'D)

37. Torque all of the solenoid body retaining bolts to 10 N•m (89 in.lb.), beginning in the center and working in a circle outward.
38. Install the transmission range sensor connector, as shown in Figure 182.
39. Install a new pan gasket on the case surface, as shown in Figure 182.
    Note: Pan gasket is reuseable as long as no beads are broken.
40. Install a new fluid filter and seal, as shown in Figure 182.
    Note: Be sure old filter seal has been removed from pump bore before installing filter.
41. Ensure that all internal harness connectors are connected properly.

Continued on Page 110

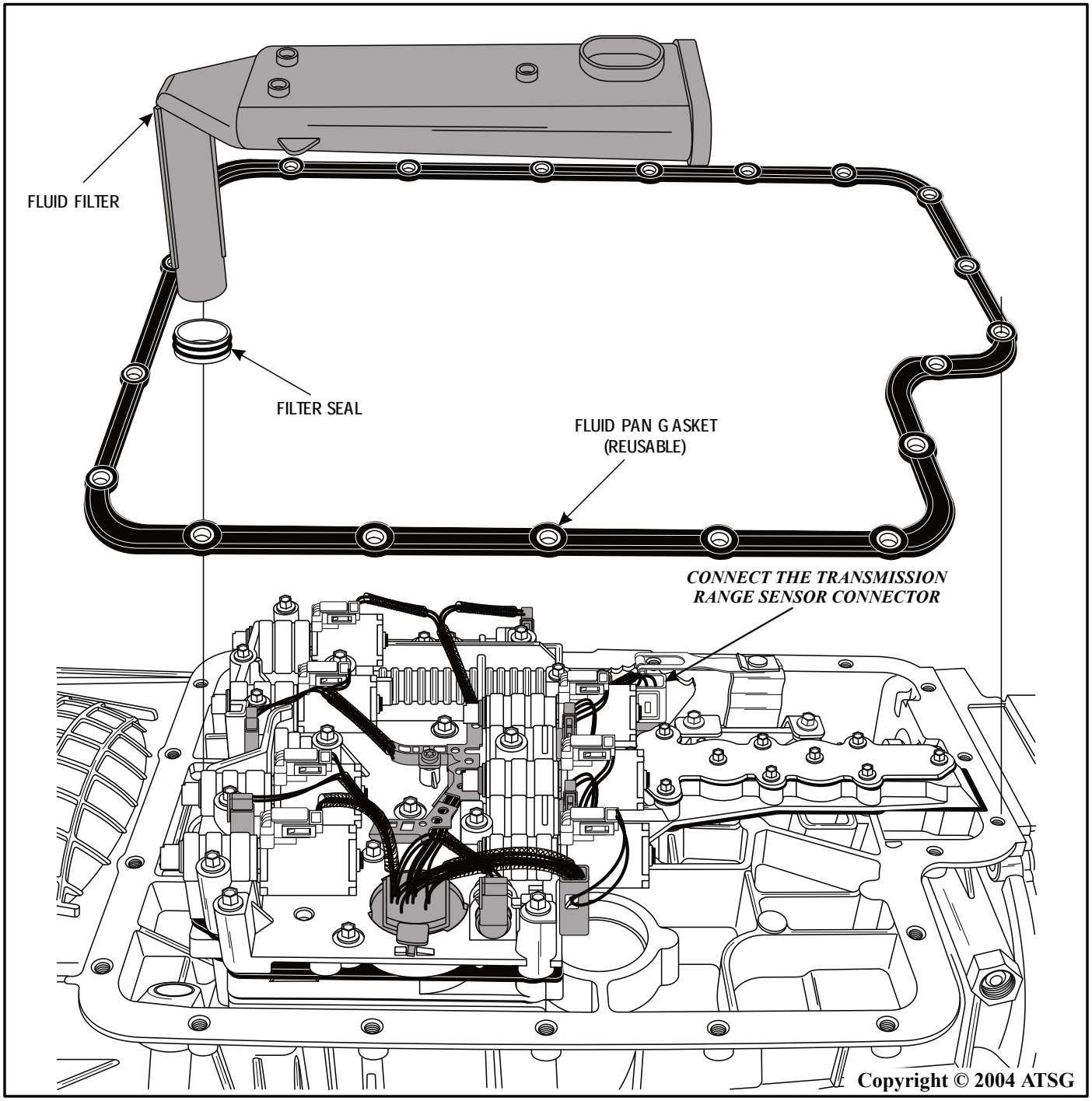


Figure 182

TRANSMISSION ASSEMBLY

INTERNAL COMPONENTS (CONT'D)

42. Install the oil pan, as shown in Figure 183, and install the 20 pan bolts.
43. Torque pan bolts to 15 N•m (11 ft.lb.).

Continued on Page 111

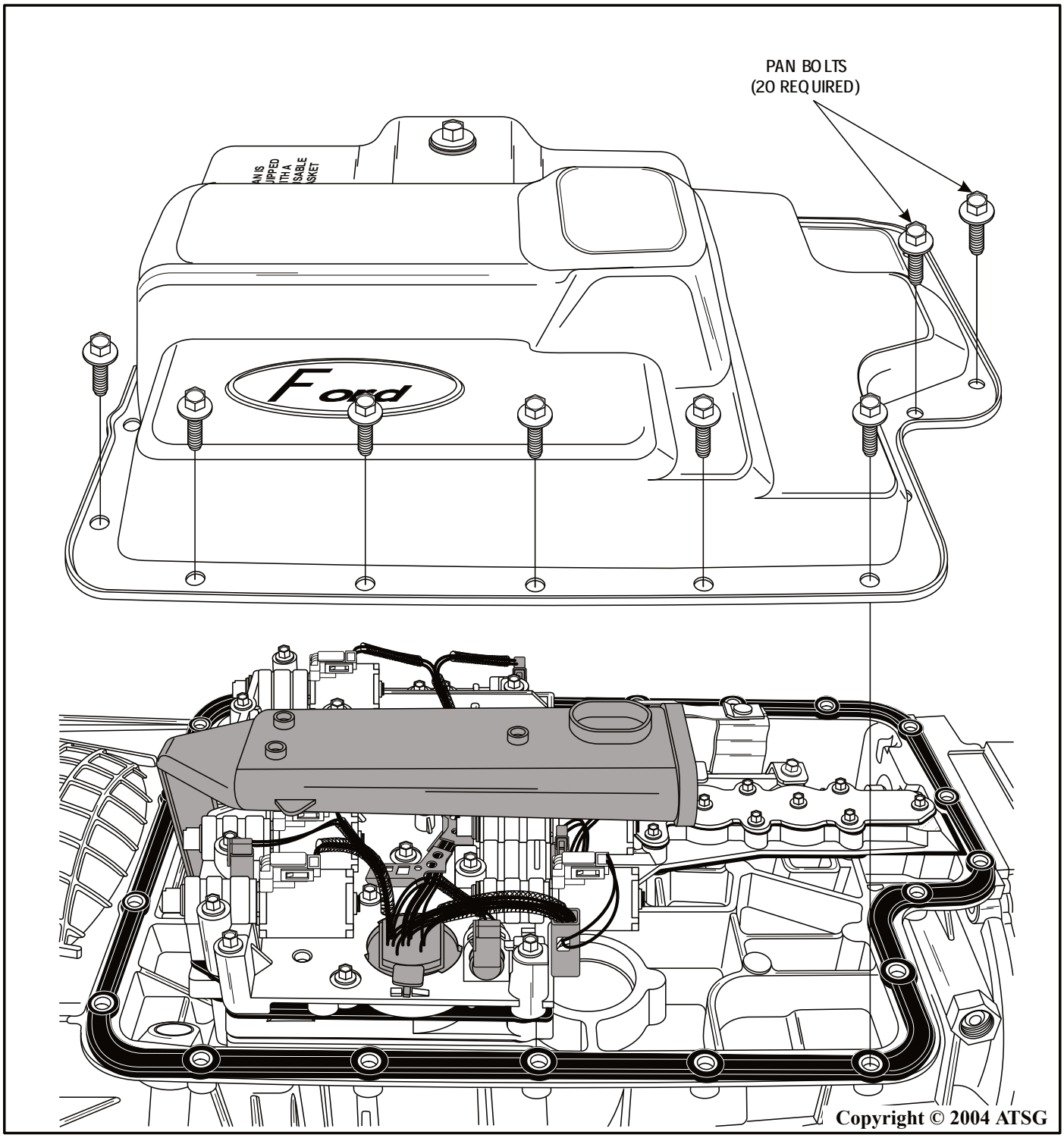


Figure 183

TRANSMISSION ASSEMBLY

INTERNAL COMPONENTS (CONT'D)

44. Rotate the transmission in fixture so that oil pan is facing down.
45. Check turbine/intermediate shaft speed sensor as shown in Figure 184.
46. Install new "O" ring on turbine/intermediate speed sensor, as shown in Figure 185.
47. Lubricate "O" ring and install the speed sensor as shown in Figure 185.
48. Torque speed sensor bolt to 9 N•m (80 in.lb.).

Continued on Page 112

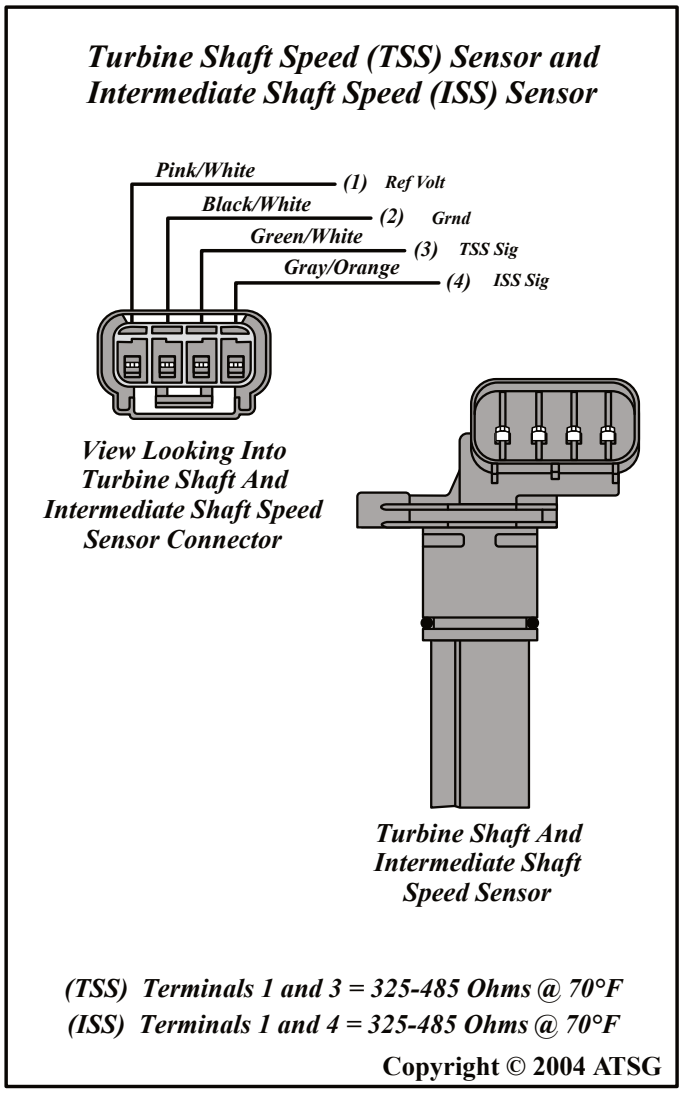


Figure 184

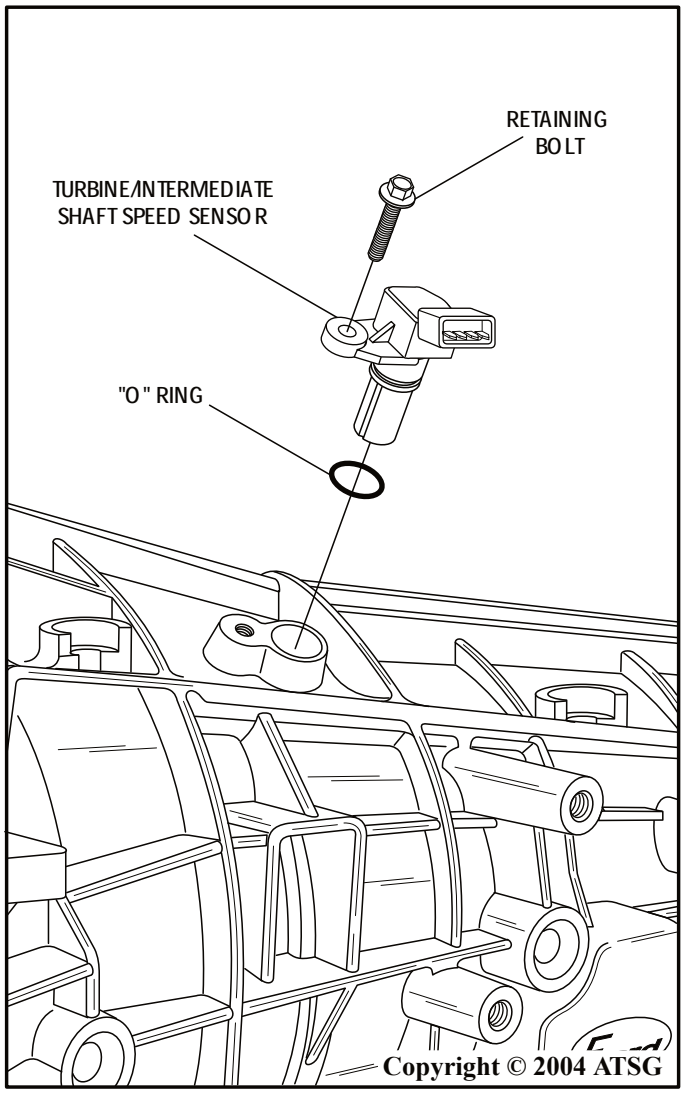


Figure 185

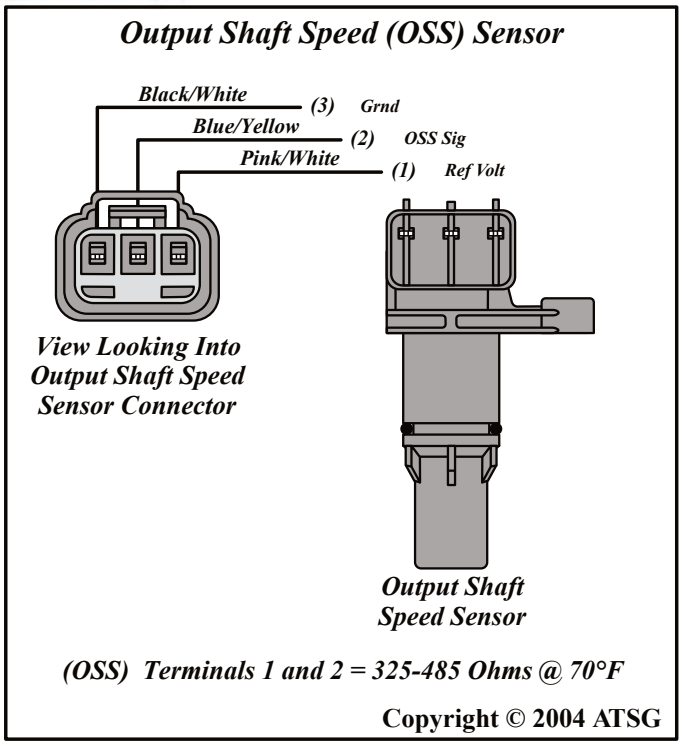


Figure 186

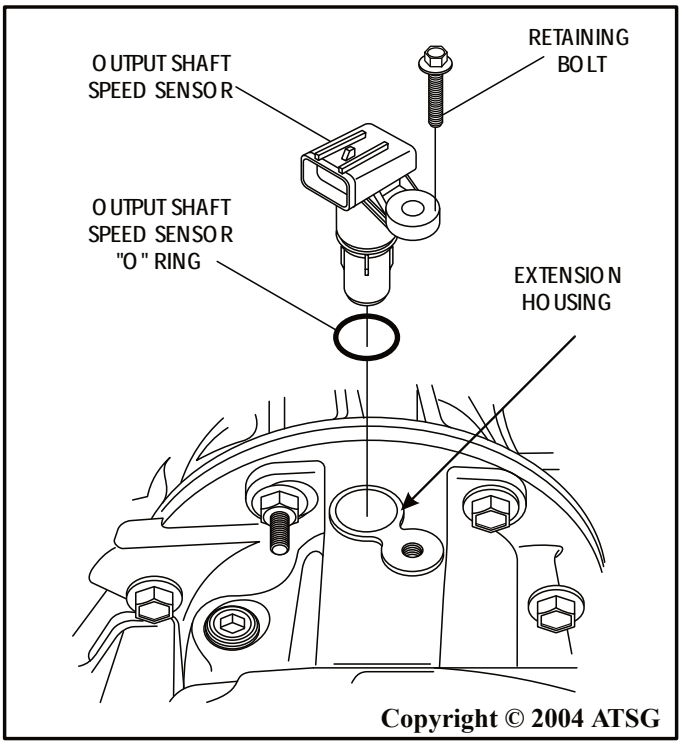


Figure 187

TRANSMISSION ASSEMBLY

INTERNAL COMPONENTS (CONT'D)

49. Check the output shaft speed sensor, as shown in Figure 186.
50. Install new "O" ring on output shaft speed sensor, as shown in Figure 187.
51. Lubricate "O" ring and install the speed sensor as shown in Figure 187.
52. Torque speed sensor bolt to 9 N•m (80 in.lb.).
53. Install turbine shaft as shown in Figure 188.

Continued on Page 113

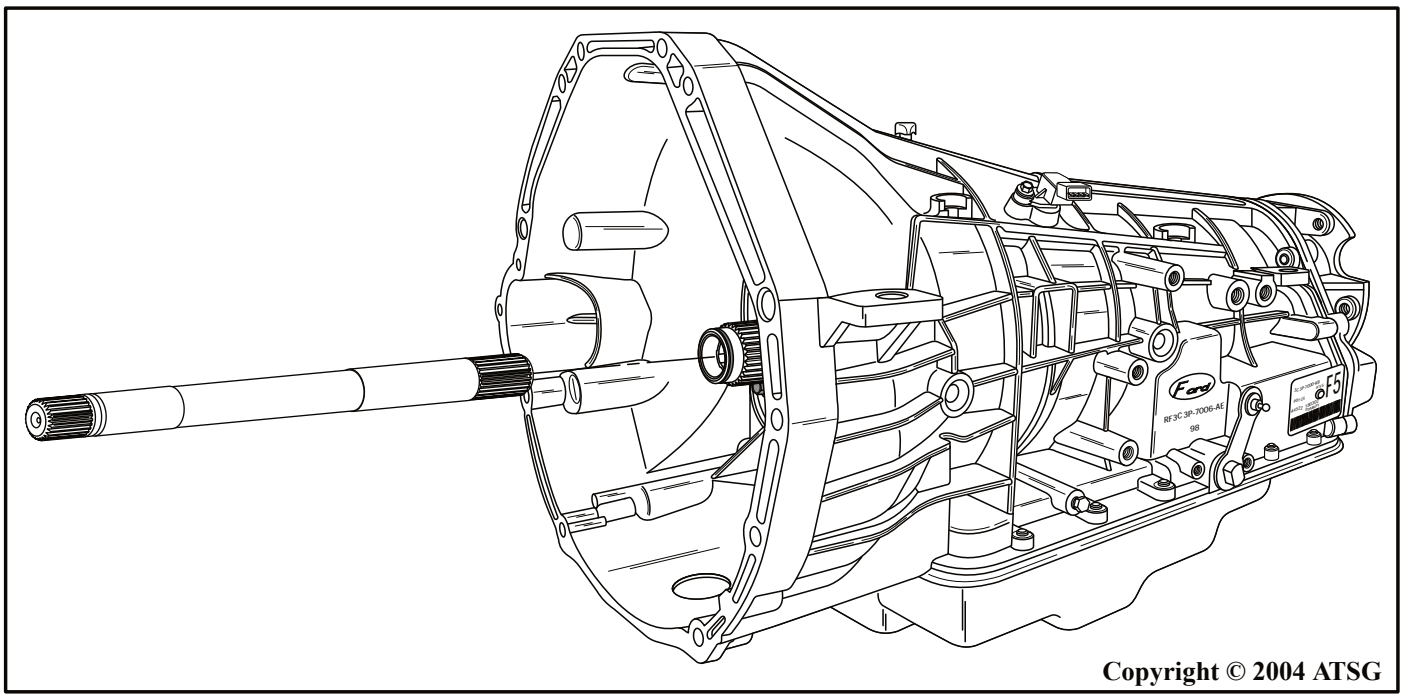


Figure 188

TRANSMISSION ASSEMBLY
INTERNAL COMPONENTS (CONT'D)

54. Remove the transmission holding fixture, as shown in Figure 189.
55. ***Congratulations, You Are Finished.***

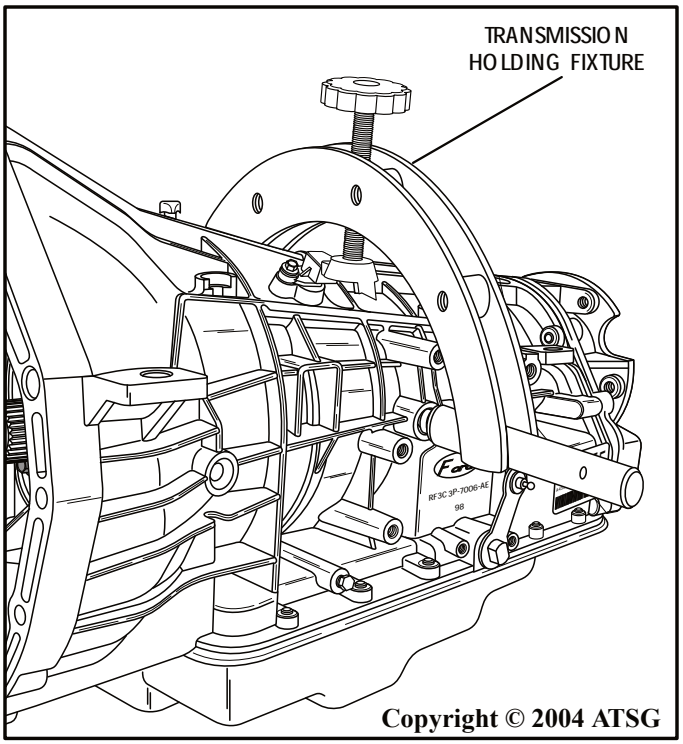
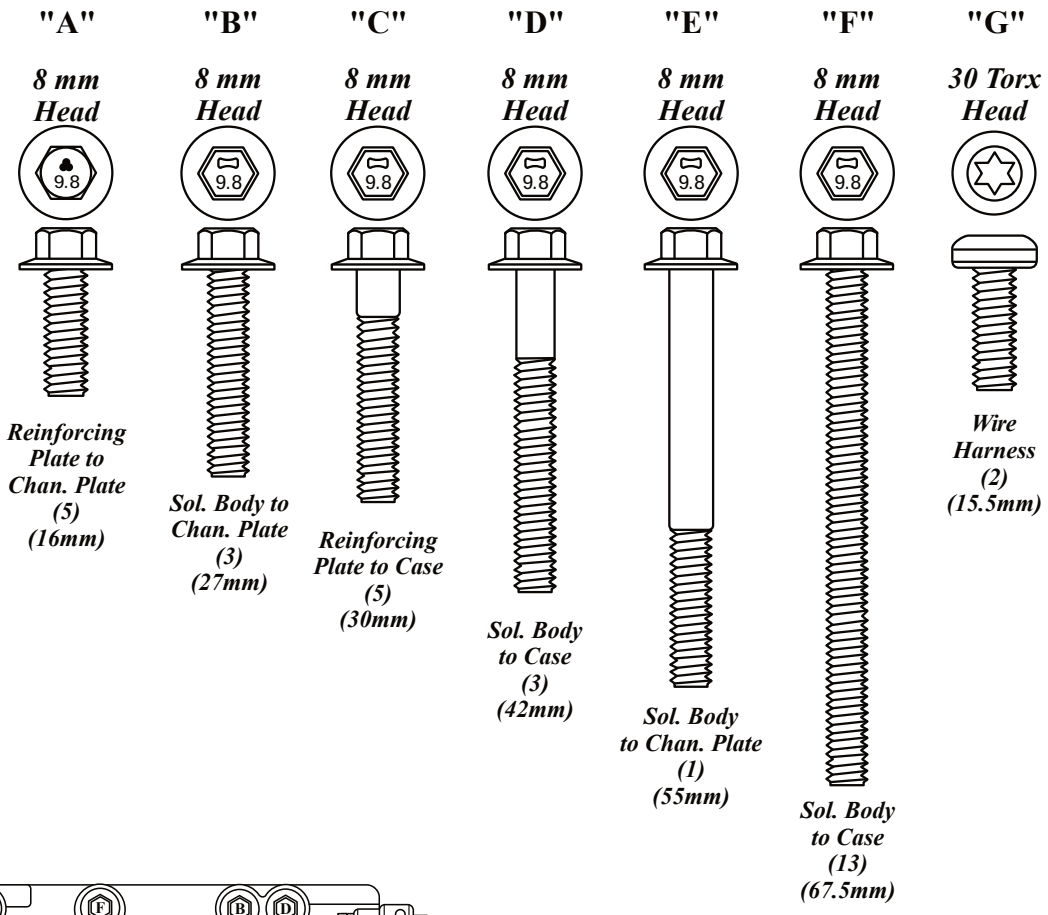


Figure 189

TORQUE SPECIFICATIONS			
DESCRIPTION	N·m	ft.lbs.	in.lbs.
Oil Pump Assembly to Case (9)	*27*	*20*	
Oil Pump Cover to Oil Pump Body (8)	*31*	*23*	
Stator Shaft to Oil Pump Cover (3)	*10*		*89*
Center Support Feed Bolts (2)	*33*	*24*	
Solenoid Body Bolts (All)	*10*		*89*
Spacer Plate Reinforcing Plate to Channel Plate (4)	*10*		*89*
Output Shaft Flange Nut 2WD (1)	*150*	*110*	
Transmission Range Sensor to Case (2)	*10*		*89*
Line Pressure Plug (1)	*8-16*	*6-12*	
Parking Pawl Abutment Plate to Case (1)	*24*	*18*	
Parking Pawl Guide Plate to Case (2)	*24*	*18*	
Extension Housing Bolts (9)	*47*	*35*	
Transmission Oil Pan to Case (20)	*15*	*11*	
Transmission Oil Pan Drain Plug (1)	*18*	*33*	
Front Cooler Line Connector to Case (1)	*30*	*22*	
Rear Cooler Line Connector to Case (1)	*36*	*27*	
Speed Sensors to Case (2)	*9*		*80*
Output Shaft Nut 4WD (1)	*200*	*148*	

Figure 190

5R110W (Torqshift) VALVE BODY BOLT CHART



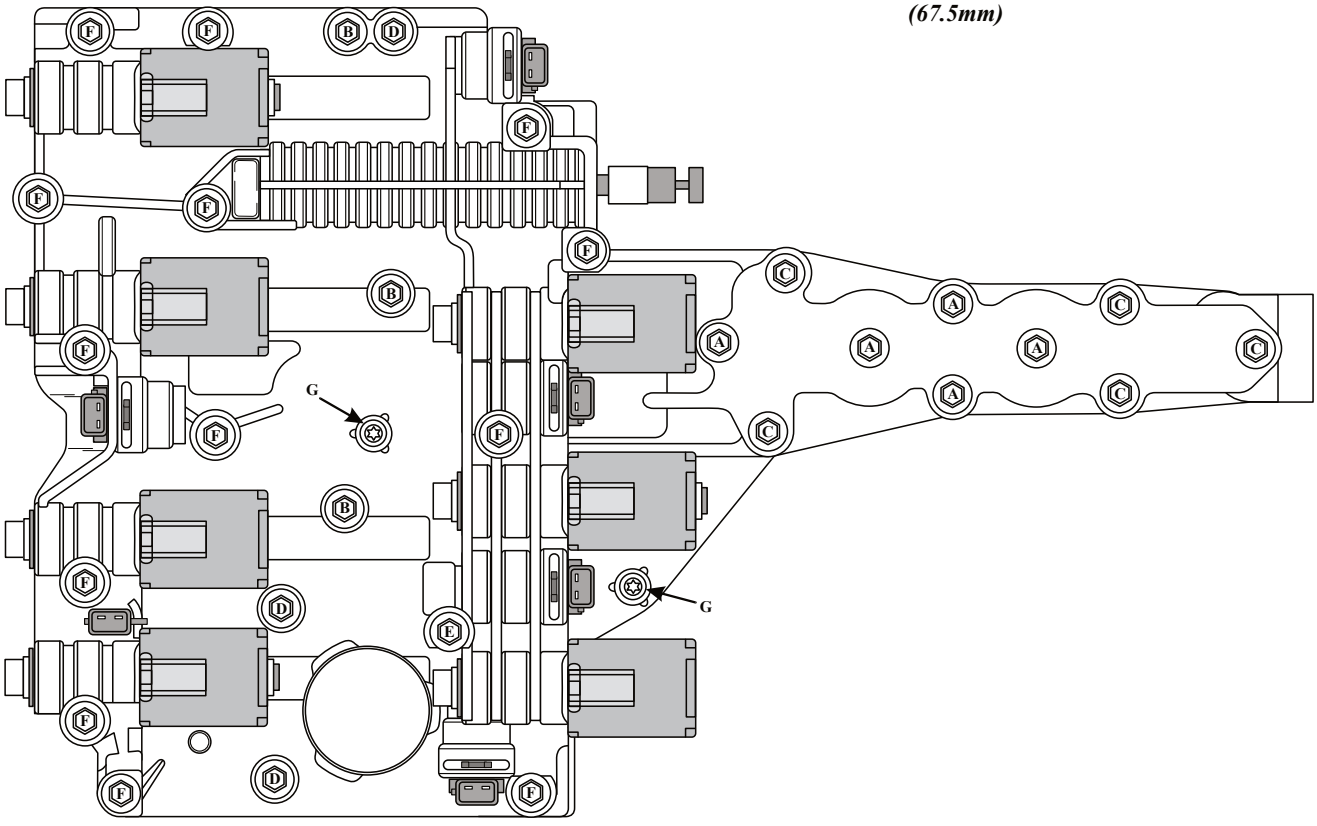
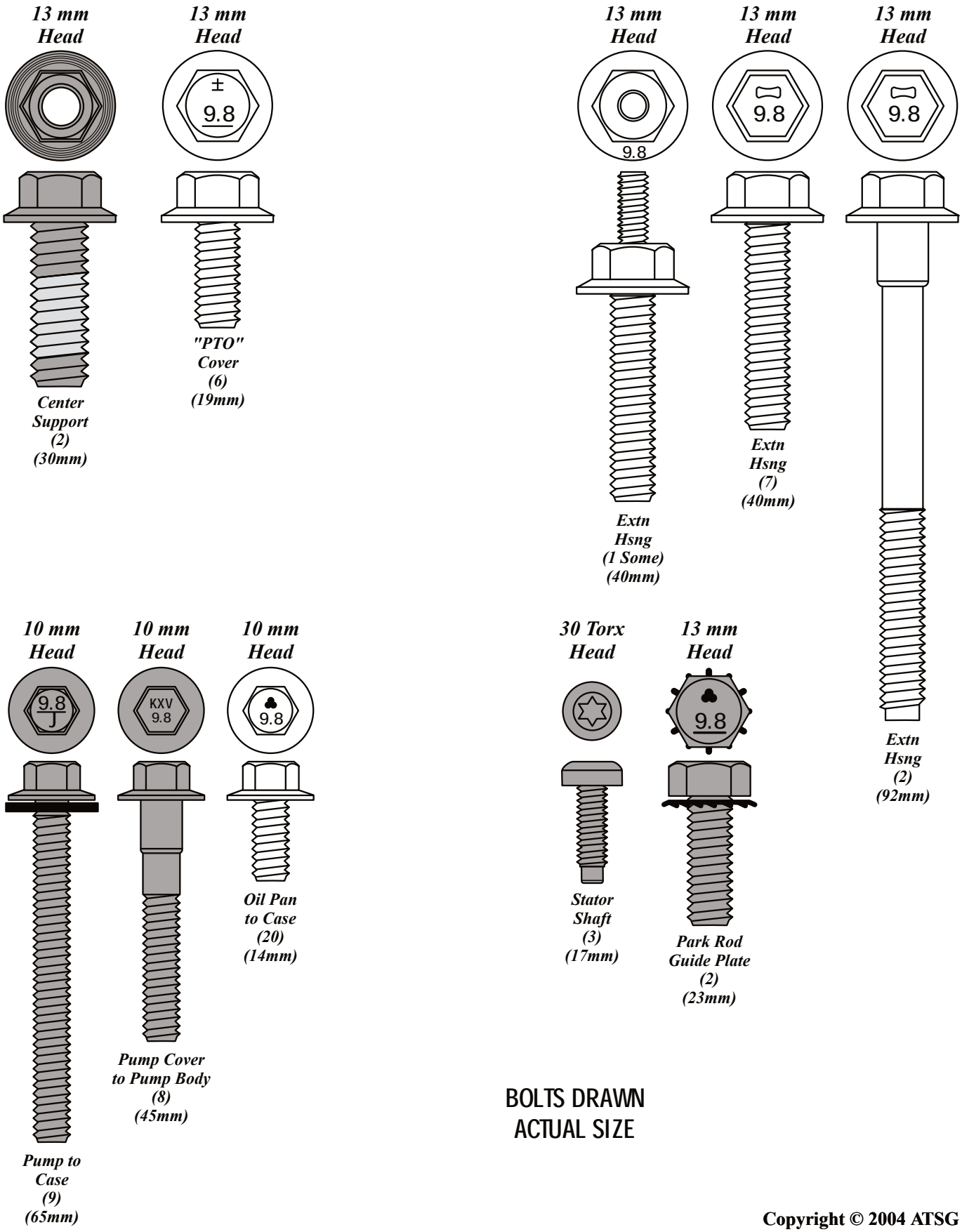


Figure 191

BOLT CHART



BOLTS DRAWN ACTUAL SIZE

Figure192

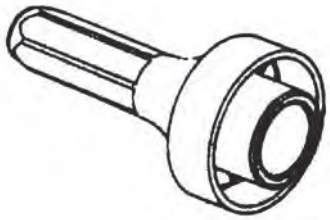
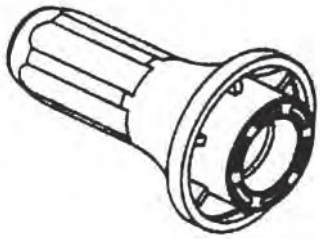
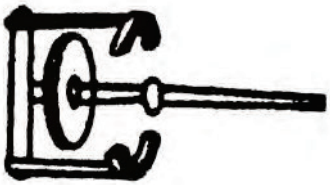
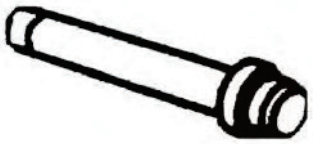
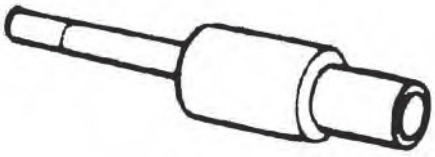
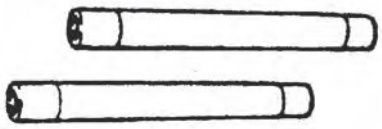
SPECIAL TOOLS	
	***2WD Extension Housing Seal Installer*** ***307-462***
	***4WD Extension Housing Seal Installer*** ***307-453***
	***Clutch Spring Compressor*** ***307-015***
	***Manual Shift Lever Seal Installer*** ***307-002***
	***Output Shaft Bushing Installer*** ***307-464***
	***Torque Converter Handles*** ***307-091*** **Copyright © 2004 ATSG**

Figure 193

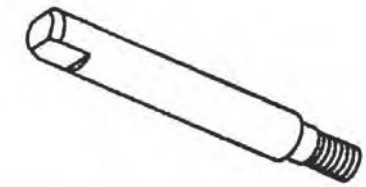
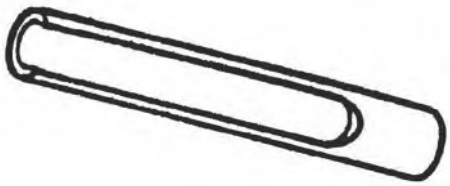
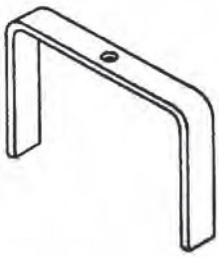
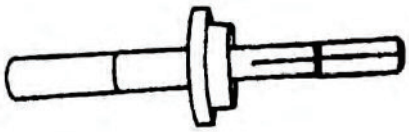
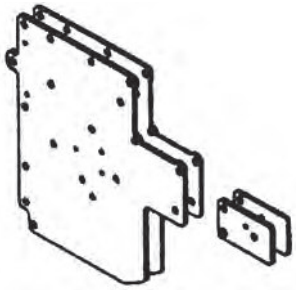
SPECIAL TOOLS	
	***Oil Pump Alignment Dowel*** ***307-222***
	***Filler Tube Installer*** ***307-376***
	***Forward Clutch And Sun Shell Assembly Installer*** ***307-436***
	***Bridge Adapter (Use With 370-436)*** ***307-436-01***
	***Coast Clutch Loading Fixture*** ***307-S383***
	***Air Test Plate*** ***307-457***

Figure 194

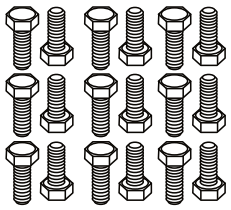
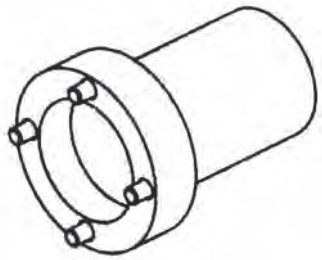
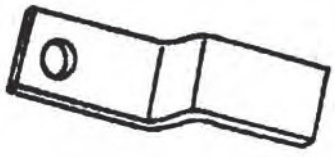
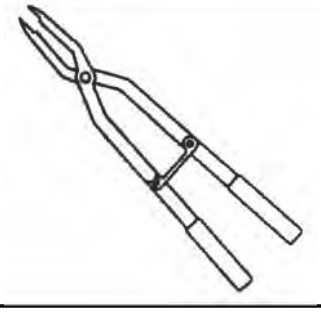
SPECIAL TOOLS	
	***Air Test Plate Bolt Kit*** ***307-126***
	***Alignment Cone*** ***307-455***
	***Output Shaft Nut Driver*** ***307-458***
	***Seal Pack Installer*** ***(Rear Of Case)*** ***307-461***
	***Torque Converter Retainer*** ***307-346***
	***Center Support Snap Ring Pliers*** ***307-343***

Figure 195

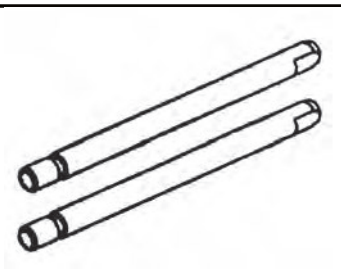
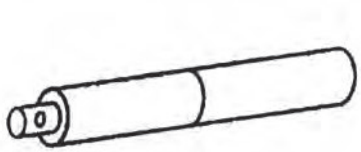
SPECIAL TOOLS	
	***Pump Alignment Pins*** ***307-456***
	***Handle*** ***205-153***

Figure 196

Notes