



MITSUBISHI MONTERO

R/V4A51 AND V5A51

(4 Speed) (5 Speed)

INDEX

QUICK EXTERNAL IDENTIFICATION	3
IDENTIFICATION CODE STAMPING LOCATION	4
4 SPEED COMPONENT APPLICATION CHART	5
5 SPEED COMPONENT APPLICATION CHART	6
ELECTRONIC COMPONENT DESCRIPTION	7
SOLENOID CONNECTOR IDENTIFICATION AND RESISTANCE CHART	8
4 SPEED WIRE SCHEMATIC	14
4 SPEED CONNECTOR IDENTIFICATION	15
5 SPEED WIRE SCHEMATIC	16
5 SPEED CONNECTOR IDENTIFICATION	17
DIAGNOSTIC TROUBLE CODE DESCRIPTION	19
AIR CHECKS	20
LINE PRESSURE TEST SPECS, PRESSURE TAP LOCATIONS, FLUID SPECIFICATION	21
TRANSMISSION DISASSEMBLY	24
COMPONENT REBUILD SECTION	
TRANSMISSION CASE ASSEMBLY	45
EXTENSION HOUSING OR 4WD ADAPTER HOUSING	48
2WD SPEEDOMETER GEAR ASSEMBLY	49
OIL PUMP ASSEMBLY	51
OVERDRIVE AND REVERSE CLUTCH HOUSING ASSEMBLY	55
PLANETARY GEAR TRAIN AND LOW SPRAG ASSEMBLY	62
REVERSE SUN GEAR AND HUB ASSEMBLY	66
CENTER SUPPORT ASSEMBLY	66
REDUCTION ANNULUS AND UNDERDRIVE CLUTCH HOUSING ASSEMBLY	70
2ND BRAKE CLUTCH PISTON AND RETAINER ASSEMBLY	75
REDUCTION SERVO ASSEMBLY	76
DIRECT CLUTCH HOUSING ASSEMBLY	78
4 SPEED OUTPUT SHAFT SUPPORT	81
5 SPEED OUTPUT SHAFT SUPPORT AND DIRECT SPRAG ASSEMBLY	82
DIRECT SPRAG FREEWHEEL DIRECTION	84
LOW SPRAG FREEWHEEL DIRECTION	85
REDUCTION CARRIER AND OUTPUT SHAFT ASSEMBLY	86
VALVE BODY ASSEMBLY	88
CHECK BALL LOCATIONS	91
TRANSMISSION ASSEMBLY (4 SPEED)	97
TRANSMISSION ASSEMBLY (5 SPEED)	100
REDUCTION BAND ADJUSTMENT	112
TORQUE SPECIFICATIONS	124
THRUST BEARING IDENTIFICATION	125
SPECIAL SERVICE TOOLS	126

AUTOMATIC TRANSMISSION SERVICE GROUP
18635 S.W. 107 AVENUE
MIAMI, FLORIDA 33157
(305) 670-4161



INTRODUCTION R/V4A51 AND V5A51

*1st Printing
November, 2008*

R/V4A51 R=2WD, V=4WD

This is a four speed, Rear Wheel Drive transmission, with fully electronic controls for the upshifts and downshifts, with 4th gear being overdrive. The individual gear ratios are achieved through two planetary gear sets connected one behind the other. The components of the planetary gear sets are driven or held by means of five multiple plate clutch packs, and a low sprag.

To minimize fuel consumption, the torque converter clutch is applied by the PCM, depending on throttle position and vehicle speed. These units are currently found in Mitsubishi Montero 1999-2002 models, equipped with 3.0L and 3.5L engines.

V5A51 V=4WD

This is a five speed, Rear Wheel Drive transmission, with fully electronic controls for the upshifts and downshifts, with 5th gear being overdrive. The individual gear ratios are achieved through 3 planetary gear sets connected one behind the other. The components of the planetary gear sets are driven or held by means of six multiple plate clutch packs, 1 band, and two sprags.

To minimize fuel consumption, the torque converter clutch is applied by the PCM, depending on throttle position and vehicle speed. These units are currently found in Mitsubishi Montero 2001-Up models, equipped with 3.5L and 3.8L engines.

We wish to thank Mitsubishi Motor Company for the information and illustrations that have made this booklet possible. A special thanks also to Bob Nuttall for information and suggestions that has made this a very accurate booklet.

No part of any ATSG publication may be reproduced, stored in any retrieval system or transmitted in any form or by any means, including but not limited to electronic, mechanical, photocopying, recording or otherwise, without **written** permission of Automatic Transmission Service Group. This includes all text illustrations, tables and charts.

The information and part numbers contained in this booklet have been carefully compiled from industry sources known for their reliability, but ATSG does not guarantee its accuracy.

WAYNE COLONNA
PRESIDENT

Copyright © ATSG 2008

JIM DIAL
TECHNICAL CONSULTANT

DALE ENGLAND
FIELD SERVICE CONSULTANT

ED KRUSE
TECHNICAL CONSULTANT

PETER LUBAN
TECHNICAL CONSULTANT

GREGORY LIPNICK
TECHNICAL CONSULTANT

JON GLATSTEIN
TECHNICAL CONSULTANT

DAVID CHALKER
TECHNICAL CONSULTANT

RICHARD GRAHAM
TECHNICAL CONSULTANT

ROLAND ALVAREZ
TECHNICAL CONSULTANT

GERALD CAMPBELL
TECHNICAL CONSULTANT

GREG CATANZARO
TECHNICAL CONSULTANT

**AUTOMATIC TRANSMISSION SERVICE GROUP
18635 S.W. 107 AVENUE
MIAMI, FLORIDA 33157
(305) 670-4161**

PREFACE

The information contained within this manual is designed as both a teaching aid and self learning guide for automotive technicians, who aspire to broaden their working knowledge of automatic transmissions. A basic understanding of hydraulics and electronics is also a prerequisite to mastering this transmission.

This manual will cover both the 4 speed unit (R/V4A51), and the 5 speed unit (V5A51), in both the "R" 2WD and "V" 4WD versions. Currently, there are no 2WD 5 speed units available, only the 4 speed.

Mitsubishi Miracle

This transmission, in our opinion, is one of the most well engineered transmissions we have seen. It first appeared in the 1999 Montero, as a four speed unit, but was engineered with the space left inside to make it a five speed, by simply adding additional components and changing the strategy in the PCM, to accomodate an added solenoid and 2 added valve trains in the valve body. This occured in 2001. They added a reduction planetary system, reduction band, direct clutch pack and direct sprag. The added solenoid is used to apply the added reduction band. The added direct clutch is applied using the existing L/R solenoid, along with an added switch valve in the valve body, much like the 41TE. The power-flow for 1st thru 3rd gears, and reverse, all go through the reduction planetary gear set, which changes all of the gear ratios in the five speed transmission with the exception of overdrive.

The manual shift indicators are the same in both the 4 and 5 speed units, and are as follows, P,R,N,D,3,2,L. This makes it very difficult to identify the transmissions apart when laying on the floor, since the cases are the same in preparation for the added internal parts. There is however an easy way to identify it externally, as shown in Figure 1. The 5 speed will have a band anchor plug for the added reduction band, and the 4 speed unit will not. Also the accumulators on the outside for the direct clutch and the reduction band will be empty.

Component applications and gear ratios for the 4 speed unit are shown in Figure 3, and component applications and gear ratios for the 5 speed unit are shown in Figure 4.

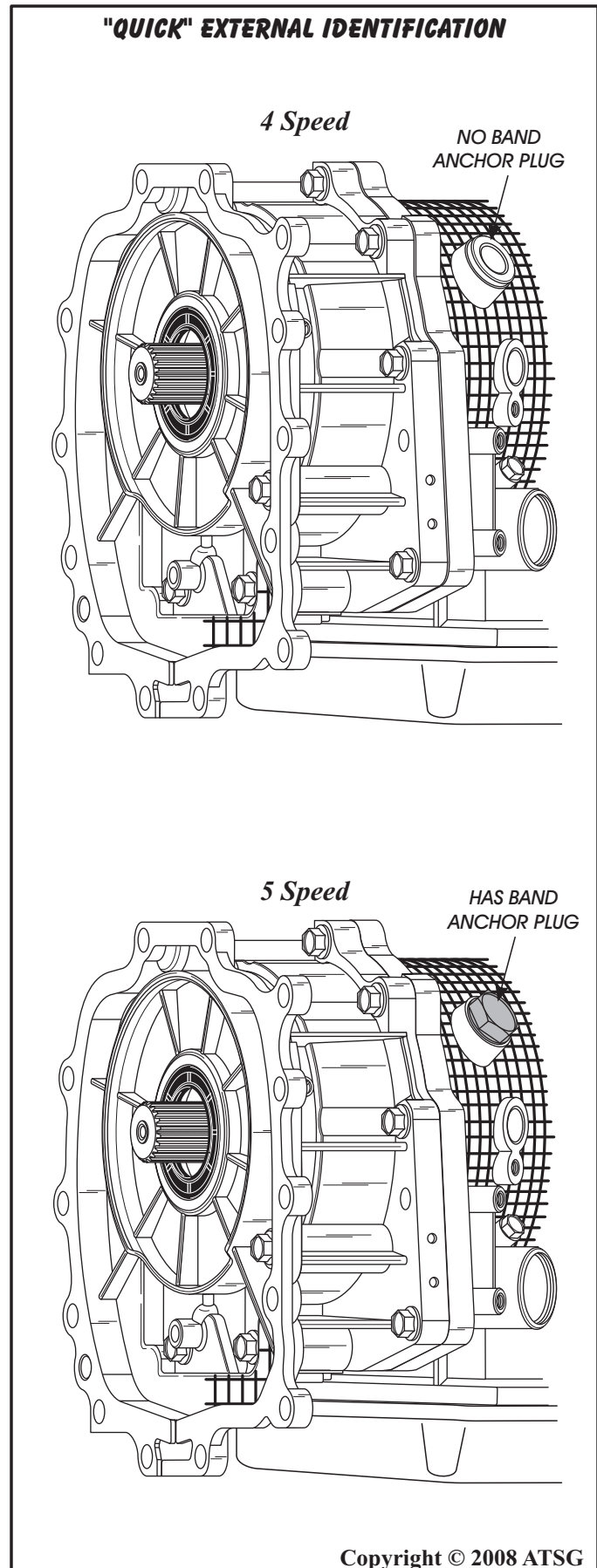
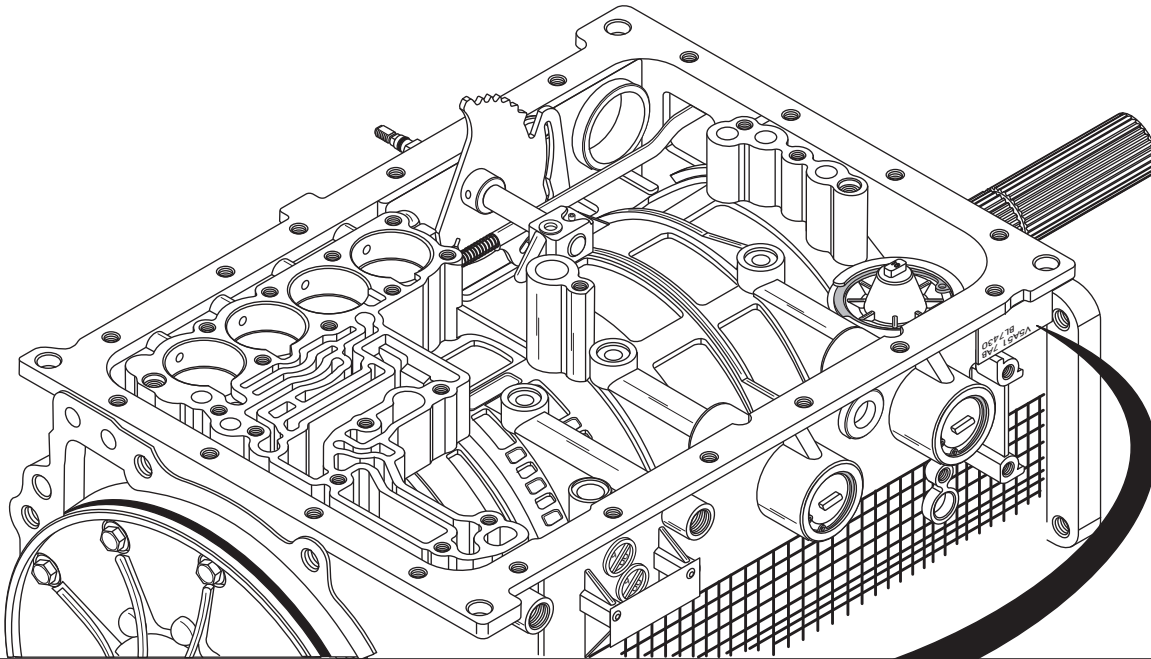


Figure 1

IDENTIFICATION CODE STAMPING LOCATION



V 5 A 51 7AB

Drive Axle
 R = Rear 2WD
 V = Rear 4WD

Forward Speeds
 4 = Four Speeds
 5 = Five Speeds

Transmission Type
 A = Automatic
 M = Manual

Model Code

Trans Capacity
 41 = Light Duty
 42 = Standard Duty
 51 = Heavy Duty

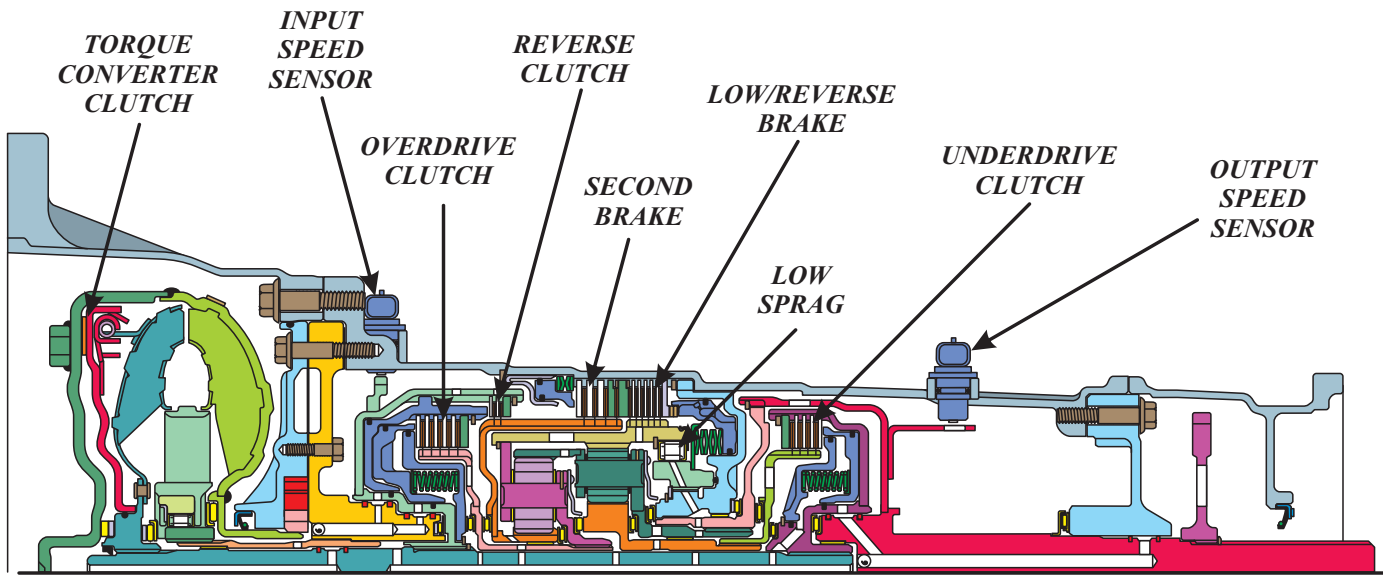
VEHICLE AND TRANSMISSION APPLICATION CHART

4 Speed 2WD Models				4 Speed 4WD Models			
Year	Model	Engine	Transmission	Year	Model	Engine	Transmission
1999	Montero	3.0L SOHC	R4A51-5-DDA	99-00	Montero	3.5L SOHC	V4A51-5-CIA
1999	Montero	3.0L SOHC	R4A51-5-DDA1	99-01	Montero	3.0L SOHC	V4A51-5-DA
1999	Montero	3.0L SOHC	R4A51-5-DEA	99-01	Montero	3.0L SOHC	V4A51-5-DIA
1999	Montero	3.0L SOHC	R4A51-5-DEA1	00-01	Montero	3.0L SOHC	V4A51-5-DIB
1999	Montero	3.5L SOHC	R4A51-5-CCA	00-01	Montero	3.5L SOHC	V4A51-5-CIB
1999	Montero	3.5L SOHC	R4A51-5-CCA1	01-02	Montero	3.0L SOHC	V4A51-5-DIB1
00-01	Montero	3.0L SOHC	R4A51-5-DFA	02-04	Montero	3.5L SOHC	V4A51-5-CIB1
00-01	Montero	3.0L SOHC	R4A51-5-DFA1				
00-01	Montero	3.5L SOHC	R4A51-5-CEA				
00-01	Montero	3.5L SOHC	R4A51-5-CEA1	5 Speed 4WD Models			
01-03	Montero	3.0L SOHC	R4A51-5-DFB	Year	Model	Engine	Transmission
01-04	Montero	3.5L SOHC	R4A51-5-CEB	2001	Montero	3.5L SOHC	V4A51-7-ACA1
				2001	Montero	3.5L SOHC	V4A51-7-AA
				2002	Montero	3.5L SOHC	V4A51-7-ACB1
				2002	Montero	3.5L SOHC	V4A51-7-AB
				03-05	Montero	3.8L SOHC	V4A51-7-HCB

Copyright © 2008 ATSG

Figure 2

R4A51/V4A51 COMPONENT APPLICATION CHART



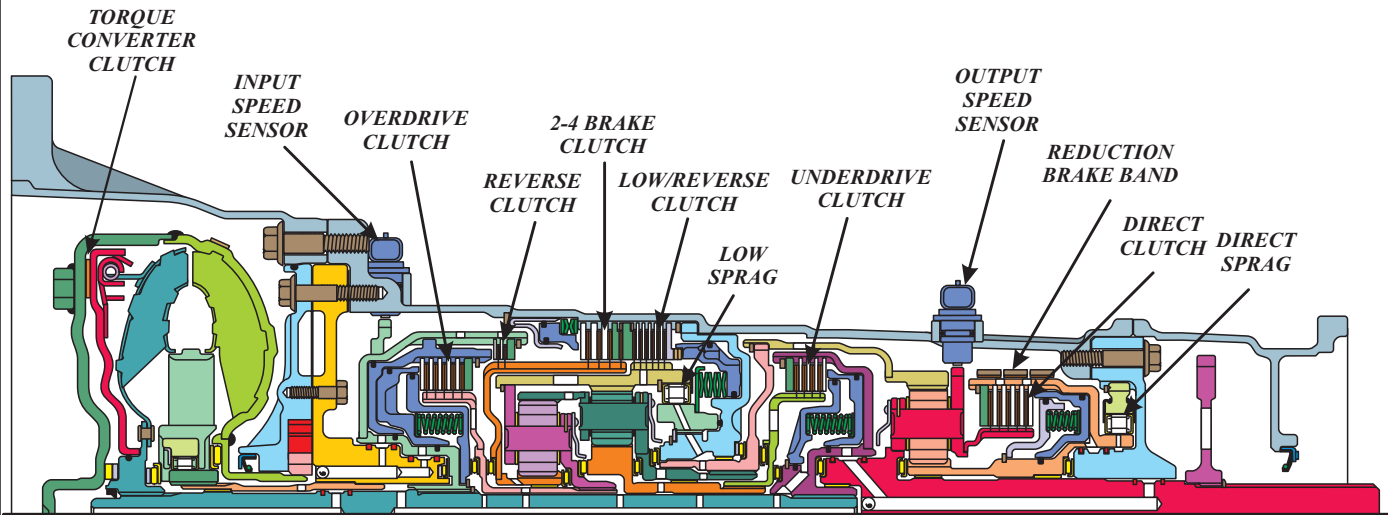
R4A51/V4A51 COMPONENT APPLICATION CHART

Selector Lever Position/Gear	Under Drive Clutch	Reverse Clutch	Over Drive Clutch	Low/Rev Brake Clutch	2nd Brake Clutch	Low Sprag	Gear Ratio				
Park				ON							
Reverse		ON		ON			2.720				
Neutral				ON							
"D" 1st	ON			ON		HOLD	2.842				
"D" 2nd	ON				ON		1.495				
"D" 3rd	ON		ON				1.000				
"D" 4th			ON		ON		.731				
"3" 1st	ON			ON		HOLD	2.842				
"3" 2nd	ON				ON		1.495				
"3" 3rd	ON		ON				1.000				
"2" 1st	ON			ON		HOLD	2.842				
"2" 2nd	ON				ON		1.495				
"L" 1st	ON			ON		HOLD	2.842				

Copyright © 2008 ATSG

Figure 3

V5A51 COMPONENT APPLICATION CHART



V5A51 COMPONENT APPLICATION CHART

Selector Lever Position/Gear	Under Drive Clutch	2nd Brake Clutch	Over Drive Clutch	Low/Rev Brake Clutch	Reverse Clutch	Low Sprag	Direct Clutch	Reduct. Brake Band	Direct Sprag	Gear Ratio	
Park				ON				ON			
Reverse				ON	ON			ON		3.865	
Neutral				ON				ON			
"D" 1st	ON			ON*		HOLD		ON	HOLD	3.789	
"D" 2nd	ON	ON						ON	HOLD	2.057	
"D" 3rd	ON		ON					ON	HOLD	1.421	
"D" 4th	ON		ON				ON			1.000	
"D" 5th		ON	ON				ON			.731	
"3" 1st	ON			ON		HOLD		ON	HOLD	3.789	
"3" 2nd	ON	ON						ON	HOLD	2.057	
"3" 3rd	ON		ON					ON	HOLD	1.421	
"2" 1st	ON			ON		HOLD		ON	HOLD	3.789	
"2" 2nd	ON	ON						ON	HOLD	2.057	
"L" 1st	ON			ON		HOLD		ON	HOLD	3.789	

* Operates only when stopped in "D" 1st gear (Approximately 10 KMH {6.2 MPH} or less).

The 5 speed units from late 2001 thru current, are equipped with a "Sport Tronic" feature. This is a selector lever with two operation gates, a Main gate and a Manual gate as shown on page 10. All manual positions below the "D" position must be achieved in the Manual gate with Plus or Minus indicators.

Copyright © 2008 ATSG

Figure 4

ELECTRONIC COMPONENTS

Solenoid Locations And Identification

All solenoids operate in exactly the same manner and are interchangeable. The transmission control relay supplies battery voltage to each solenoid through terminals 9 and 10 in the transmission case connector. Each solenoid closes when energized (On) and opens to exhaust when de-energized (Off). The PCM provides the ground to energize each solenoid. The ground time is displayed in percent. The PCM energizes or de-energizes each solenoid based on input from various sensors such as TPS, ISS, OSS, VSS, TFT and PNP etc. As each solenoid is energized or de-energized, it controls hydraulic pressure in the transmission to apply and release control elements.

The four and five speed solenoid names and locations are illustrated in Figure 5. The reduction band solenoid was added to the five speed unit and

the low/reverse solenoid in addition to applying the low/reverse clutch, must also apply the added direct clutch, with the help of an added "switch" valve in the five speed valve body, much like the 41TE unit. There was also a regulator valve for the reduction band added to the valve body.

The valve body worm tracks are the same in both valve bodies, so extra care must be used when there are replacement parts necessary. The 4 and 5 speed spacer plates and valve body gaskets are the same.

A quick reference resistance chart has been provided for you in Figure 6, to check each solenoid, and again they are all the same, even though Mitsubishi recommends tagging them as they are removed so that they go back in the same bore. Solenoid air checks are found in Figure 7.

Electrical Components Continued on Page 9

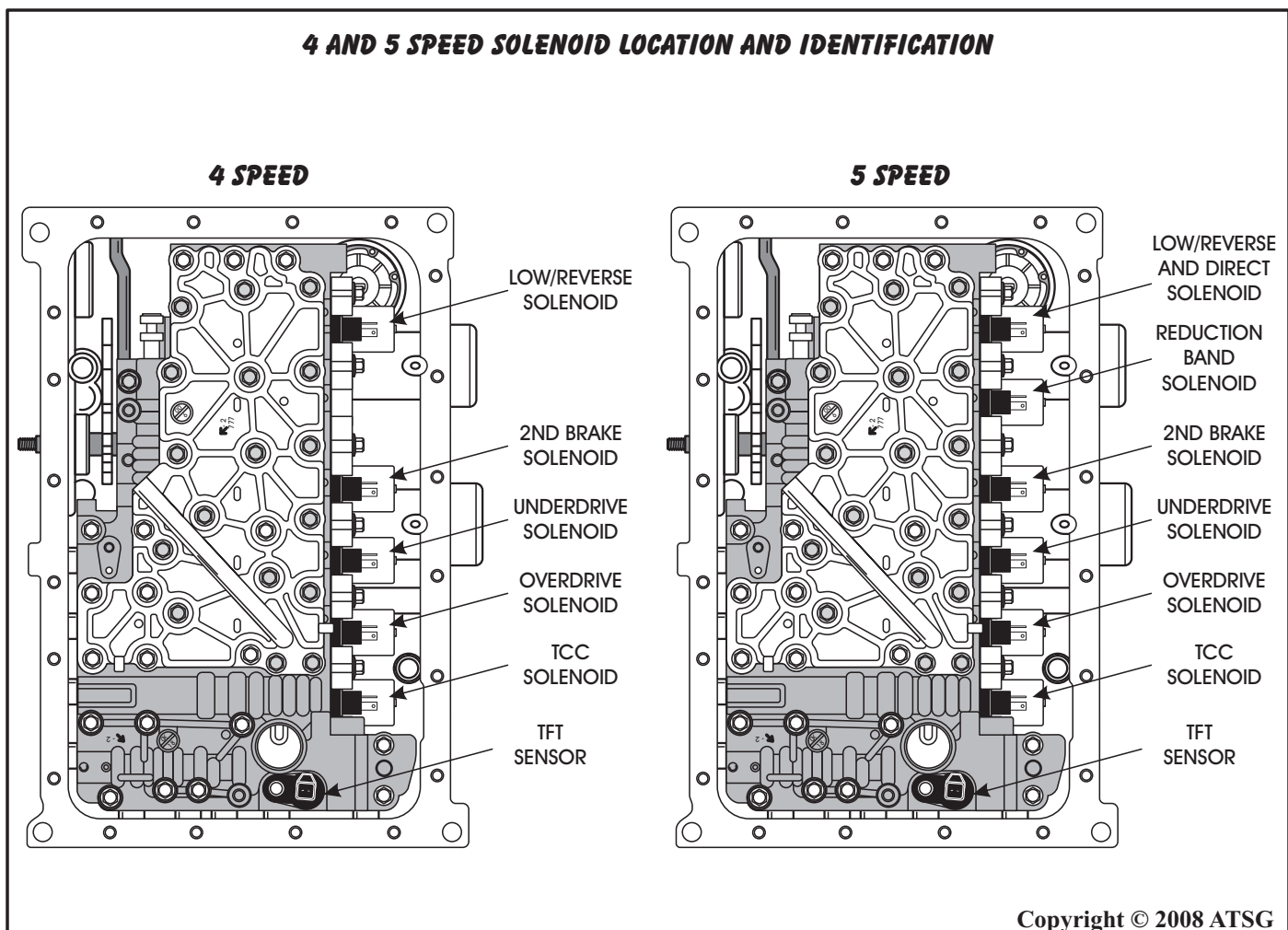
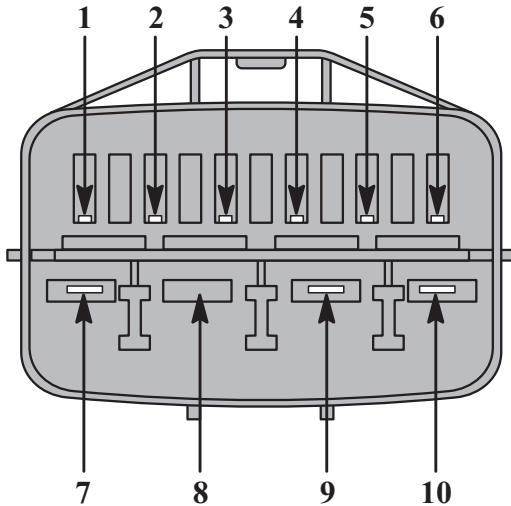


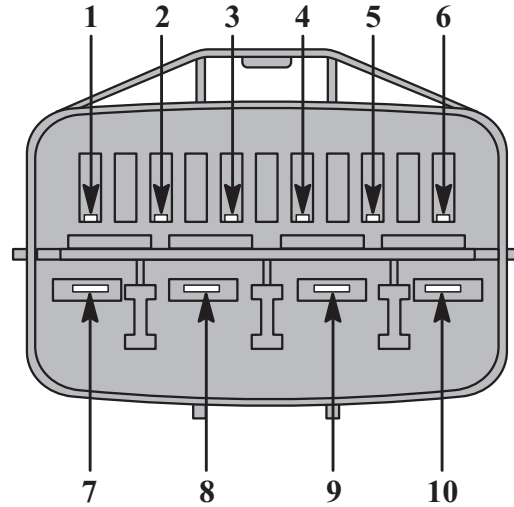
Figure 5

SOLENOID AND ATF TEMPERATURE SENSOR RESISTANCE CHART

*View Looking Into
Front Of 4 Speed
Harness Connector*



*View Looking Into
Front Of 5 Speed
Harness Connector*



TERMINAL NUMBERS	COMPONENT CHECKED	PART NUMBER	RESISTANCE
<i>Terminals 7 and 10</i>	<i>TCC Solenoid</i>	<i>MD758981</i>	<i>2.7-3.4 Ohms @ 68°F</i>
<i>Terminals 6 and 10</i>	<i>L/R Solenoid</i>	<i>MD758981</i>	<i>2.7-3.4 Ohms @ 68°F</i>
<i>Terminals 5 and 9</i>	<i>OD Solenoid</i>	<i>MD758981</i>	<i>2.7-3.4 Ohms @ 68°F</i>
<i>Terminals 4 and 9</i>	<i>2nd Brake Solenoid</i>	<i>MD758981</i>	<i>2.7-3.4 Ohms @ 68°F</i>
<i>Terminals 3 and 9</i>	<i>UD Solenoid</i>	<i>MD758981</i>	<i>2.7-3.4 Ohms @ 68°F</i>
<i>Terminals 8 and 10</i>	<i>Reduction Solenoid</i>	<i>MD758981</i>	<i>2.7-3.4 Ohms @ 68°F</i>
<i>Terminals 1 and 2</i>	<i>ATF Temp. Sensor</i>		<i>0°C (32°F) = 16.7 - 20.5 k ohms</i> <i>20°C (68°F) = 7.3 - 8.9 k ohms</i> <i>40°C (104°F) = 3.4 - 4.2 k ohms</i> <i>60°C (140°F) = 1.9 - 2.2 k ohms</i> <i>80°C (176°F) = 1.0 - 1.2 k ohms</i> <i>100°C (212°F) = 0.57 - 0.69 k ohms</i>

Transmission Fluid Specification = Diamond SP III

Copyright © 2008 ATSG

Figure 6

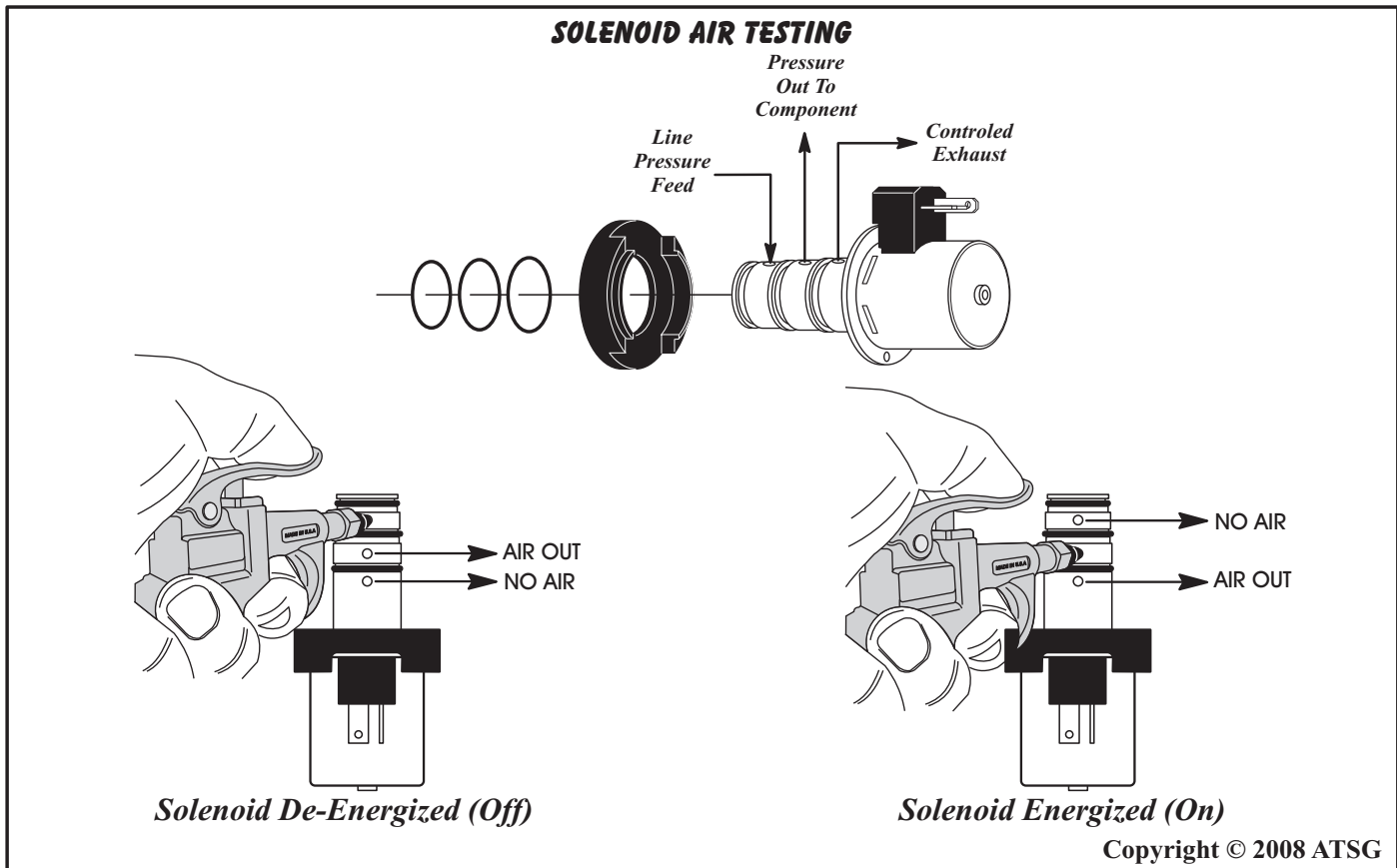


Figure 7

ELECTRONIC COMPONENTS (CONT'D)

Transmission Fluid Temperature Sensor

The Transmission Fluid Temp (TFT) Sensor is located inside the transmission on the valve body, as shown in Figure 5. The PCM applies a 5 volt signal to the TFT sensor output terminal (terminal 1). The ground terminal (terminal 2) is grounded back to the PCM. The TFT sensor output voltage rises when the resistance increases, and drops when the resistance decreases. Resistance of the TFT sensor decreases as the fluid temperature increases, as shown in the chart in Figure 6.

If the TFT sensor output voltage is 2.6 volts or more, even after driving for 10 minutes, it is judged that there is an open circuit in the TFT sensor circuit and diagnostic trouble code 15 will be stored.

If the TFT sensor output detects the voltage that corresponds to 200°C (392°F) for more than one second, it is judged that there is a short in the TFT sensor circuit and diagnostic trouble code 16 will be stored.

The TFT sensor can be checked through terminals 1 and 2 of the transmission case connector, as shown in Figure 6. Notice there is also an "O" ring seal on the TFT sensor, as shown in Figure 8.

Electronic Components Continued on Page 11

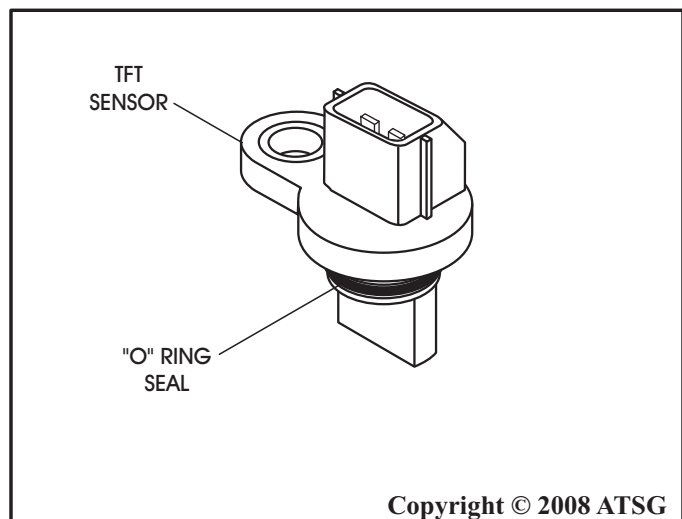


Figure 8

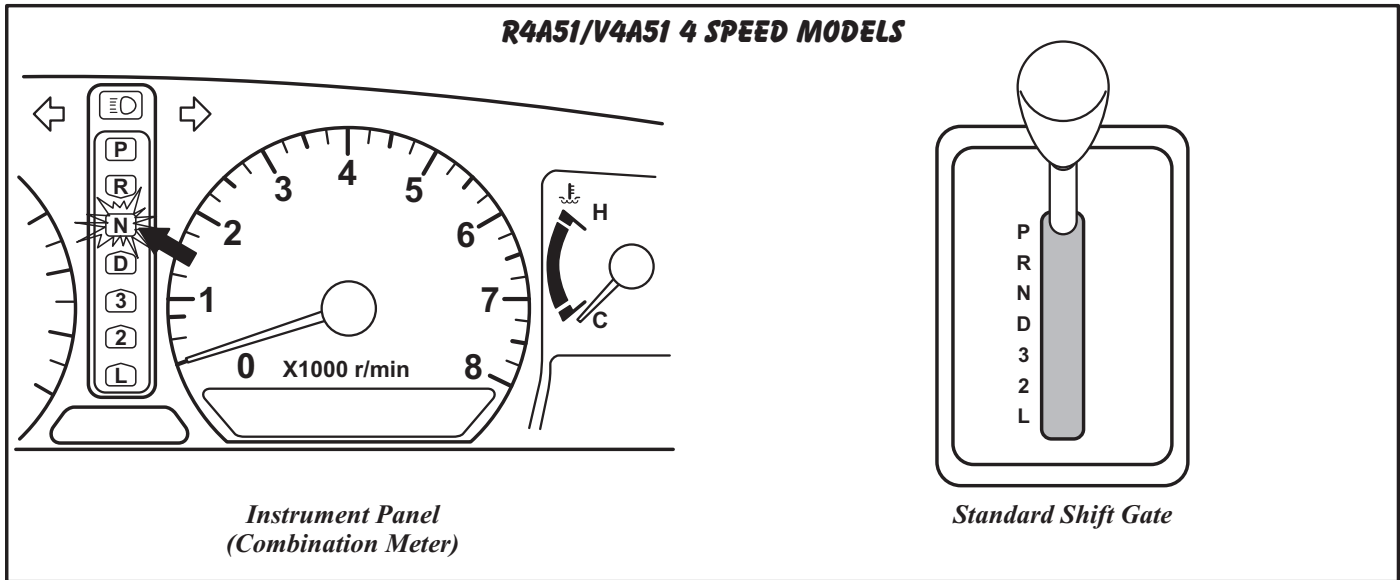


Figure 9

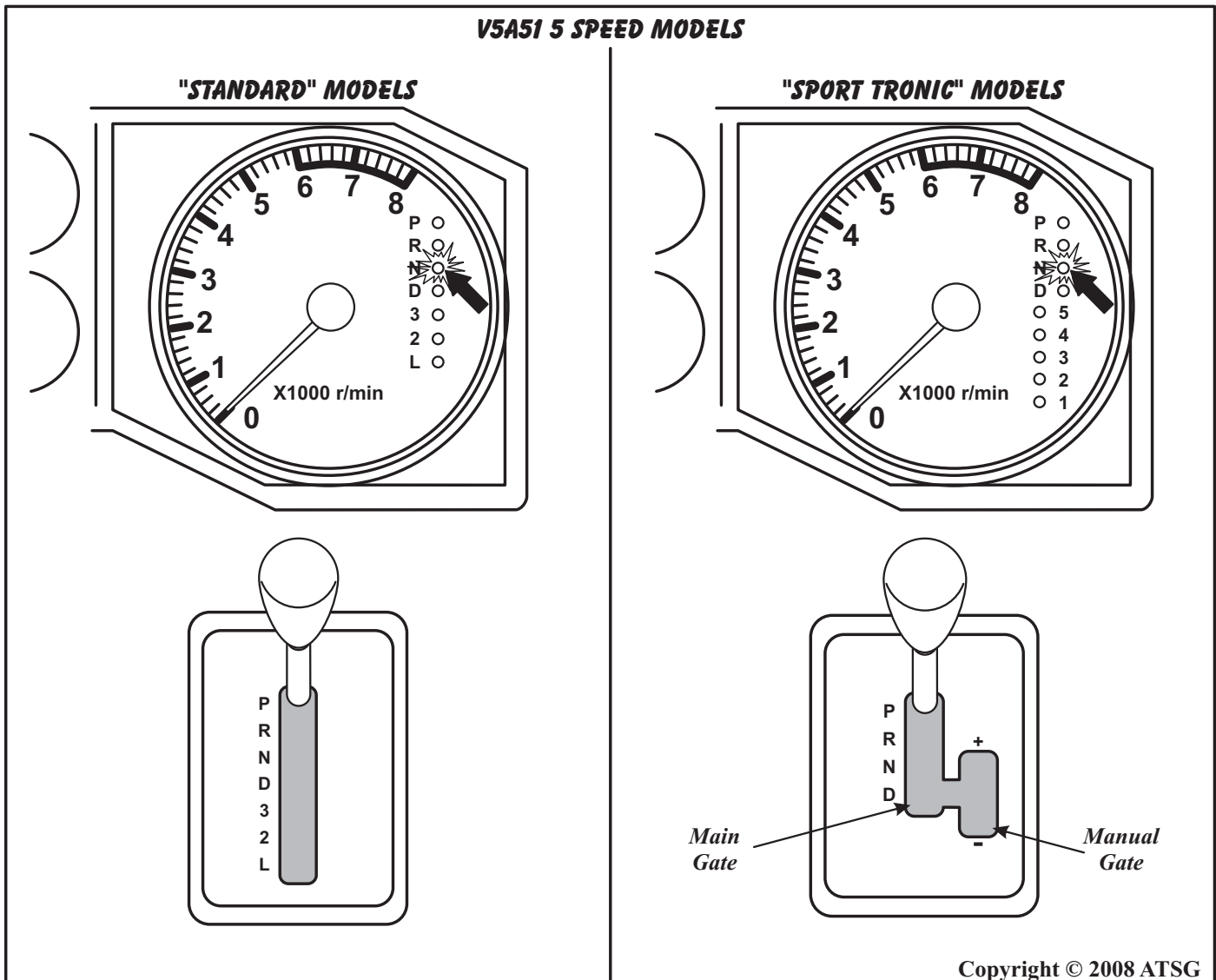


Figure 10

ELECTRONIC COMPONENTS (CONT'D)

Manual Shift Gate (4 Speed Models)

A 7 position (P, R, N, D, 3, 2, L) manual selector lever is used in all vehicles with the 4 speed transmission. The Manual Selector Lever assembly and indicators in the instrument panel are illustrated in Figure 9. Each indicator represents the gear that is selected with the manual selector lever.

Mitsubishi refers to the instrument panel as a "Combination Meter" in their wire schematics and text.

"Standard" Shift Gate (5 Speed Models)

A 7 position (P, R, N, D, 3, 2, L) manual selector lever is used in some 2001 vehicles equipped with the 5 speed transmission. The Manual Selector Lever assembly and indicators in the instrument panel are illustrated in Figure 10. Each indicator represents the gear that is selected with the manual selector lever.

Mitsubishi refers to the instrument panel as a "Combination Meter" in their wire schematics and text.

"Sport Tronic" Shift Gate (5 Speed Models)

A 4 position (P, R, N, D) Sport Tronic selector lever is used in some 2001 vehicles equipped with the 5 speed transmission. The Manual Selector Lever assembly and indicators in the instrument panel are illustrated in Figure 10. Each indicator represents the gear that is selected with the manual selector lever. The 5 speed units from late 2001 thru current, are equipped with a "Sport Tronic" feature. This is a selector lever with two operation gates, a Main gate and a Manual gate, and is shown in Figure 10. All manual positions below the "D" position must be selected using the Manual gate with the Plus or Minus indicators. Please refer to Figure 10.

Mitsubishi refers to the instrument panel as a "Combination Meter" in their wire schematics and text.

Trouble Code Diagnosis

The powertrain control module (PCM) monitors the input/output signals, some signals all of the time and others only under specified conditions.

When an irregular signal is initially detected, the PCM decides that a malfunction has occurred and will store a code in memory. Diagnostic trouble codes are kept in memory by direct battery feed. The codes are retained in memory even if the ignition switch is off. Diagnostic trouble codes will, however, be erased when a battery terminal, or the PCM connector is disconnected. They can also be erased using a scan tool.

Check "N" Range Light

The "N" range light flashes at a frequency of approximately 1 Hz (once per second), if there is an abnormality detected in any of the following;

- Input Shaft Speed Sensor
- Output Shaft Speed Sensor
- Any of the Solenoids
- A/T Control Relay System

Caution: The "N" range light will flash at approximately 2 Hz (twice per second), on 1999 to 2000 models, if the transmission fluid temperature is too high. Stop the vehicle and wait until the "N" light quits flashing. 2001-Up models have an "ATF-TEMP" light on the instrument panel

SCANNER FOR CODE RETRIEVAL, OR "N" RANGE INDICATOR LIGHT ON INSTRUMENT CLUSTER

"N" Range Indicator Light Method:

Turn ignition off. Using jumper wire, ground terminal 1 of the Data Link Connector as shown below. Turn ignition on. Read DTC's by observing flash pattern of "N" range indicator light located in the instrument cluster. First series of flashes indicates first digit of DTC. Second series of flashes indicates second digit of DTC.

Example: 2 flashes followed by a pause, and then 6 flashes indicates DTC 26. Refer to trouble code description.

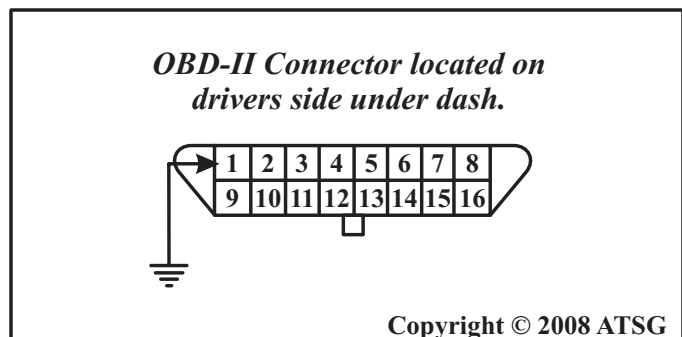


Figure 11

ELECTRONIC COMPONENTS (CONT'D)

Transmission Range Selector Switch

All models use a Transmission Range Selector Switch, commonly referred to in the past as "Inhibitor Switch", which is externally mounted on the transmission case, as shown in Figure 13. The detent positions vary and may have four or seven positions, depending on model. We are covering 2 different transmissions in this manual, and there are 2 different range switch electrical schematics which we will identify for you, one at a time. This will make the diagnostic process much easier. Pay close attention to the wire schematics provided, as some models are equipped with a "Sport Tronic" feature, or a manual mode, that allows a "Slap Stick" for the Up and Down shift control.

Notice in the connector check charts (Figure 14 and 15), that there is one terminal that is common for all ranges. This is the voltage supply terminal into the switch. When the ignition is in the "ON" position, there needs to be battery voltage at this terminal. If there is not, this needs to be repaired first. If voltage is present, it should exit the assigned terminal per the range selected.

The electrical connector is hard wired to, and part of the transmission range selector switch, as shown in Figure 12. Connector terminal identification is shown in Figure 14 and 15.

Continued on Page 13

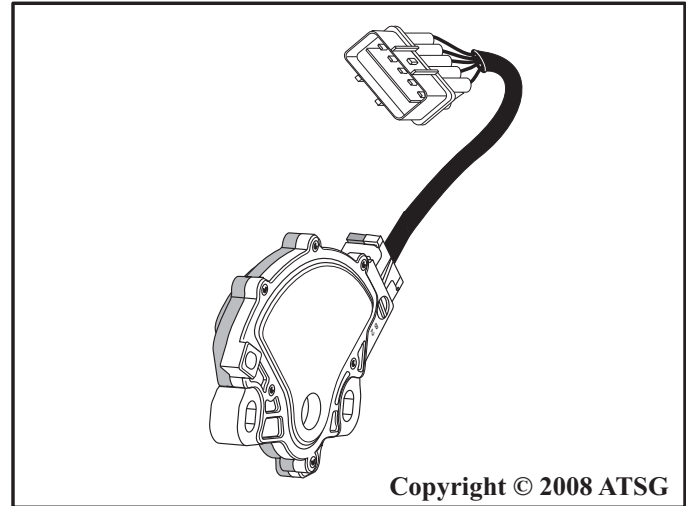


Figure 12

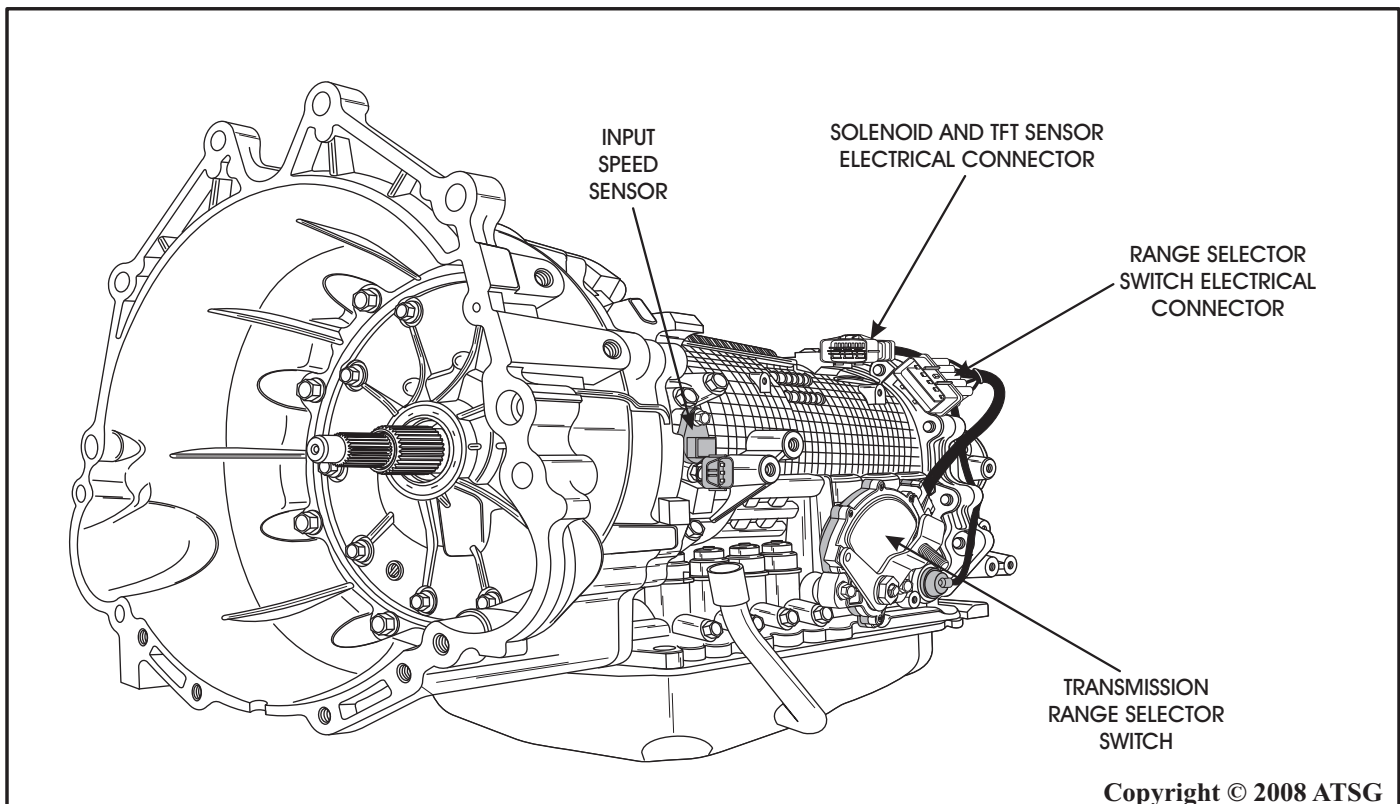


Figure 13

ELECTRONIC COMPONENTS (CONTD)

R/V4A51 and V5A51 1999 - Some 2001

Park/Neutral Position Switch

On the above models Mitsubishi calls it a Park/Neutral Position Switch, and they have seven detent positions (P R N D 3 2 L), as shown in Figure 14. Although the charts in Figure 14 are used to check the integrity of the switch's range selection, using an ohmmeter, the best method is to check the switch in the vehicle with a voltmeter.

By looking at the chart in Figure 14, it can be seen that terminal 7 is the common terminal for all range selections. This is the voltage supply into the switch. Terminals 9 and 10 are used for starting purposes only. With the ignition switch "ON" there must be battery voltage at terminal 7. If there is not, this must be repaired first and is usually a fuse. If voltage is present, it should exit the assigned terminal for each range selection.

The PNP switch can also be checked for shorts. With the ignition switch "OFF", using an ohmmeter at the same terminals shown in the Figure 14 chart, the reading should be less than 2 ohms resistance.

A complete wiring schematic from transmission to the PCM is shown in Figure 16 and PCM connector identification is shown in Figure 17.

R/V4A51 and V5A51 Some 2001-Up

Transmission Range Switch

On the above models Mitsubishi calls it a Transmission Range Switch, and they have four detent positions (P R N D), as shown in Figure 15. Although the charts in Figure 15 are used to check the integrity of the switch's range selection, using an ohmmeter, the best method is to check the switch in the vehicle with a voltmeter.

By looking at the chart in Figure 15, it can be seen that terminal 7 is the common terminal for all range selections. This is the voltage supply into the switch. Terminals 9 and 10 are used for starting purposes only. With the ignition switch "ON" there must be battery voltage at terminal 7. If there is not, this must be repaired first and is usually a fuse. If voltage is present, it should exit the assigned terminal for each range selection.

The TRS switch can also be checked for shorts. With the ignition switch "OFF", using an ohmmeter at the same terminals shown in the Figure 15 chart, the reading should be less than 2 ohms resistance.

A complete wiring schematic from transmission to the PCM is shown in Figure 18 and PCM connector identification is shown in Figure 19.

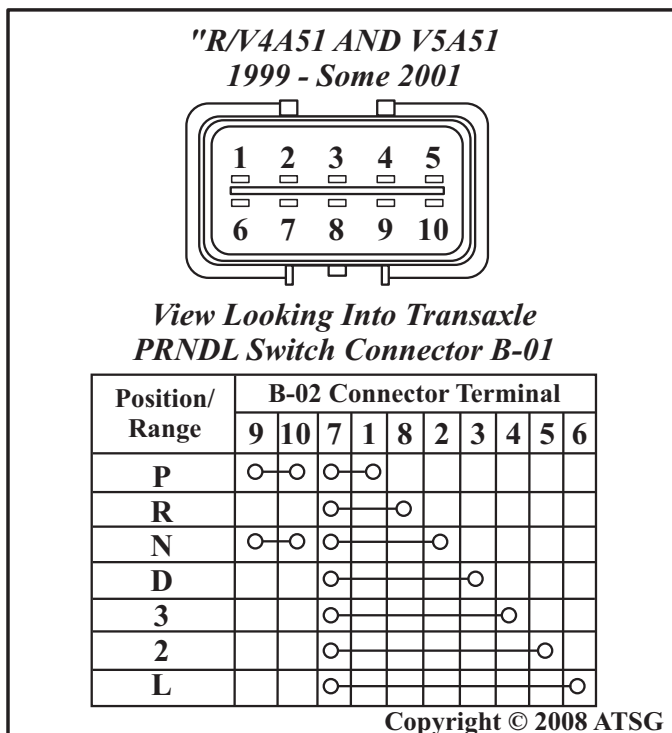


Figure 14

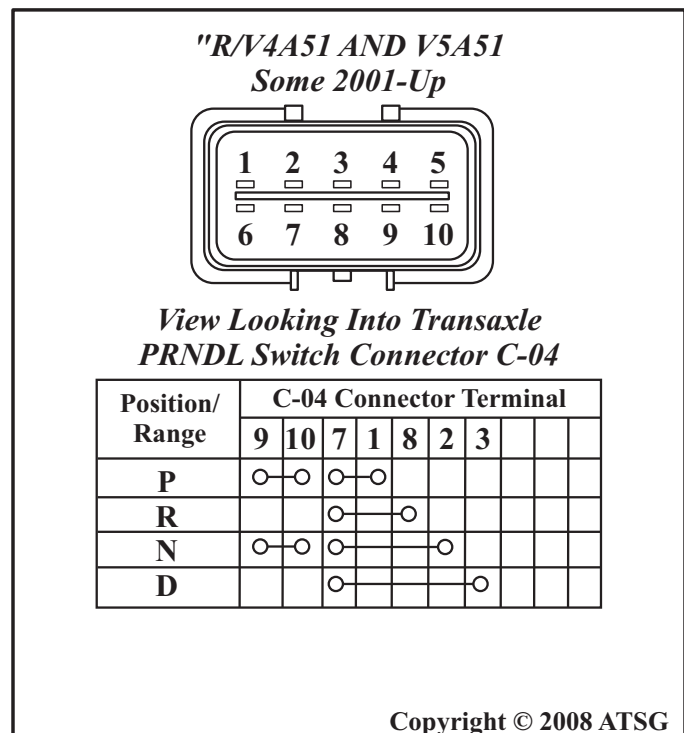
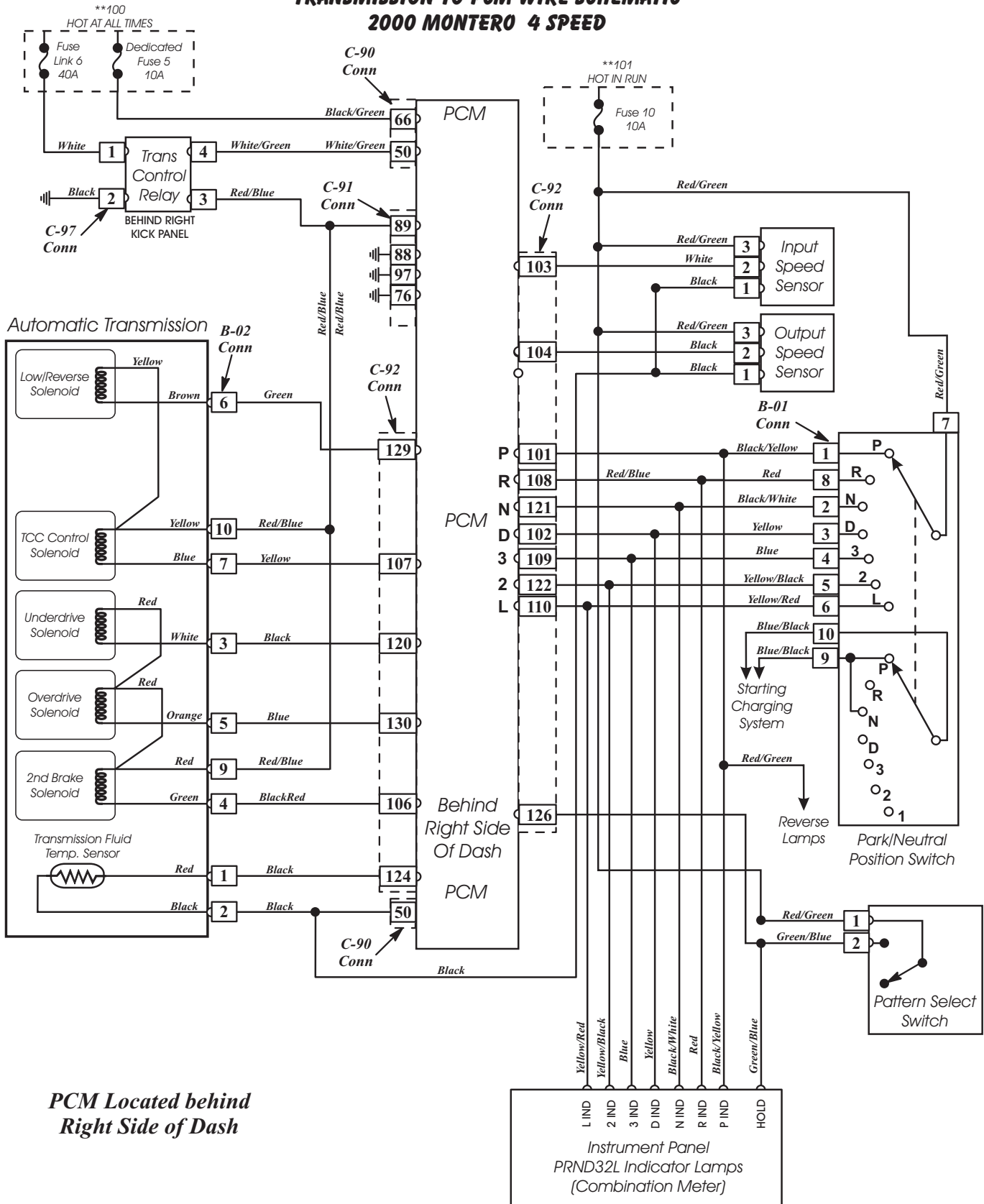


Figure 15

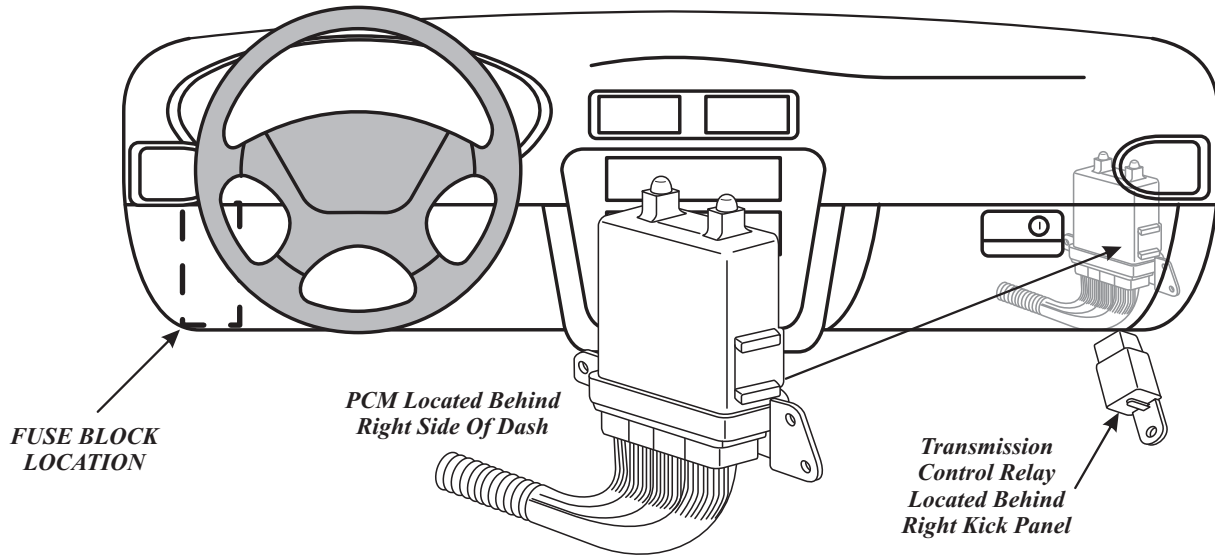
TRANSMISSION TO PCM WIRE SCHEMATIC 2000 MONTERO 4 SPEED



Copyright © 2008 ATSG

Figure 16

PCM CONNECTOR TERMINAL IDENTIFICATION FOR 4 SPEED TRANSMISSION (R/V4A51)



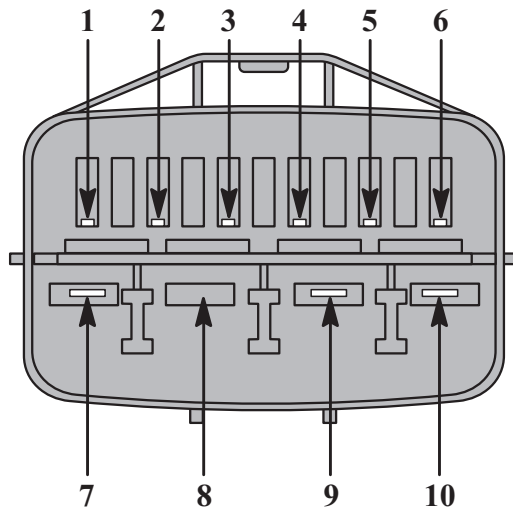
PCM CONNECTOR C-90											
41	42	43						44	45	46	
47	48	49	50	51	52	53	54	55	56	57	
58	59		60	61	62	63		64	65	66	

PCM CONNECTOR C-91											
71	72	73	74					75	76	77	
78	79	80	81	82	83	84	85	86	87	88	89
90	91		92	93	94		95	96		97	98

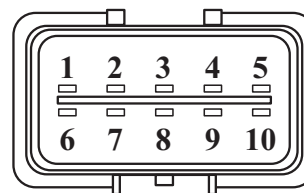
PCM CONNECTOR C-92											
101	102		103	104					105	106	107
108	109	110	111	112	113	114	115	116	117	118	119
121	122	123		124	125		126	127	128		129

All PCM Connector Views are from the wire side of connector.

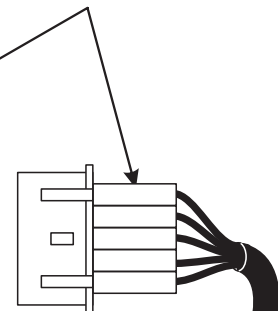
View Looking Into Front Of 4 Speed Harness Connector (B-02 Connector)



View Looking Into Front Of 4 Speed Harness Connector (B-01 Connector)

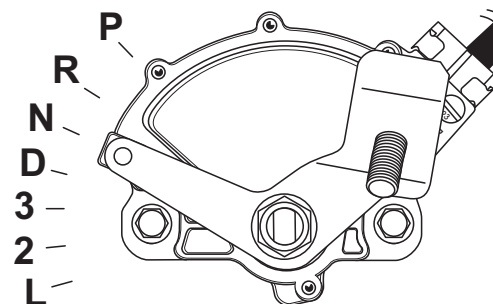


Neutral Switch Harness Connector (B-01 Connector)



View Looking Into Front A/T Relay Harness Connector (C-97 Connector)

1	2
3	4

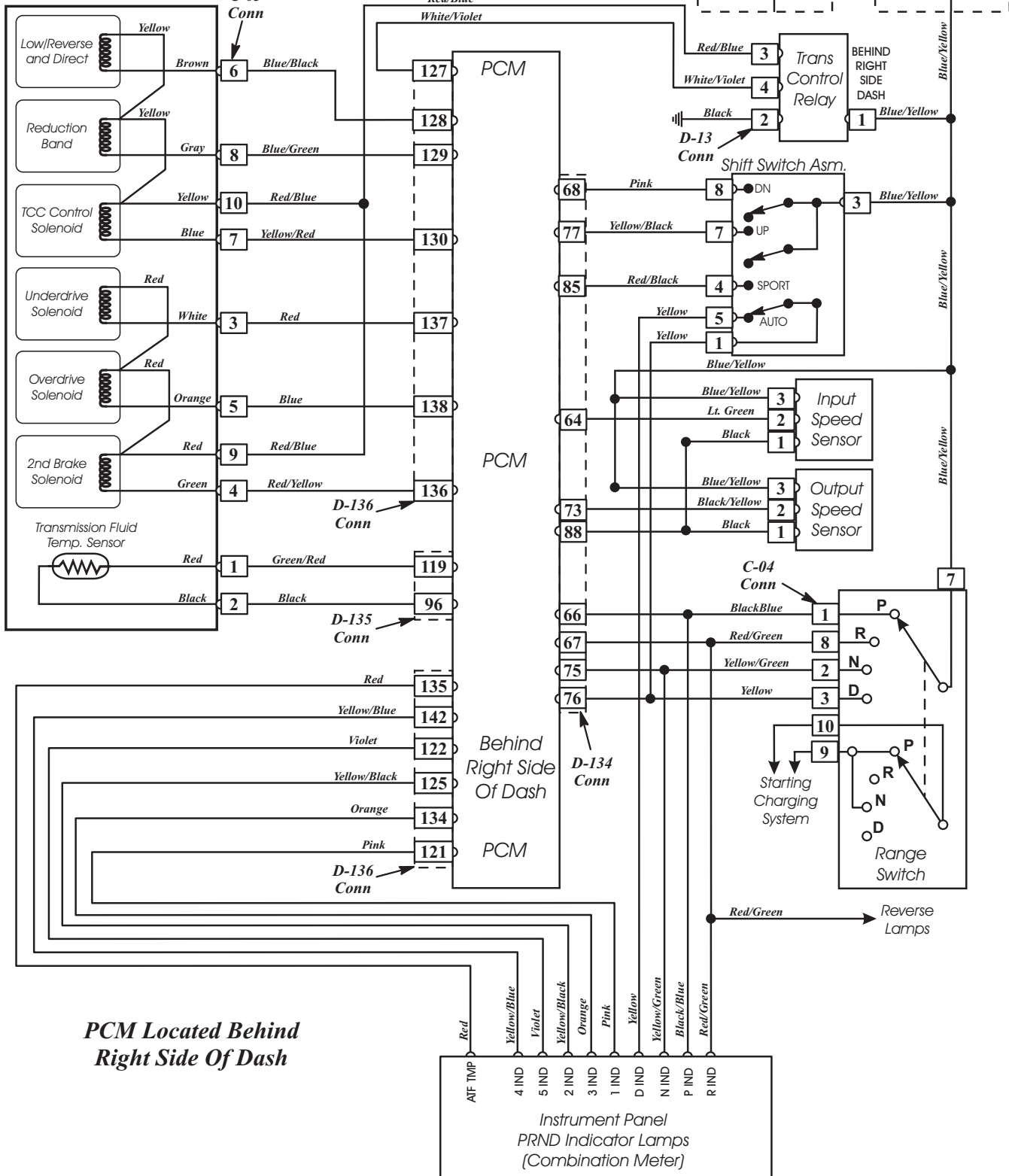


Copyright © 2008 ATSG

Figure 17

TRANSMISSION TO PCM WIRE SCHEMATIC 2003 MONTERO 5 SPEED

Automatic Transmission



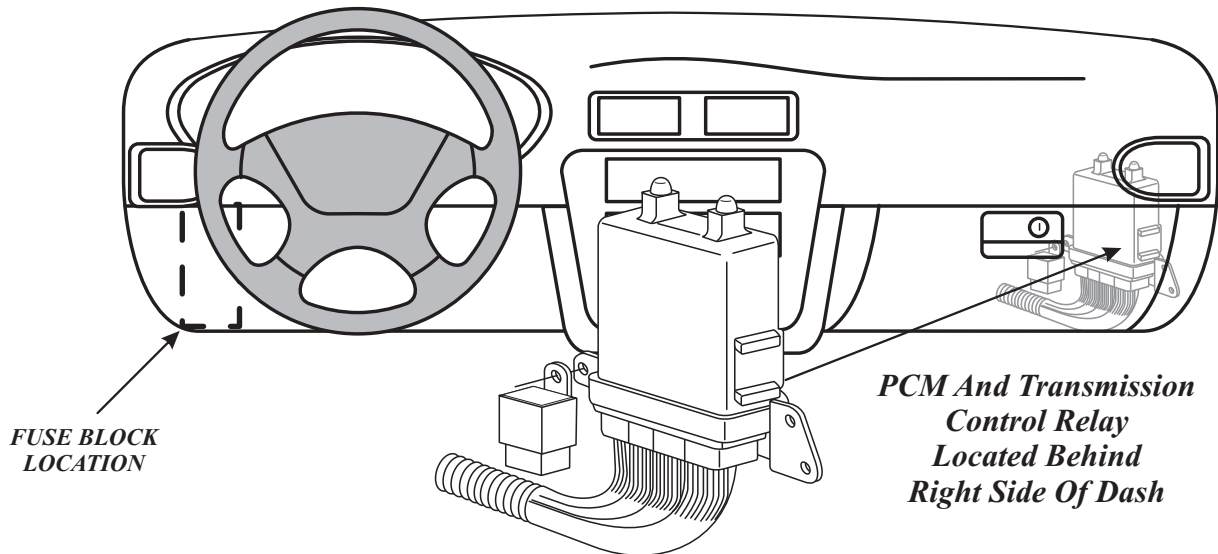
**100 = ENGINE COMPARTMENT RELAY BOX (LEFT SIDE OF ENGINE COMPARTMENT)

**101 = JUNCTION BLOCK (BEHIND LEFT SIDE OF DASH)

Copyright © 2008 ATSG

Figure 18

PCM CONNECTOR TERMINAL IDENTIFICATION FOR 5 SPEED TRANSMISSION (V5A51)



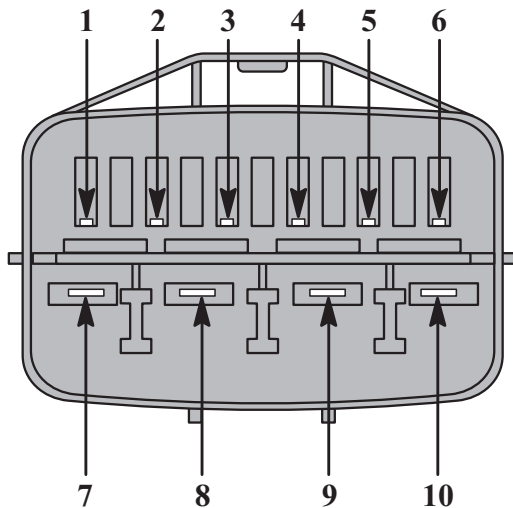
PCM CONNECTOR D-134															
61	62												63	64	
65	66	67	68	69	70	71	72	73							
74	75	76	77	78	79	80	81	82							
83	74		85	86	87								88	89	

PCM CONNECTOR D-135															
91	92												93	94	95
96	97	98	99	100	101	102	103	104							
105	106		107	108	109								110	111	112
113	114		115	116	117								118	119	120

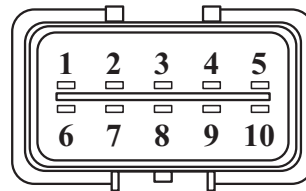
PCM CONNECTOR D-136															
121	122													123	124
125	126	127	128	129	130									132	133
134	135		136	137	138	139								140	141
142	143		144											145	146

All PCM Connector Views are from the wire side of connector.

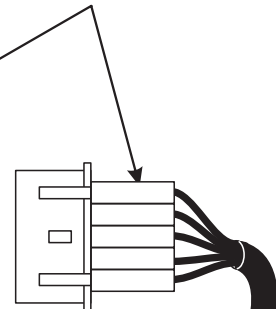
*View Looking Into
Front Of 5 Speed
Harness Connector
(C-03 Connector)*



*View Looking Into
Front Of 5 Speed
Harness Connector
(C-04 Connector)*

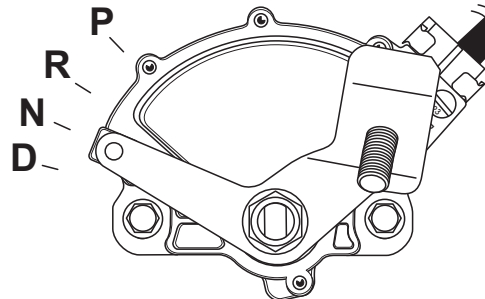


*Range Switch
Harness Connector
(C-04 Connector)*



*View Looking Into
Front A/T Relay
Harness Connector
(D-13 Connector)*

1	2
3	4



Copyright © 2008 ATSG

Figure 19

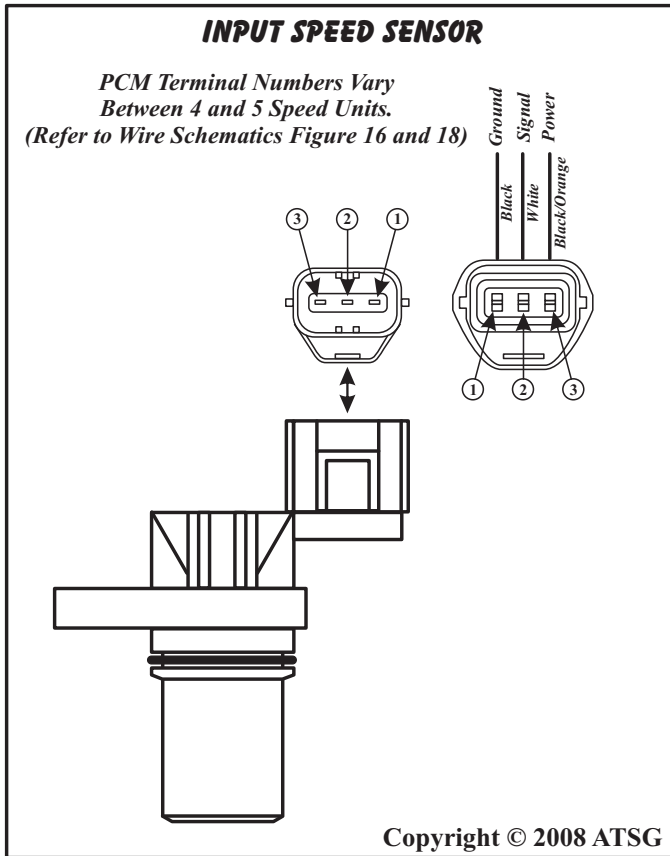


Figure 20

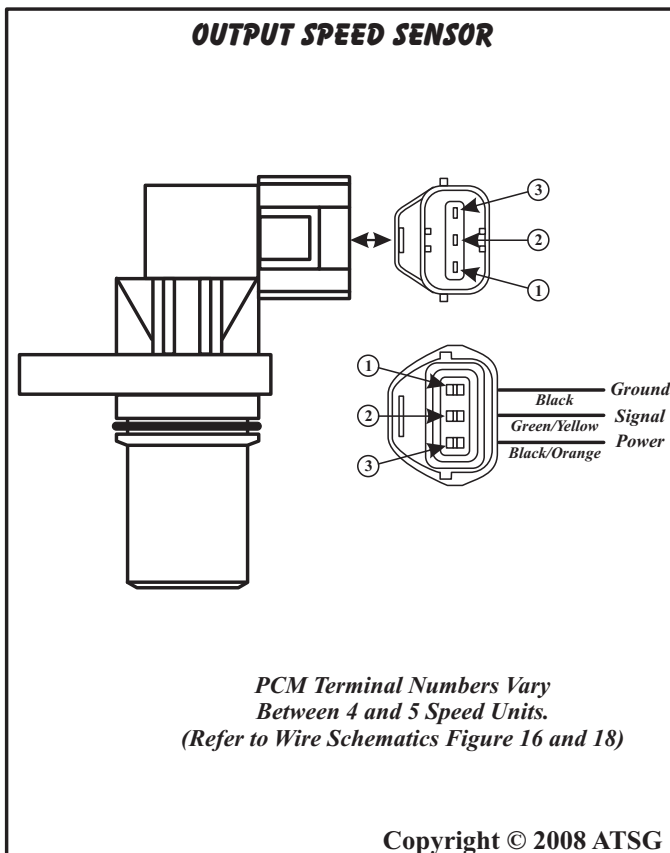


Figure 21

INPUT SPEED SENSOR CIRCUIT OPERATION

When the key is turned on, you should see battery voltage at input speed sensor terminal 3. A coil built into the input shaft speed sensor generates a 0 - 5 volt pulse signal at both ends of this coil when the input shaft rotates. The pulse signal frequency increases with a rise in input shaft speed. Both ends of the coil are connected to the PCM, via the input shaft speed sensor connector (terminals 1 and 2), as shown in Figure 20. The PCM detects the input shaft speed by the signal input from terminal 2. The input shaft speed sensor generates the pulse signal as the teeth on the reverse clutch housing pass the magnetic tip of the sensor.

CONDITIONS TO SET DTC

If no output pulse is detected from the input shaft speed sensor for one second or more, while driving in 3rd or 4th gear at a speed of 30 km/h (19 mph) or more, there is an open or short in the input shaft speed sensor circuit, and a DTC is set. When a DTC is output four times, transmission is locked into 3rd or 2nd gear as a failsafe measure, and the "N" range light flashes once per second.

OUTPUT SPEED SENSOR CIRCUIT OPERATION

When the key is turned on, you should see battery voltage at output speed sensor terminal 3. A coil built into the output shaft speed sensor generates a 0-5 volt pulse signal at both ends of this coil when the output shaft rotates. The pulse signal frequency increases with a rise in output shaft speed. Both ends of the coil are connected to the PCM, via the output shaft speed sensor connector (terminals 1 and 2), as shown in Figure 21. The PCM detects the output shaft speed by the signal input from terminal 2. The output shaft speed sensor generates the pulse signal as the teeth on the output shaft pass the magnetic tip of the sensor.

CONDITIONS TO SET DTC

If the output from the output speed sensor is continuously 50% lower than vehicle speed for one second or more, while driving in 3rd or 4th gear at a speed of 30 km/h (19 mph) or more, there is an open or short in the output speed sensor circuit, and a DTC is set. When a DTC is output four times, the transmission is locked into 3rd or 2nd gear as a failsafe measure, and the "N" range light flashes once per second.

DIAGNOSTIC TROUBLE CODES			
CODE	OBD II	COMPONENT	DESCRIPTION
11		Throttle Position Sensor	Short Circuit
12		Throttle Position Sensor	Open Circuit
14		Throttle Position Sensor	Out Of Adjustment
15	P0713	Transmission Fluid Temperature System	Open Circuit
16	P0712	Transmission Fluid Temperature System	Short Circuit
21		Crankshaft Position Sensor System	Open Circuit
22	P0715	Input Shaft Speed Sensor System	Open/Short Circuit
23	P0720	Output Shaft Speed Sensor System	Open/Short Circuit
26		Stoplight Switch System	Short Circuit
27	P0705	Transmission Range Switch System	Open Circuit
28	----	Transmission Range Switch System	Short Circuit
29	P0500	Vehicle Speed Sensor System	Open/Short Circuit
31	P0753	Low/Reverse-Direct Solenoid System	Open/Short Circuit
32	P0758	Underdrive Solenoid System	Open/Short Circuit
33	P0763	2nd Brake Solenoid System	Open/Short Circuit
34	P0768	Overdrive Solenoid System	Open/Short Circuit
*35	P0773	Reduction Band Solenoid System	Open/Short Circuit
36	P0743	Torque Converter Clutch Solenoid System	Open/Short Circuit
41	P0731	1st Gear Incorrect Ratio	Mechanical Solenoid Failure Low Line Pressure Low Fluid Level Sealing Ring Failure Piston Seal Failure Valve Body Malfunction
42	P0732	2nd Gear Incorrect Ratio	
43	P0733	3rd Gear Incorrect Ratio	
44	P0734	4th Gear Incorrect Ratio	
*45	P0735	5th Gear Incorrect Ratio	
46	P0736	Reverse Gear Incorrect Ratio	
52	P0741	Torque Converter Clutch Solenoid System, Performance	Defective System
53	P0742	Torque Converter Clutch Solenoid System	Clutch Stuck On
54	P1751	Transmission Control Relay System	Open/Short Circuit
56	----	"N" Range Light System	Open Circuit
* = 5 Speed Only			

SCANNER FOR CODE RETRIEVAL, OR "N" RANGE INDICATOR LIGHT ON INSTRUMENT CLUSTER

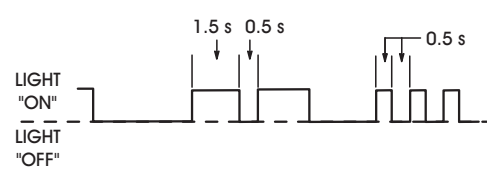
OBD-II Connector located on drivers side under dash.



View Looking Into Diagnostic Connector

"N" Range Indicator Light Method:

Turn ignition off. Using jumper wire, ground terminal 1 of the Data Link Connector as shown at left. Turn ignition on. Read DTC's by observing flash pattern of "N" range indicator light located in instrument cluster. First series of flashes indicates first digit of DTC. Second series of flashes indicates second digit of DTC. Example: 2 flashes followed by a pause, and then 3 flashes indicates DTC 23, as show below.



P
R
N
D
3
2
L



Copyright © 2008 ATSG

Figure 22

ELECTRONIC CONTROLS (CONT'D)

Innovative Electronic Control System

Sometime during the 2001 model year, after the five speed was introduced, Mitsubishi introduced advanced software package for the Montero referred to as "Inovative Electronic Control System" (INVECS-II). The new INVECS-II system uses adaptive learning that provides a high level of comfort and matches all driving conditions as well as the individual driver's driving style. The shift patterns found satisfying by the typical driver for all ranges of driving, are stored in the PCM's memory. The PCM uses this data to analyze road conditions and the drivers style of operation, and then outputs the optimal shift patterns stored in its memory to best match the conditions.

Using adaptive shift control, the PCM learns the driving habits and preferences of each individual driver, by processing driving data on engine output, tire load, foot brake operation, etc. It then uses this data to adjust the shift timing to best suit the drivers

style. If the PCM determines from the driving patterns that the driver is one who enjoys a relaxed, unhurried style, it adjusts timing to execute upshifts at a lower engine speed to provide a smooth quiet ride. On the other hand if the PCM determines the driver to prefer a sporty ride, it adjusts timing to shift up at a higher engine speed to provide a more powerful response.

If the PCM determines that the driver tends to apply the brakes often on a descending road, it adjusts timing to downshift sooner, so that engine braking is more effectively applied. Conversely, if the PCM determines that the driver does not brake much while driving downhill, it delays downshifting to minimize the effect of engine braking.

This new "Adaptive Learning" software obviously changed the PCM, and also changed the number of terminals in the PCM and related connectors, as shown in Figure 17 and 19.

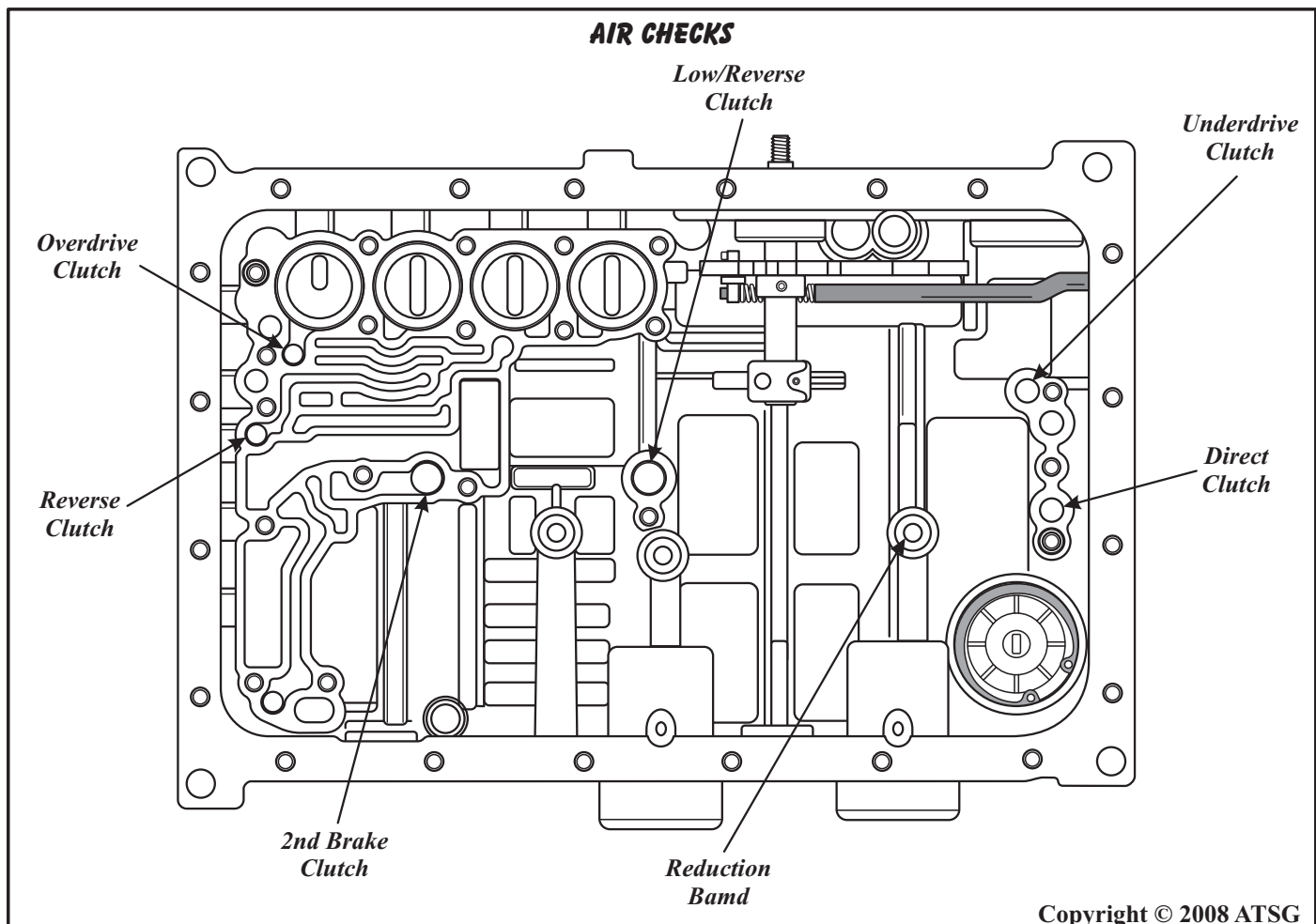


Figure 23



Technical Service Information

LINE PRESSURE SPECIFICATIONS

R4A51/V4A51 4 SPEED PRESSURE CHART (PSI)

Selector Position	Gear	Engine RPM	Underdrive Clutch "UC"	Reverse Clutch "RC"	Overdrive Clutch "OC"		Low Reverse Clutch "LB"	2nd Brake Clutch "2B"		Torque Converter Clutch "TR"
P	— — —	2500					38-52			*32-52
R	Reverse	2500		185-256			185-256			*73-106
N	— — —	2500					38-52			*32-52
D	1st Gear	2500	142-152				142-152			*94-123
D	2nd Gear	2500	142-152					142-152		*94-123
D	3rd Gear	2500	113-131		113-131					*94-123
D	4th Gear	2500			113-131			113-131		*94-123

* When the TCC pressure is measured, the engine speed should be 1500 RPM or less.

V5A51 5 SPEED PRESSURE CHART (PSI)

Selector Position	Gear	Engine RPM	Underdrive Clutch "UC"	Reverse Clutch "RC"	Overdrive Clutch "OC"	Direct Clutch "DC"	Low Reverse Clutch "LB"	2nd Brake Clutch "2B"	Reduction Brake Band "RB"	Torque Converter Clutch "TR"
P	— — —	2500					38-52		38-52	*32-52
R	Reverse	2500		185-256			185-256		185-256	*73-106
N	— — —	2500					38-52		38-52	*32-52
D	1st Gear	2500	142-152				142-152		142-152	*73-106
D	2nd Gear	2500	142-152					142-152	142-152	*73-106
D	3rd Gear	2500	113-131		113-131				113-128	*65-104
D	4th Gear	2500	113-131		113-131	113-128				*65-104
D	5th Gear	2500			113-131	113-128		113-128		*65-104

* When the TCC pressure is measured, the engine speed should be 1500 RPM or less.

NOTE: Pressure tap locations are shown on Page 22.
Requires Special Tool Adapters MB998332 and MB998900.
Refer to Page 23 if line pressure adjustment is necessary.

Caution:

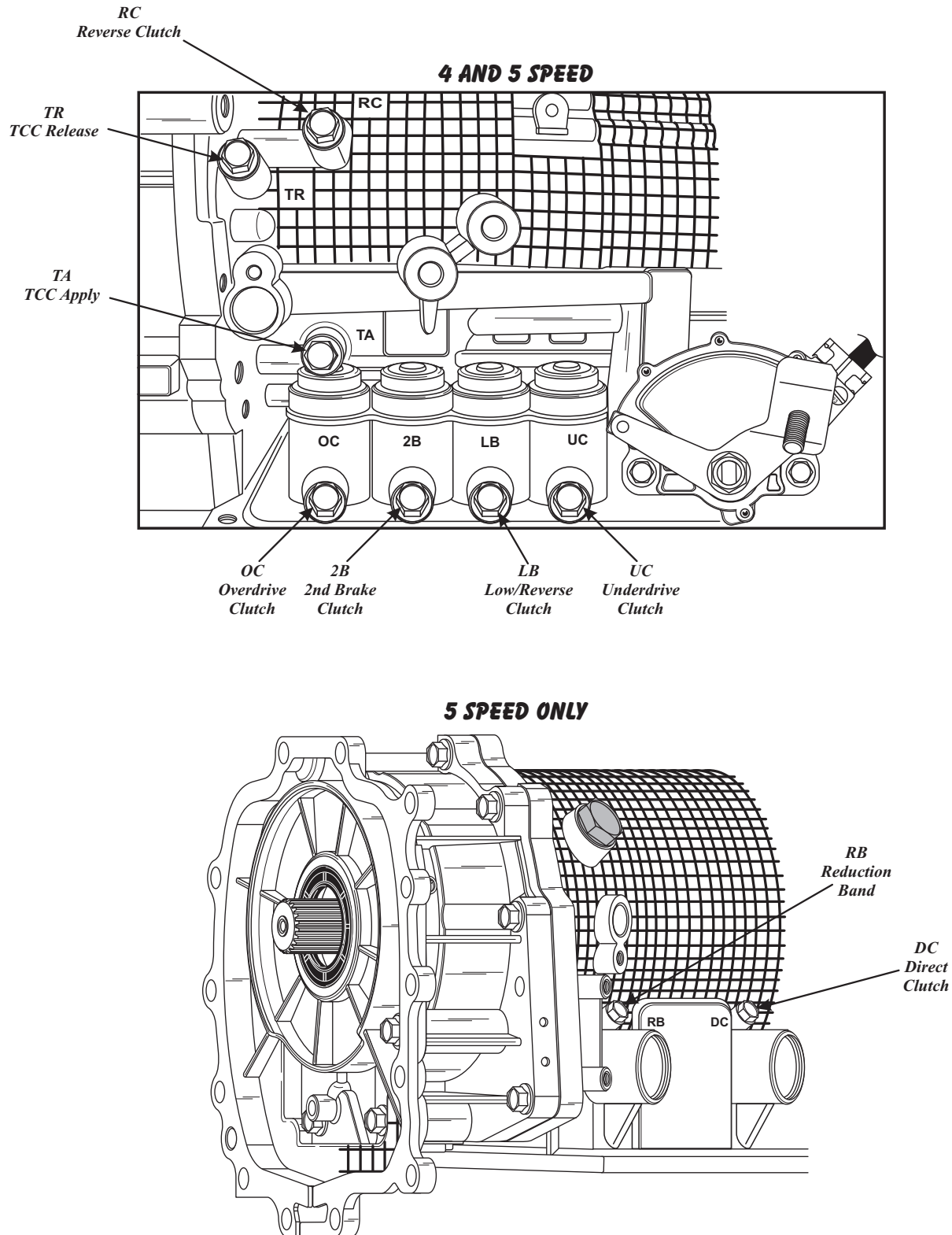
- (1) Transmission fluid temperature should be between 70-80°C (158-176°F) during the test.
- (2) Replace all port plug "O" rings with new ones after line pressure test and torque to 11 N•m (97 in.lb.).
- (3) Start the engine and ensure that there are no leaks around the plugs after the test.
- (4) Refill with the proper transmission fluid as necessary.

Transmission Fluid Specification = Diamond SP III

Copyright © 2008 ATSG

Figure 24

PRESSURE TAP LOCATIONS

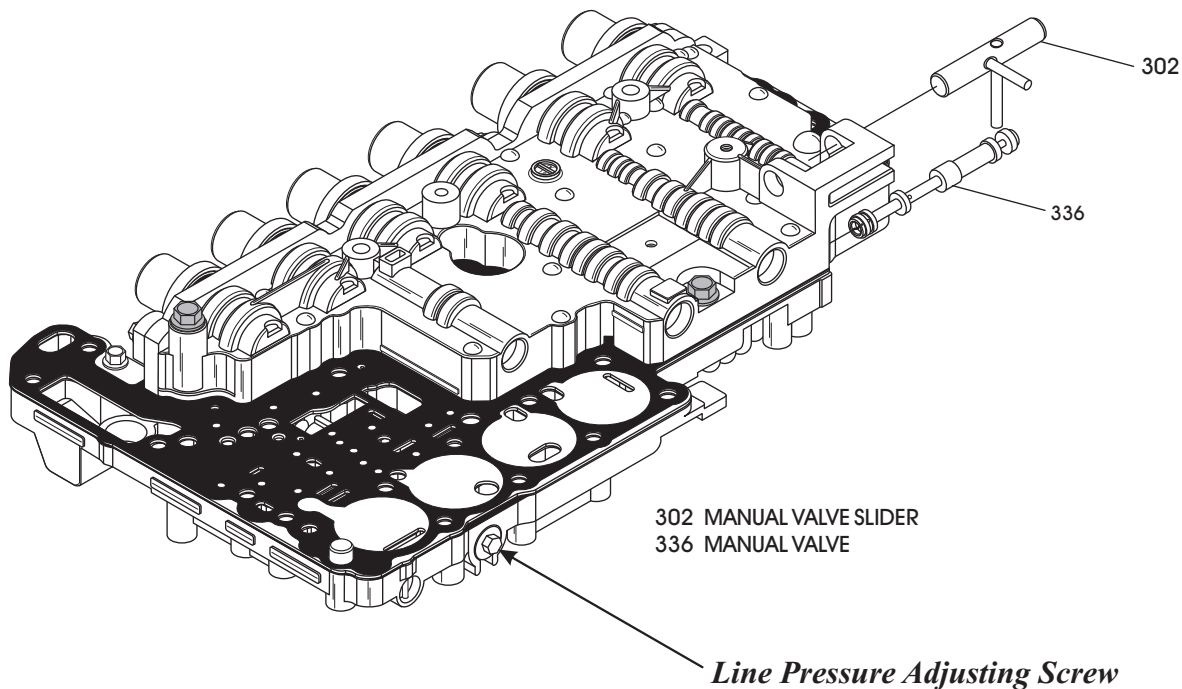


Copyright © 2008 ATSG

Figure 25

ADJUSTING LINE PRESSURE**Adjustment Procedure**

1. Drain the transmission fluid.
Note: Pressure test must be performed before attempting any adjustments.
2. Remove the transmission oil pan.
3. Turn the adjusting screw shown in Figure 26 to adjust line pressure to the nominal value. The pressure increases when the screw is turned counter-clockwise.
Note: Adjust to the middle of the nominal range when transmission is in "D" position.
Nominal line pressure is 142-152 PSI.
Each complete turn of the adjusting screw changes pressure 5.1 PSI.
4. Install the transmission pan and transmission fluid.
5. Repeat the line pressure test, and re-adjust the line pressure as necessary.



Copyright © 2008 ATSG

Figure 26

SAFETY PRECAUTIONS

Service information provided in this manual by ATSG is intended for use by professional, qualified technicians. Attempting repairs or service without the appropriate training, tools and equipment could cause injury to you or others.

The service procedures we recommend and describe in this manual are effective methods of performing service and repair on this unit. Some of the procedures require the use of special tools that are designed for specific purposes.

This manual contains CAUTIONS that you must observe carefully in order to reduce the risk of injury to yourself or others. This manual also contains NOTES that must be carefully followed in order to avoid improper service that may damage the vehicle, tools and/or equipment.

TRANSMISSION DISASSEMBLY

SPECIAL NOTE:

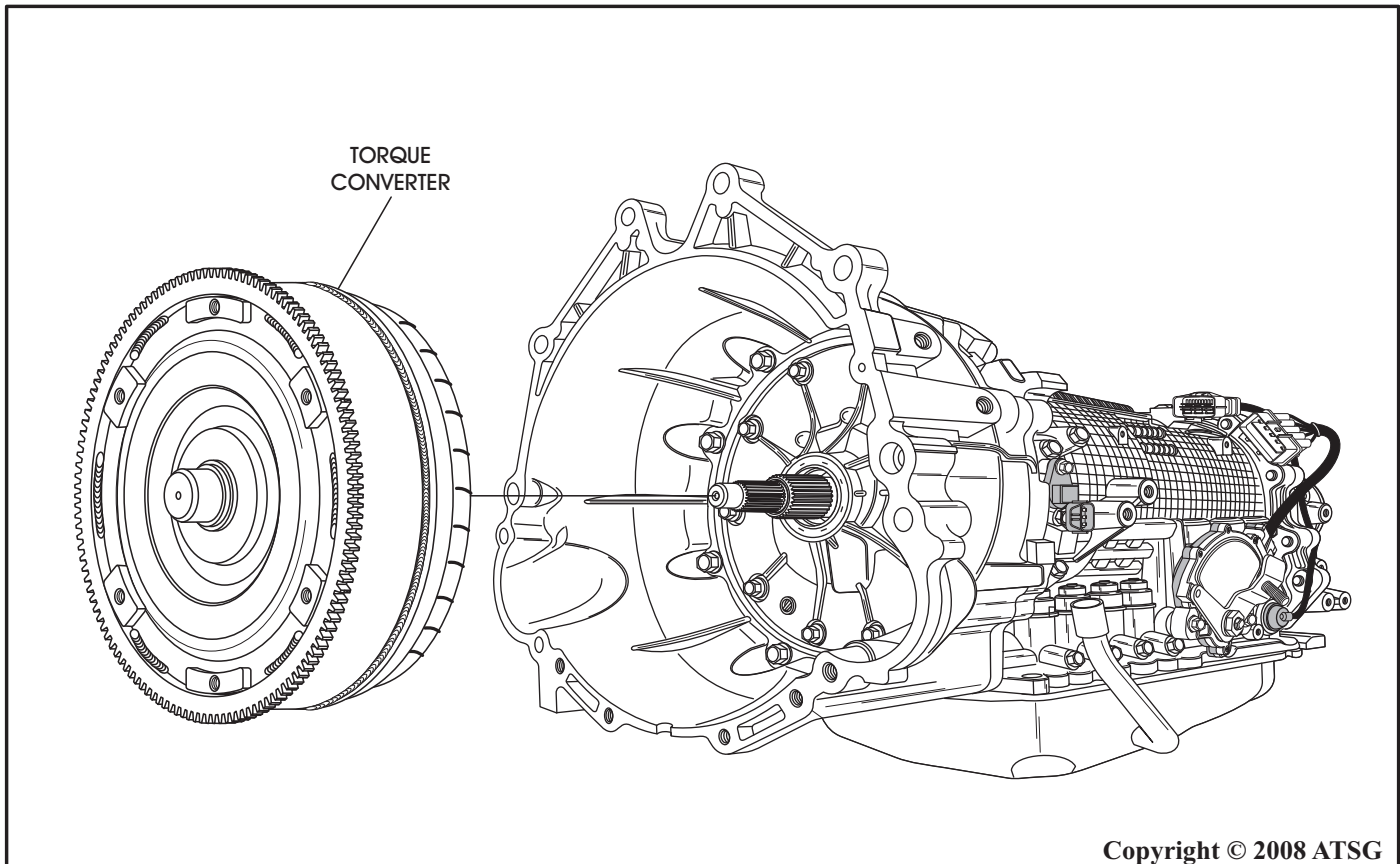
This manual will cover both 4 speed and 5 speed versions of the 5A51 unit in the Montero. Most of the illustrations will be of the 5 speed unit, however, we will show the differences when they are necessary.

EXTERNAL COMPONENTS

1. The transmission should be steam cleaned on the outside, to remove any dirt or debris before disassembly begins.
2. This transmission can be disassembled very easily on a work bench without the benefit of a holding fixture for rotation.
3. Remove torque converter from transmission, as shown in Figure 27, and place on a container to drain.

Caution: *Use extreme care when removing the torque converter, to avoid personal injury and/or damage to the converter, as it is heavy.*

Continued on Page 25



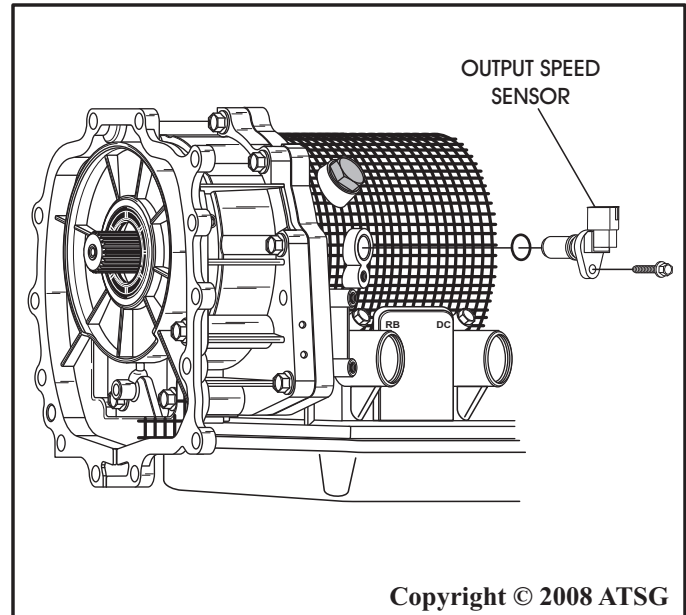
Copyright © 2008 ATSG

Figure 27

TRANSMISSION DISASSEMBLY

EXTERNAL COMPONENTS (CONT'D)

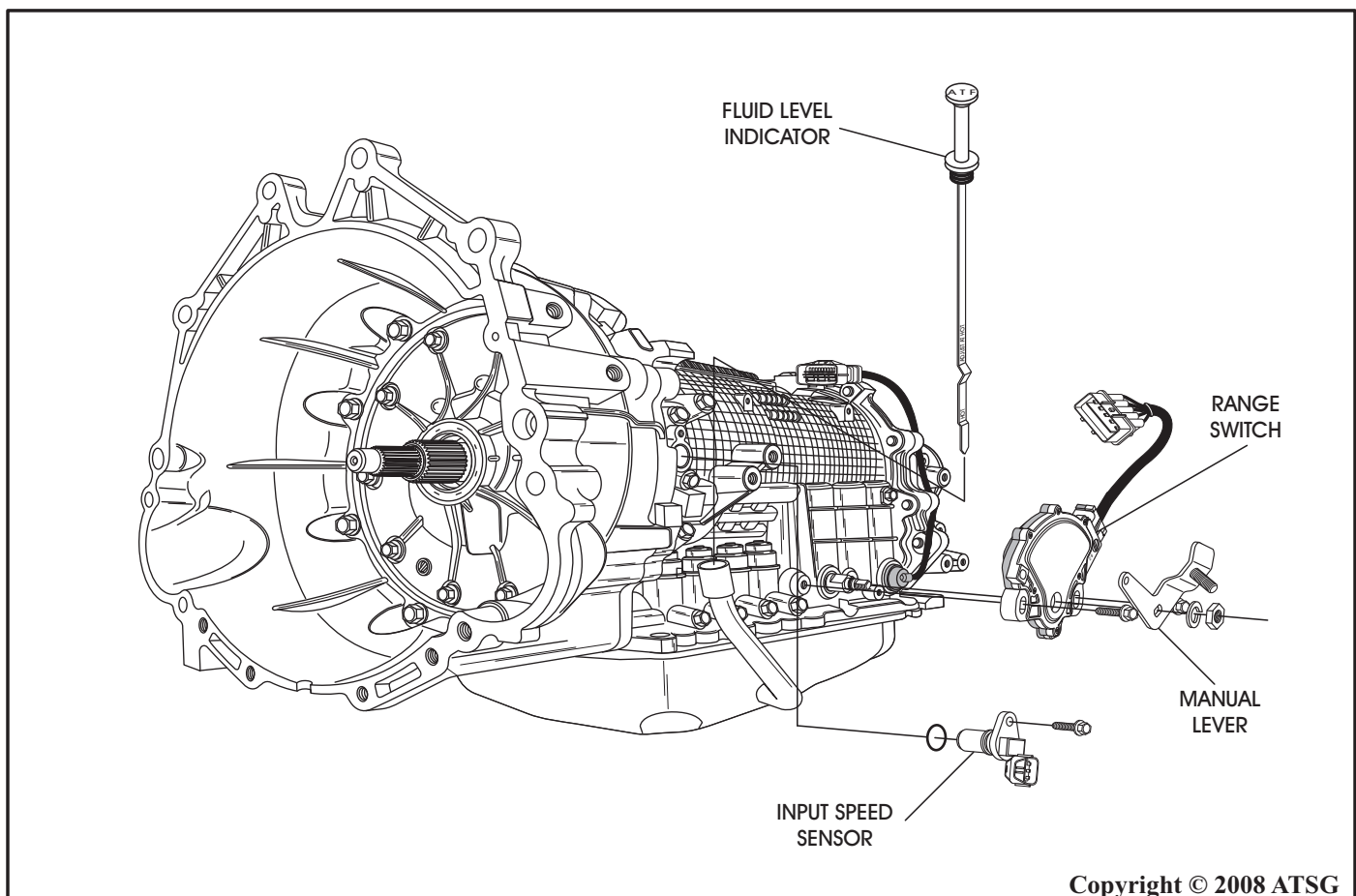
4. Remove the output speed sensor from the case, as shown in Figure 28, remove and discard the speed sensor "O" ring.
5. Remove fluid level indicator from the tube, as shown in Figure 29.
- Note: Fluid level indicators vary in design by year and model.*
6. Remove the input speed sensor from the case, as shown in Figure 29, remove and discard the speed sensor "O" ring.
7. Remove the external manual control lever nut, washer, and manual control lever, as shown in Figure 29.
8. Remove the transmission range switch from case, as shown in Figure 29.



Copyright © 2008 ATSG

Figure 28

Continued on Page 26



Copyright © 2008 ATSG

Figure 29

TRANSMISSION DISASSEMBLY EXTERNAL COMPONENTS (CONT'D)

9. Remove the 4WD adapter housing, as shown in Figure 30, or the 2WD extension housing. Both are similar in their removal, and bolt locations and lengths are the same on both versions.
Note: Exploded views of both versions are shown in Figure 32 and 33.
10. Set the adapter housing, or extension housing aside for component rebuild.

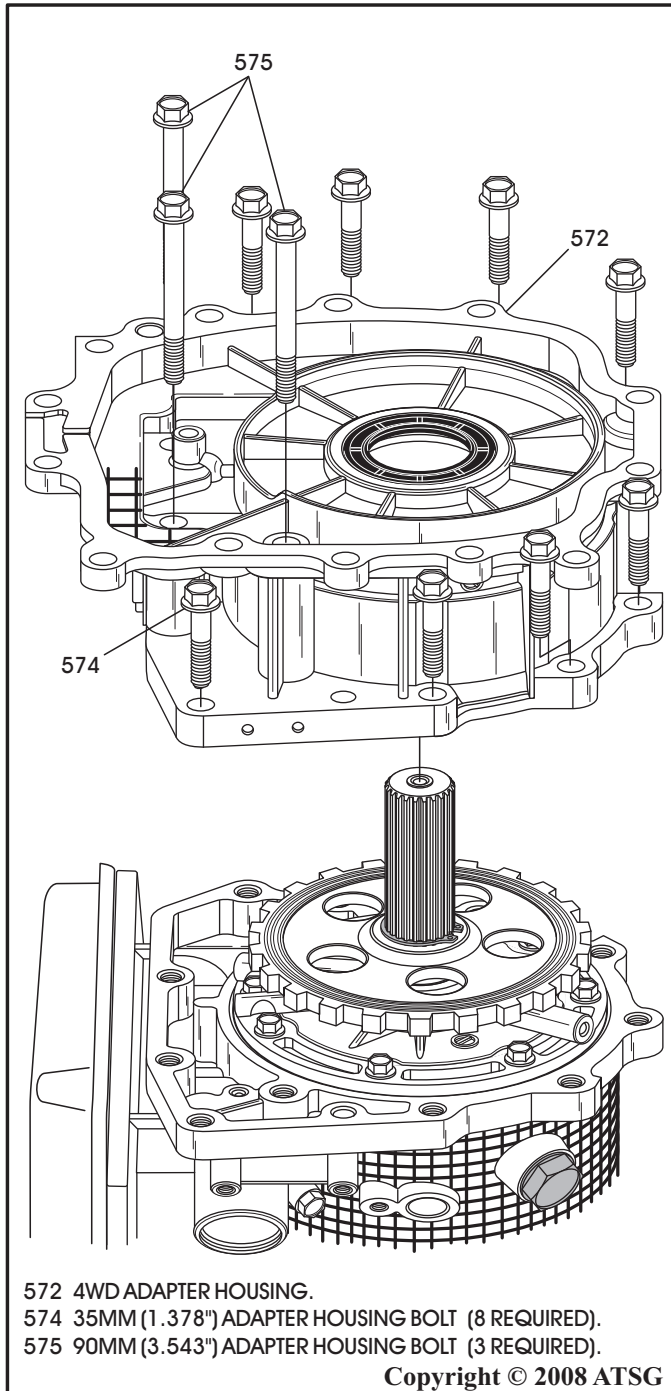


Figure 30

11. Remove the parking gear snap ring from the output shaft, as shown in Figure 31.
12. Remove the parking gear using a puller that is capable of 2200 pounds.
Note: There are two versions of the parking gear. One that uses a "heat shrink" process for installation and one that does not. Two ID grooves is the normal type and three ID grooves is the shrink fit type.
13. Some parking gears may be removed without using a puller.

Continued on Page 28

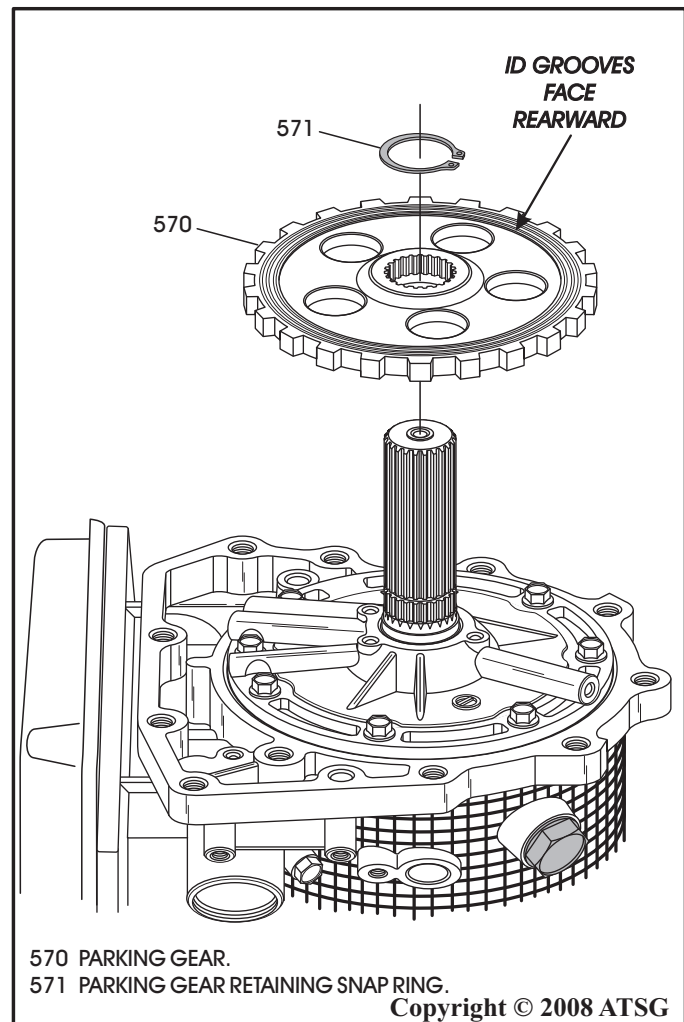
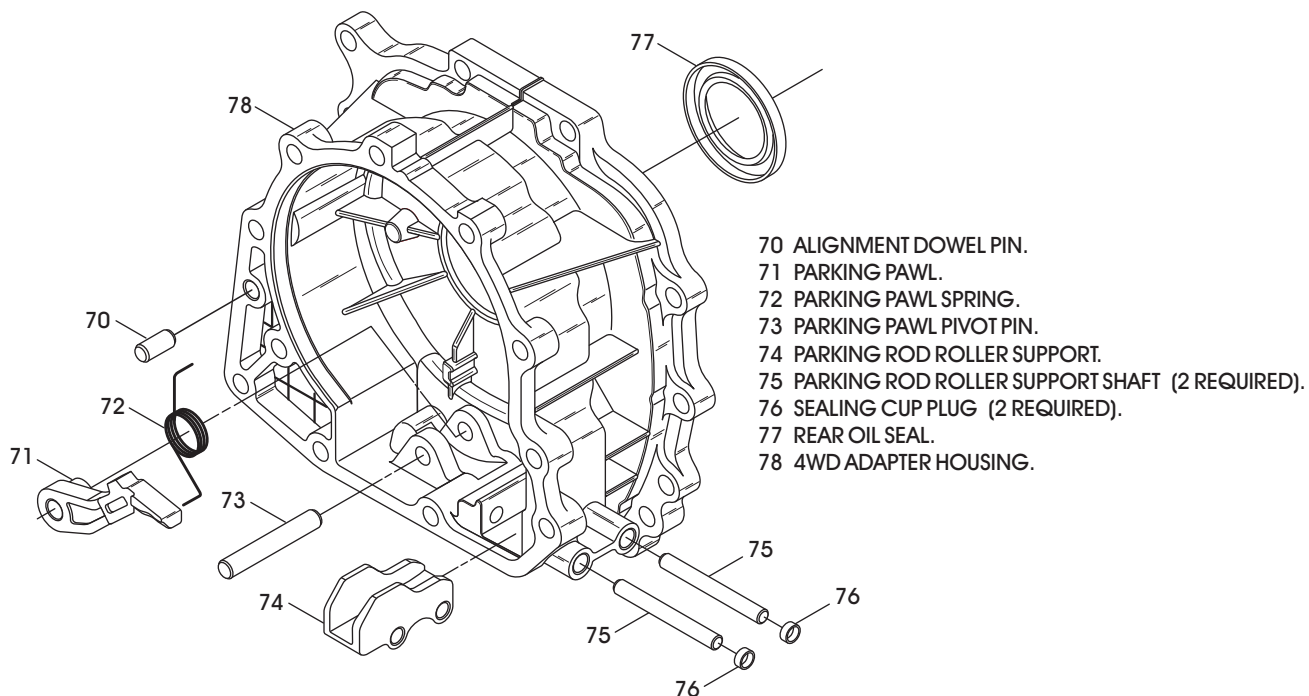


Figure 31

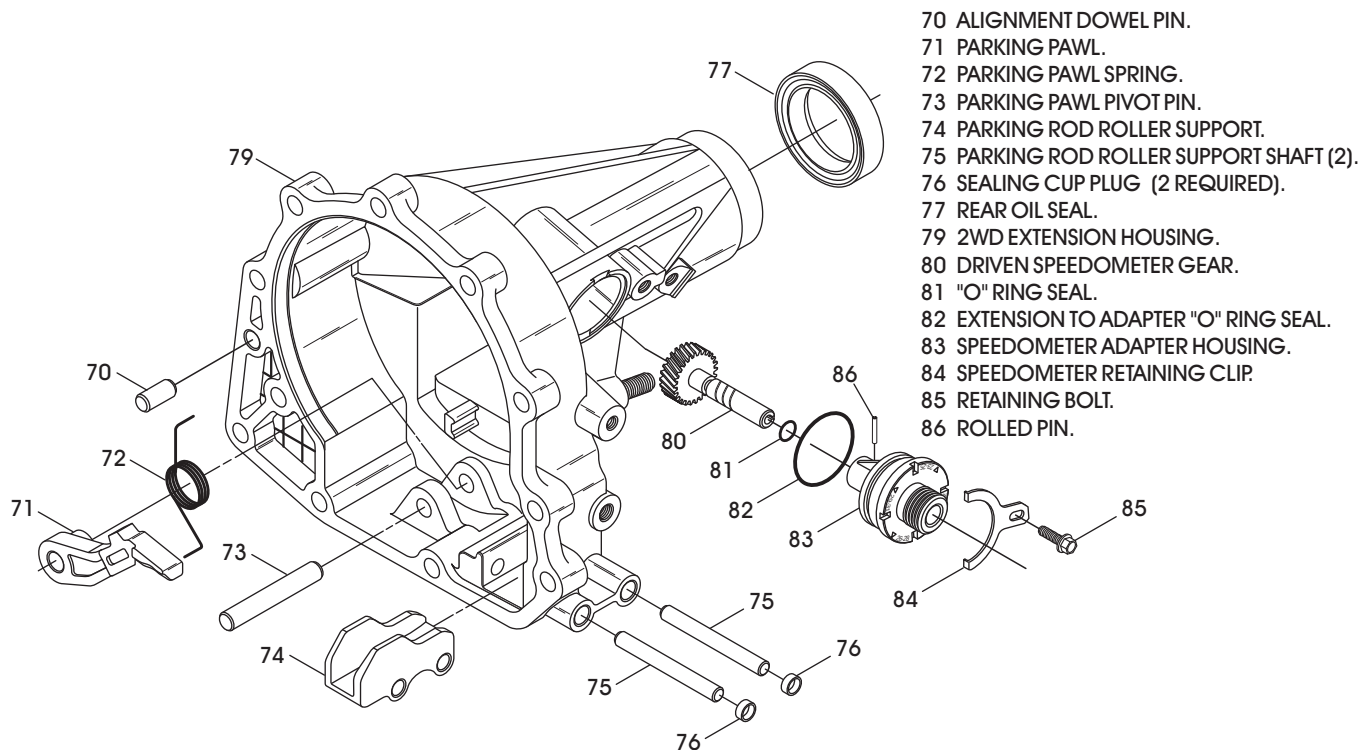
4WD ADAPTER HOUSING, V4A51 AND V5A51 MODELS, EXPLODED VIEW



Copyright © 2008 ATSG

Figure 32

2WD EXTENSION HOUSING, R4A51 MODELS, EXPLODED VIEW



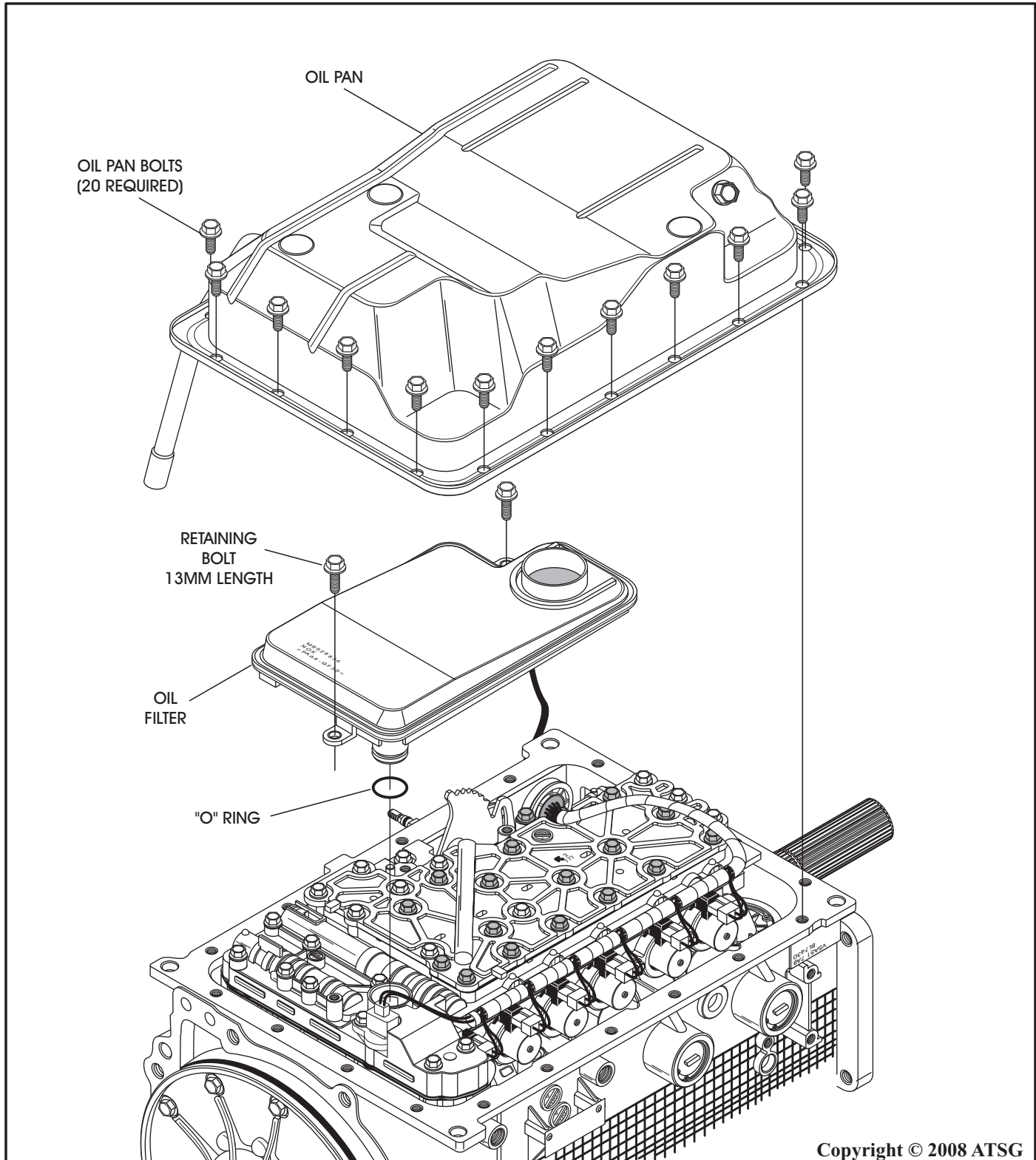
Copyright © 2008 ATSG

Figure 33

TRANSMISSION DISASSEMBLY **INTERNAL COMPONENTS**

1. Remove the twenty oil pan bolts and remove the oil pan, as shown in Figure 34

2. Remove the two oil filter retaining bolts and remove and discard the oil filter, as shown in Figure 34.



Copyright © 2008 ATSG

Figure 34

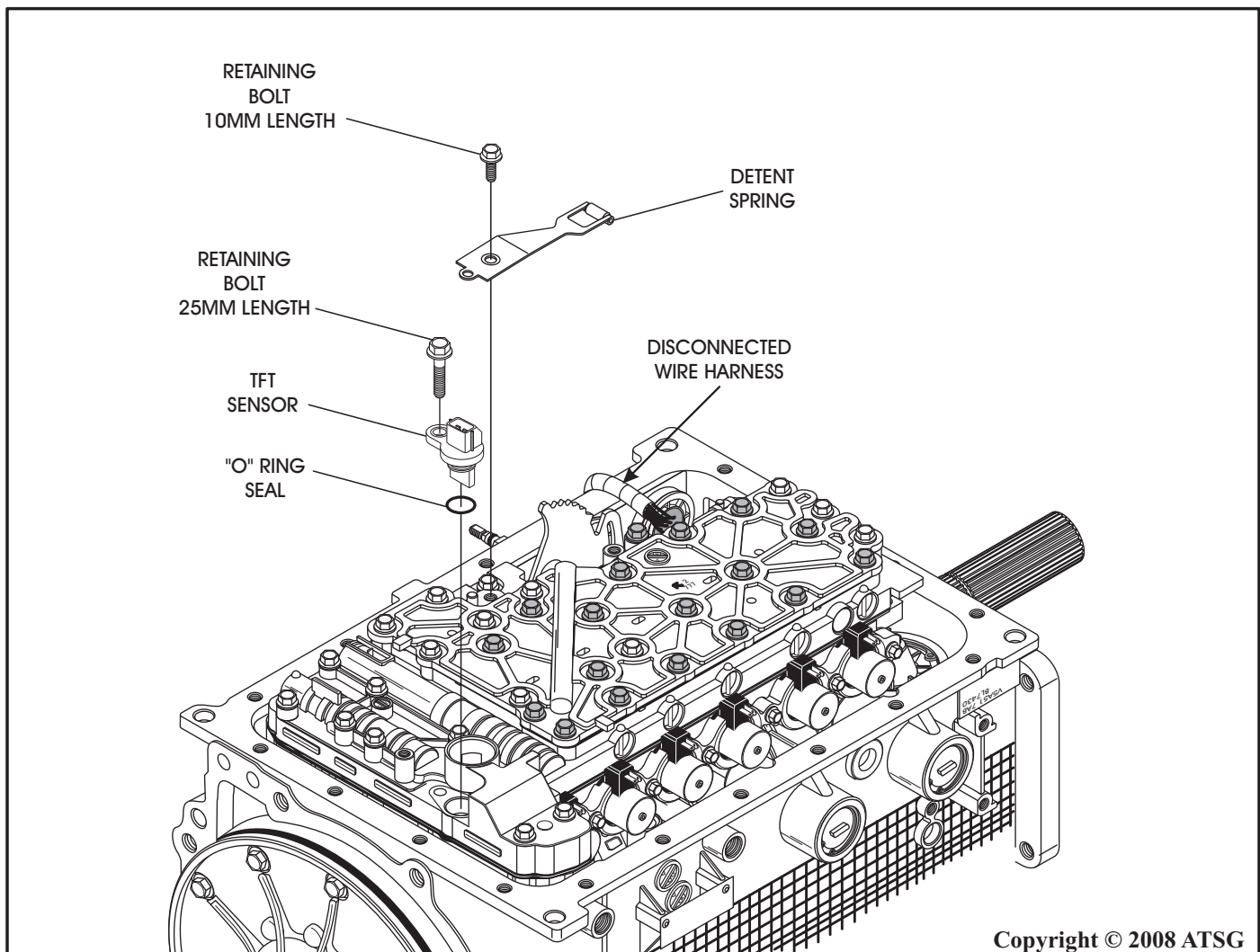
TRANSMISSION DISASSEMBLY **INTERNAL COMPONENTS (CONT'D)**

3. Remove solenoid and TFT sensor connectors and fold the wiring harness over the pan rail, as shown in Figure 35.
4. Remove the inside detent spring bolt and the detent spring, as shown in Figure 35.
5. Remove the TFT sensor retaining bolt and the TFT sensor, as shown in Figure 35.

Note: *Some models the retaining bolt screws into the valve body, and other models the bolt goes through the valve body and screws into the case.*

6. Remove and discard the TFT sensor "O" ring seal, as shown in Figure 35.

Continued on Page 30



Copyright © 2008 ATSG

Figure 35

TRANSMISSION DISASSEMBLY INTERNAL COMPONENTS (CONT'D)

7. Remove the 20 valve body bolts retaining the valve body onto the case.

Note: The twenty valve body retaining bolts are the plated bolts. You may have only 19, as we have already removed TFT sensor.

8. Remove the valve body assembly, as shown in Figure 36, and set aside for component rebuild.

Note: Alignment dowels may stick in case.

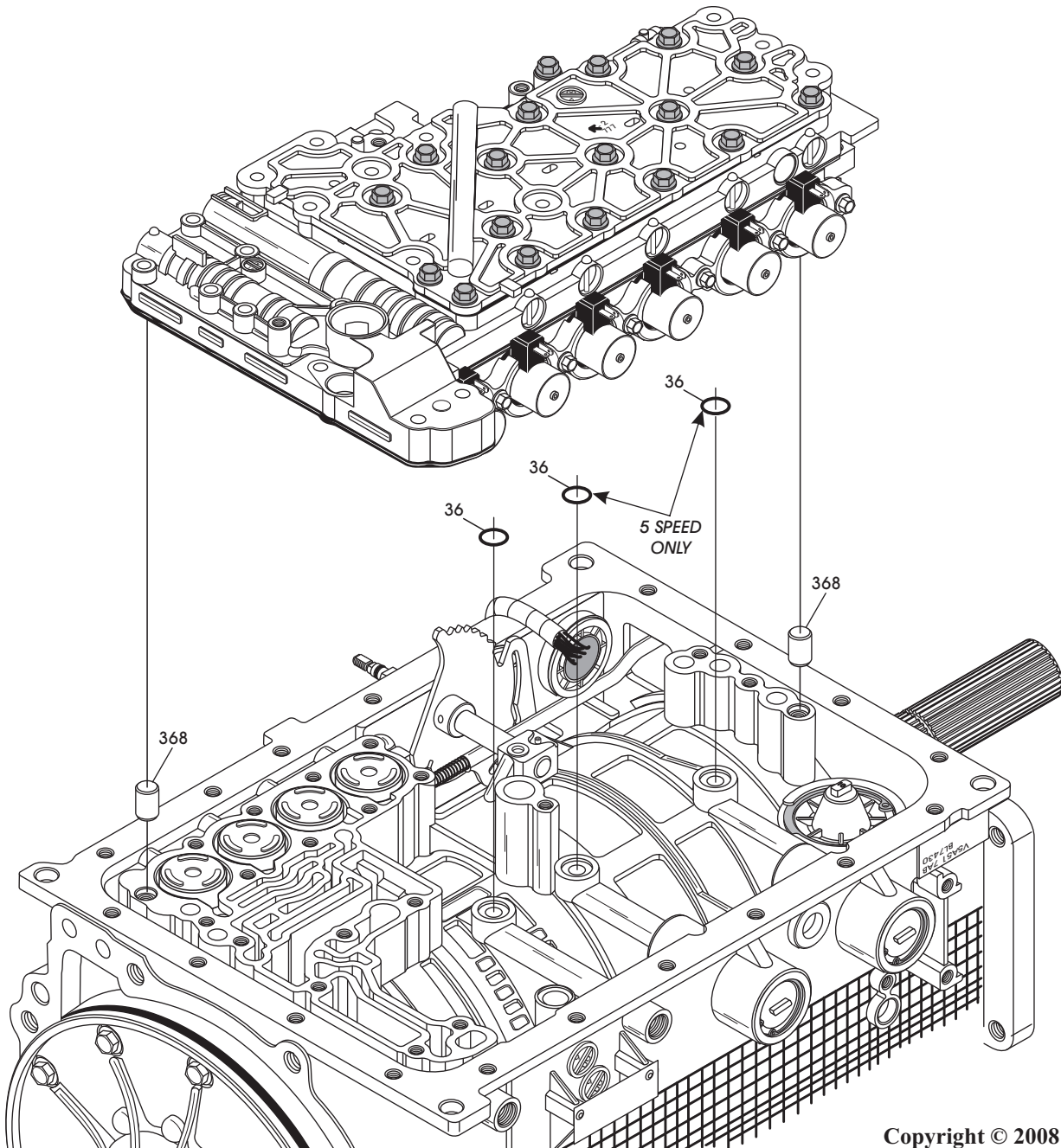
9. Remove and discard the "O" ring seals in the case. 1 for 4 speed units, 3 for 5 speed units. Refer to Figure 36.

Continued on Page 31

36 VALVE BODY TO CASE "O" RING SEALS.

(3 REQUIRED IN 5 SPEED, 1 REQUIRED IN 4 SPEED)

368 VALVE BODY TO CASE HOLLOW ALIGNMENT DOWELS.



Copyright © 2008 ATSG

Figure 36

TRANSMISSION DISASSEMBLY INTERNAL COMPONENTS (CONT'D)

10. Remove the oil screen, low/reverse seal and 2nd brake seal from the transmission case, as shown in Figure 38.

Note: Discard all three, as they come in the Trans-Tec® overhaul kit.

11. Remove the external snap ring from pass-thru connector as shown in Figure 37.

Note: The wire harness is one piece and does not disconnect externally.

12. Remove the complete wiring harness through the inside of the case, as shown in Figure 38.

Continued on Page 33

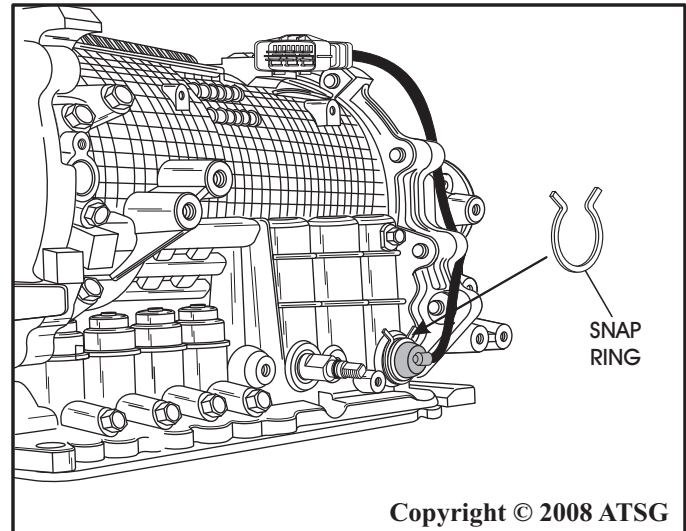


Figure 37

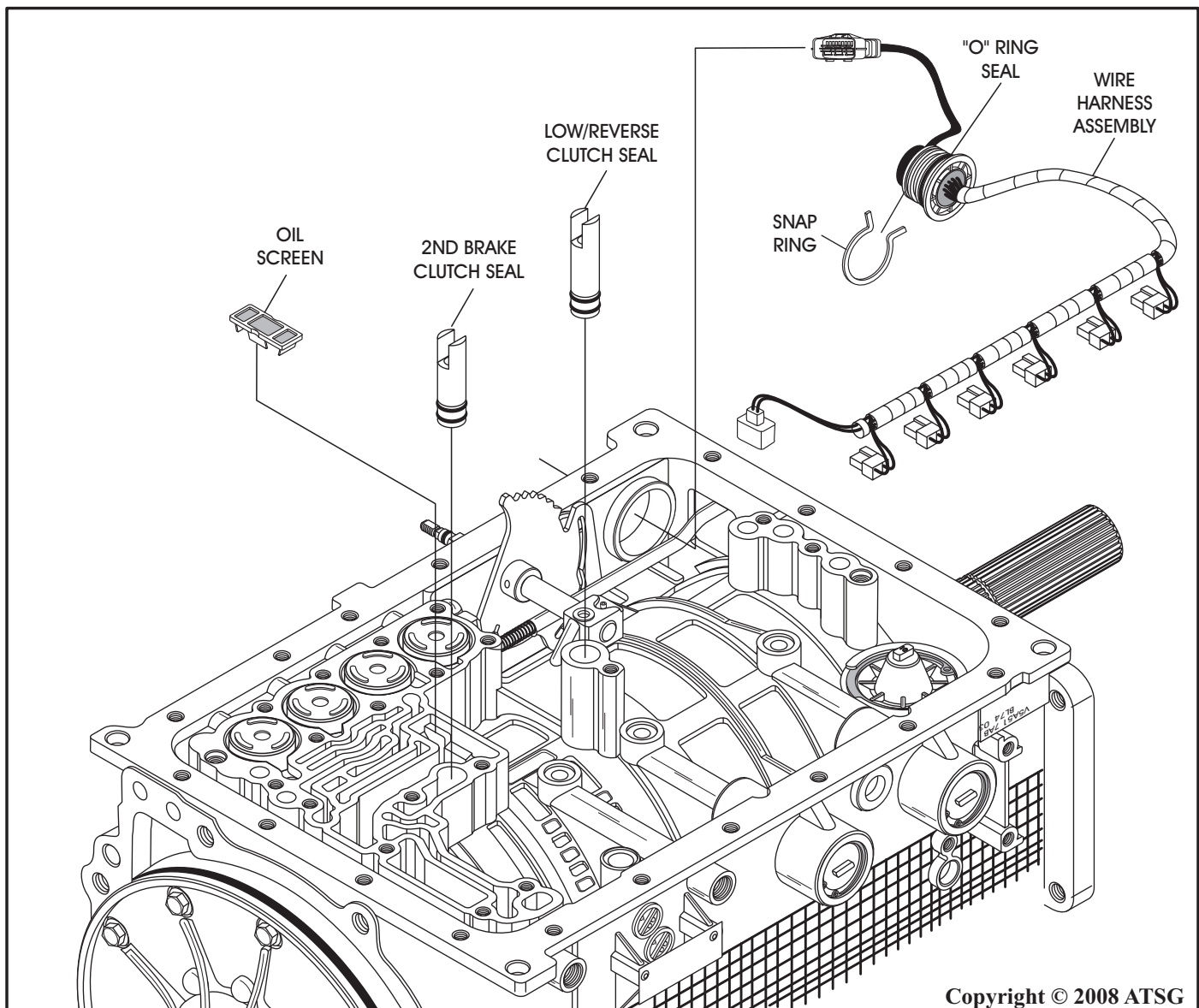
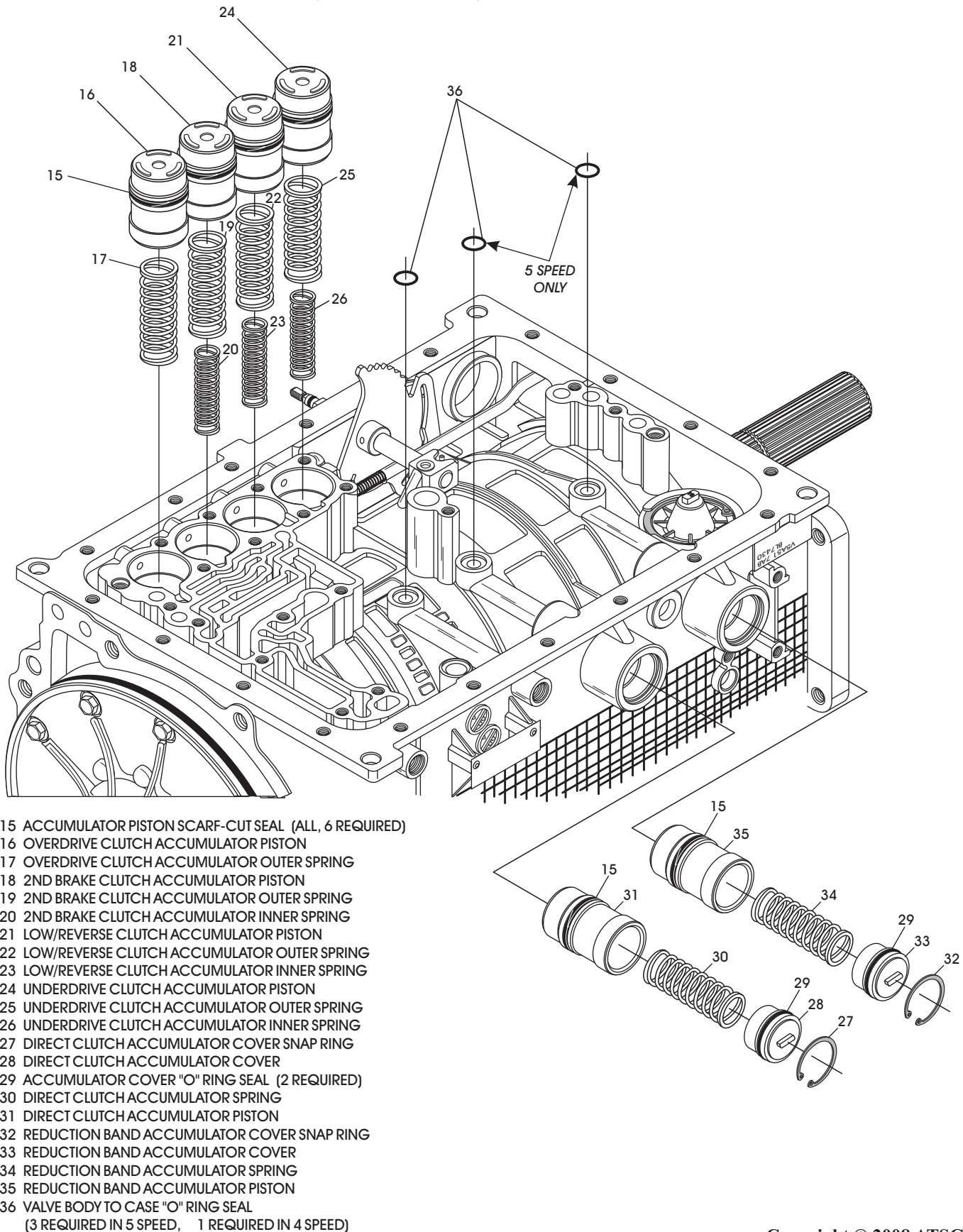


Figure 38

ACCUMULATOR PISTON AND SPRING LOCATIONS EXPLODED VIEW



Copyright © 2008 ATSG

Figure 39

TRANSMISSION DISASSEMBLY

INTERNAL COMPONENTS (CONT'D)

13. Remove the 4 accumulator pistons from case, under the valve body, as shown in Figure 39.
Note: Accumulator pistons are all the same for 4 and 5 speed transmissions.
14. Remove the accumulator springs from case, as shown in Figure 39.
Note: Best procedure is to tag the springs for identification, as they are removed.
15. Remove the snap rings retaining the reduction band and direct clutch accumulators, located on the side of case, as shown in Figure 39.
16. Remove the accumulator covers from the case, as shown in Figure 39.
17. Remove the accumulator springs and pistons, as shown in Figure 39.
Note: These 2 pistons are the same as under the valve body, but tag the springs for ID.

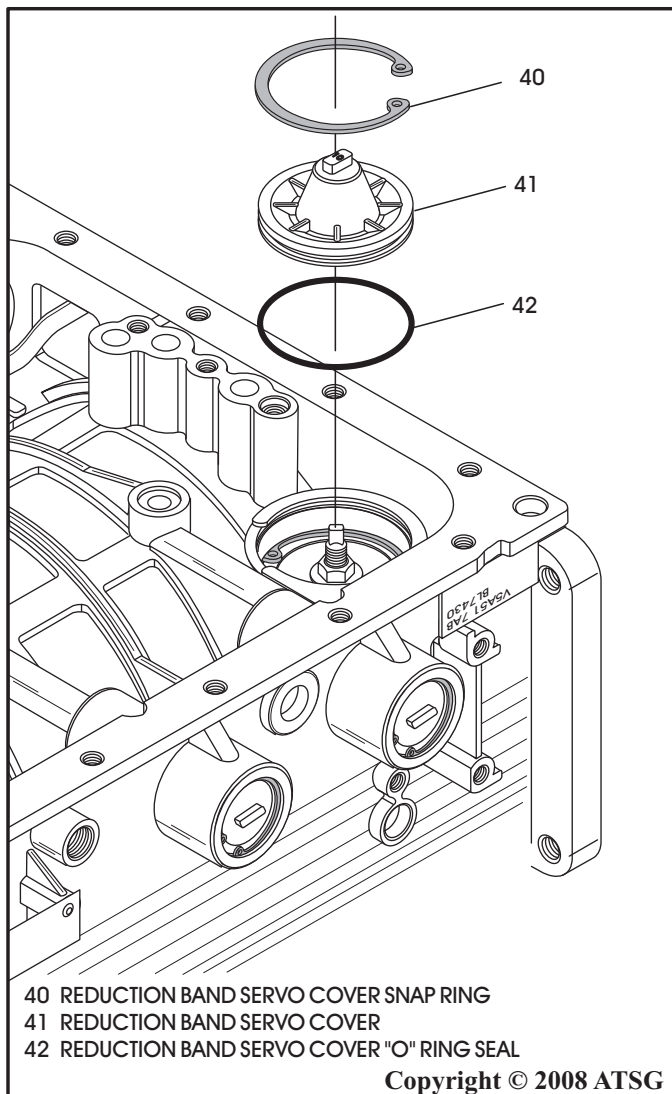


Figure 40

18. On 5 speed units, remove the reduction band servo cover, as shown in Figure 40, remove and discard the "O" ring seal.
19. Remove the reduction band servo piston and spring, as shown in Figure 41, remove and discard the scarf-cut piston seal.

Continued on Page 34

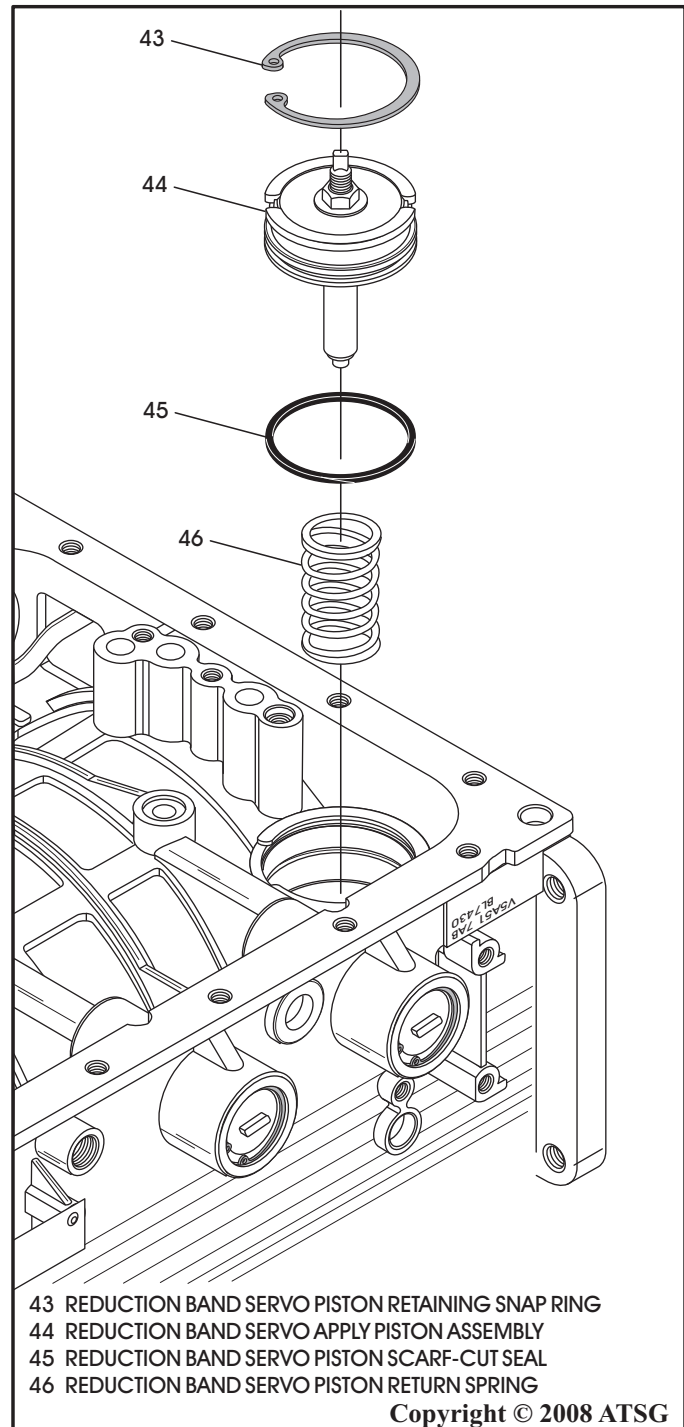


Figure 41

TRANSMISSION DISASSEMBLY **INTERNAL COMPONENTS (CONT'D)**

20. Remove the 8 converter housing retaining bolts and remove converter housing, as shown in Figure 42.
21. Remove the 10 oil pump assembly retaining bolts, as shown in Figure 43.
22. Remove and discard the oil pump retaining bolt seals, as they come in the Trans-Tec kit. Refer to Figure 44.

Continued on Page 35

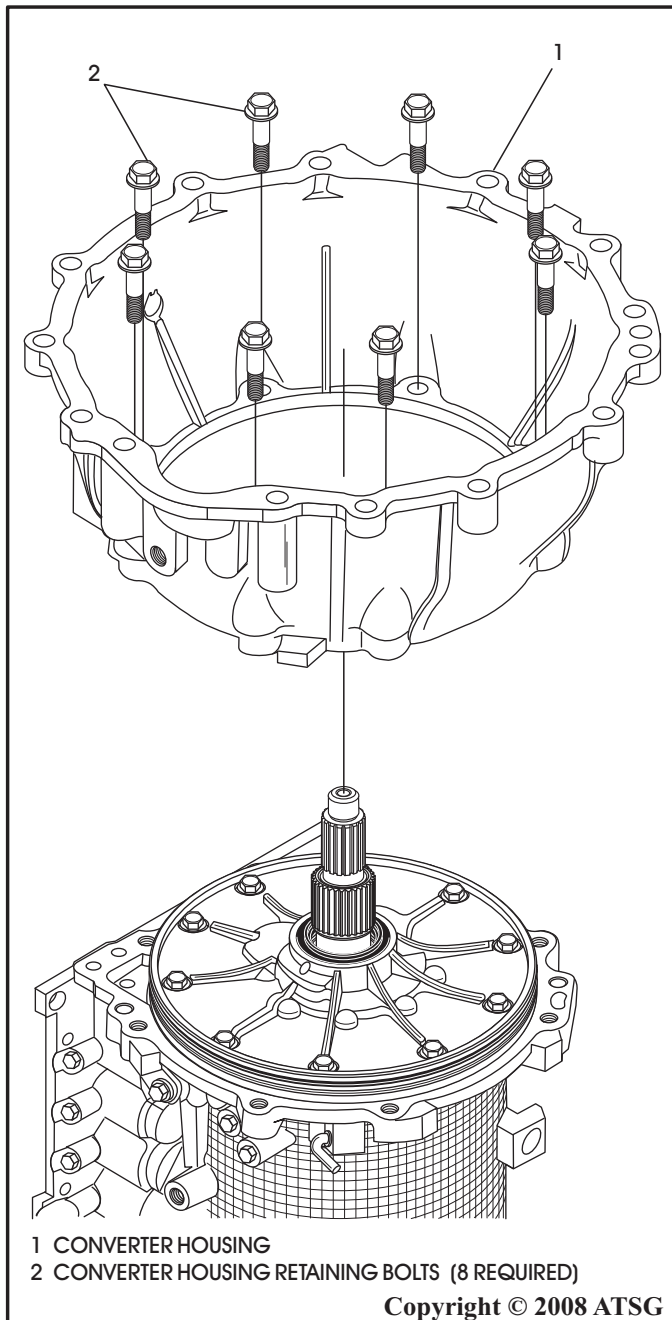


Figure 42

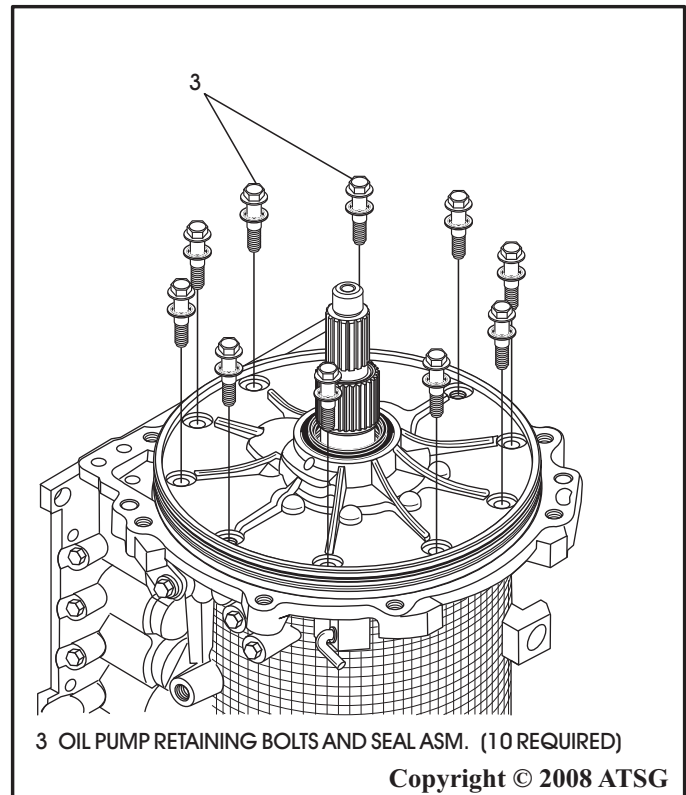


Figure 43

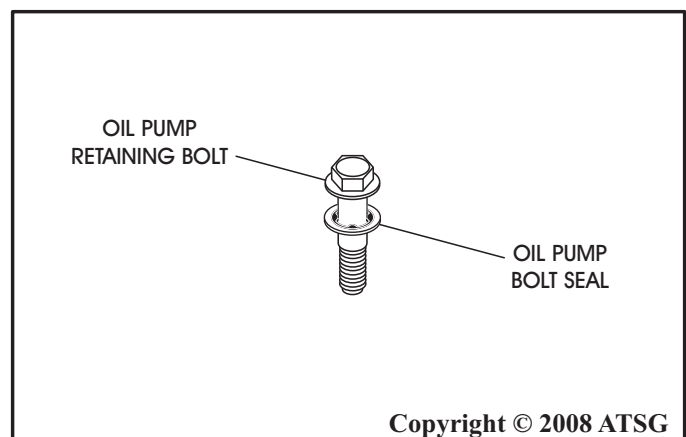


Figure 44

TRANSMISSION DISASSEMBLY INTERNAL COMPONENTS (CONT'D)

23. Break the oil pump assembly loose from case using the tools shown in Figure 45.
Note: The converter housing bolts may also be used to loosen the oil pump assembly.
24. Remove the oil pump assembly from the case, as shown in Figure 46, remove and discard the oil pump to converter housing "O" ring seal.
25. Remove the number 1 selective thrust washer, as shown in Figure 46.
Note: Selective washer may be stuck to back of oil pump assembly.
26. Set the oil pump assembly aside for component rebuild section.
27. Remove and discard oil pump to case gasket, as shown in Figure 46.
28. Remove the number 2 thrust bearing from the overdrive/reverse clutch housing, as shown in Figure 46, just so we do not lose it during the cleaning process.

Continued on Page 36

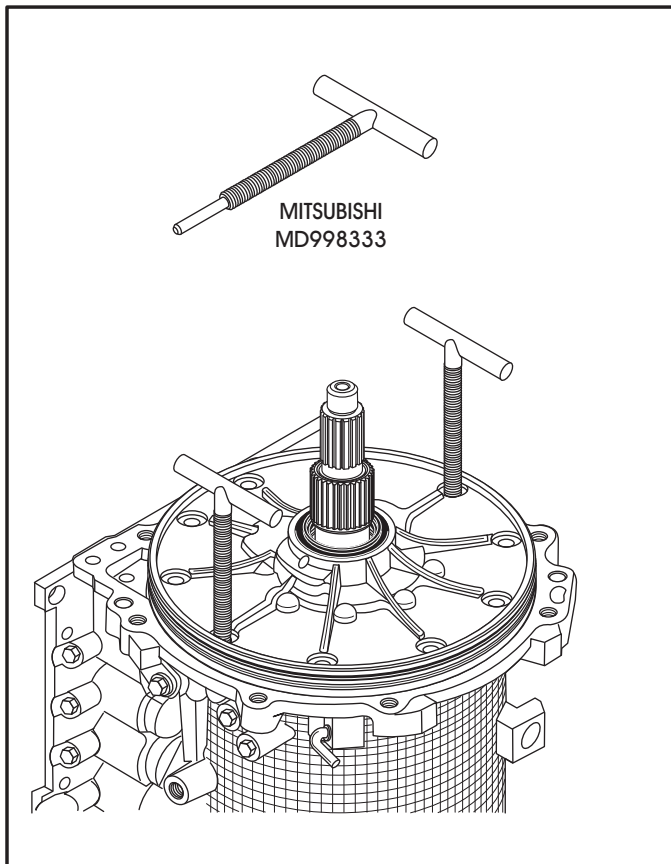


Figure 45

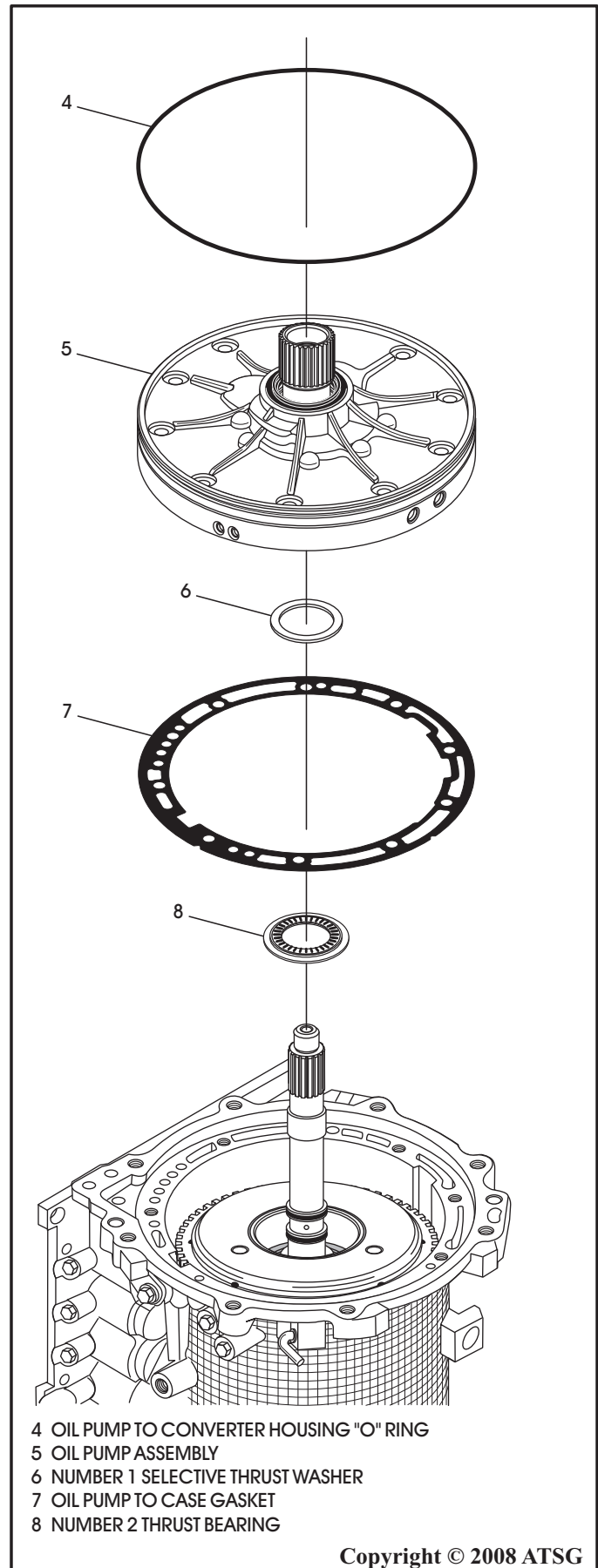


Figure 46

TRANSMISSION DISASSEMBLY INTERNAL COMPONENTS (CONT'D)

29. Remove overdrive and reverse clutch housing, as shown in Figure 47, by grasping and lifting straight up.
30. Set the overdrive and reverse clutch housing aside for the component rebuild section.
31. Remove the number 3 thrust bearing, as shown in Figure 48.
32. Remove the overdrive clutch hub and shaft, as shown in Figure 48.
33. Remove the number 4 thrust bearing, as shown in Figure 48.
34. Remove the reverse sun gear and reverse hub assembly, as shown in Figure 48.

Continued on Page 37

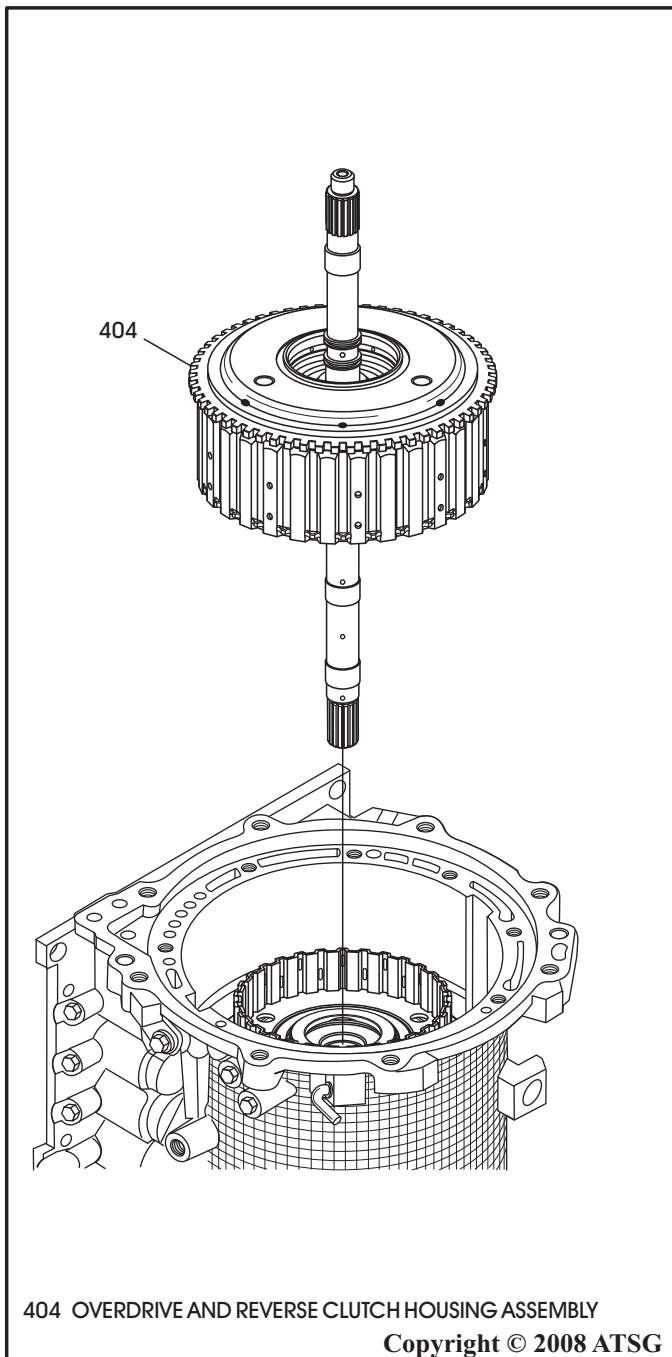


Figure 47

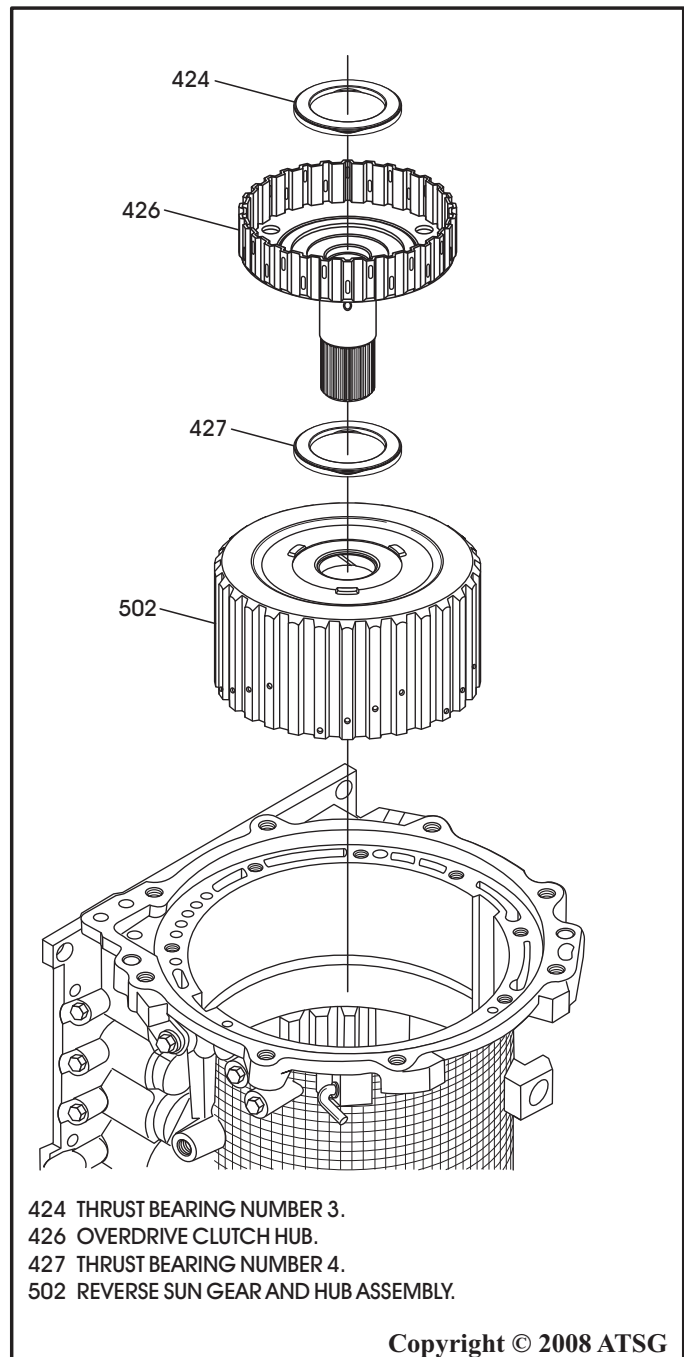


Figure 48

TRANSMISSION DISASSEMBLY INTERNAL COMPONENTS (CONT'D)

35. Remove 2nd brake clutch retainer snap ring, as shown in Figure 49.

Note: Best procedure is to tag all snap rings for identification, as most are selective.

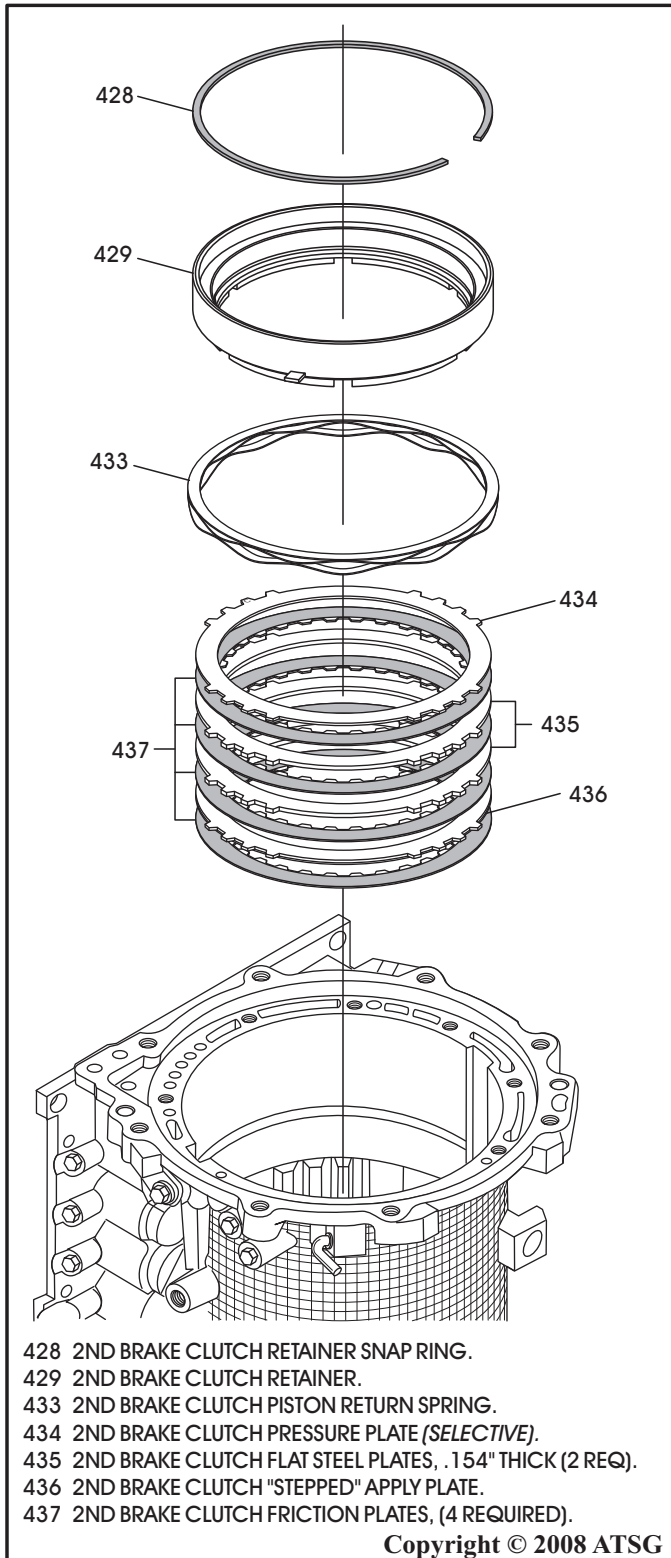


Figure 49

36. Remove 2nd brake clutch retainer, as shown in Figure 49.

37. Set the 2nd brake clutch retainer aside for the component rebuild section.

38. Remove 2nd brake clutch piston return spring, as shown in Figure 49.

39. Remove the 2nd brake clutches, as shown in Figure 49.

40. Remove the low/reverse annulus and planetary assembly, as shown in Figure 50.

41. Remove the number 7 thrust bearing, as shown in Figure 50.

Note: Thrust bearing may be stuck to back of planetary assembly.

42. Set the low/reverse annulus and planetary aside for component rebuild section.

Continued on Page 38

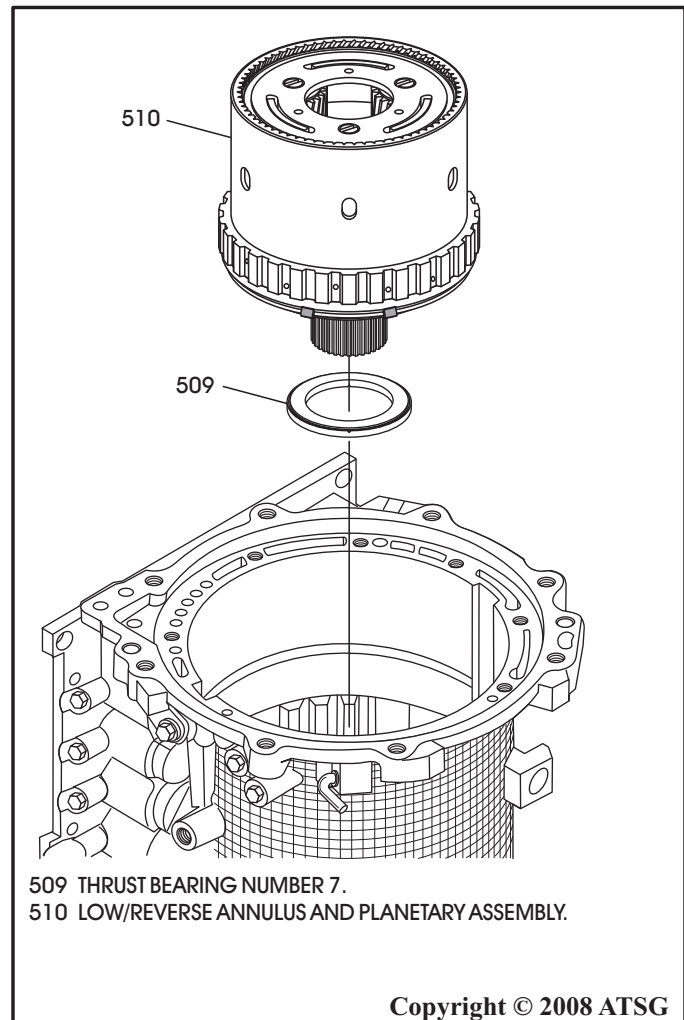


Figure 50

TRANSMISSION DISASSEMBLY INTERNAL COMPONENTS (CONT'D)

43. Remove low/reverse pressure plate selective snap ring, as shown in Figure 51.

Note: Best procedure is to tag all snap rings for identification, as most are selective.

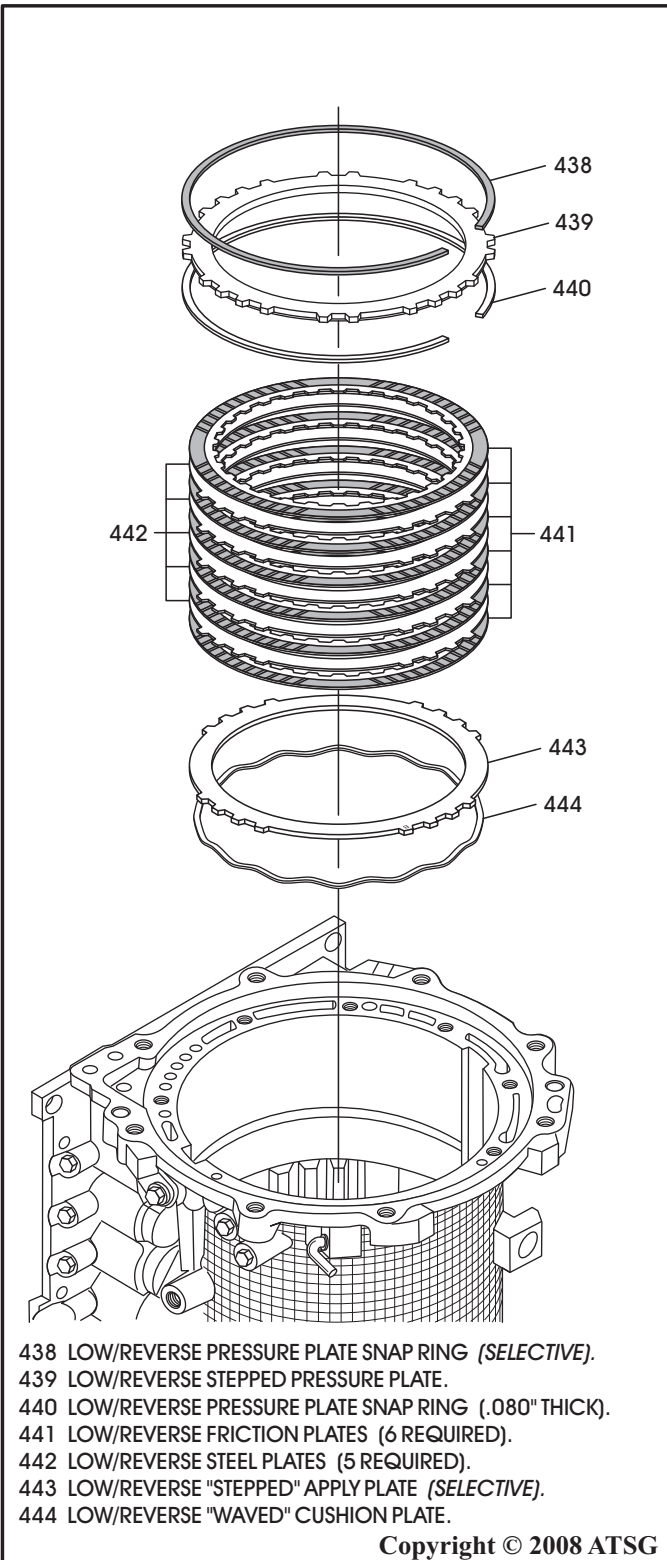


Figure 51

44. Remove low/reverse pressure plate and one friction plate, as shown in Figure 51.
45. Remove low/reverse pressure plate .080" snap ring, as shown in Figure 51, and tag for ID.
46. Remove low/reverse clutch plates, as shown in Figure 51.
47. Remove low/reverse clutch apply plate and the cushion spring, as shown in Figure 51.
48. Remove the center support retaining snap ring, as shown in Figure 52, and tag for ID.
49. Remove center support assembly from case, as shown in Figure 52.
50. Remove the number 8 selective thrust washer, as shown in Figure 52.
Note: Thrust washer may be stuck on back of the center support.
51. Set the center support assembly aside for the component rebuild section.

Continued on Page 39

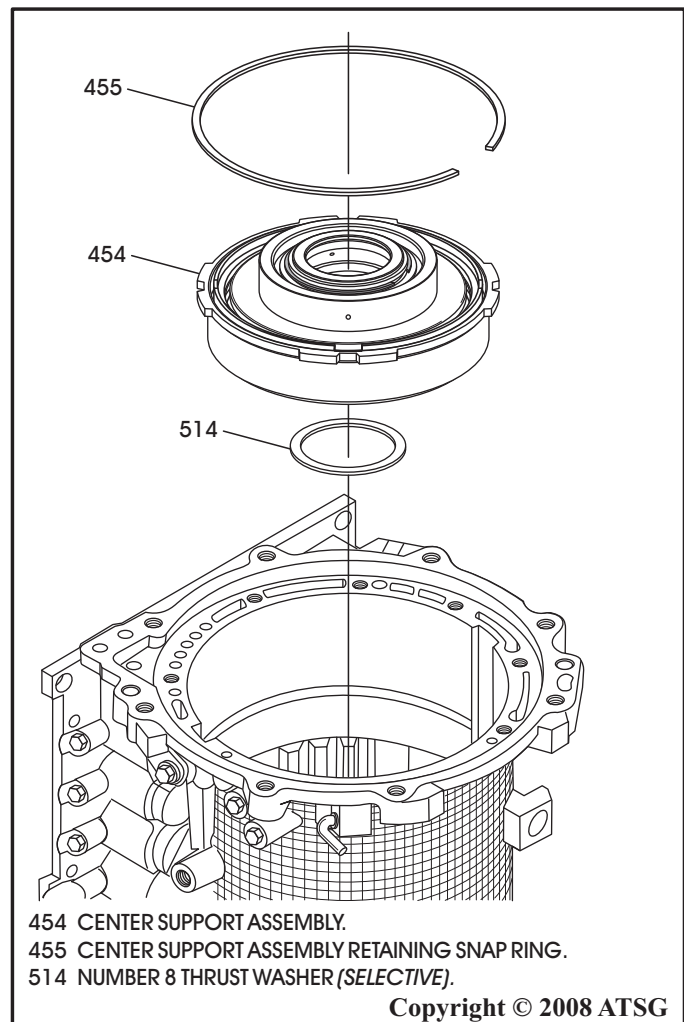


Figure 52

TRANSMISSION DISASSEMBLY

"4 SPEED" INTERNAL COMPONENTS (CONT'D)

After the center support has been removed, the disassembly process changes between the 4 speed and 5 speed units. This of course is because of the added reduction planetary, reduction band, direct clutch and direct sprag, all in the rear of case.

We will begin here with the 4 speed disassembly below the center support, as shown in Figure 53.

The 5 speed disassembly below the center support begins on Page 42.

Continued on Page 40

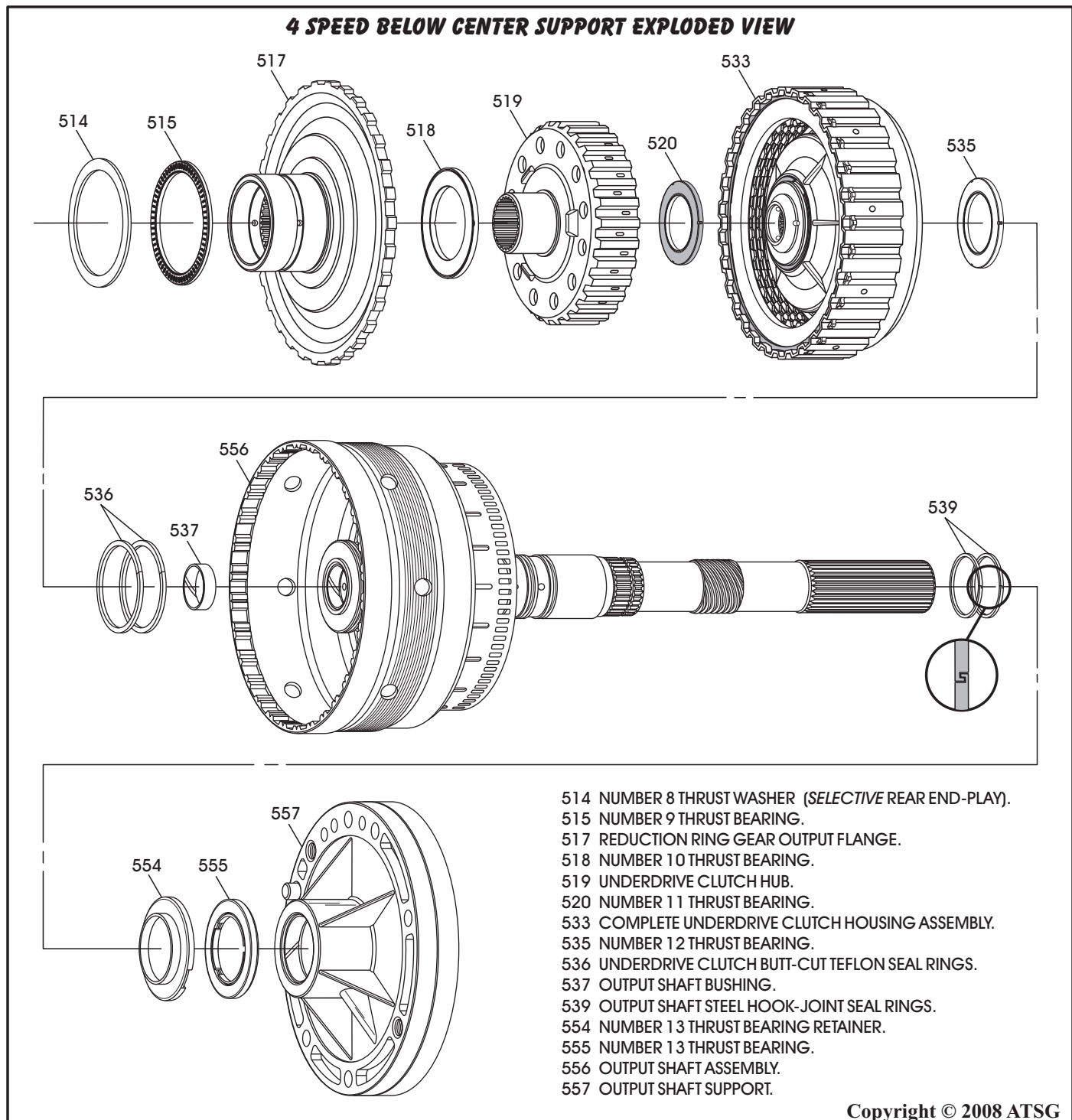


Figure 53

TRANSMISSION DISASSEMBLY

"4 SPEED" INTERNAL COMPONENTS (CONTD)

1. Remove the number 8 selective thrust washer, as shown in Figure 54.
2. Remove the number 9 thrust bearing, as shown in Figure 54.
3. Remove output flange, as shown in Figure 54, by lifting straight up.
4. Remove number 10 thrust bearing, as shown in Figure 55.
5. Remove the underdrive clutch hub, as shown in Figure 55.
6. Remove number 11 thrust bearing, as shown in Figure 55.
- Note: Thrust bearing may be stuck to back of underdrive clutch hub.*
7. Remove complete underdrive clutch housing, as shown in Figure 55.

8. Remove number 12 thrust bearing, as shown in Figure 55.

Note: Thrust bearing may be stuck to back of underdrive clutch housing.

9. Set the underdrive clutch housing aside for the component rebuild section.

Continued on Page 41

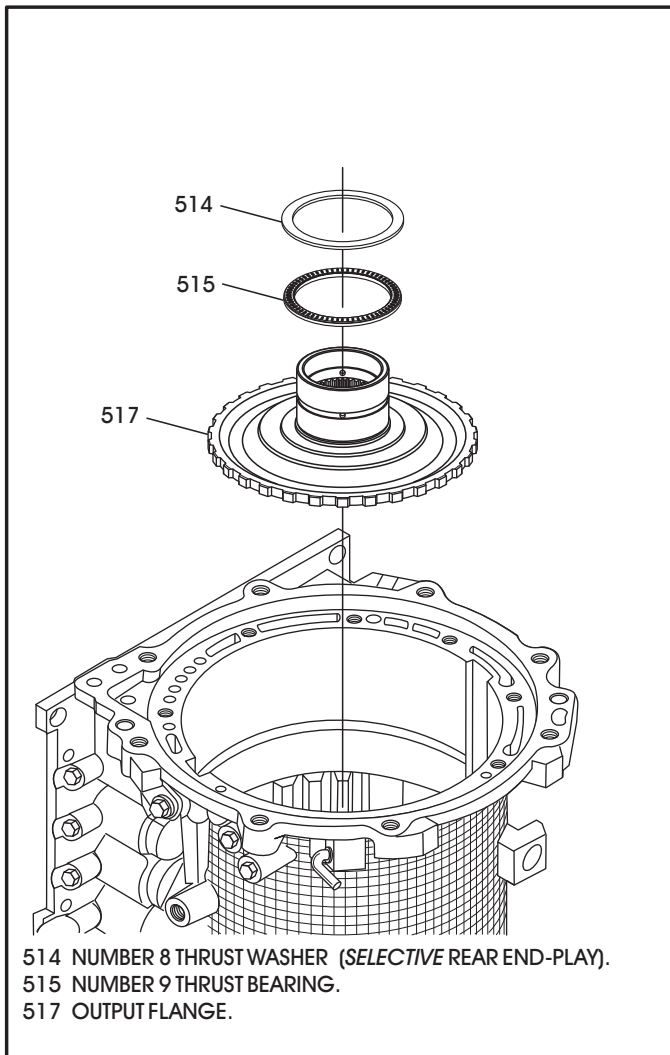
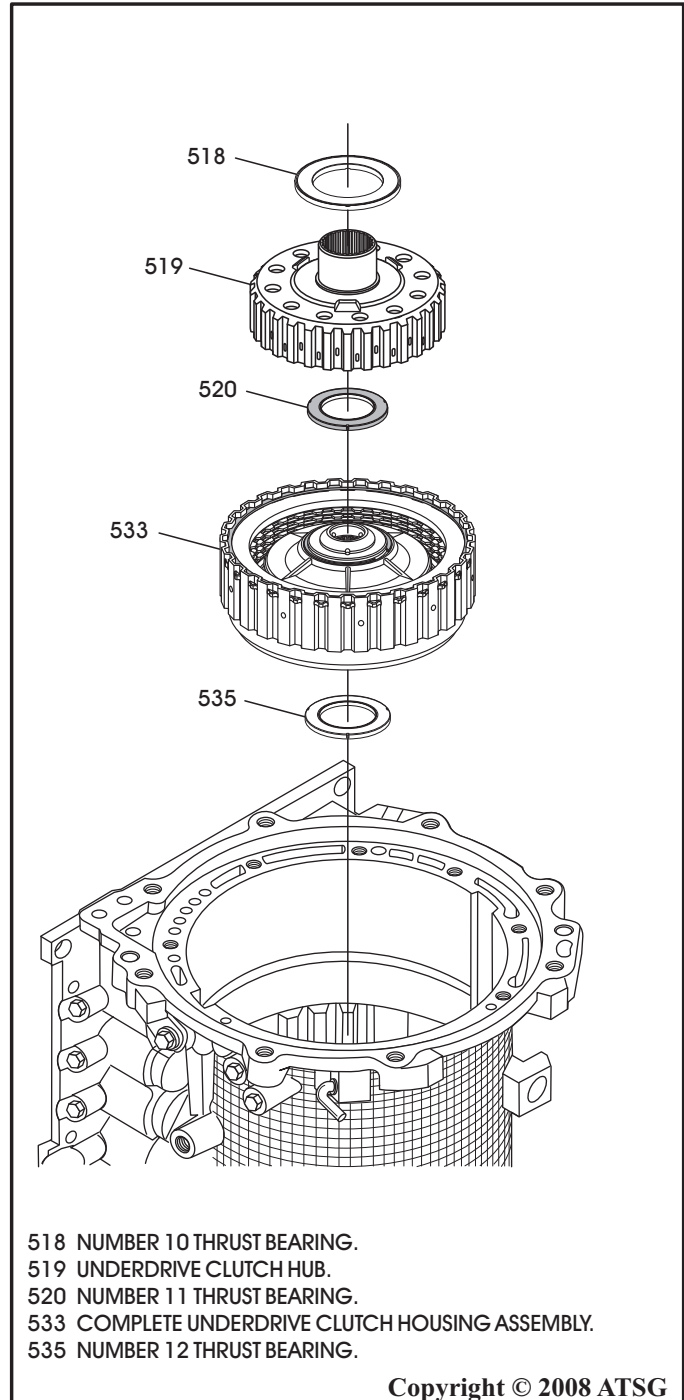


Figure 54



Copyright © 2008 ATSG

Figure 55

TRANSMISSION DISASSEMBLY

"4 SPEED" INTERNAL COMPONENTS (CONT'D)

10. Remove output shaft from transmission case, as shown in Figure 56.
11. Remove the number 13 thrust bearing and the bearing retainer, as shown in Figure 56.
12. Remove the sealing rings from output shaft and set output shaft aside for component rebuild.

13. Remove the retaining bolts and remove output shaft support from case, as shown in Figure 57.
14. Remove and discard output shaft support to case gasket, as shown in Figure 57.

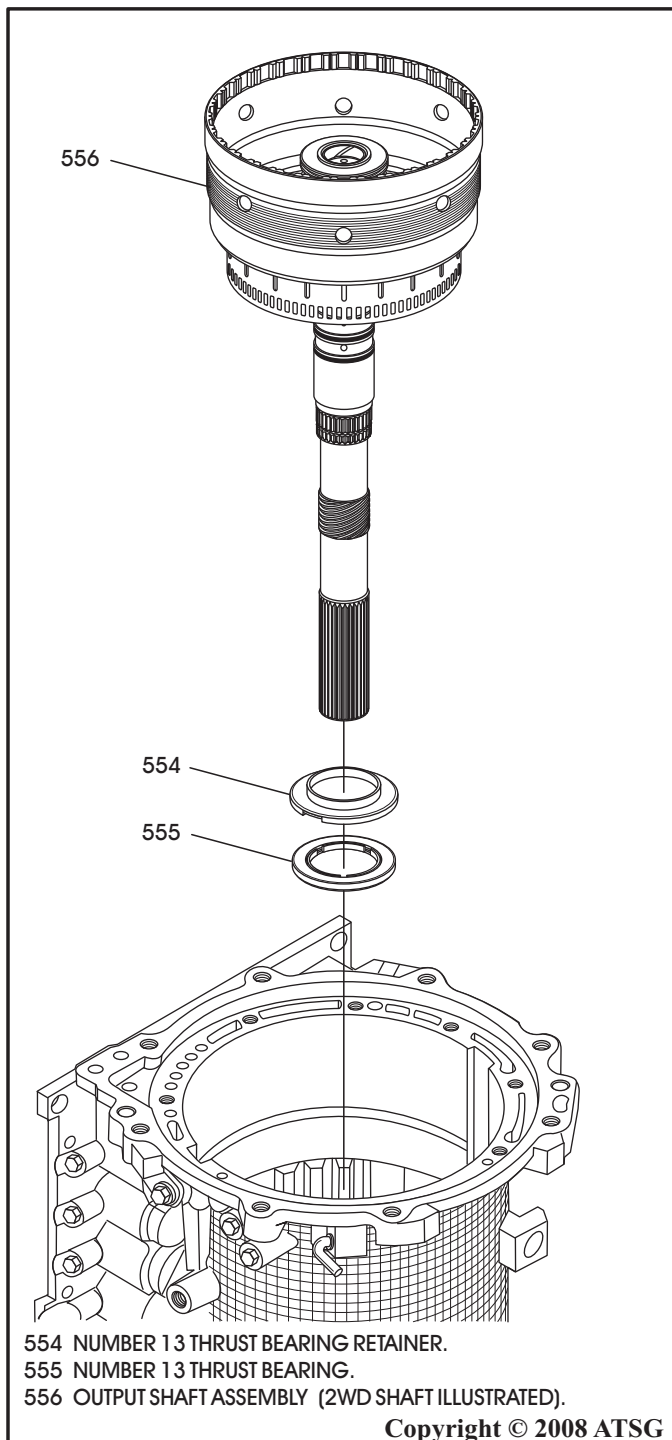


Figure 56

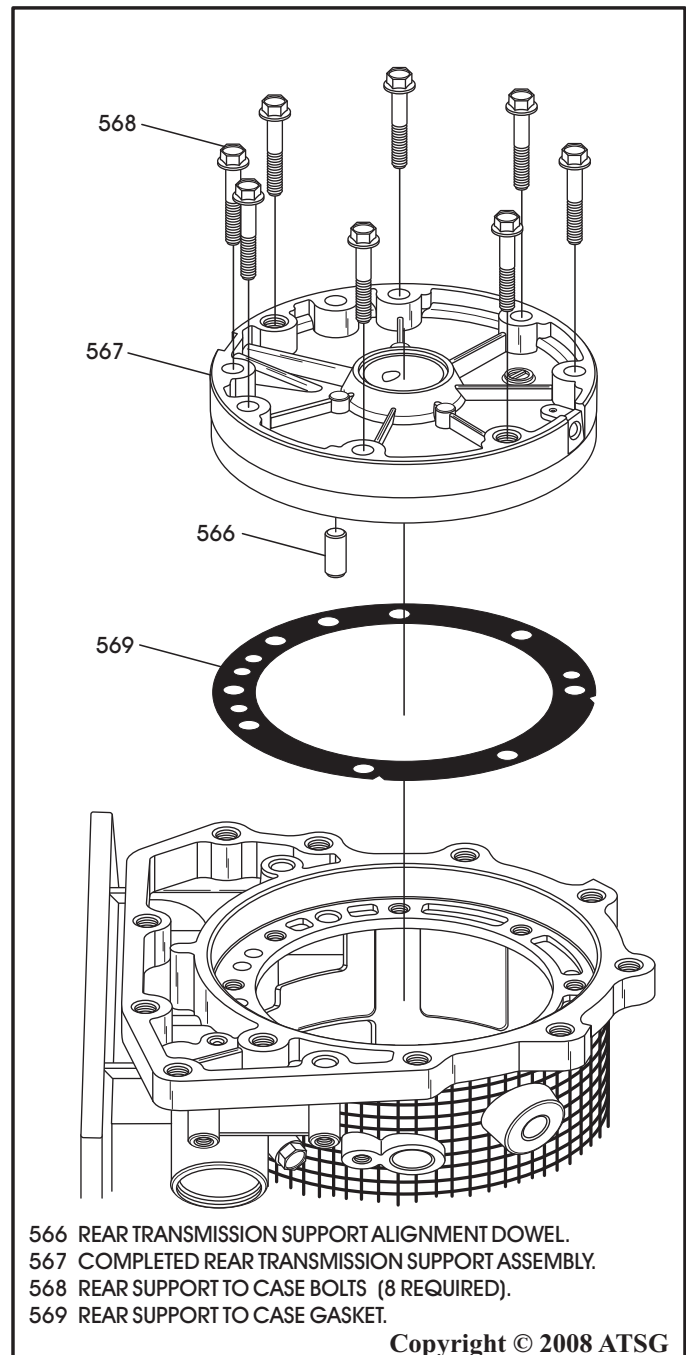


Figure 57

TRANSMISSION DISASSEMBLY

"5 SPEED" INTERNAL COMPONENTS (CONT'D)

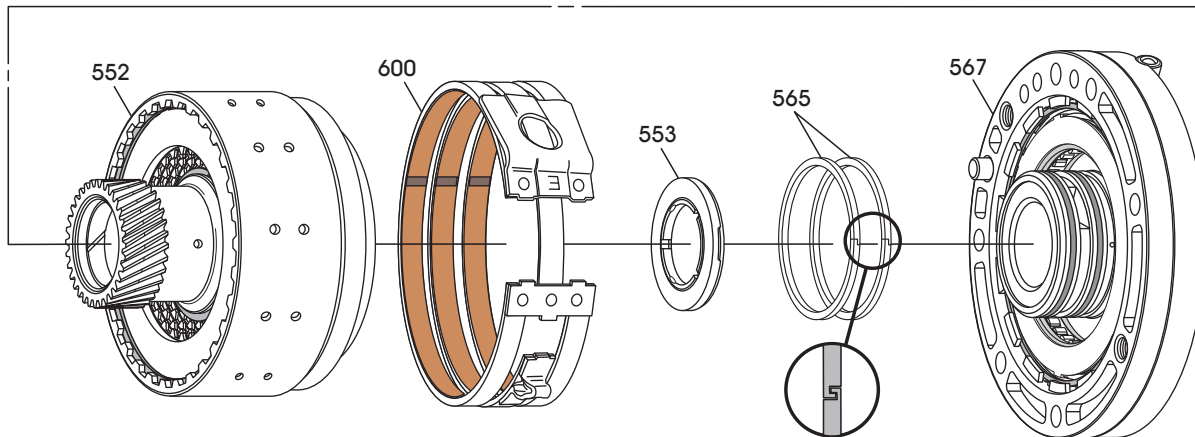
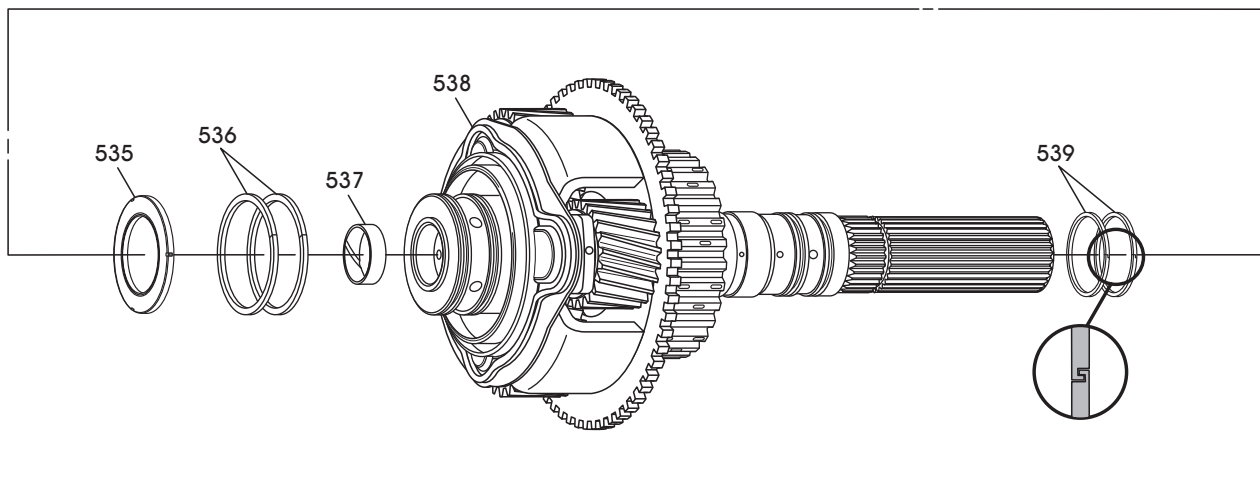
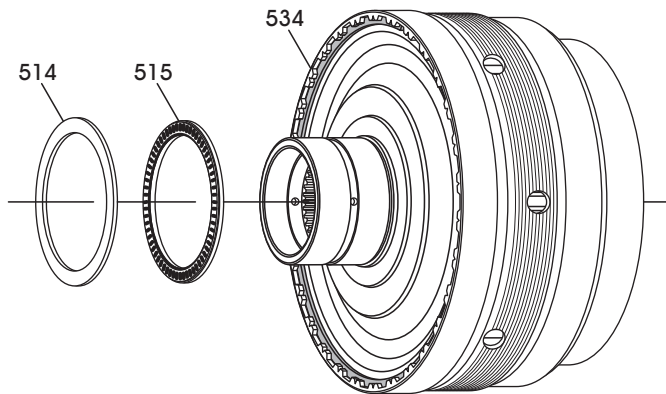
After the center support has been removed, the disassembly process changes between the 4 speed and 5 speed units. This of course is because of the added reduction planetary, reduction band, direct clutch and direct sprag, all in the rear of case.

We will begin here with the 5 speed disassembly below the center support, as shown in Figure 58, and the 4 speed disassembly below the center support begins on Page 39.

Continued on Page 43

5 SPEED BELOW CENTER SUPPORT EXPLODED VIEW

- 514 NUMBER 8 THRUST WASHER (SELECTIVE REAR END-PLAY).
- 515 NUMBER 9 THRUST BEARING.
- 534 REDUCTION ANNULUS AND UNDERDRIVE CLUTCH ASSEMBLY.
- 535 NUMBER 12 THRUST BEARING.
- 536 UNDERDRIVE CLUTCH BUTT-CUT TEFLON SEAL RINGS.
- 537 OUTPUT SHAFT BUSHING.
- 538 REDUCTION PLANETARY CARRIER AND OUTPUT SHAFT.
- 539 OUTPUT SHAFT STEEL HOOK-JOINT SEAL RINGS.
- 552 COMPLETE DIRECT CLUTCH HOUSING.
- 553 NUMBER 13 THRUST BEARING.
- 565 DIRECT CLUTCH STEEL HOOK-JOINT SEALING RINGS.
- 567 OUTPUT SHAFT SUPPORT AND DIRECT SPRAG ASSEMBLY.
- 600 REDUCTION BAND ASSEMBLY.



Copyright © 2008 ATSG

Figure 58

TRANSMISSION DISASSEMBLY

"5 SPEED" INTERNAL COMPONENTS (CONT'D)

1. Remove the number 8 selective thrust washer, as shown in Figure 59.
2. Remove the number 9 thrust bearing, as shown in Figure 59.
3. Remove the reduction annulus and underdrive clutch assembly, as shown in Figure 59, and set aside for the component rebuild section.
4. Remove number 12 thrust bearing, as shown in Figure 60.
5. Remove reduction planetary carrier and output shaft, as shown in Figure 60.
6. Remove and discard underdrive clutch butt-cut teflon seal rings, as shown in Figure 60.
7. Remove and discard the steel hook-joint seal rings, as shown in Figure 60.

Continued on Page 44

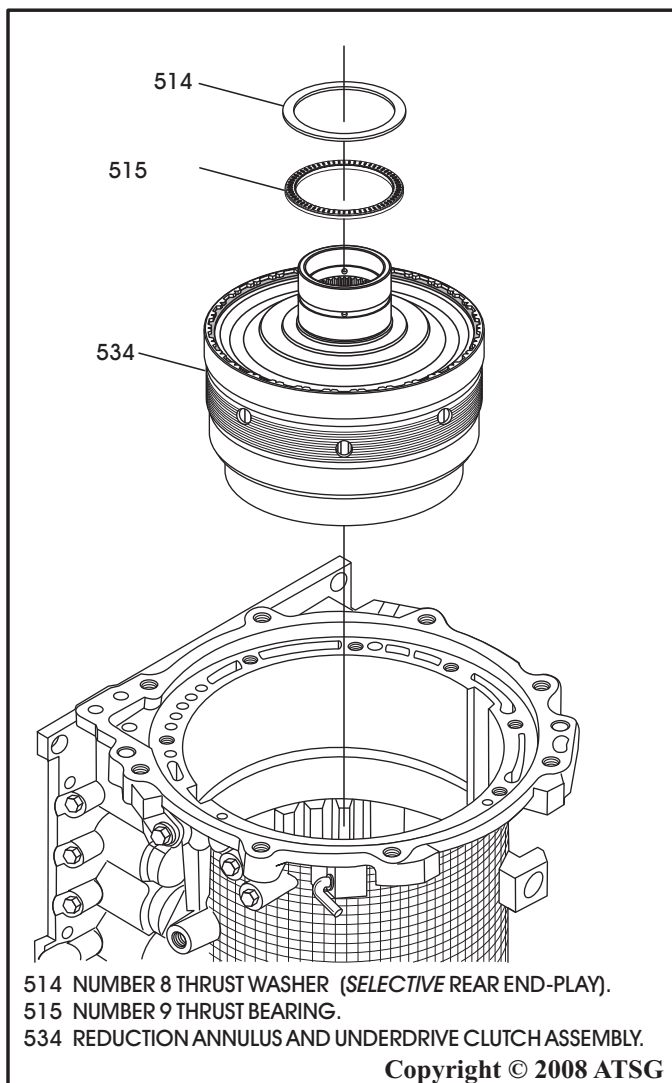


Figure 59

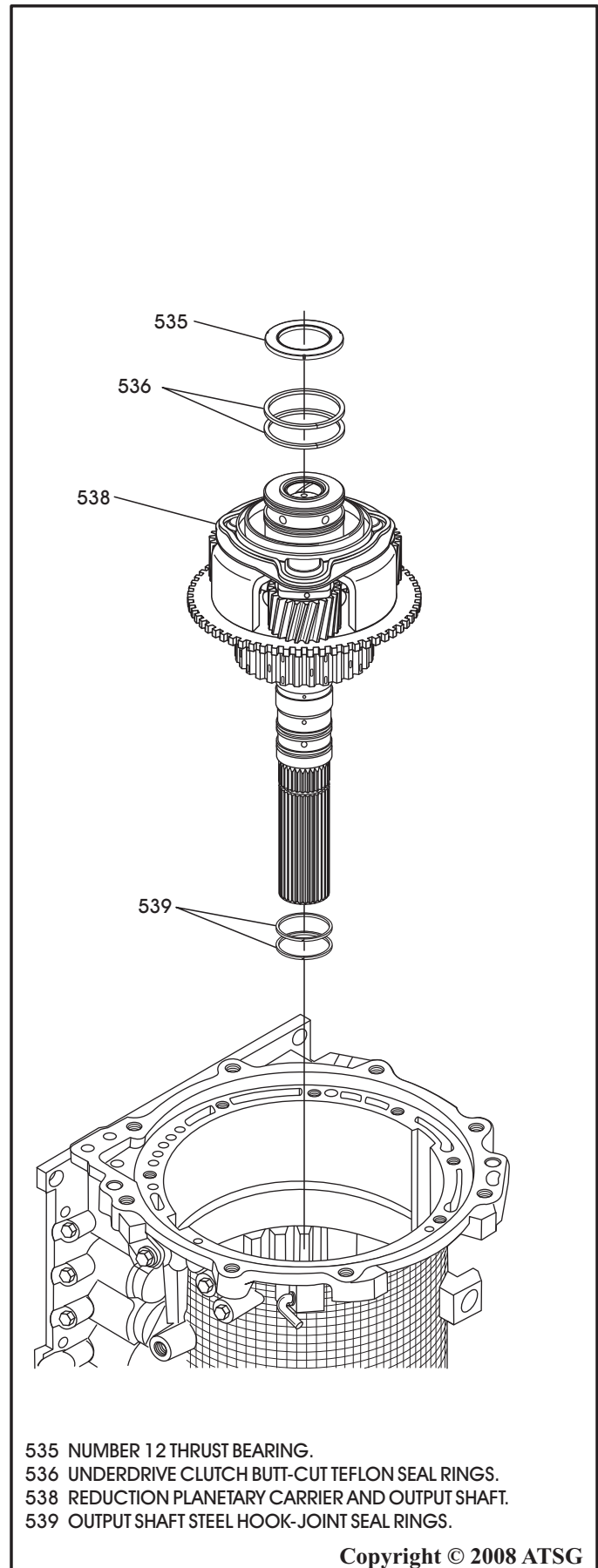


Figure 60

TRANSMISSION DISASSEMBLY

"5 SPEED" INTERNAL COMPONENTS (CONT'D)

8. Remove the complete direct clutch housing, as shown in Figure 61, and set the drum aside for the component rebuild section.
 9. Remove number 13 thrust bearing, as shown in Figure 61.
- Note:** Thrust bearing may be stuck to back of the direct clutch housing.
10. Remove the reduction band assembly from the case, as shown in Figure 61.
 11. Remove the eight retaining bolts holding the output shaft support, as shown in Figure 62.

12. Remove output shaft support and direct sprag assembly, as shown in Figure 62, and set aside for the component rebuild section.
13. Remove and discard output shaft support to case gasket, as shown in Figure 62.

Disassembly Complete

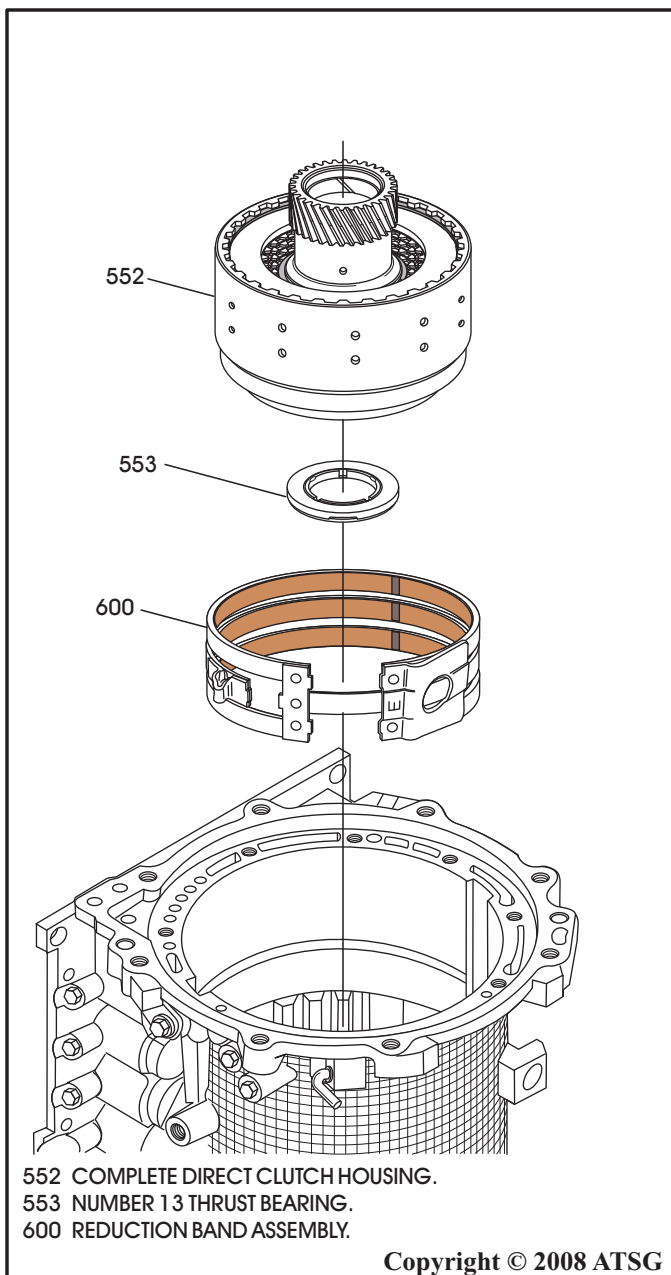


Figure 61

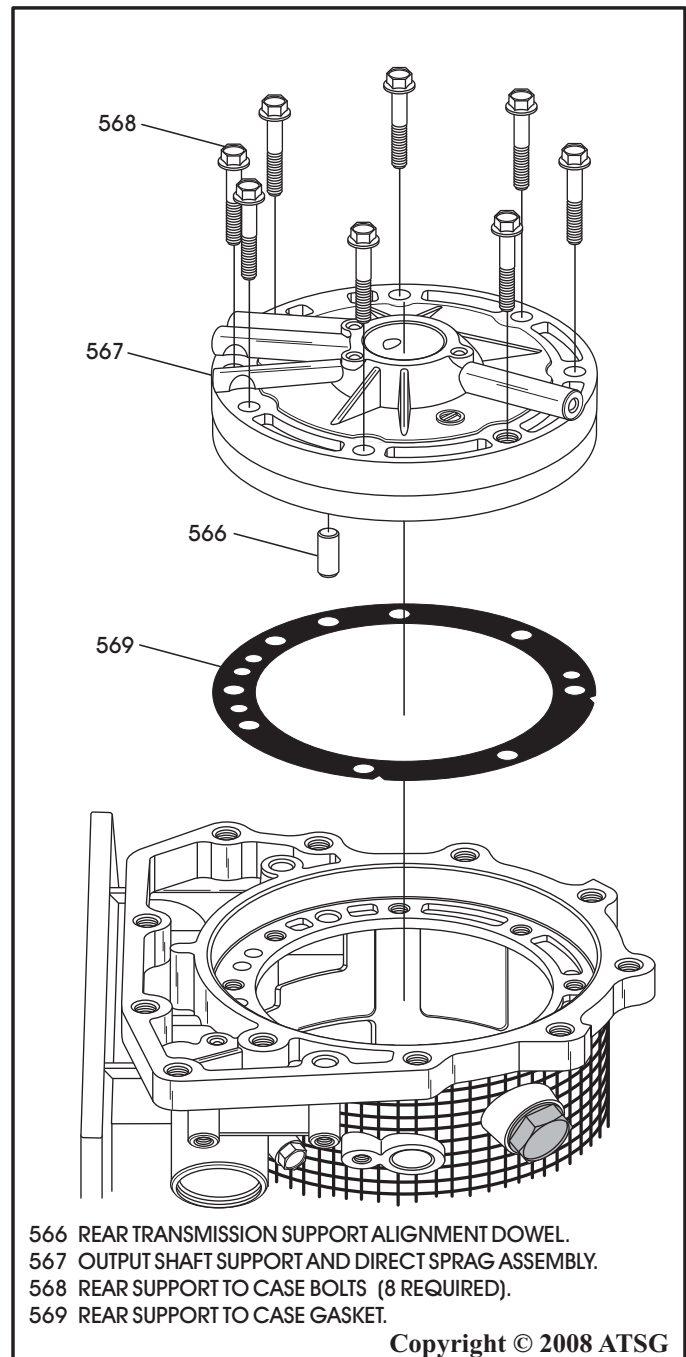


Figure 62

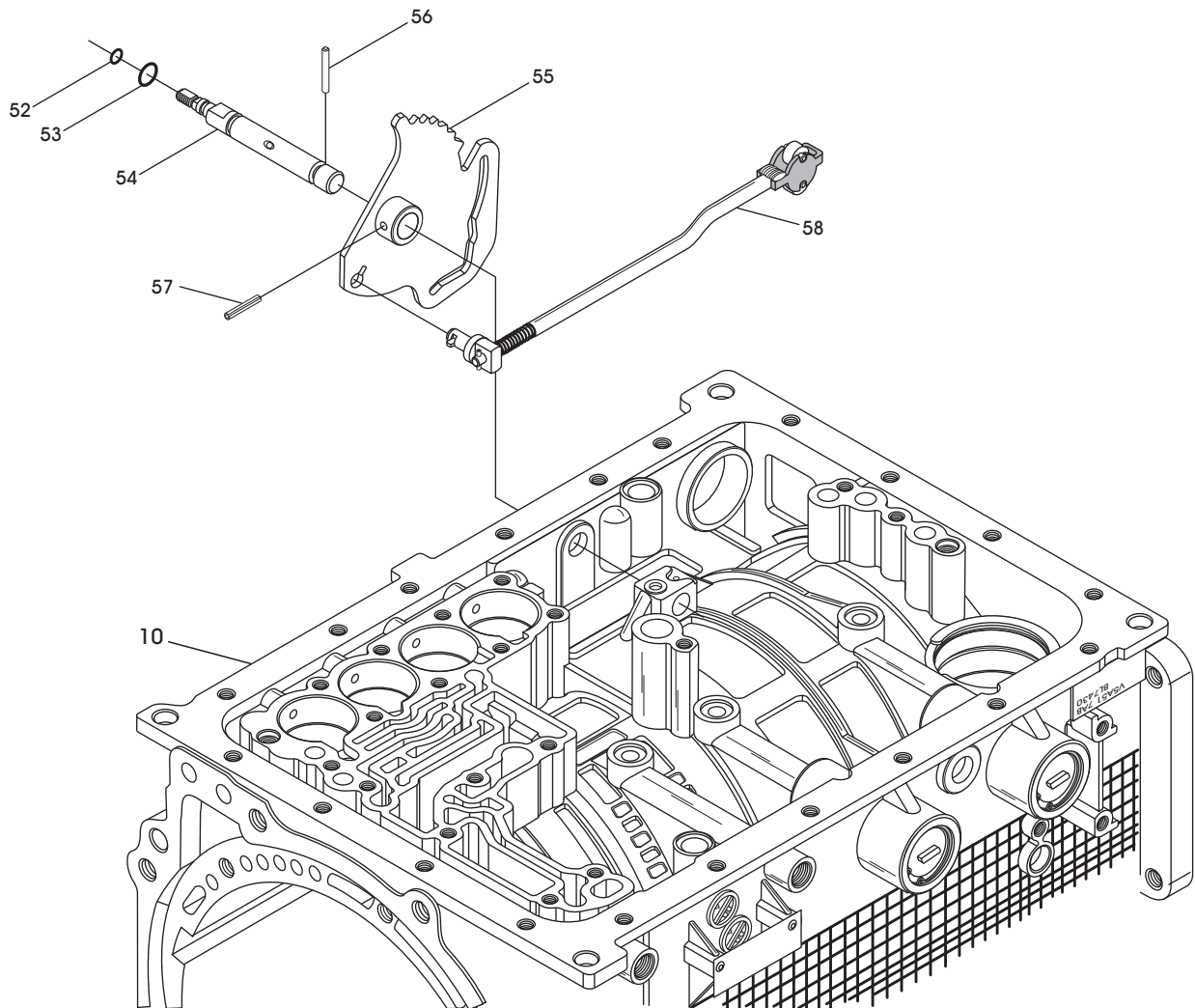
COMPONENT REBUILD

TRANSMISSION CASE ASSEMBLY

1. Disassemble the manual and parking linkage parts by removing the two retaining pins, and using Figure 63 as a guide.
2. Remove and discard the two "O" ring seals on the manual shaft, as shown in Figure 63.
3. Remove and discard the manual shaft seal from the case, as shown in Figure 63.
4. Clean all case and linkage parts thoroughly and dry with compressed air.
5. Inspect all case and linkage parts thoroughly for any wear and/or damage and replace as necessary.

Continued on Page 46

PARKING LINKAGE AND RELATED PARTS EXPLODED VIEW



10 TRANSMISSION CASE ASSEMBLY
 52 SMALL MANUAL SHAFT "O" RING
 53 LARGE MANUAL SHAFT "O" RING
 54 MANUAL SHAFT

55 INSIDE DETENT LEVER
 56 MANUAL SHAFT SOLID RETAINING PIN (GOES IN CASE)
 57 INSIDE DETENT LEVER RETAINING SPRING PIN (SPLIT)
 58 PARK ROD AND ROLLER ASSEMBLY

Copyright © 2008 ATSG

Figure 63

COMPONENT REBUILD

TRANSMISSION CASE ASSEMBLY

6. Inspect the rolled pin in the park rod and roller assembly **very** closely, as shown in Figure 64, for any damage or bent.

Note: *There is a great amount of tension on this pin, which can cause it to break, resulting in no park, ratcheting noise, or binding.*

7. Install new "O" ring seals on manual shaft, as shown in Figure 65, and lubricate with a small amount of Trans-Jel®.
8. Engage park rod and roller assembly into the "key-hole" in the inside detent lever, as shown in Figure 63, and install into case.
9. Install the manual shaft and "O" ring assembly through the case bore, through the inside detent lever and into inside case boss, as shown in Figure 63.

10. Install the spring pin (split) through the inside detent lever and into manual shaft, as shown in Figure 63.

Note: *Install spring pin so that the split faces front or rear of transmission.*

11. Install the solid retaining pin through case boss to retain manual shaft assembly in case.
12. Remove the reduction band anchor plug from case, as shown in Figure 66, and install a new "O" ring.
13. Re-install the reduction band anchor plug and torque to 98 N•m (72 ft.lb.).
14. Set the transmission case aside for the final assembly process.

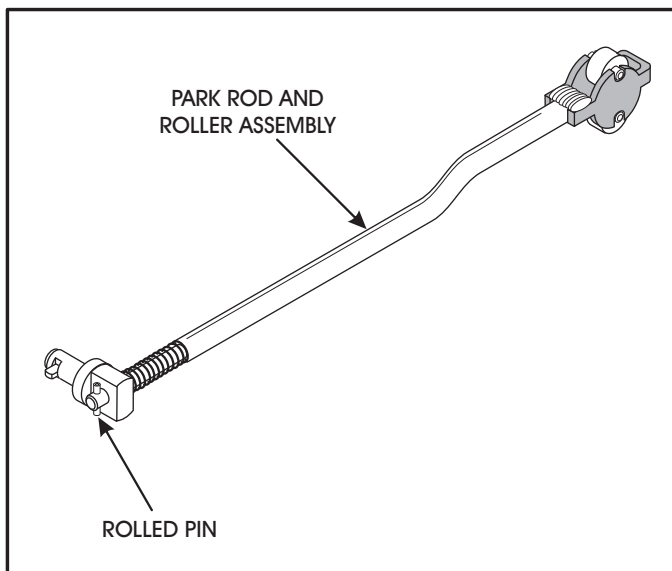


Figure 64

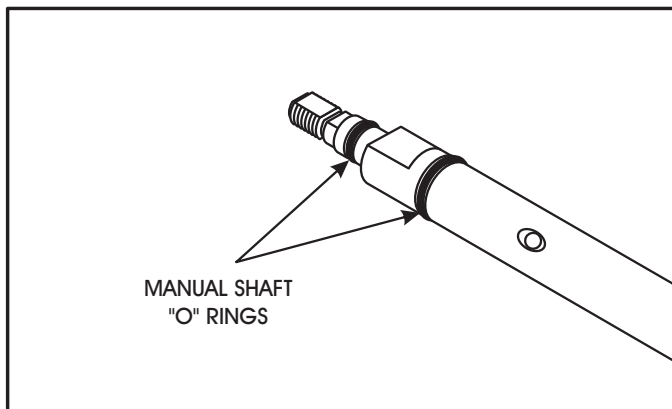


Figure 65

**Component Rebuild
Continued on Page 48**

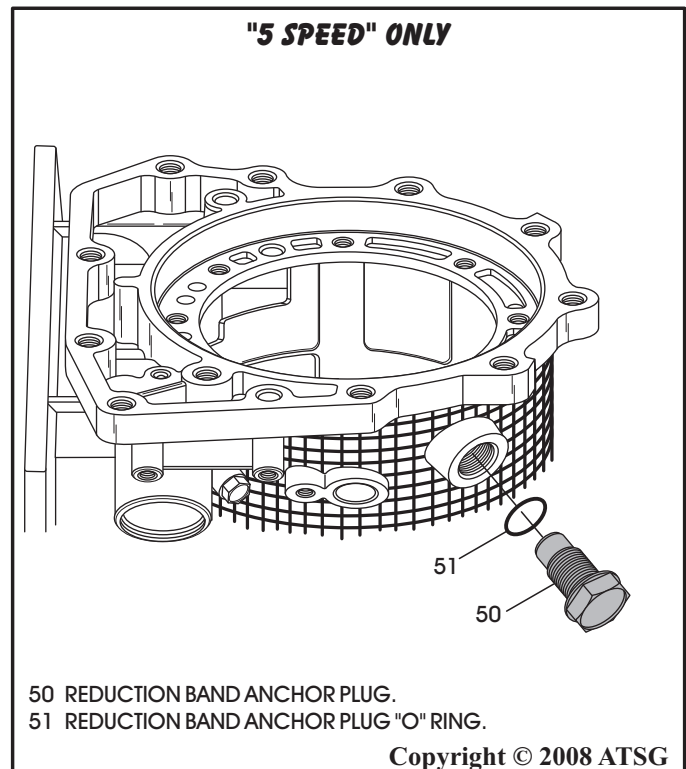
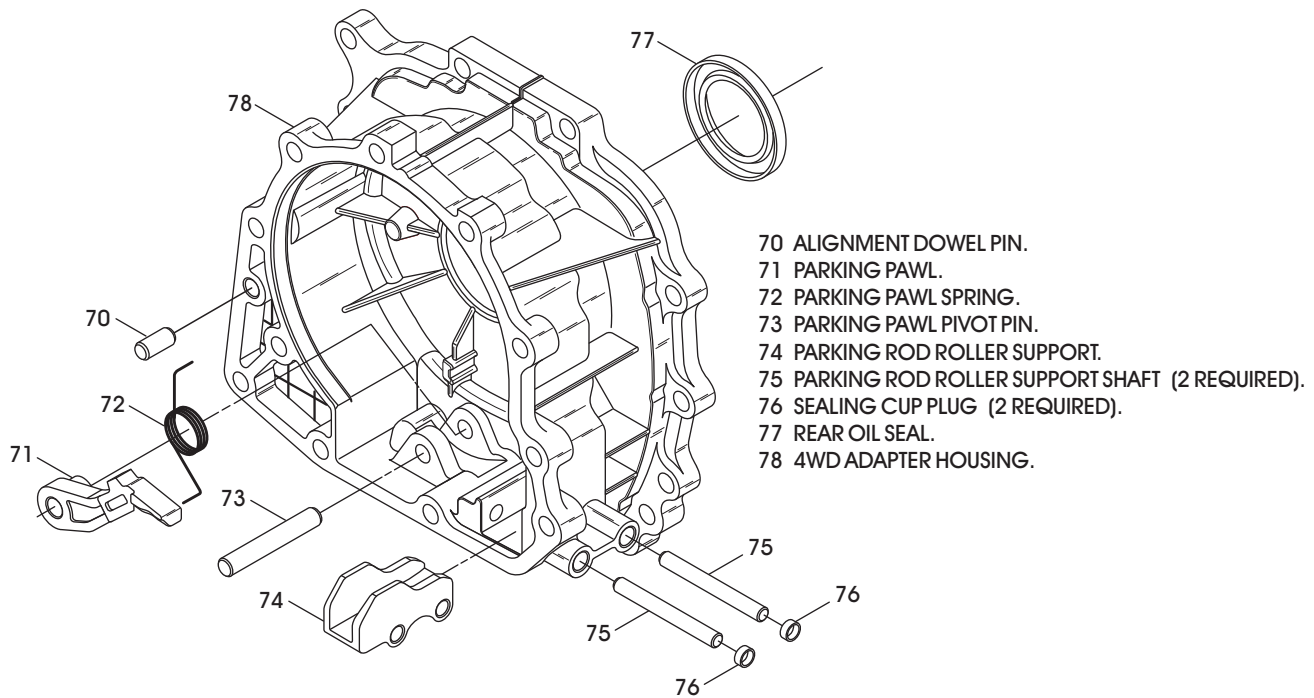


Figure 66

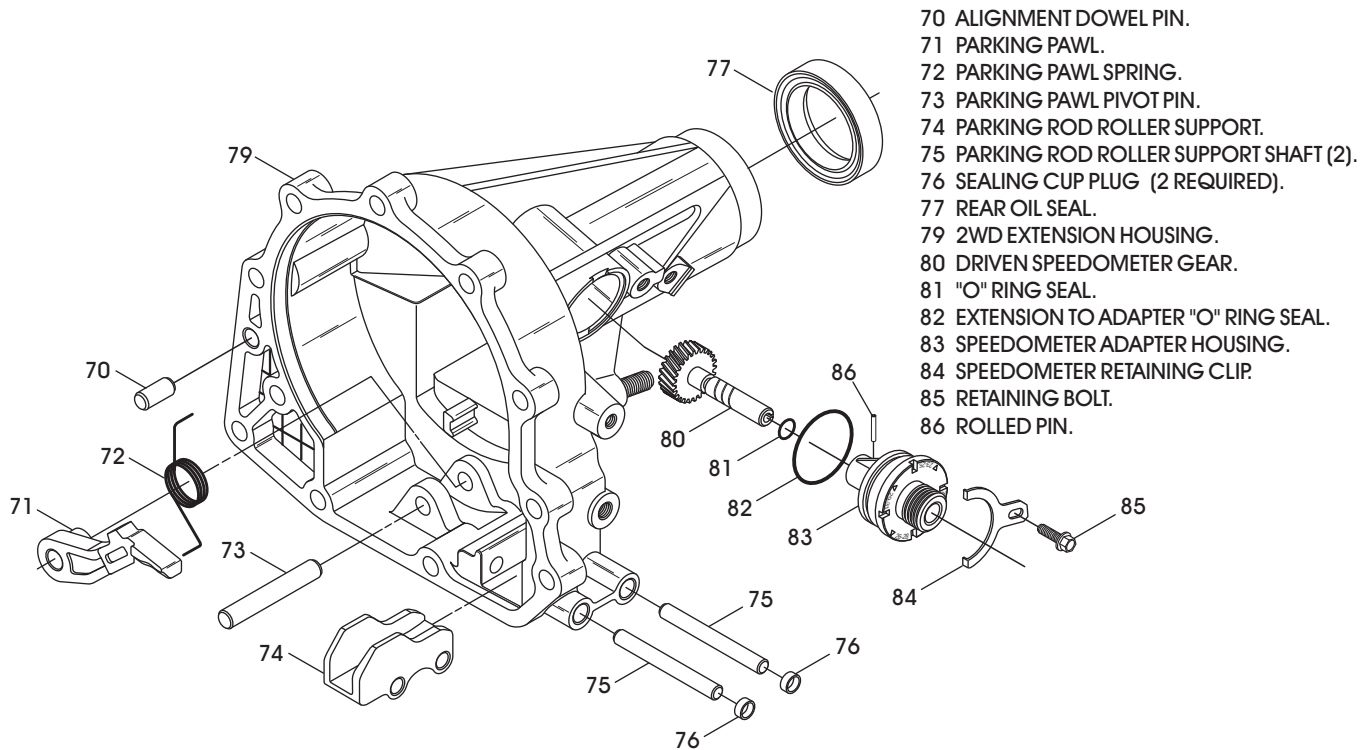
4WD ADAPTER HOUSING, V4A51 AND V5A51 MODELS, EXPLODED VIEW



Copyright © 2008 ATSG

Figure 67

2WD EXTENSION HOUSING, R4A51 MODELS, EXPLODED VIEW



Copyright © 2008 ATSG

Figure 68

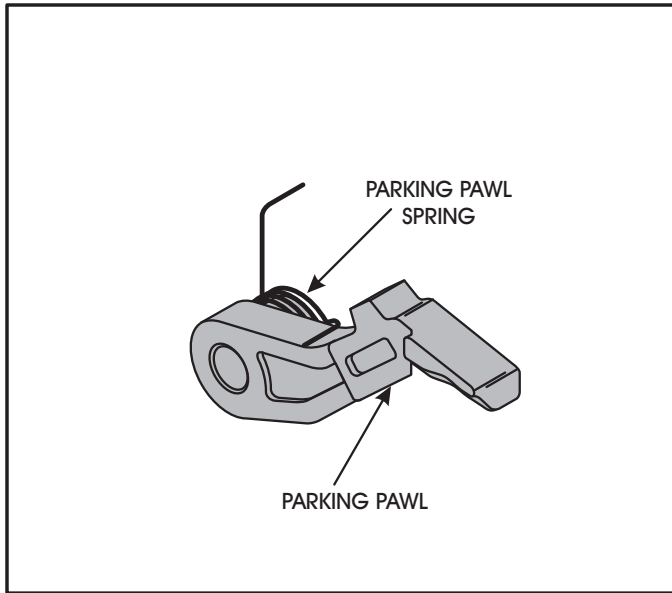


Figure 69

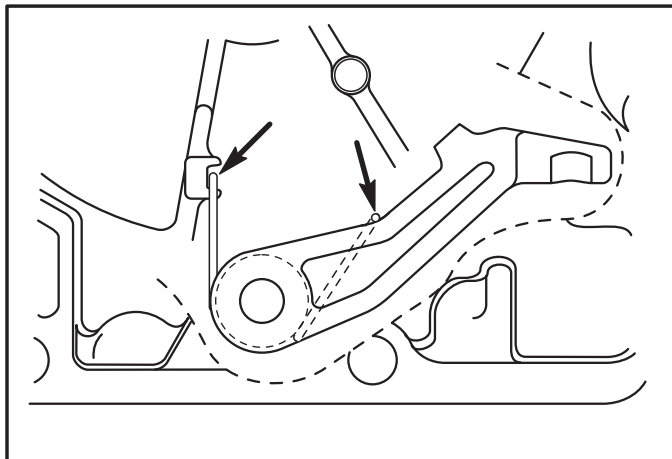


Figure 70

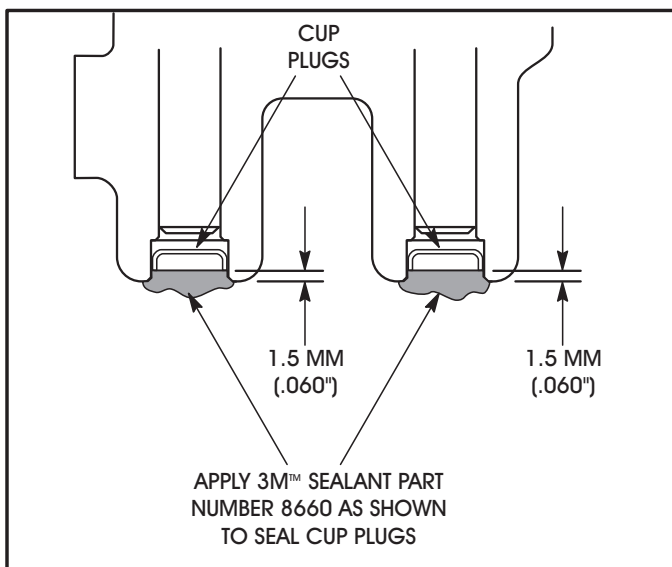


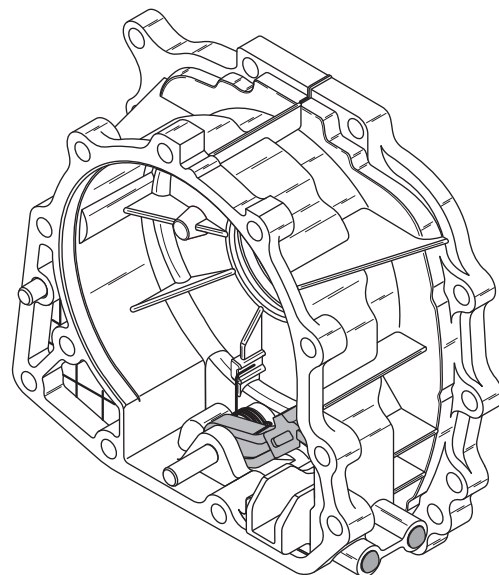
Figure 71

COMPONENT REBUILD

EXTENSION HOUSING OR 4WD ADAPTER HOUSING

1. Disassemble the parking pawl parts from the adapter housing, using Figure 67 as a guide.
Note: Procedures for adapter housing are the same for 4 speed, 5 speed, 2WD, 4WD.
2. Clean all adapter housing parts thoroughly and dry with compressed air.
3. Inspect all adapter housing parts thoroughly for any wear and/or damage, and replace as necessary.
4. Install the parking pawl spring over the pilot on the back side of parking pawl and hook spring on the top, as shown in Figure 69.
5. Install the assembly between the extension housing boss', as shown in Figure 67, and then install the parking pawl pivot pin.
6. Hook the other end of the parking pawl spring on the boss in housing, as shown in Figure 70.
7. Slide the parking roller support into housing, as shown in Figure 67, and install both support shafts.
8. Press the sealing caps in to the dimensions that are shown in Figure 71, and apply sealant to the caps as shown.
9. Install the extension housing seal or adapter housing metal clad seal into the housing using the proper seal driver, and set the completed housing aside for final assembly.

COMPLETED 4WD ADAPTER HOUSING



Copyright © 2008 ATSG

Figure 72

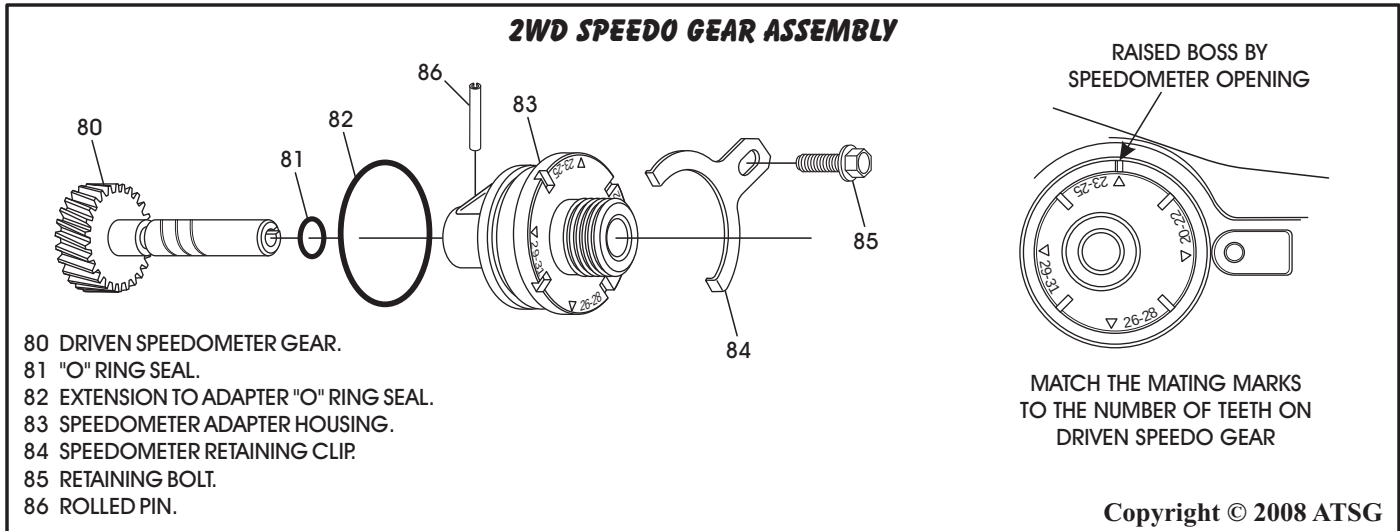


Figure 73

COMPONENT REBUILD

2WD SPEEDO GEAR ASSEMBLY

1. Assemble the speedometer gear to the adapter housing, as shown in Figure 73.
Note: The speedometer adapter housing is bored off-center, and is adaptable to several different tooth counts (See Figure 73).
2. Install new "O" rings on inside diameter and outside diameter, as shown in Figure 73.
3. Refer to Figure 74 for speedometer tooth count available at time of printing, and Figure 75 for location of drive gear, which is cut into the output shaft like the old C4, and like the old C4 it is available in 8 tooth and 9 tooth.

<i>Montero 4 Speed</i>		
	DRIVE TEETH	DRIVEN TEETH
3.0L ENGINE, P235/75R15 TIRES, 2WD	8	24
3.5L ENGINE, P235/75R15 TIRES, 2WD	8	23
3.0L ENGINE, 265/70R15 TIRES, 2WD	8	25
3.0L & 3.5L ENGINE, P235/75R15 TIRES, 4WD	9	26
3.0L ENGINE, 265/70R15 TIRES, 4WD	9	28

Copyright © 2008 ATSG

Figure 74

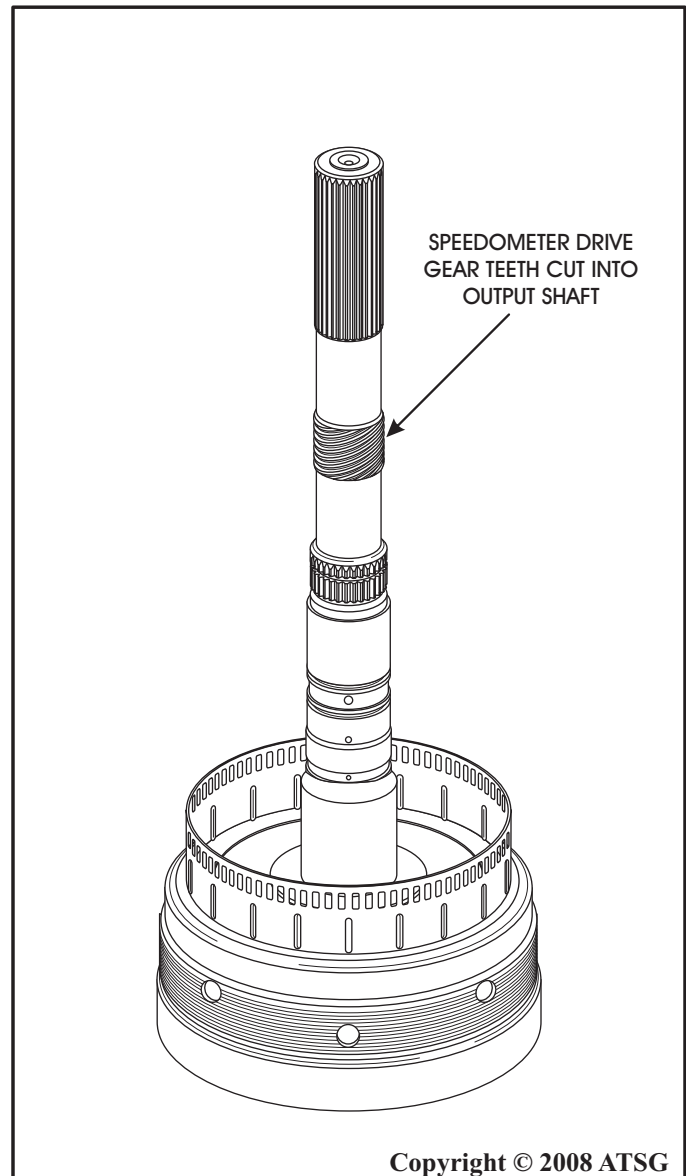
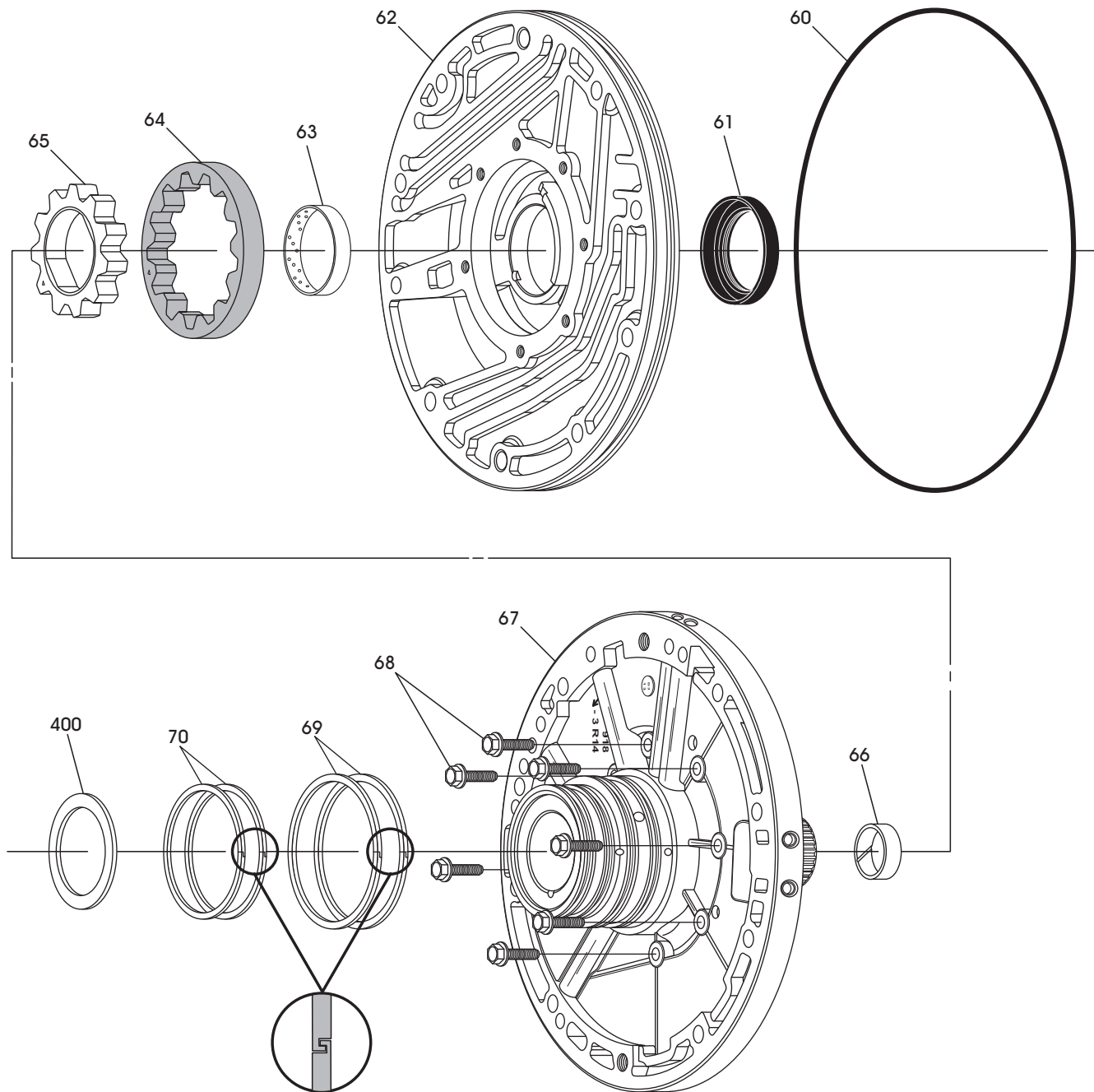


Figure 75

OIL PUMP ASSEMBLY EXPLODED VIEW



- 60 OIL PUMP BODY TO CONVERTER HOUSING "O" RING SEAL.
- 61 CONVERTER HUB SEAL.
- 62 OIL PUMP BODY.
- 63 OIL PUMP BODY CONVERTER HUB BUSHING.
(NO BUSHING IN EARLY 4 SPEED UNITS)
- 64 OIL PUMP OUTER GEAR.
- 65 OIL PUMP INNER GEAR.

- 66 OIL PUMP COVER TURBINE SHAFT BUSHING.
- 67 OIL PUMP COVER ASSEMBLY.
- 68 OIL PUMP COVER TO PUMP BODY BOLTS (7 REQUIRED).
- 69 OIL PUMP COVER LARGE "HOOK-JOINT" SEAL RINGS (2).
- 70 OIL PUMP COVER SMALL "HOOK-JOINT" SEAL RINGS (2).
- 400 NUMBER 1 SELECTIVE THRUST WASHER.

Copyright © 2008 ATSG

Figure 76

COMPONENT REBUILD

OIL PUMP ASSEMBLY

1. Disassemble the oil pump assembly using Figure 76 as a guide.
2. Clean all oil pump parts thoroughly and dry with compressed air.
3. Inspect all oil pump parts thoroughly for any wear and/or damage.
4. Install new oil pump body bushing as needed, as shown in Figure 77, using a proper bushing driver (*No bushing in early 4 speed units*).
5. Stake the bushing in place using a small punch, as shown in Figure 78.
6. Turn the oil pump body over and install a new converter seal, as shown in Figure 79, using the proper seal driver.
7. Install the outer and inner gears into the pump body, with the marks facing up, as shown in Figure 80.
8. Lubricate the pump gears with a small amount of the proper fluid.

Continued on Page 52

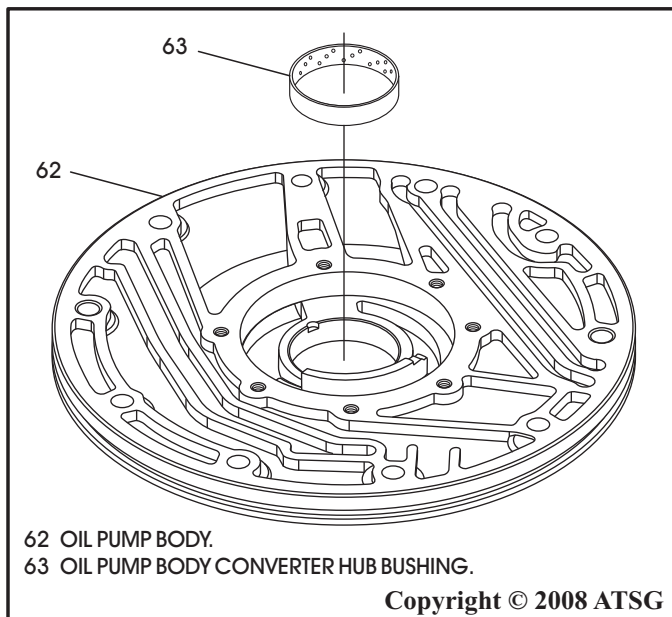


Figure 77

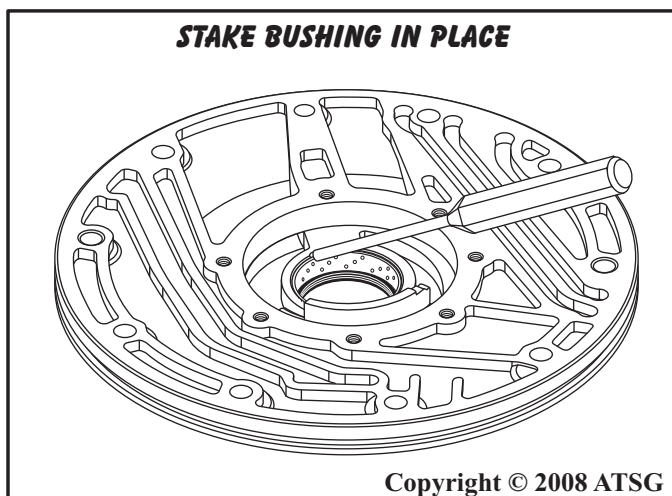


Figure 78

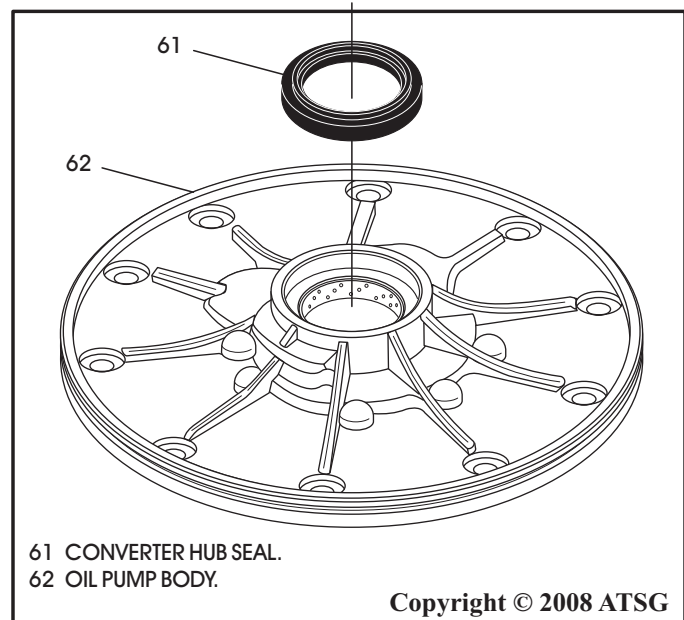


Figure 79

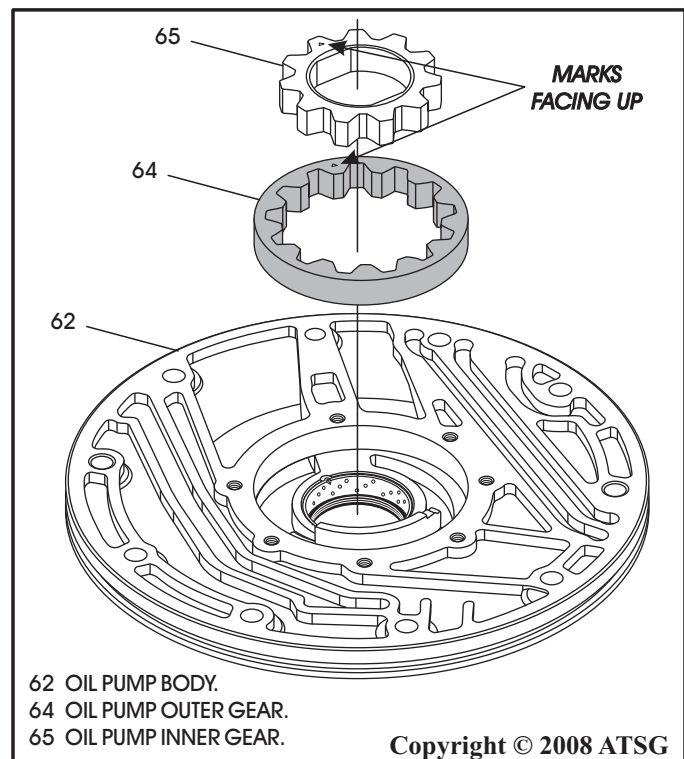


Figure 80

OIL PUMP ASSEMBLY (CONT'D)

9. Measure the oil pump gear clearances using a feeler gauge and a straight edge, as shown in Figure 81.

Note: Pump clearance specifications are also shown in Figure 81.

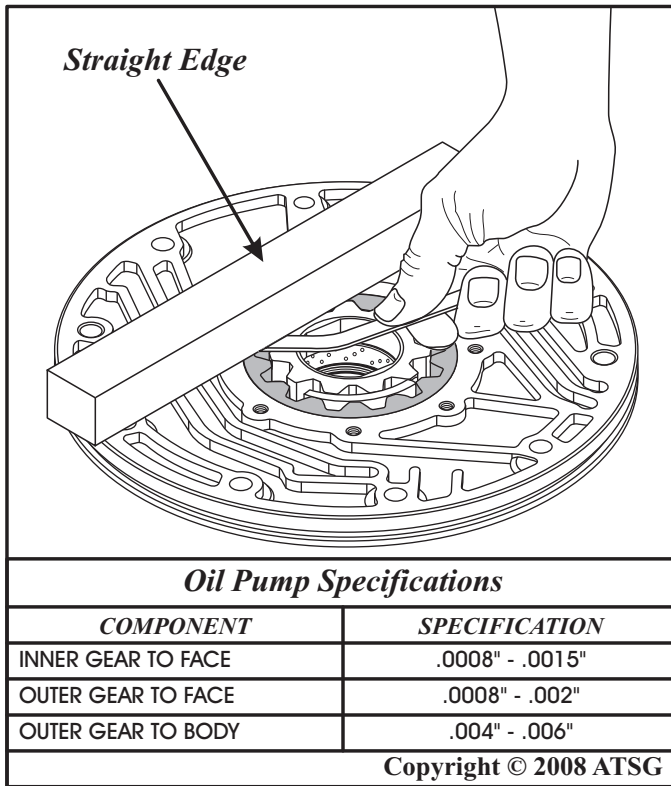


Figure 81

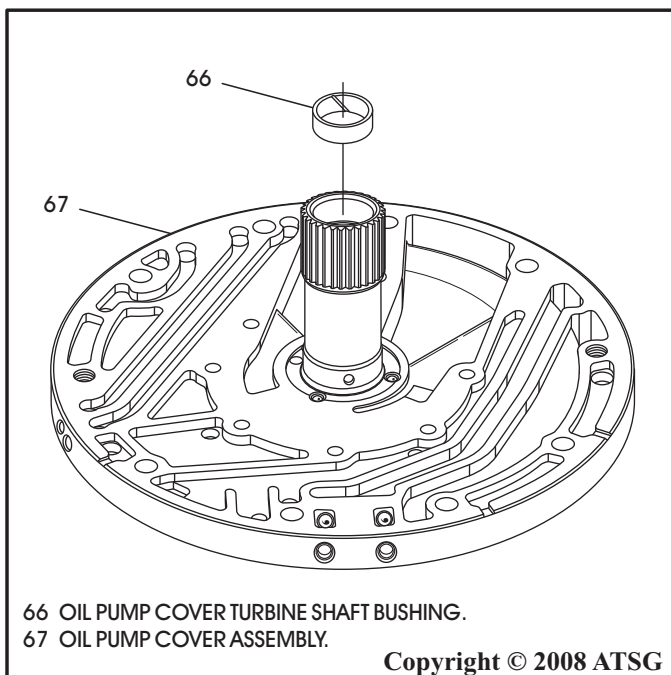


Figure 82

10. Install new stator shaft bushings as necessary, as shown in Figure 82, using the proper driver.
11. Install Sonnax® pump alignment tool through the pump bushing, as shown in Figure 83.

Note: Pump alignment tool must be aligned perfectly to fit through the bushing because of the tight tolerances.

12. Install the oil pump cover onto the oil pump body, as shown in Figure 83, and install the 7 retaining bolts.
13. Finger tighten at this time.

Continued on Page 53

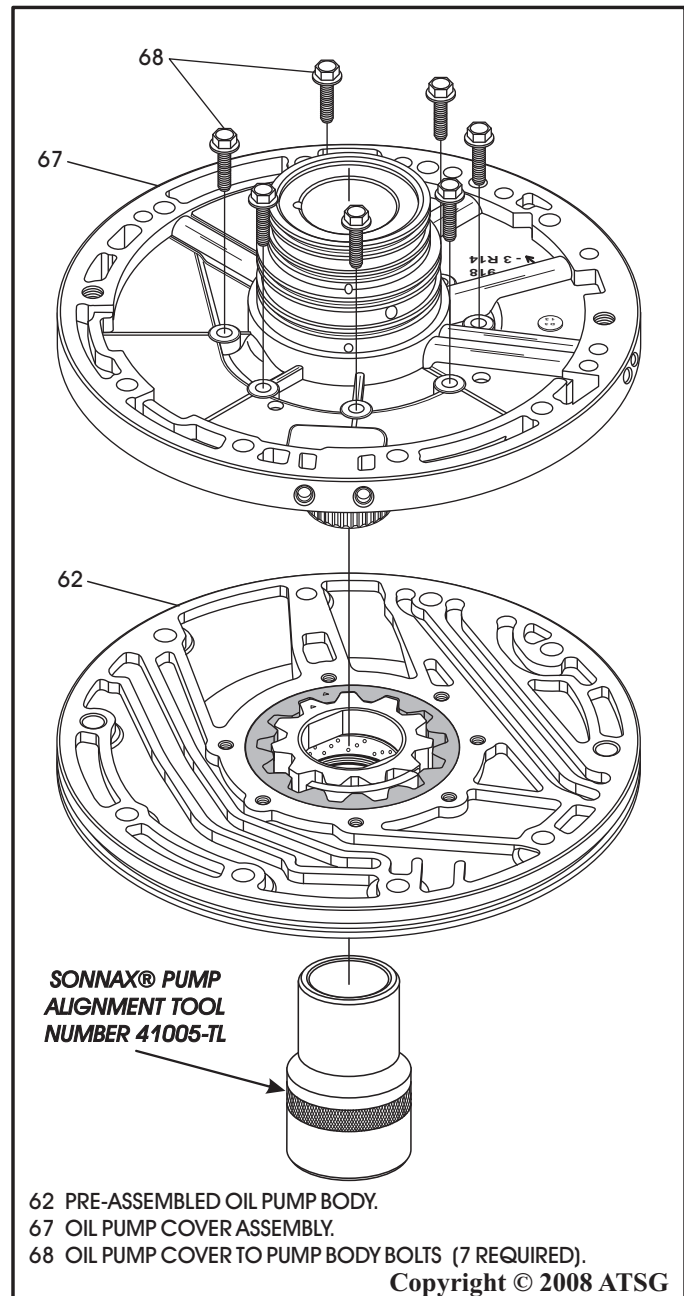


Figure 83

COMPONENT REBUILD

OIL PUMP ASSEMBLY (CONT'D)

14. Install the oil pump alignment tool, as shown in Figure 84, and now torque the 7 retaining bolts to 11 N•m (97 in.lb.), with the Sonnax® alignment tool in place.
Note: Pump alignment strap may also be used but the Sonnax® alignment tool is preferred.
15. Remove the Sonnax® pump alignment tool.
16. Install the four steel hook-joint sealing rings, as shown in Figure 85, and ensure that they are hooked properly and rotate freely in their grooves.
17. Install the number 1 selective thrust washer on pump tower, as shown in Figure 85, and retain with a small amount of Trans-Jel®.
Note: We will check for the proper selective washer to set front end-play during the final assembly.
18. Install oil pump to converter housing "O" ring seal into the groove in pump body, as shown in Figure 86, and lube with a small amount of Trans-Jel®.
19. Set the completed oil pump assembly aside for the final assembly process.

Component Rebuild
Continued on Page 54

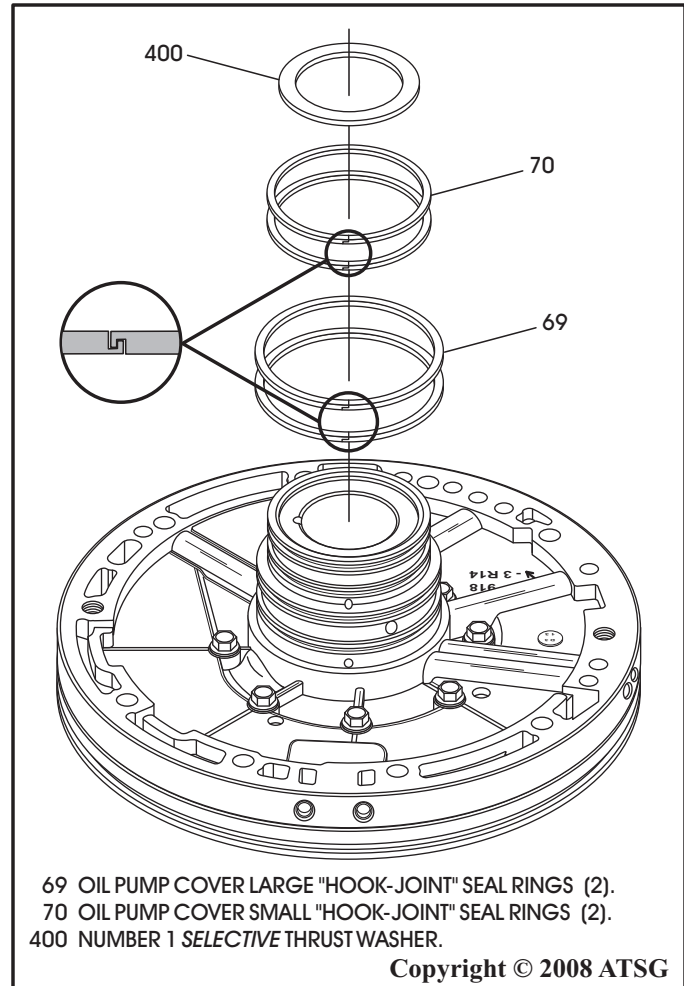


Figure 85

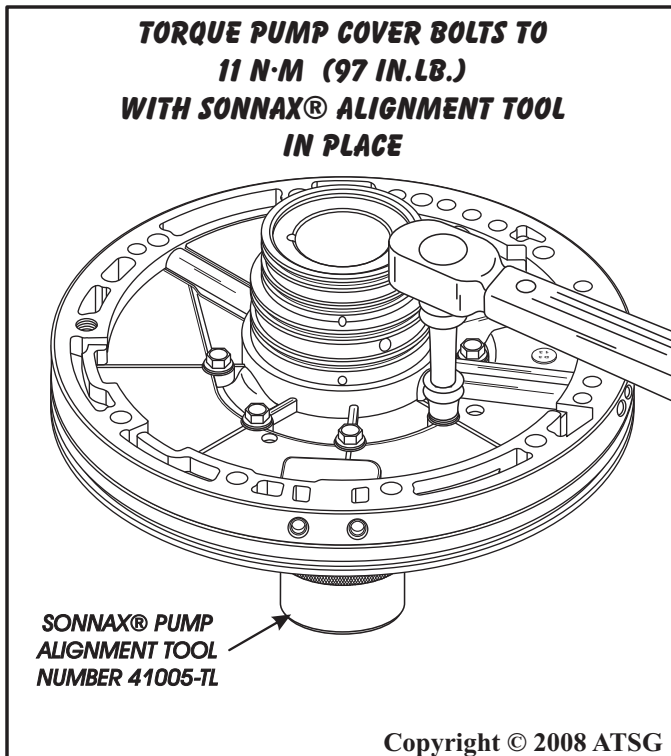


Figure 84

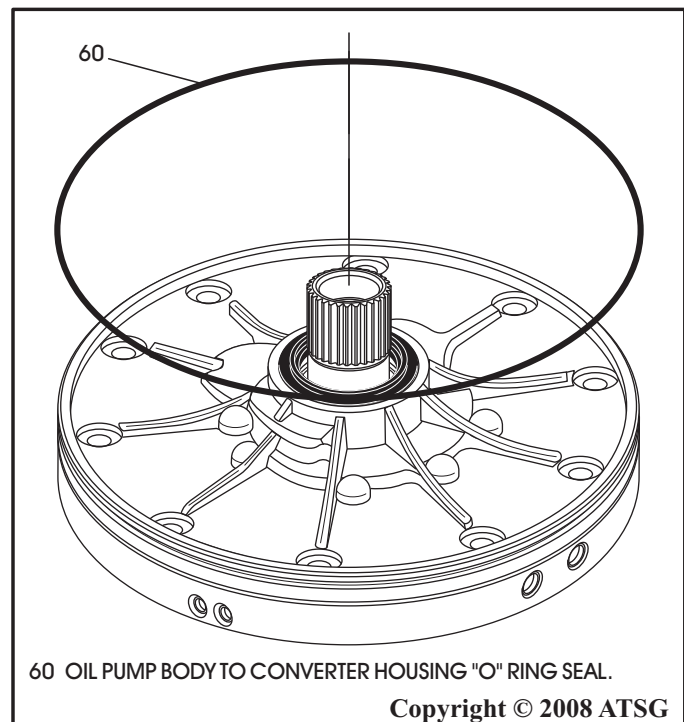
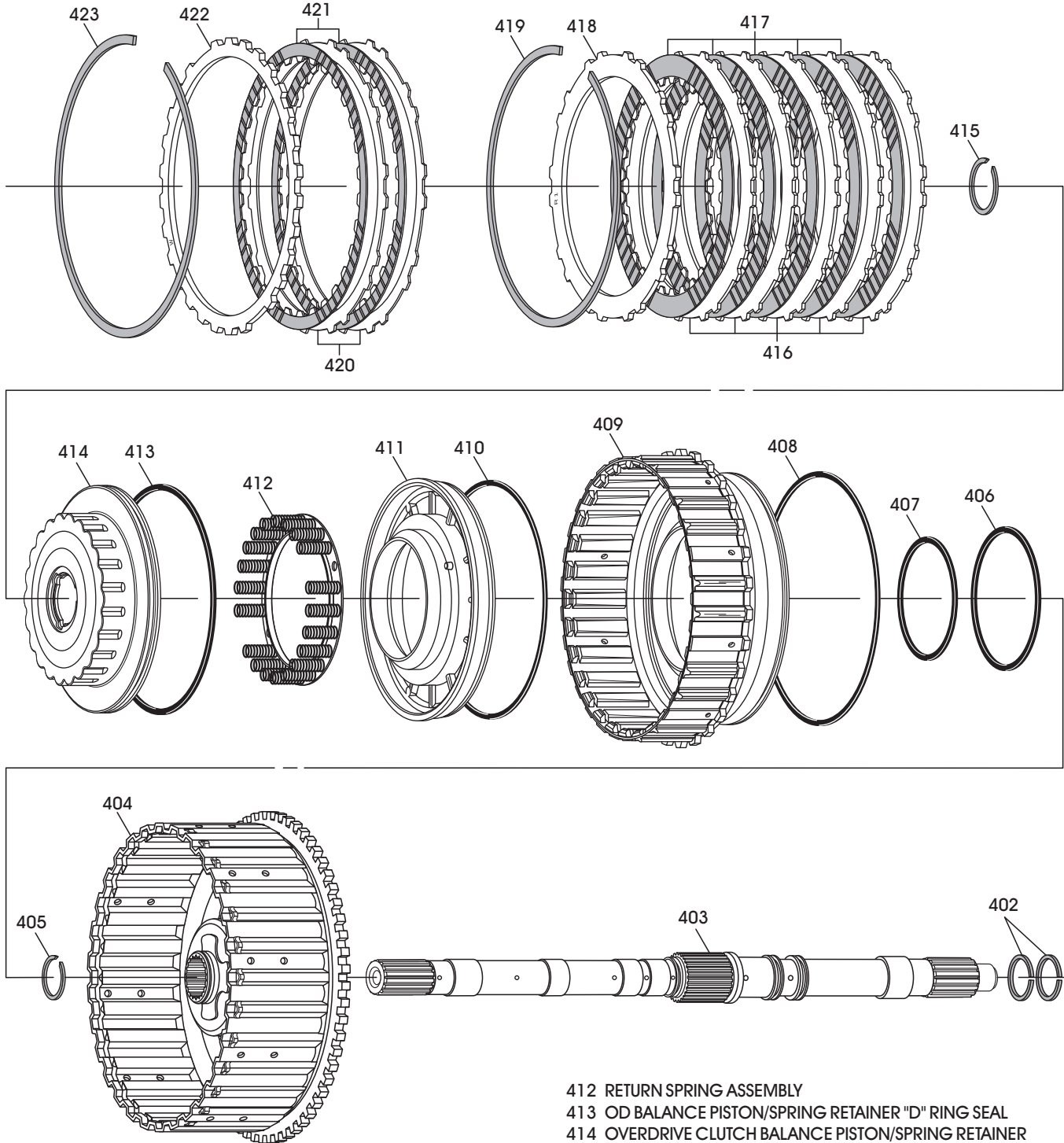


Figure 86

REVERSE AND OVERDRIVE CLUTCH HOUSINGS EXPLODED VIEW



- 402 TURBINE SHAFT "BUTT-CUT" SEALING RINGS
- 403 TURBINE SHAFT
- 404 REVERSE CLUTCH HOUSING
- 405 TURBINE SHAFT RETAINING SNAP RING
- 406 REVERSE CLUTCH INNER "D" RING SEAL
- 407 OVERDRIVE CLUTCH INNER "D" RING SEAL
- 408 REVERSE CLUTCH OUTER "D" RING SEAL
- 409 OVERDRIVE CLUTCH HOUSING/REVERSE CLUTCH PISTON
- 410 OVERDRIVE CLUTCH OUTER "D" RING SEAL
- 411 OVERDRIVE CLUTCH PISTON

- 412 RETURN SPRING ASSEMBLY
- 413 OD BALANCE PISTON/SPRING RETAINER "D" RING SEAL
- 414 OVERDRIVE CLUTCH BALANCE PISTON/SPRING RETAINER
- 415 OD BALANCE PISTON/SPRING RETAINER SNAP RING
- 416 OVERDRIVE CLUTCH STEEL PLATES (5 REQUIRED)
- 417 OVERDRIVE CLUTCH FRICTION PLATES (5 REQUIRED)
- 418 OVERDRIVE CLUTCH BACKING PLATE
- 419 OVERDRIVE CLUTCH BACKING PLATE *SELECTIVE* SNAP RING
- 420 REVERSE CLUTCH STEEL PLATES (2 REQUIRED)
- 421 REVERSE CLUTCH FRICTION PLATES (2 REQUIRED)
- 422 REVERSE CLUTCH BACKING PLATE
- 423 REVERSE CLUTCH BACKING PLATE *SELECTIVE* SNAP RING

Copyright © 2008 ATSG

Figure 87

COMPONENT REBUILD

OVERDRIVE AND REVERSE CLUTCH HOUSING

1. Disassemble the overdrive and reverse clutch housing, using Figure 87 as a guide.
- Note: Best procedure is to tag all snap rings for identification, as most are selective.*
2. Clean all overdrive and reverse clutch housing parts thoroughly and dry with compressed air.
3. Inspect all overdrive and reverse clutch parts thoroughly for any wear and/or damage.
4. Install new inner piston seals in the grooves in reverse clutch housing, as shown in Figure 88.
5. Install new outer piston seal in the groove of balance piston, as shown in Figure 89.
6. Install new outer piston seal in the groove of overdrive piston, as shown in Figure 89.
7. Install new outer piston seal in the groove of reverse piston, as shown in Figure 89.

Continued on Page 56

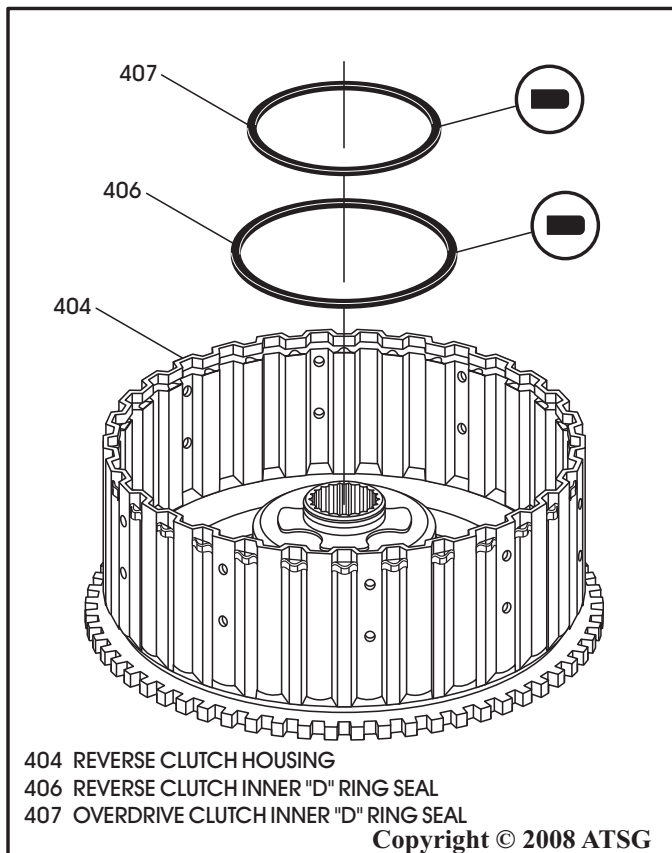


Figure 88

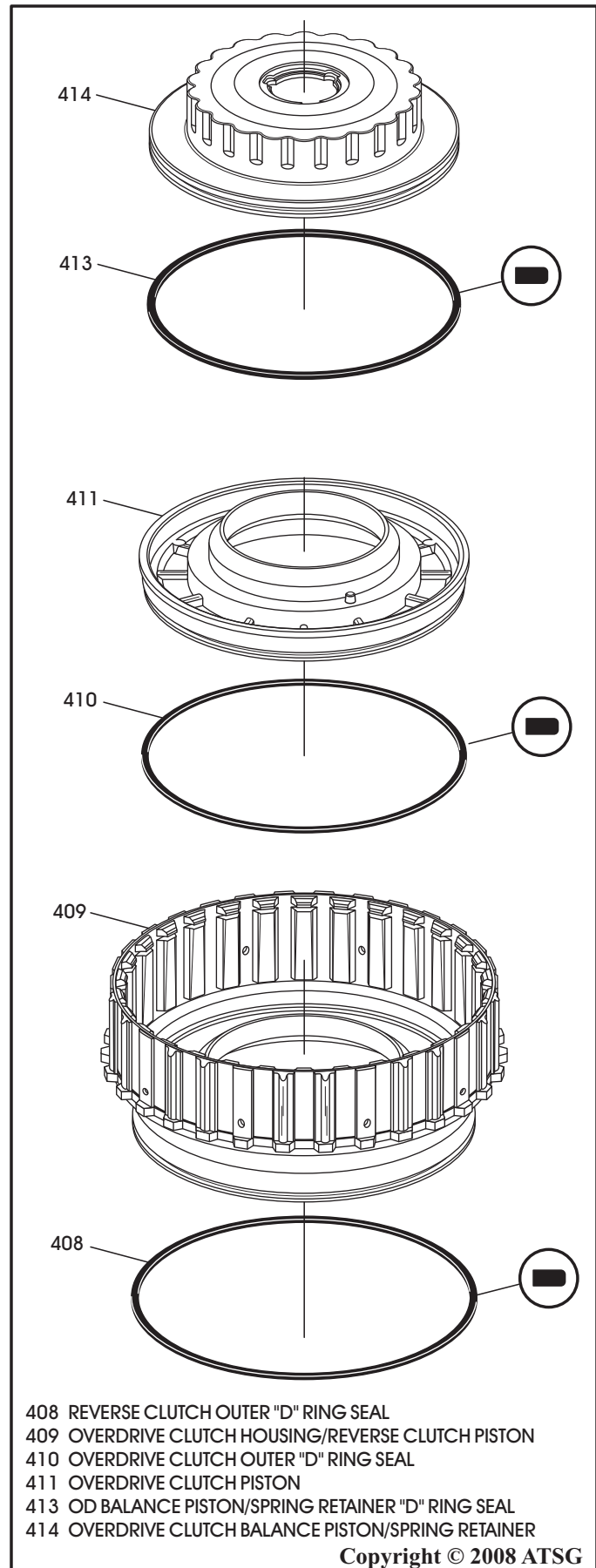


Figure 89

COMPONENT REBUILD

OVERDRIVE AND REVERSE CLUTCH HOUSING (CONT'D)

8. Lubricate all seals with a small amount of Trans-Jel®, before assembly begins.
9. Install overdrive housing/reverse clutch piston into the reverse clutch housing, as shown in Figure 90.
Note: As you install, ensure the lube holes in the two pieces are aligned, as it is shown in Figure 90.
10. Install the overdrive clutch piston into housing, as shown in Figure 91.
11. Install piston return spring assembly, as shown in Figure 91.
Note: Ensure that holes in return spring are aligned with tabs on piston (See Figure 91).
12. Install overdrive balance piston, as shown in Figure 91.
13. Compress the assembly and install snap ring, as shown in Figure 91, and ensure snap ring is fully seated.

Continued on Page 57

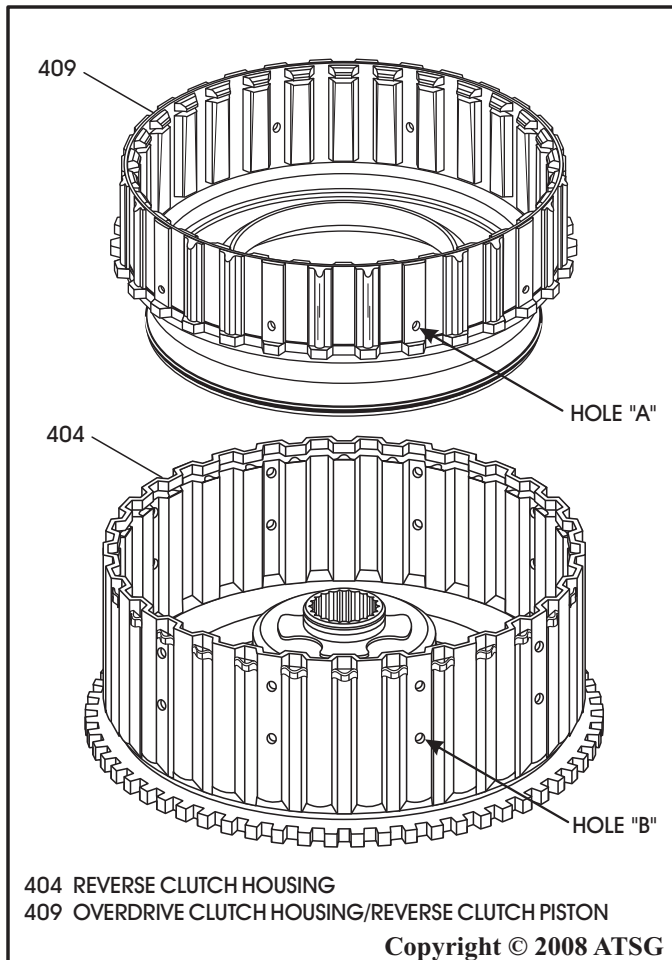


Figure 90

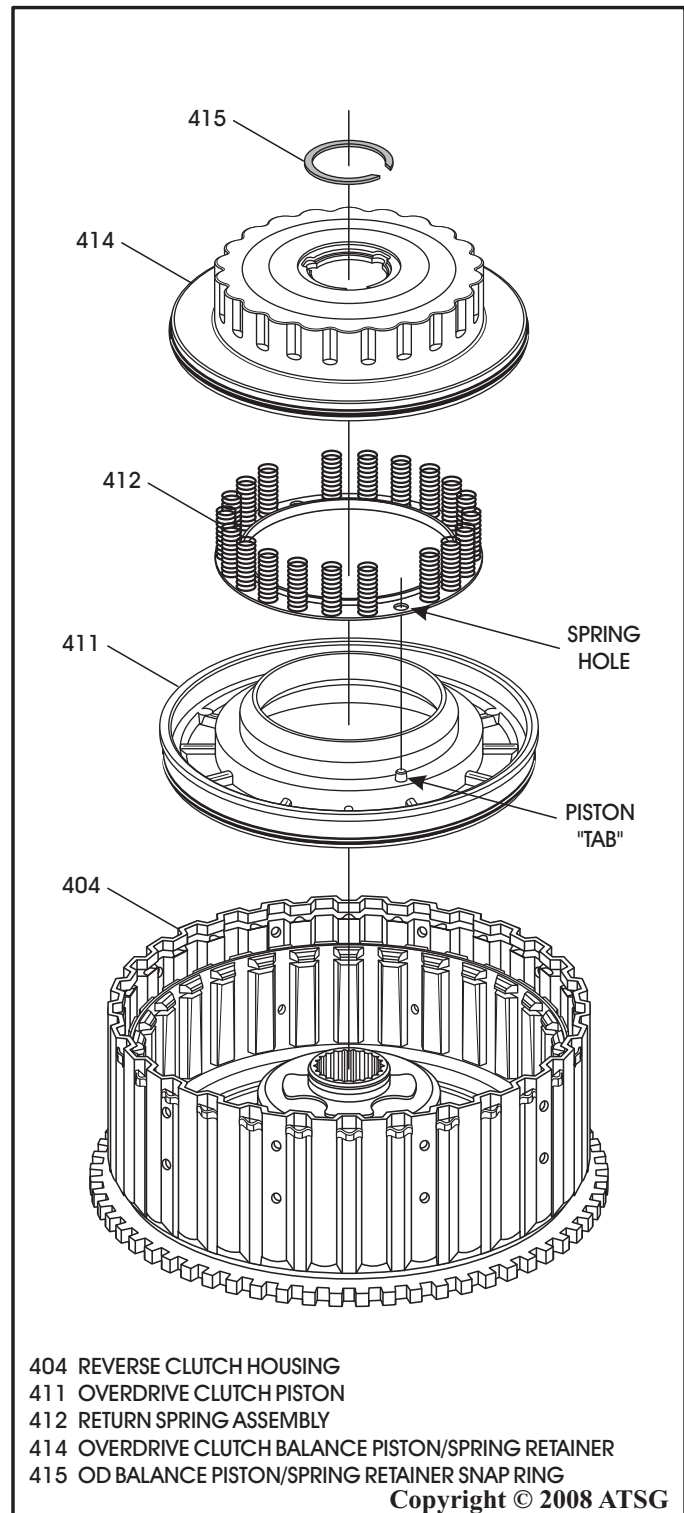


Figure 91

COMPONENT REBUILD

OVERDRIVE AND REVERSE CLUTCH HOUSING (CONT'D)

14. While the assembly is compressed, measure with a feeler gauge, the snap ring clearance, as shown in Figure 92.
Note: Make a selection as necessary from the chart in Figure 92.
15. Install overdrive clutch plates beginning with a steel plate and alternating with friction plates, as shown in Figure 93.
Note: Steel plates must be installed so that no teeth are blocking lube holes, as shown in Figure 97. All plates should be soaked for 30 minutes in the proper fluid before assembly, and the number of plates may vary.
16. Install the overdrive clutch backing plate, as shown in Figure 93, and the "R1" stamp must face up as shown, and must be oriented the same as the steel plates.
17. Install overdrive clutch backing plate selective snap ring, as shown in Figure 93.

Continued on Page 58

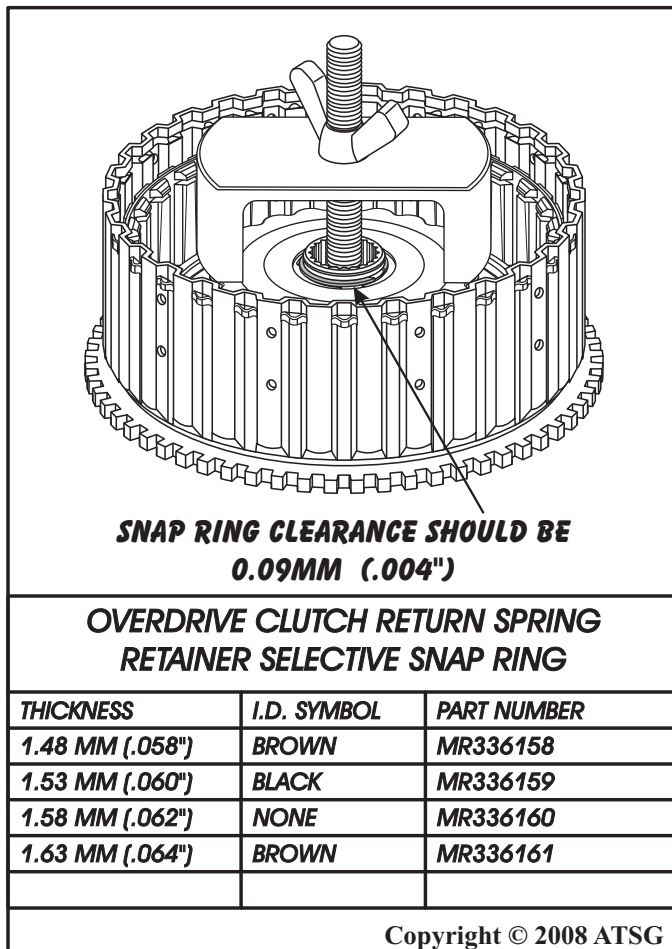


Figure 92

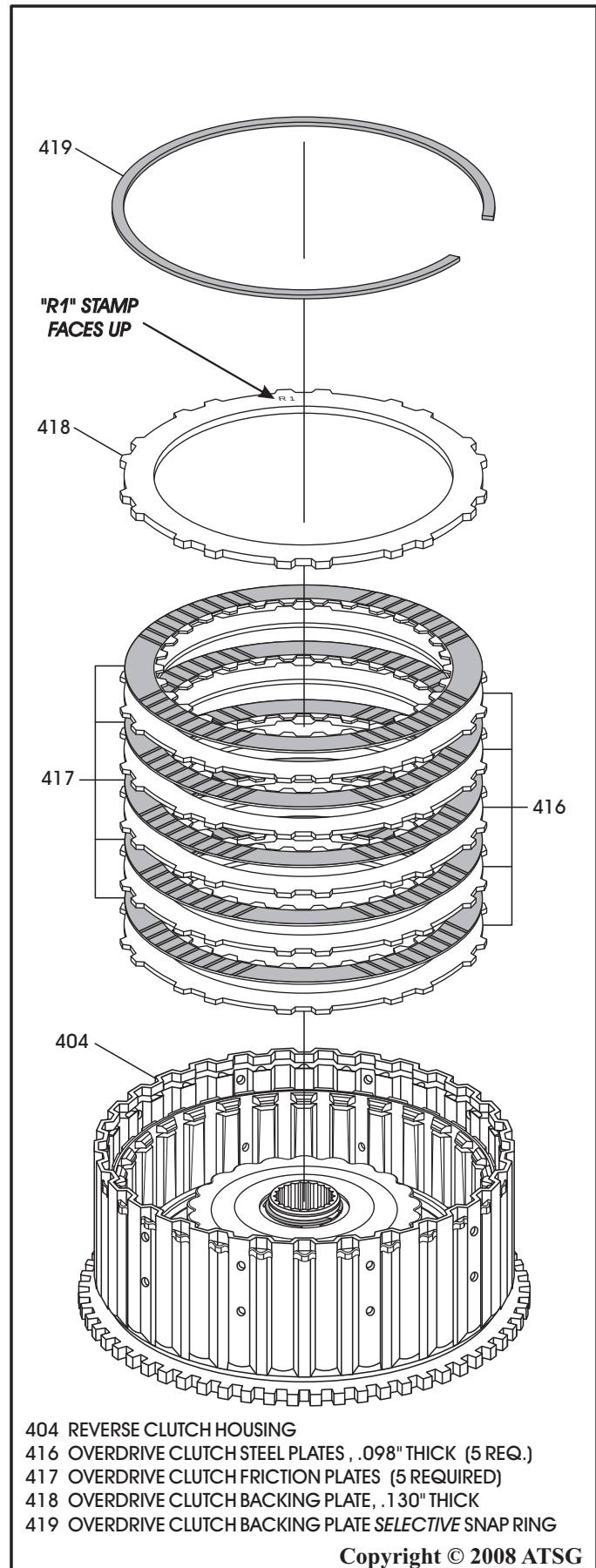


Figure 93

COMPONENT REBUILD

OVERDRIVE AND REVERSE CLUTCH HOUSING (CONT'D)

18. Install clutch pack compression tools, as shown in Figure 95 and 96.

Note: *Overdrive frictions plates are "Waved" on all models and must be compressed as shown in Figure 96 to accurately measure for the proper selective snap ring.*

19. Compress the plates and measure with feeler gauge between snap ring and backing plate, as shown in Figure 96.

20. With plates compressed, OD clutch clearance should be 2.0-2.2 mm (.079" - .087").

21. Change the selective snap ring as necessary, using the chart in Figure 96, to obtain proper overdrive clutch clearance.

22. Remove the compression tool.

Continued on Page 59

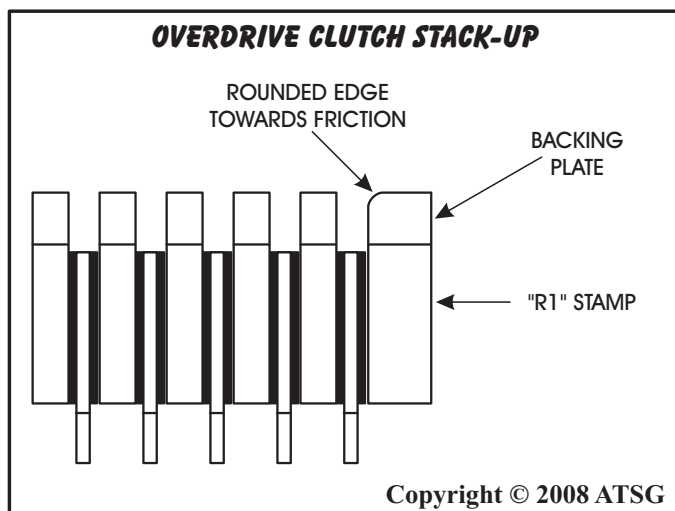


Figure 94

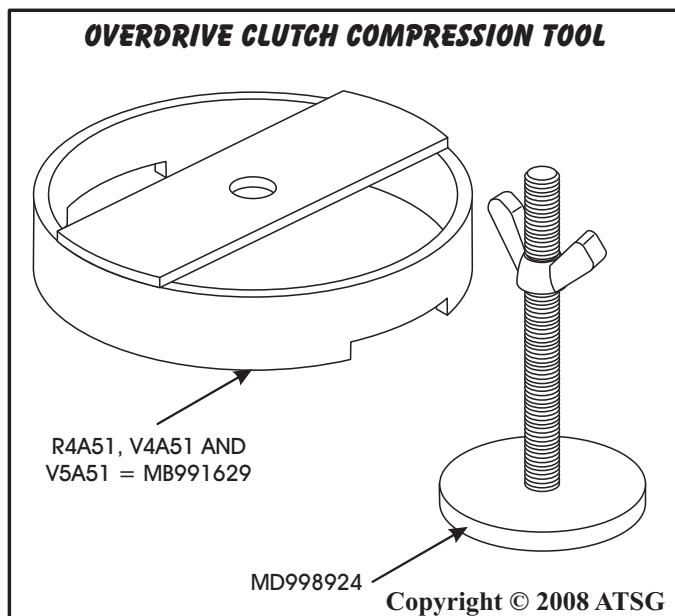


Figure 95



Figure 96

COMPONENT REBUILD

OVERDRIVE AND REVERSE CLUTCH HOUSING (CONT'D)

23. Install the reverse clutch plates beginning with a steel plate and alternating with frictions, as shown in Figure 98.

Note: Steel plates must be installed so that no teeth are blocking lube holes, as shown in Figure 97. All plates should be soaked for 30 minutes in the proper fluid before assembly, and the number of plates may vary.

24. Install the reverse clutch backing plate, as shown in Figure 98, and the "W" stamp must face up as shown, and must be oriented the same as the steel plates.

25. Install the reverse clutch selective snap ring, as shown in Figure 98.

Continued on Page 60

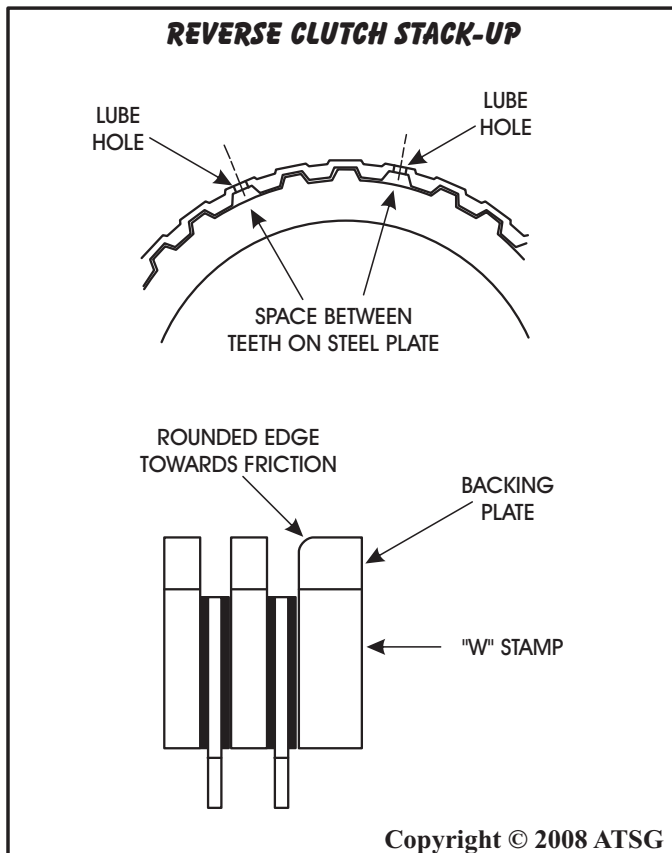


Figure 97

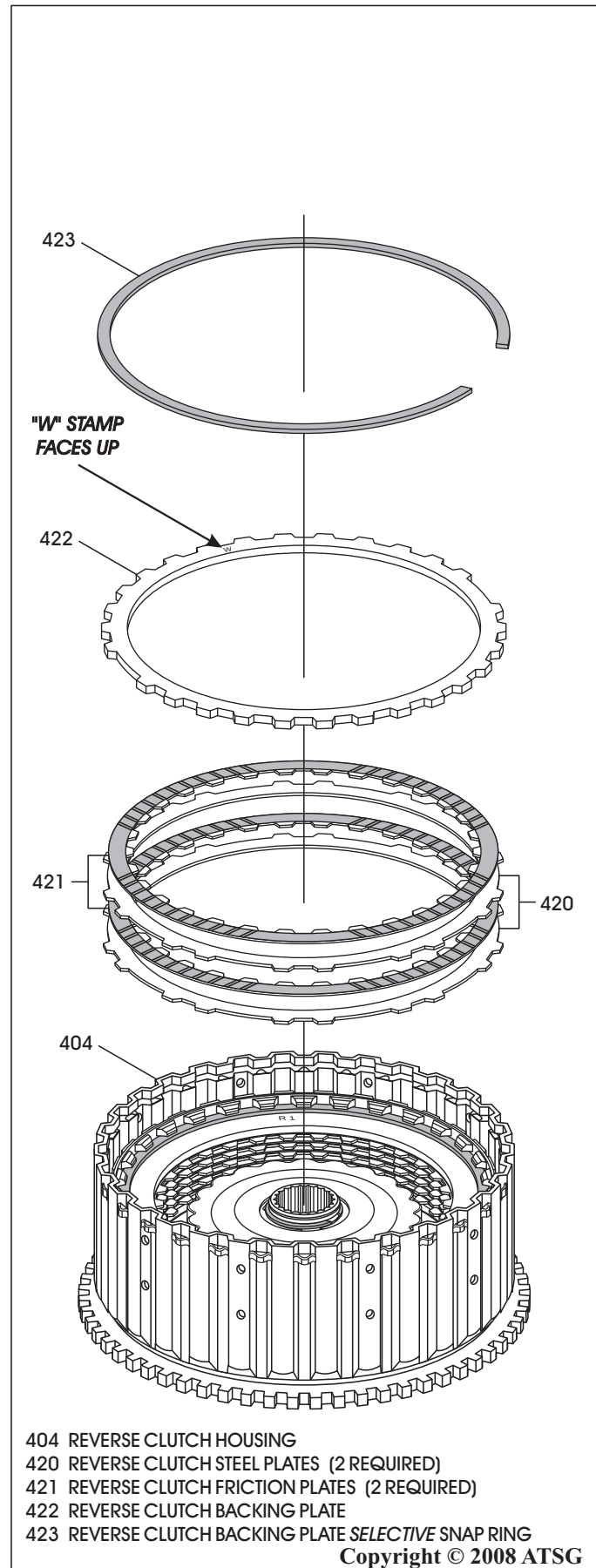


Figure 98

COMPONENT REBUILD

OVERDRIVE AND REVERSE CLUTCH HOUSING (CONT'D)

26. Install clutch pack compression tools, as shown in Figure 99.

Note: Reverse clutch plates are "Waved" on all models and must be compressed as shown in Figure 99, to accurately measure for the proper selective snap ring.

27. Compress the plates and measure with feeler gauge between snap ring and backing plate, as shown in Figure 99.

28. With plates compressed, the reverse clutch clearance should be 1.5-1.7 mm (.059" - .067").

29. Change selective snap ring as necessary, using the chart in Figure 99, and remove tool.

30. Install the turbine shaft through overdrive and reverse housing, as shown in Figure 100, and install the retaining snap ring.

Continued on Page 61

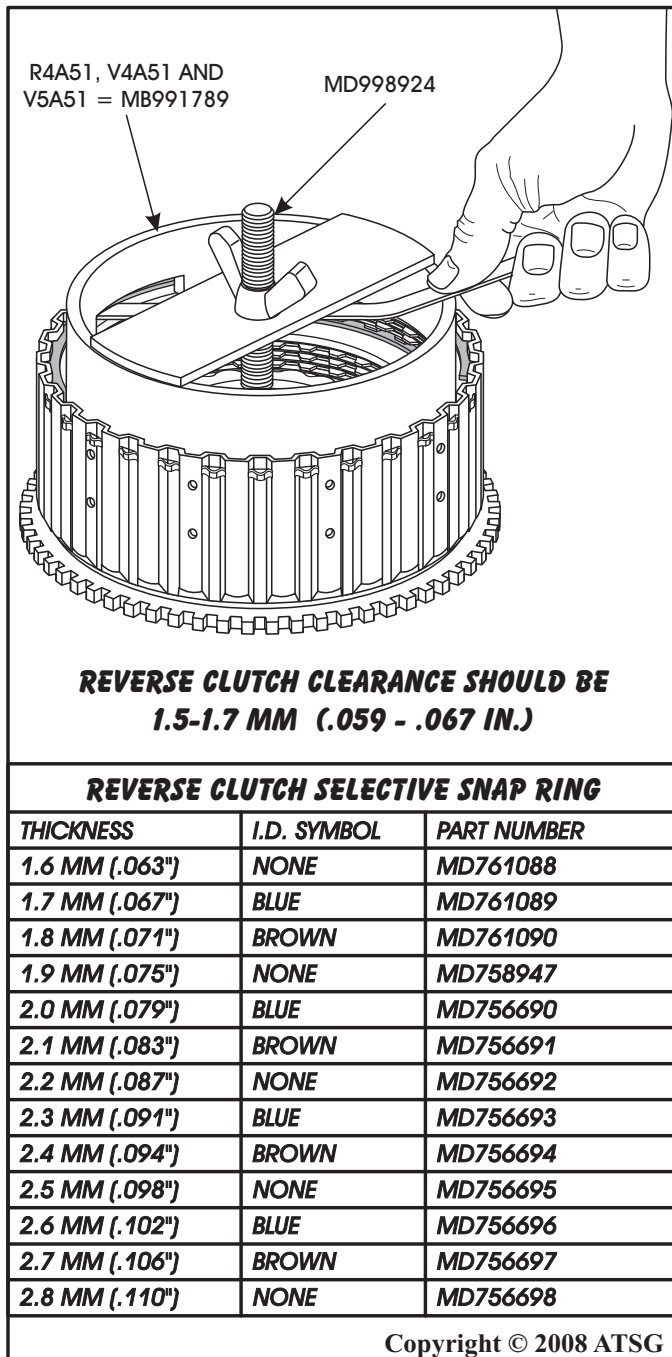


Figure 99

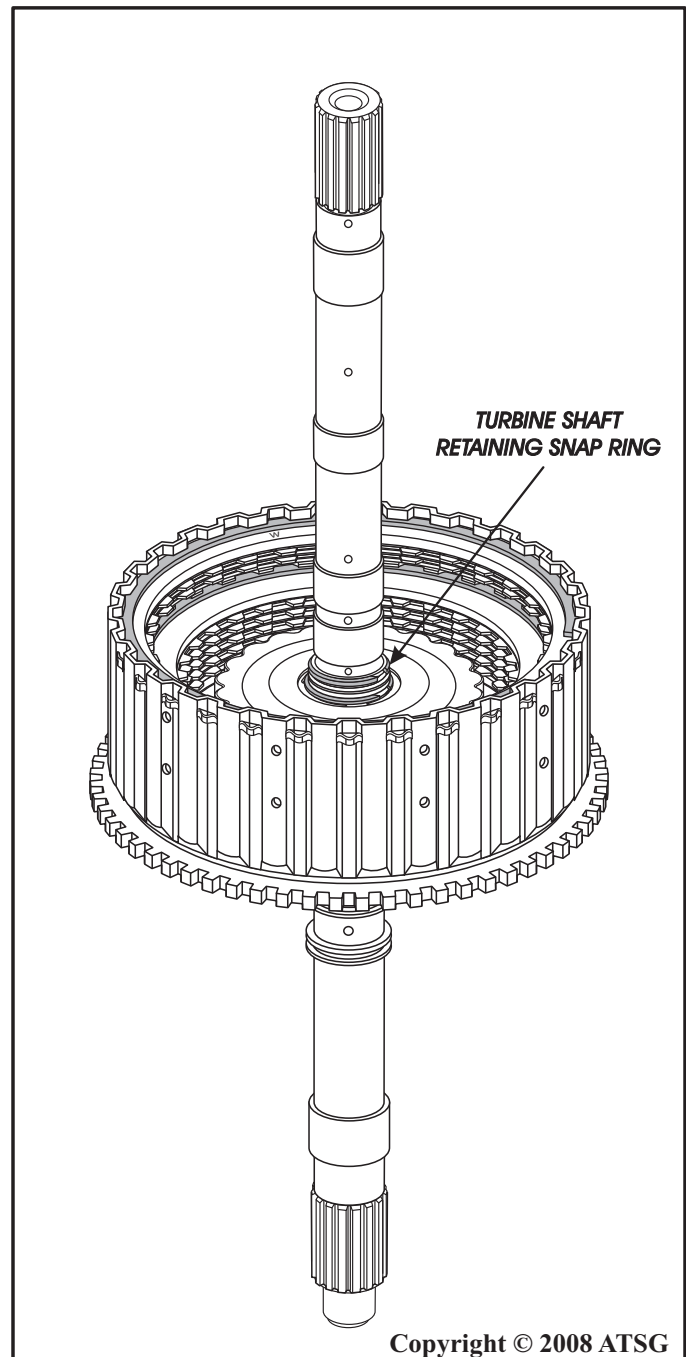


Figure 100

COMPONENT REBUILD

OVERDRIVE AND REVERSE CLUTCH HOUSING (CONT'D)

31. Install 2 new butt-cut teflon sealing rings into the grooves of the turbine shaft, as shown in Figure 101.
32. Install the number 2 thrust bearing, as shown in Figure 101, and retain with a small amount of Trans-Jel®.
33. Set the completed overdrive and reverse clutch housing aside for the final assembly process.
34. Install new bushings as necessary in overdrive clutch hub, as shown in Figure 102.
35. Install the number 3 thrust bearing, as shown in Figure 102, and retain with a small amount of Trans-Jel®.
36. Set completed overdrive clutch hub aside for the final assembly process.

Component Rebuild
Continued on Page 62

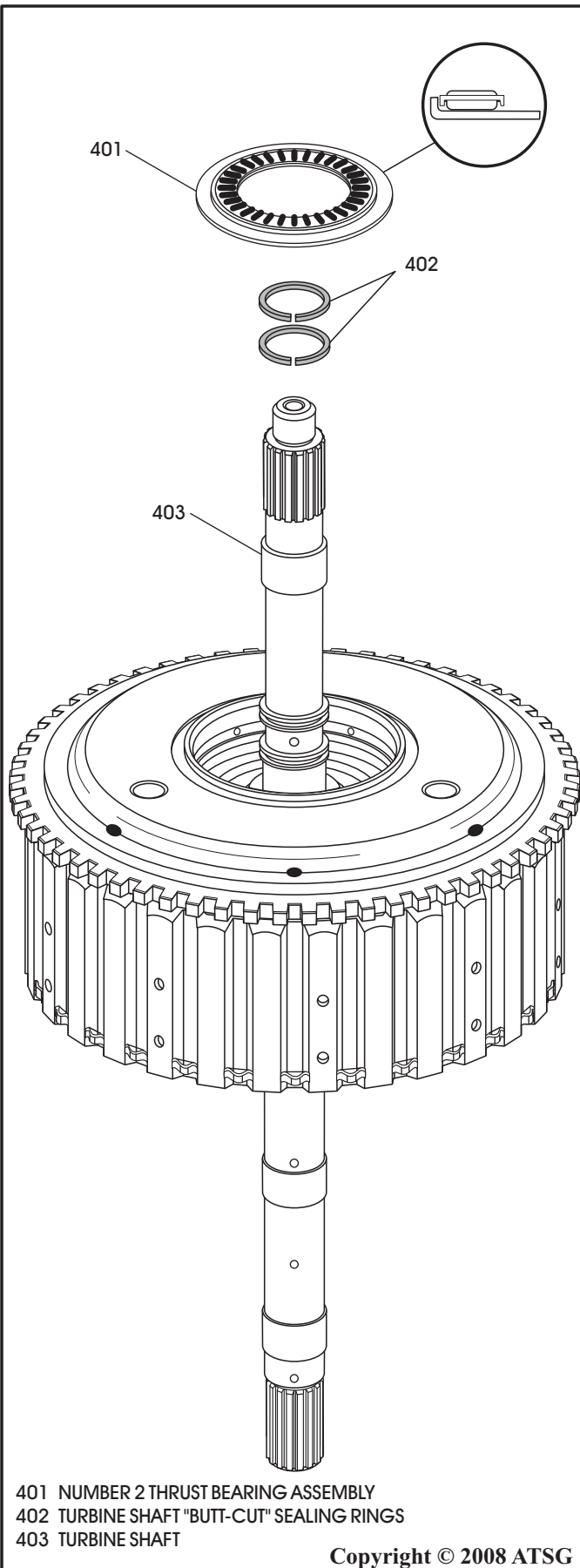


Figure 101

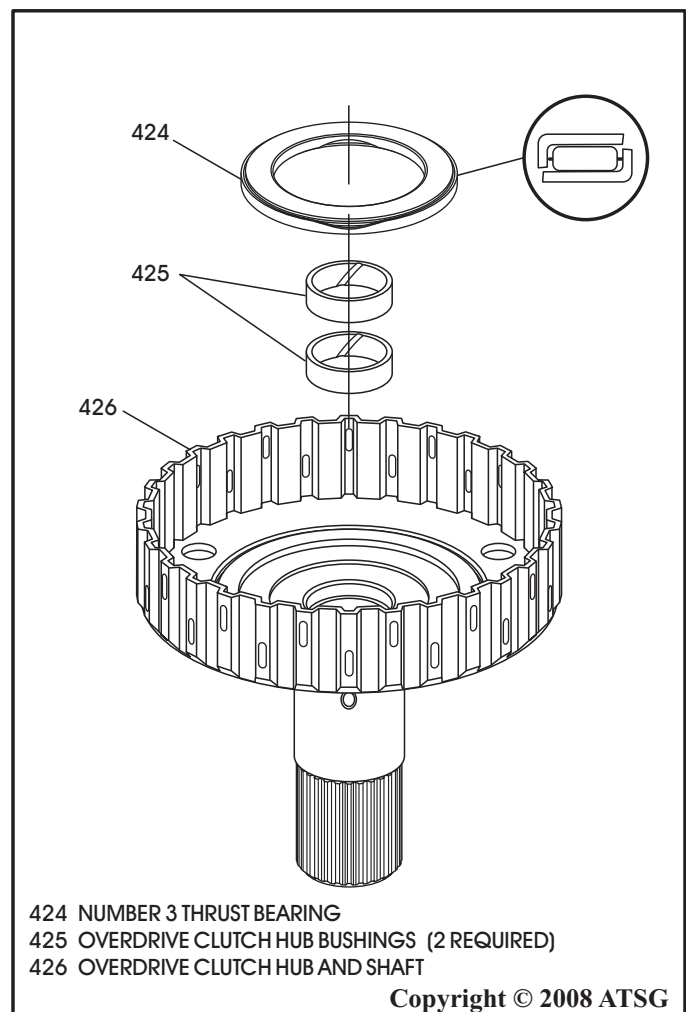


Figure 102

COMPONENT REBUILD

PLANETARY GEAR TRAIN ASSEMBLY

1. Disassemble planetary, sun gear, and low sprag assembly, using Figure 103 and 104 as a guide.

Note: Best procedure is to tag all snap rings for identification, as most are selective.

2. Clean all planetary parts thoroughly and dry with compressed air.

Continued on Page 63

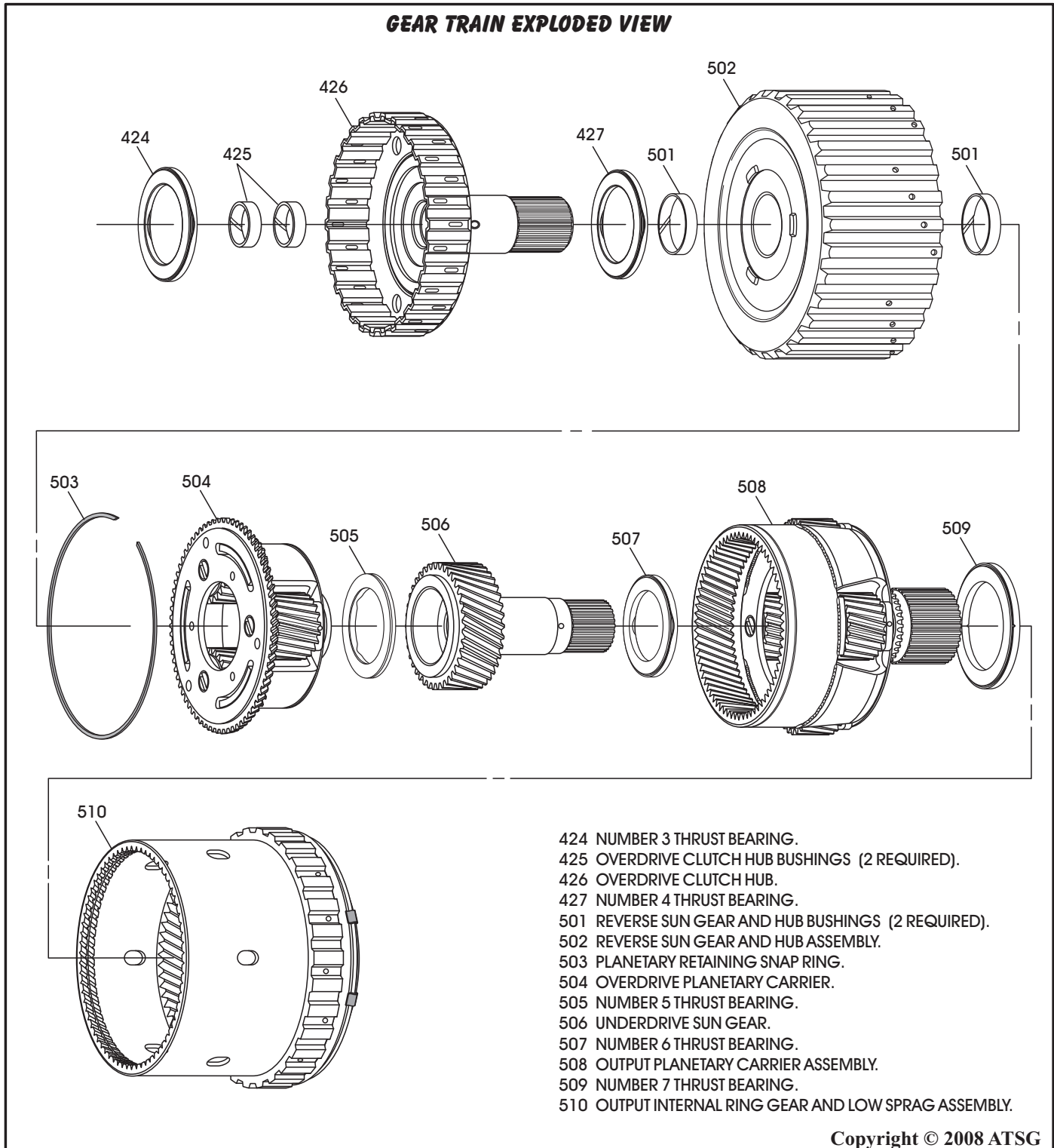
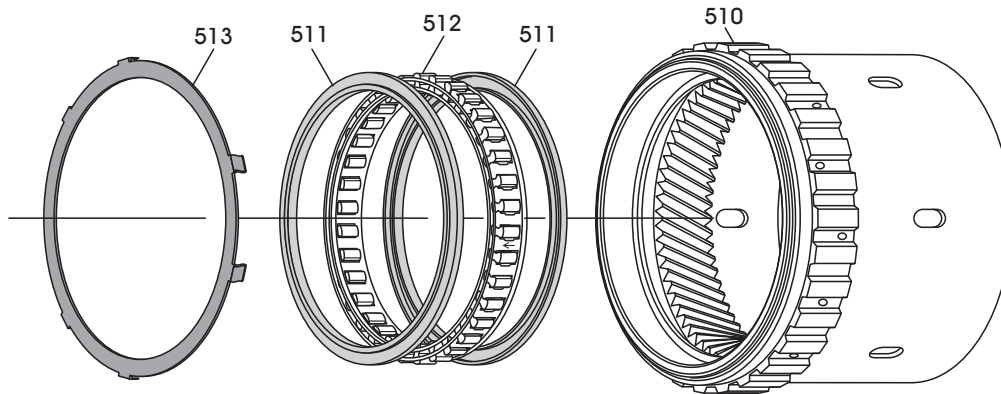


Figure 103

LOW SPRAG ASSEMBLY EXPLODED VIEW



510 OUTPUT INTERNAL RING GEAR.
511 LOW SPRAG END BEARINGS (2 REQUIRED).

512 LOW SPRAG ASSEMBLY.
513 LOW SPRAG ASSEMBLY RETAINER.

Copyright © 2008 ATSG

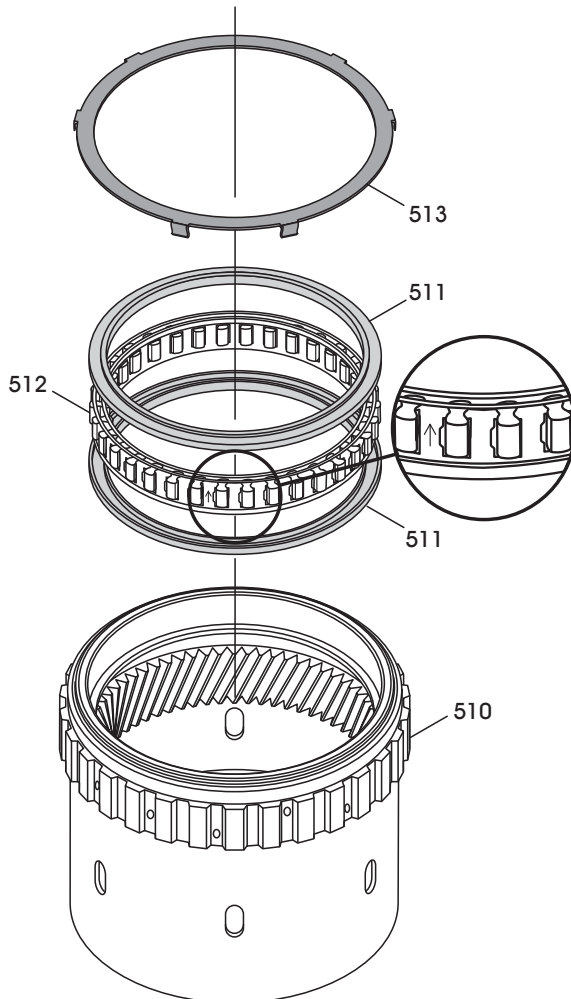
Figure 104

COMPONENT REBUILD

PLANETARY GEAR TRAIN ASSEMBLY (CONT'D)

3. Inspect all planetary and sprag parts thoroughly for any wear and/or damage, and replace as necessary.
4. Place output internal ring gear on a flat work surface, as shown in Figure 105.
5. Install one low sprag end bearing in direction shown in Figure 105, until fully seated.
6. Install the low sprag assembly into the ring gear so that the arrow is pointing "Up", as shown in Figure 105.
7. Install the second low sprag end bearing in the direction shown in Figure 105, and ensure that it is fully seated.
8. Install the low sprag assembly retainer by snapping it over the lip on the ring gear, as shown in Figure 105.

Continued on Page 64



510 OUTPUT INTERNAL RING GEAR.
511 LOW SPRAG END BEARINGS (2 REQUIRED).
512 LOW SPRAG ASSEMBLY.

Copyright © 2008 ATSG

Figure 105

COMPONENT REBUILD SECTION PLANETARY GEAR TRAIN ASSEMBLY (CONT'D)

9. Ensure that low sprag retainer is fully seated, as shown in Figure 106, and inspect it the full 360 degrees.
10. Turn the ring gear assembly over and set on device to raise it off of the work surface, as shown in Figure 107.
11. Install the output planetary carrier into output ring gear, as shown in Figure 107, and rotate to engage planetary gears.
12. Install the number 5 thrust bearing onto the overdrive carrier, as shown in Figure 108, and retain with Trans-Jel®.

Continued on Page 65

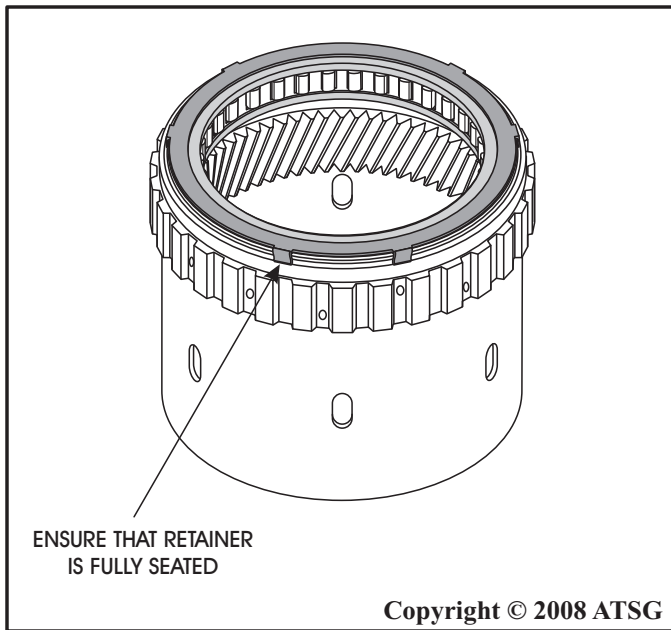


Figure 106

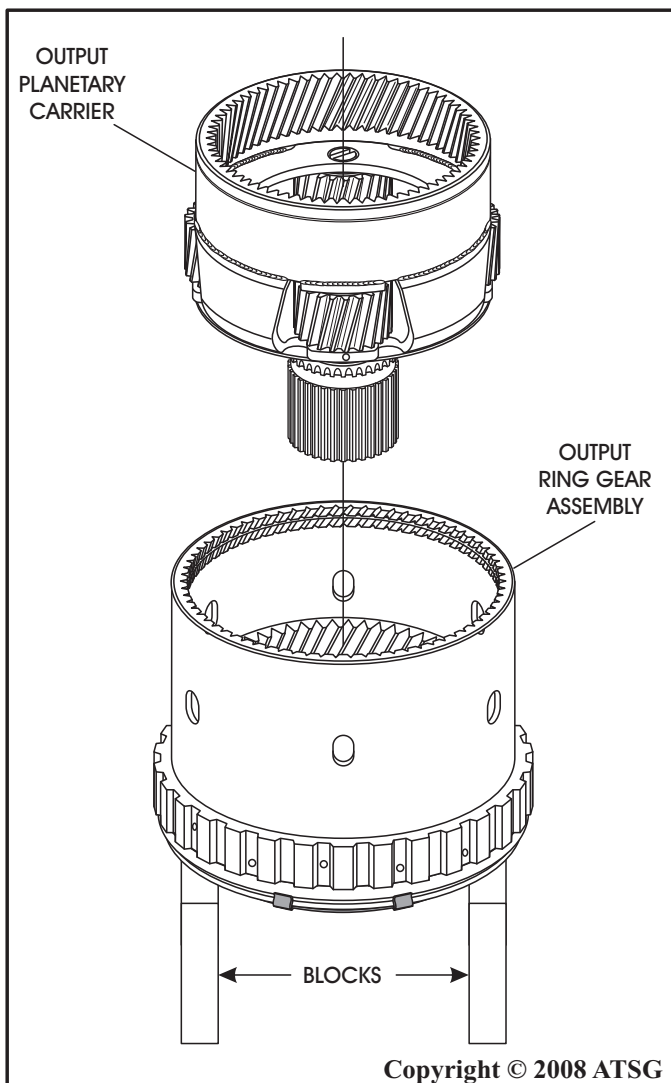


Figure 107

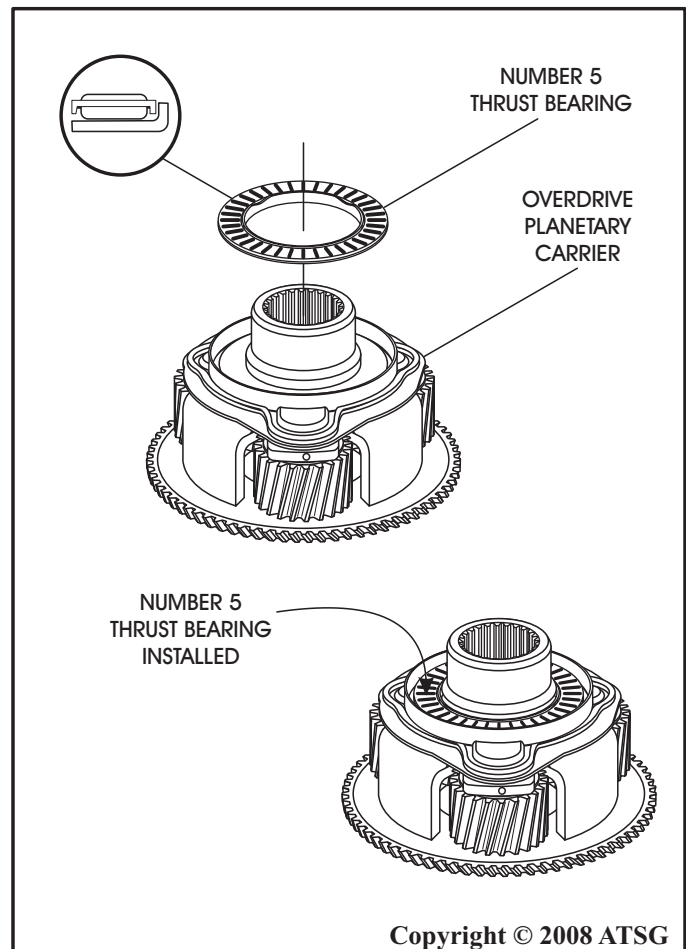


Figure 108

COMPONENT REBUILD SECTION PLANETARY GEAR TRAIN ASSEMBLY (CONT'D)

13. Install the number 6 thrust bearing, as shown in Figure 109.
14. Install the underdrive sun gear, as shown in Figure 109.
15. Ensure that the number 5 thrust bearing is still in place on the overdrive planetary carrier and install OD carrier, as shown in Figure 109, by rotating into position.
16. Install overdrive carrier retaining snap ring, as shown in Figure 109, and ensure that it is fully seated.
17. Install the number 7 thrust bearing, as shown in Figure 110, and retain with a small amount of Trans-Jel®.
18. Set the completed planetary gear train assembly aside for the final assembly process.

Continued on Page 66

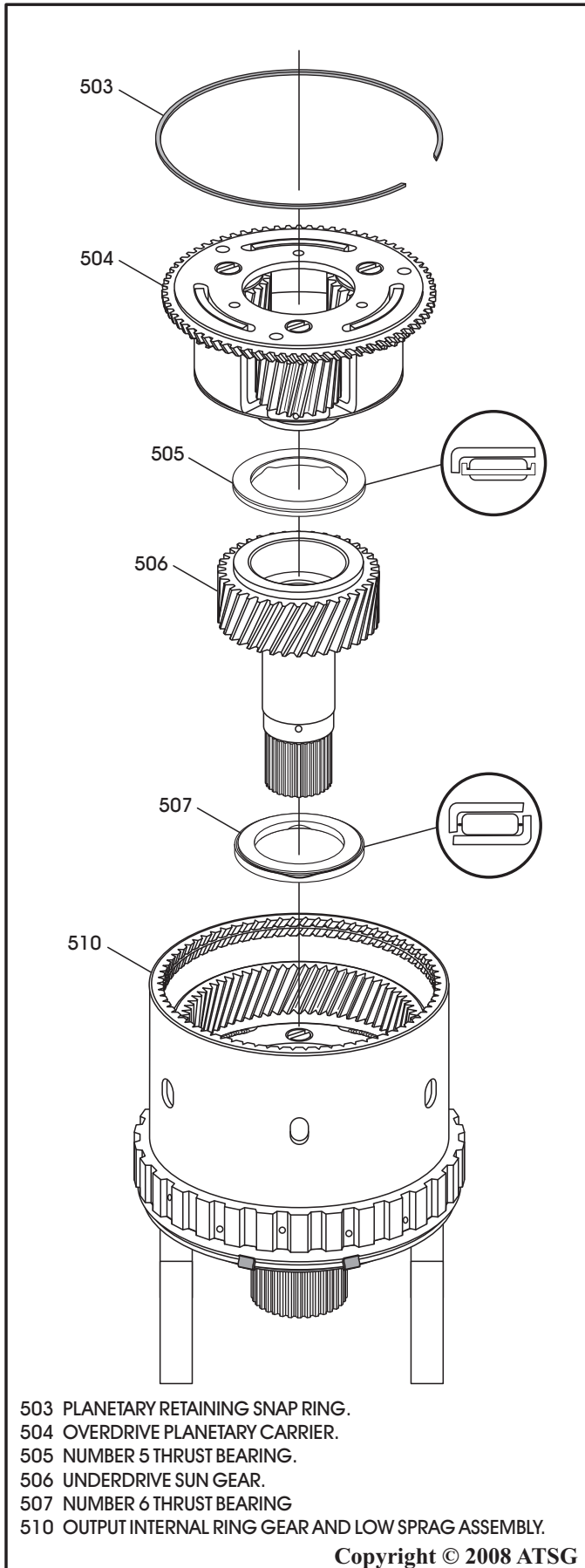


Figure 109

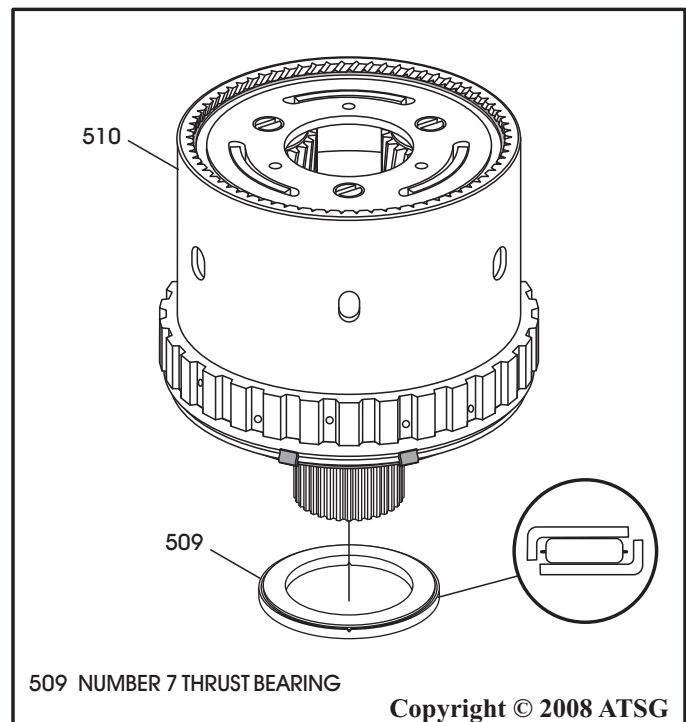


Figure 110

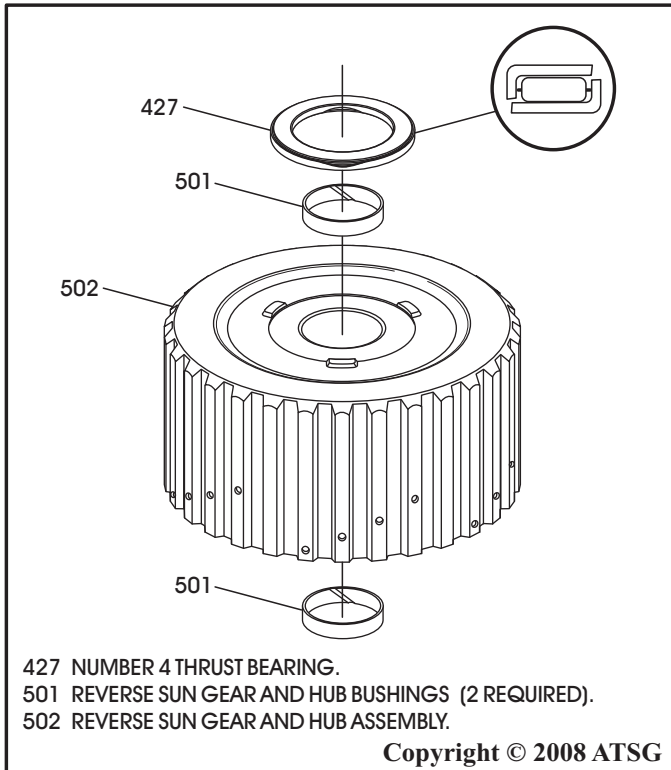


Figure 111

COMPONENT REBUILD

REVERSE SUN GEAR AND HUB

1. Clean reverse sun gear and hub thoroughly and dry with compressed air.
2. Inspect reverse sun gear and hub thoroughly for any wear and/or damage.
3. Install new bushings as necessary, as shown in Figure 111, using the proper bushing driver.
4. Install the number 4 thrust bearing, as shown in Figure 111, and retain with a small amount of Trans-Jel®.
5. Set the completed reverse sun gear and hub assembly aside for the final assembly process.

CENTER SUPPORT ASSEMBLY

1. Disassemble the center support assembly using Figure 112 as a guide.
Note: Best procedure is to tag all snap rings for identification, as most are selective.
2. Clean all center support parts thoroughly and dry with compressed air.

Continued on Page 67

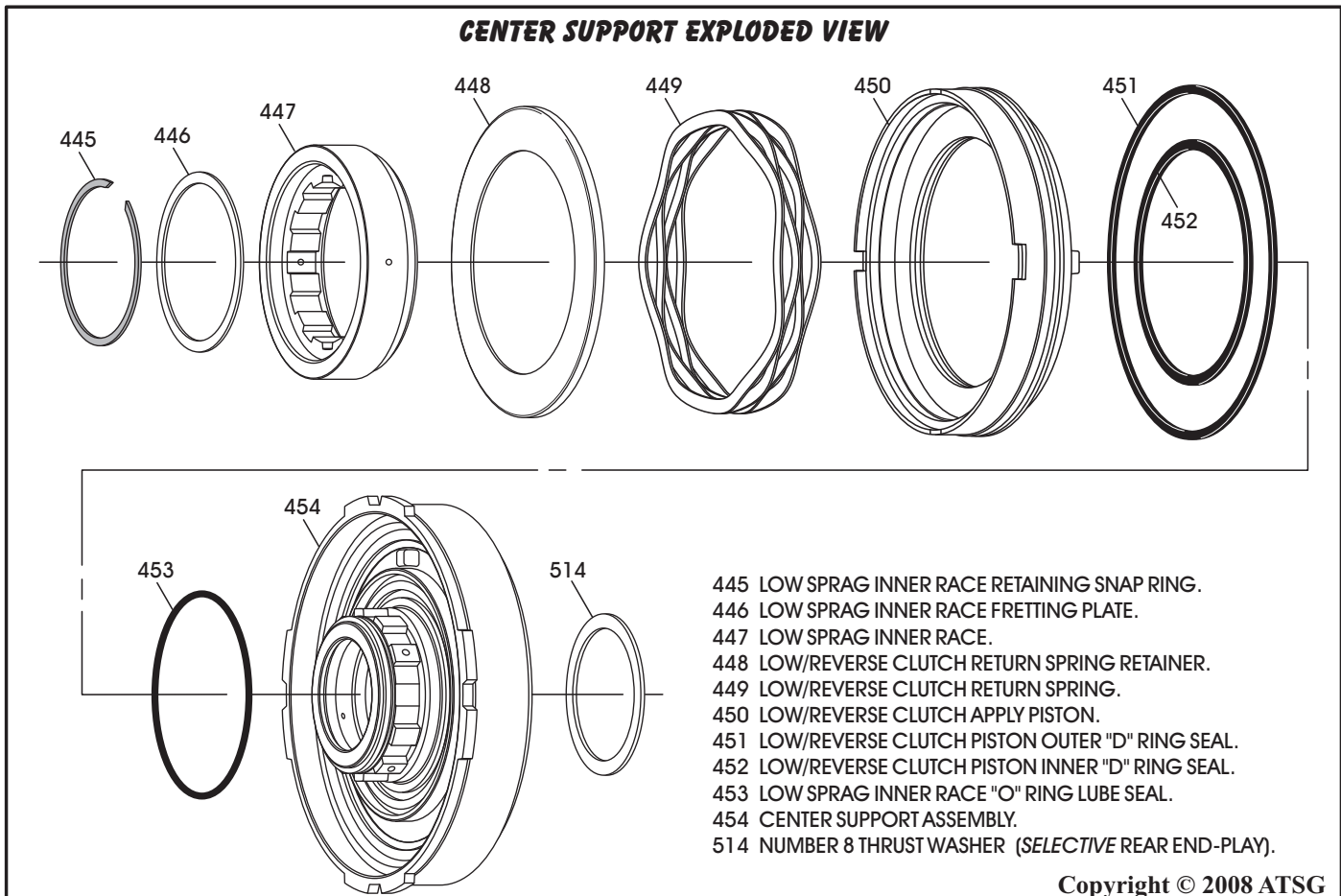


Figure 112

COMPONENT REBUILD CENTER SUPPORT ASSEMBLY (CONT'D)

3. Inspect all center support parts thoroughly for any wear and/or damage, replace as necessary.
4. Install new inner "D" ring seal into the groove in low/reverse piston, as shown in Figure 113.
5. Install new outer "D" ring seal into the groove in low/reverse piston, as shown in Figure 113.
6. Install new lube seal "O" ring into the groove in center support, as shown in Figure 114.

Note: This "O" ring seals lube oil for the low sprag assembly.

7. Lubricate the piston seals and the surfaces in the center support where the seals ride, with a small amount of Trans-Jel®.
8. Install the low/reverse piston into the center support, as shown in Figure 115.

Note: The piston has a stem on it that must fit into a pocket in the center support, for it to be fully seated, as shown in Figure 115.

9. Ensure that the lube seal is not disturbed.

Continued on Page 68

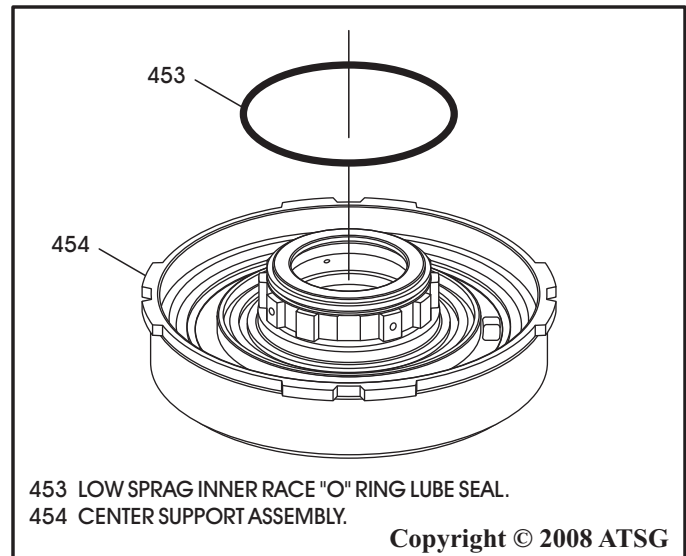


Figure 114

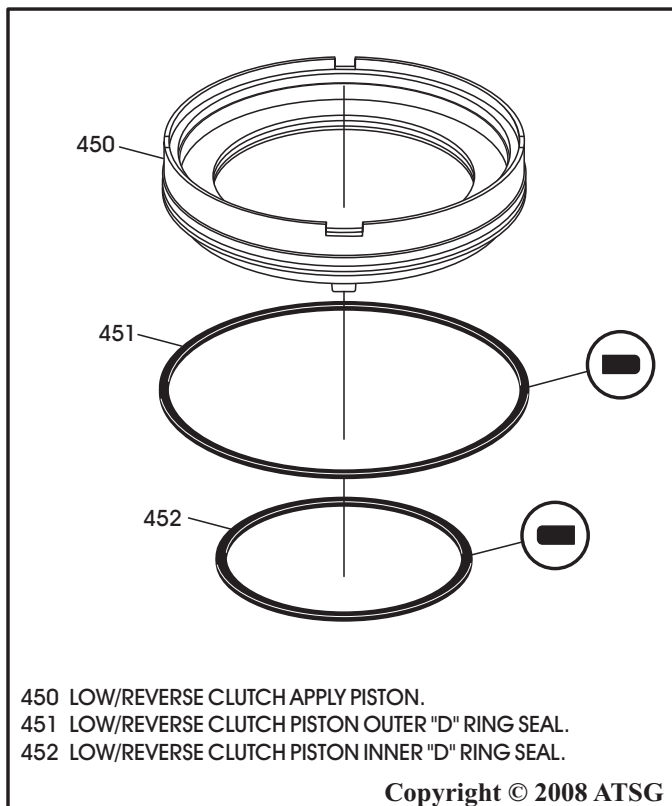


Figure 113

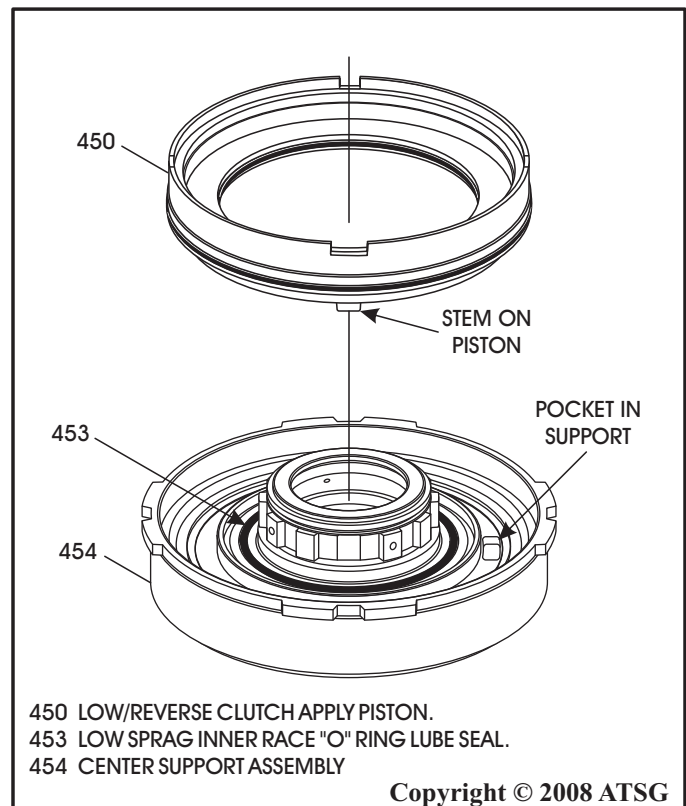


Figure 115

COMPONENT REBUILD CENTER SUPPORT ASSEMBLY (CONT'D)

10. Install the low/reverse piston return spring, as shown in Figure 116.
11. Install the low/reverse piston spring retainer, as shown in Figure 116.

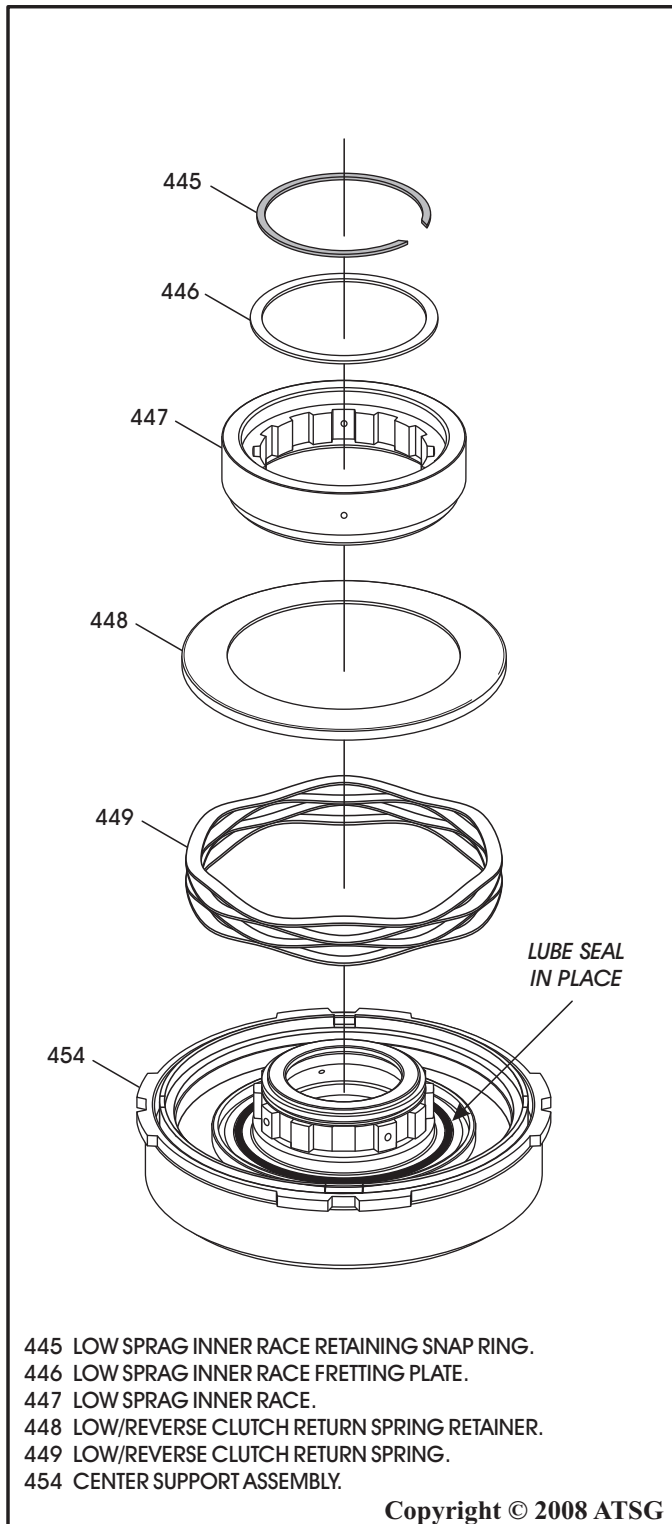


Figure 116

12. Install the low sprag inner race onto the splines of the center support, as shown in Figure 116.
Note: There is a blind spline on both pieces and it will fit in only one direction.
13. Install the fretting plate on the low sprag inner race, as shown in Figure 116.
14. Compress the assembly with light pressure on the inner race, and install the snap ring.
15. Ensure that the snap ring is fully seated.
16. Install the number 8 selective thrust washer on the center support, as shown in Figure 117, and retain with a small amount of Trans-Jel®.
Note: We will measure for proper selective to set rear end-play during final assembly.

Component Rebuild Continued on Page 69

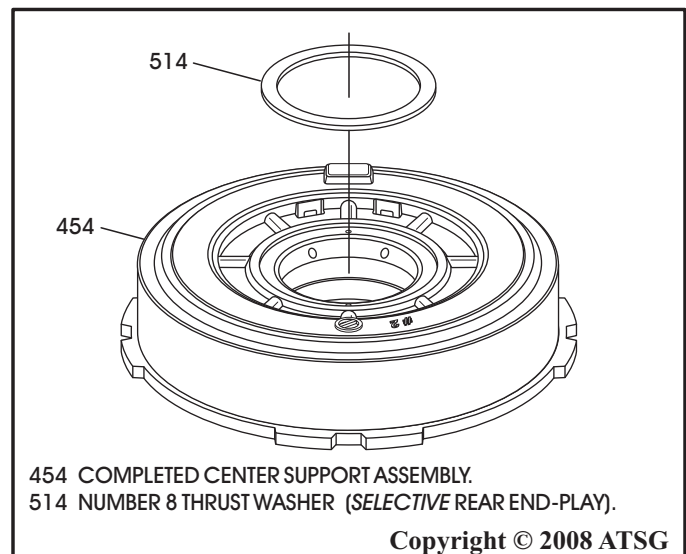


Figure 117

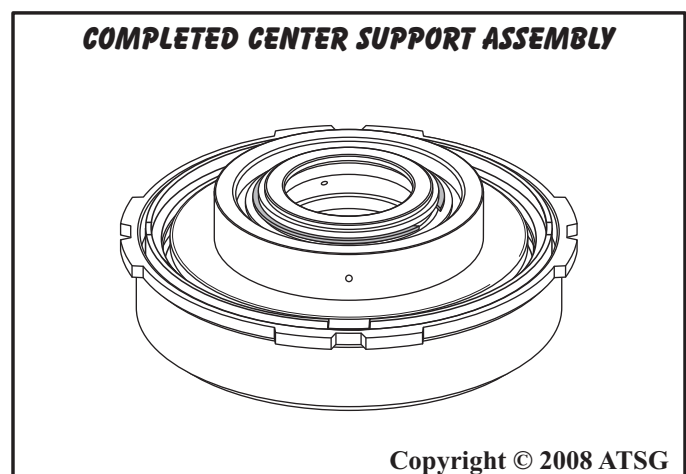
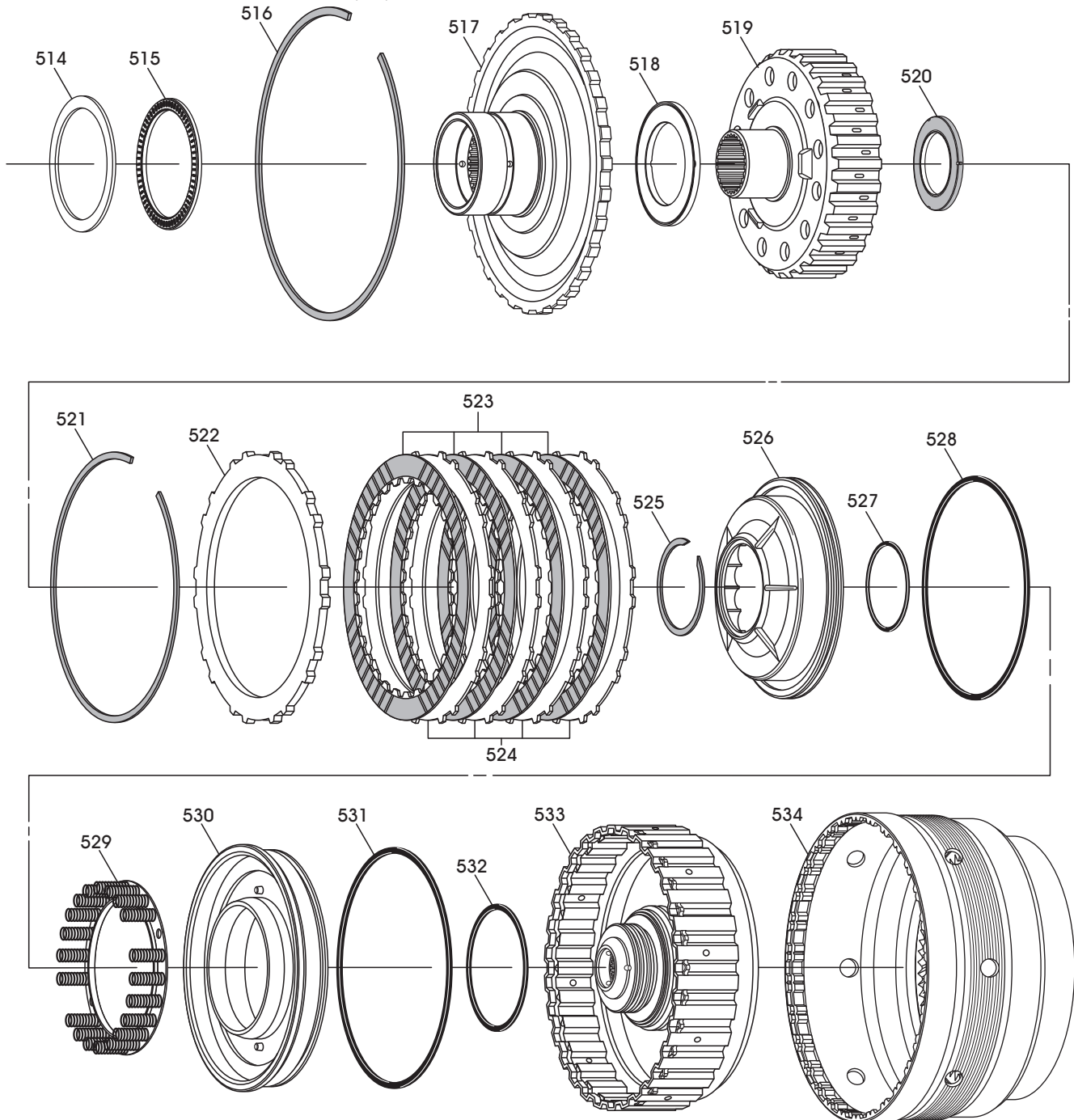


Figure 118

UNDERDRIVE CLUTCH HOUSING EXPLODED VIEW



- 514 NUMBER 8 THRUST WASHER (*SELECTIVE* REAR END-PLAY).
- 515 NUMBER 9 THRUST BEARING.
- 516 REDUCTION RING GEAR OUTPUT FLANGE SNAP RING.
- 517 REDUCTION RING GEAR OUTPUT FLANGE.
- 518 NUMBER 10 THRUST BEARING.
- 519 UNDERDRIVE CLUTCH HUB.
- 520 NUMBER 11 THRUST BEARING.
- 521 UNDERDRIVE CLUTCH *SELECTIVE* BACKING PLATE SNAP RING.
- 522 UNDERDRIVE CLUTCH BACKING PLATE.
- 523 UNDERDRIVE CLUTCH FRICTION PLATES (4 REQUIRED).
- 524 UNDERDRIVE CLUTCH STEEL PLATES (4 REQUIRED).

- 525 UNDERDRIVE CLUTCH SPRING RETAINER SNAP RING.
- 526 UNDERDRIVE CLUTCH RETURN SPRING RETAINER.
- 527 RETURN SPRING RETAINER INNER "D" RING SEAL.
- 528 RETURN SPRING RETAINER OUTER "D" RING SEAL.
- 529 UNDERDRIVE CLUTCH PISTON RETURN SPRING ASSEMBLY.
- 530 UNDERDRIVE CLUTCH APPLY PISTON.
- 531 UNDERDRIVE CLUTCH PISTON OUTER "D" RING SEAL.
- 532 UNDERDRIVE CLUTCH HOUSING INNER "D" RING SEAL.
- 533 UNDERDRIVE CLUTCH HOUSING ASSEMBLY.
- 534 REDUCTION PLANETARY RING GEAR.

Copyright © 2008 ATSG

Figure 119

COMPONENT REBUILD

REDUCTION ANNULUS, UNDERDRIVE CLUTCH

1. Disassemble reduction annulus and underdrive clutch housing using Figure 119 as a guide.
Note: Best procedure is to tag all snap rings for identification, as most are selective.
2. Clean all reduction annulus and underdrive clutch housing parts thoroughly and dry with compressed air.

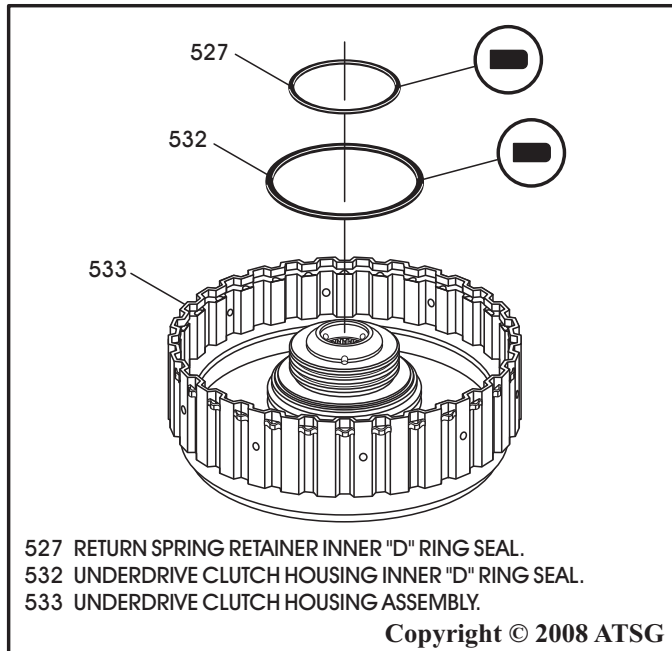


Figure 120

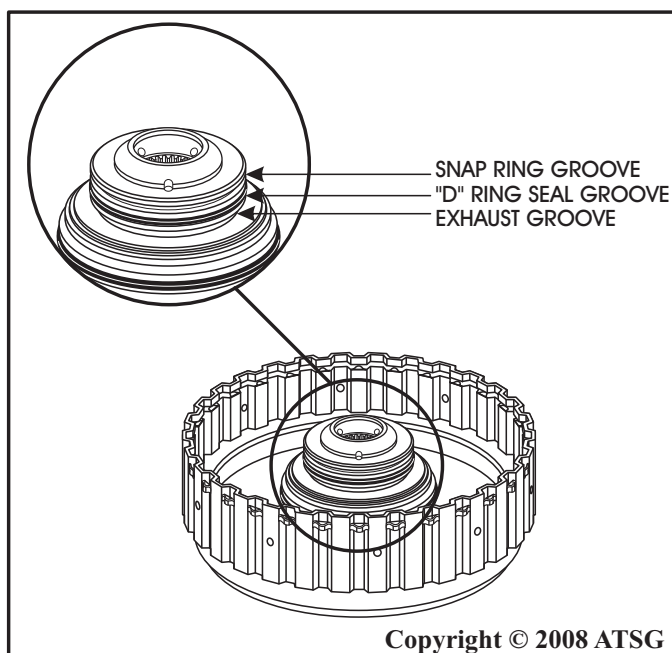


Figure 121

3. Inspect all reduction annulus and underdrive clutch housing parts thoroughly for any wear and/or damage, replace as necessary.
4. Install underdrive clutch piston inner "D" ring seal, as shown in Figure 120.
5. Install underdrive clutch return spring retainer inner "D" ring seal, as shown in Figure 120.
Note: This seal can be installed in the wrong groove "very" easily. There is a snap ring groove, seal groove, and an exhaust groove. The "D" ring seal goes in the 2nd groove, as shown in Figure 121.
6. Install the outer "D" ring seal into groove of the underdrive clutch piston, as shown in Figure 122.
7. Install the outer "D" ring seal into groove of the underdrive clutch spring retainer, as shown in Figure 122.

Continued on Page 71

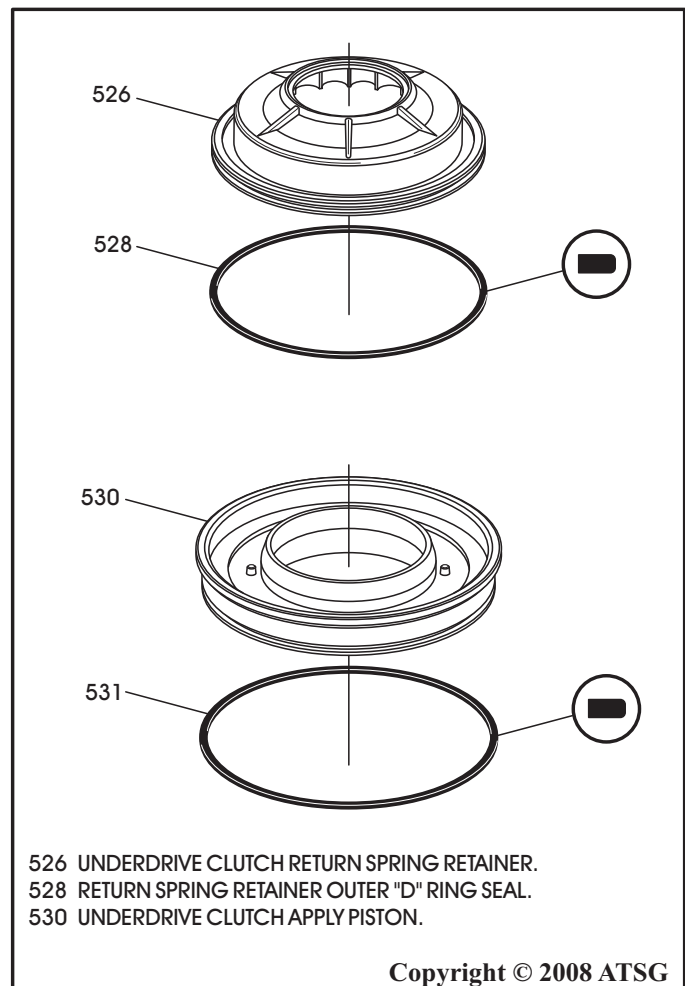


Figure 122

COMPONENT REBUILD

REDUCTION ANNULUS, UNDERDRIVE CLUTCH (CONT'D)

8. Lube the seals and install the underdrive clutch piston into housing, as shown in Figure 123.
9. Install underdrive clutch piston return spring assembly, as shown in Figure 123.
Note: Ensure that holes in the return spring are aligned with the tabs on piston, as shown in Figure 123.
10. Lube the seals and install the underdrive clutch return spring retainer (See Figure 123).
11. Compress the assembly and install snap ring, as shown in Figure 123, and ensure that it is fully seated.
12. Install the underdrive clutch plates beginning with a steel plate and alternating with friction plates, as shown in Figure 124.

Note: Steel plates must be installed so that no teeth are blocking lube holes, as shown in Figure 125. All plates should be soaked for 30 minutes in the proper fluid before assembly, and the number of plates may vary.

13. Install the underdrive clutch backing plate, as shown in Figure 124, with the "W" stamp in plate facing up, and oriented the same as the steel plates.
14. Install the underdrive clutch backing plate selective snap ring, as shown in Figure 124.

Continued on Page 72

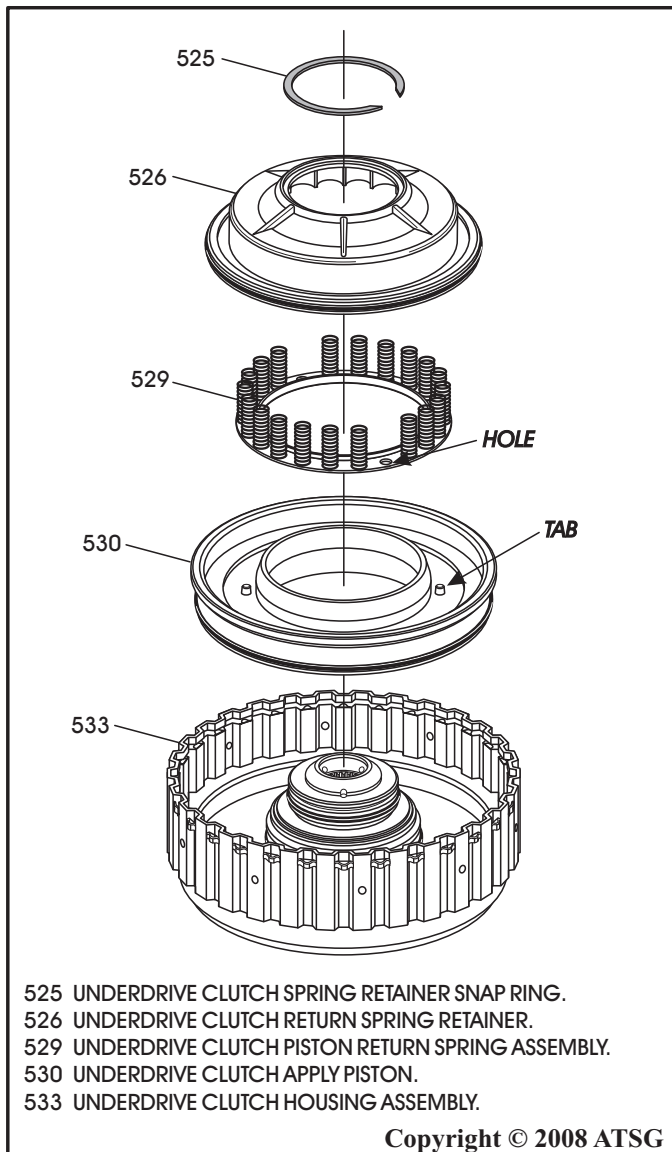


Figure 123

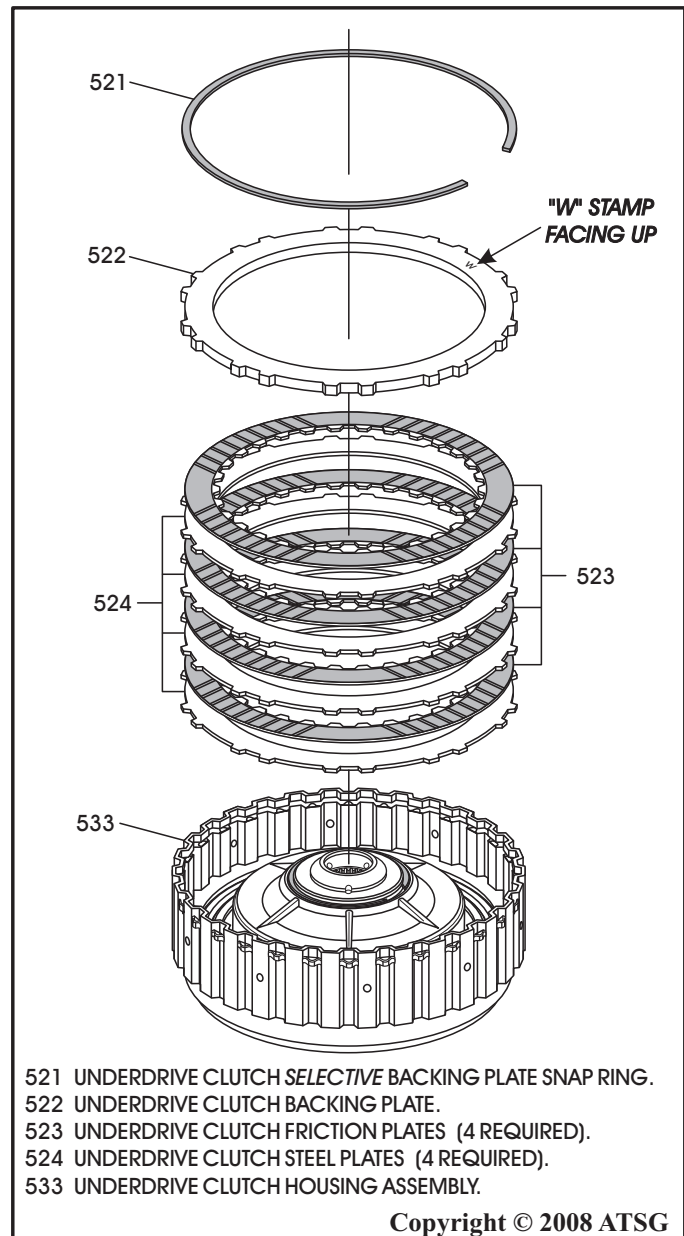


Figure 124

COMPONENT REBUILD

REDUCTION ANNULUS, UNDERDRIVE CLUTCH (CONT'D)

15. Install clutch pack compression tools, as shown in Figure 126.
- Note: Underdrive clutch plates are "Waved" on all models and must be compressed, as shown in Figure 126, to accurately measure for the proper selective snap ring.*
16. Compress the plates and measure with feeler gauge between snap ring and backing plate, as shown in Figure 126.
17. With plates compressed UD clutch clearance should be 1.6-1.8 mm (.063"-.071").
18. Change the selective snap ring as necessary, using the chart in Figure 126, to obtain proper underdrive clutch clearance.
19. Remove the compression tools.

Continued on Page 73

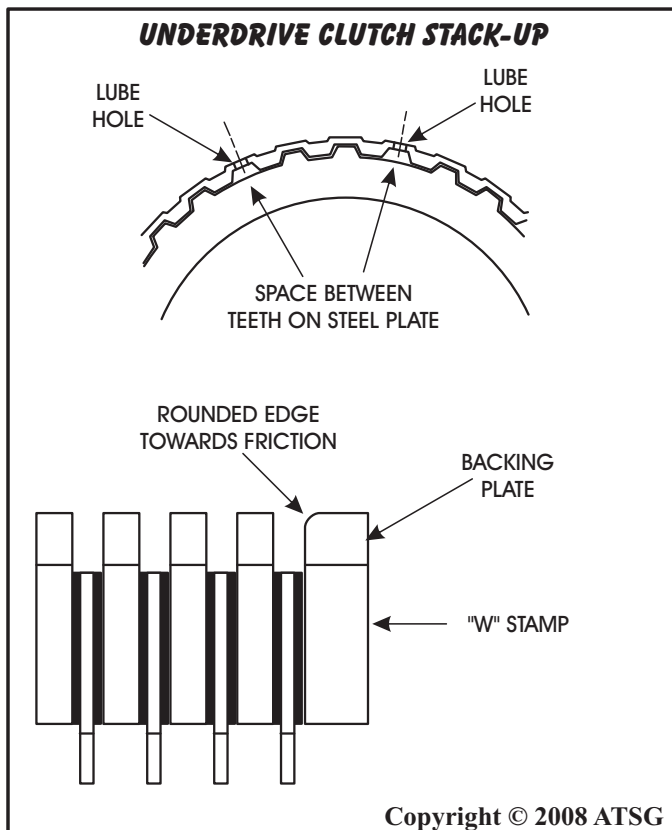


Figure 125

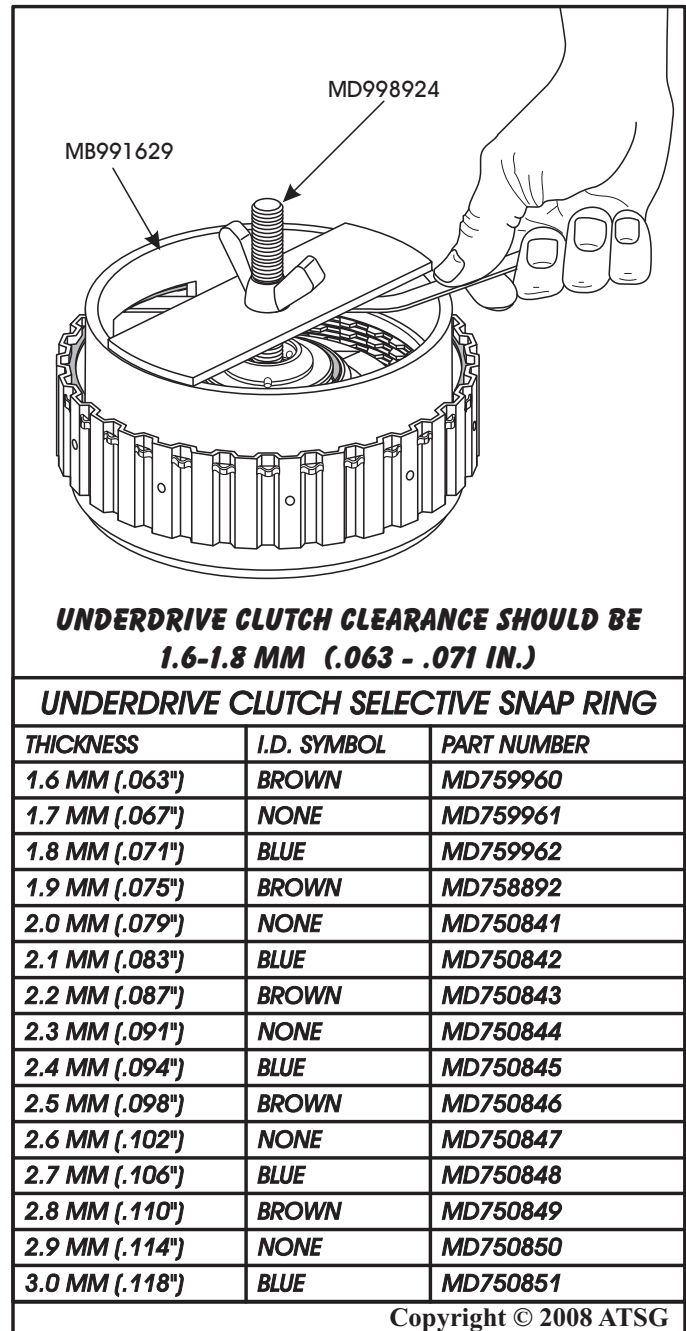


Figure 126

COMPONENT REBUILD

REDUCTION ANNULUS, UNDERDRIVE CLUTCH (CONT'D)

20. Place the reduction planetary ring gear on flat work surface, as shown in Figure 127.
21. Install the completed underdrive clutch housing inside of the reduction planetary ring gear, as shown in Figure 127.
22. Install the number 11 thrust bearing, as shown in Figure 128, with the black side facing up.
23. Install the underdrive clutch hub, as shown in Figure 128, by rotating back and forth until it is fully seated.
24. Install the number 10 thrust bearing, as shown in Figure 128.

Continued on Page 74

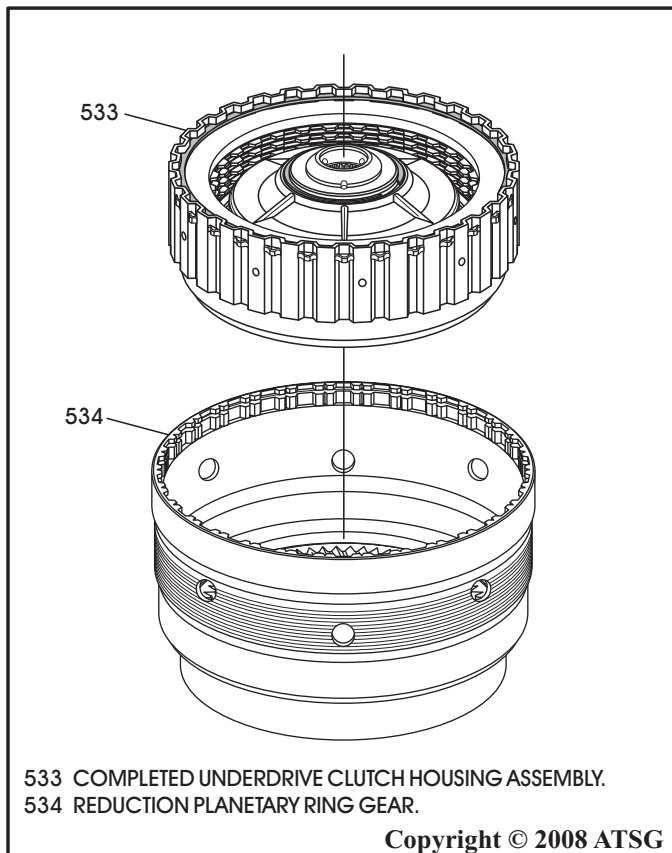


Figure 127

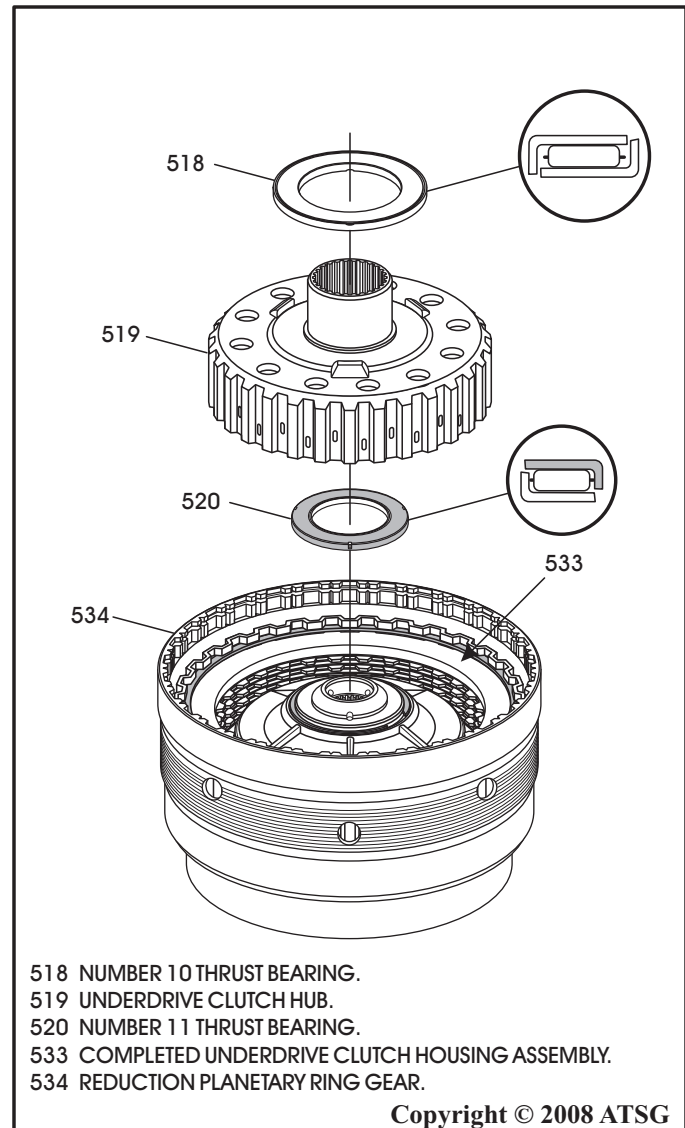


Figure 128

COMPONENT REBUILD

REDUCTION ANNULUS, UNDERDRIVE CLUTCH (CONT'D)

25. Install the reduction ring gear output flange, as shown in Figure 129.
26. Install the reduction ring gear output flange snap ring, as shown in Figure 129, and ensure that it is fully seated.
27. Install the number 9 thrust bearing, as shown in Figure 129, and retain with a small amount of Trans-Jel®.
28. Set the completed reduction annulus and underdrive clutch assembly aside for the final assembly process (See Figure 130).
29. The number 8 selective thrust washer should have been installed earlier on center support, as shown in Figure 131.

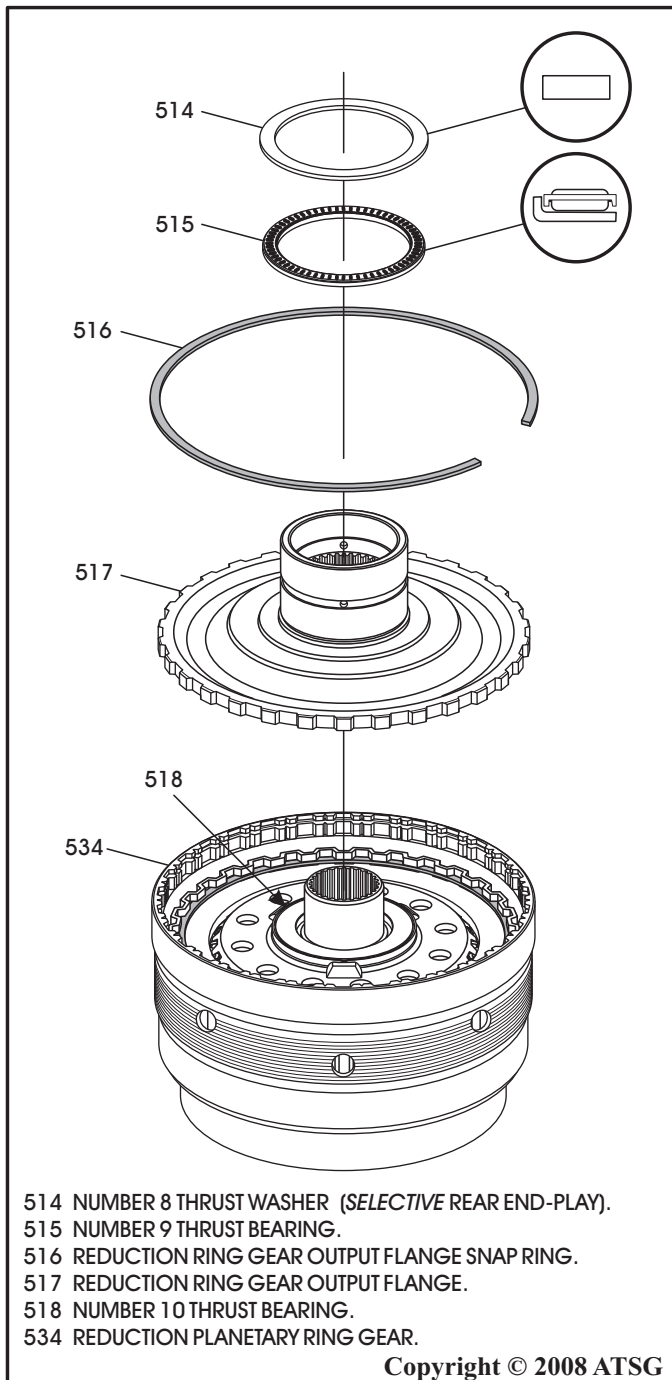
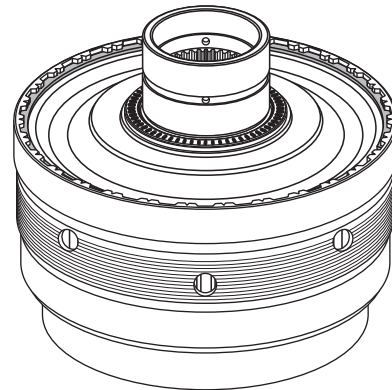


Figure 129

Component Rebuild Continued on Page 75

COMPLETED REDUCTION ANNULUS AND UNDERDRIVE CLUTCH ASSEMBLY



Copyright © 2008 ATSG

Figure 130

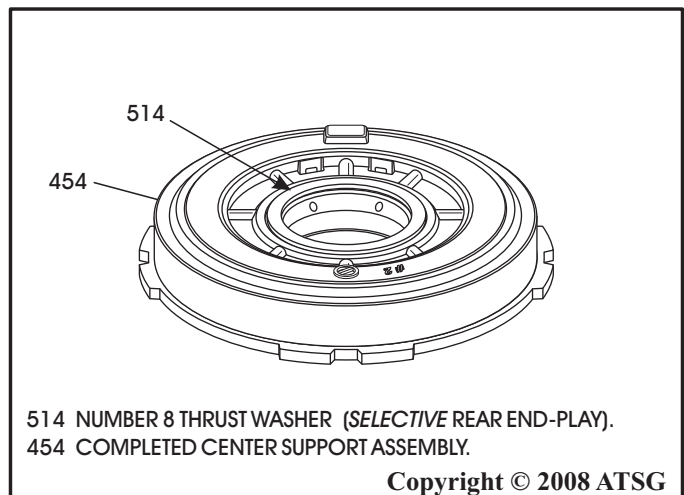
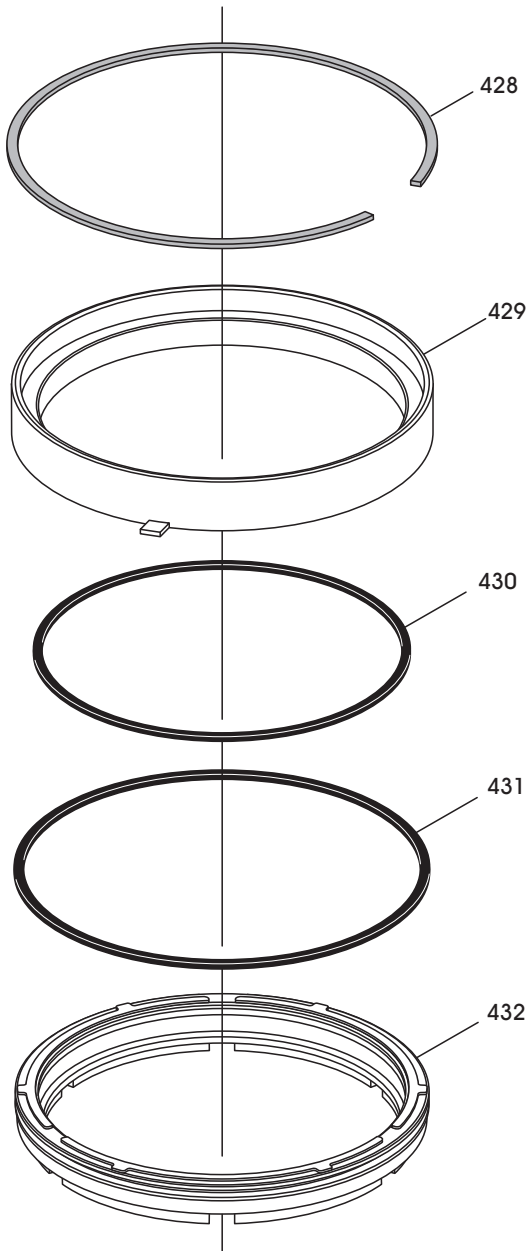


Figure 131

2ND CLUTCH RETAINER EXPLODED VIEW



- 428 2-4 CLUTCH RETAINER SNAP RING.
- 429 2-4 CLUTCH RETAINER.
- 430 2-4 CLUTCH PISTON INNER "D" RING SEAL.
- 431 2-4 CLUTCH PISTON OUTER "D" RING SEAL.
- 432 2-4 CLUTCH PISTON.

Copyright © 2008 ATSG

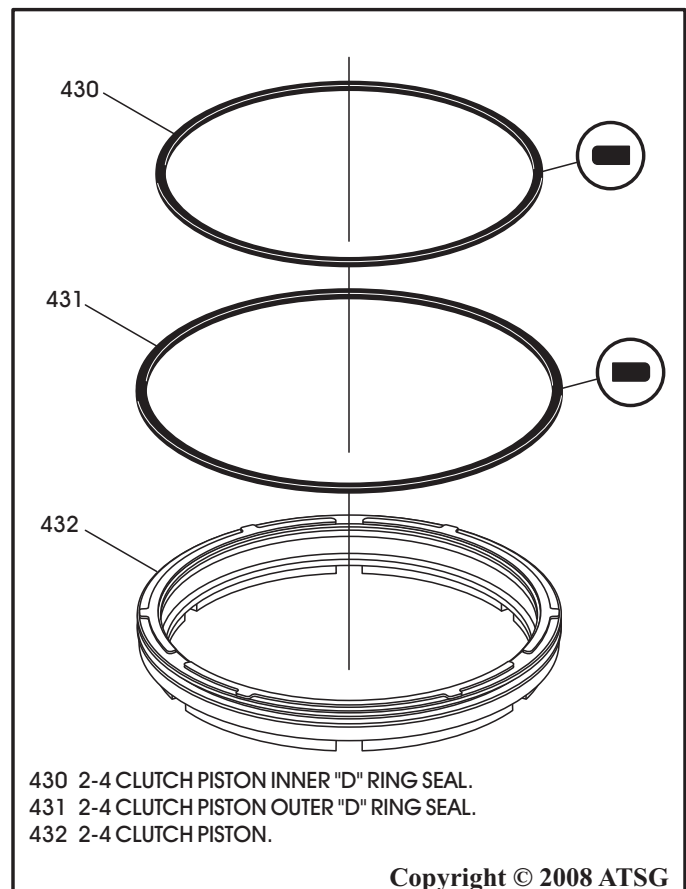
Figure 132

COMPONENT REBUILD

2ND CLUTCH PISTON AND RETAINER ASSEMBLY

1. Disassemble the 2nd clutch retainer assembly using Figure 132 as a guide.
2. Remove and discard inner and outer "D" ring seals from the piston, as shown in Figure 132.
3. Clean the retainer and piston thoroughly with cleaning solution and dry with compressed air.
4. Inspect the retainer and piston thoroughly for any wear and/or damage. Replace as necessary.
5. Install new inner and outer "D" ring seals onto the 2nd clutch piston, as shown in Figure 133, and lube with a small amount of Trans-Jel®.

Continued on Page 76



- 430 2-4 CLUTCH PISTON INNER "D" RING SEAL.
- 431 2-4 CLUTCH PISTON OUTER "D" RING SEAL.
- 432 2-4 CLUTCH PISTON.

Copyright © 2008 ATSG

Figure 133

COMPONENT REBUILD

2ND CLUTCH PISTON AND RETAINER (CONT'D)

6. Lube the inside seal surfaces of the retainer with a small amount of Trans-Jel® and install the piston assembly into the retainer, as shown in Figure 134.
7. Use care so as not to cut the "D" ring seals during installation.
8. Set completed 2nd clutch piston and retainer assembly aside for the final assembly process, as shown in Figure 135.

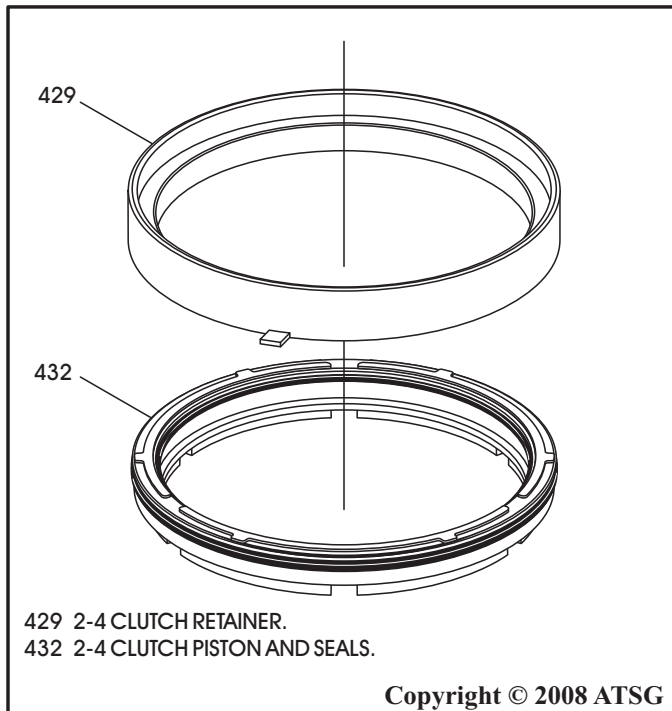


Figure 134

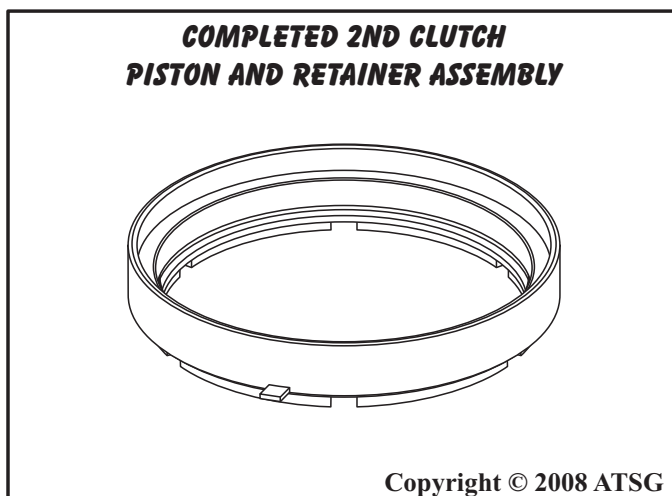


Figure 135

COMPONENT REBUILD

REDUCTION SERVO ASSEMBLY

1. Install new "O" ring seal into the groove of the reduction servo cover, as shown in Figure 136.
2. Install new scarf-cut seal into the groove of the reduction servo piston, as shown in Figure 136.
3. Set the reduction servo parts aside for the final assembly process.

Component Rebuild Continued on Page 77

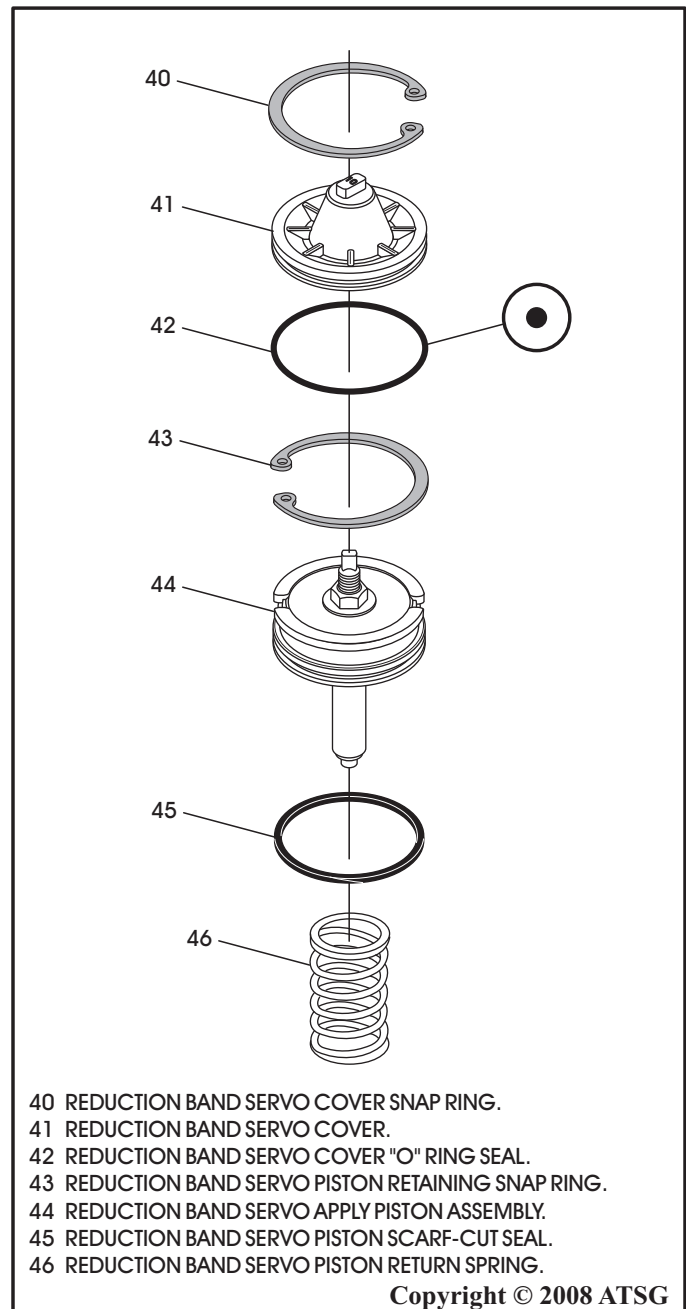
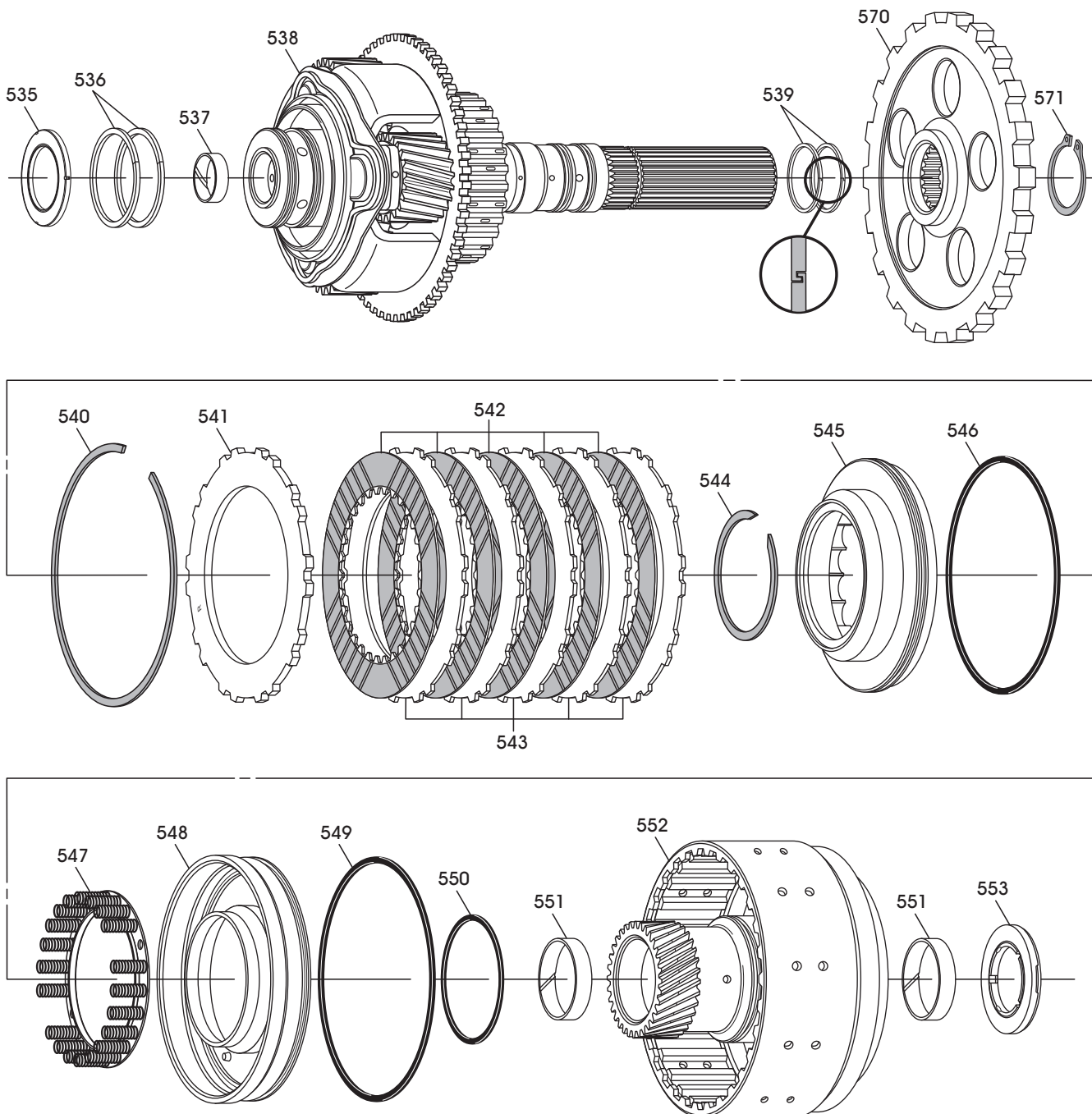


Figure 136

V5A51 DIRECT CLUTCH AND REDUCTION CARRIER EXPLODED VIEW



- 535 NUMBER 12 THRUST BEARING.
- 536 UNDERDRIVE CLUTCH BUTT-CUT TEFLON SEAL RINGS.
- 537 OUTPUT SHAFT BUSHING.
- 538 REDUCTION PLANETARY CARRIER AND OUTPUT SHAFT.
- 539 OUTPUT SHAFT STEEL HOOK-JOINT SEAL RINGS.
- 540 DIRECT CLUTCH BACKING PLATE *SELECTIVE* SNAP RING.
- 541 DIRECT CLUTCH BACKING PLATE.
- 542 DIRECT CLUTCH FRICTION PLATES (5 REQUIRED).
- 543 DIRECT CLUTCH STEEL PLATES (5 REQUIRED).
- 544 DIRECT CLUTCH RETURN SPRING RETAINER SNAP RING.
- 545 DIRECT CLUTCH RETURN SPRING RETAINER.

- 546 DIRECT CLUTCH RETURN SPRING RETAINER "D" RING SEAL.
- 547 DIRECT CLUTCH APPLY PISTON RETURN SPRING.
- 548 DIRECT CLUTCH APPLY PISTON.
- 549 DIRECT CLUTCH APPLY PISTON OUTER "D" RING SEAL.
- 550 DIRECT CLUTCH HOUSING INNER "D" RING SEAL..
- 551 DIRECT CLUTCH HOUSING BUSHINGS (2 REQUIRED).
- 552 DIRECT CLUTCH HOUSING.
- 553 NUMBER 13 THRUST BEARING.
- 570 PARKING GEAR.
- 571 PARKING GEAR RETAINING SNAP RING.

Copyright © 2008 ATSG

Figure 137

COMPONENT REBUILD

DIRECT CLUTCH HOUSING

1. Disassemble the direct clutch housing using Figure 137 as a guide.
Note: Best procedure is to tag all snap rings for identification, as most are selective.
2. Clean all direct clutch parts thoroughly and dry with compressed air.

3. Inspect all direct clutch parts thoroughly for any wear and/or damage. Install new bushings as necessary using the proper driver.
4. Install new "D" ring seals on both pistons and in the direct clutch housing (See Figure 138).
5. Lube seals and install the direct clutch piston in direct clutch housing, as shown in Figure 139.
6. Install the direct clutch piston return spring, as shown in Figure 139, and ensure that holes in return spring align with tabs on piston.
7. Install direct return spring retainer, as shown in Figure 139.
8. Compress the assembly and install the snap ring, as shown in Figure 139.

Continued on Page 79

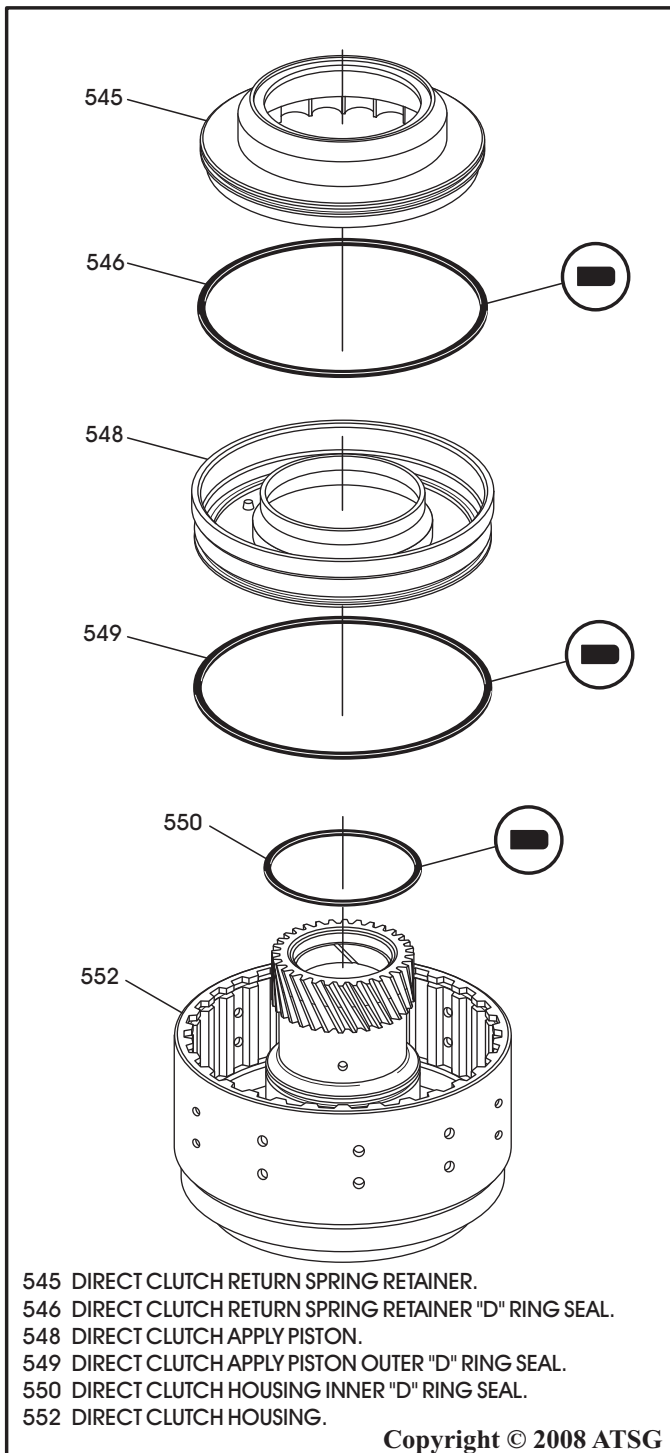


Figure 138

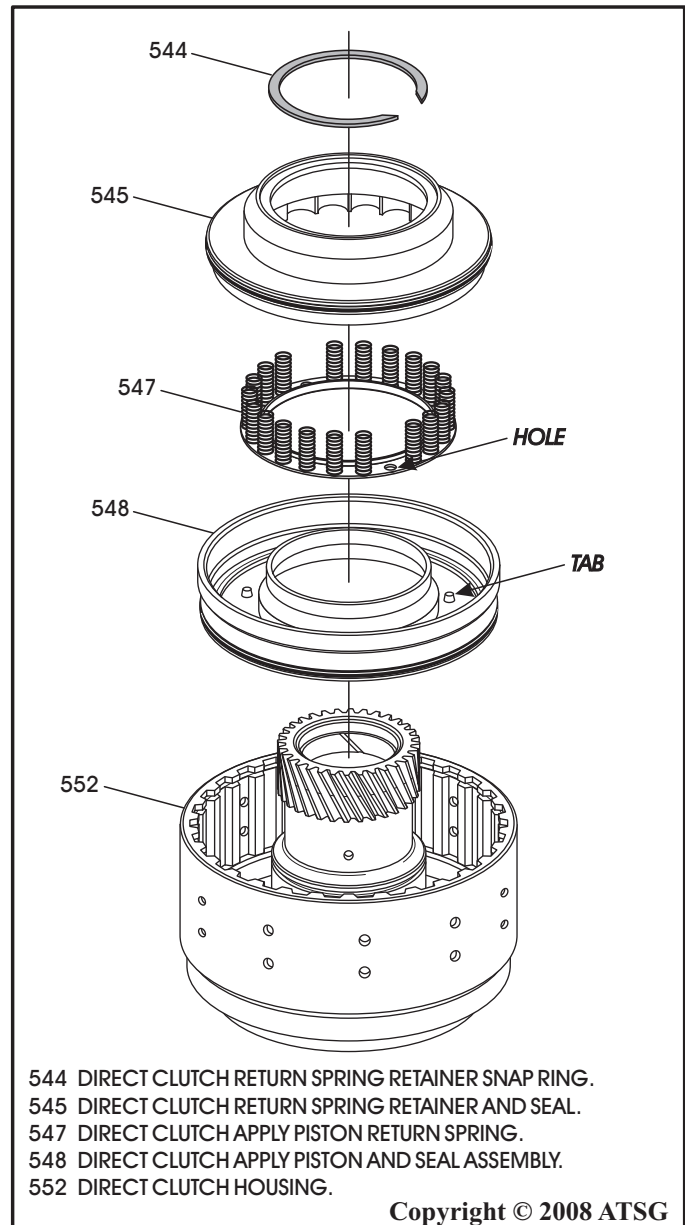


Figure 139

COMPONENT REBUILD

DIRECT CLUTCH HOUSING (CONT'D)

9. Install the direct clutch plates beginning with a steel plate and alternating with friction plates, as shown in Figure 140.

Note: Steel plates must be installed so that no teeth are blocking lube holes, as shown in Figure 141. All clutch plates should be soaked for 30 minutes before assembly, and the number of plates may vary.

10. Install the direct clutch backing plate, as shown in Figure 140, with the "R" stamp facing up, and oriented same as steel plates.

11. Install the backing plate selective snap ring, as shown in Figure 140.

Continued on Page 80

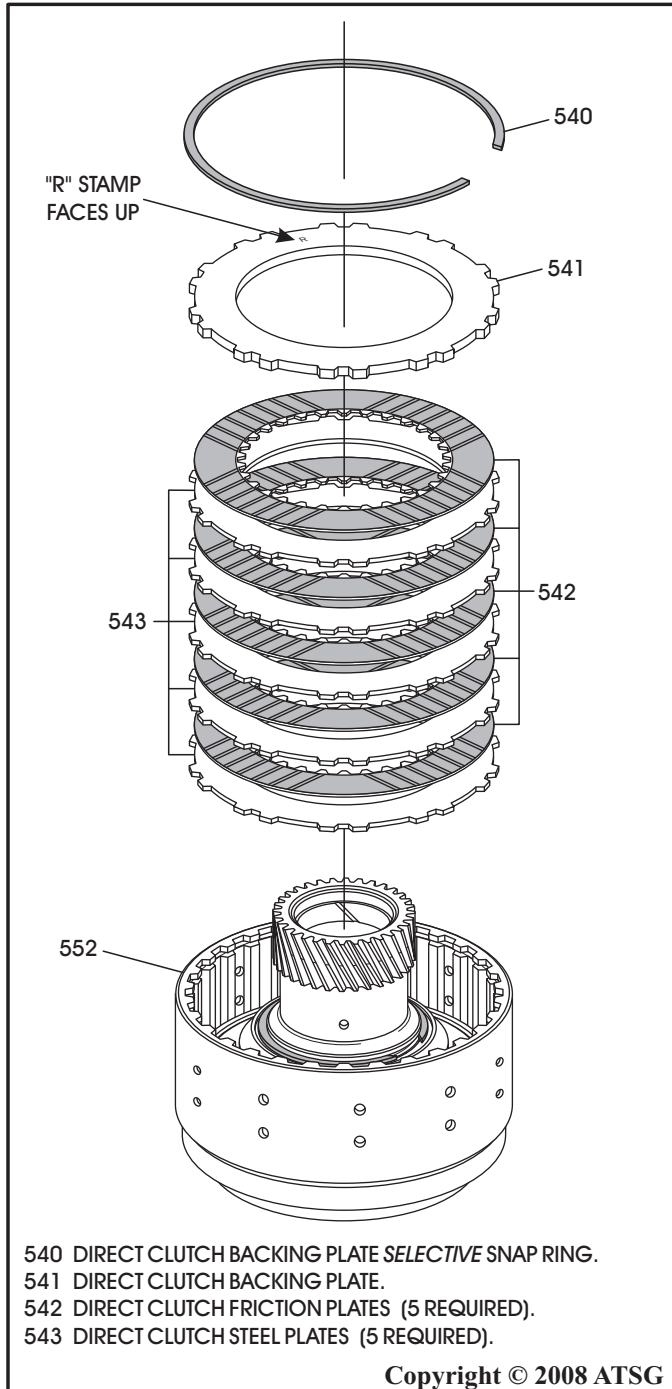


Figure 140

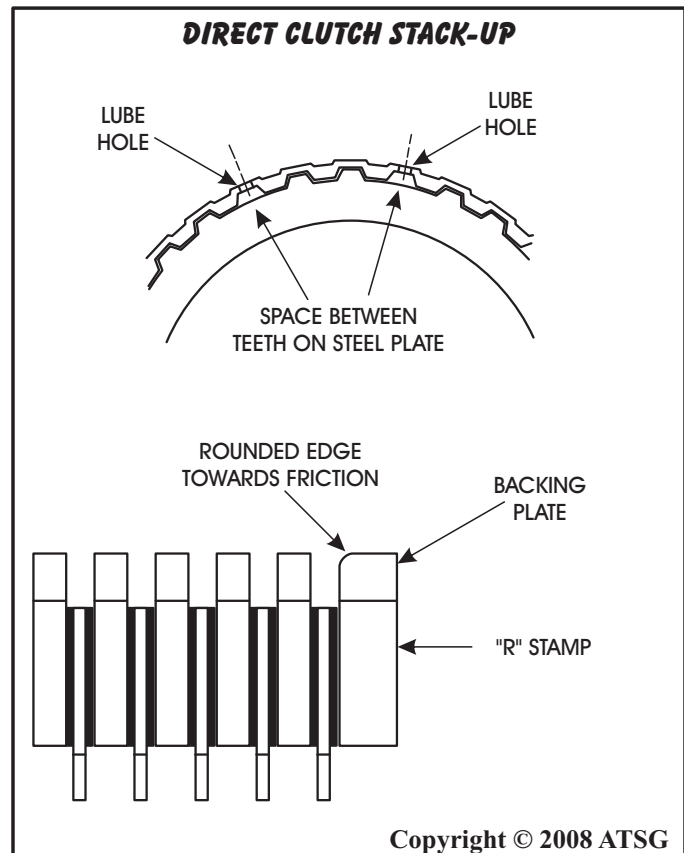


Figure 141

COMPONENT REBUILD

DIRECT CLUTCH HOUSING (CONT'D)

12. Compress the plates by hand and measure with feeler gauge between the snap ring and backing plate, as shown in Figure 142.
13. With plates compressed direct clutch clearance should be 1.0-1.2 mm (.037" - .047").
14. Change the selective snap ring as necessary, using the chart in Figure 142, to obtain proper direct clutch clearance.

15. Install the number 13 thrust bearing, as shown in Figure 143, and retain with Trans-Jel®.
16. Set the completed direct clutch housing aside for the final assembly process, as shown in Figure 144.

**Component Rebuild
Continued on Page 81**

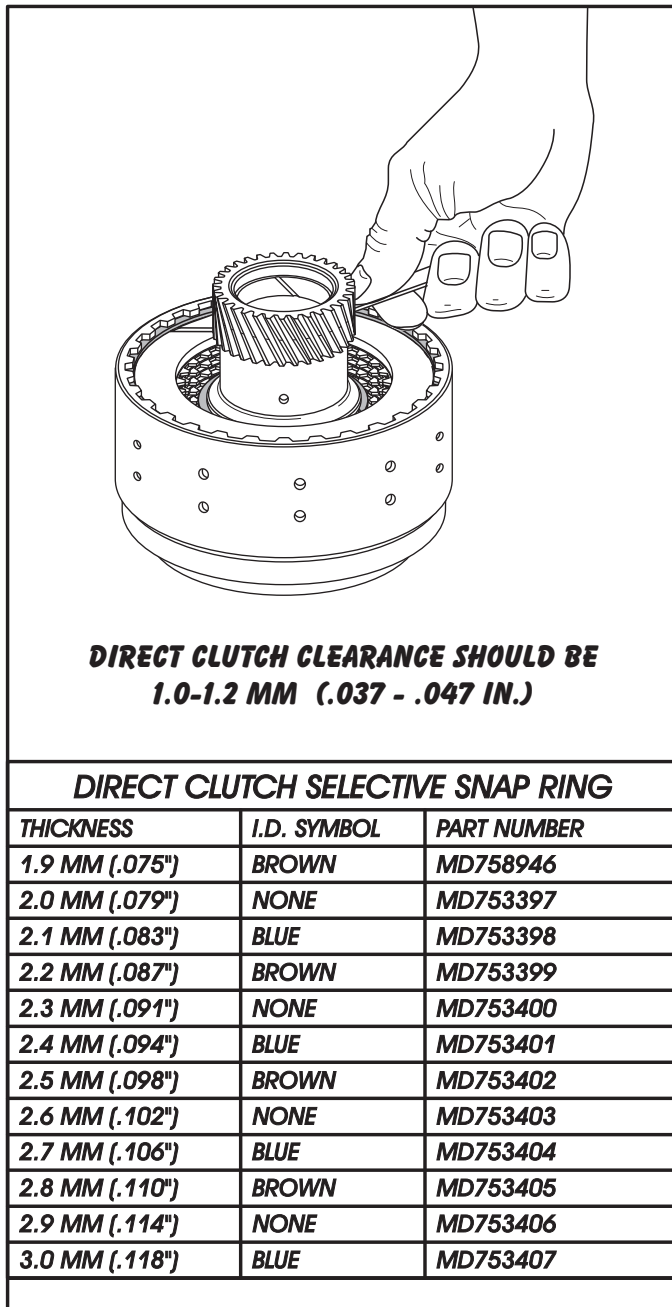


Figure 142

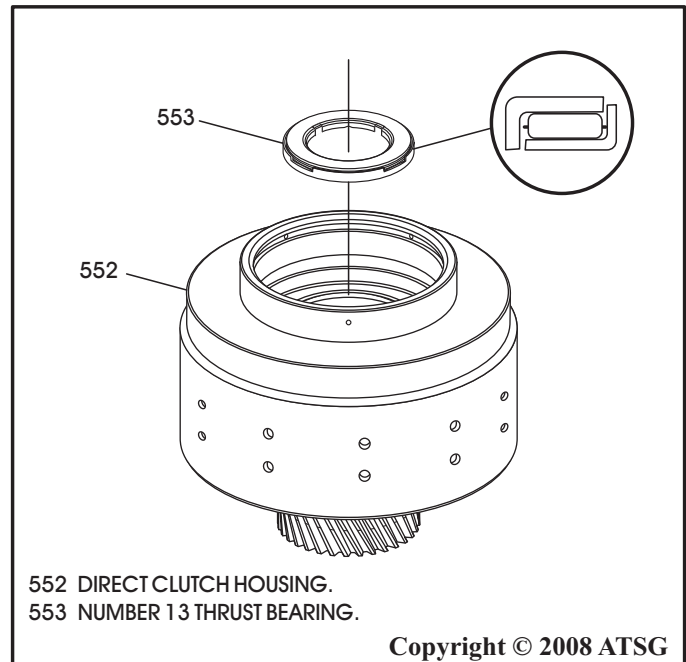


Figure 143

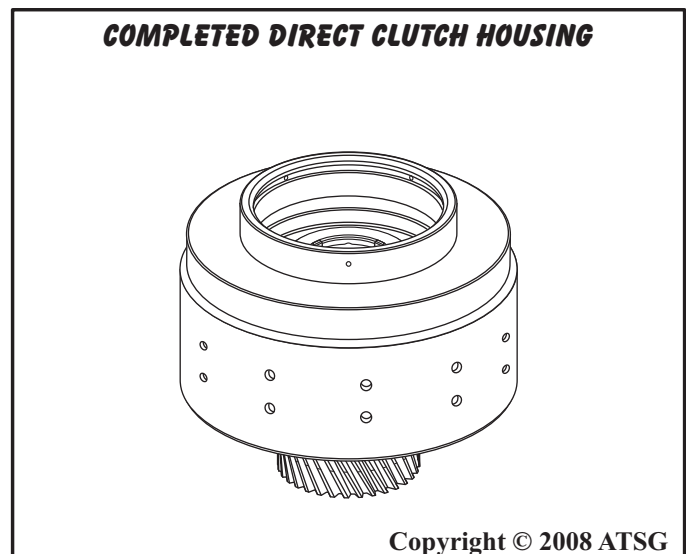


Figure 144

COMPONENT REBUILD

REDUCTION BAND

1. Clean the reduction band thoroughly and dry with compressed air.
2. Inspect the reduction band thoroughly for any wear and/or damage, replace as necessary.
3. Set the reduction band aside for final assembly, as shown in Figure 145.

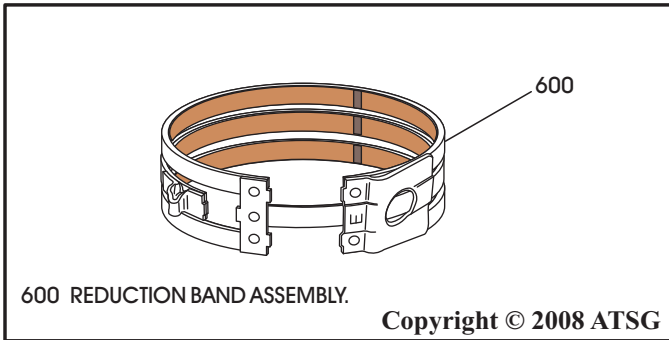


Figure 145

COMPONENT REBUILD

4 SPEED OUTPUT SHAFT SUPPORT

1. Clean 4 speed output shaft support thoroughly and dry with compressed air.
2. Inspect 4 speed output shaft support for any wear and/or damage.
3. There is no sub-assembly required on 4 speed output shaft support except to ensure that the alignment dowel is installed.
4. The differences between the 4 speed and the 5 speed output shaft supports, are illustrated in Figure 146, for identification purposes.

Component Rebuild
Continued on Page 82

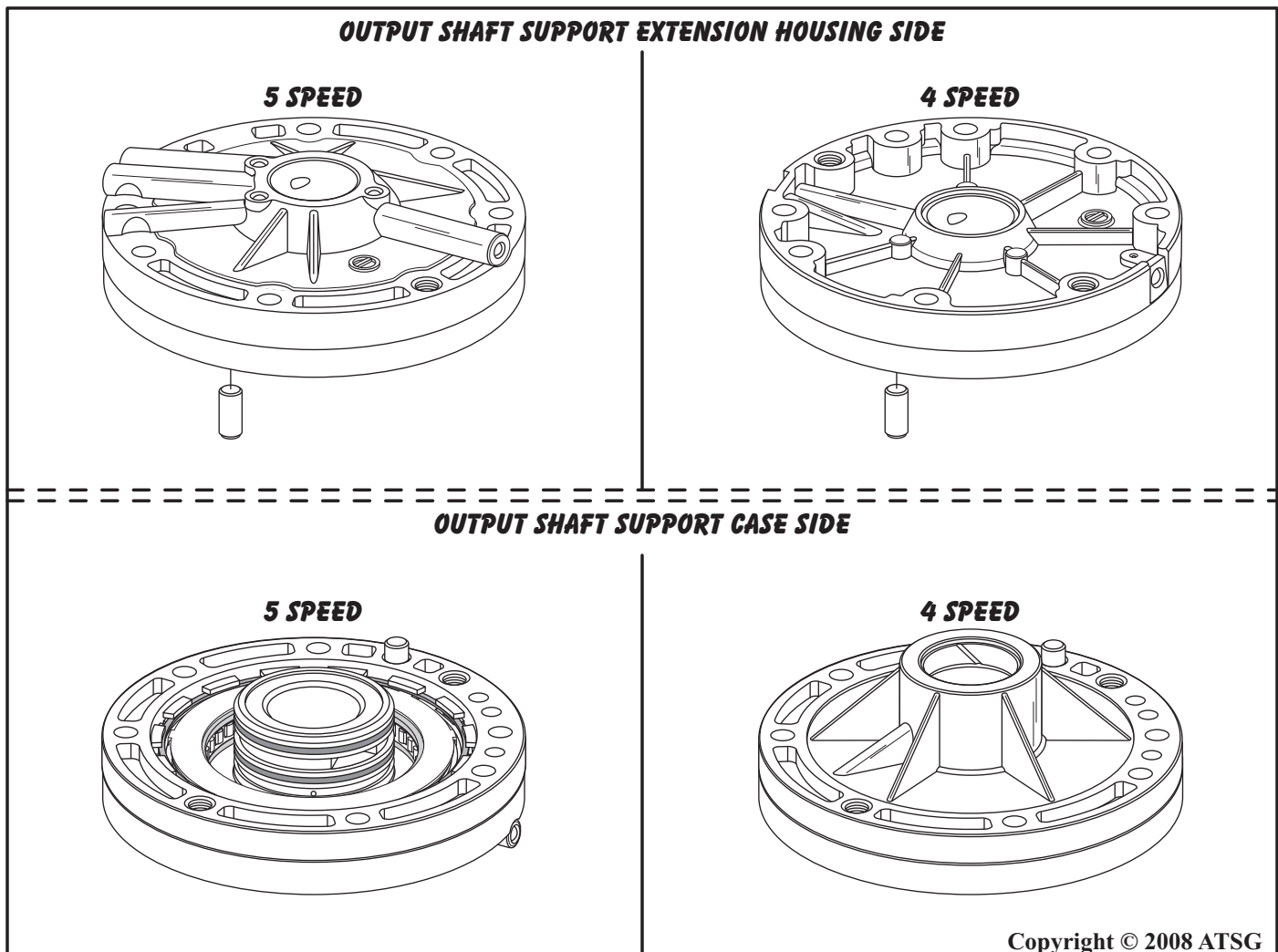
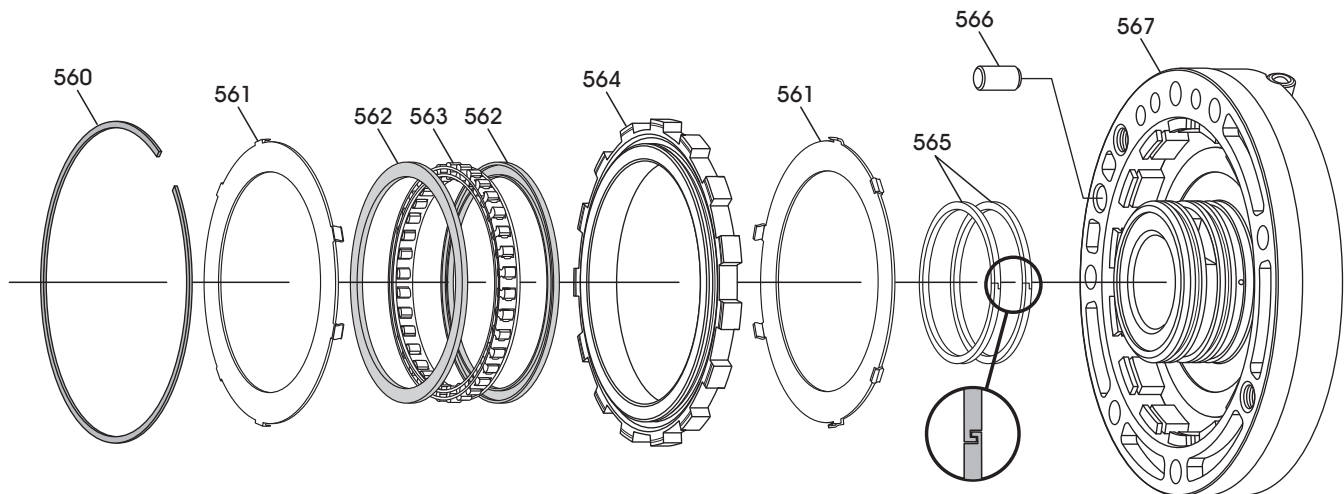


Figure 146

DIRECT SPRAG AND 5 SPEED OUTPUT SHAFT SUPPORT EXPLODED VIEW



560 DIRECT SPRAG ASSEMBLY RETAINING SNAP RING.
561 DIRECT SPRAG RETAINERS (2 REQUIRED).
562 DIRECT SPRAG END BEARINGS (2 REQUIRED).
563 DIRECT SPRAG ASSEMBLY.

564 DIRECT SPRAG OUTER RACE.
565 DIRECT CLUTCH STEEL "HOOK-JOINT" SEALING RINGS.
566 REAR TRANSMISSION SUPPORT ALIGNMENT DOWEL.
567 REAR OUTPUT SHAFT SUPPORT (5 SPEED).

Copyright © 2008 ATSG

Figure 147

COMPONENT REBUILD

5 SPEED OUTPUT SHAFT SUPPORT

1. Disassemble the 5 speed output shaft support using Figure 147 as a guide.
Note: Best procedure is to tag all snap rings for identification, as most are selective.
2. Clean all 5 speed output shaft support parts and dry with compressed air.
3. Inspect all 5 speed output shaft support parts thoroughly for any wear and/or damage, and replace as necessary.

4. Install one direct sprag retainer on bottom of direct sprag outer race, as shown in Figure 148.
Note: ID groove on outer race must face up.
5. Install one direct sprag end bearing, as shown in Figure 149, into the direct sprag outer race.
Note: ID groove on outer race must face up.

Continued on Page 83

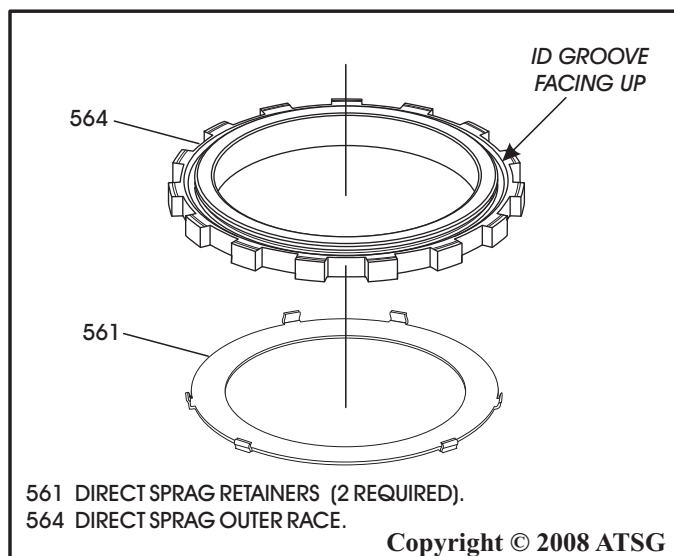


Figure 148

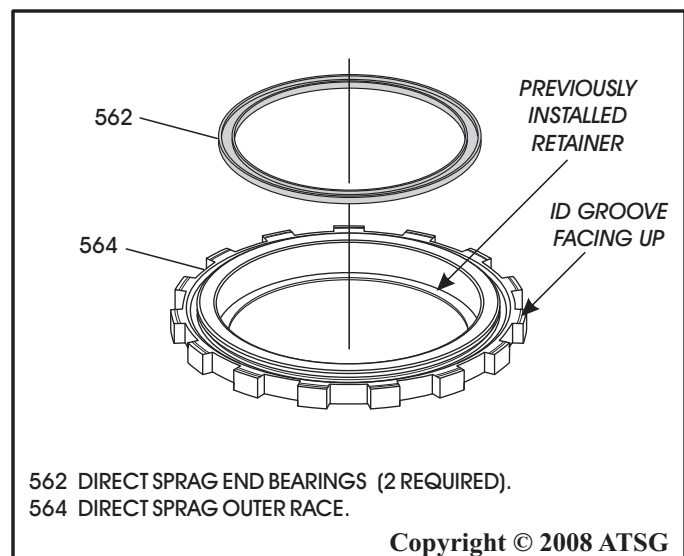


Figure 149

COMPONENT REBUILD

5 SPEED OUTPUT SHAFT SUPPORT (CONT'D)

6. Install the direct sprag assembly into the outer race, as shown in Figure 150, with the "lip" on sprag cage facing down.

Note: The direct sprag cage has no arrows on it to help with direction of installation. The "lip" must face down, with the ID groove on the race facing up, as shown in Figure 150.
7. Install the second direct sprag end bearing, as shown in Figure 150, with the smooth side facing up.
8. Install the second direct sprag retainer by snapping it over the lip on the outer race, as shown in Figure 150.
9. Install the completed direct sprag assembly, as shown in Figure 151, into the output shaft support with ID groove facing up.
10. Install the direct sprag assembly retaining snap ring, as shown in Figure 151.
11. Install the alignment dowel, if removed, into output shaft support, as shown in Figure 151.
12. Install the two direct clutch, steel, hook-joint sealing rings, as shown in Figure 152.

Continued on Page 84

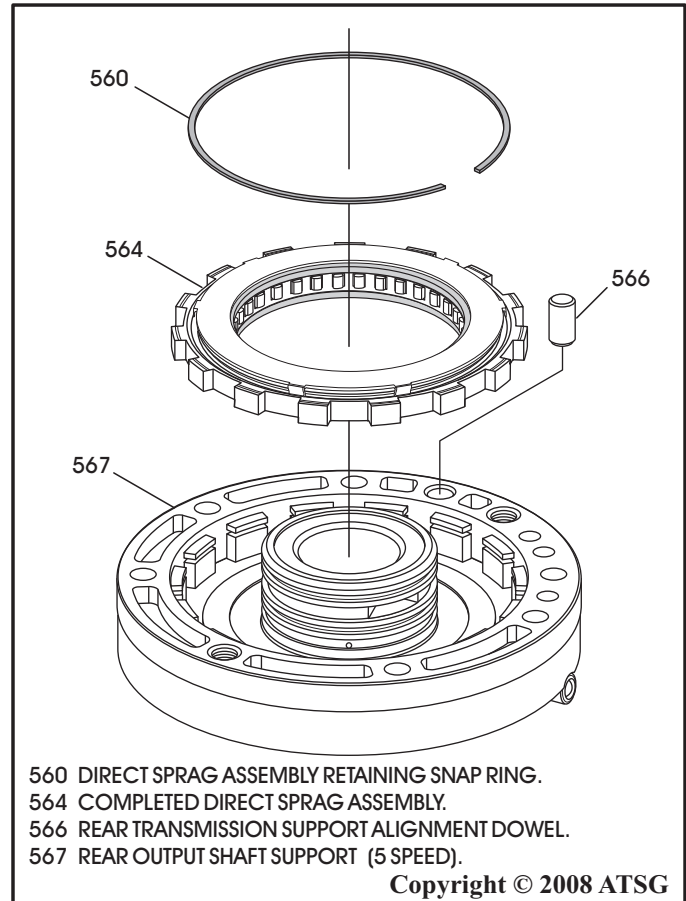


Figure 151

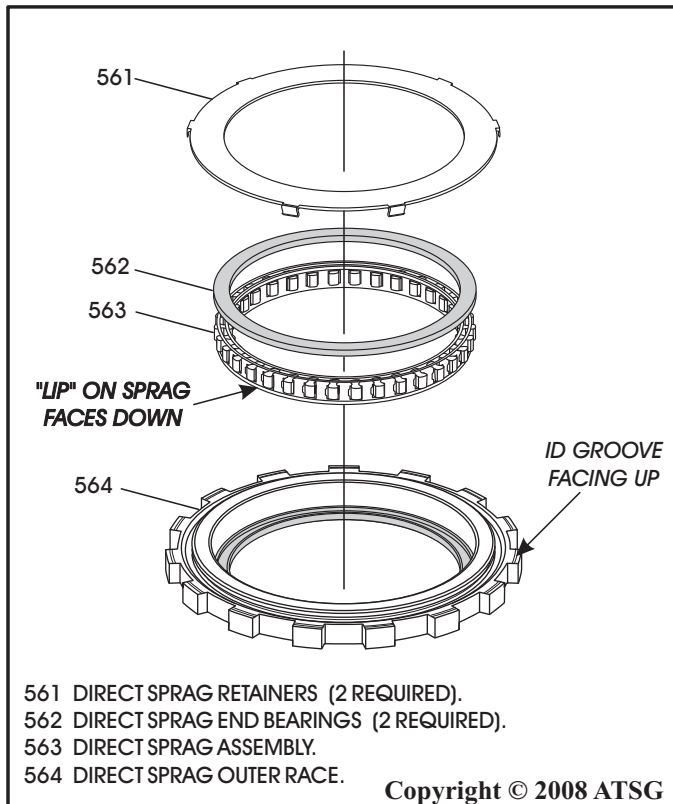


Figure 150

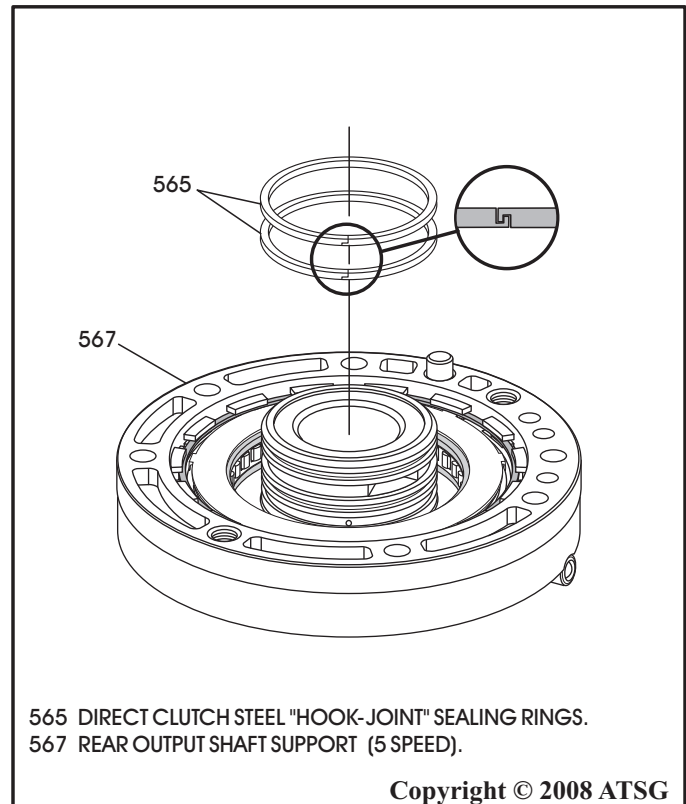


Figure 152

COMPONENT REBUILD

5 SPEED OUTPUT SHAFT SUPPORT (CONT'D)

13. Install the completed direct clutch housing onto the completed output shaft support, as shown in Figure 153.

14. The direct clutch housing should freewheel clockwise, and lock counter-clockwise, as shown in Figure 154.

Note: There are two ways to mis-assemble the direct sprag. Proper assembly is as follows;

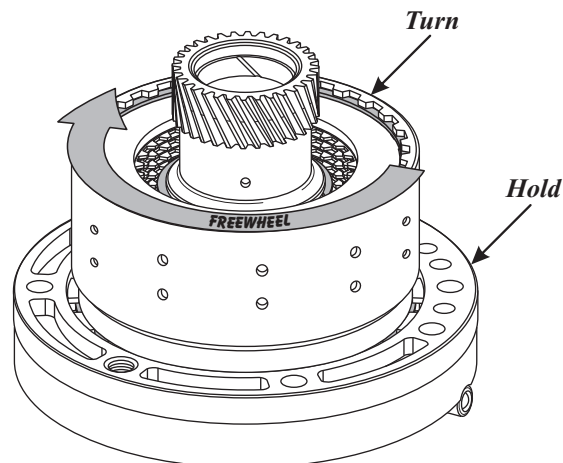
1. The sprag cage must go into the outer race with the "lip" facing down, while the ID groove on the race is facing up.

2. The completed direct sprag assembly must go into the rear support with the ID groove facing up.

15. Set the completed output shaft support aside for the final assembly process (See Figure 155).

Component Rebuild
Continued on Page 85

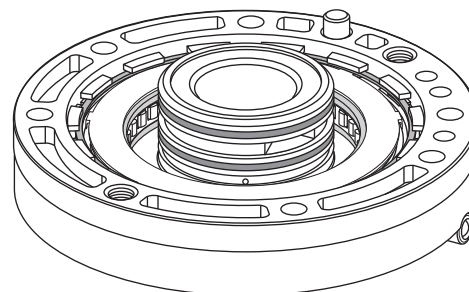
**DIRECT CLUTCH HOUSING SHOULD
FREEWHEEL CLOCKWISE AND LOCK
COUNTER-CLOCKWISE WHILE HOLDING
OUTPUT SHAFT SUPPORT**



Copyright © 2008 ATSG

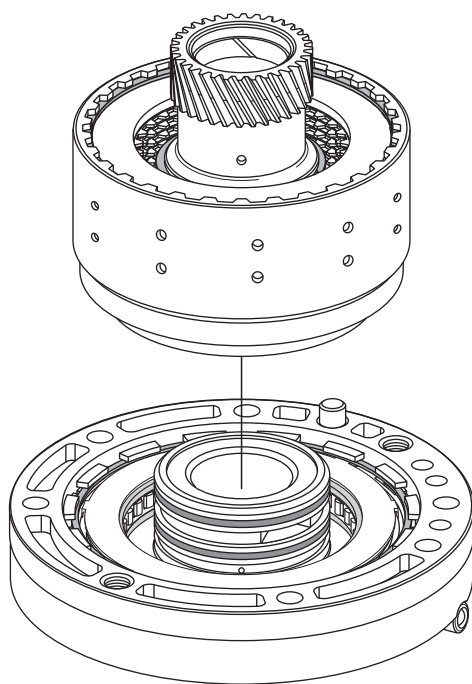
Figure 154

**COMPLETED OUTPUT SHAFT SUPPORT
AND DIRECT SPRAG ASSEMBLY
5 SPEED**



Copyright © 2008 ATSG

Figure 155



Copyright © 2008 ATSG

Figure 153

COMPONENT REBUILD

CHECKING LOW SPRAG

1. Install completed planetary gear train and low sprag assembly onto center support with the number 7 thrust bearing (See Figure 156).
2. The planetary assembly should freewheel in a clockwise direction & lock counter-clockwise, as shown in Figure 157, if the low sprag is correctly assembled.
3. If not correctly assembled, go back to Page 63.

Component Rebuild
Continued on Page 86

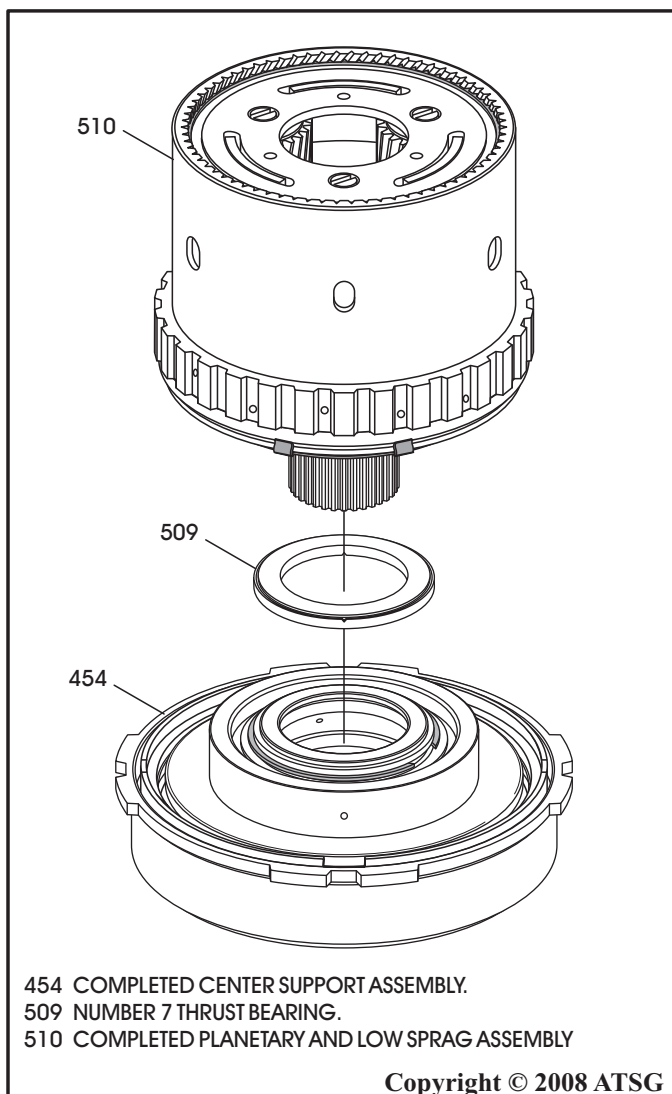


Figure 156

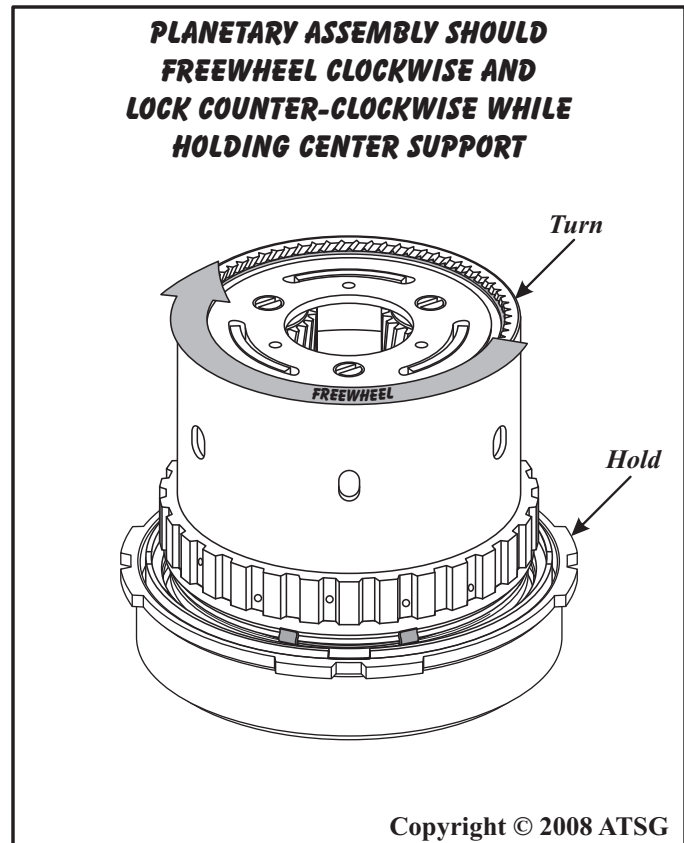


Figure 157

COMPONENT REBUILD

REDUCTION CARRIER AND OUTPUT SHAFT

1. Install new bushing as necessary, as shown in Figure 158 and 159.
2. Install new underdrive clutch, butt-cut, Teflon sealing rings on the output shaft, as shown in Figure 158 and 159.
3. Install new steel, hook-joint, sealing rings on the output shaft, as shown in Figure 158 and Figure 159.
4. Install the number 12 thrust bearing on front of output shaft, as shown in Figure 158 and Figure 159. Retain with Trans-Jel®.

Continued on Page 87

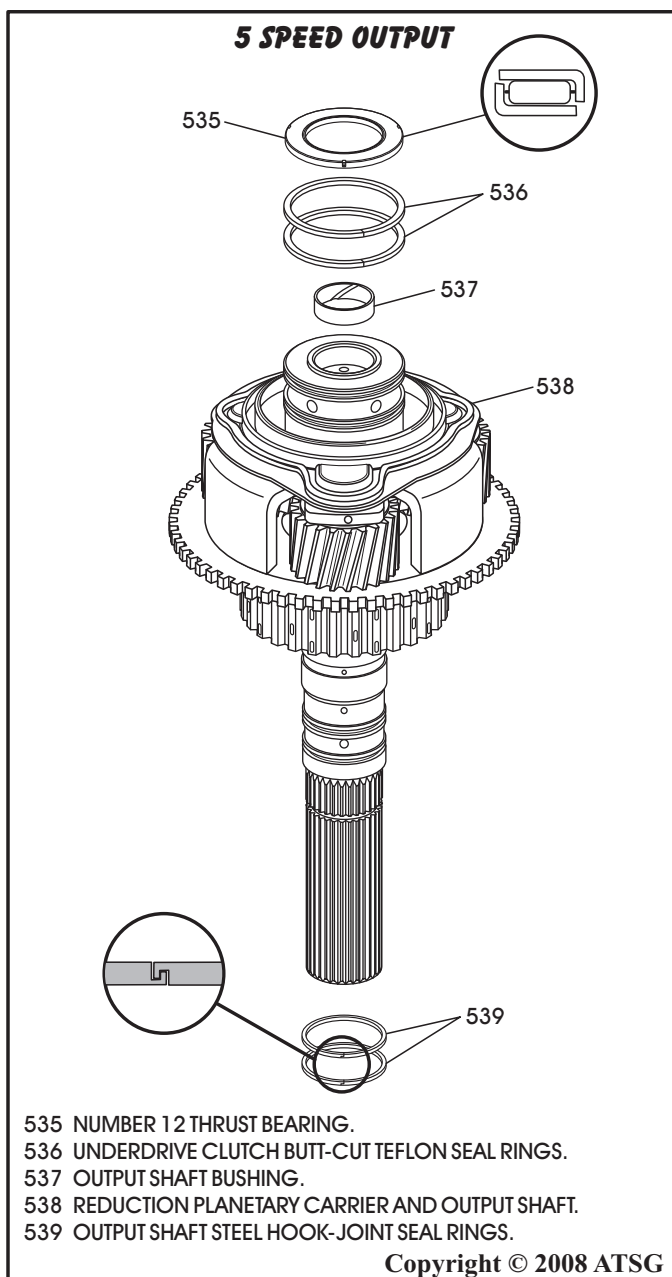


Figure 158

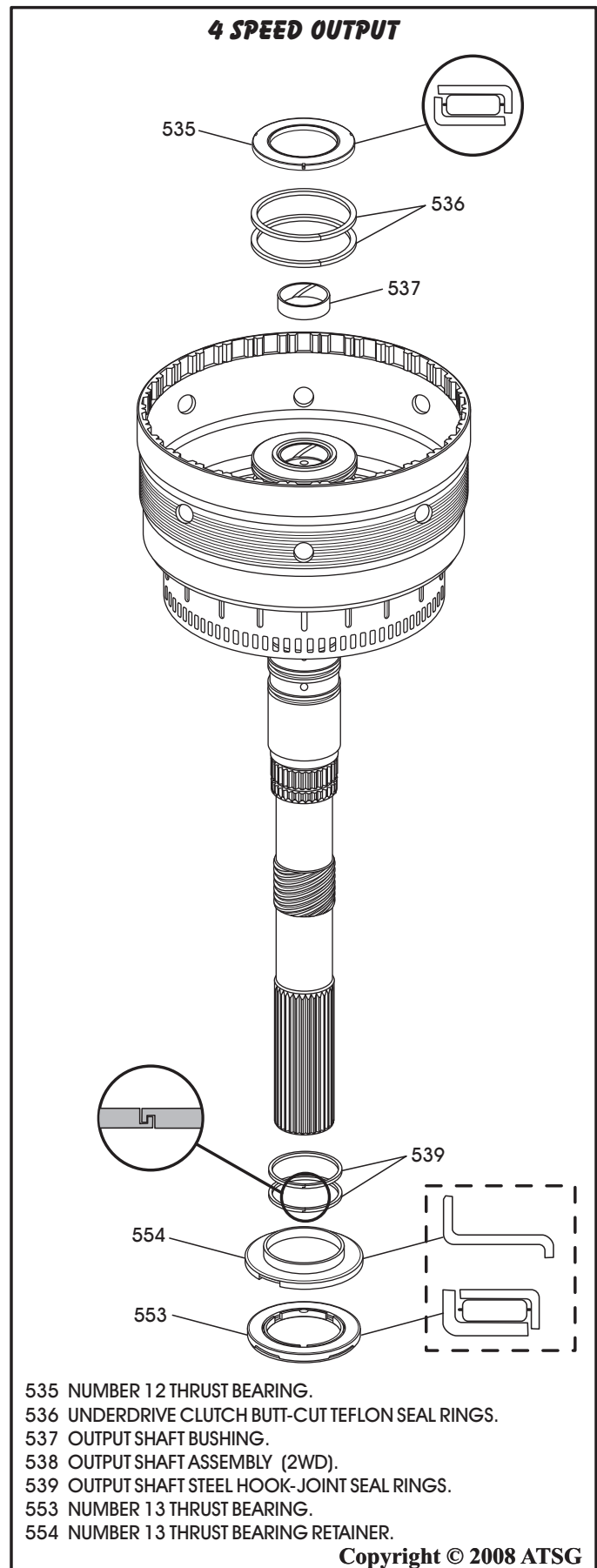


Figure 159

COMPONENT REBUILD

REDUCTION CARRIER AND OUTPUT SHAFT (CONT'D)

5. If you are working on a 4 speed, install number 13 thrust bearing retainer and the number 13 thrust bearing, as shown in Figure 160.

Note: Retain both with a liberal amount of Trans-Jel® to hold in position.

6. Set the completed reduction carrier and output shaft aside for the final assembly process, as shown in Figure 161.

Component Rebuild
Continued on Page 88

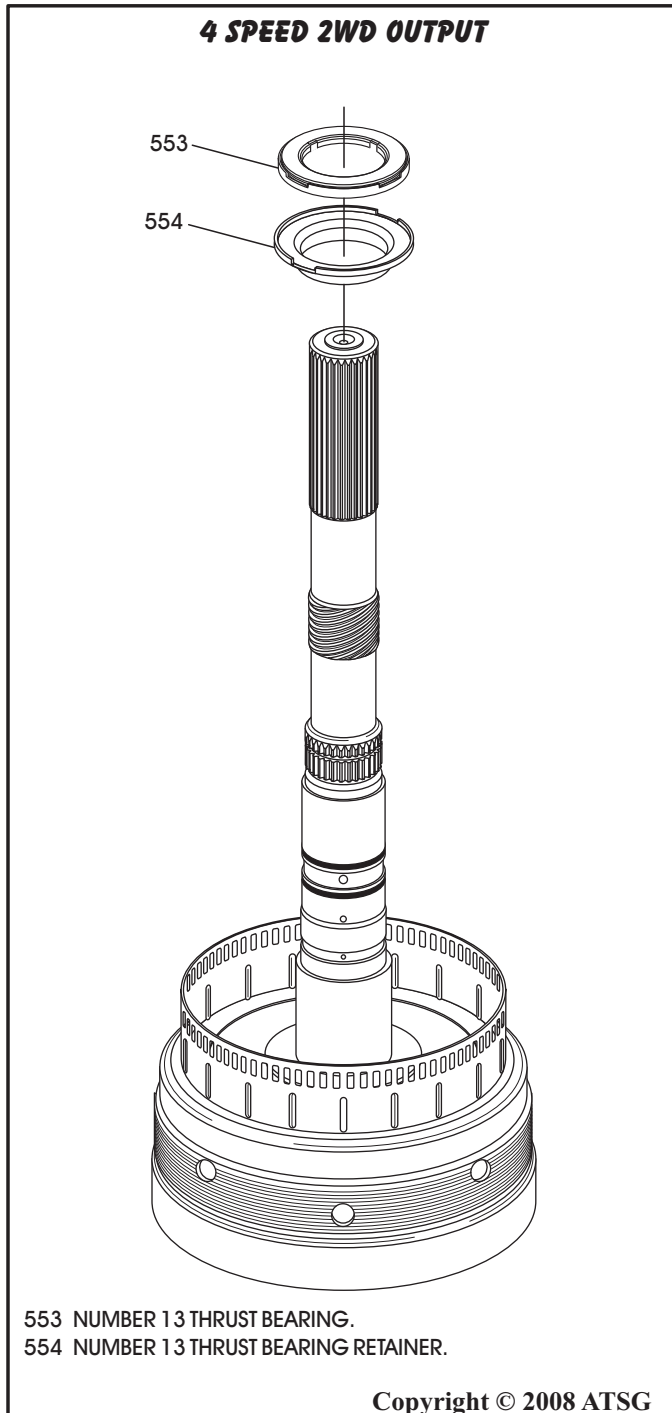


Figure 160

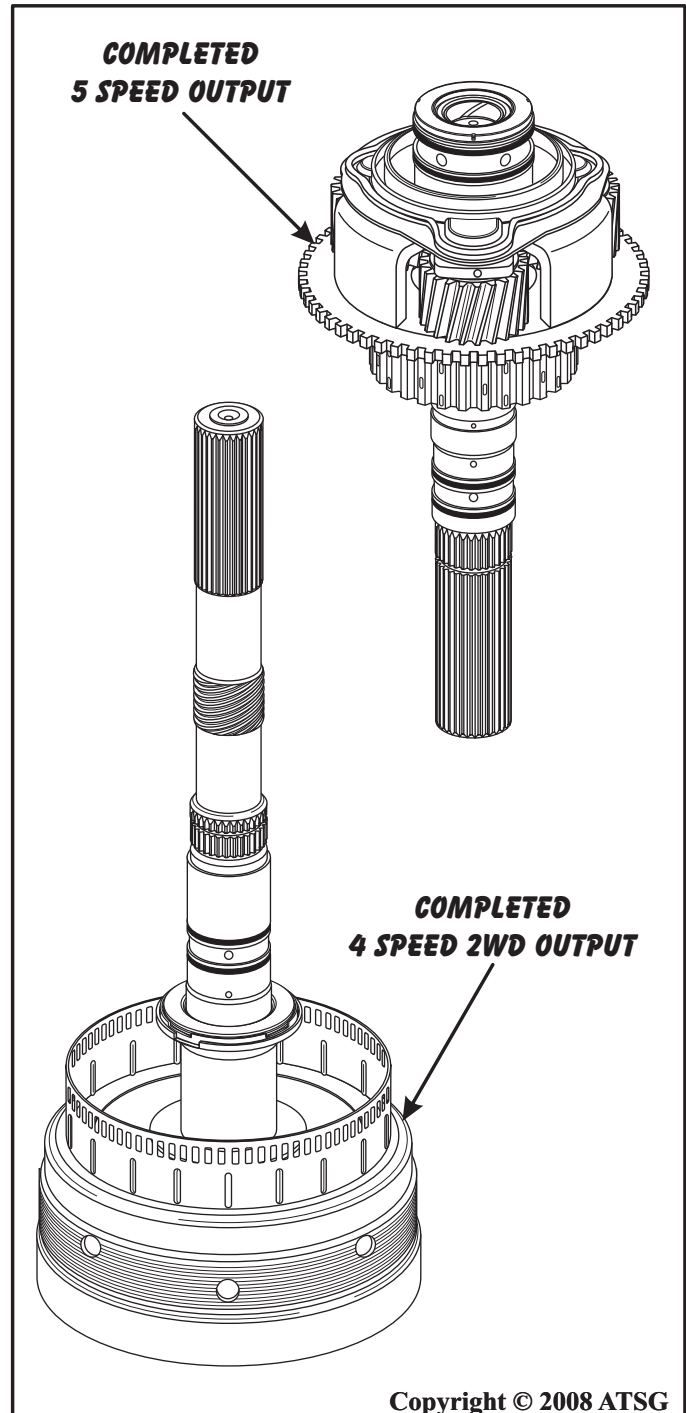
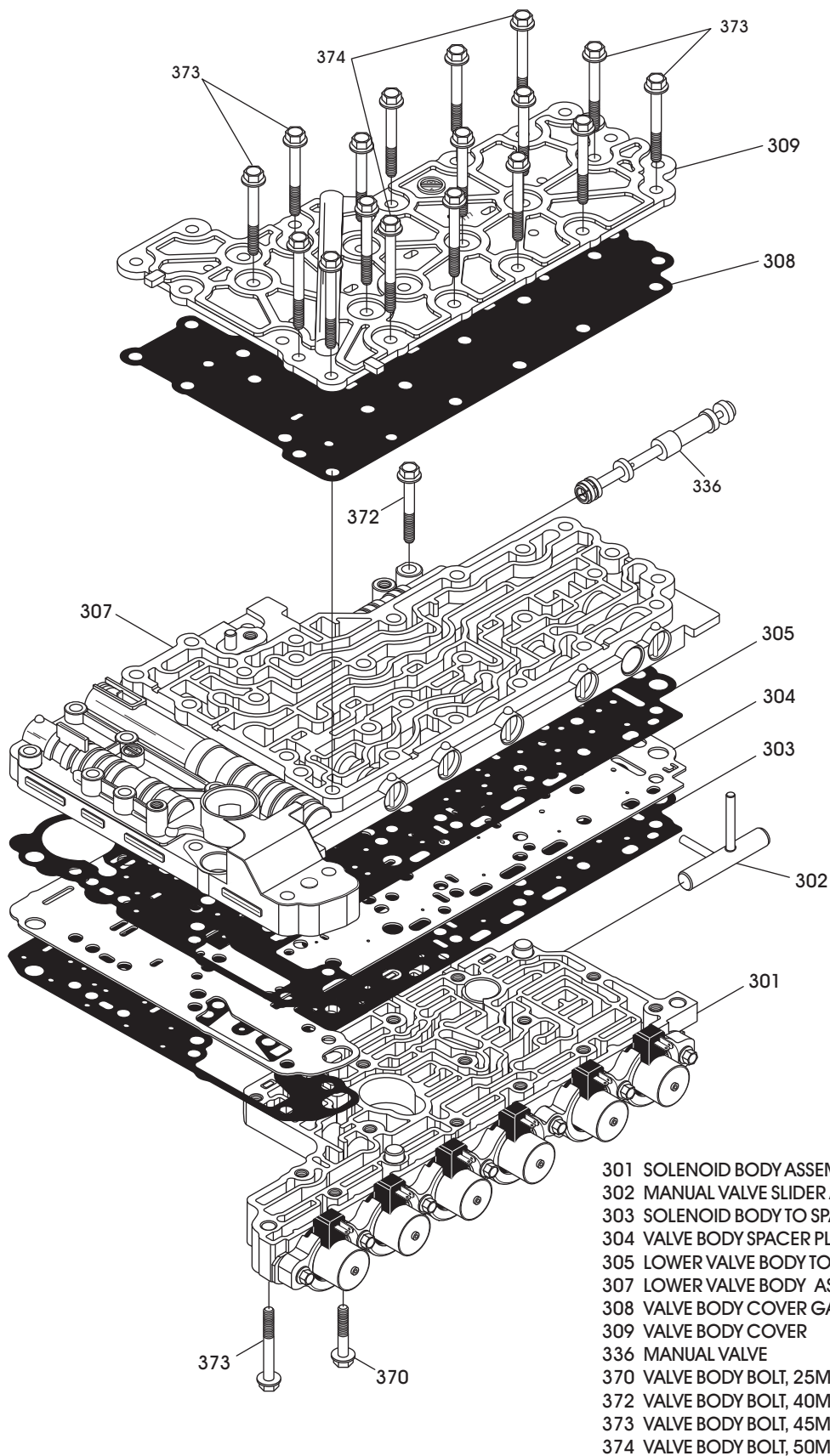


Figure 161

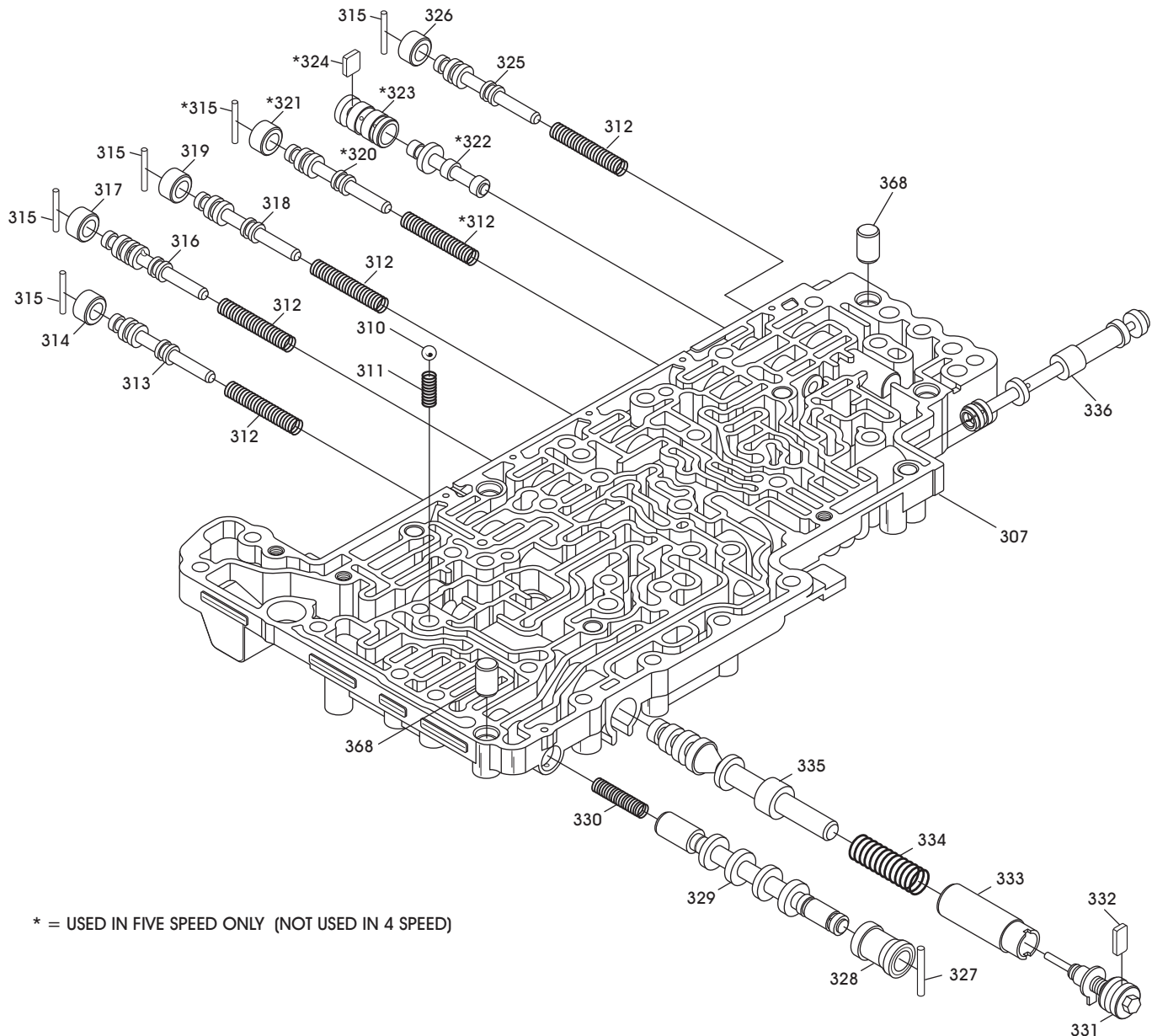
V5A51 VALVE BODY ASSEMBLY EXPLODED VIEW



Copyright © 2008 ATSG

Figure 162

V5A51 LOWER VALVE BODY EXPLODED VIEW



* = USED IN FIVE SPEED ONLY (NOT USED IN 4 SPEED)

- 307 LOWER VALVE BODY ASSEMBLY
- 310 LINE PRESSURE RELIEF BALL, (.250" STEEL)
- 311 LINE PRESSURE RELIEF BALL SPRING, (SEE SPRING SPEC'S)
- 312 VALVE RETURN SPRINGS, 5 REQUIRED (SEE SPRING SPECS)
- 313 OVERDRIVE CLUTCH PRESSURE CONTROL VALVE
- 314 OVERDRIVE CLUTCH PRESSURE CONTROL VALVE SLEEVE
- 315 VALVE RETAINING PIN, .097" DIA .854" LONG (5 REQUIRED)
- 316 UNDERDRIVE CLUTCH PRESSURE CONTROL VALVE
- 317 UNDERDRIVE CLUTCH PRESSURE CONTROL VALVE SLEEVE
- 318 2ND BRAKE CLUTCH PRESSURE CONTROL VALVE
- 319 2ND BRAKE CLUTCH PRESSURE CONTROL VALVE SLEEVE
- 320 REDUCTION BRAKE BAND PRESSURE CONTROL VALVE
- 321 REDUCTION BRAKE BAND PRESSURE CONTROL VALVE SLEEVE
- 322 FAIL-SAFE VALVE "C"
- 323 FAIL-SAFE VALVE "C" SLEEVE

- 324 FAIL-SAFE VALVE "C" SLEEVE RETAINER
- 325 LOW REVERSE BRAKE PRESSURE CONTROL VALVE
- 326 LOW REVERSE BRAKE PRESSURE CONTROL VALVE SLEEVE
- 327 TCC CONTROL VALVE RETAINING PIN, (.117 DIA. 1.012 LONG)
- 328 TCC CONTROL VALVE SLEEVE
- 329 TCC CONTROL VALVE
- 330 TCC CONTROL VALVE SPRING
- 331 PRESSURE REGULATOR VALVE ADJUSTING SCREW
- 332 PRESSURE REGULATOR VALVE RETAINER
- 333 PRESSURE REGULATOR VALVE SLEEVE
- 334 PRESSURE REGULATOR VALVE SPRING
- 335 PRESSURE REGULATOR VALVE
- 336 MANUAL VALVE
- 368 LONG, HOLLOW LOCATING DOWEL, (.509" IN LENGTH)

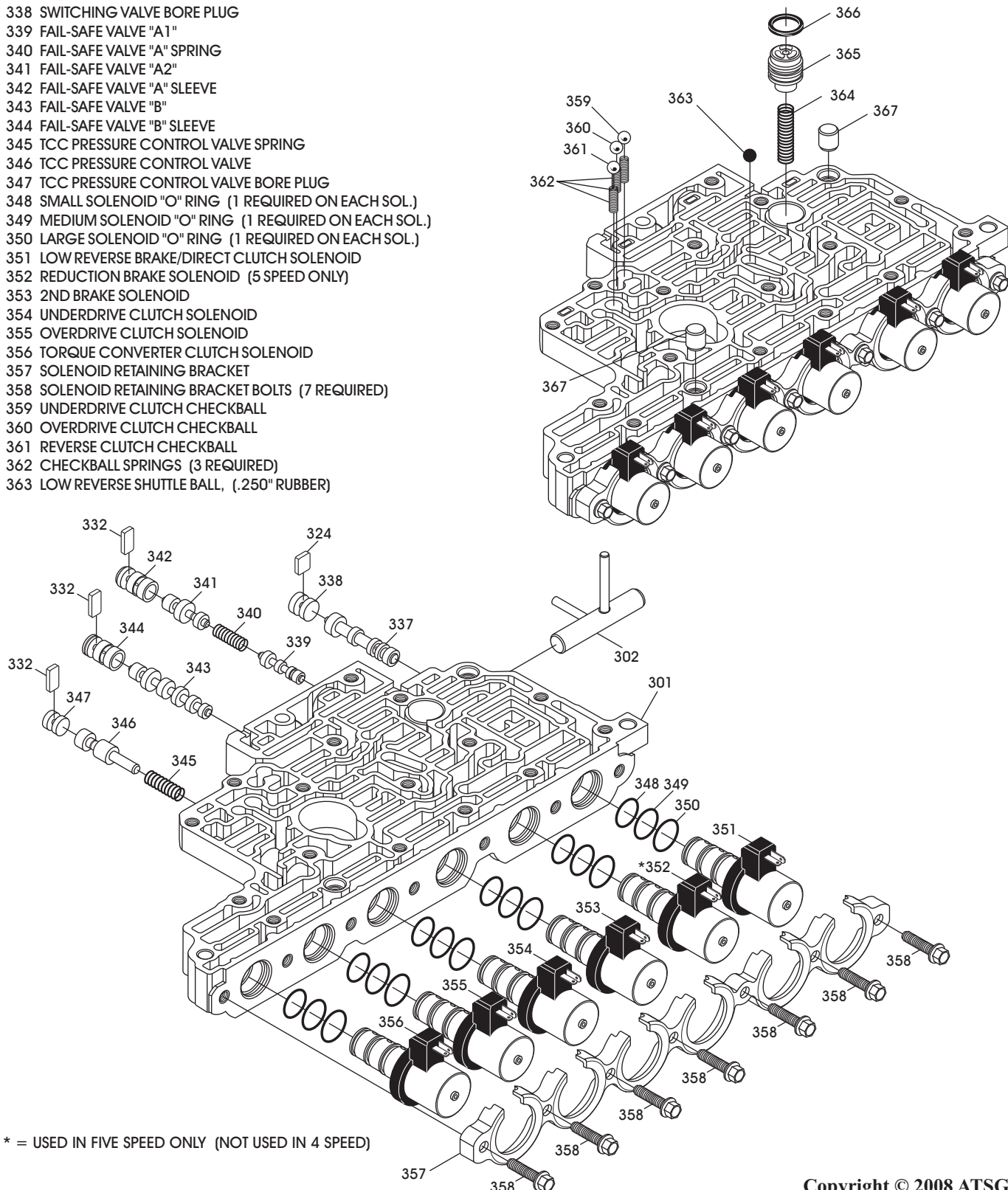
Copyright © 2008 ATSG

Figure 163

V5A51 SOLENOID BODY EXPLODED VIEW

- 301 SOLENOID BODY ASSEMBLY
- 302 MANUAL VALVE SLIDER ASSEMBLY
- 324 SWITCHING VALVE BORE PLUG RETAINER
- 332 VALVE RETAINER (3 REQUIRED)
- 337 SWITCHING VALVE
- 338 SWITCHING VALVE BORE PLUG
- 339 FAIL-SAFE VALVE "A1"
- 340 FAIL-SAFE VALVE "A" SPRING
- 341 FAIL-SAFE VALVE "A2"
- 342 FAIL-SAFE VALVE "A" SLEEVE
- 343 FAIL-SAFE VALVE "B"
- 344 FAIL-SAFE VALVE "B" SLEEVE
- 345 TCC PRESSURE CONTROL VALVE SPRING
- 346 TCC PRESSURE CONTROL VALVE
- 347 TCC PRESSURE CONTROL VALVE BORE PLUG
- 348 SMALL SOLENOID "O" RING (1 REQUIRED ON EACH SOL.)
- 349 MEDIUM SOLENOID "O" RING (1 REQUIRED ON EACH SOL.)
- 350 LARGE SOLENOID "O" RING (1 REQUIRED ON EACH SOL.)
- 351 LOW REVERSE BRAKE/DIRECT CLUTCH SOLENOID
- 352 REDUCTION BRAKE SOLENOID (5 SPEED ONLY)
- 353 2ND BRAKE SOLENOID
- 354 UNDERDRIVE CLUTCH SOLENOID
- 355 OVERDRIVE CLUTCH SOLENOID
- 356 TORQUE CONVERTER CLUTCH SOLENOID
- 357 SOLENOID RETAINING BRACKET
- 358 SOLENOID RETAINING BRACKET BOLTS (7 REQUIRED)
- 359 UNDERDRIVE CLUTCH CHECKBALL
- 360 OVERDRIVE CLUTCH CHECKBALL
- 361 REVERSE CLUTCH CHECKBALL
- 362 CHECKBALL SPRINGS (3 REQUIRED)
- 363 LOW REVERSE SHUTTLE BALL, (.250" RUBBER)

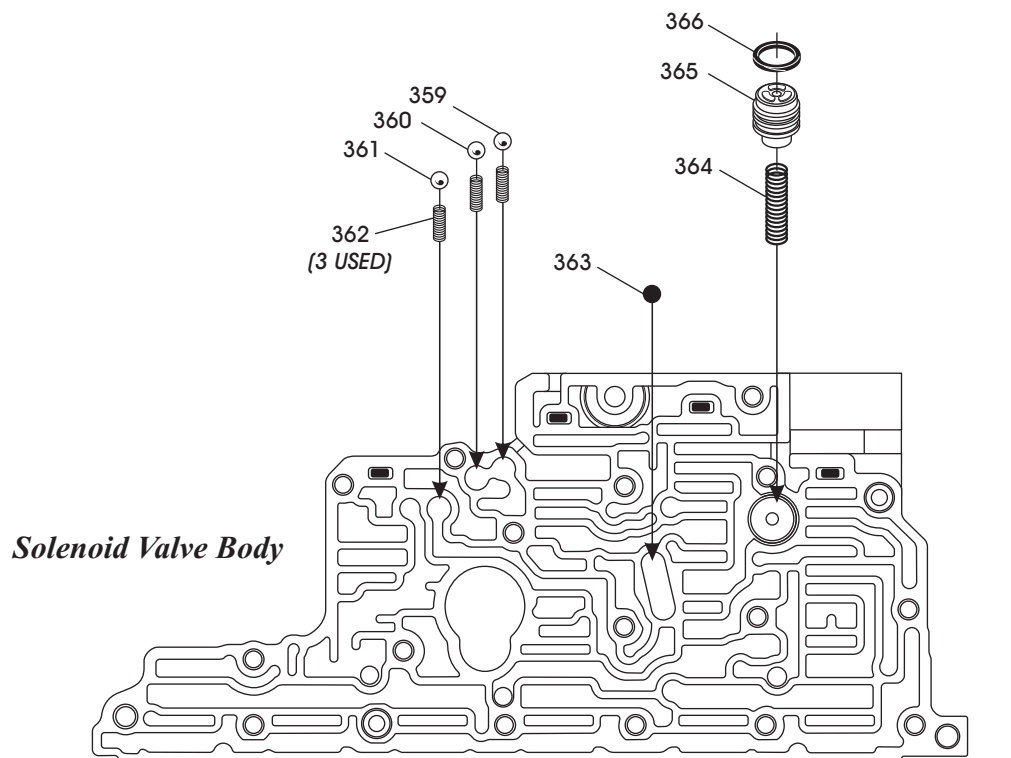
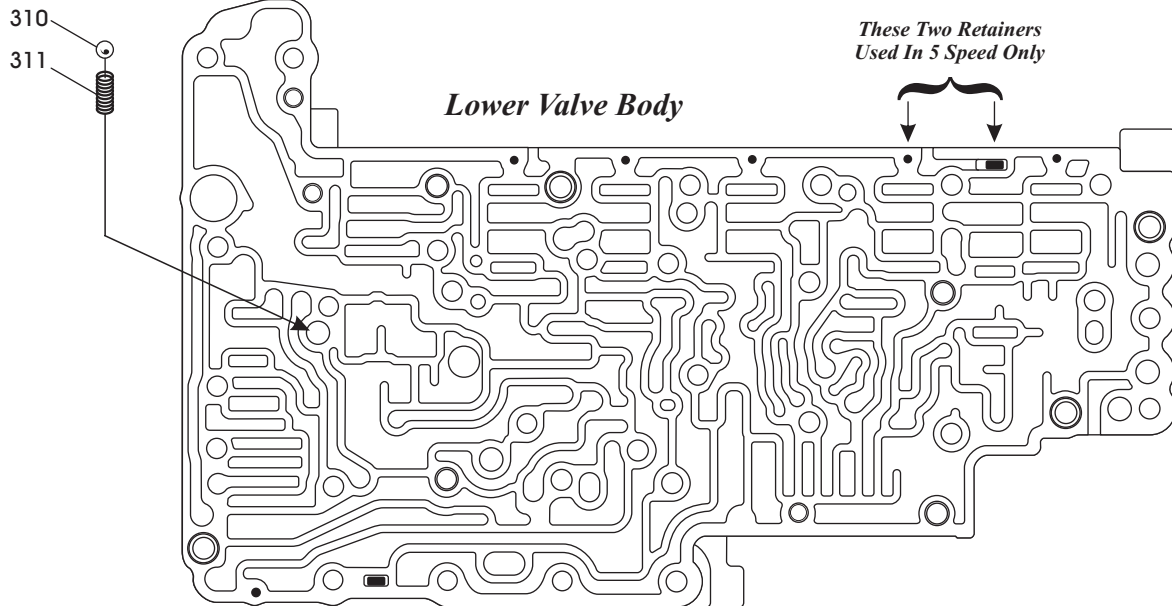
- 364 LOW REVERSE BRAKE ACCUMULATOR SPRING
- 365 LOW REVERSE BRAKE ACCUMULATOR
- 366 LOW REVERSE BRAKE ACCUMULATOR SCARF-CUT SEAL RING
- 367 SHORT, HOLLOW LOCATING DOWEL, (.351" IN LENGTH)



Copyright © 2008 ATSG

Figure 164

R/V4A51 & V5A 51 VALVE BODY CHECK BALL AND RETAINER LOCATIONS



310 LINE PRESSURE RELIEF BALL, .250" STEEL

311 LINE PRESSURE RELIEF SPRING

359 UNDERDRIVE CLUTCH BALL AND SPRING, 250" STEEL

360 OVERDRIVE CLUTCH BALL AND SPRING, 250" STEEL

361 REVERSE CLUTCH BALL AND SPRING, 250" STEEL

362 SPRING FOR 3 STEEL BALLS, ALL THE SAME

363 LOW/REVERSE SHUTTLE BALL, .250" RUBBER

364 LOW/REVERSE BRAKE ACCUMULATOR SPRING

365 LOW/REVERSE BRAKE ACCUMULATOR

366 LOW/REVERSE BRAKE ACCUM. "SCARF-CUT" SEAL RING

Copyright © 2008 ATSG

Figure 165

COMPONENT REBUILD

VALVE BODY ASSEMBLY

1. Disassemble the complete valve body using Figure 162 as a guide.
2. Clean all valve body parts thoroughly and dry with compressed air.
3. Inspect all valve body parts thoroughly for any wear and/or damage.
4. Disassemble the lower valve body and place the valves, springs and retainers on appropriate trays exactly as they were removed, as shown in Figure 163.

Note: Notice in Figure 163 that valve number 320 and 322, are not used in the 4 speed unit. Other than that, the 4 speed and 5 speed valve bodies are identical.

5. Clean all lower valve body parts thoroughly and dry with compressed air.
6. Inspect all lower valve body parts thoroughly for any wear and/or damage.

Note: Refer to Figure 166 for spring specs.

7. Assemble lower valve body parts *exactly*, as shown in Figure 163, and lube with the proper ATF as they are installed.

Note: Use a small amount of Trans-Jel® on flat retainers, to prevent them from falling out, as all valves are not spring loaded.

VALVE BODY SPRING SPECIFICATIONS

SPRING NUMBER 311 Free Length = .672" Spring Diameter = .275" Wire Diameter = .039" Approx Coils = 10	SPRING NUMBER 340 Free Length = .862" Spring Diameter = .349" Wire Diameter = .027" Approx Coils = 9
SPRING NUMBER 312 (5 USED IN FIVE SPEED) (4 USED IN FOUR SPEED) Free Length = 1.470" Spring Diameter = .299" Wire Diameter = .027" Approx Coils = 24	SPRING NUMBER 345 Free Length = 1.175" Spring Diameter = .440" Wire Diameter = .063" Approx Coils = 10
SPRING NUMBER 330 Free Length = 1.094" Spring Diameter = .232" Wire Diameter = .028" Approx Coils = 19	SPRING NUMBER 362 (3) Free Length = .600" Spring Diameter = .176" Wire Diameter = .020" Approx Coils = 14
SPRING NUMBER 334 Free Length = 1.767" Spring Diameter = .520" Wire Diameter = .070" Approx Coils = 13	SPRING NUMBER 364 Free Length = 1.410" Spring Diameter = .302" Wire Diameter = .039" Approx Coils = 17

Copyright © 2008 ATSG

Figure 166

8. Disassemble the solenoid body and place the valves, springs and retainers on appropriate trays exactly as they were removed, as shown in Figure 164.

Note: Notice in Figure 164 that the reduction band solenoid (352) is not used in the 4 speed units. Other than that the 4 speed and 5 speed solenoid bodies are identical.

9. Clean all solenoid body parts thoroughly and dry with compressed air.
10. Inspect all solenoid body parts thoroughly for any wear and/or damage.

Note: Refer to Figure 166 for spring specs. Refer to Page 8 for solenoid resistance, and to Page 9 for solenoid testing.

11. Install new solenoid to solenoid body casting seal, as shown in Figure 167, on all solenoids.

Note: These solenoid seals are included in the gasket and seal package from Trans-Tec®.

12. Install 3 new "O" rings on each solenoid, as shown in Figure 167, and notice there are three different sizes for each solenoid.

13. Assemble the solenoid body parts *exactly*, as shown in Figure 164, and lube with the proper ATF as they are installed.

Note: Use a small amount of Trans-Jel® on flat retainers, to prevent them from falling out, as all valves are not spring loaded.

14. Torque the solenoid retaining bracket bolts to 7 N•m (62 in.lb.).

Continued on Page 93

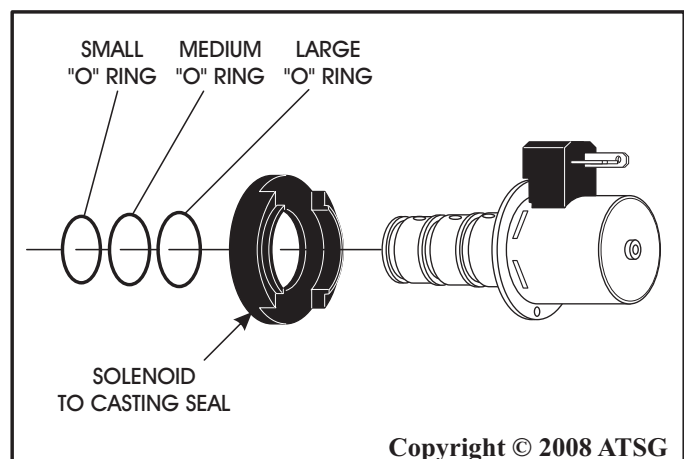


Figure 167

COMPONENT REBUILD

VALVE BODY ASSEMBLY (CONT'D)

15. Install two long, hollow locating dowels in the locations shown in Figure 168.
16. Install line pressure relief spring and ball in the location shown in Figure 165 and 168.
17. Install spacer plate to lower valve body gasket over locating dowels, as shown in Figure 168.
18. Install the valve body spacer plate, as shown in Figure 168, install retaining bolt and torque to 7 N•m (62 in.lb.).

Note: *This unit has a reputation for blowing valve body gaskets. We have reports of techs eliminating the gaskets with great success. Ensure that you have "Flat" worm track surfaces if you decide to eliminate gaskets.*

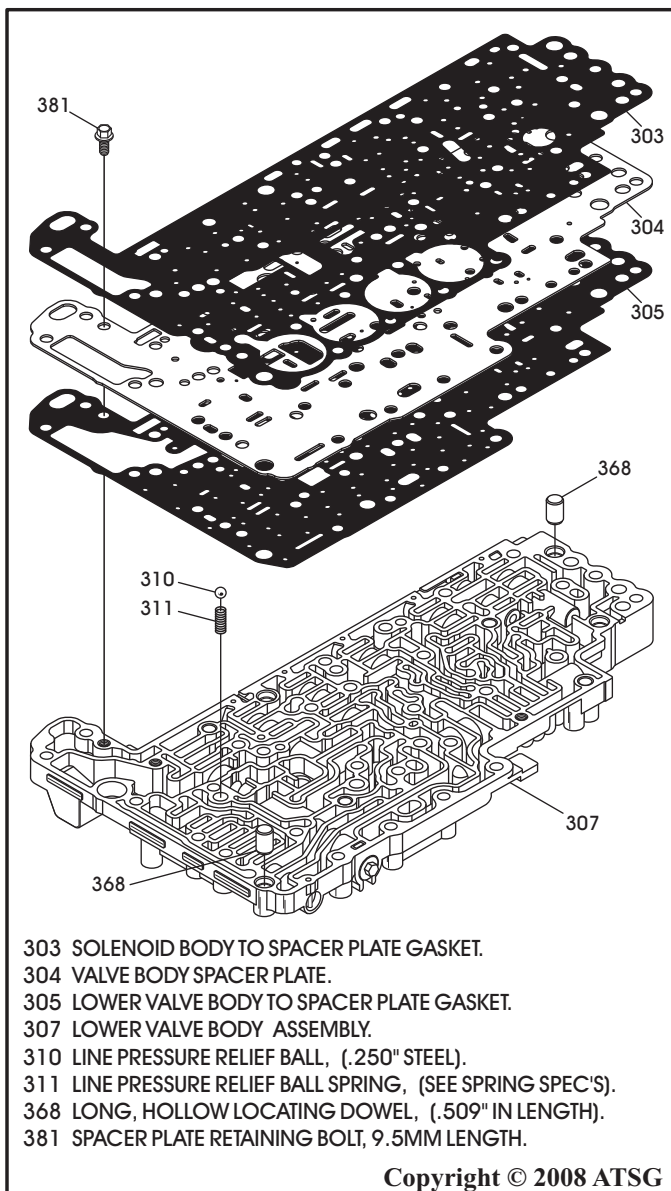


Figure 168

19. Install the spacer plate to solenoid body gasket as shown in Figure 168.
20. Install two short, hollow locating dowels into the solenoid body, as shown in Figure 169.
21. Install a new Teflon scarf-cut seal on the low reverse brake accumulator piston, as shown in Figure 169.
22. Install the low reverse accumulator spring and piston into the solenoid body, as shown in Figure 169.
23. Install the rubber check ball in the location shown in Figure 165 and 169.
24. Install the 3 springs and 3 steel check balls, as shown in Figure 165 and 169.

Continued on Page 94

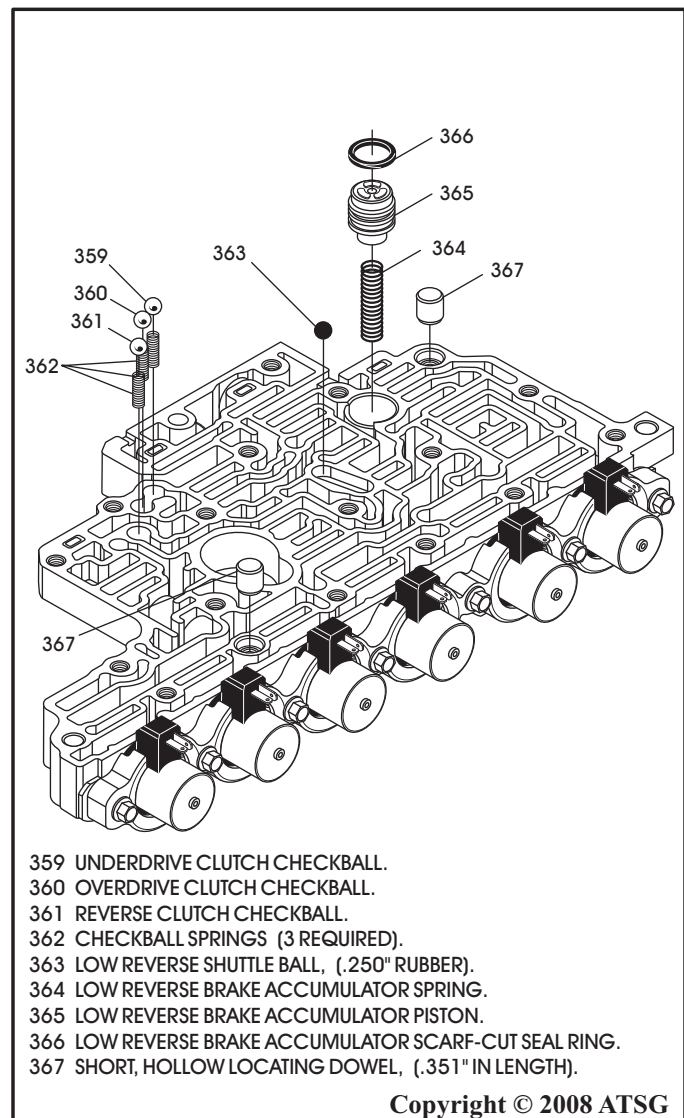


Figure 169

COMPONENT REBUILD

VALVE BODY ASSEMBLY (CONT'D)

25. With completed solenoid body on a flat work surface, install the lower valve body over the locating dowels, as shown in Figure 170.
26. Install non-plated, 40mm length valve body bolt, as shown in Figure 170, and torque to 11 N•m (97 in.lb.).
27. Turn the valve body assembly over and install one non-plated, 25mm length and 1 non-plated 45mm length valve body bolt, in the locations shown in Figure 171, and torque both bolts to 11 N•m (97 in.lb.).
28. Install the manual valve slider and the manual valve, as shown in Figure 172.
29. Install manual valve first and then the slider.
Note: *The slider must be rotated to engage the manual valve, and then moved into the bores as a pair, as shown in Figure 173.*

Continued on Page 95

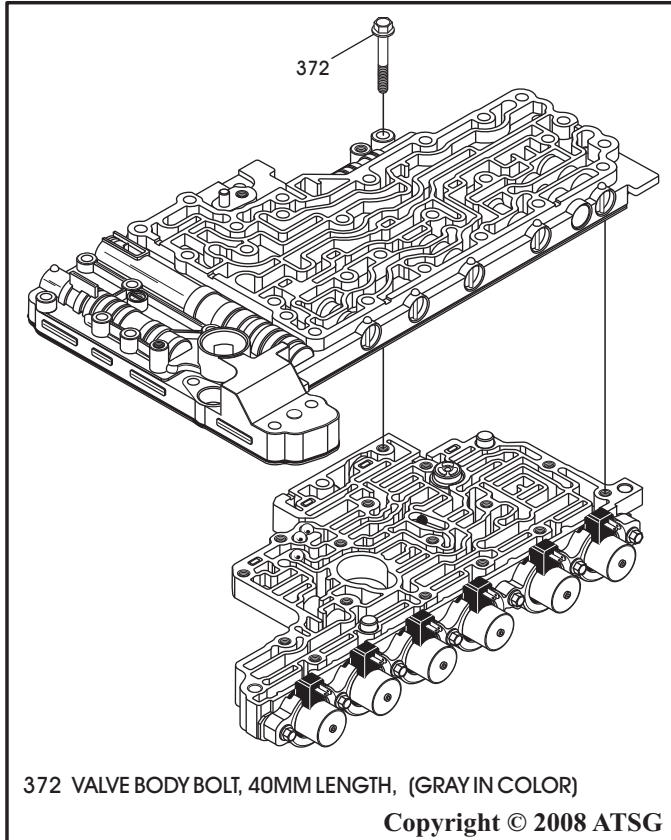


Figure 170

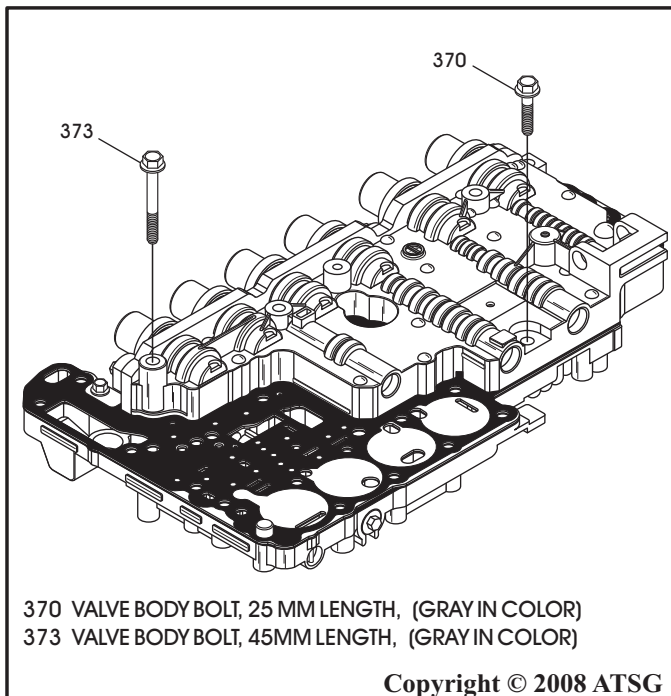


Figure 171

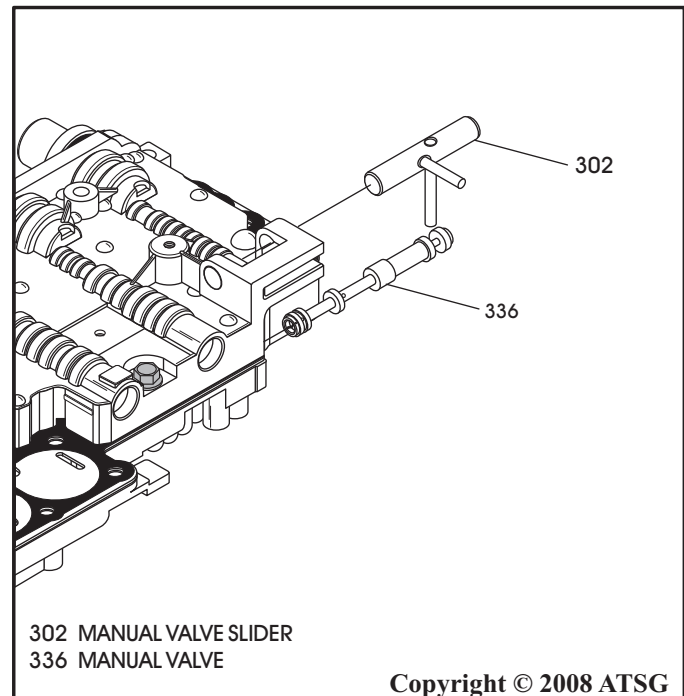


Figure 172

COMPONENT REBUILD

VALVE BODY ASSEMBLY (CONT'D)

29. Install the valve body cover gasket, as shown in Figure 174.
30. Install the valve body cover, as shown in Figure 174.
31. Install the valve body cover bolts, as shown in Figure 174.
32. There are 17 valve body cover bolts required at this time, two 50mm length and fifteen 45mm length, as shown in Figure 174.
Note: Refer to the valve body bolt chart in Figure 176 for the specific locations.
33. Torque the 17 valve body cover bolts to 11 N•m (97 in.lb.).
34. Set the completed valve body assembly aside for the final assembly process, as shown in Figure 177.

Continued on Page 96

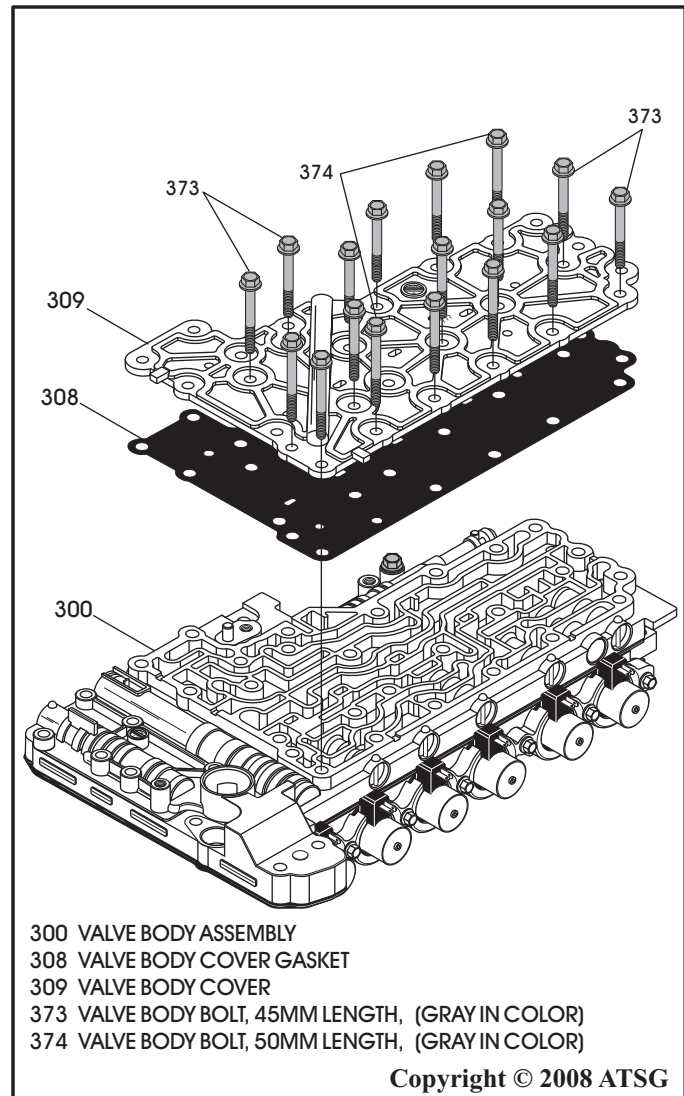


Figure 174

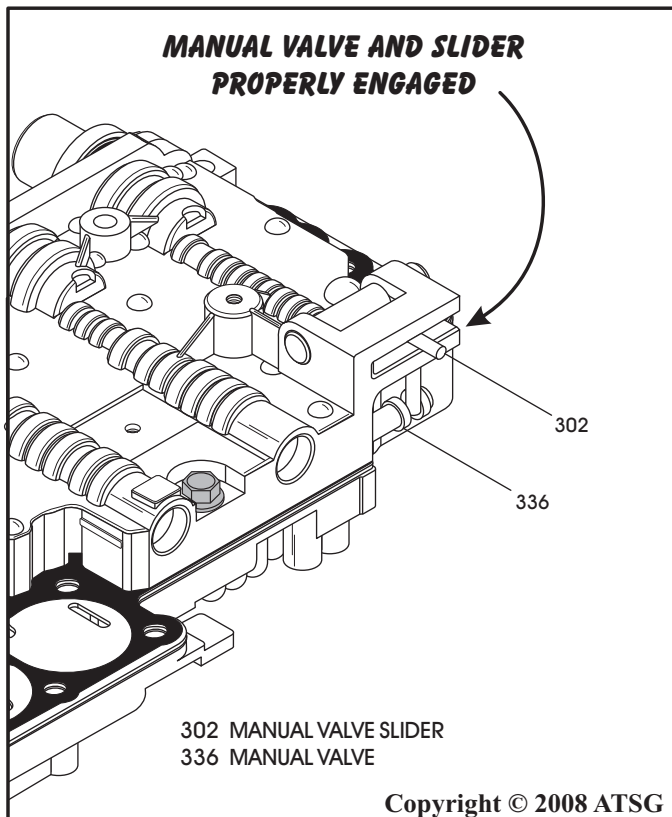


Figure 173

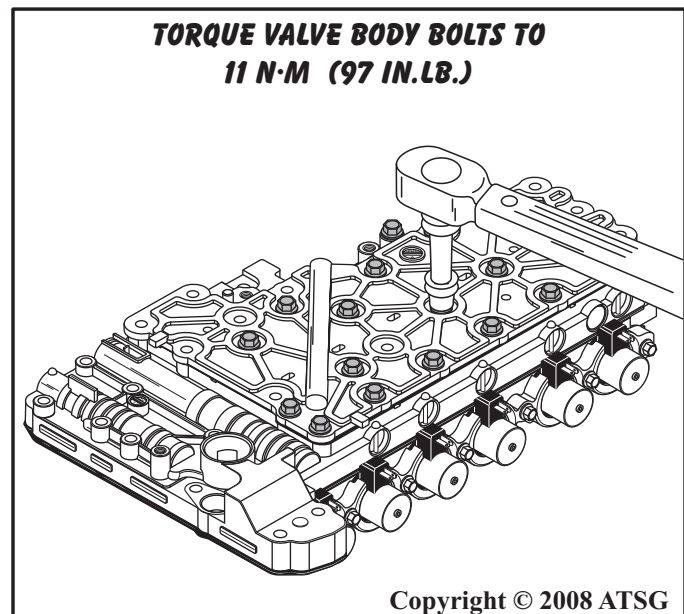
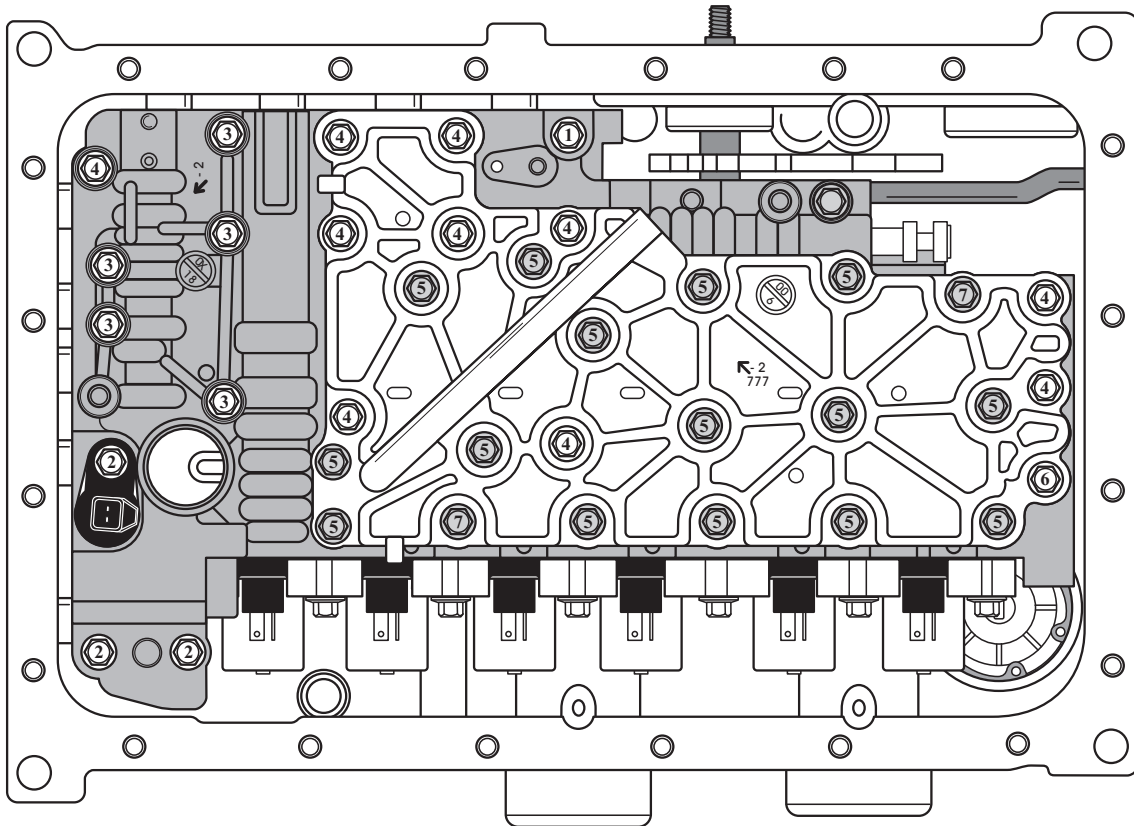


Figure 175



Valve Body Retaining Bolt Location Chart

ID Number	Length In MM (Inch)	Color
1	25mm (.984")	Gold or Brass
2	30mm (1.181")	Gold or Brass
3	40mm (1.574")	Gold or Brass
4	45mm (1.772")	Gold or Brass
6	55mm (2.165")	Gold or Brass

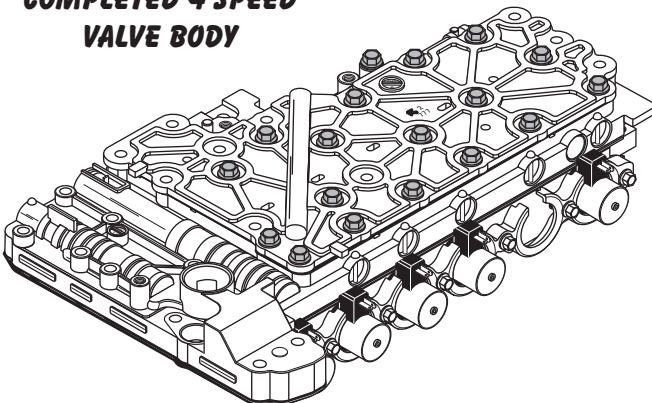
Valve Body Cover Bolt Location Chart

ID Number	Length In MM (Inch)	Color
5	50mm (1.968")	Gray or Black
7	45mm (1.772")	Gray or Black

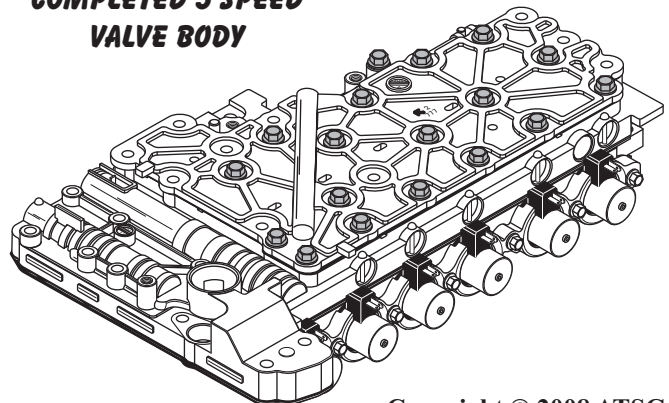
Copyright © 2008 ATSG

Figure 176

**COMPLETED 4 SPEED
VALVE BODY**



**COMPLETED 5 SPEED
VALVE BODY**



Copyright © 2008 ATSG

Figure 177

TRANSMISSION ASSEMBLY

"4 SPEED" INTERNAL COMPONENTS

Below the center support, the assembly process changes between the 4 speed and 5 speed units. This of course is because of the added reduction planetary, reduction band, direct clutch and direct sprag, all in the rear of case.

We will begin here with the 4 speed assembly below the center support, as shown in Figure 178.

The 5 speed assembly below the center support begins on Page 100.

Continued on Page 98

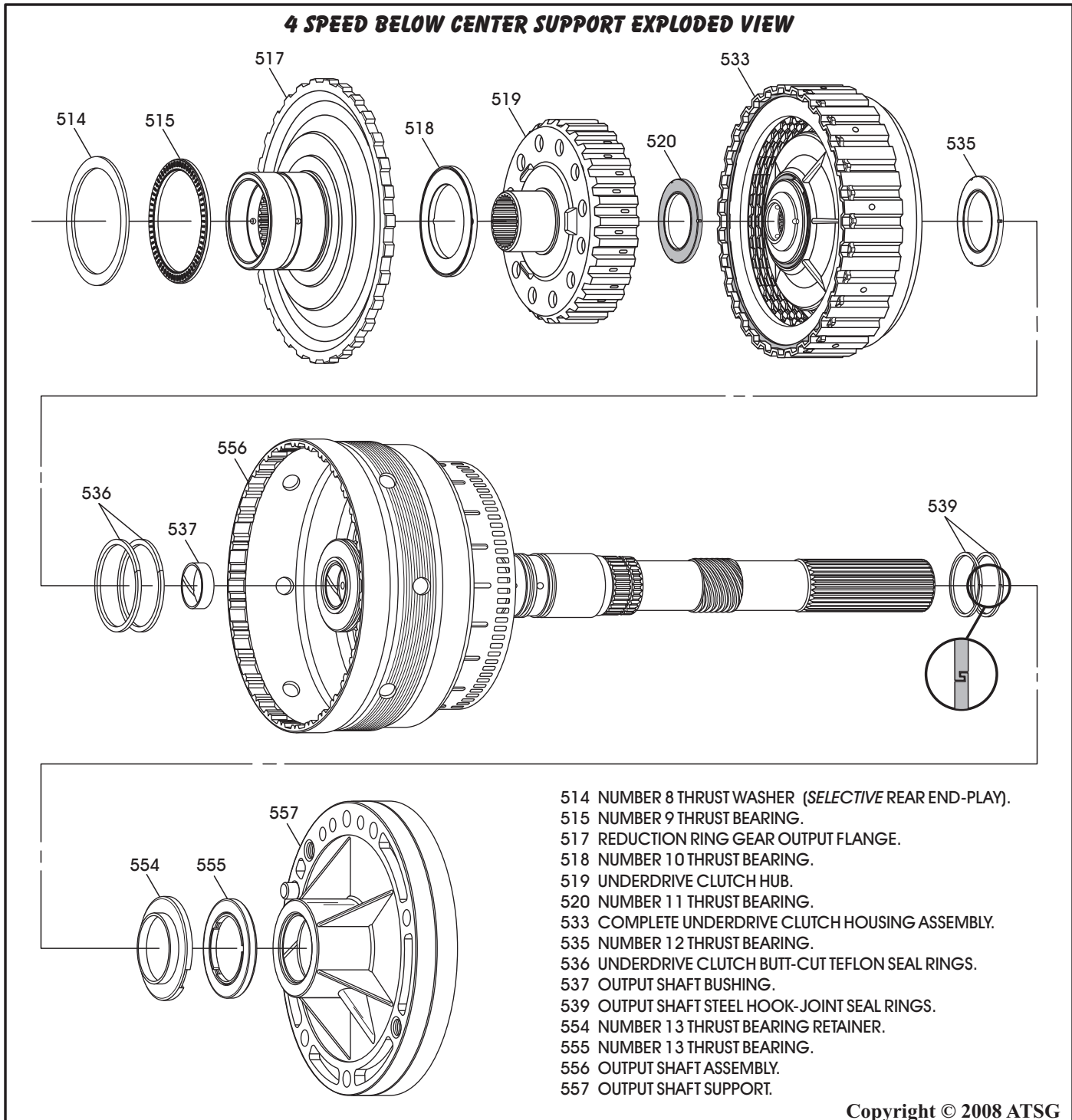


Figure 178

TRANSMISSION ASSEMBLY

"4 SPEED" INTERNAL COMPONENTS (CONT'D)

1. Install a new rear support to case gasket, as shown in Figure 179.
2. Install 4 speed output shaft support, as shown in Figure 179.
3. Install the eight rear support retaining bolts, as shown in Figure 179.
4. Torque the eight rear support retaining bolts to 23 N•m (17 ft.lb.).

5. Install the completed output shaft ensuring that number 13 thrust bearing and retainer are still in place, as shown in Figure 180.

Note: This would be a very good time to verify the speedometer tooth count compared with the chart on Page 49.

Continued on Page 99

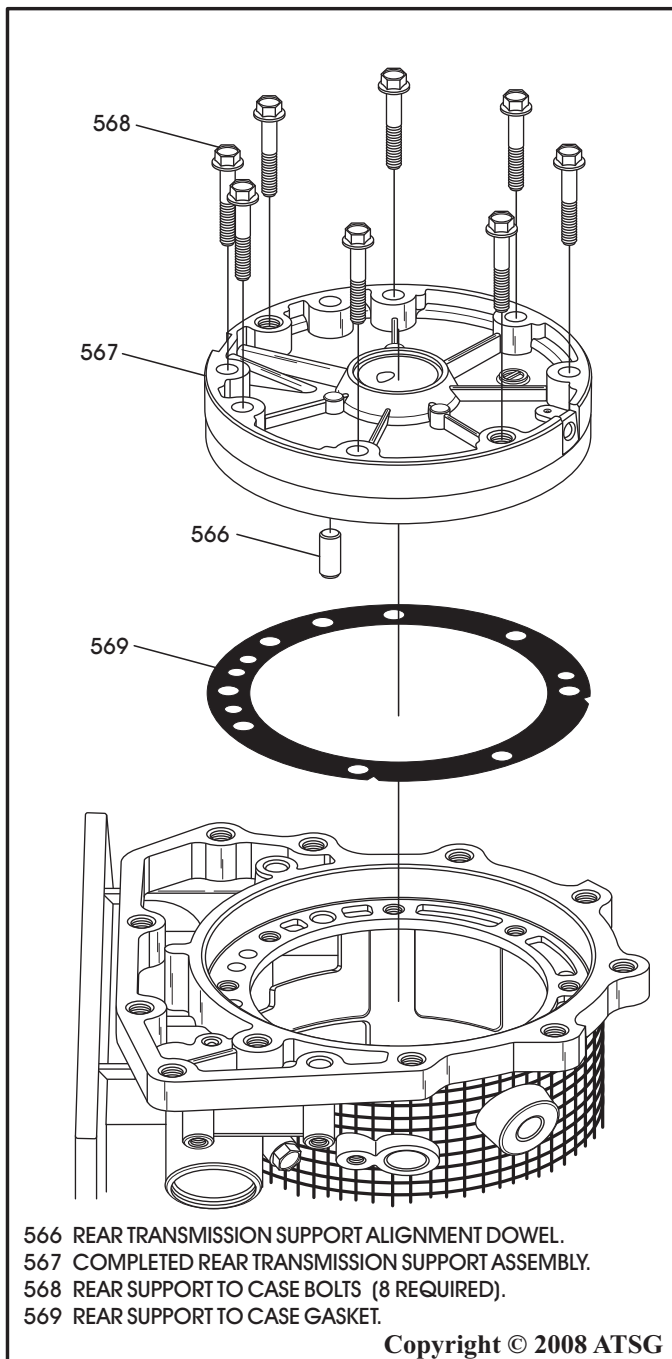


Figure 179

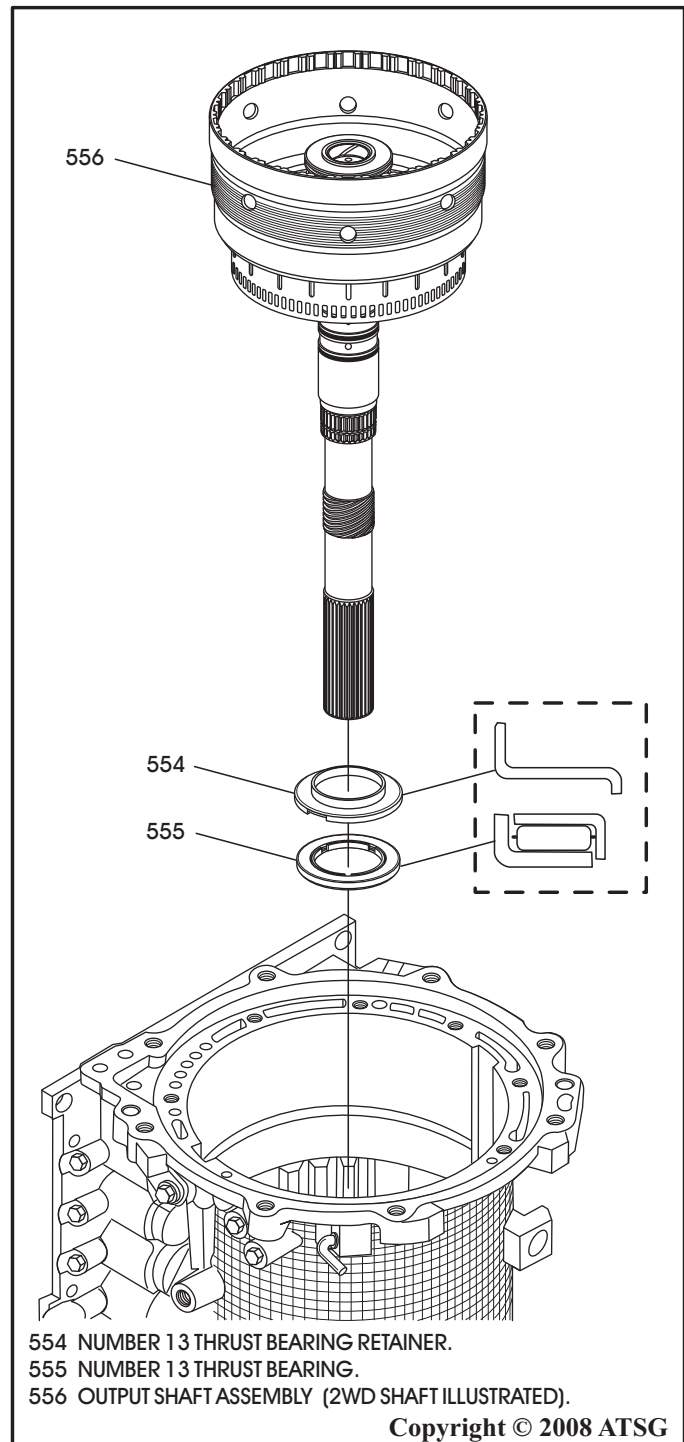


Figure 180

TRANSMISSION ASSEMBLY

"4 SPEED" INTERNAL COMPONENTS (CONT'D)

6. Verify that the number 12 thrust bearing is still in place on the output shaft (See Figure 181).
7. Install completed underdrive clutch housing, as shown in Figure 181.
8. Install the number 11 thrust bearing onto the underdrive clutch housing and retain with a small amount of Trans-Jel® (See Figure 181).

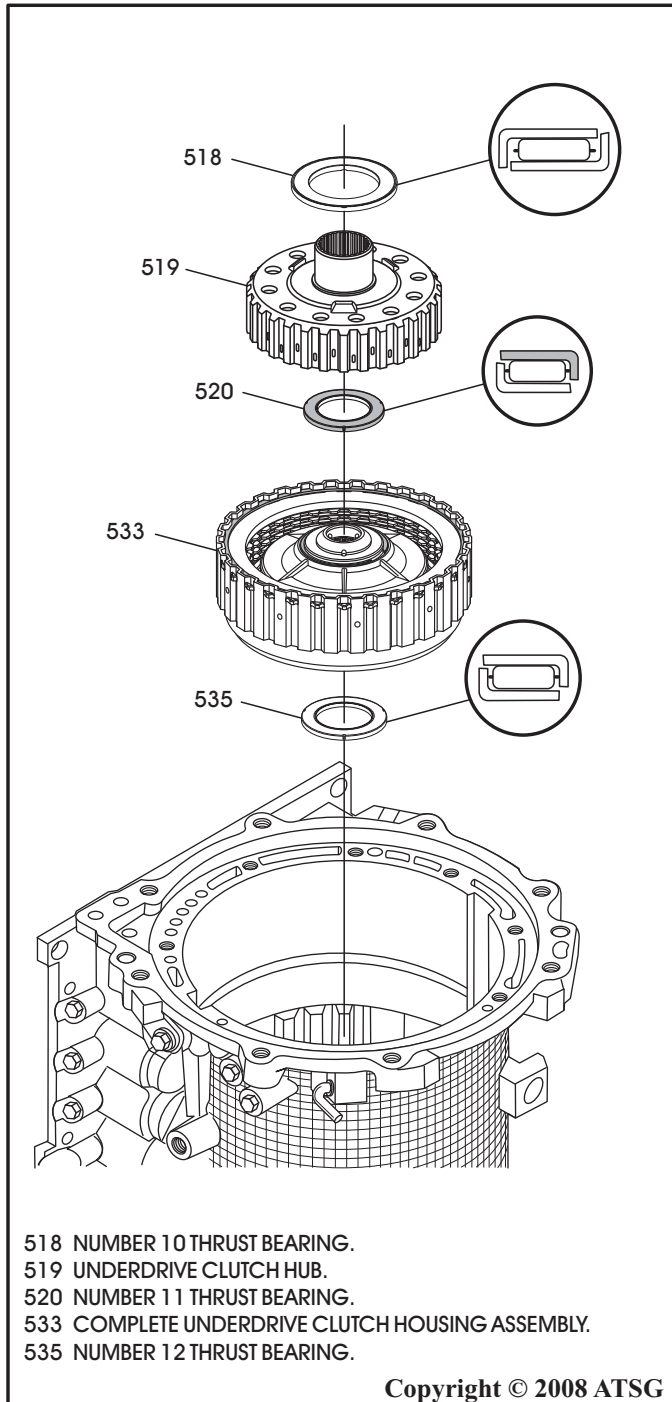


Figure 181

9. Install the underdrive clutch hub, as shown in Figure 181, by rotating back and forth until it is fully seated.
10. Install the number 10 thrust bearing onto the underdrive clutch hub, as shown in Figure 181.
11. Install the output flange into the splines of the output shaft, as shown in Figure 182.
12. Install the number 9 thrust bearing over the hub of the output flange, as shown in Figure 182.
13. Install the number 8 selective thrust washer on top of the number 9 thrust bearing, as shown in Figure 182.

Note: You are now ready to check rear end clearance and install center support which is the same for both units and will be covered under the 5 speed section.

Continued on Page 100

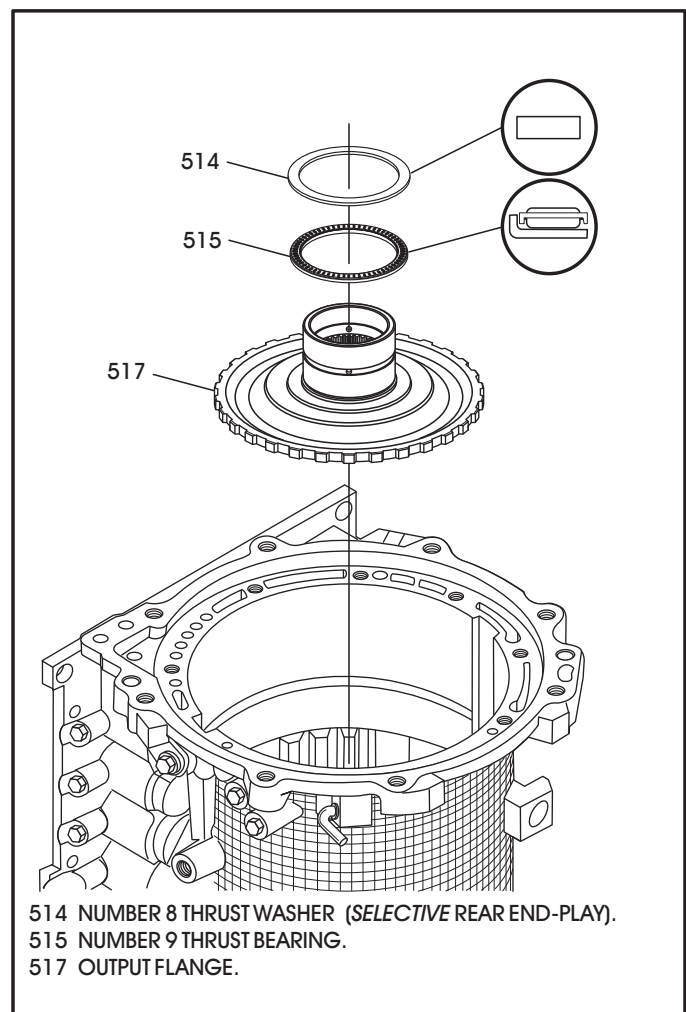


Figure 182

TRANSMISSION ASSEMBLY

"5 SPEED" INTERNAL COMPONENTS

Below the center support, the assembly process changes between the 4 speed and 5 speed units. This of course is because of the added reduction planetary, reduction band, direct clutch and direct sprag, all in the rear of case.

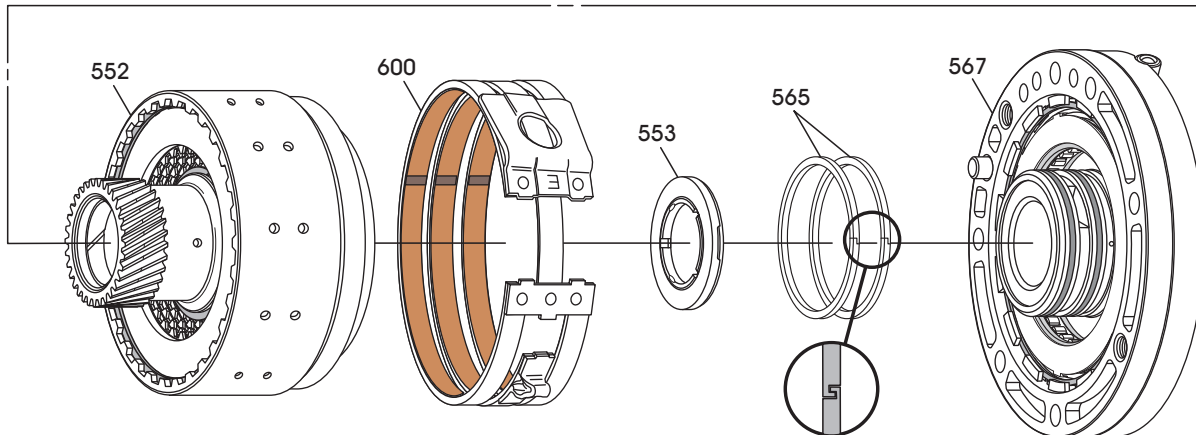
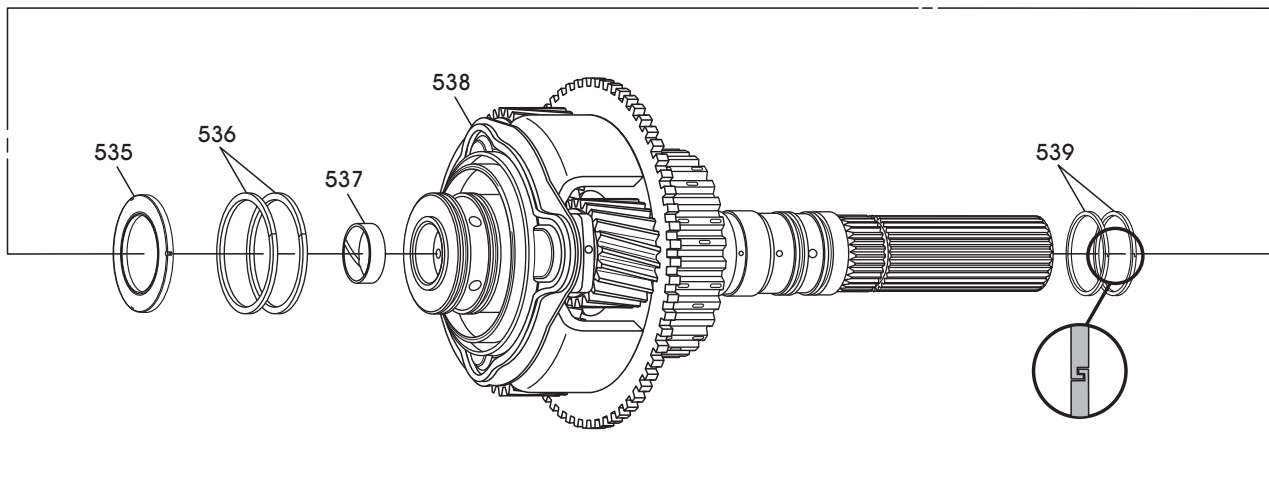
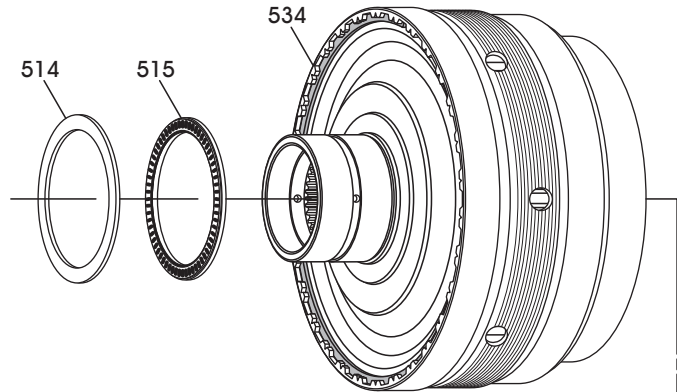
We will begin here with the 5 speed assembly below the center support, as shown in Figure 183.

The 4 speed assembly below the center support begins on Page 98.

Continued on Page 101

5 SPEED BELOW CENTER SUPPORT EXPLODED VIEW

- 514 NUMBER 8 THRUST WASHER (SELECTIVE REAR END-PLAY).
- 515 NUMBER 9 THRUST BEARING.
- 534 REDUCTION ANNULUS AND UNDERDRIVE CLUTCH ASSEMBLY.
- 535 NUMBER 12 THRUST BEARING.
- 536 UNDERDRIVE CLUTCH BUTT-CUT TEFLON SEAL RINGS.
- 537 OUTPUT SHAFT BUSHING.
- 538 REDUCTION PLANETARY CARRIER AND OUTPUT SHAFT.
- 539 OUTPUT SHAFT STEEL HOOK-JOINT SEAL RINGS.
- 552 COMPLETE DIRECT CLUTCH HOUSING.
- 553 NUMBER 13 THRUST BEARING.
- 565 DIRECT CLUTCH STEEL HOOK-JOINT SEALING RINGS.
- 567 OUTPUT SHAFT SUPPORT AND DIRECT SPRAG ASSEMBLY.
- 600 REDUCTION BAND ASSEMBLY.



Copyright © 2008 ATSG

Figure 183

TRANSMISSION ASSEMBLY

"5 SPEED" INTERNAL COMPONENTS (CONT'D)

1. Install a new rear support to case gasket, as shown in Figure 184.
2. Install 5 speed output shaft support, as shown in Figure 184.
3. Install the eight rear support retaining bolts, as shown in Figure 184.
4. Torque the eight rear support retaining bolts to 23 N•m (17 ft.lb.).

5. Install the reduction band into case, as shown in Figure 185, and ensure it is engaged on the band anchor plug.
6. Ensure that number 13 thrust bearing is still stuck in place, in the direct clutch housing, as shown in Figure 185, and install direct clutch housing by rotating clockwise into the case.
7. Rotate the direct clutch housing and ensure that it is fully seated on rear support.

Note: The direct clutch housing should freewheel clockwise and lock in the opposite direction after fully seated.

Continued on Page 102

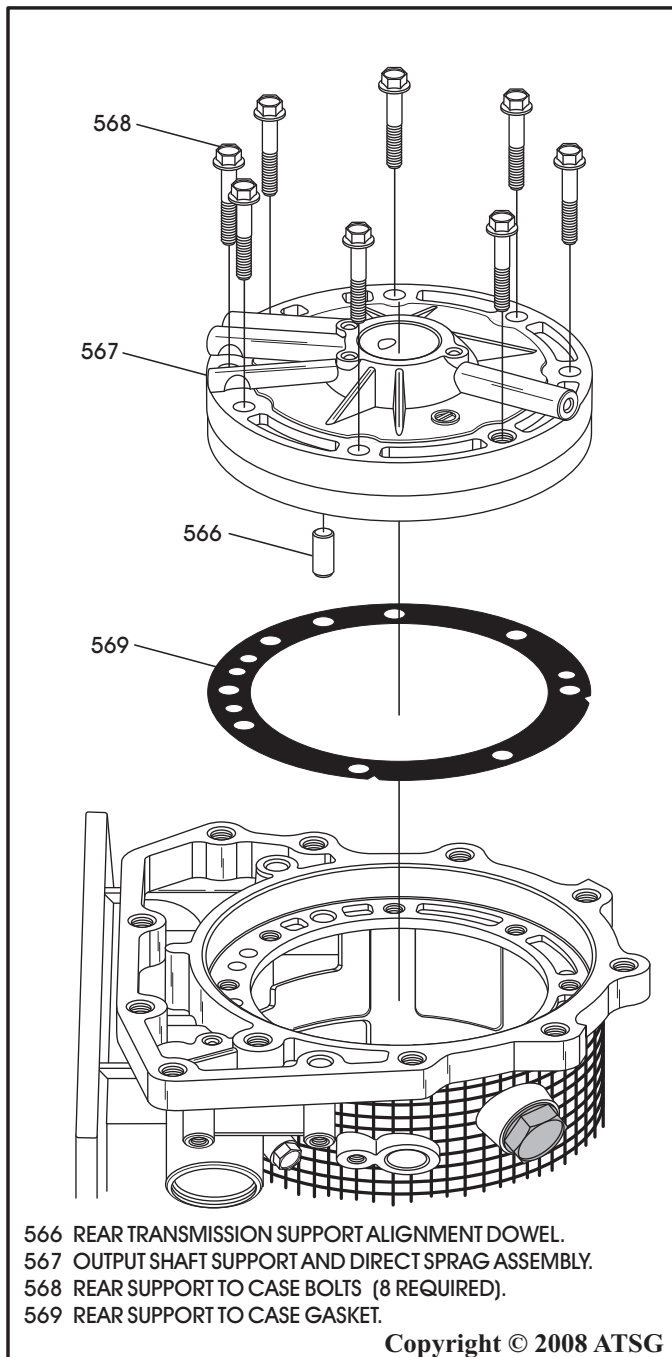


Figure 184

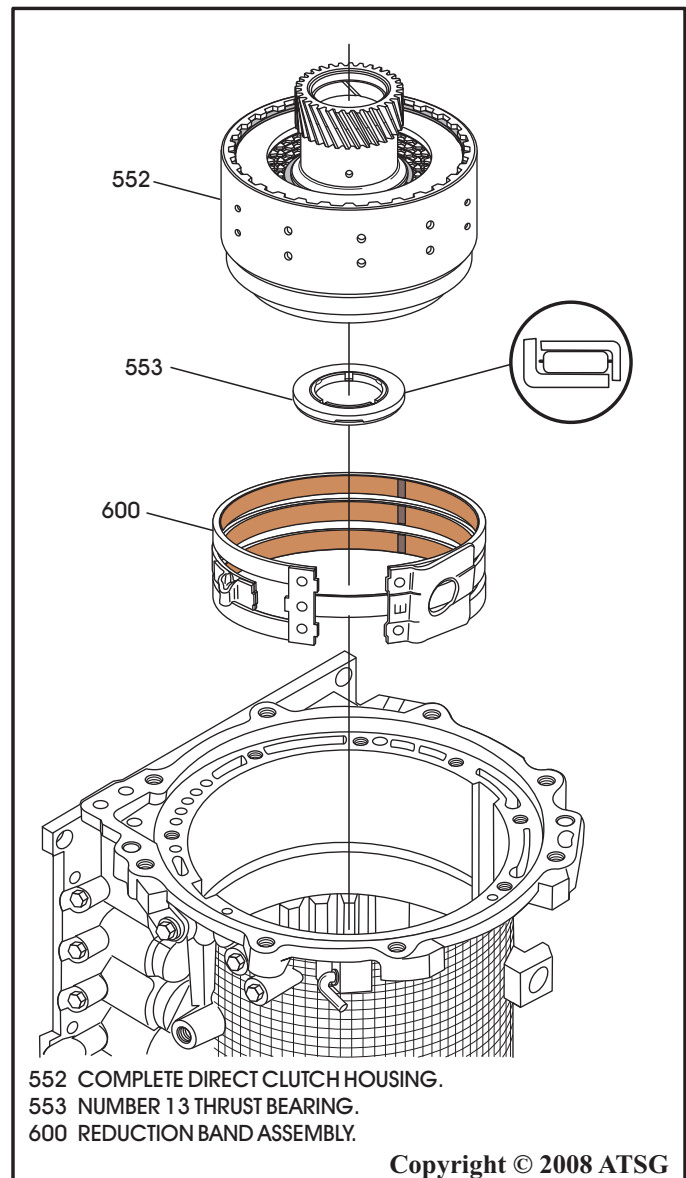


Figure 185

TRANSMISSION ASSEMBLY

"5 SPEED" INTERNAL COMPONENTS (CONT'D)

8. Ensure the number 12 thrust bearing is still in place on top of the reduction carrier, as shown in Figure 186, and install the reduction carrier by rotating back and forth, to engage all direct clutch plates, until fully seated.

Note: Ensure that all direct clutch plates are engaged on direct hub and planetary gears are engaged with sun gear on direct clutch housing and that it is fully seated.

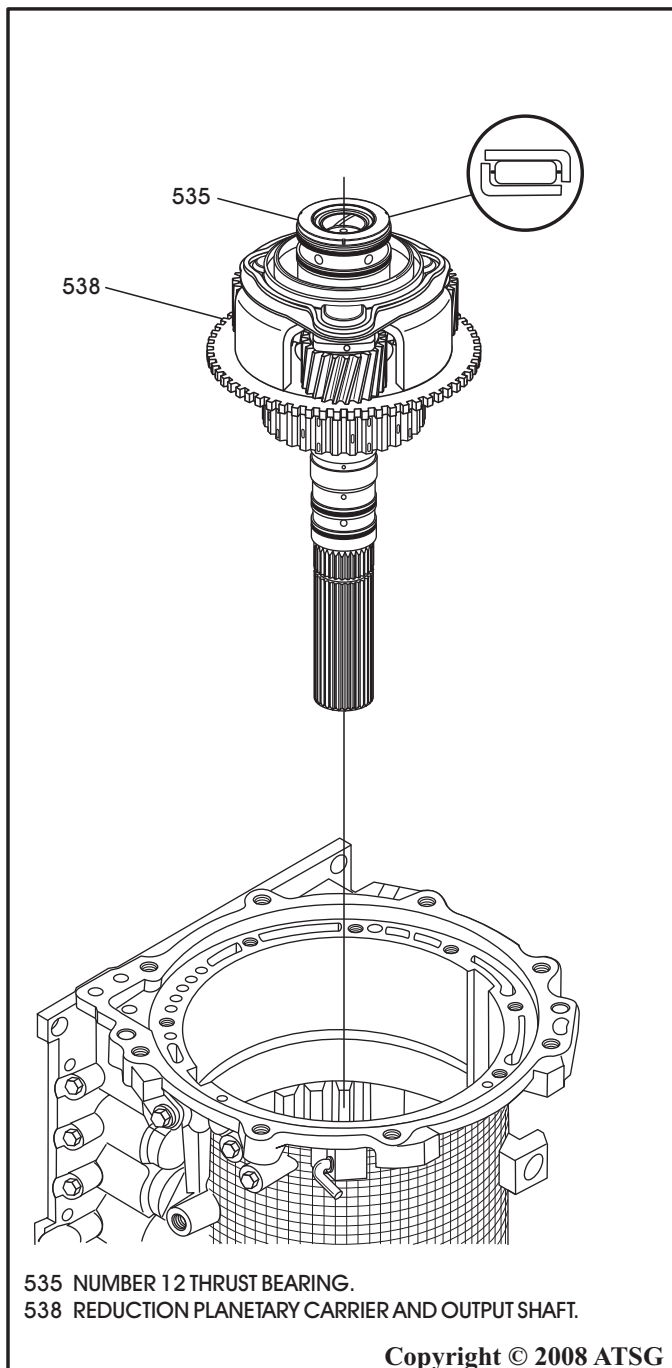


Figure 186

9. Install the completed reduction annulus and underdrive clutch assembly in case, as shown in Figure 187, by rotating back and forth to engage the ring gear onto reduction carrier.

Note: Use care so as not to damage Teflon underdrive clutch sealing rings.

10. Install the number 9 thrust bearing, as shown in Figure 187.

11. Install the number 8 selective thrust washer, as shown in Figure 187.

Note: From here to the pump installation the procedures are the same for both 4 Speed and 5 Speed units.

12. We are now ready to install the center support and check rear end-play.

Continued on Page 103

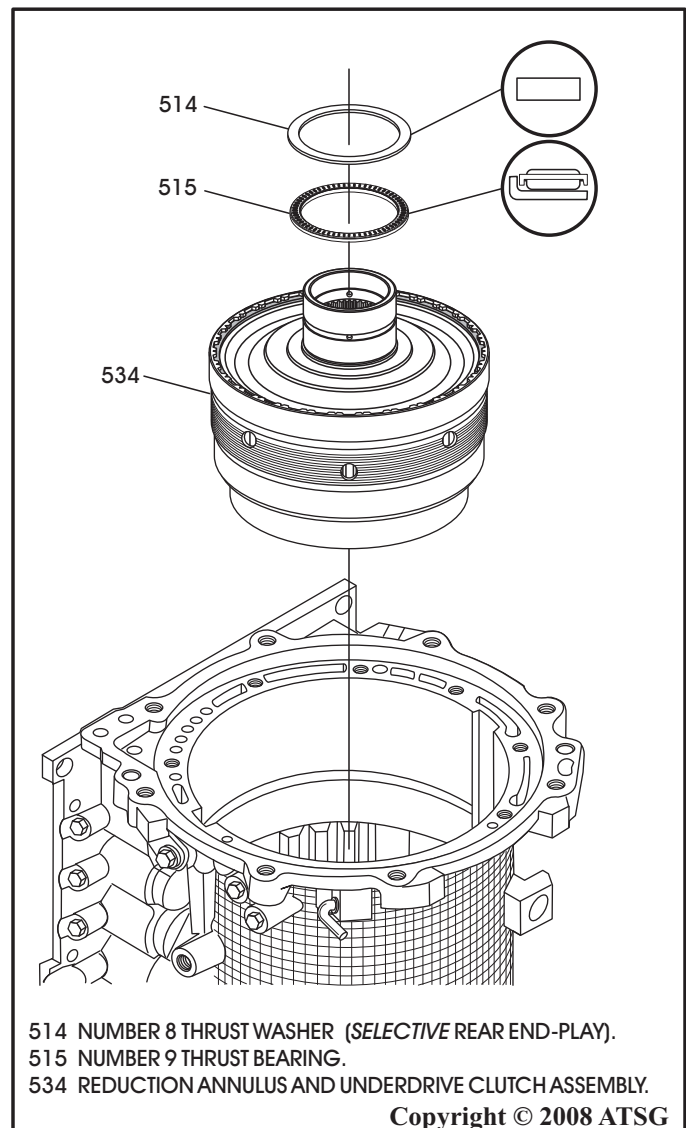


Figure 187

TRANSMISSION ASSEMBLY

"5 SPEED" INTERNAL COMPONENTS (CONT'D)

13. Install *only* the center support snap ring and measure with a feeler gauge between snap ring and the case groove, and remove snap ring.
14. Center support snap ring clearance should be zero to 0.16mm (zero to .006").
15. Change center support snap ring as necessary to obtain the proper clearance, using the chart in Figure 189.
16. Install the completed center support assembly, as shown in Figure 188, and install snap ring selected in step 15.
17. Choose a bushing driver that will fit into the output flange, as shown in Figure 190.
18. Install dial indicator, as shown in Figure 190, and zero the indicator.
19. Move the output shaft up and down to measure the amount of rear end-play, using screwdriver through the OSS hole in case.
20. Rear end-play should be 0.25-0.71mm (.009" - .027").

Continued on Page 104

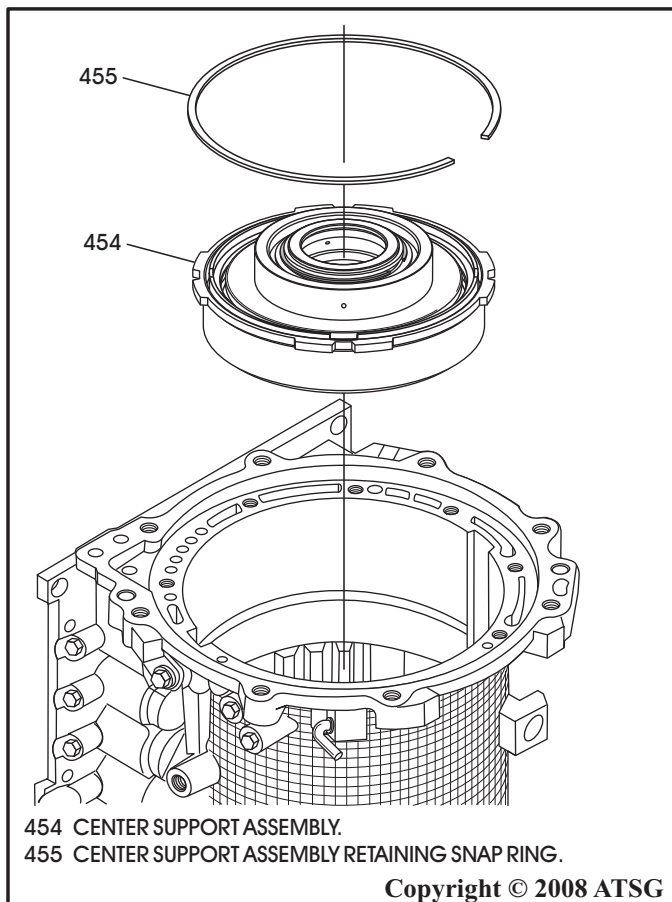


Figure 188

CENTER SUPORT SELECTIVE SNAP RING CHART		
R/V4A51 AND V5A51 MODELS		
Thickness	I.D. Symbol	Part Number
2.2 mm (.087")	None	MD756784
2.3 mm (.091")	Blue	MD756785
2.4 mm (.094")	Brown	MD758552
2.5 mm (.098")	None	MD758553

Figure 189

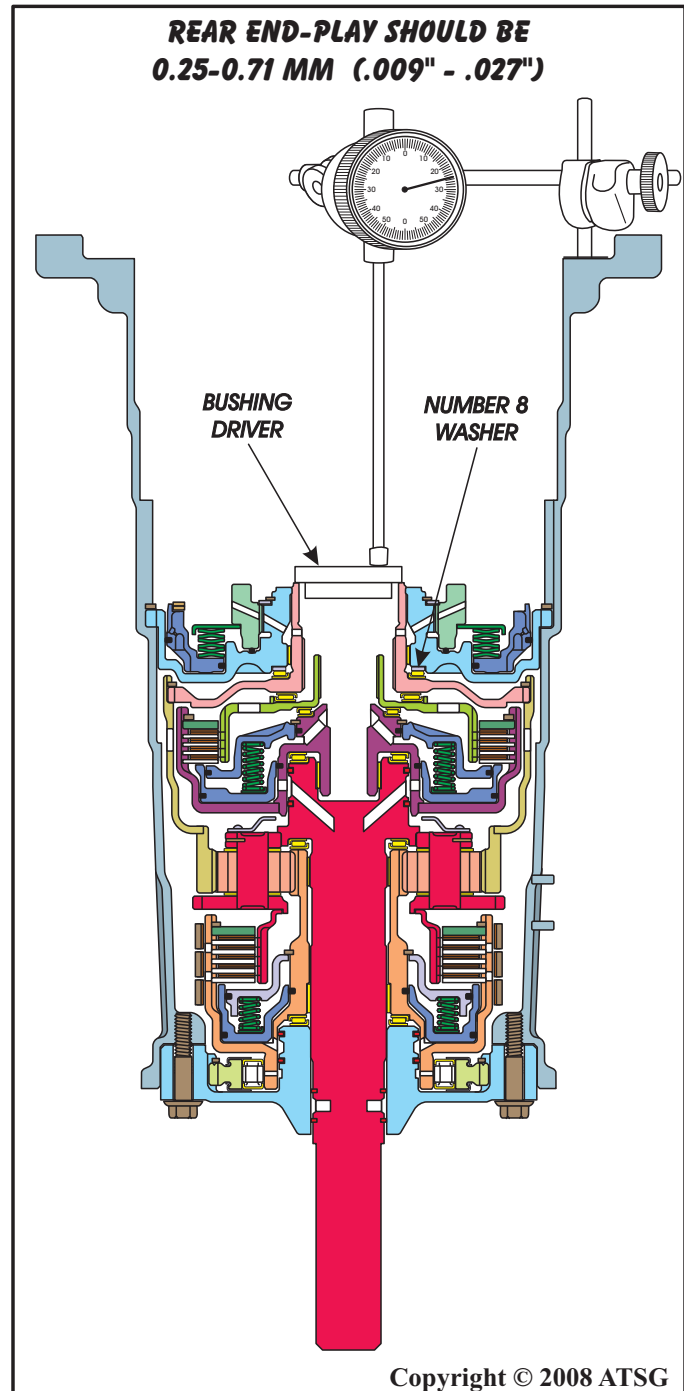


Figure 190

TRANSMISSION ASSEMBLY

"5 SPEED" INTERNAL COMPONENTS (CONT'D)

21. Change the number 8 selective thrust washer as necessary to obtain proper transmission rear end-play, using the chart in Figure 191.
 22. Install the .080" snap ring, the pressure plate with the step down, and the selective snap ring, as shown in Figure 193.
- Note: Do not install any clutches at this time.**
23. Measure with a feeler gauge between pressure plate and the selective snap ring, as shown in Figure 194.
 24. Mitsubishi wants maximum of .006" at this location. Specification is zero to .006".
 25. Select a snap ring from the chart in Figure 192 to obtain the desired specification.
 26. Now remove both snap rings and the pressure plate from the transmission case.

Continued on Page 105

NUMBER 8 SELECTIVE THRUST WASHER TO SET REAR END-PLAY		
R/V4A51 AND V5A51 MODELS		
Thickness	I.D. Symbol	Part Number
1.6 mm (.063")	None	MR276705
1.8 mm (.071")	None	MR276706
2.0 mm (.079")	None	MR276707
2.2 mm (.087")	None	MR276708
2.4 mm (.094")	None	MR276709
Copyright © 2008 ATSG		

Figure 191

BRAKE REACTION PLATE SELECTIVE SNAP RING CHART		
R/V4A51 AND V5A51 MODELS		
Thickness	I.D. Symbol	Part Number
2.2 mm (.087")	None	MD756784
2.3 mm (.091")	Blue	MD756785
2.4 mm (.094")	Brown	MD758552
2.5 mm (.098")	None	MD758553

Figure 192

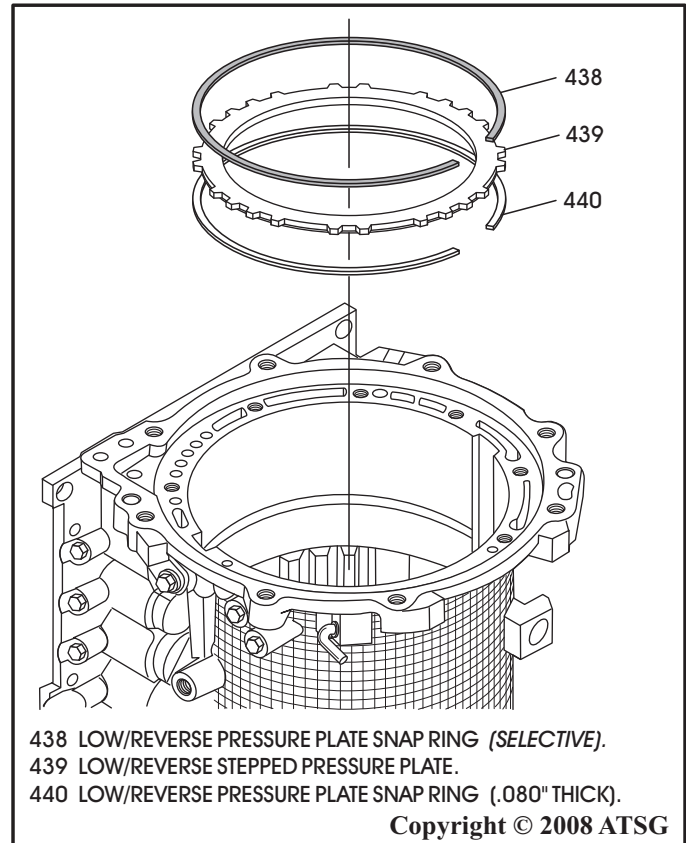


Figure 193

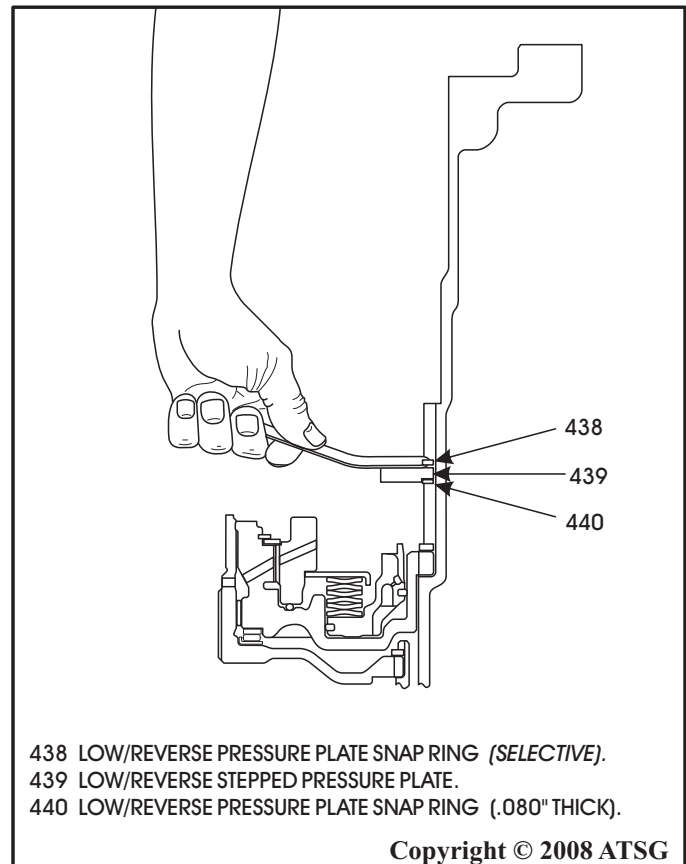


Figure 194

TRANSMISSION ASSEMBLY

"5 SPEED" INTERNAL COMPONENTS (CONT'D)

27. Install the low/reverse brake cushion plate, as shown in Figure 195.
28. Install low/reverse brake "stepped" selective apply plate, as shown in Figure 195, with the step facing down.

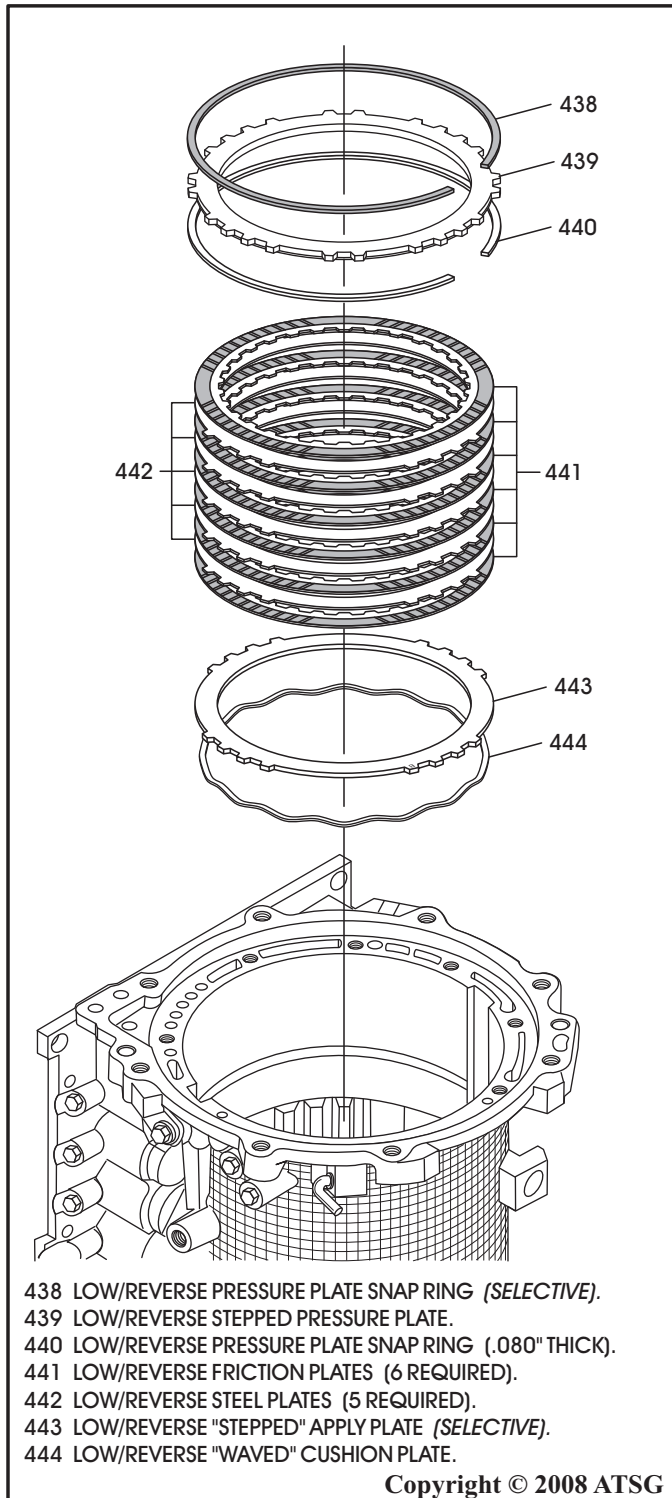


Figure 195

29. Install the low/reverse clutch plates beginning with a friction plate and alternating with steel plates, as shown in Figure 195.

Note: "Do not" yet install the last friction. All clutch plates should be soaked in proper ATF for 30 minutes before assembly, and the number of plates may vary from illustration.

30. Install the .080" thick snap ring into the case groove, as shown in Figure 195.
31. Now install the last friction, the pressure plate with the step facing down and the selective snap ring that you chose in Step 23. Refer to Figure 195.
32. Measure the low/reverse clutch clearance using a feeler gauge *carefully*, between top friction and pressure plate, as shown in Figure 196.
33. The low/reverse clutch clearance should be 1.65 - 2.11 mm (.065" - .083").
34. Change the selective apply plate as necessary to obtain specified clearance, using the chart in Figure 197.

Continued on Page 106

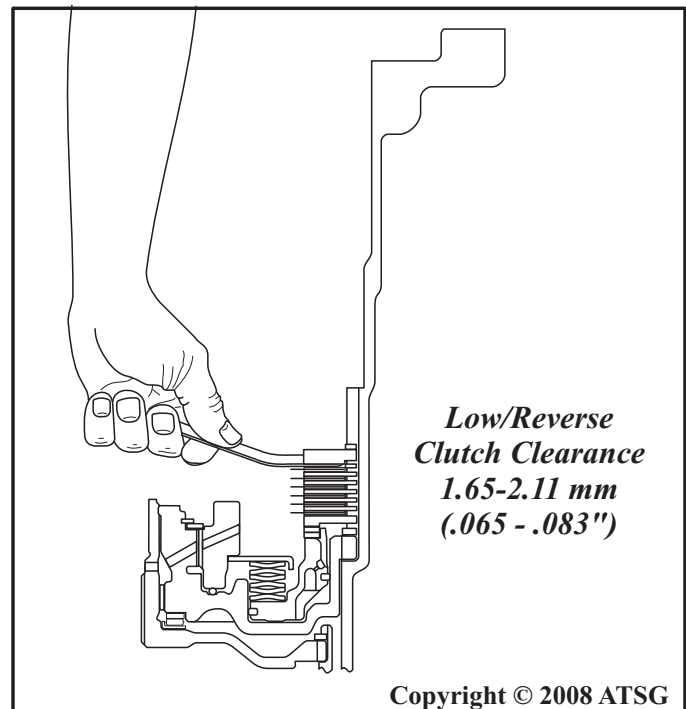


Figure 196

TRANSMISSION ASSEMBLY

"5 SPEED" INTERNAL COMPONENTS (CONT'D)

35. Install the 2-4 brake clutch plates, beginning with a friction plate and alternating with steel plates, as shown in Figure 198.

Note: All clutch plates should be soaked for 30 minutes before assembly, and the number of plates may vary from illustration.

36. Install selective 2-4 brake clutch apply plate, as shown in Figure 198.

37. Install the 2-4 brake clutch piston return spring, as shown in Figure 198.

38. Install 2-4 brake retainer and piston assembly, as shown in Figure 198.

39. Install the 2-4 brake clutch retainer snap ring, as shown in Figure 198.

Continued on Page 107

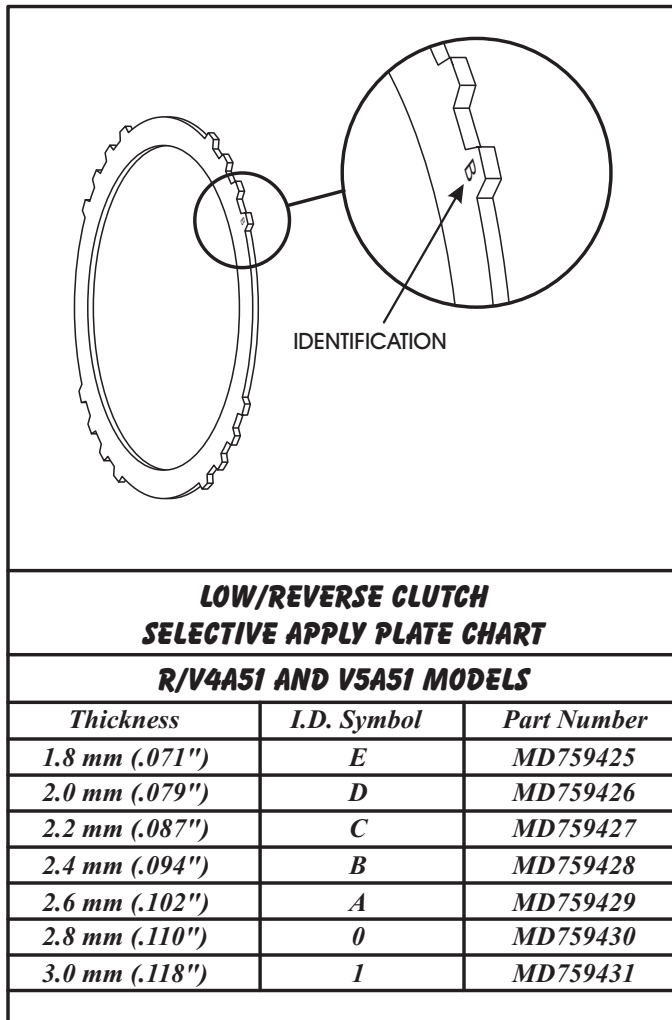


Figure 197

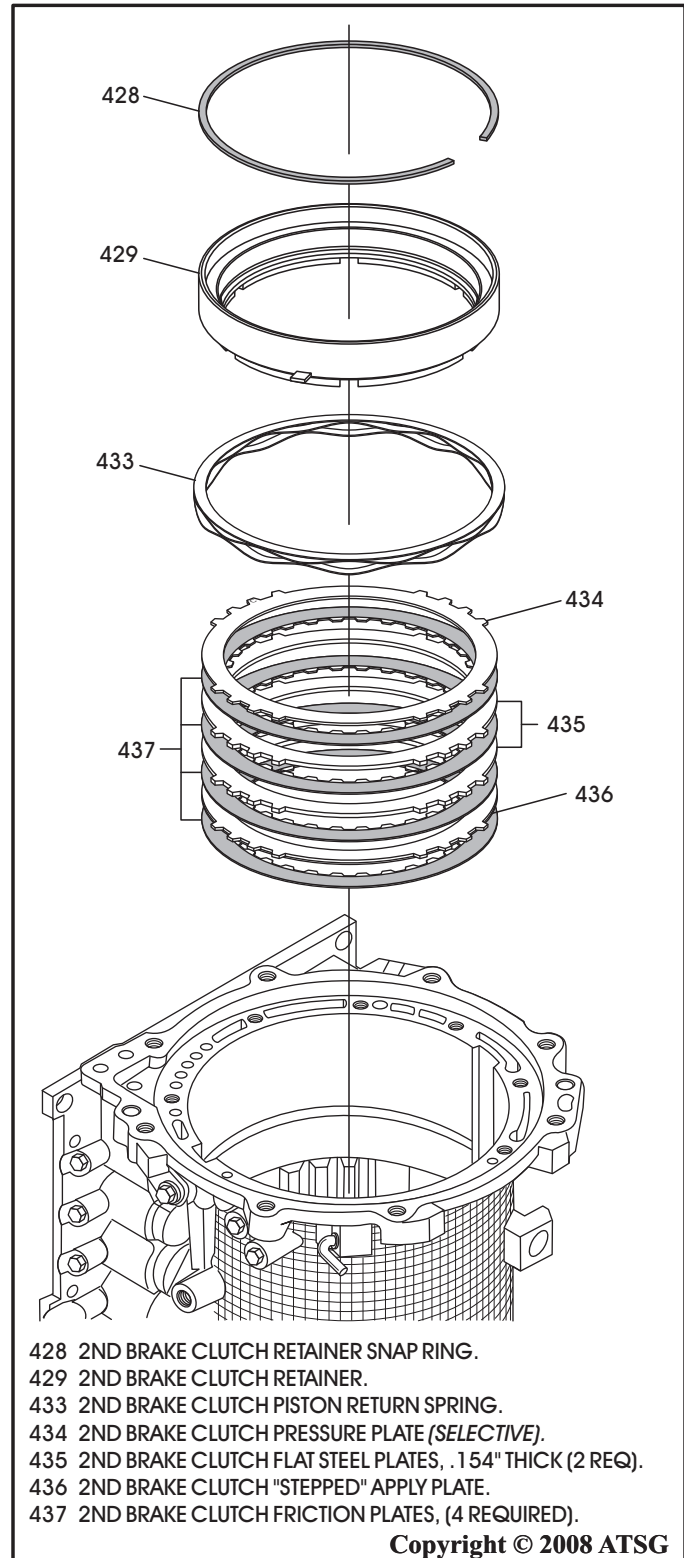


Figure 198

TRANSMISSION ASSEMBLY

"5 SPEED" INTERNAL COMPONENTS (CONT'D)

40. Measure the 2-4 brake clutch clearance with a feeler gauge, between the apply plate and the 2-4 clutch piston, as shown in Figure 200.
41. The 2-4 brake clutch clearance should be 1.49 - 1.95 mm (.058" - .077").
42. Change the selective apply plate as necessary, using the chart in Figure 199, to obtain proper 2-4 brake clutch clearance.
43. Now, remove the complete 2-4 brake clutch pack, using Figure 198 as a guide.
44. Install the completed planetary gear set and low sprag assembly, by rotating in a clockwise direction to engage the low/reverse frictions and ensuring the number 7 thrust bearing is still in place, as shown in Figure 201.

Note: Planetary gear set should freewheel clockwise and lock counter-clockwise.

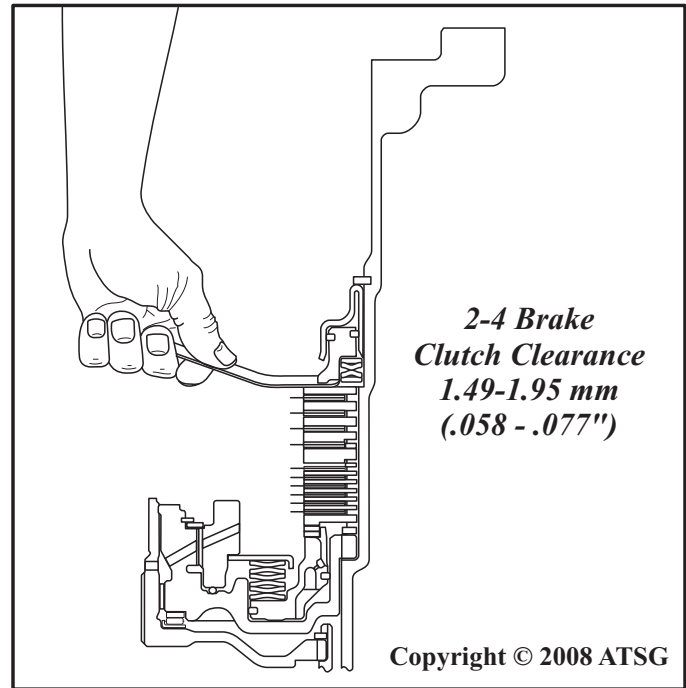


Figure 200

Continued on Page 108

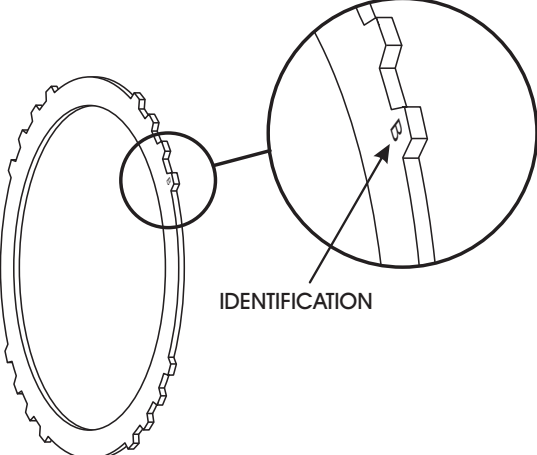
 IDENTIFICATION		
2ND BRAKE CLUTCH SELECTIVE APPLY PLATE CHART R/V4A51 AND V5A51 MODELS		
Thickness	I.D. Symbol	Part Number
1.6 mm (.063")	F	MR336390
1.8 mm (.071")	E	MR336391
2.0 mm (.079")	D	MR336392
2.2 mm (.087")	C	MR336393
2.4 mm (.094")	B	MR336394
2.6 mm (.102")	A	MR336395
2.8 mm (.110")	0	MR336396
3.0 mm (.118")	1	MR336397

Figure 199

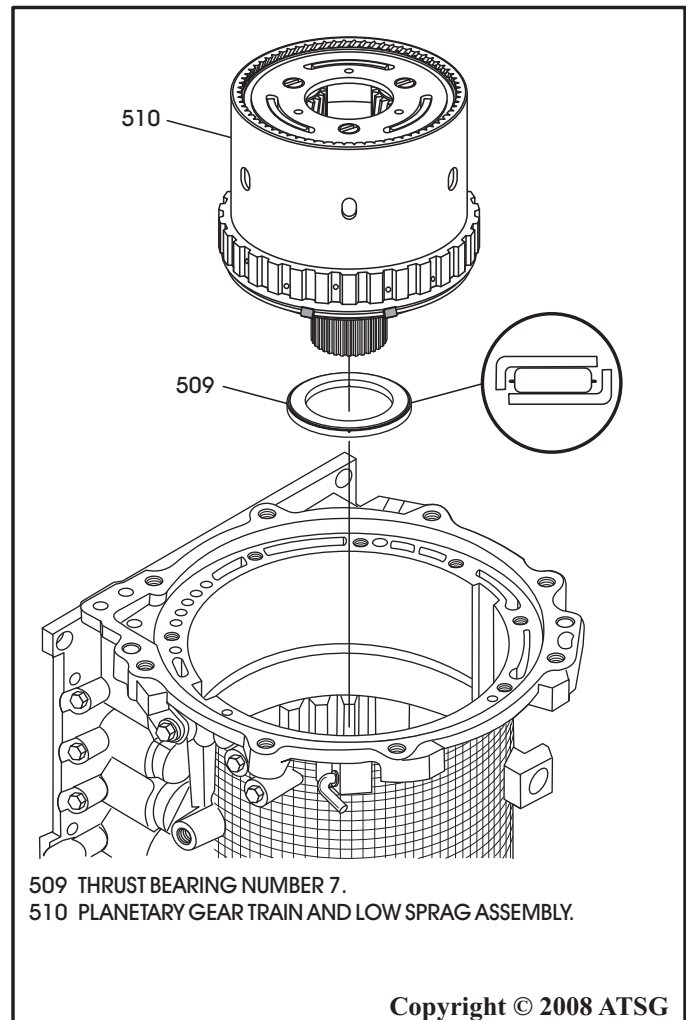


Figure 201

TRANSMISSION ASSEMBLY

"5 SPEED" INTERNAL COMPONENTS (CONT'D)

45. Install the reverse sun gear and hub assembly, as shown in Figure 202, ensuring the number 4 thrust bearing is still in place.

Note: Sun gear and hub assembly must be engaged in planetary by rotating into place.

46. Now you can re-install the 2-4 brake clutch plates beginning with a friction and alternating with steel plates, as shown in Figure 203.

47. Install the pre-selected selective apply plate, as shown in Figure 203.

48. Install the 2-4 brake piston return spring, as shown in Figure 203.

49. Install the 2-4 brake clutch retainer and piston assembly, as shown in Figure 203.

50. Install the 2-4 clutch retainer snap ring, as shown in Figure 203.

Continued on Page 109

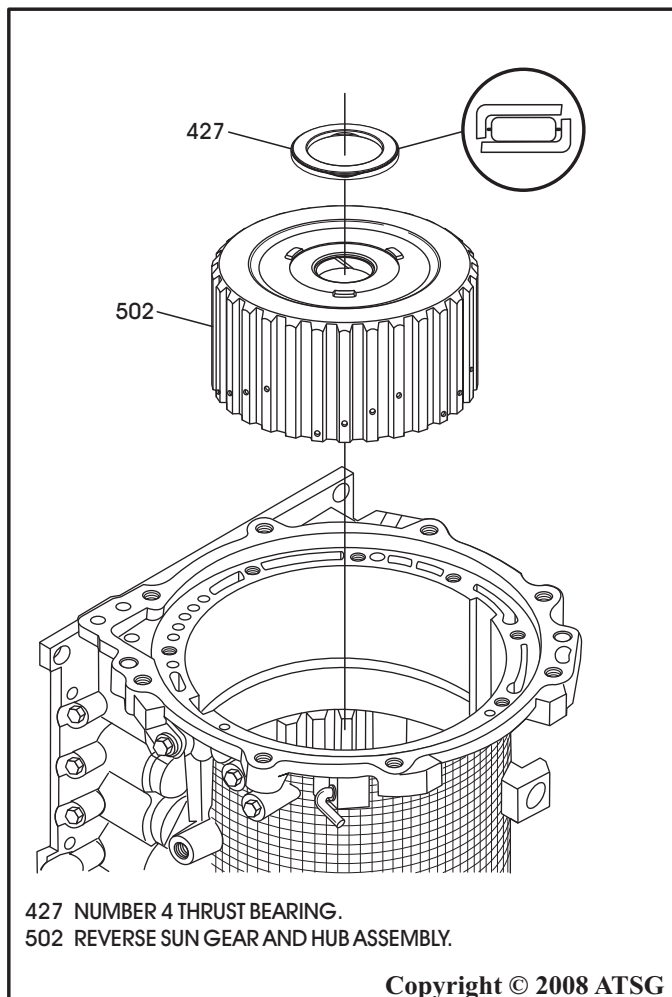


Figure 202

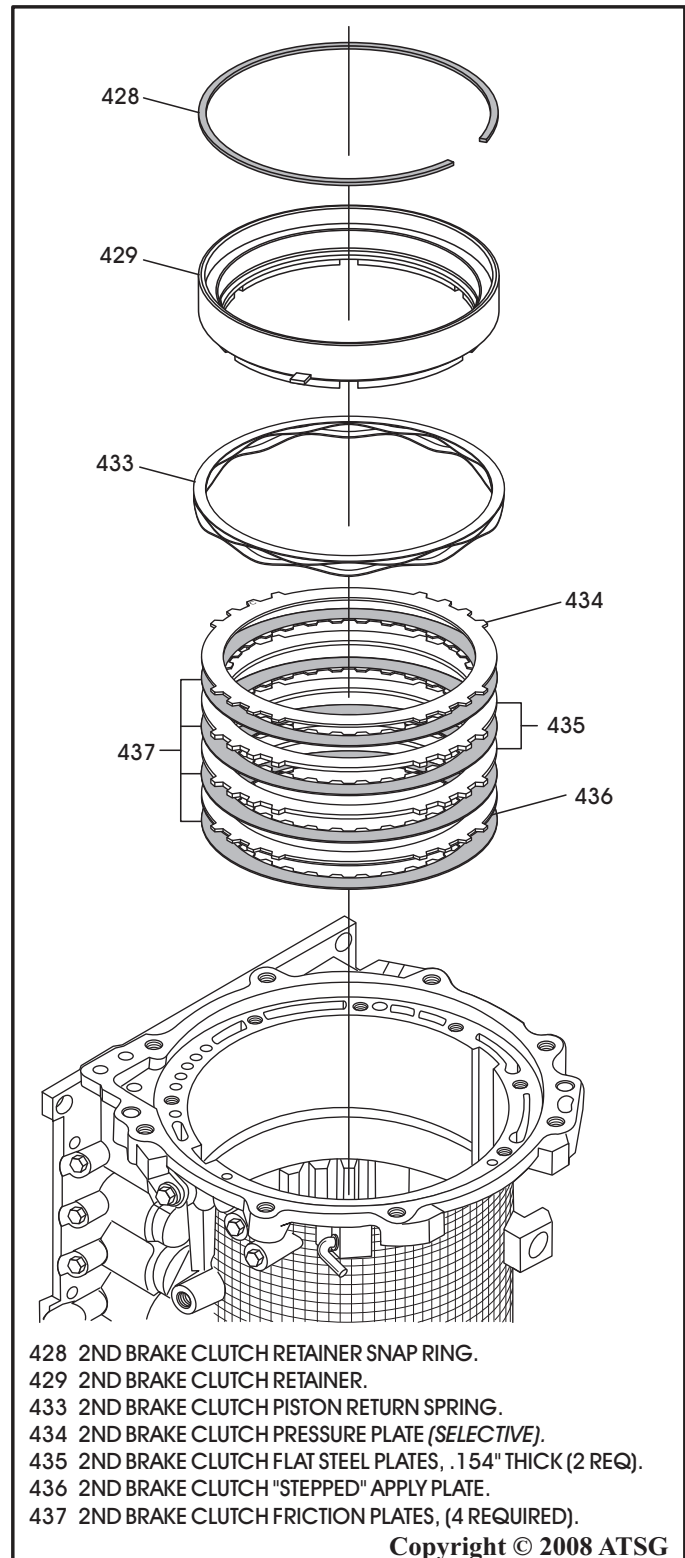


Figure 203

TRANSMISSION ASSEMBLY

"5 SPEED" INTERNAL COMPONENTS (CONT'D)

51. Install number 3 thrust bearing on overdrive clutch hub, as shown in Figure 204, and retain with small amount of Trans-Jel®.
52. Install the overdrive clutch hub assembly into transmission, as shown in Figure 204.
53. Install the completed overdrive and reverse clutch housing assembly, as shown in Figure 205, by rotating back and forth to engage the reverse frictions and the overdrive frictions.
Note: Ensure the overdrive and reverse clutch housing is fully seated.
54. Install the number 2 thrust bearing, as shown in Figure 205, with needles facing up.

Continued on Page 110

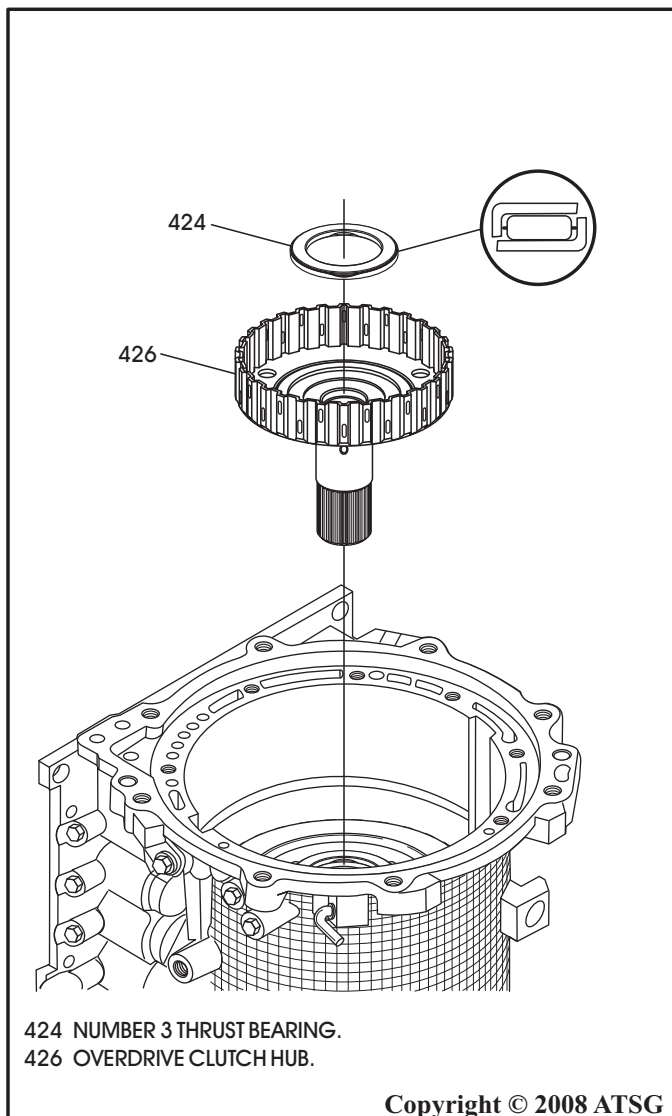


Figure 204

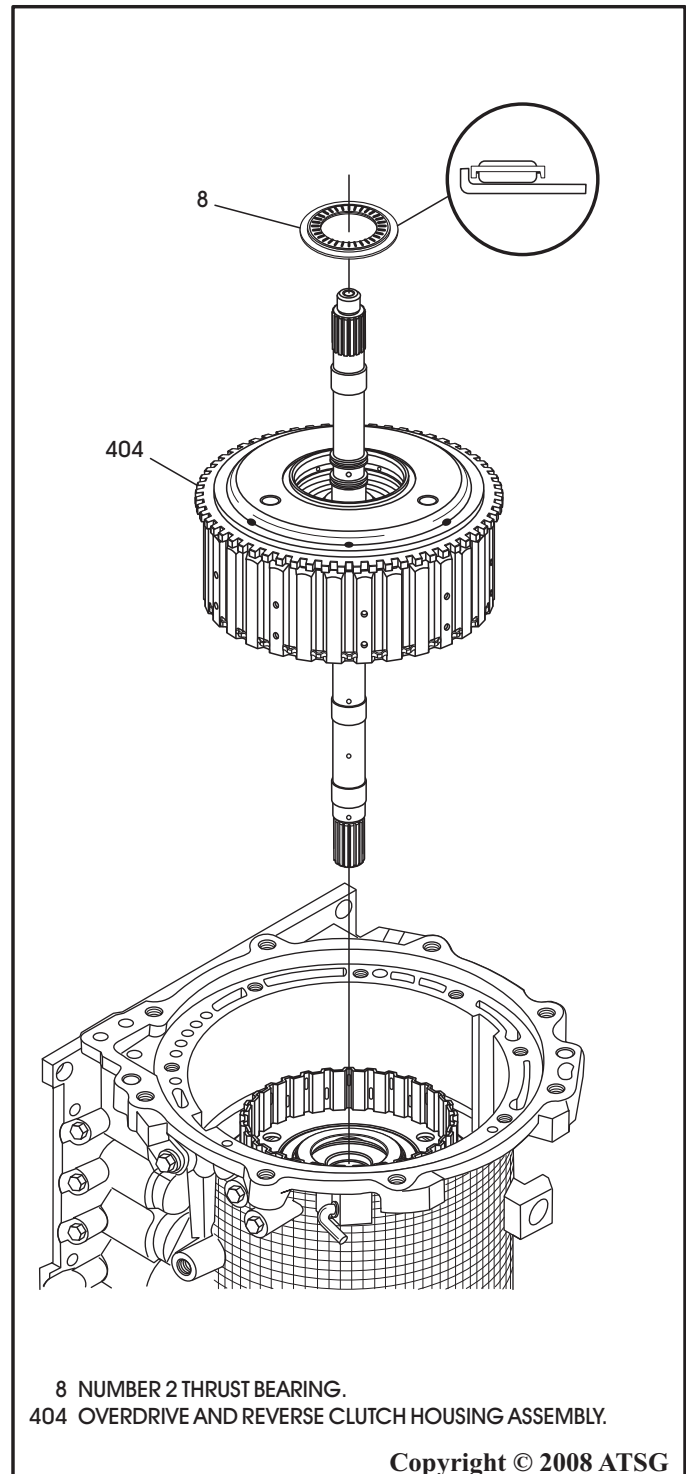


Figure 205

TRANSMISSION ASSEMBLY

"5 SPEED" INTERNAL COMPONENTS (CONT'D)

55. Install pump gasket, and then install "H" gage on transmission, as shown in Figure 206.

Note: Pump gasket thickness is critical and must be figured into the front end clearance.

56. Set the adjustment rod on the roller surface of the installed number 2 thrust bearing, as shown in Figure 207, and tighten the adjustment rod locking knob.

57. Adjustment rod **must** be on the roller surface of the bearing, as shown in Figure 207.

58. Install the number 1 selective thrust washer on the completed oil pump assembly, as shown in Figure 208, and retain with Trans-Jel®.

59. Now, turn the "H" gage over and set it on the completed oil pump assembly, as shown in Figure 208.

60. Measure with feeler gauge between number 1 selective thrust washer and adjustment rod, as shown in Figure 208, for proper front end-play.

61. Front end clearance should be 0.25 - 0.81 mm (.009" - .031").

62. Change the number 1 selective thrust washer as necessary to obtain the specified clearance using the chart in Figure 209.

Continued on Page 111

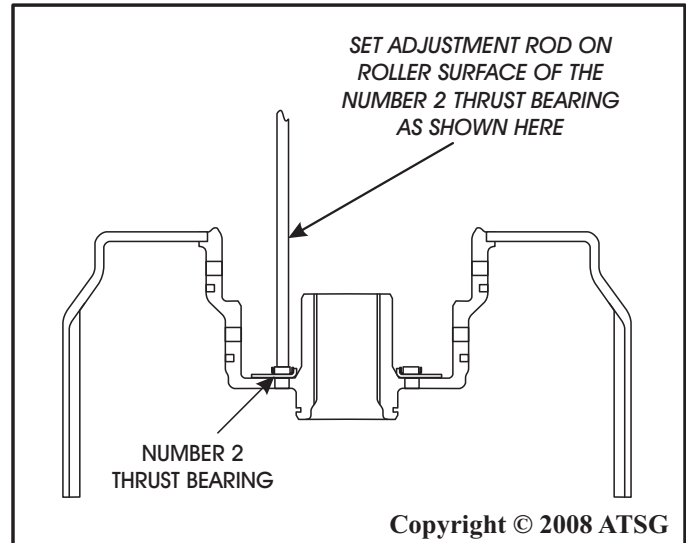


Figure 207

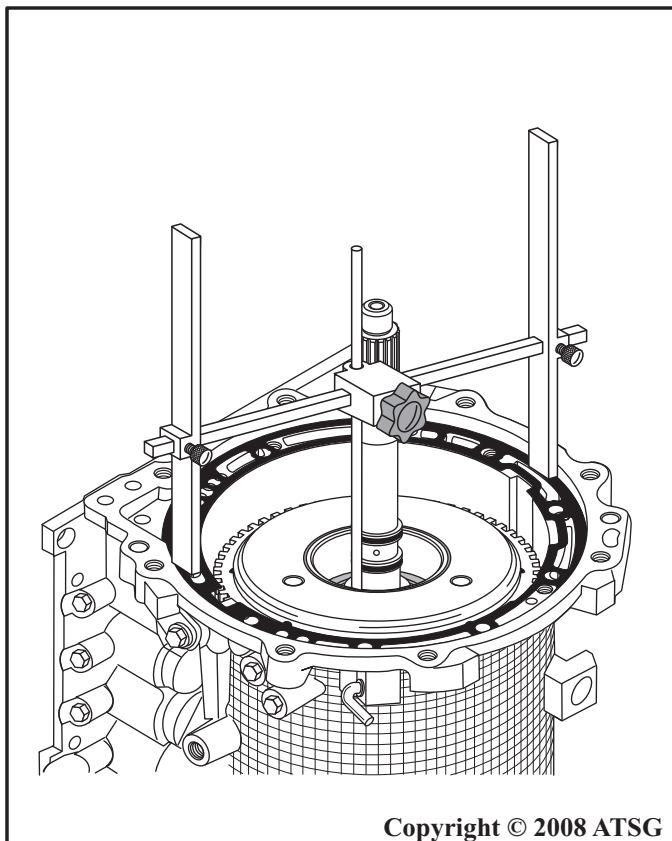


Figure 206

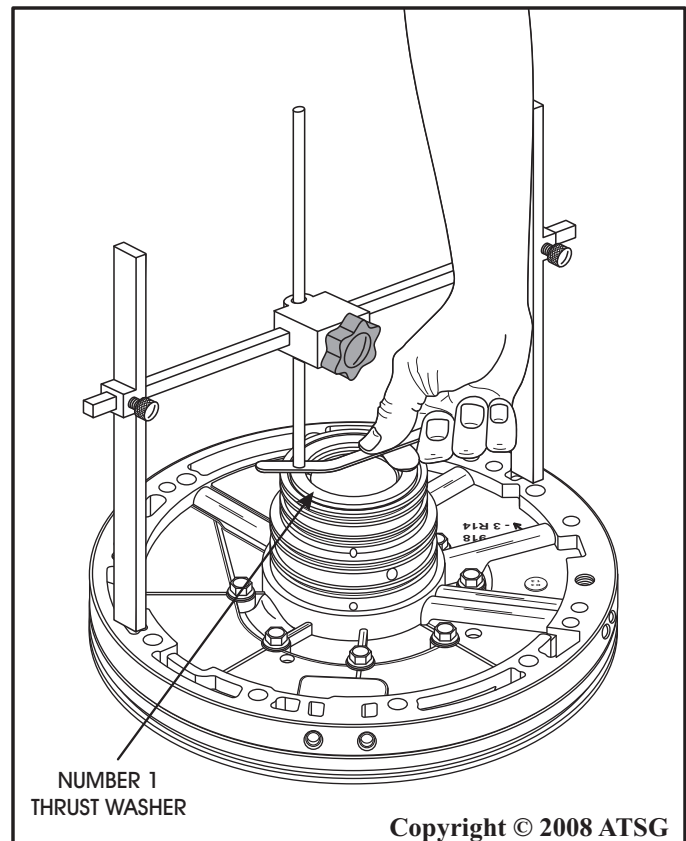


Figure 208

NUMBER 1 SELECTIVE THRUST WASHER TO SET FRONT END-PLAY

R/V4A51 AND V5A51 MODELS

Thickness	I.D. Symbol	Part Number
1.4 mm (.055")	None	MR723063
1.6 mm (.063")	None	MR707267
1.8 mm (.071")	None	MR723064
2.0 mm (.079")	None	MR707268
2.2 mm (.087")	None	MR723065
2.4 mm (.094")	None	MR724358
2.6 mm (.102")	None	MR754798

Copyright © 2008 ATSG

Figure 209

TRANSMISSION ASSEMBLY "5 SPEED" INTERNAL COMPONENTS (CONT'D)

63. Install guide pins, and install new pump gasket as shown in Figure 210.

64. Install completed oil pump assembly, as shown in Figure 210.

Note: Use small amount of Trans-Jel® to lube pump "O" ring and surfaces.

65. Install new seals on the ten oil pump retaining bolts, as shown in Figure 211.

66. Install the oil pump to case bolts with seals, as shown in Figure 212.

Continued on Page 112

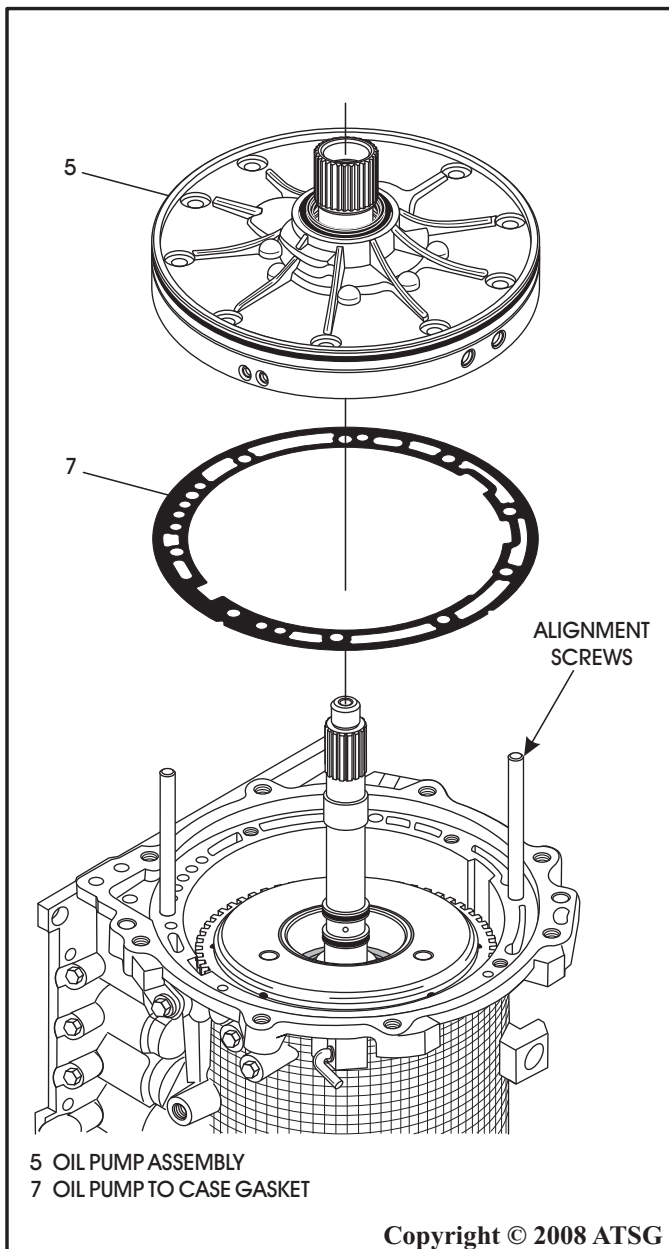


Figure 210

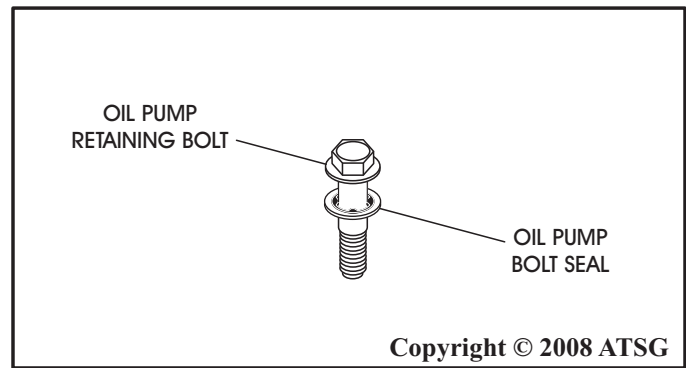


Figure 211

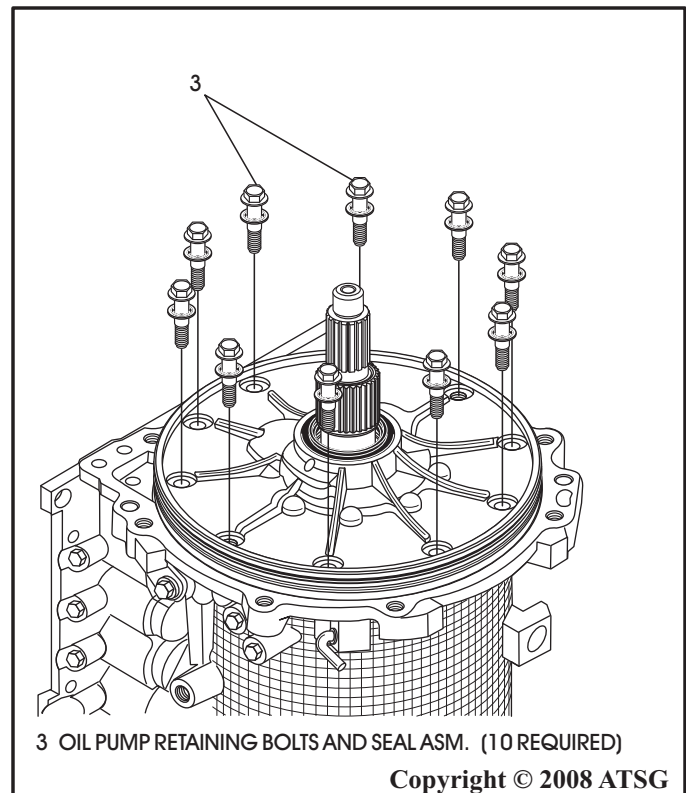


Figure 212

TRANSMISSION ASSEMBLY

"5 SPEED" INTERNAL COMPONENTS (CONT'D)

67. Torque the ten oil pump assembly to case bolts to 23 N•m (17 ft.lb.), as shown in Figure 213.

Note: Install dial indicator on turbine shaft and verify front end-play is correct.

68. Install the reduction servo return spring into case, as shown in Figure 214.

69. Install pre-assembled reduction servo piston and seal assembly, as shown in Figure 214, compress the spring and install snap ring, with flat side facing down.

Note: Place the cavity in the piston and the opening in the snap ring, to opening in case as shown in Figure 214.

70. Turn the adjusting screw in completely with a substantial amount of torque to ensure band is fully seated on anchor plug and servo pin.

71. Torque the adjustment screw to 44 in.lb. and back off 5-1/2 to 5-3/4 turns, and torque the lock nut to 18 N•m (13 ft.lb.).

Note: Mitsubishi supplies a special tool to hold the piston from turning during the adjustment process, as shown in Figure 214. A screwdriver, bent just right and cut off, will serve the same purpose.

72. Install the pre-assembled reduction servo cover and snap ring, flat side facing down, as shown in Figure 215.

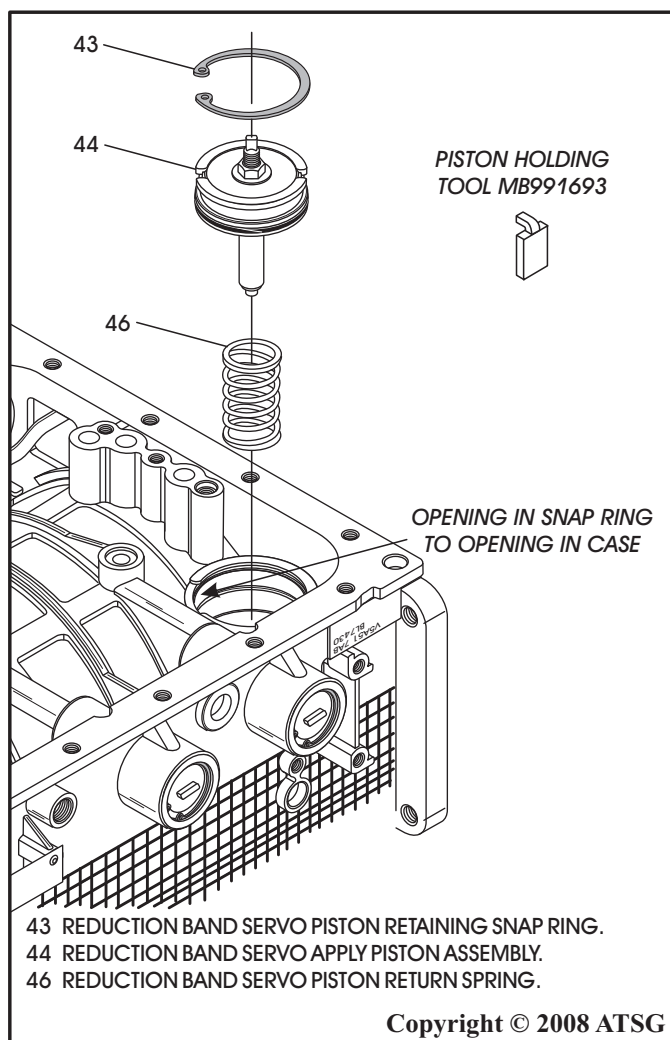


Figure 214

Continued on Page 113

TORQUE OIL PUMP TO CASE BOLTS TO 23 N•M (17 FT.LB.) AND RE-CHECK END-PLAY WITH DIAL INDICATOR

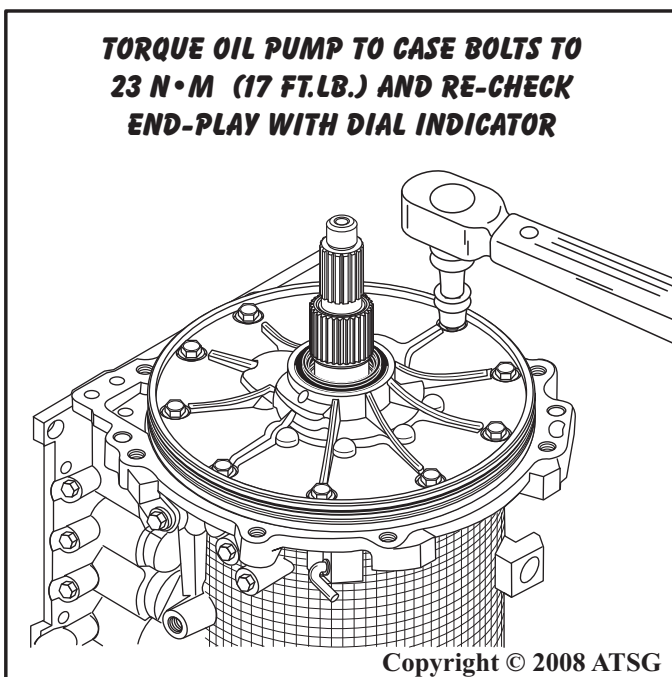


Figure 213

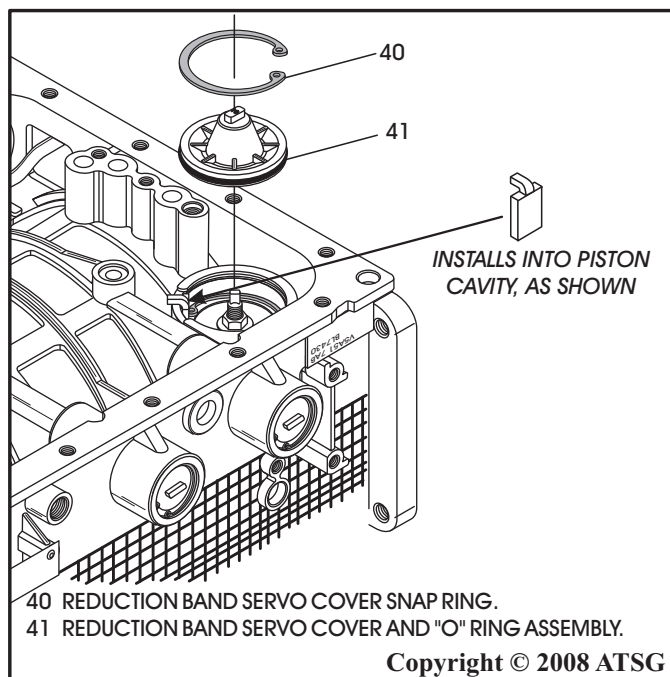


Figure 215

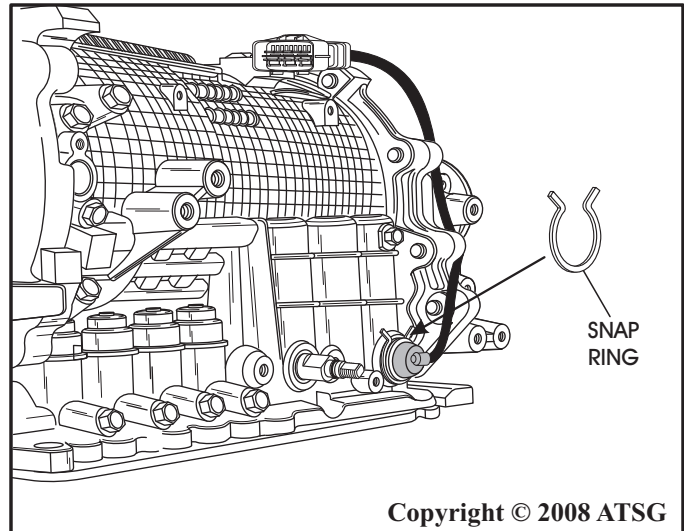
TRANSMISSION ASSEMBLY

"5 SPEED" INTERNAL COMPONENTS (CONT'D)

73. Install the complete wiring harness through the inside of the case, as shown in Figure 217.
74. Install the external snap ring into groove of the pass-thru connector, as shown in Figure 216.
75. Install new low/reverse seal and new 2nd brake seal into transmission case cavities, as shown in Figure 217.

Note: Install both seals so that the notched section is parallel with the centerline of the transmission, as shown in Figure 217.

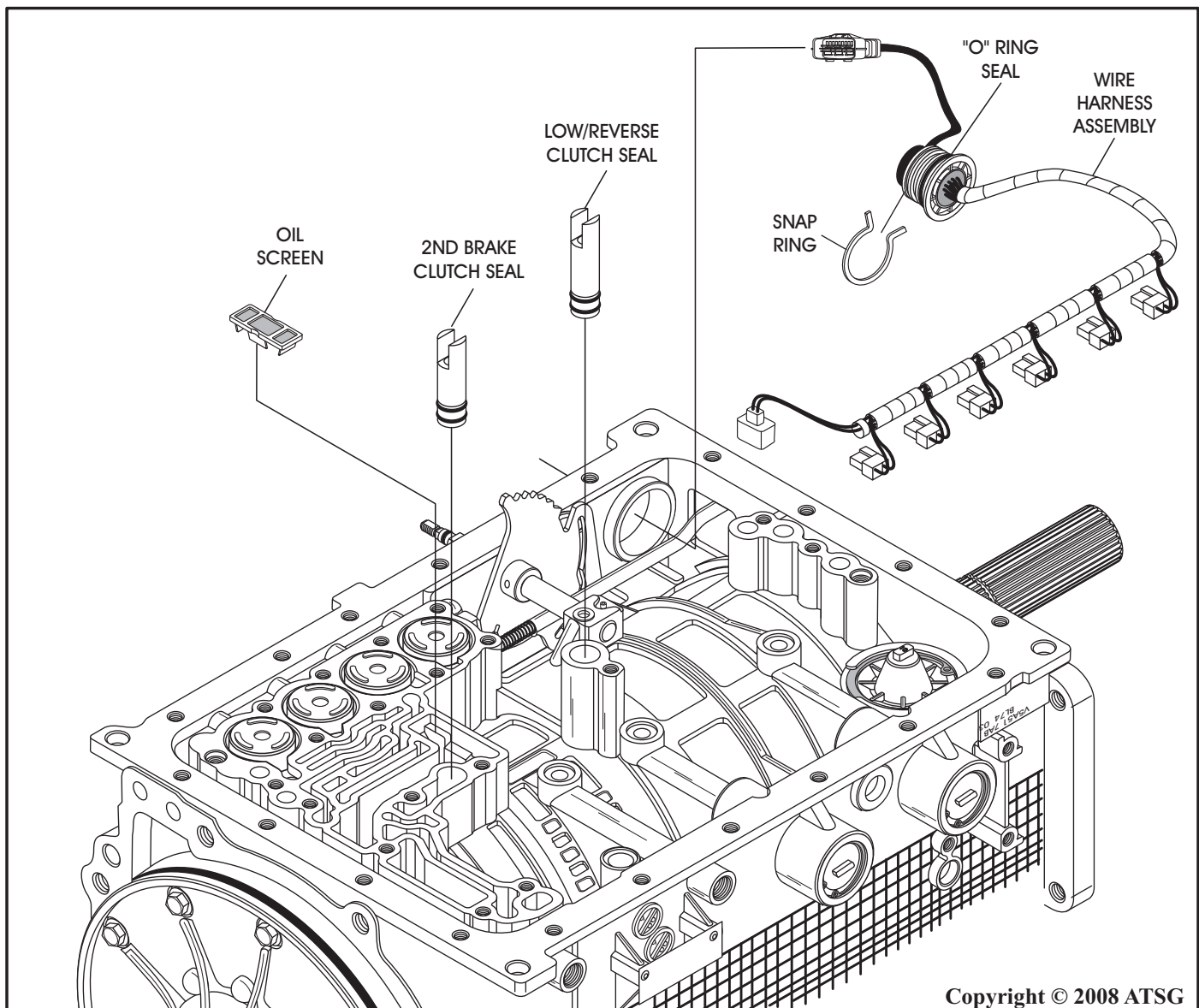
76. Install oil screen into case cavity, as shown in Figure 217.



Copyright © 2008 ATSG

Figure 216

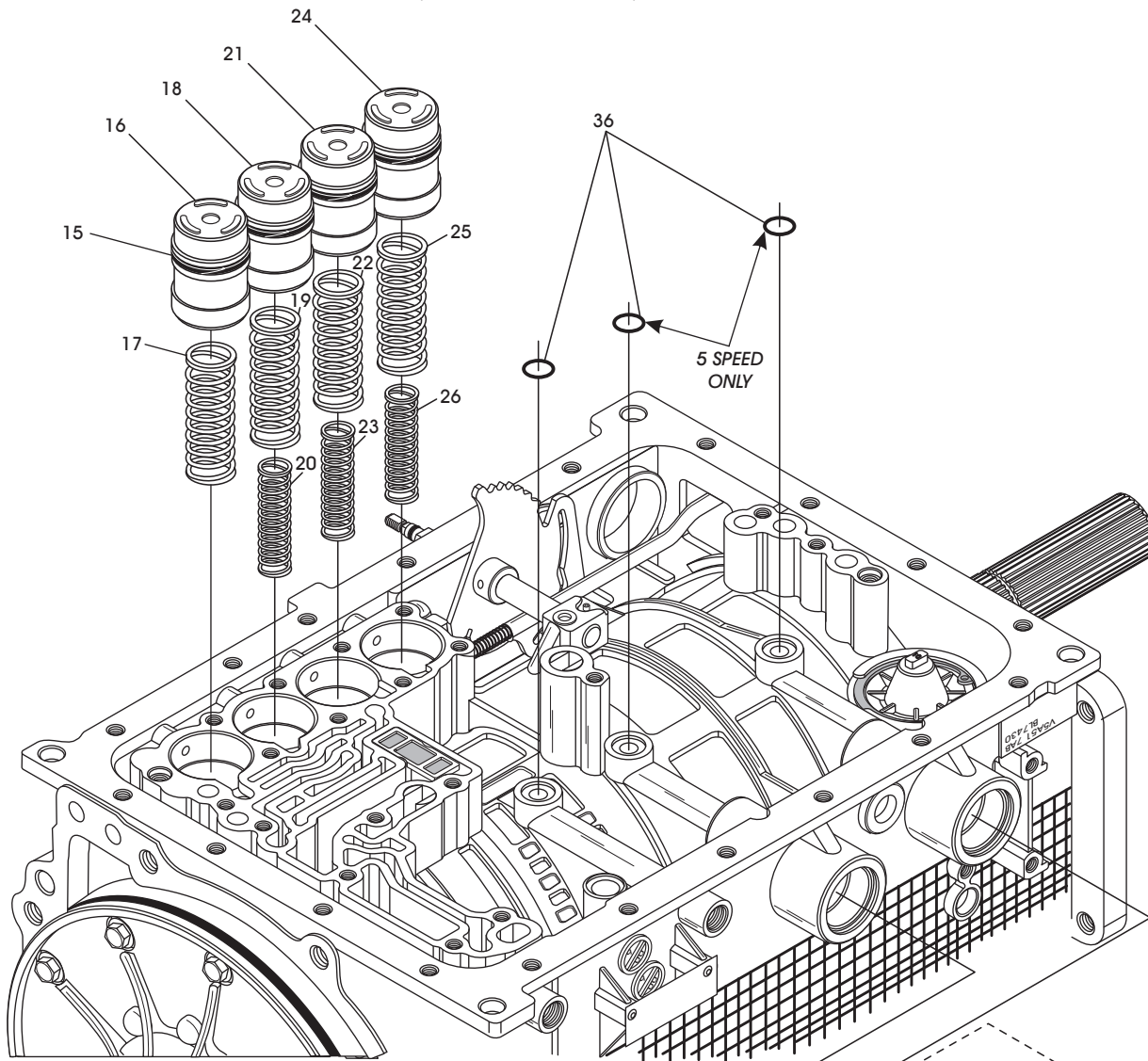
Continued on Page 115



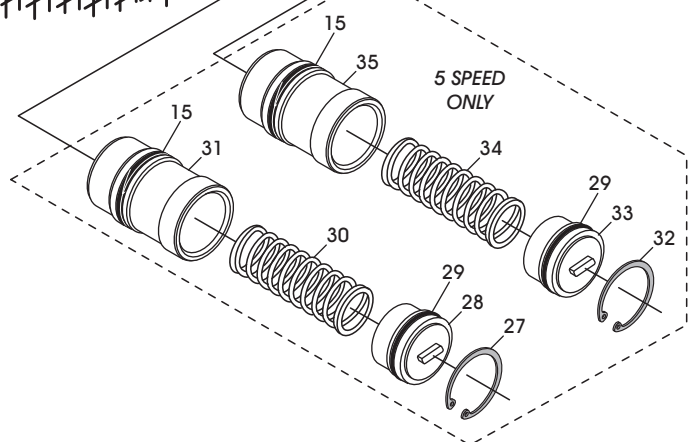
Copyright © 2008 ATSG

Figure 217

ACCUMULATOR PISTON AND SPRING LOCATIONS EXPLODED VIEW



- 15 ACCUMULATOR PISTON SCARF-CUT SEAL (ALL, 6 REQUIRED)
- 16 OVERDRIVE CLUTCH ACCUMULATOR PISTON
- 17 OVERDRIVE CLUTCH ACCUMULATOR OUTER SPRING
- 18 2ND BRAKE CLUTCH ACCUMULATOR PISTON
- 19 2ND BRAKE CLUTCH ACCUMULATOR OUTER SPRING
- 20 2ND BRAKE CLUTCH ACCUMULATOR INNER SPRING
- 21 LOW/REVERSE CLUTCH ACCUMULATOR PISTON
- 22 LOW/REVERSE CLUTCH ACCUMULATOR OUTER SPRING
- 23 LOW/REVERSE CLUTCH ACCUMULATOR INNER SPRING
- 24 UNDERDRIVE CLUTCH ACCUMULATOR PISTON
- 25 UNDERDRIVE CLUTCH ACCUMULATOR OUTER SPRING
- 26 UNDERDRIVE CLUTCH ACCUMULATOR INNER SPRING
- 27 DIRECT CLUTCH ACCUMULATOR COVER SNAP RING
- 28 DIRECT CLUTCH ACCUMULATOR COVER
- 29 ACCUMULATOR COVER "O" RING SEAL (2 REQUIRED)
- 30 DIRECT CLUTCH ACCUMULATOR SPRING
- 31 DIRECT CLUTCH ACCUMULATOR PISTON
- 32 REDUCTION BAND ACCUMULATOR COVER SNAP RING
- 33 REDUCTION BAND ACCUMULATOR COVER
- 34 REDUCTION BAND ACCUMULATOR SPRING
- 35 REDUCTION BAND ACCUMULATOR PISTON
- 36 VALVE BODY TO CASE "O" RING SEAL
(3 REQUIRED IN 5 SPEED, 1 REQUIRED IN 4 SPEED)



Copyright © 2008 ATSG

Figure 218

TRANSMISSION ASSEMBLY

"5 SPEED" INTERNAL COMPONENTS (CONT'D)

77. Install the accumulator springs and pistons with new seals, as shown in Figure 218.

Note: Use the chart in Figure 219 to ID the springs, if you forgot to tag them.

78. Install the direct clutch and reduction band accumulator pistons with new seals and the springs, as shown in Figure 218.

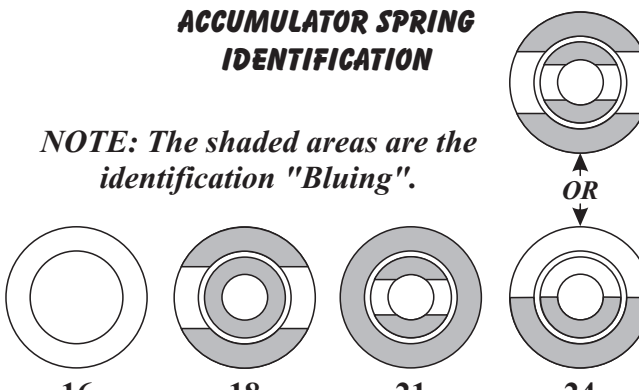
79. Install new seals on the covers and install them into case, and install snap rings, as shown in Figure 218.

Note: These two accumulators are not used in the 4 speed transmissions.

80. Remove the two long hollow alignment dowels from the valve body and install them into the case in the positions shown in Figure 220.

81. Install the valve body to case "O" ring seals in case cavities, as shown in Figure 220, retain with small amount of Trans-Jel®.

Note: Only one used in 4 speed units.

ACCUMULATOR SPRING IDENTIFICATION			
<i>NOTE: The shaded areas are the identification "Bluing".</i> 			
NO.	ACCUMULATOR	I.D. "Bluing" Outer	I.D. "Bluing" Inner
16	Overdrive Clutch	None	Not Used
18	2nd Brake Clutch	2/3rds	Full Surface
21	Low/Reverse Clutch	Full Surface	2/3rds
24	Underdrive Clutch	Half or 2/3rds	Half or 2/3rds
31	Direct Clutch	None	Not Used
35	Reduction Band	None	Not Used

Continued on Page 116

Figure 219

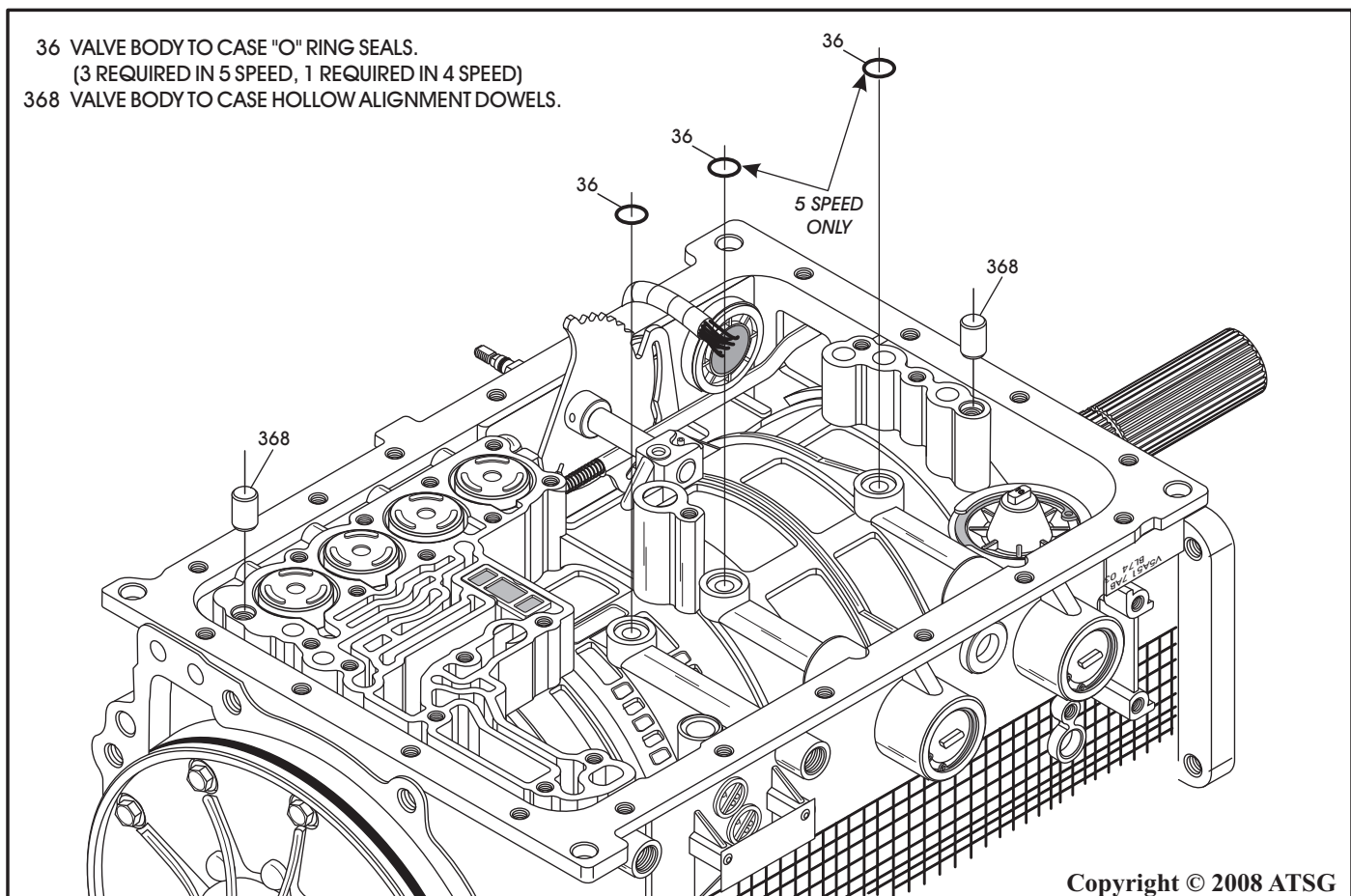


Figure 220

TRANSMISSION ASSEMBLY

"5 SPEED" INTERNAL COMPONENTS (CONT'D)

82. Lay the internal wire harness over the case pan rail, as shown in Figure 222.
83. Install completed valve body, while inserting manual valve slider into the inside detent lever, as shown in Figure 221.
84. Then install valve body over the dowels in case and gently onto the "O" ring seals, as shown in Figure 222.

Continued on Page 117

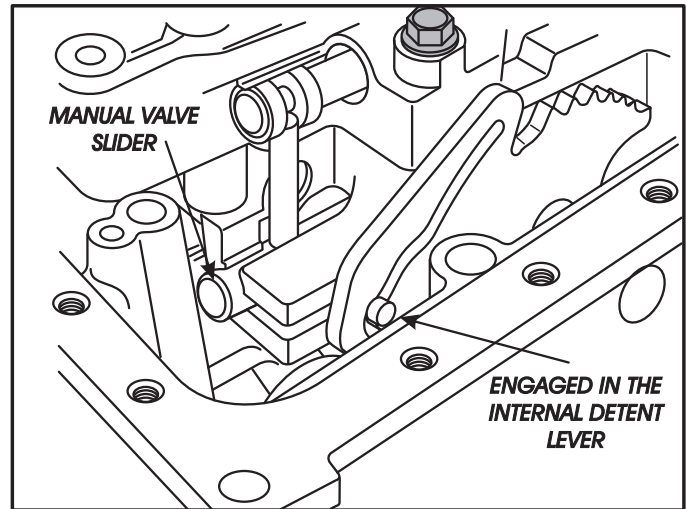


Figure 221

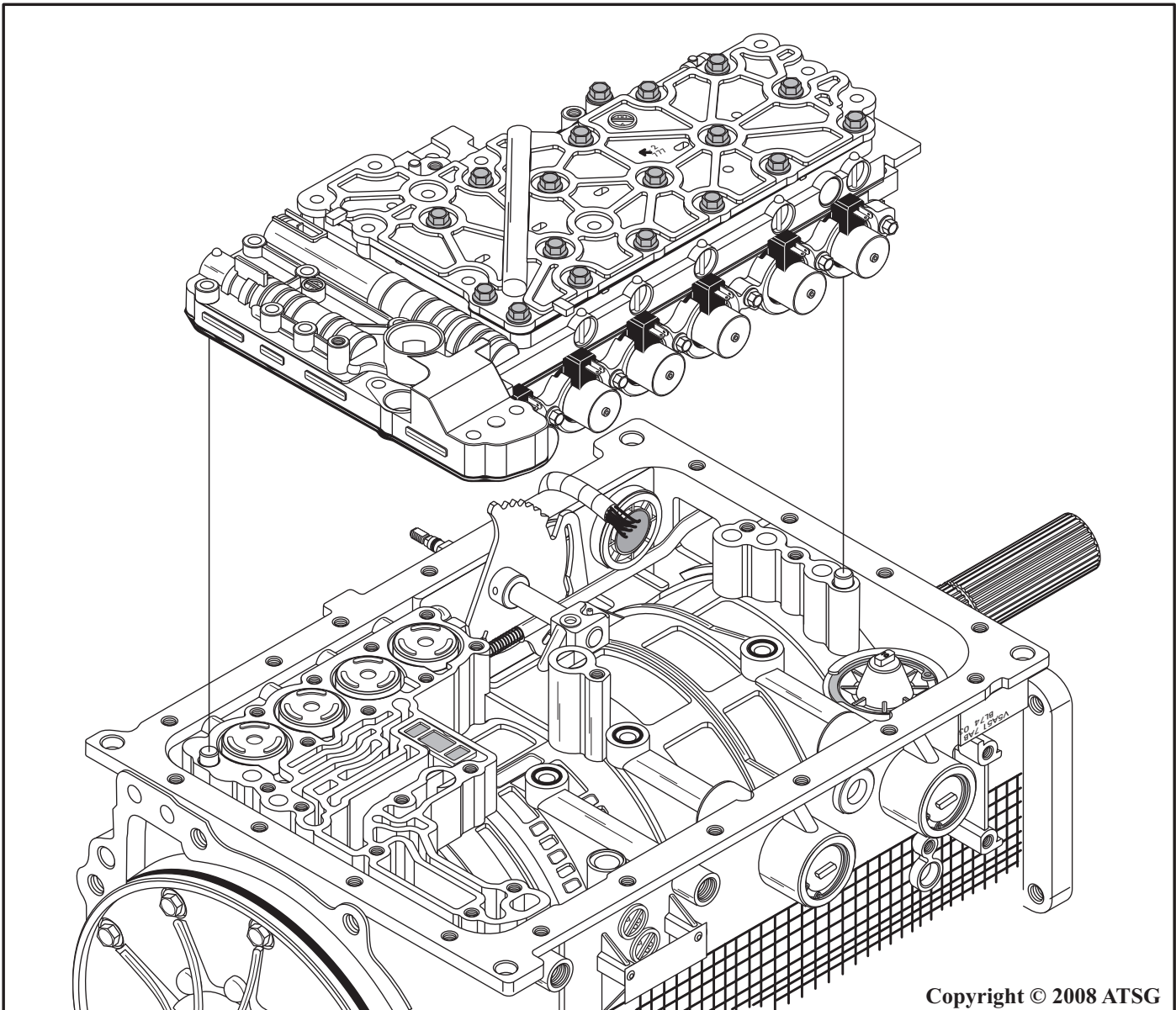


Figure 222

Copyright © 2008 ATSG

TRANSMISSION ASSEMBLY

"5 SPEED" INTERNAL COMPONENTS (CONT'D)

85. There are five different lengths of valve body to case retaining bolts, as shown in Figure 223.
86. Install all of them except the one holding the TFT sensor.
87. Use the chart in Figure 224 to install the proper length bolt in the proper position, hand tighten only at this time.

Continued on Page 118

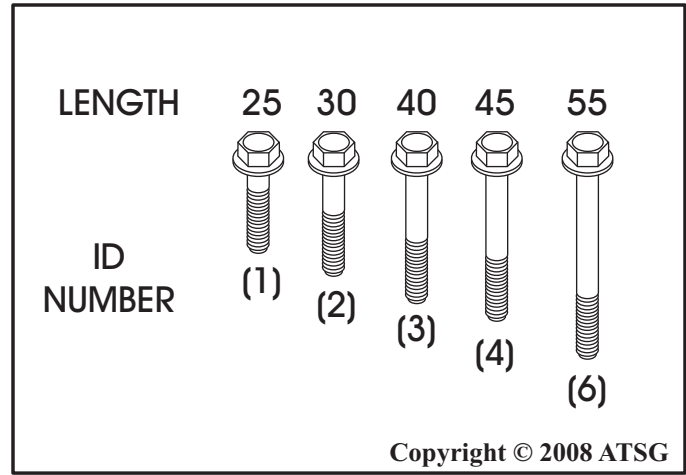


Figure 223

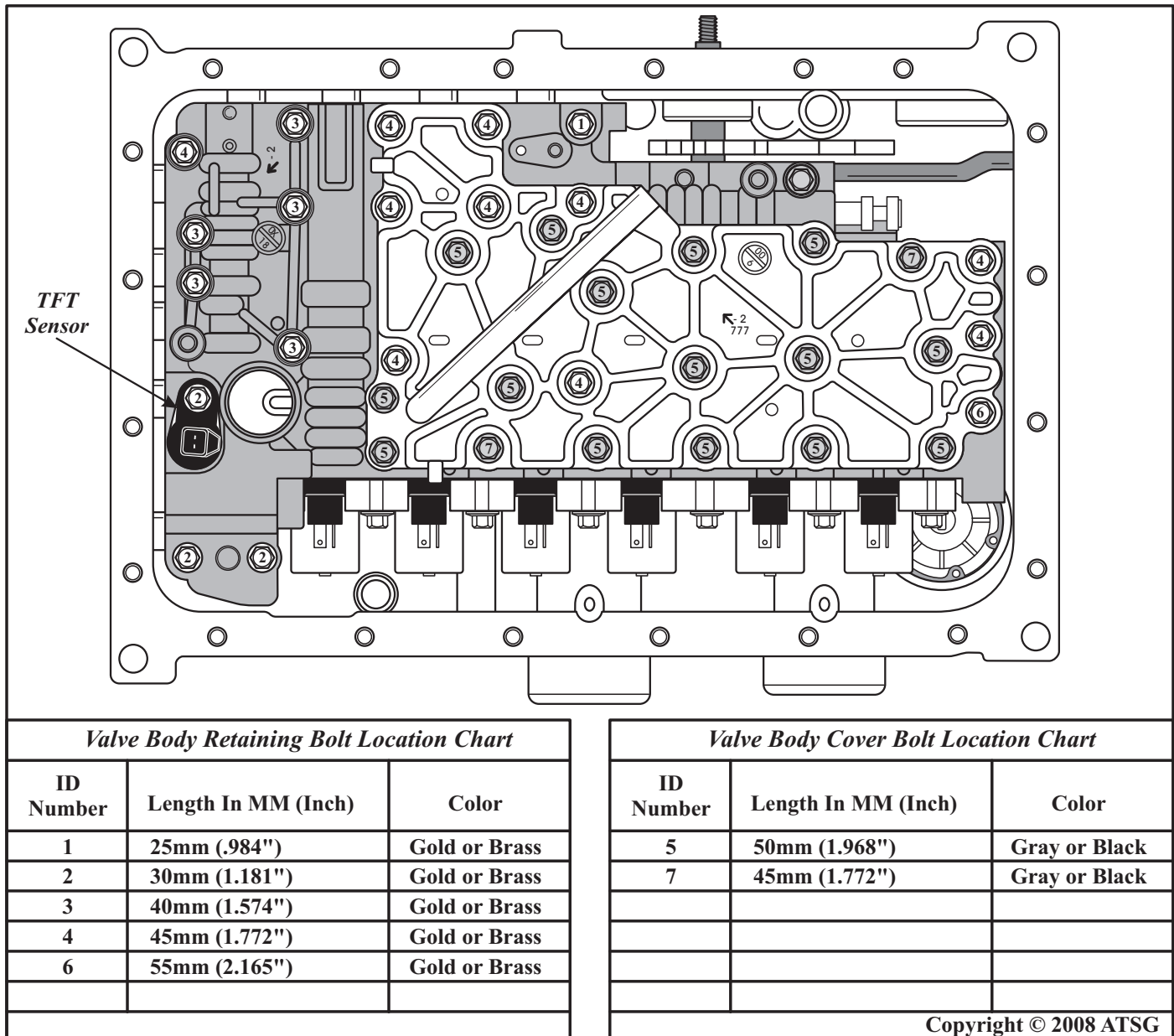


Figure 224

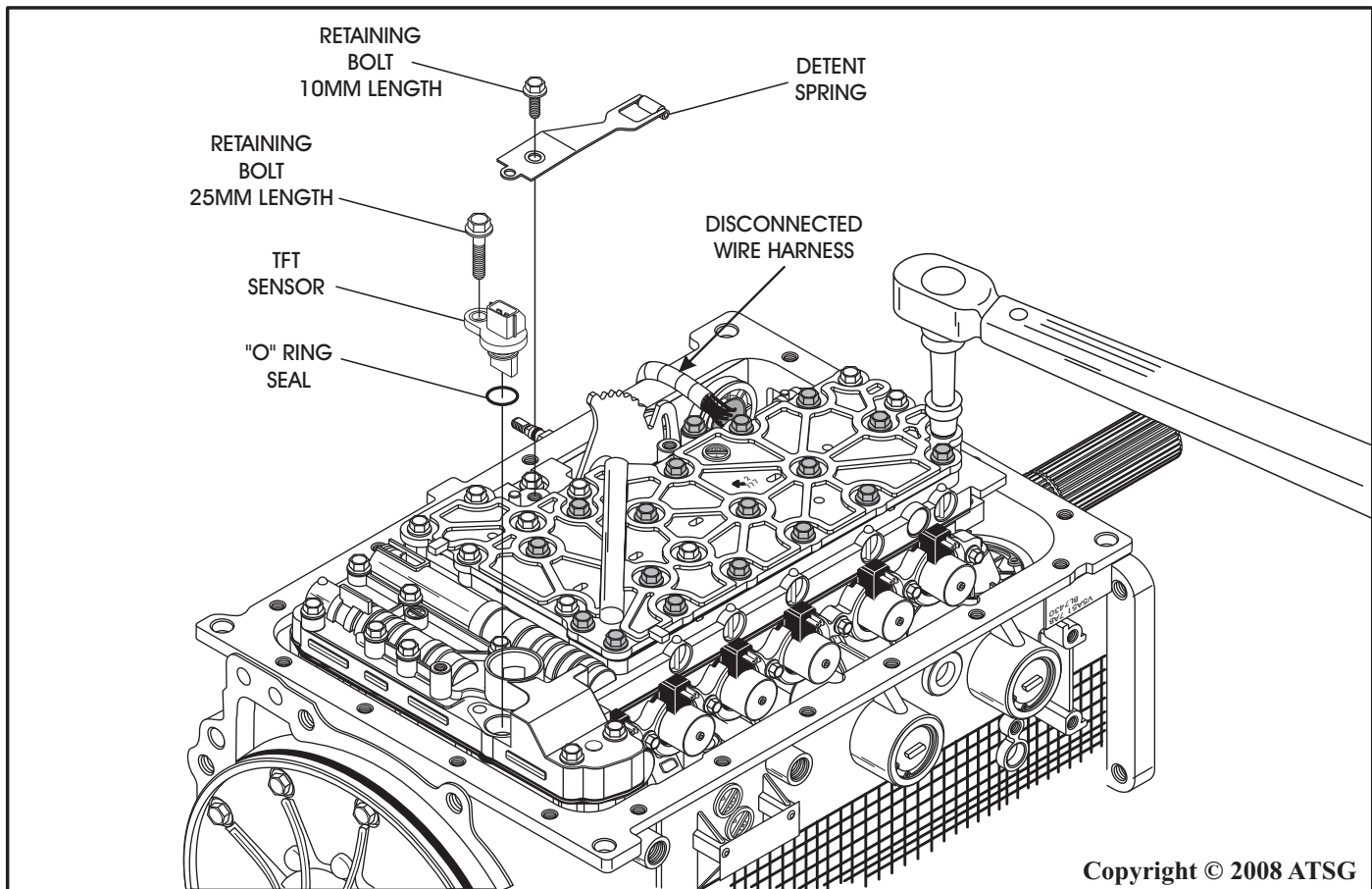


Figure 225

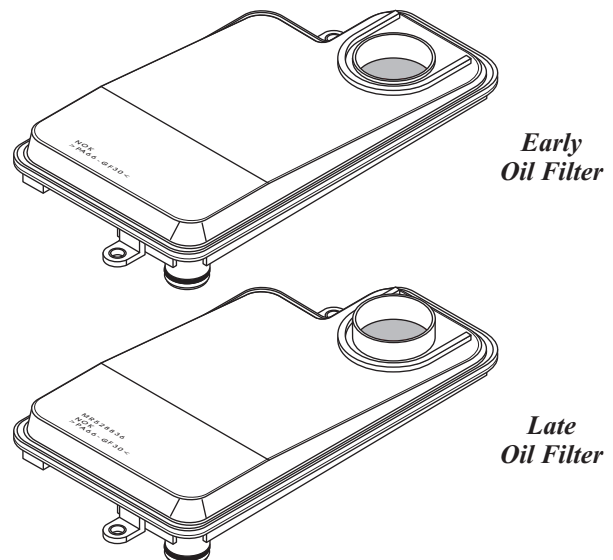
TRANSMISSION ASSEMBLY

"5 SPEED" INTERNAL COMPONENTS (CONT'D)

88. Install new "O" ring seal onto the TFT sensor, as shown in Figure 225.
89. Install the completed TFT sensor into the valve body, as shown in Figure 225, and hand tighten only at this time.
Note: Some models the retaining bolt screws into the valve body, and other models the bolt goes through the valve body and screws into the case.
90. Now, you can torque all valve body to case retaining bolts to 11 N•m (97 in.lb.), as shown in Figure 225.
91. Install the inside detent spring and bolt, as shown in Figure 225, and torque the bolt to 6 N•m (52 in.lb.).

Continued on Page 119

Beginning in mid-year 2000 Mitsubishi introduced an expanded capacity transmission oil pan that is deeper and requires a oil filter with a longer pick up tube, and a longer dipstick. This package was introduced to help eliminate an overheat condition and is available under OEM part number MR593383.



Copyright © 2008 ATSG

Figure 226

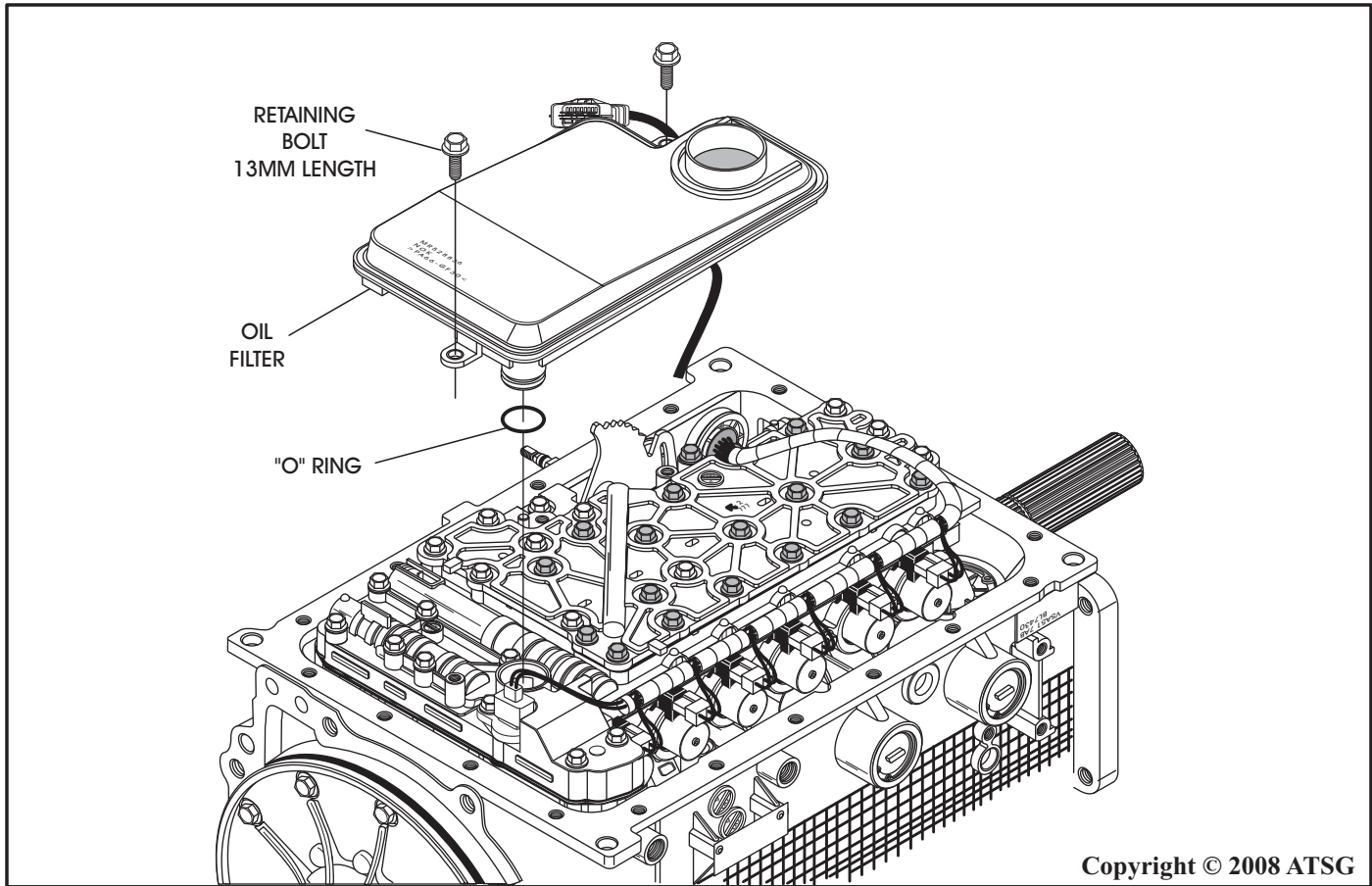


Figure 227

Copyright © 2008 ATSG

TRANSMISSION ASSEMBLY "5 SPEED" INTERNAL COMPONENTS (CONT'D)

92. Fold the internal wiring harness back over the valve body and connect each of the solenoid connectors, as shown in Figure 227.
93. Install the connector on the TFT sensor, as shown in Figure 227.
94. Install new "O" ring on a new oil filter, lube "O" ring with a small amount of Trans-Jel®.
Note: Ensure that you are installing the correct oil filter (See Figure 226).
95. Install the oil filter assembly onto transmission, as shown in Figure 227.
96. Torque filter bolts to 6 N•m (52 in.lb.).
97. Clean the oil pan and magnets thoroughly and dry with compressed air.
98. Place the magnets in the positions shown in Figure 228.

Note: Magnet positions may vary from model model, but there will be an indentation in the pan where they belong.

Continued on Page 120

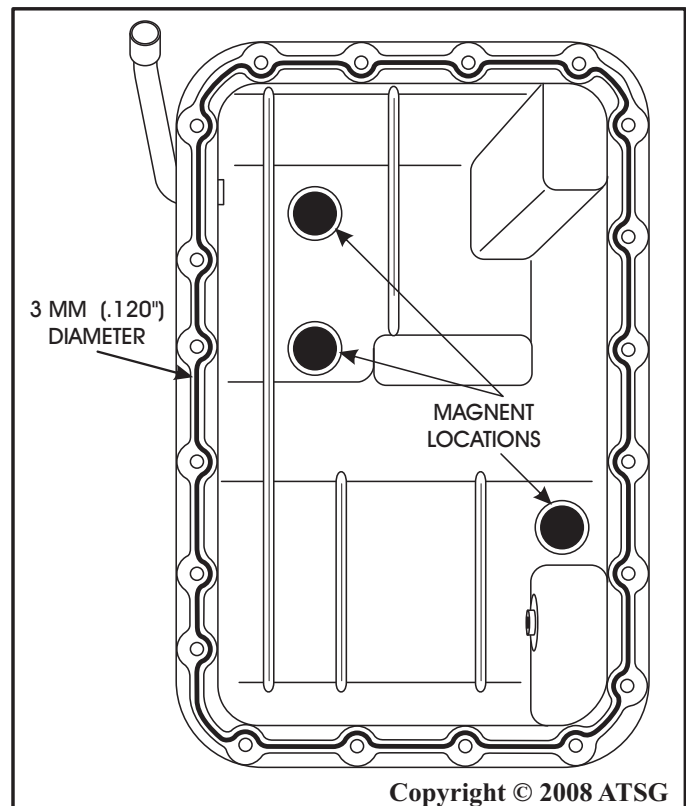


Figure 228

Copyright © 2008 ATSG

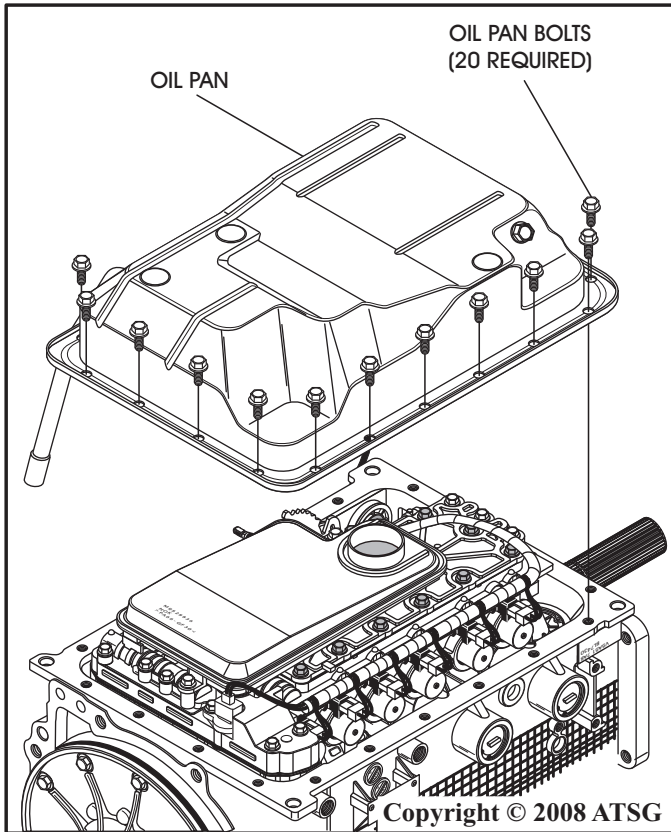


Figure 229

TRANSMISSION ASSEMBLY "5 SPEED" INTERNAL COMPONENTS (CONT'D)

99. Apply a 3 mm (.120") bead of sealant (RTV) on the oil pan, as shown in Figure 228.
Note: Use Mitsubishi genuine sealant part number MR166584 or equivalent.
100. Install the oil pan onto the transmission, as shown in Figure 229, install the 20 pan bolts and torque to 11 N•m (97 in.lb.).
101. Install the parking gear with the "non-spline" area toward the transmission, as shown in Figure 230, and install the snap ring.
Note: There are 2 versions of the park gear. One that uses a "heat shrink" process for installation and one that does not. Two ID grooves is the normal type and 3 ID grooves is the shrink fit type. Heat shrink models must be heated to 160-180°C (320-356°F) to be installed.

Transmission Assembly
Continued on Page 121

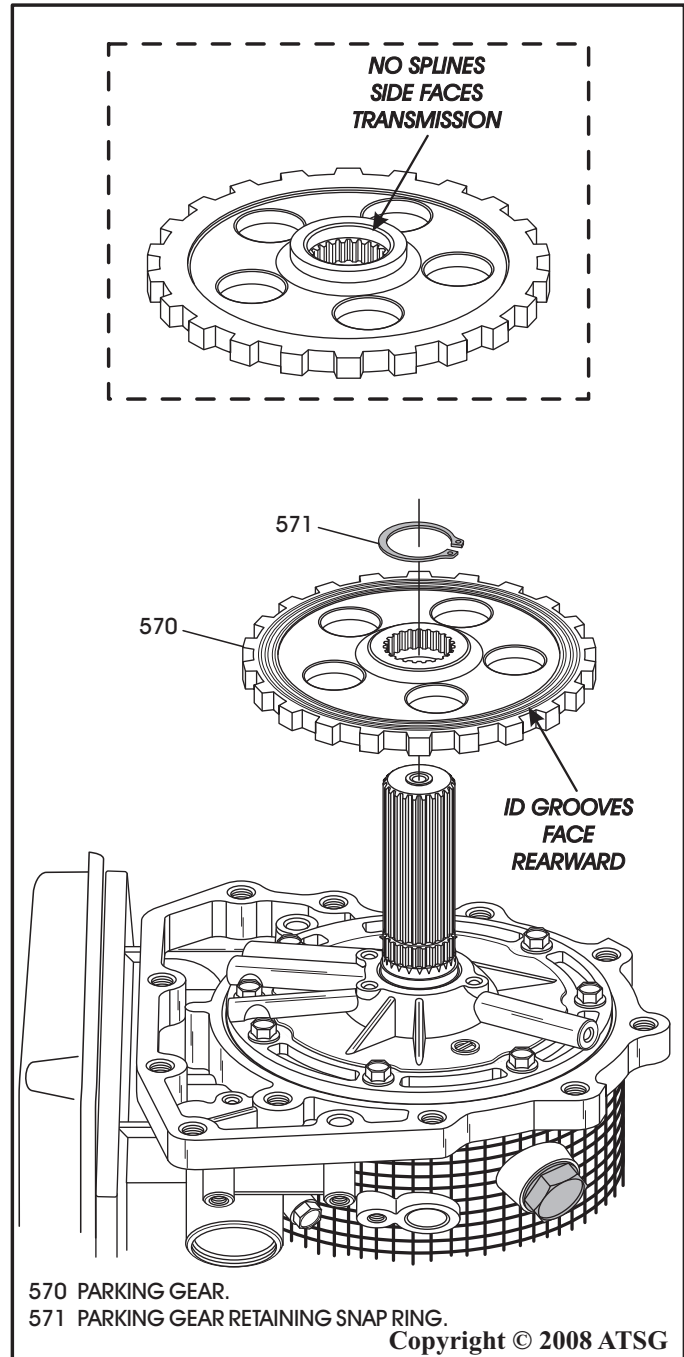


Figure 230

TRANSMISSION ASSEMBLY

"5 SPEED" EXTERNAL COMPONENTS

1. Apply a 3 mm (.120") bead of sealant (RTV) onto the 4WD adapter housing in two places, as shown in Figure 232.
Note: Use Mitsubishi genuine sealant part number MR166584 or equivalent.
2. Install 4WD adapter housing on transmission, as shown in Figure 231.
3. Torque all of the extension housing bolts to 47 N•m (35 ft.lb.), as shown in Figure 233.

Note: All procedures and bolt lengths for the extension housing are the same for 2WD and 4WD transmissions.

Continued on Page 122

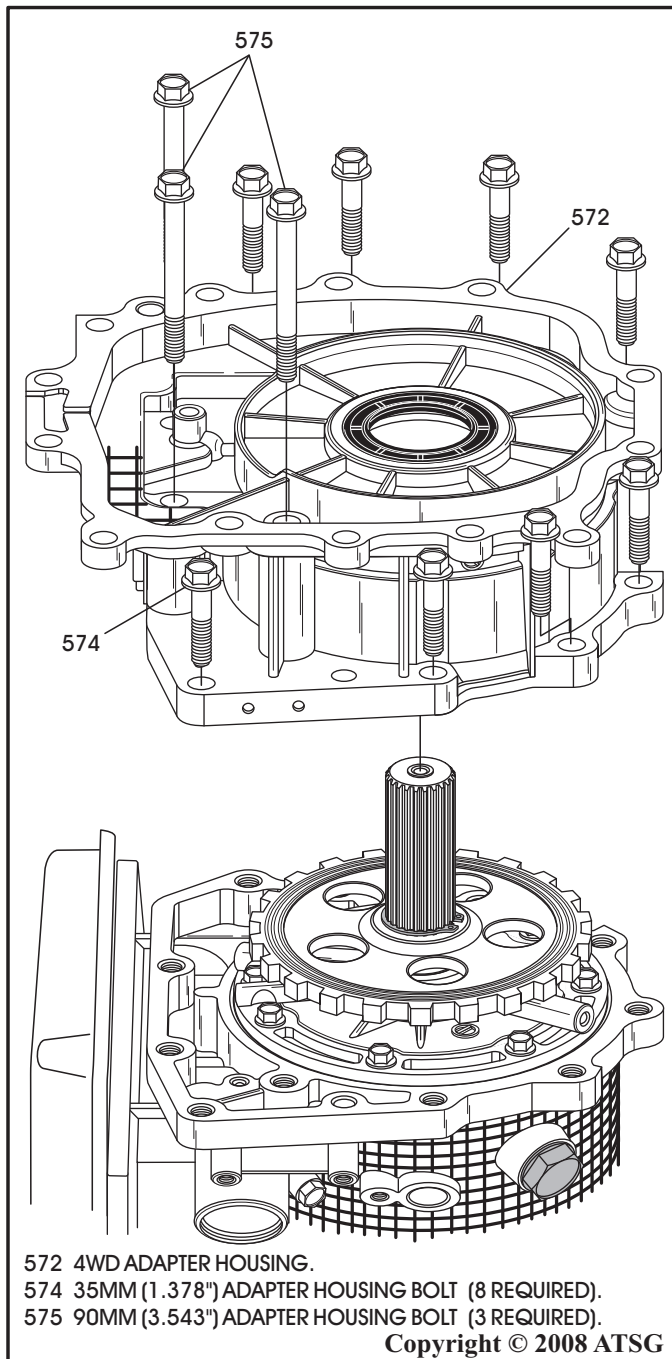


Figure 231

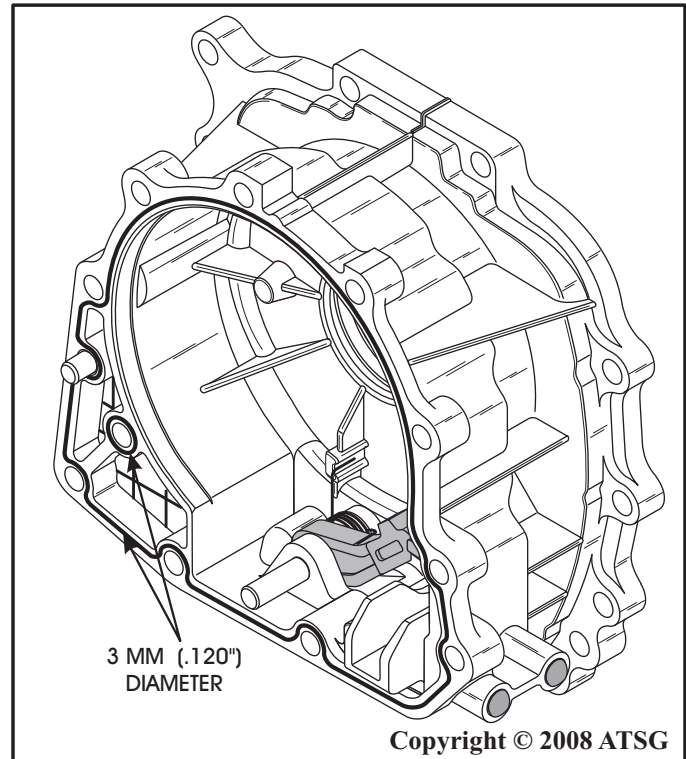


Figure 232

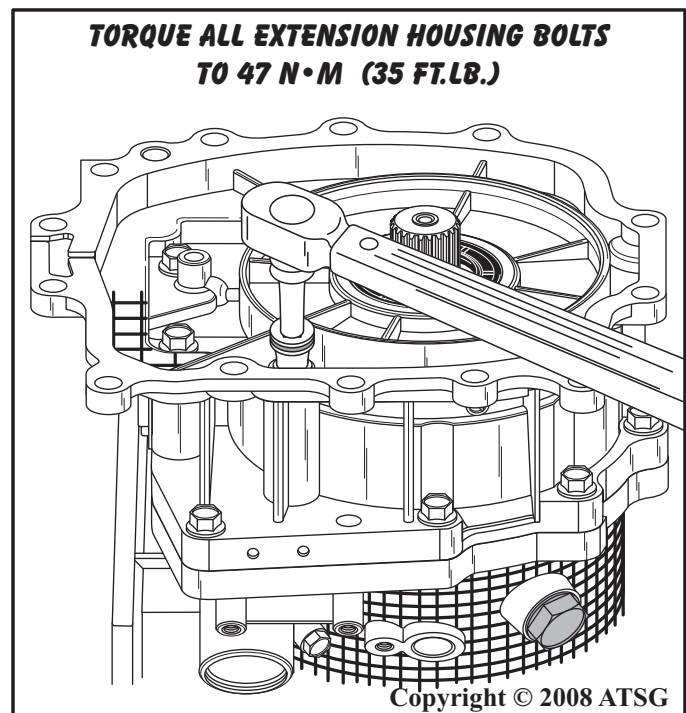


Figure 233

TRANSMISSION ASSEMBLY

"5 SPEED" EXTERNAL PARTS (CONT'D)

4. Lubricate the oil pump "O" ring and the inside surface of the converter housing with a small amount of Trans-Jel®.

5. Apply a 2 mm (.080") bead of sealant (RTV) to the case side of the converter housing, as shown in Figure 235.

Note: Use Mitsubishi genuine sealant part number MR166584 or equivalent.

6. Install the converter housing onto transmission case, as shown in Figure 234, and install the eight retaining bolts.

7. Torque the eight converter housing retaining bolts to 47 N•m (35 ft.lb.), as shown in Figure 236.

Continued on Page 123

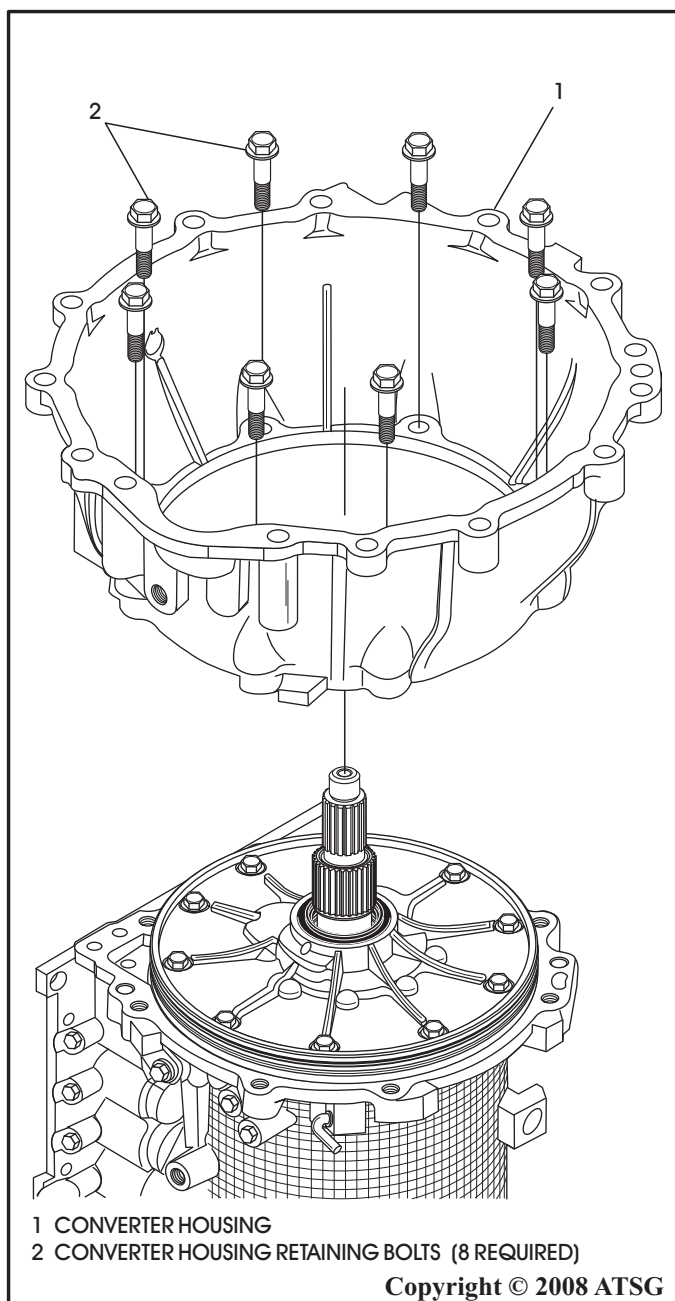


Figure 234

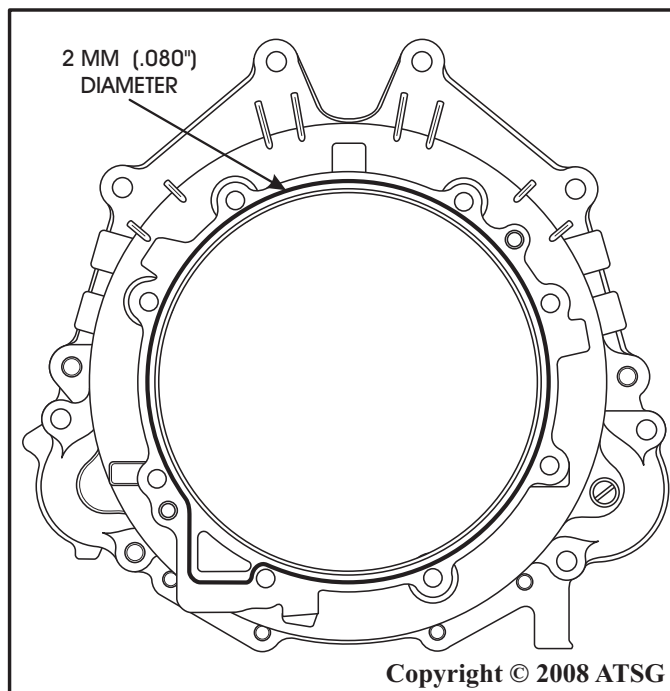


Figure 235

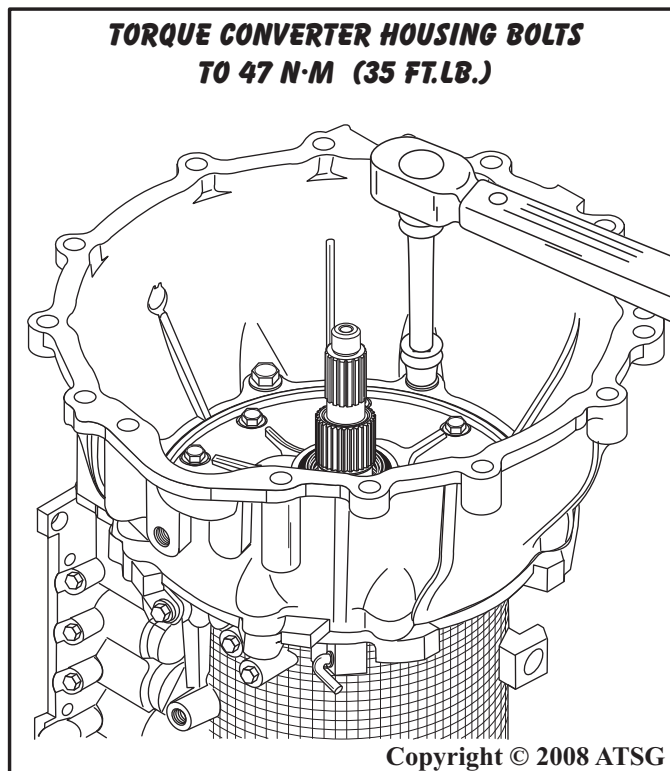
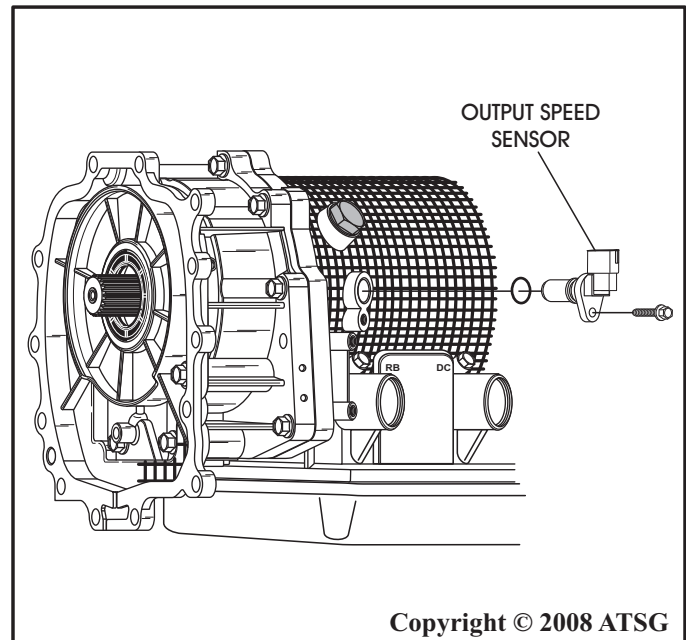


Figure 236

TRANSMISSION ASSEMBLY

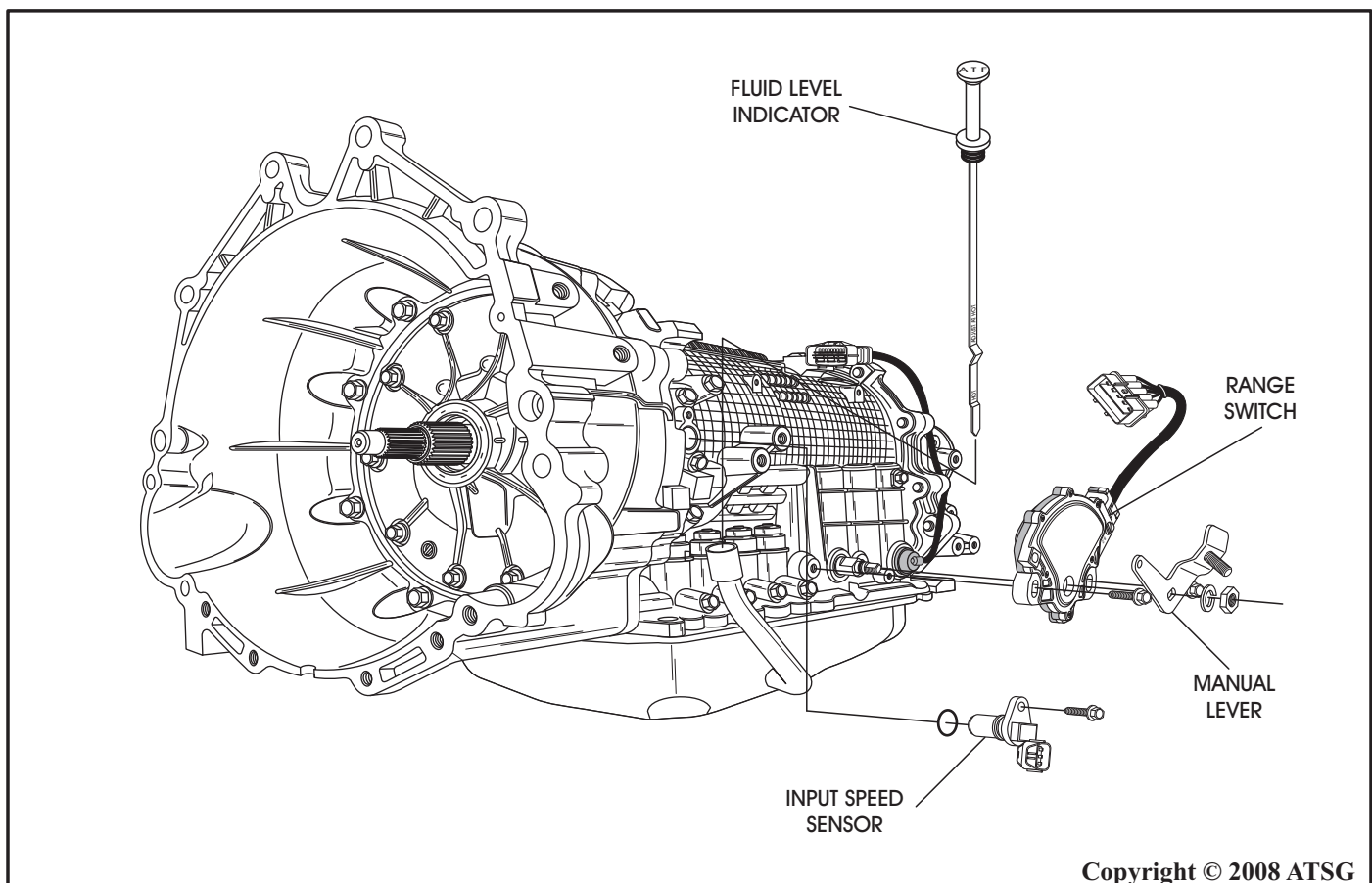
"5 SPEED" EXTERNAL PARTS (CONT'D)

8. Install new "O" ring on output speed sensor, lube with a small amount of Trans-Jel®, install into case bore, as shown in Figure 237.
 9. Install new "O" ring on the input speed sensor, lube with a small amount of Trans-Jel®, install into case bore, as shown in Figure 238.
 10. Torque both speed sensor retaining bolts to 11 N•m (97 in.lb.).
 11. Install the transmission range switch, as shown in Figure 238, and torque the retaining bolts to 11 N•m (97 in.lb.).
 12. Install the external manual shift lever, as shown in Figure 238, and torque the retaining nut to 22 N•m (16 ft.lb.).
 13. Install the fluid level indicator into the tube, as shown in Figure 238.
- Note:** Fluid level indicators vary in design by year and model.
14. Lubricate the converter hub with small amount of Trans-Jel® and install converter, as shown in Figure 239.



Copyright © 2008 ATSG

Figure 237



Copyright © 2008 ATSG

Figure 238

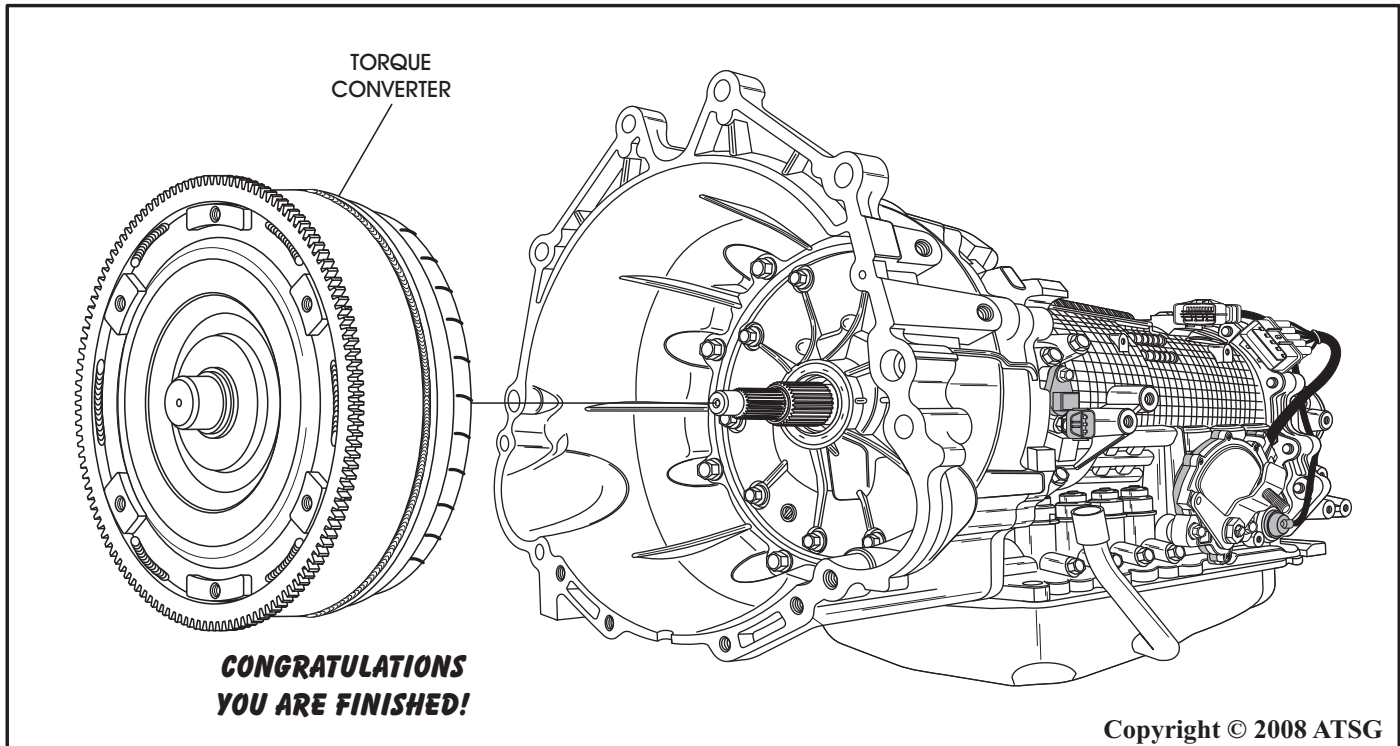


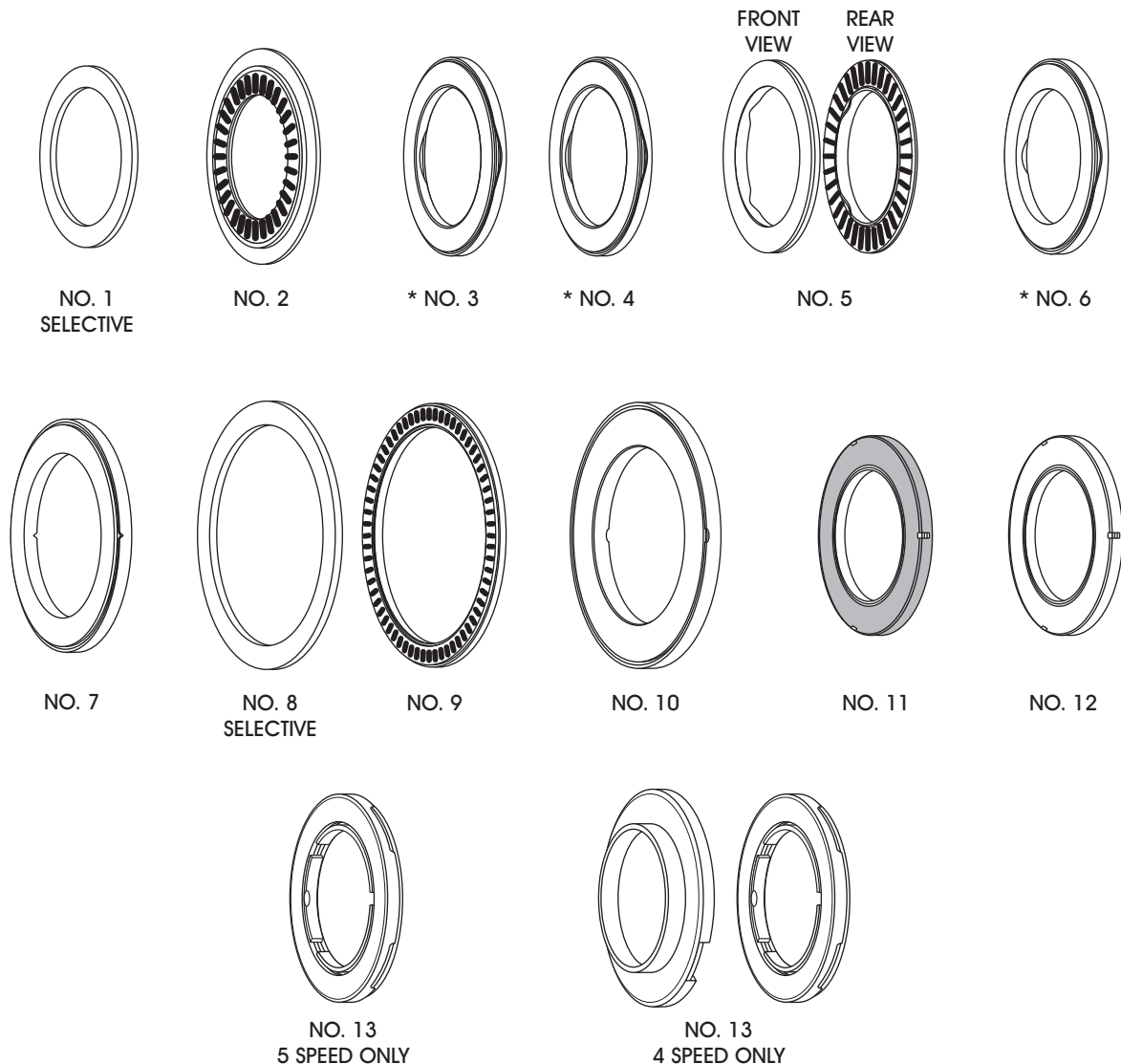
Figure 239

TORQUE SPECIFICATIONS			
Component	N•m	Ft.Lb.	In.Lb.
Output Shaft Support to Case	23	17	
Oil Pump Assembly to Case	23	17	
Oil Pump Cover to Pump Body	11		97
Reduction Band Adjustment Locking Nut	18	13	
Reduction Band Anchor	98	72	
Valve Body to Case	11		97
Valve Body Cover to Valve Body	11		97
Valve Body to Solenoid Body	11		97
Solenoid Bracket to Solenoid Body	7		62
Spacer Plate to Valve Body	7		62
Detent Spring to Valve Body	6		52
Oil Filter to Valve Body	6		52
Oil Pan to Case	11		97
4WD Adapter Housing/Extension Housing to Case	47	35	
Speedometer Adapter to 2WD Extension Housing	18	13	
Converter Housing to Case	47	35	
Output Speed Sensor to Case	11		97
Input Speed Sensor to Case	11		97
Transmission Range Sensor to Case	11		97
External Manual Shift Lever Nut	22		97
Oil Pressure Test Plugs	11		97

Copyright © 2008 ATSG

Figure 240

THRUST BEARING AND WASHER IDENTIFICATION



- NO. 1 OVERDRIVE AND REVERSE CLUTCH HOUSING TO OIL PUMP "SELECTIVE" THRUST BEARING RACE (ILLUSTRATION NO. 400).
- NO. 2 OVERDRIVE AND REVERSE CLUTCH HOUSING TO OIL PUMP THRUST BEARING (ILLUSTRATION NO. 401).
- *NO. 3 OVERDRIVE AND REVERSE CLUTCH HOUSING TO OVERDRIVE CLUTCH HUB THRUST BEARING (ILLUSTRATION NO. 424).
- *NO. 4 OVERDRIVE CLUTCH HUB TO REVERSE SUN GEAR AND HUB THRUST BEARING (ILLUSTRATION NO. 427).
- NO. 5 OVERDRIVE CARRIER TO UNDERDRIVE SUN GEAR THRUST BEARING (ILLUSTRATION NO. 505).
- *NO. 6 UNDERDRIVE SUN GEAR TO OUTPUT PLANETARY CARRIER THRUST BEARING (ILLUSTRATION NO. 507).
- NO. 7 OUTPUT PLANETARY CARRIER TO CENTER SUPPORT THRUST BEARING (ILLUSTRATION NO. 509).
- NO. 8 CENTER SUPPORT TO OUTPUT FLANGE "SELECTIVE" THRUST BEARING RACE (ILLUSTRATION NO. 514).
- NO. 9 CENTER SUPPORT TO OUTPUT FLANGE THRUST BEARING (ILLUSTRATION NO. 515).
- NO. 10 OUTPUT FLANGE TO UNDERDRIVE CLUTCH HUB THRUST BEARING (ILLUSTRATION NO. 518).
- NO. 11 UNDERDRIVE CLUTCH HUB TO UNDERDRIVE CLUTCH HOUSING THRUST BEARING (ILLUSTRATION NO. 520).
- NO. 12 UNDERDRIVE CLUTCH HOUSING TO OUTPUT SHAFT THRUST BEARING (ILLUSTRATION NO. 535).
- NO. 13 "5 SPEED", DIRECT CLUTCH HOUSING TO OUTPUT SHAFT SUPPORT THRUST BEARING (ILLUSTRATION NO. 553)
- NO. 13 "4 SPEED", OUTPUT SHAFT RETAINER TO OUTPUT SHAFT SUPPORT THRUST BEARING (ILLUSTRATION NO. 555).

NOTE: NUMBER 3, NUMBER 4, AND NUMBER 6 THRUST BEARINGS ARE THE SAME AND WILL INTERCHANGE.

Figure 241

Technical Service Information

SPECIAL SERVICE TOOLS

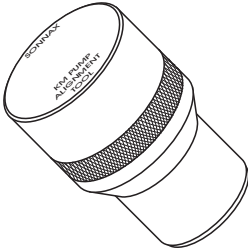
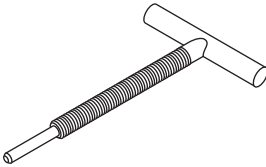
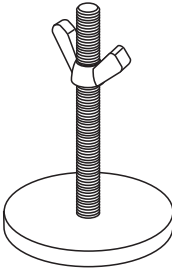
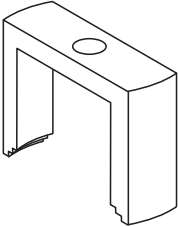
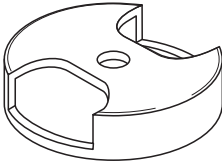
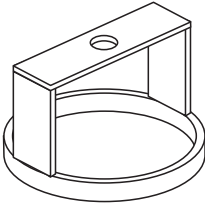
	<i>FUNCTION</i>		<i>R/V4A51 V5A51</i>
	OIL PUMP ALIGNMENT		SONNAX® 41005-TL
	OIL PUMP REMOVAL		MITSUBISHI MD998333
	UNIVERSAL SPRING COMPRESSOR		MITSUBISHI MD998924
	REMOVE AND INSTALL REVERSE AND OVERDRIVE SPRING RETAINER AND SNAP RING		MITSUBISHI MD999590
	REMOVE AND INSTALL UNDERDRIVE CLUTCH SPRING RETAINER AND SNAP RING		MITSUBISHI MD998907
	REMOVE AND INSTALL CENTER SUPPORT AND DIRECT CLUTCH SNAP RING		MITSUBISHI MB991630
Copyright © 2008 ATSG			

Figure 242

Technical Service Information

SPECIAL SERVICE TOOLS

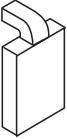
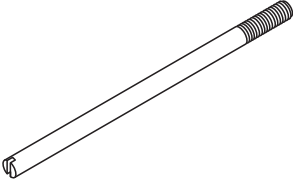
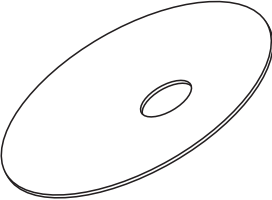
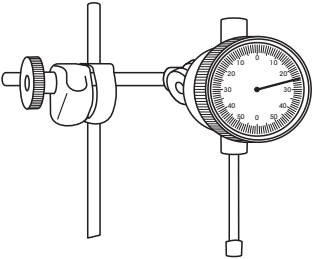
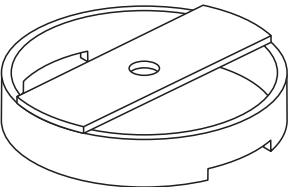
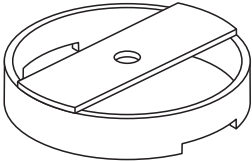
	<i>FUNCTION</i>		<i>R/V4A51 V5A51</i>
	HOLDS REDUCTION BRAKE PISTON DURING ADJUSTMENT		MITSUBISHI MB991693
	ALIGNMENT DOWEL FOR OIL PUMP		MITSUBISHI MD998412
	MEASUREMENT OF BRAKE REACTION PLATE FOR 2ND BRAKE & LOW/REVERSE END PLAYS		MITSUBISHI MD991632
	CHECKING FRONT AND REAR END CLEARANCES		UNIVERSAL
	MEASUREMENT OF REVERSE CLUTCH END PLAY		MITSUBISHI MB991789
	MEASUREMENT OF UNDERDRIVE AND OVERDRIVE CLUTCH END PLAYS		MITSUBISHI MB991629
Copyright © 2008 ATSG			

Figure 243

Technical Service Information

SPECIAL SERVICE TOOLS

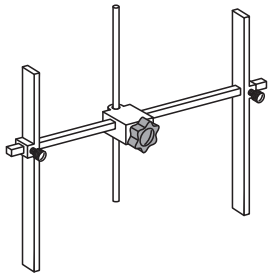
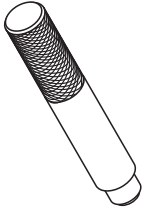
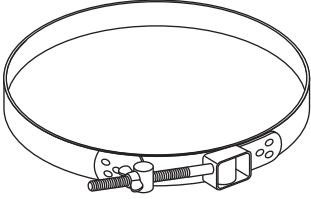
	<i>FUNCTION</i>		<i>R/V4A51 V5A51</i>
	"H" GAGE TO MEASURE FOR THE FRONT END-PLAY SELECTIVE		UNIVERSAL
	SEAL INSTALLER HANDLE		UNIVERSAL OR MITSUBISHI MB990938
	SEAL INSTALLER		UNIVERSAL OR MITSUBISHI MB990929
	PUMP ALIGNMENT STRAP		UNIVERSAL
			Copyright © 2008 ATSG

Figure 244