



# INTRODUCTION

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## ***SATURN/GM/SAAB/VOLVO/NISSAN AF23/33-5, AW55-50/51SN, RE5F22A***

The AF23/33-5 is a fully-automatic, five speed, electrically controlled, front-wheel drive transmission. This transmission is currently used by many different vehicle manufacturers, among them are; GM, Infiniti, Nissan, Saab, Saturn, Suzuki, and Volvo. In the GM, Saturn and Suzuki vehicles, the transmission is known as the AF23/33-5. In Saab vehicles it's designated FA 57. Nissan and Infiniti call it the RE5F22A, and in a Volvo it's known as the AW55-50/51SN. This transmission contains three planetary gear sets, three driving friction elements, five holding friction elements (*one of which is a servo applied band*), two sprags, and a torque converter, which contains a clutch assembly for increased fuel efficiency. The three planetary gear sets provide five forward speeds and one reverse speed. Gear ratio change is fully automatic and controlled through the Transmission Control Module (TCM). The TCM monitors and receives inputs from various electronic sensors, then uses the information to control shift timing, clutch apply control, line pressure control, and torque converter clutch application. This manual will contain overhaul information pertaining to the AF23/33-5, AW55-50/51SN, and RE5F22A transmission.

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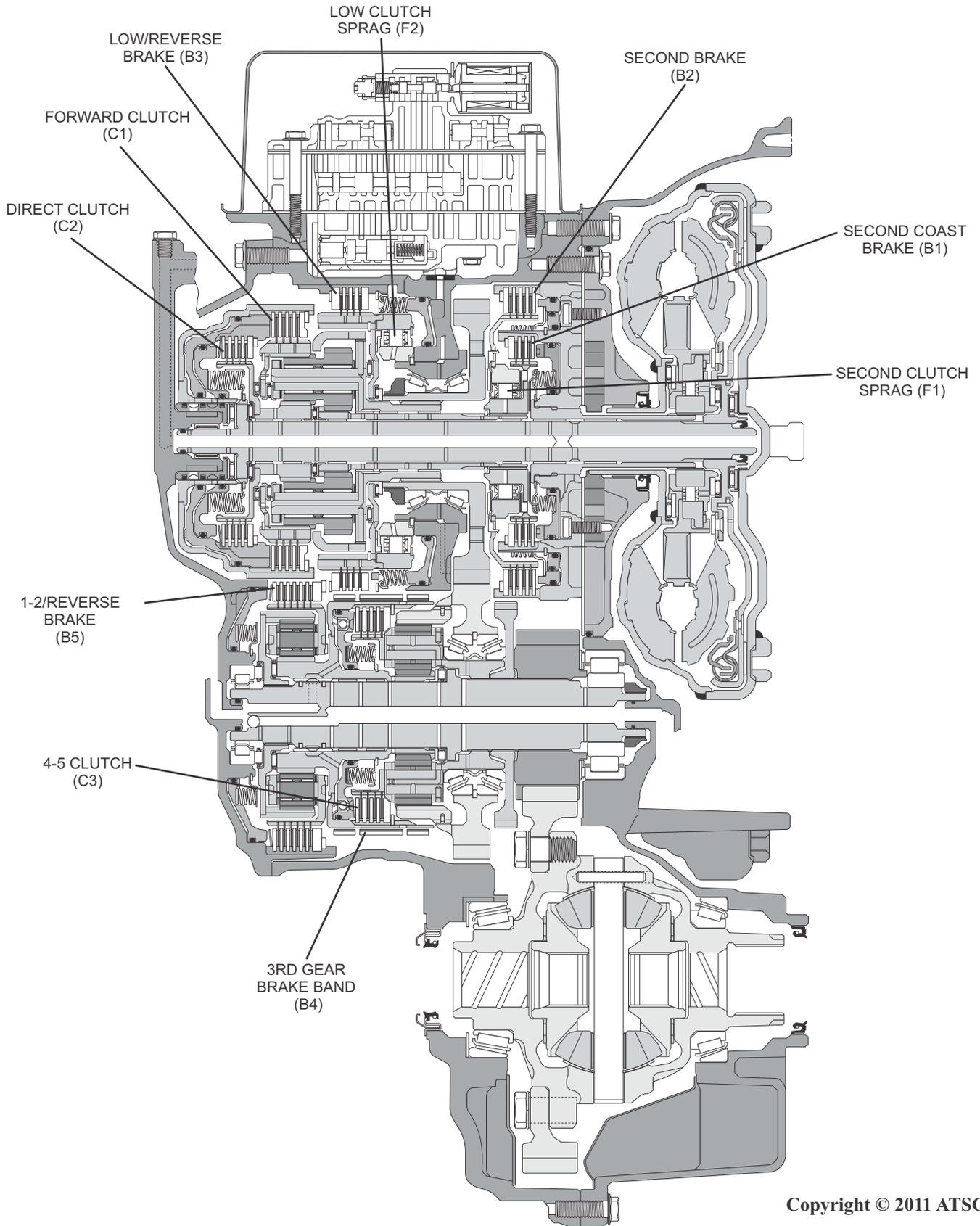
**SATURN/GM/SAAB  
NISSAN/VOLVO  
AF23/33-5, AW55-50/51SN  
RE5F22A  
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**SATURN/GM/SAAB/VOLVO/NISSAN AF23/33-5, AW55-50/51SN, RE5F22A  
CUT-AWAY VIEW/INTERNAL COMPONENT LOCATIONS**



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Figure 1



# Technical Service Information

## COMPONENT APPLICATION INFORMATION

Refer to Figure 1 for a cutaway view of the transmission indicating the internal component locations. Refer to Figure 2 for the component application chart, which indicates individual component application for each gear range.

A shift solenoid application chart is also provided in Figure 2 to aid the technician in diagnosis of this transmission.

<b>COMPONENT APPLICATION CHART</b>											
RANGE	GEAR	SECOND BRAKE (B2)	SECOND COAST BRAKE (B1)	SECOND CLUTCH SPRAG (F1)	LOW CLUTCH SPRAG (F2)	LOW AND REVERSE BRAKE (B3)	FORWARD CLUTCH (C1)	DIRECT CLUTCH (C2)	4-5 CLUTCH (C3)	3RD GEAR BRAKE BAND (B4)	1-2 AND REVERSE BRAKE (B5)
PARK	P										APPLIED
REVERSE	R					APPLIED		APPLIED			APPLIED
NEUTRAL	N										APPLIED
DRIVE	1				HOLDING		APPLIED				APPLIED
	2	APPLIED	APPLIED	HOLDING			APPLIED				APPLIED
	3	APPLIED	APPLIED	HOLDING			APPLIED			APPLIED	
	4	APPLIED	APPLIED	HOLDING			APPLIED		APPLIED		
	5	APPLIED					APPLIED	APPLIED	APPLIED		
	EMERGENCY MODE	APPLIED					APPLIED	APPLIED	APPLIED		
"I" INTERMEDIATE	1				HOLDING		APPLIED				APPLIED
	2	APPLIED	APPLIED	HOLDING			APPLIED				APPLIED
	3	APPLIED	APPLIED	HOLDING			APPLIED			APPLIED	
"L" LOW	1 E/B				HOLDING	APPLIED	APPLIED				APPLIED
	2	APPLIED	APPLIED	HOLDING			APPLIED				APPLIED

<b>SHIFT SOLENOID APPLICATION CHART</b>															
SOLENOID \ GEAR RANGE	Park	Reverse	Reverse Inhibit	Neutral	Drive 1st	Drive 2nd	Drive 3rd	Drive 4th	Drive 5th	Emer. Mode	Int. 1st	Int. 2nd	Int. 3rd	Low 1 E/B	Low 2nd
REVERSE/1ST SOLENOID (S1)	OFF	OFF	*ON	OFF	ON	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF	ON	OFF
2-3/3-4 SOLENOID (S2)	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	OFF	OFF	OFF	ON	ON	OFF	ON
1-2/2-3/REVERSE SOLENOID (S3)	OFF	ON	*OFF	OFF	ON	ON	ON	OFF	OFF	OFF	ON	ON	ON	ON	ON
3-4/4-5 SOLENOID (S4)	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	OFF	OFF	OFF	ON	OFF	OFF
REVERSE SOLENOID (S5)	OFF	ON	*OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF

\* NOTE: If vehicle speed is detected above 7km/h (4mph), the TCM commands the solenoids to inhibit reverse.

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Figure 2

## **TRANSMISSION GENERAL DESCRIPTION**

The AF23/33-5 is a fully-automatic, electronically controlled, five speed, front wheel drive transmission, consisting primarily of a four element torque converter, three planetary gear sets, friction and mechanical clutches and a hydraulic pressure control system.

The four element torque converter contains a pump, a turbine, a pressure plate (which is splined to the turbine), and a stator assembly. The torque converter acts as a fluid coupling device to smoothly transmit power from the engine to the transmission. It also hydraulically provides additional torque multiplication when required. The pressure plate, when applied, provides a mechanical “direct drive” coupling of the engine to the turbine shaft of the transmission.

The three planetary gear sets provide five gear ratios forward, and one gear ratio in reverse. Gear ratio change is provided automatically through the use of the Transmission Control Module (TCM). The TCM receives and monitors input from various electronic sensors, then utilizes the information to change the gear ratios as needed for optimum efficiency.

The TCM activates five on/off shift control solenoids, and three duty cycle solenoids within the transmission to control functions such as; desired gear ratio, shift timing, and pressure control. The TCM also controls the apply and release of the torque converter clutch which allows the engine to deliver maximum fuel efficiency without sacrificing vehicle performance.

The hydraulic system consists of a gear type pump, four control valve bodies, case cover, converter housing and transmission case. The pump functions to maintain adequate working pressure to stroke the servo and clutch pistons that apply or release the friction components. These friction components (when applied or released), support the fully automatic shifting qualities of the transmission.

The friction components used in this transmission consist of seven multiple disc clutches, and one brake band. The multiple disc clutches combine with two mechanical sprag clutches to deliver six different gear ratios through the gear sets. The gear sets then transfer torque through the differential assembly and then out to the drive axles.

## **DESCRIPTION OF GEAR RANGES**

The Saturn Vue, Ion Sedan, Chevrolet Equinox, and Pontiac Torrent, all use a six detent shift quadrant as shown in the diagram in Figure 3.

**P** - Park position enables the engine to be started while preventing the vehicle from rolling either backward or forward. For safety reasons, the vehicles parking brake should be used in addition to the Park position.

**R** - Reverse enables the vehicle to be operated in a rearward direction.

**N** - Neutral position enables the engine to start and operate without driving the vehicle. If necessary, this position should be selected to restart the engine while the vehicle is moving.

**D** - Drive range should be used for all normal driving conditions for maximum efficiency and fuel economy. Drive range allows the transmission to operate in each of the five forward gear ratios. Downshifts to a lower gear, or higher gear ratio are available for safe passing by depressing the accelerator or by manually selecting a lower gear range with the selector lever.

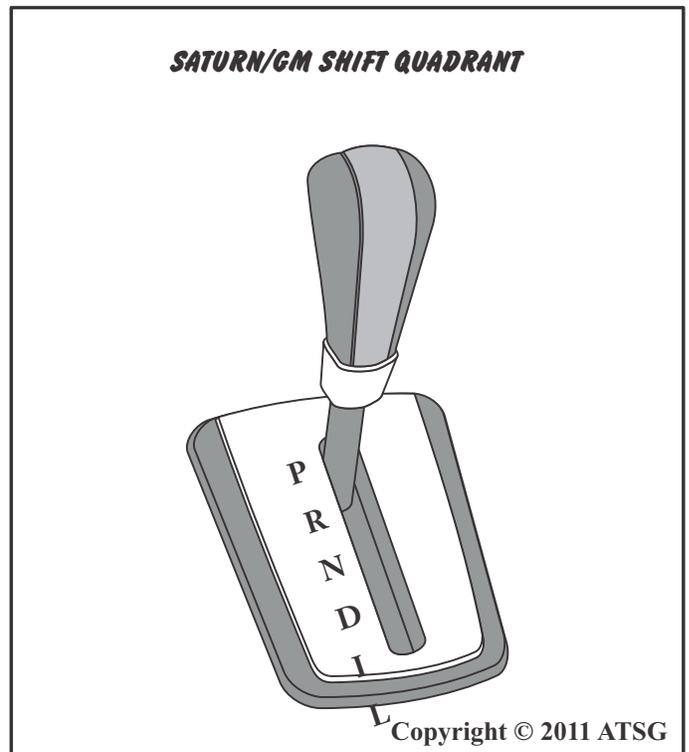


Figure 3

## DESCRIPTION OF GEAR RANGES (CONT'D)

I - Intermediate range can be used for conditions where it may be desirable to use only three gear ratios. These conditions include towing a trailer and driving in hilly or mountainous terrain. This range is also helpful for engine braking when descending slight grades. Upshifts and downshifts are the same as in the Drive range for first, second and third gears except that the transmission is prevented from shifting above third gear. Intermediate range can be selected at any vehicle speed, however, the transmission will downshift into third gear only if vehicle speed is low enough so that the engine will not over-rev. Such conditions determined by calibration of the TCM.

L - Low range adds more performance for congested traffic and hilly, mountainous terrain. It has the same starting ratio (first gear) as Drive and Intermediate ranges but prevents the transmission from shifting above second gear. Therefore, Low range can be used to retain second gear for acceleration and engine braking as desired. Low range can be selected at any vehicle speed, however, the transmission will downshift to second gear only if vehicle speed is low enough so that the engine will not over-rev. Such conditions determined by calibration of the TCM. This range is particularly beneficial for maintaining maximum engine braking effect when descending steep grades.

## FLUID REQUIREMENTS/LEVEL CHECKING

The AF23/33-5 transmission in the Saturn Vue and Ion, the Chevrolet Equinox, and the Pontiac Torrent are all filled through the dipstick tube located on the side of the transmission by the side pan. Refer to Figure 4 for dipstick tube location.

**IMPORTANT NOTE: DexronIII ATF is not compatible with this transmission, if DexronIII ATF is used, transmission failure may result. Use only GM T-IV fluid Part No. 88900925 or equivalent in this transmission.**

To check fluid level, warm transmission temperature to 60° - 70° C (140° - 158° F). With engine running and selector lever in park remove the dipstick retaining bolt as shown in Figure 4. Next, remove the dipstick and wipe clean, then insert dipstick into the case and remove quickly. Check to make sure fluid is at the correct level on the stick as shown in Figure 4.

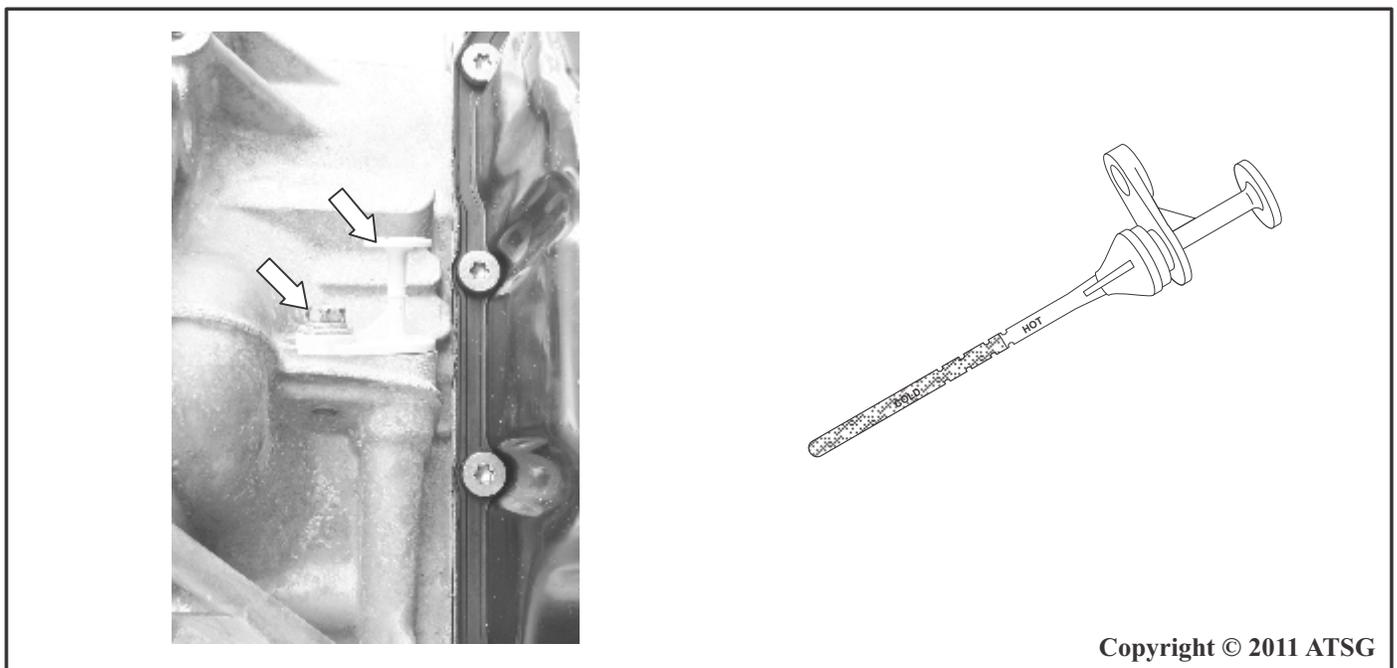


Figure 4

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## ELECTRICAL COMPONENTS

### Emergency Mode Operation

If for any reason the entire electronic control system of the transmission becomes disabled, all five of the shift solenoid valves will be de-energized (turned OFF). This “Emergency Mode” operating state of the solenoids forces the transmission to operate in fifth gear regardless of other vehicle operating conditions when the gear selector is in a forward drive range. Also, in “Emergency Mode” the TCC lock up pressure control solenoid valve is turned OFF in order to prevent TCC apply. This allows the vehicle to be operated safely, despite the disabled electronic controls, until the condition can be corrected. However, the transmission will operate in reverse, if selected, as well as park and neutral.

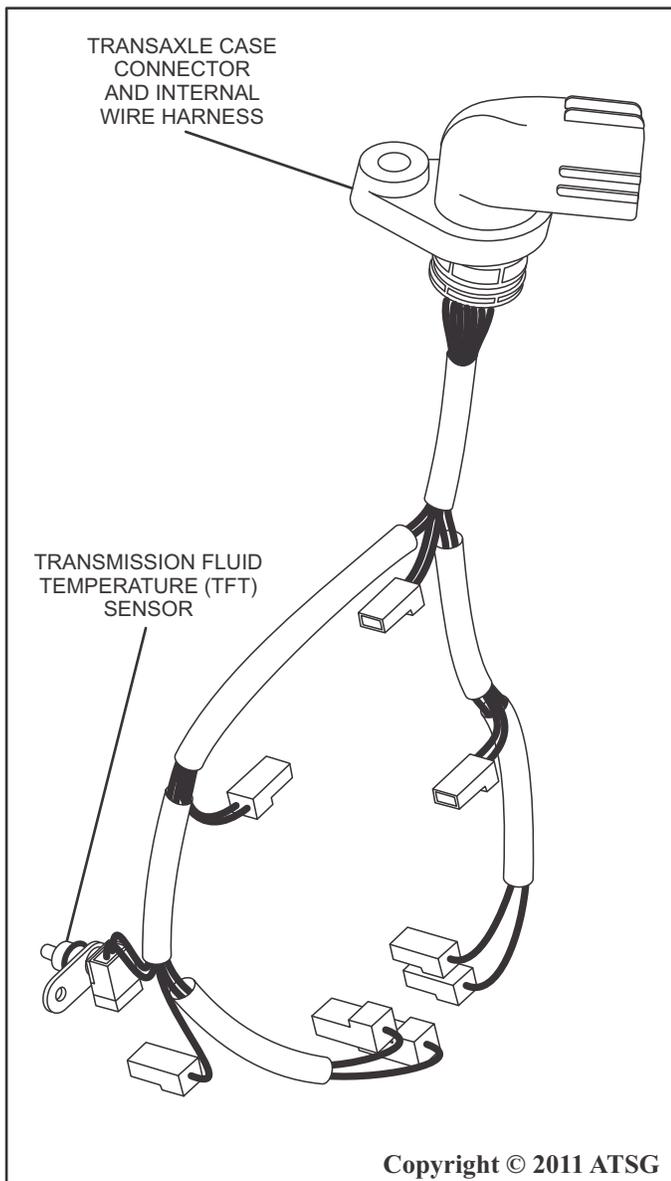


Figure 5

## ELECTRICAL COMPONENTS (Cont'd)

### Transmission Fluid Temperature (TFT) Sensor

The Transmission Fluid Temperature (TFT) sensor is part of the transaxle internal wire harness assembly, as shown in Figure 5. The TFT sensor is a thermister, and as such changes value based on temperature, as shown in the chart in Figure 6. The TCM supplies a 5 volt reference signal to the TFT sensor and measures the voltage drop in the circuit. When the transmission fluid is cold, the TFT sensor resistance is high and the TCM detects high signal voltage. As the fluid temperature warms to a normal operating temperature, the resistance becomes less and the signal voltage decreases. The TCM uses this information to maintain shift quality and TCC apply quality over the entire operating temperature range. If the TCM detects an improper signal from the TFT sensor, a DTC will be stored in TCM memory.

**Transmission Fluid Temperature (TFT) Sensor Resistance Chart**

Temperature °C	Ohms Resistance
-40 °C (-40°F)	77,480
-30 °C (-22°F)	44,000
-20 °C (-04°F)	25,880
-10 °C (14°F)	15,730
0 °C (32°F)	9,846
10 °C (50°F)	6,445
20 °C (68°F)	4,184
30 °C (86°F)	2,829
40 °C (104°F)	1,955
50 °C (122°F)	1,379
60 °C (140°F)	992
70 °C (158°F)	726
80 °C (176°F)	541
90 °C (194°F)	409
100 °C (212°F)	314
110 °C (230°F)	247
120 °C (248°F)	192
130 °C (266°F)	153
140 °C (284°F)	124
150 °C (302°F)	101

Figure 6

## ELECTRICAL COMPONENTS (Cont'd)

### Output Shaft Speed (OSS) Sensor

The Output Shaft Speed (OSS) sensor is an active, hall effect pickup located in the top of the transaxle case, as shown in Figure 7. This sensor is mounted in the case opposite the parking gear that is splined to the front differential transfer drive gear carrier assembly shaft. The sensor is supplied with a reference voltage of 0.6 volts. As the parking gear is rotated, a square wave voltage signal is generated by the teeth on the parking gear as they pass by the sensor, that is proportional to vehicle speed. Refer to Figure 7. Output voltage from the sensor is fixed at 1.4 volts and does not depend on a rotational number for its input value. Therefore, the slower the parking gear rotates, the fewer pulses will be detected by the TCM and conversely, the faster the parking gear rotates, a greater number of pulses will be detected by the TCM during the same time frame.

If the TCM detects an improper signal from the OSS, a DTC will be stored in the TCM memory.

### Input Shaft Speed (ISS) Sensor

The Input Shaft Speed (ISS) sensor operates identically to the OSS sensor, except that it uses the teeth on the forward/direct clutch housing as the reluctor or rotor. The forward/direct clutch housing is driven at converter turbine speed. The TCM uses transaxle input and output speeds to help determine line pressure, transaxle shift patterns, TCC apply pressure, gear ratios, and TCC slippage for diagnostic purposes.

If the TCM detects an improper signal from the ISS, a DTC will be stored in the TCM memory.

Refer to Figure 18 and Figure 19 for DTC definitions.

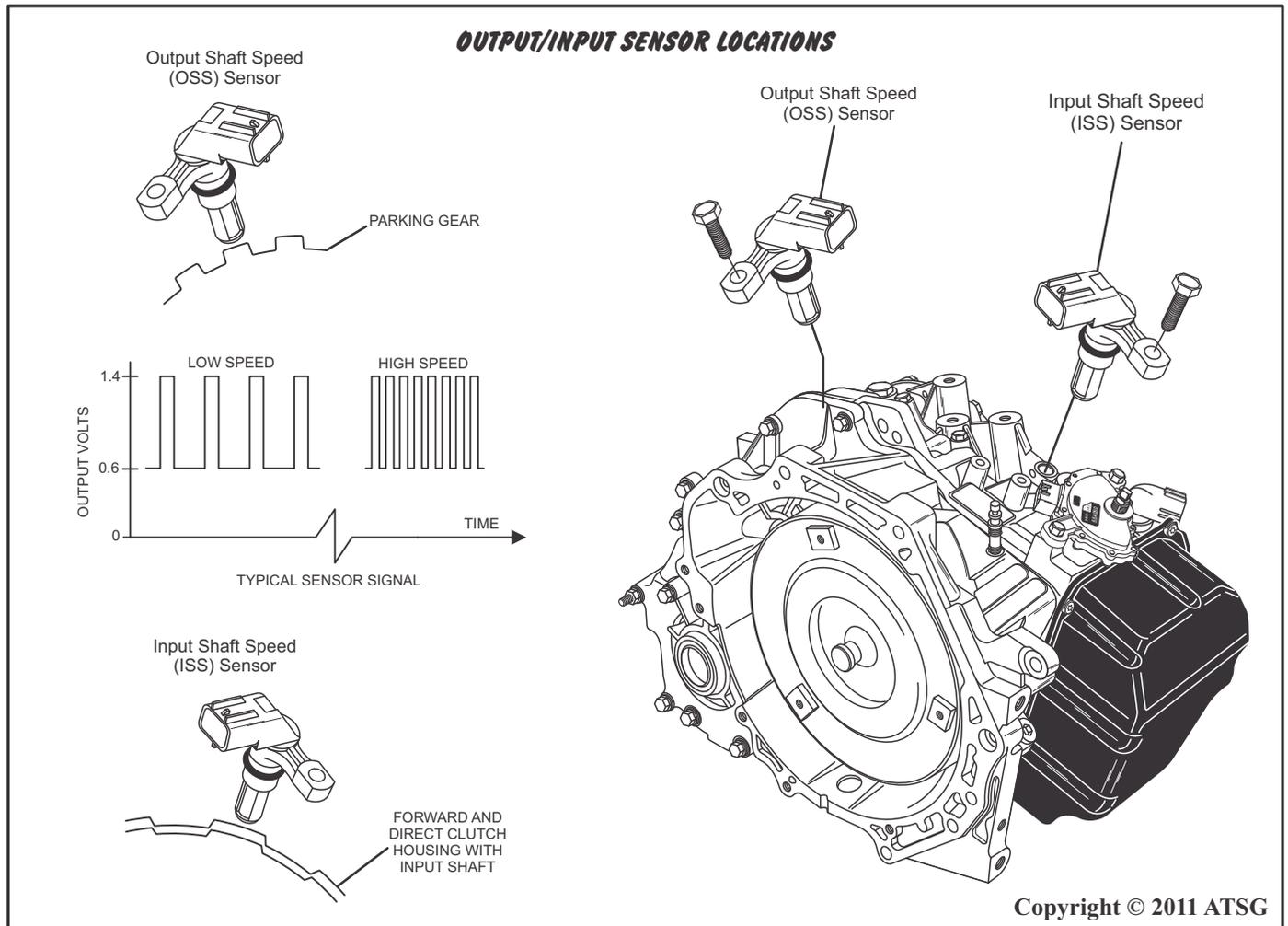


Figure 7

## ***ELECTRICAL COMPONENTS (Cont'd)***

### ***Park/Neutral Position Switch***

The Park/Neutral Position Switch assembly is a sliding contact switch attached to the manual shift detent lever assembly on the outside of transaxle, as shown in Figure 8. The four inputs to the TCM from the P/N switch indicate which position has been selected by the manual selector lever. This information is used for engine controls as well as determining the transaxle shift patterns. The state of each input is available for display on the scan tool. The four input parameters shown in Figure 9 are Mode A, Mode B, Mode C and Mode PA.

The Park/Neutral Position Switch assembly is also responsible for allowing the engine to be started in Park or Neutral only, and no other selector position. This switch is also responsible for illuminating the Back-Up lamps when Reverse is selected, as shown in Figure 9.

If the TCM detects an improper signal from the Park/Neutral Position Switch assembly, a DTC will be activated.

The DTC strategy may be different between the models you are working on.

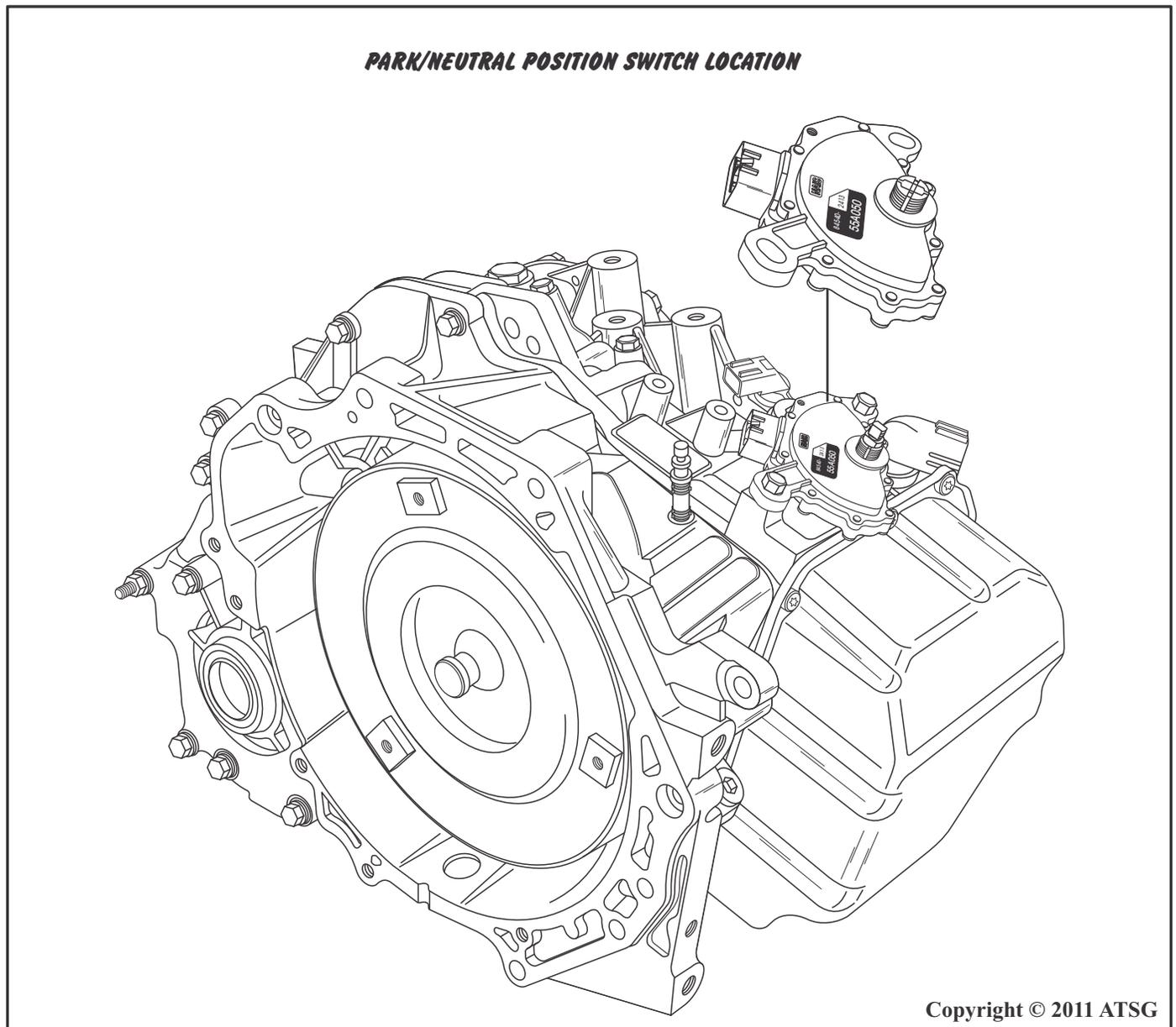
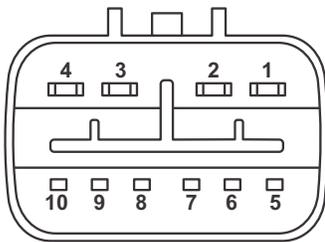


Figure 8

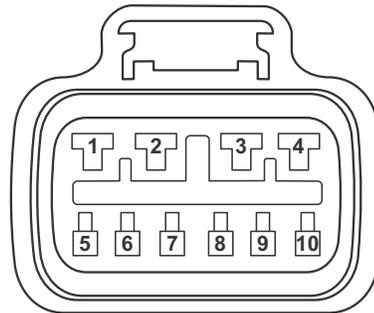
## PARK/NEUTRAL POSITION SWITCH 10-WAY CONNECTOR IDENTIFICATION

Pin No.	Wire Color	Circuit Number	Circuit Function
1	Pink	239	Back-Up Lamp Power Fuse (10A) From Underhood Fuse Block .
2	Lt. Green	24	Out To Back-Up Lamps.
3	Purple	6	Out To Starter Relay.
4	Yellow	5	Starter Relay Power Fuse (30A) From Underhood Fuse Block.
5	Gray	773	Transaxle Range "C" Signal To TCM.
6	Yellow	772	Transaxle Range "B" Signal To TCM.
7	Not Used		
8	White	776	Transaxle Range "PA" Signal To TCM.
9	Pink	239	Range Switch Power Fuse (10A) From Underhood Fuse Block.
10	Tan/White	771	Transaxle Range "A" Signal To TCM.

Transaxle Range Switch Connector, Face View



Transaxle Range Switch Vehicle Harness Connector, Face View



RANGE INDICATOR	CIRCUIT				
	+ IG	A	B	C	PA
Park	+	1	0	0	1
Reverse	+	1	1	0	0
Neutral	+	0	1	0	1
Drive	+	0	1	1	0
Intermediate	+	1	1	1	1
Low	+	1	0	1	0

1 = Closed (Resistance < 10 ohms)  
2 = Open (Resistance > 100k ohms)

Figure 9

## **ELECTRICAL COMPONENTS (Cont'd)**

### **Shift Solenoids**

The AF23/33-5 uses five electromagnetic shift solenoids to control up shifts and down shifts in all forward ranges and are controlled by the TCM. They work together in a combination of ON and OFF sequences to control the various shift valves.

#### **Reverse, 1st Shift Solenoid (SS1)**

The reverse, 1st shift solenoid is a normally-open (N.O.), ON/OFF type solenoid controlled by the TCM. Line fluid feeds the S1 signal fluid circuit through orifice No. 3. When the reverse, 1st shift solenoid is energized (ON), S1 fluid is blocked from exhausting through the solenoid, creating S1 fluid pressure that acts on the U1 shift valve and the M1 shift valve. When the reverse, 1st shift solenoid is OFF, any existing S1 signal fluid pressure is exhausted through holes at the base of the solenoid, as shown in Figure 10.

#### **2-3, 3-4 Shift Solenoid (SS2)**

The 2-3, 3-4 shift solenoid is a normally-open (N.O.) ON/OFF type solenoid controlled by the TCM. Drive fluid feeds the S2 signal fluid through orifice No. 25. When the 2-3, 3-4 shift solenoid is energized (ON), S2 fluid is blocked from exhausting through the solenoid, creating S2 signal fluid pressure that acts on the M2 shift valve, against spring force, to move the valve into the applied position. When the 2-3, 3-4 shift solenoid is OFF, any existing S2 signal fluid pressure is exhausted through the end of the solenoid, as shown in Figure 10.

#### **1-2, 2-3, Reverse Shift Solenoid (SS3)**

The 1-2, 2-3, reverse shift solenoid is a normally-closed (N.C.) ON/OFF type solenoid controlled by the TCM. Drive fluid feeds the S3 signal fluid through orifice No. 24. When the 1-2, 2-3, reverse shift solenoid is energized (ON), S3 signal fluid is allowed to exhaust through the base of the solenoid, as shown in Figure 10. When the 1-2, 2-3, reverse shift solenoid is OFF, S3 signal fluid is blocked from exhausting through the base of the solenoid, creating S3 signal fluid pressure that acts on the U2 shift valve, against spring force, to move the valve into the applied position as shown in Figure 10.

#### **3-4, 4-5 Shift Solenoid (SS4)**

The 3-4, 4-5 shift solenoid is a normally-open (N.O.) ON/OFF type solenoid controlled by the TCM. Line fluid feeds the S4 signal fluid through orifice No. 4. When the 3-4, 4-5 shift solenoid is energized (ON), S4 fluid is blocked from exhausting through the solenoid, creating S4 signal fluid pressure that acts on the U2 shift valve and the U1 shift valve. When the 3-4, 4-5 shift solenoid is OFF, any existing S4 signal fluid pressure is exhausted through the end of the solenoid, as shown in Figure 10.

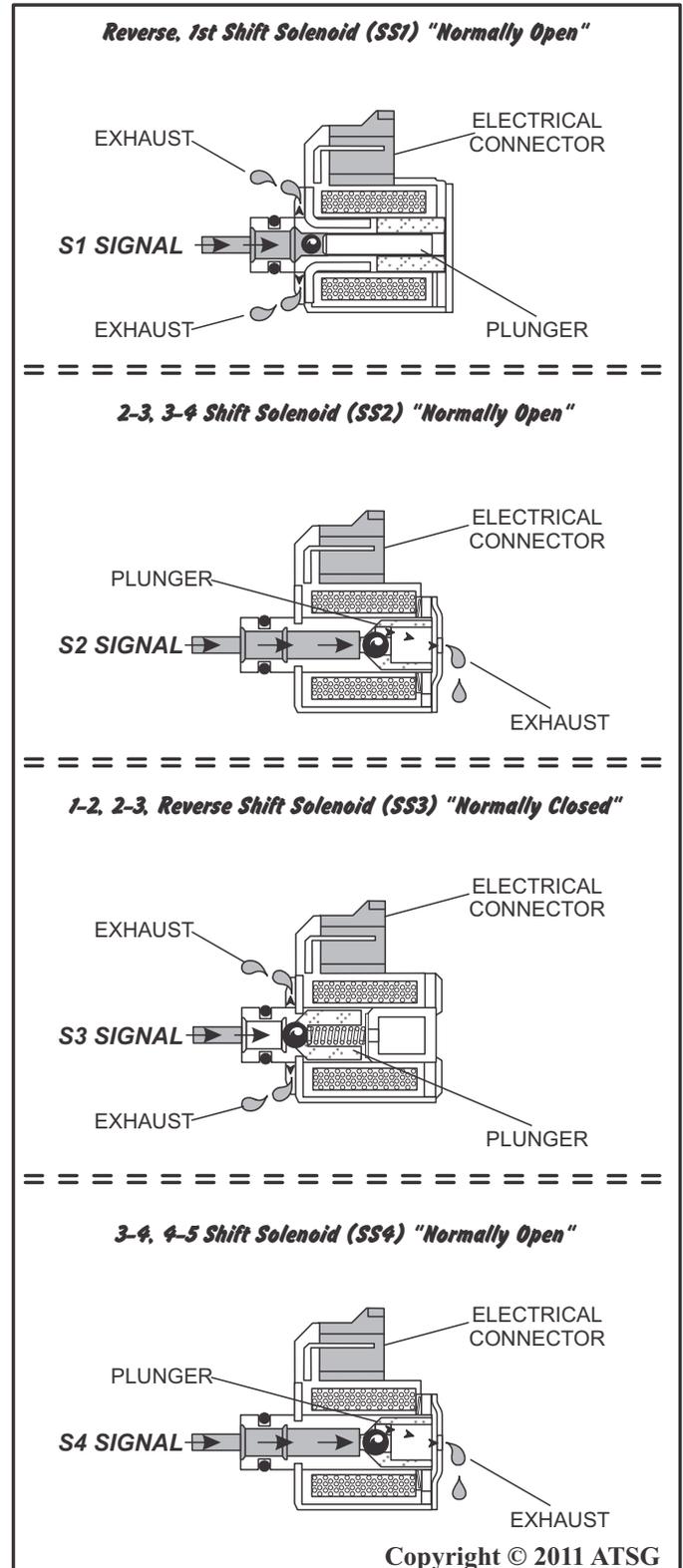


Figure 10

## ***ELECTRICAL COMPONENTS (Cont'd)***

### ***Reverse Shift Solenoid (SS5)***

The reverse shift solenoid is a normally-closed (N.C.) ON/OFF type solenoid controlled by the TCM. Line fluid feeds the S5 signal fluid through orifice No. 5. When the reverse shift solenoid is energized (ON), S5 signal fluid is allowed to exhaust through the base of the solenoid, as shown in Figure 11. When the reverse shift solenoid is OFF, S5 signal fluid is blocked from exhausting through the base of the solenoid, creating S5 signal fluid pressure that acts on the shift pressure relay valve, against spring force, to move the valve into the applied position.

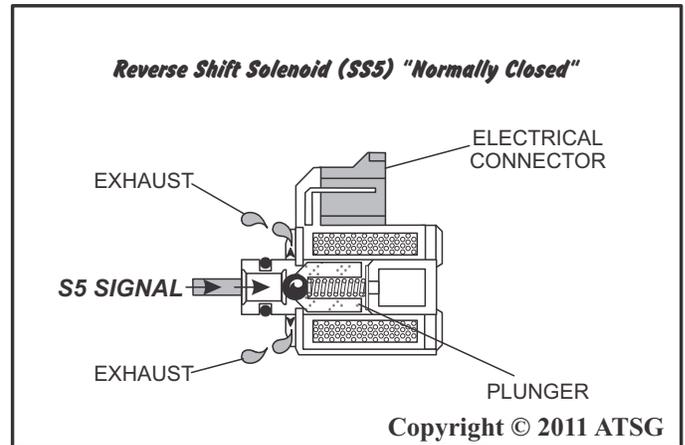


Figure 11

### ***Line Pressure Control Solenoid (SLT)***

The line pressure control solenoid is a normally-open 3-port solenoid and is a precision electronic pressure regulator that controls transaxle line pressure based on current flow through its coil windings. This solenoid is Pulse Width Modulated (PWM) and operates at a fixed frequency of 300 Hz (cycles per second) and from 0.0 to 1.1 amps. As current flow is increased, the pressure control to throttle signal is decreased. As current flow is decreased, the pressure control to throttle signal is increased as shown in Figure 12.

If a total electronic failure is encountered, this solenoid will put line pressure to maximum pressure, and will set DTC P0962 or P0963 in the TCM memory.

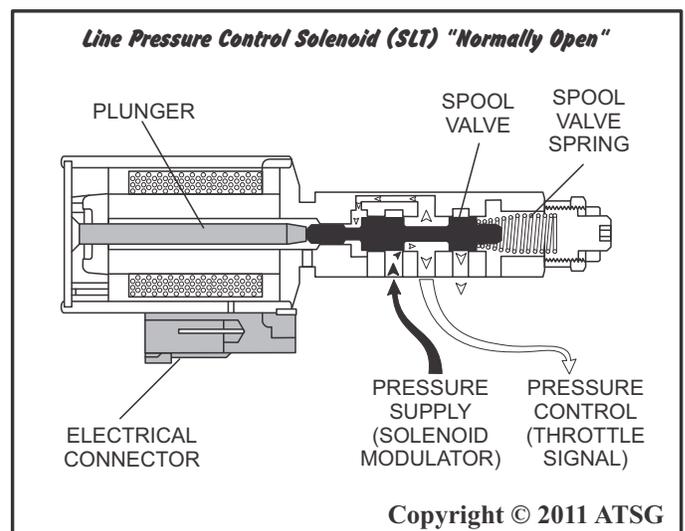


Figure 12

### ***Transmission Adapt Function Solenoid (SLT)***

Programming within the TCM allows for automatic adjustments in pressure that are based on the changing characteristics of the internal transaxle components. As the apply components within the transaxle wear, the time to apply a clutch increases. In order to compensate for this wear, the TCM adjusts trim pressure by controlling the line pressure control solenoid in order to maintain the originally calibrated shift timing. This process is referred to as "Adaptive Learning" and is used to assure consistent shift feel and increase transaxle durability. The TCM monitors the ISS and OSS during commanded shifts to determine if a shift is occurring too fast (harsh) or too slow (soft) and adjusts the line pressure control solenoid signal to maintain a set shift feel.

## ***ELECTRICAL COMPONENTS (Cont'd)***

### ***Shift Pressure Control Solenoid (SLS)***

The shift pressure control solenoid is a normally-open 3-port solenoid and is a precision electronic pressure regulator that controls transaxle clutch apply pressure based on current flow through its coil windings. This solenoid is Pulse Width Modulated (PWM) and operates at a fixed frequency of 300 Hz (cycles per second) and from 0.0 to 1.1 amps. As current flow is increased, the pressure control to clutch apply is decreased. As current flow is decreased, the pressure control to clutch apply is increased as shown in Figure 13.

If a total electronic failure is encountered, this solenoid will put clutch apply pressure to maximum pressure, and will set DTC P0970 or P0971 in the TCM memory.

### ***Transmission Adapt Function Solenoid (SLS)***

Programming within the TCM allows for automatic adjustments in pressure that are based on the changing characteristics of the internal transaxle components. As the apply components within the transaxle wear, the time to apply a clutch increases. In order to compensate for this wear, the TCM adjusts trim pressure by controlling the shift pressure control solenoid in order to maintain the originally calibrated shift timing. This process is referred to as "Adaptive Learning" and is used to assure consistent shift feel and increase transaxle durability. The TCM monitors the ISS and OSS during commanded shifts to determine if a shift is occurring too fast (harsh) or too slow (soft) and adjusts the shift pressure control solenoid signal to maintain a set shift feel.

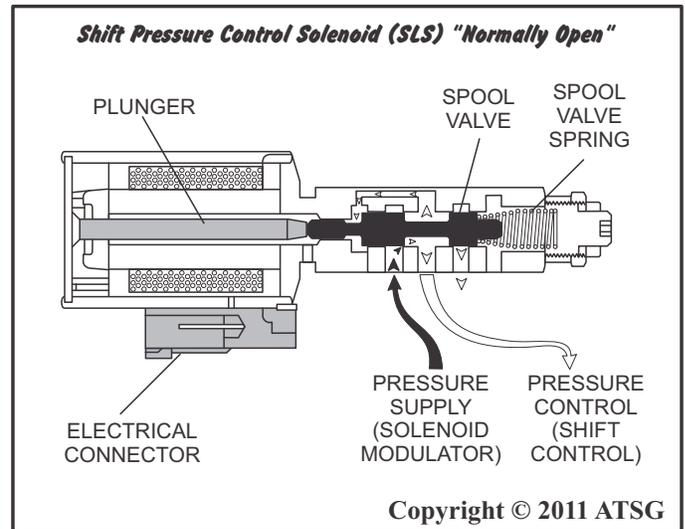


Figure 13

### ***TCC Lock-Up Pressure Control Solenoid (SLU)***

The TCC lock-up pressure control solenoid (SLU) is a normally-closed 3-port solenoid and is a precision electronic pressure regulator that controls the apply and release of the torque converter clutch, the second clutch (B2), and the Low/Reverse clutch (B3) during Low range, based on current flow through its coil windings. This solenoid is Pulse Width Modulated (PWM) and operates at a fixed frequency of 300 Hz (cycles per second) and from 0.0 to 1.1 amps. As the current flow is increased, the pressure control to TCC lock-up control pressure is increased. As current flow is decreased, the pressure control to TCC lock-up control pressure is decreased as shown in Figure 14.

If a total electronic failure is encountered, the torque converter clutch apply will be inhibited, and will set DTC P0966 or P0967 in the TCM memory.

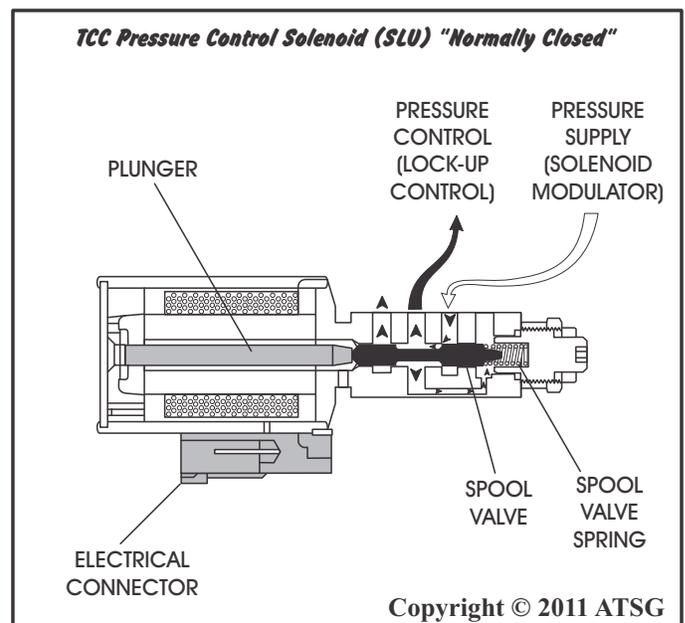


Figure 14

## ELECTRICAL COMPONENTS (Cont'd)

### Transaxle Case Connector Identification

The 14-way transaxle case connector is actually part of the internal wiring harness assembly, as shown in Figure 5. We have provided you with a chart in Figure 15 that identifies the individual terminals in the 14-way transaxle case connector and the vehicle external harness connector, color of the wires and circuit function. A complete transaxle wire schematic from transaxle to the TCM is provided in Figure 16, and a resistance chart for internal transaxle electrical components is shown in Figure 17.

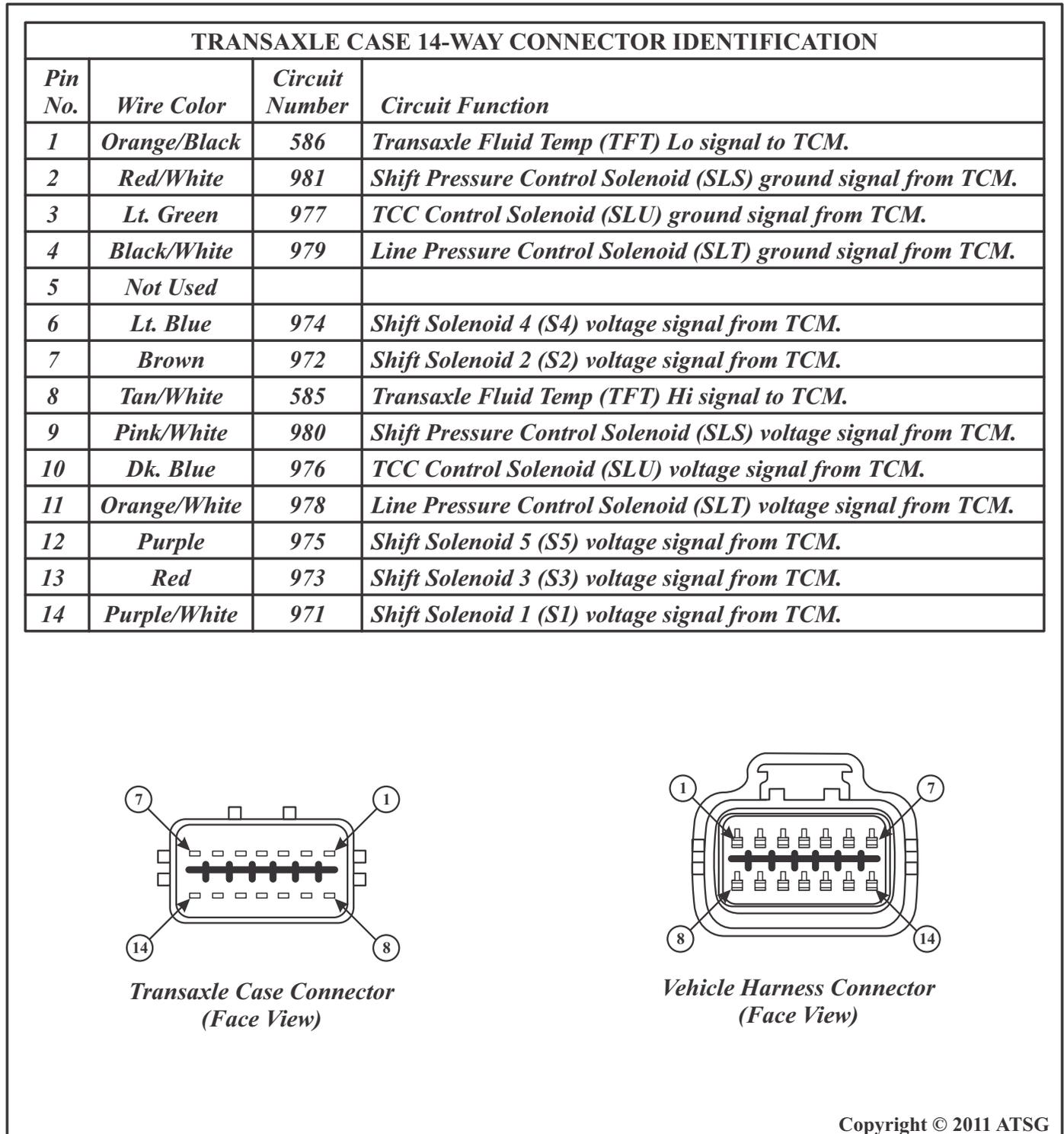


Figure 15

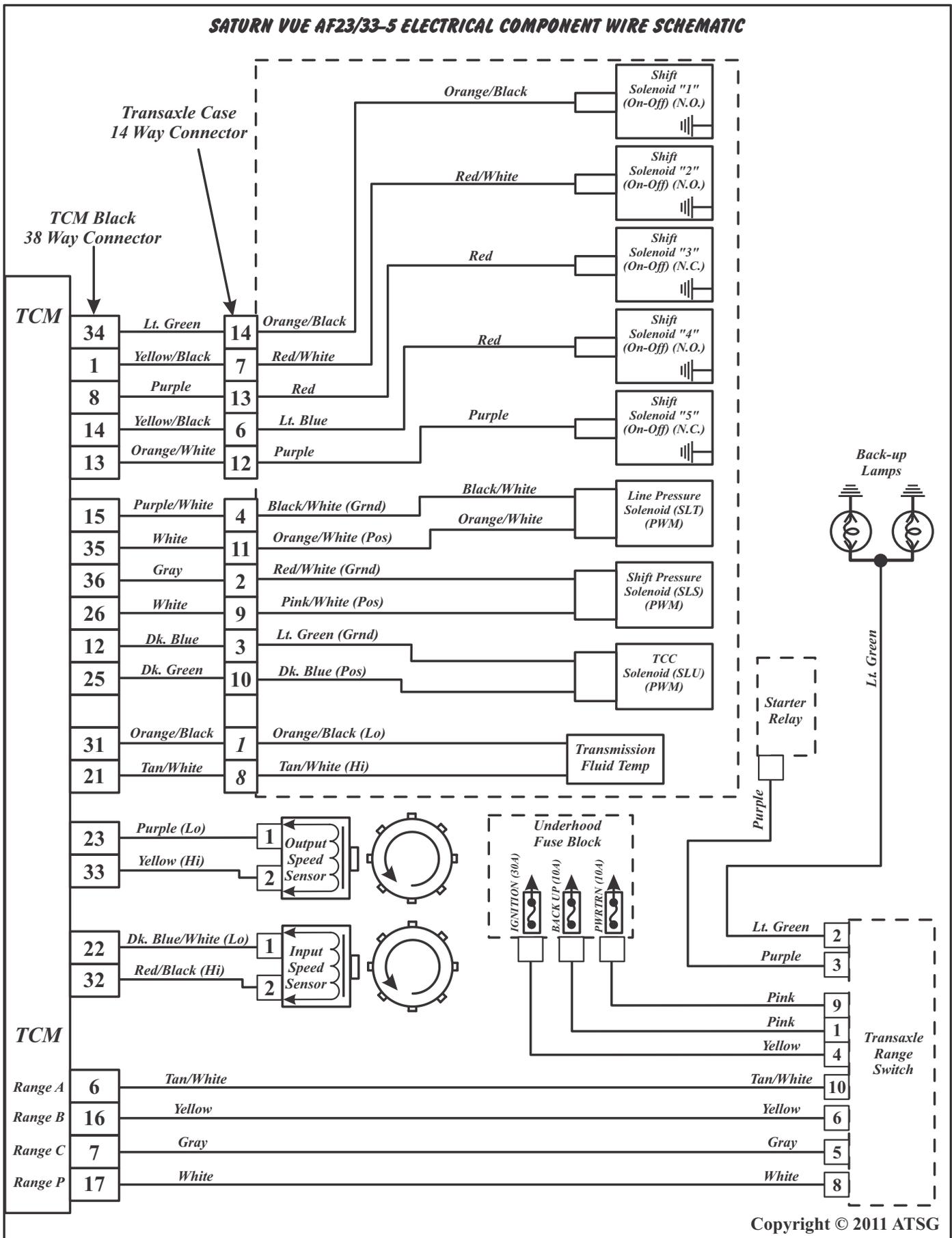
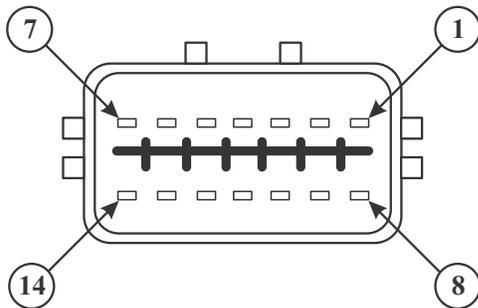


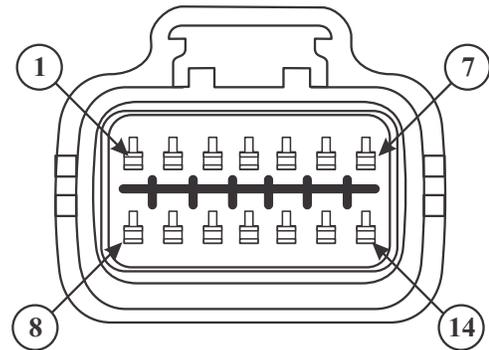
Figure 16

## TRANSAXLE CASE 14-WAY CONNECTOR IDENTIFICATION

<i>Component</i>	<i>Terminal Numbers</i>	<i>Ohms Resistance</i>
<i>Shift Solenoid 1 (S1)</i>	<i>14 and Grnd</i>	<i>11 - 16 Ohms @ 20° C (68° F)</i>
<i>Shift Solenoid 2 (S2)</i>	<i>7 and Grnd</i>	<i>11 - 16 Ohms @ 20° C (68° F)</i>
<i>Shift Solenoid 3 (S3)</i>	<i>13 and Grnd</i>	<i>11 - 16 Ohms @ 20° C (68° F)</i>
<i>Shift Solenoid 4 (S4)</i>	<i>6 and Grnd</i>	<i>11 - 16 Ohms @ 20° C (68° F)</i>
<i>Shift Solenoid 5 (S5)</i>	<i>12 and Grnd</i>	<i>11 - 16 Ohms @ 20° C (68° F)</i>
<i>Line Pressure Control Solenoid (SLT)</i>	<i>4 and 11</i>	<i>5.0 - 5.6 Ohms @ 20° C (68° F)</i>
<i>Shift Pressure Control Solenoid (SLS)</i>	<i>2 and 9</i>	<i>5.0 - 5.6 Ohms @ 20° C (68° F)</i>
<i>TCC Control Solenoid (SLU)</i>	<i>3 and 10</i>	<i>5.0 - 5.6 Ohms @ 20° C (68° F)</i>
<i>Transaxle Fluid Temp (TFT)</i>	<i>1 and 8</i>	<i>See Chart in Figure 6</i>
<i>Input Shaft Speed (ISS) Sensor</i>		<i>&gt; 10 M Ohms @ 20° C (68° F)</i>
<i>Output Shaft Speed (OSS) Sensor</i>		<i>&gt; 10 M Ohms @ 20° C (68° F)</i>



Transaxle Case Connector  
(Face View)



Vehicle Harness Connector  
(Face View)

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Figure 17



# Technical Service Information

## **EXTERNAL ELECTRONIC COMPONENTS**

### ***Throttle Position (TP) Sensor***

The ECM monitors the variable voltage signal from the TP sensor to calculate throttle angle. These inputs are then sent over the CAN bus to the TCM, to determine the appropriate line pressure, shift pattern and TCC apply and release for the transaxle. In general with greater throttle angle, upshift speeds and line pressure will both increase.

### ***Manifold Absolute Pressure (MAP) Sensor***

The MAP sensor changes relative to intake manifold pressure which results from changes in engine load and speed. These changes are converted into a voltage signal which is monitored by the ECM and transmitted over the CAN bus to the TCM to assist in adjusting line pressure and shift timing.

### ***Engine Coolant Temp (ECT) Sensor***

The ECM monitors the variable resistance signal from this sensor to determine engine coolant temperature. When the engine is cold, resistance is high, and when the engine is hot, resistance through the sensor is low. The ECM then transmits this information over the CAN bus to the TCM where it is used to prevent TCC apply when the engine temp is below approximately 20°C (68°F).

### ***Accelerator Pedal Position (APP) Sensor***

The APP sensor is monitored by the ECM to determine accelerator pedal position and is transmitted over the CAN bus to the TCM, in order to help determine the appropriate line pressure, shift pattern and TCC apply and release speeds. In general with increased throttle position, upshift speeds and line pressure both increase.

### ***TCC Brake Switch***

This signal is transmitted over the CAN bus to the TCM and causes the TCM to command TCC release. When the brake pedal is depressed at low speeds, the TCM opens the ground path for the TCC electrical circuit which releases the converter clutch.

### ***Controller Area Network (CAN) Bus***

The CAN bus consists of two twisted wires that connect the various vehicle control modules together, allowing them to share information about vehicle conditions.

***Note: The sensor/switch information listed above is not a complete listing of TCM inputs that may affect transaxle operation. The combination and usage of these inputs may vary depending on model and the application. Always refer to the appropriate service manual for specific electrical diagnosis information.***

<b>SATURN VUE AF23/33-5 DIAGNOSTIC TROUBLE CODES</b>	
<b>CODE</b>	<b>DESCRIPTION</b>
<b>P0562</b>	<b>System Voltage low (Battery)</b>
<b>P0563</b>	<b>System Voltage high (Battery)</b>
<b>P0601</b>	<b>TCM Read only memory failure (ROM)</b>
<b>P0602</b>	<b>TCM not programmed (no vin number loaded in TCM)</b>
<b>P0603</b>	<b>TCM long term memory failure (check-sum failure)</b>
<b>P0604</b>	<b>TCM random access failure (RAM)</b>
<b>P0703</b>	<b>Brake switch fault via ECM thru CAN</b>
<b>P0705</b>	<b>Transmission range switch fault</b>
<b>P0711</b>	<b>Transmission fluid temp sensor performance</b>
<b>P0712</b>	<b>Transmission fluid temp sensor circuit low voltage/short to ground (150°C/302°F)</b>
<b>P0713</b>	<b>Transmission fluid temp sensor circuit high voltage/open circuit (-40°C/-40°F)</b>
<b>P0717</b>	<b>Input speed sensor loss of signal</b>
<b>P0722</b>	<b>Output speed sensor loss of signal</b>
<b>Continued on next Page</b>	

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Figure 18



## Technical Service Information

<b>SATURN VUE AF2333-5 DIAGNOSTIC TROUBLE CODES</b>	
<b>CODE</b>	<b>DESCRIPTION</b>
<i>P0727</i>	<i>Engine RPM sensor fault via ECM thru CAN</i>
<i>P0730</i>	<i>Incorrect 1st gear Low ratio (No Engine Braking on Decel in Low Range)</i>
<i>P0731</i>	<i>Incorrect 1st gear ratio</i>
<i>P0732</i>	<i>Incorrect 2nd gear ratio</i>
<i>P0733</i>	<i>Incorrect 3rd gear ratio</i>
<i>P0734</i>	<i>Incorrect 4th gear ratio</i>
<i>P0735</i>	<i>Incorrect 5th gear ratio</i>
<i>P0736</i>	<i>Incorrect Reverse ratio</i>
<i>P0741</i>	<i>TCC excessive slip or stuck off</i>
<i>P0742</i>	<i>TCC low slip or stuck on</i>
<i>P0744</i>	<i>TCC intermittent system fault (Mechanical)</i>
<i>P0762</i>	<i>SS3 stuck open (Mechanical)</i>
<i>P0962</i>	<i>Line Pressure Control Solenoid Low current</i>
<i>P0963</i>	<i>Line Pressure Control Solenoid High current</i>
<i>P0966</i>	<i>TCC Pressure Control Solenoid Low current</i>
<i>P0967</i>	<i>TCC Pressure Control Solenoid High current</i>
<i>P0970</i>	<i>Shift Pressure Control Solenoid Low current</i>
<i>P0971</i>	<i>Shift Pressure Control Solenoid High current</i>
<i>P0973</i>	<i>SS1 Control Circuit Low voltage</i>
<i>P0974</i>	<i>SS1 Control Circuit High voltage</i>
<i>P0976</i>	<i>SS2 Control Circuit Low voltage</i>
<i>P0977</i>	<i>SS2 Control Circuit High voltage</i>
<i>P0979</i>	<i>SS3 Control Circuit Low voltage</i>
<i>P0980</i>	<i>SS3 Control Circuit High voltage</i>
<i>P0982</i>	<i>SS4 Control Circuit Low voltage</i>
<i>P0983</i>	<i>SS4 Control Circuit High voltage</i>
<i>P0985</i>	<i>SS5 Control Circuit Low voltage</i>
<i>P0986</i>	<i>SS5 Control Circuit High voltage</i>
<i>P1719</i>	<i>Incorrect shifting detected (Mechanical)</i>
<i>P1779</i>	<i>Invalid Torque Delivered Signal from ECM via CAN</i>
<i>P1780</i>	<i>Invalid Torque Reduction request from ECM via CAN</i>
<i>P1781</i>	<i>Invalid Engine Torque Signal Circuit from ECM via CAN</i>
<i>P1791</i>	<i>Invalid Pedal Position Signal Circuit from ECM via CAN</i>
<i>P1792</i>	<i>Invalid Engine Coolant Signal Circuit from ECM via CAN</i>
<i>P1868</i>	<i>Transmission fluid over 212°F or Calculated Fluid life at 0%</i>
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Figure 19

## ***SAFETY PRECAUTIONS***

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

*The service procedures we recommend and describe in this manual are effective methods of performing service and repair on this transmission. 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 to 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.*

## ***TRANSAXLE DISASSEMBLY***

### ***EXTERNAL COMPONENTS***

1. The transaxle should be cleaned on the outside to remove dirt or grease prior to disassembly.
2. This transaxle can be disassembled quite easily on a suitable workbench without the aid of any holding fixture for rotation.
3. Place the transmission onto a suitable work bench or appropriate holding fixture.
4. Using a small screwdriver, bend the tabs of the park/neutral switch locking washer away from the park/neutral switch lock nut.
5. Remove the park/neutral switch lock nut, the locking washer and the flat washer as shown in Figure 20.
6. Remove the park/neutral switch bolt, the stud and the flat washers as shown in Figure 20.
7. Remove the park/neutral position switch by lifting straight up as shown in Figure 20.
8. Remove the output speed sensor bolt then carefully remove the output speed sensor with a twisting motion as shown in Figure 21.
9. Remove and then discard the output speed sensor o-ring.
10. Remove the input speed sensor bolt then carefully remove the input speed sensor with a twisting motion as shown in Figure 22.
11. Remove and discard the input speed sensor o-ring.

***NOTE: Use care when removing the speed sensors to avoid damage.***

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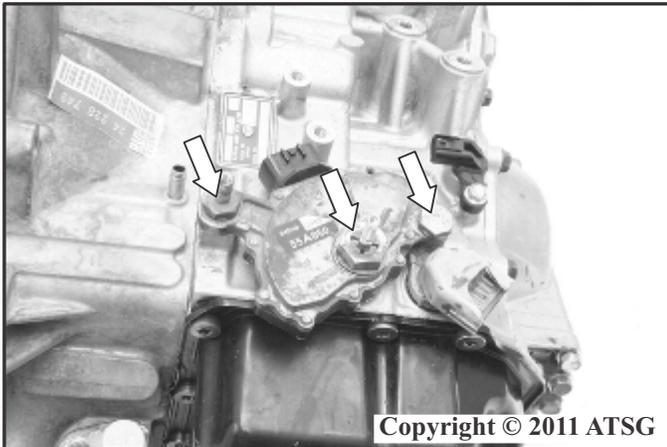


Figure 20

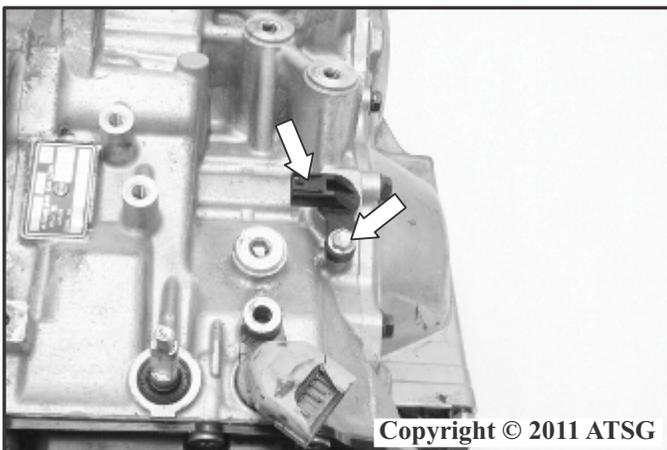


Figure 21



Figure 22

## TRANSAXLE DISASSEMBLY (CONT'D)

12. Remove the transmission fluid level indicator retaining bolt as shown in Figure 23.
13. Carefully remove the transmission fluid level indicator using a twisting motion and lift straight up as shown in Figure 23.
14. Remove and discard the transmission fluid level indicator o-ring.
15. Remove the nine control valve body cover attaching bolts then remove the control valve body cover as shown in Figure 24.

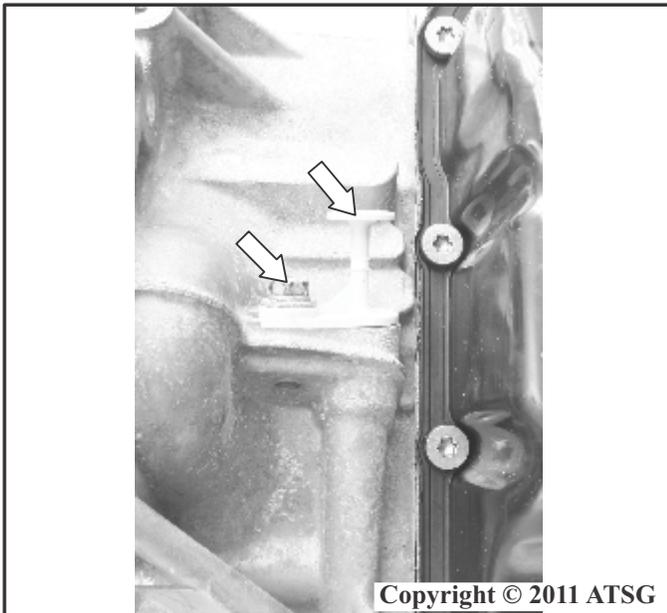


Figure 23

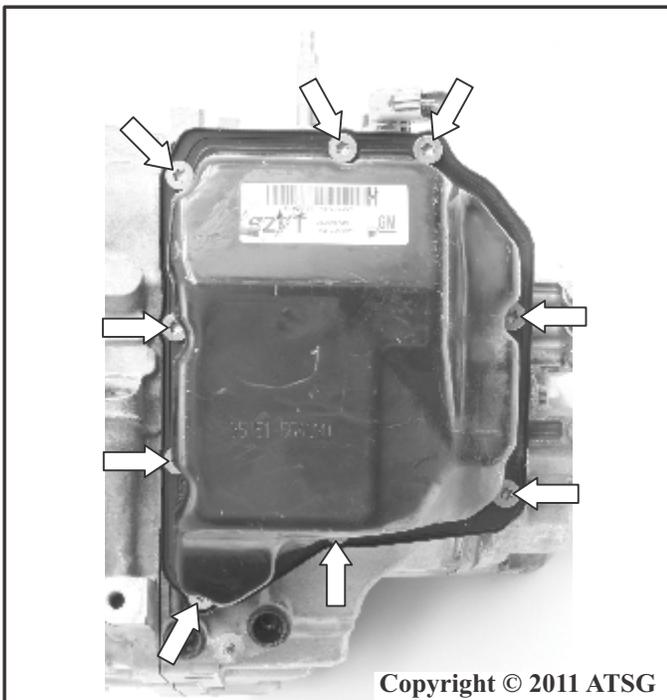


Figure 24

16. Remove the control valve body fluid passage cover attaching bolts as shown in Figure 25.
17. Remove the control valve body fluid passage cover and the control valve body fluid passage cover gasket as shown in Figure 25.
18. Carefully depress the locking tab for each of the five shift solenoids (S1, S2, S3, S4, and S5) then remove the connector from the five solenoids as shown in Figure 25.
19. Using a small screwdriver or scribe carefully depress the locking tab for each of the three linear solenoids (SLS, SLT, and SLU) then remove the connector from the three solenoids as shown in Figure 25.
20. Remove the ATF temperature sensor hold down retainer attaching bolt as shown in Figure 25.
21. Remove the ATF temperature sensor hold down retainer and gently lift the ATF temperature sensor upward with a twisting motion and carefully move the harness away from the control valve body assembly as shown in Figure 25.
22. Remove and discard the ATF temperature sensor o-ring.

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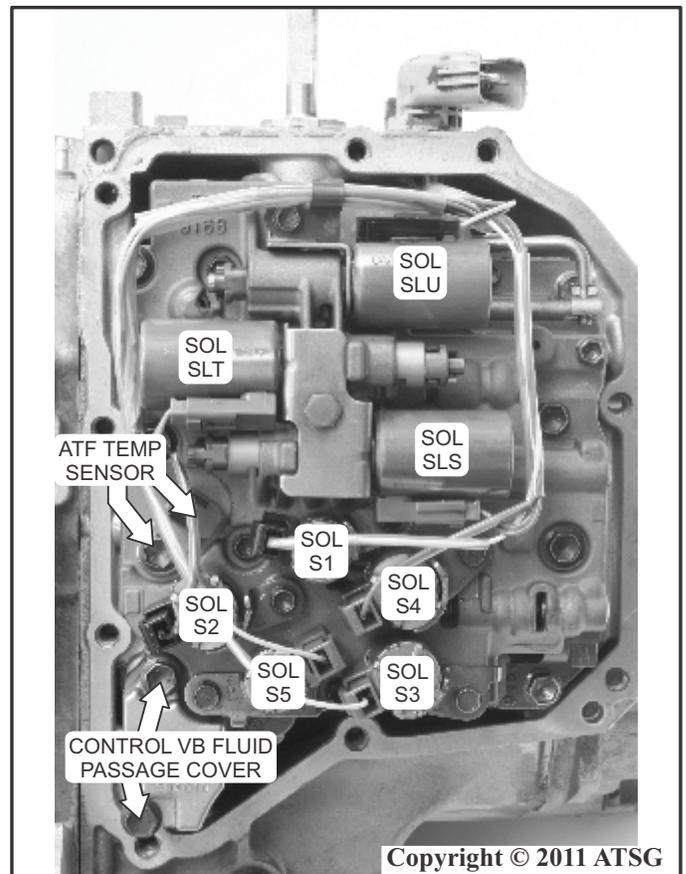


Figure 25

## ***TRANSAXLE DISASSEMBLY (CONT'D)***

23. Remove the six 10 mm control valve body attaching bolts as shown in Figure 26.
24. While holding the control valve body assembly, carefully remove the manual valve shift detent lever from the manual valve link as shown in Figure 27
25. Remove the control valve body assembly and set aside for cleaning and component rebuild.
26. Using a twisting motion, carefully remove the transmission wiring harness assembly from the transmission as shown in Figure 28.
27. Use care when removing the wiring harness to avoid damage to the connectors or the transmission oil temperature sensor.
28. Remove and discard the transmission wiring harness assembly o-ring.

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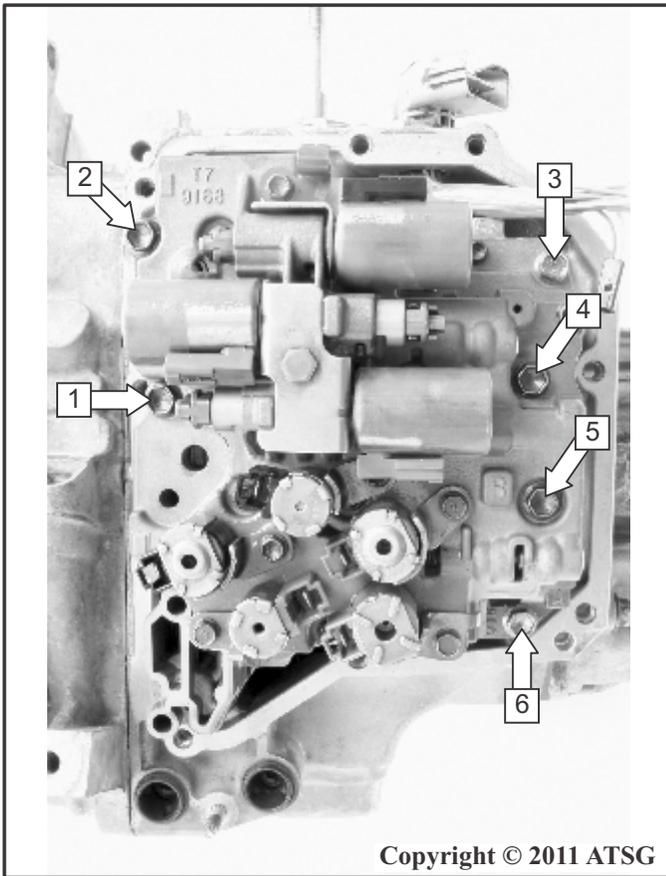


Figure 26

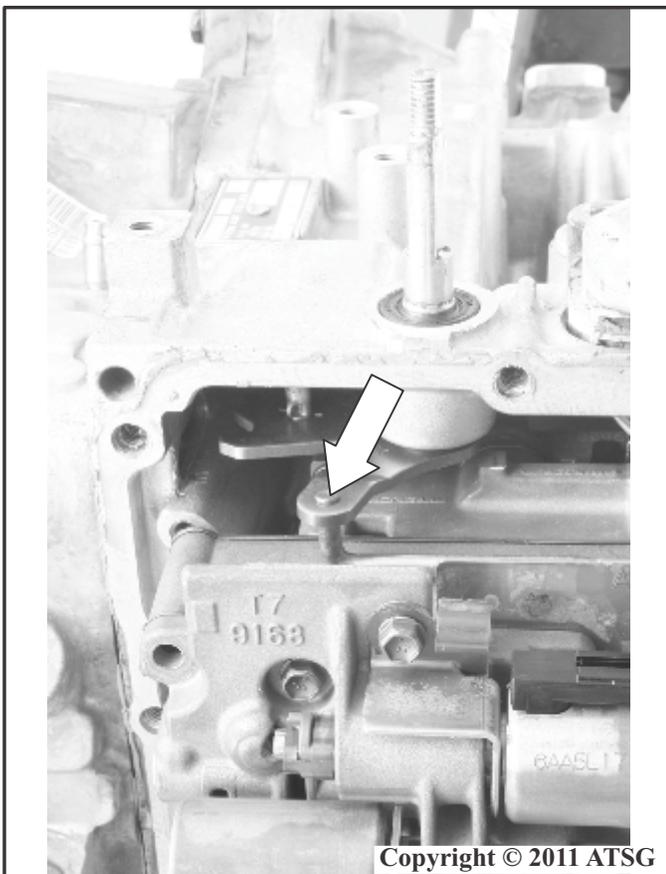


Figure 27

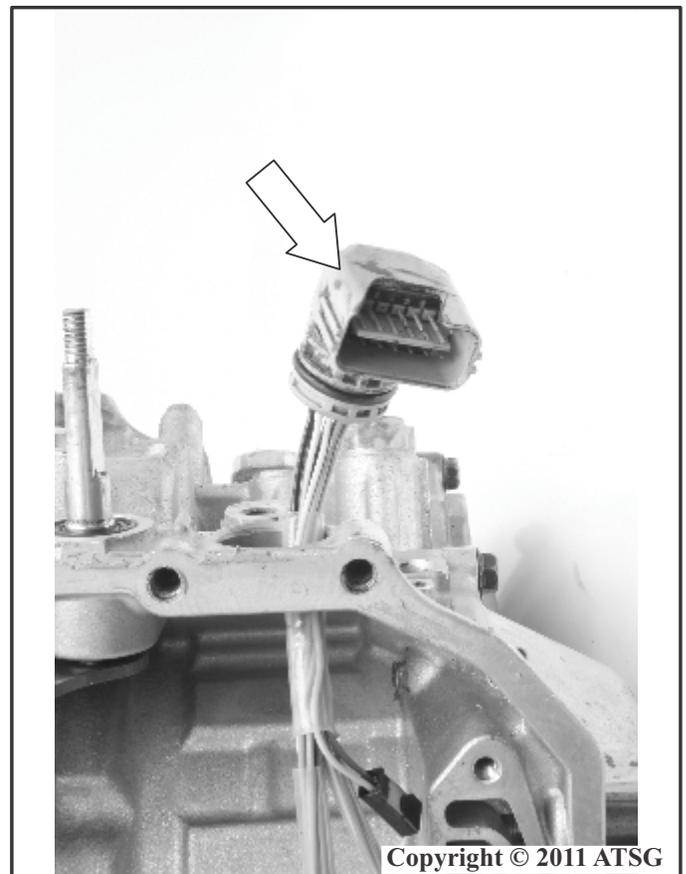


Figure 28

## TRANSAXLE DISASSEMBLY (CONT'D)

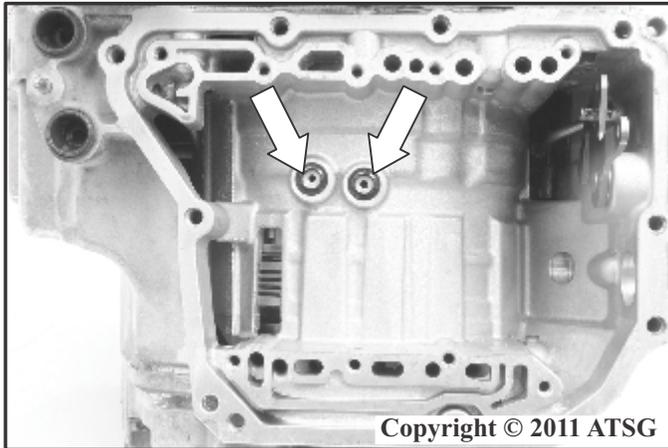


Figure 29

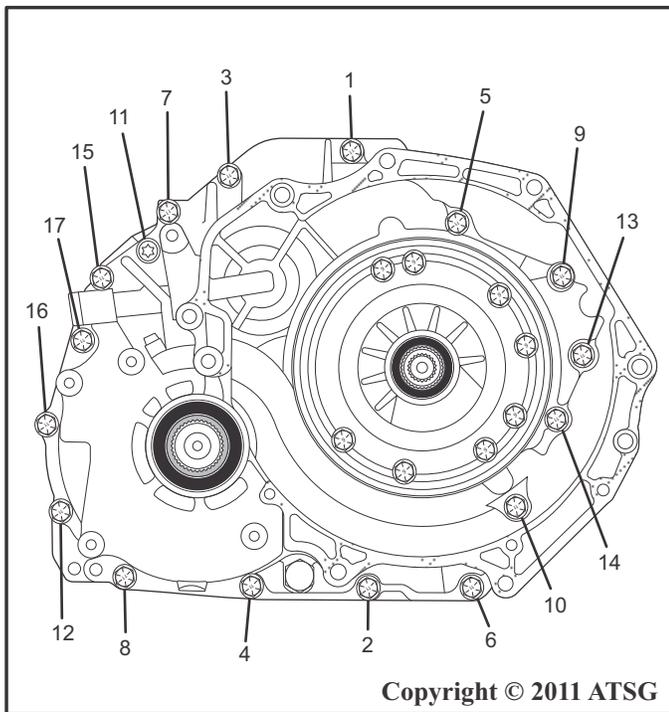


Figure 30

29. Remove and discard the two transmission case fluid passage seals as shown in Figure 29.
30. Remove the seventeen torque converter housing attaching bolts as shown in Figure 30.
31. Remove the eight pump assembly to case attaching bolts as shown in Figure 31.
32. Using Universal Clamp Press J 45053 or other adequate pump pulling device, attach the clamp and carefully remove the pump assembly from the case being careful not to damage the turbine shaft as shown in Figure 32.
33. Set the pump assembly aside for cleaning and component rebuild.
34. Using a soft faced hammer or plastic mallet gently tap and loosen the converter housing as shown in Figure 33.
35. Remove the converter housing from the transmission case by lifting straight up.
36. Set the converter housing aside for cleaning and component rebuild.

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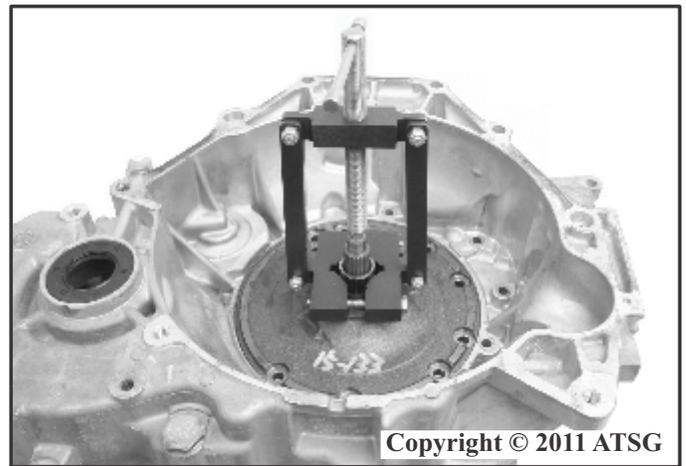


Figure 32

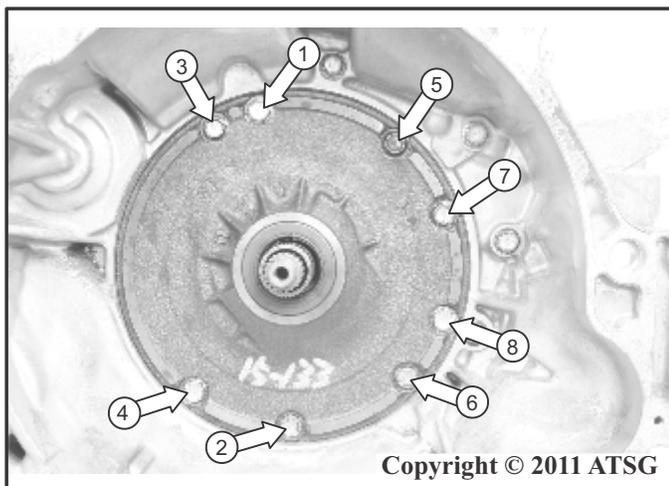


Figure 31

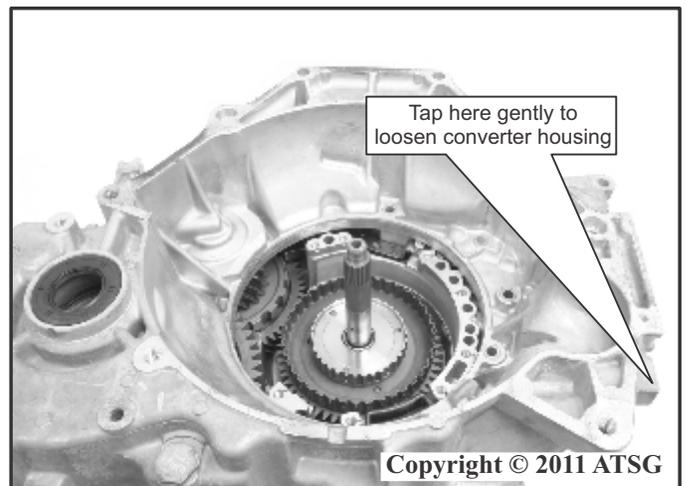


Figure 33

## ***TRANSAXLE DISASSEMBLY (CONT'D)***

37. Remove the ATF fluid filter retaining bolt as shown in Figure 34.
38. Remove and discard the ATF fluid filter by lifting straight up as shown in Figure 34.
39. Remove the front differential carrier assembly by lifting straight up as shown in Figure 35.
40. Set differential carrier assembly aside for cleaning and component rebuild.
41. Remove the 2nd coast clutch hub outer race and the 2nd coast clutch hub as shown in Figure 36.
42. Set the 2nd coast clutch outer race and hub assembly aside for cleaning and component rebuild.
43. Remove the three transmission fluid baffle retaining bolts as shown in Figure 37.
44. Remove the transmission fluid baffle as shown in Figure 37.
45. Remove the transmission case fluid passage seal as shown in Figure 37.

46. Remove the two transmission case fluid passage cover retaining bolts as shown in Figure 38.
47. Remove the transmission case fluid passage cover as shown in Figure 38.

Cont'd on page 24



Figure 36

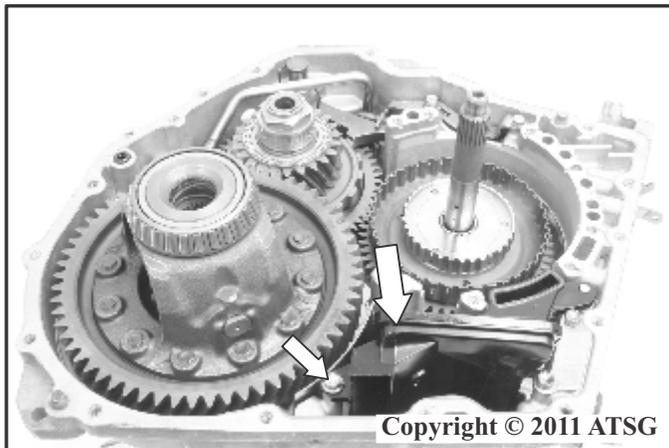


Figure 34

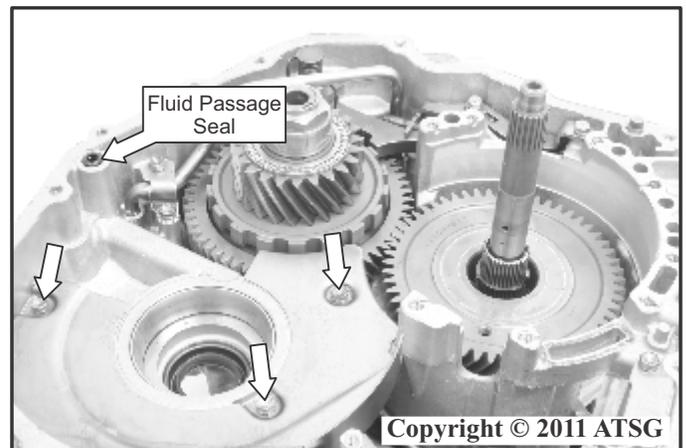


Figure 37

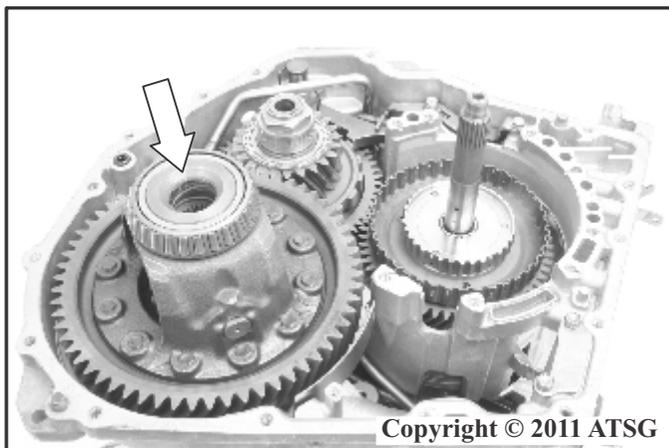


Figure 35

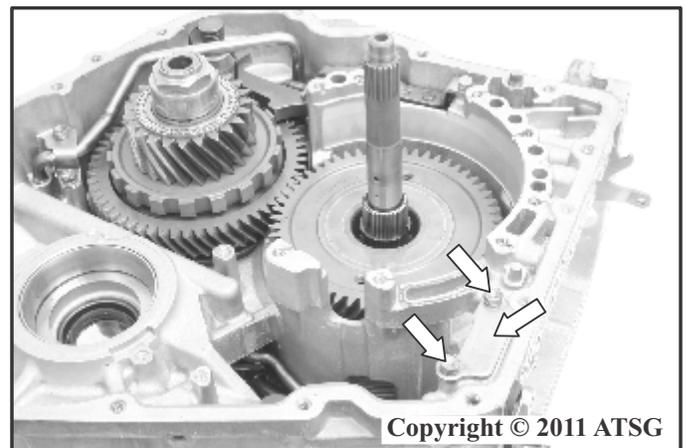


Figure 38

## ***TRANSAXLE DISASSEMBLY (CONT'D)***

48. Lift the manual valve detent spring upward away from the manual valve detent lever and slide the detent lever in the direction of the arrow as shown in Figure 39.
49. Rotate the manual valve detent lever forward in order to disengage the parking pawl actuator rod and remove the actuator rod from the manual valve detent lever then remove the actuator rod from the transmission as shown in Figure 39.
50. Remove the manual valve detent lever assembly from the case in the direction of the arrow as shown in Figure 39.
51. Remove the two manual valve detent lever spring retaining bolts as shown in Figure 40.
52. Remove the manual valve detent lever spring by lifting and sliding in direction of the arrow as shown in Figure 40.
53. Remove the parking pawl retaining shaft by lifting straight up as shown in Figure 41.
54. Remove the parking pawl retaining shaft return spring as shown in Figure 41.
55. Remove the parking pawl actuating bracket and the parking pawl lever as shown in Figure 42.

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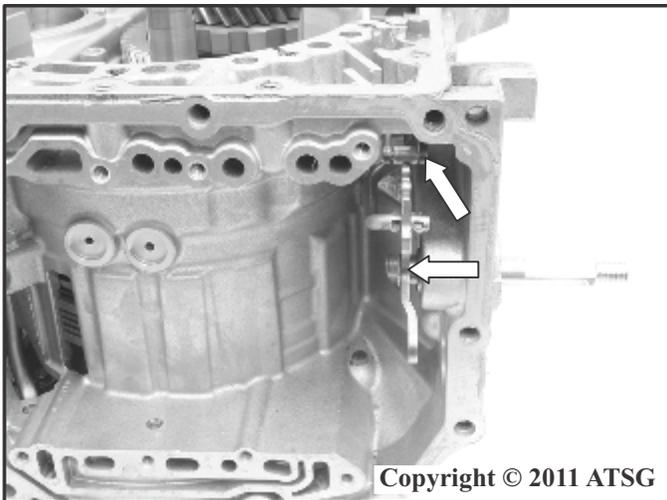


Figure 39

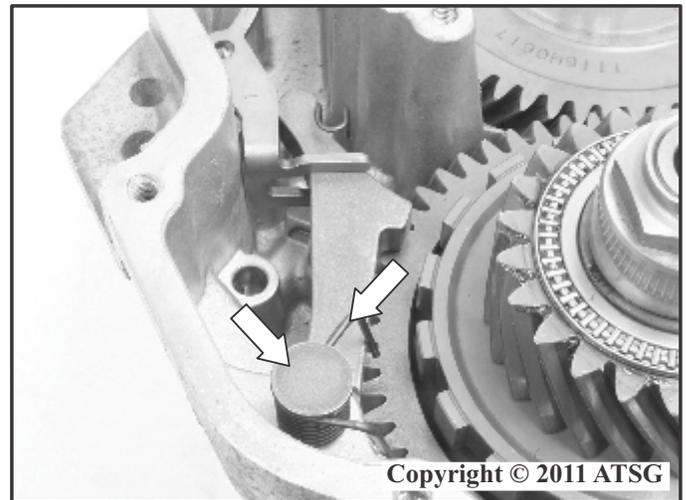


Figure 41

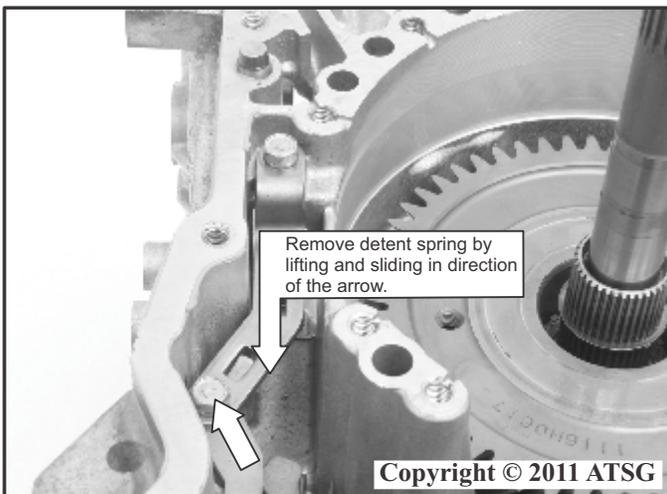


Figure 40

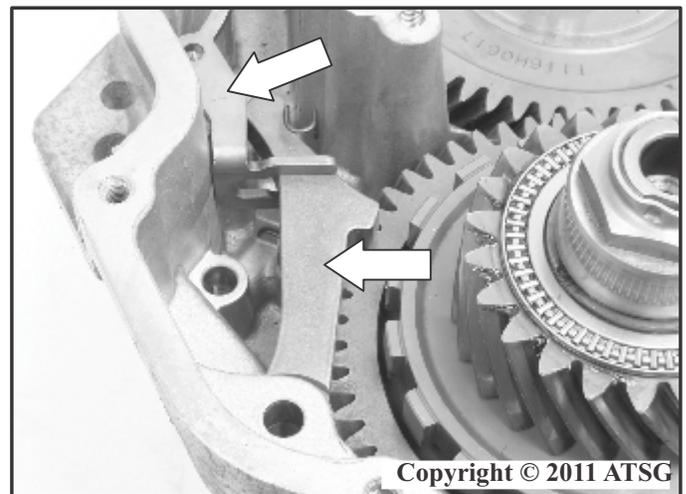


Figure 42

## TRANSAXLE DISASSEMBLY (CONT'D)

56. Remove the parking pawl pin spring retaining bolt as shown in Figure 43.
57. Remove the parking pawl pin spring and the guide sleeve/spacer as shown in Figure 43.
58. Remove the parking pawl spring guide pin as shown in Figure 44.
59. Remove the front differential transfer drive gear thrust bearing from the transfer drive gear assembly as shown in Figure 45.
60. Remove the front differential transfer drive gear thrust bearing race from the transfer drive gear assembly as shown in Figure 45.
61. Using Universal Clamp Press J 45053 or other adequate puller device, attach the clamp and carefully remove the front differential transfer drive gear assembly from the transmission case as shown in Figure 45.
62. Set the transfer drive gear assembly aside for cleaning and component rebuild.

63. Remove the 4-5 clutch drum assembly as shown in Figure 46.
64. Set the 4-5 clutch drum assembly aside for cleaning and component rebuild.
65. Remove the third gear (B4) band assembly from the case as shown in Figure 47.

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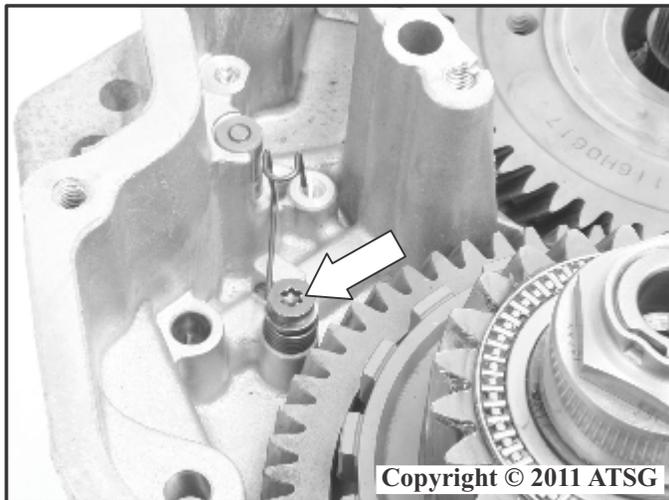


Figure 43

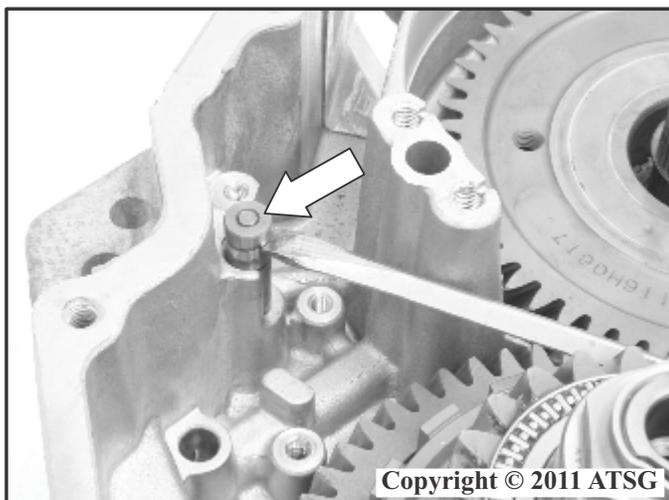


Figure 44

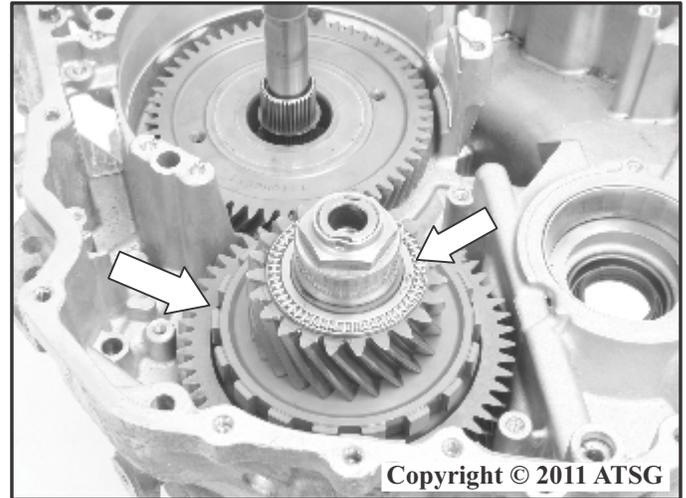


Figure 45

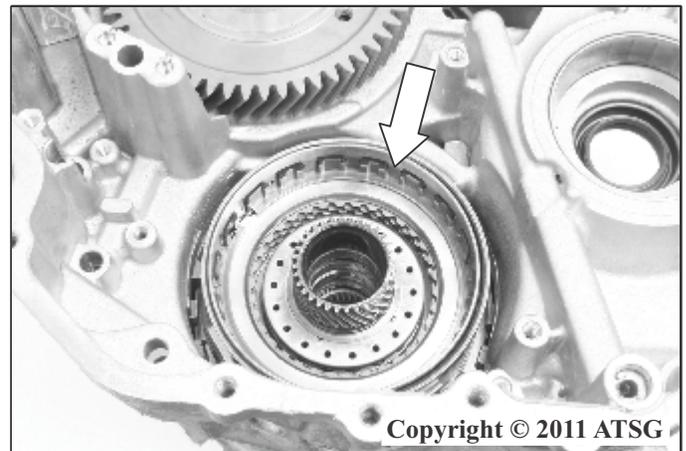


Figure 46

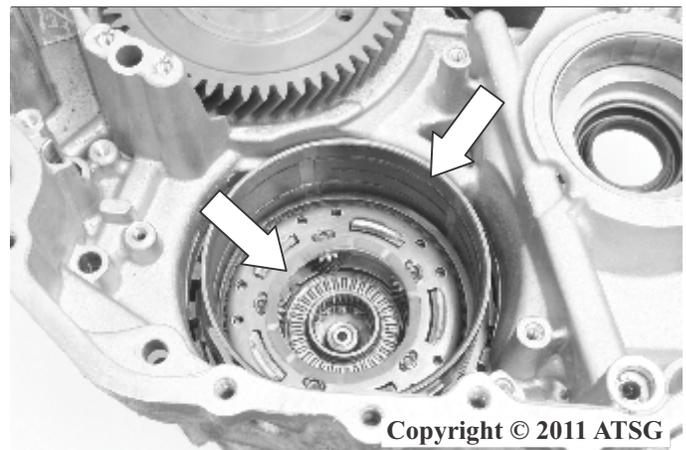


Figure 47

## ***TRANSAXLE DISASSEMBLY (CONT'D)***

66. Remove the upper 1-2/Reverse planet carrier thrust washer as shown on the previous page in Figure 47.
67. Remove the 1-2/Reverse planet carrier assembly as shown in Figure 48.
68. Remove the lower 1-2/Reverse planet carrier thrust washer as shown in Figure 48.
69. Set the 1-2/Reverse planetary carrier aside for cleaning and component rebuild.
70. Remove the 1-2/Reverse internal gear front thrust bearing assembly as shown in Figure 49.
71. Remove the 1-2/Reverse internal gear from the transmission as shown in Figure 49.
72. Remove the 1-2/Reverse internal gear race and lower thrust bearing assembly from the lower side of the internal gear as shown in Figure 49.
73. Using a pair of snap ring pliers, remove the snap ring that retains the cover of the 3rd gear (B4) band servo as shown in Figure 50.
74. Remove the 3rd gear (B4) band servo cover as shown in Figure 50.
75. Remove and discard the o-rings from the servo cover.
76. Remove the 3rd gear (B4) band servo and return spring as shown in Figure 50.
77. Set the servo assembly aside for cleaning and component rebuild.  
Remove the twelve transmission case rear cover attaching bolts from the transmission case as shown in Figure 51.

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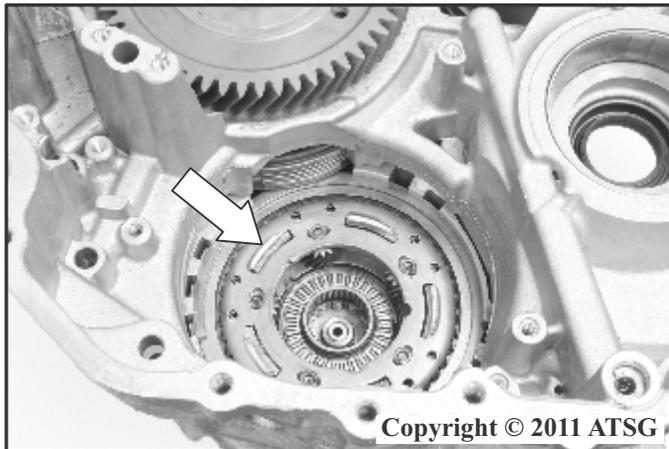


Figure 48

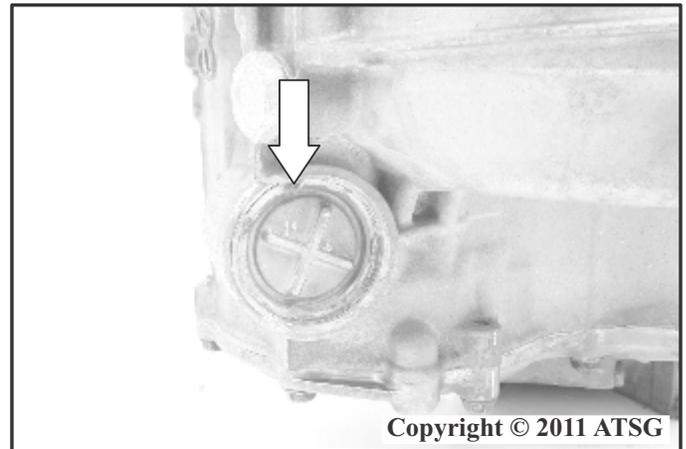


Figure 50

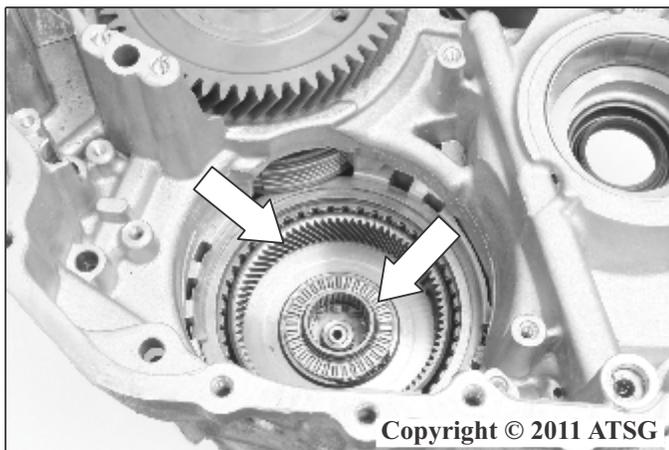


Figure 49

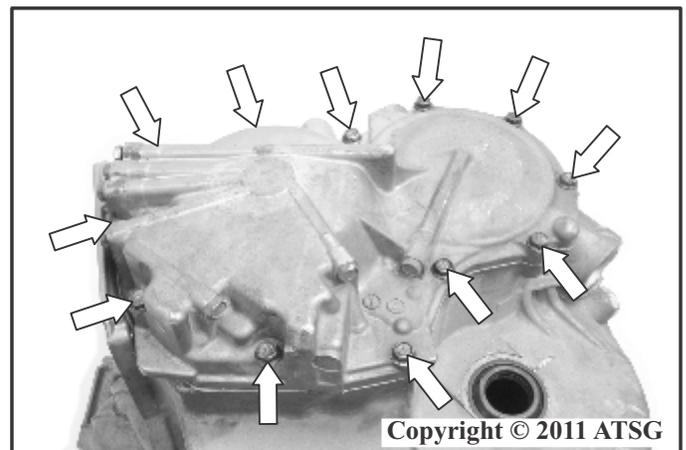


Figure 51

## TRANSAXLE DISASSEMBLY (CONT'D)

78. Using a soft faced hammer or plastic mallet gently tap and loosen the transmission rear case cover as shown in Figure 52.
79. Set the transmission rear case cover aside for cleaning and component rebuild.
80. Remove and discard the five case fluid passage seals as shown in Figure 53.
81. Remove the forward (C1) and direct (C2) clutch housing thrust bearing and thrust bearing race as shown in Figure 53.
82. Remove the forward (C1) and direct (C2) clutch housing as shown in Figure 53 and set aside for cleaning and component rebuild.
83. Remove the input shaft thrust bearing assembly as shown in Figure 54.
84. Remove the rear sun gear assembly and the rear sun gear thrust bearing assembly as shown in Figure 54.
85. Remove the rear sun gear thrust bearing race as shown in Figure 55.
86. Remove the front sun gear thrust bearing race and front sun gear thrust bearing assembly as shown in Figure 55.

87. Remove the rear internal gear assembly as shown in Figure 55.
88. Remove the rear internal gear thrust bearing assembly as shown in Figure 55.
89. Remove the front planet carrier thrust bearing race as shown in Figure 56.
90. Remove the front planet carrier and sun gear assembly as shown in Figure 56.

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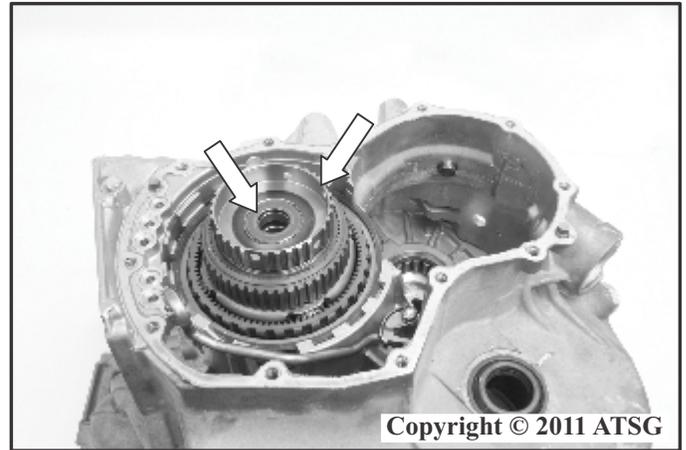


Figure 54

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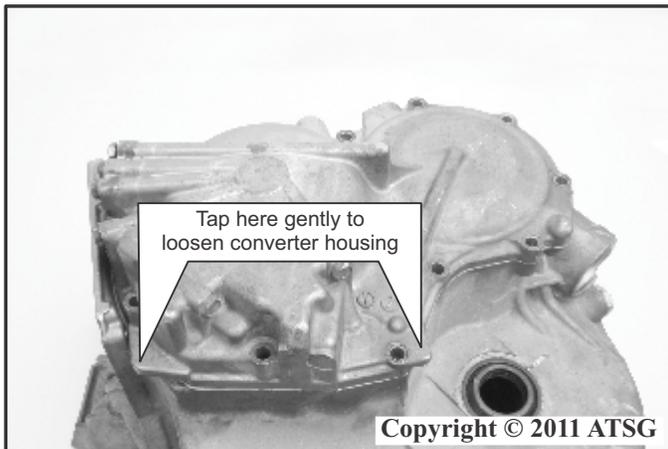


Figure 52

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Tap here gently to  
loosen converter housing

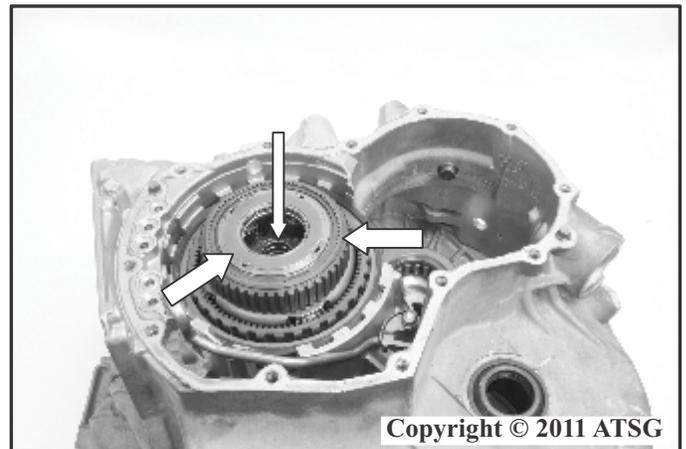


Figure 55

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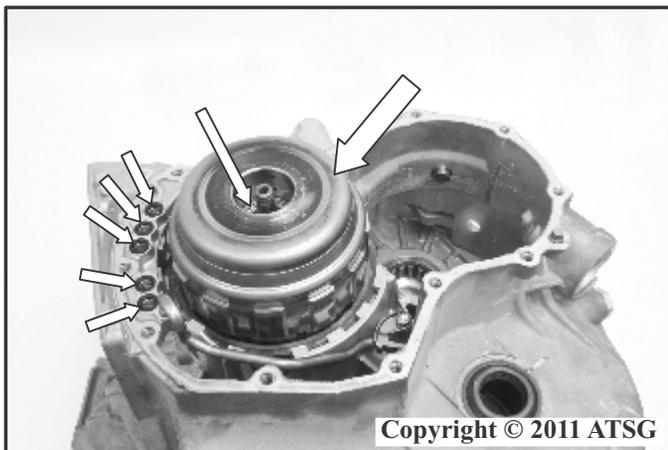


Figure 53

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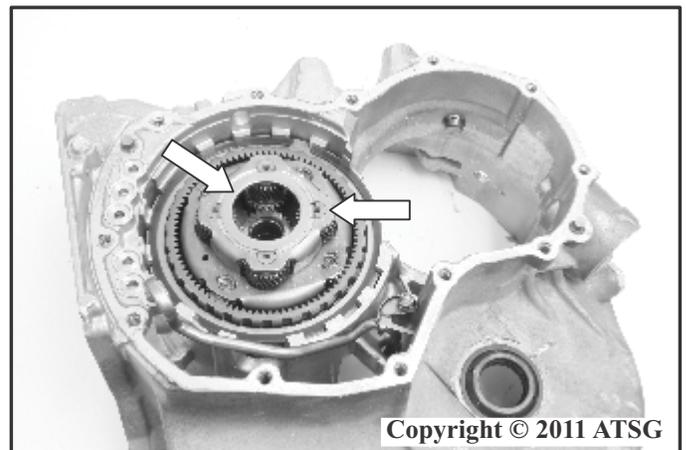


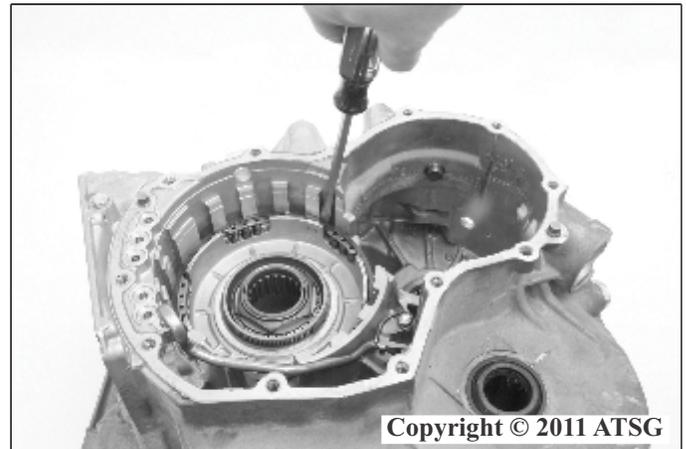
Figure 56

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## TRANSAXLE DISASSEMBLY (CONT'D)

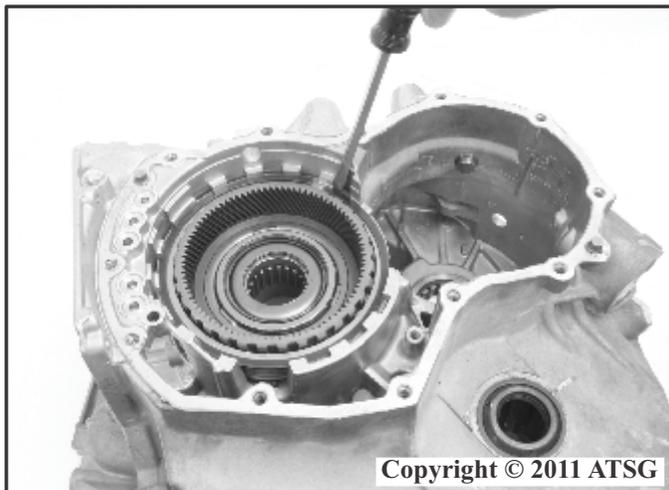
91. Using a screwdriver remove the low and reverse clutch snap ring as shown in Figure 57.
92. Remove the low and reverse clutch upper backing plate, the lined and steel plates and the lower backing plate as shown in Figure 57.
93. Remove the front internal gear thrust bearing assembly as shown in Figure 58.
94. Remove the front internal gear assembly as shown in Figure 58.
95. Remove the front internal gear thrust bearing assembly and the front internal gear thrust washer race (*located on the back side of the front internal gear*) as shown in Figure 58.
96. Using a screwdriver remove the low and reverse clutch piston return spring retaining snap ring as shown in Figure 59.
97. Remove the low and reverse clutch piston return spring as shown in Figure 59.
98. Remove the low and reverse clutch piston as shown in Figure 59.
99. Remove and discard the low and reverse clutch piston o-rings.
100. Remove the output gear assembly retaining snap ring and remove the output gear assembly from the case as shown in Figure 60.
101. Remove the lube pipe hold down bracket retaining bolt, the hold down bracket and tube as shown in Figure 61.

Cont'd on page 29



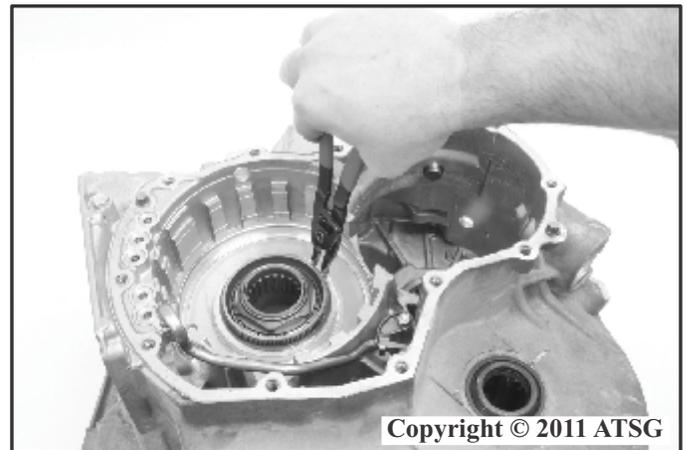
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Figure 59



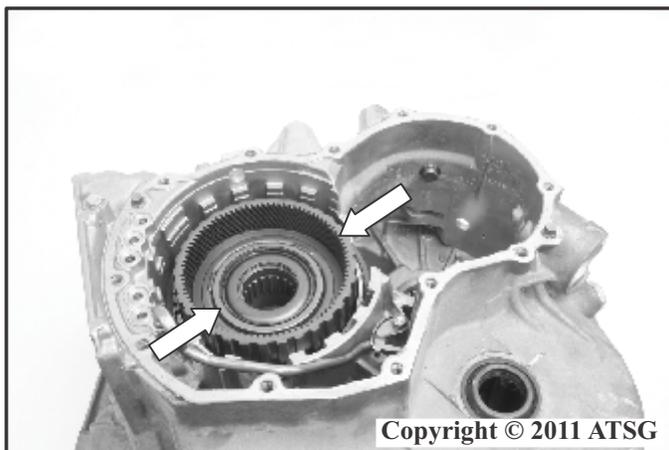
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Figure 57



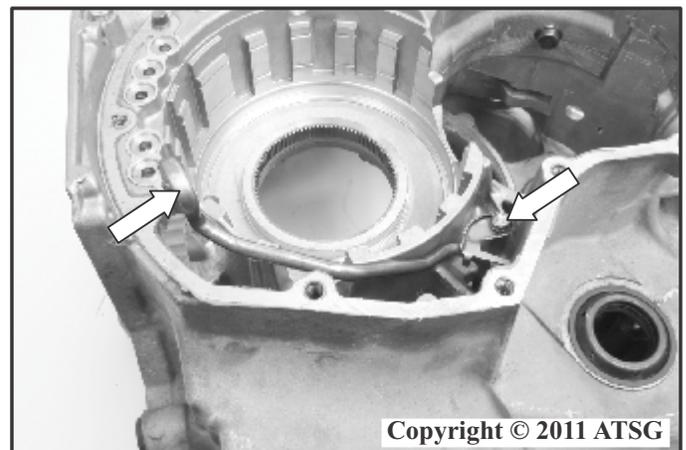
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Figure 60



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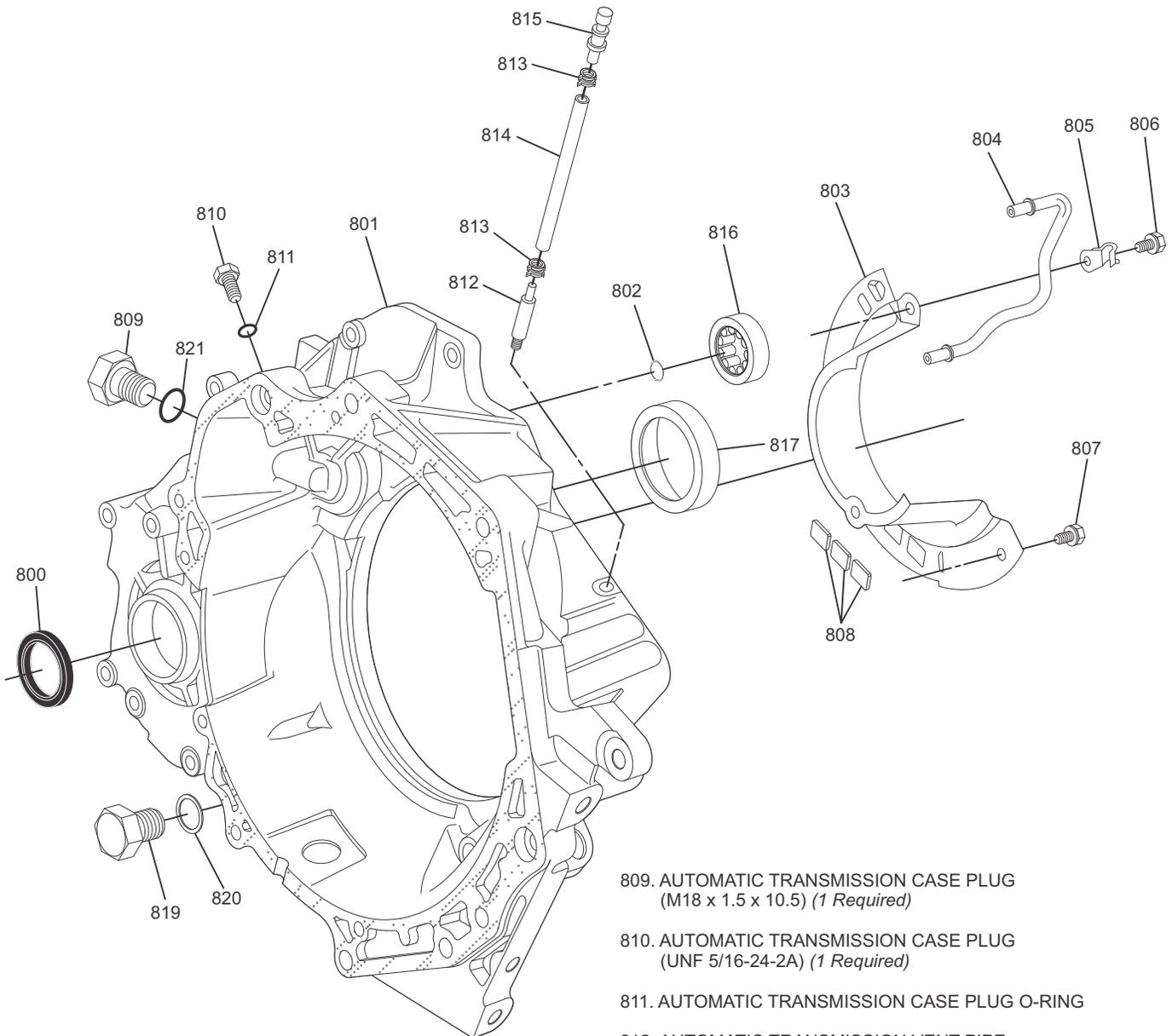
Figure 58



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Figure 61

## TORQUE CONVERTER HOUSING ASSEMBLY EXPLODED VIEW



- |  |   |
|--|---|
| 800. TORQUE CONVERTER HOUSING AXLE SEAL  | 809. AUTOMATIC TRANSMISSION CASE PLUG (M18 x 1.5 x 10.5) (1 Required) |
| 801. TORQUE CONVERTER HOUSING ASSEMBLY   | 810. AUTOMATIC TRANSMISSION CASE PLUG (UNF 5/16-24-2A) (1 Required)   |
| 802. FRONT DIFFERENTIAL TRANSFER DRIVE GEAR FRONT LUBE TEFLON SEAL                 | 811. AUTOMATIC TRANSMISSION CASE PLUG O-RING                          |
| 803. AUTOMATIC TRANSMISSION FLUID BAFFLE   | 812. AUTOMATIC TRANSMISSION VENT PIPE                                 |
| 804. TRANSMISSION LUBE FLUID TUBE  | 813. AUTOMATIC TRANSMISSION VENT HOSE CLIP                            |
| 805. LUBE FLUID TUBE HOLD DOWN BRACKET   | 814. AUTOMATIC TRANSMISSION VENT HOSE                                 |
| 806. LUBE FLUID TUBE HOLD DOWN BRACKET RETAINING BOLT (M6 x 1.0 x 14) (1 Required) | 815. AUTOMATIC TRANSMISSION VENT ASSEMBLY                             |
| 807. TRANSMISSION FLUID BAFFLE RETAINING BOLT (M6 x 1.0 x 14) (3 Required)         | 816. DIFFERENTIAL TRANSFER DRIVE GEAR FRONT BEARING ASSEMBLY          |
| 808. TRANSMISSION METAL PARTICLE COLLECTOR MAGNET (3 Required)                     | 817. FRONT DIFFERENTIAL ASSEMBLY BEARING RACE                         |
|  | 819. AUTOMATIC TRANSMISSION FLUID DRAIN PLUG                          |
|  | 820. AUTOMATIC TRANSMISSION FLUID DRAIN PLUG WASHER                   |
|  | 821. AUTOMATIC TRANSMISSION CASE PLUG O-RING                          |

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Figure 62

## COMPONENT REBUILD

### Torque Converter Housing

1. Disassemble the Torque Converter Housing using the diagram in Figure 62 as a guide.
2. Using SST J45000 or other equivalent seal removal tool remove the torque converter housing axle seal from the torque converter housing as shown in Figure 63.
3. Remove the transmission fluid lube tube bracket retaining bolt and remove the bracket as shown in Figure 64.
4. Remove three transmission fluid baffle retaining bolts and the baffle as shown in Figure 64.
5. Carefully remove the transmission fluid lube tube as shown in Figure 65.

Cont'd on page 31

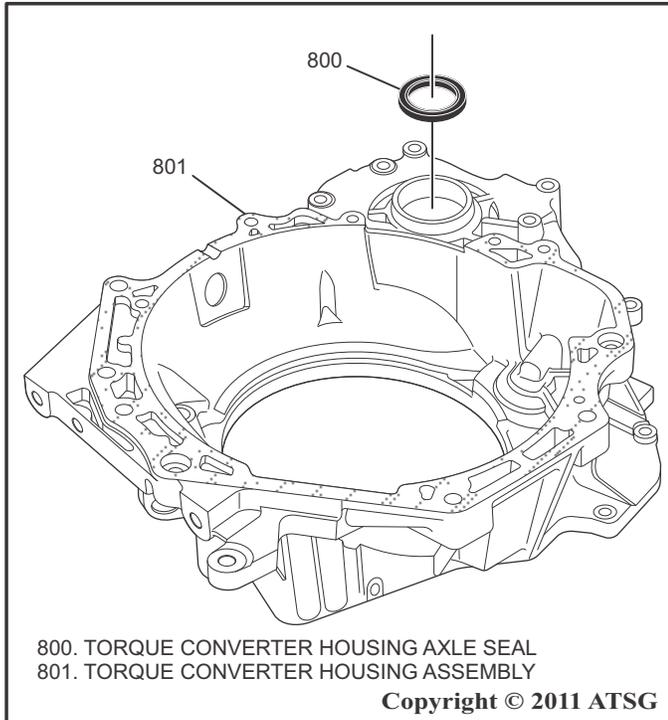


Figure 63

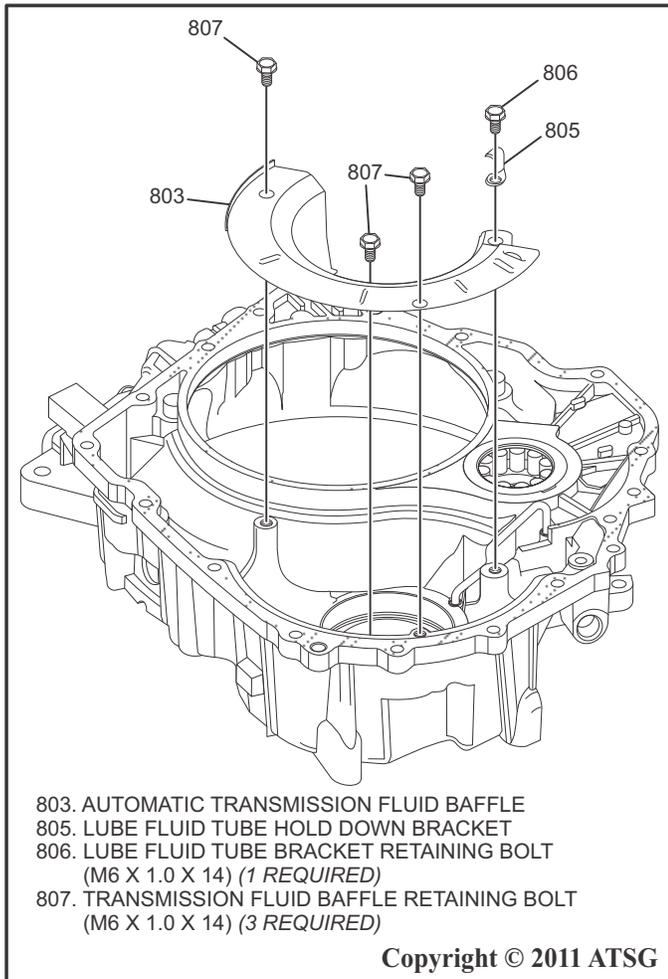


Figure 64

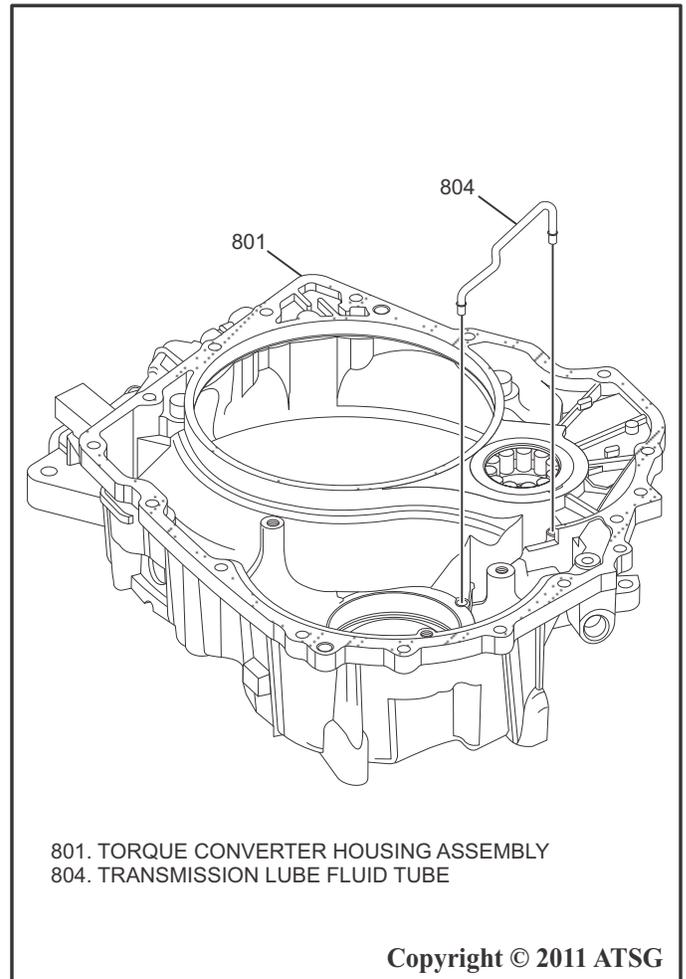


Figure 65

## COMPONENT REBUILD (CONT'D)

### Torque Converter Housing

6. Remove the transfer drive gear front lube seal as shown in Figure 66.
7. Inspect the transfer drive gear front bearing assembly and the front differential assembly bearing race as shown in Figure 66 and replace as necessary.
8. Inspect and clean all torque converter housing parts thoroughly and dry with compressed air replacing parts as necessary.
9. Install a new transfer drive gear front lube seal as shown in Figure 67.
10. Carefully install the transmission lube fluid tube with a plastic hammer using care not to bend the tube as shown in Figure 68.

Cont'd on page 32

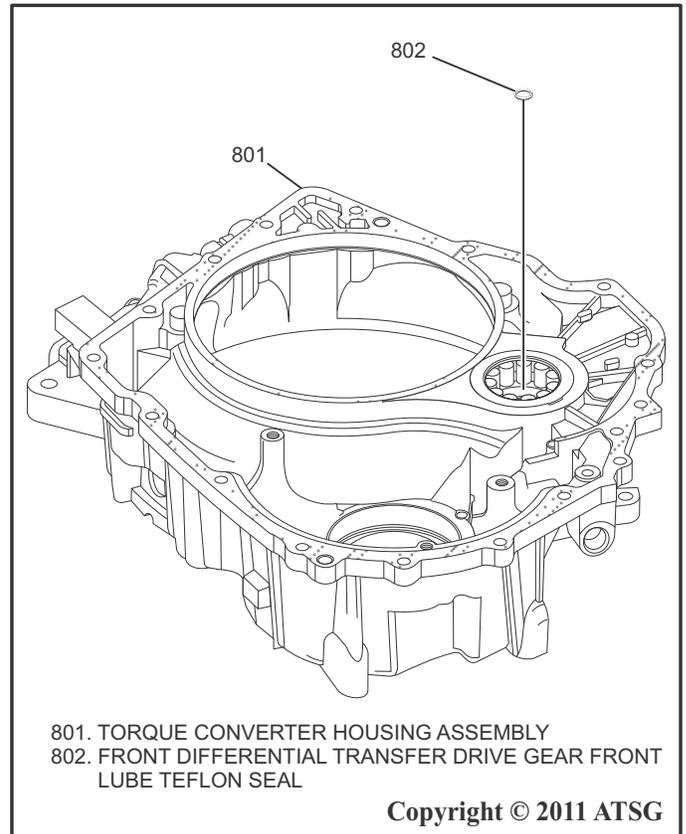


Figure 67

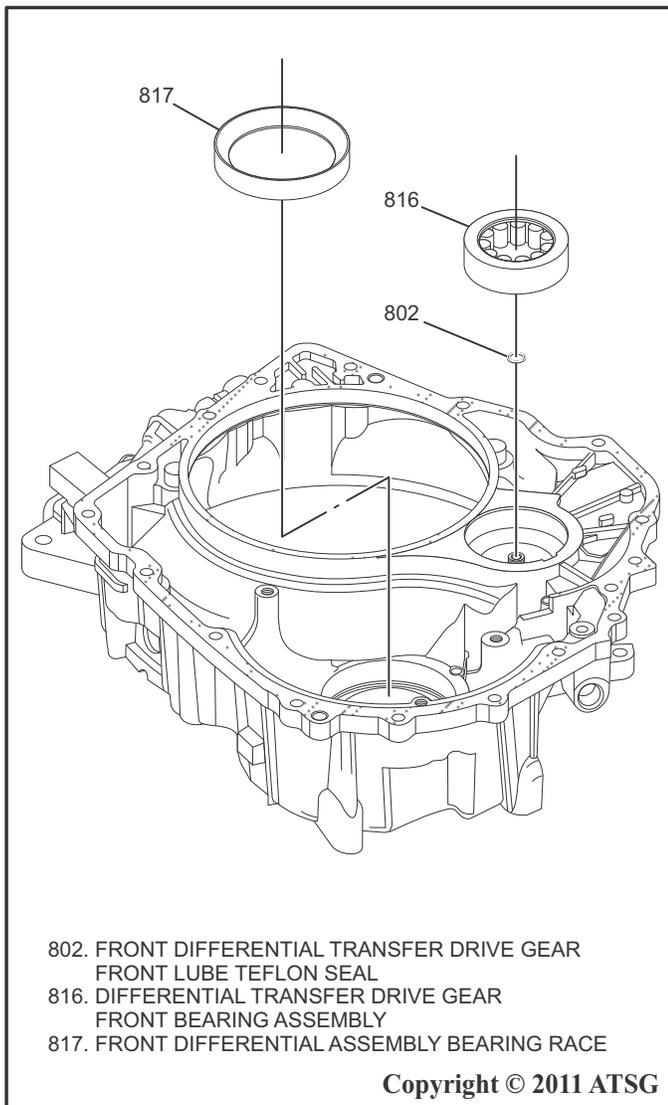


Figure 66

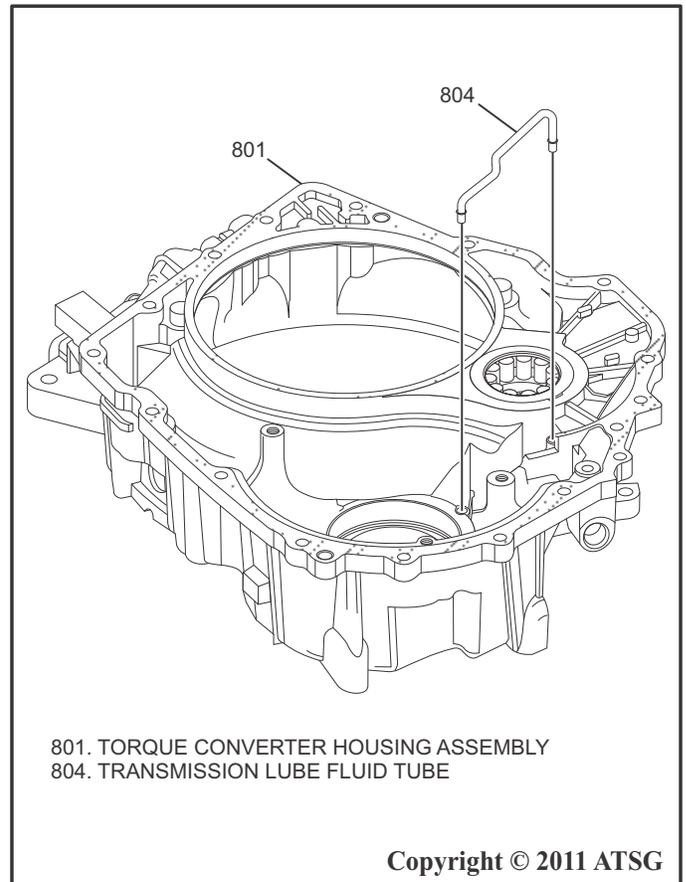


Figure 68

## COMPONENT REBUILD (CONT'D)

### Torque Converter Housing

11. Install the automatic transmission fluid baffle as shown in Figure 69.
12. Install and hand tighten the lube fluid tube hold down bracket and the hold down bracket retaining bolt as shown in Figure 69.
13. Install and hand tighten the three automatic transmission fluid baffle retaining bolts as shown in Figure 69.
14. Using a torque wrench tighten the lube fluid tube hold down bracket retaining bolt and torque the bolt to **5 N.m (44 in. lb.)** as shown in Figure 70.
15. Using a torque wrench, tighten the three automatic transmission fluid baffle retaining bolts and torque the bolts to **5 N.m (44 in. lb.)** as shown in Figure 70.
16. Using a plastic hammer, tapping evenly, install the torque converter housing axle seal as shown in Figure 71.

17. Coat the inside of the seal with a small amount of Trans-Jel® and set the torque converter housing assembly aside for final assembly.

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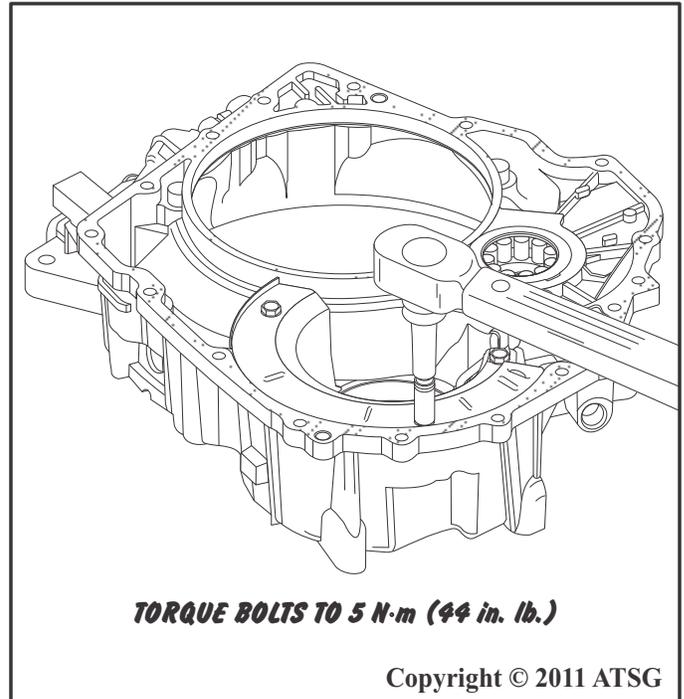


Figure 70

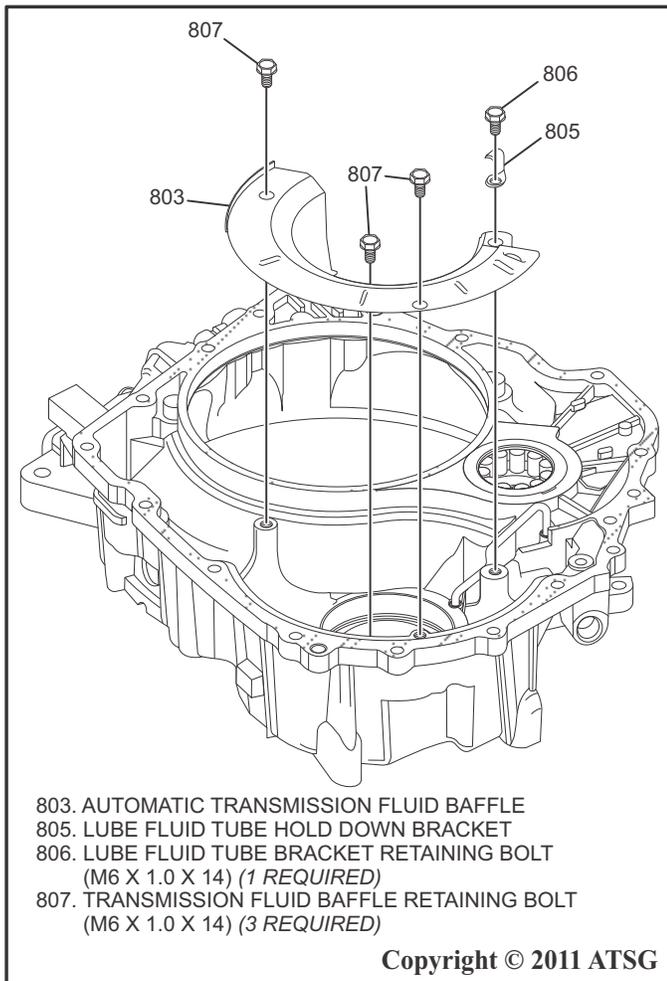


Figure 69

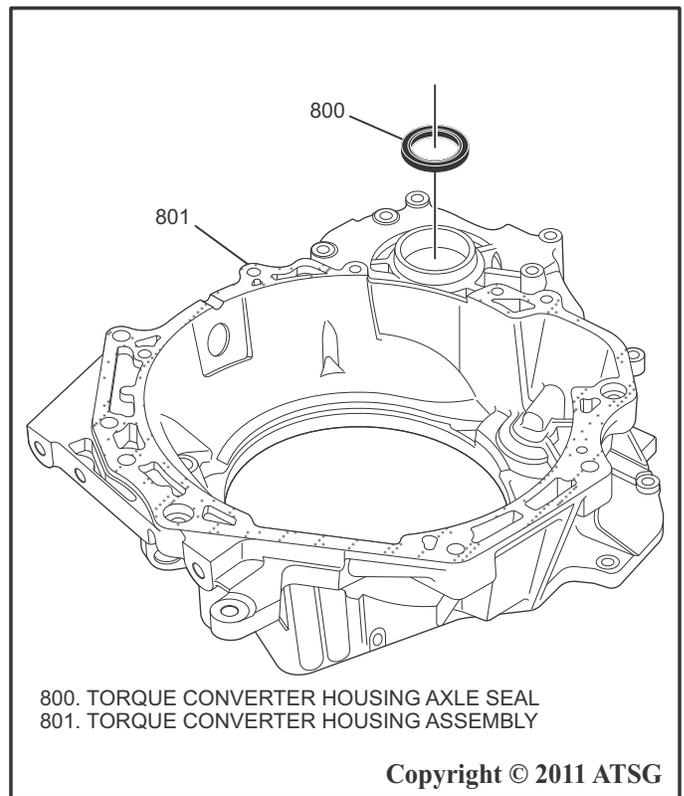
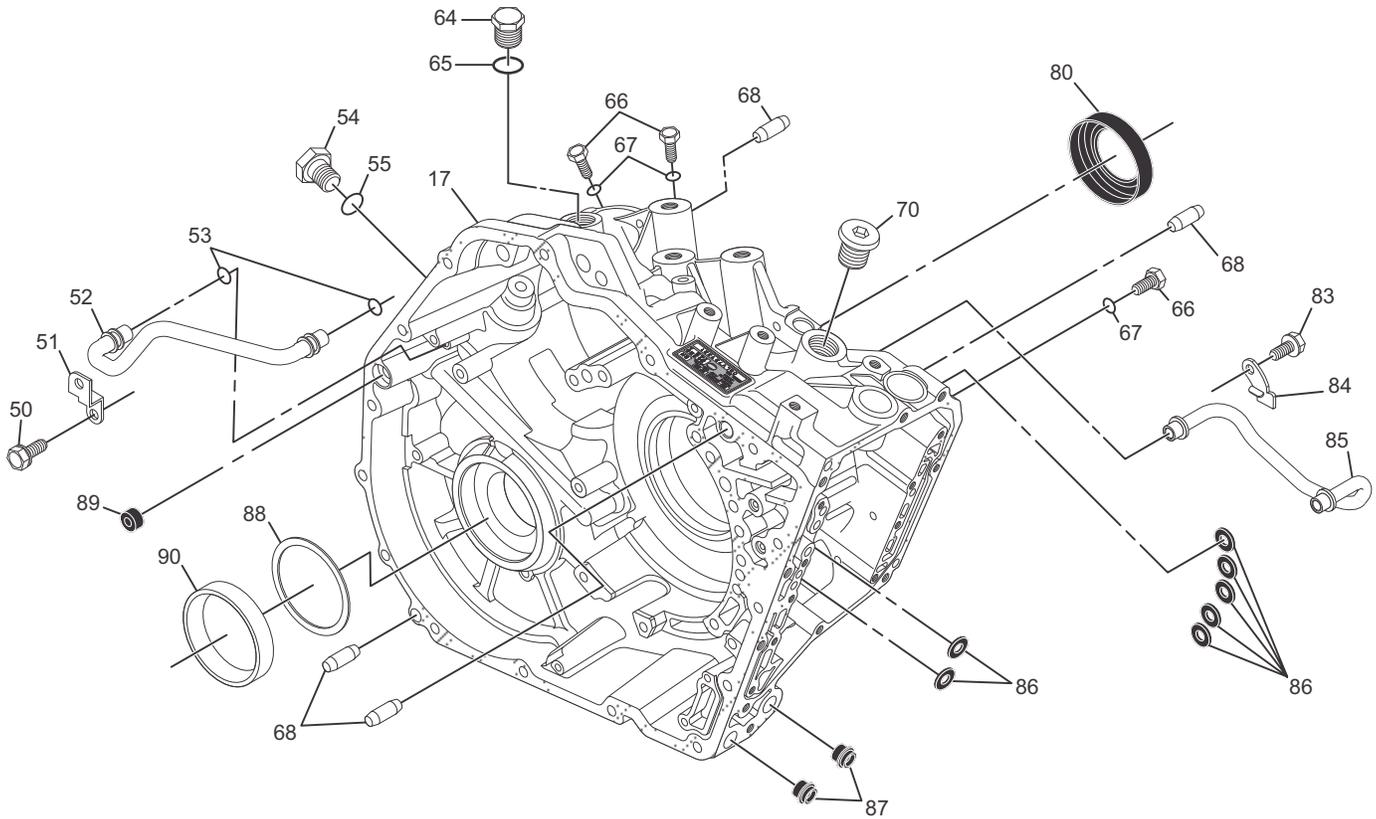


Figure 71

## TRANSMISSION CASE ASSEMBLY AND ASSOCIATED PARTS



17. AUTOMATIC TRANSMISSION CASE ASSEMBLY

50. 3RD GEAR BAND APPLY TUBE HOLD DOWN BRACKET  
RETAINING BOLT (M6 x 1.0 x 14) (2 Required)

51. 3RD GEAR BAND APPLY TUBE HOLD DOWN BRACKET

52. 3RD GEAR BAND APPLY TUBE

53. 3RD GEAR BAND APPLY TUBE O-RING SEAL  
(2 Required)

54. AUTOMATIC TRANSMISSION CASE PLUG  
(M20 x 1.5 x 13.5) (1 Required)

55. AUTOMATIC TRANSMISSION CASE PLUG O-RING SEAL

64. 3RD GEAR BAND ANCHOR BOLT  
(M20 x 1.5 x 21) (1 Required)

65. 3RD GEAR BAND ANCHOR BOLT O-RING SEAL

66. AUTOMATIC TRANSMISSION FLUID PRESSURE TEST PLUG  
(UNF 5/16-24-2A) (3 Required)

67. AUTOMATIC TRANSMISSION FLUID PRESSURE TEST PLUG  
O-RING SEAL (3 Required)

68. TRANSMISSION CASE LOCATING DOWEL PIN  
(4 Required)

70. TRANSMISSION LUBE FILL PLUG

80. AUTOMATIC TRANSMISSION AXLE SHAFT SEAL

83. TRANSMISSION LUBE FLUID TUBE HOLD DOWN BRACKET  
RETAINING BOLT (M6 x 1.0 x 14.5) (1 Required)

84. TRANSMISSION LUBE FLUID TUBE HOLD DOWN BRACKET

85. TRANSMISSION LUBE FLUID TUBE

86. AUTOMATIC TRANSMISSION CASE FLUID PASSAGE SEAL  
(7 Required)

87. AUTOMATIC TRANSMISSION FLUID COOLER LINE SEAL  
(2 Required)

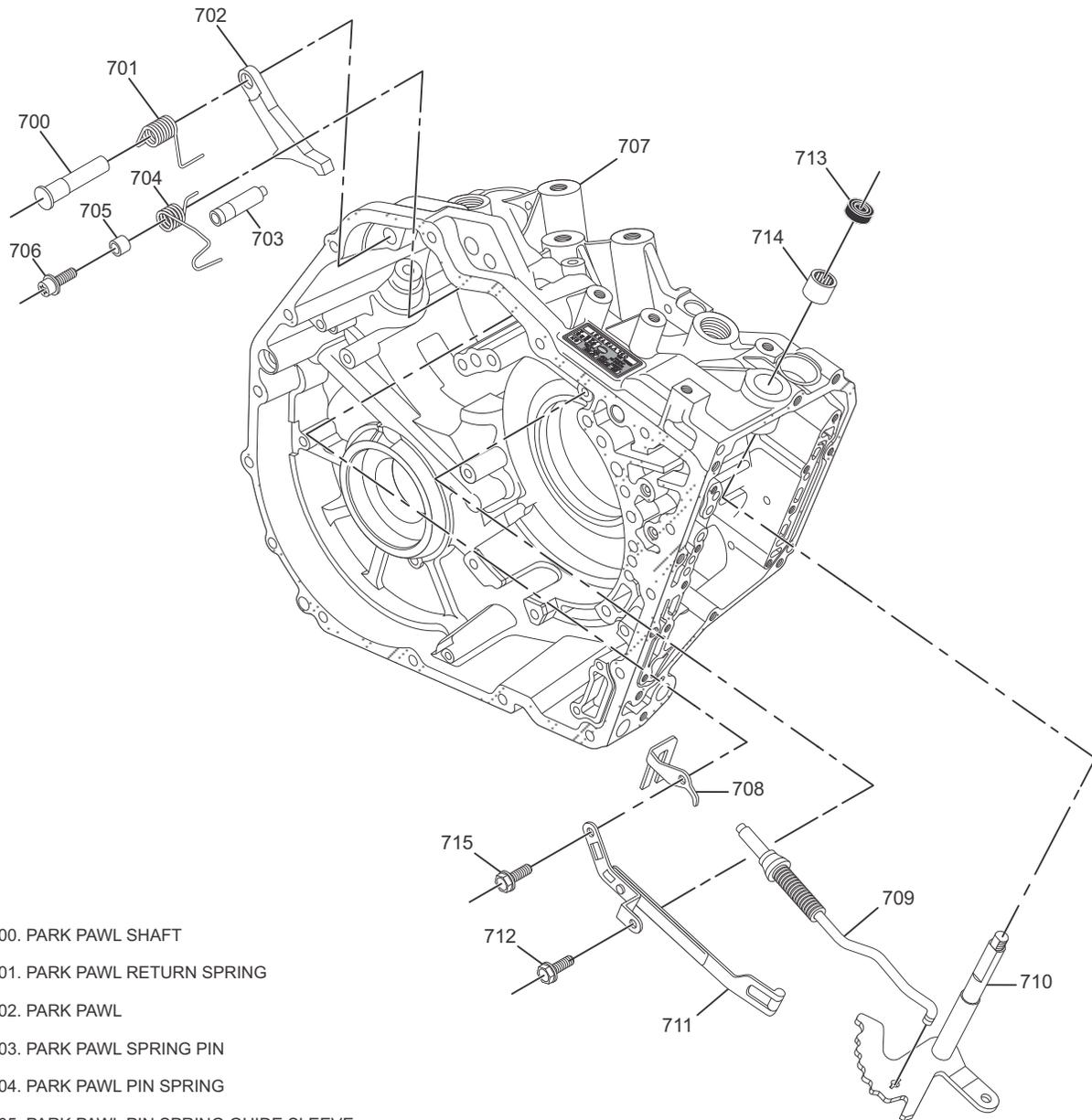
88. FRONT DIFFERENTIAL ASSEMBLY BEARING RACE SELECTIVE SHIM  
(1 Required)

89. AUTOMATIC TRANSMISSION CASE FLUID PASSAGE SEAL  
(1 Required)

90. FRONT DIFFERENTIAL ASSEMBLY BEARING RACE

Figure 72

## TRANSMISSION CASE ASSEMBLY PARK PAWL AND SHIFT LINKAGE ASSEMBLY



- 700. PARK PAWL SHAFT
- 701. PARK PAWL RETURN SPRING
- 702. PARK PAWL
- 703. PARK PAWL SPRING PIN
- 704. PARK PAWL PIN SPRING
- 705. PARK PAWL PIN SPRING GUIDE SLEEVE
- 706. PARK PAWL PIN SPRING RETAINING BOLT  
(M6 x 1.0 x 25) (1 Required)
- 707. AUTOMATIC TRANSMISSION CASE ASSEMBLY
- 708. PARK PAWL ACTUATOR BRACKET
- 709. PARK PAWL ACTUATOR ROD
- 710. MANUAL SHAFT DETENT LEVER
- 711. MANUAL SHAFT DETENT LEVER SPRING
- 712. MANUAL SHAFT DETENT LEVER SPRING HOLD DOWN BRACKET  
RETAINING BOLT (M6 x 1.0 x 14) (1 Required)
- 713. MANUAL SHIFT SHAFT SEAL
- 714. MANUAL SHIFT SHAFT BEARING ASSEMBLY
- 715. PARK PAWL ACTUATOR BRACKET HOLD DOWN BRACKET RETAINING BOLT  
(M6 x 1.0 x 16.7) (1 Required)

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Figure 73

## COMPONENT REBUILD (CONT'D)

### Transmission Case Assembly

1. Disassemble the transmission case assembly using the diagram in Figure 72 and Figure 73 as a guide.
2. Using SST J45201 or other adequate seal removing tool, remove the two automatic transmission fluid cooler line seals as shown in Figure 74.
3. Using a screwdriver carefully pry upward and remove the manual shift shaft seal as shown in Figure 75.
4. Using SST J 45161 or other similar driver and a hammer, drive the manual shift shaft bearing assembly through the case bore and remove the bearing assembly as shown in Figure 75.
5. Using SST J 45000 or other adequate seal puller, remove the automatic transmission axle seal as shown in Figure 76.

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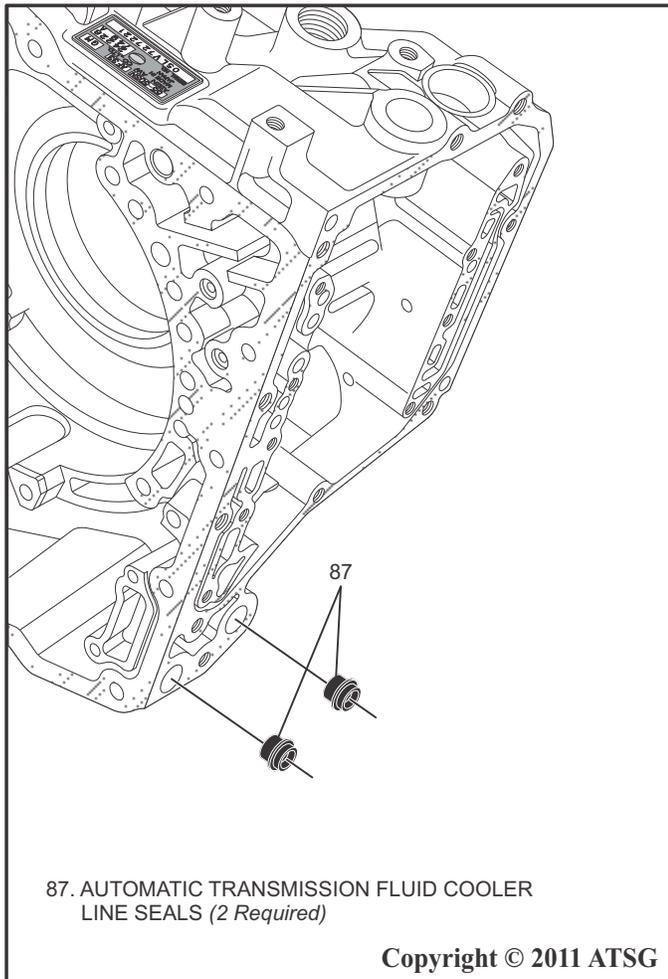


Figure 74

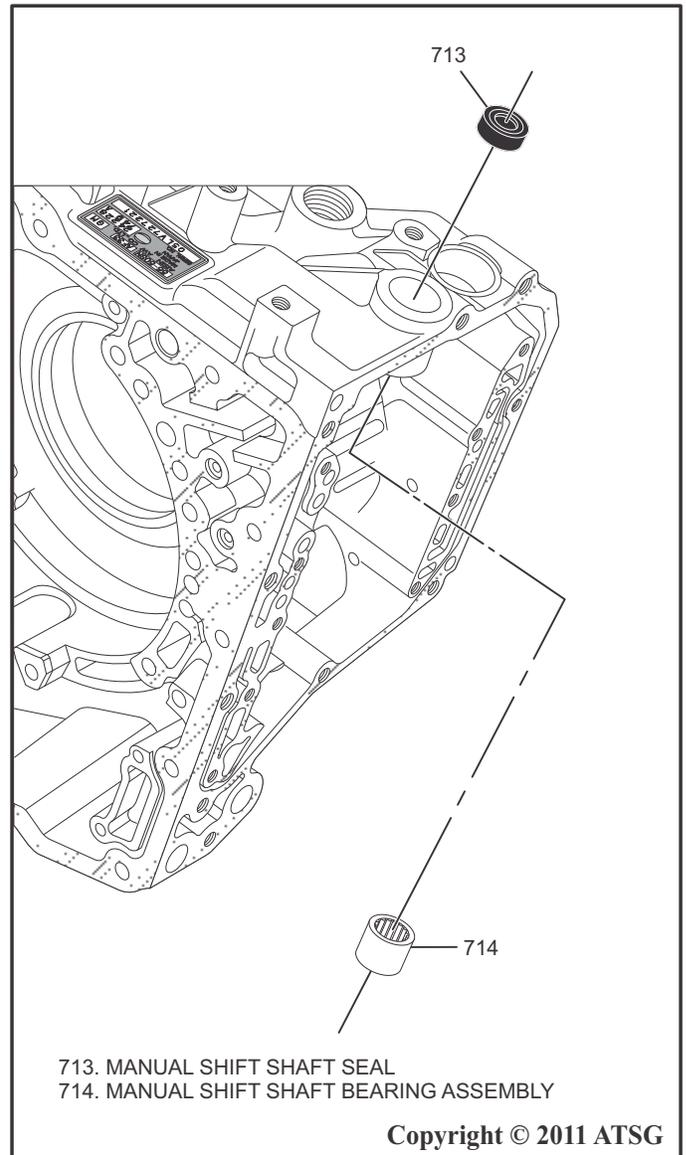


Figure 75

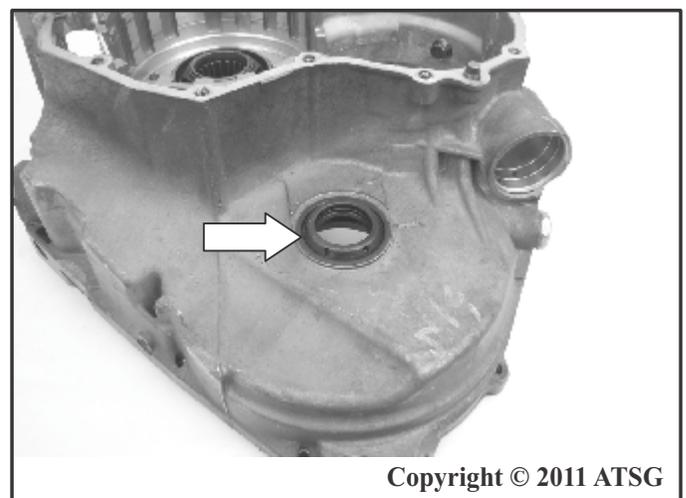


Figure 76

## COMPONENT REBUILD (CONT'D)

### Transmission Case Assembly

6. Clean all case assembly parts thoroughly with solvent and dry with compressed air.
7. Inspect all transmission case assembly parts for wear and/or damage and replace as necessary.

**CAUTION:** It is vital to check the transmission case assembly for wear in the area where the drive transfer gear bearing support sleeve contacts the case as shown in Figure 77. If the case is worn in this area it will need to be repaired or replaced. Failure to do so will result in premature transmission failure.

8. Using SST J 44809 or other adequate seal installer and a hammer, install a new automatic transmission axle seal as shown in Figure 78.
9. Using SST J 45161 or other adequate driver and a hammer, install a new shift shaft bearing assembly then install a new shift shaft seal as shown in Figure 79.
10. Using SST J 41239-1A or other adequate seal installer and a hammer, install two new transmission fluid cooler line seals as shown in Figure 79.

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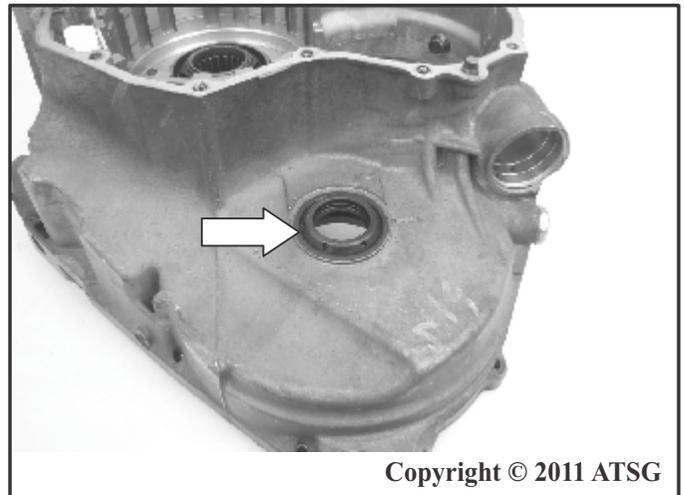


Figure 78

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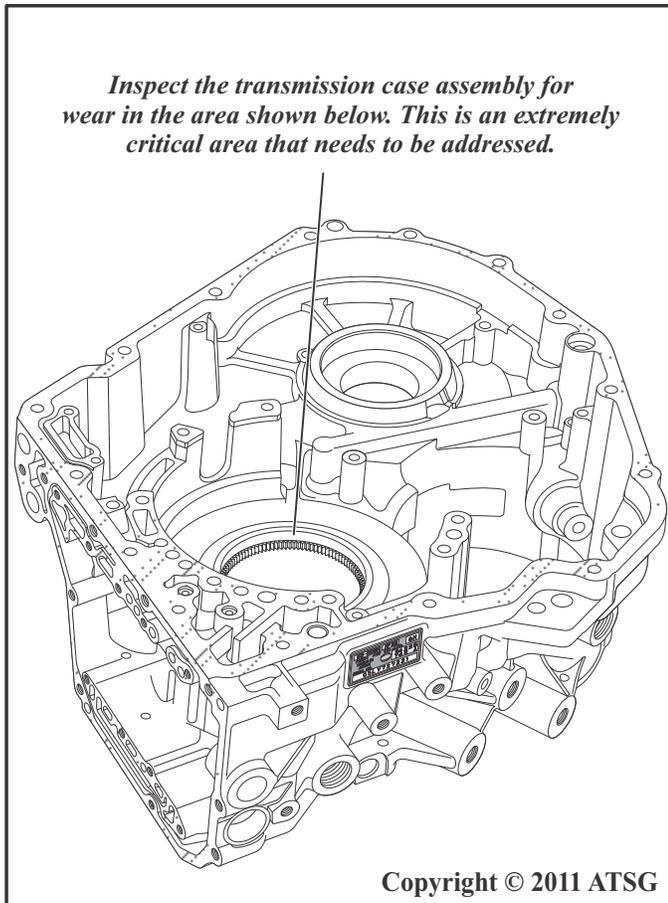
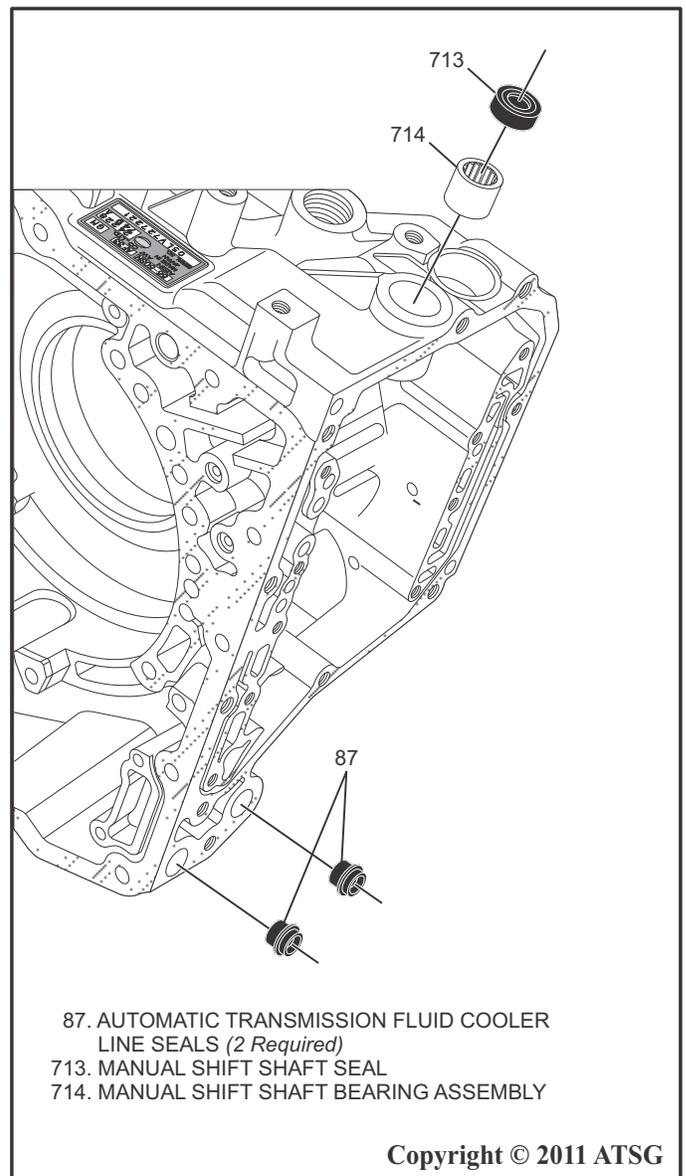


Figure 77

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- 87. AUTOMATIC TRANSMISSION FLUID COOLER LINE SEALS (2 Required)
- 713. MANUAL SHIFT SHAFT SEAL
- 714. MANUAL SHIFT SHAFT BEARING ASSEMBLY

Figure 79

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## COMPONENT REBUILD (CONT'D)

### Transmission Case Assembly

#### Checking Differential Assembly Rotational Torque

1. Rotate the transmission case assembly so the converter housing side is facing upward, and install the front differential assembly into the empty case as shown in Figure 80.
2. Install the converter housing onto the transmission case assembly and install the twelve converter housing attaching bolts (*hand tightening only*) as shown in Figure 81.
3. Using an appropriate torque wrench, torque the twelve converter housing attaching bolts to 29 Nm (21 ft. lb.) in a cross-wise fashion using the pattern shown in Figure 82.

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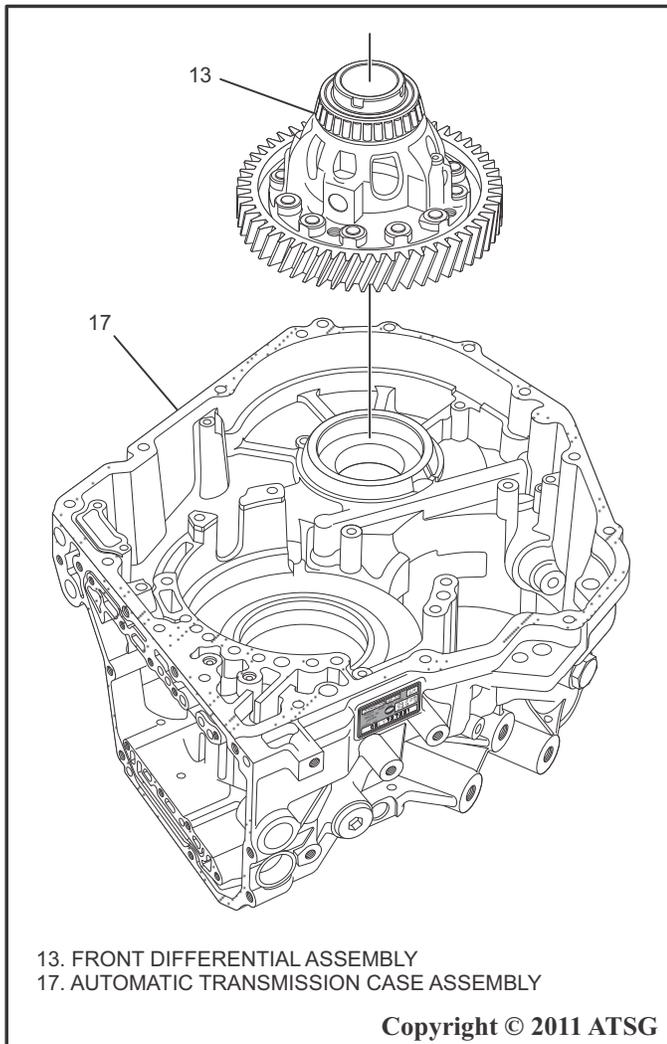


Figure 80

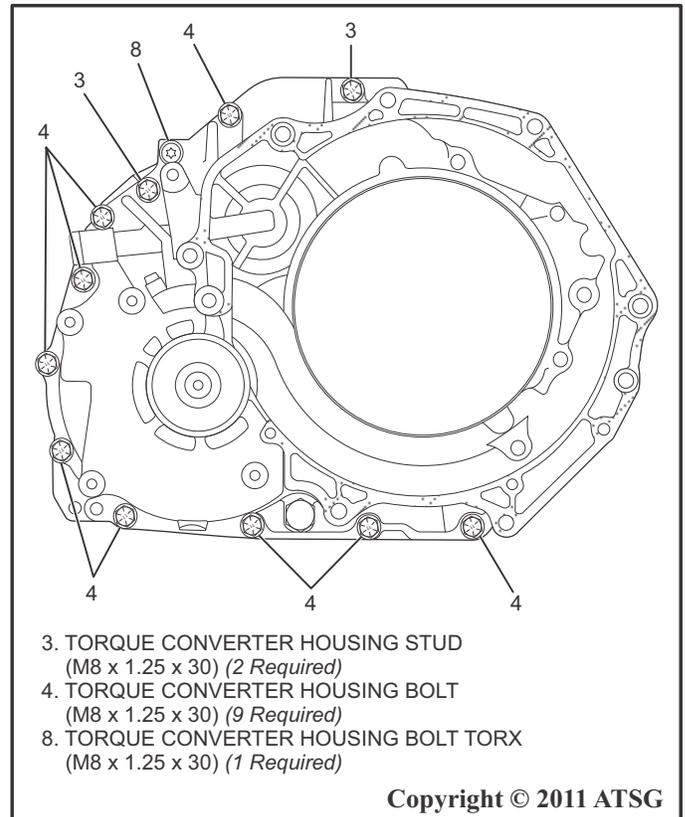


Figure 81

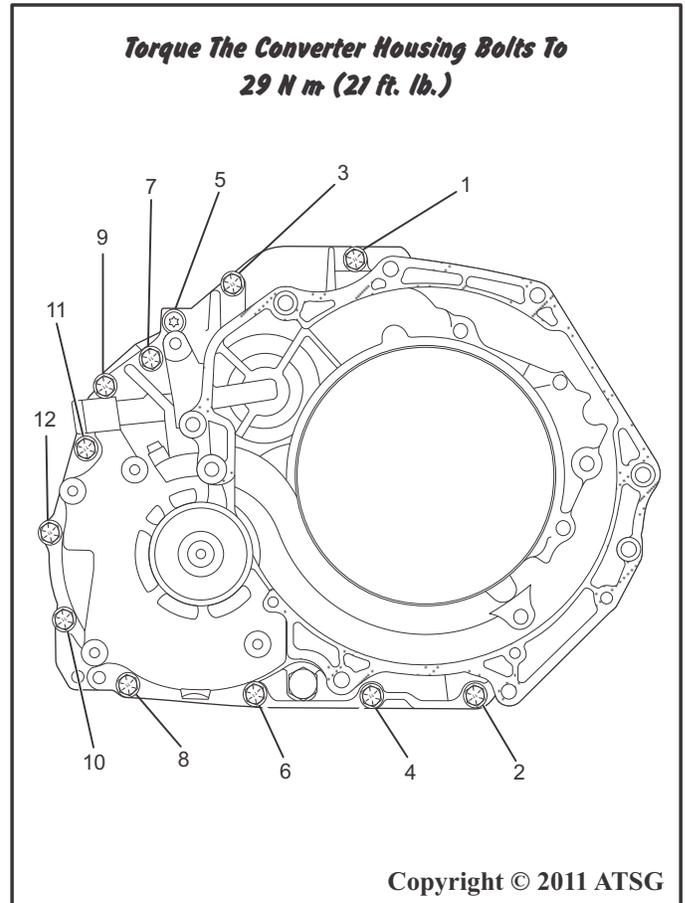


Figure 82

## COMPONENT REBUILD (CONT'D)

### Rotational Torque Measurement

4. Using SST DT-47687 or other similar rotational torque adapter tool insert the tool into the axle shaft opening in the converter housing and turn the adapter so it engages the differential pinion cross shaft as shown in Figure 83.
5. Using an appropriate torque wrench, measure the rotational torque required to slowly rotate the front differential assembly.
6. Make a notation of the rotational torque reading.

#### Rotational Torque Specification:

Rotational torque should be between **0.70 - 1.20 Nm (6 - 11 lb. in.)**

7. If rotational torque is within specification, front differential bearing race selective shim replacement will not be necessary.
8. If rotational torque is not within specification it will be necessary to replace the front differential bearing race selective shim.

### Choosing Front Differential Bearing Race Selective Shim

9. Remove the rotational torque adapter tool from the front differential and remove the torque converter housing and differential assembly from the transmission case assembly.
10. Using SST J 45160 differential bearing race remover and J 45124 removal bridge or other adequate bearing race removal tool, remove the front differential bearing race from the transmission case as shown in Figure 84.
11. Remove the front differential bearing race selective shim as shown in Figure 84.

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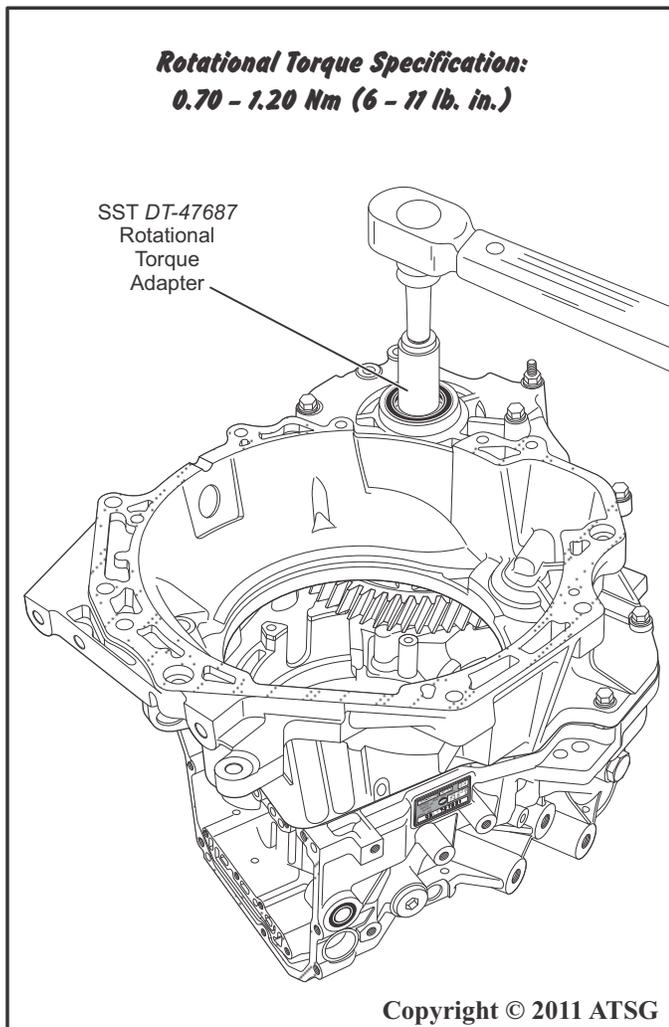


Figure 83

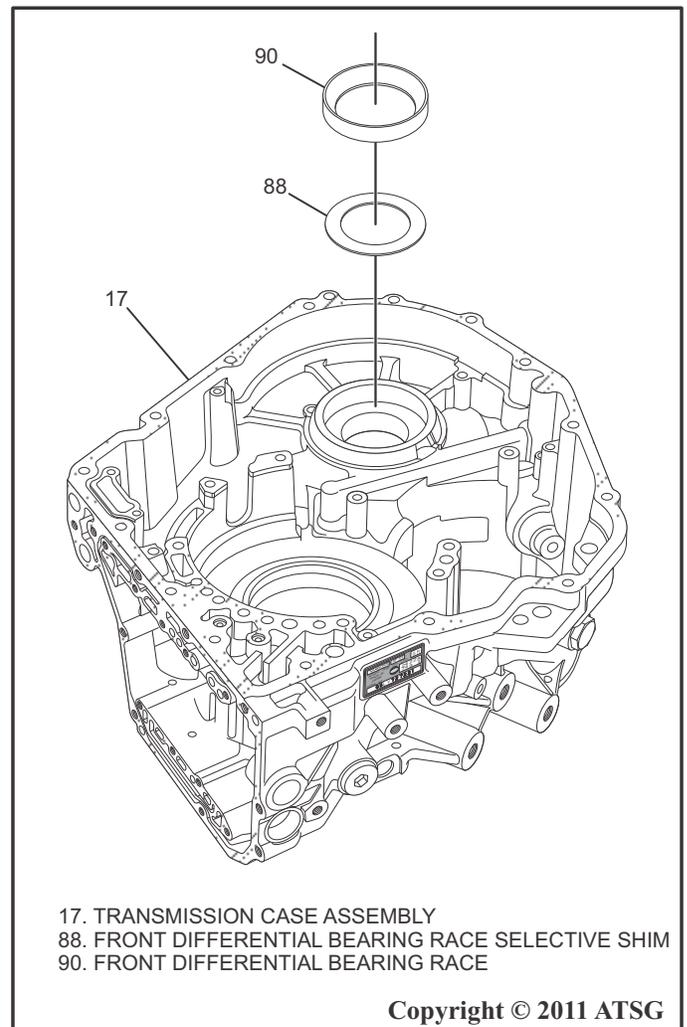


Figure 84

## COMPONENT REBUILD (CONT'D)

### Rotational Torque Measurement Cont'd

- 12.If front differential bearing race selective shim replacement is needed, select an appropriate shim using the chart in Figure 85 as a guide.
- 13.If rotational torque measurement is less than specification, a thicker shim will be required.
- 14.If rotational torque measurement is greater than specification, a thinner shim will be required.
- 15.Once proper shim has been selected and rotational torque measurement is within specification, install the appropriate shim into the transmission case assembly as shown in Figure 86.
- 16.Using SST J 8092 and J 45184 or other adequate driver and handle, install a new front differential bearing race into the case as shown in Figure 87.
- 17.Set the transmission case assembly aside for final assembly.

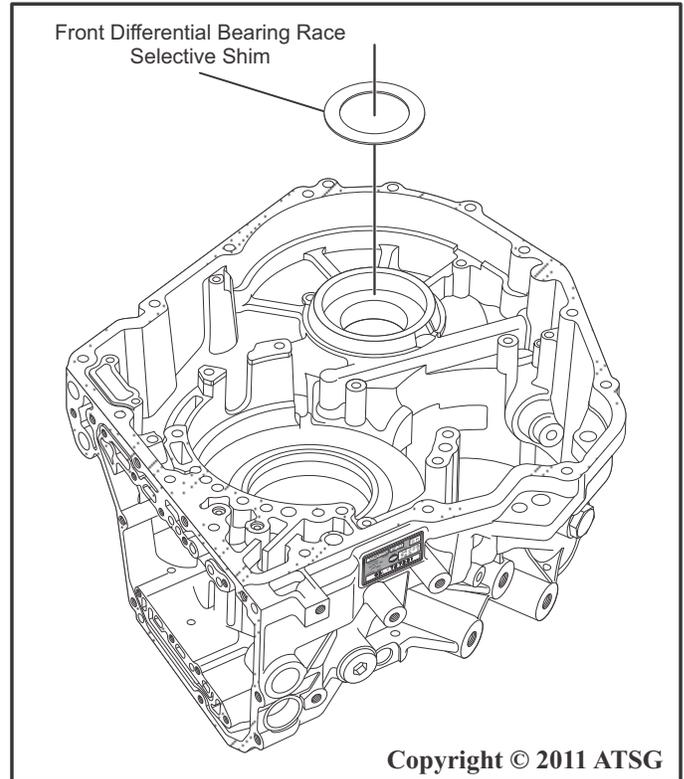
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### Front Differential Bearing Race Selective Shims

IDENTIFICATION	SPECIFICATIONS	
	METRIC	ENGLISH
Available Shims	1.00 mm	0.039 in
	1.05 mm	0.041 in
	1.10 mm	0.043 in
	1.15 mm	0.045 in
	1.20 mm	0.047 in
	1.25 mm	0.049 in
	1.30 mm	0.051 in
	1.35 mm	0.053 in
	1.40 mm	0.055 in
	1.45 mm	0.057 in
	1.50 mm	0.059 in
	1.55 mm	0.061 in
	1.60 mm	0.063 in
	1.65 mm	0.065 in
	1.70 mm	0.067 in
	1.75 mm	0.069 in
	1.80 mm	0.071 in
1.85 mm	0.073 in	
1.90 mm	0.075 in	

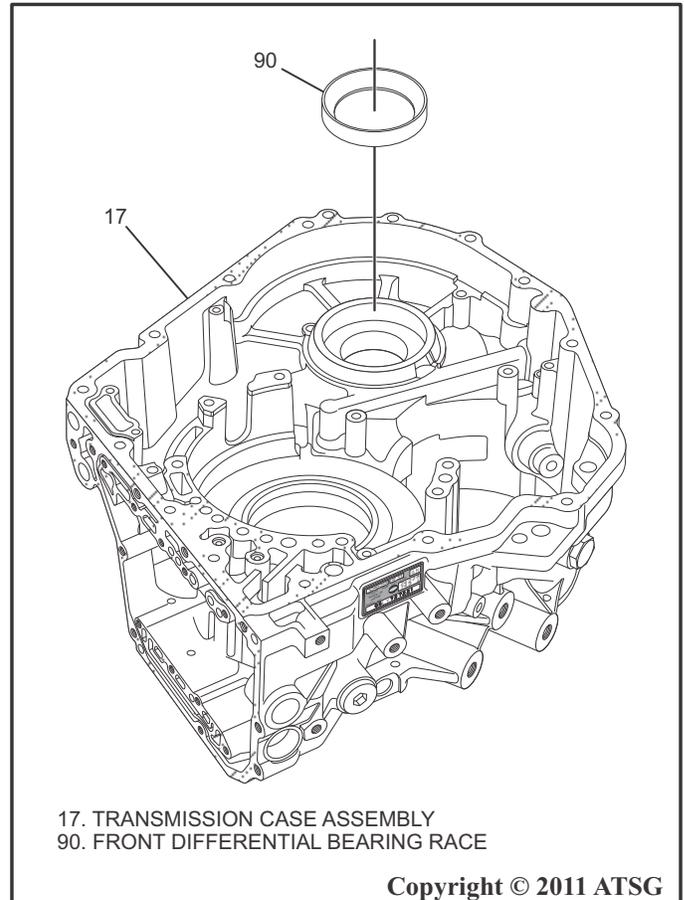
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Figure 85



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Figure 86

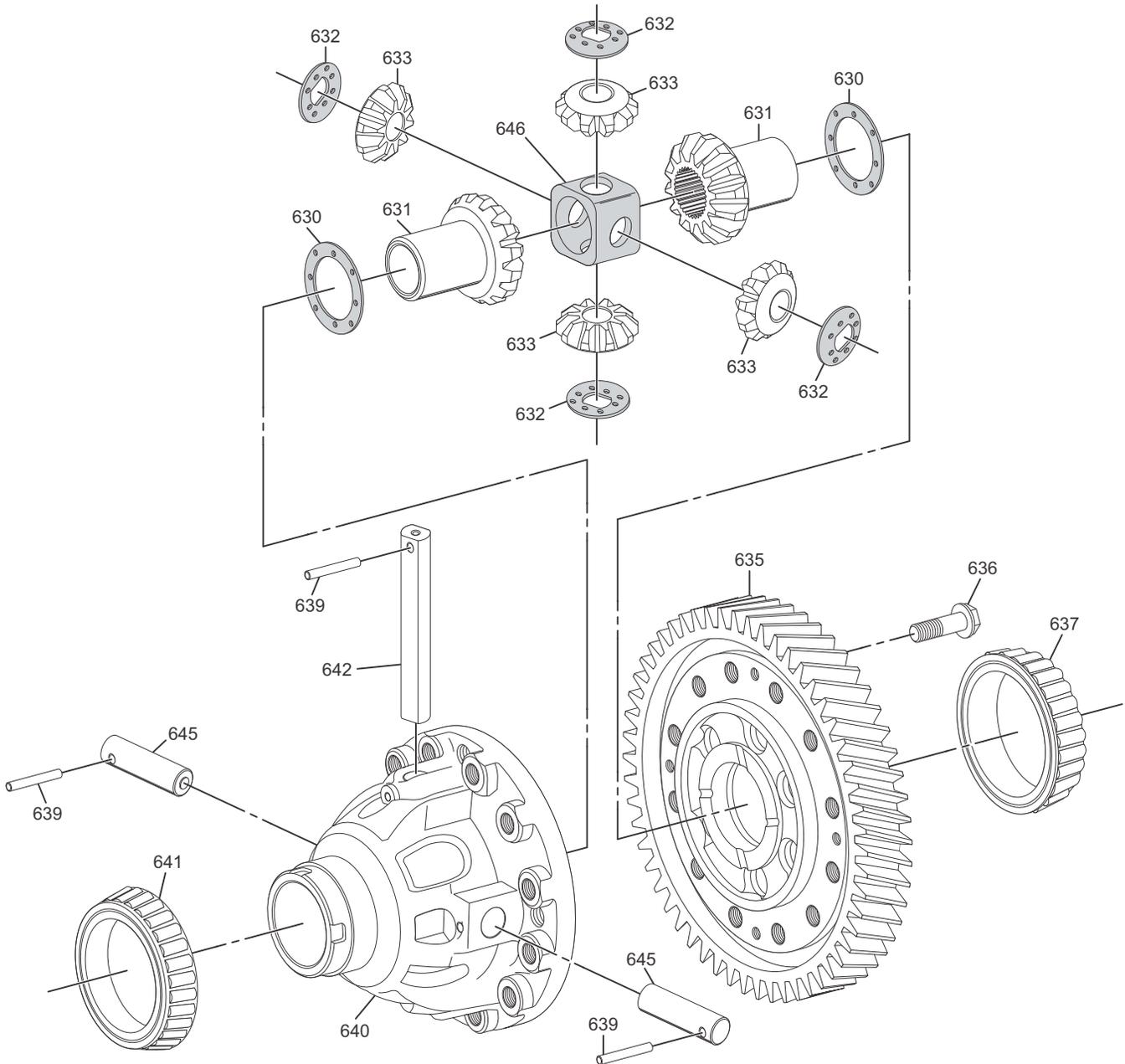


17. TRANSMISSION CASE ASSEMBLY  
90. FRONT DIFFERENTIAL BEARING RACE

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Figure 87

## FRONT DIFFERENTIAL ASSEMBLY EXPLODED VIEW



630. FRONT DIFFERENTIAL SIDE GEAR THRUST WASHER (SELECTIVE) (2 REQUIRED)

631. FRONT DIFFERENTIAL SIDE GEAR (2 REQUIRED)

632. FRONT DIFFERENTIAL PINION SHAFT THRUST WASHER (4 REQUIRED)

633. FRONT DIFFERENTIAL PINION GEAR (4 REQUIRED)

635. FRONT DIFFERENTIAL RING GEAR

636. FRONT DIFFERENTIAL RING GEAR ATTACHING BOLT (M11 X 1.0 X 34) (12 REQUIRED)

637. FRONT DIFFERENTIAL TAPERED ROLLER BEARING (86MM ID)

639. FRONT DIFFERENTIAL PINION SHAFT RETAINING PIN (6MM x 38MM) (3 REQUIRED)

640. FRONT DIFFERENTIAL CARRIER ASSEMBLY

641. FRONT DIFFERENTIAL TAPERED ROLLER BEARING (90MM ID)

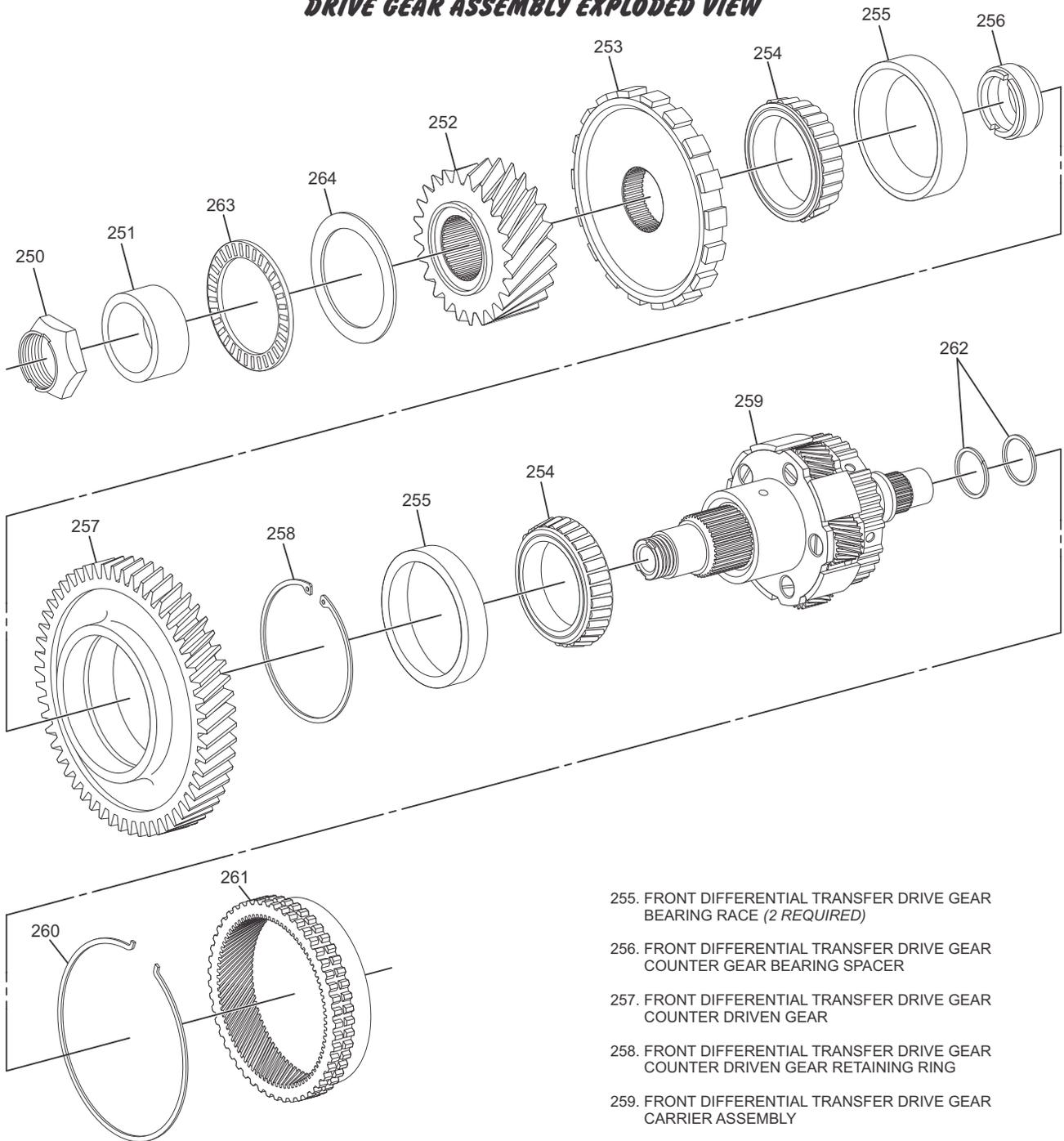
642. FRONT DIFFERENTIAL PINION SHAFT (17.0 x 110.4)

645. FRONT DIFFERENTIAL PINION SHAFT (2 REQUIRED)

646. FRONT DIFFERENTIAL PINION SHAFT HOLDER

Figure 88

## FRONT DIFFERENTIAL TRANSFER DRIVE GEAR ASSEMBLY EXPLODED VIEW



250. FRONT DIFFERENTIAL TRANSFER DRIVE GEAR LOCK NUT

251. FRONT DIFFERENTIAL TRANSFER DRIVE GEAR BEARING ASSEMBLY INNER RACE

252. FRONT DIFFERENTIAL TRANSFER DRIVE GEAR DRIVE PINION

253. FRONT DIFFERENTIAL TRANSFER DRIVE GEAR PARKING LOCK GEAR

254. FRONT DIFFERENTIAL TRANSFER DRIVE GEAR BEARING ASSEMBLY (2 REQUIRED)

255. FRONT DIFFERENTIAL TRANSFER DRIVE GEAR BEARING RACE (2 REQUIRED)

256. FRONT DIFFERENTIAL TRANSFER DRIVE GEAR COUNTER GEAR BEARING SPACER

257. FRONT DIFFERENTIAL TRANSFER DRIVE GEAR COUNTER DRIVEN GEAR

258. FRONT DIFFERENTIAL TRANSFER DRIVE GEAR COUNTER DRIVEN GEAR RETAINING RING

259. FRONT DIFFERENTIAL TRANSFER DRIVE GEAR CARRIER ASSEMBLY

260. FRONT DIFFERENTIAL TRANSFER DRIVE GEAR RING GEAR RETAINING RING

261. FRONT DIFFERENTIAL TRANSFER DRIVE GEAR RING GEAR

262. 4-5 CLUTCH HOUSING FLUID SEALING RINGS (2 REQUIRED)

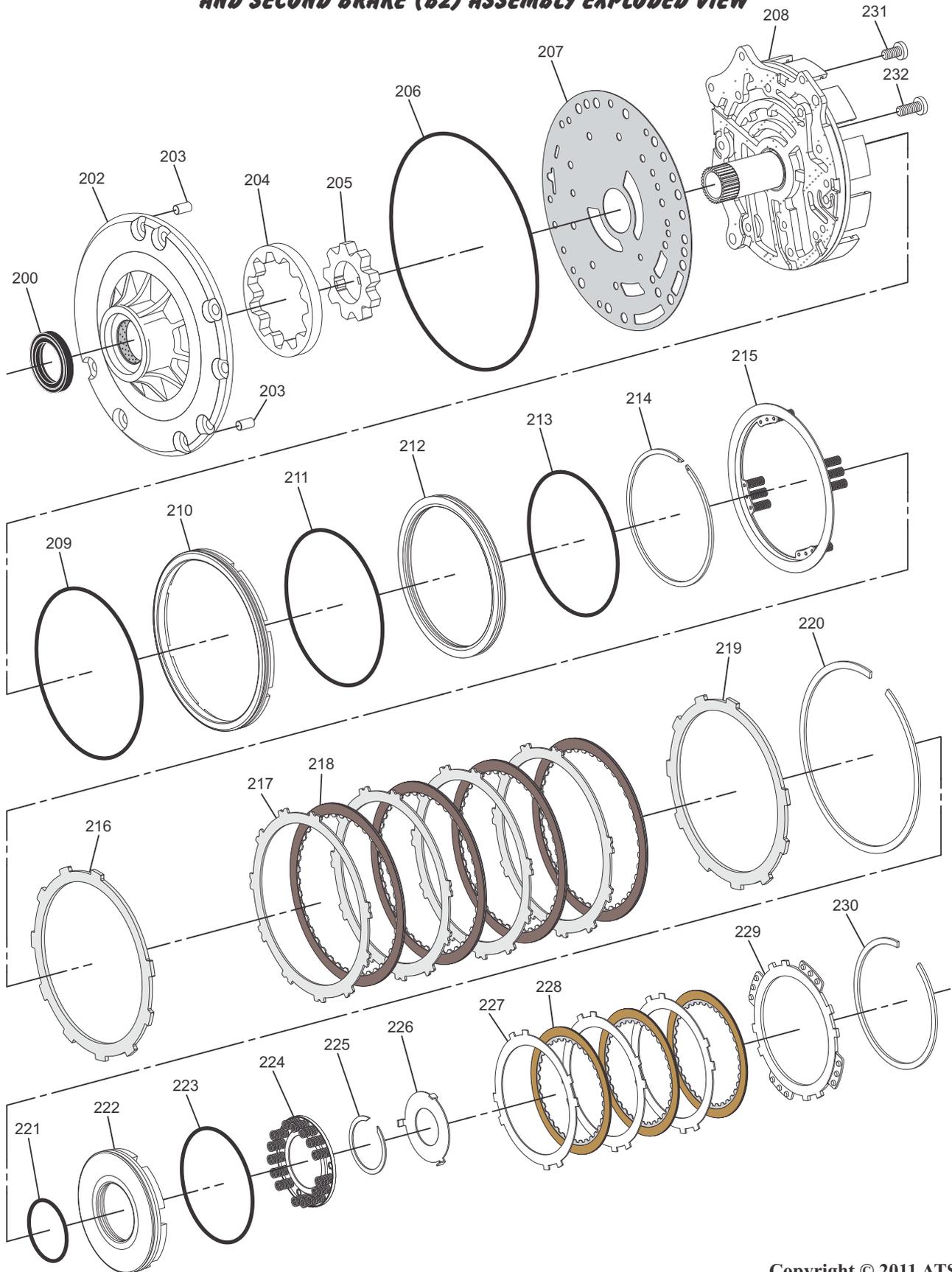
263. FRONT DIFFERENTIAL TRANSFER DRIVE GEAR THRUST BEARING ASSEMBLY

264. FRONT DIFFERENTIAL TRANSFER DRIVE GEAR THRUST BEARING WASHER

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Figure 89

## ***OIL PUMP ASSEMBLY, SECOND COAST BRAKE (B1) AND SECOND BRAKE (B2) ASSEMBLY EXPLODED VIEW***



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Figure 90

## ***OIL PUMP ASSEMBLY, SECOND COAST BRAKE (B1) AND SECOND BRAKE (B2) ASSEMBLY LEGEND***

- |  |  |
|--|--|
| 200. AUTOMATIC TRANSMISSION OIL PUMP BODY SEAL ASSEMBLY                                | 218. SECOND BRAKE (B2) LINED PLATE ASSEMBLY<br>(AF23-5 REQUIRES 2 / AF33-5 REQUIRES 4)     |
| 202. OIL PUMP BODY   | 219. SECOND BRAKE (B2) BACKING PLATE<br>(SELECTIVE)  |
| 203. OIL PUMP BODY TO PUMP STATOR SHAFT ASSEMBLY ALIGNMENT DOWEL PIN                   | 220. SECOND BRAKE (B2) BACKING PLATE RETAINING SNAP RING                                   |
| 204. OIL PUMP DRIVEN GEAR  | 221. SECOND COAST BRAKE (B1) PISTON INNER SEAL   |
| 205. OIL PUMP DRIVE GEAR   | 222. SECOND COAST BRAKE (B1) PISTON ASSEMBLY   |
| 206. AUTOMATIC TRANSMISSION OIL PUMP O-RING SEAL                                       | 223. SECOND COAST BRAKE (B1) PISTON OUTER SEAL   |
| 207. OIL PUMP PLATE  | 224. Second Coast Brake (B1) Piston Return Spring Assembly                                 |
| 208. OIL PUMP STATOR SHAFT ASSEMBLY  | 225. Second Coast Brake (B1) Piston Return Spring Assembly Retaining Snap Ring             |
| 209. SECOND BRAKE (B2) PISTON OUTER SEAL   | 226. Second Coast Brake (B1) Clutch Hub Thrust Washer Assembly                             |
| 210. SECOND BRAKE (B2) PISTON ASSEMBLY   | 227. Second Coast Brake (B1) Steel Plate Assembly<br>(3 Required)                          |
| 211. SECOND BRAKE (B2) PISTON SLEEVE OUTER SEAL  | 228. Second Coast Brake (B1) Lined Plate Assembly<br>(3 Required)                          |
| 212. SECOND BRAKE (B2) PISTON SLEEVE   | 229. Second Coast Brake (B1) Backing Plate   |
| 213. SECOND BRAKE (B2) PISTON SLEEVE INNER SEAL  | 230. Second Coast Brake (B1) Backing Plate Retaining Snap Ring                             |
| 214. SECOND BRAKE (B2) PISTON RETURN SPRING ASSEMBLY RETAINING SNAP RING               | 231. Automatic Transmission Oil Pump Cover Attaching Bolts (M6 x 1.0 x 14.5) (13 Required) |
| 215. SECOND BRAKE (B2) PISTON RETURN SPRING ASSEMBLY                                   | 232. Automatic Transmission Oil Pump Cover Attaching Bolt (M5 x 0.8 x 17) (1 Required)     |
| 216. SECOND BRAKE (B2) APPLY PLATE<br>(AF23-5 UNITS ONLY)                              |  |
| 217. SECOND BRAKE (B2) STEEL PLATE ASSEMBLY<br>(AF23-5 REQUIRES 3 / AF33-5 REQUIRES 4) |  |

## COMPONENT REBUILD (CONT'D)

### Differential Assembly and Front Differential Transfer Drive Gear Assembly

**Note:** It is not recommended to disassemble the Differential assembly. The exploded view diagram shown in Figure 88 is provided for illustration purposes only.

1. Clean the differential assembly with solvent and dry with compressed air.
2. Inspect the differential assembly for wear or damage using the diagram in Figure 88 as a reference. If any wear or damage is observed, replace the differential assembly.

**Note:** It is not recommended to disassemble the Front Differential Transfer Drive Gear Assembly. The exploded view diagram shown in Figure 89 is provided for illustration purposes only.

1. Clean the Front Differential Transfer Drive Gear Assembly with solvent and dry with compressed air.
2. Inspect the Front Differential Transfer Drive Gear Assembly for wear or damage using the diagram in Figure 89 as a reference. If any wear or damage is observed, replace the assembly.

### Oil Pump Assembly, Second Coast Brake (B1) and Second Brake (B2) Assembly

1. Disassemble the Oil Pump Assembly, Second Coast Brake (B1) and Second Brake (B2) Assembly using the diagram in Figure 90 and the legend in Figure 91 as a guide.
2. Using SST J 23327 Spring Compressor or other similar tool, compress the Second Brake (B2) spring then using SST J28585 or a small screw driver remove the Second Coast Brake (B1) Backing Plate Retaining Snap Ring, the Second Coast Brake (B1) Backing Plate, the Second Coast Brake (B1) Lined Plates (*discard the lined plates*) and the Second Coast Brake (B1) Steel plates as shown in Figure 92.
3. Using SST J 23327, and J 41236 or other similar spring compressor tool, compress the Second Coast Brake (B1) Piston Return Spring Assembly, then using a pair of snap ring pliers, remove the Second Coast Brake (B1) Piston Return Spring Retaining Snap Ring as shown in Figure 93.
4. Remove the Second Coast Brake (B1) Piston Return Spring Assembly from the oil pump assembly as shown in Figure 93.

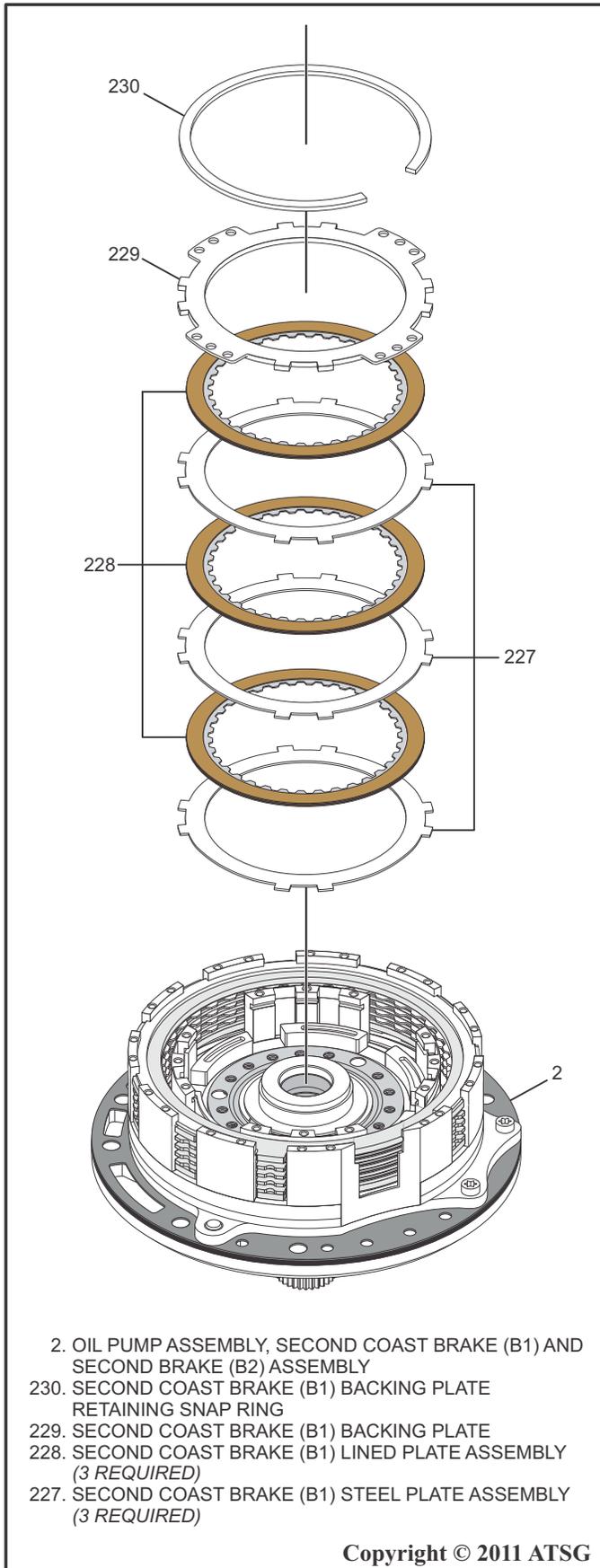


Figure 92

Cont'd on page 45

## Oil Pump Assembly, Second Coast Brake (B1) and Second Brake (B2) Assembly (Cont'd)

**Caution:** When using compressed air, wear safety glasses in order to help prevent injury to the eyes.

5. While pulling upward on the piston assembly, carefully apply compressed air into the passage for the Second Coast Brake (B1) in the pump assembly and remove the Second Coast Brake (B1) Piston Assembly as shown in Figure 94.
6. Remove and discard the Second Coast Brake (B1) Piston Inner Seal and Outer Seal as shown in Figure 94.
7. Using SST J 28585 or a small screw driver, remove Second Brake (B2) Backing Plate Retaining Snap Ring as shown in Figure 95.
8. Remove the Second Brake (B2) Backing Plate, the Lined Plate and Steel Plate Assemblies (discard the lined plates) and the Apply Plate as shown in Figure 95.
9. Remove the Second Brake (B2) Piston Return Spring Assembly as shown in Figure 95.

10. Using a pair of snap ring pliers, remove the Second Brake (B2) Piston Return Spring Assembly Retaining Snap Ring as shown in Figure 96.

Cont'd on page 47

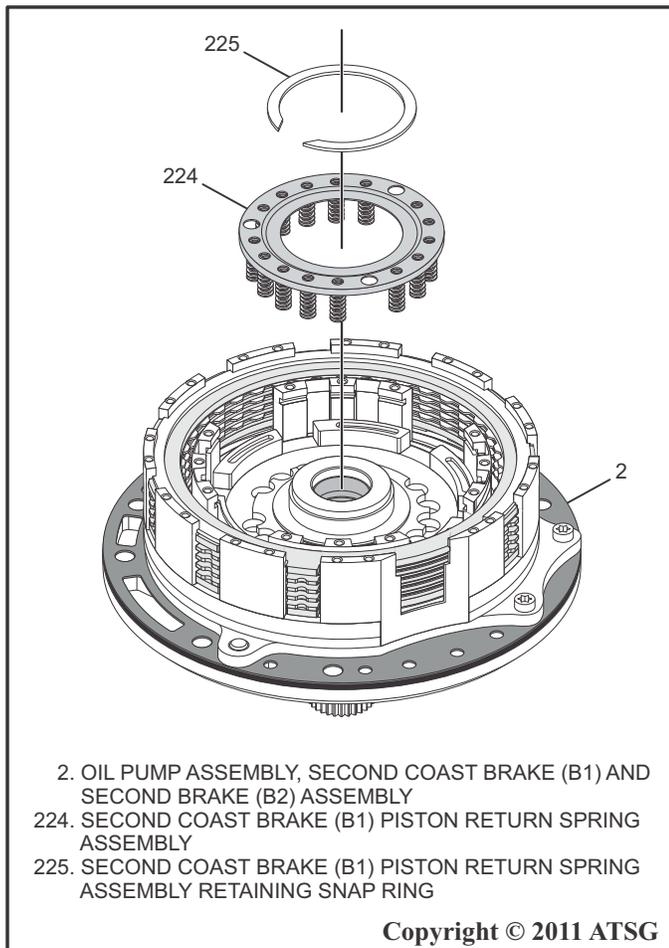


Figure 93

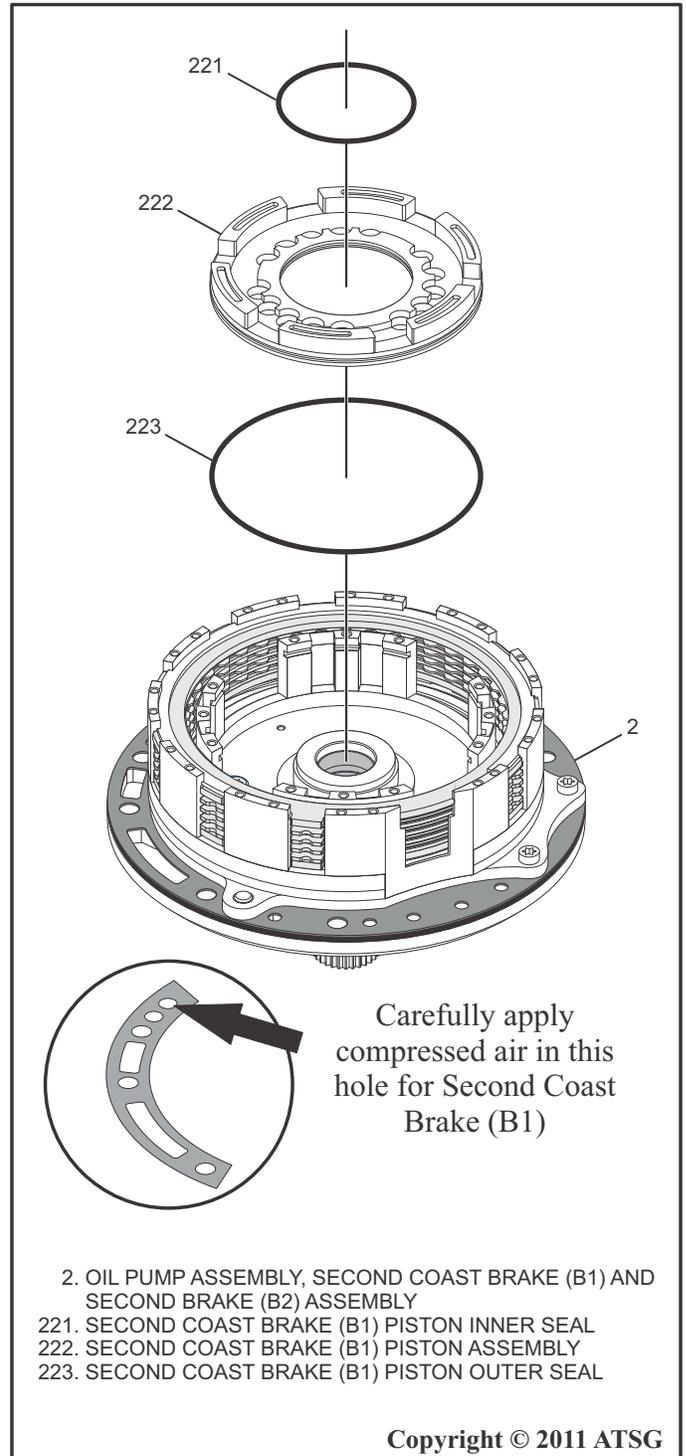


Figure 94

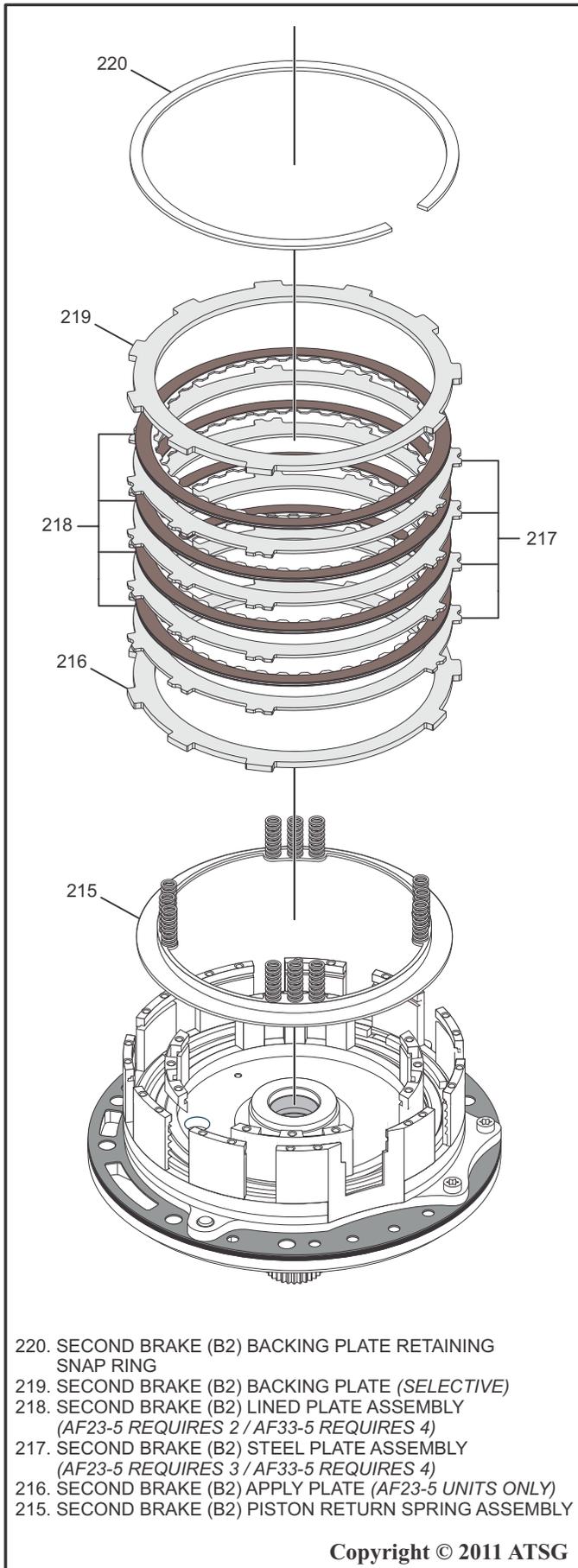


Figure 95

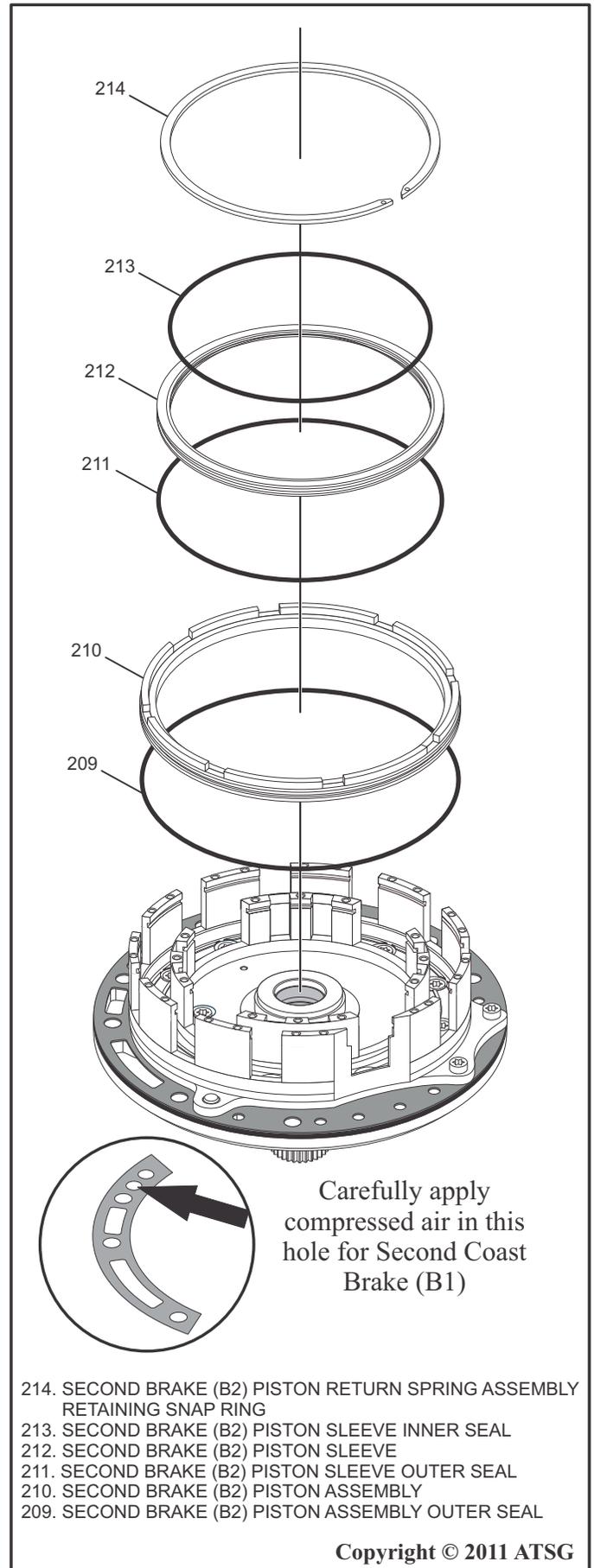


Figure 96

## *Oil Pump Assembly, Second Coast Brake (B1) and Second Brake (B2) Assembly ( Cont'd)*

11. While pulling upward on the piston assemblies, carefully apply compressed air into the passage for the Second Brake (B2) in the pump assembly and remove the Second Brake (B2) Piston Assembly and the Second Brake (B2) Piston Sleeve Assembly as shown in Figure 96.
12. Remove and discard the Second Brake (B2) Piston Inner and Outer Seal, and also the Second Brake (B2) Piston Sleeve Outer Seal as shown in Figure 96.
13. Remove the 13 (M6 x 1.0 x 14.5) oil pump cover attaching bolts as shown in Figure 97.
14. Remove the 1 (M5 x 0.8 x 17) oil pump cover attaching bolt as shown in Figure 97.
15. Carefully remove the Oil Pump Stator Shaft Assembly from the Oil Pump Body as shown in Figure 97.

16. Remove the Oil Pump Plate, Oil Pump O-Ring Seal (*Discard the O-Ring Seal*) and the Oil Pump Driven and Oil Pump Drive Gears from the Oil Pump Body as shown in Figure 98.
17. Remove the Oil Pump Body Alignment dowels as shown in Figure 98.

Cont'd on page 48

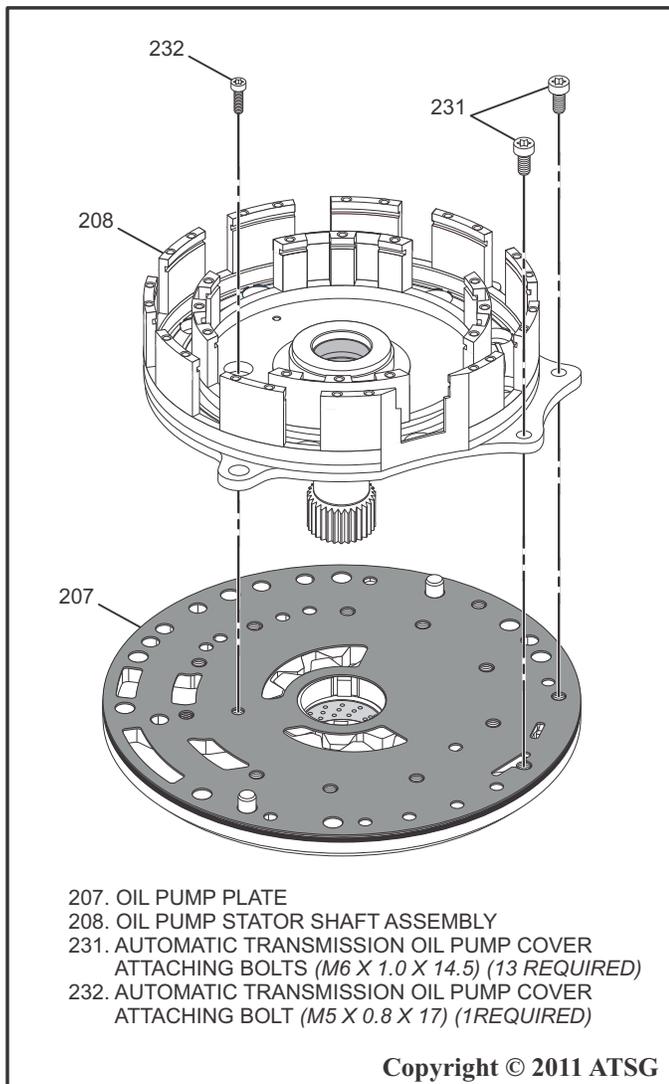


Figure 97

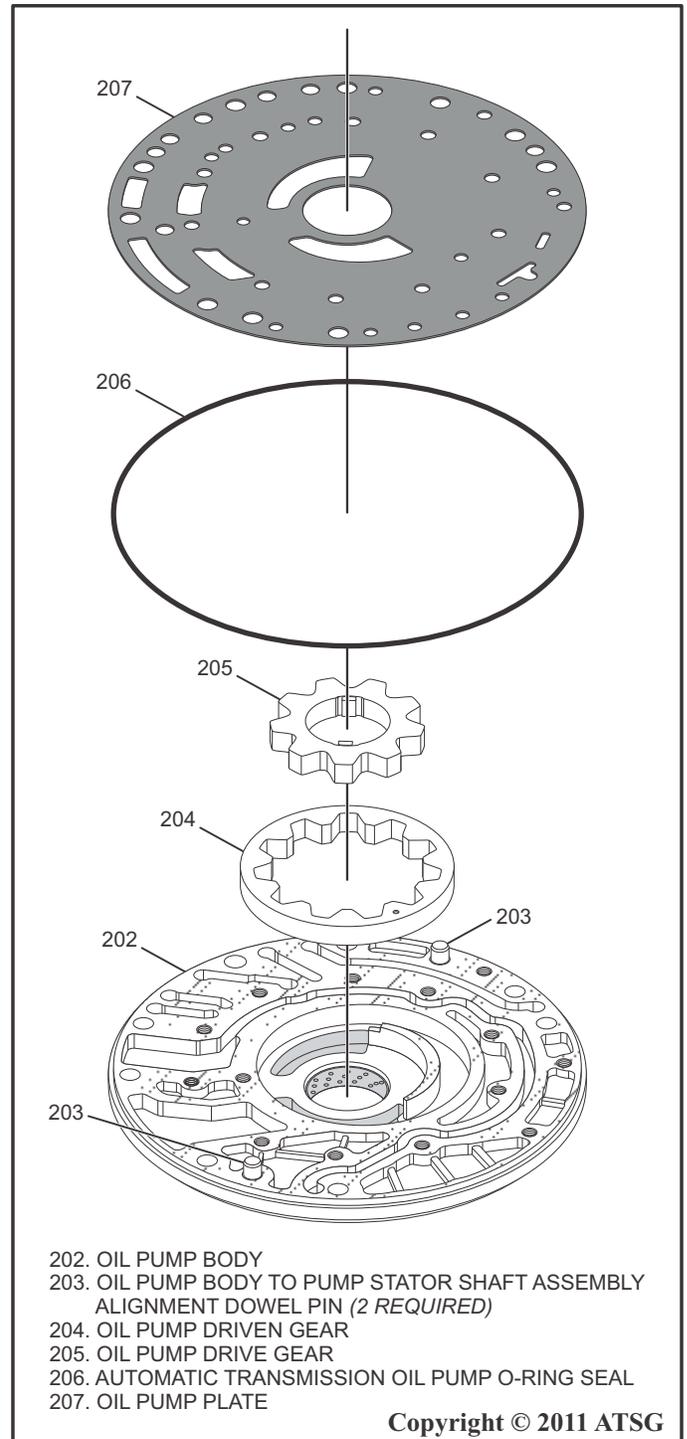


Figure 98

## *Oil Pump Assembly, Second Coast Brake (B1) and Second Brake (B2) Assembly (Cont'd)*

18. Clean all Oil Pump parts thoroughly and dry with compressed air.
19. Using a feeler gage, measure the clearance between the Pump Body and the gears as shown in Figure 99
20. Use the specifications shown in Figure 99 to determine if the pump gears and pump body are within clearance specifications.
21. If excessive wear is indicated, replace the pump assembly.
22. Using SST J 45000 or similar seal removal tool, remove the Oil Pump Body Seal as shown in Figure 100.
23. Inspect the Oil Pump Body Converter Hub Bushing and replace as necessary.
24. Using SST J 35582 or other similar seal installing tool, install a new Oil Pump Body Seal as shown in Figure 101.

Cont'd on page 49

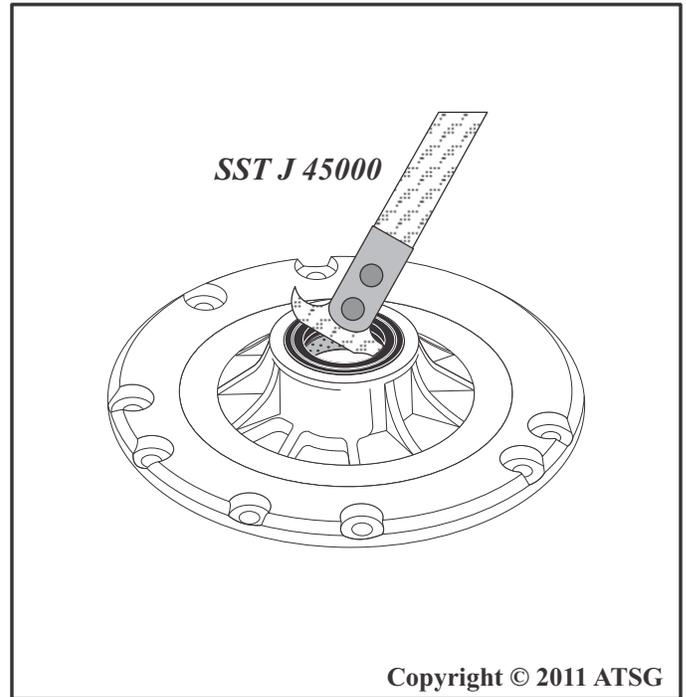


Figure 100

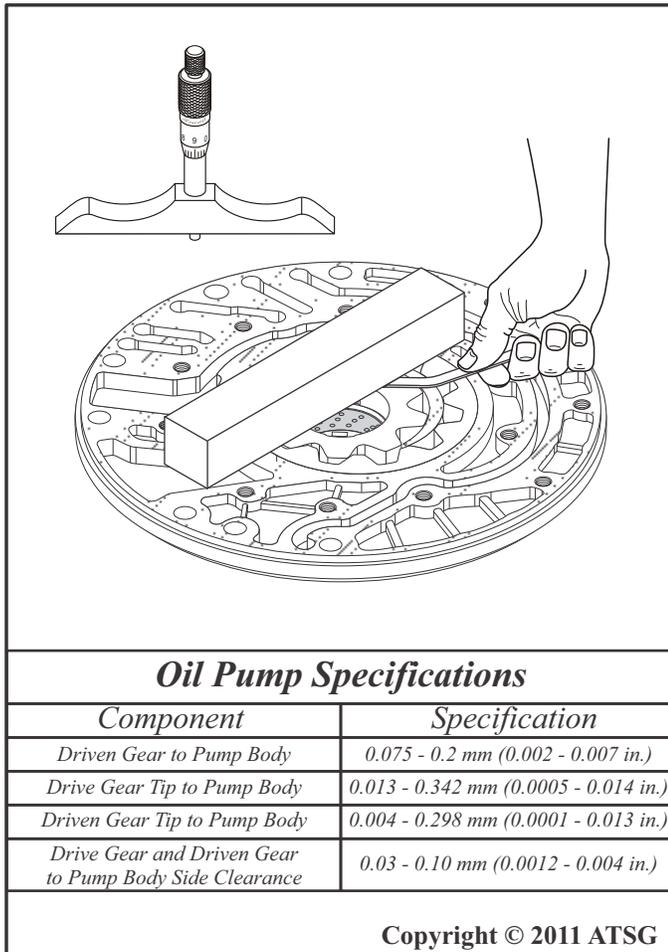


Figure 99

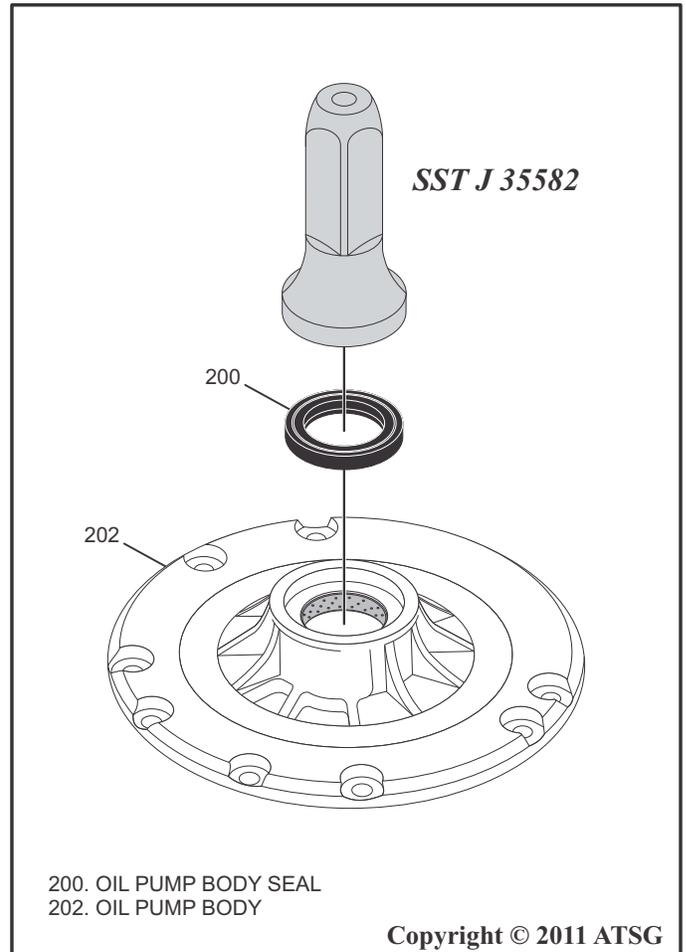


Figure 101

## *Oil Pump Assembly, Second Coast Brake (B1) and Second Brake (B2) Assembly (Cont'd)*

25. Apply a small amount of Automatic Transmission Fluid ATF to the surface of the pump body.
26. Install the Oil Pump Driven Gear into the Pump Body as shown in Figure 102.
27. Install the Oil Pump Drive Gear into the Pump Body as shown in Figure 102.

**NOTE: Check the index marks on the pump gears as they are being installed. The index mark on the Driven Gear faces Up. The index mark on the Drive Gear faces Down.**

28. Install a new Oil Pump O-Ring Seal onto the Oil Pump Body as shown in Figure 103.
29. Coat the O-Ring Seal with a small amount of Trans-Jel®.
30. Install the Alignment Dowels and the Oil Pump Plate onto the Oil Pump Body, carefully aligning the holes in the Oil Pump Plate onto the Alignment Dowel Pins in the Pump Body as shown in Figure 103.

Cont'd on page 50

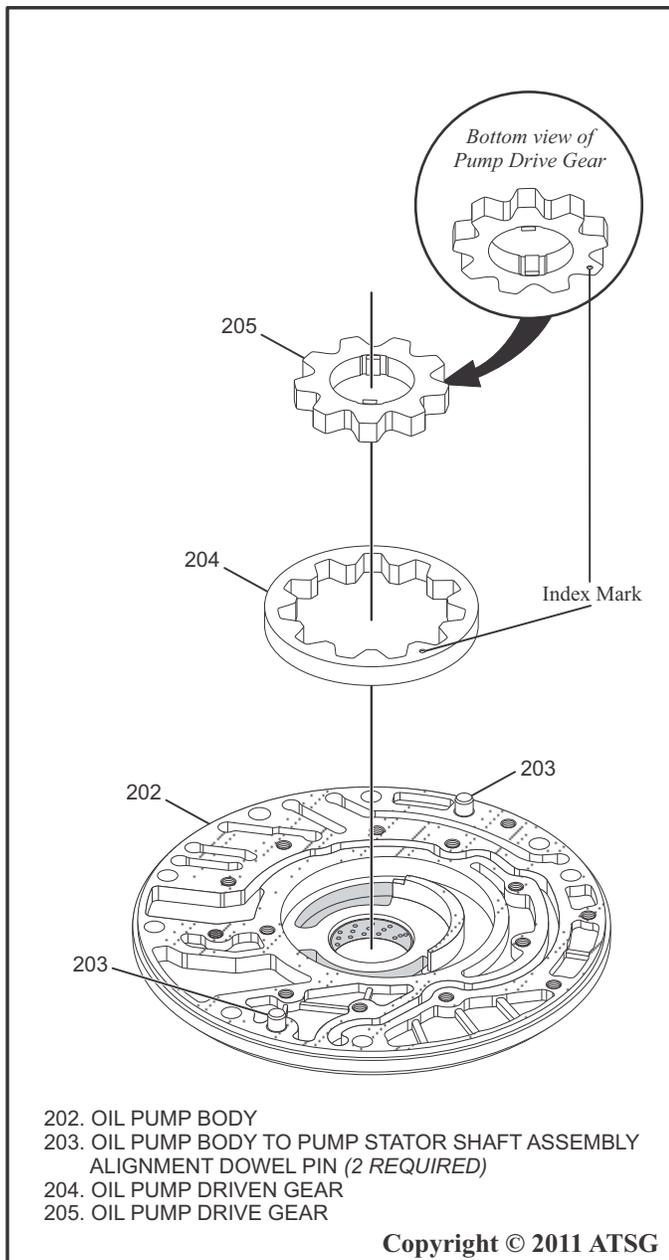


Figure 102

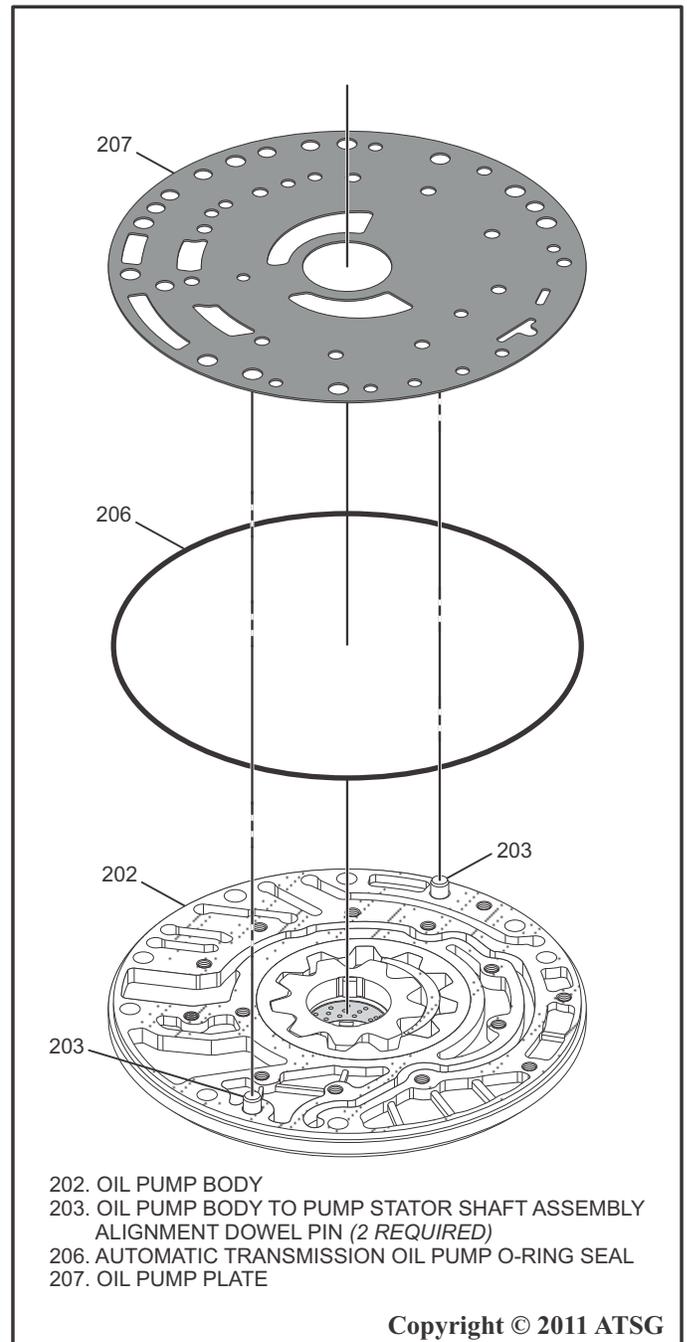


Figure 103

## Oil Pump Assembly, Second Coast Brake (B1) and Second Brake (B2) Assembly (Cont'd)

31. Align the Fluid Pump Stator Shaft Assembly with the bolt holes shown through the Pump Plate and assemble the Fluid Pump Stator Shaft Assembly on to the Dowel Pins in the Pump Body as shown in Figure 104.
32. Install and hand tighten 12 of the 13 Oil Pump Cover Attaching Bolts temporarily omitting the one indicated by the arrow as shown in Figure 104.

*NOTE: The omitted bolt is left out in order to attach SST J 45166 Dial Indicator Tool for verifying piston travel.*

33. Tighten the 12 installed Oil Pump Cover Attaching Bolts using the pattern as shown in Figure 105.
34. Torque the bolts using an appropriate torque wrench referring to the Torque Specifications as indicated in Figure 105.

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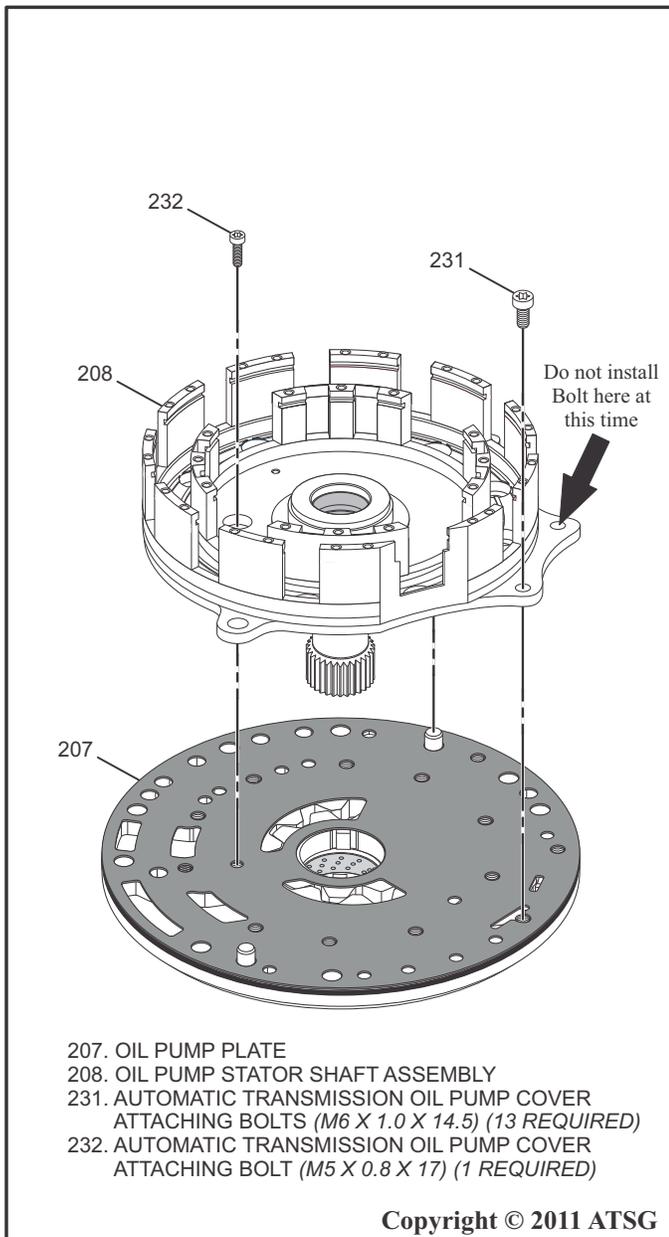


Figure 104

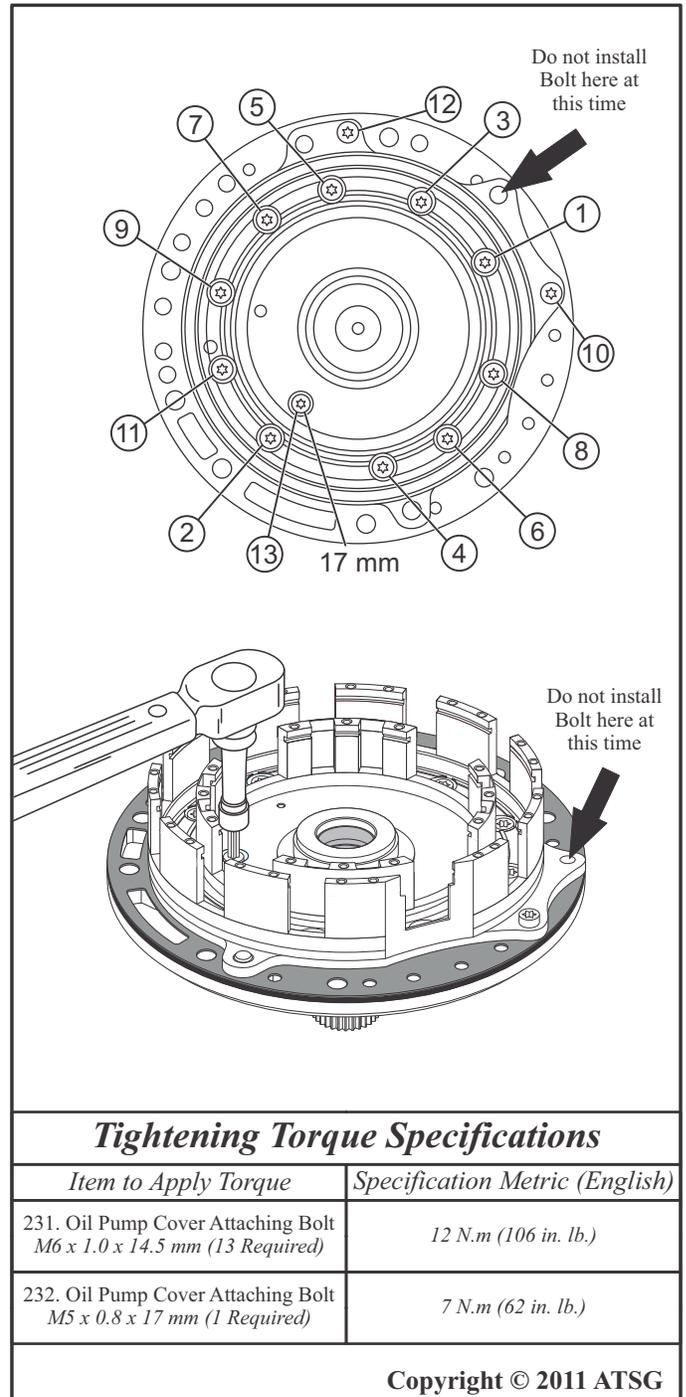


Figure 105

## *Oil Pump Assembly, Second Coast Brake (B1) and Second Brake (B2) Assembly (Cont'd)*

35. Once the Oil Pump Cover Attaching Bolts are tightened to the proper torque specification, inspect the pump gears for smooth rotation.
36. Install the pump assembly on the torque converter as shown in Figure 106.
37. Rotate the pump assembly to insure smooth rotation of the pump gears as shown in Figure 106.
38. Be careful not to damage the pump seal during this operation.
39. Install a new Second Brake (B2) Piston Outer Seal and Inner Seal onto the Second Brake (B2) Piston and a new Second Brake (B2) Piston Sleeve Outer Seal as shown in Figure 107.
40. Coat the seals with a small amount of Trans-Jel®.
41. Install the Second Brake (B2) Piston Sleeve into the pump assembly using a twisting motion.
42. Install the Second Brake (B2) Piston inside of the Piston Sleeve using a twisting motion.
43. Install the Second Brake (B2) Piston Return Spring Retaining Snap ring onto the pump assembly as shown in Figure 107, making certain the retaining snap ring is fully seated.

Cont'd on page 52

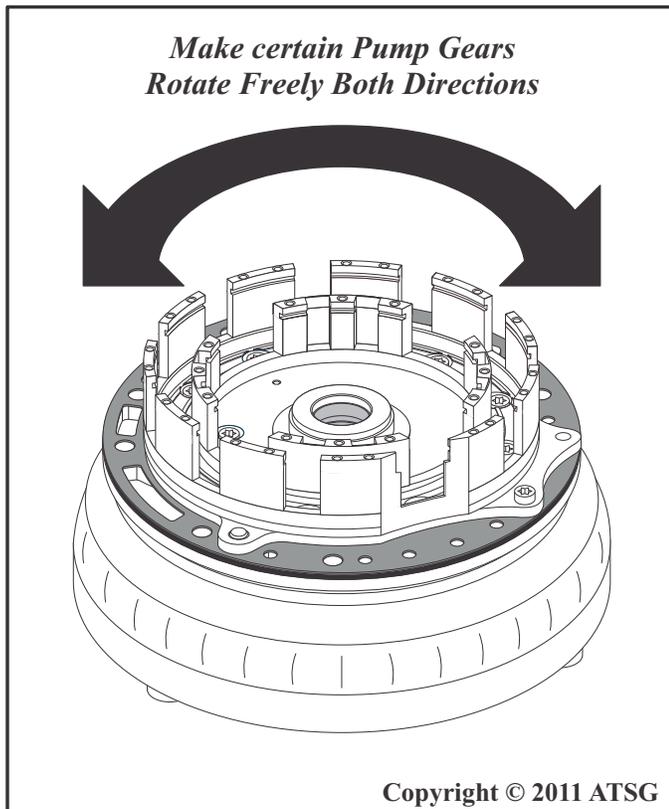
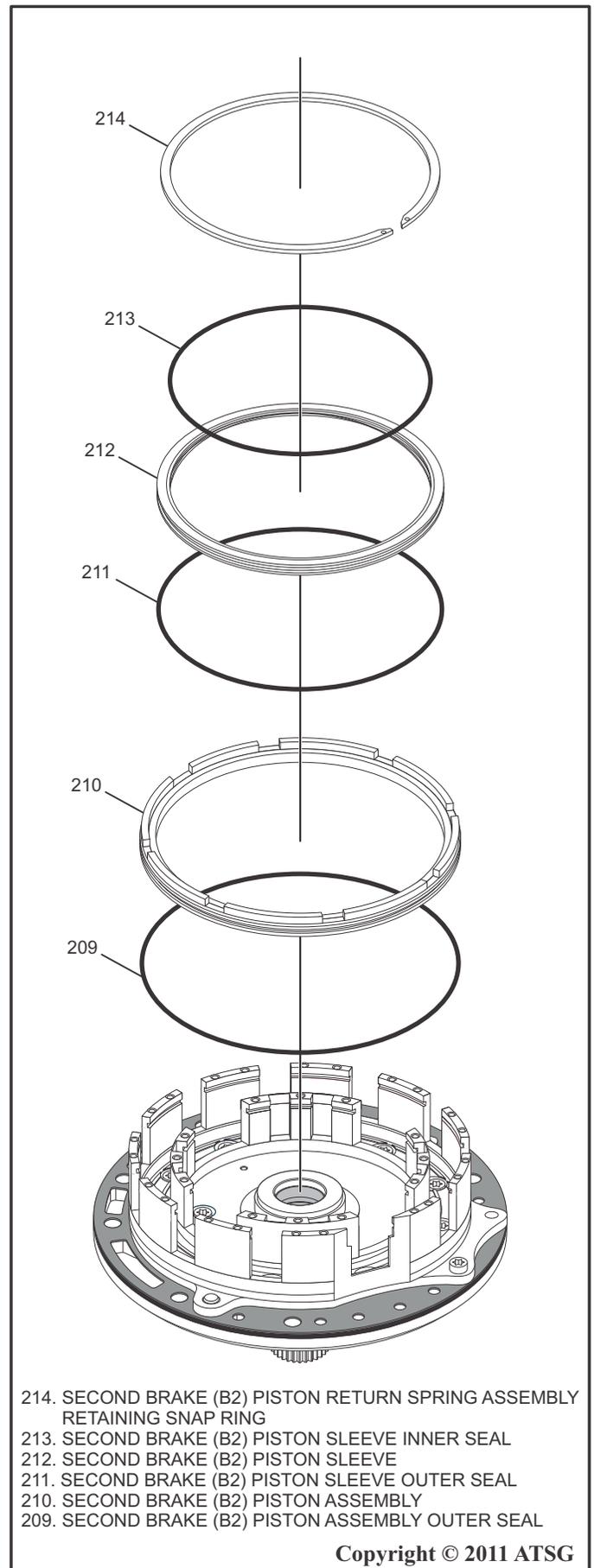


Figure 106



- 214. SECOND BRAKE (B2) PISTON RETURN SPRING ASSEMBLY RETAINING SNAP RING
- 213. SECOND BRAKE (B2) PISTON SLEEVE INNER SEAL
- 212. SECOND BRAKE (B2) PISTON SLEEVE
- 211. SECOND BRAKE (B2) PISTON SLEEVE OUTER SEAL
- 210. SECOND BRAKE (B2) PISTON ASSEMBLY
- 209. SECOND BRAKE (B2) PISTON ASSEMBLY OUTER SEAL

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Figure 107

## *Oil Pump Assembly, Second Coast Brake (B1) and Second Brake (B2) Assembly ( Cont'd)*

44. Install the Second Brake (B2) Piston Return Spring Assembly into the pump assembly with the springs facing upward as shown in Figure 108.
 

**Note:** All frictions should be soaked in the appropriate ATF for at least 30 minutes prior to installation.
45. Install the Second Brake (B2) Apply Plate (*model dependant*) as shown in Figure 108.
46. Install the Second Brake (B2) Steel Plates and Lined Plates starting with a steel plate then alternating lined plates and steel plates, ending with a lined plate as shown in Figure 108.
47. Install the Second Brake (B2) Backing Plate (*Selective*) as shown in Figure 108.
48. Install the Second Brake (B2) Retaining Snap Ring as shown in Figure 108.
49. Make sure the Retaining Snap Ring is fully seated and the ends not aligned with any of the cutouts as shown in Figure 109.

Cont'd on page 53

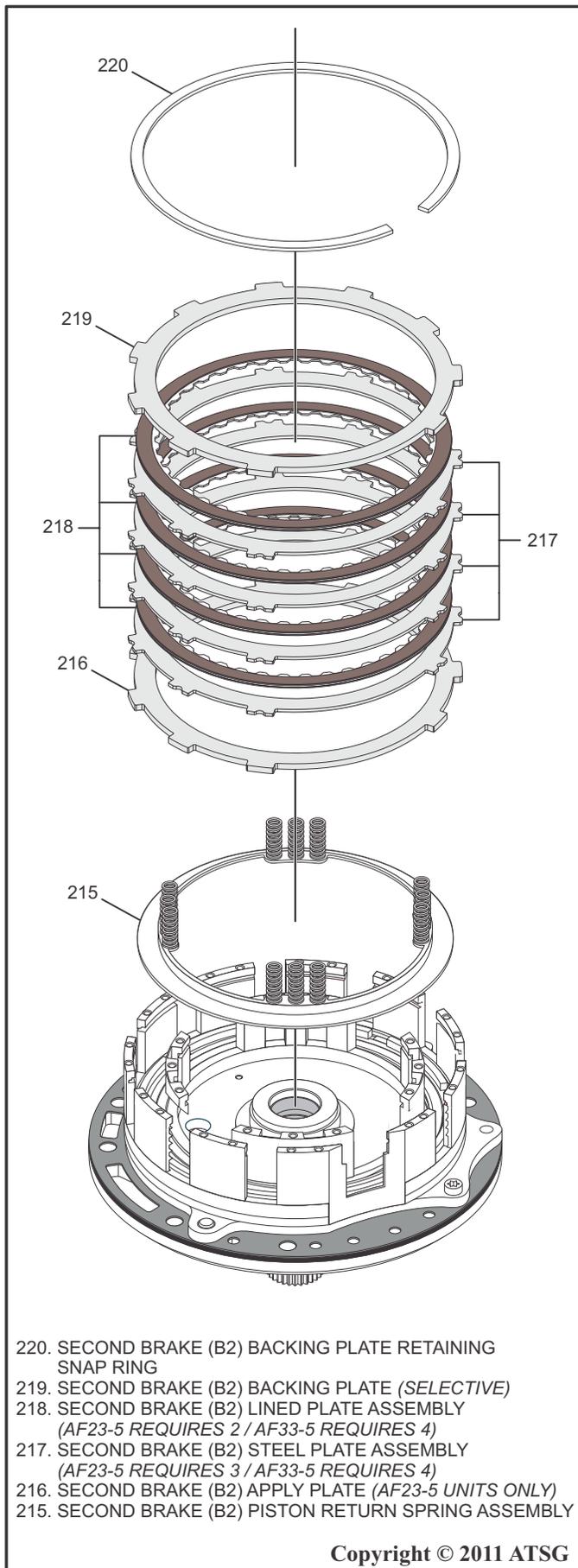


Figure 108

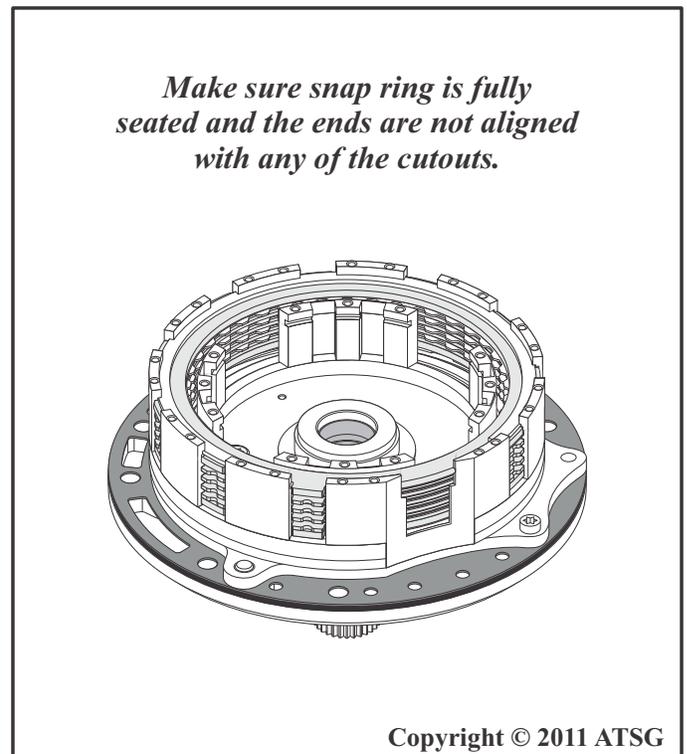


Figure 109

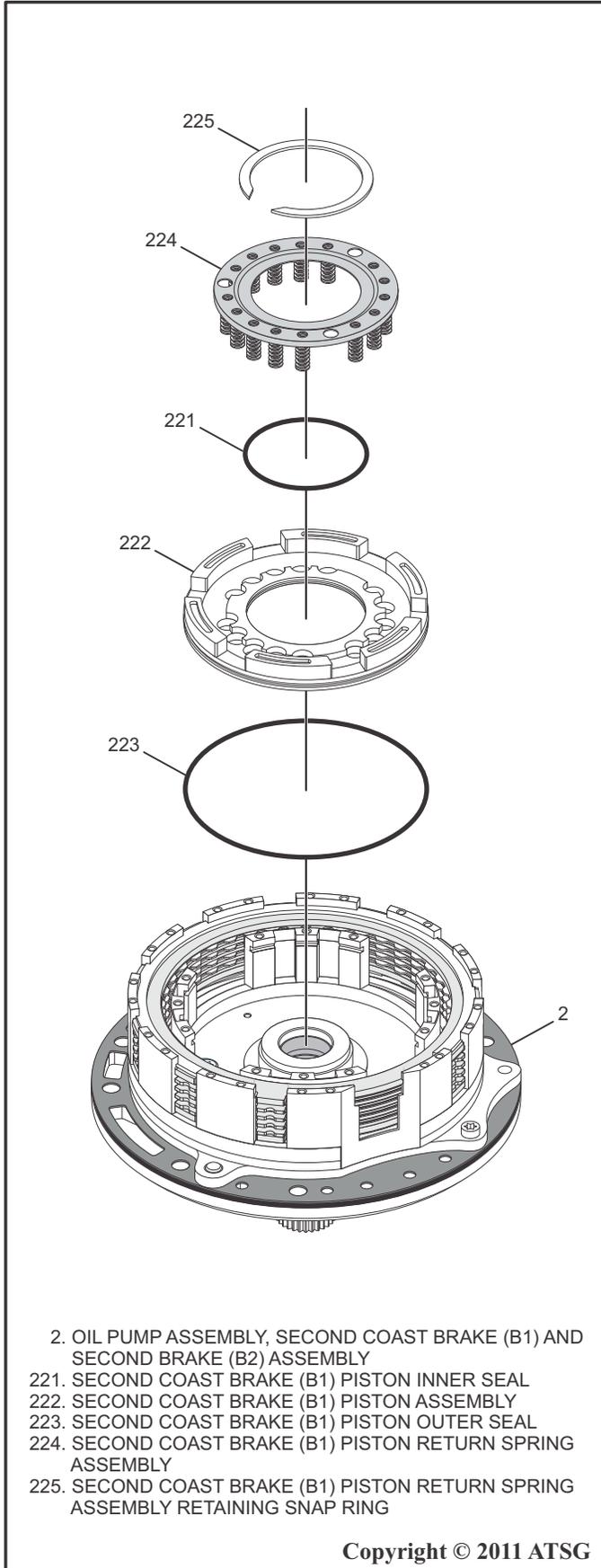


Figure 110

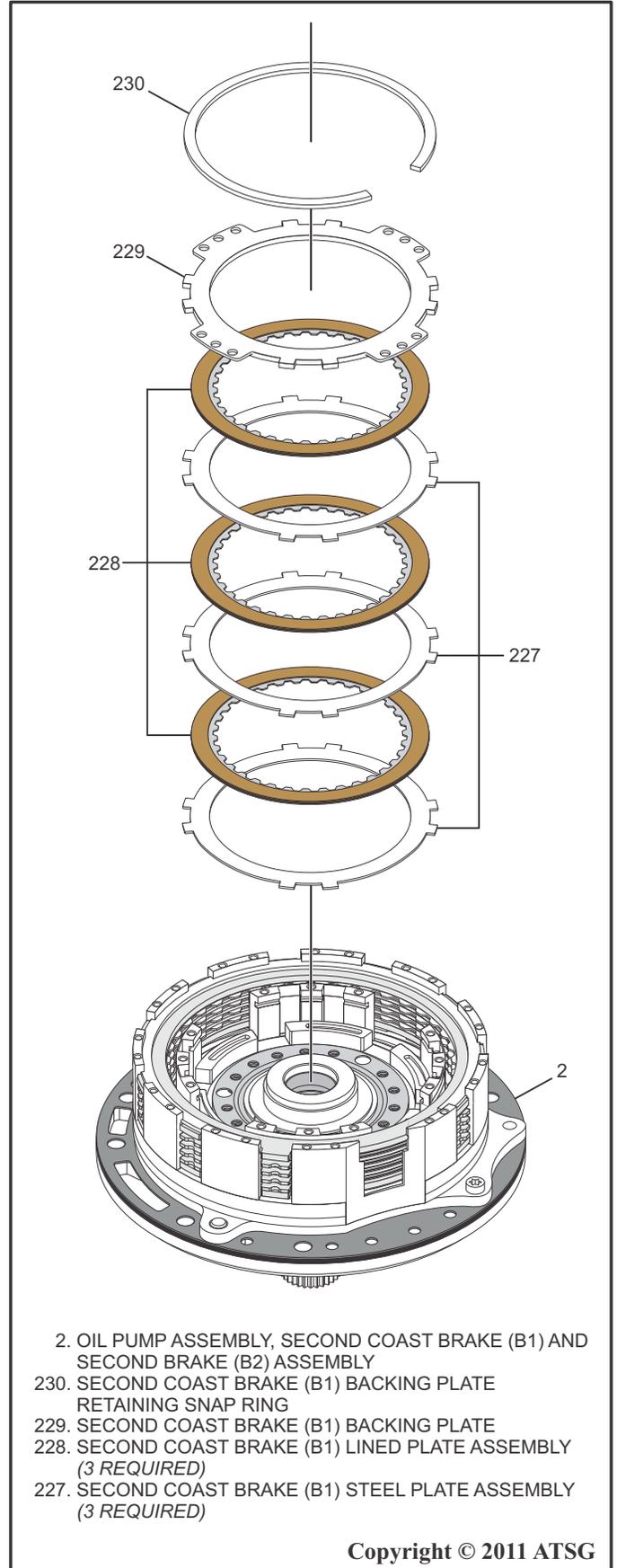


Figure 111

## Oil Pump Assembly, Second Coast Brake (B1) and Second Brake (B2) Assembly (Cont'd)

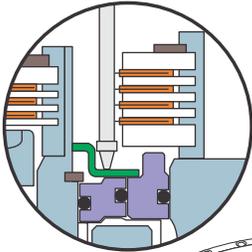
50. Install a new Inner O-ring and Outer O-ring Seal into the Second Coast Brake (B1) Piston as shown in Figure 110.
51. Coat the seals with a small amount of Trans-Jel®.
52. Carefully install the Second Coast Brake (B1) Piston Assembly into the pump assembly using a twisting motion as shown in Figure 110.
53. Install the Second Coast Brake (B1) Piston Return Spring Assembly aligning the springs into the piston as shown in Figure 110.
54. Using SST J 23327, and J 41236 or other similar spring compressor tool, compress the Second Coast Brake (B1) Piston Return Spring Assembly, and install the Piston Return Spring Retaining Snap Ring into the pump body assembly using a pair of snap ring pliers or a small screwdriver as shown in Figure 110.
55. Make certain the retaining snap ring is fully seated into the snap ring groove in the pump body assembly.  
**Note: All frictions should be soaked in the appropriate ATF for at least 30 minutes prior to installation.**
56. Install the Second Coast Brake (B1) clutch plates starting with a Steel Plate and alternating lined plates and steel plates, ending with a lined plate as shown in Figure 111.
57. Install the Second Coast Brake (B1) Backing Plate as shown in Figure 111.
58. Using SST J 23327 Spring Compressor or other similar tool, compress the Second Brake (B2) spring.
59. Using SST J 28585 or a pair of snap ring pliers, install the Second Coast Brake (B1) Backing Plate Retaining snap ring making sure the snap ring is fully seated as shown in Figure 111.
60. Using SST J 45166 and J 45200 or other adequate dial indicator, set the dial indicator base onto the pump body assembly where the attaching bolt was omitted as shown in Figure 112.
61. Put the dial indicator on the Second Brake (B2) Piston Return Spring and set the dial indicator to a zero reading as shown in Figure 112.

**Caution: When using compressed air, wear safety glasses in order to help prevent injury to the eyes.**

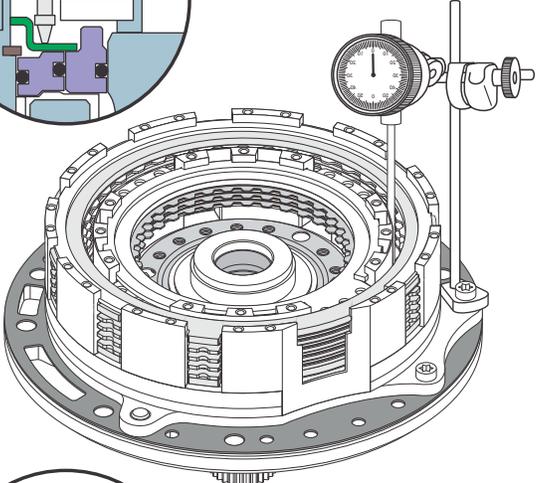
62. Carefully apply a small amount of compressed air to the Second Brake (B2) passage as shown in Figure 112 and measure piston travel (*make certain the piston travels smoothly*).
63. Piston travel (*clutch clearance*) should be between 1.10 - 1.50 mm (0.043 - 0.059 in).
64. If clutch clearance is not within specification, select another backing plate using the chart in Figure 112 as a reference.

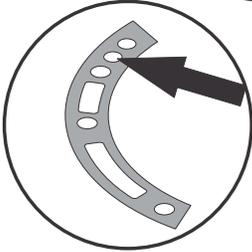
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### Checking Second Brake (B2) Clutch Clearance



Set the Dial Indicator on the Second Brake (B2) Piston Return Spring





Carefully apply compressed air in this hole for Second Brake (B2)

<b>Clutch Assembly Specifications</b>	
Second Brake (B2)	Specification Metric (English)
Second Brake (B2) Clearance	1.10 - 1.50 mm (0.043 - 0.059 in.)
Available Second Brake (B2) Backing Plate Thicknesses	3.6 mm (0.142 in.)
	3.8 mm (0.150 in.)
	4.0 mm (0.157 in.)

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Figure 112

## Oil Pump Assembly, Second Coast Brake (B1) and Second Brake (B2) Assembly (Cont'd)

- 65. Using SST J 45166 and J 45200 or other adequate dial indicator, set the dial indicator base onto the pump body assembly where the attaching bolt was omitted as shown in Figure 113.
- 66. Put the dial indicator on the Second Coast Brake (B1) piston and set the dial indicator to a zero reading as shown in Figure 113.

**Caution:** When using compressed air, wear safety glasses in order to help prevent injury to the eyes.

- 67. Carefully apply a small amount of compressed air to the Second Coast Brake (B1) passage as shown in Figure 113 and measure piston travel (*make certain the piston travels smoothly*).
- 68. Piston travel (*clutch clearance*) should be between 1.24 - 1.96 mm (0.049 - 0.077 in).
- 69. There are no selective backing plates for the Second Coast Brake (B1). If clutch clearance is not within specification, make sure the clutch plates are assembled correctly.
- 70. Remove SST J 45166 and J 45200 from the oil pump assembly.
- 71. Install the omitted bolt as shown in Figure 114.
- 72. Torque the remaining bolt to 12 N.m (106 in. lb) as shown in Figure 114.

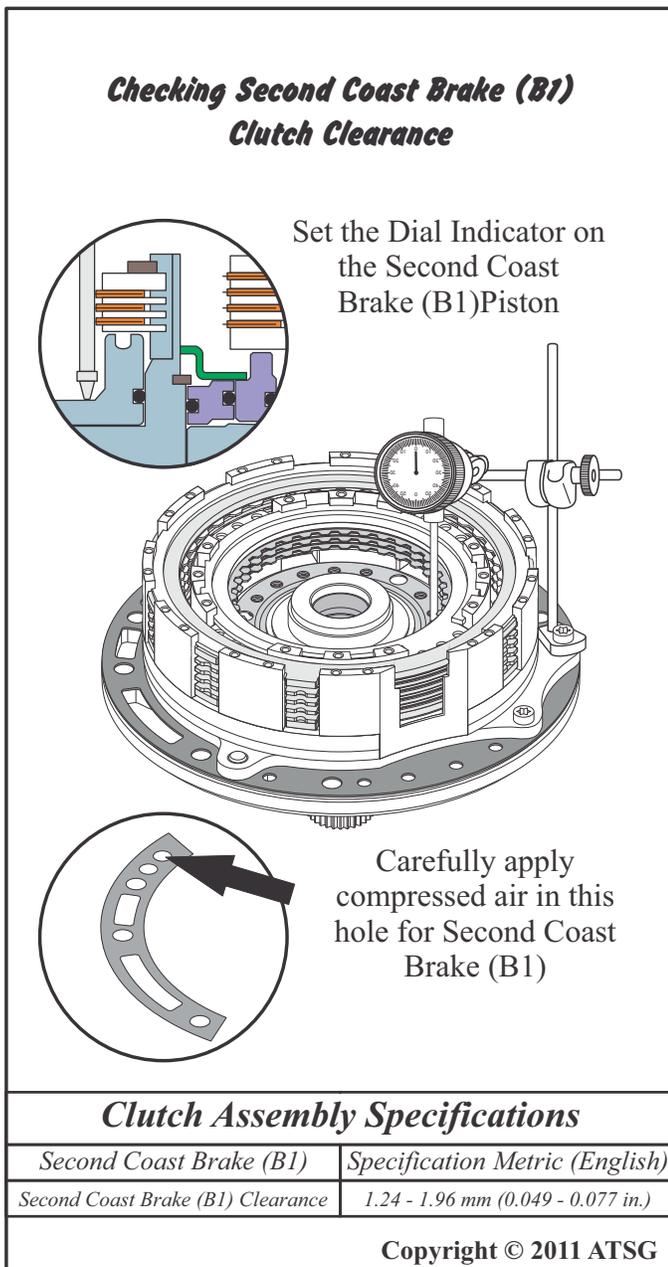


Figure 113

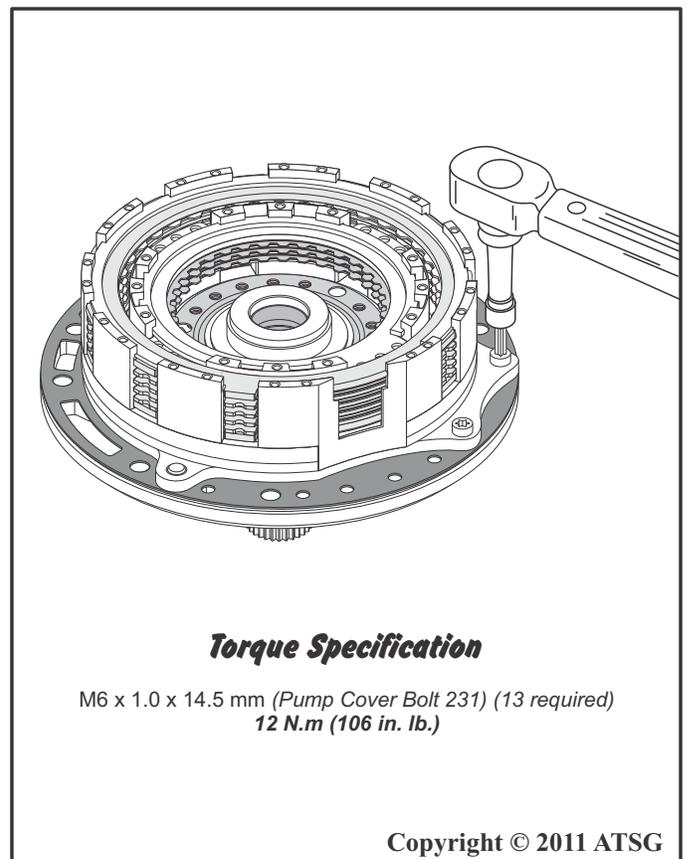
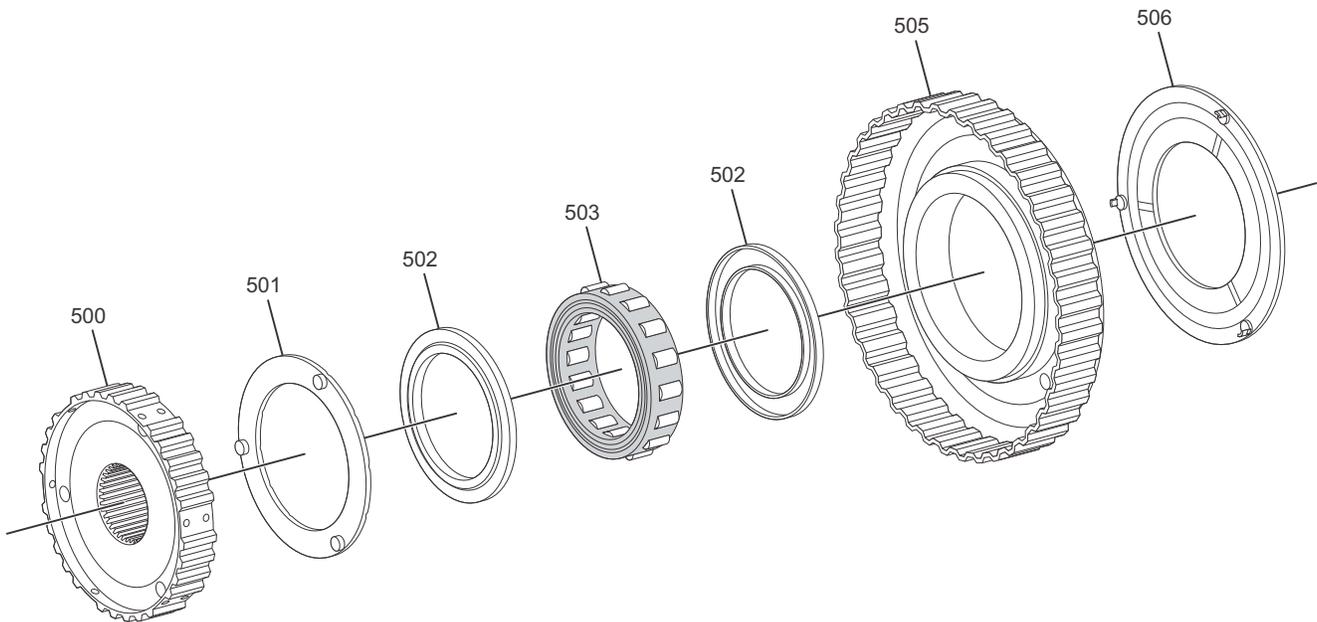


Figure 114

## **SECOND COAST BRAKE (B1), SECOND BRAKE (B2) HUB AND SECOND BRAKE SPRAG (F1) ASSEMBLY**



500. SECOND COAST BRAKE (B1) HUB, SPRAG INNER RACE ASSEMBLY

501. SECOND COAST BRAKE (B1) THRUST WASHER

502. SECOND BRAKE SPRAG (F1) END BEARING  
(2 REQUIRED)

503. SECOND BRAKE SPRAG (F1) ASSEMBLY

505. SECOND BRAKE SPRAG (F1) OUTER RACE AND CLUTCH HUB ASSEMBLY

506. SECOND BRAKE SPRAG (F1) OUTER RACE AND CLUTCH HUB ASSEMBLY THRUST WASHER

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Figure 115

## *Second Coast Brake (B1), Second Brake (B2) Hub and Second Brake Sprag (F1) Assembly*

1. Disassemble the Second Coast Brake (B1), Second Brake (B2) Hub and Second Brake Sprag (F1) Assembly using the diagram in Figure 115 as a guide.
2. Clean all Second Coast Brake (B1), Second Brake (B2) Hub and Second Brake Sprag (F1) parts with solvent and dry with compressed air.
3. Inspect the Sprag, the Inner and Outer Race for wear and replace as necessary.
4. Coat the Second Brake Sprag (F1) Assembly with a small amount of ATF or Trans-Jel® and install the sprag into the Second Brake (B2) Outer Race as shown in Figure 116.
5. Install the Second Brake Sprag (F1) End Bearings as shown in Figure 116.
6. Coat the Second Coast Brake (B1) Thrust Washer with a small amount of Trans-Jel® and attach to the Second Coast Brake (B1) Inner Race as shown in Figure 117.

7. Install the Second Coast Brake (B1) Hub onto the Sprag Assembly using a clockwise twisting motion as shown in Figure 117.
8. Check for proper Sprag rotation. The Second Coast Brake (B1) Hub, Sprag Inner Race must **Freewheel Clockwise and Lock Counter-Clockwise** as indicated in Figure 118.

Cont'd on page 58

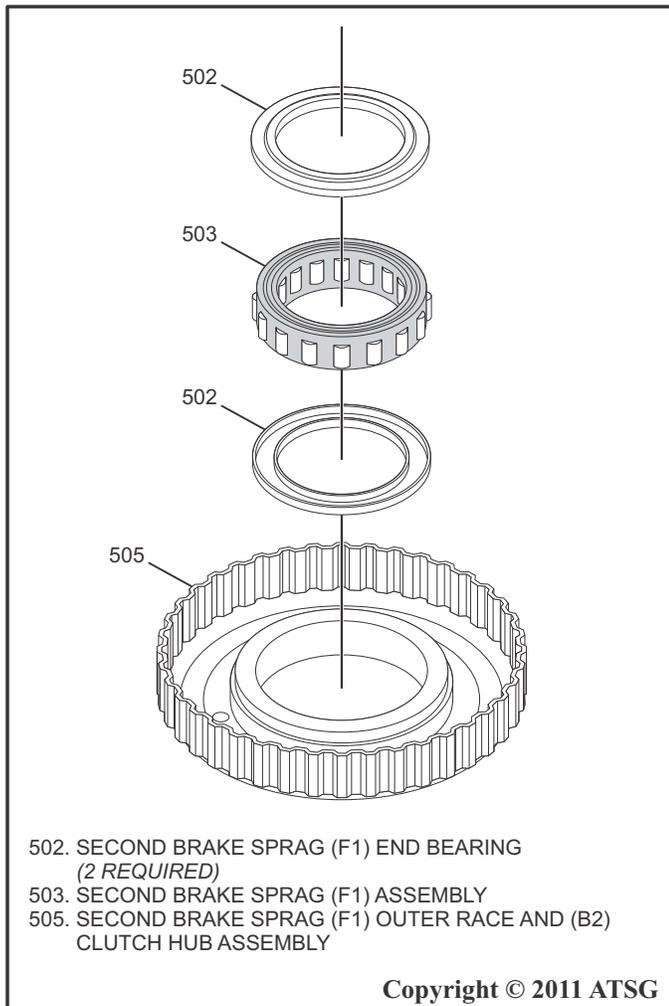


Figure 116

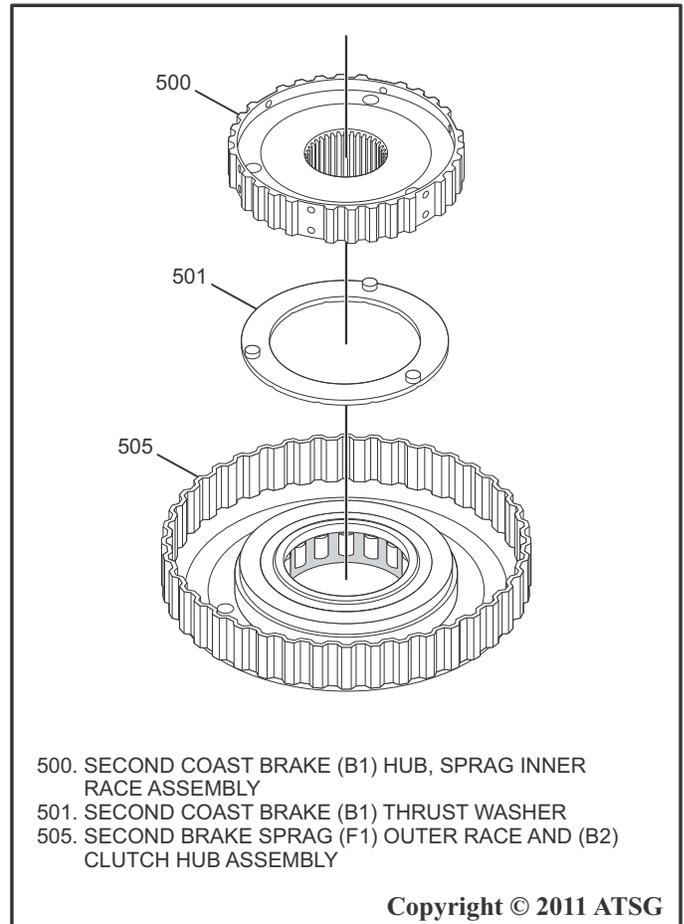


Figure 117

***The Second Coast Brake (B1) Hub, Sprag Inner Race must Freewheel Clockwise and Lock Counter-Clockwise***

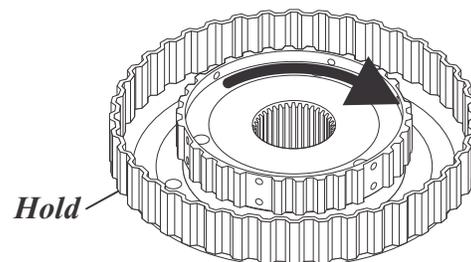


Figure 118

## *Second Coast Brake (B1), Second Brake (B2) Hub and Second Brake Sprag (F1) Assembly*

9. Coat the Second Coast Brake (B1) Clutch Hub Thrust Washer with a small amount of Trans-Jel® and install the washer on the Pump Assembly as shown in Figure 119
10. Install the Second Brake (B2), Second Coast Brake (B1) Hub and Sprag Assembly into the Pump Assembly using a twisting motion until it is indexed into all clutch plates and is seated against the washer as shown in Figure 119.
11. Coat the Second Brake Sprag (F1) Outer Race and Clutch Hub Thrust Washer with a small amount of Trans-Jel® and install onto the sprag assembly as shown in Figure 119.

12. Use a straight edge to measure the installed height of the Second Brake (B2), Second Coast Brake (B1) Hub and Sprag Assembly by placing the straight edge on top of the thrust washer and making a measurement between the bottom of the straight edge and the face of the pump body as shown in Figure 120.
13. If the installed height is greater than the specification shown in Figure 120, the hub and sprag assembly is not indexed correctly. Remove and reinstall until the installed height is within the specifications.
14. Set the completed pump assembly aside for final assembly.

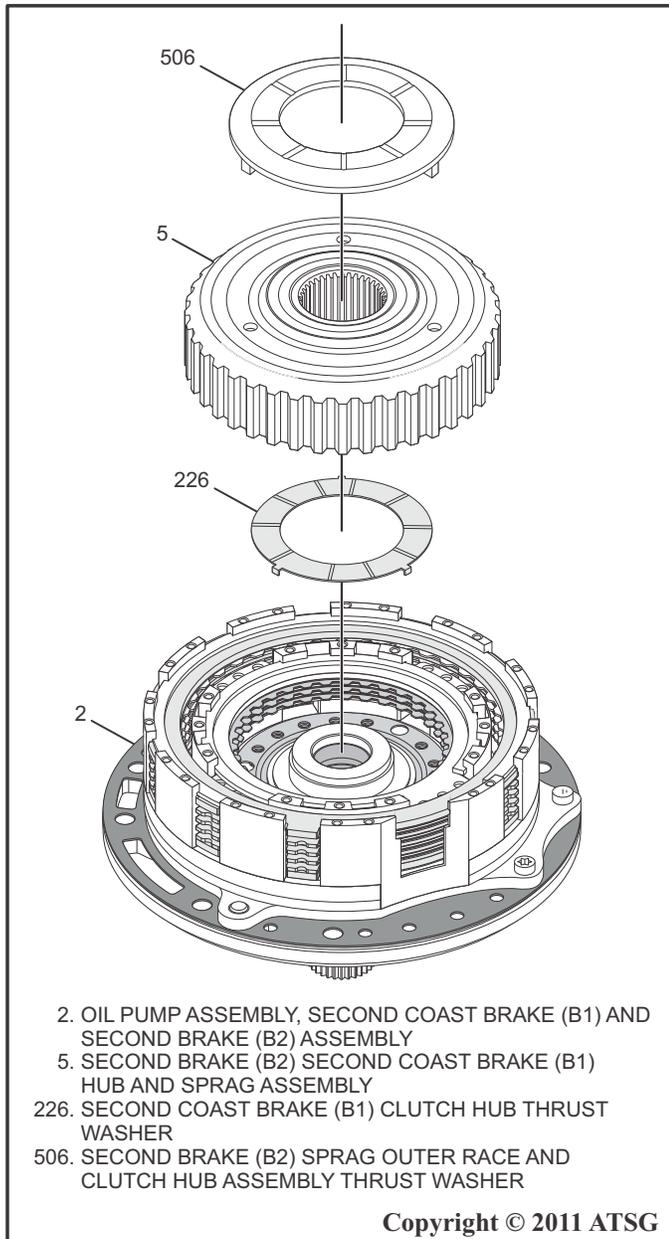


Figure 119

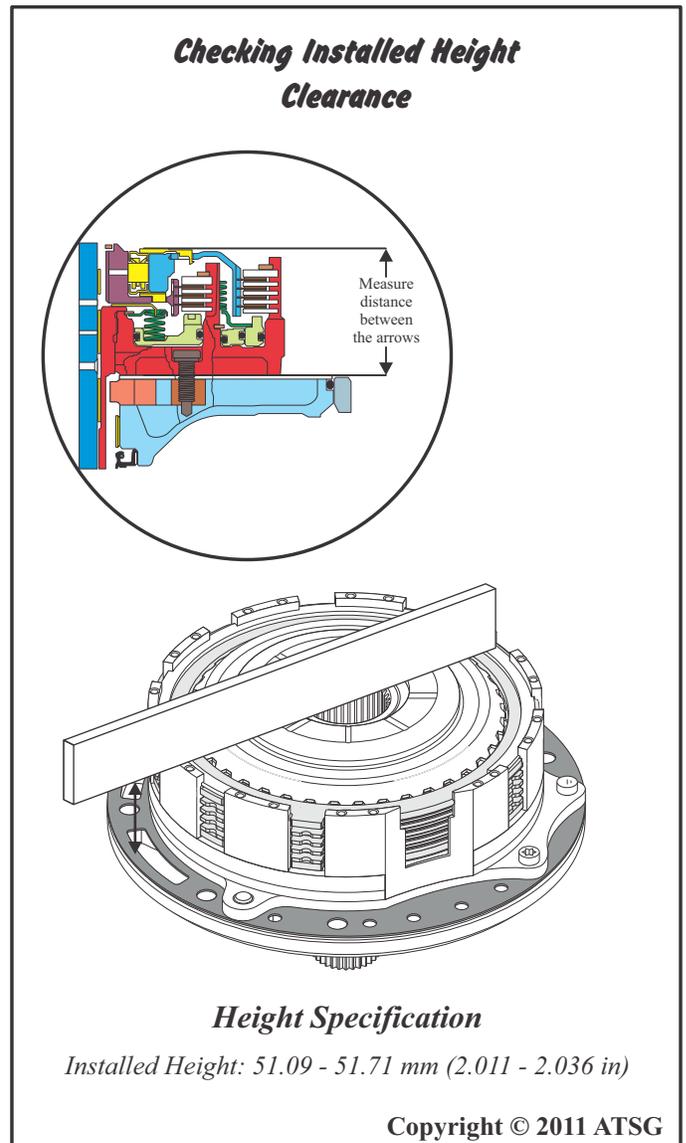
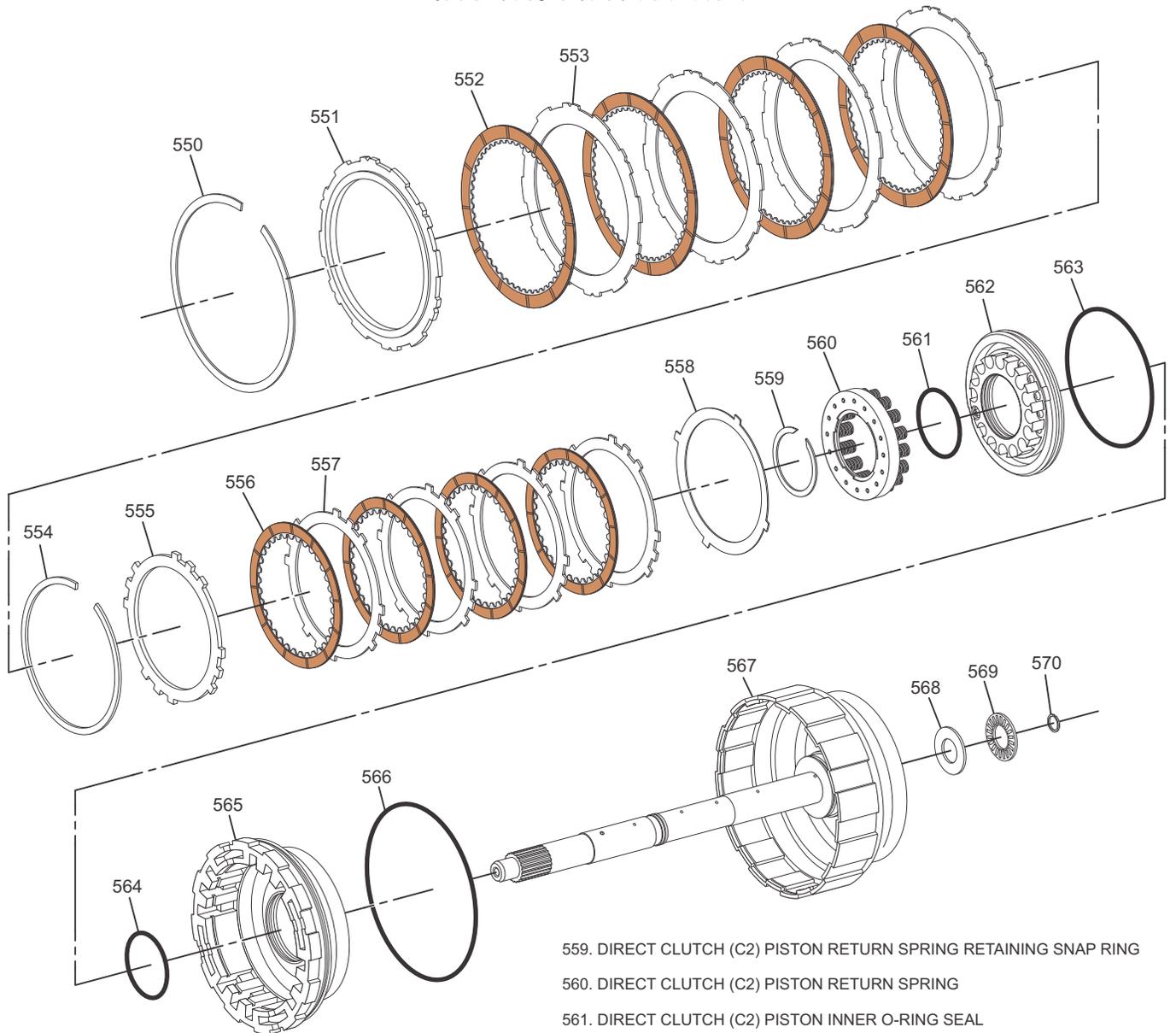


Figure 120

## FORWARD (C1) AND DIRECT (C2) CLUTCH ASSEMBLY EXPLODED VIEW



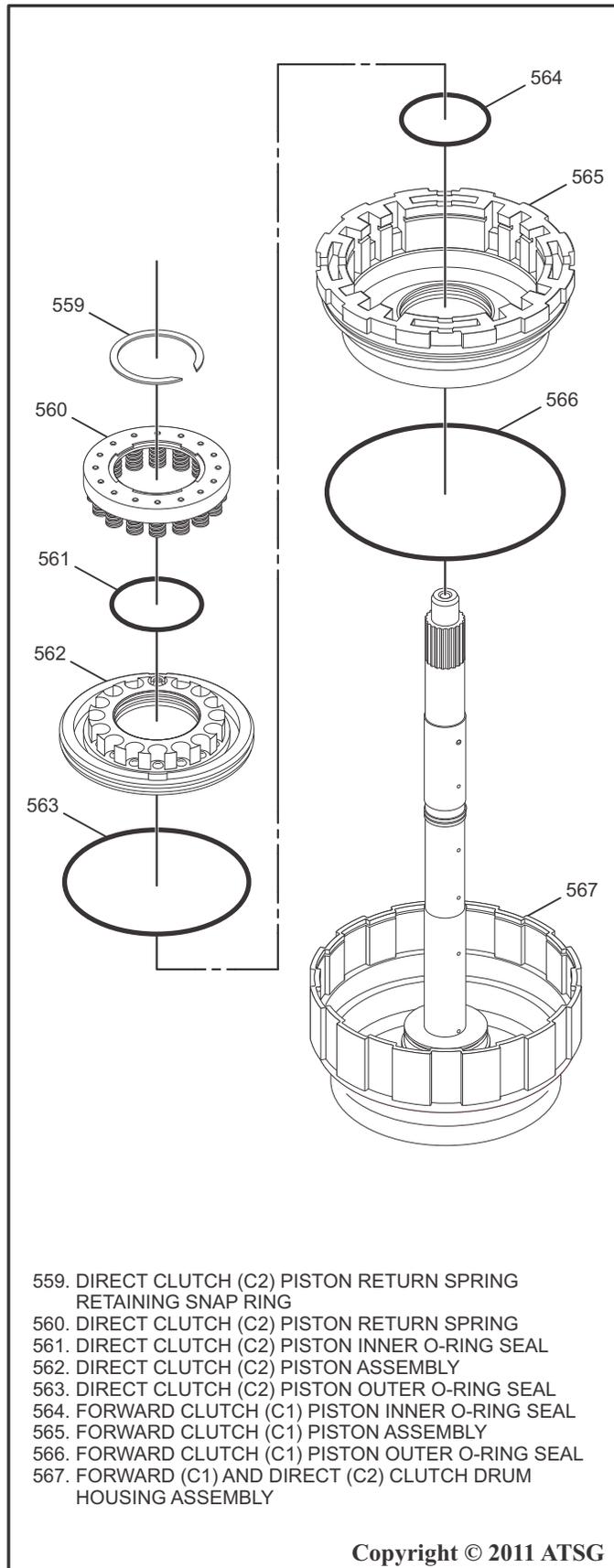
- 550. FORWARD CLUTCH (C1) RETAINING SNAP RING
- 551. FORWARD CLUTCH (C1) BACKING PLATE (SELECTIVE)
- 552. FORWARD CLUTCH (C1) LINED PLATE (4 REQUIRED)
- 553. FORWARD CLUTCH (C1) STEEL PLATE (4 REQUIRED)
- 554. DIRECT CLUTCH (C2) RETAINING SNAP RING
- 555. DIRECT CLUTCH (C2) BACKING PLATE (SELECTIVE)
- 556. DIRECT CLUTCH (C2) LINED PLATE (4 REQUIRED)
- 557. DIRECT CLUTCH (C2) STEEL PLATE (4 REQUIRED)
- 558. DIRECT CLUTCH (C2) APPLY CUSHION PLATE

- 559. DIRECT CLUTCH (C2) PISTON RETURN SPRING RETAINING SNAP RING
- 560. DIRECT CLUTCH (C2) PISTON RETURN SPRING
- 561. DIRECT CLUTCH (C2) PISTON INNER O-RING SEAL
- 562. DIRECT CLUTCH (C2) PISTON ASSEMBLY
- 563. DIRECT CLUTCH (C2) PISTON OUTER O-RING SEAL
- 564. FORWARD CLUTCH (C1) PISTON INNER O-RING SEAL
- 565. FORWARD CLUTCH (C1) PISTON ASSEMBLY
- 566. FORWARD CLUTCH (C1) PISTON OUTER O-RING SEAL
- 567. FORWARD (C1) AND DIRECT (C2) CLUTCH DRUM HOUSING ASSEMBLY
- 568. FORWARD (C1) AND DIRECT (C2) CLUTCH DRUM HOUSING THRUST BEARING RACE (SELECTIVE)
- 569. FORWARD (C1) AND DIRECT (C2) CLUTCH DRUM HOUSING THRUST BEARING ASSEMBLY
- 570. TURBINE SHAFT SEAL RING

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Figure 121

## *Forward (C1) and Direct (C2) Clutch Assembly*



1. Disassemble the Forward (C1) and Direct (C2) Clutch Assembly using the diagram in Figure 121 as a guide.
2. Clean all Forward (C1) and Direct (C2) Clutch parts with solvent and dry with compressed air.
3. Inspect the clutch drum and pistons for wear or cracks and replace as necessary.
4. Install a new Forward Clutch (C1) Piston Outer O-Ring Seal as shown in Figure 122.
5. Install a new Forward Clutch (C1) Piston Inner O-Ring Seal as shown in Figure 122.
6. Apply a small amount of Trans-Jel® to both piston O-Ring seals, then carefully install the Forward Clutch (C1) Piston into the Forward (C1) and Direct (C2) Drum Housing by pressing downward as shown in Figure 122.
7. Install a new Direct Clutch (C2) Piston Outer O-Ring Seal as shown in Figure 122.
8. Install a new Direct Clutch (C2) Piston Inner O-Ring Seal as shown in Figure 122.
9. Apply a small amount of Trans-Jel® to both piston o-ring seals then carefully install the Direct Clutch (C2) Piston into the Forward (C1) and Direct (C2) Drum Housing using a twisting motion as shown in Figure 122.
10. Install the Direct Clutch (C2) Piston Return Spring into the Direct Clutch (C2) Piston as shown in Figure 122.
11. Using SST J 25024-A, J 45186, J 21420 and J 23327 or similar spring compression tool and press such as an arbor press, compress the Direct Clutch (C2) Piston Return Spring and install the Direct Clutch (C2) Piston Return Spring Retaining Snap Ring using a pair of snap ring pliers as shown in Figure 122.
12. Make sure the snap ring is fully seated in the snap ring groove.

Cont'd on page 61

Figure 122

**Forward (C1) and Direct (C2)  
Clutch Assembly Cont'd.**

**Note: All frictions should be soaked in the appropriate ATF for at least 30 minutes prior to installation.**

13. Install the Direct Clutch (C2) Apply Plate into the drum as shown in Figure 123.
14. Starting with a Steel Plate and alternating Steel Plates and Lined Plates, install the Direct Clutch (C2) Steel and Lined Plates into the drum as shown in Figure 123.
15. Install the Direct Clutch (C2) Backing Plate into the drum as shown in Figure 123.

Cont'd on page 62

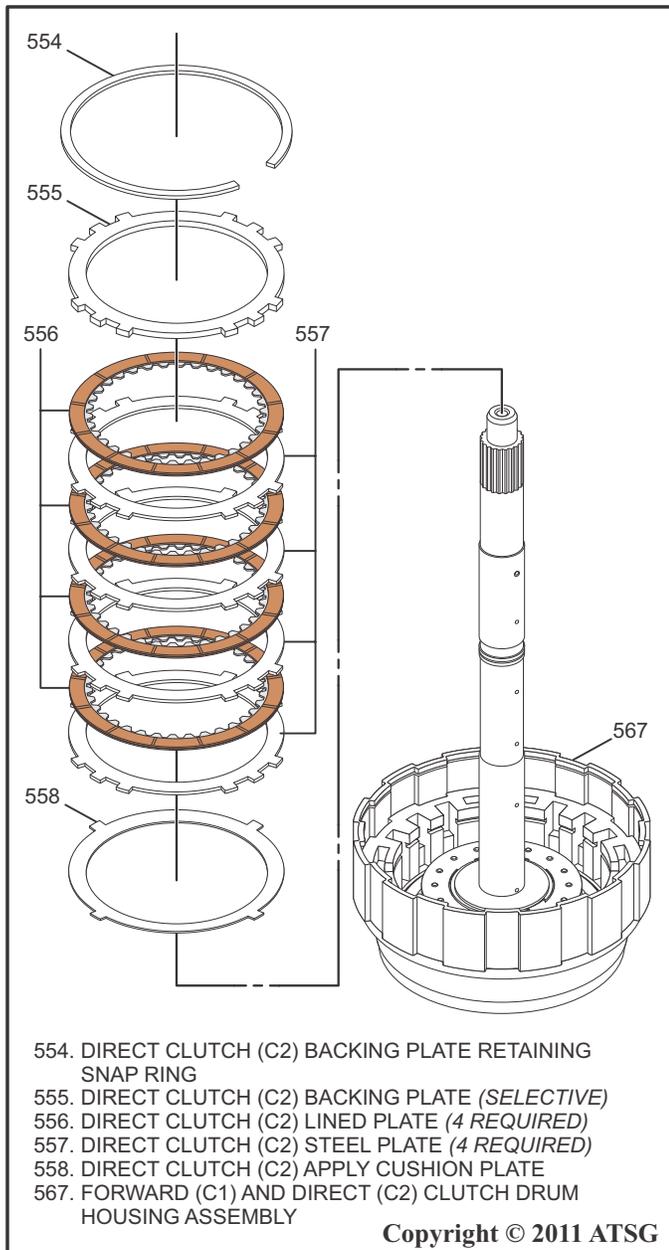


Figure 123

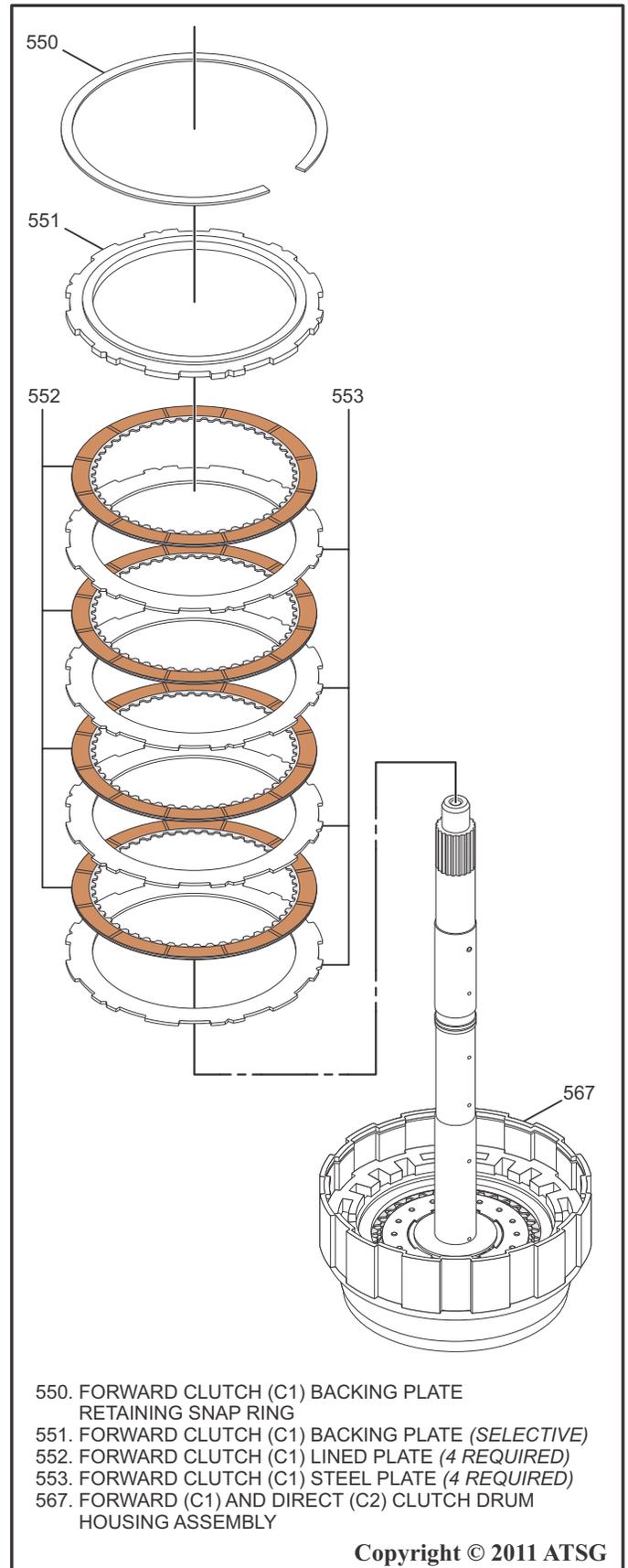


Figure 124

## Forward (C1) and Direct (C2) Clutch Assembly Cont'd.

16. Install the Direct Clutch (C2) Backing Plate Retaining Snap Ring into the drum as shown in Figure 123.
17. Make sure the snap ring is fully seated in the snap ring groove.  
**Note: All frictions should be soaked in the appropriate ATF for at least 30 minutes prior to installation.**
18. Starting with a Steel Plate and alternating Steel Plates and Lined Plates, install the Forward Clutch (C1) Steel and Lined Plates into the drum as shown in Figure 124.
19. Install the Forward Clutch (C1) Backing Plate into the drum as shown in Figure 124.
20. Install the Forward Clutch (C1) Backing Plate Retaining Snap Ring into the drum as shown in Figure 124.
21. Make sure the snap ring is fully seated in the snap ring groove.

22. Install the Forward (C1) and Direct (C2) Thrust Bearing Race, and Thrust Bearing into the drum and retain with a small amount of Trans-Jel®, then install a new Turbine Shaft Seal Ring and coat with a small amount of Trans-Jel® as shown in Figure 125.
23. Set the Forward (C1) and Direct (C2) Clutch Drum into the 1-2/Reverse Brake Housing then using SST J 45166 and J 45200 or other adequate dial indicator, attach the base onto the housing, bolt it in place then put the dial indicator on the direct clutch piston and set the dial indicator to a zero reading as shown in Figure 126.
24. Using a small amount of compressed air, carefully apply pressure to the ports for the Forward (C1) and Direct (C2) clutch as shown in Figure 126.
25. Use the chart in Figure 126 to determine clutch clearance.
26. If clutch clearance is not within specification, select a different thickness backing plate from the chart shown in Figure 126.
27. Set the completed drum assembly aside for final assembly.

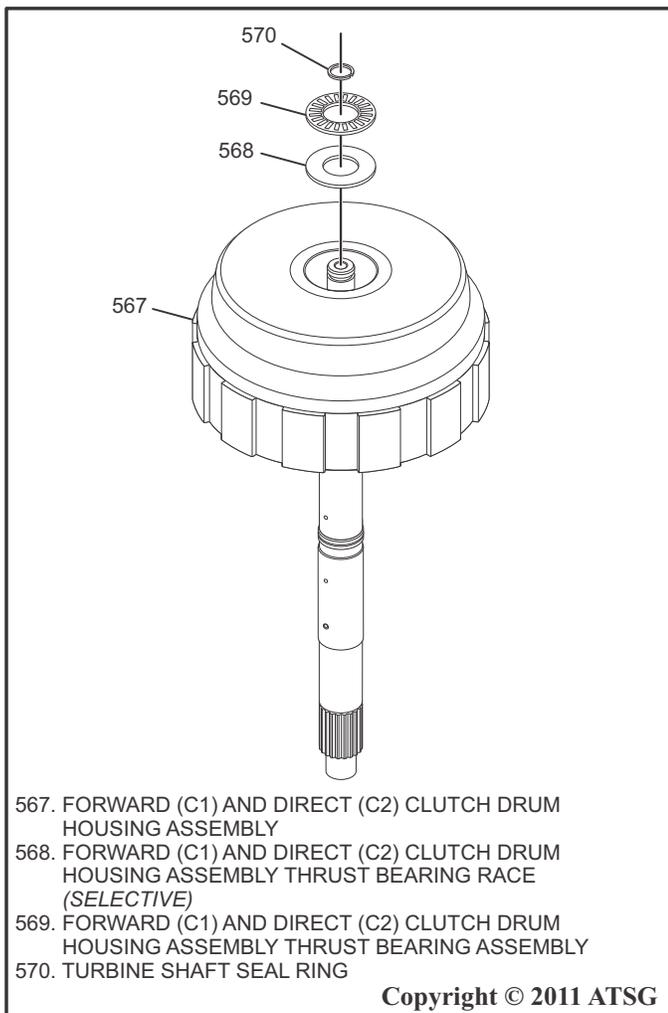


Figure 125

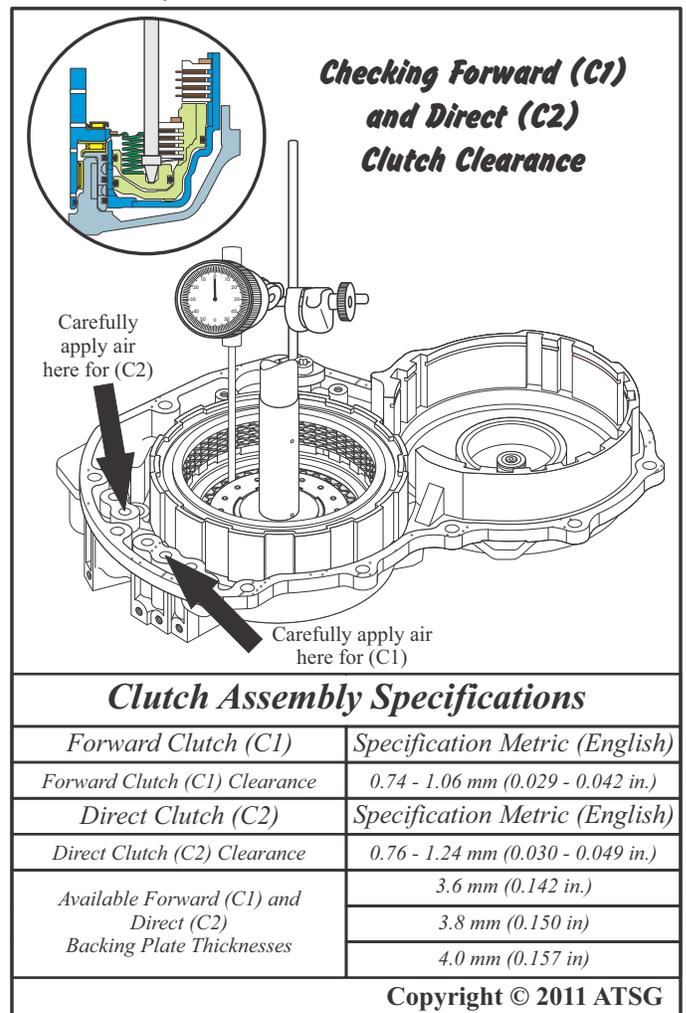
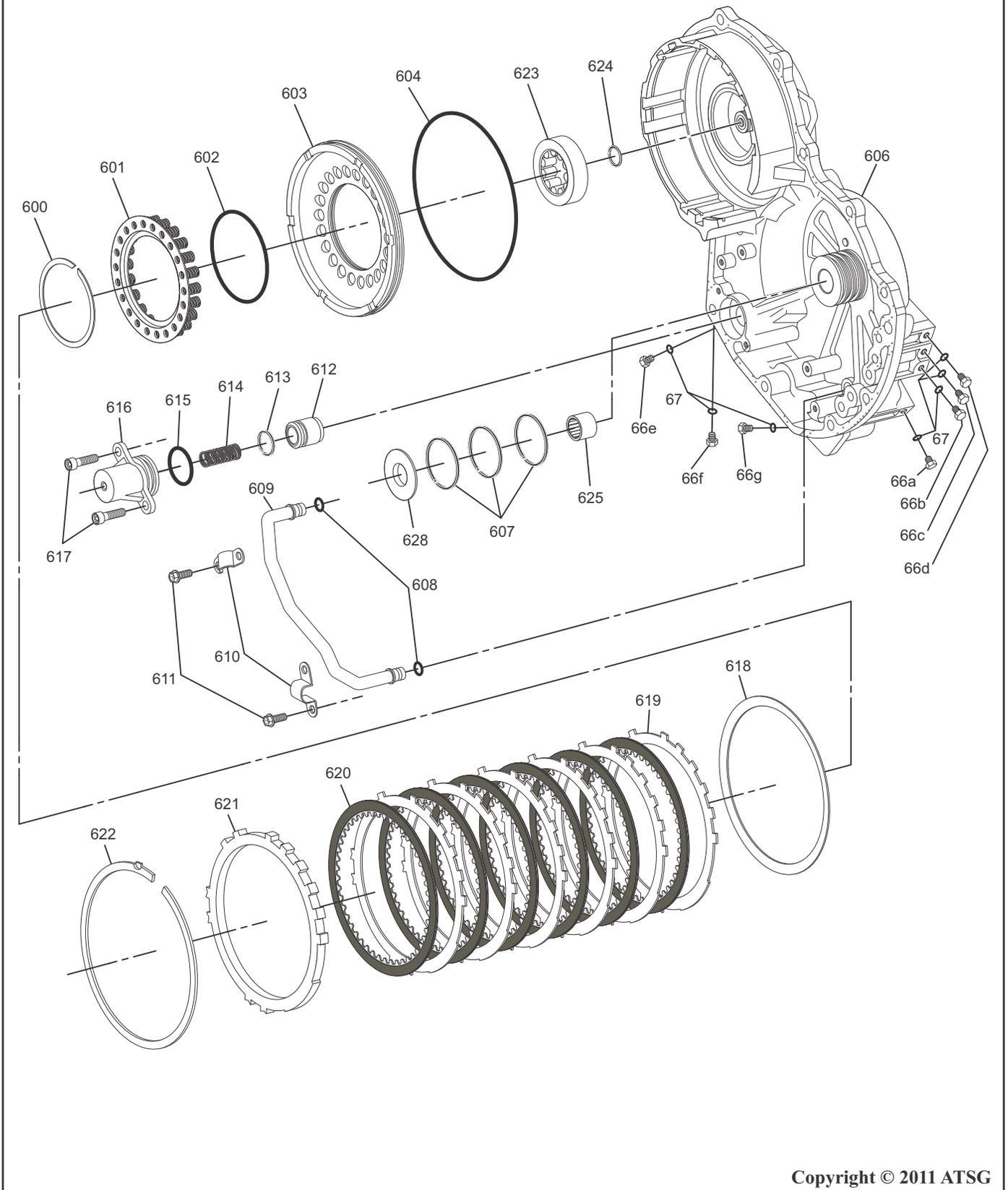


Figure 126

## ***AUTOMATIC TRANSMISSION REAR COVER AND 1-2/REVERSE BRAKE (B5) HOUSING ASSEMBLY***



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Figure 127

## ***AUTOMATIC TRANSMISSION REAR COVER AND 1-2/REVERSE BRAKE (B5) HOUSING ASSEMBLY LEGEND***

- |   |  |
|---|--|
| 66a. A/T FLUID PRESSURE TEST PORT DIRECT CLUTCH (C2) PRESSURE                                     | 612. FORWARD CLUTCH (C1) ACCUMULATOR PISTON  |
| 66b. A/T FLUID PRESSURE TEST PORT LUBRICATION PRESSURE  | 613. FORWARD CLUTCH (C1) ACCUMULATOR PISTON FLUID SEALING RING                             |
| 66c. A/T FLUID PRESSURE TEST PORT FORWARD CLUTCH (C1) PRESSURE                                    | 614. FORWARD CLUTCH (C1) ACCUMULATOR PISTON CUSHION SPRING ( <i>ID COLOR NATURAL</i> )     |
| 66d. A/T FLUID PRESSURE TEST PORT 1-2/REVERSE BRAKE (B5) PRESSURE                                 | 615. FORWARD CLUTCH (C1) ACCUMULATOR COVER O-RING SEAL                                     |
| 66e. A/T FLUID PRESSURE TEST PORT FORWARD CLUTCH (C1) PRESSURE                                    | 616. FORWARD CLUTCH (C1) ACCUMULATOR HOUSING   |
| 66f. A/T FLUID PRESSURE TEST PORT LUBRICATION PRESSURE  | 617. FORWARD CLUTCH (C1) ACCUMULATOR HOUSING ATTACHING BOLT (M5 X 0.8 X 12MM) (2 REQUIRED) |
| 66g. A/T FLUID PRESSURE TEST PORT LUBRICATION PRESSURE  | 618. 1-2/REVERSE BRAKE (B5) CUSHION APPLY PLATE (1 REQUIRED)                               |
| 67. A/T FLUID PRESSURE TEST PORT PLUG O-RING SEAL (7 REQUIRED)                                    | 619. 1-2/REVERSE BRAKE (B5) STEEL PLATE (6 REQUIRED)                                       |
| 600. 1-2/REVERSE BRAKE (B5) PISTON RETURN SPRING RETAINING SNAP RING                              | 620. 1-2/REVERSE BRAKE (B5) LINED PLATE (6 REQUIRED)                                       |
| 601. 1-2/REVERSE BRAKE (B5) PISTON RETURN SPRING ASSEMBLY   | 621. 1-2/REVERSE BRAKE (B5) BACKING PLATE ( <i>SELECTIVE</i> )                             |
| 602. 1-2/REVERSE BRAKE (B5) PISTON INNER O-RING SEAL  | 622. 1-2/REVERSE BRAKE (B5) BACKING PLATE RETAINING SNAP RING                              |
| 603. 1-2/REVERSE BRAKE (B5) PISTON ASSEMBLY   | 623. FRONT DIFFERENTIAL TRANSFER DRIVE GEAR ASSEMBLY REAR BEARING ASSEMBLY                 |
| 604. 1-2/REVERSE BRAKE (B5) PISTON OUTER O-RING SEAL  | 624. FRONT DIFFERENTIAL TRANSFER DRIVE GEAR ASSEMBLY REAR LUBRICATION SEALING RING         |
| 606. AUTOMATIC TRANSMISSION REAR COVER AND 1-2/REVERSE BRAKE (B5) HOUSING ASSEMBLY                | 625. TURBINE SHAFT REAR SUPPORT BEARING  |
| 607. FORWARD (C1) AND DIRECT (C2) CLUTCH DRUM HOUSING FLUID SEALING RINGS (3 REQUIRED)            | 628. FORWARD (C1) AND DIRECT (C2) CLUTCH DRUM HOUSING THRUST BEARING RACE                  |
| 608. 4-5 CLUTCH (C3) APPLY TUBE O-RING SEALS (2 REQUIRED)   |  |
| 609. 4-5 CLUTCH(C3) APPLY TUBE  |  |
| 610. 4-5 CLUTCH (C3) APPLY TUBE RETAINING BRACKETS (2 REQUIRED)                                   |  |
| 611. 4-5 CLUTCH (C3) APPLY TUBE RETAINING BRACKET ATTACHING BOLTS (M5 x 0.8 x 12 MM) (4 REQUIRED) |  |

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Figure 128

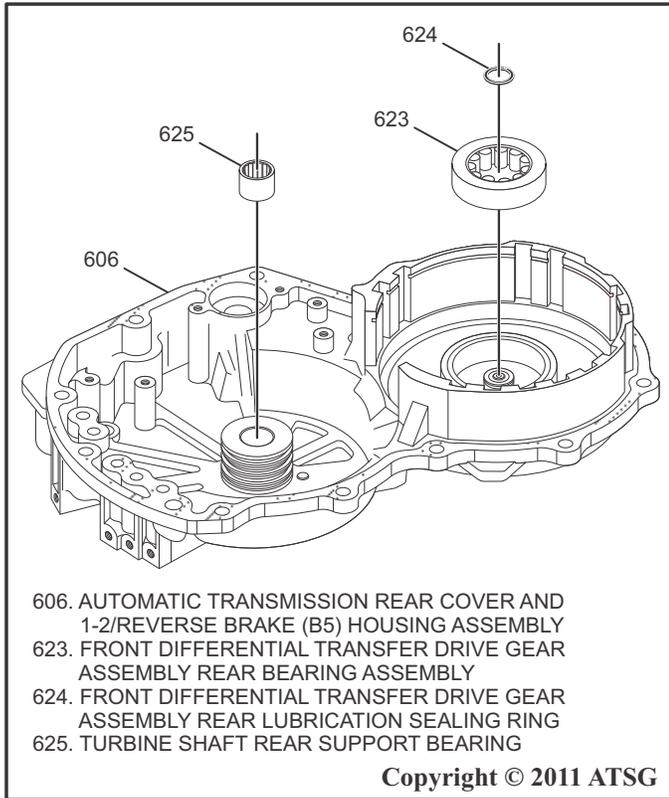


Figure 129

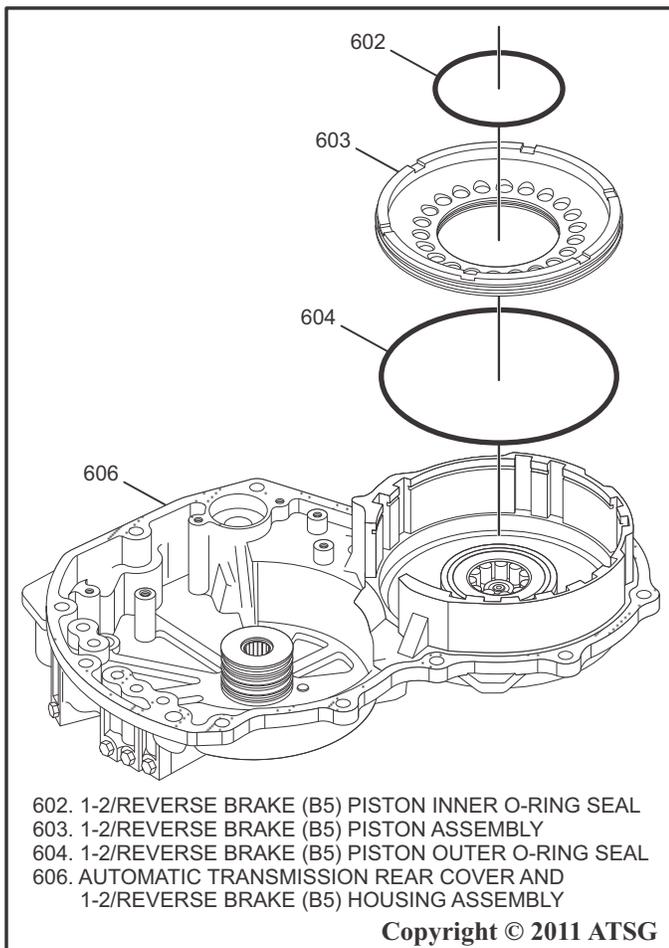


Figure 130

## *Automatic Transmission Rear Cover 1-2/Reverse Brake (B5) Housing Assembly*

1. Disassemble the Automatic Transmission Rear Cover 1-2/Reverse Brake (B5) Housing Assembly using the diagram in Figure 127 as a guide.
2. Clean all 1-2/Reverse Brake (B5) Housing Assembly parts with solvent.
3. Blow dry all parts with compressed air.
4. Inspect 1-2/Reverse Brake (B5) Housing Assembly parts for wear or defect and replace as necessary.
5. Inspect the Front Differential Transfer Drive Gear Assembly Rear Bearing Assembly and the Turbine Shaft Rear Support Bearing as shown in Figure 129.
6. Install a new Front Differential Transfer Drive Gear Assembly Rear Lubrication Sealing Ring and coat the seal with a small amount of Trans-Jel® as shown in Figure 129.
7. Install a new 1-2/Reverse Brake (B5) Piston Inner and Outer O-Ring Seal onto the Piston as shown in Figure 130.
8. Coat the O-Rings with a small amount of Trans-Jel®.
9. Install the 1-2/Reverse Brake (B5) Piston into the housing assembly by pushing down firmly and gently as shown in Figure 130.

Cont'd on page 66

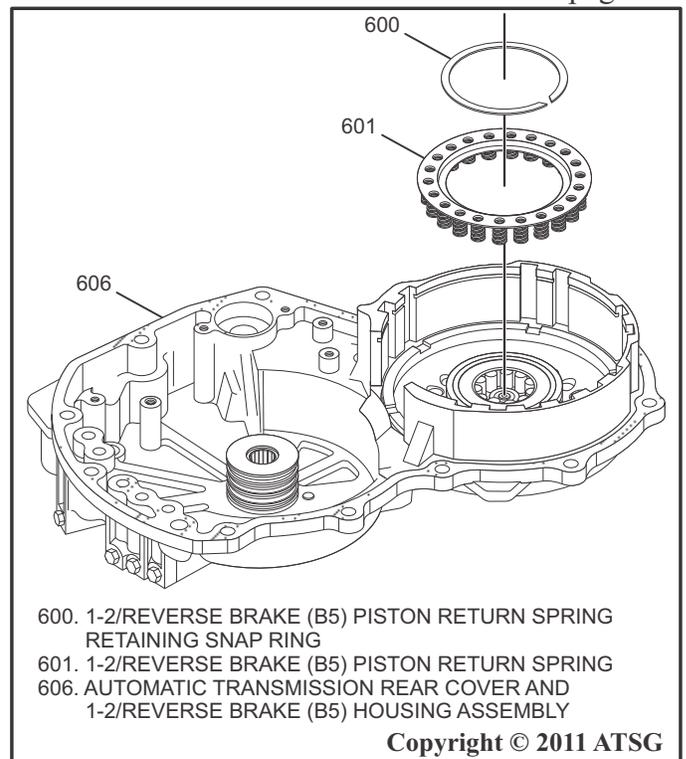


Figure 131

## Automatic Transmission Rear Cover 1-2/Reverse Brake (B5) Housing Assembly (Cont'd).

10. Install the 1-2/Reverse Piston Return Spring Assembly into the Piston as shown in Figure 131.
11. Using SST J 45184, J 23456 and J 23327 or other adequate spring compressing device such as an arbor press, compress the 1-2/Reverse Piston Return Spring gently, being careful not to bend the spring cage.
12. Install the 1-2/Reverse Piston Return Spring Retaining Snap Ring as shown in Figure 131.

13. Make sure the snap ring is fully seated in the snap ring groove.  
*Note: All frictions should be soaked in the appropriate ATF for at least 30 minutes prior to installation.*
14. Install the 1-2/Reverse Brake (B5) Cushion Apply Plate into the housing as shown in Figure 132.
15. Starting with a Steel Plate and alternating Steel Plates and Lined Plates, install the 1-2/Reverse Brake (B5) Steel and Lined Plates into the housing as shown in Figure 132.
16. Install the 1-2/Reverse Brake (B5) Backing Plate as shown in Figure 132.
17. Install the 1-2/Reverse Brake (B5) Backing Plate Retaining Snap Ring as indicated in Figure 132.
18. Make sure the locating notch of the retaining snap ring is indexed into the proper location of the housing as shown in Figure 133.

Cont'd on page 67

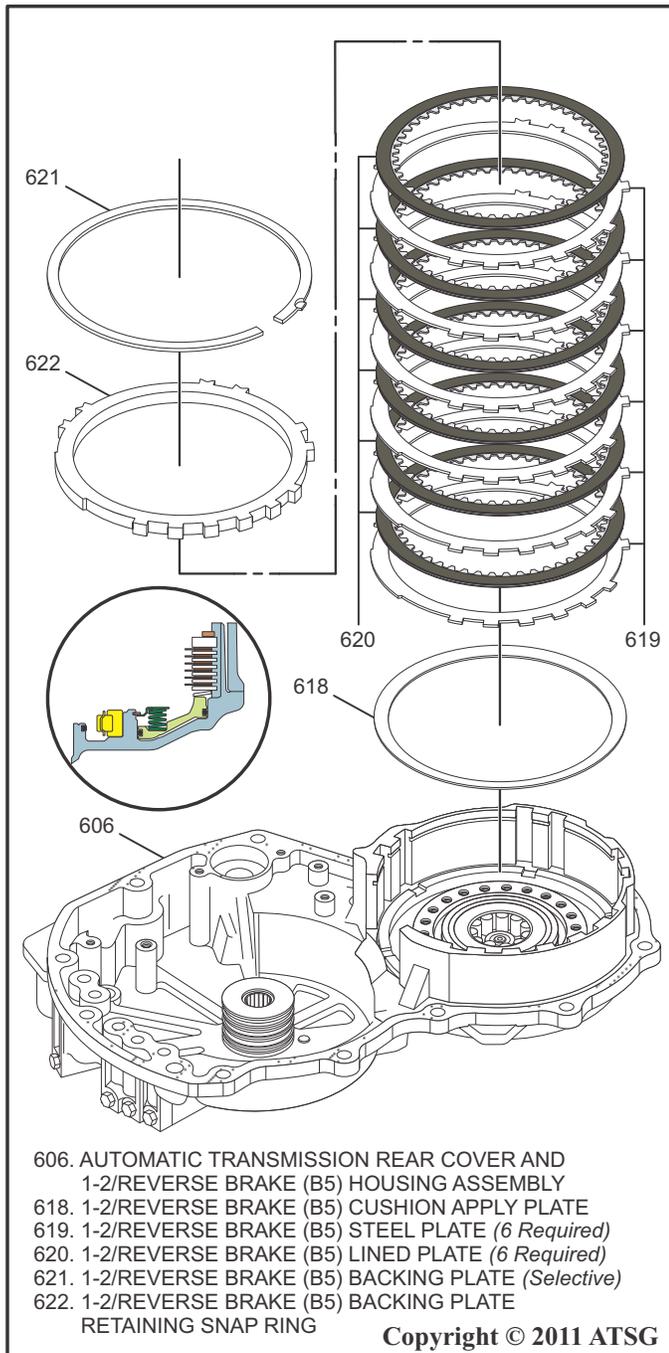


Figure 132

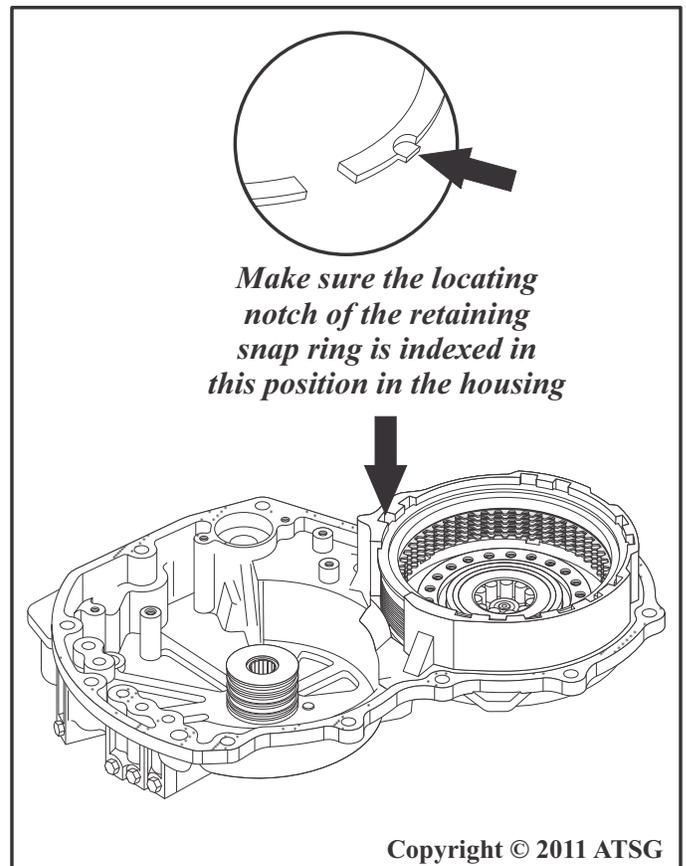


Figure 133

## *Automatic Transmission Rear Cover 1-2/Reverse Brake (B5) Housing Assembly (Cont'd).*

19. Install three new Forward (C1) and Direct (C2) Clutch Drum Fluid Sealing Rings as shown in Figure 134.
20. Coat the three fluid sealing rings with a small amount of Trans-Jel®.
21. Coat the Forward (C1) and Direct (C2) Clutch Drum Housing Thrust Bearing Race with a small amount of Trans-Jel® then place the thrust bearing race onto the 1-2/Reverse Brake (B5) Housing as shown in Figure 134.
22. Install two new O-ring Seals onto the 4-5 Clutch (C3) Apply Tube and coat the rings with a small amount of Trans-Jel® then install the tube by pressing downward gently or use a small plastic hammer and lightly tap the tube downward as shown in Figure 134.
23. Install the 4-5 Clutch (C3) Apply Tube Retaining Brackets and the four Retaining Bracket Attaching Bolts and hand tighten the bolts as shown in Figure 134.
24. Install a new Sealing Ring onto the Forward Clutch (C1) Accumulator Piston and a new O-ring seal onto the Accumulator Housing as shown in Figure 134.
25. Coat the Accumulator Piston Seal with a small amount of Trans-Jel® then install the accumulator piston with a twisting motion into the 1-2/Reverse Brake (B5) housing as shown in Figure 134.
26. Install the Accumulator Cushion Spring as shown in Figure 134.
27. Coat the Accumulator Housing O-ring seal with a small amount of Trans-Jel® and install the accumulator housing by pushing downward with a slight twisting motion so it compresses the spring, then install one of the two attaching bolts and hand tighten the bolt as shown in Figure 134.

Cont'd on page 68

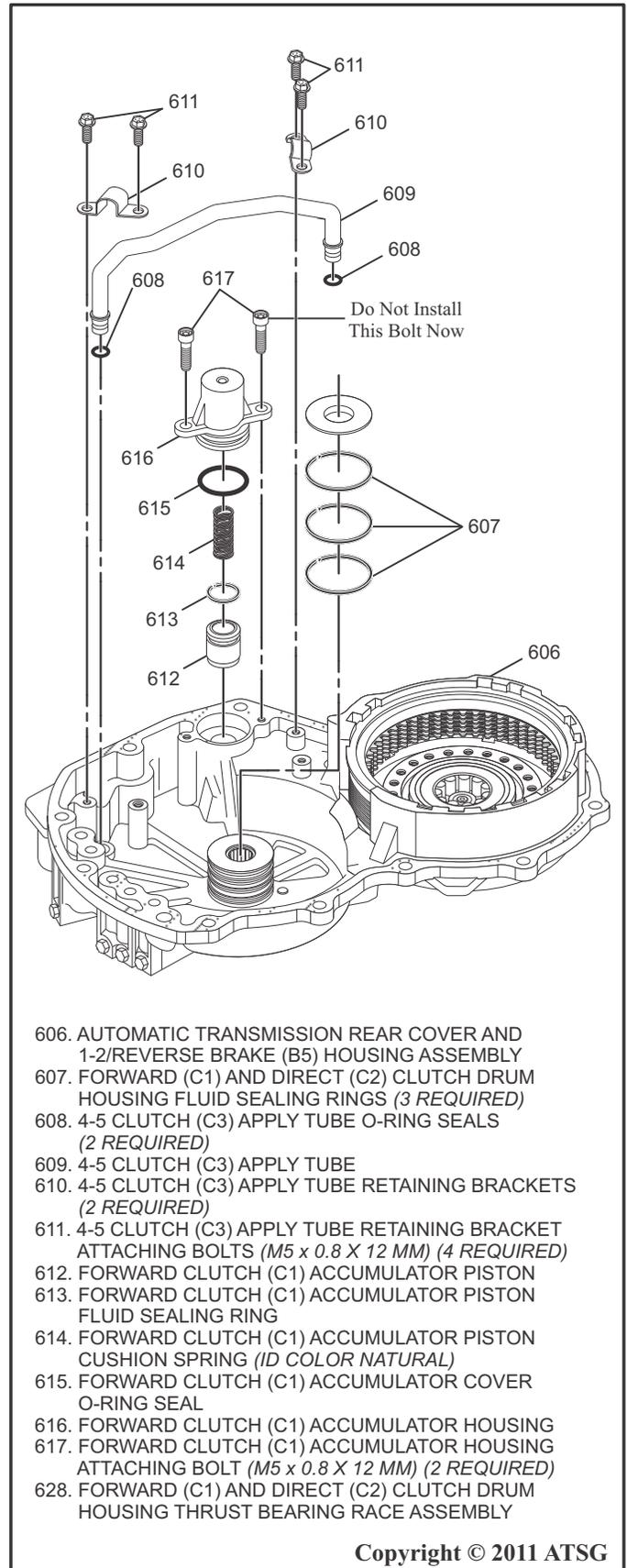


Figure 134

## Automatic Transmission Rear Cover 1-2/Reverse Brake (B5) Housing Assembly (Cont'd).

28. Using SST J 45166 and J 45200 or other adequate dial indicator, set the dial indicator base onto the Forward Clutch (C1) Accumulator and attach with the previously omitted bolt.
29. Put the dial indicator on the 1-2/Reverse Brake (B5) Piston and set the dial indicator to a zero reading as shown in Figure 135.

**Caution:** When using compressed air, wear safety glasses in order to help prevent injury to the eyes.

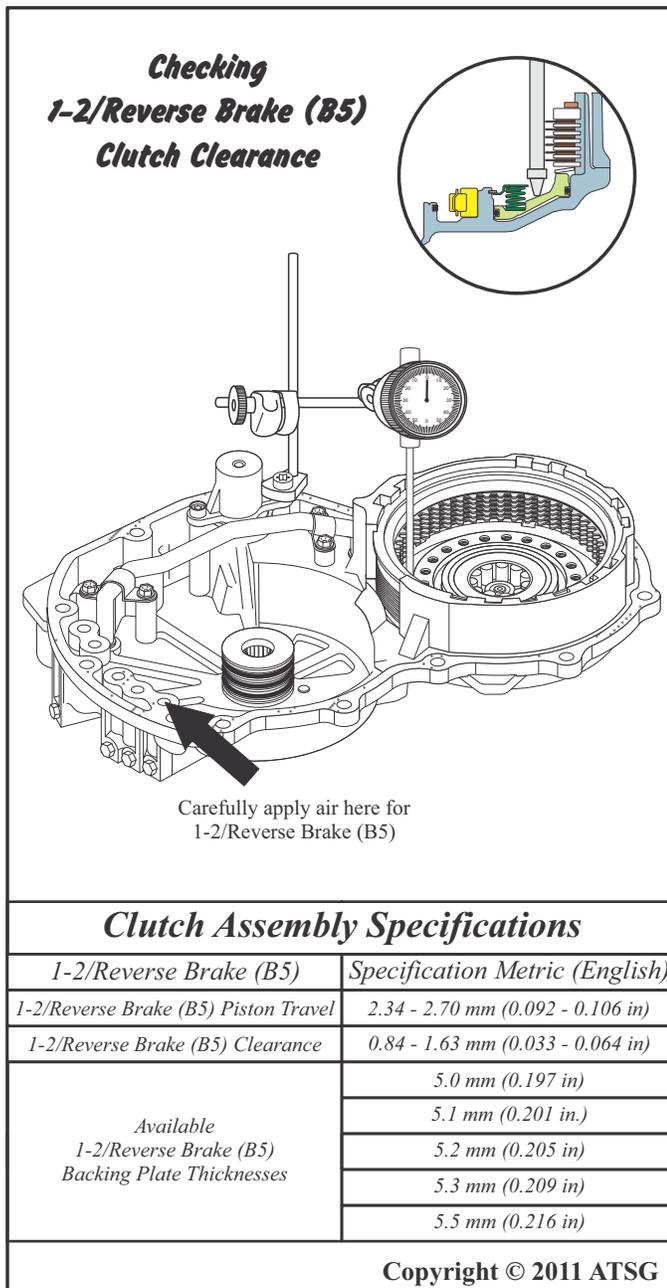


Figure 135

30. Carefully apply a small amount of compressed air into the 1-2/Reverse Brake (B5) apply port and check for proper piston stroke as shown in Figure 135.
31. When applying the compressed air, make sure piston moves smoothly in the bore.
32. If piston stroke is not within the specifications listed in the chart in Figure 135, select a different size 1-2/Reverse Brake (B5) Backing Plate from the available thicknesses listed.
33. Remove the dial indicator assembly and install the remaining bolt into the Forward Clutch (C1) Accumulator Housing.
34. Using an appropriate torque wrench, torque the 4-5 Clutch Apply Tube Retaining Brackets Bolts to 7 N.m (62 in. lb.) as shown in Figure 136.
35. Torque the Forward Clutch Accumulator Housing Attaching Bolts to 10 N.m (89 in. lb) as shown in Figure 136.
36. Set the completed housing aside for final assembly.

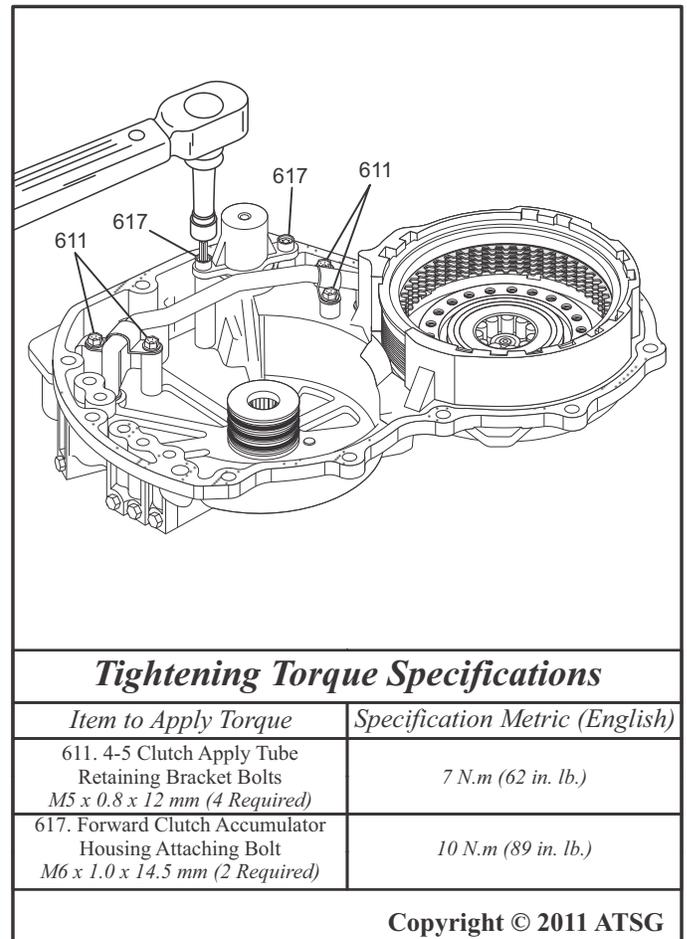
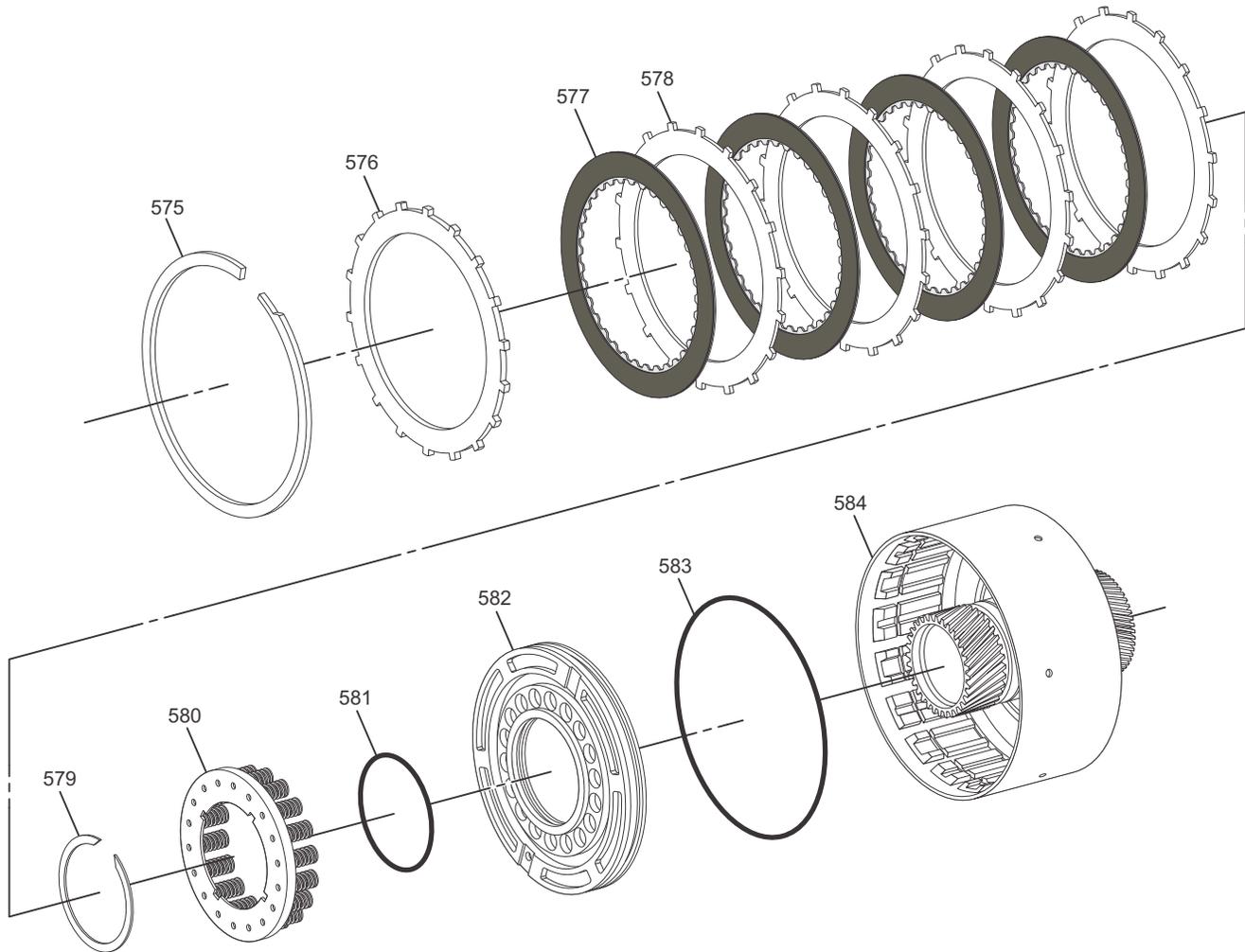


Figure 136

## 4 - 5 CLUTCH (C3) ASSEMBLY EXPLODED VIEW



575. 4 - 5 CLUTCH (C3) BACKING PLATE RETAINING SNAP RING

576. 4 - 5 CLUTCH (C3) BACKING PLATE (*SELECTIVE*)

577. 4 - 5 CLUTCH (C3) LINED PLATE (*4 REQUIRED*)

578. 4 - 5 CLUTCH (C3) STEEL PLATE (*4 REQUIRED*)

579. 4 - 5 CLUTCH PISTON RETURN SPRING RETAINING SNAP RING

580. 4 - 5 CLUTCH (C3) PISTON RETURN SPRING ASSEMBLY

581. 4 - 5 CLUTCH (C3) PISTON INNER O-RING SEAL

582. 4 - 5 CLUTCH (C3) PISTON ASSEMBLY

583. 4 - 5 CLUTCH (C3) PISTON OUTER O-RING SEAL

584. 4 - 5 CLUTCH (C3) DRUM ASSEMBLY

Figure 137

## 4-5 Clutch (C3) Assembly

1. Disassemble the 4-5 Clutch (C3) Assembly using the diagram in Figure 137 as a guide.
2. Clean all 4-5 Clutch (C3) Assembly parts thoroughly and dry with compressed air.
3. Inspect all 4-5 Clutch (C3) Assembly parts for wear and/or damage, replace as necessary.
4. Install a new Inner O-ring Seal and a new Outer O-ring Seal on the 4-5 Clutch (C3) Piston as shown in Figure 138.
5. Coat both O-ring seals with a small amount of Trans-Jel®.

6. Install the 4-5 Clutch (C3) Piston Assembly into the drum by carefully pushing downward with your hand as shown in Figure 138.
7. Install the 4-5 Clutch (C3) Piston Return Spring Assembly into the clutch piston as shown in Figure 139.
8. Using SST J 23327, J 25024-A, and J 45186 or similar spring compression tools, carefully compress the 4-5 Clutch (C3) Piston Return Spring and install the 4-5 Clutch (C3) Piston Return Spring Retaining Snap Ring as shown in Figure 139. Be careful not to bend the return spring assembly.
9. Make sure the retaining snap ring is fully seated in the snap ring groove.

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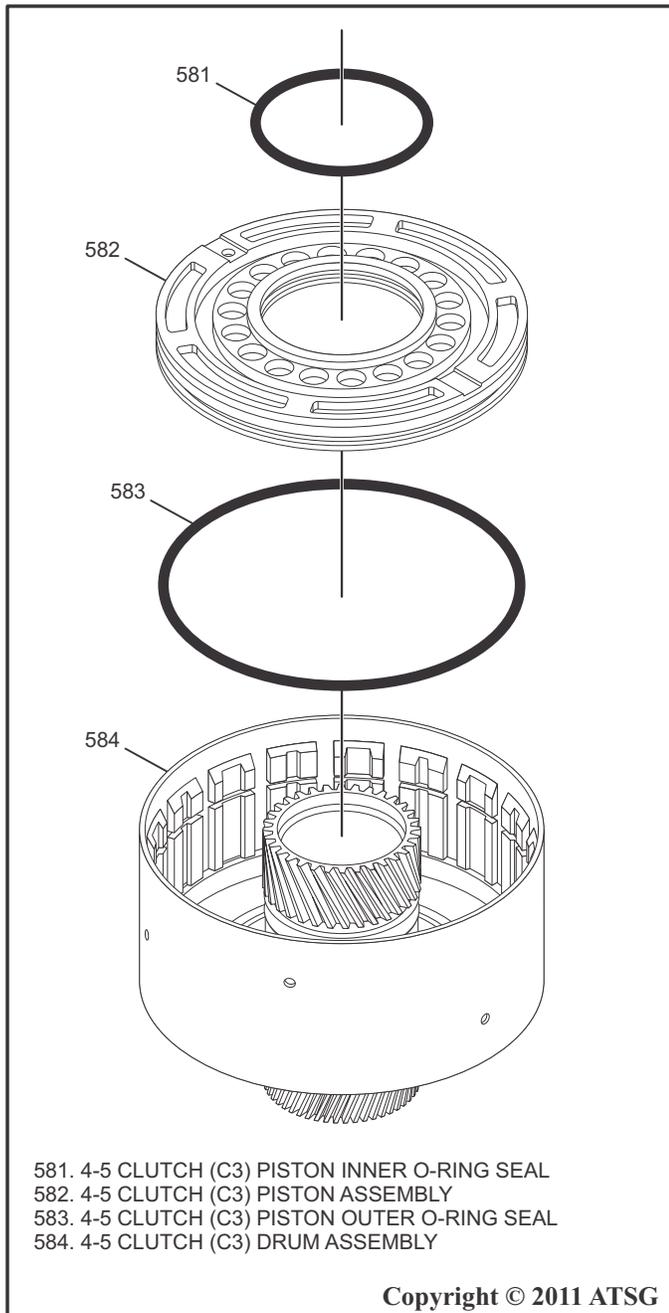


Figure 138

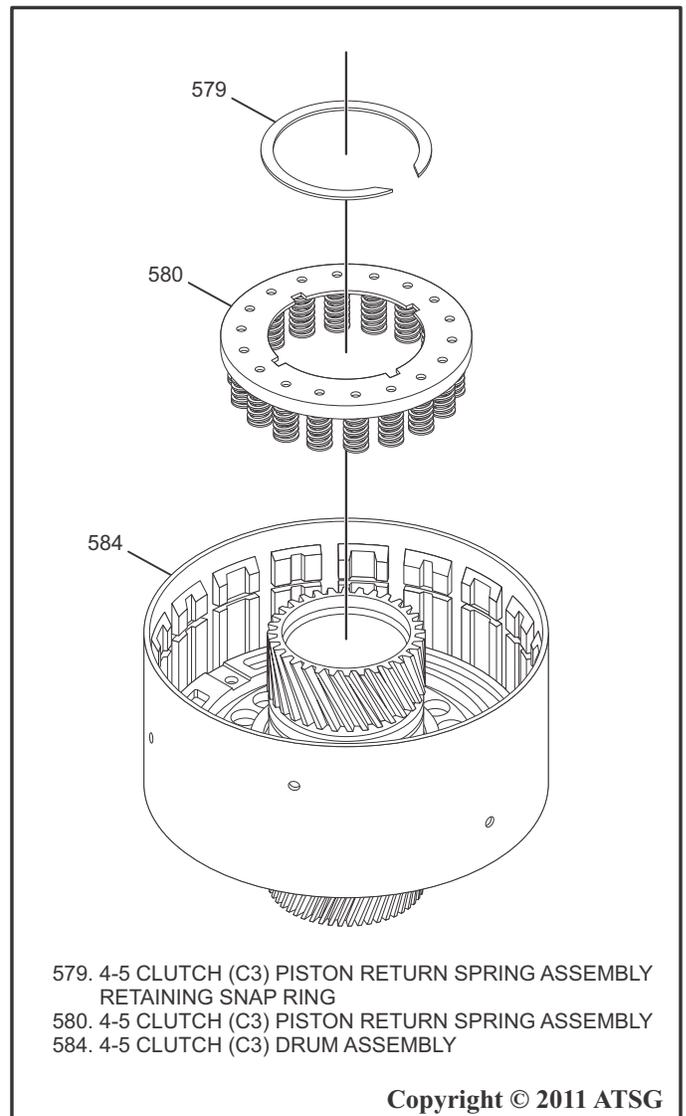
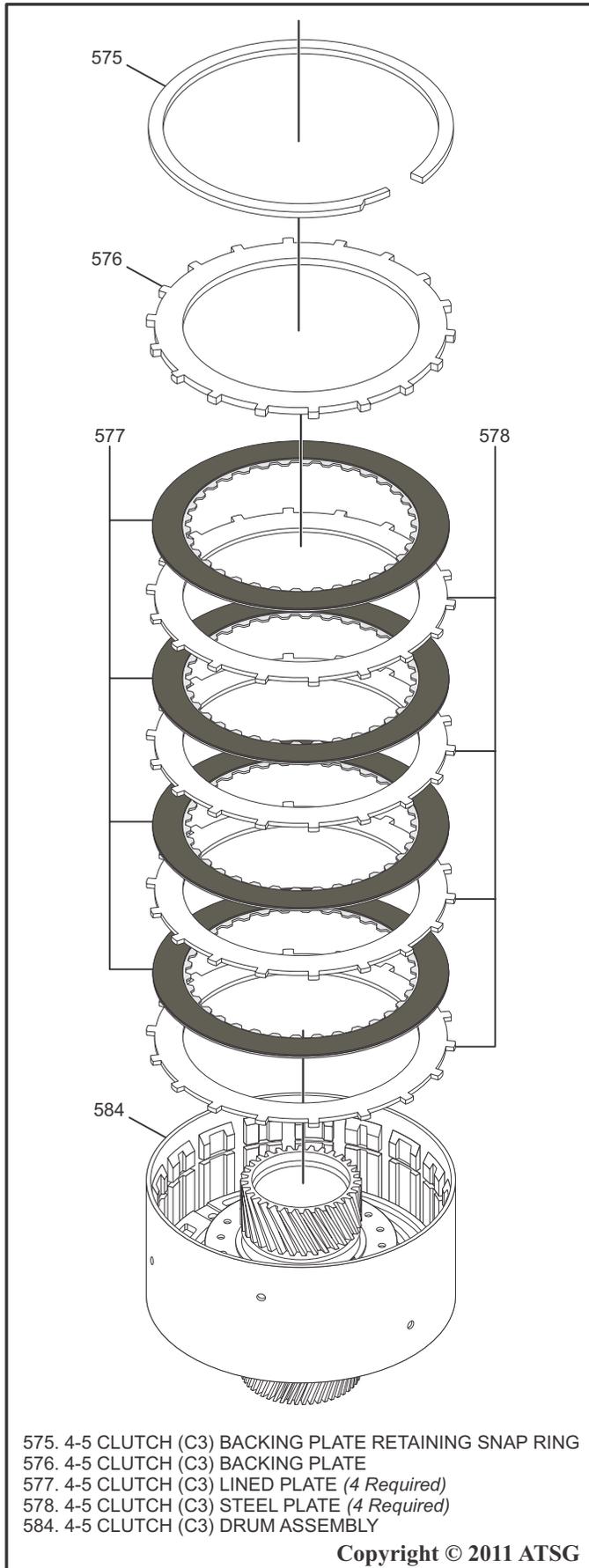


Figure 139

## 4-5 Clutch (C3) Assembly (Cont'd)

**Note:** All frictions should be soaked in the appropriate ATF for at least 30 minutes prior to installation.

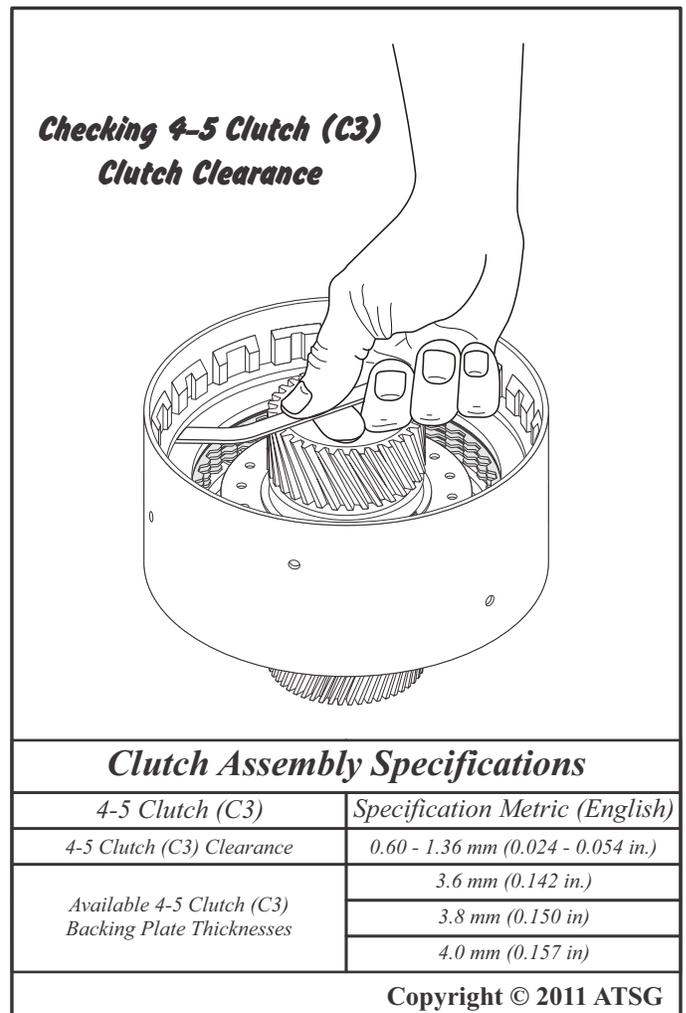
10. Starting with a Steel Plate and alternating Steel Plates and Lined Plates, install the 4-5 Clutch (C3) steel and lined plates into the 4-5 Clutch (C3) Drum as shown in Figure 140.
11. Install the 4-5 Clutch (C3) Backing Plate as shown in Figure 140.
12. Install the 4-5 Clutch (C3) Backing Plate Retaining Snap Ring as shown in Figure 140.
13. Make sure the snap ring is fully seated in the snap ring groove.
14. Check clutch clearance using an appropriate feeler gage as shown in Figure 141. If clutch clearance is not within specification, select a different thickness backing plate from the chart in Figure 141.
15. Set the 4-5 Clutch (C3) Drum Assembly aside for final assembly.



575. 4-5 CLUTCH (C3) BACKING PLATE RETAINING SNAP RING  
 576. 4-5 CLUTCH (C3) BACKING PLATE  
 577. 4-5 CLUTCH (C3) LINED PLATE (4 Required)  
 578. 4-5 CLUTCH (C3) STEEL PLATE (4 Required)  
 584. 4-5 CLUTCH (C3) DRUM ASSEMBLY

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Figure 140



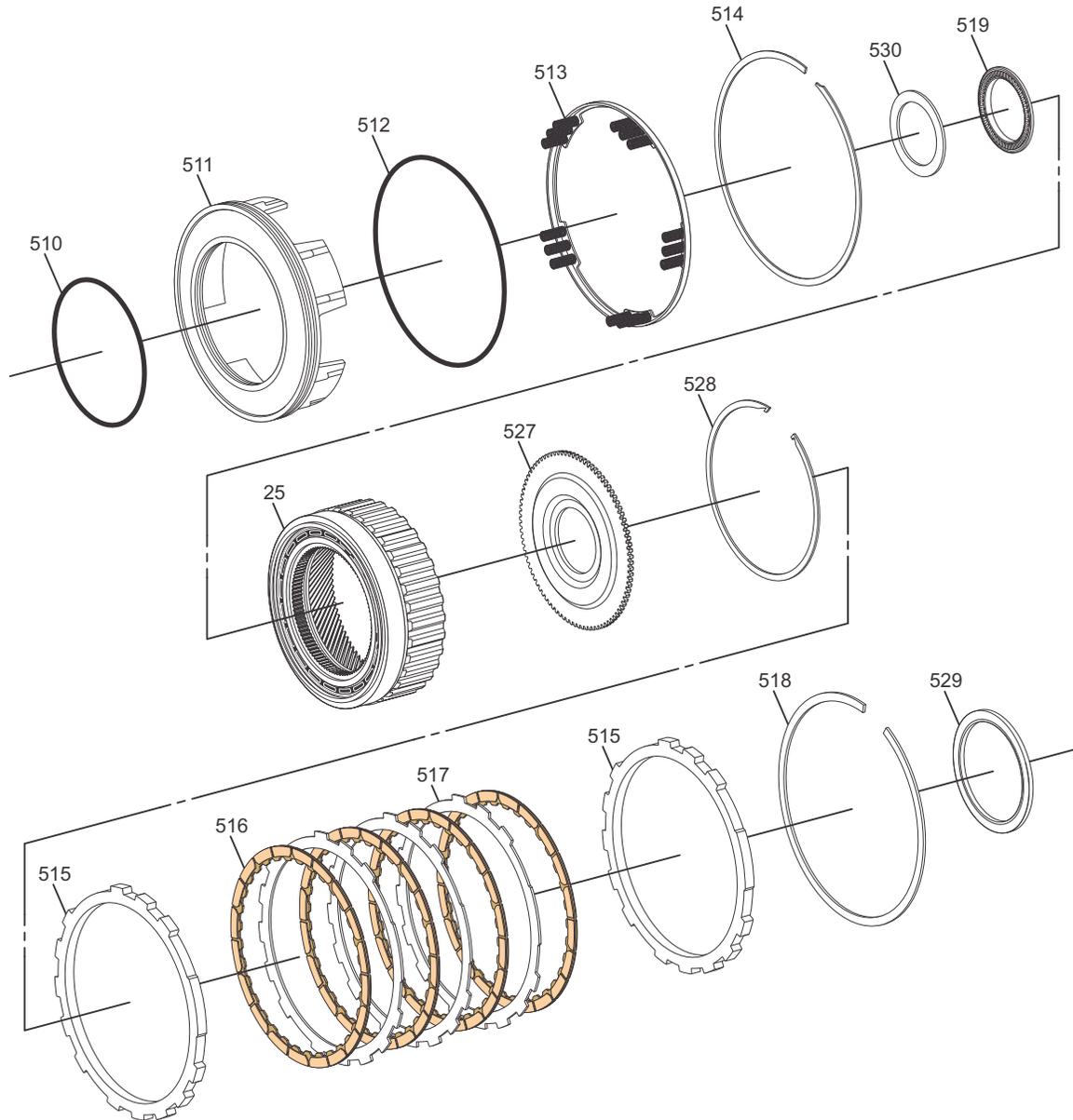
### Clutch Assembly Specifications

4-5 Clutch (C3)	Specification Metric (English)
4-5 Clutch (C3) Clearance	0.60 - 1.36 mm (0.024 - 0.054 in.)
Available 4-5 Clutch (C3) Backing Plate Thicknesses	3.6 mm (0.142 in.)
	3.8 mm (0.150 in.)
	4.0 mm (0.157 in.)

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Figure 141

## LOW AND REVERSE BRAKE (B3), FRONT INTERNAL GEAR AND LOW CLUTCH SPRAG (F2) ASSEMBLY EXPLODED VIEW



- |   |   |
|---|---|
| 25. FRONT INTERNAL GEAR AND LOW CLUTCH SPRAG (F2) ASSEMBLY                        | 516. LOW AND REVERSE BRAKE (B3) LINED PLATE (4 REQUIRED)          |
| 510. LOW AND REVERSE BRAKE (B3) PISTON INNER SEAL                                 | 517. LOW AND REVERSE BRAKE (B3) STEEL PLATE (3 REQUIRED)          |
| 511. LOW AND REVERSE BRAKE (B3) PISTON ASSEMBLY                                   | 518. LOW AND REVERSE BRAKE (B3) BACKING PLATE RETAINING SNAP RING |
| 512. LOW AND REVERSE BRAKE (B3) PISTON OUTER SEAL                                 | 519. FRONT INTERNAL GEAR THRUST BEARING ASSEMBLY                  |
| 513. LOW AND REVERSE BRAKE (B3) PISTON RETURN SPRING ASSEMBLY                     | 527. FRONT INTERNAL GEAR FLANGE                                   |
| 514. LOW AND REVERSE BRAKE (B3) PISTON RETURN SPRING ASSEMBLY RETAINING SNAP RING | 528. FRONT INTERNAL GEAR FLANGE RETAINING SNAP RING               |
| 515. LOW AND REVERSE BRAKE (B3) PACKING PLATE (2 REQUIRED)                        | 529. FRONT INTERNAL GEAR THRUST BEARING ASSEMBLY                  |
|   | 530. FRONT INTERNAL GEAR THRUST BEARING ASSEMBLY RACE             |

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Figure 142

## ***Low and Reverse Brake (B3), Front Internal Gear and Low Clutch Sprag (F2) Assembly***

1. Disassemble the Low and Reverse Brake (B3), Front Internal Gear and Low Clutch Sprag (F2) Assembly using the diagram in Figure 142 as a guide.

***NOTE: The Low Clutch Sprag (F2) assembly does not come apart. If wear is indicated, it must be replaced as an assembly.***

2. Clean all Low and Reverse Brake (B3), Front Internal Gear and Low Clutch Sprag (F2) Assembly parts thoroughly and dry with compressed air.

3. Inspect all Low and Reverse Brake (B3), Front Internal Gear and Low Clutch Sprag (F2) Assembly parts for wear and/or damage, replace as necessary.

4. Install a new Inner O-ring Seal and a new Outer O-ring Seal on the Low and Reverse Brake (B3) Piston as shown in Figure 143.

5. Coat both O-ring seals with a small amount of Trans-Jel®.

6. Set the Low and Reverse Brake (B3) Piston Assembly aside for final assembly.

7. Install the Front Internal Gear Flange into the Front Internal Gear and Low Clutch Sprag (F2) Assembly as shown in Figure 144.

8. Install the Front Internal Gear Flange Retaining Snap Ring into the Front Internal Gear and Low Clutch Sprag (F2) Assembly as shown in Figure 144.

9. Make sure the retaining snap ring is fully seated.

Cont'd on page 74

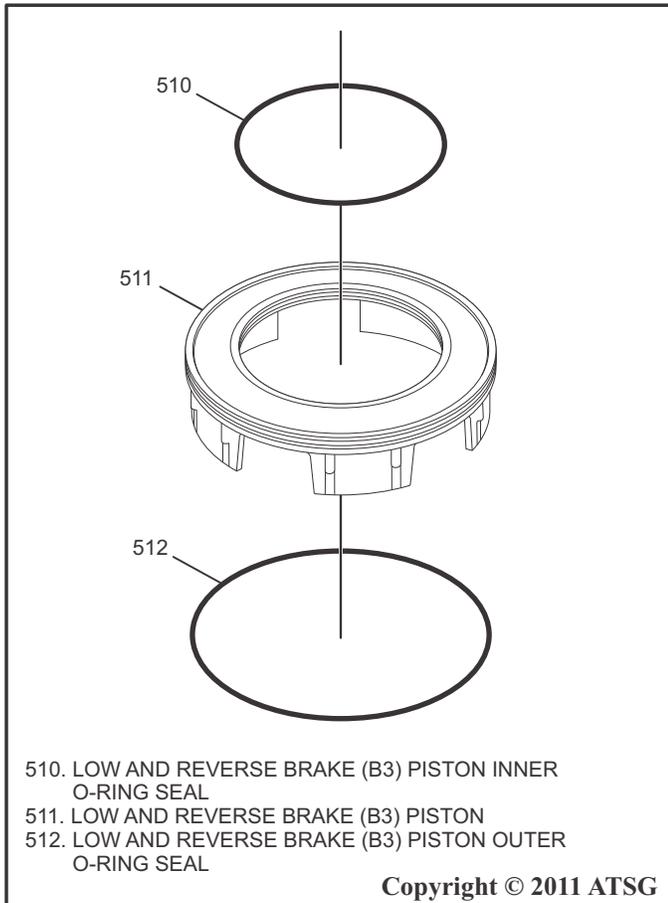


Figure 143

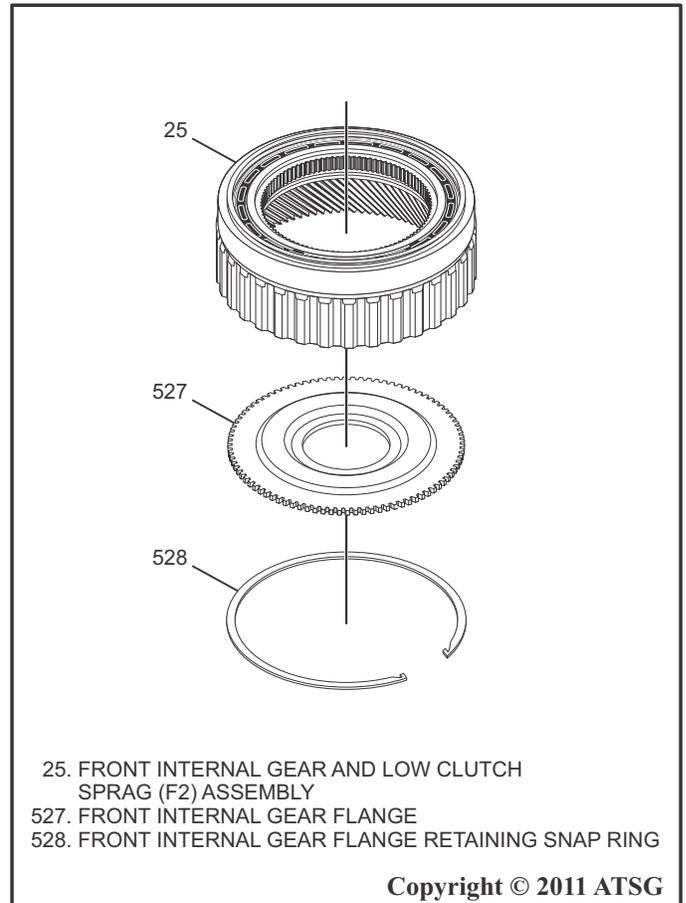


Figure 144

## *Low and Reverse Brake (B3), Front Internal Gear and Low Clutch Sprag (F2) Assembly*

10. Coat the Front Internal Gear Thrust Bearing Assembly with a small amount of Trans-Jel® and place it onto the Front Internal Gear and Low Clutch Sprag (F2) Assembly as shown in Figure 145.
11. Coat the Front Internal Gear Thrust Bearing Race with a small amount of Trans-Jel® and place it onto the Front Internal Gear and Low Clutch Sprag (F2) Assembly as shown in Figure 145.  
Check the operation fo the Low Clutch Sprag (F2)
12. Assembly as shown in Figure 146. The Low Clutch Sprag (F2) Inner Race must **Rotate Counter Clockwise and Lock Clockwise**.

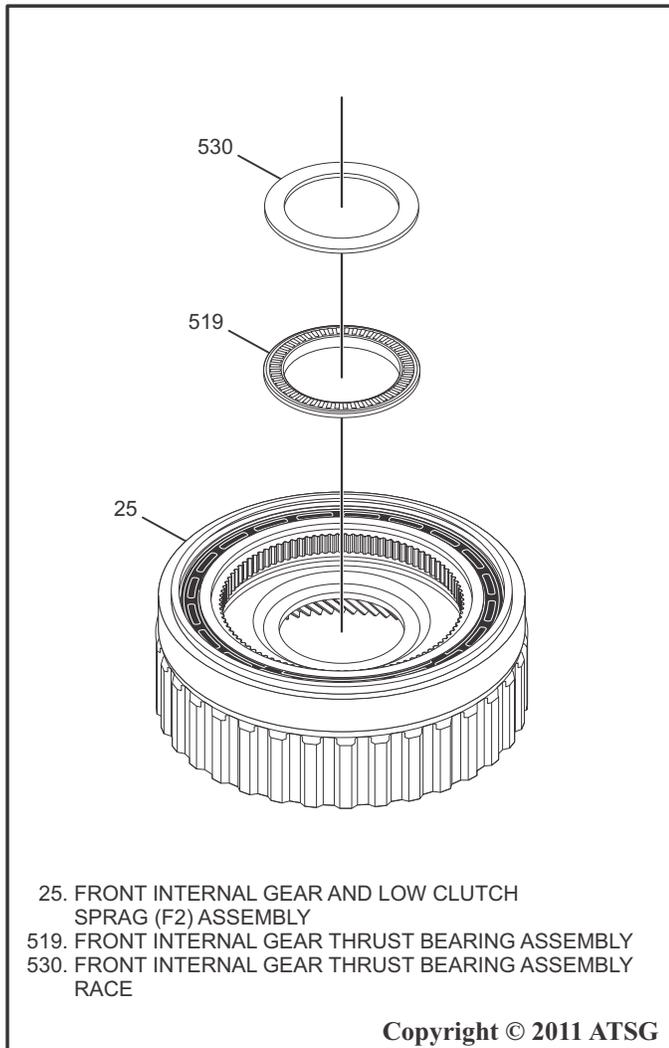


Figure 145

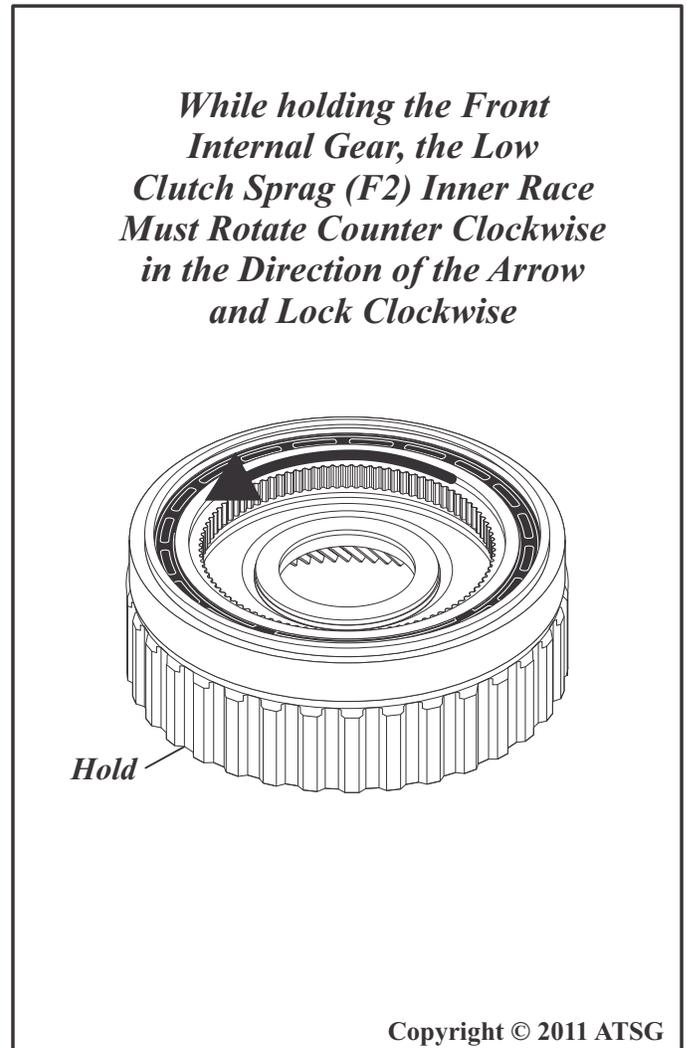


Figure 146

## Third Gear Band (B4) Servo Piston Assembly

1. Disassemble the Third Gear Band (B4) Servo Piston Assembly using the diagram in Figure 147 as a guide.
2. Clean all Third Gear Band (B4) Servo Assembly parts thoroughly and dry with compressed air.
3. Inspect all servo parts and replace as necessary.
4. Reassemble the Third Gear Band (B4) Servo Piston Assembly using the diagram in Figure 147 as a guide.
5. Install a new O-ring seal onto the servo piston and two new O-ring seals onto the piston cover as shown in Figure 147. Coat the three O-ring seals with a small amount of Trans-Jel®.
6. During final assembly it will be necessary to check the servo piston travel. Servo piston travel specification is provided in the Servo Assembly Specifications chart shown in Figure 148. If servo piston travel is not within specification, select a different servo pin from the chart in Figure 148.

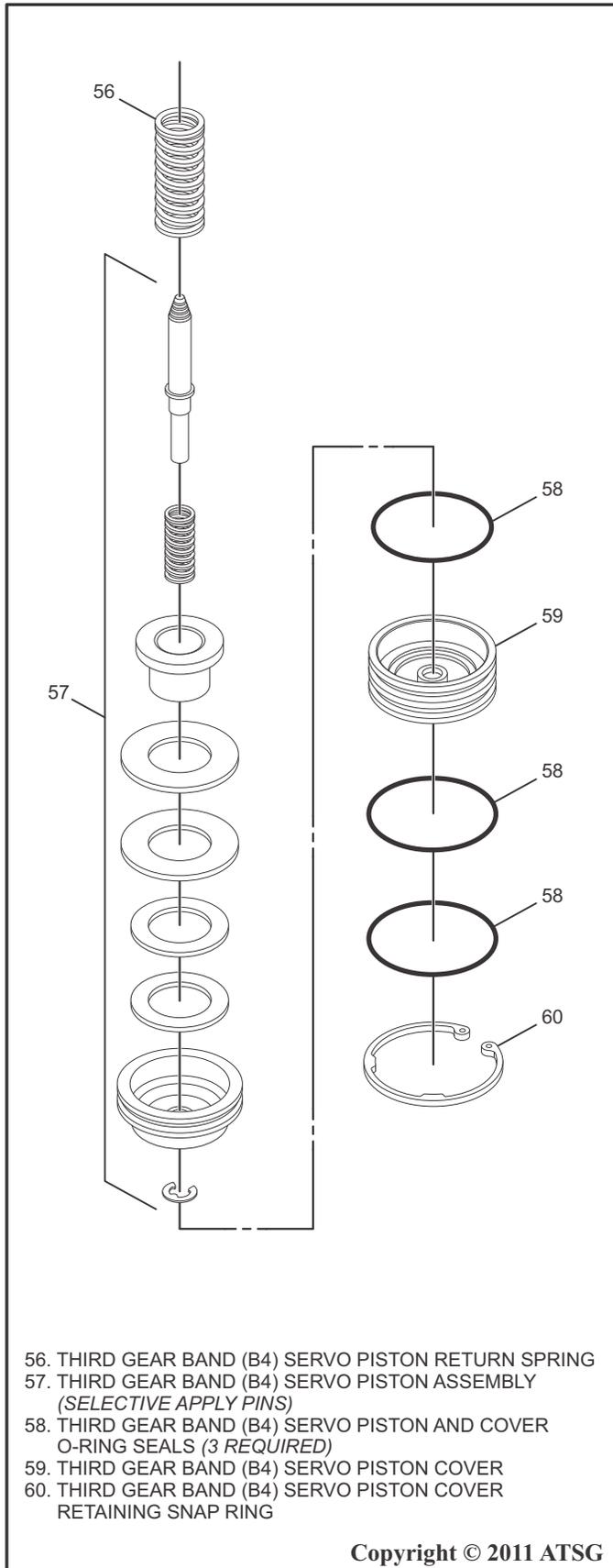


Figure 147

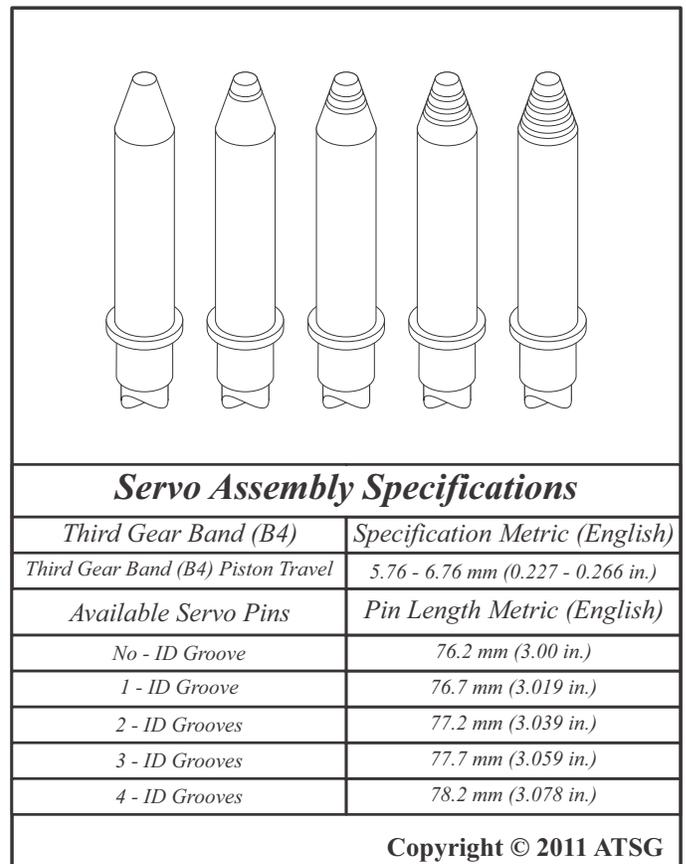


Figure 148

## 1-2/Reverse Carrier Gear Assembly

1. Disassemble the 1-2/Reverse Carrier Gear Assembly using the diagram in Figure 149 as a guide.
2. Clean all 1-2/Reverse Carrier Gear Assembly parts thoroughly and dry with compressed air.
3. Inspect all carrier gear parts and replace as necessary.
4. Reassemble the 1-2/Reverse Carrier Gear Assembly using the diagram in Figure 149 as a guide.
5. Coat the washers, bearings and selective race with a small amount of Trans-Jel® to keep them in place for assembly.
6. Set the 1-2/Reverse Carrier Gear Assembly aside for final assembly.

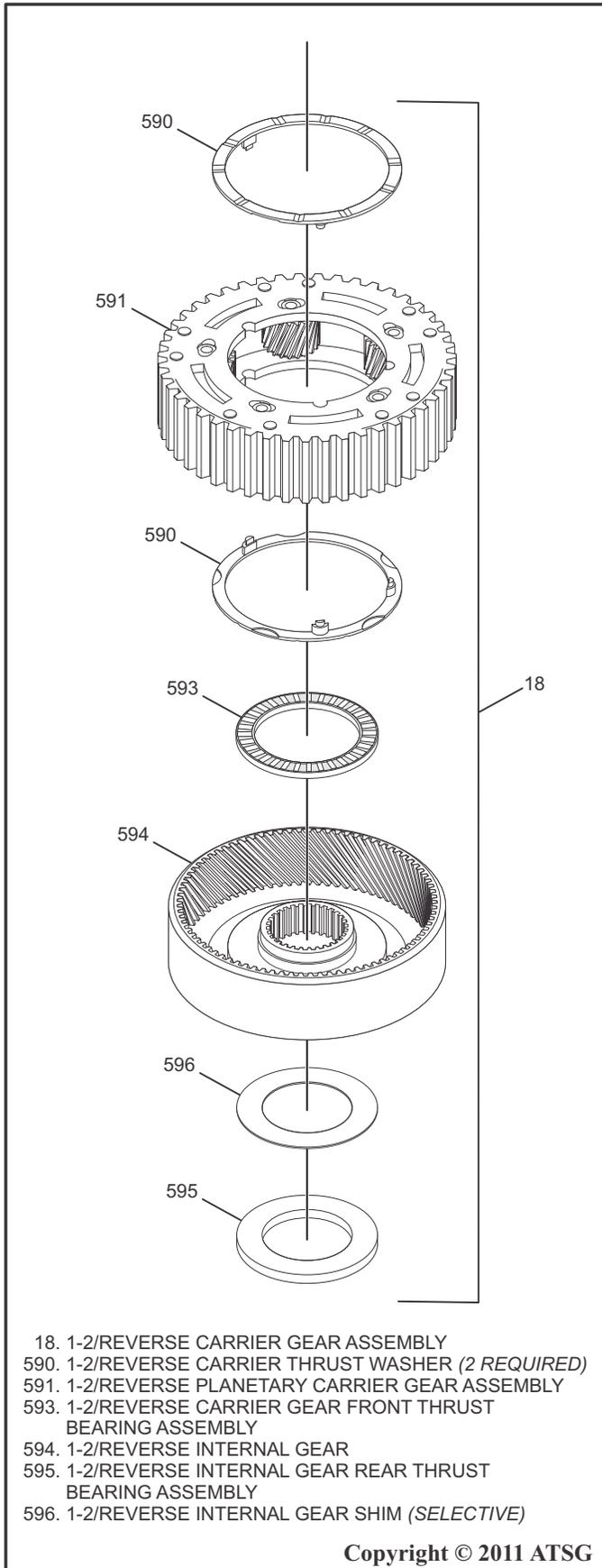
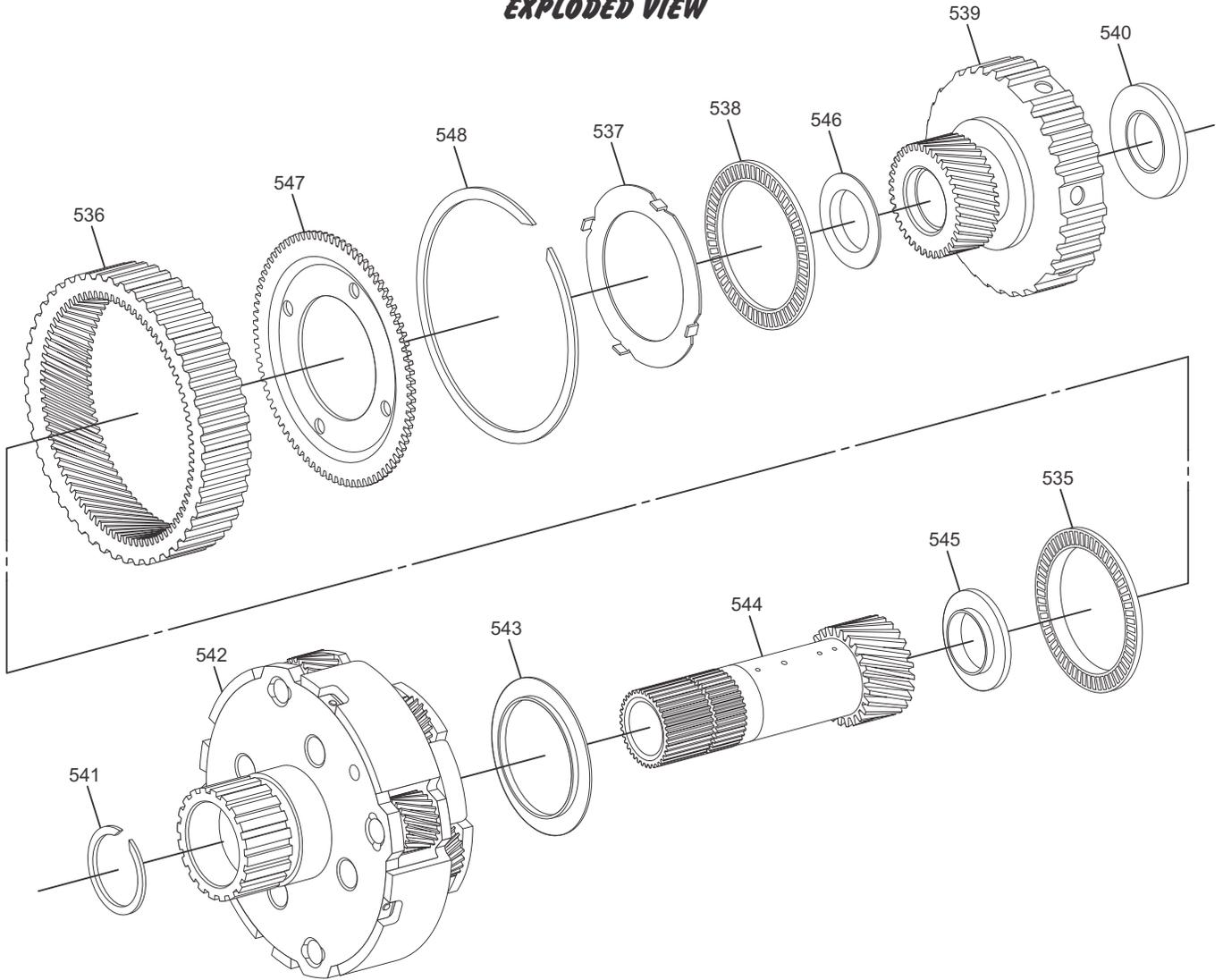


Figure 149

## **FRONT PLANET CARRIER AND SUN GEAR ASSEMBLY EXPLODED VIEW**



535. REAR INTERNAL GEAR THRUST BEARING ASSEMBLY

536. REAR INTERNAL GEAR

537. REAR SUN GEAR THRUST BEARING RACE

538. REAR SUN GEAR THRUST BEARING ASSEMBLY

539. REAR SUN GEAR ASSEMBLY

540. INPUT SHAFT THRUST BEARING ASSEMBLY

541. FRONT SUN GEAR RETAINING SNAP RING

542. FRONT PLANET CARRIER ASSEMBLY

543. FRONT PLANET CARRIER THRUST BEARING RACE

544. FRONT SUN GEAR

545. FRONT SUN GEAR THRUST BEARING ASSEMBLY

546. FRONT SUN GEAR THRUST BEARING RACE

547. REAR INTERNAL GEAR FLANGE

548. REAR INTERNAL GEAR FLANGE RETAINING SNAP RING

Figure 150

## Front Planet Carrier and Sun Gear Assembly

1. Disassemble the Front Planet Carrier and Sun Gear Assembly using the diagram in Figure 150 as a guide.
2. Clean all Front Planet Carrier and Sun Gear Assembly parts thoroughly and dry with compressed air.
3. Inspect all Front Planet Carrier and Sun Gear parts and replace as necessary.
4. Install the Rear Internal Gear Flange into the Rear Internal Gear and install the snap ring as shown in Figure 151.
5. Coat the Rear Internal Gear Thrust Bearing with a small amount of Trans-Jel® and install onto upper side of the Rear Internal Gear Flange as shown in Figure 151.
6. Coat the Rear Sun Gear Thrust Bearing Race with a small amount of Trans-Jel® and install onto the lower side of the Rear Internal Gear Flange as shown in Figure 151.

7. Install the Front Sun Gear into the Front Planet Carrier Assembly and install the retaining snap ring as shown in Figure 152.
8. Coat the Front Planet Carrier Thrust Bearing Race and the Front Sun Gear Thrust Bearing with a small amount of Trans-Jel® and install onto the Front Planet Carrier Assembly and the Front Sun Gear as shown in Figure 152.
9. Coat the Rear Sun Gear Thrust Bearing Assembly, the Front Sun Gear Thrust Bearing Race and the Input Shaft Thrust Bearing Assembly with a small amount of Trans-Jel® and install onto the Rear Sun Gear Assembly as shown in Figure 152.
10. Set all Front Planet Carrier and Sun Gear Assembly parts aside for final assembly.

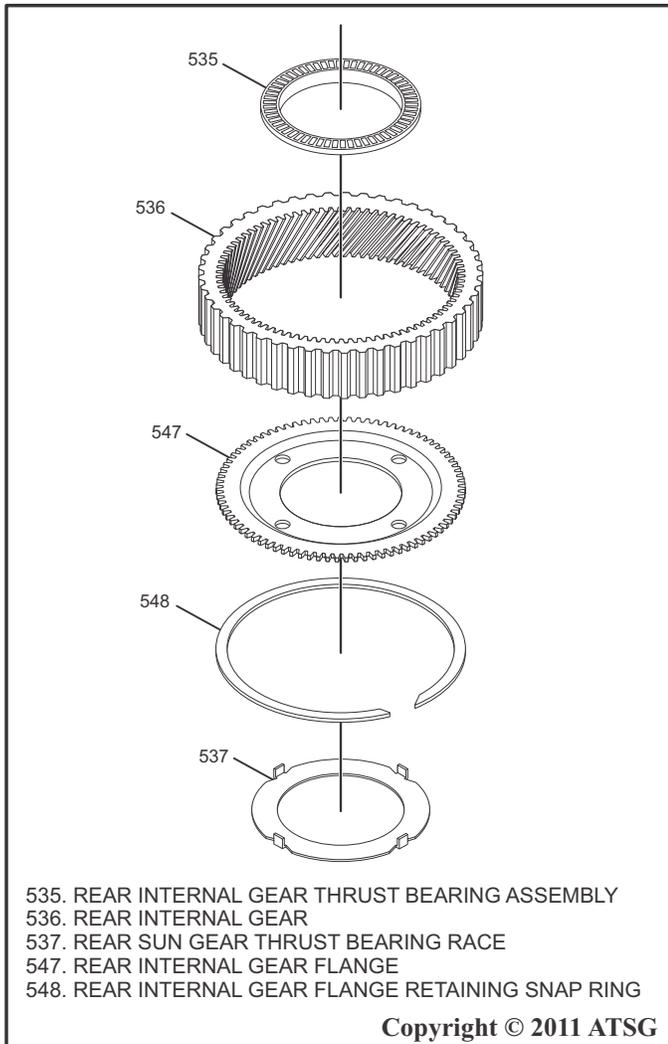


Figure 151

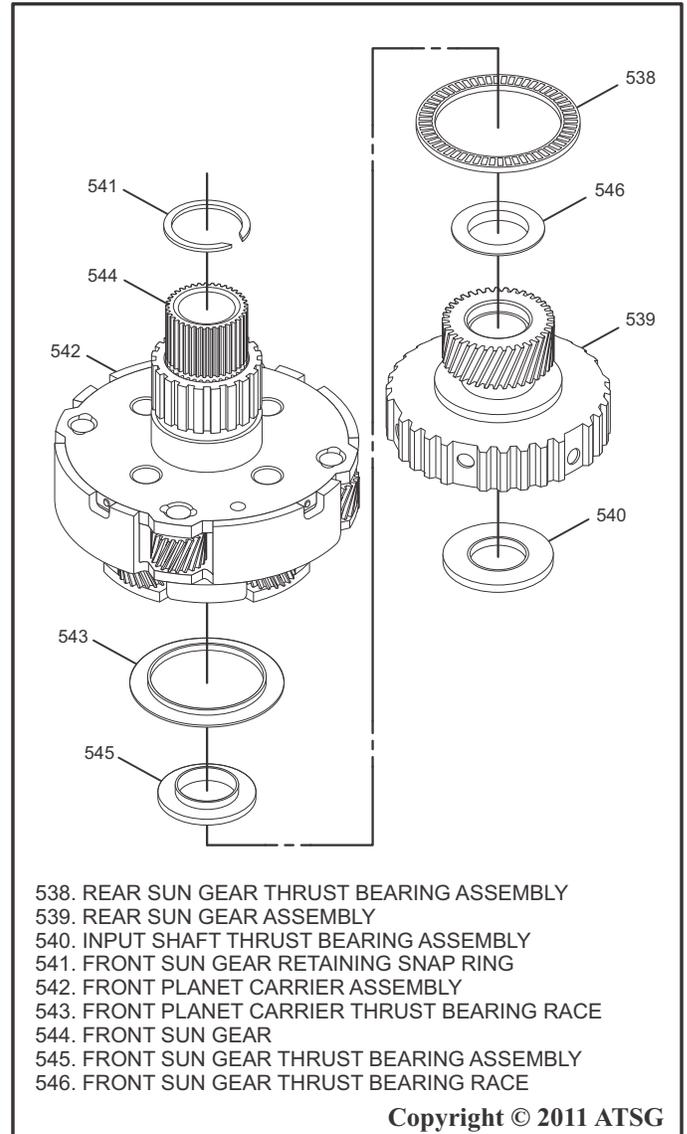


Figure 152

## COMPONENT REBUILD

### Control Valve Body Assembly

*NOTE: There is no need to remove the manual valve link retaining clip from the manual valve link unless the link, retaining clip, or manual valve is damaged. Disassembled view of the manual valve in Figure 153 is used primarily for illustrative purposes.*

1. Remove the control valve body bolt using a 10 mm socket, then remove the solenoid SLT/SLS hold down bracket as shown in Figure 154.
2. Remove the control valve body bolt using a 8 mm socket, then remove the A/T internal wire harness clip and the solenoid SLU hold down bracket as shown in Figure 154.
3. Remove the solenoids SLS, SLT, and SLU as shown in Figure 154.

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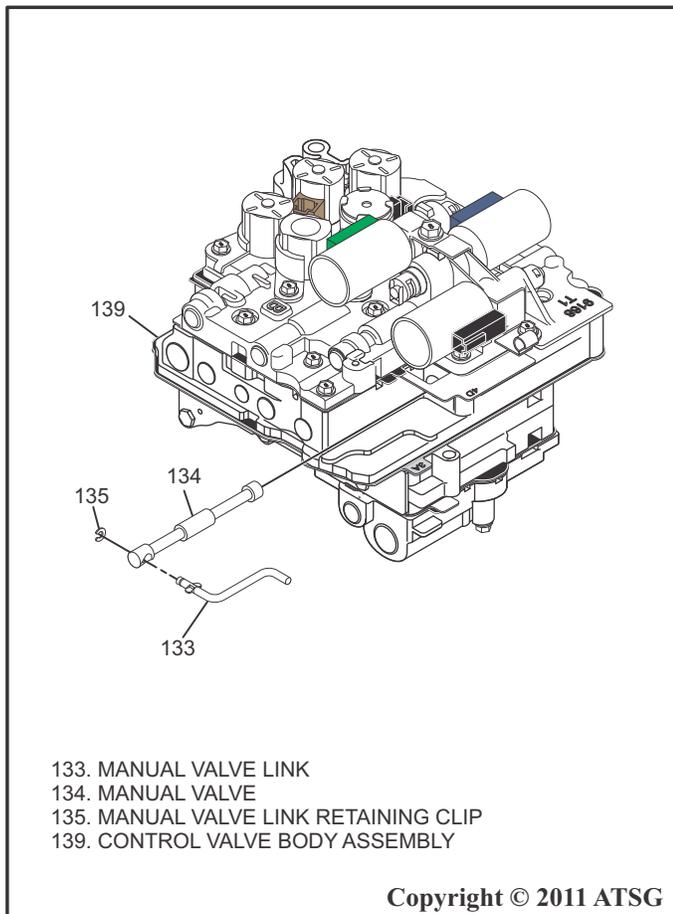


Figure 153

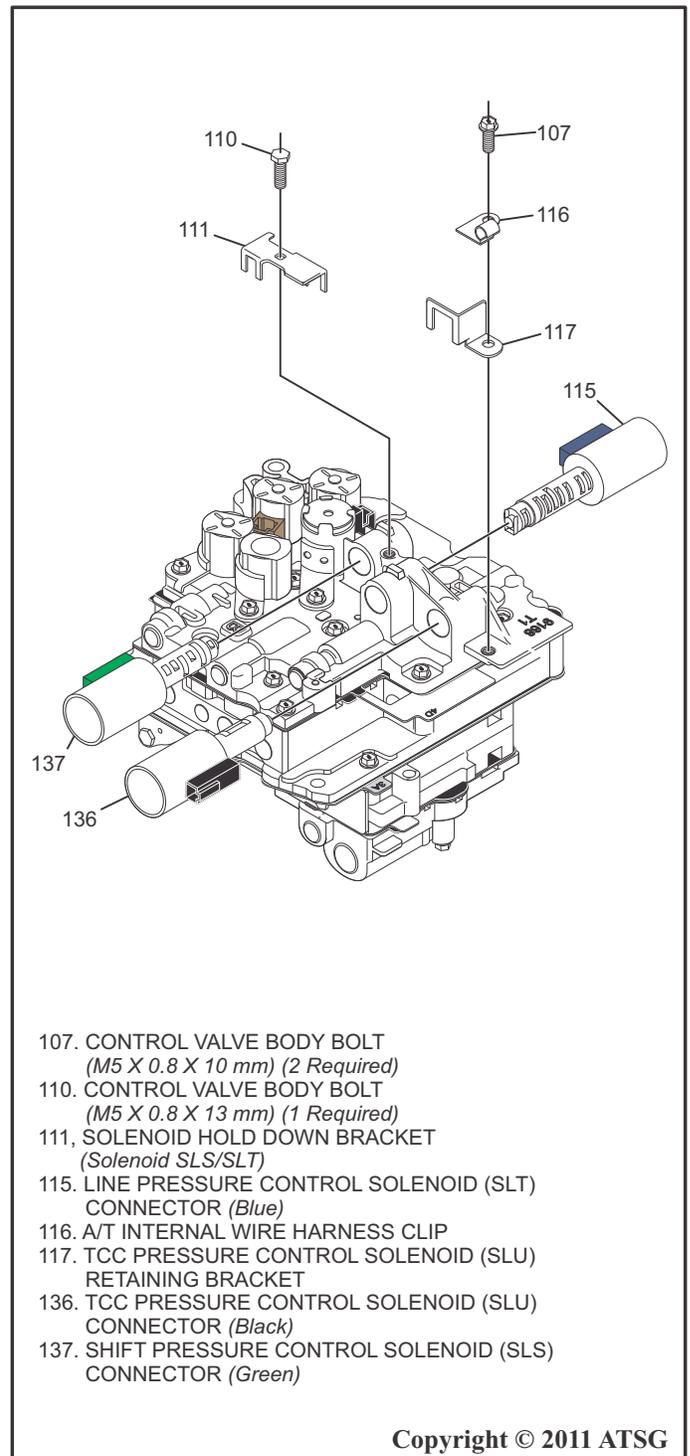


Figure 154

## COMPONENT REBUILD

### Control Valve Body Assembly Cont'd

4. Remove the control valve body bolts using a 8 mm socket, then remove the five solenoids S1, S2, S3, S4, and S5 as shown in Figure 155.
5. Remove and discard the shift solenoid valve o-ring seals as shown in Figure 155.

6. Remove the 7 remaining control valve body bolts using an 8 mm socket as shown in Figure 156.

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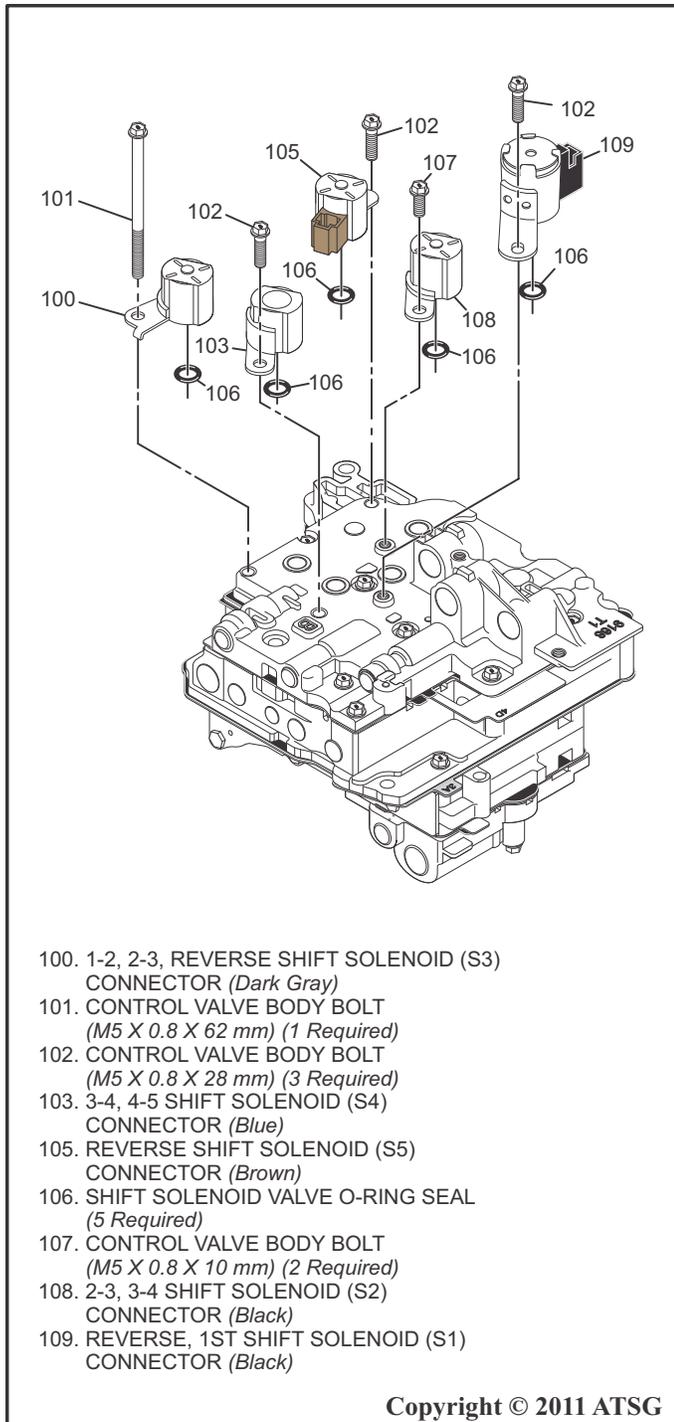


Figure 155

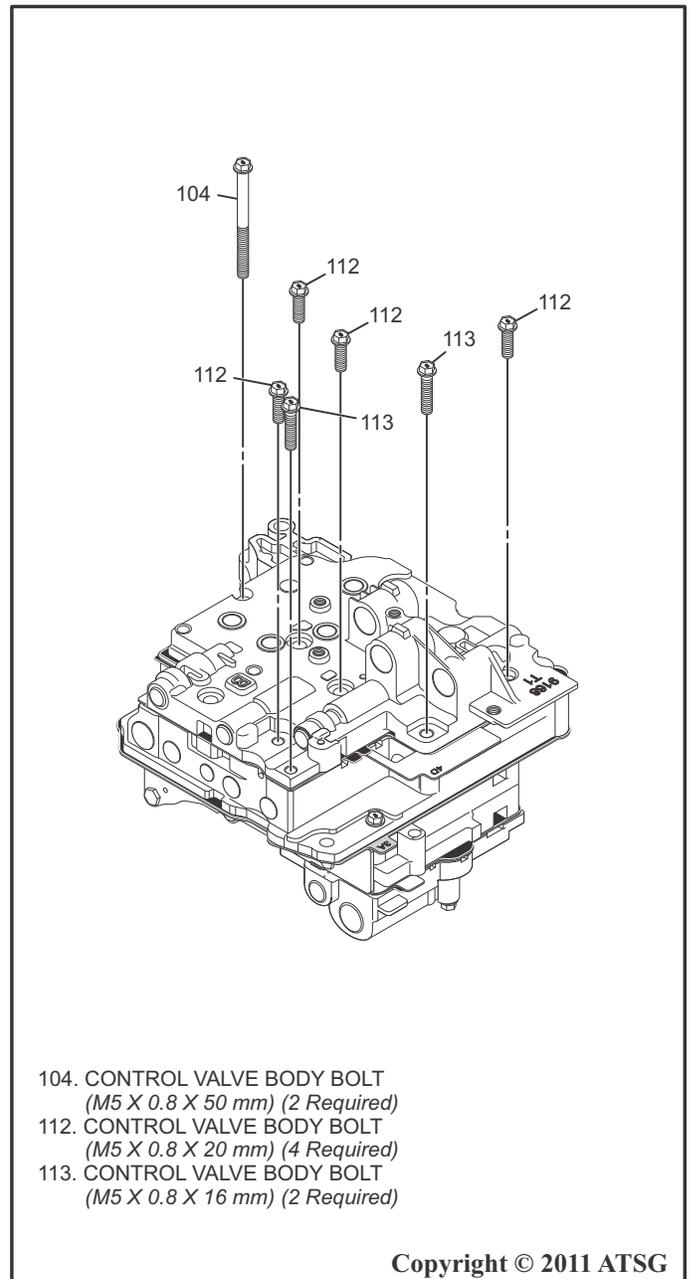


Figure 156

## COMPONENT REBUILD

### Control Valve Body Assembly Cont'd

7. Remove the front control valve body assembly, the front control valve body spacer plate and gaskets together as an assembly by holding the front control valve body spacer plate against the front control valve body while lifting gently away from the middle control valve body assembly.

8. To avoid losing small parts, flip the front control valve body assembly so the gaskets and spacer plate are facing upward and lay on the work area for further disassembly as shown in Figure 157.

9. Remove the shift solenoid filters and the accumulator check valves from the middle control valve body as shown in Figure 158.

10. Remove the control valve body bolt from the middle control valve body using an 8 mm socket as shown in Figure 158.

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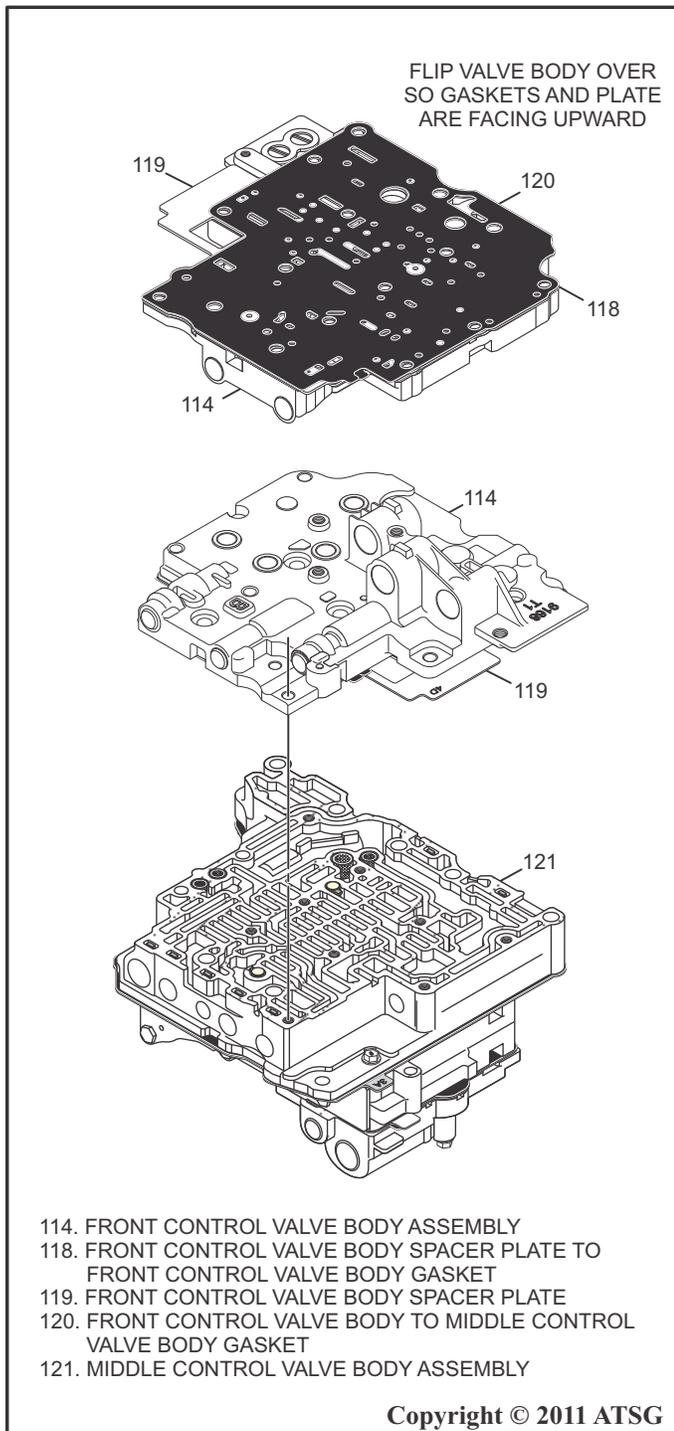


Figure 157

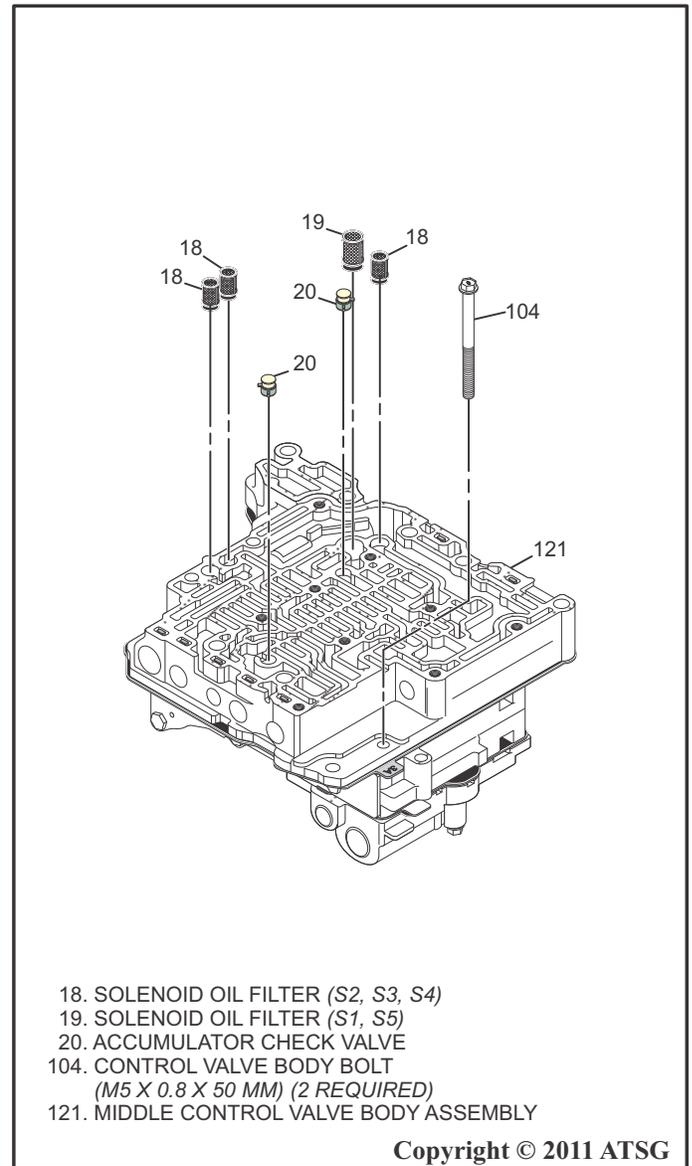


Figure 158

## COMPONENT REBUILD

### Control Valve Body Assembly Cont'd

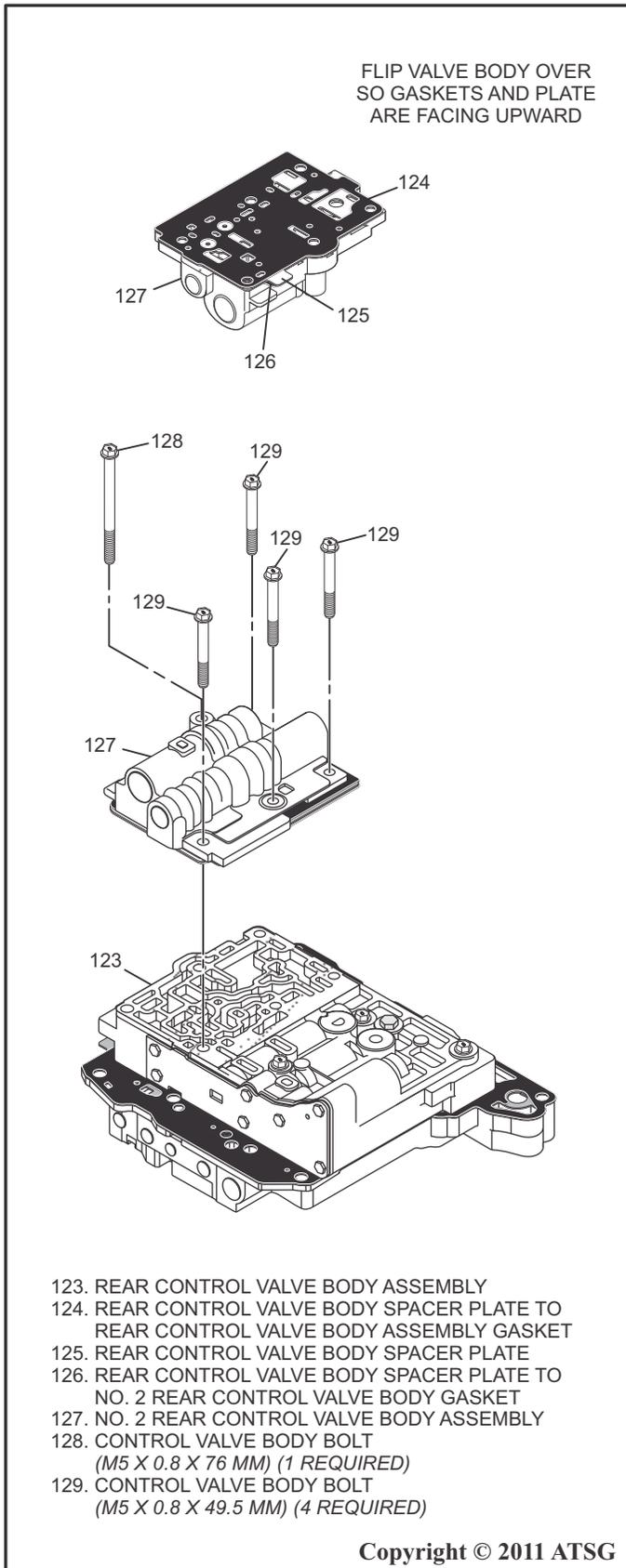


Figure 159

11. Flip the control valve body assembly over so the No. 2 rear control valve body is facing upward and remove the five control valve body bolts using an 8 mm socket as shown in Figure 159.
12. Remove the No. 2 rear control valve body, the No. 2 rear control valve body spacer plates and both gaskets as an assembly by holding the spacer plate against the No. 2 rear control valve body and lift gently away from the rear control valve body as shown in Figure 159.
13. To avoid losing small parts, flip the No. 2 rear control valve body assembly so the gaskets and spacer plate are facing upward and lay on the work area for disassembly as shown in Figure 159.
14. Remove the three control valve body bolts using an 8 mm socket as shown in Figure 160.
15. Lift straight up and remove the rear control valve body assembly as shown in Figure 160.

Cont'd on page 83

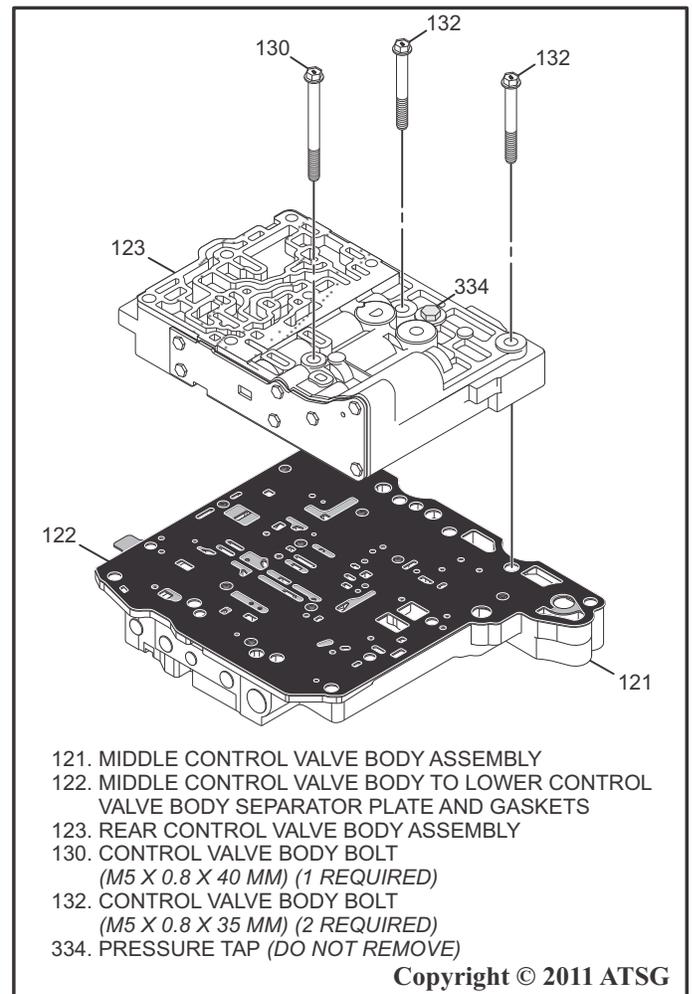


Figure 160

## COMPONENT REBUILD

### Control Valve Body Assembly Cont'd

16. Lift and remove the middle control valve body to lower control valve body separator plate with gaskets away from the middle control valve body assembly as shown in Figure 161.
17. Remove the cooler bypass valve and spring, the tcc check valve and spring and the five accumulator check valves as shown in Figure 161.
18. Lift and remove the front control valve body spacer plate gasket and spacer plate and the front control valve body spacer plate to middle control body gasket as shown in Figure 162.

19. Remove the solenoid modulator valve oil filter, the pressure relief valve and spring, the two exhaust check valves and springs and the forward clutch (C1) accumulator ball #12 as shown in Figure 162.

Cont'd on page 84

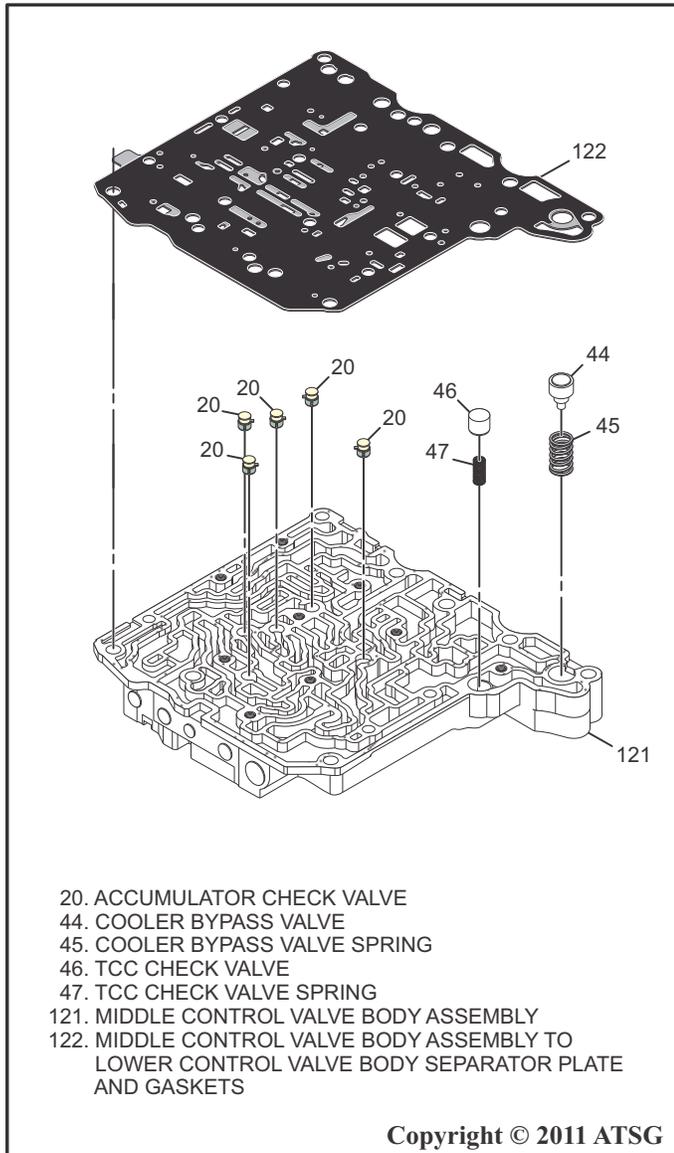


Figure 161

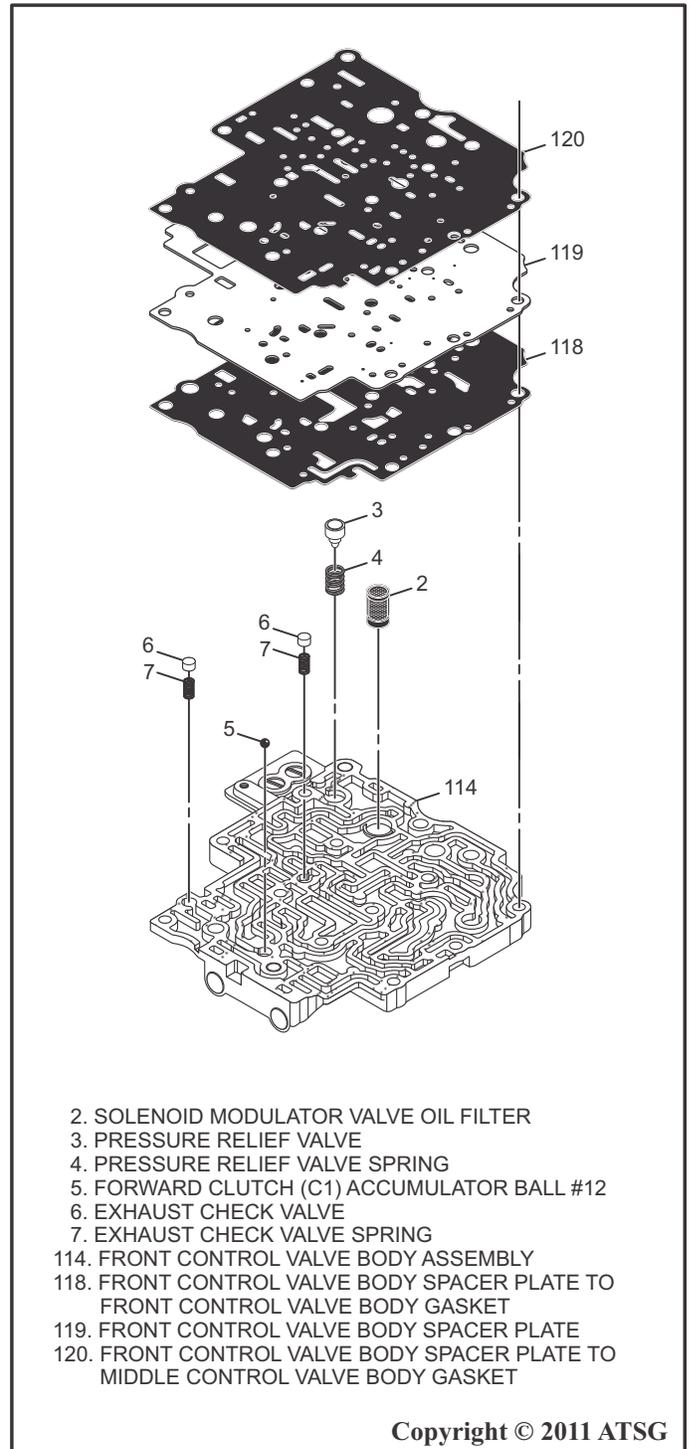


Figure 162

## **COMPONENT REBUILD**

### *Control Valve Body Assembly Cont'd*

20. Lift and remove the rear control valve body spacer plate to rear control valve body gasket, the rear control valve body spacer plate and the rear control valve body spacer plate to No. 2 rear control valve body gasket as shown in Figure 163.
21. Remove the TCC check valve, the TCC check valve spring and the two accumulator check valves as shown in Figure 163.

Cont'd on page 85

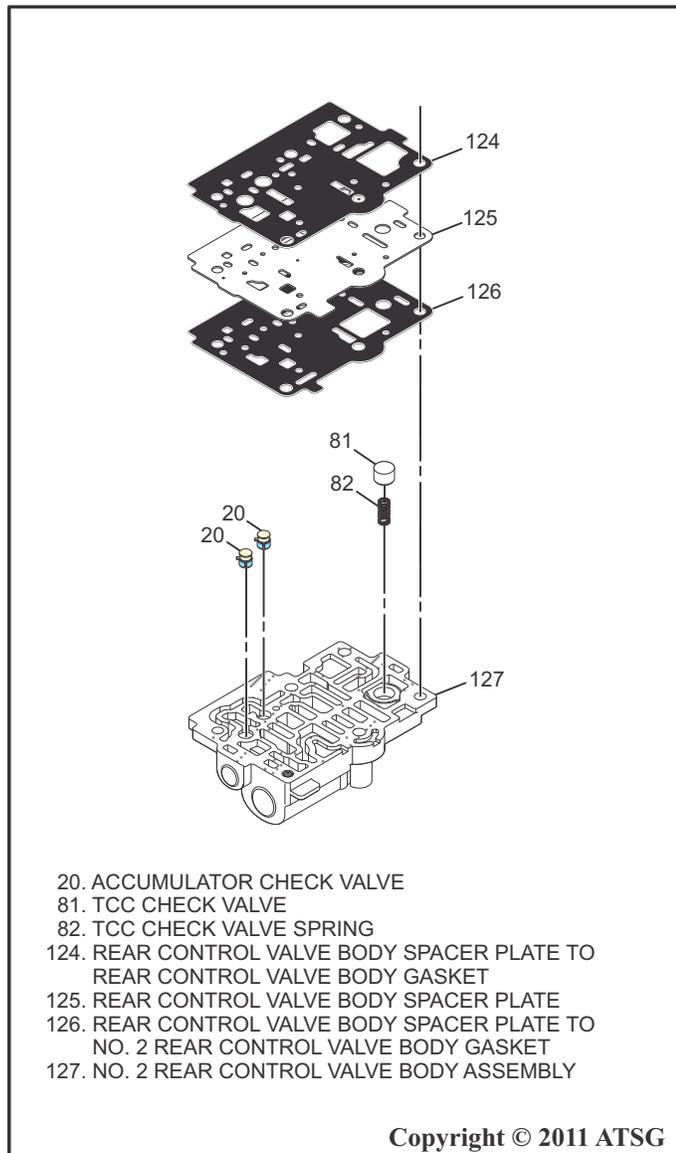


Figure 163

## COMPONENT REBUILD

### Control Valve Body Assembly Cont'd

22. Disassemble the No. 2 rear control valve body using the diagram in Figure 164 as a guide. Place all valves and springs into an appropriate tray exactly as they were removed.
23. Clean all No. 2 rear control valve body parts with solvent and dry with compressed air.
24. Assemble the No. 2 rear control valve body using the diagram in Figure 164 as a guide. Lubricate all valves with a small amount of ATF during installation.
 

*Note: the 2nd clutch (B2) control valve plug is stepped and adjustable and should be marked before removal to ensure the retainer is relocated in the factory specified setting.*
25. Remove the rear control valve body cover plate attaching bolts using an 8 mm socket then disassemble the rear control valve body using the diagram in Figure 165 as a guide.
26. Place all valves and springs into an appropriate tray exactly as they were removed.
27. Clean all rear control valve body parts with solvent and dry with compressed air.
28. Assemble the rear control valve body using the diagram in Figure 165 as a guide. Lubricate all valves with a small amount of ATF during installation.
29. Install two new rear control valve body cover plate gaskets then install the cover plates and thread the bolts into the rear control valve body.
30. Tighten the rear control valve body cover plate attaching bolts using a speed handle.
31. Torque the rear control valve body cover plate attaching bolts to 7 Nm (62 in. lb.).

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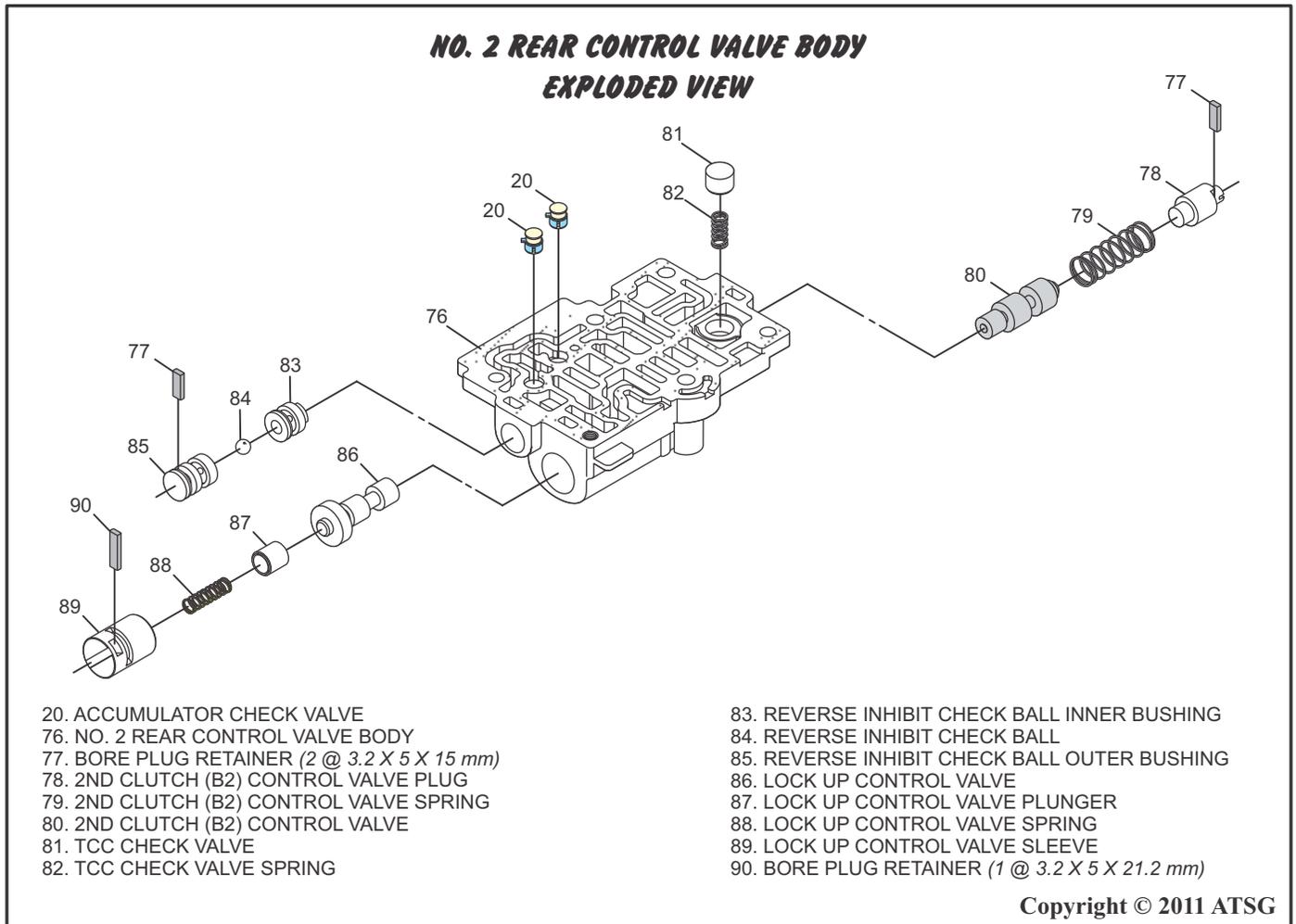
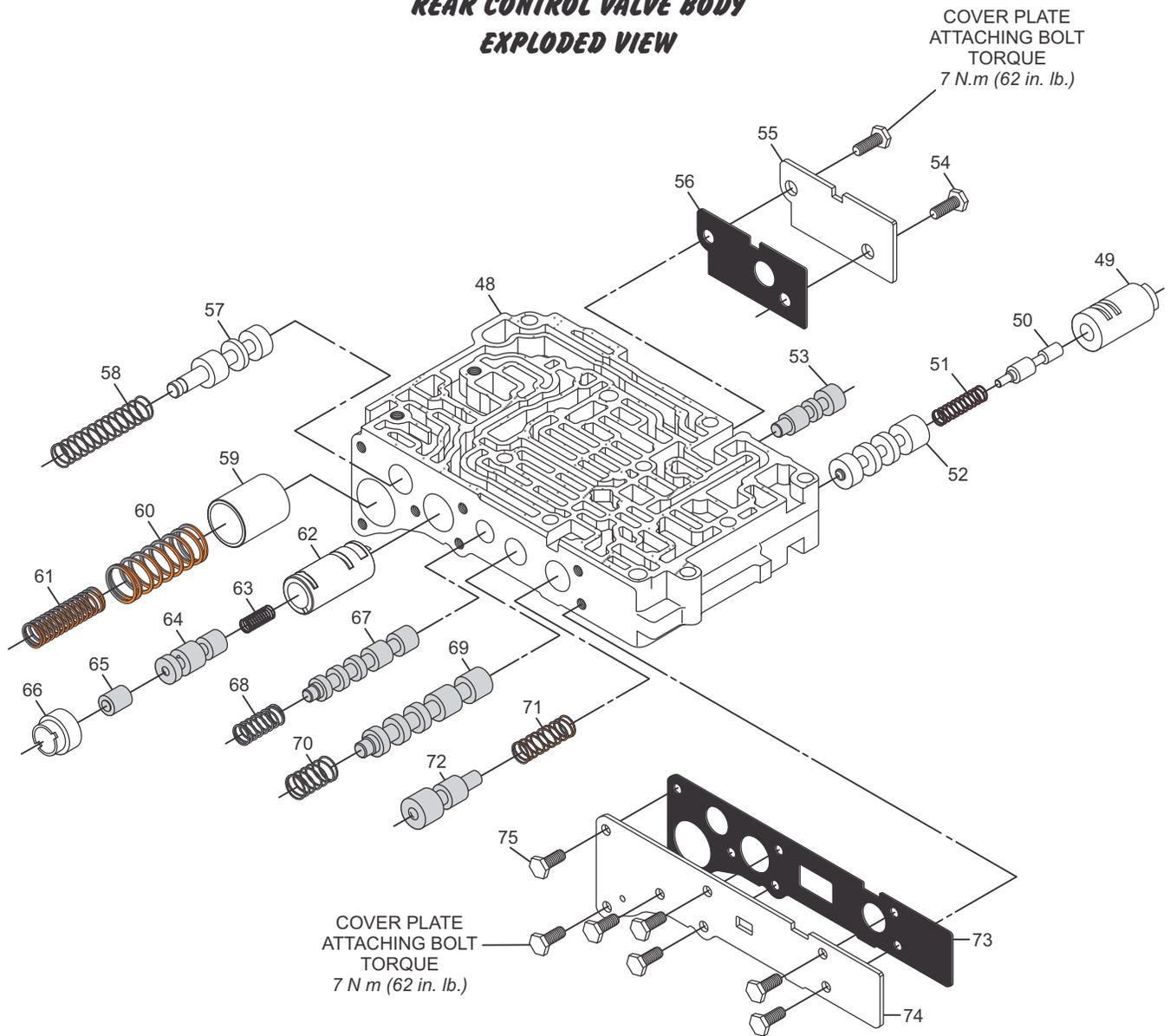


Figure 164

## REAR CONTROL VALVE BODY EXPLODED VIEW



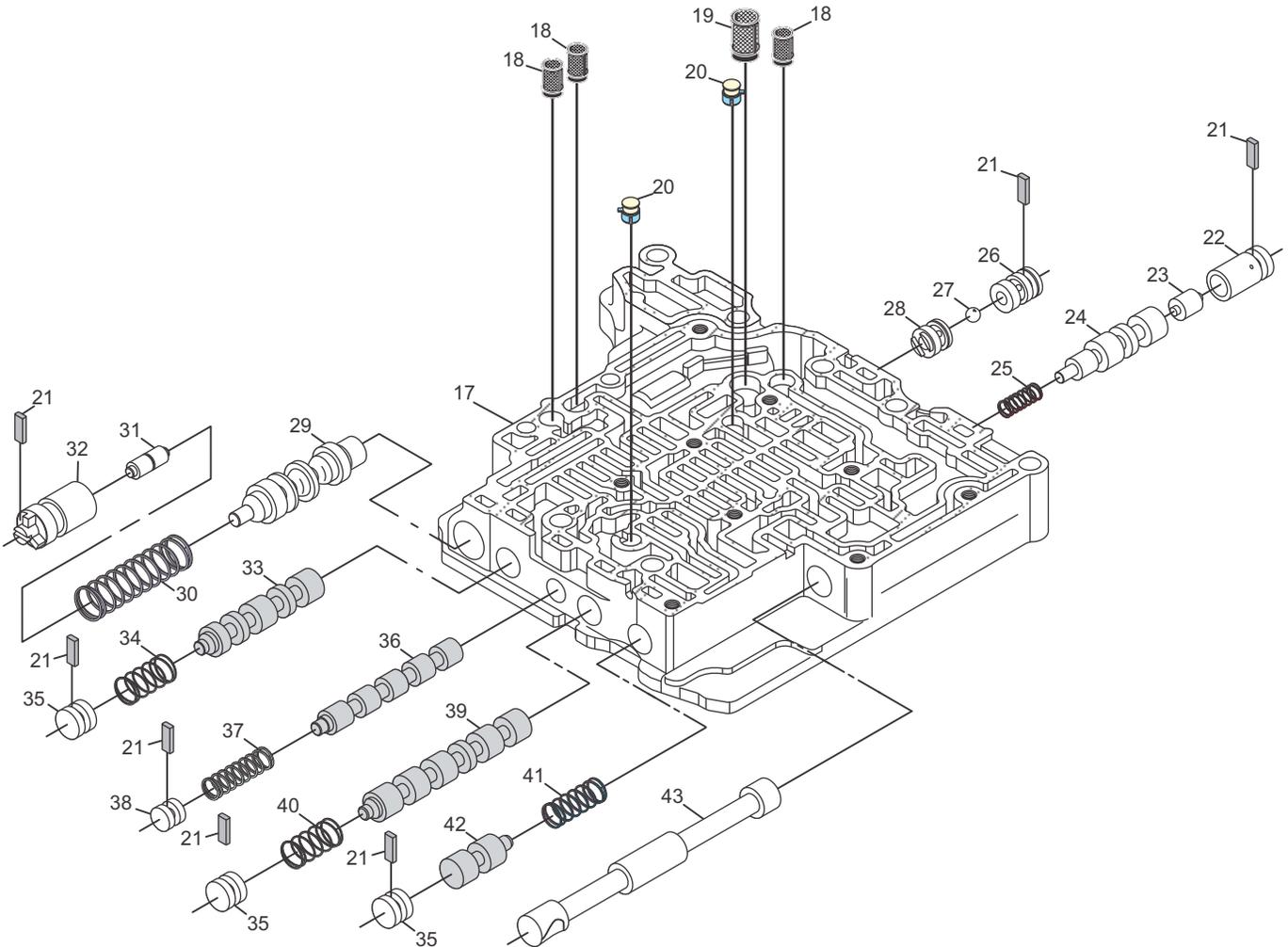
- 48. REAR CONTROL VALVE BODY
- 49. LOCK UP RELAY CONTROL VALVE SLEEVE
- 50. LOCK UP RELAY CONTROL VALVE PLUNGER
- 51. LOCK UP RELAY CONTROL VALVE SPRING
- 52. LOCK UP RELAY CONTROL VALVE
- 53. 1-2/REVERSE CLUTCH (B5) CONTROL VALVE
- 54. COVER PLATE ATTACHING BOLT (2 Required)
- 55. REAR CONTROL VALVE BODY COVER PLATE
- 56. REAR CONTROL VALVE BODY COVER PLATE GASKET
- 57. SECONDARY REGULATOR VALVE
- 58. SECONDARY REGULATOR VALVE SPRING
- 59. SOLENOID SLT ACCUMULATOR PISTON
- 60. SLT ACCUMULATOR OUTER SPRING
- 61. SLT ACCUMULATOR INNER SPRING

- 62. SHIFT PRESSURE CONTROL VALVE SLEEVE
- 63. SHIFT PRESSURE CONTROL VALVE SPRING
- 64. SHIFT PRESSURE CONTROL VALVE
- 65. SHIFT PRESSURE CONTROL VALVE PLUNGER
- 66. SHIFT PRESSURE CONTROL VALVE PLUNGER SLEEVE
- 67. M2 SHIFT VALVE
- 68. M2 SHIFT VALVE SPRING
- 69. SHIFT PRESSURE RELAY VALVE
- 70. SHIFT PRESSURE RELAY VALVE SPRING
- 71. B4 BAND CONTROL VALVE SPRING
- 72. B4 BAND CONTROL VALVE
- 73. REAR CONTROL VALVE BODY COVER PLATE GASKET
- 74. REAR CONTROL VALVE BODY COVER PLATE
- 75. COVER PLATE ATTACHING BOLT (7 Required)

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Figure 165

## MIDDLE CONTROL VALVE BODY EXPLODED VIEW



- |  |                                      |
|--|--------------------------------------|
| 17. MIDDLE CONTROL VALVE BODY                  | 31. PRESSURE REGULATOR VALVE PLUNGER |
| 18. SOLENOID OIL FILTER (S2, S3, S4)           | 32. PRESSURE REGULATOR VALVE SLEEVE  |
| 19. SOLENOID OIL FILTER (S1, S5)               | 33. U2 SHIFT VALVE                   |
| 20. ACCUMULATOR CHECK VALVE                    | 34. U2 SHIFT VALVE SPRING            |
| 21. BORE PLUG RETAINER (7 @ 3.2 X 5 X 12.5 mm) | 35. BORE PLUG (3)                    |
| 22. SOLENOID RELAY VALVE SLEEVE                | 36. M1 SHIFT VALVE                   |
| 23. SOLENOID RELAY VALVE PLUNGER               | 37. M1 SHIFT VALVE SPRING            |
| 24. SOLENOID RELAY VALVE                       | 38. M1 SHIFT VALVE BORE PLUG (1)     |
| 25. SOLENOID RELAY VALVE SPRING                | 39. U1 SHIFT VALVE                   |
| 26. REVERSE SHIFT CHECK BALL OUTER BUSHING     | 40. U1 SHIFT VALVE SPRING            |
| 27. REVERSE SHIFT CHECK BALL                   | 41. B4 RELEASE VALVE SPRING          |
| 28. REVERSE SHIFT CHECK BALL INNER BUSHING     | 42. B4 RELEASE VALVE                 |
| 29. PRESSURE REGULATOR VALVE                   | 43. MANUAL VALVE                     |
| 30. PRESSURE REGULATOR VALVE SPRING            |                                      |

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Figure 166

## COMPONENT REBUILD

### Control Valve Body Assembly Cont'd

32. Disassemble the middle control valve body using the diagram in Figure 166 as a guide. Place all valves and springs into an appropriate tray exactly as they were removed.
33. Clean all middle control valve body parts with solvent and dry with compressed air.
34. Assemble the middle control valve body using the diagram in Figure 166 as a guide. Lubricate all valves with a small amount of ATF during installation.
- Note: pressure regulator valve sleeve is stepped and adjustable and should be marked before removal to ensure the retainer is relocated in the factory specified setting.*
35. Disassemble the front control valve body using the diagram in Figure 167 as a guide. Place all valves and springs into an appropriate tray exactly as they were removed.
36. Clean all front control valve body parts with solvent and dry with compressed air.
37. Assemble the front control valve body using the diagram in Figure 167 as a guide. Lubricate all valves with a small amount of ATF during installation.

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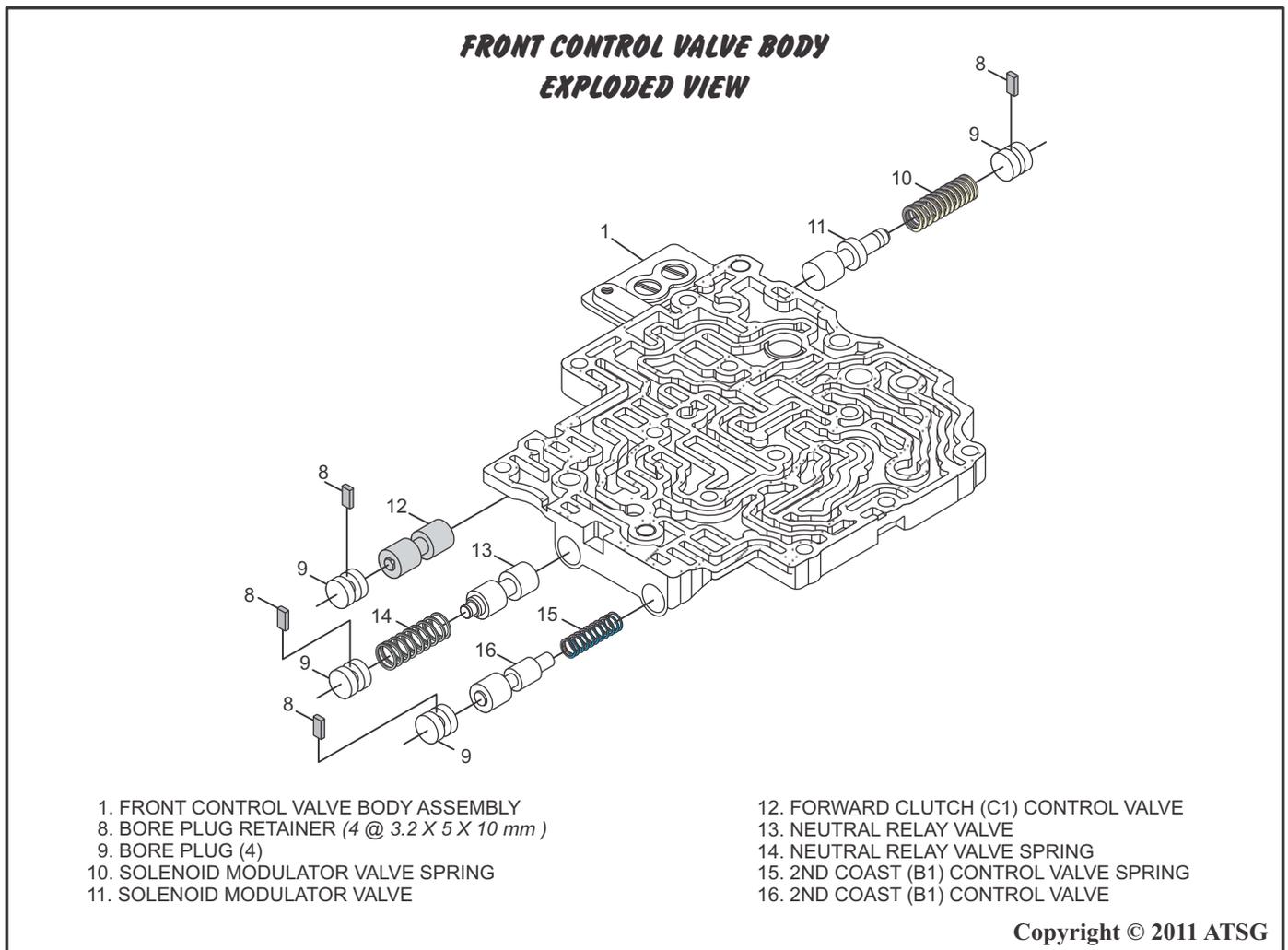


Figure 167

## COMPONENT REBUILD

### Control Valve Body Assembly Cont'd

38. Install the cooler bypass valve spring and the cooler bypass valve, the TCC check valve spring and the TCC check valve and the five accumulator check valves into the middle control valve body assembly as shown in Figure 168.
39. Install the middle control valve body assembly to lower control valve body separator plate and gaskets onto the middle control valve body as shown in Figure 168.

40. Align the bolt holes in the separator plate with the bolt holes in the middle control valve body then lower the rear control valve body onto the separator plate and thread the three control valve body attaching bolts and hand tighten only as shown in Figure 169.

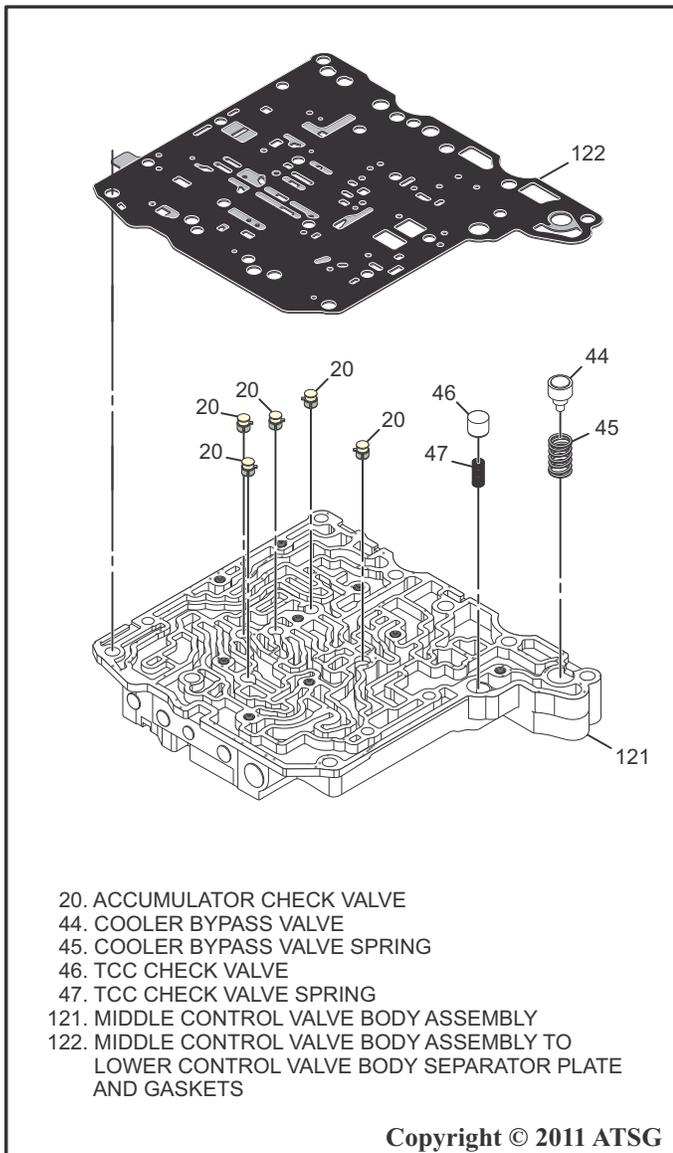


Figure 168

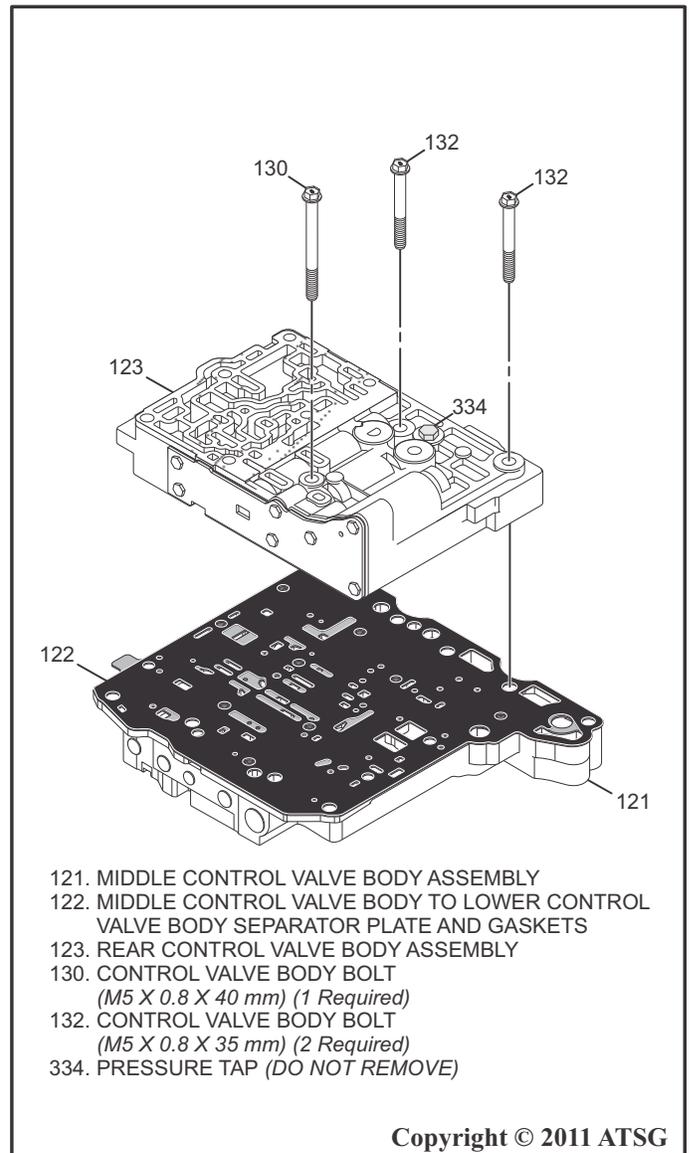


Figure 169

## COMPONENT REBUILD

### Control Valve Body Assembly Cont'd

41. Install the two accumulator check valves into the No. 2 rear control valve body assembly, then install the TCC check valve spring and the TCC check valve as shown in Figure 170.
42. Install a new rear control valve body spacer plate to No. 2 rear control valve body gasket onto the No. 2 rear control valve body, then install the rear control valve body spacer plate and the rear control valve body spacer plate to rear control valve body gasket as shown in Figure 170.
43. If necessary, use a small amount of Trans-Jel® to hold the gaskets and plate in place.
44. While holding the separator plate and gaskets to the No. 2 rear control valve body, flip the valve body over and align the bolt holes in the No. 2 rear control valve body with the bolt holes in the rear control valve body as shown in Figure 171.
45. Install the five control valve body attaching bolts and hand tighten only as shown in Figure 171.

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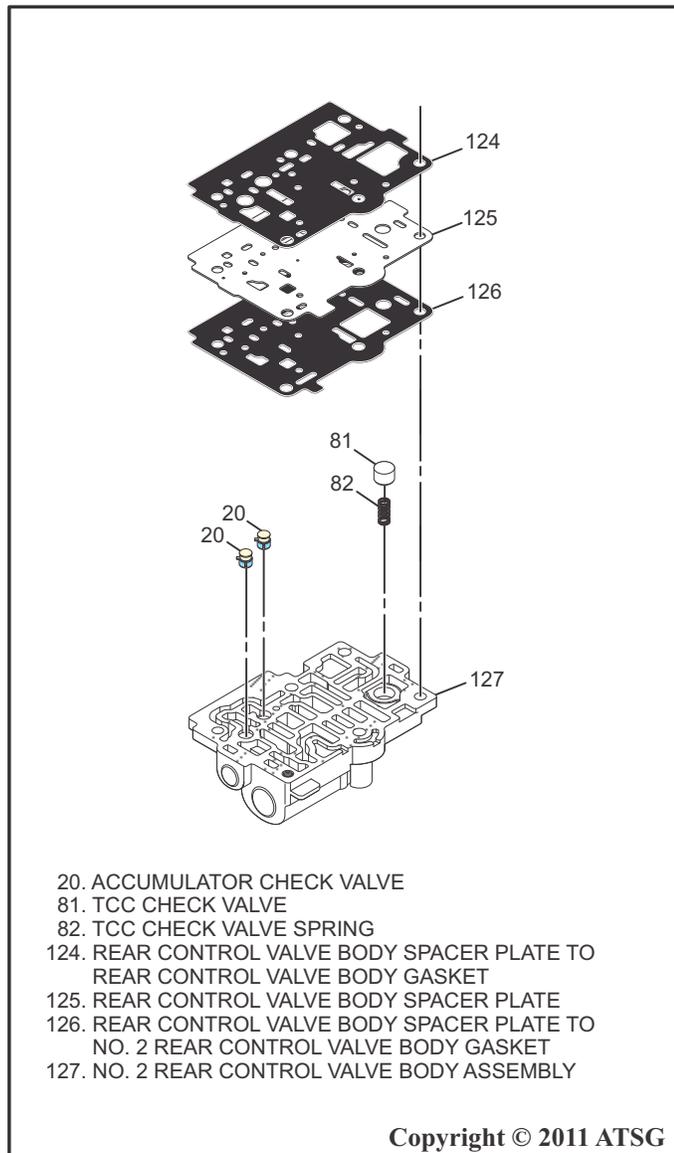


Figure 170

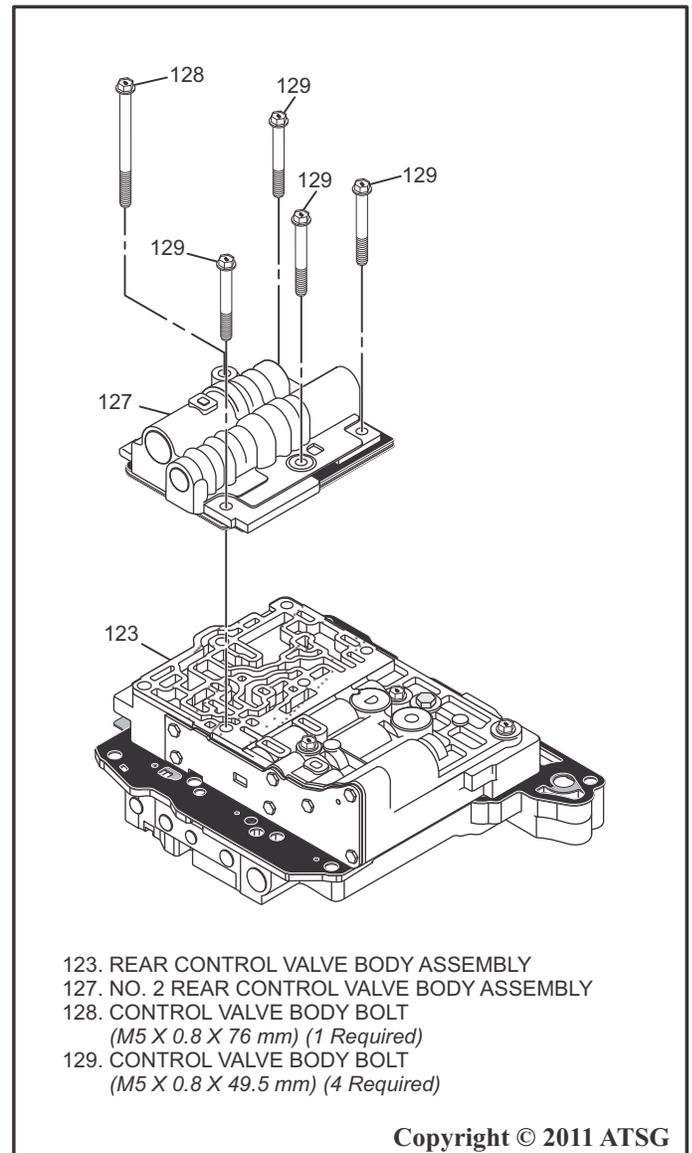


Figure 171

## COMPONENT REBUILD

### Control Valve Body Assembly Cont'd

46. Install the S2, S3, and S4 solenoid oil filters into the middle control valve body as shown in Figure 168.
47. Install the S1 and S5 oil filter into the middle control valve body as shown in Figure 172.
48. Install the two accumulator check valves into the middle control valve body and then install the control valve body attaching bolt and hand tighten only as shown in Figure 172.
49. Install the solenoid modulator valve filter into the front control valve body as shown in Figure 173.
50. Install the pressure relief valve spring and the pressure relief valve into the front control valve body as shown in Figure 173.
51. Install the two exhaust check valve springs and the check valves and the (C1) accumulator ball #12 into the valve body as shown in Figure 173.

52. Install the front control valve body spacer plate to front control valve body gasket, the spacer plate and the front control valve body spacer plate to middle control valve body gasket as shown in Figure 173.
53. Align the bolt holes in the gaskets and spacer plate with the bolt holes in the front control valve body. Use a small amount of Trans-Jel® to hold gaskets in place if necessary.

Cont'd on page 92

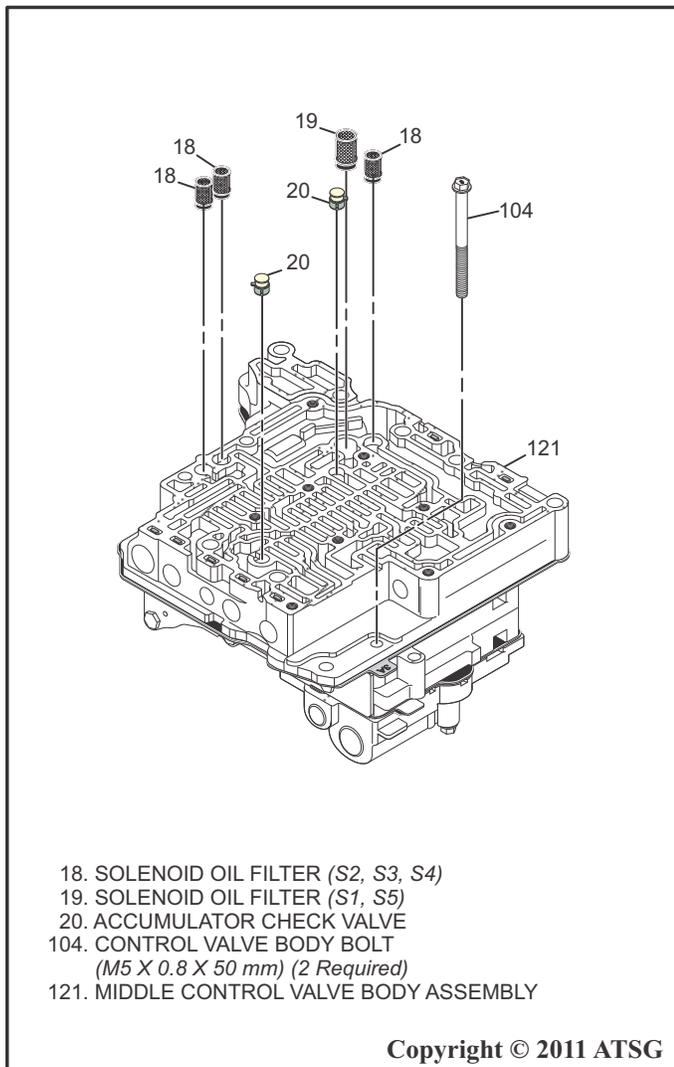


Figure 172

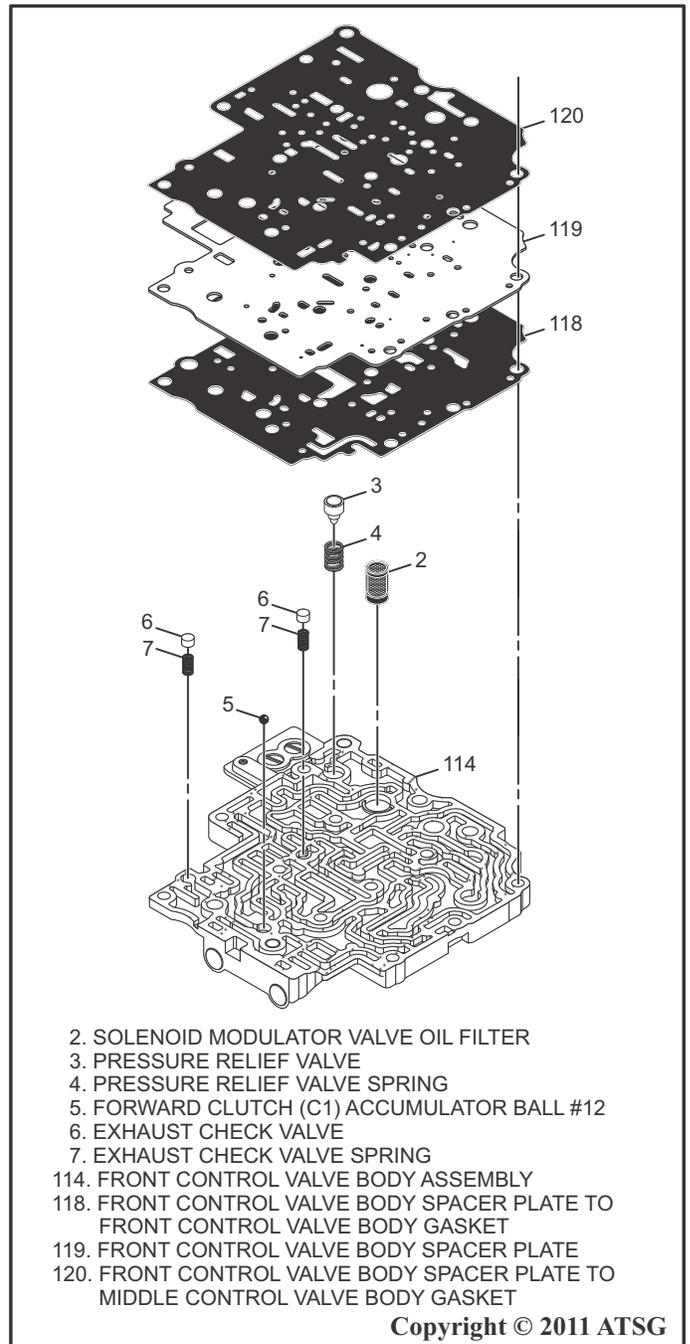


Figure 173

## COMPONENT REBUILD

### Control Valve Body Assembly Cont'd

54. While holding the separator plate and gaskets to the front control valve body, flip the valve body over and align the bolt holes in the front control valve body with the bolt holes in the middle control valve body and set valve body down onto middle control valve body as shown in Figure 174.

55. Install and hand tighten the seven control valve body attaching bolts as shown in Figure 174.

Using a torque wrench and an 8 mm socket, tighten all sixteen control valve body attaching bolts evenly from the center out and torque to  $7\text{ N m}$  ( $62\text{ in. lb.}$ ) as shown in Figure 175.

Cont'd on page 93

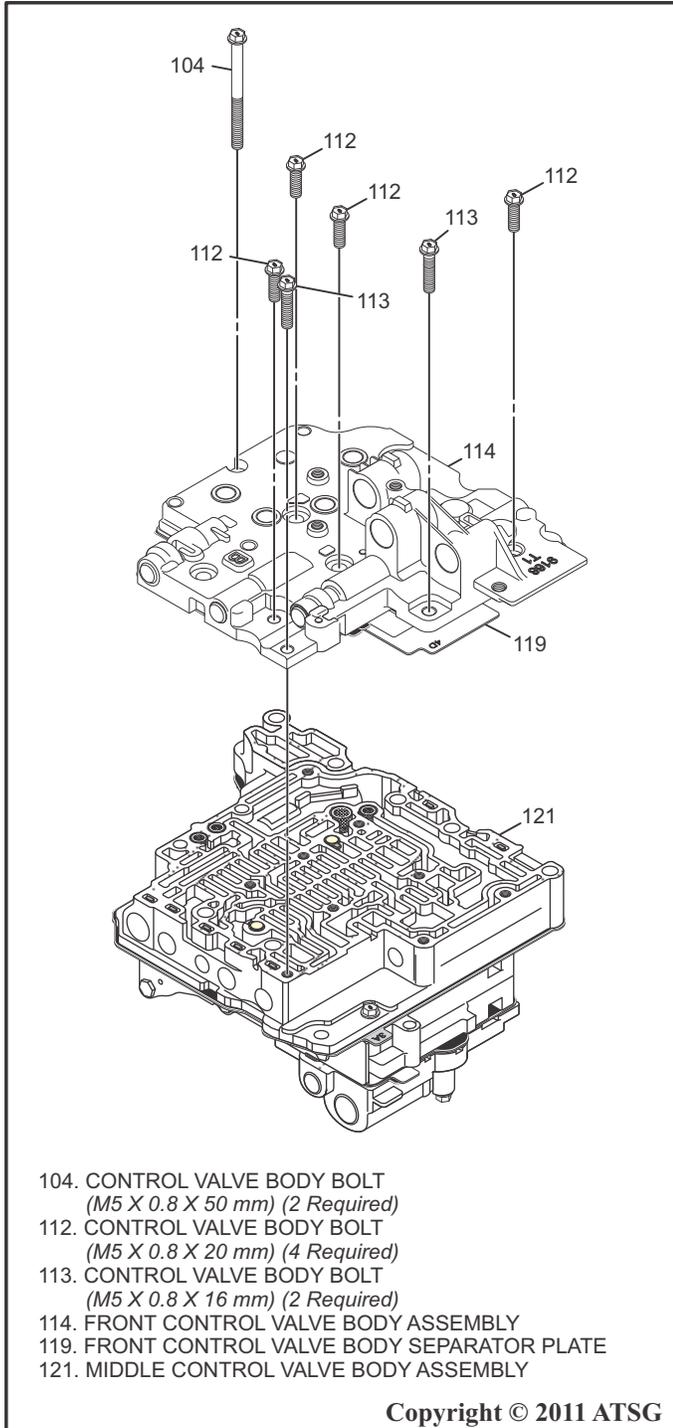


Figure 174

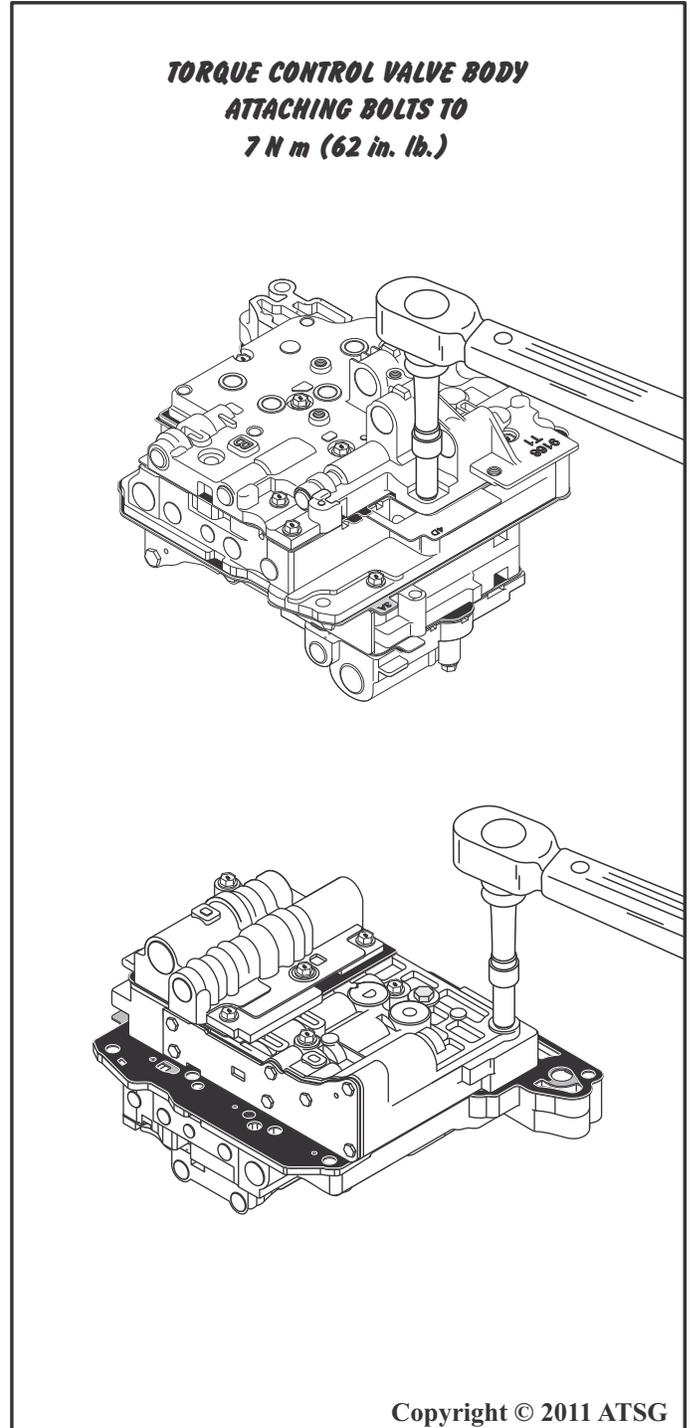


Figure 175

## COMPONENT REBUILD

### Control Valve Body Assembly Cont'd

56. Install new o-rings on each of the five shift solenoids. Coat the o-rings with a small amount of ATF or Trans-Jel® then install each solenoid into the front control valve body as shown in Figure 176.

57. Install the five solenoid control valve body attaching bolts as shown in Figure 177.

Using a torque wrench and an 8 mm socket, tighten the solenoid control valve body bolts and torque the bolts to  $7\text{ N m}$  ( $62\text{ in. lb.}$ ) as shown in Figure 177.

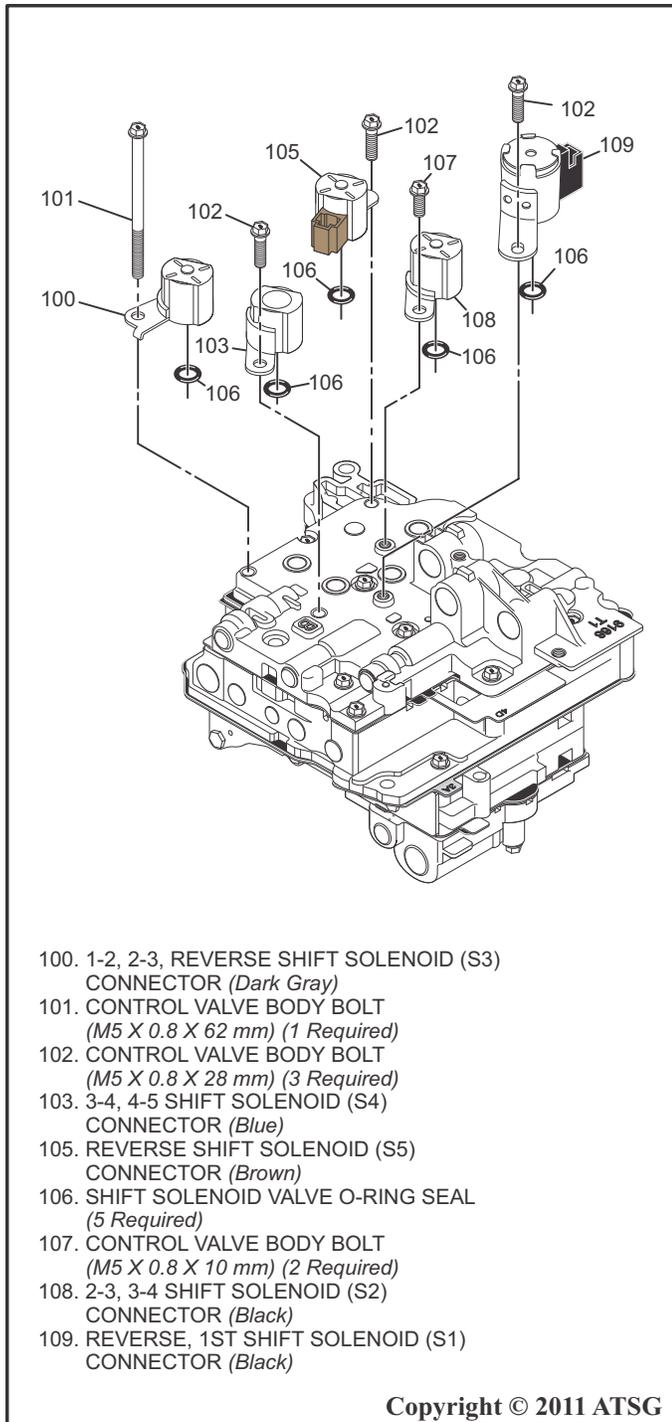


Figure 176

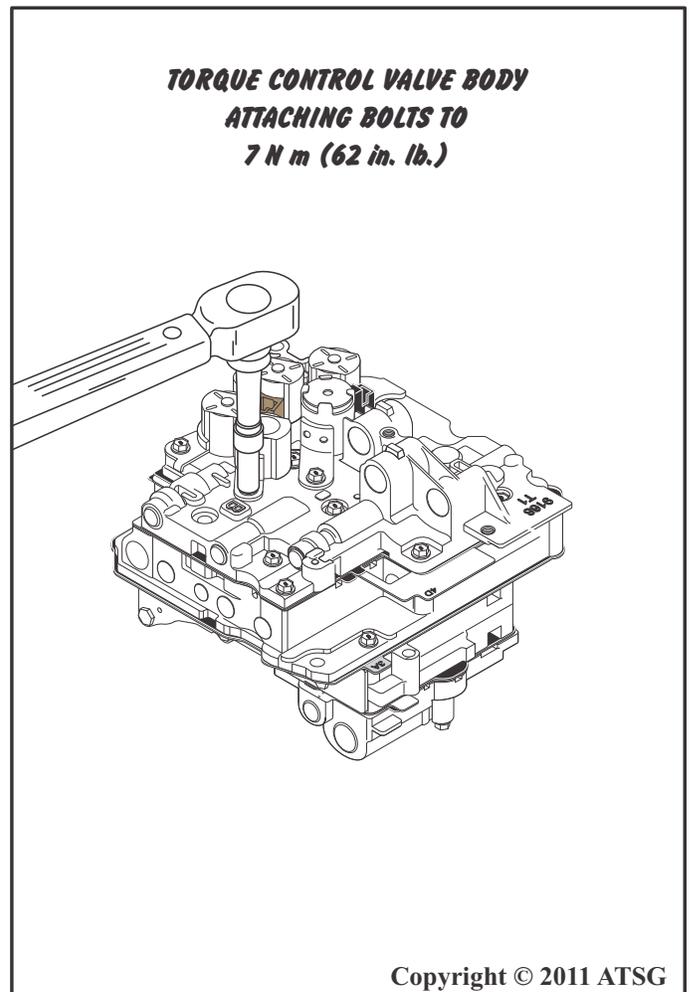


Figure 177

## COMPONENT REBUILD

### Control Valve Body Assembly

58. Install solenoids SLS, SLT, and SLU into the front control valve body as shown in Figure 178.

59. Install the solenoid SLT/SLS hold down bracket and the 10 mm bolt as shown in Figure 178.

Install the solenoid SLU hold down bracket and the 60. A/T internal wire harness clip, then the control valve body bolt as shown in Figure 178.

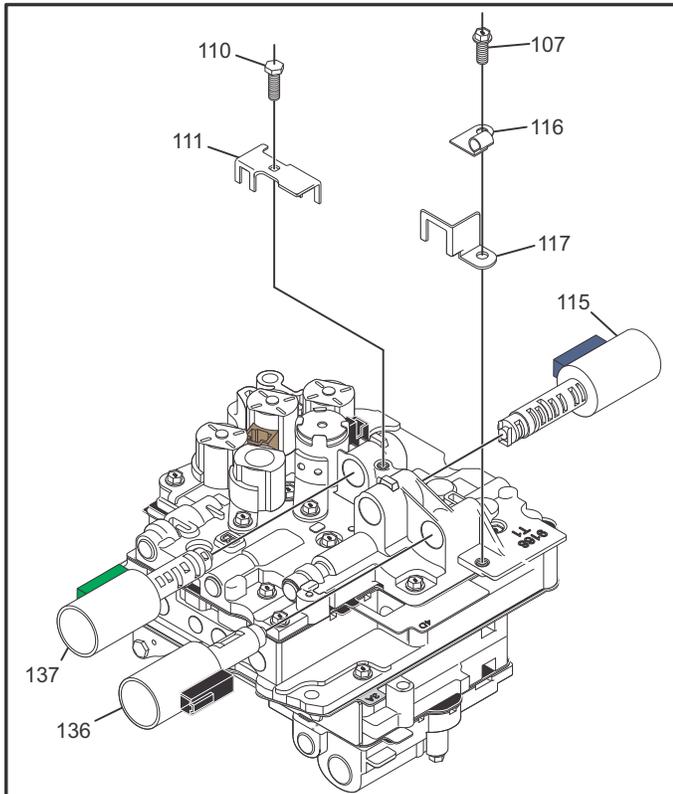
Tighten control valve body bolt 110 using a torque wrench and a 10 mm socket and torque to 7 Nm (62 in. lb.) as shown in Figure 178.

Tighten control valve body bolt 107 using a torque wrench and an 8 mm socket and torque to 7 Nm (62 in. lb.) as shown in Figure 178.

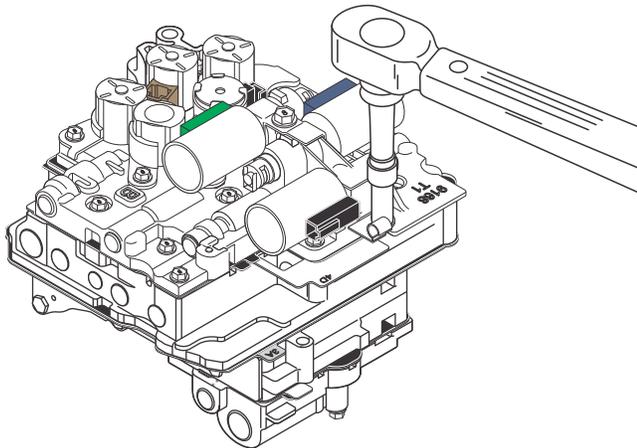
Install the manual valve into the valve body as 63. shown in Figure 179.

Set control valve body assembly aside for final 64. assembly.

The following valve body diagrams in Figures 180 65. thru 207 on pages 95 thru 122 detail the differences in the four valve body types. They are classified early to late by their respective ID stamps located on top of the Front Control Valve Body Assembly as shown in Figure 179, and can be identified by "No ID Stamp", ID Stamp "A", ID Stamp "B" and ID Stamp "C".



**TORQUE CONTROL VALVE BODY  
ATTACHING BOLTS TO  
7 N m (62 in. lb.)**

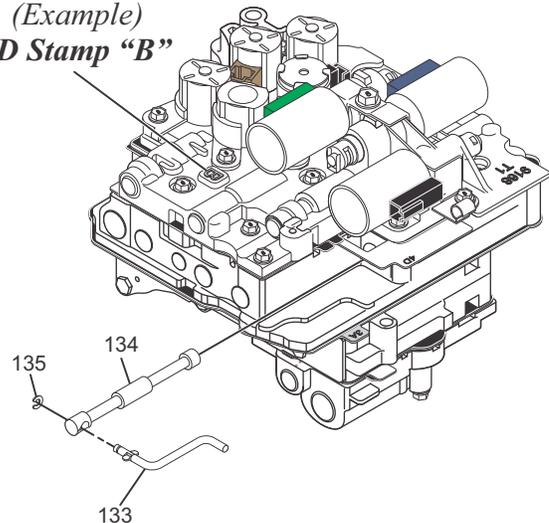


- 107. CONTROL VALVE BODY BOLT  
(M5 X 0.8 X 10 mm) (2 Required)
- 110. CONTROL VALVE BODY BOLT  
(M5 X 0.8 X 13 mm) (1 Required)
- 111. SOLENOID HOLD DOWN BRACKET  
(Solenoid SLS/SLT)
- 115. LINE PRESSURE CONTROL SOLENOID (SLT)  
CONNECTOR (Blue)
- 116. A/T INTERNAL WIRE HARNESS CLIP
- 117. TCC PRESSURE CONTROL SOLENOID (SLU)  
RETAINING BRACKET
- 136. TCC PRESSURE CONTROL SOLENOID (SLU)  
CONNECTOR (Black)
- 137. SHIFT PRESSURE CONTROL SOLENOID (SLS)  
CONNECTOR (Green)

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Figure 178

ID Stamp Location  
(Example)  
ID Stamp "B"

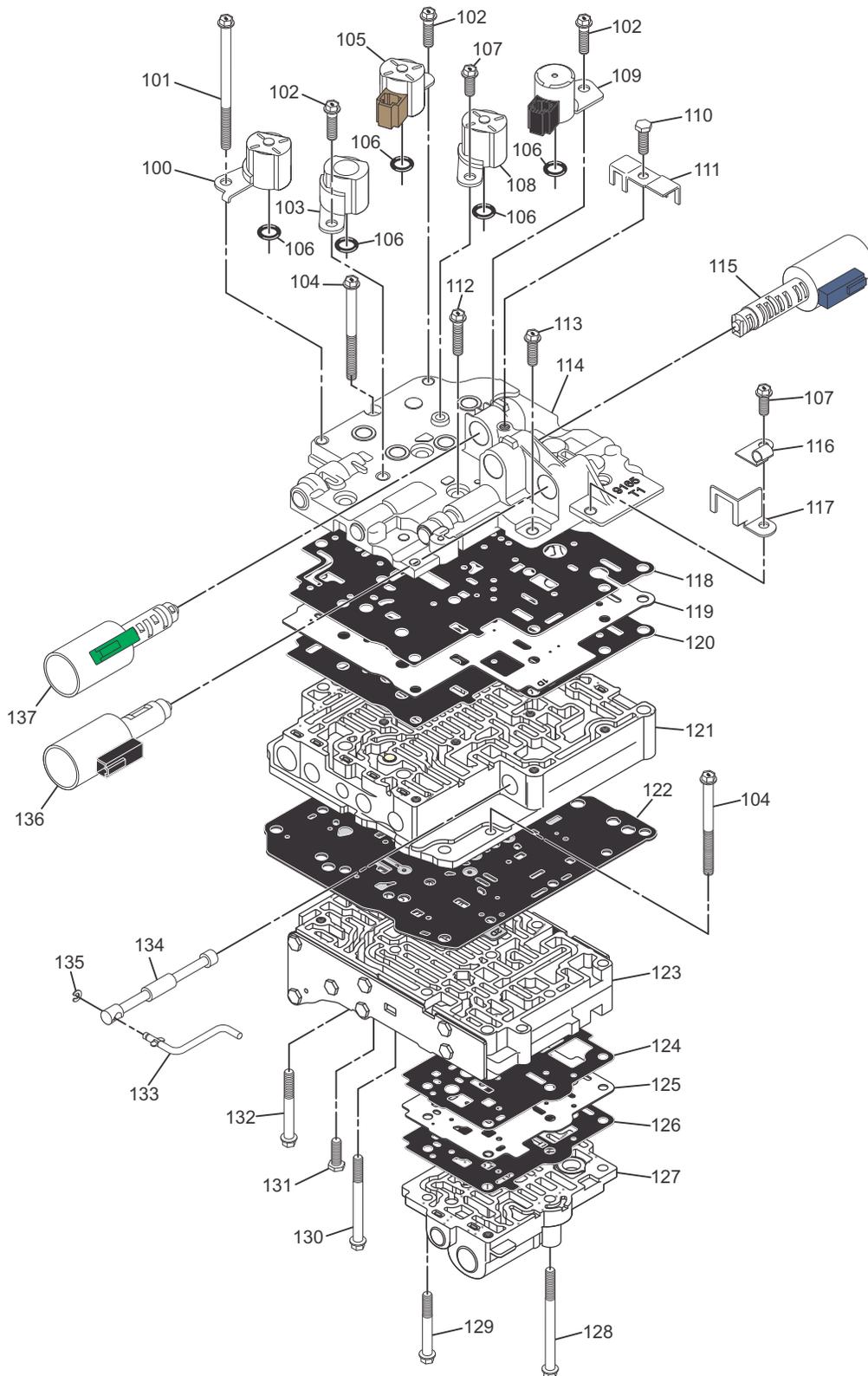


- 133. MANUAL VALVE LINK
- 134. MANUAL VALVE
- 135. MANUAL VALVE LINK RETAINING CLIP

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Figure 179

**CONTROL VALVE BODY ASSEMBLY  
EXPLODED VIEW  
ID. STAMP "NONE"**



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Figure 180

## ***CONTROL VALVE BODY ASSEMBLY LEGEND***

- |   |  |
|---|--|
| 100. 1-2, 2-3, REVERSE SHIFT SOLENOID (S3) CONNECTOR (DARK GRAY)              | 120. FRONT CONTROL VALVE BODY SPACER PLATE TO MIDDLE CONTROL VALVE BODY GASKET                         |
| 101. CONTROL VALVE BODY BOLT (M5 X 0.8 X 62 mm) (1 REQUIRED)                  | 121. MIDDLE CONTROL VALVE BODY ASSEMBLY  |
| 102. CONTROL VALVE BODY BOLT (M5 X 0.8 X 28 mm) (3 REQUIRED)                  | 122. MIDDLE CONTROL VALVE BODY ASSEMBLY TO LOWER CONTROL VALVE BODY SEPARATOR PLATE AND BONDED GASKETS |
| 103. 3-4, 4-5 SHIFT SOLENOID (S4) CONNECTOR (BLUE)                            | 123. REAR CONTROL VALVE BODY ASSEMBLY  |
| 104. CONTROL VALVE BODY BOLT (M5 X 0.8 X 50mm) (2 REQUIRED)                   | 124. REAR CONTROL VALVE BODY SPACER PLATE TO REAR CONTROL VALVE BODY ASSEMBLY GASKET                   |
| 105. REVERSE SHIFT SOLENOID (S5) CONNECTOR (BROWN)                            | 125. REAR CONTROL VALVE BODY SPACER PLATE  |
| 106. SHIFT SOLENOID VALVE O-RING SEAL (5 REQUIRED)                            | 126. REAR CONTROL VALVE BODY SPACER PLATE TO NO. 2 REAR CONTROL VALVE BODY GASKET                      |
| 107. CONTROL VALVE BODY BOLT (M5 X 0.8 X 10 mm) (2 REQUIRED)                  | 127. NO. 2 REAR CONTROL VALVE BODY ASSEMBLY  |
| 108. 2-3, 3-4 SHIFT SOLENOID (S2) CONNECTOR (BLACK)                           | 128. CONTROL VALVE BODY BOLT (M5 X 0.8 X 76 mm) (1 REQUIRED)   |
| 109. REVERSE, 1ST SHIFT SOLENOID (S1) CONNECTOR (BLACK)                       | 129. CONTROL VALVE BODY BOLT (M5 X 0.8 X 49.5 mm) (4 REQUIRED)   |
| 110. CONTROL VALVE BODY BOLT (M5 X 0.8 X 13 mm) (1 REQUIRED)                  | 130. CONTROL VALVE BODY BOLT (M5 X 0.8 X 40 mm) (1 REQUIRED)   |
| 111. SOLENOID HOLD DOWN BRACKET (SOLENOID SLS/SLT)                            | 131. CONTROL VALVE BODY ASSEMBLY PRESSURE TEST PORT BOLT (M6 X 1.0 X 12 mm) (1 REQUIRED)               |
| 112. CONTROL VALVE BODY BOLT (M5 X 0.8 X 20 mm) (4 REQUIRED)                  | 132. CONTROL VALVE BODY BOLT (M5 X 0.8 X 35 mm) (2 REQUIRED)   |
| 113. CONTROL VALVE BODY BOLT (M5 X 0.8 X 16 mm) (2 REQUIRED)                  | 133. MANUAL VALVE LINK   |
| 114. FRONT CONTROL VALVE BODY ASSEMBLY  | 134. MANUAL VALVE  |
| 115. LINE PRESSURE CONTROL SOLENOID (SLT) CONNECTOR (BLUE)                    | 135. MANUAL VALVE LINK RETAINING CLIP  |
| 116. A/T INTERNAL WIRE HARNESS CLIP   | 136. TCC PRESSURE CONTROL SOLENOID (SLU) CONNECTOR (BLACK)   |
| 117. TCC PRESSURE CONTROL SOLENOID (SLU) RETAINING BRACKET                    | 137. SHIFT PRESSURE CONTROL SOLENOID (SLS) CONNECTOR (GREEN)   |
| 118. FRONT CONTROL VALVE BODY SPACER PLATE TO FRONT CONTROL VALVE BODY GASKET |  |
| 119. FRONT CONTROL VALVE BODY SPACER PLATE                                    |  |

**FRONT CONTROL VALVE BODY**

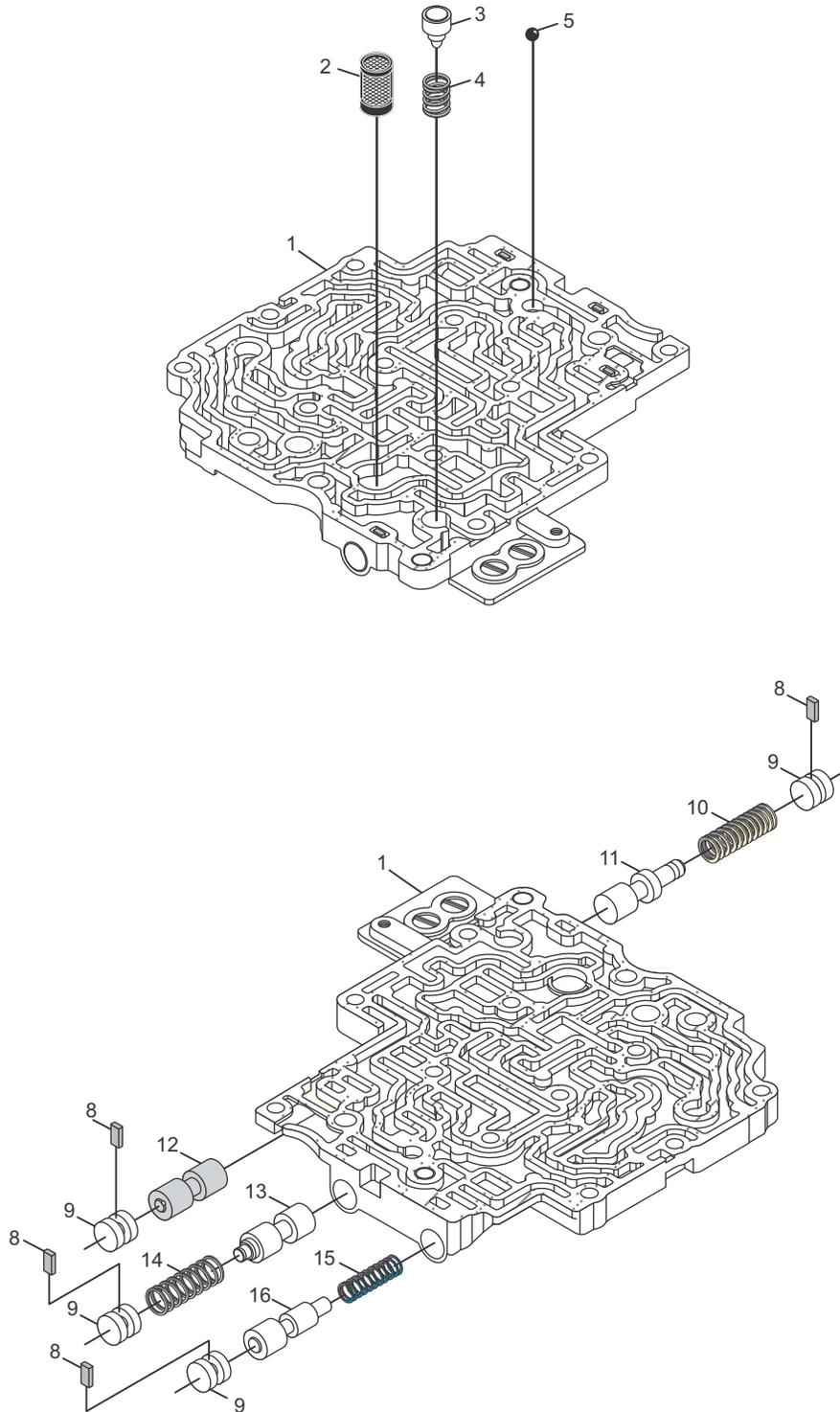
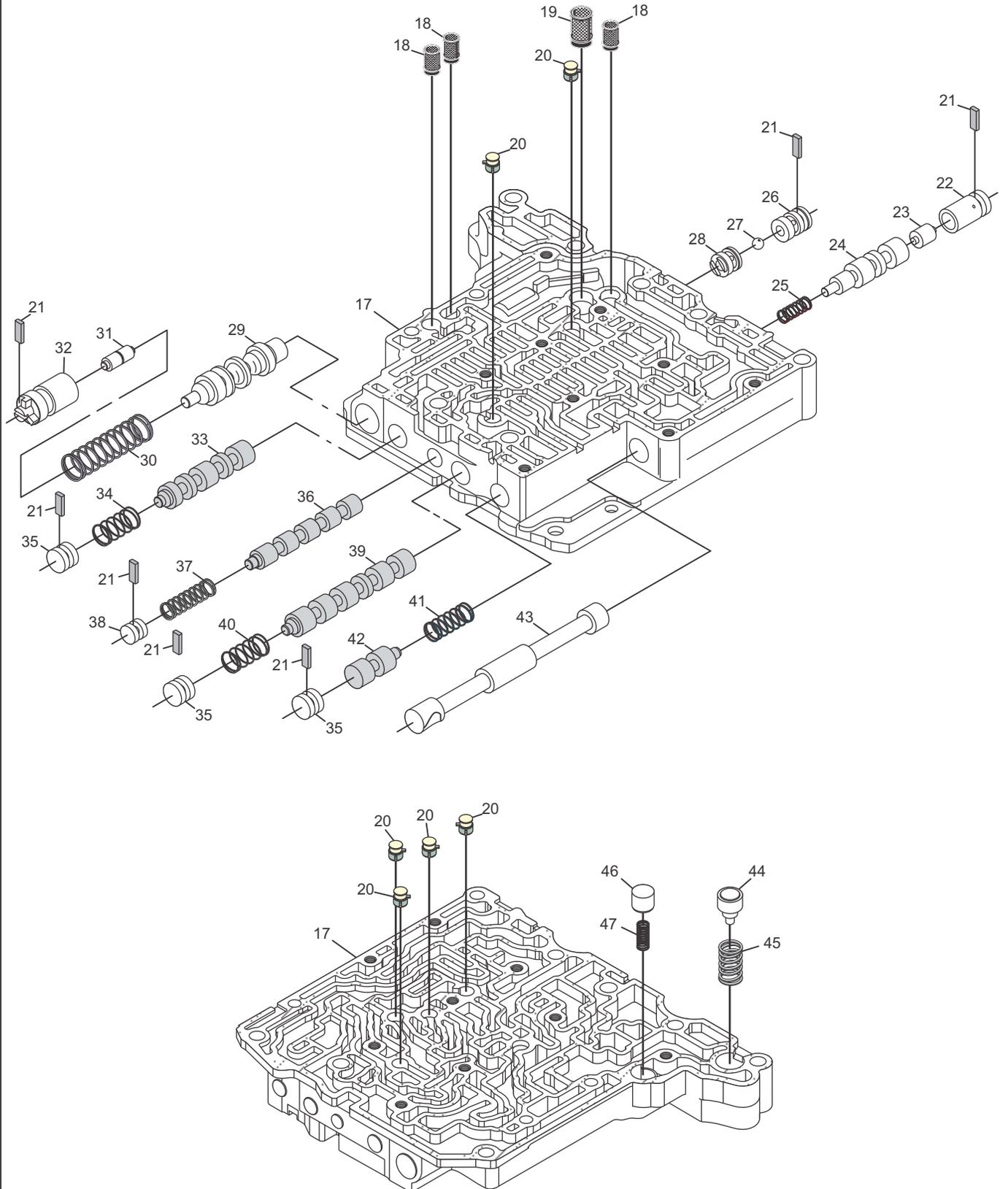


Figure 182

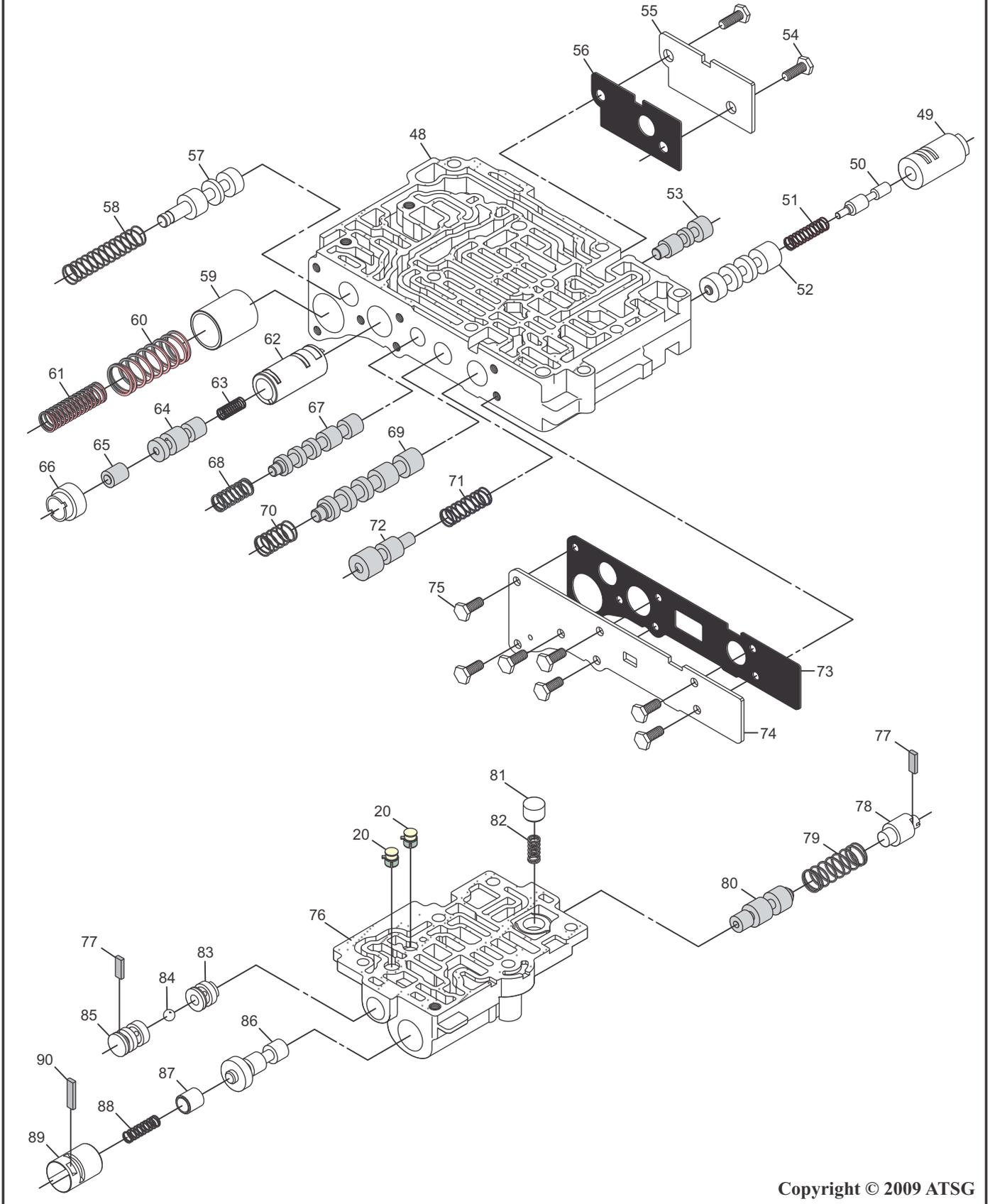
## MIDDLE CONTROL VALVE BODY



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Figure 183

## REAR CONTROL VALVE BODY NO. 2 REAR CONTROL VALVE BODY



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Figure 184

## **CONTROL VALVE BODY ASSEMBLY LEGEND**

- |  |   |
|--|---|
| 1. FRONT CONTROL VALVE BODY                        | 46. TCC CHECK VALVE                                   |
| 2. SOLENOID MODULATOR VALVE OIL FILTER             | 47. TCC CHECK VALVE SPRING (ID. YELLOW)               |
| 3. PRESSURE RELIEF VALVE                           | 48. REAR CONTROL VALVE BODY                           |
| 4. PRESSURE RELIEF VALVE SPRING (ID. NONE)         | 49. LOCK UP RELAY CONTROL VALVE SLEEVE                |
| 5. FORWARD CLUTCH (C1) ACCUMULATOR BALL #12        | 50. LOCK UP RELAY CONTROL VALVE PLUNGER               |
| 8. BORE PLUG RETAINER (4 @ 3.2 X 5 X 10 mm)        | 51. LOCK UP RELAY CONTROL VALVE SPRING (ID. RED)      |
| 9. BORE PLUG (4)                                   | 52. LOCK UP RELAY CONTROL VALVE                       |
| 10. SOLENOID MODULATOR VALVE SPRING (ID. YELLOW)   | 53. 1-2/REVERSE CLUTCH (B5) CONTROL VALVE             |
| 11. SOLENOID MODULATOR VALVE                       | 54. COVER PLATE ATTACHING BOLT (2 REQUIRED)           |
| 12. FORWARD CLUTCH (C1) CONTROL VALVE              | 55. REAR CONTROL VALVE BODY COVER PLATE               |
| 13. NEUTRAL RELAY VALVE                            | 56. REAR CONTROL VALVE BODY COVER PLATE GASKET        |
| 14. NEUTRAL RELAY VALVE SPRING (ID. LT. GREEN)     | 57. SECONDARY REGULATOR VALVE                         |
| 15. 2ND COAST (B1) CONTROL VALVE SPRING (ID. BLUE) | 58. SECONDARY REGULATOR VALVE SPRING (ID. NONE)       |
| 16. 2ND COAST (B1) CONTROL VALVE                   | 59. SOLENOID SLT ACCUMULATOR PISTON                   |
| 17. MIDDLE CONTROL VALVE BODY                      | 60. SLT ACCUMULATOR OUTER SPRING (ID. PINK)           |
| 18. SOLENOID OIL FILTER (S2, S3, S4)               | 61. SLT ACCUMULATOR INNER SPRING (ID. PINK)           |
| 19. SOLENOID OIL FILTER (S1, S5)                   | 62. SHIFT PRESSURE CONTROL VALVE SLEEVE               |
| 20. ACCUMULATOR CHECK VALVE                        | 63. SHIFT PRESSURE CONTROL VALVE SPRING (ID. WHITE)   |
| 21. BORE PLUG RETAINER (7 @ 3.2 X 5 X 12.5 mm)     | 64. SHIFT PRESSURE CONTROL VALVE                      |
| 22. SOLENOID RELAY VALVE SLEEVE                    | 65. SHIFT PRESSURE CONTROL VALVE PLUNGER              |
| 23. SOLENOID RELAY VALVE PLUNGER                   | 66. SHIFT PRESSURE CONTROL VALVE PLUNGER SLEEVE       |
| 24. SOLENOID RELAY VALVE                           | 67. M2 SHIFT VALVE                                    |
| 25. SOLENOID RELAY VALVE SPRING (ID. RED)          | 68. M2 SHIFT VALVE SPRING (ID. LT. BLUE)              |
| 26. REVERSE SHIFT CHECK BALL OUTER BUSHING         | 69. SHIFT PRESSURE RELAY VALVE                        |
| 27. REVERSE SHIFT CHECK BALL                       | 70. SHIFT PRESSURE RELAY VALVE SPRING (ID. LT. GREEN) |
| 28. REVERSE SHIFT CHECK BALL INNER BUSHING         | 71. B4 BAND CONTROL VALVE SPRING (ID. PURPLE)         |
| 29. PRESSURE REGULATOR VALVE                       | 72. B4 BAND CONTROL VALVE                             |
| 30. PRESSURE REGULATOR VALVE SPRING (ID. PURPLE)   | 73. REAR CONTROL VALVE BODY COVER PLATE GASKET        |
| 31. PRESSURE REGULATOR VALVE PLUNGER               | 74. REAR CONTROL VALVE BODY COVER PLATE               |
| 32. PRESSURE REGULATOR VALVE SLEEVE                | 75. COVER PLATE ATTACHING BOLT (7 REQUIRED)           |
| 33. U2 SHIFT VALVE                                 | 76. NO. 2 REAR CONTROL VALVE BODY                     |
| 34. U2 SHIFT VALVE SPRING (ID. LT. GREEN)          | 77. BORE PLUG RETAINER (2 @ 3.2 X 5 X 15 mm)          |
| 35. BORE PLUG (3)                                  | 78. 2ND CLUTCH (B2) CONTROL VALVE PLUG                |
| 36. M1 SHIFT VALVE                                 | 79. 2ND CLUTCH (B2) CONTROL VALVE SPRING (ID. NONE)   |
| 37. M1 SHIFT VALVE SPRING (ID. LT. GREEN)          | 80. 2ND CLUTCH (B2) CONTROL VALVE                     |
| 38. M1 SHIFT VALVE BORE PLUG (1)                   | 81. TCC CHECK VALVE                                   |
| 39. U1 SHIFT VALVE                                 | 82. TCC CHECK VALVE SPRING (ID. WHITE)                |
| 40. U1 SHIFT VALVE SPRING (ID. LT. GREEN)          | 83. REVERSE INHIBIT CHECK BALL INNER BUSHING          |
| 41. B4 RELEASE VALVE SPRING (ID. BLUE)             | 84. REVERSE INHIBIT CHECK BALL                        |
| 42. B4 RELEASE VALVE                               | 85. REVERSE INHIBIT CHECK BALL OUTER BUSHING          |
| 43. MANUAL VALVE                                   | 86. LOCK UP CONTROL VALVE                             |
| 44. COOLER BYPASS VALVE                            | 87. LOCK UP CONTROL VALVE PLUNGER                     |
| 45. COOLER BYPASS VALVE SPRING (ID. NONE)          | 88. LOCK UP CONTROL VALVE SPRING (ID. NONE)           |
|  | 89. LOCK UP CONTROL VALVE SLEEVE                      |
|  | 90. BORE PLUG RETAINER (1 @ 3.2 X 5 X 21.2 mm)        |

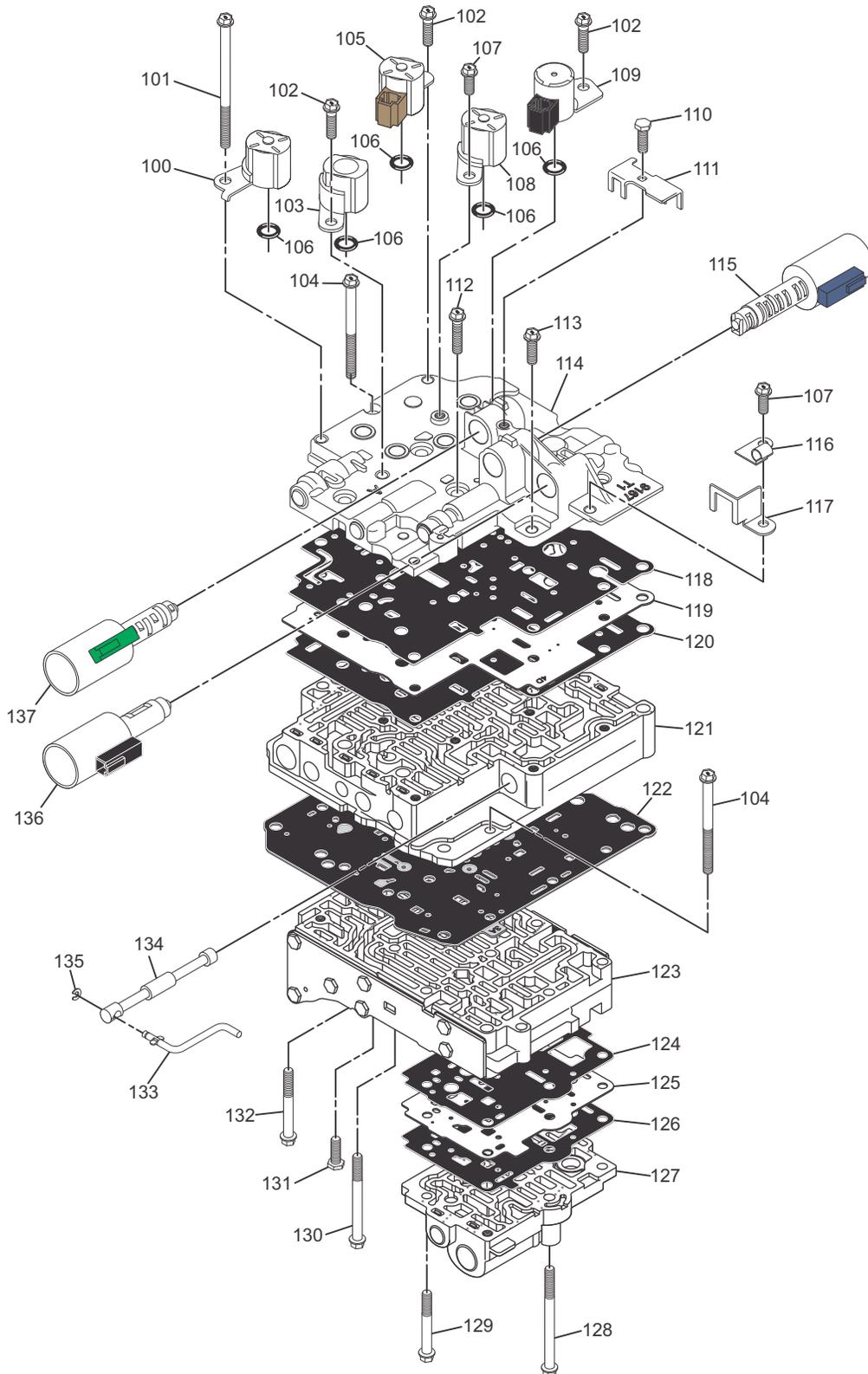
**CONTROL VALVE BODY ASSEMBLY  
SPRING SPECIFICATIONS  
NO ID STAMP VB**

PRESSURE RELIEF VALVE SPRING (4) WIRE DIAMETER .050" OUTSIDE DIAMETER .370" OVERALL LENGTH 1.128" COILS 5 COLOR ID. NONE	SOLENOID MODULATOR VALVE SPRING (10) WIRE DIAMETER .043" OUTSIDE DIAMETER .315" OVERALL LENGTH 1.128" COILS 12 COLOR ID. YELLOW	NEUTRAL RELAY VALVE SPRING (14) WIRE DIAMETER .026" OUTSIDE DIAMETER .324" OVERALL LENGTH 1.031" COILS 9 COLOR ID. LT. GREEN	B1 CONTROL VALVE SPRING (15) WIRE DIAMETER .022" OUTSIDE DIAMETER .233" OVERALL LENGTH .725" COILS 11 COLOR ID. BLUE
SOLENOID RELAY VALVE SPRING (25) WIRE DIAMETER .019" OUTSIDE DIAMETER .235" OVERALL LENGTH .755" COILS 9 COLOR ID. RED	PRESSURE REGULATOR VALVE SPRING (30) WIRE DIAMETER .047" OUTSIDE DIAMETER .525" OVERALL LENGTH 1.840" COILS 12 COLOR ID. PURPLE	U2 SHIFT VALVE SPRING (34) WIRE DIAMETER .032" OUTSIDE DIAMETER .401" OVERALL LENGTH 1.000" COILS 7 COLOR ID. LT. GREEN	M1 SHIFT VALVE SPRING (37) WIRE DIAMETER .026" OUTSIDE DIAMETER .233" OVERALL LENGTH 1.040" COILS 9 COLOR ID. LT. GREEN
U1 SHIFT VALVE SPRING (40) WIRE DIAMETER .032" OUTSIDE DIAMETER .400" OVERALL LENGTH 1.000" COILS 7 COLOR ID. LT. GREEN	B4 BAND RELEASE VALVE SPRING (41) WIRE DIAMETER .027" OUTSIDE DIAMETER .354" OVERALL LENGTH 0.90" COILS 8 COLOR ID. BLUE	COOLER BYPASS VALVE SPRING (45) WIRE DIAMETER .042" OUTSIDE DIAMETER .471" OVERALL LENGTH .680" COILS 6 COLOR ID. NONE	TCC CHECK VALVE SPRING (47) WIRE DIAMETER .019" OUTSIDE DIAMETER .270" OVERALL LENGTH .654" COILS 11 COLOR ID. YELLOW
LOCK UP RELAY VALVE SPRING (51) WIRE DIAMETER .010" OUTSIDE DIAMETER .222" OVERALL LENGTH 0.927" COILS 12 COLOR ID. RED	SECONDARY REGULATOR VALVE SPRING (58) WIRE DIAMETER .035" OUTSIDE DIAMETER .375" OVERALL LENGTH 1.891" COILS 16 COLOR ID. NONE	SLT ACCUMULATOR SPRING OUTER (60) WIRE DIAMETER .090" OUTSIDE DIAMETER .642" OVERALL LENGTH 1.550" COILS 9 COLOR ID. PINK	SLT ACCUMULATOR SPRING INNER (61) WIRE DIAMETER .063" OUTSIDE DIAMETER .413" OVERALL LENGTH 1.546" COILS 15 COLOR ID. PINK
SHIFT PRESSURE CONTROL VALVE SPRING (63) WIRE DIAMETER .025" OUTSIDE DIAMETER .229" OVERALL LENGTH 0.630" COILS 12 COLOR ID. WHITE	M2 SHIFT VALVE SPRING (68) WIRE DIAMETER .027" OUTSIDE DIAMETER .325" OVERALL LENGTH 1.044" COILS 9 COLOR ID. LT. BLUE	SHIFT PRESSURE RELAY VALVE SPRING (70) WIRE DIAMETER .033" OUTSIDE DIAMETER .400" OVERALL LENGTH 0.996" COILS 7 COLOR ID. LT. GREEN	B4 CONTROL VALVE SPRING (71) WIRE DIAMETER .032" OUTSIDE DIAMETER .299" OVERALL LENGTH 1.010" COILS 10 COLOR ID. PURPLE
TCC CHECK VALVE SPRING (82) WIRE DIAMETER .016" OUTSIDE DIAMETER .205" OVERALL LENGTH 0.468" COILS 7 COLOR ID. WHITE	B2 CONTROL VALVE SPRING (79) WIRE DIAMETER .035" OUTSIDE DIAMETER .385" OVERALL LENGTH 1.368" COILS 9 COLOR ID. NONE	LOCK UP CONTROL VALVE SPRING (88) WIRE DIAMETER .027" OUTSIDE DIAMETER .218" OVERALL LENGTH 0.830" COILS 11 COLOR ID. NONE	

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Figure 186

## CONTROL VALVE BODY ASSEMBLY EXPLODED VIEW ID STAMP "A"



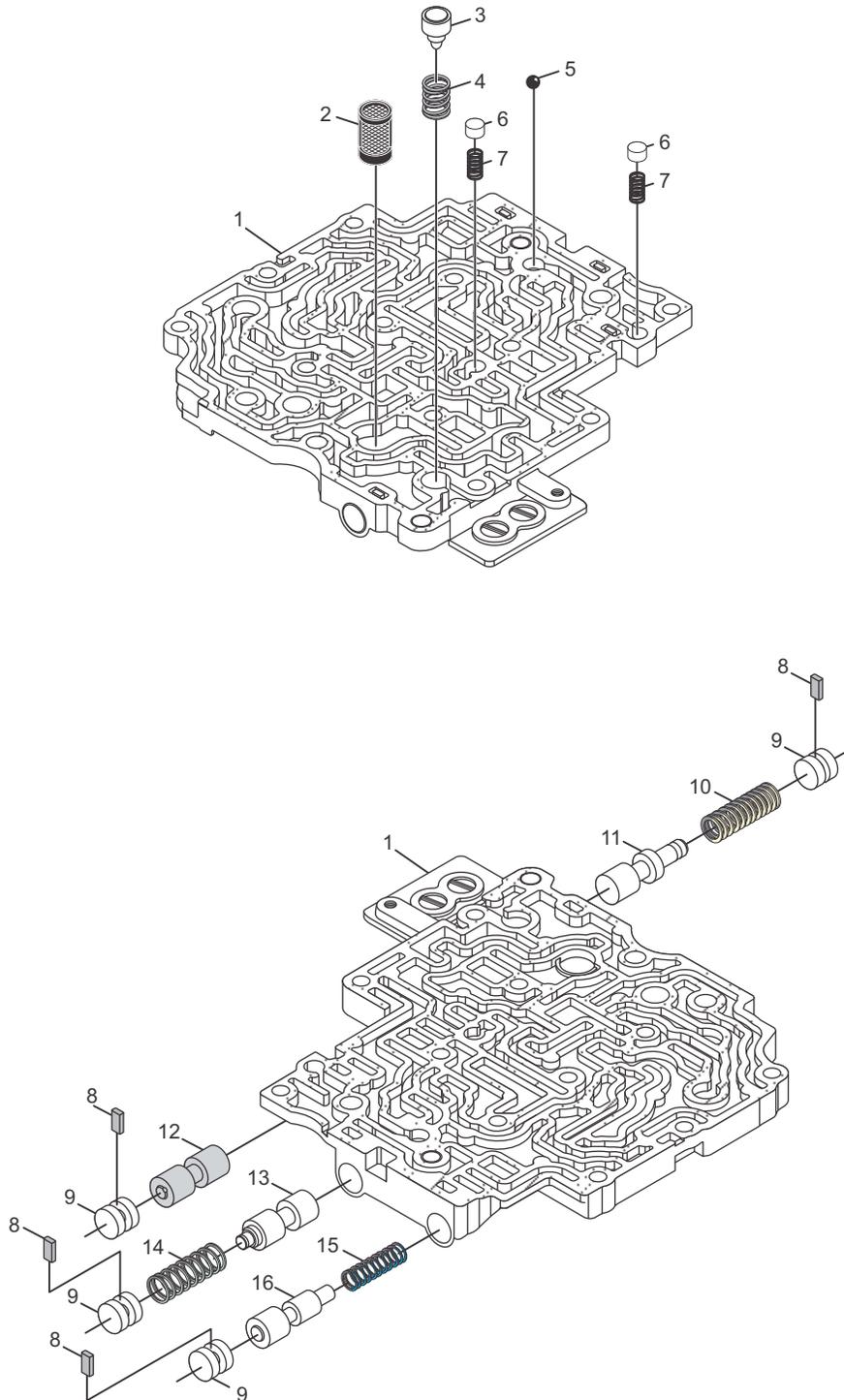
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Figure 187

## ***CONTROL VALVE BODY ASSEMBLY LEGEND***

- |  |  |
|--|--|
| 100. 1-2, 2-3, REVERSE SHIFT SOLENOID (S3)<br>CONNECTOR (DARK GRAY)              | 120. FRONT CONTROL VALVE BODY SPACER PLATE TO<br>MIDDLE CONTROL VALVE BODY GASKET                            |
| 101. CONTROL VALVE BODY BOLT<br>(M5 X 0.8 X 62 mm) (1 REQUIRED)                  | 121. MIDDLE CONTROL VALVE BODY ASSEMBLY  |
| 102. CONTROL VALVE BODY BOLT<br>(M5 X 0.8 X 28 mm) (3 REQUIRED)                  | 122. MIDDLE CONTROL VALVE BODY ASSEMBLY TO<br>LOWER CONTROL VALVE BODY SEPARATOR PLATE<br>AND BONDED GASKETS |
| 103. 3-4, 4-5 SHIFT SOLENOID (S4)<br>CONNECTOR (BLUE)                            | 123. REAR CONTROL VALVE BODY ASSEMBLY  |
| 104. CONTROL VALVE BODY BOLT<br>(M5 X 0.8 X 50mm) (2 REQUIRED)                   | 124. REAR CONTROL VALVE BODY SPACER PLATE TO<br>REAR CONTROL VALVE BODY ASSEMBLY<br>GASKET                   |
| 105. REVERSE SHIFT SOLENOID (S5)<br>CONNECTOR (BROWN)                            | 125. REAR CONTROL VALVE BODY SPACER PLATE  |
| 106. SHIFT SOLENOID VALVE O-RING SEAL<br>(5 REQUIRED)                            | 126. REAR CONTROL VALVE BODY SPACER PLATE TO<br>NO. 2 REAR CONTROL VALVE BODY GASKET                         |
| 107. CONTROL VALVE BODY BOLT<br>(M5 X 0.8 X 10 mm) (2 REQUIRED)                  | 127. NO. 2 REAR CONTROL VALVE BODY ASSEMBLY  |
| 108. 2-3, 3-4 SHIFT SOLENOID (S2)<br>CONNECTOR (BLACK)                           | 128. CONTROL VALVE BODY BOLT<br>(M5 X 0.8 X 76 mm) (1 REQUIRED)  |
| 109. REVERSE, 1ST SHIFT SOLENOID (S1)<br>CONNECTOR (BLACK)                       | 129. CONTROL VALVE BODY BOLT<br>(M5 X 0.8 X 49.5 mm) (4 REQUIRED)  |
| 110. CONTROL VALVE BODY BOLT<br>(M5 X 0.8 X 13 mm) (1 REQUIRED)                  | 130. CONTROL VALVE BODY BOLT<br>(M5 X 0.8 X 40 mm) (1 REQUIRED)  |
| 111. SOLENOID HOLD DOWN BRACKET<br>(SOLENOID SLS/SLT)                            | 131. CONTROL VALVE BODY ASSEMBLY PRESSURE<br>TEST PORT BOLT (M6 X 1.0 X 12 mm) (1 REQUIRED)                  |
| 112. CONTROL VALVE BODY BOLT<br>(M5 X 0.8 X 20 mm) (4 REQUIRED)                  | 132. CONTROL VALVE BODY BOLT<br>(M5 X 0.8 X 35 mm) (2 REQUIRED)  |
| 113. CONTROL VALVE BODY BOLT<br>(M5 X 0.8 X 16 mm) (2 REQUIRED)                  | 133. MANUAL VALVE LINK   |
| 114. FRONT CONTROL VALVE BODY ASSEMBLY   | 134. MANUAL VALVE  |
| 115. LINE PRESSURE CONTROL SOLENOID (SLT)<br>CONNECTOR (BLUE)                    | 135. MANUAL VALVE LINK RETAINING CLIP  |
| 116. A/T INTERNAL WIRE HARNESS CLIP  | 136. TCC PRESSURE CONTROL SOLENOID (SLU)<br>CONNECTOR (BLACK)  |
| 117. TCC PRESSURE CONTROL SOLENOID (SLU)<br>RETAINING BRACKET                    | 137. SHIFT PRESSURE CONTROL SOLENOID (SLS)<br>CONNECTOR (GREEN)  |
| 118. FRONT CONTROL VALVE BODY SPACER PLATE TO<br>FRONT CONTROL VALVE BODY GASKET |  |
| 119. FRONT CONTROL VALVE BODY SPACER PLATE                                       |  |

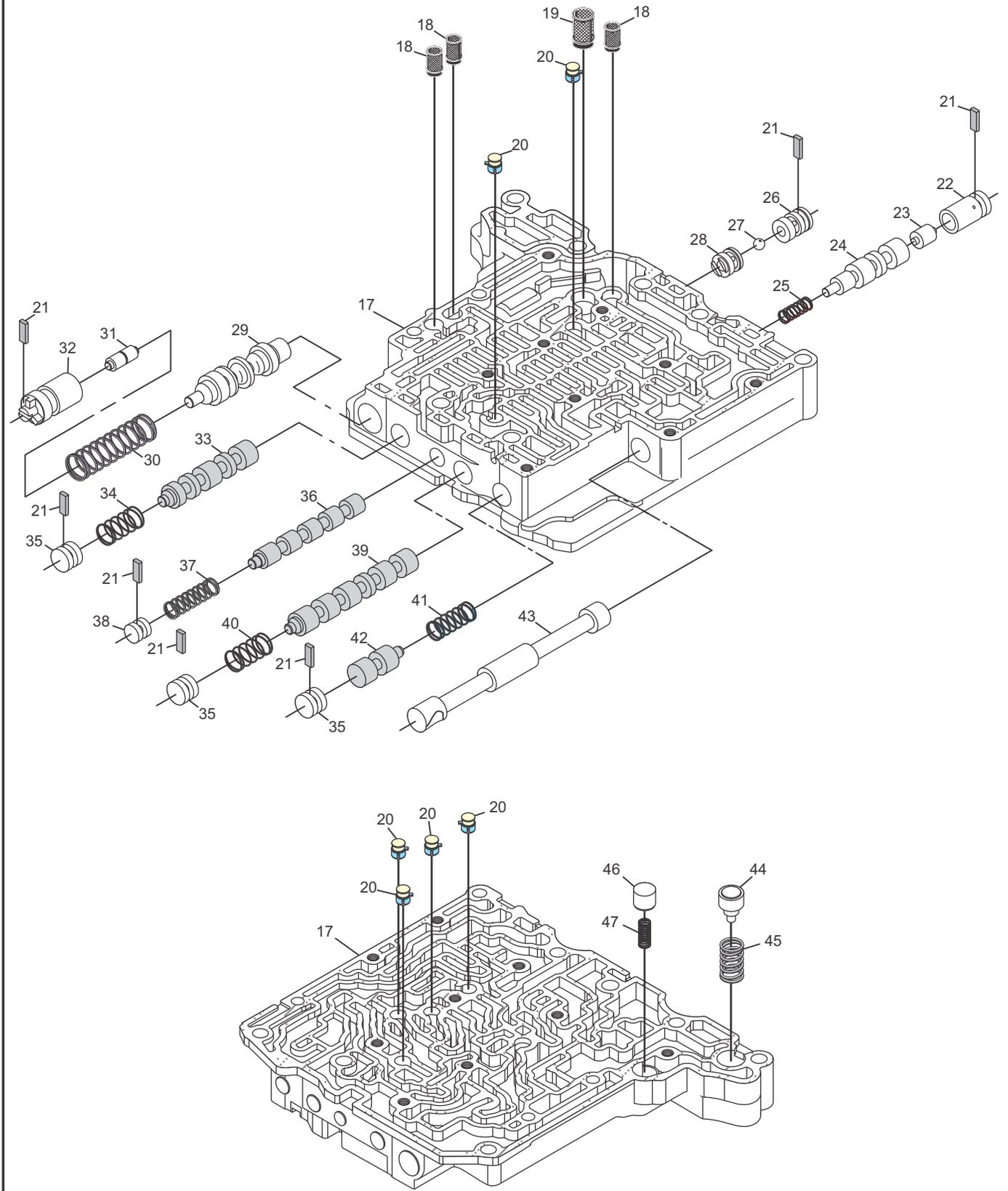
## FRONT CONTROL VALVE BODY



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Figure 189

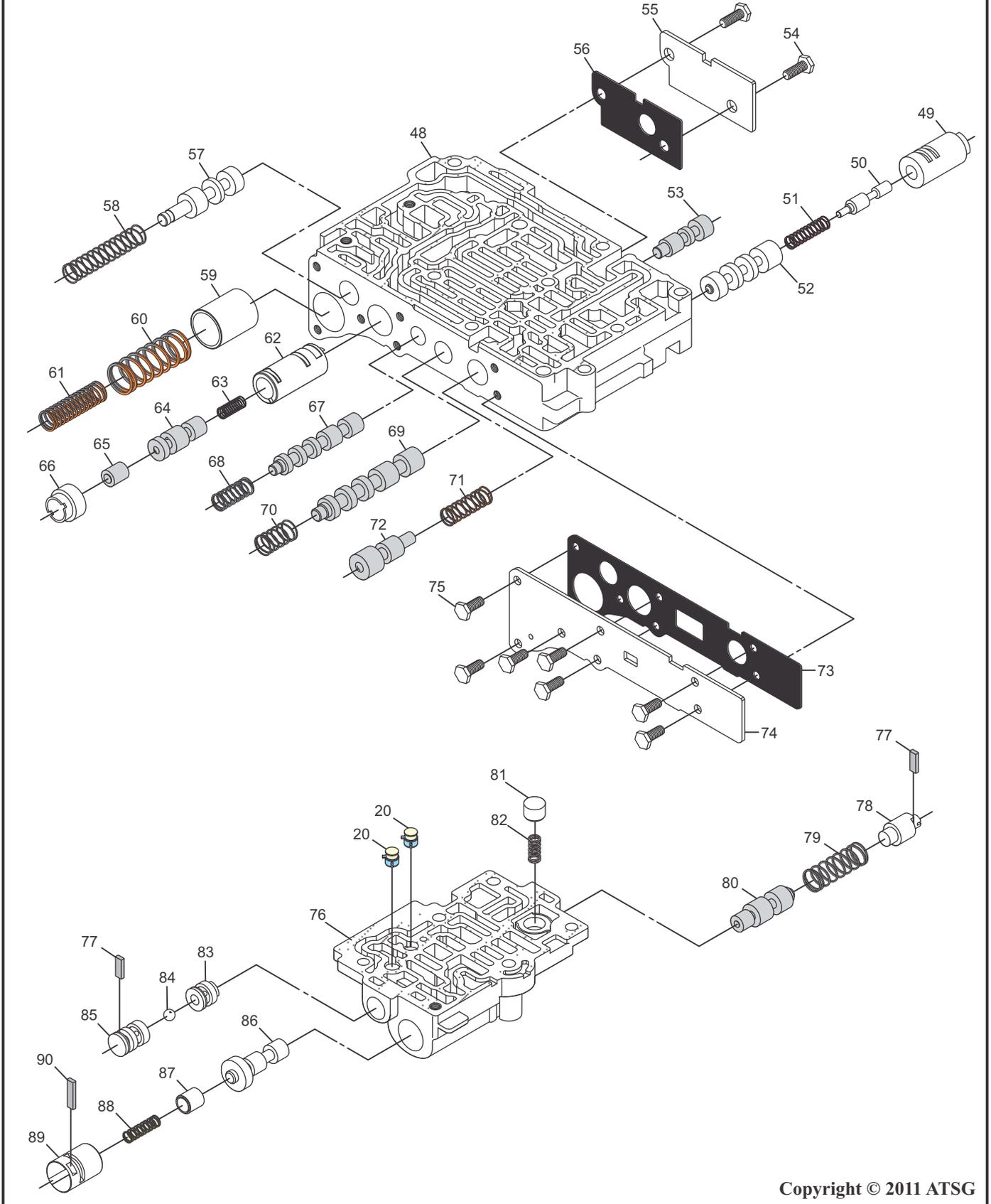
## MIDDLE CONTROL VALVE BODY



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Figure 190

**REAR CONTROL VALVE BODY**  
**NO. 2 REAR CONTROL VALVE BODY**



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Figure 191

## **CONTROL VALVE BODY ASSEMBLY LEGEND**

- |   |   |
|---|---|
| 1. FRONT CONTROL VALVE BODY                           | 46. TCC CHECK VALVE                                   |
| 2. SOLENOID MODULATOR VALVE OIL FILTER                | 47. TCC CHECK VALVE SPRING (ID. YELLOW)               |
| 3. PRESSURE RELIEF VALVE                              | 48. REAR CONTROL VALVE BODY                           |
| 4. PRESSURE RELIEF VALVE SPRING (ID. NONE)            | 49. LOCK UP RELAY CONTROL VALVE SLEEVE                |
| 5. FORWARD CLUTCH (C1) ACCUMULATOR BALL #12           | 50. LOCK UP RELAY CONTROL VALVE PLUNGER               |
| 6. EXHAUST CHECK VALVE (2 REQUIRED)                   | 51. LOCK UP RELAY CONTROL VALVE SPRING (ID. RED)      |
| 7. EXHAUST CHECK VALVE SPRING (ID. NONE) (2 REQUIRED) | 52. LOCK UP RELAY CONTROL VALVE                       |
| 8. BORE PLUG RETAINER (4 @ 3.2 X 5 X 10 mm )          | 53. 1-2/REVERSE CLUTCH (B5) CONTROL VALVE             |
| 9. BORE PLUG (4)                                      | 54. COVER PLATE ATTACHING BOLT (2 REQUIRED)           |
| 10. SOLENOID MODULATOR VALVE SPRING (ID. YELLOW)      | 55. REAR CONTROL VALVE BODY COVER PLATE               |
| 11. SOLENOID MODULATOR VALVE                          | 56. REAR CONTROL VALVE BODY COVER PLATE GASKET        |
| 12. FORWARD CLUTCH (C1) CONTROL VALVE                 | 57. SECONDARY REGULATOR VALVE                         |
| 13. NEUTRAL RELAY VALVE                               | 58. SECONDARY REGULATOR VALVE SPRING (ID. NONE)       |
| 14. NEUTRAL RELAY VALVE SPRING (ID. LT. GREEN)        | 59. SOLENOID SLT ACCUMULATOR PISTON                   |
| 15. 2ND COAST (B1) CONTROL VALVE SPRING (ID. BLUE)    | 60. SLT ACCUMULATOR OUTER SPRING (ID. ORANGE)         |
| 16. 2ND COAST (B1) CONTROL VALVE                      | 61. SLT ACCUMULATOR INNER SPRING (ID. ORANGE)         |
| 17. MIDDLE CONTROL VALVE BODY                         | 62. SHIFT PRESSURE CONTROL VALVE SLEEVE               |
| 18. SOLENOID OIL FILTER (S2, S3, S4)                  | 63. SHIFT PRESSURE CONTROL VALVE SPRING (ID. WHITE)   |
| 19. SOLENOID OIL FILTER (S1, S5)                      | 64. SHIFT PRESSURE CONTROL VALVE                      |
| 20. ACCUMULATOR CHECK VALVE                           | 65. SHIFT PRESSURE CONTROL VALVE PLUNGER              |
| 21. BORE PLUG RETAINER (7 @ 3.2 X 5 X 12.5 mm)        | 66. SHIFT PRESSURE CONTROL VALVE PLUNGER SLEEVE       |
| 22. SOLENOID RELAY VALVE SLEEVE                       | 67. M2 SHIFT VALVE                                    |
| 23. SOLENOID RELAY VALVE PLUNGER                      | 68. M2 SHIFT VALVE SPRING (ID. LT. BLUE)              |
| 24. SOLENOID RELAY VALVE                              | 69. SHIFT PRESSURE RELAY VALVE                        |
| 25. SOLENOID RELAY VALVE SPRING (ID. ORANGE)          | 70. SHIFT PRESSURE RELAY VALVE SPRING (ID. LT. GREEN) |
| 26. REVERSE SHIFT CHECK BALL OUTER BUSHING            | 71. B4 BAND CONTROL VALVE SPRING (ID. ORANGE)         |
| 27. REVERSE SHIFT CHECK BALL                          | 72. B4 BAND CONTROL VALVE                             |
| 28. REVERSE SHIFT CHECK BALL INNER BUSHING            | 73. REAR CONTROL VALVE BODY COVER PLATE GASKET        |
| 29. PRESSURE REGULATOR VALVE                          | 74. REAR CONTROL VALVE BODY COVER PLATE               |
| 30. PRESSURE REGULATOR VALVE SPRING (ID. PURPLE)      | 75. COVER PLATE ATTACHING BOLT (7 REQUIRED)           |
| 31. PRESSURE REGULATOR VALVE PLUNGER                  | 76. NO. 2 REAR CONTROL VALVE BODY                     |
| 32. PRESSURE REGULATOR VALVE SLEEVE                   | 77. BORE PLUG RETAINER (2 @ 3.2 X 5 X 15 mm)          |
| 33. U2 SHIFT VALVE                                    | 78. 2ND CLUTCH (B2) CONTROL VALVE PLUG                |
| 34. U2 SHIFT VALVE SPRING (ID. LT. GREEN)             | 79. 2ND CLUTCH (B2) CONTROL VALVE SPRING (ID. NONE)   |
| 35. BORE PLUG (3)                                     | 80. 2ND CLUTCH (B2) CONTROL VALVE                     |
| 36. M1 SHIFT VALVE                                    | 81. TCC CHECK VALVE                                   |
| 37. M1 SHIFT VALVE SPRING (ID. LT. GREEN)             | 82. TCC CHECK VALVE SPRING (ID. WHITE)                |
| 38. M1 SHIFT VALVE BORE PLUG (1)                      | 83. REVERSE INHIBIT CHECK BALL INNER BUSHING          |
| 39. U1 SHIFT VALVE                                    | 84. REVERSE INHIBIT CHECK BALL                        |
| 40. U1 SHIFT VALVE SPRING (ID. LT. GREEN)             | 85. REVERSE INHIBIT CHECK BALL OUTER BUSHING          |
| 41. B4 RELEASE VALVE SPRING (ID. BLUE)                | 86. LOCK UP CONTROL VALVE                             |
| 42. B4 RELEASE VALVE                                  | 87. LOCK UP CONTROL VALVE PLUNGER                     |
| 43. MANUAL VALVE                                      | 88. LOCK UP CONTROL VALVE SPRING (ID. YELLOW)         |
| 44. COOLER BYPASS VALVE                               | 89. LOCK UP CONTROL VALVE SLEEVE                      |
| 45. COOLER BYPASS VALVE SPRING (ID. NONE)             | 90. BORE PLUG RETAINER (1 @ 3.2 X 5 X 21.2 mm)        |

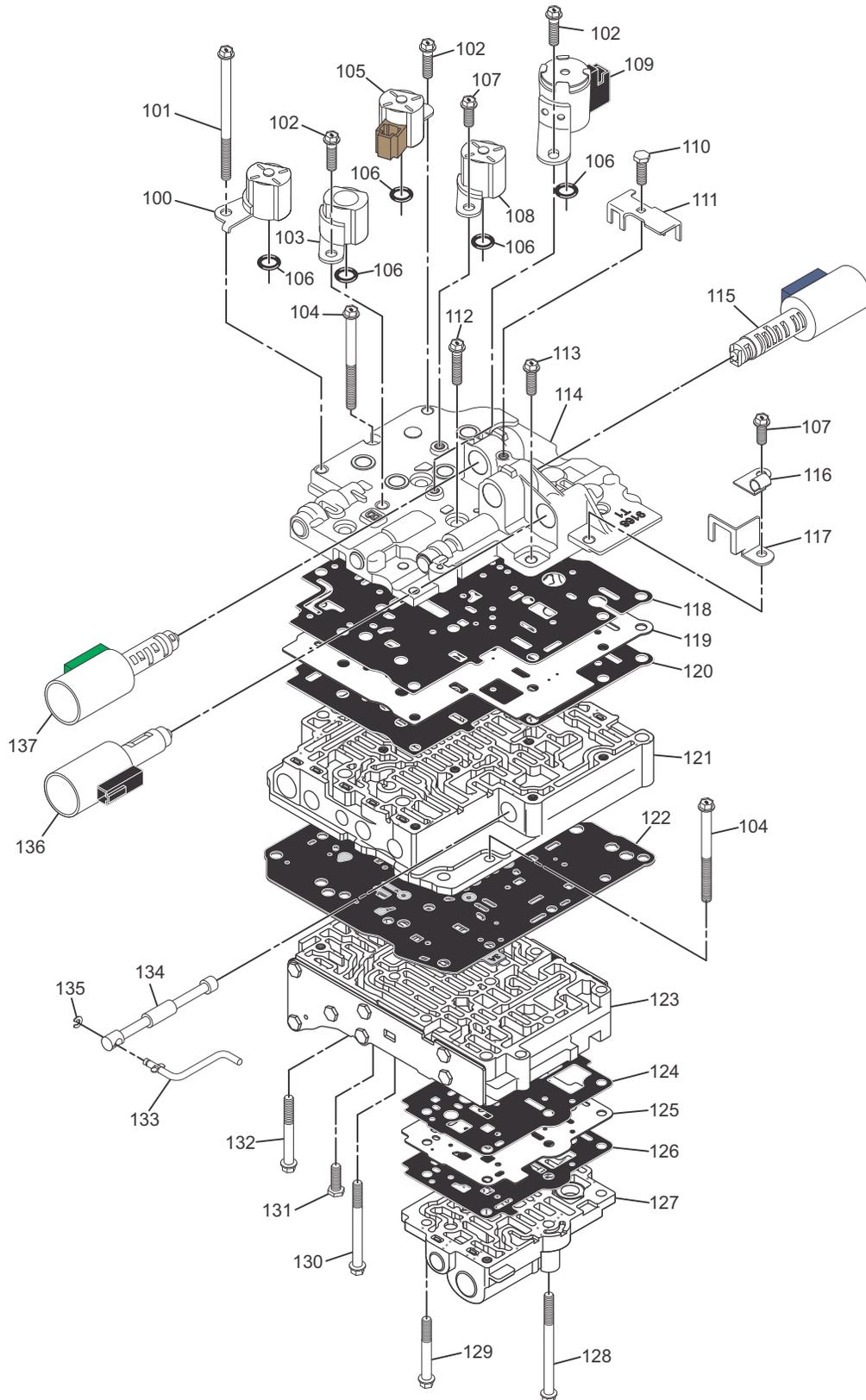
**CONTROL VALVE BODY ASSEMBLY  
SPRING SPECIFICATIONS  
VALVE BODY ID. STAMP "A"**

PRESSURE RELIEF VALVE SPRING (4) WIRE DIAMETER .050" OUTSIDE DIAMETER .370" OVERALL LENGTH 1.128" COILS 5 COLOR ID. NONE	SOLENOID MODULATOR VALVE SPRING (10) WIRE DIAMETER .043" OUTSIDE DIAMETER .318" OVERALL LENGTH 1.128" COILS 12 COLOR ID. YELLOW	NEUTRAL RELAY VALVE SPRING (14) WIRE DIAMETER .026" OUTSIDE DIAMETER .324" OVERALL LENGTH 1.021" COILS 9 COLOR ID. LT. GREEN	B1 CONTROL VALVE SPRING (15) WIRE DIAMETER .022" OUTSIDE DIAMETER .233" OVERALL LENGTH .716" COILS 11 COLOR ID. BLUE
SOLENOID RELAY VALVE SPRING (25) WIRE DIAMETER .019" OUTSIDE DIAMETER .235" OVERALL LENGTH .793" COILS 9 COLOR ID. ORANGE	PRESSURE REGULATOR VALVE SPRING (30) WIRE DIAMETER .047" OUTSIDE DIAMETER .525" OVERALL LENGTH 1.890" COILS 12 COLOR ID. PURPLE	U2 SHIFT VALVE SPRING (34) WIRE DIAMETER .032" OUTSIDE DIAMETER .394" OVERALL LENGTH 1.014" COILS 7 COLOR ID. LT. GREEN	M1 SHIFT VALVE SPRING (37) WIRE DIAMETER .026" OUTSIDE DIAMETER .323" OVERALL LENGTH 1.021" COILS 9 COLOR ID. LT. GREEN
U1 SHIFT VALVE SPRING (40) WIRE DIAMETER .032" OUTSIDE DIAMETER .396" OVERALL LENGTH 1.028" COILS 7 COLOR ID. LT. GREEN	B4 BAND RELEASE VALVE SPRING (41) WIRE DIAMETER .027" OUTSIDE DIAMETER .354" OVERALL LENGTH 0.902" COILS 8 COLOR ID. BLUE	COOLER BYPASS VALVE SPRING (45) WIRE DIAMETER .042" OUTSIDE DIAMETER .471" OVERALL LENGTH .680" COILS 6 COLOR ID. NONE	TCC CHECK VALVE SPRING (47) WIRE DIAMETER .019" OUTSIDE DIAMETER .323" OVERALL LENGTH .654" COILS 11 COLOR ID. YELLOW
LOCK UP RELAY VALVE SPRING (51) WIRE DIAMETER .022" OUTSIDE DIAMETER .231" OVERALL LENGTH 0.922" COILS 12 COLOR ID. RED	SECONDARY REGULATOR VALVE SPRING (58) WIRE DIAMETER .038" OUTSIDE DIAMETER .382" OVERALL LENGTH 1.866" COILS 16 COLOR ID. NONE	SLT ACCUMULATOR SPRING OUTER (60) WIRE DIAMETER .088" OUTSIDE DIAMETER .645" OVERALL LENGTH 1.555" COILS 9 COLOR ID. ORANGE	SLT ACCUMULATOR SPRING INNER (61) WIRE DIAMETER .063" OUTSIDE DIAMETER .409" OVERALL LENGTH 1.554" COILS 15 COLOR ID. ORANGE
SHIFT PRESSURE CONTROL VALVE SPRING (63) WIRE DIAMETER .025" OUTSIDE DIAMETER .229" OVERALL LENGTH 0.620" COILS 12 COLOR ID. WHITE	M2 SHIFT VALVE SPRING (68) WIRE DIAMETER .027" OUTSIDE DIAMETER .322" OVERALL LENGTH 1.044" COILS 9 COLOR ID. LT. BLUE	SHIFT PRESSURE RELAY VALVE SPRING (70) WIRE DIAMETER .033" OUTSIDE DIAMETER .399" OVERALL LENGTH 1.009" COILS 7 COLOR ID. LT. GREEN	B4 CONTROL VALVE SPRING (71) WIRE DIAMETER .033" OUTSIDE DIAMETER .292" OVERALL LENGTH 0.977" COILS 10 COLOR ID. ORANGE
B2 CONTROL VALVE SPRING (79) WIRE DIAMETER .034" OUTSIDE DIAMETER .385" OVERALL LENGTH 1.351" COILS 9 COLOR ID. NONE	TCC CHECK VALVE SPRING (82) WIRE DIAMETER .016" OUTSIDE DIAMETER .205" OVERALL LENGTH 0.468" COILS 7 COLOR ID. WHITE	LOCK UP CONTROL VALVE SPRING (88) WIRE DIAMETER .027" OUTSIDE DIAMETER .222" OVERALL LENGTH 0.813" COILS 11 COLOR ID. YELLOW	EXHAUST CHECK VALVE SPRING (7) WIRE DIAMETER .010" OUTSIDE DIAMETER .173" OVERALL LENGTH 0.465" COILS 8 COLOR ID. NONE

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Figure 193

## CONTROL VALVE BODY ASSEMBLY EXPLODED VIEW ID STAMP "B"



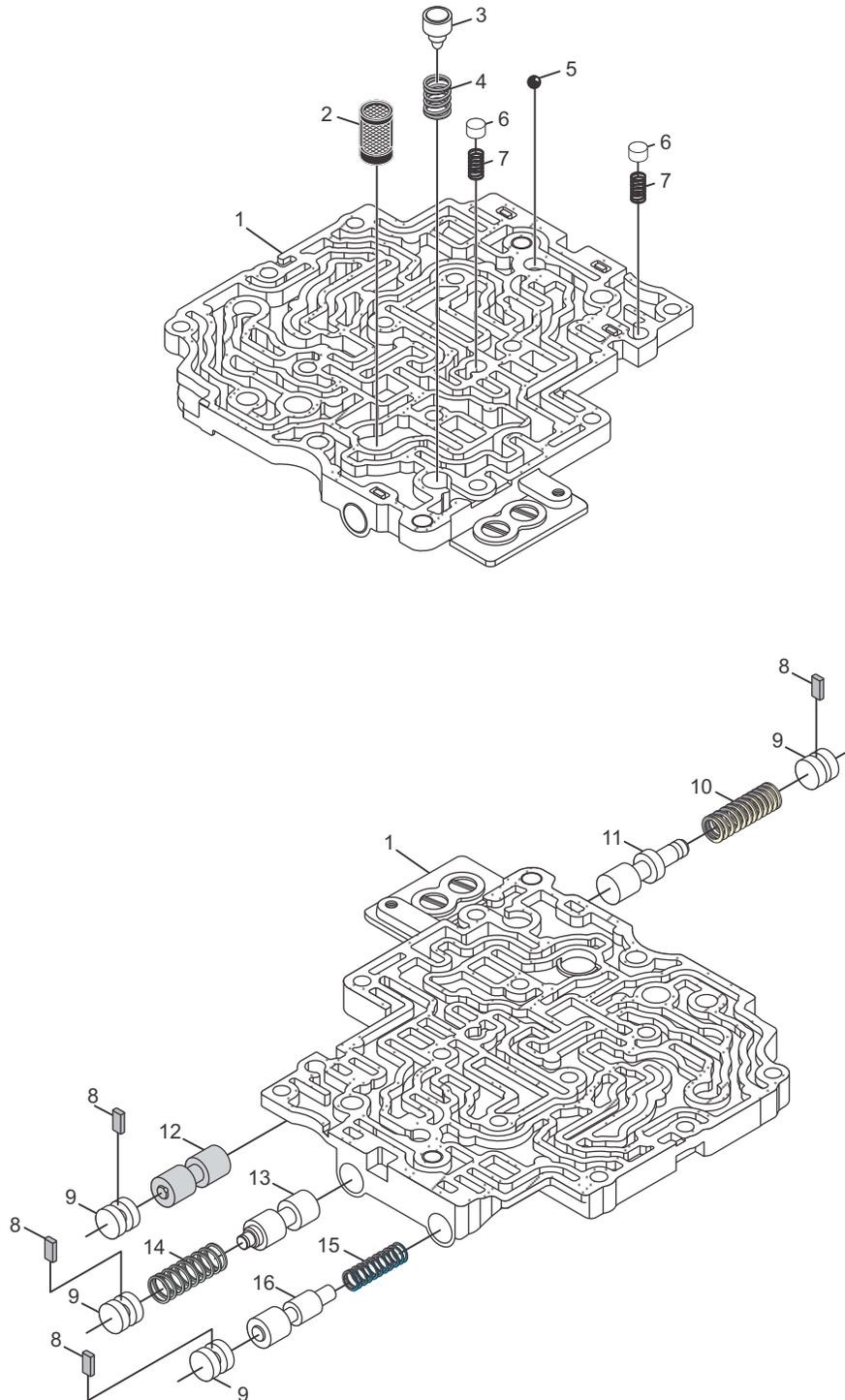
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Figure 194

## ***CONTROL VALVE BODY ASSEMBLY LEGEND***

- |   |  |
|---|--|
| 100. 1-2, 2-3, REVERSE SHIFT SOLENOID (S3) CONNECTOR (DARK GRAY)              | 120. FRONT CONTROL VALVE BODY SPACER PLATE TO MIDDLE CONTROL VALVE BODY GASKET                         |
| 101. CONTROL VALVE BODY BOLT (M5 X 0.8 X 62 mm) (1 REQUIRED)                  | 121. MIDDLE CONTROL VALVE BODY ASSEMBLY  |
| 102. CONTROL VALVE BODY BOLT (M5 X 0.8 X 28 mm) (3 REQUIRED)                  | 122. MIDDLE CONTROL VALVE BODY ASSEMBLY TO LOWER CONTROL VALVE BODY SEPARATOR PLATE AND BONDED GASKETS |
| 103. 3-4, 4-5 SHIFT SOLENOID (S4) CONNECTOR (BLUE)                            | 123. REAR CONTROL VALVE BODY ASSEMBLY  |
| 104. CONTROL VALVE BODY BOLT (M5 X 0.8 X 50mm) (2 REQUIRED)                   | 124. REAR CONTROL VALVE BODY SPACER PLATE TO REAR CONTROL VALVE BODY ASSEMBLY GASKET                   |
| 105. REVERSE SHIFT SOLENOID (S5) CONNECTOR (BROWN)                            | 125. REAR CONTROL VALVE BODY SPACER PLATE  |
| 106. SHIFT SOLENOID VALVE O-RING SEAL (5 REQUIRED)                            | 126. REAR CONTROL VALVE BODY SPACER PLATE TO NO. 2 REAR CONTROL VALVE BODY GASKET                      |
| 107. CONTROL VALVE BODY BOLT (M5 X 0.8 X 10 mm) (2 REQUIRED)                  | 127. NO. 2 REAR CONTROL VALVE BODY ASSEMBLY  |
| 108. 2-3, 3-4 SHIFT SOLENOID (S2) CONNECTOR (BLACK)                           | 128. CONTROL VALVE BODY BOLT (M5 X 0.8 X 76 mm) (1 REQUIRED)   |
| 109. REVERSE, 1ST SHIFT SOLENOID (S1) CONNECTOR (BLACK)                       | 129. CONTROL VALVE BODY BOLT (M5 X 0.8 X 49.5 mm) (4 REQUIRED)   |
| 110. CONTROL VALVE BODY BOLT (M5 X 0.8 X 13 mm) (1 REQUIRED)                  | 130. CONTROL VALVE BODY BOLT (M5 X 0.8 X 40 mm) (1 REQUIRED)   |
| 111. SOLENOID HOLD DOWN BRACKET (SOLENOID SLS/SLT)                            | 131. CONTROL VALVE BODY ASSEMBLY PRESSURE TEST PORT BOLT (M6 X 1.0 X 12 mm) (1 REQUIRED)               |
| 112. CONTROL VALVE BODY BOLT (M5 X 0.8 X 20 mm) (4 REQUIRED)                  | 132. CONTROL VALVE BODY BOLT (M5 X 0.8 X 35 mm) (2 REQUIRED)   |
| 113. CONTROL VALVE BODY BOLT (M5 X 0.8 X 16 mm) (2 REQUIRED)                  | 133. MANUAL VALVE LINK   |
| 114. FRONT CONTROL VALVE BODY ASSEMBLY  | 134. MANUAL VALVE  |
| 115. LINE PRESSURE CONTROL SOLENOID (SLT) CONNECTOR (BLUE)                    | 135. MANUAL VALVE LINK RETAINING CLIP  |
| 116. A/T INTERNAL WIRE HARNESS CLIP   | 136. TCC PRESSURE CONTROL SOLENOID (SLU) CONNECTOR (BLACK)   |
| 117. TCC PRESSURE CONTROL SOLENOID (SLU) RETAINING BRACKET                    | 137. SHIFT PRESSURE CONTROL SOLENOID (SLS) CONNECTOR (GREEN)   |
| 118. FRONT CONTROL VALVE BODY SPACER PLATE TO FRONT CONTROL VALVE BODY GASKET |  |
| 119. FRONT CONTROL VALVE BODY SPACER PLATE                                    |  |

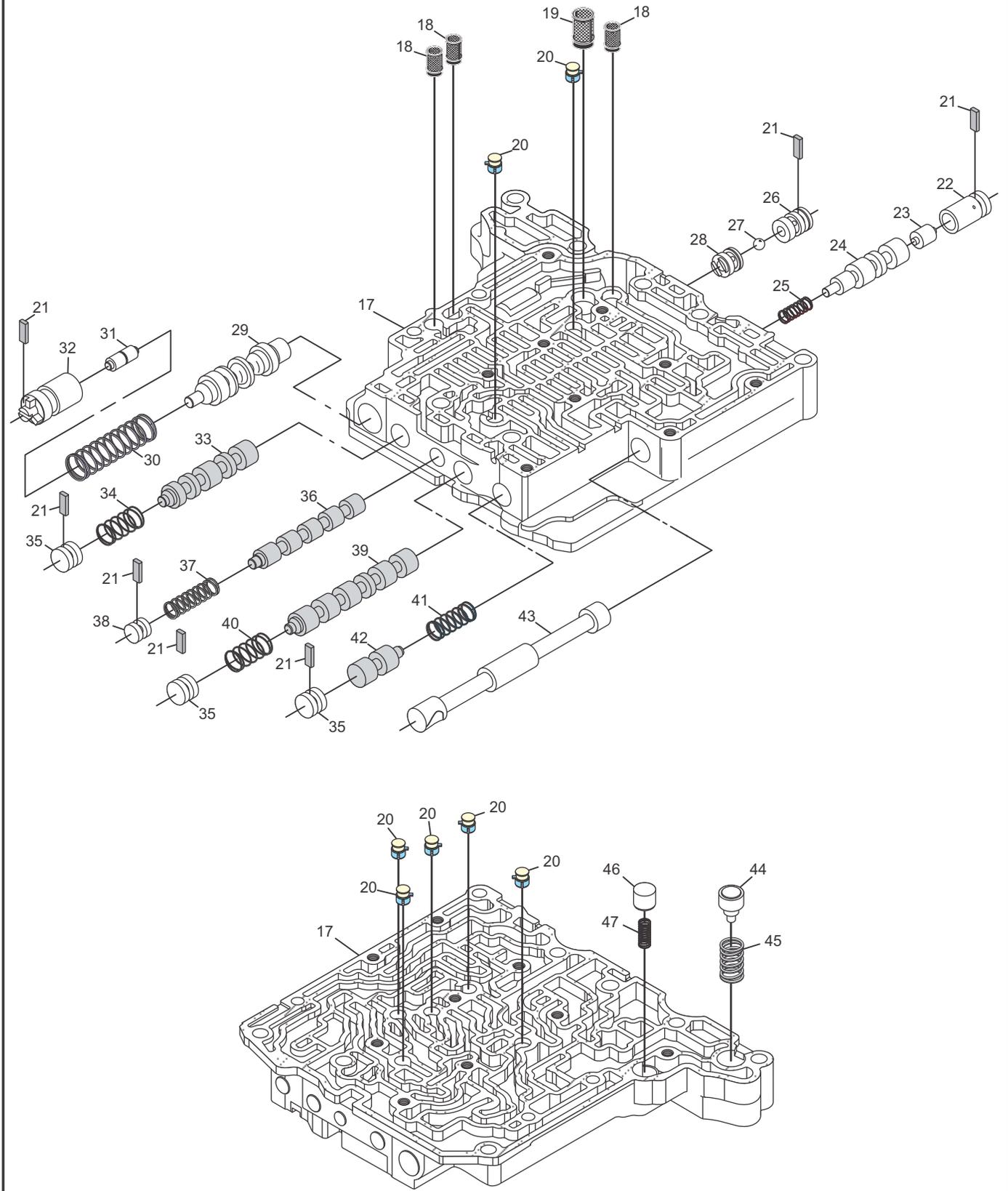
## FRONT CONTROL VALVE BODY



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Figure 196

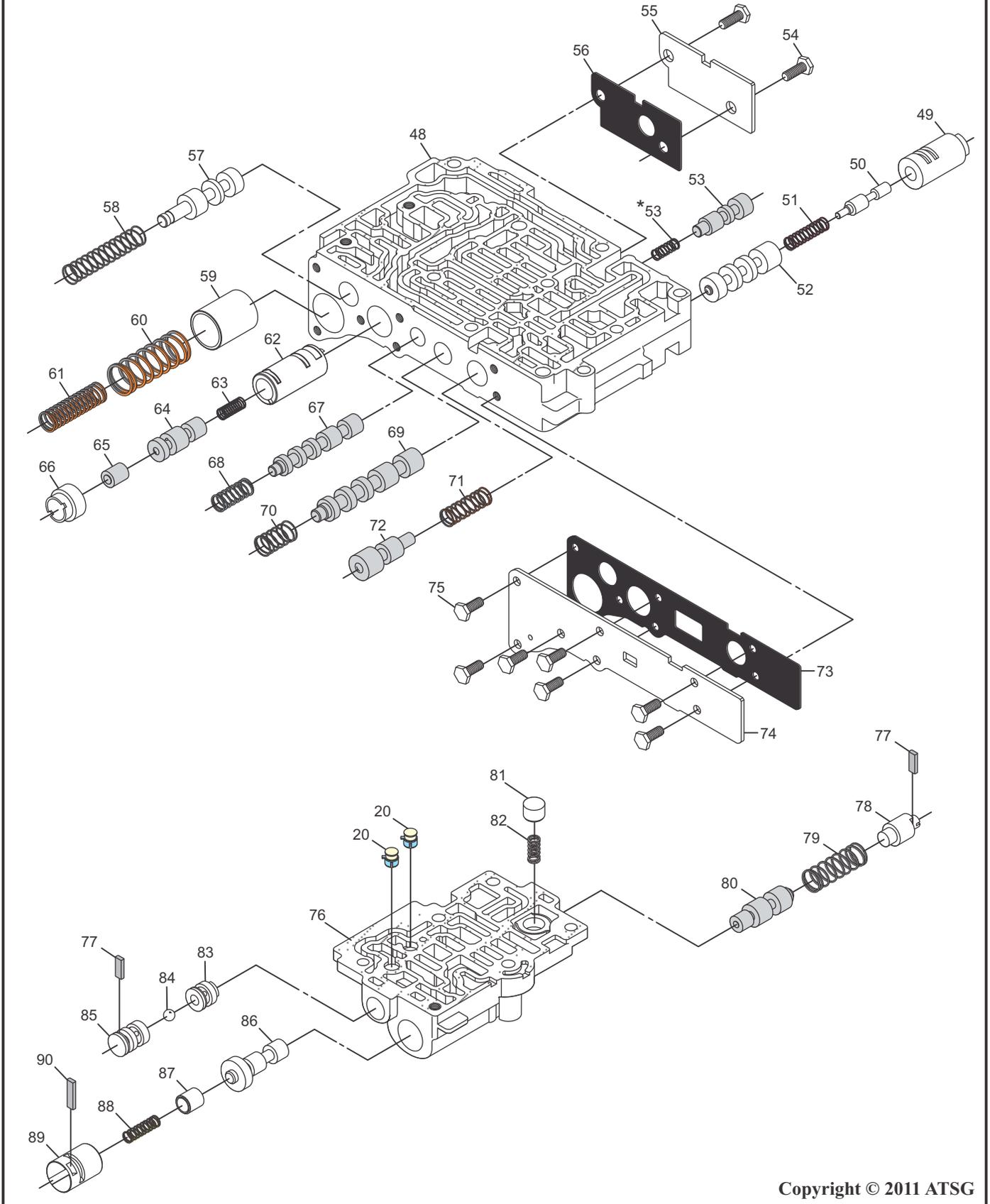
## MIDDLE CONTROL VALVE BODY



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Figure 197

**REAR CONTROL VALVE BODY**  
**NO. 2 REAR CONTROL VALVE BODY**



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Figure 198

## **CONTROL VALVE BODY ASSEMBLY LEGEND**

1. FRONT CONTROL VALVE BODY
2. SOLENOID MODULATOR VALVE OIL FILTER
3. PRESSURE RELIEF VALVE
4. PRESSURE RELIEF VALVE SPRING (ID. NONE)
5. FORWARD CLUTCH (C1) ACCUMULATOR BALL #12
6. EXHAUST CHECK VALVE (2 REQUIRED)
7. EXHAUST CHECK VALVE SPRING (ID. NONE) (2 REQUIRED)
8. BORE PLUG RETAINER (4 @ 3.2 X 5 X 10 mm )
9. BORE PLUG (4)
10. SOLENOID MODULATOR VALVE SPRING (ID. YELLOW)
11. SOLENOID MODULATOR VALVE
12. FORWARD CLUTCH (C1) CONTROL VALVE
13. NEUTRAL RELAY VALVE
14. NEUTRAL RELAY VALVE SPRING (ID. LT. GREEN)
15. 2ND COAST (B1) CONTROL VALVE SPRING (ID. BLUE)
16. 2ND COAST (B1) CONTROL VALVE
17. MIDDLE CONTROL VALVE BODY
18. SOLENOID OIL FILTER (S2, S3, S4)
19. SOLENOID OIL FILTER (S1, S5)
20. ACCUMULATOR CHECK VALVE
21. BORE PLUG RETAINER (7 @ 3.2 X 5 X 12.5 mm)
22. SOLENOID RELAY VALVE SLEEVE
23. SOLENOID RELAY VALVE PLUNGER
24. SOLENOID RELAY VALVE
25. SOLENOID RELAY VALVE SPRING (ID. ORANGE)
26. REVERSE SHIFT CHECK BALL OUTER BUSHING
27. REVERSE SHIFT CHECK BALL
28. REVERSE SHIFT CHECK BALL INNER BUSHING
29. PRESSURE REGULATOR VALVE
30. PRESSURE REGULATOR VALVE SPRING (ID. PURPLE)
31. PRESSURE REGULATOR VALVE PLUNGER
32. PRESSURE REGULATOR VALVE SLEEVE
33. U2 SHIFT VALVE
34. U2 SHIFT VALVE SPRING (ID. LT. GREEN)
35. BORE PLUG (3)
36. M1 SHIFT VALVE
37. M1 SHIFT VALVE SPRING (ID. LT. GREEN)
38. M1 SHIFT VALVE BORE PLUG (1)
39. U1 SHIFT VALVE
40. U1 SHIFT VALVE SPRING (ID. LT. GREEN)
41. B4 RELEASE VALVE SPRING (ID. BLUE)
42. B4 RELEASE VALVE
43. MANUAL VALVE
44. COOLER BYPASS VALVE
45. COOLER BYPASS VALVE SPRING (ID. NONE)
46. TCC CHECK VALVE
47. TCC CHECK VALVE SPRING (ID. YELLOW)
48. REAR CONTROL VALVE BODY
49. LOCK UP RELAY CONTROL VALVE SLEEVE
50. LOCK UP RELAY CONTROL VALVE PLUNGER
51. LOCK UP RELAY CONTROL VALVE SPRING (ID. RED)
52. LOCK UP RELAY CONTROL VALVE
53. 1-2/REVERSE CLUTCH (B5) CONTROL VALVE
- \*53. 1-2/REVERSE CLUTCH (B5) CONTROL VALVE SPRING (2005 AND LATER NISSAN MAXIMA UNITS ONLY)
54. COVER PLATE ATTACHING BOLT (2 REQUIRED)
55. REAR CONTROL VALVE BODY COVER PLATE
56. REAR CONTROL VALVE BODY COVER PLATE GASKET
57. SECONDARY REGULATOR VALVE
58. SECONDARY REGULATOR VALVE SPRING (ID. NONE)
59. SOLENOID SLT ACCUMULATOR PISTON
60. SLT ACCUMULATOR OUTER SPRING (ID. ORANGE)
61. SLT ACCUMULATOR INNER SPRING (ID. ORANGE)
62. SHIFT PRESSURE CONTROL VALVE SLEEVE
63. SHIFT PRESSURE CONTROL VALVE SPRING (ID. WHITE)
64. SHIFT PRESSURE CONTROL VALVE
65. SHIFT PRESSURE CONTROL VALVE PLUNGER
66. SHIFT PRESSURE CONTROL VALVE PLUNGER SLEEVE
67. M2 SHIFT VALVE
68. M2 SHIFT VALVE SPRING (ID. LT. BLUE)
69. SHIFT PRESSURE RELAY VALVE
70. SHIFT PRESSURE RELAY VALVE SPRING (ID. LT. GREEN)
71. B4 BAND CONTROL VALVE SPRING (ID. ORANGE)
72. B4 BAND CONTROL VALVE
73. REAR CONTROL VALVE BODY COVER PLATE GASKET
74. REAR CONTROL VALVE BODY COVER PLATE
75. COVER PLATE ATTACHING BOLT (7 REQUIRED)
76. NO. 2 REAR CONTROL VALVE BODY
77. BORE PLUG RETAINER (2 @ 3.2 X 5 X 15 mm)
78. 2ND CLUTCH (B2) CONTROL VALVE PLUG
79. 2ND CLUTCH (B2) CONTROL VALVE SPRING (ID. NONE)
80. 2ND CLUTCH (B2) CONTROL VALVE
81. TCC CHECK VALVE
82. TCC CHECK VALVE SPRING (ID. WHITE)
83. REVERSE INHIBIT CHECK BALL INNER BUSHING
84. REVERSE INHIBIT CHECK BALL
85. REVERSE INHIBIT CHECK BALL OUTER BUSHING
86. LOCK UP CONTROL VALVE
87. LOCK UP CONTROL VALVE PLUNGER
88. LOCK UP CONTROL VALVE SPRING (ID. YELLOW)
89. LOCK UP CONTROL VALVE SLEEVE
90. BORE PLUG RETAINER (1 @ 3.2 X 5 X 21.2 mm)



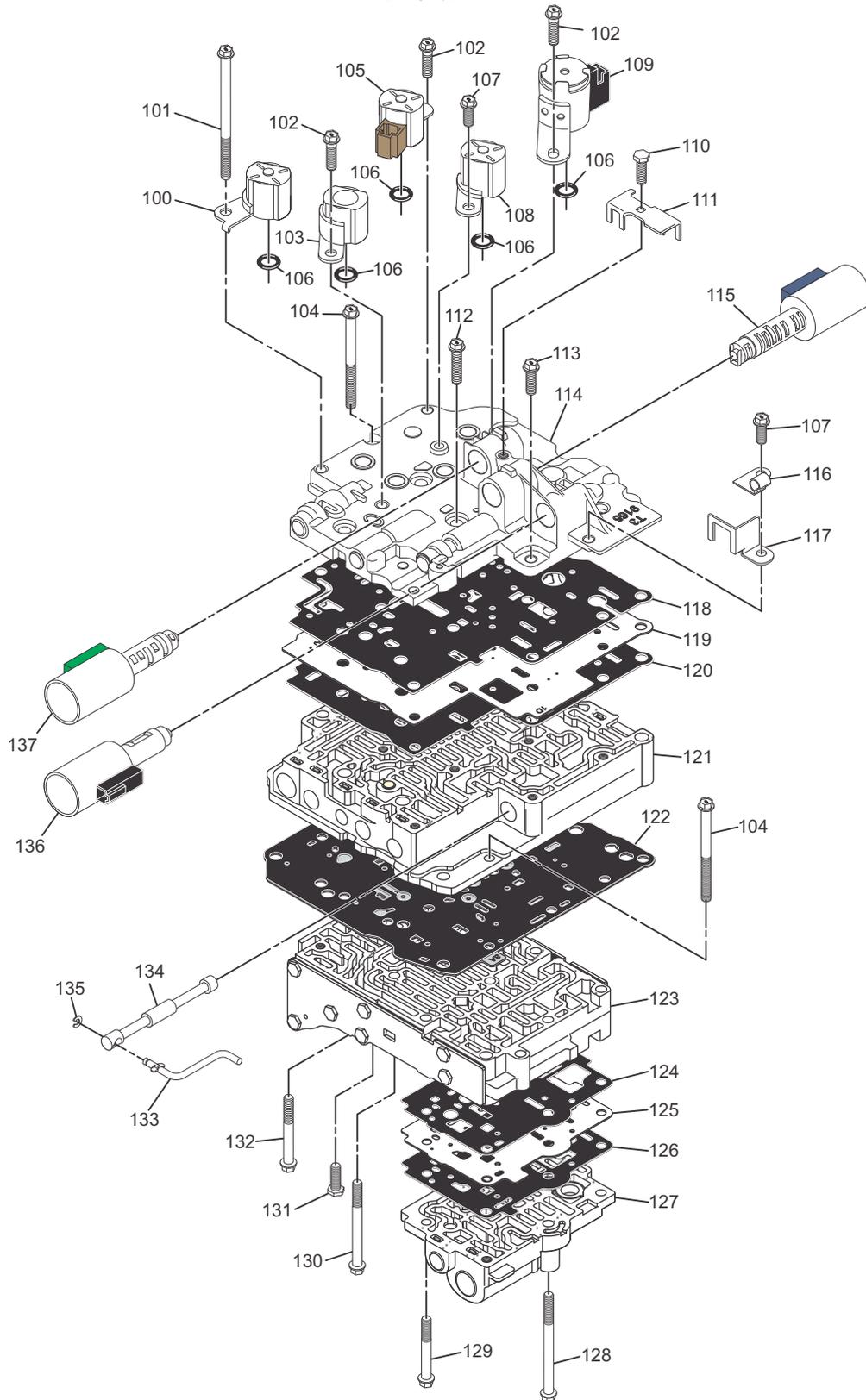
**CONTROL VALVE BODY ASSEMBLY  
SPRING SPECIFICATIONS  
LATE VALVE BODY ID. STAMP "B"**

<p>PRESSURE RELIEF VALVE SPRING (4) WIRE DIAMETER .050" OUTSIDE DIAMETER .370" OVERALL LENGTH 1.128" COILS 5 COLOR ID. NONE</p>	<p>SOLENOID MODULATOR VALVE SPRING (10) WIRE DIAMETER .043" OUTSIDE DIAMETER .315" OVERALL LENGTH 1.113" COILS 12 COLOR ID. YELLOW</p>	<p>NEUTRAL RELAY VALVE SPRING (14) WIRE DIAMETER .026" OUTSIDE DIAMETER .324" OVERALL LENGTH 1.021" COILS 9 COLOR ID. LT. GREEN</p>	<p>B1 CONTROL VALVE SPRING (15) WIRE DIAMETER .022" OUTSIDE DIAMETER .233" OVERALL LENGTH .716" COILS 11 COLOR ID. BLUE</p>
<p>SOLENOID RELAY VALVE SPRING (25) WIRE DIAMETER .019" OUTSIDE DIAMETER .235" OVERALL LENGTH .800" COILS 9 COLOR ID. ORANGE</p>	<p>PRESSURE REGULATOR VALVE SPRING (30) WIRE DIAMETER .047" OUTSIDE DIAMETER .525" OVERALL LENGTH 1.890" COILS 12 COLOR ID. PURPLE</p>	<p>U2 SHIFT VALVE SPRING (34) WIRE DIAMETER .032" OUTSIDE DIAMETER .394" OVERALL LENGTH 1.035" COILS 7 COLOR ID. LT. GREEN</p>	<p>M1 SHIFT VALVE SPRING (37) WIRE DIAMETER .026" OUTSIDE DIAMETER .323" OVERALL LENGTH 1.040" COILS 9 COLOR ID. LT. GREEN</p>
<p>U1 SHIFT VALVE SPRING (40) WIRE DIAMETER .032" OUTSIDE DIAMETER .396" OVERALL LENGTH 1.044" COILS 7 COLOR ID. LT. GREEN</p>	<p>B4 BAND RELEASE VALVE SPRING (41) WIRE DIAMETER .027" OUTSIDE DIAMETER .354" OVERALL LENGTH 0.92" COILS 8 COLOR ID. BLUE</p>	<p>COOLER BYPASS VALVE SPRING (45) WIRE DIAMETER .042" OUTSIDE DIAMETER .471" OVERALL LENGTH .680" COILS 6 COLOR ID. NONE</p>	<p>TCC CHECK VALVE SPRING (47) WIRE DIAMETER .019" OUTSIDE DIAMETER .270" OVERALL LENGTH .654" COILS 11 COLOR ID. YELLOW</p>
<p>LOCK UP RELAY VALVE SPRING (51) WIRE DIAMETER .022" OUTSIDE DIAMETER .231" OVERALL LENGTH 0.927" COILS 12 COLOR ID. RED</p>	<p>SECONDARY REGULATOR VALVE SPRING (58) WIRE DIAMETER .038" OUTSIDE DIAMETER .375" OVERALL LENGTH 1.860" COILS 16 COLOR ID. NONE</p>	<p>SLT ACCUMULATOR SPRING OUTER (60) WIRE DIAMETER .088" OUTSIDE DIAMETER .642" OVERALL LENGTH 1.560" COILS 9 COLOR ID. ORANGE</p>	<p>SLT ACCUMULATOR SPRING INNER (61) WIRE DIAMETER .063" OUTSIDE DIAMETER .409" OVERALL LENGTH 1.550" COILS 15 COLOR ID. ORANGE</p>
<p>SHIFT PRESSURE CONTROL VALVE SPRING (63) WIRE DIAMETER .025" OUTSIDE DIAMETER .229" OVERALL LENGTH 0.620" COILS 12 COLOR ID. WHITE</p>	<p>M2 SHIFT VALVE SPRING (68) WIRE DIAMETER .027" OUTSIDE DIAMETER .320" OVERALL LENGTH 1.044" COILS 9 COLOR ID. LT. BLUE</p>	<p>SHIFT PRESSURE RELAY VALVE SPRING (70) WIRE DIAMETER .033" OUTSIDE DIAMETER .397" OVERALL LENGTH 1.045" COILS 7 COLOR ID. LT. GREEN</p>	<p>B4 CONTROL VALVE SPRING (71) WIRE DIAMETER .032" OUTSIDE DIAMETER .293" OVERALL LENGTH 0.977" COILS 10 COLOR ID. ORANGE</p>
<p>B2 CONTROL VALVE SPRING (79) WIRE DIAMETER .032" OUTSIDE DIAMETER .382" OVERALL LENGTH 1.339" COILS 9 COLOR ID. NONE</p>	<p>TCC CHECK VALVE SPRING (82) WIRE DIAMETER .016" OUTSIDE DIAMETER .205" OVERALL LENGTH 0.468" COILS 7 COLOR ID. WHITE</p>	<p>LOCK UP CONTROL VALVE SPRING (88) WIRE DIAMETER .025" OUTSIDE DIAMETER .219" OVERALL LENGTH 0.830" COILS 11 COLOR ID. YELLOW</p>	<p>EXHAUST CHECK VALVE SPRING (7) WIRE DIAMETER .010" OUTSIDE DIAMETER .173" OVERALL LENGTH 0.465" COILS 8 COLOR ID. NONE</p>
<p>B5 CONTROL VALVE SPRING (*53) WIRE DIAMETER .027" OUTSIDE DIAMETER .315" OVERALL LENGTH .650" COILS 4.5 COLOR ID. LT. GREEN</p>			

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Figure 200

## CONTROL VALVE BODY ASSEMBLY EXPLODED VIEW ID. STAMP "C"



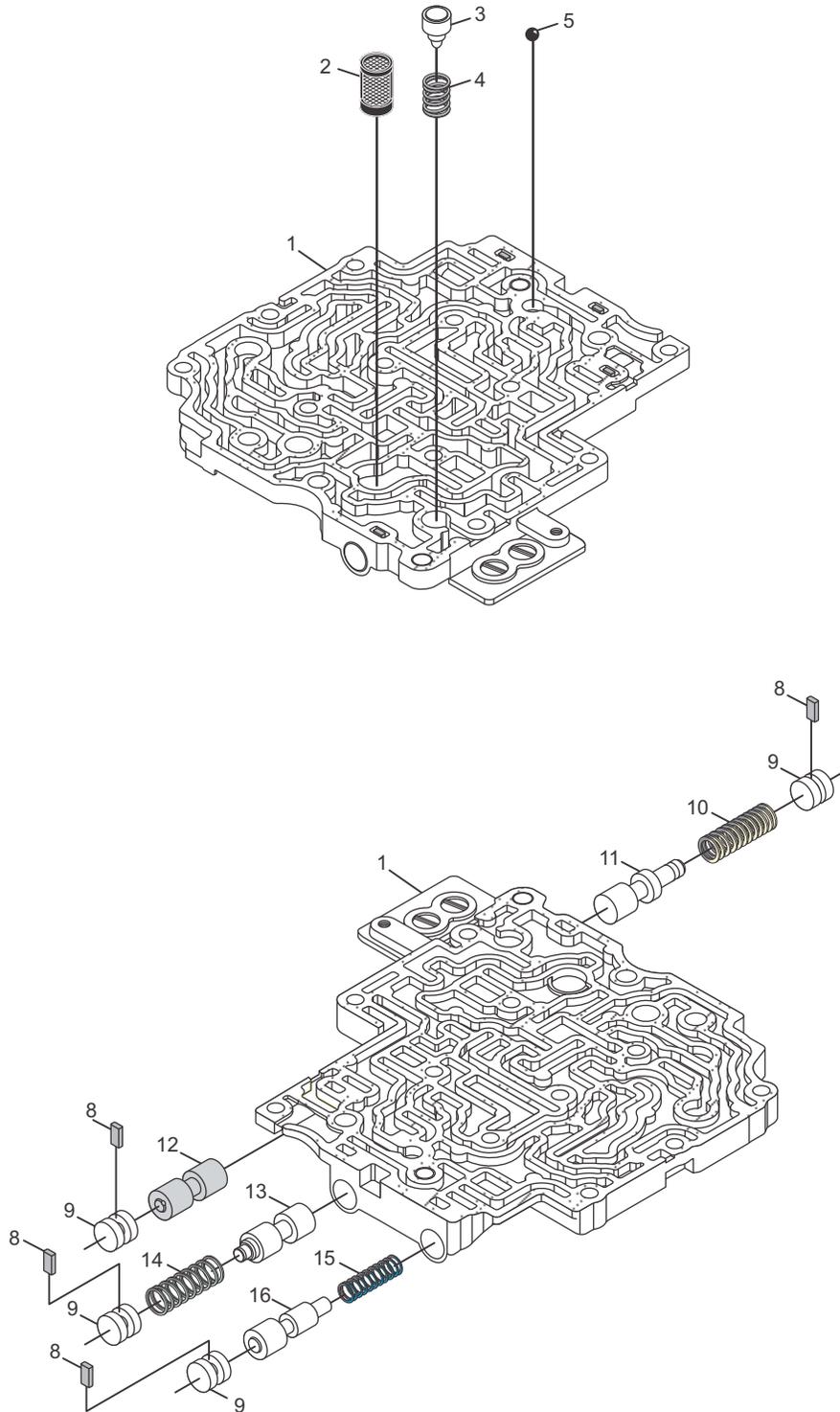
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Figure 201

## ***CONTROL VALVE BODY ASSEMBLY LEGEND***

- |   |  |
|---|--|
| 100. 1-2, 2-3, REVERSE SHIFT SOLENOID (S3) CONNECTOR (DARK GRAY)              | 120. FRONT CONTROL VALVE BODY SPACER PLATE TO MIDDLE CONTROL VALVE BODY GASKET                         |
| 101. CONTROL VALVE BODY BOLT (M5 X 0.8 X 62 mm) (1 REQUIRED)                  | 121. MIDDLE CONTROL VALVE BODY ASSEMBLY  |
| 102. CONTROL VALVE BODY BOLT (M5 X 0.8 X 28 mm) (3 REQUIRED)                  | 122. MIDDLE CONTROL VALVE BODY ASSEMBLY TO LOWER CONTROL VALVE BODY SEPARATOR PLATE AND BONDED GASKETS |
| 103. 3-4, 4-5 SHIFT SOLENOID (S4) CONNECTOR (BLUE)                            | 123. REAR CONTROL VALVE BODY ASSEMBLY  |
| 104. CONTROL VALVE BODY BOLT (M5 X 0.8 X 50mm) (2 REQUIRED)                   | 124. REAR CONTROL VALVE BODY SPACER PLATE TO REAR CONTROL VALVE BODY ASSEMBLY GASKET                   |
| 105. REVERSE SHIFT SOLENOID (S5) CONNECTOR (BROWN)                            | 125. REAR CONTROL VALVE BODY SPACER PLATE  |
| 106. SHIFT SOLENOID VALVE O-RING SEAL (5 REQUIRED)                            | 126. REAR CONTROL VALVE BODY SPACER PLATE TO NO. 2 REAR CONTROL VALVE BODY GASKET                      |
| 107. CONTROL VALVE BODY BOLT (M5 X 0.8 X 10 mm) (2 REQUIRED)                  | 127. NO. 2 REAR CONTROL VALVE BODY ASSEMBLY  |
| 108. 2-3, 3-4 SHIFT SOLENOID (S2) CONNECTOR (BLACK)                           | 128. CONTROL VALVE BODY BOLT (M5 X 0.8 X 76 mm) (1 REQUIRED)   |
| 109. REVERSE, 1ST SHIFT SOLENOID (S1) CONNECTOR (BLACK)                       | 129. CONTROL VALVE BODY BOLT (M5 X 0.8 X 49.5 mm) (4 REQUIRED)   |
| 110. CONTROL VALVE BODY BOLT (M5 X 0.8 X 13 mm) (1 REQUIRED)                  | 130. CONTROL VALVE BODY BOLT (M5 X 0.8 X 40 mm) (1 REQUIRED)   |
| 111. SOLENOID HOLD DOWN BRACKET (SOLENOID SLS/SLT)                            | 131. CONTROL VALVE BODY ASSEMBLY PRESSURE TEST PORT BOLT (M6 X 1.0 X 12 mm) (1 REQUIRED)               |
| 112. CONTROL VALVE BODY BOLT (M5 X 0.8 X 20 mm) (4 REQUIRED)                  | 132. CONTROL VALVE BODY BOLT (M5 X 0.8 X 35 mm) (2 REQUIRED)   |
| 113. CONTROL VALVE BODY BOLT (M5 X 0.8 X 16 mm) (2 REQUIRED)                  | 133. MANUAL VALVE LINK   |
| 114. FRONT CONTROL VALVE BODY ASSEMBLY  | 134. MANUAL VALVE  |
| 115. LINE PRESSURE CONTROL SOLENOID (SLT) CONNECTOR (BLUE)                    | 135. MANUAL VALVE LINK RETAINING CLIP  |
| 116. A/T INTERNAL WIRE HARNESS CLIP   | 136. TCC PRESSURE CONTROL SOLENOID (SLU) CONNECTOR (BLACK)   |
| 117. TCC PRESSURE CONTROL SOLENOID (SLU) RETAINING BRACKET                    | 137. SHIFT PRESSURE CONTROL SOLENOID (SLS) CONNECTOR (GREEN)   |
| 118. FRONT CONTROL VALVE BODY SPACER PLATE TO FRONT CONTROL VALVE BODY GASKET |  |
| 119. FRONT CONTROL VALVE BODY SPACER PLATE                                    |  |

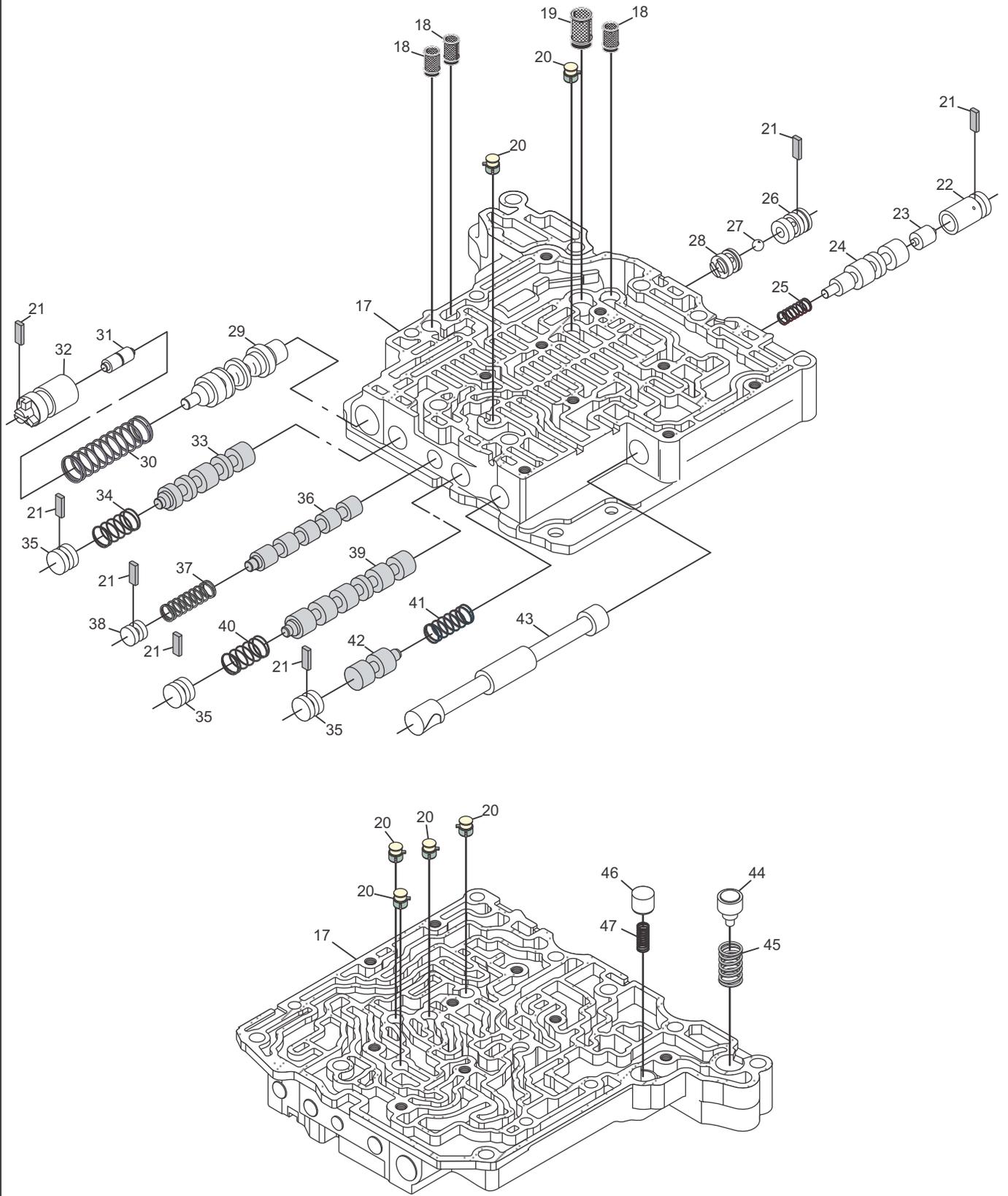
## FRONT CONTROL VALVE BODY



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Figure 203

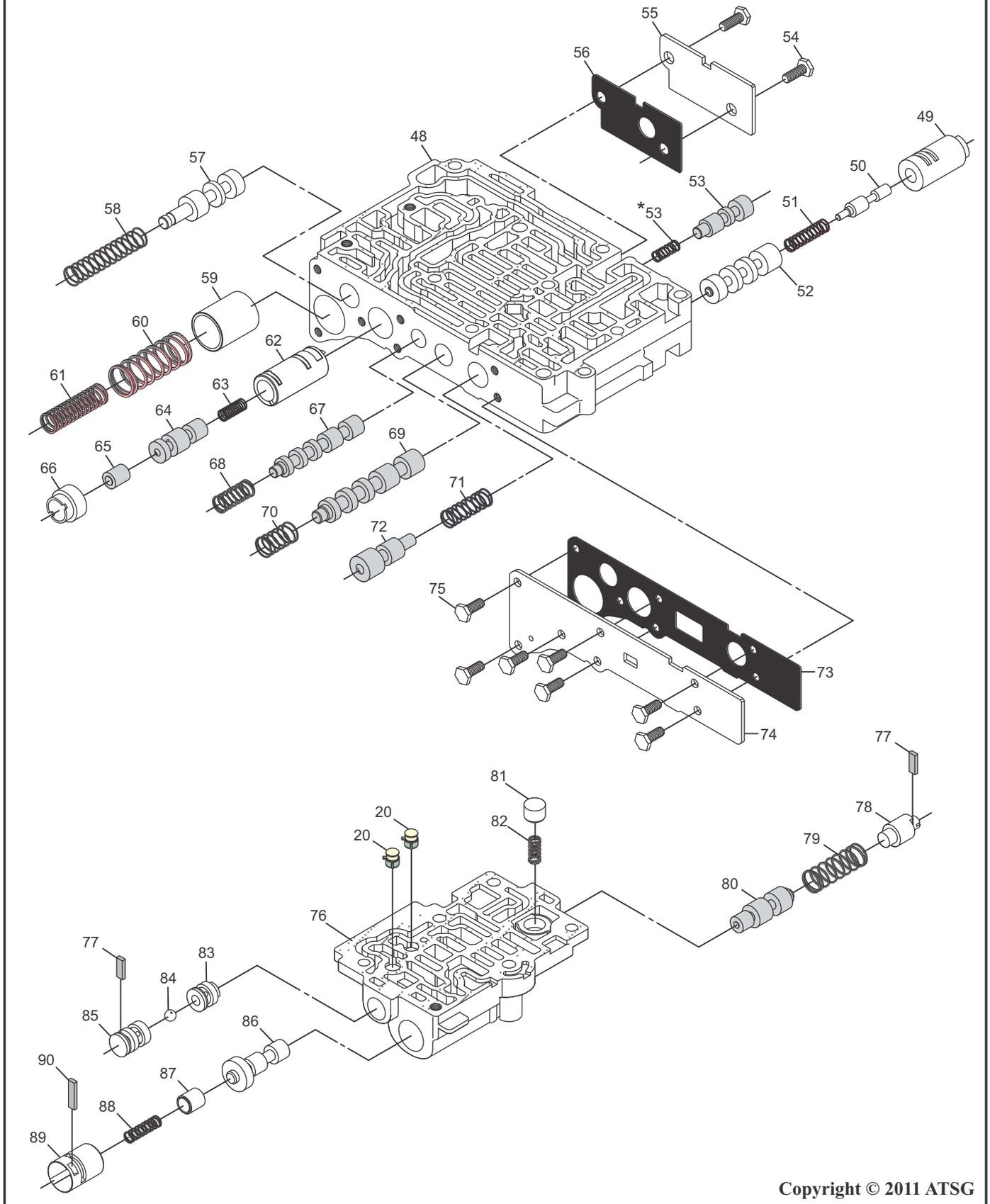
## MIDDLE CONTROL VALVE BODY



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Figure 204

## REAR CONTROL VALVE BODY NO. 2 REAR CONTROL VALVE BODY



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Figure 205

## **CONTROL VALVE BODY ASSEMBLY LEGEND**

1. FRONT CONTROL VALVE BODY
2. SOLENOID MODULATOR VALVE OIL FILTER
3. PRESSURE RELIEF VALVE
4. PRESSURE RELIEF VALVE SPRING (ID. NONE)
5. FORWARD CLUTCH (C1) ACCUMULATOR BALL #12
8. BORE PLUG RETAINER (4 @ 3.2 X 5 X 10 mm )
9. BORE PLUG (4)
10. SOLENOID MODULATOR VALVE SPRING (ID. YELLOW)
11. SOLENOID MODULATOR VALVE
12. FORWARD CLUTCH (C1) CONTROL VALVE
13. NEUTRAL RELAY VALVE
14. NEUTRAL RELAY VALVE SPRING (ID. LT. GREEN)
15. 2ND COAST (B1) CONTROL VALVE SPRING (ID. BLUE)
16. 2ND COAST (B1) CONTROL VALVE
17. MIDDLE CONTROL VALVE BODY
18. SOLENOID OIL FILTER (S2, S3, S4)
19. SOLENOID OIL FILTER (S1, S5)
20. ACCUMULATOR CHECK VALVE
21. BORE PLUG RETAINER (7 @ 3.2 X 5 X 12.5 mm)
22. SOLENOID RELAY VALVE SLEEVE
23. SOLENOID RELAY VALVE PLUNGER
24. SOLENOID RELAY VALVE
25. SOLENOID RELAY VALVE SPRING (ID. RED)
26. REVERSE SHIFT CHECK BALL OUTER BUSHING
27. REVERSE SHIFT CHECK BALL
28. REVERSE SHIFT CHECK BALL INNER BUSHING
29. PRESSURE REGULATOR VALVE
30. PRESSURE REGULATOR VALVE SPRING (ID. PURPLE)
31. PRESSURE REGULATOR VALVE PLUNGER
32. PRESSURE REGULATOR VALVE SLEEVE
33. U2 SHIFT VALVE
34. U2 SHIFT VALVE SPRING (ID. LT. GREEN)
35. BORE PLUG (3)
36. M1 SHIFT VALVE
37. M1 SHIFT VALVE SPRING (ID. LT. GREEN)
38. M1 SHIFT VALVE BORE PLUG (1)
39. U1 SHIFT VALVE
40. U1 SHIFT VALVE SPRING (ID. LT. GREEN)
41. B4 RELEASE VALVE SPRING (ID. BLUE)
42. B4 RELEASE VALVE
43. MANUAL VALVE
44. COOLER BYPASS VALVE
45. COOLER BYPASS VALVE SPRING (ID. NONE)
46. TCC CHECK VALVE
47. TCC CHECK VALVE SPRING (ID. YELLOW)
48. REAR CONTROL VALVE BODY
49. LOCK UP RELAY CONTROL VALVE SLEEVE
50. LOCK UP RELAY CONTROL VALVE PLUNGER
51. LOCK UP RELAY CONTROL VALVE SPRING (ID. RED)
52. LOCK UP RELAY CONTROL VALVE
53. 1-2/REVERSE CLUTCH (B5) CONTROL VALVE
- \*53. 1-2/REVERSE CLUTCH (B5) CONTROL VALVE SPRING (2005 AND LATER NISSAN MAXIMA UNITS ONLY)
54. COVER PLATE ATTACHING BOLT (2 REQUIRED)
55. REAR CONTROL VALVE BODY COVER PLATE
56. REAR CONTROL VALVE BODY COVER PLATE GASKET
57. SECONDARY REGULATOR VALVE
58. SECONDARY REGULATOR VALVE SPRING (ID. NONE)
59. SOLENOID SLT ACCUMULATOR PISTON
60. SLT ACCUMULATOR OUTER SPRING (ID. PINK)
61. SLT ACCUMULATOR INNER SPRING (ID. PINK)
62. SHIFT PRESSURE CONTROL VALVE SLEEVE
63. SHIFT PRESSURE CONTROL VALVE SPRING (ID. WHITE)
64. SHIFT PRESSURE CONTROL VALVE
65. SHIFT PRESSURE CONTROL VALVE PLUNGER
66. SHIFT PRESSURE CONTROL VALVE PLUNGER SLEEVE
67. M2 SHIFT VALVE
68. M2 SHIFT VALVE SPRING (ID. LT. BLUE)
69. SHIFT PRESSURE RELAY VALVE
70. SHIFT PRESSURE RELAY VALVE SPRING (ID. LT. GREEN)
71. B4 BAND CONTROL VALVE SPRING (ID. PURPLE)
72. B4 BAND CONTROL VALVE
73. REAR CONTROL VALVE BODY COVER PLATE GASKET
74. REAR CONTROL VALVE BODY COVER PLATE
75. COVER PLATE ATTACHING BOLT (7 REQUIRED)
76. NO. 2 REAR CONTROL VALVE BODY
77. BORE PLUG RETAINER (2 @ 3.2 X 5 X 15 mm)
78. 2ND CLUTCH (B2) CONTROL VALVE PLUG
79. 2ND CLUTCH (B2) CONTROL VALVE SPRING (ID. NONE)
80. 2ND CLUTCH (B2) CONTROL VALVE
81. TCC CHECK VALVE
82. TCC CHECK VALVE SPRING (ID. WHITE)
83. REVERSE INHIBIT CHECK BALL INNER BUSHING
84. REVERSE INHIBIT CHECK BALL
85. REVERSE INHIBIT CHECK BALL OUTER BUSHING
86. LOCK UP CONTROL VALVE
87. LOCK UP CONTROL VALVE PLUNGER
88. LOCK UP CONTROL VALVE SPRING (ID. NONE)
89. LOCK UP CONTROL VALVE SLEEVE
90. BORE PLUG RETAINER (1 @ 3.2 X 5 X 21.2 mm)

**CONTROL VALVE BODY ASSEMBLY  
SPRING SPECIFICATIONS  
LATE VALVE BODY ID. STAMP "C"**

PRESSURE RELIEF VALVE SPRING (4) WIRE DIAMETER .050" OUTSIDE DIAMETER .370" OVERALL LENGTH 1.128" COILS 5 COLOR ID. NONE	SOLENOID MODULATOR VALVE SPRING (10) WIRE DIAMETER .043" OUTSIDE DIAMETER .315" OVERALL LENGTH 1.113" COILS 12 COLOR ID. YELLOW	NEUTRAL RELAY VALVE SPRING (14) WIRE DIAMETER .026" OUTSIDE DIAMETER .324" OVERALL LENGTH 1.026" COILS 9 COLOR ID. LT. GREEN	B1 CONTROL VALVE SPRING (15) WIRE DIAMETER .022" OUTSIDE DIAMETER .233" OVERALL LENGTH .716" COILS 11 COLOR ID. BLUE
SOLENOID RELAY VALVE SPRING (25) WIRE DIAMETER .019" OUTSIDE DIAMETER .235" OVERALL LENGTH .800" COILS 9 COLOR ID. RED	PRESSURE REGULATOR VALVE SPRING (30) WIRE DIAMETER .047" OUTSIDE DIAMETER .528" OVERALL LENGTH 1.859" COILS 12 COLOR ID. PURPLE	U2 SHIFT VALVE SPRING (34) WIRE DIAMETER .032" OUTSIDE DIAMETER .394" OVERALL LENGTH 1.020" COILS 7 COLOR ID. LT. GREEN	M1 SHIFT VALVE SPRING (37) WIRE DIAMETER .026" OUTSIDE DIAMETER .323" OVERALL LENGTH 1.022" COILS 9 COLOR ID. LT. GREEN
U1 SHIFT VALVE SPRING (40) WIRE DIAMETER .032" OUTSIDE DIAMETER .397" OVERALL LENGTH 1.020" COILS 7 COLOR ID. LT. GREEN	B4 BAND RELEASE VALVE SPRING (41) WIRE DIAMETER .027" OUTSIDE DIAMETER .354" OVERALL LENGTH 0.91" COILS 8 COLOR ID. BLUE	COOLER BYPASS VALVE SPRING (45) WIRE DIAMETER .042" OUTSIDE DIAMETER .471" OVERALL LENGTH .680" COILS 6 COLOR ID. NONE	TCC CHECK VALVE SPRING (47) WIRE DIAMETER .019" OUTSIDE DIAMETER .270" OVERALL LENGTH .654" COILS 11 COLOR ID. YELLOW
LOCK UP RELAY VALVE SPRING (51) WIRE DIAMETER .022" OUTSIDE DIAMETER .231" OVERALL LENGTH 0.940" COILS 12 COLOR ID. RED	SECONDARY REGULATOR VALVE SPRING (58) WIRE DIAMETER .038" OUTSIDE DIAMETER .370" OVERALL LENGTH 1.857" COILS 16 COLOR ID. NONE	SLT ACCUMULATOR SPRING OUTER (60) WIRE DIAMETER .088" OUTSIDE DIAMETER .632" OVERALL LENGTH 1.560" COILS 9 COLOR ID. PINK	SLT ACCUMULATOR SPRING INNER (61) WIRE DIAMETER .063" OUTSIDE DIAMETER .413" OVERALL LENGTH 1.552" COILS 15 COLOR ID. PINK
SHIFT PRESSURE CONTROL VALVE SPRING (63) WIRE DIAMETER .025" OUTSIDE DIAMETER .229" OVERALL LENGTH 0.620" COILS 12 COLOR ID. WHITE	M2 SHIFT VALVE SPRING (68) WIRE DIAMETER .027" OUTSIDE DIAMETER .320" OVERALL LENGTH 1.044" COILS 9 COLOR ID. LT. BLUE	SHIFT PRESSURE RELAY VALVE SPRING (70) WIRE DIAMETER .033" OUTSIDE DIAMETER .397" OVERALL LENGTH 1.045" COILS 7 COLOR ID. LT. GREEN	B4 CONTROL VALVE SPRING (71) WIRE DIAMETER .032" OUTSIDE DIAMETER .293" OVERALL LENGTH 0.977" COILS 10 COLOR ID. PURPLE
B2 CONTROL VALVE SPRING (79) WIRE DIAMETER .032" OUTSIDE DIAMETER .382" OVERALL LENGTH 1.356" COILS 9 COLOR ID. NONE	TCC CHECK VALVE SPRING (82) WIRE DIAMETER .016" OUTSIDE DIAMETER .205" OVERALL LENGTH 0.462" COILS 7 COLOR ID. WHITE	LOCK UP CONTROL VALVE SPRING (88) WIRE DIAMETER .025" OUTSIDE DIAMETER .219" OVERALL LENGTH 0.839" COILS 11 COLOR ID. NONE	B5 CONTROL VALVE SPRING (*53) WIRE DIAMETER .027" OUTSIDE DIAMETER .315" OVERALL LENGTH .650" COILS 4.5 COLOR ID. LT. GREEN

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Figure 207

## TRANSAXLE FINAL ASSEMBLY

*Note: It is not recommended to disassemble the Output Gear Assembly. The exploded view diagram shown in Figure 208 is provided for illustration purposes only.*

1. Clean the output gear assembly with solvent and dry with compressed air
2. Inspect the output gear assembly for wear or damage using the diagram in Figure 208 as a reference. If any wear or damage is observed, replace the output gear assembly.
3. Carefully install the lube pipe into the transaxle case using a soft faced mallet and then install the lube pipe hold down bracket and hold down bracket retaining bolt as shown in Figure 209.
4. Torque the hold down bracket retaining bolt to 5 *N.m (44 in. lb.)* as shown in Figure 209.
5. Install the output gear assembly into the transaxle case and install the output gear assembly retaining snap ring as shown in Figure 210.
6. Make sure the retaining snap ring is fully seated in the output gear assembly.

Cont'd on page 124

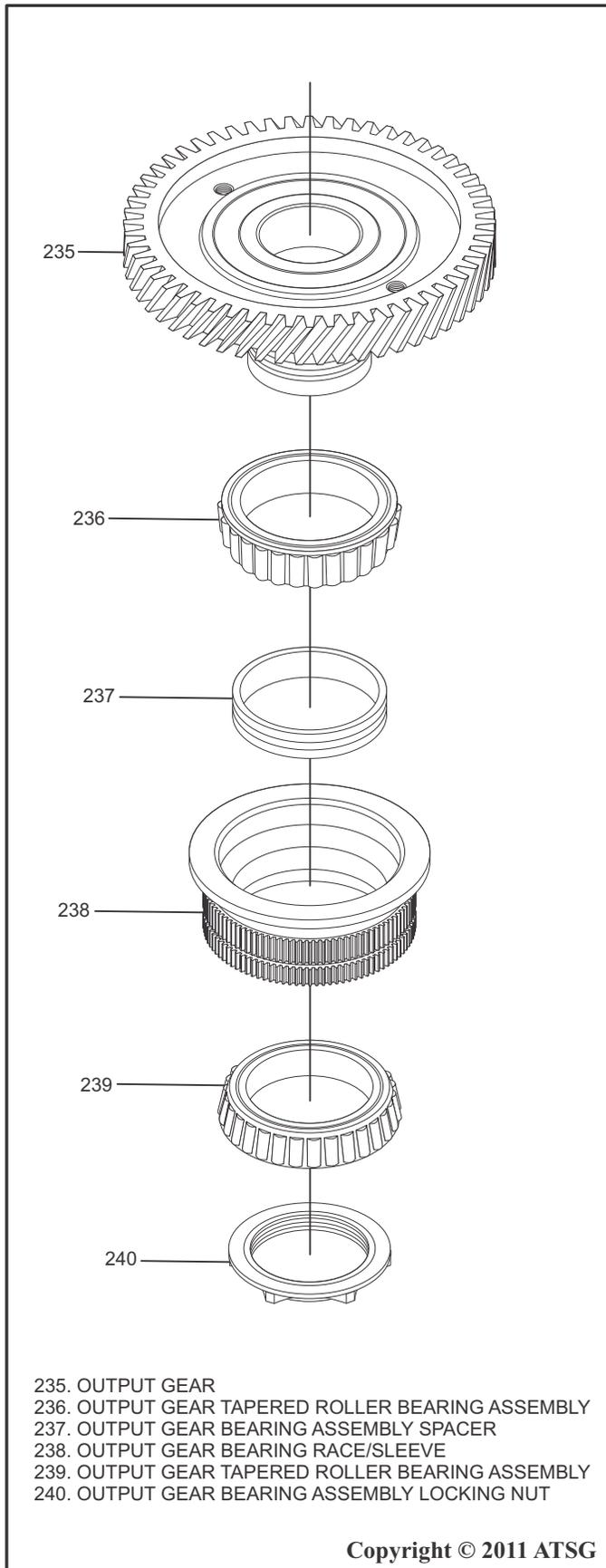


Figure 208

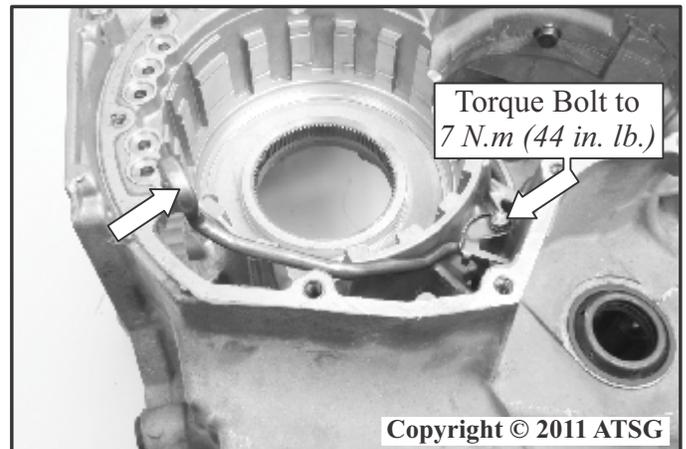


Figure 209

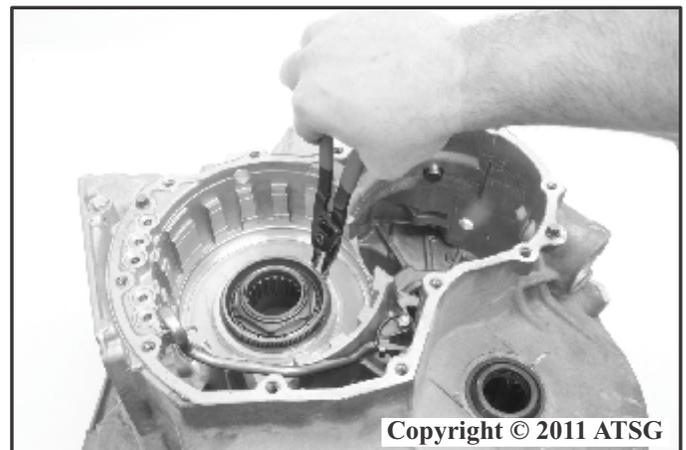


Figure 210

## ***TRANSAXLE FINAL ASSEMBLY (Cont'd)***

7. Install the L/R brake (B3) piston into the transaxle case by pressing downward and tap lightly with the handle of a screwdriver if necessary, as shown in Figure 211.
  8. Install the L/R Brake (B3) piston return spring and the return spring retaining snap ring as shown in Figure 211.
  9. Make sure the snap ring is fully seated in the snap ring groove in the case as shown in Figure 211.
  10. Install the front internal gear assembly onto the splines of the output gear assembly as shown in Figure 212.
  11. Install the front internal gear thrust bearing assembly onto the front internal gear and hold the bearing in place with a small amount of Trans-Jel® as shown in Figure 212.
  12. Install the L/R brake (B3) backing plate into the case.
  13. Starting with a lined plate and alternating lined and steel plates, install the friction plates into the case.
  14. Install the remaining backing plate into the case and the backing plate retaining snap ring.
  15. Make sure the snap ring is fully seated in the snap ring groove in the case as shown in Figure 213.
  16. Install the front planet carrier and sun gear assembly into the transaxle with a twisting motion as shown in Figure 214.
- Note:** All frictions should be soaked in the appropriate ATF for at least 30 minutes prior to installation.

Cont'd on page 125

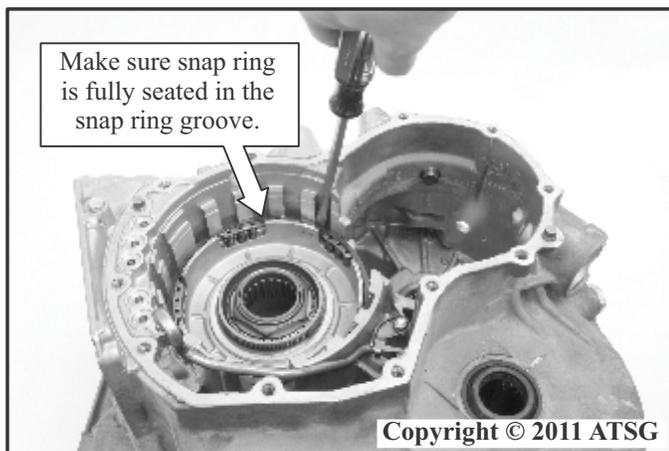


Figure 211

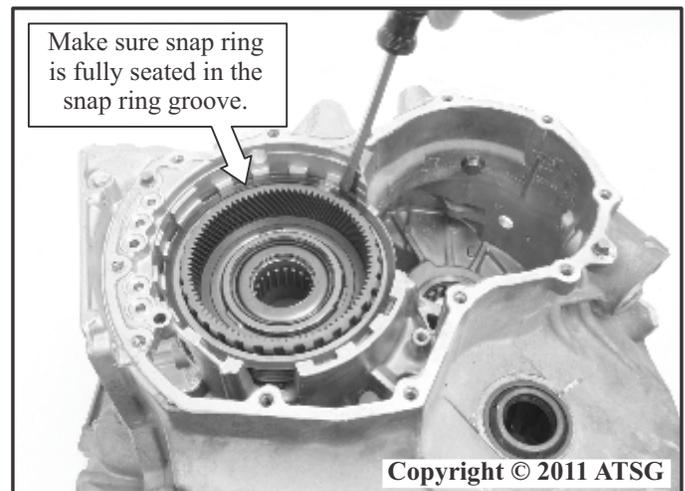


Figure 213

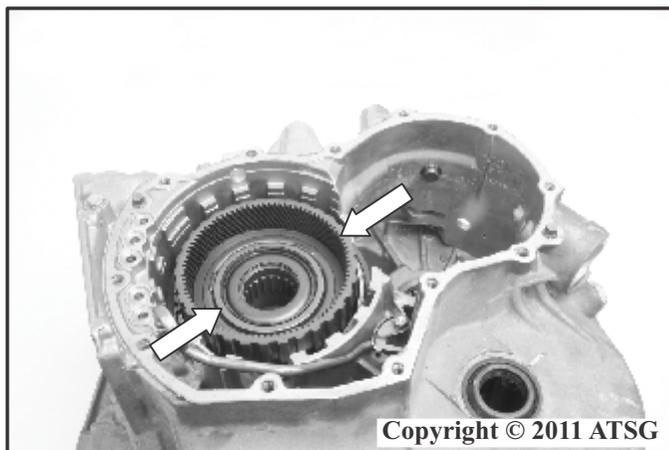


Figure 212

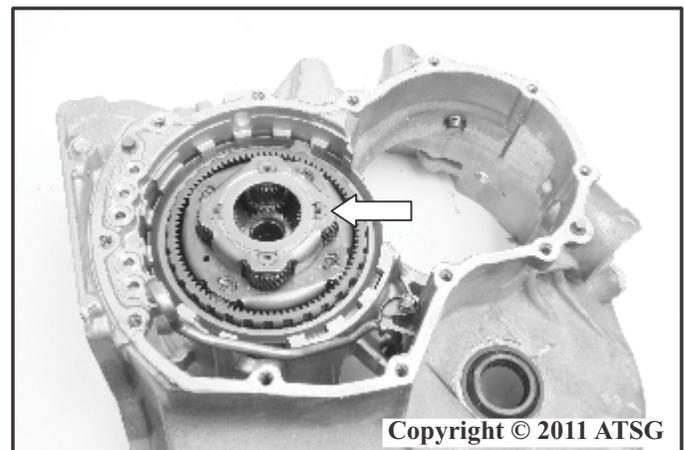


Figure 214

## TRANSAXLE FINAL ASSEMBLY (Cont'd)

17. Install the rear internal gear assembly into the transaxle with a twisting motion and make sure the rear sun gear thrust bearing race does not become dislodged as shown in Figure 215.
18. Install the rear sun gear assembly with a twisting motion and make sure the input shaft thrust bearing assembly does not become dislodged as shown in Figure 216.
19. Install the forward (C1) and direct (C2) clutch housing assembly into the transaxle with a twisting motion so that the forward and direct clutches are splined onto the rear sun gear and rear internal gear as shown in Figure 217.
20. Install five new case passage oil seals and hold them in place with a small amount of Trans-Jel® as shown in Figure 217.
21. Install the case cover assembly onto the transmission and install the 12 bolts, hand tight only as shown in Figure 218.
22. Rotate the transmission so the front section of the case is facing upward as shown in Figure 219.
23. Place SST J 45200 or similar dial indicator base onto the transfer gear as shown in Figure 219.

24. Place the dial indicator on the turbine shaft and set the dial indicator to zero.
25. Lift the turbine shaft gently until it stops and record the reading on the dial indicator.
26. The dial indicator reading is the end play.

**END PLAY MEASUREMENT SHOULD BE:**  
 0.188 - 0.570mm (0.007 - 0.022 in.)

Cont'd on page 126

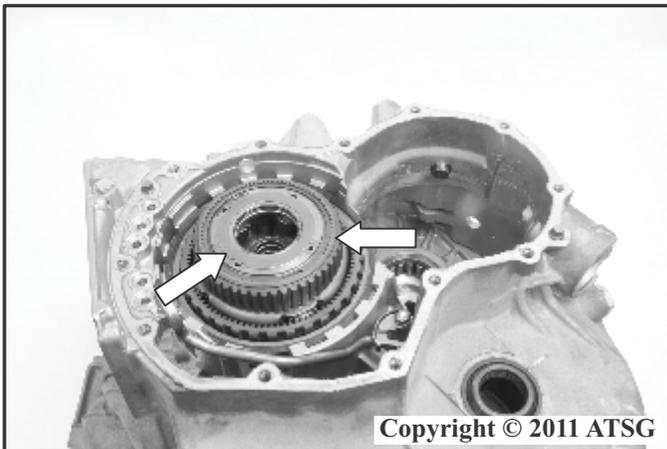


Figure 215

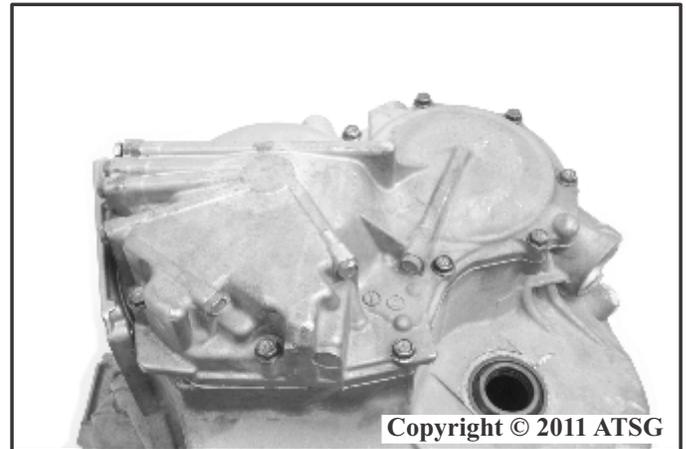


Figure 218

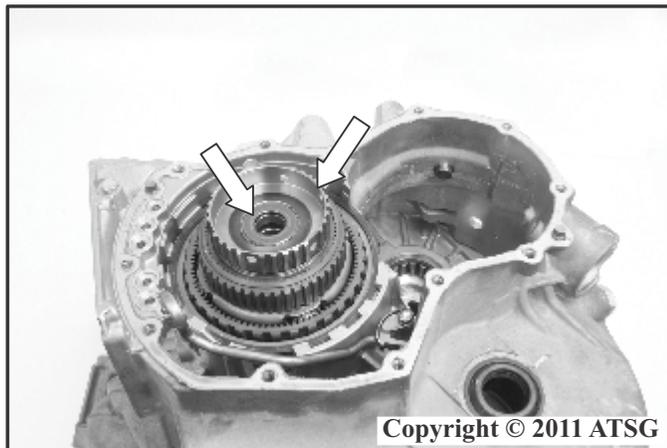


Figure 216

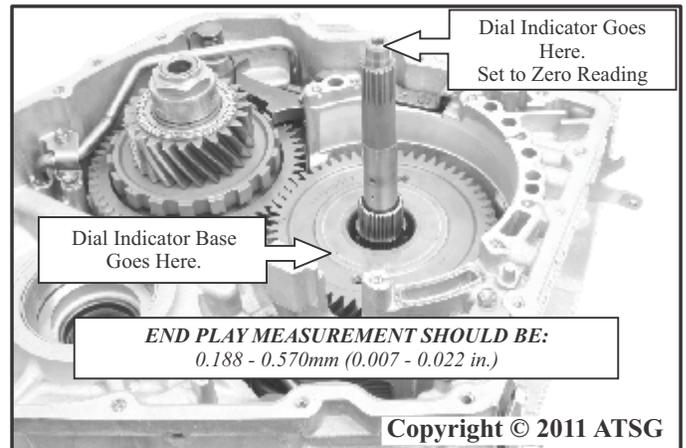


Figure 219

## TRANSAXLE FINAL ASSEMBLY (Cont'd)

27. If end play measurement is not within specification, choose another selective shim from the chart in Figure 230 on page 128.
28. Apply a 3mm (1/8 in.) bead of sealant GM P/N 89020326 or equivalent to the transmission rear case cover and install the cover onto the transaxle as shown in Figure 220.
29. Remove the bolts from the case cover and apply a small amount of threadlocker GM P/N 12345382 or equivalent to all 12 transmission rear case cover bolts as shown in Figure 220.
30. Install 9 M8 x 1.25 x 30mm bolts and hand tighten only as shown in Figure 220.
31. Install 2 M8 x 1.25 x 45mm bolts and hand tighten only as shown in Figure 220.
32. Install 1 M8 x 1.25 x 48mm bolt and hand tighten only as shown in Figure 220.
33. Once the rear case cover bolts have been hand tightened, torque each of the twelve bolts to 25 N.m (18 lb. ft.) in the numerical sequence shown in Figure 221.
34. Install the 1-2/Reverse internal gear as shown in Figure 222.
35. Make sure the internal gear thrust bearing assembly doesn't become dislodged as shown in Figure 222.

36. Install the 1-2/Reverse planetary carrier into the transmission using a twisting motion so that the planetary carrier assembly splines into each of the 1-2/Reverse clutches as shown in Figure 223.

Cont'd on page 127

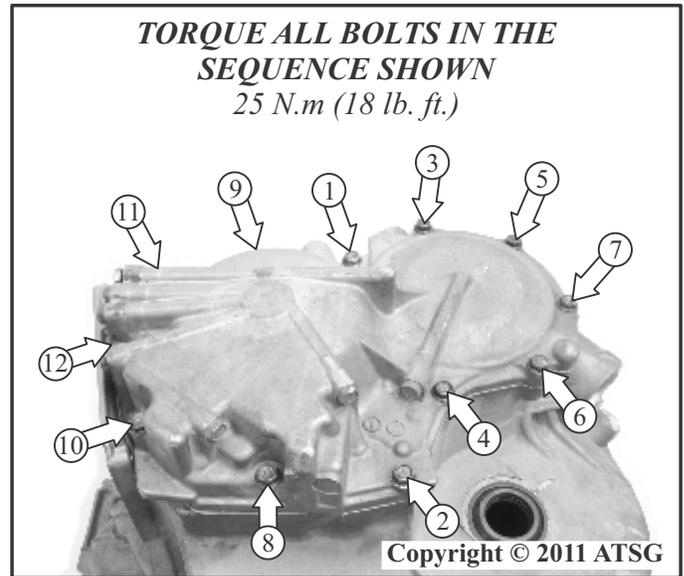


Figure 221

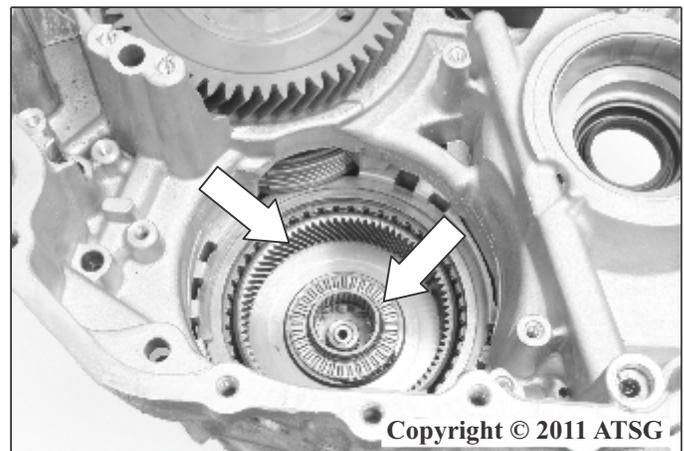


Figure 222

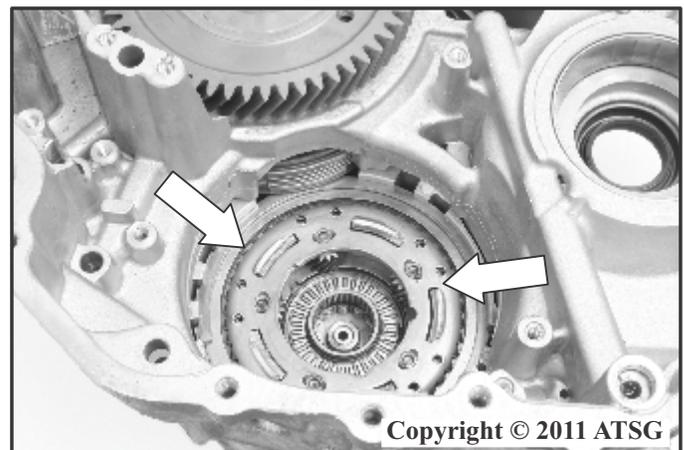


Figure 223

### Rear Case Cover Bolts

- (1) M8 x 1.25 x 30mm (9 Required)
- (2) M8 x 1.25 x 45mm (1 Required)
- (3) M8 x 1.25 x 48mm (2 Required)

*Apply Threadlocker  
GM P/N 12345382 or  
Equivalent to each bolt  
before installing*

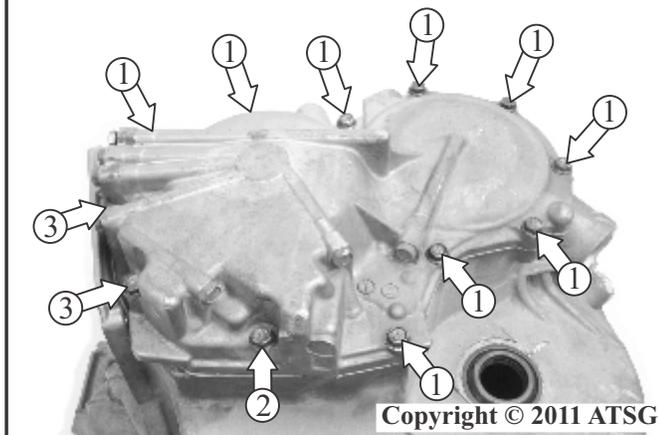


Figure 220

## TRANSAXLE FINAL ASSEMBLY (Cont'd)

37. Install a new third gear (B4) band into the transmission as shown in Figure 224.
  38. Make sure the 1-2/Reverse carrier thrust washer does not become dislodged from the carrier as shown in Figure 224.
  39. Install the 4-5 (C3) clutch drum assembly with a twisting motion as shown in Figure 225.
  40. Install the servo assembly into the case then install and tap the cover into the case using a soft faced mallet and install the retaining snap ring as shown in Figure 226.
- Caution: Wear Safety glasses when using compressed air to prevent eye injury.**
41. Measure the servo travel using the diagram and instructions in Figure 227.
  42. If servo travel is not within specification, select a different length servo pin to obtain specified servo travel.
  43. See Page 75, Figure 148 for servo travel specifications.

Cont'd on page 128

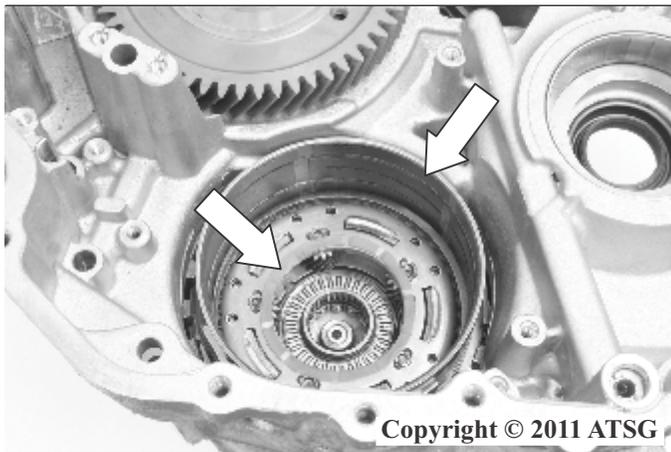


Figure 224

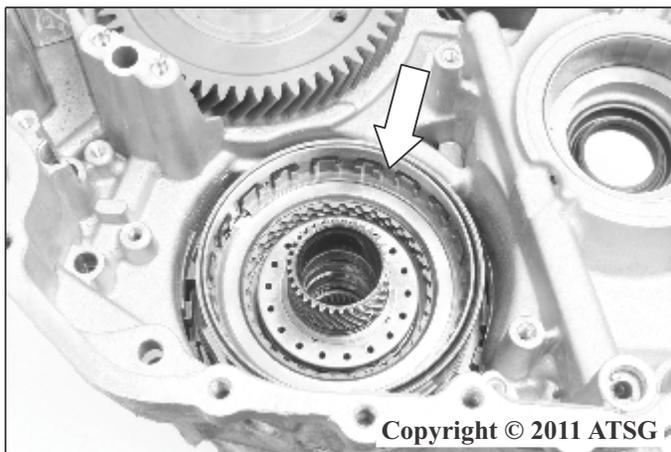


Figure 225

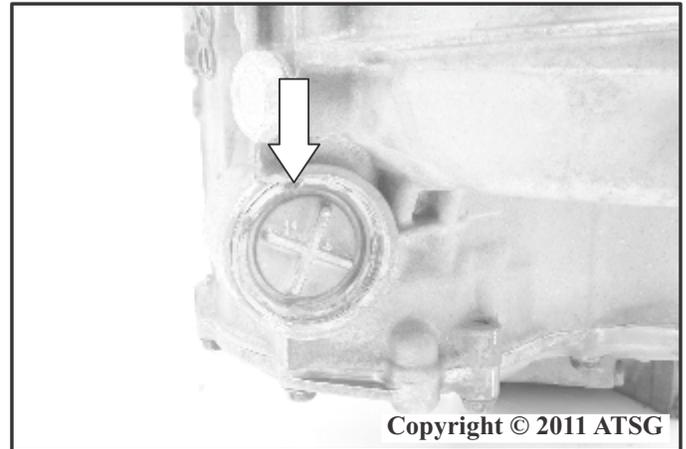


Figure 226

**MEASURING SERVO TRAVEL**

1. Make a mark on the servo piston pin with the servo in its released position (**This is Mark 1**).
2. Apply compressed air to the servo apply port indicated by the number 3.
3. With the servo piston fully applied with compressed air, make a mark on the servo piston pin (**This is Mark 2**).
4. Take a measurement between Mark 1 and Mark 2, this distance is (**Measurement A**).
5. Using Measurement A, determine whether the overall servo travel is within the specifications indicated in the chart on Page 75, Figure 148. If servo travel is not within specification, select a different length pin to obtain specified servo travel.

Figure 227

## TRANSAXLE FINAL ASSEMBLY (Cont'd)

44. Using Universal Clamp Press J 45053 or other adequate puller device, attach the clamp and carefully install the front differential assembly transfer drive gear assembly into the transmission case as shown in Figure 228. It will be necessary to twist the transfer drive gear assembly in order to spline with all the frictions of the 4-5 clutch (C3) drum.
45. Install the front differential transfer drive gear thrust washer (selective) and the transfer drive gear bearing assembly. Refer to Figure 228.
46. Place a straight edge across the transfer drive gear bearing and using a feeler gage, take a clearance measurement between the straight edge and the case. Refer to Figure 229.
47. The measurement specification should be 1.269 - 1.645mm (0.050 - 0.065 in.).

48. If measurement is not within specification, choose a different transfer drive gear thrust washer from the chart in Figure 230.
49. If the measurement is still not within specification using the largest thrust washer, it will be necessary to remove the 1-2/Reverse internal gear and select a different 1-2/Reverse internal gear shim from the chart in Figure 230.
50. Once the proper shims and washers are selected, reinstall the transfer drive gear assembly and install the thrust washer and bearing as shown in Figure 228.

Cont'd on page 129

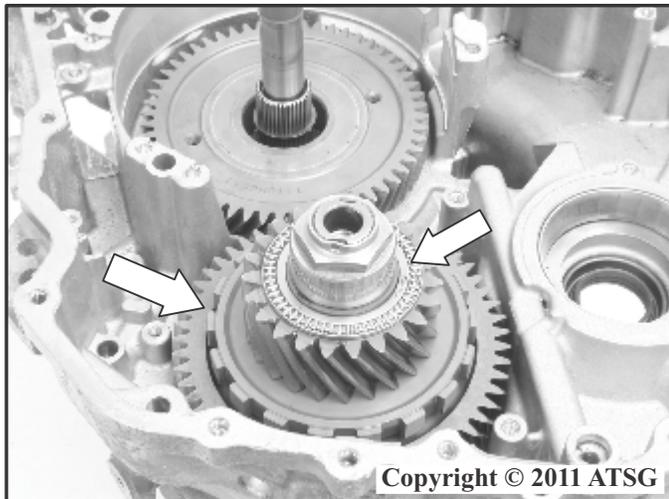


Figure 228

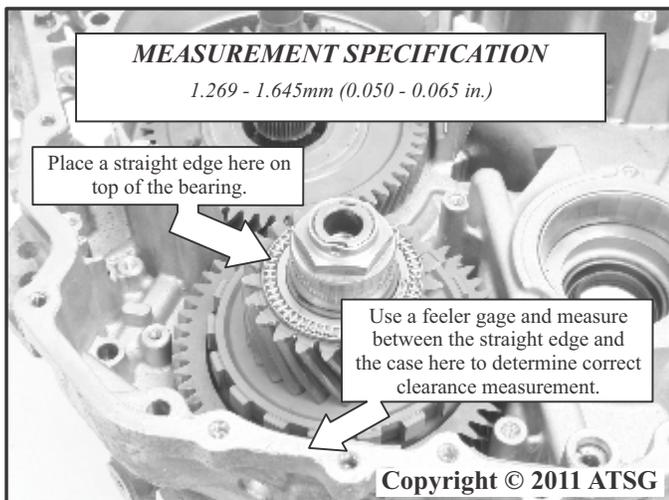


Figure 229

<b>Front Differential Transfer Drive Gear Thrust Bearing Washer (264)</b>		
<b>Identification</b>	<b>Washer Thickness (mm)</b>	<b>Washer Thickness (in.)</b>
None	0.80 mm	0.031 in.
A	0.90 mm	0.035 in.
B	1.00 mm	0.039 in.
C	1.10 mm	0.043 in.
D	1.20 mm	0.047 in.
E	1.30 mm	0.051 in.
F	1.40 mm	0.055 in.
G	1.50 mm	0.059 in.

<b>1-2/Reverse Internal Gear Shim (596)</b>		
<b>Identification</b>	<b>Washer Thickness (mm)</b>	<b>Washer Thickness (in.)</b>
8	0.81 mm	0.032 in.
9	0.90 mm	0.035 in.
10	1.00 mm	0.039 in.
11	1.10 mm	0.043 in.
12	1.20 mm	0.047 in.
13	1.30 mm	0.051 in.
14	1.40 mm	0.055 in.
15	1.50 mm	0.059 in.

<b>Forward (C1) and Direct (C2) Clutch Housing Thrust Bearing Race (628)</b>		
<b>Identification</b>	<b>Washer Thickness (mm)</b>	<b>Washer Thickness (in.)</b>
8	0.81 mm	0.032 in.
9	0.90 mm	0.035 in.
10	1.00 mm	0.039 in.
11	1.10 mm	0.043 in.
12	1.20 mm	0.047 in.
13	1.30 mm	0.051 in.
14	1.40 mm	0.055 in.
15	1.50 mm	0.059 in.

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Figure 230

## TRANSAXLE FINAL ASSEMBLY (Cont'd)

51. Install the parking pawl spring guide pin as shown in Figure 231.
52. Install the parking pawl pin spring, the guide sleeve/spacer the parking pawl pin spring retaining bolt as shown in Figure 232.
53. Torque the retaining bolt to *10 N.m (89 in. lb.)*
54. Install the parking pawl actuating bracket and the parking pawl lever as shown in Figure 233.
55. Install the parking pawl retaining shaft and the retaining shaft return spring with the spring holding the parking pawl lever against the actuating bracket as shown in Figure 234.
56. Install the manual valve detent lever spring as shown in Figure 235.
57. Install the 14 mm and the 16.7 mm manual valve detent lever spring retaining bolts as shown in Figure 235.
58. Torque the 14 mm bolt to *5 N.m (44 in. lb.)* as shown in Figure 235.

59. Torque the 16.7 mm bolt to *10 N.m (89 in. lb.)* as shown in Figure 235.

Cont'd on page 130

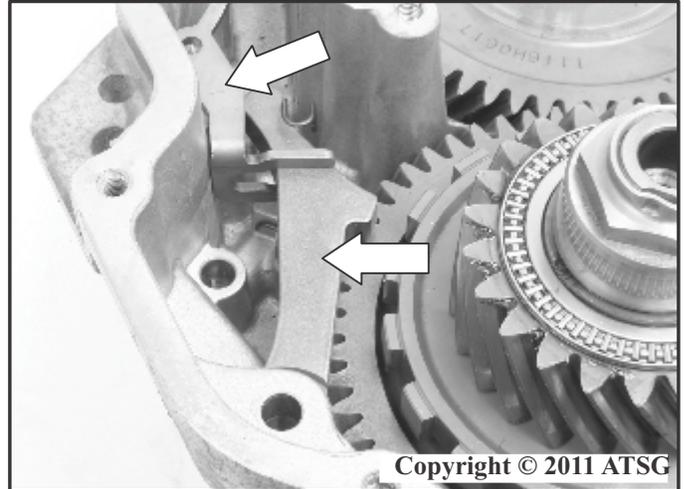


Figure 233

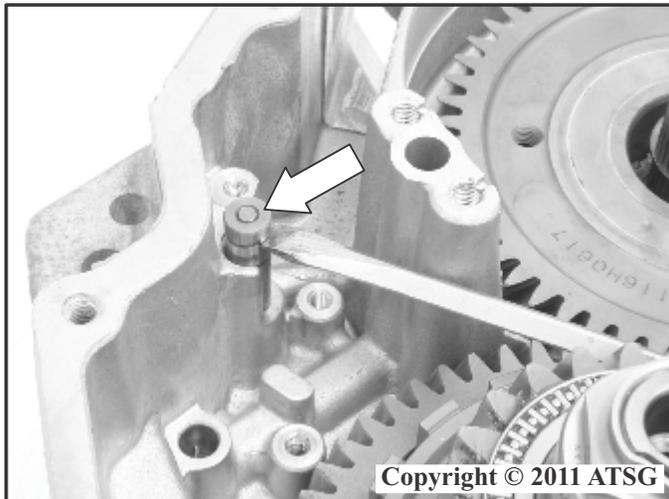


Figure 231

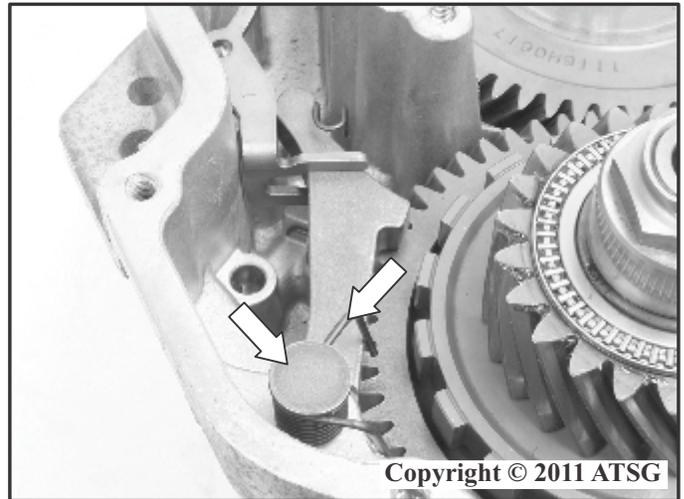


Figure 234

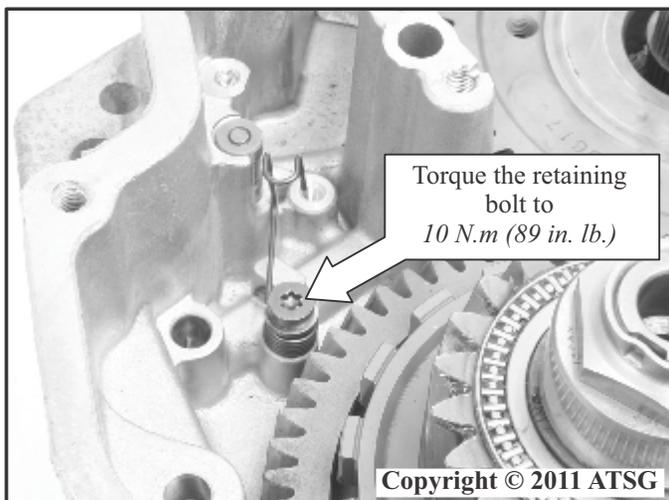


Figure 232

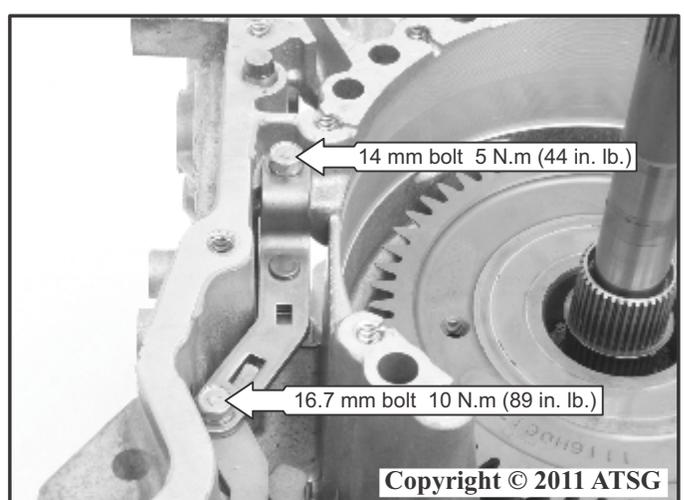


Figure 235

## TRANSAXLE FINAL ASSEMBLY (Cont'd)

60. Install the parking pawl actuator rod into the transmission as shown in Figure 236.
61. Install the manual valve detent lever into the case as shown in Figure 236.
62. Rotate the manual valve detent lever forward and engage the parking pawl actuator rod into the detent lever. Lift upward on the manual valve detent spring and slide the manual valve detent lever into place in the transmission as shown in Figure 236. Be careful not to damage the linkage seal when installing the detent lever.
63. Install the transmission case fluid passage cover as shown in Figure 237.
64. Install the two transmission case fluid passage cover retaining bolts  $M6 \times 1.0 \times 14 \text{ mm}$  as shown in Figure 237.
65. Torque the bolts to  $5 \text{ N.m}$  ( $44 \text{ in. lb.}$ ) as shown in Figure 237.
66. Install two new O-rings onto the third gear (B4) apply pipe as shown in Figure 238.
67. Coat the O-rings with a small amount of Trans-Jel® and install the pipe into the transmission as shown in Figure 238.
68. Install the apply pipe hold down bracket and the two hold down bracket retaining bolts  $M6 \times 1.0 \times 14 \text{ mm}$  as shown in Figure 238.
69. Torque the bolts to  $5 \text{ N.m}$  ( $44 \text{ in. lb.}$ ) as shown in Figure 238.
70. Install a new fluid passage seal into the case as shown in Figure 239.

Cont'd on page 131

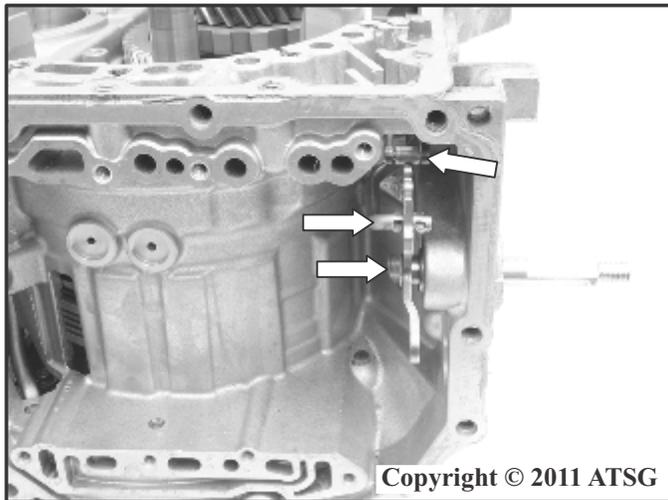


Figure 236

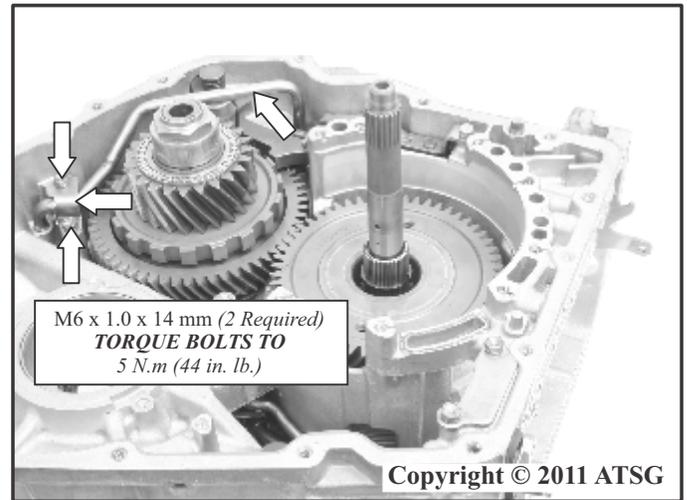


Figure 238

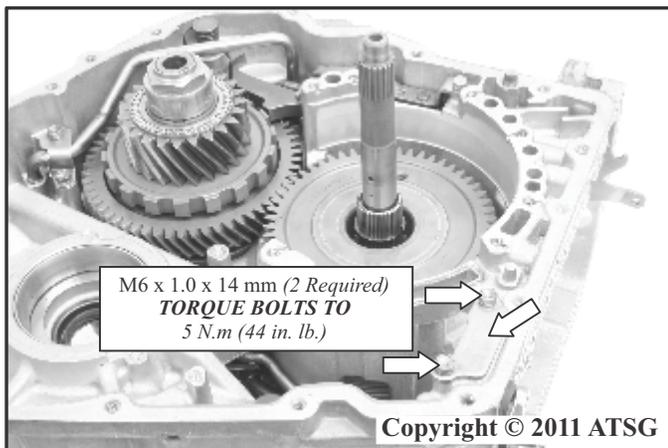


Figure 237

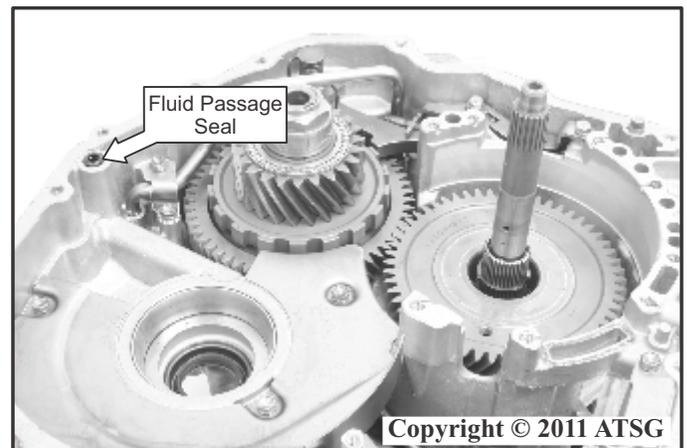


Figure 239

## TRANSAXLE FINAL ASSEMBLY (Cont'd)

71. Coat the front differential bearing assemblies with a small amount of atf and install the differential into the transmission as shown in Figure 240.
72. Install the transmission fluid filter into the case as shown in Figure 241.
73. Be careful to not dislodge the fluid filter seals.
74. Install the transmission fluid filter retaining bolt *M6 x 1.0 x 16.7 mm* as shown in Figure 241.
75. Torque the transmission fluid filter retaining bolt to *5 N.m (44 in. lb.)* as shown in Figure 241.
76. Apply a 3 mm (1/8 in.) bead of sealant GM P/N 89020326 or equivalent to the inside of the bolt holes on the mating surface of the torque converter housing as shown in Figure 242.
77. Apply threadlocker GM P/N 12345382 or equivalent to each of the torque converter housing bolts.
78. Install the eleven M8 x 1.25 x 30 mm bolts (4) and hand tighten as shown in Figure 243.
79. Install the two M8 x 1.25 x 30 mm bolt/studs (3) and hand tighten as shown in Figure 243.

80. Install the two M8 x 1.25 x 35 mm bolts (6) and hand tighten as shown in Figure 243.
81. Install the one M8 x 1.25 x 45 mm bolt (7) and hand tighten as shown in Figure 243.
82. Install the one M8 x 1.25 x 30 mm TORX 40 bolt (8) and hand tighten as shown in Figure 243.

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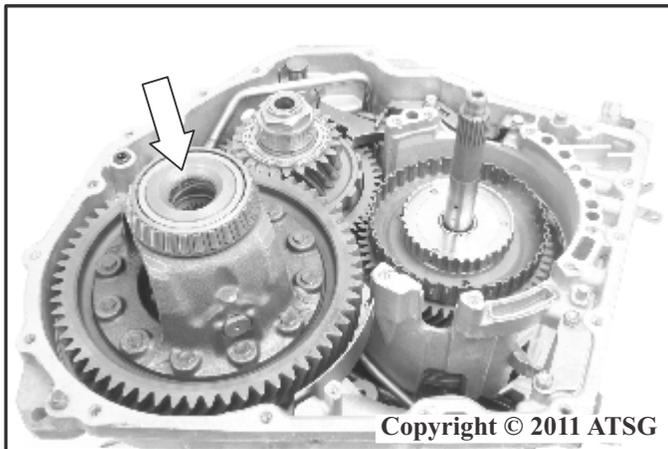


Figure 240

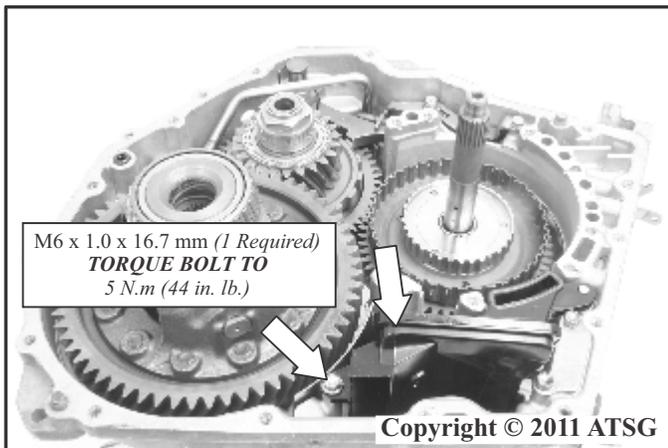


Figure 241

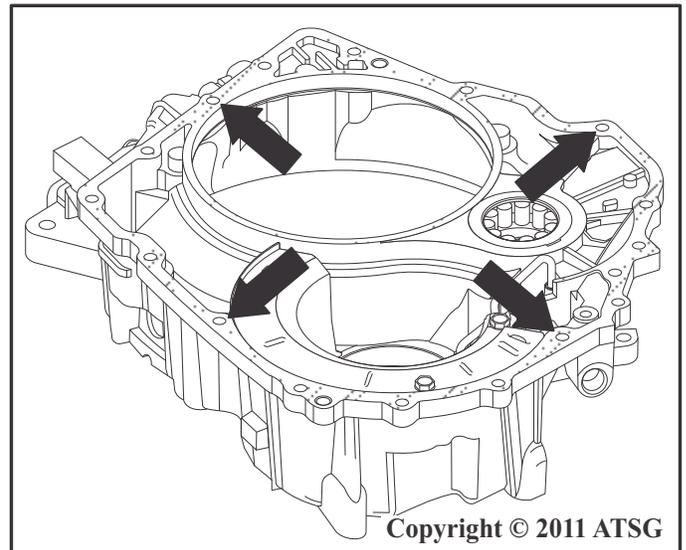


Figure 242

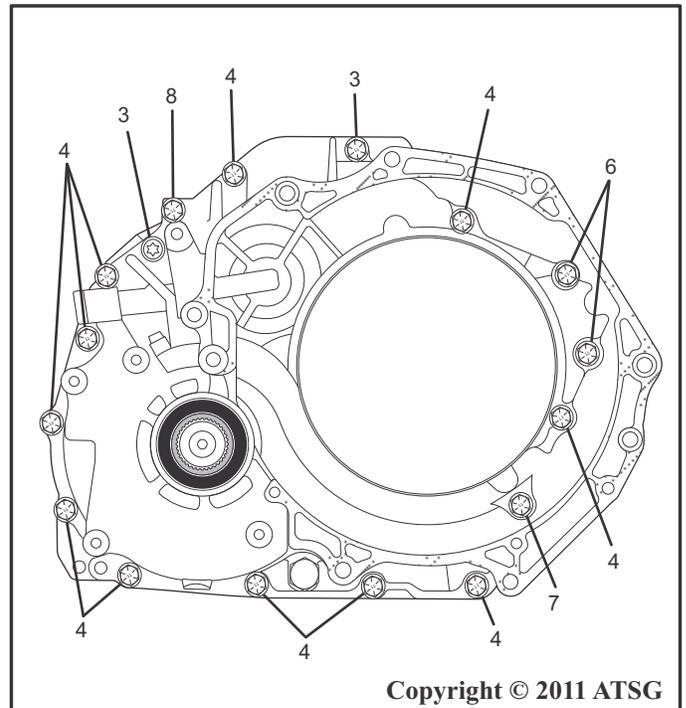


Figure 243

## TRANSAXLE FINAL ASSEMBLY (Cont'd)

83. Torque the seventeen torque converter housing bolts to  $29\text{ N.m}$  ( $21\text{ lb. ft.}$ ) according to the sequence shown in Figure 244.
84. Install SST J 45053 or similar pump removal/installing tool onto the pump assembly and carefully install the fluid pump into the transmission as shown in Figure 245. Use care when installing the fluid pump assembly so that the second clutch (B2) sprag assembly does not become dislodged during the installation of the fluid pump.
85. Lightly press the fluid pump into the transmission case so that the pump is fully seated in place as shown in Figure 245.
86. Install the eight  $M8 \times 1.25 \times 28\text{ mm}$  fluid pump to case assembly bolts and hand tighten as shown in Figure 246.
87. Torque the eight  $M8 \times 1.25 \times 28\text{ mm}$  fluid pump to case bolts to  $25\text{ N.m}$  ( $18\text{ lb. ft.}$ ) and in the sequence shown in Figure 246.
88. Rotate the transmission and install the two case fluid passage seals into the transmission as shown in Figure 247.

Cont'd on page 133



Figure 245

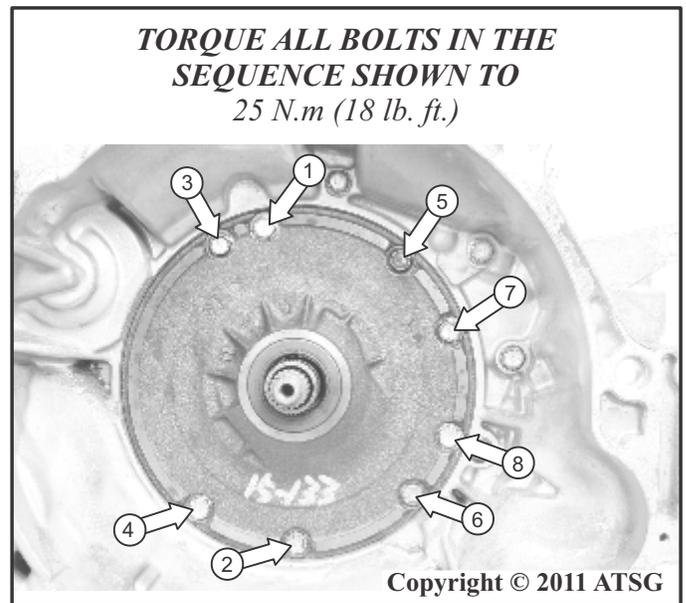


Figure 246

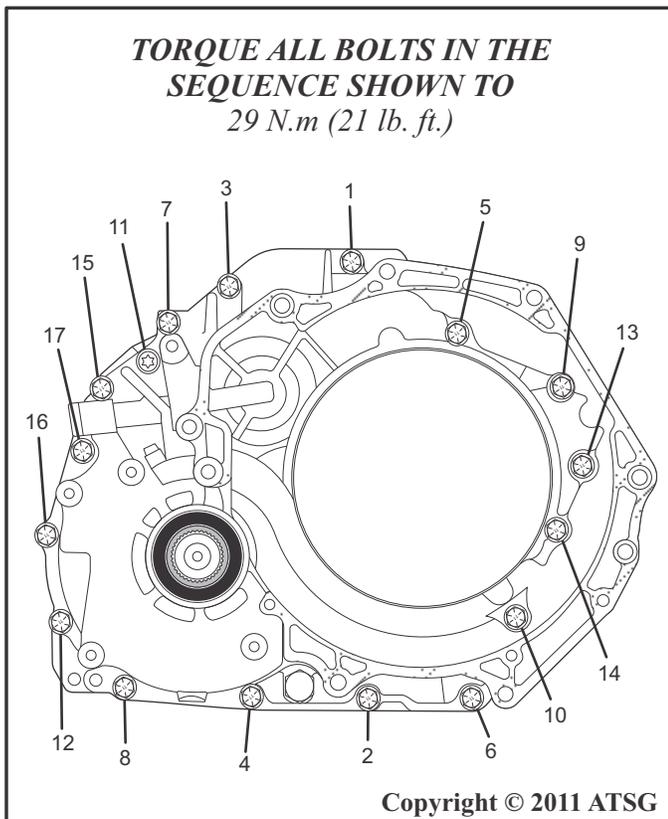


Figure 244

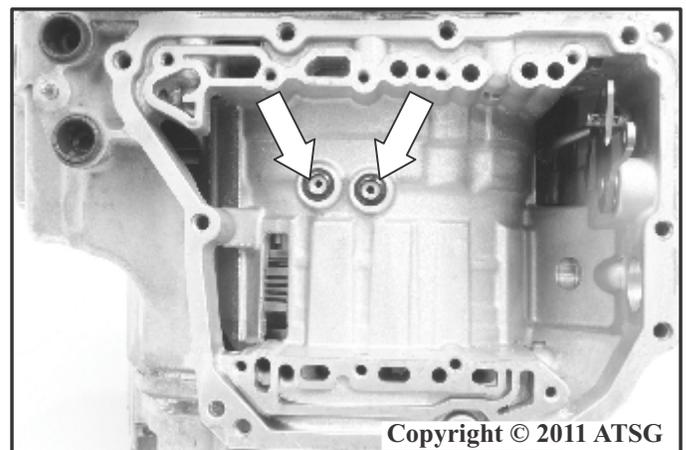


Figure 247

## **TRANSAXLE FINAL ASSEMBLY (Cont'd)**

89. Install a new o-ring onto the transmission wiring harness assembly and coat the o-ring with a small amount of Trans-Jel® as shown in Figure 248.
90. Install the transmission wiring harness assembly into the transmission using a twisting motion while pushing carefully downward as shown in Figure 248.
91. While holding the control valve body assembly, install the manual valve link into the manual valve shift detent lever as shown in Figure 249.
92. Install the control valve body assembly onto the transmission case being careful to not pinch or damage the transmission wiring harness.
93. Install the two  $M6 \times 1.0 \times 16 \text{ mm}$  (34) bolts and hand tighten as shown in Figure 250.
94. Install the two  $M6 \times 1.0 \times 28 \text{ mm}$  (35) bolts and hand tighten as shown in Figure 250.
95. Install the two  $M6 \times 1.0 \times 55 \text{ mm}$  (37) bolts and hand tighten as shown in Figure 250.

Cont'd on page 134

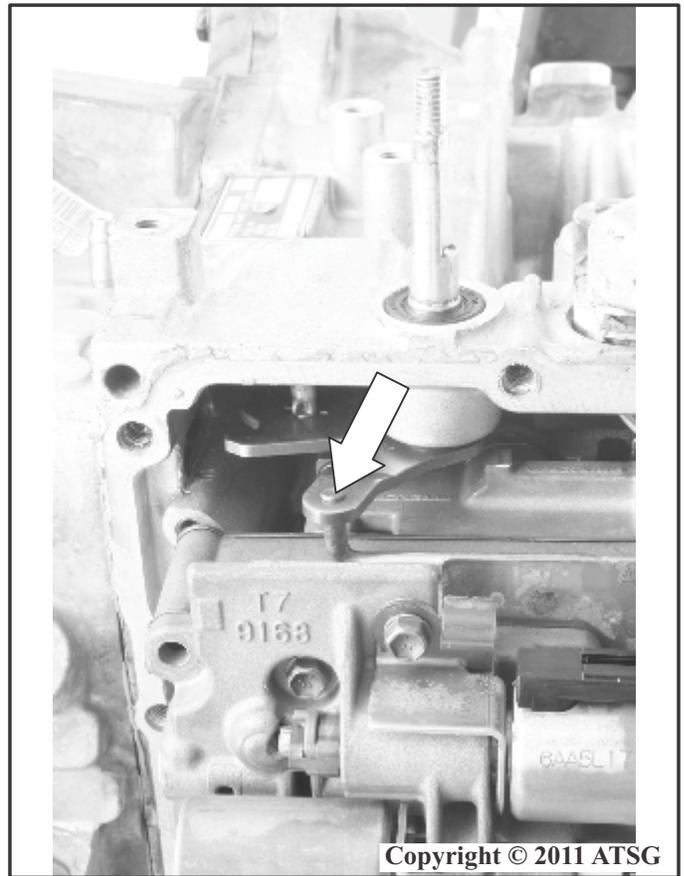


Figure 249

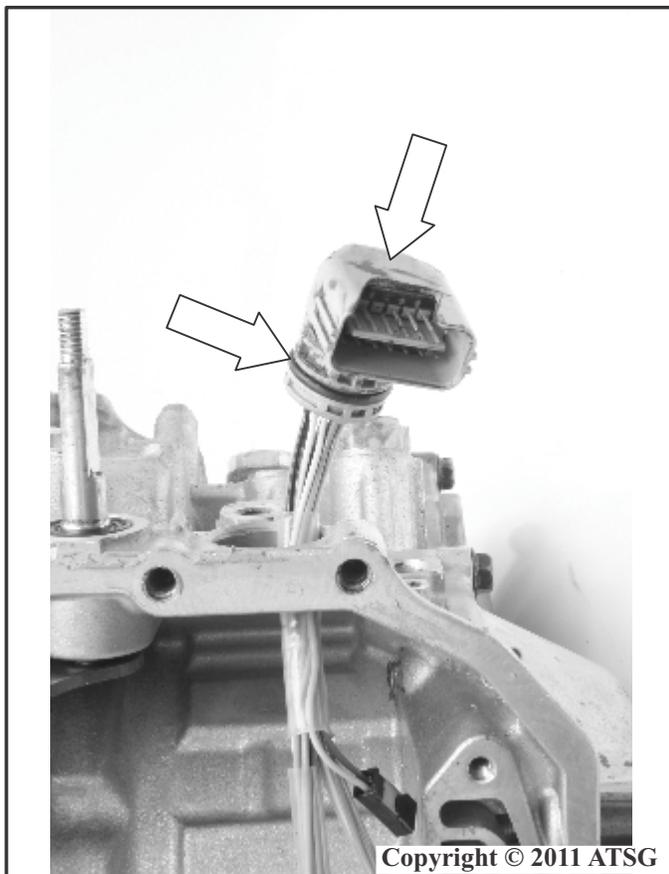


Figure 248

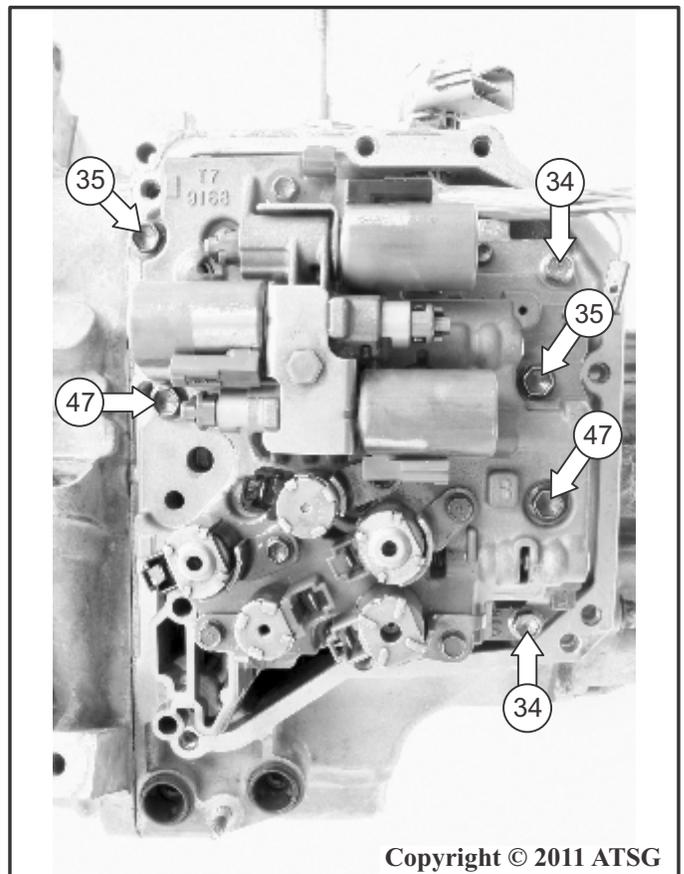


Figure 250

## TRANSAXLE FINAL ASSEMBLY (Cont'd)

96. Torque the six control valve body assembly attaching bolts to *10 N.m (89 in. lb.)* in the sequence shown in Figure 251.
97. Install a new control valve body fluid passage cover gasket and the control valve body fluid passage cover as shown in Figure 252.
98. Install the two *M6 x 1.0 x 50 mm* control valve body fluid passage cover retaining bolts and torque the bolts to *10 N.m (89 in. lb.)* as shown in Figure 252.
99. Install a new o-ring seal onto the ATF temperature sensor and coat the o-ring with a small amount of Trans-Jel® then install the ATF temperature sensor into the valve body with a twisting motion while pushing downward as shown in Figure 252. Install the ATF temperature sensor hold down
100. bracket and the one *M6 x 1.0 x 55 mm* bolt and torque the bolt to *10 N.m (89 in. lb.)* as shown in Figure 252.

101. Install the five shift solenoid connectors (S1, S2, S3, S4, and S5) as shown in Figure 252.
102. Make sure the connectors are secure and the locking tabs lock into place.
103. Install the three linear solenoid connectors (SLS, SLT, and SLU) as shown in Figure 252.
104. Make sure the connectors are secure and the locking tabs lock into place.

Cont'd on page 135

SOLENOID	CONNECTOR COLOR	WIRE COLOR
SLU	BLACK	1 GREEN 1 BROWN
SLT	BLUE	1 GREEN 1 GREY
SLS	GREEN	1 BLUE 1 RED
S1	BLACK	WHITE
S2	BLACK OR GREY	BLACK
S3	GREY	YELLOW
S4	BLUE OR GREEN	PURPLE OR RED
S5	GREEN OR RED OR GREY	BLUE OR BLACK

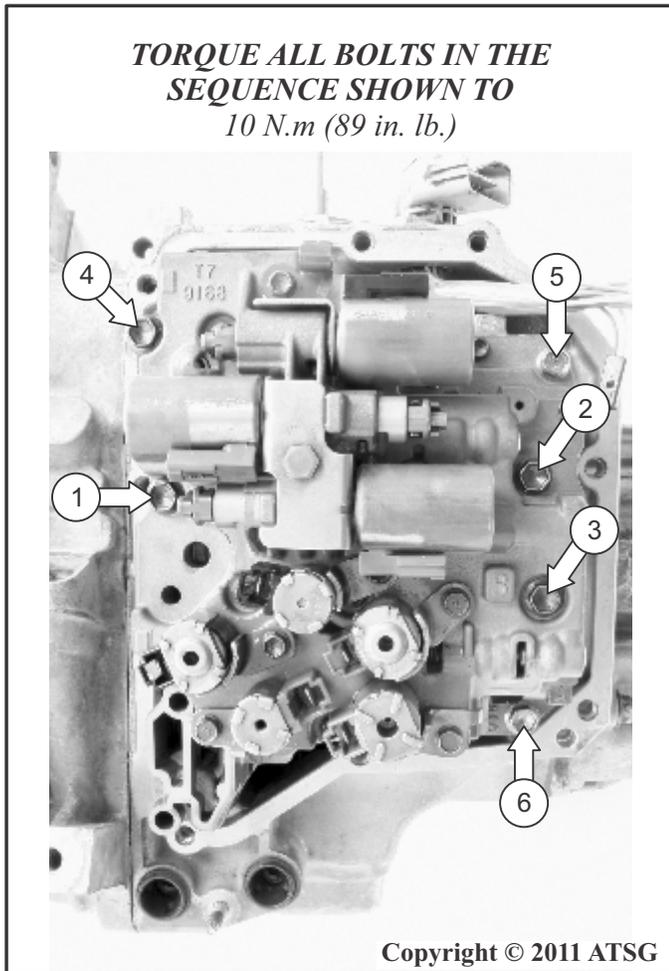


Figure 251

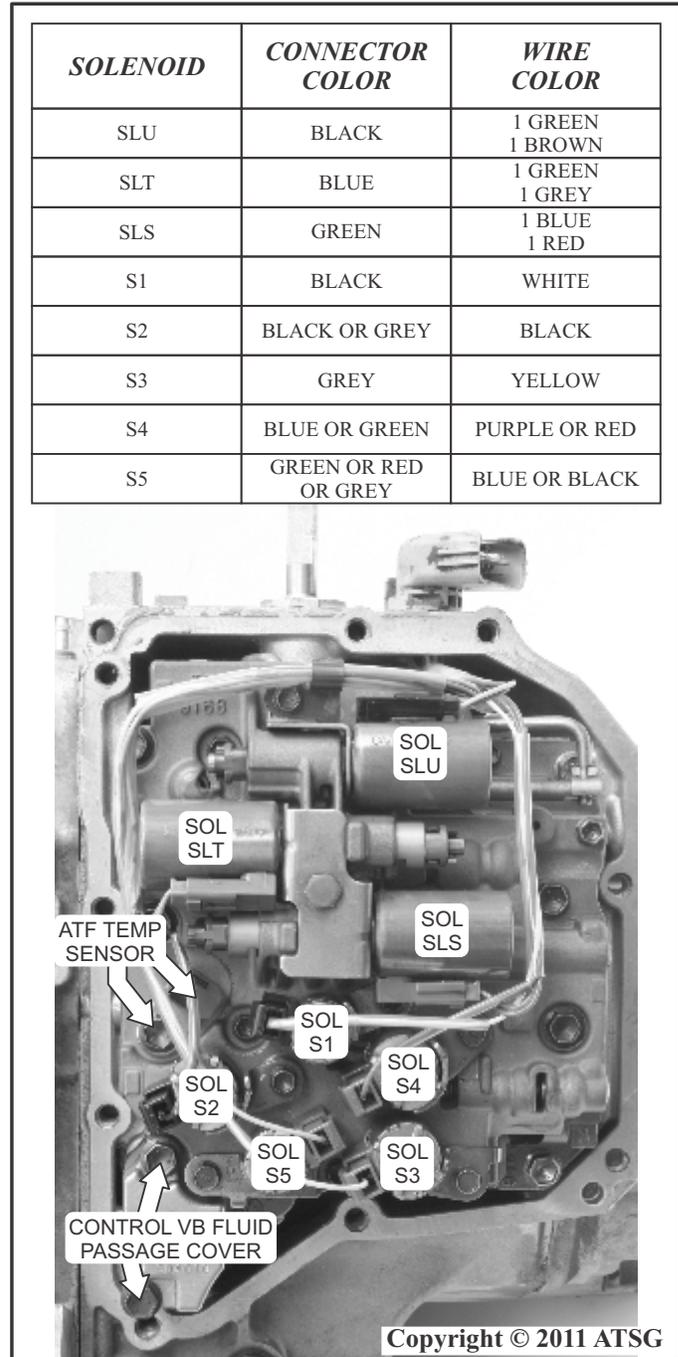


Figure 252

## TRANSAXLE FINAL ASSEMBLY (Cont'd)

105. Apply a 3 mm (1/8 in.) bead of sealant GM P/N 89020326 or equivalent to the mating surface of the control valve body cover.
106. Apply threadlocker GM P/N 12345382 or equivalent to each attaching bolt then install the nine *M8 x 1.25 x 15.5 mm* control valve body cover attaching bolts into the case and torque the bolts to *13 N.m (10 lb. ft.)* as shown in Figure 253.
107. Install a new o-ring seal onto the output sensor and coat the o-ring with a small amount of Trans-Jel® as shown in Figure 254.
108. Install the output sensor into the transmission case using a twisting motion while carefully pushing downward as shown in Figure 254.
109. Install the output sensor retaining bolt *M6 x 1.0 x 16 mm* and torque the bolt to *5 N.m (44 in. lb.)* as shown in Figure 254.
110. Install a new o-ring seal onto the turbine sensor and coat the o-ring with a small amount of Trans-Jel® as shown in Figure 255.
111. Install the turbine sensor into the transmission case using a twisting motion while carefully pushing downward as shown in Figure 255.
112. Install the turbine sensor retaining bolt *M6 x 1.0 x 16 mm* and torque the bolt to *5 N.m (44 in. lb.)* as shown in Figure 255.

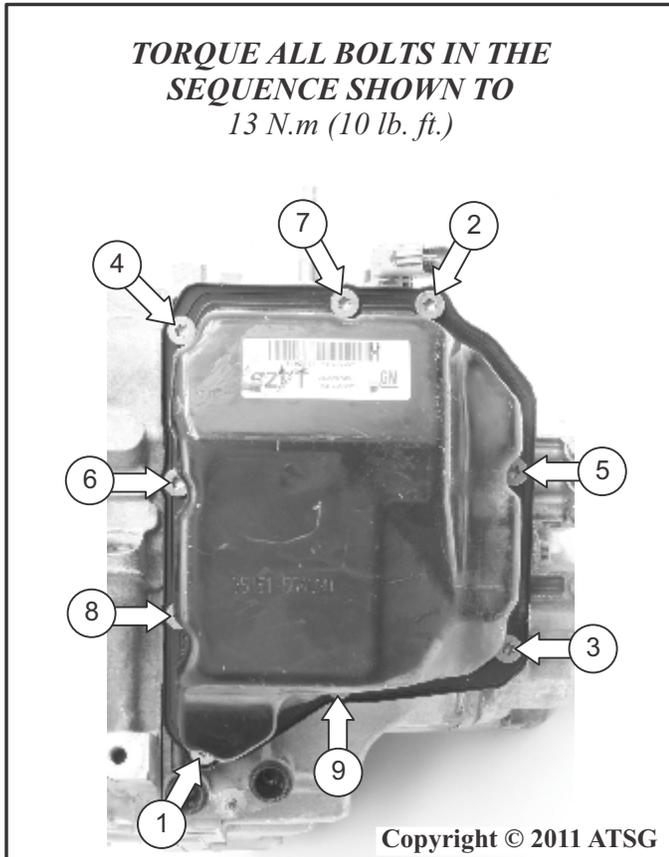


Figure 253



Figure 254

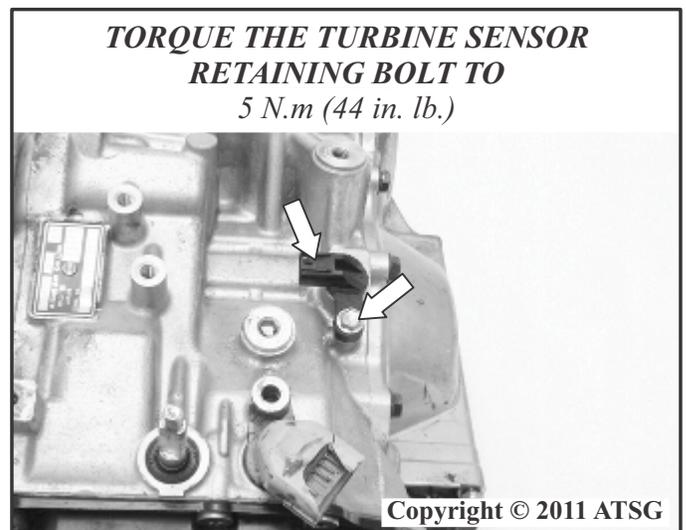


Figure 255

Cont'd on page 136

## TRANSAXLE FINAL ASSEMBLY (Cont'd)

113. Install the park/neutral position switch onto the manual shift detent lever assembly as shown in Figure 256.
114. Install the park/neutral position switch flat washers and the stud and bolt and hand tighten enough so the switch will still rotate and allow adjustment by hand as shown in Figure 256.
115. Install the park/neutral position switch flat washer, locking tab washer, and nut as shown in Figure 256.

**TORQUE PARK/NEUTRAL POSITION SWITCH NUT TO**  
7 N.m (62 in. lb.)

**TORQUE PARK/NEUTRAL POSITION SWITCH STUD AND BOLT TO**  
25 N.m (18 lb. ft.)

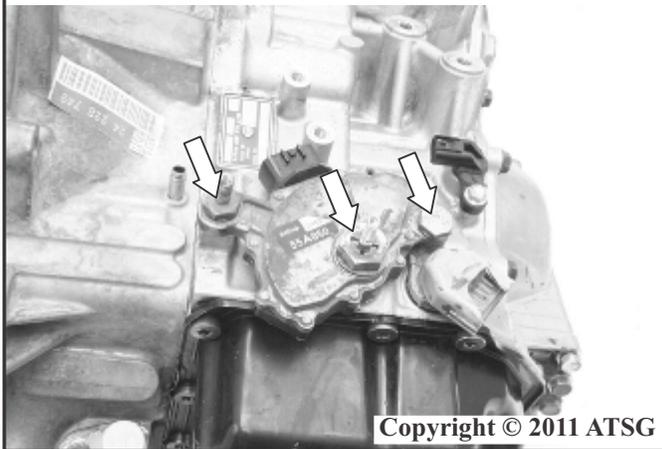


Figure 256

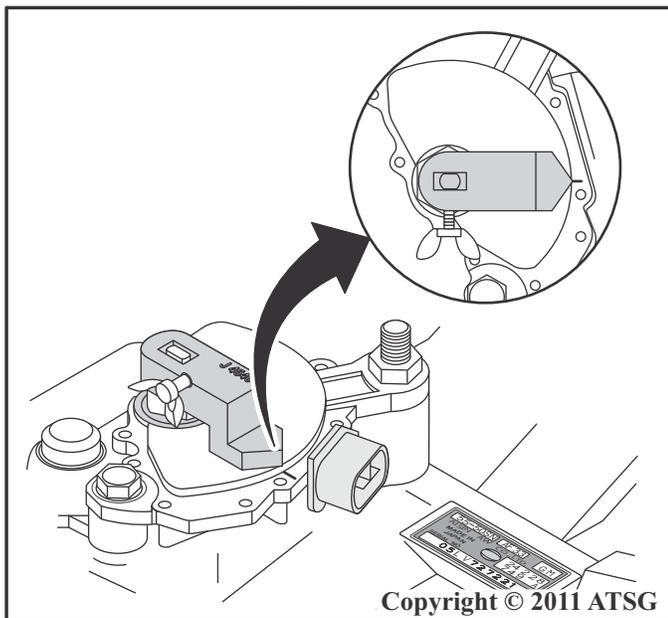


Figure 257

116. Tighten the park/neutral position switch nut to 7 N.m (62 in. lb.) as shown in Figure 256.
117. Bend up the tabs of the locking washer to secure the nut as shown in Figure 256.
118. Place the manual shift detent lever into the neutral position as shown in Figure 257.
119. Install SST J 45404 onto the manual shift detent lever and rotate the park/neutral position switch until the tool is aligned with the mark on the park/neutral position switch as shown in Figure 257.
120. Install a new o-ring onto the fluid level indicator and coat with a small amount of Trans-Jel® and install the fluid level indicator into the transmission then the retaining bolt and hand tighten only as shown in Figure 258.
121. Once the transmission has been reinstalled into the vehicle and the fluid level has been checked and verified as shown in Figure 4, torque the fluid level indicator retaining bolt to 10 N.m (89 in. lb.) as shown in Figure 258.

**TORQUE THE FLUID LEVEL INDICATOR RETAINING BOLT TO**  
10 N.m (89 in. lb.)

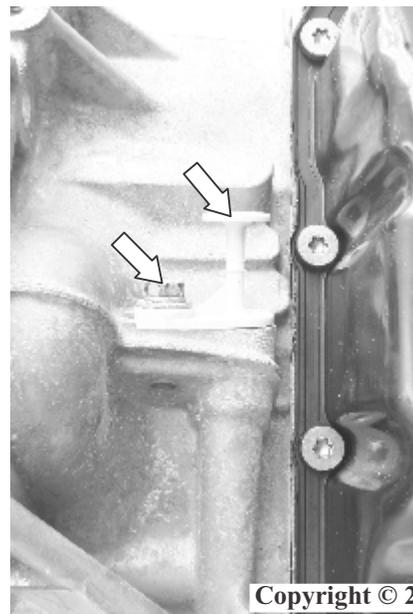


Figure 258



## AW55-50/SN SERIES VALVE BODY and SOLENOID I.D. FOR SERVICE

**COMPLAINT:** Vehicles equipped with the AW55-50SN series transaxles may exhibit various erratic shifting problems, bind up conditions and/or complete transmission failure on initial road test after a valve body or solenoid repair or replacement.

**CAUSE:** The cause of any one or combination of the above complaints may be due to mis matching the valve body, using an incorrect solenoid, cross connecting internal harness connectors to the wrong solenoid or mis positioning the SLS/SLT solenoid retaining bracket.

**CORRECTION:** To properly identify your valve body assembly you must first check the casting next to the S4 solenoid for the presence of a capital letter **A**, **B** or **C**.

Valve bodies that have **no** letter or show the letter **A** are early design assemblies, first and second generation. These valve bodies will also have the SLT and SLS solenoid connectors facing up as shown in Figure 259.

Valve bodies with either letter **B** or **C** are late design assemblies, third and fourth generation and will have the redesigned 3rd version SLT and SLS solenoids with the connectors facing down. The S1 solenoid was also changed at this time with the connector relocated to the left and the mounting bracket to the right to allow clearance for the SLS solenoid connector now facing downward. These changes also made a new internal harness necessary so that the wires will reach the relocated solenoid connectors as shown in Figure 260.

The S1 through S5 solenoids are all ON/OFF type solenoids that typically measure 11-16 ohms resistance. The S1 and S4 solenoids are normally open while the S3 and S5 solenoids are normally closed for all versions. The **S2 solenoid** however, may be either normally open or normally closed dependant upon the vehicle manufacturer .

A GM, Saab or Saturn valve body will use a **normally open** S2 solenoid that can be identified by the **raised domed top**. as depicted in Figure 261.

The Nissan/Volvo valve bodies use a **normally closed** S2 solenoid that can be identified by the **flat top with 4 raised lines** radiating from the hole in the center of the solenoid as shown in Figure 262. Nissan and Volvo vehicles have the S2 solenoid firing sequence opposite to the GM, Saab, Saturn vehicles as indicated in Figure 263. The SLU solenoid, also referred to as the lock up or TCC solenoid, is located at the top of the valve body with a black connector turned upwards. This is a PWM type solenoid that typically measures 5.0-5.6 ohms resistance and has remained the same through all versions. The SLS (Shift Pressure Solenoid) and the SLT (Line Pressure Solenoid) have been redesigned twice for a total of 3 versions of each solenoid. Both of these solenoids are of the PWM type and will typically measure 5.0-5.6 ohms resistance. The SLS and SLT solenoids are retained to the valve body by the same retaining bracket. There are three different versions of this bracket. The original version proved to be a bit weak so as a result the second version is basically the same as the first design in appearance but has more metal added for extra strength and now measures approximately 0.065” in thickness. Both the 1st and 2nd design brackets are used to retain the first version shorter design SLS and SLT solenoids to the body as shown in Figure 264.



### **AW55-50/SN SERIES VALVE BODY and SOLENOID I.D. FOR SERVICE**

**CORRECTION *continued*:** The first version SLS and SLT solenoids have their electrical connectors turned up with the SLS connector being green and the SLT connector being blue. The first version SLS and SLT solenoids can be identified by the round hole in the valve portion of the solenoid that is next to the can portion that contains the winding.

The second design SLS and SLT solenoids are longer than the first design and still have the electrical connectors facing upwards.

The second design solenoids require the 3rd design retaining bracket which can be identified by a protrusion at the bottom left that looks a bit like a backwards “L” as indicated in Figure 264. The third design SLS and SLT solenoids are the same length as the second design solenoids and use the same 3rd design retaining bracket, but the electrical connectors are now facing downward. The third design SLS and SLT solenoids are used in the **B** and **C** (3rd and 4th generation) valve bodies only as shown in Figure 265. Using an incorrect retaining bracket or rotating the 1st or 2nd design retaining bracket 180 degrees will position the solenoids so that the passages are misaligned or blocked, rendering the solenoids useless causing harsh engagements and shifting. Refer to the diagrams in Figure 266 and Figure 267. This is much more difficult to do with the 3rd design bracket, but is possible with some extra effort.

It is not uncommon for the internal wire connectors to be cross connected on to an incorrect solenoid. This seems to happen most often with the S1 and S3 solenoids. The internal harness connector colors do not necessarily match the solenoid connector colors. It is best to note wire colors and/or tag the internal harness connectors at their correct location upon initial disassembly for future reference. If this is not possible then we would recommend to use the wire color and refer to the chart provided in Figure 268.

#### **SERVICE INFORMATION:**

***INTERCHANGE:*** It is a recommended practice to use the “C” stamp valve bodies on earlier vehicles that may have had a “B”, “A”, or “NO ID” stamp valve body installed. When using the “C” stamp valve body it may be necessary to use the late internal wiring harness because of the difference between the connector locations of the two linear solenoids. It may also be necessary to have the vehicle re-flashed with the latest PCM software updates and also have the adapts reset. The shift solenoid S2 may be interchanged as well as long as the correct “open/closed” state solenoid is utilized. In other words a valve body from a Saturn vehicle with the “dome” top “normally open” solenoid may be used on a Nissan or Volvo vehicle providing the “flat” top “normally closed” solenoid is used in the solenoid S2 position, and vice-versa.

***WHAT WILL NOT INTERCHANGE:*** It is not recommended to interchange valve body sections because of worm track differences in the front control valve body and middle control valve body as well as differences in hole locations in the front control valve body separator plate and gaskets.



## Technical Service Information

### **SERVICE INFORMATION CONT'D:**

**VALVE BODY DIFFERENCES:** At first glance the four valve body versions appear to be very similar, however there are some differences as previously mentioned that can cause consequence if castings, plates or gaskets are interchanged.

Valve bodies with NO ID STAMP and ID STAMP C are almost identical in every way. There are some differences in spring calibration, however separator plates, gaskets, and castings are identical. Valve bodies with ID STAMP A and ID STAMP B are almost identical in every way. There are some differences in spring calibration, however separator plate, gaskets, and castings are identical. Refer to Figure 269 for front control valve body separator plate differences between castings NO ID STAMP/ ID STAMP C and ID STAMP B/ID STAMP C. Refer to Figure 270 for front control valve body to middle control valve body gasket differences. Refer to Figure 271 for front control valve body casting differences, refer to Figure 272 for middle control valve body casting differences.

### AW55-50/SN SERIES VALVE BODY and SOLENOID I.D. FOR SERVICE

#### EARLY VALVE BODY I.D.

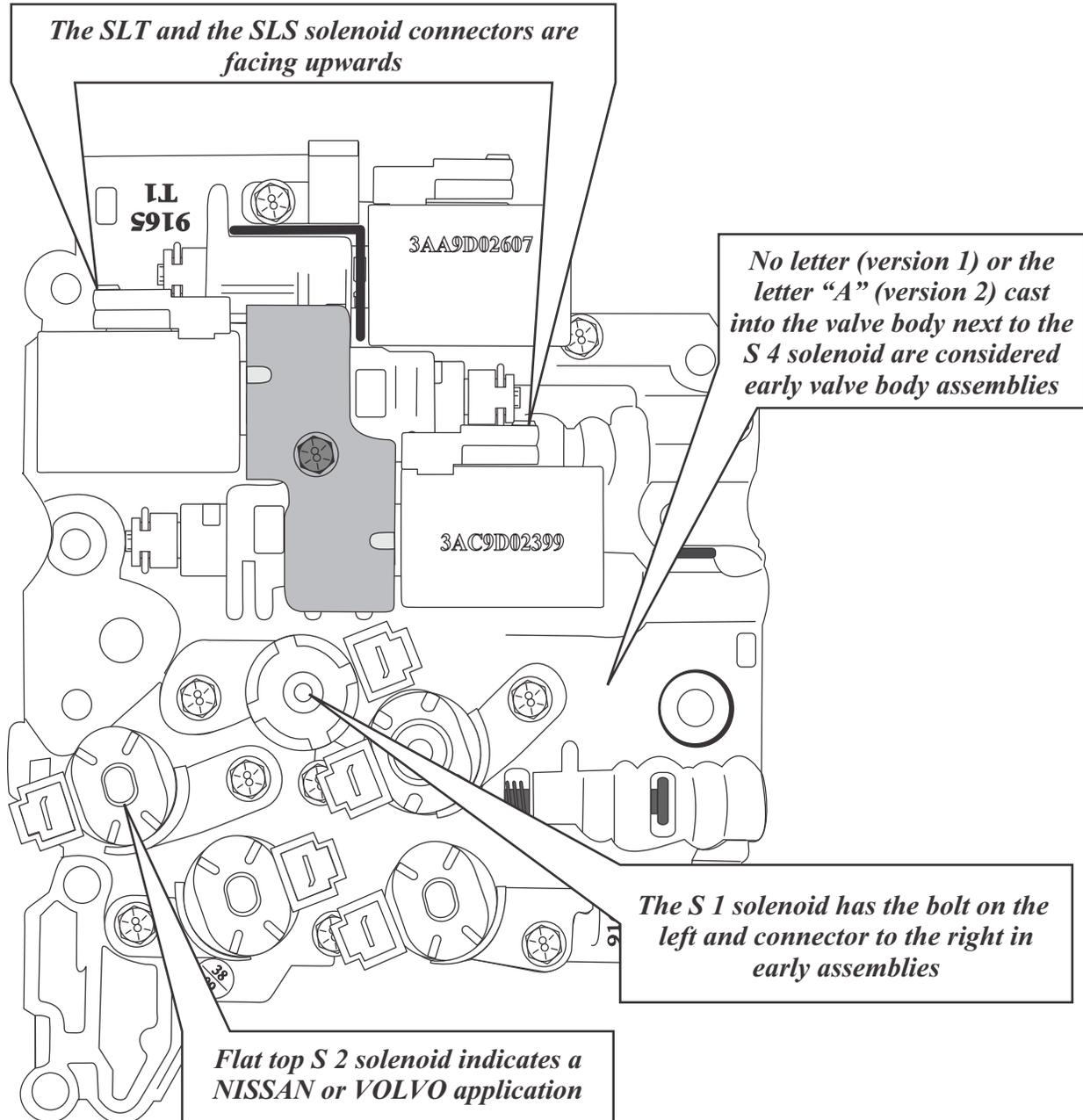


Figure 259

**AW55-50/SN SERIES**  
**VALVE BODY and SOLENOID I.D. FOR SERVICE**

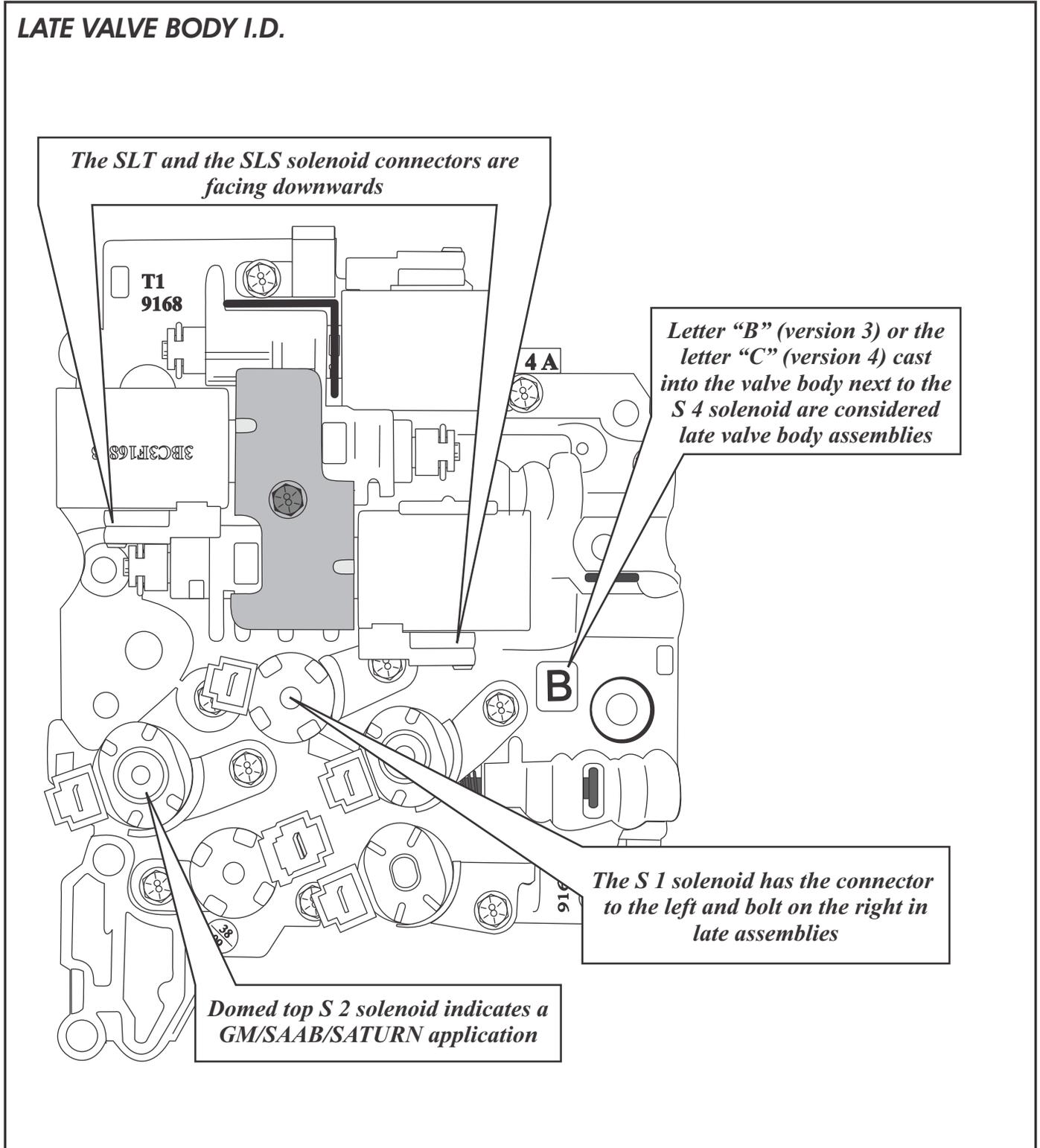


Figure 260

**AW55-50/SN SERIES**  
**VALVE BODY and SOLENOID I.D. FOR SERVICE**

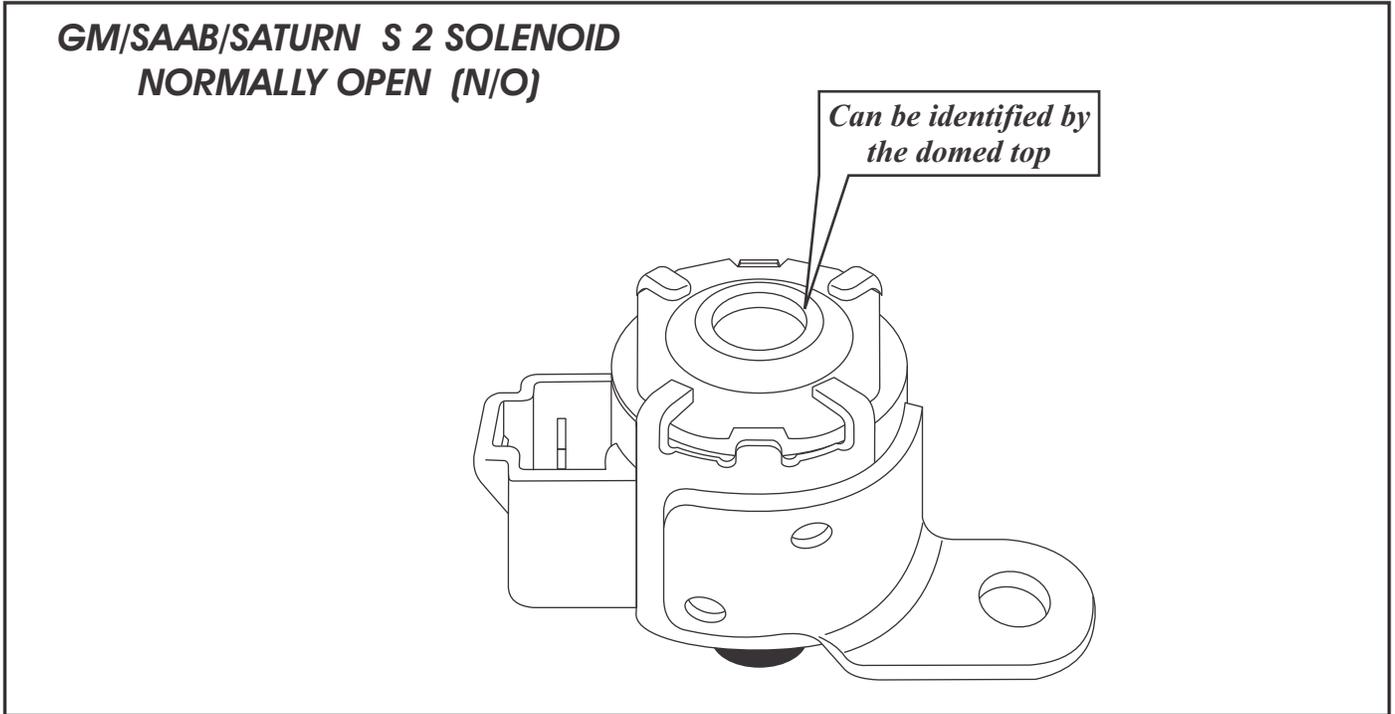


Figure 261

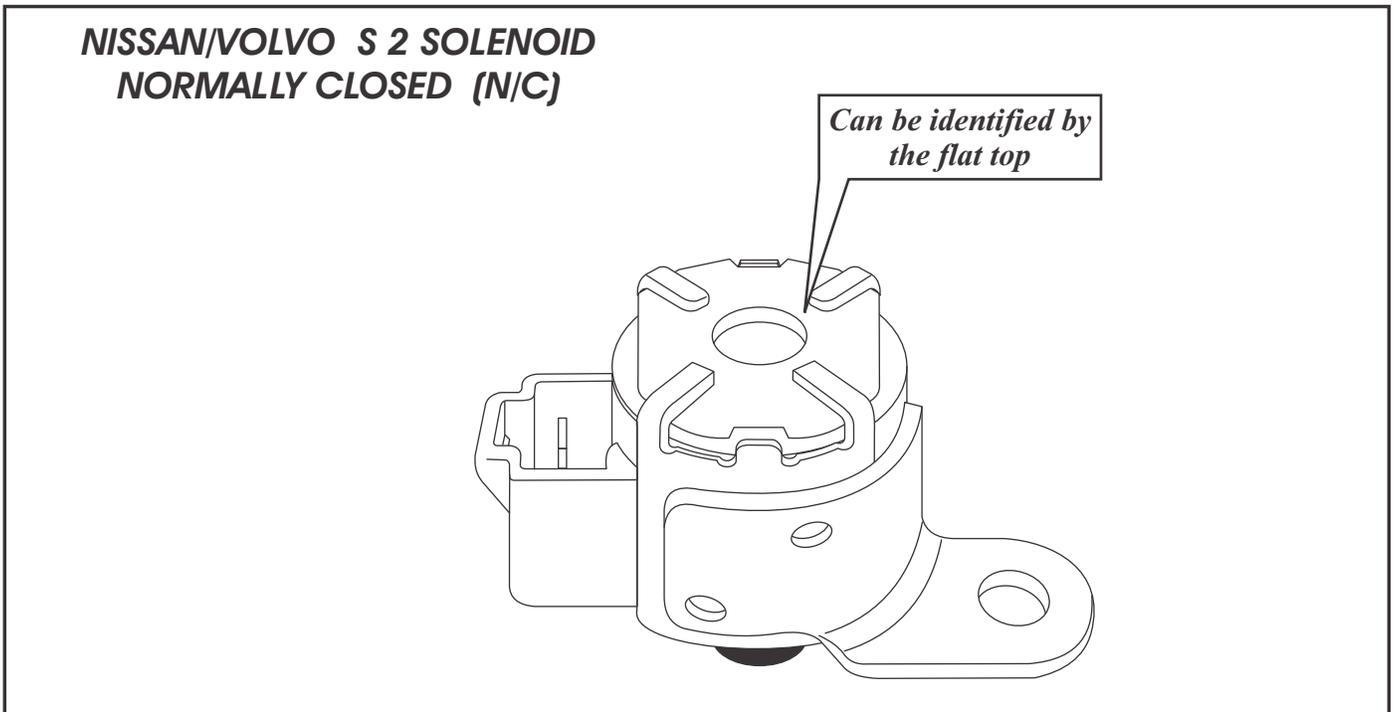


Figure 262



**AW55-50/SN SERIES**  
**VALVE BODY and SOLENOID I.D. FOR SERVICE**

**SHIFT SOLENOID SEQUENCE CHART**

**GM - SAAB - SATURN**

<i>RANGE</i>	<i>GEAR</i>	<i>(S 1)</i>	<i>(S 2)</i>	<i>(S 3)</i>	<i>(S 4)</i>	<i>(S 5)</i>
<i>Park</i>	<i>P</i>	<i>Off</i>	<i>Off</i>	<i>Off</i>	<i>Off</i>	<i>Off</i>
<i>Reverse</i>	<i>R</i>	<i>Off</i>	<i>Off</i>	<i>On</i>	<i>Off</i>	<i>On</i>
<i>Neutral</i>	<i>N</i>	<i>Off</i>	<i>Off</i>	<i>Off</i>	<i>Off</i>	<i>Off</i>
<i>D</i>	<i>1</i>	<i>On</i>	<i>Off</i>	<i>On</i>	<i>Off</i>	<i>Off</i>
	<i>2</i>	<i>Off</i>	<i>On</i>	<i>On</i>	<i>Off</i>	<i>Off</i>
	<i>3</i>	<i>Off</i>	<i>On</i>	<i>On</i>	<i>On</i>	<i>Off</i>
	<i>4</i>	<i>Off</i>	<i>On</i>	<i>Off</i>	<i>On</i>	<i>Off</i>
	<i>5</i>	<i>Off</i>	<i>Off</i>	<i>Off</i>	<i>On</i>	<i>Off</i>

**NISSAN - VOLVO**

<i>RANGE</i>	<i>GEAR</i>	<i>(A) (S 1)</i>	<i>(B) (S 2)</i>	<i>(C) (S 3)</i>	<i>(D) (S 4)</i>	<i>(E) (S 5)</i>
<i>Park</i>	<i>P</i>	<i>Off</i>	<i>Off</i>	<i>Off</i>	<i>Off</i>	<i>Off</i>
<i>Reverse</i>	<i>R</i>	<i>Off</i>	<i>Off</i>	<i>On</i>	<i>Off</i>	<i>On</i>
<i>Neutral</i>	<i>N</i>	<i>Off</i>	<i>Off</i>	<i>Off</i>	<i>Off</i>	<i>Off</i>
<i>D</i>	<i>1</i>	<i>On</i>	<i>On</i>	<i>On</i>	<i>Off</i>	<i>Off</i>
	<i>2</i>	<i>Off</i>	<i>Off</i>	<i>On</i>	<i>Off</i>	<i>Off</i>
	<i>3</i>	<i>Off</i>	<i>Off</i>	<i>On</i>	<i>On</i>	<i>Off</i>
	<i>4</i>	<i>Off</i>	<i>Off</i>	<i>Off</i>	<i>On</i>	<i>Off</i>
	<i>5</i>	<i>Off</i>	<i>On</i>	<i>Off</i>	<i>On</i>	<i>Off</i>

Figure 263

**AW55-50/SN SERIES**  
**VALVE BODY and SOLENOID I.D. FOR SERVICE**

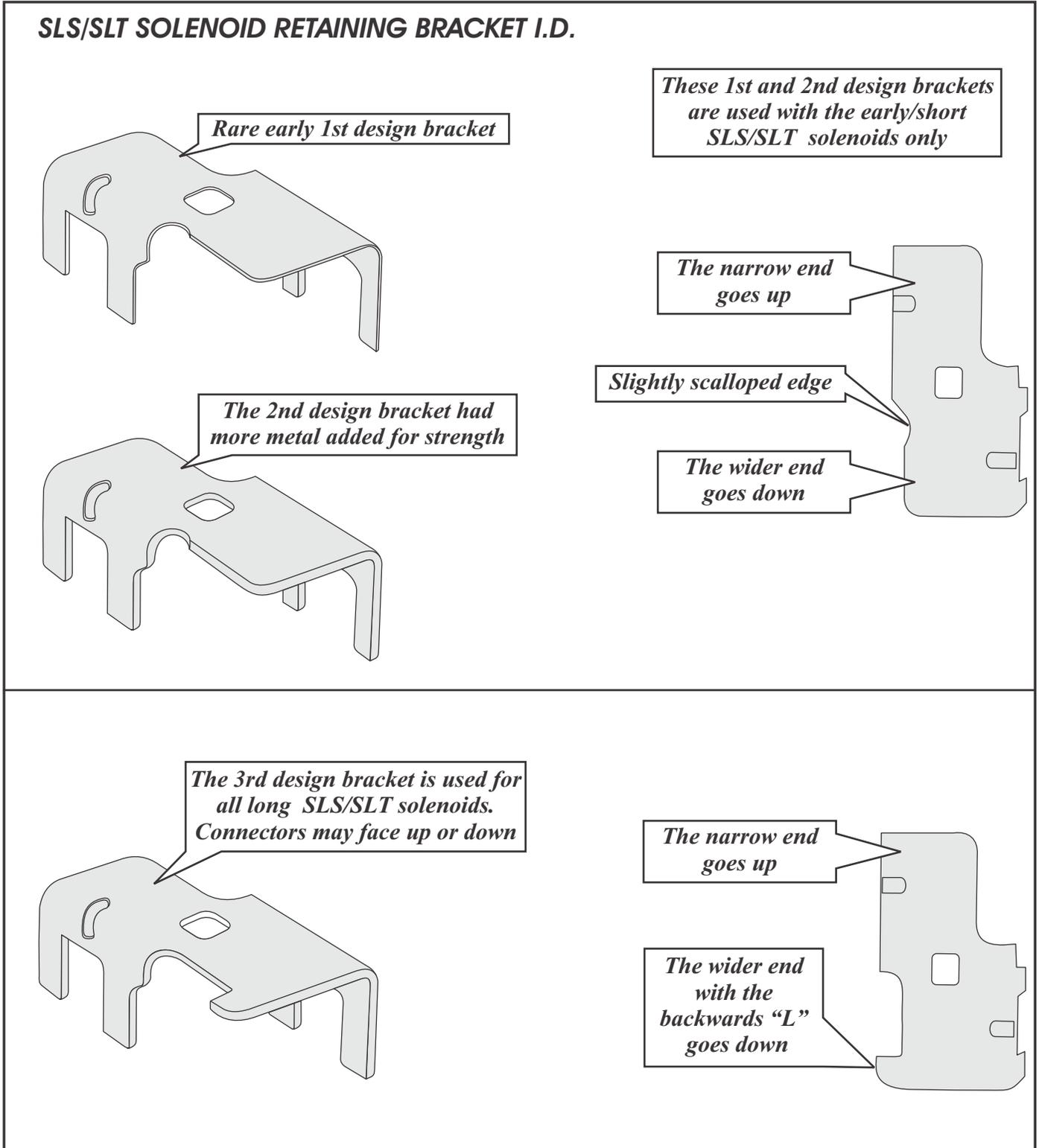


Figure 264

## AW55-50/SN SERIES VALVE BODY and SOLENOID I.D. FOR SERVICE

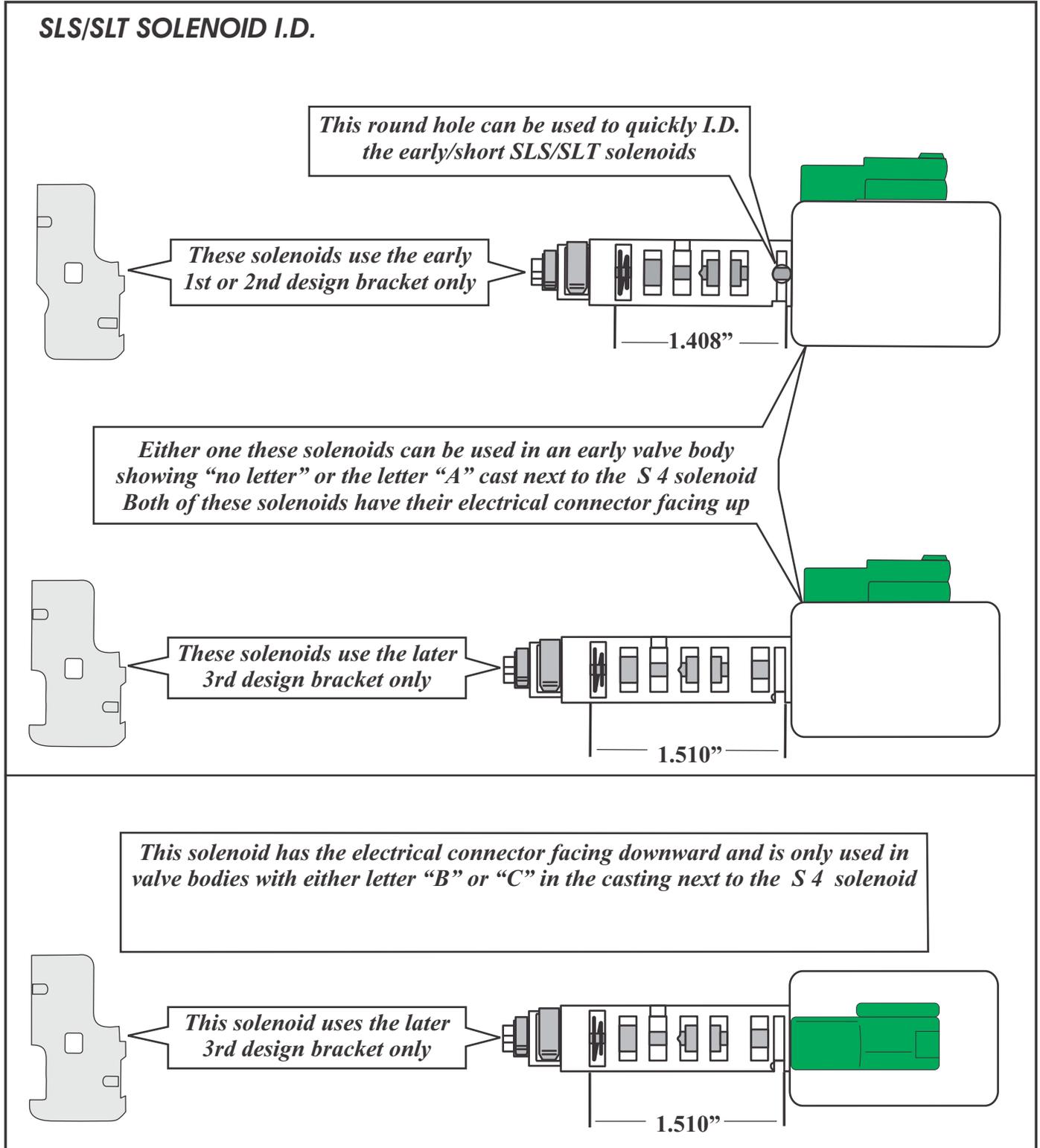


Figure 265

**AW55-50/SN SERIES  
VALVE BODY and SOLENOID I.D. FOR SERVICE**

**EARLY SLS/SLT SOLENOID RETAINING BRACKET ORIENTATION**

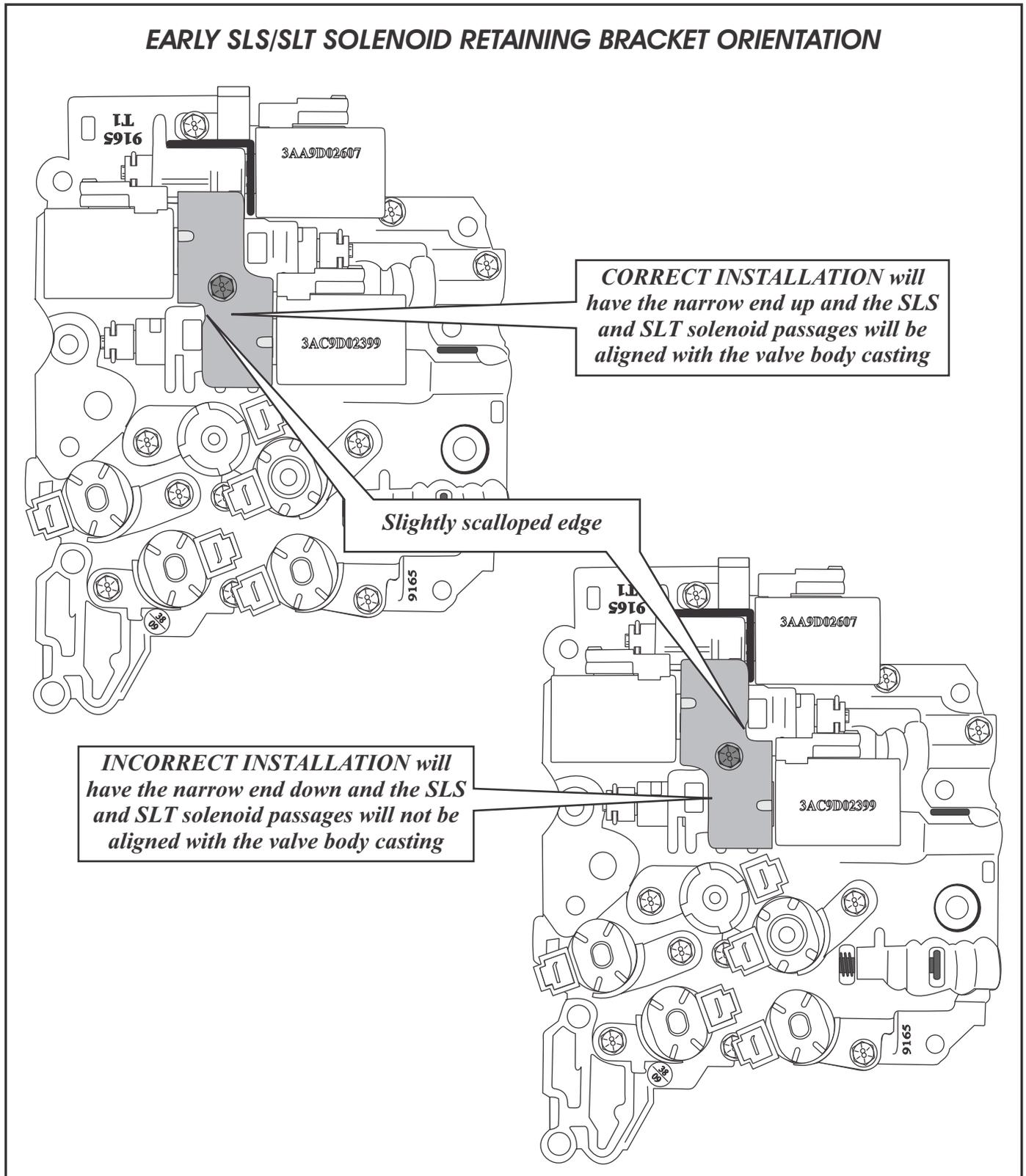


Figure 266

**AW55-50/SN SERIES**  
**VALVE BODY and SOLENOID I.D. FOR SERVICE**

**EARLY SLS/SLT SOLENOID RETAINING BRACKET ORIENTATION**

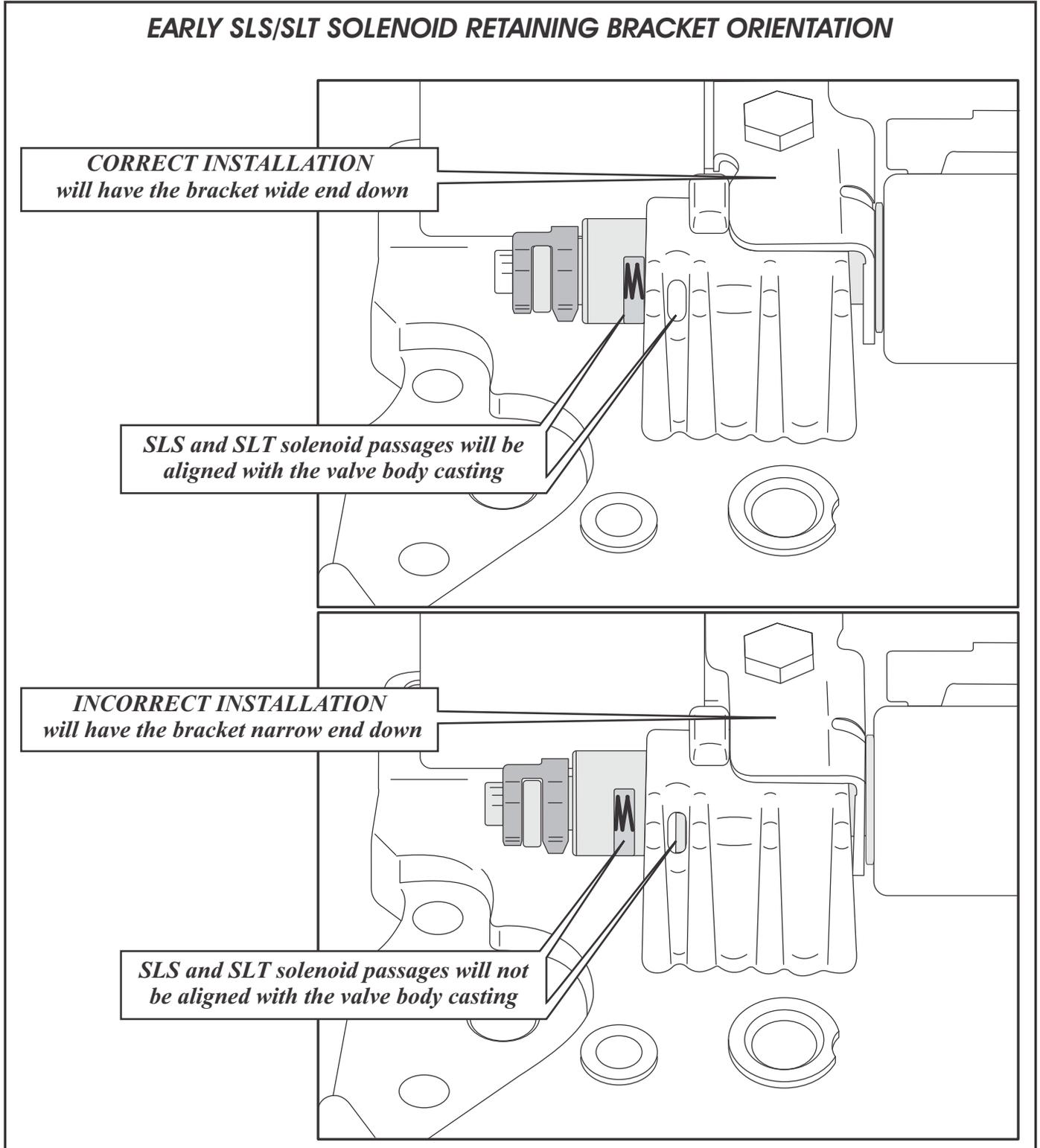


Figure 267

## AW55-50/SN SERIES VALVE BODY and SOLENOID I.D. FOR SERVICE

### SOLENOID WIRE COLOR CHART

<i>SOLENOID I.D.</i>	<i>SOLENOID CONNECTOR COLOR</i>	<i>WIRE COLOR</i>
<i>SLU</i>	<i>BLACK</i>	<i>1 GREEN 1 BROWN</i>
<i>SLT</i>	<i>BLUE</i>	<i>1 GREEN 1 GRAY</i>
<i>SLS</i>	<i>GREEN</i>	<i>1 BLUE 1 RED</i>
<i>S 1</i>	<i>BLACK</i>	<i>WHITE</i>
<i>S 2</i>	<i>BLACK or GRAY</i>	<i>BLACK</i>
<i>S 3</i>	<i>GRAY</i>	<i>YELLOW</i>
<i>S 4</i>	<i>BLUE or GREEN</i>	<i>PURPLE or RED</i>
<i>S 5</i>	<i>GREEN or RED or GRAY</i>	<i>BLUE or BLACK</i>

### SOLENOID LOCATION

*For Nissan Units:*

*PCA = SLT*  
*PCB = SLS*  
*PCC = SLU*  
*A = S 1*  
*B = S 2*  
*C = S 3*  
*D = S 4*  
*E = S 5*

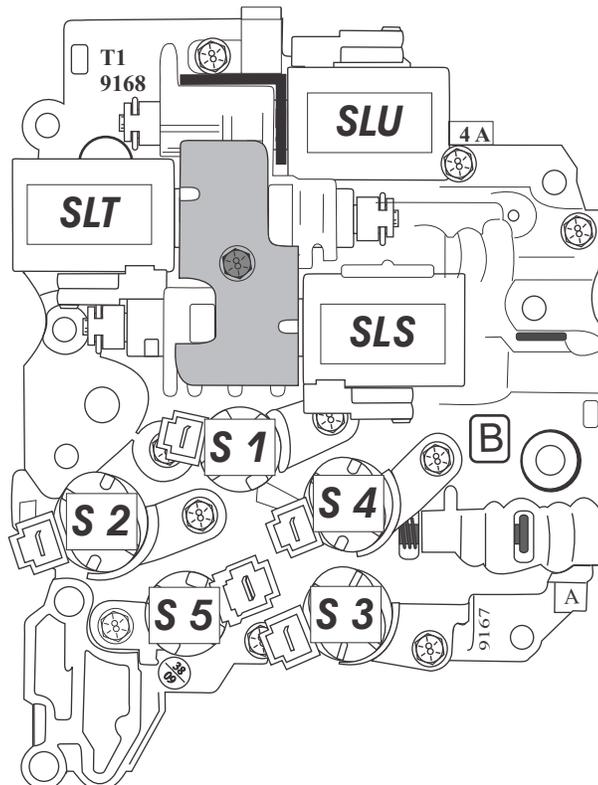
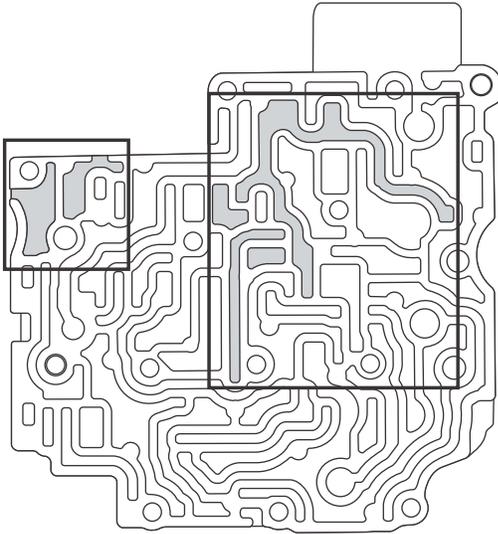


Figure 268

**FRONT CONTROL VALVE BODY  
CASTING DIFFERENCES**

NO ID STAMP/ID STAMP C  
CASTING



ID STAMP A/ID STAMP B  
CASTING

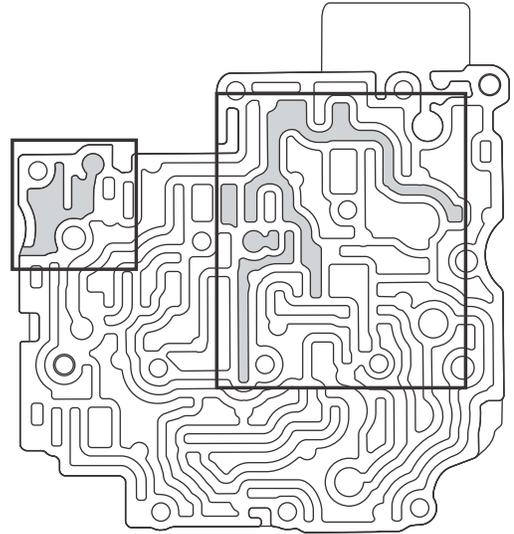
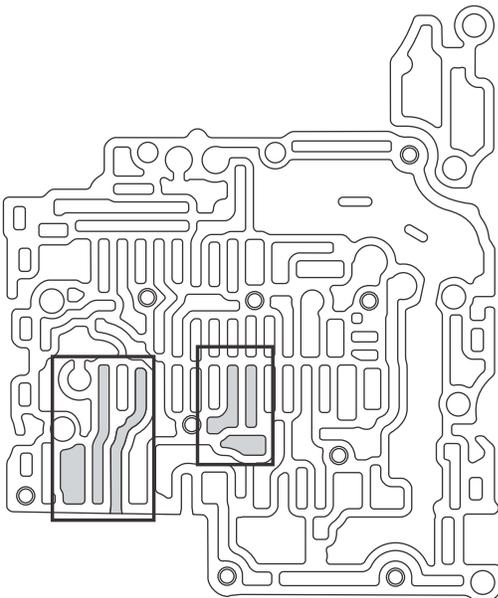


Figure 269

**MIDDLE CONTROL VALVE BODY  
CASTING DIFFERENCES**

NO ID STAMP/ID STAMP C  
CASTING



ID STAMP A/ID STAMP B  
CASTING

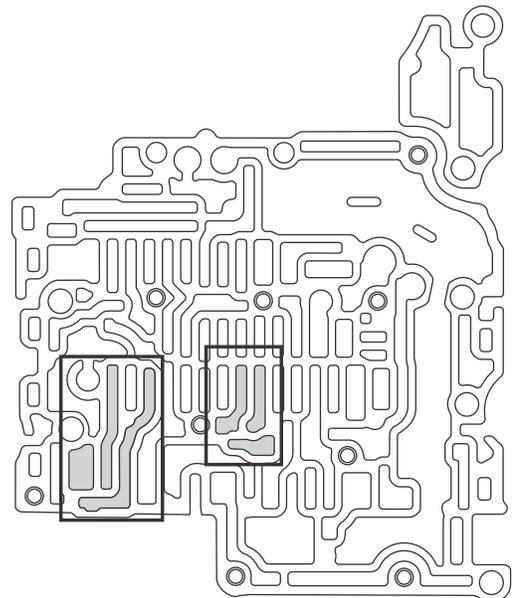
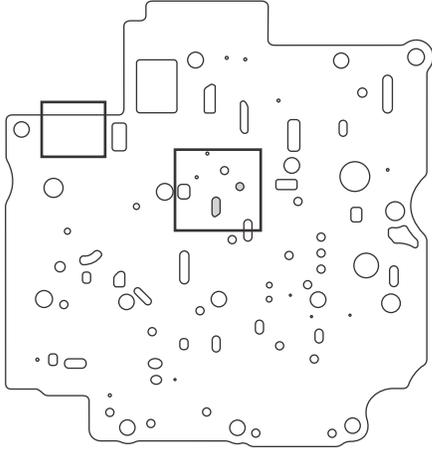


Figure 270

**SPACER PLATE  
DIFFERENCES**

NO ID STAMP/ID STAMP C  
SPACER PLATE



ID STAMP A/ID STAMP B  
SPACER PLATE

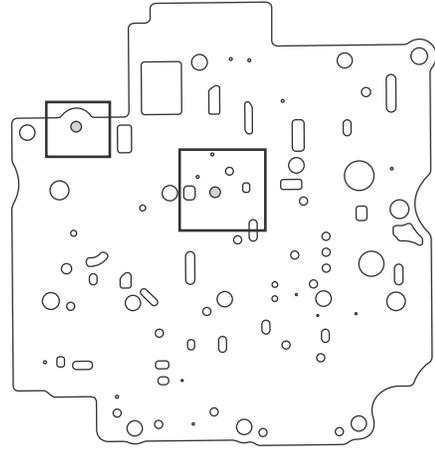
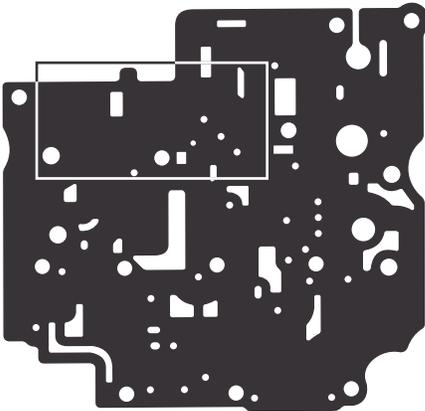


Figure 271

**GASKET  
DIFFERENCES**

NO ID STAMP/ID STAMP C  
GASKETS



ID STAMP A/ID STAMP B  
GASKETS

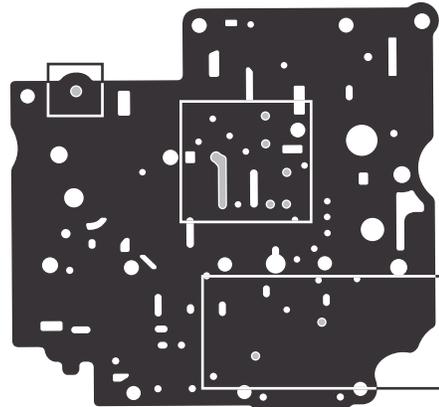
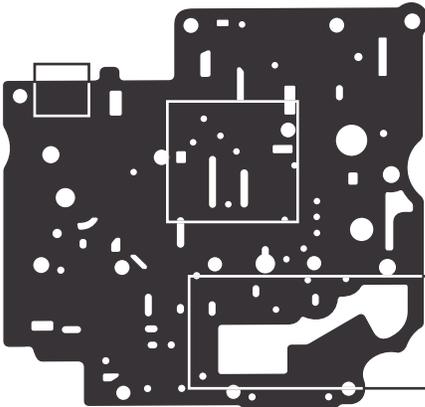
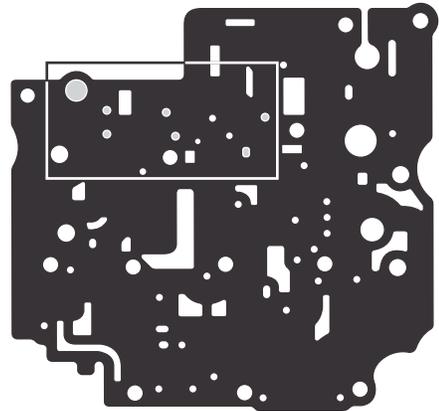


Figure 272



# Technical Service Information

## AW55-50/SN SERIES OPERATING MODES

**COMPLAINT:** Vehicles equipped with the AW55-50SN series transaxles may exhibit what is perceived to be erratic shift operation such as delayed shifts, sudden downshifts, wrong gear starts or high gear starts with no automatic shifting at all.

**CAUSE:** A cause of 5th gear starts in D range with only 2nd gear available when Low range is manually selected may be due to a fault condition being detected and the TCM is in a Protection Mode. This may also be referred to as a Fail Safe or Limp In Mode.

Other shift characteristics such as 2nd gear starts, delayed shifts or sudden downshifts may be normal operation dependant upon factors related to temperature or current driving conditions.

**CORRECTION:** To correct the cause of a vehicle determined to be in Protection Mode, the fault code(s) must be retrieved with a capable scan tool and the related failure that caused the fault to be stored must be successfully repaired before the transaxle will resume normal operation.

Delayed shifts, sudden downshifts when pulling a load, climbing or descending a grade and a 2nd gear start at times while driving in heavy stop and go city traffic may all be perceived as erratic shifting if you or your customer are not aware of the various special operating modes. Your customer may be used to Normal Mode and they may have noticed Cold Mode operation, however other special operating modes don't always show up very often and may seem to be an intermittent problem. These special modes can vary with the manufacturer. Refer to the following charts for a description of operational characteristics while driving with certain special operating mode strategies.



## AW55-50/SN SERIES OPERATING MODES

### GM/SATURN VEHICLE SHIFT MODES

Normal Mode	The control module provides earliest possible up shifts and lock up for best fuel economy. Oil pressures are adjusted electronically for engagement and shift quality.
Protection Mode	May also be referred to as Fail Safe or Limp Mode. When fault codes are set, this mode will only allow limited ratio function. Usually 5th gear in D or I ranges and 2nd gear in L range. If the key is cycled and the fault code is no longer current, normal operation will be resumed. If a code is current after ignition cycle, then Protection Mode is maintained.
Hot Mode	Hot Mode is initiated when the transaxle oil temperature exceeds 280 degrees (F). Shift points are raised to a higher vehicle speed and the converter clutch will apply at a lower vehicle speed to aid in cooling the unit. Once the transaxle has cooled to less than 270 degrees (F) then Hot Mode will be turned off.
Cold Mode	Cold Mode is initiated when the engine coolant temperature is less than 120 degrees (F). Shift points will be raised to a higher shift point to provide for a quicker engine warm up and to compensate for reduced engine power.
Uphill Mode	If the engine torque is high and the vehicle speed is decreasing, shift points will be raised to compensate for the increase in load. Towing or a heavily loaded vehicle can cause an Uphill Mode operating strategy to be in use as well.
Downhill Mode	If the accelerator pedal position angle is less than 3% and the vehicle speed is increasing, shift points will be raised to a higher speed to provide for engine braking. A downshift may be noticed in some vehicles when the brake pedal is depressed under this condition.
High Altitude Mode	If the barometric pressure is less than 12.76 PSI absolute, then the control module will raise shift points slightly to compensate for reduced engine power.
Traffic Jam Mode	If the vehicle stops and starts with less than 10% accelerator angle then 1st gear will be inhibited. A rolling 2nd gear start is commanded in an effort to increase fuel economy and make shifting less busy. Traffic Jam Mode is turned off with the accelerator angle greater than 30% or if the vehicle slows to less than 1 MPH or exceeds 18 MPH.



## AW55-50/SN SERIES OPERATING MODES

### VOLVO VEHICLE SHIFT MODES

Economy Mode	The control module provides earliest possible up shifts and lock up for best fuel economy under normal driving conditions. Oil pressures are adjusted electronically to provide for smooth shifting and garage shift engagements.
Sport Mode	The control module changes from Economy to Sport Mode if the accelerator is depressed quickly and the vehicle exceeds 31 MPH. In Sport Mode shift points are raised to provide the best performance and downshifting occurs at a lower engine RPM. Economy Mode will resume when accelerator is moved less quickly.
Extreme Mode	Extreme Mode is another way of saying wide open throttle or kick down. The control module will select the lowest possible gear for the vehicle speed at full throttle.
Winter Mode	Winter Mode is obtained by using the “W” button on the top panel of the gear selector assembly. An indicator lamp in the instrument cluster will be lit when Winter Mode is selected. In D range, the transaxle starts in 3rd gear to provide maximum traction on slippery surfaces and automatically shifts between 3rd, 4th and 5th gears. In 4 range, the transaxle starts in 3rd and automatically shifts to 4th gear earlier than Economy Mode in D range and 5th gear is locked out. In 3 range, the transaxle starts in 3rd and stays in 3rd. In L range, the transaxle starts in 2nd gear and stays in 2nd gear. At wide open throttle in Winter Mode, the transaxle uses all gears for maximum performance.
Catalytic Converter Start	This function allows the engine to reach proper operating temperature more quickly by preventing converter clutch lock up and significantly delaying the 1-2 and the 2-3 up shifts when the engine is cold. This is a normal function.
Temperature Controlled Lock Up	If the transmission oil temperature rises excessively as a result of a heavy load with high ambient temperature conditions, the converter clutch will be applied to reduce the heat generated through torque multiplication. Lock up is inhibited below 68 degrees (F).
Driving Uphill	When ascending a grade or driving uphill the control module will alter the shift pattern to reduce busy shifting. Towing or driving with a heavy load can have the same result.
Neutral Control	(This function is not available on all models) The control module will release the forward clutch (C1) at a stop with the brake applied to reduce engine load, vibration and improve fuel economy. When the brake is released the forward clutch engages. (This operating strategy will make a 2 footed driver crazy.) The following conditions must be met to allow Neutral Control function. Manual shifter must be in D, 4 or 3. Neutral Control will not work if Winter Mode or Geartronic operation is selected. Trans oil temp must be over 50 degrees (F). Throttle position must be less than 3%. Brake pedal must be depressed. Vehicle speed must be 0 MPH. Engine RPM less than 1500. There is a 2 second delay to neutral when the vehicle is stopped in the D position and a 5 second delay to neutral when shifted from N to D range.



## AW55-50/SN SERIES OPERATING MODES

### ***VOLVO SHIFTING USING GEARTRONIC***

When the shifter is placed into the Geartronic position, the transmission remains in the hydraulic D range. When the shifter is moved to the + or - positions, the gear selector module sends a signal to the TCM to shift the transmission up or down. The driver information module will change the symbol on the instrument cluster from D to the gear that has been selected. A signal is sent to the gear selector to illuminate the M and turn off the other LEDs on the shifter console. The TCM will over ride the driver's selection under certain operating conditions.

The following factors apply during Geartronic shifting:

- (1) Only 1st, 2nd or 3rd gears can be selected from a stop. The transmission will not up shift to 4th gear until a minimum speed of at least 19 MPH has been attained. The transmission will not up shift to 5th gear until a minimum speed of 25 MPH has been attained.
- (2) Automatic downshifts will occur below certain speeds if the driver forgets to manually down shift the transaxle. Manual up shifting is still necessary after automatic down shifting has occurred.
- (3) Kick down is not available when using Geartronic shifting mode.
- (4) The TCM will not allow the transaxle to be manually down shifted if the engine speed would exceed 6000 RPM.
- (5) If the transmission oil temperature gets too high, the TCM will select an appropriate gear so that lock up function can be utilized.
- (6) Torque converter clutch lock up is only possible in 3rd, 4th and 5th gears.

### ***VOLVO SLIPPING LOCK UP***

Slipping lock up allows for a smoother converter clutch engagement while reducing torsional vibrations and noise. The control module maintains a **50 - 200 RPM** torque converter clutch slip while operating in this mode.

The following conditions must be met for this mode to function:

- (1) The gear shifter must be in the D, 4 or 3 position.
- (2) The transaxle must be operating in 3rd, 4th or 5th gear.
- (3) The transmission input speed must be 1100 RPM or greater and the throttle opening must be 35 % or less.
- (4) Engine coolant must reach a minimum temperature requirement.
- (5) Transmission oil temperature must be at least 104 degrees (F) but is not to exceed 248 degrees (F).

**NOTE:** The friction properties of this transmission fluid (***Type T-IV***) are different from other fluids and will affect converter clutch operation and shift quality. The manufacturer states that failure to use the correct fluid can cause damage and fault codes to be stored.



## AW55-50/SN SERIES OPERATING MODES

### **NISSAN VEHICLE SHIFT MODES**

Upslope Mode	When the TCM detects an upslope because of an increase in engine load and decrease of acceleration, this mode will raise shift points to prevent busy shifting of transaxle.
Downslope Mode	When the TCM detects a downslope because of an increase in acceleration with the throttle fully closed, this mode provides moderate engine braking by raising shift points.
Hot Mode Control	This mode lowers the ATF temperature by altering shift points when the temperature is extremely high.
Down Shift Permission	In order to prevent an engine over speed condition, down shifts are allowed only under a predetermined minimal vehicle speed.
Fail-Safe Mode	The TCM has an electrical fail-safe mode. This mode makes it possible to operate even if there is a malfunction in a main electronic control input or output signal circuit. In fail-safe mode, the driving condition is determined according to the area of the malfunction and line pressure is set at maximum. (See Nissan fail safe charts to follow) Diagnosis and repair is made according to the type of fault code stored.

### **UP/DOWN SHIFT LEARNING CONTROL**

This control learns the pressure to each clutch or brake to reduce shift shock for all up , down and coast down shifting.

### **N-D SHIFT CONTROL**

This control improves N-D shift quality by controlling the line pressure solenoid on forward engagements including the L range.

### **N-D SHIFT LEARNING CONTROL**

This control learns the forward clutch piston stroke and apply pressure by monitoring the forward clutch engagement time based on a rotational change rate.

### **N-R SHIFT CONTROL**

This control improves N-R shift quality by controlling the shift pressure solenoid during reverse engagements.

### **N-R SHIFT LEARNING CONTROL**

This control learns the direct clutch piston stroke and apply pressure by monitoring the direct clutch engagement time based on a rotational change rate.

### **TORQUE REDUCTION CONTROL**

This control improves shift quality by sending a torque reduction request signal form the TCM to the ECM to cut engine torque increase at N-D, N-R and 1-2-3-4-5 or 5-4-3-2-1. If the accelerator is depressed rapidly, this control establishes the upper limit value of engine torque and avoids engine flare at 2-3, 3-2, 3-4, 4-3 and 4-2 of a clutch to clutch shift.

## AW55-50/SN SERIES OPERATING MODES

### SMOOTH LOCK UP CONTROL

When shifting from the lock up released state to the lock up applied state, current output to pressure control solenoid C is controlled by the TCM. When shifting to the lock up applied state the converter clutch is temporarily set to the half clutched state to reduce the shock.

**Half Clutched State:** Current output from the TCM to pressure control solenoid C is varied to steadily increase pressure control solenoid C pressure. The lock up pressure gradually rises and while the converter clutch piston is put into half clutched status, the converter clutch piston operating pressure is increased and the coupling is completed smoothly.

**Slip Lock Up Control:** In the slip mode, the pressure control solenoid C current is controlled by the TCM to put it into the half clutched state. This absorbs engine torque fluctuation and lock up operates at low speed. This raises fuel efficiency for 4th and 5th gears at both low speed and when the accelerator has a low degree of throttle opening.

### NISSAN FAIL SAFE MODES

Fail Safe Mode	Shift Lever Position	Actual Gear Range Obtained (1)	Shift Solenoid Status					Pressure Control Solenoid Status		
			A	B	C	D	E	A	B	C
Fail Safe Mode 1	D	4th	Off	Off	Off	Off	Off	Off	Off	Off
	L	2nd	Off	Off	On	Off	Off	Off	Off	Off
	R	Reverse	Off	Off	Off	Off	On	Off	Off	Off
Fail Safe Mode 2 Consult-II displays "8"	D	3rd	Off	Off	On	On	Off	Off	Off	Off
	L	2nd	Off	Off	On	Off	Off	Off	Off	Off
	R	Reverse	Off	Off	On	Off	On	Off	Off	Off
Fail Safe Mode 3	D	4th	Off	Off	Off	Off	Off	Off	Off	Off
	L	2nd	Off	Off	On	Off	On	Off	Off	Off
	R	Reverse	Off	Off	Off	Off	On	Off	Off	Off
Fail Safe Mode 4	D	4th	Off	Off	Off	Off	Off	Off	Off	Off
	L	4th	Off	Off	Off	Off	Off	Off	Off	Off
	R	Reverse	Off	Off	Off	Off	Off	Off	Off	Off
Fail Safe Mode 5	D	4th	Off	Off	Off	Off	Off	Off	Off	Off
	L	4th	Off	Off	Off	Off	Off	Off	Off	Off
	R	Reverse	Off	Off	Off	Off	On	Off	Off	Off



**AW55-50/SN SERIES  
OPERATING MODES**

**NISSAN FAIL SAFE MODES continued**

Fail Safe Mode	Shift Lever Position	Actual Gear Range Obtained	Shift Solenoid Status					Pressure Control Solenoid Status		
			A	B	C	D	E	A	B	C
Fail Safe Mode 6	D	4th	Off	Off	Off	Off	Off	Off	Off	Off
	L	2nd	Off	Off	On	Off	Off	Off	Off	Off
	R	Reverse	Off	Off	On	Off	Off	Off	Off	Off
Fail Safe Mode 7	D	4th	On	Off	Off	Off	Off	Off	Off	Off
	L	2nd	On	Off	On	Off	Off	Off	Off	Off
	R	Reverse (2)	On	Off	On	On	Off	Off	Off	Off
Fail Safe Mode 8 Consult-II displays "1"	D	5th	Off	On	Off	Off	Off	Off	Off	Off
	L	2nd (3)	Off	On	On	Off	Off	Off	Off	Off
	R	Reverse	Off	On	Off	Off	On	Off	Off	Off
Fail Safe Mode 9 Consult-II displays "8"	D	4th	Off	Off	Off	On	Off	Off	Off	Off
	L	4th	Off	Off	Off	Off	Off	Off	Off	Off
	R	Reverse	Off	Off	Off	Off	On	Off	Off	Off
Fail Safe Mode 10 Consult-II displays "6"	D	4th	Off	Off	Off	On	Off	Off	Off	Off
	L	3rd	Off	Off	On	On	Off	Off	Off	Off
	R	Reverse (2)	Off	Off	On	On	Off	Off	Off	Off

**Note:** (1) = CONSULT-II indicates "5th"  
 (2) = Reverse gear ratio difference (Gear ratio: 3.342)  
 (3) = 3rd gear ratio difference (Gear ratio: 2.301)

**BEARING AND RACE LOCATIONS AND SPECIFICATIONS**

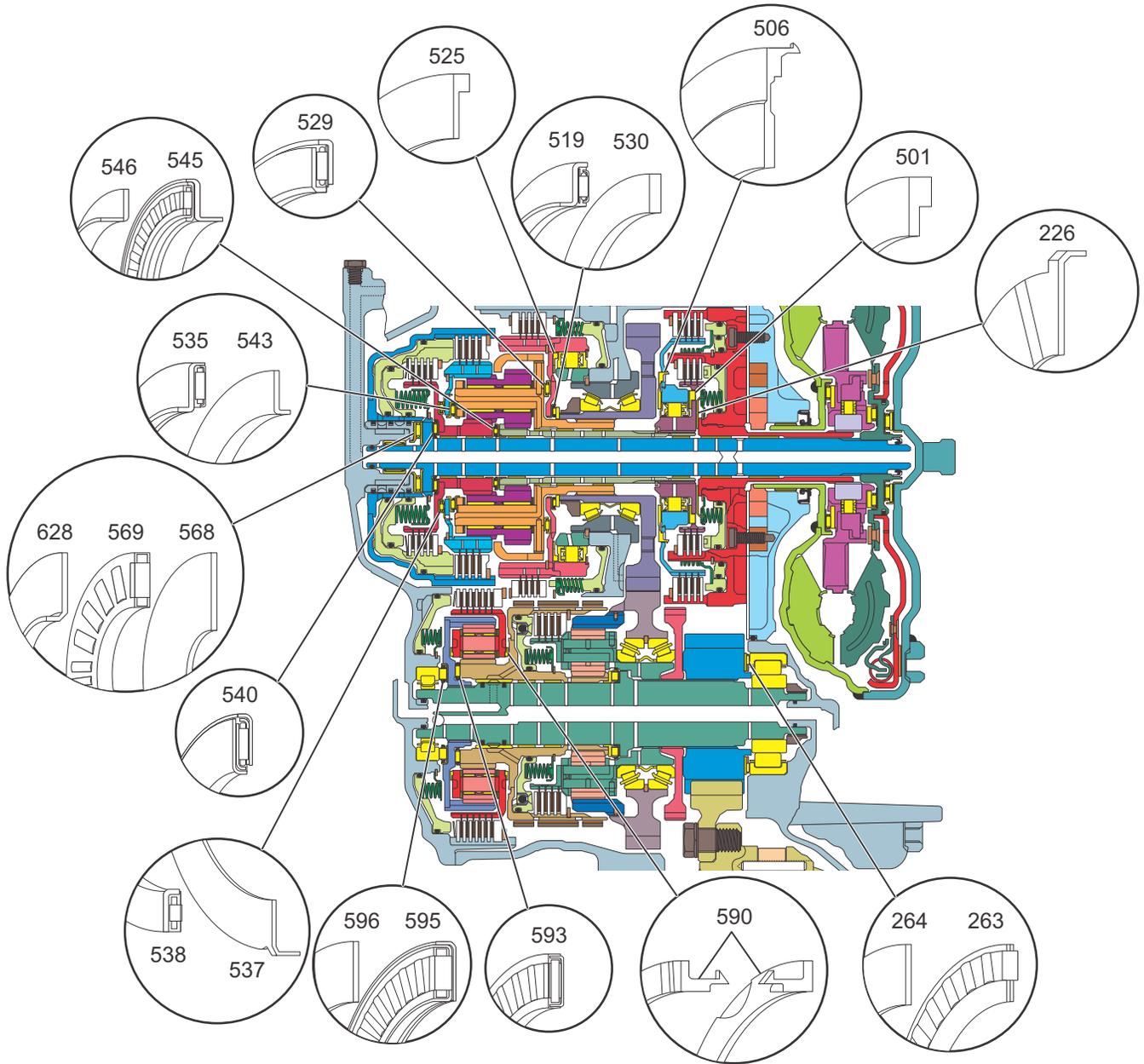


Figure 273

## ***BEARING AND RACE LOCATIONS AND SPECIFICATIONS***

<b>Item No.</b>	<b>COMPONENT</b>	<b>Outer Diameter Specification mm - (in.)</b>	<b>Inner Diameter Specification mm - (in.)</b>
(263)	Front Differential Transfer Drive Gear Thrust Bearing	71 mm - (2.795 in.)	49.10 mm - (1.933 in.)
(264)	Front Differential Transfer Drive Gear Thrust Bearing Washer - (Front)	71 mm - (2.795 in.)	49.00 mm - (1.929 in.)
(590)	1-2/Reverse Carrier Thrust Washer (2 Required)	77.60 mm - (3.055 in.)	66.80 mm - (2.630 in.)
(593)	1-2/Reverse Internal Gear Front Thrust Bearing	58.10 mm - (2.287 in.)	39.60 mm - (1.559 in.)
(595)	1-2/Reverse Internal Gear Rear Thrust Bearing	57.70 mm - (2.272 in.)	37.00 mm - (1.457 in.)
(596)	1-2/Reverse Internal Gear Shim	57.70 mm - (2.272 in.)	37.00 mm - (1.457 in.)
(537)	Rear Sun Gear Thrust Bearing Race - (Front)	74.00 mm - (2.913 in.)	53.00 mm - (2.087 in.)
(538)	Rear Sun Gear Thrust Bearing	65.00 mm - (2.559 in.)	50.00 mm - (1.968 in.)
(540)	Input Shaft Thrust Bearing	43.40 mm - (1.709 in.)	22.05 mm - (0.868 in.)
(568)	Forward Clutch Housing Thrust Bearing Race - (Front)	41.00 mm - (1.614 in.)	13.50 mm - (0.531 in.)
(569)	Forward Clutch Housing Thrust Bearing	41.70 mm - (1.641 in.)	23.00 mm - (0.905 in.)
(628)	Forward Clutch Housing Thrust Bearing Race - (Rear)	41.00 mm - (1.614 in.)	17.30 mm - (0.681 in.)
(543)	Front Carrier Thrust Bearing Race - (Front)	61.00 mm - (2.401 in.)	45.40 mm - (1.787 in.)
(535)	Rear Internal Gear Thrust Bearing	64.00 mm - (2.520 in.)	46.40 mm - (1.827 in.)
(545)	Front Sun Gear Thrust Bearing	38.50 mm - (1.516 in.)	23.00 mm - (0.905 in.)
(546)	Front Sun Gear Thrust Bearing Race - (Rear)	35.10 mm - (1.382 in.)	23.00 mm - (0.905 in.)
(529)	Front Internal Gear Thrust Bearing	89.00 mm - (3.504 in.)	73.50 mm - (2.894 in.)
(525)	Front Internal Gear Thrust Washer - (Front)	122.00 mm - (4.803 in.)	115.50 mm - (4.547 in.)
(519)	Front Internal Gear Thrust Bearing	61.95 mm - (2.439 in.)	45.80 mm - (1.803 in.)
(530)	Front Internal Gear Thrust Washer Race - (Front)	58.00 mm - (2.283 in.)	43.80 mm - (1.724 in.)
(506)	Second Clutch Sprag Outer Race Thrust Washer - (Front)	99.30 mm - (3.909 in.)	56.50 mm - (2.224 in.)
(501)	Coast Clutch Hub Thrust Washer - (Front)	77.30 mm - (3.043 in.)	56.50 mm - (2.224 in.)
(226)	Coast Clutch Hub Thrust Washer - (Front)	62.40 mm - (2.456 in.)	33.30 mm - (1.311 in.)

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Figure 274

## ***FASTENER TIGHTENING SPECIFICATIONS***

<b>Fastener Description</b>	<b>Ref. (No.)</b>	<b>Qty.</b>	<b>Fastener Dimension</b>	<b>Fastener Specification N.m - (in./ft. lb.)</b>
Automatic Transmission Fluid Pump (2) to Transmission Case Assembly (17)	(5)	8	M8 x 1.25 x 28.00 mm	25 N.m - (18 ft. lb.)
Control Valve Body Cover (29) to Transmission Case Assembly (17)	(28)	9	M8 x 1.25 x 15.50 mm	13 N.m - (10 ft. lb.)
Control Valve Body Fluid Passage Cover (37) to Control Valve Body (39)	(30)	2	M6 x 1.0 x 55.00 mm	10 N.m - (89 in. lb.)
Fluid Baffle (803) to Torque Converter Housing Assembly (801)	(807)	3	M6 x 1.0 x 14.00 mm	5 N.m - (44 in. lb.)
Fluid Baffle (803) to Transmission Case Assembly (17)	(45)	3	M6 x 1.0 x 14.70 mm	5 N.m - (44 in. lb.)
Fluid Filter (42) to Transmission Case Assembly (17)	(43)	1	M6 x 1.0 x 16.70 mm	5 N.m - (44 in. lb.)
Fluid Level Indicator Attaching Bolt (825)	(825)	1	M8 x 1.0 x 16.70 mm	5 N.m - (44 in. lb.)
Fluid Pump Body (202) to Fluid Pump Stator Shaft Assembly (208)	(231)	13	M6 x 1.0 x 14.50 mm	12 N.m - (106 in. lb.)
Fluid Pump Body (202) to Fluid Pump Stator Shaft Assembly (208)	(232)	1	M5 x 0.8 x 17.00 mm	7 N.m - (62 in. lb.)
Fluid Temperature Sensor Clip (49) to Control Valve Body (39)	(31)	1	M6 x 1.0 x 50.00 mm	10 N.m - (89 in. lb.)
Forward Clutch Accumulator Cover (616) to Case Cover (606)	(617)	2	M6 x 1.0 x 14.50 mm	10 N.m - (89 in. lb.)
Input Speed Sensor (73) to Transmission Case Assembly (17)	(72)	1	M6 x 1.0 x 16.00 mm	5 N.m - (44 in. lb.)
Lube Fluid Pipe Retainer (805) to Torque Converter Housing (801)	(806)	1	M6 x 1.0 x 14.00 mm	5 N.m - (44 in. lb.)
Lube Fluid Pipe Retainer (84) to Torque Converter Housing (17)	(83)	1	M6 x 1.0 x 14.50 mm	5 N.m - (44 in. lb.)
Manual Shift Detent Spring (711) to Transmission Case (707)	(712)	1	M6 x 1.0 x 14.00 mm	5 N.m - (44 in. lb.)
Output Speed Sensor (72) to Transmission Case Assembly (17)	(61)	1	M6 x 1.0 x 16.00 mm	5 N.m - (44 in. lb.)
Park/Neutral Position Switch Nut (78) to Manual Shift Detent Lever (710)	(78)	1	M16 x 1.50 mm	7 N.m - (62 in. lb.)
Park/Neutral Position Switch (75) to Transmission Case Assembly (17)	(76)	1	M8 x 1.25 x 22.00 mm	25 N.m - (18 ft. lb.)
Park/Neutral Position Switch (75) to Transmission Case Assembly (17)	(79)	1	M8 x 1.25 x 36.00 mm	25 N.m - (18 ft. lb.)
Park Pawl Actuator Bracket (708) to Transmission Case Assembly (17)	(715)	1	M6 x 1.00 x 16.70 mm	10 N.m - (89 in. lb.)
Park Pawl Bolt/Screw (706) to Transmission Case Assembly (17)	(706)	1	M6 x 1.00 x 25.00 mm	10 N.m - (89 in. lb.)
Torque Converter Housing (10) to Transmission Case Assembly (17)	(3)	2	M8 x 1.25 x 30.00 mm	29 N.m - (21 ft. lb.)
Torque Converter Housing (10) to Transmission Case Assembly (17)	(4)	11	M8 x 1.25 x 30.00 mm	29 N.m - (21 ft. lb.)
Torque Converter Housing (10) to Transmission Case Assembly (17)	(6)	2	M8 x 1.25 x 35.00 mm	29 N.m - (21 ft. lb.)
Torque Converter Housing (10) to Transmission Case Assembly (17)	(7)	1	M8 x 1.25 x 45.00 mm	29 N.m - (21 ft. lb.)
Torque Converter Housing (10) to Transmission Case Assembly (17) - TORX	(8)	1	M8 x 1.25 x 30.00 mm	29 N.m - (21 ft. lb.)
Transmission Case Cover (606) to Transmission Case Assembly (17)	(20)	9	M8 x 1.25 x 30.00 mm	25 N.m - (18 ft. lb.)

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Figure 275

## ***FASTENER TIGHTENING SPECIFICATIONS***

<b>Fastener Description</b>	<b>Ref. (No.)</b>	<b>Qty.</b>	<b>Fastener Dimension</b>	<b>Fastener Specification N.m - (in./ft. lb.)</b>
Transmission Case Cover (606) to Transmission Case Assembly (17)	(21)	2	M8 x 1.25 x 48.00 mm	25 N.m - (18 ft. lb.)
Transmission Case Cover (606) to Transmission Case Assembly (17)	(22)	1	M8 x 1.25 x 45.00 mm	25 N.m - (18 ft. lb.)
Transmission Case Fluid Passage Cover (40) to Transmission Case Assembly (17)	(41)	2	M6 x 1.0 x 14.00 mm	5 N.m - (44 in. lb.)
Transmission Fluid Drain Plug (819) to Torque Converter Housing (801)	(819)	1	M20 x 1.5 x 21.00 mm	39 N.m - (29 ft. lb.)
Transmission Fluid Pressure Port Plug	(66)	9	- - -	7 N.m - (62 in. lb.)
3rd Gear Band Anchor Bolt (64) to Transmission Case Assembly (17)	(64)	1	M20 x 1.5 x 21.00 mm	167 N.m - (123 ft. lb.)
3rd Gear Band Apply Tube Retainer (51) To Transmission Case Assembly (17)	(50)	2	M6 x 1.0 x 14.00 mm	5 N.m - (44 in. lb.)
4-5 Clutch Apply Pipe Retainer (610) to Transmission Case Cover (606)	(611)	4	M5 x 0.8 x 12.00 mm	7 N.m - (62 in. lb.)
Control Valve Body (139) to Transmission Case Assembly (17)	(34)	2	M6 x 1.0 x 16.00 mm	7 N.m - (62 in. lb.)
Control Valve Body (139) to Transmission Case Assembly (17)	(35)	2	M6 x 1.0 x 50.00 mm	7 N.m - (62 in. lb.)
Control Valve Body (139) to Transmission Case Assembly (17)	(47)	2	M6 x 1.0 x 55.00 mm	7 N.m - (62 in. lb.)
Control Solenoid Valve Retainer (111) to Control Valve Body (139)	(110)	1	M5 x 0.8 x 13.00 mm	7 N.m - (62 in. lb.)
Front Control Valve Body (114) to Middle Control Valve Body (121)	(112)	4	M5 x 0.8 x 14.00 mm	7 N.m - (62 in. lb.)
Front Control Valve Body (114) to Middle Control Valve Body (121)	(113)	2	M5 x 0.8 x 16.00 mm	7 N.m - (62 in. lb.)
Front Control Valve Body (114) to No. 2 Rear Control Valve Body (127)	(128)	1	M5 x 0.8 x 76.00 mm	7 N.m - (62 in. lb.)
Front Control Valve Body (114) to No. 2 Rear Control Valve Body (127)	(129)	4	M5 x 0.8 x 49.50 mm	7 N.m - (62 in. lb.)
Rear Control Valve Body (123) Pressure Tap	(334)	1	M6 x 1.0 x 12.00 mm	7 N.m - (62 in. lb.)
Middle Control Valve Body (121) to No. 2 Rear Control Valve Body (127)	(104)	1	M5 x 0.8 x 50.00 mm	7 N.m - (62 in. lb.)
No. 2 Rear Control Valve Body (127) to Front Control Valve Body (114)	(104)	1	M5 x 0.8 x 50.00 mm	7 N.m - (62 in. lb.)
Rear Control Valve Body (123) to Middle Control Valve Body (121)	(130)	1	M5 x 0.8 x 40.00 mm	7 N.m - (62 in. lb.)
Rear Control Valve Body (123) to Middle Control Valve Body (121)	(132)	2	M5 x 0.8 x 35.00 mm	7 N.m - (62 in. lb.)
Rear Valve Body Cover Plate Bolt - Hexagon	(54)	2	M5 x 0.80 x 13.00 mm	7 N.m - (62 in. lb.)
Rear Valve Body Cover Plate Bolt - Hexagon	(75)	7	M5 x 0.80 x 13.00 mm	7 N.m - (62 in. lb.)
Reverse, 1st Shift Solenoid Valve - S1 (109) to Control Valve Body (139)	(102)	1	M5 x 0.8 x 28.00 mm	7 N.m - (62 in. lb.)
2-1, 3-4 Shift Solenoid Valve - S2 (108) to Control Valve Body (139)	(107)	1	M5 x 0.8 x 10.00 mm	7 N.m - (62 in. lb.)
1-2, 2-3, Reverse Shift Solenoid Valve - S3 (100) to Control Valve Body (139)	(101)	1	M5 x 0.8 x 62.00 mm	7 N.m - (62 in. lb.)
3-4, 4-5 Shift Solenoid Valve - S4 (103) to Control Valve Body (139)	(102)	1	M5 x 0.8 x 28.00 mm	7 N.m - (62 in. lb.)

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Figure 276

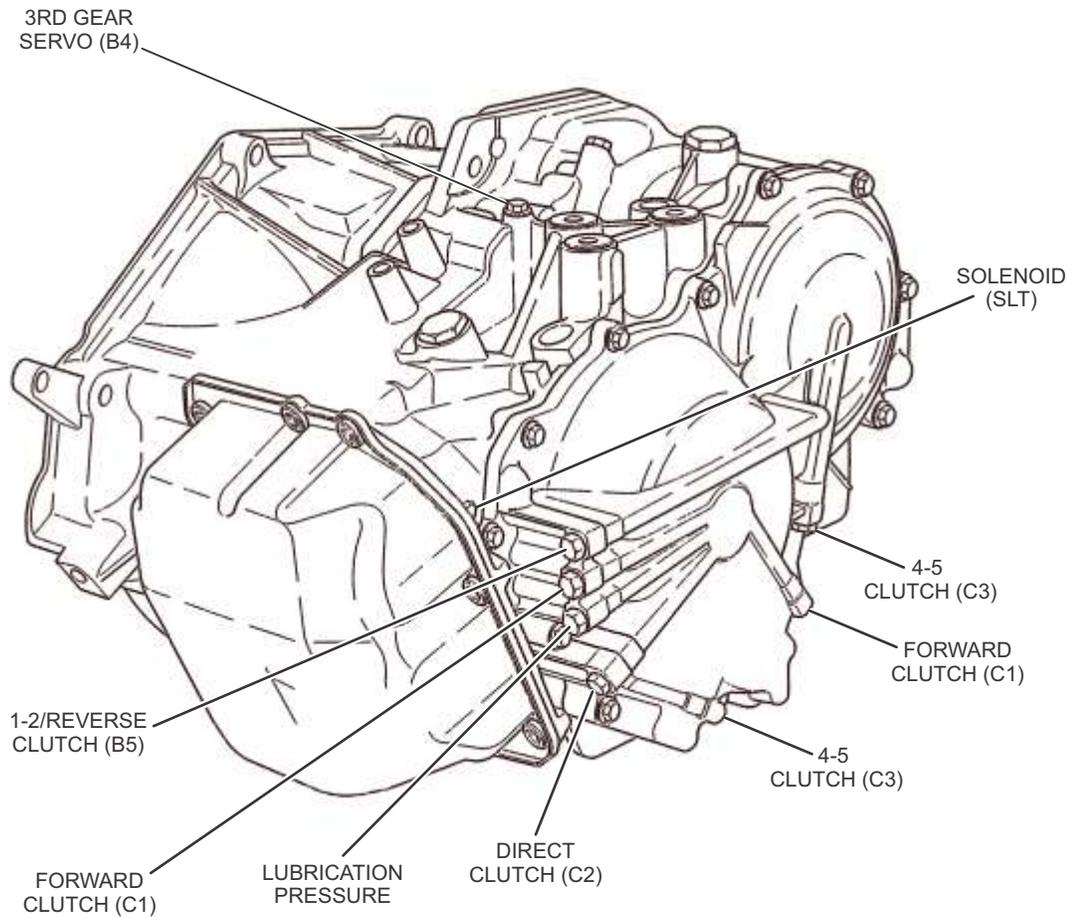
## FASTENER TIGHTENING SPECIFICATIONS

Fastener Description	Ref. (No.)	Qty.	Fastener Dimension	Fastener Specification N.m - (in./ft. lb.)
Reverse Shift Solenoid Valve - S5 (105) to Control Valve Body (139)	(102)	1	M8 x 1.25 x 28.00 mm	25 N.m - (18 ft. lb.)
Lock Up Control Solenoid Valve - SLU (136) to Control Valve Body (139)	(107)	1	M8 x 1.25 x 10.00 mm	25 N.m - (18 ft. lb.)

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Figure 276

## PRESSURE PORT LOCATIONS AND SPECIFICATIONS

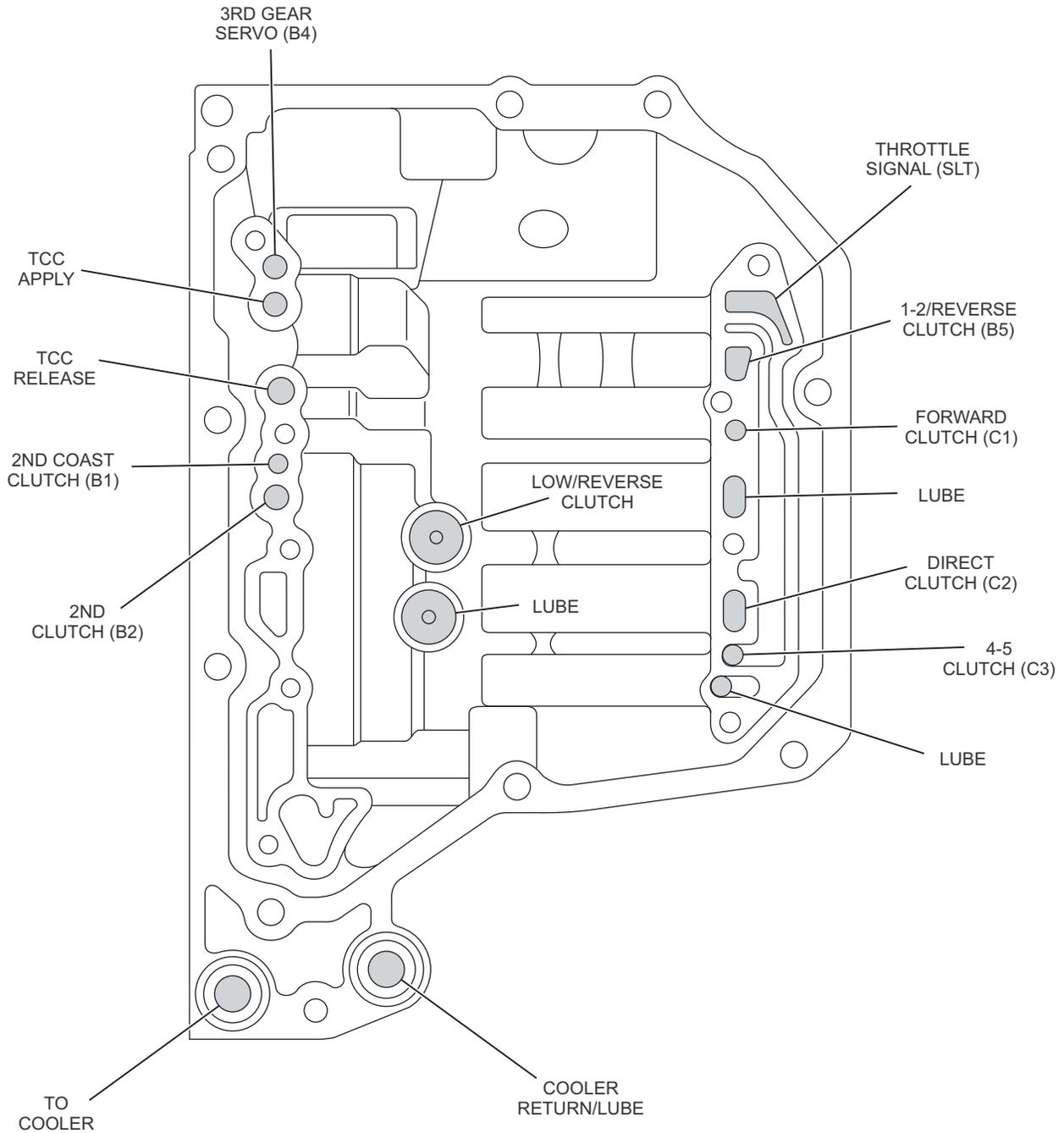


LUBRICATION PRESSURE	SOLENOID (SLT) PRESSURE	C1, C2, C3, B4, B5 PRESSURE
Cold temperature 0 deg. F above 10 psi	Approx. 5 psi idle (no load)	48-57 psi idle Drive Range (no load) 186-202 psi Drive Range WOT (max load)
Operating temp. 150 deg. F approx. 5 psi in D, 8 psi in R.	Approx. 80 psi WOT (max load)	73-89 psi idle Rev. Range (no load) 248-287 psi Rev. Range WOT (max load)

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Figure 277

## CASE PASSAGE IDENTIFICATION AIR PRESSURE TEST PORTS



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Figure 278



# Technical Service Information

## DIAGNOSTIC TROUBLE CODES (DTC'S) VOLVO

<i>P CODES</i>	<i>VOLVO OEM CODES</i>	<i>DIAGNOSTIC TROUBLE CODE (DTC) DESCRIPTION</i>	<i>FAULT DESCRIPTION</i>
P0218	TCM-0046	Oil Temperature	Oil Temperature Too High
P0560 P0561	TCM-009A	Battery Voltage	Voltage Signal Too Low
P0600	TCM-E000	Control Module Communication	Incorrect Communication
P0602 P0614	TCM-0048	Control Module	Defective Software
P0605 P0601	TCM-0049	Control Module	Internal Error. Intermittent Error Internal Error. Permanent Error
P0605 P062F	TCM-0099	Control Module	Internal Error
P0610	TCM-E003	Configuration Error	Incorrect Configuration. Intermittent or Permanent Error
P0702	TCM-0060	Control Module	Internal Error
P0702	TCM-0120	Control Module	Internal Error
P0702	TCM-0121	Control Module	Internal Error
P0702	TCM-0122	Control Module	Internal Error
P0702	TCM-0123	Control Module	Internal Error
P0702	TCM-0124	Control Module	Internal Error
P0705	TCM-0039	Gear Shift Position Sensor	Faulty Signal
P0711	TCM-0045	Oil Temperature Sensor	Faulty Signal
P0712	TCM-0043	Oil Temperature Sensor	Signal Too Low (Temperature Too High)
P0713	TCM-0044	Oil Temperature Sensor	Signal Too High (Temperature Too Low)
P0715	TCM-0087	Transmission Input Speed Sensor	Signal Too High or Short to Power
P0715 P2160	TCM-0089	Transmission Input Speed Sensor	Signal Too High or Short to Ground
P0716	TCM-0024	Transmission Input Speed Sensor	Incorrect Signal. Intermittent or Permanent Error
P0717	TCM-0023	Transmission Input Speed Sensor	Signal Missing. Intermittent or Permanent Error
P0720 P0502	TCM-0081	Vehicle Speed Sensor (VSS)	Signal Too High or Short to Power
P0720 P0503	TCM-0083	Vehicle Speed Sensor (VSS)	Signal Too Low or Short to Ground
P0720 P0501	TCM-0020	Vehicle Speed Sensor (VSS)	Incorrect Signal. Intermittent or Permanent Error
P0720 P0500	TCM-001F	Vehicle Speed Sensor (VSS)	Signal Missing. Intermittent or Permanent Error
P0731	TCM-0028	Gear 1	Incorrect Gear Ratio (First Gear)
P0732	TCM-0029	Gear 2	Incorrect Gear Ratio (Second Gear)

NOTE: CODES IN BOLD TYPE ARE FOR (2002 - LATER) MODELS

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Figure 279



# Technical Service Information

## DIAGNOSTIC TROUBLE CODES (DTC'S) VOLVO

<i>P CODES</i>	<i>VOLVO OEM CODES</i>	<i>DIAGNOSTIC TROUBLE CODE (DTC) DESCRIPTION</i>	<i>FAULT DESCRIPTION</i>
P0733	TCM-002A	Gear 3	Incorrect Gear Ratio (Third Gear)
P0734	TCM-002B	Gear 4	Incorrect Gear Ratio (Fourth Gear)
P0735	TCM-002C	Gear 5	Incorrect Gear Ratio (Fifth Gear)
P0736	TCM-0027	Reverse Gear	Incorrect Gear Ratio (Reverse Gear)
P0740 P0811	TCM-002F	Lock Up Function	Torque Converter Clutch Slipping or "Stuck Off"
P0744	TCM-002E	Lock Up Function	Torque Converter Clutch Registers Repeated Vibration
P0748 P0963	TCM-0016	Line Pressure Solenoid SLT	Signal Too High. Permanent Error
P0749 P0963	TCM-0016	Line Pressure Solenoid SLT	Signal Too High. Intermittent Error
P0750 P0960	TCM-0017	Line Pressure Solenoid SLT	Signal Missing. Permanent Error
P0751 P0960	TCM-0017	Line Pressure Solenoid SLT	Signal Missing. Intermittent Error
P0751	TCM-000B	Shift Solenoid S1	Solenoid Performance "Hydraulic Malfunction"
P0752 P0962	TCM-0118	Line Pressure Solenoid SLT	Signal Too Low (Short to Ground) Permanent Error
P0753 P0974	TCM-0001	Shift Solenoid S1	Signal Too High (Short to Voltage)
P0753	TCM-0002	Shift Solenoid S1	Signal Missing (Resistance Too High or Open Circuit)
P0753 P0973	TCM-0003	Shift Solenoid S1	Signal Too Low (Short to Ground)
P0753 P0962	TCM-0118	Line Pressure Solenoid SLT	Signal Too Low. Intermittent Error
P0756	TCM-000C	Shift Solenoid S2	Solenoid Performance "Hydraulic Malfunction"
P0758 P0977	TCM-0007	Shift Solenoid S2	Signal Too High (Short to Voltage)
P0758	TCM-0008	Shift Solenoid S2	Signal Missing (Resistance Too High or Open Circuit)
P0758	TCM-0009	Shift Solenoid S2	Signal Too Low (Short to Ground)
P0762	TCM-0115	Shift Solenoid S3	Solenoid Performance "Hydraulic Malfunction"
P0758 P0977	TCM-0101	Shift Solenoid S3	Signal Too High (Short to Voltage)
P0763	TCM-0102	Shift Solenoid S3	Signal Missing (Resistance Too High or Open Circuit)
P0753 P0979	TCM-0103	Shift Solenoid S3	Signal Too Low (Short to Ground)

**NOTE: CODES IN BOLD TYPE ARE FOR (2002 - LATER) MODELS**

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Figure 280



# Technical Service Information

## DIAGNOSTIC TROUBLE CODES (DTC'S) VOLVO

<i>P CODES</i>	<i>VOLVO OEM CODES</i>	<i>DIAGNOSTIC TROUBLE CODE (DTC) DESCRIPTION</i>	<i>FAULT DESCRIPTION</i>
P0768 P0983	TCM-0107	Shift Solenoid S4	Signal Too High (Short to Voltage)
P0768	TCM-0108	Shift Solenoid S4	Signal Missing (Resistance Too High or Open Circuit)
P0768 P0982	TCM-0109	Shift Solenoid S4	Signal Too Low (Short to Ground)
P0773 P0986	TCM-010A	Shift Solenoid S5	Signal Too High (Short to Voltage)
P0773	TCM-010B	Shift Solenoid S5	Signal Missing (Resistance Too High or Open Circuit)
P0773 P0985	TCM-010C	Shift Solenoid S5	Signal Too Low (Short to Ground)
P0778 P0967	TCM-010D	Lock Up Solenoid SLU	Signal Too High (Short to Voltage). Intermittent or Permanent Error
P0778 P0964	TCM-010F	Lock Up Solenoid SLU	Signal Missing (Resistance Too High or Open Circuit). Intermittent or Permanent Error
P0778 P0965	TCM-0110	Lock Up Solenoid SLU	Signal Too Low (Short to Ground). Intermittent or Permanent Error
P0785 P0780	TCM-0100	Poor Gear Shifting Quality	Slipping or Missed Shifts
P0798 P0799 P0971	TCM-0112	System Pressure Solenoid SLS	Signal Too High (Short to Voltage). P0798 Intermittent Error, P0799 Permanent Error
P0800 P0801 P0968	TCM-0113	System Pressure Solenoid SLS	Signal Missing (Resistance Too High or Open Circuit). P0800 Intermittent Error, P0801 Permanent Error
P0802 P0803 P0970	TCM-0114	System Pressure Solenoid SLS	Signal Too Low (Short to Ground). P0802 Intermittent Error, P0803 Permanent Error
P0810 P1700 P1516	TCM-012A TCM-012B	Neutral Check	P1700/TCM-012A Incorrect Connection, P1516/TCM-012B No Neutral Check
P0811 P0894	TCM-012C	Neutral Check	Oscillating Engine RPM
P0826	TCM-0096	Quickshift Sensor	Faulty Signal
P0860	TCM-0093	Comm. Control Module Gear Lever	Signal Too High (Short to Voltage)
P0860	TCM-0094	Comm. Control Module Gear Lever	Signal Missing
P0860	TCM-0095	Comm. Control Module Gear Lever	Signal Too Low (Short to Ground)
P0928	TCM-0091	Solenoid P-Position Shift-Lock	Signal Missing
P0930	TCM-0092	Solenoid P-Position Shift-Lock	Signal Too Low (Short to Ground)
P0931	TCM-0090	Solenoid P-Position Shift-Lock	Signal Too High (Short to Voltage)

**NOTE: CODES IN BOLD TYPE ARE FOR (2002 - LATER) MODELS**

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Figure 281



# Technical Service Information

## DIAGNOSTIC TROUBLE CODES (DTC'S) NISSAN

<i>P CODES</i>	<i>DIAGNOSTIC TROUBLE CODE (DTC) DESCRIPTION</i>
P0500	Vehicle Speed Sensor Circuit - Meter
P0613	TCM Processor
P0705	PARK/NEUTRAL Position Switch Sensor Circuit
P0710	Automatic Transmission Fluid Temperature Sensor Circuit (Open or Short Circuit)
P0711	Automatic Transmission Fluid Temperature Sensor Performance (No Signal/Voltage Change)
P0717	Turbine Sensor Circuit
P0722	Vehicle Speed Sensor Circuit - A/T
P0726	Engine Speed Input Signal/Circuit Performance
P0731	A/T First Gear Function (Gear Ratio Error in First)
P0732	A/T Second Gear Function (Gear Ratio Error in Second)
P0733	A/T Third Gear Function (Gear Ratio Error in Third)
P0734	A/T Fourth Gear Function (Gear Ratio Error in Fourth)
P0735	A/T Fifth Gear Function (Gear Ratio Error in Fifth)
P0744	A/T Torque Converter Clutch S/V Function (TCC Performance or Stuck Off)
P0745	Pressure Control Solenoid A (Line Pressure Solenoid SLT Circuit Failure)
P0750	Shift Solenoid A (Solenoid S1 Circuit Failure)
P0755	Shift Solenoid B (Solenoid S2 Circuit Failure)
P0760	Shift Solenoid C (Solenoid S3 Circuit Failure)
P0762	Shift Solenoid C Stuck On (Solenoid S3 Performance)
P0765	Shift Solenoid D (Solenoid S4 Circuit Failure)
P0770	Shift Solenoid E (Solenoid S5 Circuit Failure)
P0775	Pressure Control Solenoid B (Shift Pressure Solenoid SLS Circuit Failure)
P0780	Poor Shift Quality
P0795	Pressure Control Solenoid C (Shift Pressure Solenoid SLU Circuit Failure)
P0797	Pressure Control Solenoid C (Shift Pressure Solenoid SLU Stuck On)
P0826	Manual Mode Switch Circuit (Manual Mode Switch Shorted or Open)
P0882	TCM Power Input Signal
P1726	Electronic Throttle Control System
U1000	CAN Communication Circuit (CAN Communication Line Shorted or Open)

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Figure 282

## ***SPECIAL SERVICE TOOLS (SST) SECTION***

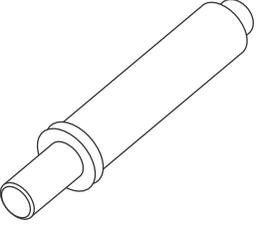
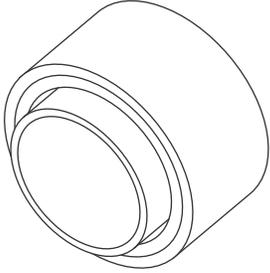
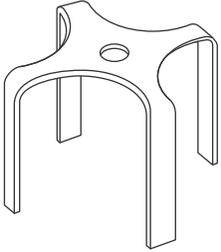
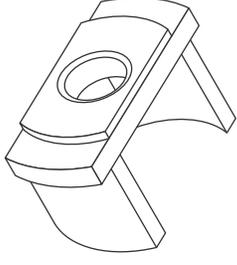
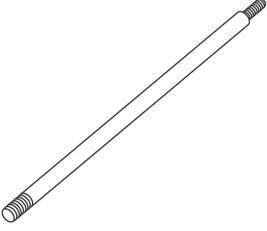
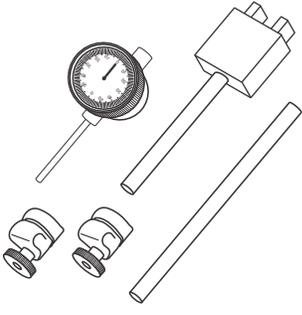
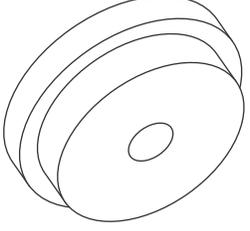
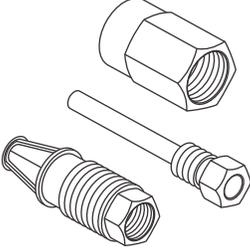
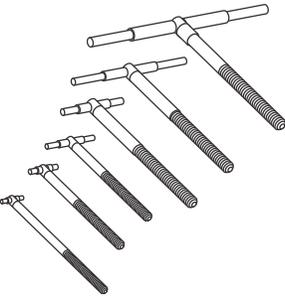
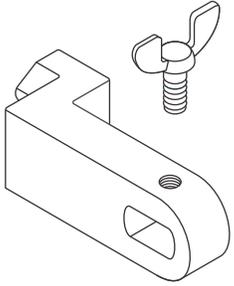
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	<p>J 45164 Spring Compressor Bridge</p>		<p>J 45186 Forward and Direct Clutch Spring Compressor</p>
	<p>J 45166 Dial Indicator Extension Rod - 8 inch"</p>		<p>J 45200 Dial Indicator Set</p>
	<p>J 45184 Differential Bearing Race Installer</p>		<p>J 45201 Cooler Line Seal Remover</p>
	<p>J 45185 Bore Gage Set</p>		<p>J 45404 Transmission Indicator Alignment Tool</p> <p>Copyright © 2011 ATSG</p>

Figure 283

## ***SPECIAL SERVICE TOOLS (SST) SECTION***

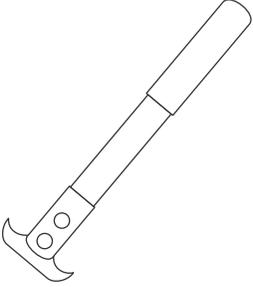
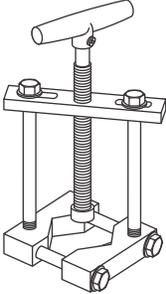
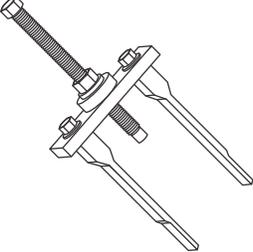
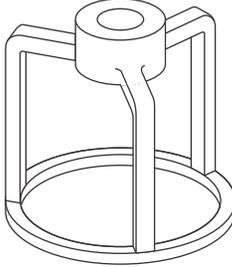
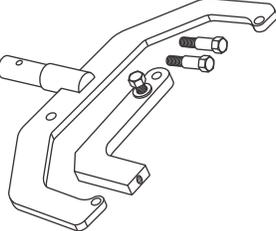
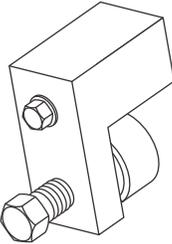
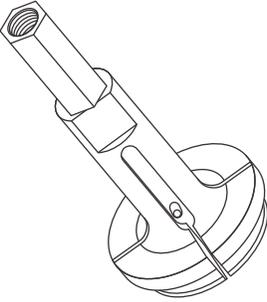
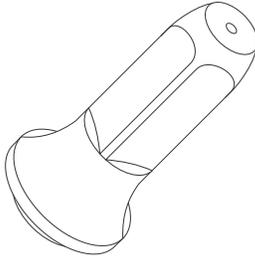
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	<p>J 45053 Universal Clamp Press</p>		<p>J 36850 Trans-jel® Lubricant</p>
	<p>J 45124 Removal Bridge</p>		<p>J 41236 Coast Clutch Spring Compressor</p>
	<p>J 45159 Holding Fixture</p>		<p>J 41239-1A Cooler Line Seal Installer</p>
	<p>J 45160 Differential Bearing Race Remover</p>		<p>J 44809 Output Shaft Seal Installer</p> <p>Copyright © 2011 ATSG</p>

Figure 284

## ***SPECIAL SERVICE TOOLS (SST) SECTION***

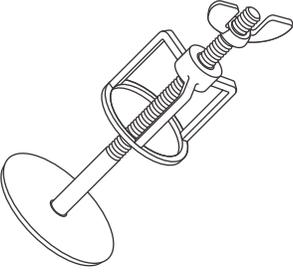
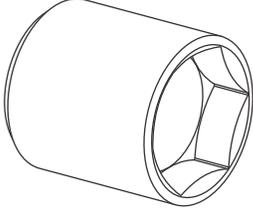
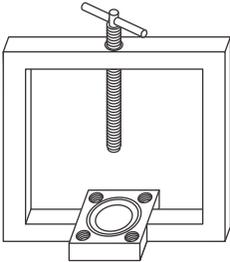
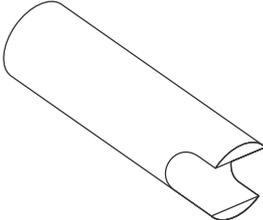
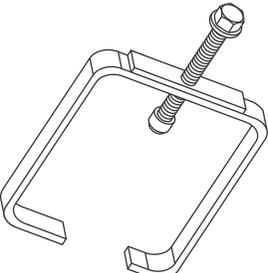
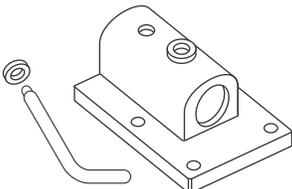
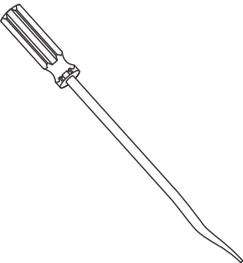
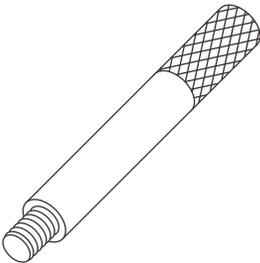
	<p>J 23327 Clutch Spring Compressor</p>		<p>DT 47599 Anchor Bolt Socket</p>
	<p>J 23456 Booster and Clutch Pack Compressor</p>		<p>DT 47687 Rotational Torque Adapter</p>
	<p>J 25024-A Servo Piston/Clutch Spring Compressor</p>		<p>J 3289-20 Holding Fixture</p>
	<p>J 28585 Snap Ring Remover</p>		<p>J 8092 Driver Handle</p> <p>Copyright © 2011 ATSG</p>

Figure 285